Chapter 6 Infrastructure and Facilities

6.1 Restore and Improvement of Facility

6.1.1 Lifelines (Roads, bridges, ports, airports, fish landing places, electricity, water and public buildings)

Directions for the recovery and reconstruction of lifelines are deliberated considering the basic requirements of the lifeline social infrastructures that they have to secure for continuity of operations or to minimize the interruption periods of their operations. At the same time, the pragmatic balance of cost-efficacy is reflected in further deliberation.

As a result the directions described below are derived from the following basic principles:

1) Avoid placement of the structures in disaster high-risk areas as much as possible,
2) Limit structural measures to the minimal,
3) Consider elevated installation of facilities, equipment, storage, and evacuation destinations,
4) Incorporate non-structural measures including evacuation, and
5) Consider associated secondary effects like loss of electricity.

(1) Roads and Bridges

1) Roads

Structures of the major paved roads in the Study Area were basically not affected by Yolanda. There were limited destructions of roads caused by the Tsunami-like storm-surge. Interference by the fallen trees and poles, and debris of broken houses and buildings were observed.

a) Damage Conditions

In the Study Area, among the 96,260m road linking Dolongan, Basey Municipality, Samar Province and Buenavista, Quinapondan Municipality, Eastern Samar Province only 3 sections, 194.0m long in total, had damage on the Portland Cement Concrete Pavement (PCCP) roadway together with their shoulders by the typhoon Yolanda, while total length of 2,507.9m shoulders along the 22 sections were damaged on the same road according to the "Report for Damage on Roads and Bridges in Samar and Leyte by the Super Typhoon Yolanda" by Katahira & Engineers International in January 2014. The 3 roadway-damaged sections are concentrated in eastern vicinities of southernmost Gapinis Point of the peninsula accommodating Marabut Municipality Center.

Among the 23 shoulder-damaged sections 20 damaged sections were on the seashore side, which include 1 section damaged on both sides. Furthermore, 11 sections of ripraps functioning as revetment, which were mostly grouted and 10 of them were seashore side ones, were damaged. Minor landslide is observed at only one section of 6m long.

Most of the seashore side destructions were conjectured to be caused by structure breakdown and scouring by the storm-surge.

In Leyte, among the total 52,550m long road linking Abuyog and Palo, only 1 section stretching for 400m had serious damage on PCCP with Asphalt Concrete (AC) Overlay roadway itself together with is shoulder including 200m sub-section of damaged stone masonry protection wall as stronger revetment work on seashore side. The destruction seems to be caused by the storm surge.

The identical damages/ destructions are observed on the coastal roads in Tacloban City and Palo Municipality.

b) Scouring by Storm-Surge Caused Most of Damages

The above stated destructions caused by the storm-surge were observed in the sections of road facing directly to the sea and the sections with narrow buffer zone beach between the road and the sea. The destructions of direct sea facing cases were conjectured to be brought by sequential causal phenomena of a) revetment breaking by impacts of the Tsunami-like storm-surge, and following b) scouring of roadbed from the break point, while the narrow buffer beach cases involved rather simple scouring of mainly road shoulder.

In relation to the structure of the revetment there might be 3 factors to allow the above scouring phenomena to happen: 1) Insufficient design strength of the revetment, 2) Inadequate construction process to materialize the designed strength, and 3) Degradation over time and/ or by inadequate maintenance. On the other hand exceeding impacting intensity can be the other factor. Retrograding coast caused by erosion might affect the souring of road shoulder/ bed.

c) Interference of Traffic by Fallen Trees and Electricity and Communication Poles, and Debris

Interferences of traffics by trees fallen, fallen electricity and communication poles with their lines, debris of broken houses and buildings by strong winds were common all over the Area especially the zones hardly hit by the storm-surge.

In seashore related cases fortification of seashore is an immediate option while the alignment/ route change is preferable option for sustained resilience of road without extra maintenance efforts.

For the issue of interference of the traffic by the fallen trees and poles, and the debris, it is recommended to secure enough right of way/ side walk zones as buffer between road structure and used lands. Selection of the species for street trees has to be considered with trees characteristics against strong winds and setting of the planting places.

2) Bridges

The damaged of bridges are noticeable although the incidents are marginal comparing to the total number of the bridges.

a) Damage Conditions

On the road stretches from Samar to Eastern Samar, no bridge had serious damage affecting to the bridge structures due to the typhoon Yolanda, while 10 bridges required slope revetment repairs for securing the protections of their abutments.

In Leyte on the same road only 1 bridge of Daguitan Bridge among 25 bridges had serious damages mainly caused by scouring including abutment and pier footings.

Some noticeable serious bridge damage cases were observed on bridges build near to the river mouths.

b) Scouring by the Flowing-in Storm-Surge Water Caused Damages

Major damages of bridges were caused by scouring of bridge pier/ abutment. The scouring of bridge pier/ abutment resulted in bridge girder dislocation with the affected tilting pier/ abutment by high water velocity with or without impacts of flowing objects like fallen trees and rocks. Scouring was exaggerated by the inflow of and returning flow of Tsunami-like storm-surge water in addition to the rainfall water.

The scouring problem is rather common weakness of the bridges in Philippines in association with the vulnerable slope protections.

The serious damages of the tilting bridge pier/ abutment by scouring tends to happen due to inappropriate designs of bridge pier/ abutment for preventing from the occurrence. The shallow footing depth of the bridge pier and insufficient land filling and/ or simple on top pile placement of abutment are major causes of the tilting bridge pier/ abutment by scouring and the consequent bridge girder dislocation.

Basic solution for preventing tilt of bridge pier is installing it with enough depth of footing till scouring is not able to reach.

For the abutment there are two directions for the solution. One is to fix the abutment to its foundation pile. The other is to completely fill the surroundings of abutment and to apply wall protection measures against river flow. Combination of the two measures is preferable in association with employment of river training works for upper and lower river embankments from the bridge.

Source: DPWH

Figure 6.1-1 Interference of Traffic by Fallen Trees and Debris

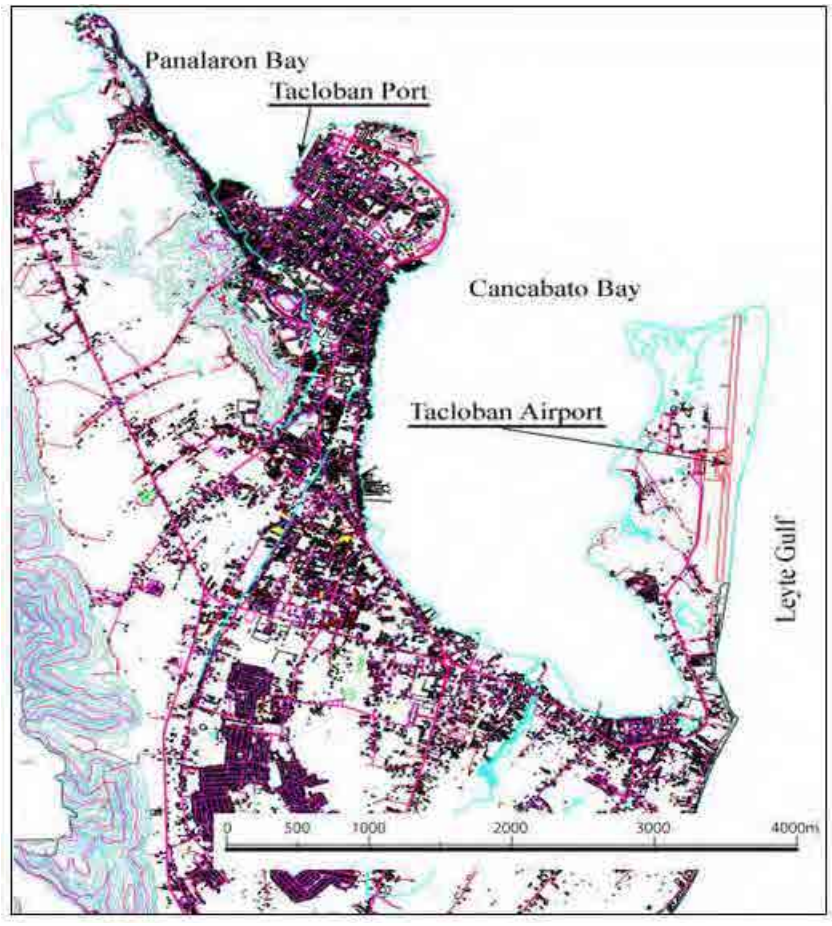
(2) Port and Airport

1) Port

The Tacloban port is located in vicinity of the city center facing the Panalaron Bay, which exists in extension of the Cancabato Bay. The port's shoreline stretches almost south to north behind the Cancabato Bay. The port seemed not directly to face the flow of the storm-surge. Rather it is protected from the direct impact of the Tsunami-like storm-surge by locational advantage (See Figure 6.1-1).

Source: JICA study team

Figure 6.1-2 Tacloban Port



Source:JICA Study Team

Figure 6.1-3 Location Map of Tacloban Port and Airport

Structure of the port itself suffered only minor damage by the Tsunami-like storm-surge partly thanks to its topographical setting as stated above. Most facilities and equipment including vehicles, however, were seriously damaged and/ or washed away.

Although the limited operations resumed on the following day, it took 10 days to resume full scale commercial operations undertaken by the Manila based private company, which operates Manila International Container Terminal. The company brought in a set of cargo handling facilities to the port.

On the other hand its facilities and equipment together with the buildings seemed to lack the appropriate protection measures.

Suggested protection measures for early operation resuming include installation of protection walls for fixed facilities, robust buildings designed with raised or tightly shielded lower levels, and heightened evacuation places for movable equipment.

2) Airport

The Tacloban Airport or Daniel Z. Romualdez (DZR) Airport, which is a Class 1 principal (major domestic) airport by the Civil Aviation Authority of the Philippines, is the main gateway from Manila and Cebu to the Eastern Visayas Region or Region VIII embracing the Study Area. As show in Figure6.1-1. It is located approximately 3 km southeast across the Cancabato Bay from the Tacloban City center on the shallows like peninsula. The buffer zone between the airport's runway stretch and shoreline of the Leyte Gulf is marginal. As of 2013, Daniel Z. Romualdez Airport serves medium-sized passenger aircrafts of 179 seats and accommodates passenger volume of 1.4 million people. It was ranked as the eighth busiest airport of the commercial airports in the Philippines.

The Yolanda disaster left the structures of the runway and taxiways almost no damage by the Tsunami-like storm-surge. Most of buildings, facilities, and equipment including the airport terminal and administration building, crash fire rescue, DVOR/DME (Doppler VHF Omnidirectional Range/ Distance Measuring Equipment,) station, perimeter fences and related equipment, etc. were utterly demolished by strong winds and a 5-meter storm surge that exceeded the shore protection and surged to the above second floor of the five story control tower.

The structure of the airport building especially its second floor and upper was not robust enough to endure with the strong impact brought by the Tsunami-like storm-surge.

The airport reopened to commercial flights November 11, 2013 after the limited use period started on 9th. The radio communication facility of the control tower restored activity with spare parts from another airport, was able to resume information service to aircrafts (arrivals and departures). The VOR ground facilities are being repaired and in use with the electric power supply from the stand-by generator transferred from the Cebu airport as temporarily measure.

Considering the current location of the airport, where is shallows like peninsula facing Leyte Gulf, relocation of the site to higher altitude land is preferable since the protection measure for the entire airport is expected to be very costly.

At the same time relocation of the airport takes long time and huge cost. Prospective measures are

for enhancing resiliencies of essential buildings, facilities, and equipment for safe airport operations to reduce lag time for resuming operations.

The main measure is to construct fortified control tower, which is able to accommodate indispensable equipment and facilities together with generators and fuel on the elevated floor. Construction or designation of the evacuation center (elevated or in highland) for the movable equipment, which are not accommodated in the control tower, is also indispensable.

(3) Fishry/ Community Port and Fish Landing Places

1) Conditions Before the Typhoon Yolanda

In the Study Area two types of facilities exist for accepting caught fishes. First type has capacity to accept open sea commercial fishing boats with mooring structure such as wharf or jetty. Among the only the Tacloban Fish Port is classified as a fish port. They are used as community port by coastal and island people.

The other type is accepting only coastal fishery boat usually canoes with supporting floats without any mooring structure like wharf or jetty. The latter type, which is stated herein as landing place, is equipped with concrete slab and simple structure with roof and working worktable that is called landing center or attached/ adjacent to the sea front public market. See table 6.1-1.

Table 6.1-1 Post Harvesting Infrastructures for Fishing

No.	Municipality / City	Mooring Structure		Landing Place		No.	Municipality/ City	Mooring Structure		Landing Place	
		Nos	Damage	Nos	Damage			Nos	Damage	Nos	Damage
【Leyte】						【Samar】					
1	Tacloban	2	□■	2	■■	10	Basey	1	□		
2	Palo					11	Marabut	1	□	1	■
3	Tanauan			2	■■	【Eastern Samar】					
4	Tolosa			2	■■	12	Lawaan	1	□		
5	Dulag			2	■■	13	Balangiga			1	■
6	Mayorga			1	■	14	Giporlos	1	□		
7	Macarthur			1	□	15	Quinapondan			1	■
8	Javier					16	Salcedo	1	□	1	■
9	Abuyog	1	□			17	Mercedes			1	■
						18	Guiuan	1	□	2	■■

■ Totally Damaged
□ Partially Damaged

Source: BFAR, processed by JICA Study Team

Source:JICA Study Team

There are 9 sites with mooring structures in the Study Area. Among the 9 sites with mooring structures 3 sites in Tacloban, Giporlos, and Guiuan accommodate piers. The remaining 6 sites

have wharf structures using sea revetment except Tacloban Fish Port that uses former port structure.

Total 17 landing places are available for the fisher folk in the Study Area.

Source: JICA study team

Figure 6.1-4 Tacloban Fishry/ Community Port

Source: JICA study team

Figure 6.1-5 Basey Fishry/ Community Port

2) Damage Caused by the Typhoon Yolanda and Factors Involved

Amongst the 3 sites accommodating piers only Guiuan's piers were partially or lightly damaged while other two sites' piers were totally destructed although Giporlos is assessed as partially damaged due to conditions of other land structures as shown in the Table 6.1-1.

Both cases of Tacloban site and Giporlos site structures' strengths were not enough to withstand against impacts of the Tsunami-like storm-surge, which hit directly from the front of the facilities. Reasons for the Guiuan site's relatively light damages is not sure though it is assessed that the impacts of the Tsunami-like storm-surge were not so strong as the other 2 sites due to protective topography or relative lightness of the impacts themselves.

Amongst the sites with wharfs Tacloban site, due to robustness of the structure, and Abuyog site, due to the relatively light impacts on the structure, were lightly damaged. Other sites' wharfs using revetments were partially damaged in various degrees depending mainly on the strengths of the impacts. Main factors for damages on the wharfs are analyzed due to insufficient strengths of the revetments.

All the landing places were totally damaged. There are 2 major factors. One is insufficient strength of the structures, which are regarded not as permanent structure. The other is the severity of the impacts of Tsunami-like storm-surge. The latter cases involved the total damage of the accommodating public markets in Tanauan, Tolosa, Dulag, and Moyorga in Leyte.

3) Directions for Recovery and Reconstruction

For pier reconstructions in Tacloban and Giporlos pursuing enough structural strength is one direction while locational or layout optimization is the alternative or complementing direction. Locational optimization, however, may involve difficulty in land acquisition and in locational advantage for conveniences of users.

Damaged sea revetments used as wharf or for protecting sea front public market have to be restored with reinforcement enough to endure the impacts of Tsunami-like storm-surge. By this the wharfs may improve the functional continuity and the public markets may acquire the easier recovery based on secured foundation protected by revetment.

Structural reconstruction of the landing centers requires deliberation on cost effectiveness since the structures are not regarded as permanent ones that means they are inexpensive.

(4) Electricity, Water Supplies, and Telecommunications

1) Electricity

Electricity supplies to the Study Area is totally dependent on the National Grid operated by National Grid Corporation of the Philippines (NGCP). Supplied electricity from the national grid to the Study Area is distributed to the customers by four local electric cooperatives (ECs) of Don Orestes Romualdez Electric Cooperative (Dorelco or Leyeco I), Leyte II Electric Cooperative (Leyeco II), Samar II Electric Cooperative (Samelco II), and Eastern Samar Electric Cooperative (Esamelco) that are non-profit and public organizations

Due to toppled/ broken transmission towers and poles by the Yolanda's extremely strong winds while distribution to the customers in the Area by the respective cooperatives were hindered by toppled/ broken electric poles by the Tsunami-like storm-surge in addition to the strong winds.

Only one sub-station was seriously damaged by the Tsunami-like storm-surge. Some sub-stations suffered from minor damage by flying objects.

Since the issues within the spatial area of the Study Area is basically limited to the ones relating to the distribution to the customers, analysis focus only on the distribution issues.

Toppling / breaking electric poles were the result of the phenomena that pressure of the winds or the impacts of the storm-surge water surpassed the stiffness of the poles and/ or strength of the pole fixture to the ground. The phenomena involved the factors of strength of the external factor, stiffness levels of the poles, and pole installation methods.

For increasing stiffness, prospective alternative is to use thicker steel poles the current ones and eliminate weaker wooden poles considering the cost effectiveness. Spun concrete pole is extremely solid and maintenance free while it is too expensive and overly exceeding the requirement as a distribution electricity pole. FRC (Fiber-Reinforced Composite) poles are not practical for the ECs in terms of availability and inflexibility in additional processing on-site because holes for fixing attachments have to be arranged by the manufacturer.

The other measure for strengthening the fixture to the ground, pole erection methods have to be improved. Holes for erecting poles must have enough depth and filled properly. Attachment of supporting wires are required depending on the ground conditions and required footing strength.

2) Water Supply

a) Damage to Water Supply Facilities

Water Supplies to Municipal Centers and Urban Areas

Water supply systems vary from barangay based communal tap-stands/ hand-pump levels, household connection system operated for single municipality center, to household connection system covering metropolitan area centered by Tacloban. Among them the household connection systems supplying the municipal centers and the urban areas are discussed here.

These water supply systems are operated by the Water Districts (WD), which are LGU backed and Local Water Utilities Administration (LWUA) approved local corporate entities that operates and maintains a respective water supply system in one or more provincial cities or municipalities, or by the LGUs. Table 6.1-2 shows the water supply entities in the Study Area.

Table 6.1-2 Major Water Supply Entities in the Study Area

No.	Name of Municipality/ City	Water District/ LGU	No.	Name of Municipality/ City	Water District/ LGU
【Leyte】			【Samar】		
1	Tacloban	Leyte Metropolitan	10	Basey	Basey (WD)
2	Palo	Leyte Metropolitan	11	Marabut	Marabut (WD)
3	Tanauan	Leyte Metropolitan			
4	Tolosa	Leyte Metropolitan	【Eastern Samar】		
5	Dulag	Central Leyte	12	Lawaan	Lawaan (WD)
6	Mayorga	Municipal	13	Balangiga	Balangiga (WD)
7	Macarthur	Municipal	14	Giporlos	Municipal
8	Javier	Municipal	15	Quinapondan	Municipal

9	Abuyog	Abuyog (WD)	16	Salcedo	Municipal
			17	Mercedes	Mercedes (WD)
			18	Guiuan	Guiuan (WD)

Source：LWUA (Local Water Utilities Administration) and JICA Study Team

Typical Issues in Water Supply Systems Raised by Typhoon Yolanda

The damages on the water supply systems varied widely in terms of their results embodied in operational interruptions from total halts to partial pauses, and from short time to long time stoppage. The only one system covering Giporlos municipal center is yet to resume its operations due to fund unavailability for restoring the damaged water purification unit and chlorination unit at the end of May.

The water supply cessations were caused by the following typical interferences or damages on facilities and equipment while most of water sources were unaffected except for a few cases of surface water source related problems caused by impairment of water intake or purification facilities

- Disconnection of Commercial Power Lines

  Commercial electricity cut off in the Study Area was a universal problem for pumping water and for treating water. In stand-by generator equipped cases, the electricity cut off problem was not a matter. For the systems without stand-by generators, generator procurement was the means to solve the problem.

- Damages on Water Supply Pipes and Water Meters

  Most water supply pipes in the Study Area don't have the required covering depth and some of them are exposed above the surface of the ground. Conveyance pipes and main distribution pipes connected to the intake weir are laid along the river bank and some of them were lightly or heavily damaged by drifting wood, fallen trees and debris in the flood water flow. The pipes attached to the bridge girder were also damaged by the same natural phenomena in the typhoon.

  Water supply entities that suffered damages on conveyance pipes were MacArthur Municipality, Javier Municipality, and Lawaan WD, while the ones that suffered damages on main distribution and/ or distribution pipes were Leyte Metropolitan WD, MacArthur Municipality, Basey WD, Marabut WD, Lawaan WD, Balangiga WD, Giporos WD, Quinapondan Municipality, and Mercedes WD.

  Since distribution pipes and feeder pipes lye in the road ditches and water meters are exposed above the surface of the ground in the populated area, the water supply facilities are vulnerable to various kinds of disasters such as storm surge, fire, earth quake and so on. The vulnerability was resulted in intentional connection cut by the residents in part of the Leyte Metropolitan WD's service area as well as the damages caused by natural disaster.

 		
Photo-1 Exposure of Feeder Pipes and Water Meters above the Ground	Photo-2 Damaged Distribution Pipe	Photo-3 Over-hanging Distribution Main Pipe

- Damages on Pumping House and Equipment

  Some of the pumping houses lost their roofs due to the strong wind of the Typhoon that were sometimes associated with the wall collapsing. The destruction of the houses resulted in exposure of some equipment inside the houses such as chlorination machines to heavy rain. Due to the exposure in the equipment were impaired

Factors Involved in Damage Occurrences on Physical Systems

Factors involved in the occurrences of the damages on the physical systems are classified in 2 groups of 1) designing factors and 2) construction, and operation and maintenance (O&M) factors as explained below.

- Design Factors

  Inadequate designs of the water supply pipe systems in terms of securing the pipes and ancillary equipment including water meters against external forces, which means shallow covering depth of pipes laid underground, direct ground laying of pipes without sand foundation, inappropriate or lack of protection measures for exposed pipes laid on ground surface or bridge girder, alignment/ route planning without hazardous risk consideration, and so on.

  Inadequate design of the structure of the pump house and other facility accommodating structures in terms of robustness often caused by miss-assignment of design criteria such as building code.

  Adoption of inferior quality/ durability/ robustness pipes or construction materials for structures.

- Construction and O&M Factors

  Improper construction processes in pipe laying or structure building, which avoids/ defies some important processes including application of sand foundation for pipe laying, insufficient structure joints, and improper roofing material installation.

  Neglect of necessities in replacing aged/ deteriorated system facilities and equipment including pipes.

b) Recovery and Reconstruction Direction for the Water Supply Systems

Directions for the Disaster Resilience

Technical measures for improved resilience contributing to continuity of water supply in the situation illustrated above are basically two-fold. One is securing electricity supply for the pumping and treatment operations. The other is protection of essential equipment and facilities including pumps, treatment facilities, and generators, surface water intake and purification facilities, and pipe systems.

Installation of stand-by generator with enough fuel to cover the cut off period is indispensable considering inevitable commercial electricity cut off for certain period. Structural measures have to be taken for protecting equipment and facilities such as solid shelters for pumps and generators, entrenchment of intake facilities and pipes, construction of flood protection structures, and so on.

The structural measures include:

- Replacement of the surface laid pipes by underground installation pipes or by robust/ durable pipes such as PE (polyethylene) pipe/ ductile cast iron pipe, or application of protection measures on the surface laid pipes made of uPVC for external physical force resilience,
- Application of protection measures on the bridge girder laid pipes or adoption of robust/ durable pipes for external physical force resilience,
- Increasing depth of shallow underground laid pipes to covering depth of 1.2m under the roads and 0.6m under the sidewalks at least with application of sand bed if necessary, and
- Re-installation of water meters from above ground to underground for external physical force resilience.

For preventing the intentional house connect cuttings, preliminary and automatic arrangement to materialize free of charge supply to the severely affected families in case of disaster is preferable as well as continuous ethical awareness raising activities that the act results in extra cost and burden to the society they belong. Physical measures of re-installation of feeder and connection pipes with water meters in underground is alternative although this takes time and cost. The soft measure approach stated above must be taken at least for a while.

Further Improvement of the Systems

In addition to the recovery and reconstruction directions following issues and measures are identified by the site investigation.

- Necessity in Installation of Treatment Facilities into the Water Supply System

  There are several water supply systems using surface water or shallow well do not equipped with proper water treatment system or chlorination system at the intake site. Since the water treatment facilities are indispensable for these water supply systems, installation of the

treatment facilities are desirable. The installation is also recommended for the systems rely on deep wells for the preferable water quality.

- Requirement in Increasing Water Volume and Water Pressure

  Water losses caused by the leakage due to the deteriorated pipes are serious as the non-revenue rate of more than 50%. In conjunction with the losses increase in service coverage/ households resulted in insufficient water volumes from their water sources.

Replacement of current deteriorated pipes and increasing water source volume are two major solutions for the problem of low water pressure. It is recommended to apply durable pipes for alteration and to adopt population increase prediction and appropriate unit water consumption volume into the system development planning.

3) Telecommunications

The people in the Study Area faced the complete breakdown of telecommunications. Landline and cellphone systems were both entirely collapsed due to the Toppling / breaking communication poles and electricity cut off. In case of cellphone system cable connections among cell sites were slashed off in association of the damage of the site facilities.

Not only the local residents but also key governmental offices including visited Secretaries lost communications with outside the areas at least for a while.

The landline system was totally not functioning mainly as the same reason as the electricity supply case.

Provisional and limited accesses by cellphone systems in conjunction with satellite systems, which included data transmission, were provided to the key governmental offices and immediate relief teams on the following day. A day after and the following the local residents were getting acquired the free call stations using the same system. Restoration of cell site networks followed with generator operations under sustained public electricity unavailability.

Installation of the stand-by satellite telecommunication systems, which provide redundancy to secure the communication access to the outside, at the region level is strongly recommended for disaster emergency situations. One satellite system at the strategic central agency' s branch office and the other system at the Provincial Government Office of Tacloban as the hosting provincial government of the region center are the prospective candidate places.

Entrenched housing for the cell sites with stand-by generator and appropriate stocks of fuel is necessary for continued functioning. Underground cable connections among the cell sites together with the stand-by satellite system are preferable.

For the landline system, same measure as the electricity distribution is applicable.

(5) Public Buildings

1) Expected Functions

When a disaster occur the branch offices of the central government agencies mostly located in Palo Municipality and the local government offices in each LGU have to play a central role in preparatory, emergency responses to the incidents brought by the disaster, and relief and recovery activities toward and against the sufferers and damages respectively. They have to keep functioning during a disaster happening and the post disaster period.

Medical facilities, which include the Regional Hospital and the District Hospital in addition to Rural Health Units (RHUs) and Barangay Health Stations (BHSs), have also to be major actors in relief activities after the disaster. School buildings of mainly elementary schools tend to be used as evacuation shelters for surrounding people.

The above stated buildings are required to endure the severe disaster impacts to sustain and to continue the expected functions of the public administration and services for the disaster risk reduction and management, emergency responses and reliefs, and recovery and reconstruction.

2) Damage Caused by the Typhoon Yolanda and Factors Involved

The Typhoon Yolanda, however, heavily damaged many of the buildings mainly by the extremely strong winds and specific areas' ones by the Tsunami-like storm-surge.

The damages by the winds stretch from a) broken windows with minor failure of exterior, b) roofing material blown off, c) partial and entire roof blown off, d) roofing structure blown off associating with/ without partial building structure collapsing including second floor total destruction, to e) total destruction.

The causes of the damage results are basically dependent on the two factors of: 1) Strength of the external force i.e. wind velocities, and 2) Strength of the building itself.

The prior factor includes a) Distance from the center of the typhoon, b) Direction of the winds, c) Topographical conditions, d) Surrounding wind breaking bodies, e) duration of the higher velocity winds, and so on.

The latter factor depends on various reasons such as: a) Aging, b) Inappropriate or outdated design, c) Inappropriate selection of materials, and d) Improper process of construction. Improper process of construction may include unsuitable roofing material fixing and dishonest use of building materials.

The case of the storm-surge water pressure the main cause was the external force for destruction. Although the composition of the damage factors is identical with the winds case, the water pressures impacted on the buildings are conjectured beyond the range of the expectation. In addition surged water flow from coast to inland and its withdrawal flow submerged, damaged, and/ or washed away the interior facilities, equipment, and materials inside the buildings, which

include computers with their peripherals, other electronics equipment, teaching materials, and medical supplies.

Heavy rains hit severely inside the buildings without their roofs entirely/ partly and caused the dysfunctions of equipment, facilities and materials inside similarly to the storm-surge case.

Many of Municipality/ City public building structures were not satisfied the building standard in the Philippines due to variety of reasons. Among them the use of existing spacy buildings, which retain unsatisfactory robustness due to their aging, designs, and/ or construction processes/ materials.

Reconstruction and repairing works of the buildings have to materialize the buildings with enough robustness for the safe accommodation mentioned above. Considering the factors involved for serious damages of the buildings, following are the key factors for the buildings: a) Choosing appropriate design criterion necessary for a building to withstand against the external forces brought by the typhoon Yolanda, and b) Ensuring proper execution of the construction processes.

In case the location of the building inevitably falls in the area prone to storm-surges, design must incorporate considerations for the safety accommodations on the second floor or the enough elevated spaces.

Installation of a sand-by generator with enough fuel in the safe accommodation place inside the building is indispensable for the continuous operations.

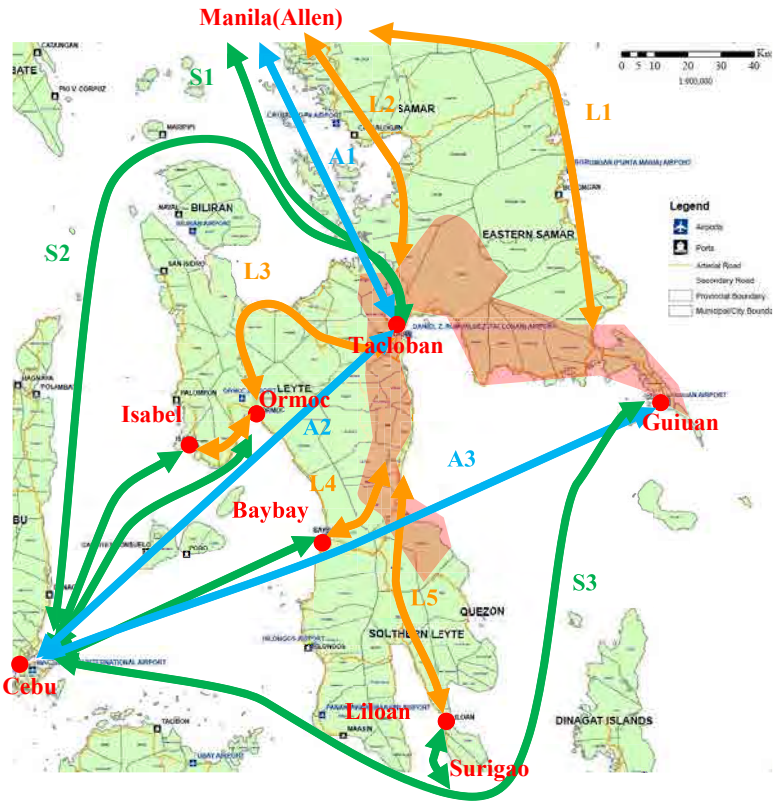
6.1.2 Transportation Network Securing Mobility at Crisis

The transport network at disaster is an indispensable social infrastructure which is used for transporting of the following: material and equipment for lifesaving; relief goods for victims; material and equipment for emergency recovery of other infrastructure. The network must be tough lest a disaster don't cut off the network. If a disaster cut off a part of the network, it is necessary that it will be recovered immediately or that there is an alternative route.

(1) Wide Area Transport Network

There are ports and airports as a transport hub which connects between study area and other area in Tacloban and Guiuan. Figure 6.1-6 shows Main routes between study area and other area. They have the most routes with Cebu which is in near distance and is connected closely as economical relationship.

Land route (the direction of Manila)	
L1	Allen- Borongan- Guiuan
L2	Allen- Catbalogan- Tacloban
Land route (the direction of Cebu)	
L3	Isabel- Ormoc- Tacloban
L4	Baybay- Tacloban
Land route (the direction of Davao)	
L5	Liloan- Tacloban
Sea route	
S1	Manila- Tacloban
S2	Cebu- Tacloban
S3	Cebu- Guiuan
Air route	
A1	Manila- Tacloban
A2	Cebu- Tacloban
A3	Cebu- Guiuan



Source: JICA study team

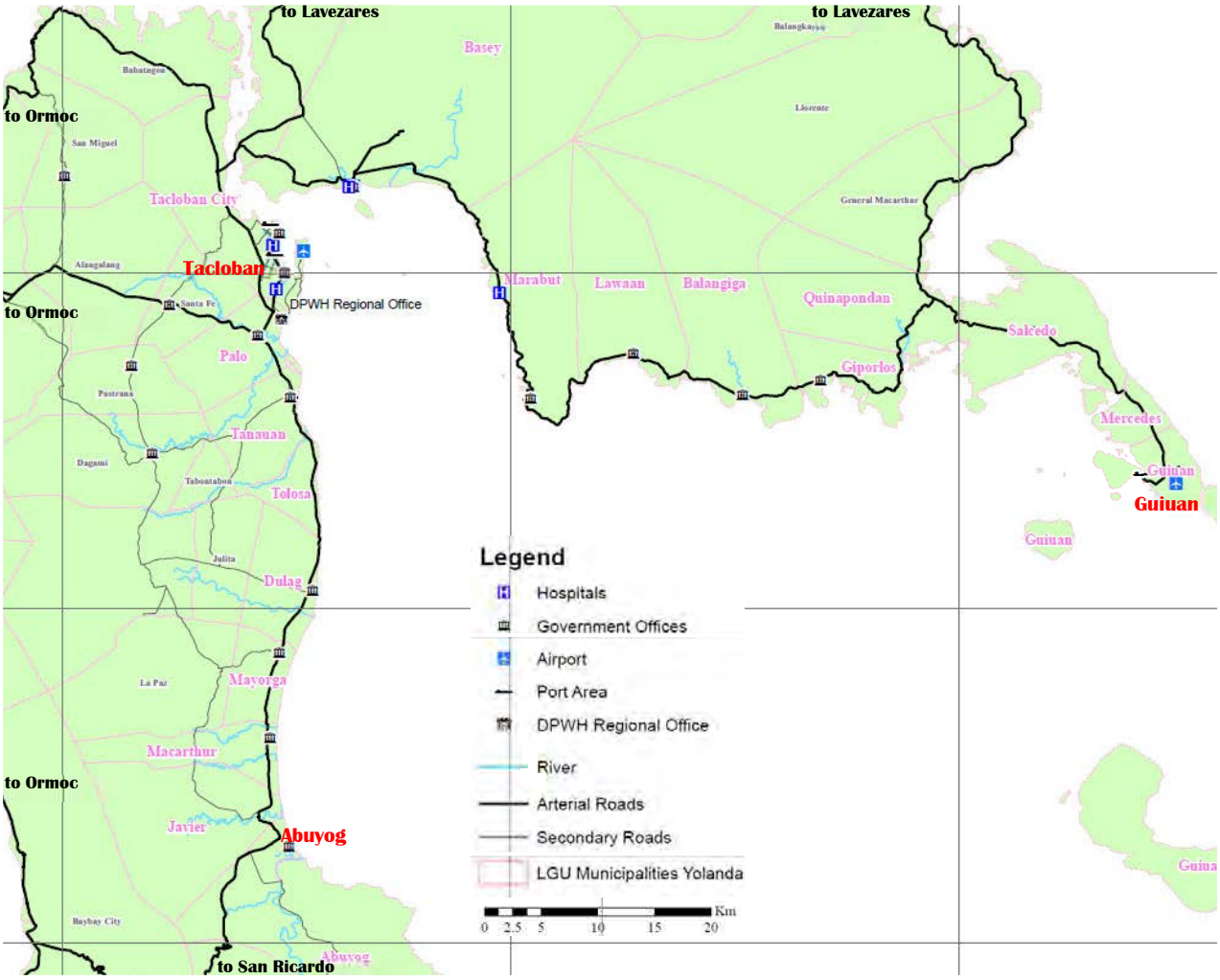
Figure 6.1-6 Wide Area Transport Network

(2) Existing of Transport Network in Study Area

The transportation network in the study area composied of roads, a port and an airport.

The roads network which DPWH administers as national road, are classified as "Arterial road" and "Secondary road" in the study area. The national road is two lane highway, except a four-lane ring road in front of Tacloban city hall..

Tacloban and Guiuan are connected by an arterial road, and there is no alternative road. Tacloban and Abuyog are connected by an arterial road and secondary road.



Source: JICA study team

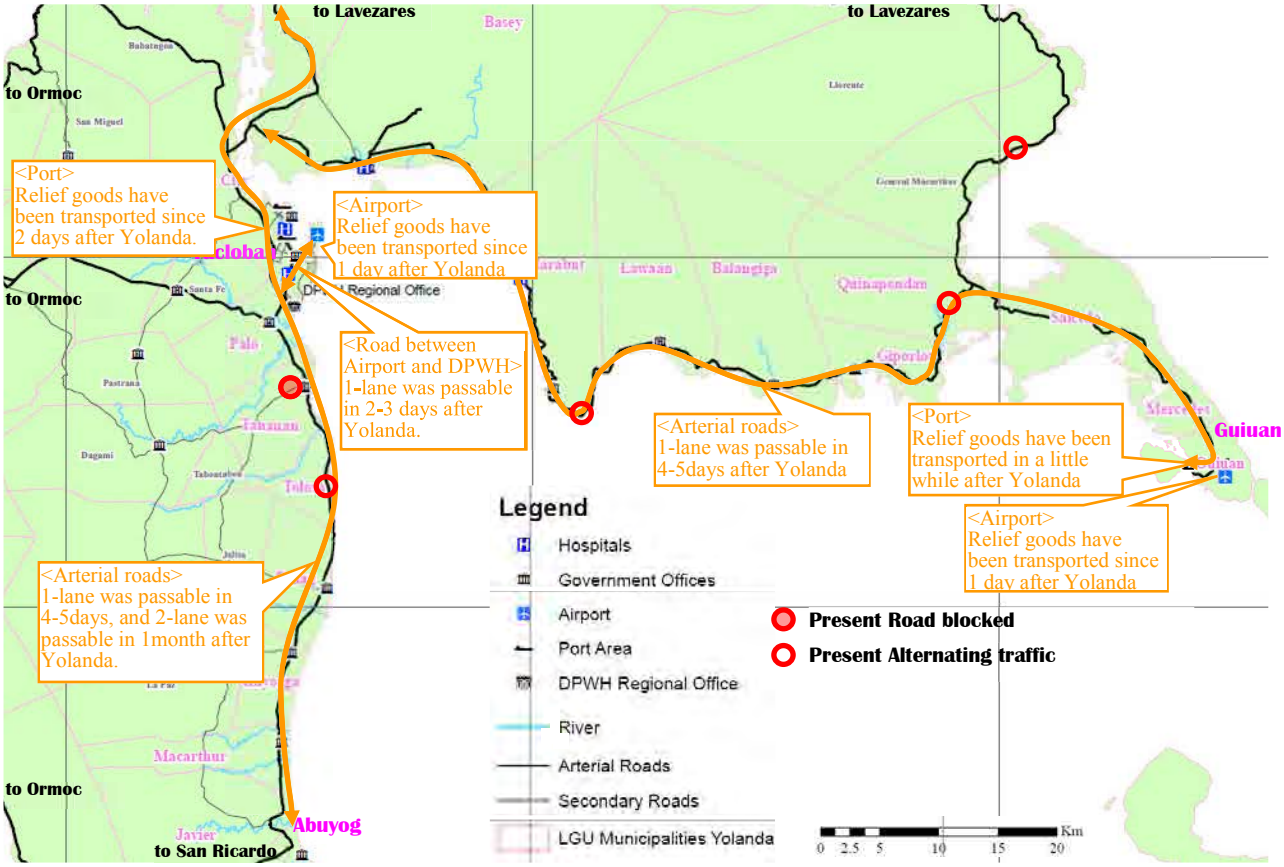
Figure 6.1-7 Transport Network in Study Area

(3) Damage to the Transport Network

After typhoon Yolanda, transportation network was not function by several reasons. The most serious damages is stormsurge leavet he many debris and fallen trees and electrictyand communication pole on the surface of the road.

DPWH is responsible for clearing debris in the national roads on the surface. The policy of road cleaning in DPWH is to make 1-lane be passable between DPWH and the airport as a first priority and it completed within 2-3days after Yolanda. The second priority was to make 1-lane be passable on other arterial roads. It was completed in 4-5days after Yolanda.

2-lanes were passable on the arterial road after one month. All debris on the arterial roads was removed after 3 months.



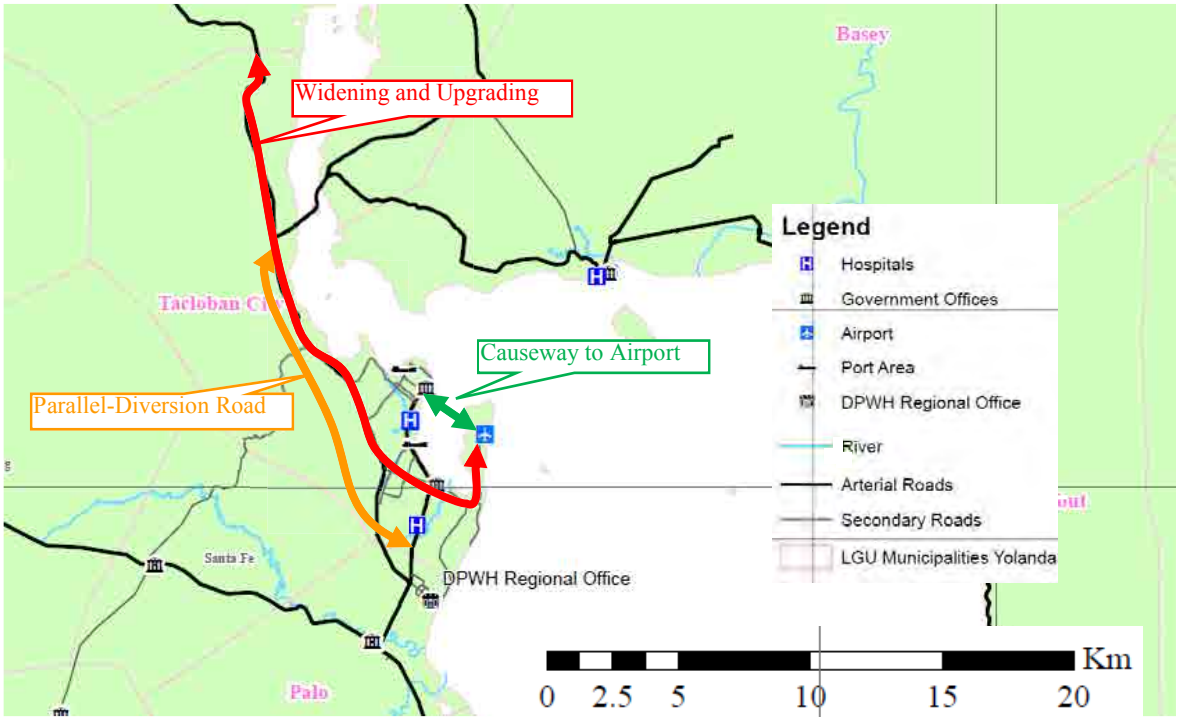
Source: JICA study team

Figure 6.1-8 The obstacles to the transportation network after Yolanda

(4) Present Transportation Network Plan

According to the trunk road plan of DPWH and each LGU, there are only rehabilitation plans for the existing roads in DPWH. Tacloban city has a plan for a bypass road and widening of a road, other LGUs have road plans in the city related to residential development. Figure 6.1-9 shows the transport network plan in Tacloban city. In this plan, the center part of Parallel-Diversion Road was approved by DPWH and is scheduled to be developed.

The port and the airport in Tacloban basically have repair plans for the buildings and a strengthening plan with a disaster prevention function. Especially, the yard in Tacloban port is to be extended by constructing a wharf in the sea.



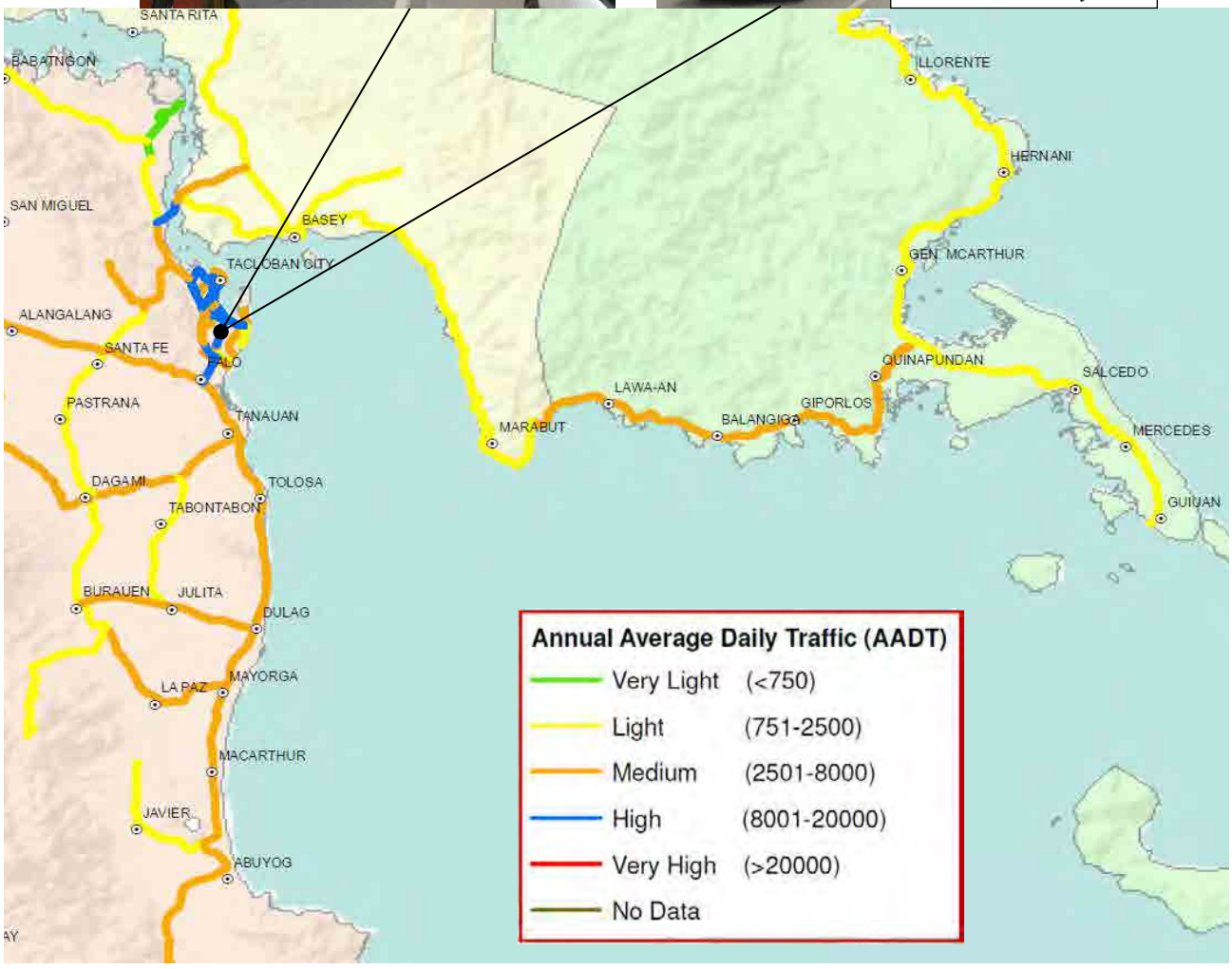
Source: JICA study team based on Tacloban Recovery and Rehabilitation Plan

Figure 6.1-9 Present transportation network plan

(5) Present of Road Traffic

Average Daily road traffic near Tacloban and Palo are the highest at 8,000～20,000veh/day. There is traffic congestion in a city area of Tacloban at peak hours because of traffic concentration. According to PepsiCo, Inc. in Tanauan, they have difficulties in their punctual distribution due to traffic congestion.

Source: JICA study team



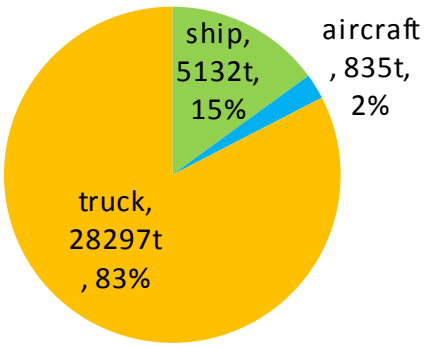
Source: Home Page of DPWH

Figure 6.1-10 Traffic congestion in Tacloban

(6) Volume and Flow of Relief Goods

After Yolanda, many donor organizations transported relief goods from outside to damaged areas by means of multi-transport. WFP which transported much relief goods to the study area was based in Cebu. All relief goods was transported from Cebu to Tacloban at first. Immediately after Yolanda, aircrafts transported a lot of relief goods. Later, the means was shifted to ships and trucks.

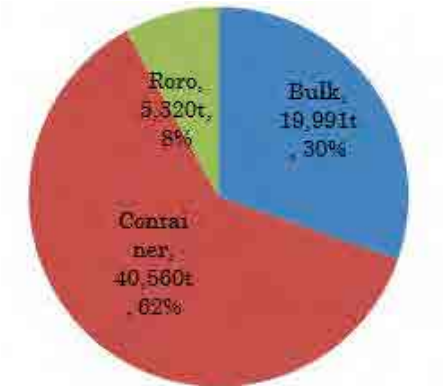
Figure 6.1-11 shows the volume and ratio of the transport means. According to the result, Trucks transported over 80% of the relief goods.



Source: JICA study team based on OCHA data

Figure 6.1-11 Means of Transport of relief goods（8 Nov 2013 - 14 May 2014.）

Figure 6.1-12 shows the weight of the landing relief goods per each style of packing at Tacloban port from 10 Nov 2013 to 29 Mar 2014. The ratio of container was the highest 62%.

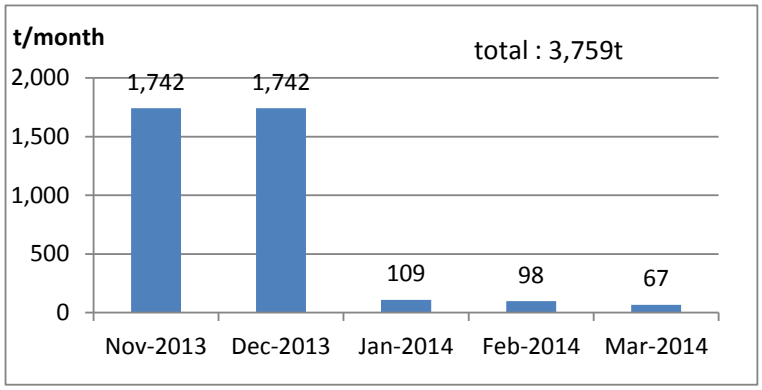


Roro was assumed as 20t/vehicle
Container was assumed as 20t/TEU

Source: JICA study team based on Port data

Figure 6.1-12 Weight of the landing relief goods per each style of packing at Tacloban port（10 Nov 2013 - 29 Mar 2014）

Figure 6.1-13 shows monthly weight of the landing relief goods at Tacloban Airport. The total value from 9 November 2013 to 31 March is 3,759t. The value of transport is decresing in this year.

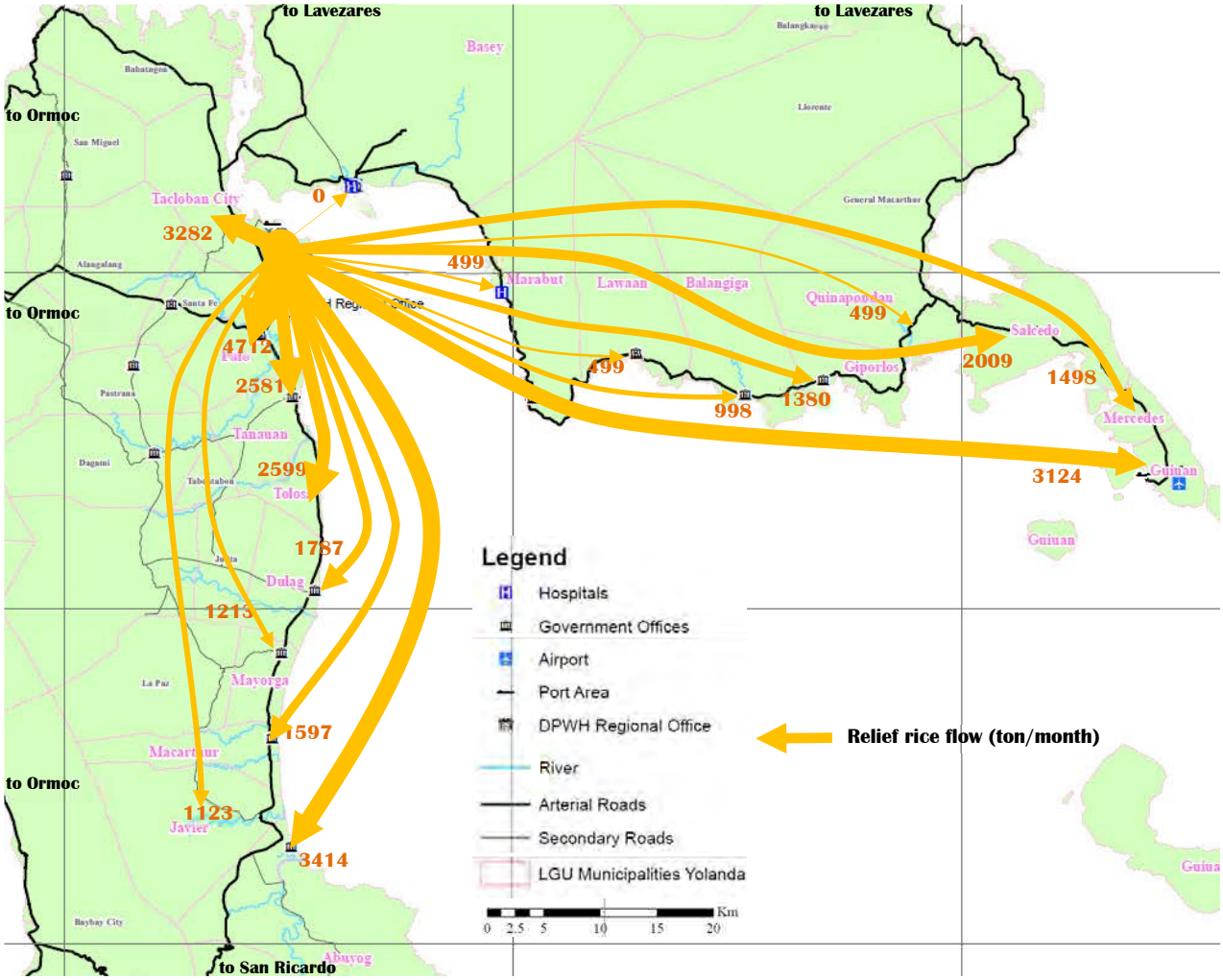


Because there was only value that added up quantity of November and quantity of December, the values of both month were assumed as the same.

Source: JICA study team based on Airport data

Figure 6.1-13 Monthly weight of the landing relief goods at Tacloban Airport

For the most part, all relief goods from UNICEF and other donor organizations was transported to a distribution center of DSWD in Tacloban at first. DSWD distributed the goods from the center to each LGU by trucks. Figure 6.1-14 shows the flow of rice as typical relief goods on December 2013.



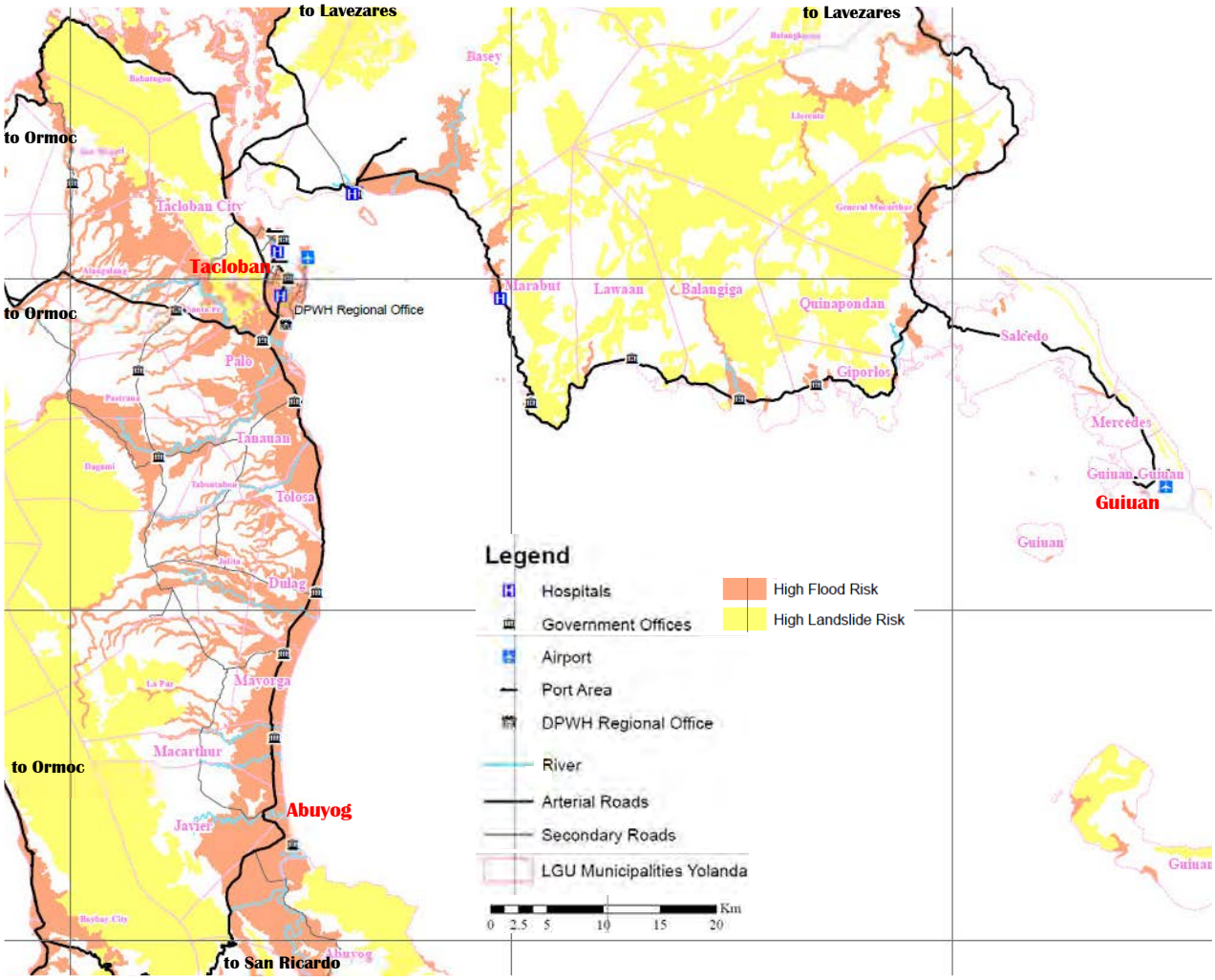
Source: JICA study team based on DSWD data

Figure 6.1-14 Flow of Relief goods on December 2013 (Rice)

(7) Hazard on Transport Network

Figure 6.1-15 shows positional relation between high risk area of flood or landslide and transport network. For the most part, the arterial roads between Tacloban and Abuyog pass through high risk area of flood. Because logistics has a high risk to be cut off for flood, these section is critical for logistics.On the other hand, secondary roads which are located inland don't pass through high risk area of flood so much.

In Samar Island, the arterial roads pass through high risk area of flood in south area of Basey, and pass through high risk area of landslide in southern extremity of Marabut.



Source: JICA study team

Figure 6.1-15 Hazard Area and Transport Network

(8) Issues in Transport Network

The sharing ratio of truck was over 80% of the relief goods transport from outside to damaged area. The most part of the relief goods in the damaged area was also transported by using the road.

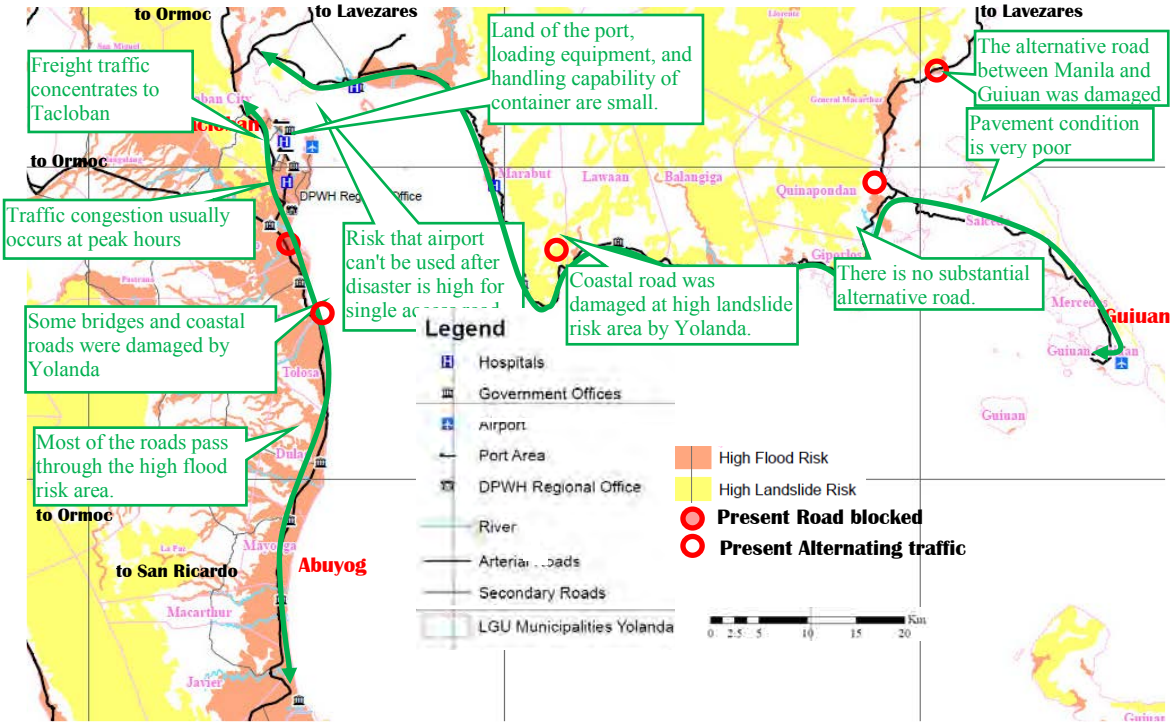
Because fortunately there were almost never damages on the road by Yolanda, the most part of roads was able to be used after short term of disaster. Because similarly there were almost never damages in the structures at the port and airport, these were be able to be used soon. Although on the whole the emergency logistics worked relatively well, some shops were plundered for the shortage of the relief goods.

When the next huge disaster strikes this area, the serious situation might occur on emergency logistics, and the more secondary damage might occur.

Because the economic development of the damaged area is delayed, some improvements on the

transport network are also needed.

The figure below shows the issues in the transport network.



Source: JICA study team

Figure 6.1-16 Issues in the transport network

Table 6.1-3 Issues in the transport network

Places	Issues	Assignments
Roads between Tacloban and Abuyog	Most of the roads pass through the high flood risk area.	Ensuring a low risk route
	Some bridges and coastal roads were damaged by Yolanda	Strengthening of disaster prevention function
Roads in the city area of Tacloban	Traffic congestion usually occurs at peak hours due to traffic concentration and frequent stopping on the road. This is an obstacle to developing the local economies.	Solving of traffic congestion at usual peak hours
	Freight traffic concentrates in Tacloban, because most relief goods pass through the distribution center in Tacloban.	Constructing a road network that can handle concentrated traffic
Tacloban Airport	Risk that the airport can't be used after a disaster is high, because the airport and arterial road are connected by a single access road.	Ensuring an access route between the airport and arterial road
Tacloban Port	Land at the port, loading equipment, and handling capability of containers are small. So, the possibility of increasing road traffic instead of marine transportation is high.	Expansion of capability of handling containers at the port
Road between Tacloban and Guiuan	There is no substantial alternative road.	Ensuring an alternative road
	The coastal road was damaged and is in a high landslide risk area.	Strengthening of the disaster prevention function
	Pavement condition is very poor near Guiuan	Rehabilitation of the pavement
Road between Guiuan and Lavezares	The alternative road between Lavezares (Manila) and Guiuan was damaged by Yolanda.	Strengthening of the disaster prevention function
—	The heavy equipment for road cleaning was damaged.	Prevention of damage of the heavy equipment by disaster

Source: JICA study team

(9) Stock Storage for Emergency Response

1) State of stock storage for emergency response

a) Usual stock storage of LGU

Most of the LGU had no food stocks for emergency due to lack of finance. So, they had no warehouse for the stock either.

b) Stock of relief goods at LGU after Yolanda

Yolanda blew off many roofs of public buildings, for example the municipality office, school and gymnasium. So, they stocked the relief goods which were transported by DSWD in the public buildings that were available for use.

Mayorga municipality office

Tanauan municipality office

Source: JICA Study Team

Figure 6.1-17 Stock of relief goods at LGU after Yolanda

In Tanauan until the end of last November, DSWD transported relief goods to the municipality office at the appointed time that the municipality had previously informed each barangay. To get the goods, each barangay came to the municipality office at the informed time. Since last December they changed the system to transporting goods directly to the evacuation center in each barangay. They didn't need much stock space this way.

Because some LGU thought out saving of stock space as stated above, they had no issue. But some LGU had issues with the risk of burglary of stock in temporary tents, and other LGU had issues on lack of manpower and vehicles to distribute the goods.

c) Building plan for stock storage at LGU

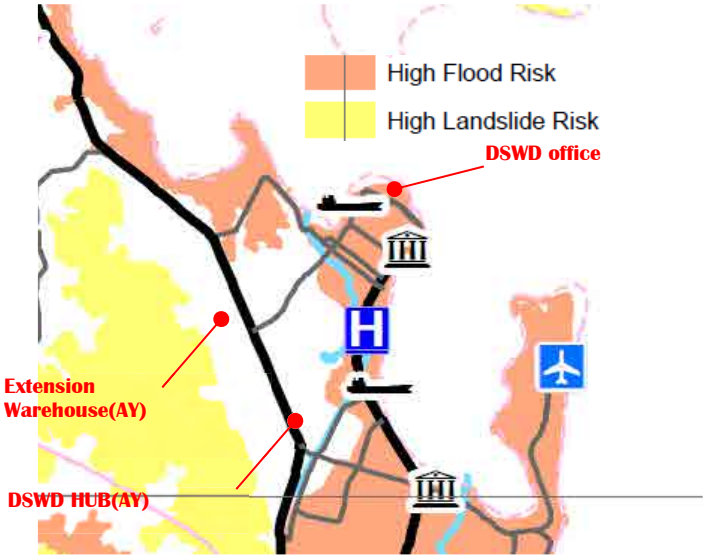
Most of public buildings which were damaged will be repaired or reconstructed by international grants.

Source: Typhoon Yolanda Rehabilitation and Recovery Plan /Province of Leyte

Figure 6.1-18 Regional Government Center and Evacuation Center (Palo)

These buildings will be used as stock storage space for disaster. Specially, large scale evacuation centers are planned at Tacloban and Palo.

DSWD stored 1000 sets of emergency family food packs in the warehouse located in the Tacloban office site. The packs consisted of 6kg of rice, 5 canned foods, 5 packs of instant noodles, 5 packs of coffee, and 1 pack of powdered milk. But Yolanda damaged this warehouse, too.



AY : after Yolanda

Source: JICA Study Team

Figure 6.1-19 DSWD Related Facilities

d) Handling of relief goods at DSWD after Yolanda

DSWD have used the DSWD HUB as a warehouse for storage and as a distribution center beginning 5 days after Yolanda. The coverage area of the distribution center is all the affected areas in region 8. Many international assistance organizations like WFP have been located in the same site. They rented this site temporarily from Citi Hardware which was a retail warehouse and outlet shop. First, they accept goods in the DSWD HUB in Tacloban. Next, they distribute the goods to the LGU. In addition to this, they have an extension warehouse near DSWD HUB and a warehouse in Guiuan.

To make up for the lack of goods immediately after Yolanda, they bought rice in Manila and

transported it to Tacloban. They have distributed relief goods to victims in Tacloban beginning 2 days after Yolanda. The latest distribution was 7 days after Yolanda.

DSWD HUB (Citi Hardware)

Extension warehouse near the DSWD HUB

Source: JICA Study Team

Figure 6.1-20 DSWD Warehouse f for relief goods after Yolanda

e) Handling of relief goods at WFP after Yolanda

WFP uses Cebu as a logistics terminal. They transport all the goods from Cebu to Tacloban.
At first, WFP transported relief goods beginning 5 days after Yolanda by an air force plane.
They asked DSWD to transport the goods from Tacloban to each municipality.
They temporarily provided big trucks with drivers for delivery to DSWD. The maximum loading capacity of the truck was 10 ton, and the number of trucks was 32 at maximum.
The issue in WFP was the delay of customs procedures immediately after Yolanda. In spite of it being emergency relief goods, it was handled the same as usual freight.
There was a lack of delivery vehicles and fuel for delivery vehicle. They provided temporary tents to DSWD and the municipalities for relief goods storage.

2) Issues on stock storage for emergency response

The table below shows the issues and assignments on stock storage for emergency response in each organization.

Table 6.1-4 Issues on stock storage for emergency response

Classification	Issues	Assignments
LGU	Public buildings which were expected as stock storage were damaged by Yolanda.	Strengthening of disaster prevention function
	There was a lack of manpower and vehicles to distribute the goods.	Study regarding procurement of manpower and vehicles
DSWD	Warehouses for emergency goods stock were damaged by Yolanda	Strengthening of disaster prevention in structural function
	Warehouses for emergency goods stock were located in high risk area of flood and storm surge	Reduction of hazard risk to the warehouse
	Delay of delivery of relief goods occurred for lack of goods and vehicles in some municipalities	Construction of early distribution system of relief goods to LGU
International Aid	Delay of customs procedures immediately after Yolanda occurred, because relief goods were handled	Speedup of customs procedures

Organizations	the same as usual freight.	
	There was a lack of delivery vehicles and fuel for delivery vehicle occurred	Study regarding procurement of manpower and vehicles

Source: JICA Study Team

3) Strategies

Strategies for stock storage for emergency response are as follows.

a) Improvement of immediate response capability of hardware
- Ensuring of appropriate warehouse location (hazard risk, traffic access, site space, etc.)
- Strengthening of disaster prevention in the structural functioning of the buildings

b) Improvement of immediate response capability of software
- Ensuring of the method of distribution
- Negotiation for speedup of customs procedures for emergency goods
- Expanding of stock storage for emergency (Storage use agreement with private enterprises)

6.1.3 Breakwater and Other Structures

(1) Location Plan

The basic concept of the location plan for tide embankments is as given in the following:

- Basically, the places that have important assets are to be protected by the tide embankments and human life is to be protected by the non-structural measures, like forecasting and warning systems, hazard maps, evacuation plans, and so on.
- The location plan for the tide embankments must reflect the disaster situation of Typhoon Yolanda.
- The location plan for the tide embankments must reflect the result of the multi hazard map prepared by the project, like storm surge, tsunami and flood.
- The intentions of the Tacloban City and municipalities, and the present and/or future land use are considered in the location plan.
- Basically, the locations of the tide embankments are selected by the cost-effectiveness

(2) Height of Tide Embankments

Considering the magnitude of Typhoon Yolanda, it is not practical to cope with its maximum storm surge heights solely by structural measures due to increase of the project cost. Therefore, the project proposes to set the following two types of storm surge levels for examining necessary measures:

- Level 1: Disaster level that enables protection of human life, assets and livelihoods by structural measures
- Level 2: Disaster level where non-structural measures, centering on evacuation of local

residents, should be considered as priority measures in order to protect human life

The heights of the tide embankments are planned by the Level-1 cited above.

1) Required Height against Storm Surge

The required height against storm surge (H) is decided by the result of storm surge simulation which is conducted in this study.

2) Required Height against Tsunami

The required height against a tsunami is generally decided by the result of tsunami simulation.

The result of tsunami analysis by the PHIVOLCS (Philippine Institute of Volcanology and Seismology) shows the project area may be hit by a tsunami. The analysis result by the PHIVOLCS is evaluated in the project and the required height against tsunami is estimated.

3) Design Height of Tide Embankment

By the estimation of the cited required height against storm surge and tsunami, the design height of tide embankment for this project is decided.

(3) Structure Examination of Tide Embankments

The point of the structure examination of tide embankments is given below.

- The tide embankments are intended to be "Tenacious Structures" to buy time until collapse of the tide embankment or to reduce the possibility of total collapse of the tide embankment even though the storm surge exceeding Level 1 or a tsunami occurred and the tide embankment is partially damaged.
- The construction material should be procurable in the Philippines and the experience from the Great East Japan Earthquake is reflected in the structural specification of the new tide embankment, such as the type of revetment and the slope gradient.

1) Seaward Slope Protection and Toe of Slope

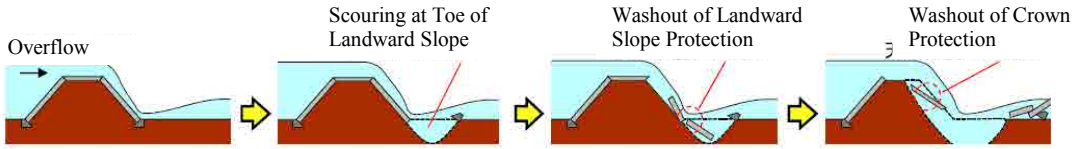
Regardless of the occurrence of storm surge or tsunami, the seaward slope is always exposed to risk of erosion and scouring by wave action, tidal action, collision with floating objects, abrasion of drift sand, and so on.

As a countermeasure against the erosion and scouring, the seaward slope is armed with a concrete structure and the seaward slope foundation is embedded in the ground.

2) Landward Slope Gradient and Toe of Slope

Overflow rapidly runs on the landward slope of the tide embankment when the scale of the storm surge exceeds a "Level 1" or tsunami disaster. The overflow runs into the toe of the slope, which might cause a scouring and washout of the slope and the toe of slope. The illustration of damage

due to scouring at the toe of a landward slope is as shown in the following.



Source: https://www.mlit.go.jp/river/shinngikai_blog/kaigantsunamitaisaku/dai03kai/dai03kai_siryou3.pdf

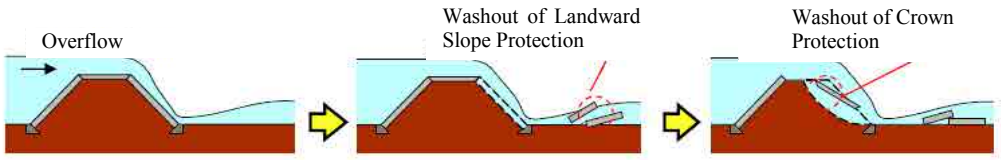
Figure 6.1-21 Damage due to Scouring at Toe of Landward Slope

As a countermeasure against the scouring and washout of the tide embankment, the toe of the slope is armed with a concrete structure or the landward slope foundation is embedded in the ground. Additionally, the energy of overflow is absorbed by the gentle slope.

As a result of the disaster report of the Great East Japan Earthquake, it was seen that tide embankments with gentle slopes and protected toe of slope are difficult to destroy.

3) Landward Slope Protection and Crown Protection

The rapid overflow by the storm surge or tsunami might cause a washout of the landward slope protection and the crown protection as well as sucking the embankment material from the gap or joint of the revetment. Furthermore, if a parapet wall is installed on the dike crown, the overflow hits the crown going over the parapet wall, which might cause damage or washout of the crown protection. The illustration of damage due to rapid overflow on the revetment is as given below.



Source: https://www.mlit.go.jp/river/shinngikai_blog/kaigantsunamitaisaku/dai03kai/dai03kai_siryou3.pdf

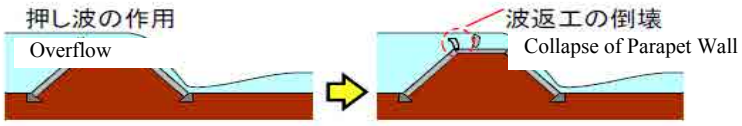
Figure 6.1-22 Damage due to Rapid Overflow of Revetment

Backrush might also cause the same damage pattern as above due to the rapid overflow of the crown and seaward slope protection.

As a countermeasure against the washout and sucking of the tide embankment due to rapid flow, providing weight and strength, like thickening the revetment and strengthening the joint of the revetment, is effective.

4) Parapet Wall

The main purpose of the parapet wall is to prevent a wave and splash onto the land side. Hence, the parapet wall might collapse when the scale of the storm surge exceeds a “Level 1” or tsunami disaster occurs. The case of backrush is also similar. The illustration of collapse of a parapet wall is as given below.



Source: https://www.mlit.go.jp/river/shinngikai_blog/kaigantsunamitaisaku/dai03kai/dai03kai_siryou3.pdf

Figure 6.1-23 Collapse of Parapet Wall

In consideration of the structural characteristic of the parapet wall which is breakable due to overflow of storm surge and tsunami disaster, the parapet wall is basically not installed. If the parapet wall is installed, the wall should be reinforced by the bar arrangement with improved durability against the strong wave force.

5) Typical Cross-section of Tide Embankment

Based on the above particulars, the typical cross-section of the tide embankment is as follow.

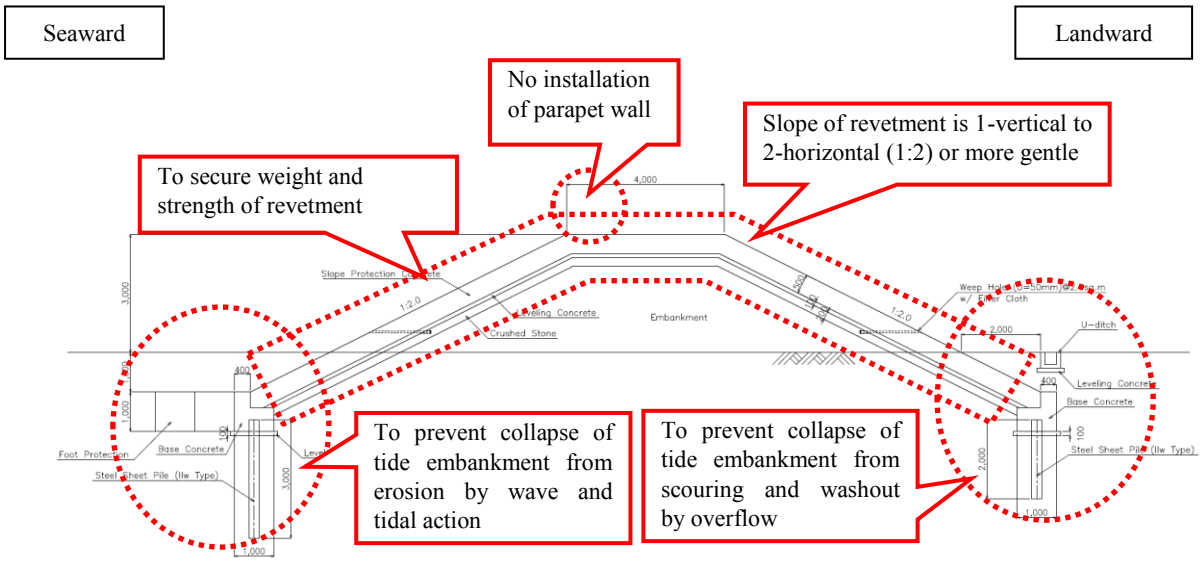


Figure 6.1-24 Typical Cross-section of Tide Embankment

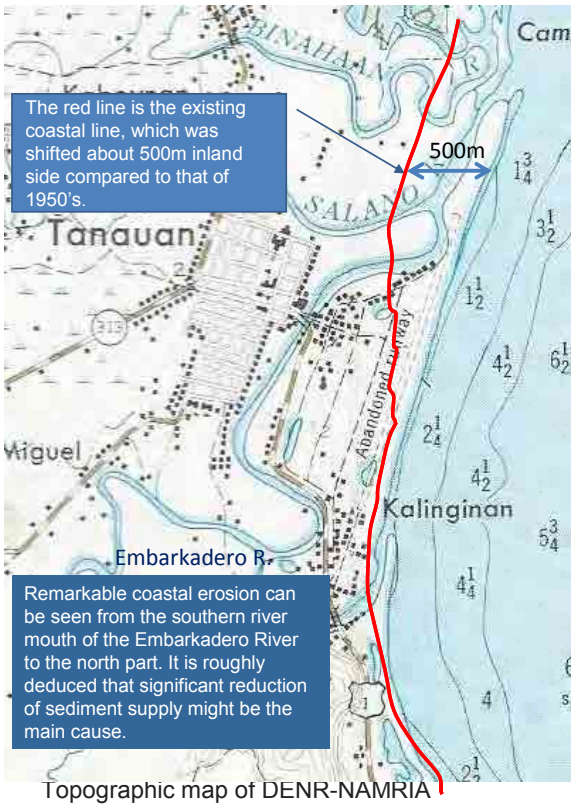
6.1.4 Possible countermeasures for coastal protection and artificial beach nourishment

(1) Current situation of coastal erosion

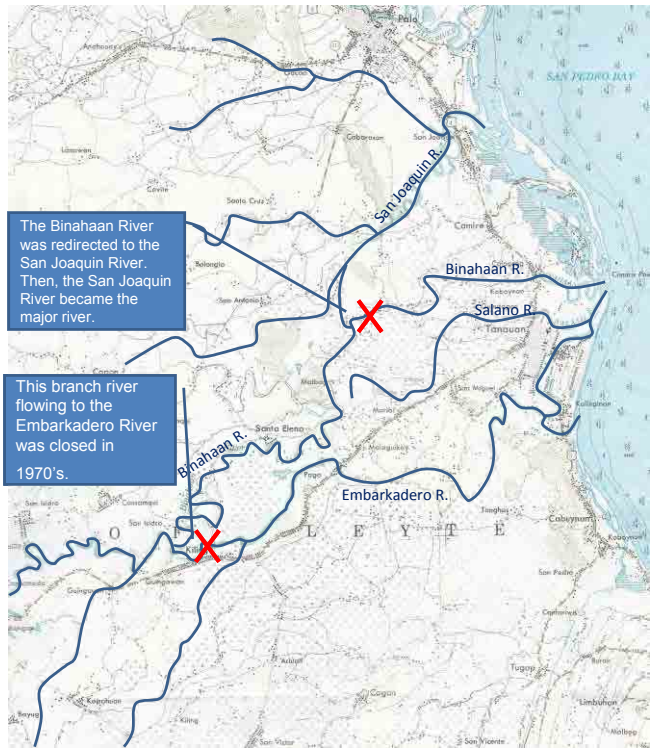
Coastal erosion has progressed remarkably along the eastern coastal area of Leyte Island. As mentioned in 2.2, it is estimated that the existing coast line shifted about 500 meters inland compared to that of the 1950's (Refer to the left figure below). Further, based on the interview survey with the officials of Tanauan city, a branch river flowing to Embarkadero river (To be referred as "the branch river", hereinafter), which is located upstream of the downtown of Tanauan city, was closed and diverted to Binahaan river in the 1970's in order to protect the city center against flooding from the Embarkadero river. Further, as the recent satellite photograph shows (Refer to the image below on the right side), it seems that the branch river is still kept closed. Then,

it is preliminarily deduced that the main causes of the coastal erosion were

1) Significant reduction of sediment supply to the coastal area due to the closure of the branch river, and
2) Littoral drift in the northern direction due to the long shore current going from south to north.



Topographic map of DENR-NAMRIA based on aerial photographs of 1947-1953



Topographic map of DENR-NAMRIA GoogleMap 2013/11/10

Figure 6.1-25 Current Situation of Coastal Erosion

(2) Possible Countermeasures

When elaborating the possible countermeasures against the coastal erosion, the following must be considered: 1) Investigation of the possibility for elimination of the causes of coastal erosion after clarifying the mechanism of generation of coastal erosion on the basis of reliable data, and 2) Investigation of the measures for early recovery of the amount of littoral drift by littoral drift control structures.

1) Possible countermeasures 1: Restoration of the closure or re-opening of the branch river flowing into the Embarkadero River

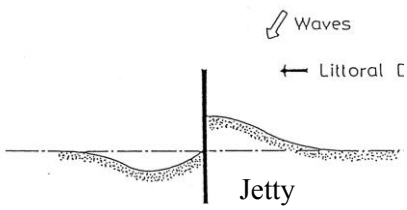
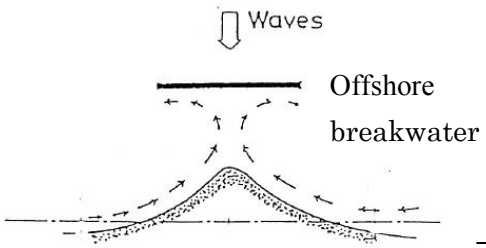
Restoration of the closure or re-opening of the branch river is considered as one of the most effective measures, since it is estimated at present that one of the major reasons for the coastal erosion is attributed to the closure of the branch river. However, first of all it is necessary to

clarify the objective evidence regarding the coastal erosion (*e.g.* estimation of extent of annual coastal erosion based on the past pictures, estimation of the reduction in the volume of sediment supply, accumulation/analysis of relevant data, *etc.*)

2) Possible countermeasures 2: Construction of littoral drift control structures

The possible countermeasures are 1) A "Jetty" and "Artificial beach nourishment" and 2) an Offshore breakwater.

Table 6.1-5 Details of Possible Countermeasure

	1) "Jetty" and "Artificial beach nourishment"	**2) Offshore breakwater**
Plan view		
Expected effects	It is expected that coastal sand will be accumulated on the upstream side of the Jetty by construction of the Jetty reducing littoral drift along the coast line, which results in restoration of the coast line and its stabilization. At the same time, Artificial beach nourishment should be carried out since early restoration of the coast line will be improbable by only the construction of the Jetty.	Recession of coast line can be expected to be reduced by construction of an offshore breakwater, which is aligned parallel to the shoreline, reducing the amount of littoral drift. Coastal sand will be accumulated behind the breakwater, resulting restoration of the coast line and its stabilization.
Remarks	The coast line will be recessed at the downstream side of the Jetty since the movement of littoral drift is prevented by the Jetty. Therefore, a number of Jetties at certain intervals (*e.g.* 500m intervals) may be needed for restoration of the coast line and its stabilization as a whole system of Jetties.	Since recession of the coast line is expected in the vicinity of the open section of the breakwater, it is necessary to ensure the safety of the inland side of the coast line. Construction barges are necessary since the construction is basically marine work. Construction cost is normally very expensive.

(3) Monitoring Activities

1) Preparation before the construction of the countermeasures

- **Estimation of extent of annual coastal erosion:** Extent of annual coastal erosion needs to be estimated based on the comparative analysis among the present and past pictures, clarifying the extent of coast line recession.
- **Estimation of reduction volume of sediment supply from the river:** Reduction volume of sediment supply from the Embarkadero River, which is considered to be caused mainly by the closure of the branch river, is to be estimated.
- **Clarification of the cause of the coastal erosion:** The degree of influence of the closure of the branch river on the coastal erosion will be evaluated by a comparison analysis of the above estimations.

2) Monitoring after the construction of the countermeasures

- Regular monitoring activities (*i.e.* aerial photograph imaging, photos from fixed points, *etc.*) are to be carried out every year after the construction of the countermeasures.

Reference:

1) Yoshiaki KURIYAMA, Currents and Morphological Changes in the Surf Zone on a Sandy Beach, Nagare, 24, 2005
2) Japan Ministry of Land, Infrastructure, Transport and Tourism, Technical Criteria for River Works: Practical Guide for Planning, 2008

6.1.5 Mangrove Afforestation & Landscape

(1) Existing Condition & Damage done to Mangrove Forests by Yolanda

The existing condition and damage caused by Yolanda was examined by data collection/ analysis and field reconnaissance from the middle of February to March 2014. In the coastal area in eastern part of Leyte Island and southern part of Samar Island, mangrove forests exist in only a very limited area and area inland of the forests is already used for farmland or residential area. The health condition of the mangrove forests is not good, so the natural expansion of the forest is not expected.

In Tacloban City in Leyte Island, there are some areas that have existing mangrove forests, such as Brgs. Diit, Anibong, San Jose, etc. These areas are located in the small bays inside of San Pablo Bay such as Anibong Bay and Tacloban Bay, which are protected from large waves and strong winds. Some of these mangrove forests were severely damaged by Yolanda (Photo 1 ~ 3). These forests need rehabilitation and still have a little more space to plant mangrove forests.

From Palo to Abuyog municipality in Leyte, the coast line is relatively straight and eroded severely (Photo 4 ~ 6). Mangrove forests have not grown in the coastal area facing ocean, because

of the small tidal flats and the impact of high waves. However, some of the lagoons and river mouths can support mangrove growth, such as Cadacan River in Abuyog (Photo 7), and the mangrove forests nearly fill these hospitable areas to capacity and they were not greatly damaged by Yolanda, therefore only a rehabilitation program is required in these areas.

In Samar Province, some areas have existing mangrove forests, such as the area along San Juanico Strait, San Antonio, and the mouth of Basey River, etc (Photo 8 ~ 11). Mangrove forests in the area along San Juanico Strait, San Antonio face the ocean directly. The waves are very weak because the water course is very limited. These forests were not severely damaged by Yolanda. There is no space for new mangrove plantation, therefore, only a rehabilitation program is required.

In the coastal area between Basey Municipality and the sea in front of Jinamic Island, there are relatively large flat areas. The areas seem suitable for mangrove growing. However, no mangrove forests have existed there for at least 50 years, and several planting attempts by Basey Municipality failed. It seems that there is a high volume of siltation from the upland reaches of Basey River, and this siltation is moved by the strong waves, therefore, it is difficult to plant mangroves in this area.

In Eastern Samar, there are many areas with mangrove forests. The coast line consists of many small inlets, and there are many shore reefs and small islands off shore of the coast line which protects it from waves. It seems that these mangrove areas have not expanded in 50 years, and the height of the mangrove trees is around 10 m, although the height should be around 20 m for a forest over 20 years old. This means that this mangrove area has reached the climax of its growth, therefore, the potential of new plantation is not good. These forests were severely damaged by Yolanda (Photo 12 ~ 14), therefore, a rehabilitation program is required.

Photo 1 Diit in Tacloban

Photo 2 Anibong in Anibong Bay in Tacloban

Photo 3 San Jose in Tacloban Bay

Photo 4 Coastal Area in Palo


Photo 5 Coastal Area in Tanauan


Photo 6 Coastal Area in Tanauan


Photo 7 River Mouth in Abuyog


Photo 8 Santa Rita along San Juanico Strait


Photo 9 San Antonio in Basey


Photo 10 Mouth of Basey River in Basey


Photo 11 River Mouth in Marabut


Photo 12 Coastal Area in Lawaan


Photo 13 Coastal Area in Giporlos


Photo 14 Coastal Area in Guiuan

(2) Activities of Philippines Government After Yolanda

The DENR (Department of Environment & Natural Resources)-HQ prepared the "Proposed Mangrove and Beach Forest Development as Climate Change Mitigation and Adaptation for Leyte Gulf after Typhoon "YOLANDA"" plan, and submitted it to the Undersecretary of President

Aquino a week after Yolanda.

The plan is to plant mangrove and beach forests on the eastern coastline of Leyte Island, southern and a part of the eastern coast of Samar Island (Figure 6.1-27).

The outline of the plan is as follows:

- Area to be planted: 1,900 ha, length 380 m, width 50 m of coastal area/ mudflats.
- Spacing to be employed: 1 m x 1 m
- No. of seedling: 10,000 seedlings/ ha i.e. 19,000,000 seedlings

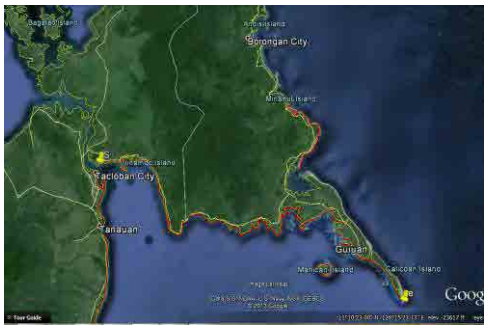


Figure 6.1-26 Area to be Planted

Sources: "Proposed Mangrove and Beach Forest Development as Climate Change Mitigation and Adaptation for Leyte Gulf after Typhoon "YOLANDA"

The budgetary requirement of the plan is as follows:

Table 6.1-6 The Budgetary Requirement of the Plan

ITEMS	Assumption	Budget Requirement (PhP)
Delineation of No-Build Zone (easement) including Monumenting	380 km x P 10,000/ km	3,800,000
Survey & Assessment of proposed mangrove/ beach forest plantation		1,710,000
Nursery Establishment (8 nurseries i.e. 1 nursery/ municipality)	8 nurseries x P 1,000,000	8,000,000
Construction of Look Out Tower (1/ municipality)	8 nurseries x P 1,000,000	8,000,000
Seedling Production (potted)	19,000,000 seedlings x P 15	285,000,000
Site Preparation & Monitoring	1,900 ha x P 900/ ha	9,500,000
Project Supervision & Monitoring		30,801,000
TOTAL		**346,811,000**

Sources: "Proposed Mangrove and Beach Forest Development as Climate Change Mitigation and Adaptation for Leyte Gulf after Typhoon "YOLANDA

According to the Philippines Daily Inquirer on 25 Nov. 2013:

- President Benigno Aquino III has ordered the Environmental Secretary, Ramon Paje, to keep coastlines off limits to homes after huge waves spawned by Super-typhoon "Yolanda" swamped seaside villages in central Philippines.
- As the government grappled with the aftermath of what was believed to be the most powerful storm to hit land, the President directed Paje to draw up a comprehensive program on environment protection against storm surges, flooding and landslides.
- "Part of the President's directive to the DENR is to establish 'no-build zones' on coastlines to ensure the transfer of residents to safe resettlement areas". Communications Secretary Herminio Coloma Jr. said over radio.
- In the country, the easement or setback from the shoreline high-water mark is currently 20 m. In order countries in the pacific, the easement is from 50 m to 200 m, according to environmental planners.
- The president directed Paje to replant mangroves in coastal areas as a natural buffer against storm surges. "The mangroves are being prepared so that planting could start, because it takes five to seven years to grow this." Coloma said.

In "Reconstruction Assistance on Yolanda" which is the policy of reconstruction prepared by NEDA, the following are mentioned.

- DENR plans to restore mangrove and beach forests in about 380 km of coastline in Eastern Visayas and Leyte and other affected areas.
- DENR estimates PhP 347 million for restoration of mangrove and natural beach forests in coastal areas.

Under these situations, DENR has been preparing the following reports for the section between Tacloban and PaloCooperated by USAID. DENR has a intention to continue preparing the same reports for the other section.

- Rapid Damage and Recovery Assessment of Coastal- Mangrove Forest Stands in Tacloban-Palo, Leyte
- B+Wiser Rehabilitation Plan of Yolanda Devastation: Tacloban- Palo Coastal Forest- Stand as Green Belt natural Barrier

Leyte Gulf Rehabilitation Project: Mangrove & Beach Forest Planting was planned in these reports, and the Project was started on 26 February, 2014 at Anibong in Tacloban by DENR-R8, related agencies, and the captain/ residents of Brg. Anibong using government budget.

After this it seems that they can continue to have planting activities at selected sites by their own budgets.

(3) Proposed Projects which will be Supported by JICA

Tacloban city and Abuyog Municipality request the following priority projects from the JICA team.

1. Mangrove/ Beach Forest Development Project (Tacloban)
2. Tacloban Rainforest Rehabilitation Project (Tacloban)
3. Massive Reforestation of Abuyog Watersheds (Abuyog)

Based on the interview survey at DENR-FMB (Forest Management Bureau)-Central, the following projects are required.

4. Capacity building for staff of MENRO (Municipality ENR Office)
5. Establishment of Mangrove Center in Region 8

No. 1 has already started as mentioned above, so JICA support is not necessary. No. 2 & 3 are very important projects from the viewpoint of reduction of landslide/ flooding. No. 4 & 5 are very useful for mangrove management for training, because MENRO staff is in charge of mangrove management in each municipality.

For No. 3, it is provided based on the "Abuyog Forest Land Use Plan (FLUP)" supported by GIZ, so there are necessary data in FLUP. For No. 4, the cooperation from related bureaus in DENR will be secured. Therefore, the priority projects which will be supported by JICA are as follows:

- Massive Reforestation of Abuyog Watersheds (Abuyog)
- Capacity building for staff of MENRO (Municipality ENR Office)

Further study will be carried out continuously.

6.1.6 Buildings Code and Actual construction situation

(1) Buildings Damage

Typhoon Yolanda caused wide and serious damage to the buildings, mainly by the strong wind. Steel roofing sheets were blown off by the strong wind. The buildings in the coastal area suffered tremendous damage in structure and furniture/equipment by the storm surge. The condition of building damages were as follows:

1) Structural Damage of Buildings

- Roof truss and beams (by strong wind) <see Photo 15>
- Column and walls (by storm surge and strong wind) <see Photo 16, Photo 17>

Photo 15

(Lawaan: Municipal Office)

Roof and roof truss were destroyed.

Photo 16

(Palo: San Joaquin Central School)

The whole structure was collapsed.

Photo 17

(Palo: RC-Gymnasium)

The whole structure was collapsed.

2) Non-structural members

- Roofing (by strong wind) <see Photo 18>
- Eaves (by strong wind)
- Ceiling (by strong wind)
- Partition wall (serious damage by storm surge and strong wind)
- Doors and windows, glass (by strong wind and storm surge)
- Furniture/equipment and property (serious damage by storm surge and strong wind)

Photo 18

(Guiuan: Municipal Office)

Roof sheets were blown off.

(2) Present Building Regulation and Standard

1) Building Regulation and Standard

a) Building Regulation and Standard

"National Building Code of the Philippines (NBCP), 1977" is the building regulation and all big buildings shall obey NBCP, which regulates basic technical requirements, permission procedures and so on.

Low cost housing is specially governed by "Revised Rules and Standards for Economic and Socialized Housing Projects to implement, HLURB" and "Revised Implementing Rules and Regulations for PD 957, HLURB, 2009". These rules and standards regulate mainly residential area development and minimum opening, access clearance and ceiling height etc. of houses are stipulated.

Specific technical standards such as structure, firefighting, mechanical and electrical utilities are provided by each organization/association of specific engineers and DPWH authorizes each

technical standard.

The authorized standard is the "National Structural Code of the Philippines (NSCP), reviewed in 2010 by the Association of Structural Engineers of the Philippines (ASEP)".

b) Wind loads

The formula for calculating wind pressure is based on the basic wind speed, a velocity pressure exposure coefficient, a topographic factor and an important factor. The basic wind speed for Leyte and Samar is 200 km/h (55 m/s) and 250 km/h (70 m/s) in the wind zone assignment (ASEP, 2010) in 3-sec wind speed with annual probability of exceedance of 0.02 or 50-year return period, whereas the maximum wind speed of Typhoon Yolanda was 255 km/h (PASAGA).

Loads by flood, storm surge and tsunami

Flood loads are prescribed in NSCP. The loads by storm surge will be similar to the flood load, while the load by tsunami shall be studied and the new formula shall be supplemented in NSCP. The following the load calculation formula of Japan[1].

$qz = \rho g (ah - z)$

qz : Tsunami wave pressure towards wave direction (kN/m^2)

ρ : Unit mass of water (t/m^3)

g : gravitational acceleration (m/s^2)

h : Design tsunami depth (m)

z : Height from ground level ($0 \leqq z \leqq ah$)(m)

a : Coefficient for water depth by influence of disaster countermeasures such as dyke or embankment etc.

c) DPWH Standard and regulation

DPWH has Standard Specifications for Public Works and Highways (Blue Book).

2) Building Permits

a) Building Permit procedure

According to NBCP, all big buildings shall obtain a building permit from the Building Official of the city, municipality or province prior to construction works, and the duly licensed architect or engineer engaged by the owner to undertake inspection and detailed supervision of the construction shall periodically certify that the construction conforms to the plans and specifications submitted in the application for a building permit. And the proper Certificate of Occupancy shall be issued to the applicant.

[1] Guideline for structure design of tsunami evacuation buildings (Notification No.1318, 27 Dec. 2011 of Ministry of land, Infrastructure, Transportation and Tourism)

b) Building permit contents

The application documents are simple with only a basic plan not including detail technical design. The site plan and relation with the site boundary is the major point to be checked. The application sheet and main check items as follows;

Building permit Application form	Checking point Items for permit
Evaluation Sheet 1) Building permit 2) Sanitary/Plumbing permit 3) Application for Electrical Permit Back-side : Electrical Permit	1) Land Use/Zoning 2) Line and Grade 3) Building (Structural) 4) Plumbing 5) Electrical 6) Mechanical 7) Others: Electronics

However these permit procedures are not enforced actually without certificate, for small private houses in particular. The knowledge and consciousness to observe the building standard and regulation of people is very weak. The technical level of building contractors and foreman for small private buildings is very low level. The manpower and technology of the Building Officials is generally far from sufficient.

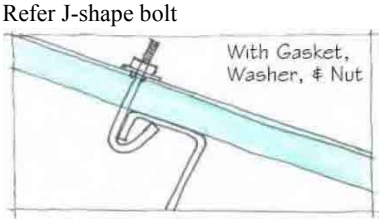
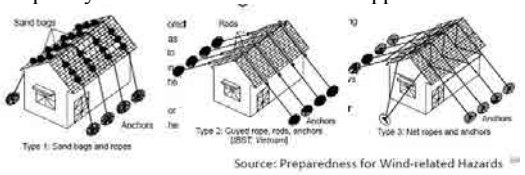
(3) Issues and Directions to Improvement

The issues and direction to improvement on building damages based on preliminary study of Typhoon Yolanda are summarized in the following table.

We recommended to modify the Issues to improve like this.

Table 6.1-7 Issues and Improvement Directions

No.	Issues	Direction to improvement
1	**Regulations and Standards**	
1-1	The design wind speed is not adequate especially for west coast areas.	The design wind speed shall be reviewed in connection of the topographic factor. West coast areas shall be taken care of, separating from administration boundary.
1-2	No requirements to strength and material of roof and joint/fixing is regulated.	Strength and material of roof and joint/fixing shall be regulated to keep sufficient strength.
1-3	No requirement for structure against storm surge and tsunami is regulated.	Requirements for structure against storm surge and tsunami shall be regulated according to the location.
2	**Enforcement of Regulations**	
2-1	Knowledge and consciousness to observe the building law of people is very weak.	Education and campaign shall be strengthened to inform how low quality buildings are vulnerable to possible damages.
2-2	The technical level of building designers for small private buildings is low.	Education for building technology shall be strengthened. The qualification of architects/engineers shall be enforced more strictly.
2-3	The manpower and technology of the Building Officials is generally far from sufficient.	The manpower, technology and budget for the Building Officials shall be improved. Philippine Association of Building Officials (PABO) shall be strengthened.

3	**Building Design**	
3-1	Structural design is not properly carried out. The strength of roof material, wall material and joint/fixing is not calculated.	Structural design shall be submitted for building permit with structural calculation and drawings. Reinforce concrete flat roof with waterproofing will be applied for RC buildings.
3-2	Generally thickness of steel roof sheet is too thin and joint/fixing is too weak.  Photo 19. Damaged steel roof sheet (photo by Mr Tatsuo Narafu)	Roof material and fixing/anchoring shall be stronger. Refer J-shape bolt 
4	**Construction Practice**	
4-1	Proper construction supervision and quality control is not implemented. Drawings and technical specification are not checked adequately in the construction site.	Construction supervision and quality control shall be strengthened. Education and public relations shall be improved. Appropriate penalty against violation shall be strictly enforced.
4-2	Concrete strength is low and concrete coverage is not enough.  Photo 20. Guiuan Municipality	Concrete mixing, casting, reinforcement work, form work shall be properly implemented under adequate construction supervision.
4-3	Welding and anchoring of roof truss is weak.	Welding and anchoring of roof truss shall be properly implemented with gasset-plate under adequate construction supervision.
5	**Emergency Measures**	
5-1	Strong and rigid structure against strong wind will cost more.	Temporary roof reinforcement will be applied.  (Source: Risk Reduction and Management through Resilient Structural Design of Buildings, 2014, University of the Philippines Diliman)
5-2	Strong and rigid structure against storm surge and tsunami will cost more.	People in the building will evacuate to upper floors above water level.

Source: JICA Study Team

(4) Actual construction situation

However above described Building code, regulation and building permit procedures are not enforced to make good sufficient building in this country. The Building code and regulation is enough and sufficient to making building. But actual construction site do not know the proper way of making building. We checked actual-way of construction in Tacloban city as follows;

a) Concrete mixing condition

There is no sufficient mixing-method in the survey of Tacloban city. In case of private small building, they mixed concrete with too much water. Our recommended water/cement ratio is 40 to 45%. Our survey sample result is 64% to 92%.(we collect video clip of concrete mixing) We think this is one of main reason of Yolanda typhoon disaster in east Visaya region.

Photo 21. This is chipping surface of concrete column of small private building. This chipping is for mortar apply.

Photo 22. This chipping photo is column of using ready mixed concrete site.

b) Re-bar arrangement

The re-bar arrangement was not sufficient in collapsed building.

Photo 23. This photo is The gymnasium at Guiuan city. This building collapsed by strong wind.

Photo 24. This photo is center of collapsed beam : The splice of re-bar at photo upper part is bottom of beam center. This splice place was prohibited.

(5) Recommendation role of Government for Actual construction

If contractor strictly make building, according as NBCP, there is very few damage by typhoon Yolanda. The Building code and regulation is enough as performance of role. Most important thing is the NBCP do not execute at actual construction site. We hope that NBCP will execute perfectly in the all construction site in Philippines. Strengthening of Building code and regulation is necessary. The role and action of Government is very important from now on.

6.1.7 Stock Storage for Emergency Response

(1) State of stock storage for emergency response

1) Usual stock storage of LGU

Most of the LGU had no food stocks for emergency due to lack of finance. So, they had no warehouse for the stock either.

2) Stock of relief goods at LGU after Yolanda

Yolanda blew off many roofs of public buildings, for example the municipality office, school and gymnasium. So, they stocked the relief goods which were transported by DSWD in the public buildings that were available for use.

Mayorga municipality office

Tanauan municipality office

Source: JICA Study Team

Figure 6.1-27 Stock of relief goods at LGU after Yolanda

In Tanauan until the end of last November, DSWD transported relief goods to the municipality office at the appointed time that the municipality had previously informed each barangay. To get the goods, each barangay came to the municipality office at the informed time. Since last December they changed the system to transporting goods directly to the evacuation center in each barangay. They didn't need much stock space this way.

Because some LGU thought out saving of stock space as stated above, they had no issue. But some LGU had issues with the risk of burglary of stock in temporary tents, and other LGU had issues on lack of manpower and vehicles to distribute the goods.

3) Building plan for stock storage at LGU

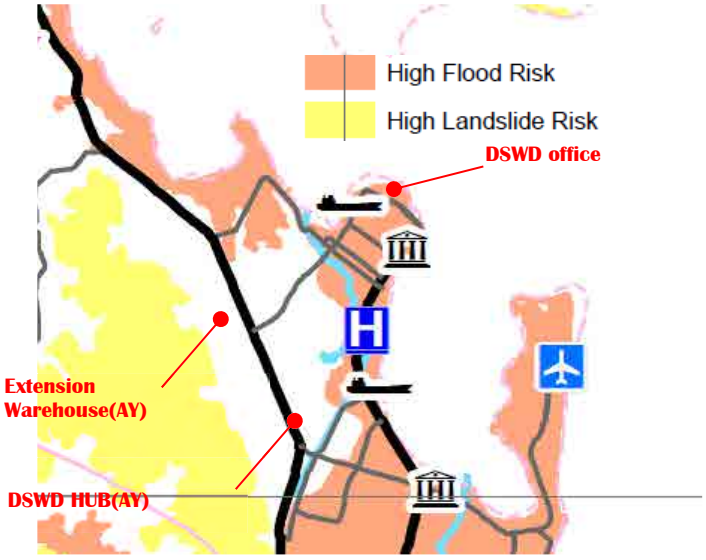
Most of public buildings which were damaged will be repaired or reconstructed by international grants.

Source: Typhoon Yolanda Rehabilitation and Recovery Plan /Province of Leyte

Figure 6.1-28 Regional Government Center and Evacuation Center (Palo)

These buildings will be used as stock storage space for disaster. Specially, large scale evacuation centers are planned at Tacloban and Palo.

DSWD stored 1000 sets of emergency family food packs in the warehouse located in the Tacloban office site. The packs consisted of 6kg of rice, 5 canned foods, 5 packs of instant noodles, 5 packs of coffee, and 1 pack of powdered milk. But Yolanda damaged this warehouse, too.



AY : after Yolanda

Source: JICA Study Team

Figure 6.1-29 DSWD Related Facilities

4) Handling of relief goods at DSWD after Yolanda

DSWD have used the DSWD HUB as a warehouse for storage and as a distribution center beginning 5 days after Yolanda. The coverage area of the distribution center is all the affected areas in region 8. Many international assistance organizations like WFP have been located in the same site. They rented this site temporarily from Citi Hardware which was a retail warehouse and outlet shop. First, they accept goods in the DSWD HUB in Tacloban. Next, they distribute the goods to the LGU. In addition to this, they have an extension warehouse near DSWD HUB and a warehouse in Guiuan.

To make up for the lack of goods immediately after Yolanda, they bought rice in Manila and

transported it to Tacloban. They have distributed relief goods to victims in Tacloban beginning 2 days after Yolanda. The latest distribution was 7 days after Yolanda.

	
DSWD HUB (Citi Hardware)	**Extension warehouse near the DSWD HUB**

Source: JICA Study Team

Figure 6.1-30 DSWD Warehouse f for relief goods after Yolanda

5) Handling of relief goods at WFP after Yolanda

WFP uses Cebu as a logistics terminal. They transport all the goods from Cebu to Tacloban.
At first, WFP transported relief goods beginning 5 days after Yolanda by an air force plane.
They asked DSWD to transport the goods from Tacloban to each municipality.

They temporarily provided big trucks with drivers for delivery to DSWD. The maximum loading capacity of the truck was 10 ton, and the number of trucks was 32 at maximum.
The issue in WFP was the delay of customs procedures immediately after Yolanda. In spite of it being emergency relief goods, it was handled the same as usual freight.
There was a lack of delivery vehicles and fuel for delivery vehicle. They provided temporary tents to DSWD and the municipalities for relief goods storage.

(2) Issues on stock storage for emergency response

The table below shows the issues and assignments on stock storage for emergency response in each organization.

Table 6.1-8 Issues on stock storage for emergency response

Classification	Issues	Assignments
LGU	Public buildings which were expected as stock storage were damaged by Yolanda.	Strengthening of disaster prevention function
	There was a lack of manpower and vehicles to distribute the goods.	Study regarding procurement of manpower and vehicles
DSWD	Warehouses for emergency goods stock were damaged by Yolanda	Strengthening of disaster prevention in structural function
	Warehouses for emergency goods stock were located in high risk area of flood and storm surge	Reduction of hazard risk to the warehouse
	Delay of delivery of relief goods occurred for lack of goods and vehicles in some municipalities	Construction of early distribution system of relief goods to LGU
International Aid Organizations	Delay of customs procedures immediately after Yolanda occurred, because relief goods were handled the same as usual freight.	Speedup of customs procedures
	There was a lack of delivery vehicles and fuel for delivery vehicle occurred	Study regarding procurement of manpower and vehicles

Source: JICA Study Team

(3) Strategies

Strategies for stock storage for emergency response are as follows.

- Improvement of immediate response capability of hardware
  - Ensuring of appropriate warehouse location (hazard risk, traffic access, site space, etc.)
  - Strengthening of disaster prevention in the structural functioning of the buildings
- Improvement of immediate response capability of software
  - Ensuring of the method of distribution
  - Negotiation for speedup of customs procedures for emergency goods
  - Expanding of stock storage for emergency (Storage use agreement with private enterprises)

6.2 Basic Infrastrucutre

6.2.1 General Issues

(1) General problems on infrastructure

- Service coverage and stable service was not in satisfactory condition.
- Loss of supply and nonpayment was large and income-expenditure was not sound.
- Strength of the poles and facilities of electricity and telecommunication were not enough and were heavily damaged by Yolanda. The electricity and telecommunication services were broken down more than one month after Yolanda.
- In water supply, the connections to houses are surface PVC pipes and loss by leakage and

stealing are huge. Also billed payment is very small, resulting in unsound financial condition.

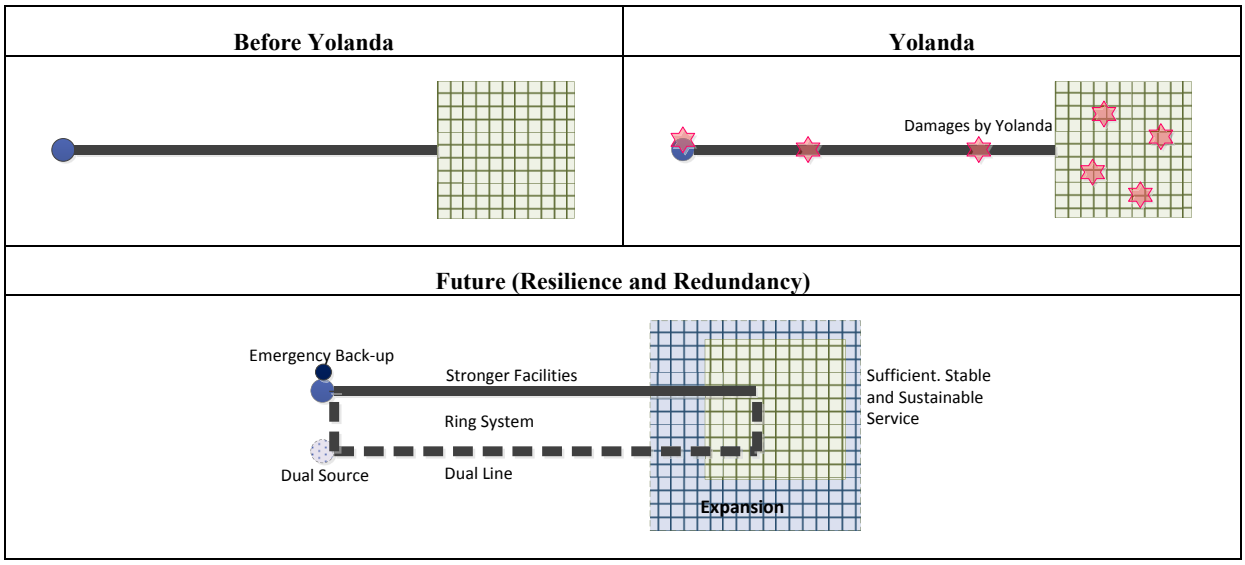
- Central sewer system has not been completed. Each house or building has septic tanks for treatment of waste water, however the treatment condition is not good.
- Rainwater drainage is not sufficient for heavy rain. Clogging of drainage usually occurred.

(2) Resilient Infrastructure

The infrastructure recovery goal is generally set as in Guiuan applicable to other LGUs:

- Swift and harmonized repair and rehabilitation of key infrastructure/lifelines
- Resilient physical infrastructure to mitigate and/or adapt to impacts of disasters
- Support the short, medium and long-term recovery of economy, environment and social development through DRR and CCA-anchored infrastructure development

Sufficient, stable and sustainable infrastructure services should be developed. Resilience will be secured with dual line, ring system, back-up and stronger facilities against disasters.

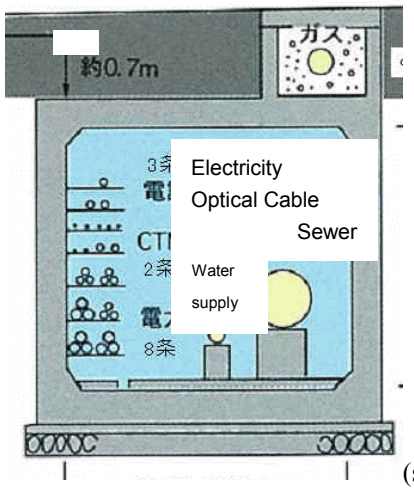


Source: JICA Study Team

Figure 6.2-1 Schematic Image for Resilient and Redundancy System

(3) Common Utility Conduit System

In order to solve the problems in vulnerable trunk utility lines including water supply, sewer-rainwater drainage, electricity and telephone lines, it will be advantageous that common utility conduit system would be constructed together with the elevated road project against storm surge and tsunami.



(source: www.cgr.mlit.go.jp/)

Figure 6.2-2 Example of Common Utility Conduit

6.2.2 Water Supply

(1) Sector Condition

1) Damage and Loss by Yolanda

a) Damage Amount by Yolanda

Damage amount on each municipality by typhoon YORANDA is shown as follows.

Table Damage Amount by Yolanda

Water District	Damage Amount (Mil. Peso)
LMWD (Tacloban, Palo, Tanauan, Tolosa and Santa Fe)	17.16
Basey	9.81
Guiuan	16.82

Source：LWUA (Local Water Utilities Administration)

b) Typical Damage Situation of Water Supply Facilities by Yolanda

- Damage of Water Supply Pipes and Water Meter
- Disconnection of Commercial Power Line
- Damage of Pumping House and Equipment

c) Damage Factors

Damage factors depend on below items.

Table 6.2-1 Damage Factors for Water Sypply Sector

Design aspect	- Covering depth of pipes and structure of pump house don't meet the design criteria such as building code etc. - Some pipe materials inferior to durability is applied and the selection

	of materials is not suitable. - - Originally required facility such as stand-by generator is not provided.
Construction, Operation and Maintenance aspect	- Sand foundation is not applied and most of pipes buried on the original excavated ground. Laid pipes do not have enough durability to vertical load. - Aging deterioration of existing pipes causes leakage of water. It is necessary to establishment operation and maintenance organization to arrange the pipe laying year and specification of existing pipe and make concrete plan for renewal of pipes.

Source: JICA Study Team

d) Damage Situation and Recovery

Damage situation and recovery at each municipality is shown as follows:

Table 6.2-2 Damage Situation and Recovery

LGU	Damage Situation	Recovery and Future Plan
Tacloban Palo Tanauan	- Cut off of commercial power line for water treatment plant - Damage of administration office - Damage of distribution pipe 8 locations - Damage of feeder pipe 6,893 locations - Inundation of downtown office	- Commercial power line to Tingib water treatment facility has restored in December 2013. - Power generator was prepared at Dagami water treatment facility. - Restoration of distribution pipe and downtown office is undergoing by LMWD.
Basey	- Sedimentation to intake weir - Damage of distribution pipe 5 locations - Damage of feeder pipe and water meter 500 ~ 600 locations - Damage of chlorination equipment	- Dredging of intake weir and restoration of distribution main pipe has been completed by Water District. - Damage of distribution pipe, feeder pipe, water meter and chlorination equipment are planned to be restored by Water District.
Guiuan	- Cut off of commercial power line - Damage of mechanical & electrical equipment for deep well pump 2 locations - Damage of pump house 2 locations - Damage of chlorine dosing unit 2 locations - Damage of distribution pipe	- Most of damaged facility has been restored by ICRC except the part of pipes and two pump houses.

2) Condition of Related Water Districts

a) Leyte Metropolitan Water District (LMWD)

- LMWD is servicing water for Tacloban, Palo, Tanauan, Tolosa and Santa Fe.
- Water intake from surface water (river?) is located 32km from Tacloban.
- The capacity of water will be sufficient for future demand. Water distribution in gravity system.
  46,000 cum/day for 46,000 household (at present service to 32,000 household)

- Construction of new purification facility and large reservoir shall be necessary.
- No service in northern part of Tacloban, but there is expansion plan to this area
  Improvement to 24 inch pipe from 4 inch pipe
- The cost for the above will be about 1 billion pesos.
- However most serious problem is large water loss by leakage from water pipes (old pipes installed from 1935) and stealing or nonpayment. Priority shall be put for improvement of this situation.
- Deep wells are servicing only their surrounding area. The cost is expensive.

b) Basy Water District (BWD)

- Water source is spring water 14 km from the center. Water is transmitted and distributed in gravity system. There is no purification facility but 2 units of 200 litter drums for chlorination. Cast iron pipes and Polyethylene pipes and uPVC pipes are used.
- Water production is 2,611 cum/day, 77,835 cum/month.
  Paid quantity is only 20,595 cum/day of 1,384 connections. Peak time is 6 - 7am, when shortage of water supply occurs. Water losses are huge. Basey II Central Elementary School、Basey National High School and Basei Hospital are not included in paid connection. Basey I Central Elementary School has its own water source. Internal displaced people take water from the hydrants.
- There are following projects:
- Rehabilitation of dilapidated transmission and distribution lines
- Expansion of transmission and distribution lines
- Construction of filtration facility and reservoir
- Basey Water District will supply water to the new development and relocation area in the west. The water source will be same. There is neither development plan nor funds at the moment.
- The temporary housing areas in the west have their own water sources from wells.

c) Guiuan Water District (GWD)

- Guiuan Water District (GWD) supply water in Municipality of Guiuan.
- The water is taken from 5 wells and the capacity is 140 cum/hour (Feb 2014), supplied to 2,700 connections or 400,000 inhabitants.
- Damage and loss by Typhoon Yolanda was estimated as 16.82 million PhP ((Local Water Utilities Administration: LWUA, 2014) to water supply facilities such as transmission and distribution pipes, water meters etc. Electricity breakdown caused disruption of water

supply as outage of pumps

- The distribution pipes are of surface uPVC and are vulnerable to external forces including storm surge.
- The water losses by leakage, steal and nonpayment are huge.
- GWD has improvement and expansion plan to supply Tempura area and to make ring system (1600 - 1750m new pipeline and 600,000 new connections). In future, it is proposed to connect the water system of Guiuan, Mercedes and Salcedo to cope with increasing future demand and stable supply.

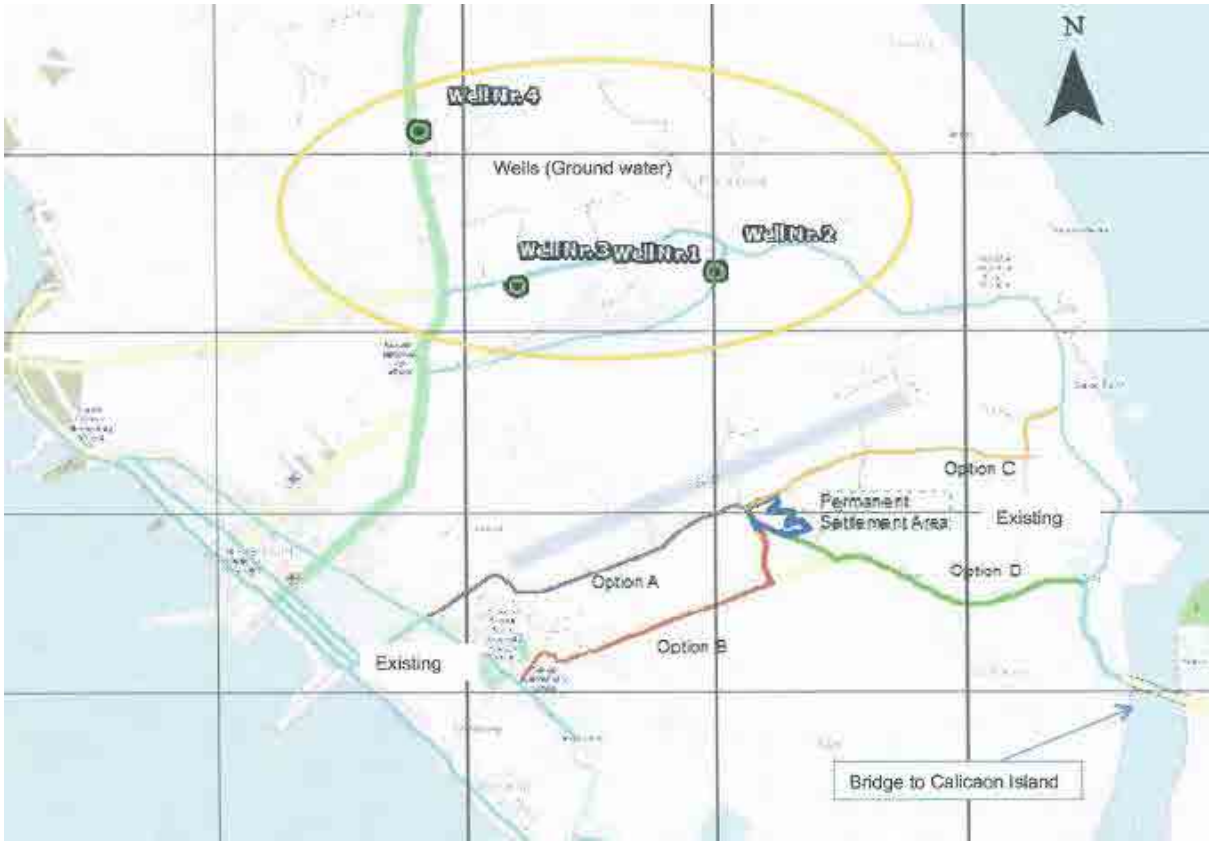


Figure 6.2-3 Plan by Guiuan Water District

(Green thick and light blue lines are existing. Central Option A-D are future plan.)

(2) Restoration and Reconstruction of Water Supply

The considerations towards a restoration and reconstruction of water supply sector are as follows.

1) Considerations for Restoration of Existing Facility

Since facility damage of major components for water supply has already restored by international donor such as ICRC, Oxfam etc., water supply sector doesn't have serious issues as for restoration of existing facility. And appurtenant facilities other than the major components is planned to be restored by LUG budget or income of water tariff in the future.

Aging deterioration of existing pipe is remarkable and exposed pipe above the ground was

damaged by fallen trees and debris. These damaged pipes are planned to be restored by LGU budget gradually. Since ICRC which has performed water supply activity by water tanker is planning to pull up in the near future, early restoration of damaged existing pipe is required.

2) Levels of water supply

Water supply system is classified as follows according to service level:

- Level 1: Stand-alone source - supply point: without distribution system
- Level 2: Communal faucet (piped water from a water point with communal faucets)
- Level 3: Reticulated system with individual house connection

Each level suffered from serious damages by Typhoon Yolanda. In particular, Level 3 has importance for rehabilitation and reconstruction for peoples' health and service with public support and intervention, while Level 1 and Level 2 will owe much to community efforts.

3) Considerations for Reconstruction of Water Supply Sector

- Inadequate Water Treatment Facility

The intake method in the scope area is in various, such as mountain stream intake, shallow well and deep well etc. Though, in the water supply division which is performing especially surface water intake, water treatment facility which has process of flocculation, sedimentation and filtration is required, in the area where is not administrated by Water District (especially in Eastern Samar), most of the water supply system doesn't have the proper water treatment system and chlorination system.

At least in the water supply division whose water source is surface water intake or shallow well, water treatment facility is necessary, and also in the division depending on deep well, it is necessary to examine the necessity of water treatment facility according to the situation of water quality at the intake site.

- The Stand-by Power Source is not secured

Since the commercial power line was cut off, some of deep well pumps and chlorination equipment stopped functioning. In those facilities, though donation of power generator is performed by other donors such as UNICEF and ICRC, since the condition of power supply is unstable and the frequency of blackout is high, it is desirable to secure reserve power sources such as stand-by generator originally

- Lack of durability of pipe

The water supply pipes are damaged with obsolescence over the year and since water pipe of some sections are exposed above the ground, those are destroyed by debris and fallen trees at the typhoon. Since uPVC pipe is applied at many sections, durable pipe such as PE (polyethylene) pipe or ductile cast iron pipe shall be applied.

- Lack of covering depth of pipe

Not only distribution branch pipe but also distribution main pipe and transmission pipe is not securing the required covering depth and exposed above the ground. The pipes shall be secured the covering depth of 1.2m on drive way and 0.6m on side walk at least.

- Exposure of water meter above the ground

Most of water meter on individual house connection feeder pipe are exposed above the ground and damaged by strong wind and debris. The water meter shall be stored in meter box and buried under the ground.

- Lack of water volume and water pressure

Application of pipes whose endurance is inferior causes a leak and water steal, and lack of water supply volume and water pressure (the non-revenue rate is more than 50%). It is necessary to apply durable pipe material and setting of proper pipe diameter to secure enough pressure of water tap. Moreover, in case of new water source development, setting of suitable water volume according to population increases prediction.

(3) Water Supply Planning

For long term water supply planning, design target year and design water supply area shall be defined. And design water supply population shall be set considering the population increases prediction. Unit water consumption volume shall be defined for residents, private company, public facility and factory etc.

The following items are considered for design and construction of new water supply facility.

1) Definition of design maximum daily supply volume

Water demand volume shall be estimated considering the unit water consumption volume, target service population, commercial water volume and industrial water volume etc. And design average daily water supply volume is calculated by adding non-revenue water volume to water demand. Moreover, design maximum daily water supply volume is calculated by considering loading factor to design average daily water supply volume.

2) Water intake location and intake method

In the scope area, mountain stream intake method is applied in case there is highland area behind the poblacion area and deep well or shallow well method is applied at lowland area. In case of setting for intake location, pollution source such as residents or industrial area shall not be distributed at upstream portion of the intake site. Moreover, Water Authority who issues water intake license and intake permission procedure shall be confirmed.

3) Confirmation of production capacity of water source

In case of surface water intake, draught water discharge volume shall be set by arranging the

discharge data on observation station along the river. Available intake volume shall be set by deducting ecological maintenance discharge from draught water discharge. In case of ground water intake, analysis of aquifer distribution and production capacity shall be confirmed by electric exploration survey such as VES (vertical electrical sounding) and pumping discharge test on test wells.

4) Confirmation of water quality on intake site and suitable water treatment method

Water quality of intake source shall be confirmed and suitable water treatment method shall be considered. In case of surface water intake, water treatment method such as rapid filtration shall be applied according to the river water turbidity at the time of rain.

5) Component of Water Supply Facility

Component of water supply facility shall be confirmed according to the geographical condition etc. According to the altitudinal relation between the water intake location and the water distribution area, necessity of transmission pump station, booster pump station and elevated water tank shall be considered. The components of water supply facility are shown as follows:

Table 6.2-3 Components of Water Supply Facility

Facility Item	Contents of Facility
Intake Facility	Intake Weir, Deep Well, Shallow Well
Water Treatment Plant	Water Treatment Facility with flocculation, sedimentation and filtration
Transmission Facility	Transmission Pipe (pump station, if necessary)
Water Storage Facility	Reservoir, Elevated Tank
Chlorination Facility	Chlorination unit with sodium hypochlorite or bleaching powder
Appurtenant Facility	Sluice Valve, Air Valve, Discharge Valve
Distribution Facility	Distribution branch pipe, Distribution Main Pipe
Service Pipe	Feeder Pipe, Water Meter
Fire Prevention Facility	Fire hydrant

Source: JICA Study Team

6) Consideration of Facility Specification

Based on the above conditions, various items of specification such as scale, capacity, dimension, length, diameter, material etc. of related facilities shall be confirmed. Each Facility shall secure the durability to any disasters such as earth quake, strong wind and storm surge etc.

7) Construction and Procurement Method

Pipes shall be secured the required covering depth and protected by sand foundation. Any appurtenant facility such as valves, flow meters etc. shall be stored in a valve box or meter box and buried under the ground in order not to be damaged by debris, fallen trees, drift wood etc.

In case of considering the procurement method for any materials and equipment, circulating situation and quality in Philippines shall be confirmed and procurement from Japan is also brought into perspective depending on the situation.

(4) Operation and Maintenance of the Facilities

Operation and maintenance of the facilities shall be conducted by constituting the organization under the director of the Water Supply Division. The organization consists of admin. dept., customer dept. and O&M dept. etc. Admin. dept. performs the administration of whole personnel of the water supply division and the customer ledger book administration. Customer dept. performs the collection of water tariff, connection of individual house connection feeder pipe and provision of water meter. O&M dept. performs the operation and maintenance of related facility such as water treatment facility, reservoir and transmission and distribution facility.

In the department in charge of operation of water treatment plant, sub-department shall be established for facility operation and water quality monitoring separately. And in order to reduce the non-revenue rate, inventory list based on the pipe laying year, pipe material and any specifications shall be arranged and concrete renewal plan is necessary considering the result of leak detection survey and actual accident rate.

6.2.3 Electricity

(1) Sector Condition

In the power generation and transmission sectors of the Philippines, the transmission system department of the National Power Corporation (NPC) spun off as the National Transmission Power Corporation (TRANSCO) in 2001, when the Electric Power Industry Reform Act (EPIRA) was executed. Then, a joint venture, undertaken by three private companies, State Grid Corporation of China (SGCC), Monte Oro Grid Resources Corporation, and Calaca High Power Corporation, has taken over operation of the national transmission network from Transco since 2009.

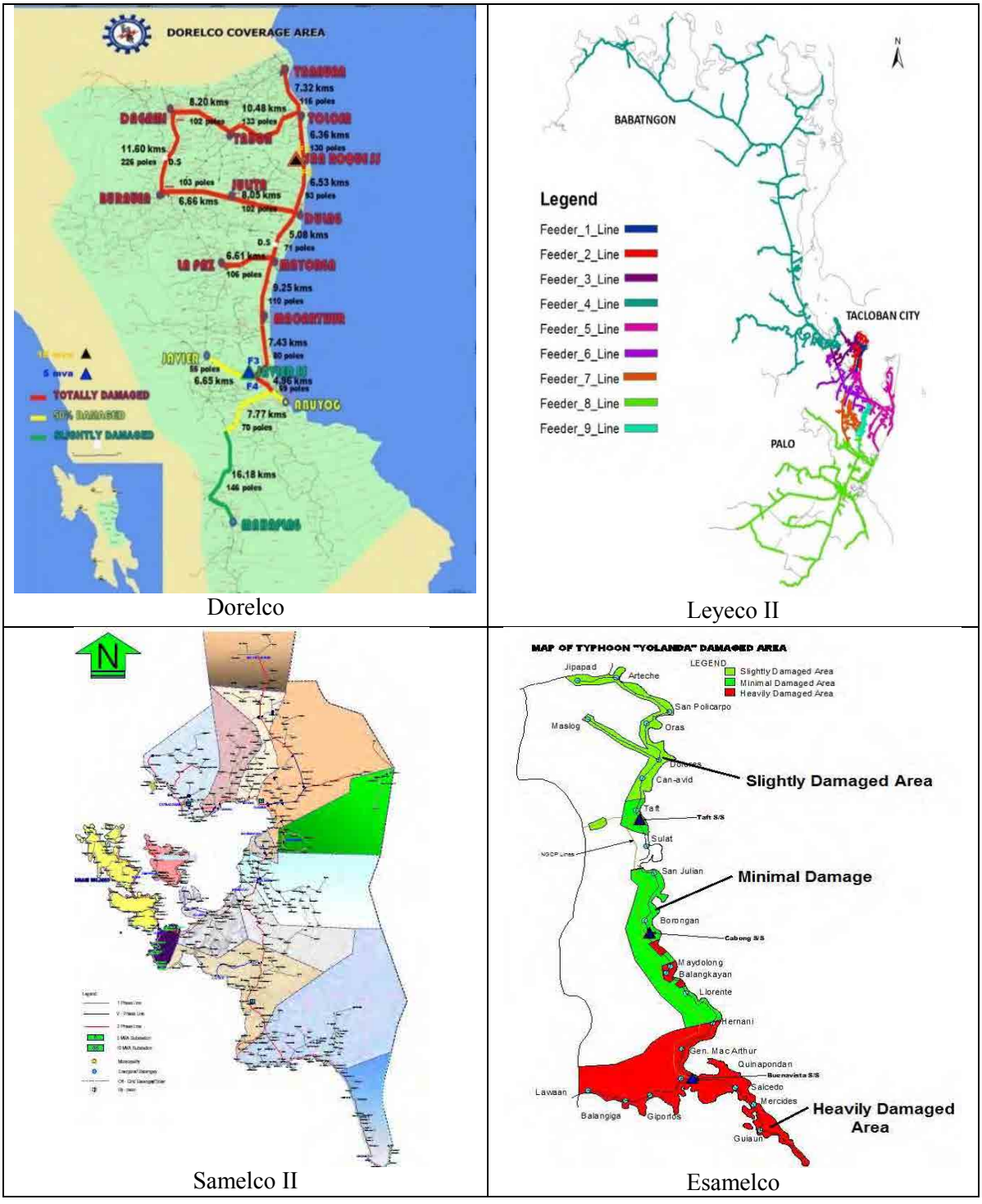
On the other hand, with the exception of the largest private company, Manila Electric Company (MERALCO), there are more than 100 electric cooperatives (ECs) that are non-profit and public organizations in the power distribution sector, aside from the generation sector. The number of existing ECs in Leyte Island, Samar Island, and Biliran Island, equivalent to Region VIII, is ten.

According to the Department of Energy (DOE), the total financial damage due to Super Typhoon Yolanda was estimated to be 4.92 billion PhP, and 34 ECs and 20 provinces were seriously affected. The most damaged EC, which supplies the northern and eastern part of Leyte Island with power, is Don Orestes Romualdez Electric Cooperative (Dorelco). The financial damage to Dorelco is 870 million PhP, comprising approximately 18% of total damage. Also, Leyte II Electric Cooperative (Leyeco II), which supplies Tacloban city and the neighboring areas with power, sustained 660 million PhP of damage, which amounts to approximately 13% of total damage.

Table 1.3-6.2-4 List of Targeted ECs

Name of EC	Dorelco	Leyeco II	Samelco II	Esamelco
Customers (Households)	59,292	67,674	53,406	64,664
Damaged Cost [PhP]	870 million	660 million	125 million	392 million

Source: JICA Study Team



Dorelco | Leyeco II

Samelco II | Esamelco

Source: JICA Study Team

Figure. 1.3-1 Service Coverage Area for Each EC

The recovery and rehabilitation work of heavily damaged power distribution facilities has been implemented in cooperation with Task Force Kapatide (TFK), which is composed of the National Electrification Association (NEA) engineer staff and technical engineers from other power distribution ECs. Furthermore, other EC's are assisting by lending heavy equipment and human resources, and each EC is making best effort to achieve the complete recovery of the damaged power distribution facilities by the end of March 2014, which is set as a goal based on DOE's instruction, by purchasing the necessary power equipment from U.S.A, China, and Korea under the supervision of NEA.

1) Dorelco

Dorelco is the electric cooperative that supplies the power mainly for the area from Tanauan to Mahaplag in the central eastern part of Leyte Island. Dorelco is based in San Roque and has 119 employees (as of Dec. 31, 2012). Aside from the main office in San Roque, it has two field offices, in Jabier and Burauen.

Dorelco has two power source substations for power supply, ① Tolosa Substation（Transformer: 10 MVA×1 unit） and ② Javier Substation（Transformer: 5 MVA×1 unit）, which both have primary voltage of 69 kV and secondary voltage of 13.2 kV. In order to supply power for mining companies, Dorelco has a plan to establish a new substation (scheduled to operate in 2016, with capacity of Tr: 25 MVA×1 unit). The transmission line installed on the primary side of the substation is operated by 、 NGCP. On the other hand, the facilities below the busbar on the primary side are operated by Dorelco.

When Super Yolanda hit, the power interruption occurred in the whole coverage area, and there was heavy damage. As the transformer installed close to Dorelco's main office had a fault due to flying objects and storm surge, Dorelco plans to replace it with a new one. (The first commissioning test was completed on February 10, 2014. The condition of the power supply was recovered.) The first energization after Yolanda was implemented 44 days later, on December 12, 2013, and the amount of the power supply was only 65 kW. As of February 2014, the maximum power demand is approximately 1.6 MW. It would take a while for the power supply to reach pre-Yolanda levels.

The number of pole transformers necessary for rehabilitation is estimated to be 868 units and they are being procured from the U.S, China, and Korea. Dorelco is utilizing subsidies and the calamity loan program provided by the Filipino government for its fund.

As for heavy equipment, Dorelco owned one boom truck with bucket and digger, one boom truck with bucket, and a cargo truck. However, the boom truck with bucket and the cargo truck were inundated by storm surge, and they are nearly discarded vehicles. Dorelco has since procured a new boom truck with bucket and a cargo truck; two pieces of heavy equipment were procured but the cargo truck broke down due to trouble. Therefore, the available heavy equipment for Dorelco is one boom truck with bucket and digger, and two boom trucks with bucket, totaling three pieces

of heavy equipment. Two of them have been used for 14 years since purchase. Accordingly, there is the possibility of depletion of spare parts and the potential occurrence of trouble is concerning. Hence, rehabilitation of heavy equipment is strongly expected.

In order to make up for the shortage of heavy equipment, five pieces of heavy equipment have been lent to Dorelco by the largest private power distribution company, Meralco, and other ECs, free of charge, and Dorelco is proceeding with recovery and rehabilitation work in order. The number of operators for boom trucks is 10 persons.

2) Leyeco II

Leyeco II is the electric cooperative that supplies power for the northeastern part of Leyte Island around Tacloban City, and has 134 employees (as of Dec. 31, 2012). The peak demand in the coverage area is approximately 40 MW（as of Dec. 31, 2012）. Aside from the main office in Tacloban, Leyeco II has two field offices in Palo and Babatngon.

Leyeco II has three power source substations for power supply, ① Abucay Substation（Transformer: 20 MVA×1 unit）, ② Sagkahan Substation（Transformer: 10 MVA×2 units）, and ③ Campetic Substation（Transformer: 10 MVA×1 unit）, which all have primary voltage of 69 kV and secondary voltage of 13.2 kV. The transmission line installed on the primary side of the substation is operated by National Grid Corporation of Philippines (NGCP). On the other hand, the facilities below the busbar on the primary side are operated by Leyeco II.

When the super typhoon hit, the power interruption occurred in the coverage area, and the whole area of Tacloban and Palo experienced total blackout. Babatngon experienced power failure. Tacloban City is the biggest city in Leyte, and had significant damage because it is the center of government and economy.

The transformer in one of the three substations was damaged by strong wind and flying objects, and others have been kept good condition. The damaged transformer is under repair, aiming at the completion of repairs by the end of April 2014.

The first energization was only 33 kW, which was implemented 24 days after Yolanda, on December 2, 2014. The maximum peak demand is approximately 2 MW.

Regarding the number of pole transformers necessary for rehabilitation, 7,508 units are required, and they are local products. Leyeco II is utilizing subsidies and grant aid.

Leyeco II owns 4 boom trucks with bucket and digger, and one truck for pole carriage—5 pieces of heavy equipment in total. Three vehicles, including a cargo truck with boom, are out of order, and available heavy equipment is only three boom trucks with bucket and digger. Two of the available three vehicles were manufactured in 2000 and the other was procured in 1998. Accordingly, depletion of spare parts and potential trouble are concerning. Hence, the replacement of heavy equipment is highly expected. Leyeco II has 15 operators of heavy equipment.

Leyeco II has a plan to upgrade Campetic Substation for Feeder 8 and 9 for Palo area. Feeder 4 for

northern Tacloban will have enough capacity for a few years.

3) Samelco II

Samelco II is the electric cooperative that supplies power for the midwestern part and southern part of Samar based on Paranas, and has 136 employees (as of Dec. 31, 2012). The maximum peak load is approximately 12 MW（as of Dec. 31, 2012）. Aside from the main office in Paranas, Samelco II has two field offices in Catbalogan and Basey.

Samelco II has three power source substations, ① Catbalogan Substation (Transformer: 10 MVA ×1 unit), ② Paranas Substation (Transformer: 5 MVA×1 unit), and ③ Bagolibas Substation (Transformer: 5 MVA×1 unit), which all have primary voltage of 69 kV and secondary voltage of 13.2 kV. The transmission line installed on the primary side of the substation is operated by NGCP. On the other hand, the facilities below the busbar on the primary side are operated by Samelco II.

When Super Yolanda hit, the whole coverage area experienced power interruption. The transformer of the power source substation was not damaged. However, the first energization after Yolanda was only 1,790 kW 20 days after, on November 28, 2013. The maximum peak load at present is approximately 9 MW.

Regarding the number of pole transformers necessary for rehabilitation, 605 units are required, and they are being procured from the U.S, China, and Korea. Samelco II is utilizing subsidies and the calamity loan provided by the Filipino government as its procurement fund.

Samelco II owns three pieces of heavy equipment, one boom truck with bucket and digger, one boom truck with bucket, and one cargo truck. The auger of the boom truck with bucket and digger is out of order, and the spare parts are depleted. Therefore, it cannot be repaired into working order. Accordingly, when pole erection is needed, Samleco II has no choice but to manually dig the hole with a post hole digger, and waste much time rebuilding an electric pole. Samelco II has 10 operators for heavy equipment.

<u>Basey</u>

- The area from Basey to Marabut is served with 5MW substation.
- Another substation will be required between Basey and Marabut.
- New substation will be necessary for new development in the west of existing poblacion, but there is no plan so far.
- The electricity poles and wiring were severely damaged by Typhoon Yolanda and electricity breakdown continued one month after Yolanda.
- For resilience against disasters, strengthening of poles and facilities will be required. Also emergency stand-by generators such as solar system will be good, but the cost will not be affordable.

4) Esamelco

Esamelco is the electric cooperative that supplies power for the mideastern part and southern part of Samar Island based on Borongan, and has 146 employees (as of Dec. 31, 2012). The maximum peak load is approximately 14 MW (as of Dec. 31, 2012). Aside from the main office in Borongan, Esamelco has four field offices in Guiuan, Buenavista, Taft, and Burak.

Esamelco has three power source substations, ① Taft Substation（Transformer: 5 MVA×1 unit）, ② Cabong Substation （Transformer: 15 MVA×1 unit）, and ③ Buenavista Substation （Transformer: 5 MVA×1 unit）, which all have a primary voltage of 69 kV and a secondary voltage of 13.2 kV. The transmission line installed on the primary side of the substation is operated by NGCP. On the other hand, the facilities below the busbar on the primary side are operated by Esamelco. Besides, Esamelco has a mini-hydro power station （Amajuray Power Station: 500 kW×2 units） at the secondary system of Buenavista Substation. Due to the synchronizing control device fault, it cannot be operated in parallel and one unit operation is forced under normal conditions.

When Super Yolanda hit, the whole coverage area experienced power interruption. The transformer of the power source substation was not damaged. However, the circuit breaker at the secondary side of Buenavista substation located in the sourthern part of Samar Island was damaged due to the flying object. As a temporary restoration, the electric circuit was bypassed in order for the electric current not to flow through the circuit breaker, and it is scheduled to be replaced in the near future. The first energization after Yolanda was only 1,579 kW, 23 days after, on December 1, 2013. The maximum peak load at present is approximately 8 MW.

Regarding the number of pole transformers necessary for rehabilitation, 815 units are required, and they are being procured from the U.S, China, Korea, and Vietnam. Esamelco is utilizing subsidies and the calamity loan provided by the Filipino government as its procurement fund.

Esamelco owns three pieces of heavy equipment, one boom truck with bucket （used vehicle purchased in 2008）, and two cargo trucks. Esamelco have no boom truck with digger. One cargo truck was hit by storm surge when it was parked at Guiuan sub-office. It’s front and side windows were completely smashed and it is difficult to start up its engine. It is in faulty condition and is close to being scrapped. In order to make up for the shortage of heavy equipment, five pieces of heavy equipment, namely, one boom truck with digger and bucket, two boom trucks with bucket, and two cargo trucks, have been lent to Esamelco by other ECs, free of charge, and Esamelco is proceeding with recovery and rehabilitation work in order. Esamelco has 2 operators for heavy equipment.

In the northeastern part of Leyte and the southern part of Samar, the disconnection and slacking of wires, the collapse and damage of electric poles, and damaged transformers were confirmed in the wide area around the coastal area. Also, recovery work from the outage is proceeding on a priority basis, and existing and damaged power facilities, such as collapsed poles and damaged wires, still remain alongside newly build facilities. In order to ensure public safety and improve the landscape,

the quick recovery of damaged facilities is required.

(2) Promotion of Ocean Thermal Energy Conversion (OTEC) in Guiuan

Guiuan is located at the end of projected peninsula in tropical zone and it is advantageous with the following:

- Deep sea[2] is near (Deep sea water of more than 700m deep will be taken in a distance of approximately 9km on Pacific ocean side.).
- Surface sea water is warm all year round.
  (more than 22°C)
- Intake and discharge of sea water will not give serious influence in environment.
- The temperature difference between surface sea water and deep sea water is large (more than 15 °C).

Source: JICA Study Team

Figure 6.2-4 Sea Depth of West Coast Side of Guiuan

(Source: www.nauticalchartsonline.com)

[2] Deep sea water deeper than 200m has the following characteristics:
(a) Water temperature is stably cold all year round
(b) Generally water quality is clean without hazardous bacteria.
(c) Water contains rich minerals.

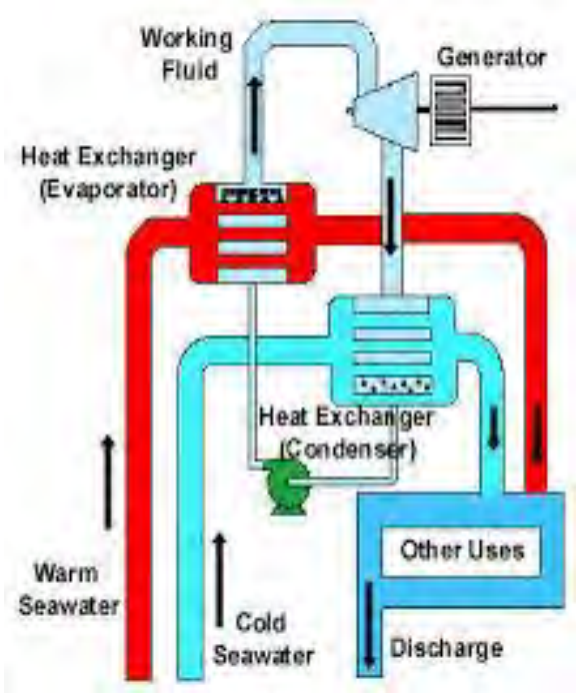


Figure 6.2-5 System of OTEC (Closed system)

(Source: zebu.uoregon.edu)

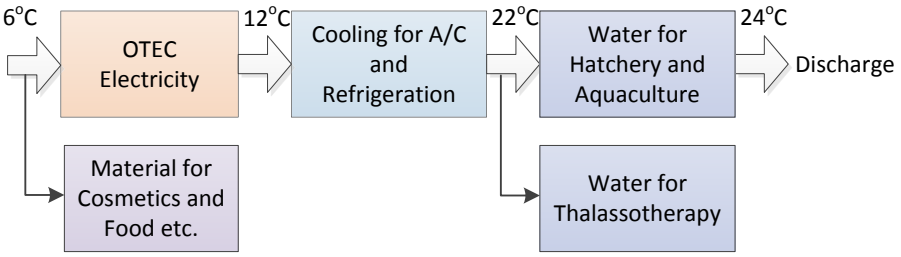
There is no major power plant in Samar island and electricity is mainly transmitted from Leyte island.

In particular, Guiuan is far end of Samar island and electricity supply is not sufficient nor stable.

Ocean thermal energy conversion (OTEC) is a technology to generate power utilizing difference of temperature between surface sea water and deep sea water, consuming no fossil fuels and discharging no carbon dioxide. Intake of cold deep sea water will be 600 - 800m deep with temperature of 5 ~ 9 ^{o}C.

Taken deep sea water can be used for materials for cosmetics rich in contained minerals, thalassotherapy[3] facility, water for hatchery without virus and so on. Cold deep sea water will be used for cooling water in air-conditioning and refrigeration.

The above various use of deep sea water will be organized in a cascade way according to increase of water temperature.



Source: JICA Study Team

Figure 6.2-6 Use of Deep Sea Water in Cascade Way

[3] Therapy with medical use of seawater

In the above circumstances, OTEC should be promoted in Guiuan.

Produced electricity can be sold to ESAMELCO or directly used for large consumer such as food processing factory and cold storage.

OTEC is still experimental and verification stage and countermeasures against storm surge, tsunami and strong wind should be considered. However OTEC should be promoted as it will have great potential and advantage.

6.2.4 Telecommunication

Mobile phone systems are operated by 4 private companies. Mobile phones are in widespread use and important communication media for any disaster. However the antennas were collapsed with no back-up electricity supply, and communication breakdown continued more than one month after Yolanda.

There are opinions and request of satellite phones and radio transceiver system for emergency with emergency electricity supply such as solar system and emergency generator with fuel storage.

6.2.5 Sewerage and Rainwater Drainage

Central sewer system has not been completed. Each house or building has septic tanks for treatment of waste water, however the treatment condition is not good.

Rainwater drainage is not sufficient for heavy rain. Clogging of drainage usually occurred.

There are following projects in Recovery and Rehabilitation Plan:

- **Tanaunan**: Drainage system rehabilitation (improvement and widening of drainage canals in poblacion areas)
- **Tacloban** (medium term): Rehabilitation/reconstruction of damaged national roads including drainage system

Chapter 7 Preliminary Study of Structural Measure for Tacloban-Palo-Tanauan

7.1 Introduction

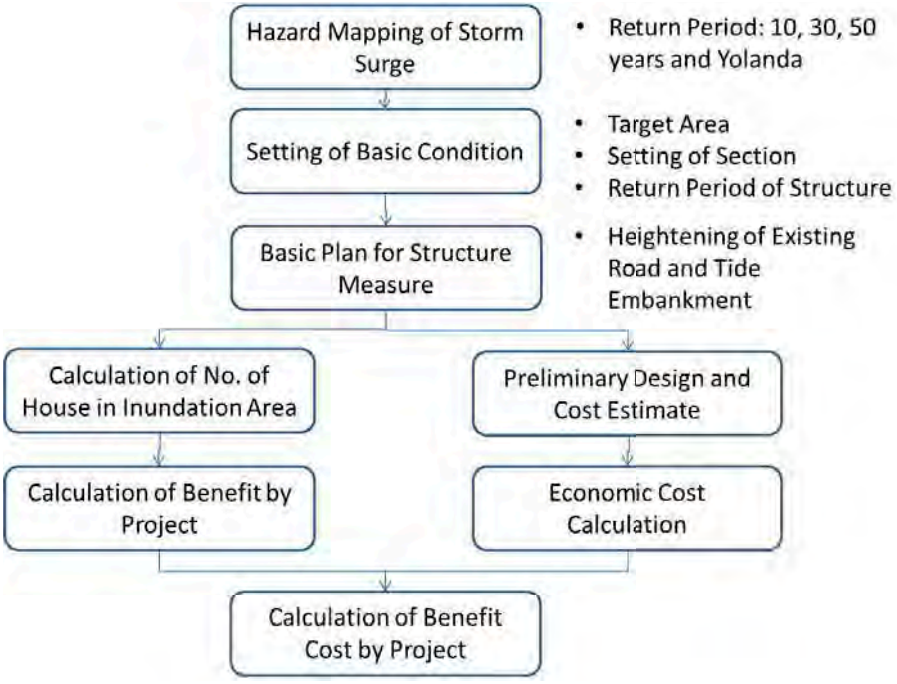
Typhoon Yolanda caused serious physical and indirect damage along "Yolanda Corridor" in which more than 150 LGUs included.

In order to mitigate physical damage resulting into creating safer cities, introduction of structure measure is inevitable; however, its quantitative effect should be analyzed in advance.

JICA Study Team conducted a case study for structure measure to protect the most affected area by Typhoon Yolanda in Tacloban, Palo and Tanauan based on the quantitative analysis using the storm surge hazard map.

It is expected that this case study (its approach and method) shall be referred in the discussion of recovery and reconstruction plan in GOP.

Figure 7.1-1 shows the general study flow for the structure measure. In this JICA Study (1st year period), the case study was conducted until the calculation of benefit by the measure and preliminary design.



Source: JICA Study Team

Figure 7.1-1 General Study Flow for Structure Measure

7.2 Hazardous Area by Storm Surge

7.2.1 Topography in Tacloban-Palo-Tanauan

The topography in Tacloban-Palo-Tanauan, especially the urban areas along coast line, can be characterized by the flat and low lying area of the Leyte plain. The most of the urban area was below 5 m above mean sea level. The storm surge caused by the typhoon Yolanda submerged such low-lying area.

7.2.2 Probable Affected Area

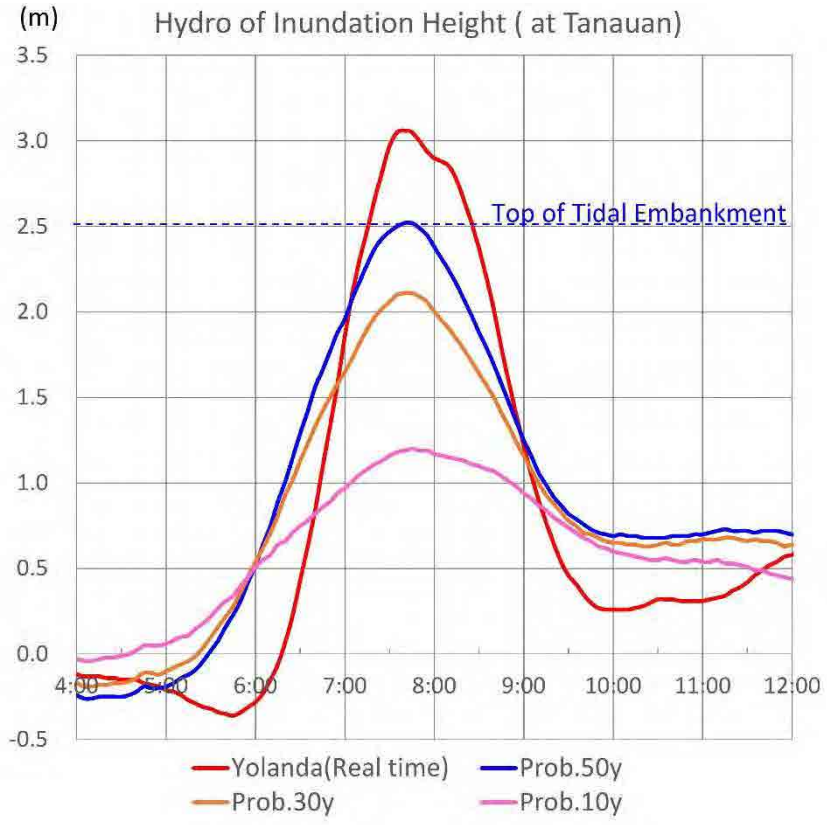
Derived from extreme value statistics (based on minimum central pressure for each year for typhoons that have passed the Leyte Gulf between 1951 and 2013） was tabulated as shown in Table 7.2-1. The elevations for Tacloban, Palo and Tanauan shown in the table are the representative value while the actual distribution of the elevation along the coastal line is more detailed. For example, in Tacloban (airport), during the Typhoon Yolanda the maximum storm surge was MSL+4.2m while for the 50 years return period it was MSL+3.4 m, which is 0.80 m lower than the Yolanda case. Also as it goes to south toward Tanauan, the maximum storm surge height decreases.

Table 7.2-1 Probable Storm Surge Elevation for various return periods

Typhoon scale	Tacloban (Airport)	Palo	Tanauan
Yolanda Pres. :895hPa	**4.2m**	**3.6m**	**3.1m**
50year Pres.: 915hPa	**3.4m**	**3.0m**	**2.5m**
30year Pres. : 928hPa	**2.8m**	**2.5m**	**2.1m**
10year Pres.: 956hPa	**1.6m**	**1.4m**	**1.2m**

Source: JICA Study Team

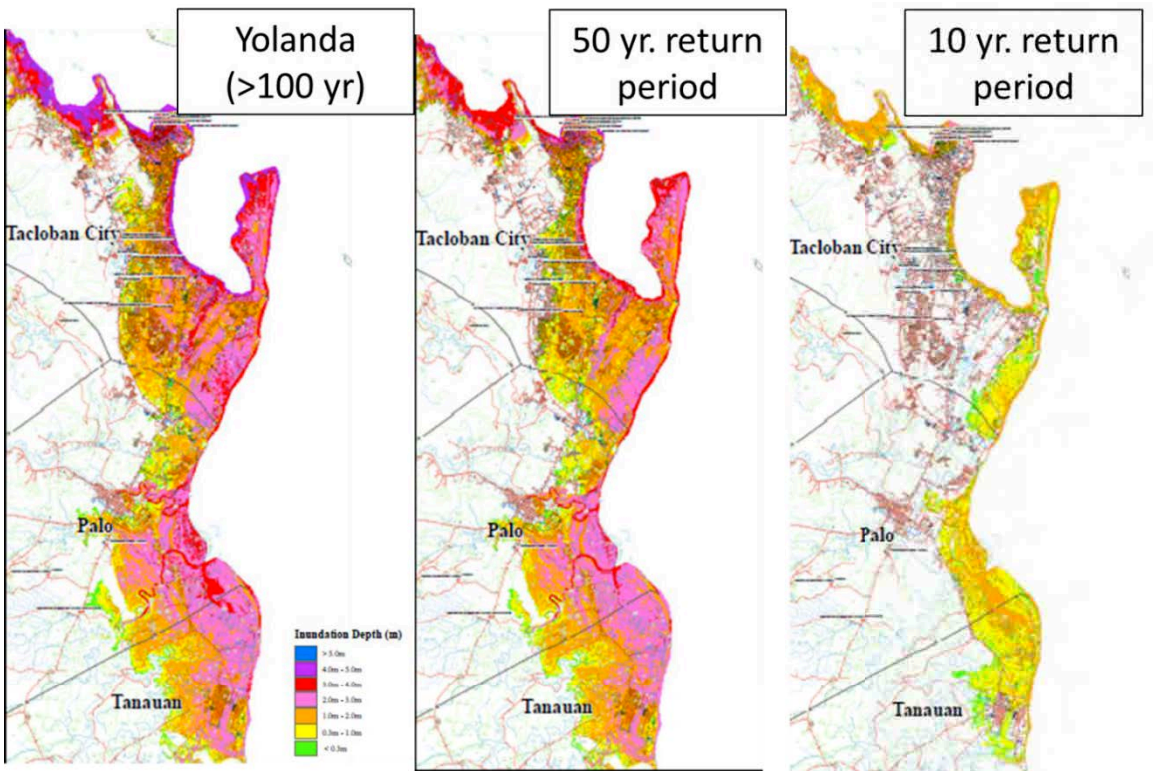
Figure 7.2-1 shows the Simulated Storm Surge Hydrograph for various return periods at Tanauan. The time of horizontal axis is Nov. 8, 2013. It is shown that before 8AM, Nov.8, 2013 there was a peak of storm surge in the case of Typhoon Yolanda. The hydrographs for other return periods were created by reducing the hydrograph of Yolanda case.



Source: JICA Study Team

Figure 7.2-1 Simulated Storm Surge Hydrograph for various return periods at Tanauan

The probable affected (inundation) area by storm surge was simulated for 10 years, 50 years return period and Yolanda case. The resultant hazard maps are shown in Figure 7.2-2. The return period of Yolanda case is approximately 100 years and more rare. Compared the Yolanda case with the 50 years return period case, there do not seem big difference in terms of the inundation area.



Source: JICA Study Team

Figure 7.2-2 Probable inundation area by storm surge for 10 and 50 years return period and Yolanda case

7.3 Selection of Structural Measure

7.3.1 Structural Type

In order to protect the area against the storm surge, the conceivable structure types are wall or embankment on the ground whose top elevation is above the protection level. The structure for wall and embankment is a retaining wall by concrete and earth dike in general.

In the typhoon Yolanda affected area in Tacloban, Palo and Tanauan, the national highway and local main roads are running through the area. Therefore, it is a practical option to utilize the existing road structure by heightening.

7.3.2 Protection Level

The return period of Typhon Yolanda was estimated to be more than 100 years. The factors to be considered for the protection level are

- The return period of Typhoon Yolanda
- Protection level by structure in the Philippines

The 50 years return period was selected as the protection level for Tacloban, Palo and Tanauan against the Storm Surge.

The above 50 years return period is estimated on the storm surge, however, for the structure design, tsunami event was considered as later discussed. The external force condition for tsunami was based on rough analysis in the READY Project tentatively. Thus, further study is needed for the structure design when tsunami force is taken into account.

As another issue, because at present the ground condition is not cleared yet for this structure design, earthquake force including liquefaction was not done. Depending on the result of geotechnical investigation in the basic design phase in the future, further countermeasure might be necessary.

7.3.3 Alignment

The basic policies to decide the alignment of the structure are

- To protect the area affected by Typhoon Yolanda
- To prioritize on the protection of urban area
- To utilize the existing road as the elevated road alignment
- To minimize the number of affected people

Based on the above basic policies JICA Study Team had a series of discussion with DPWH, Tacloban City, Palo Municipality and Tanauan Municipality in terms of the appropriate alignment. All City/Municipalities favor the utilization of the existing road and the maximization of the protected area.

DPWH would like to implement the road project by reducing the number of the affected people.

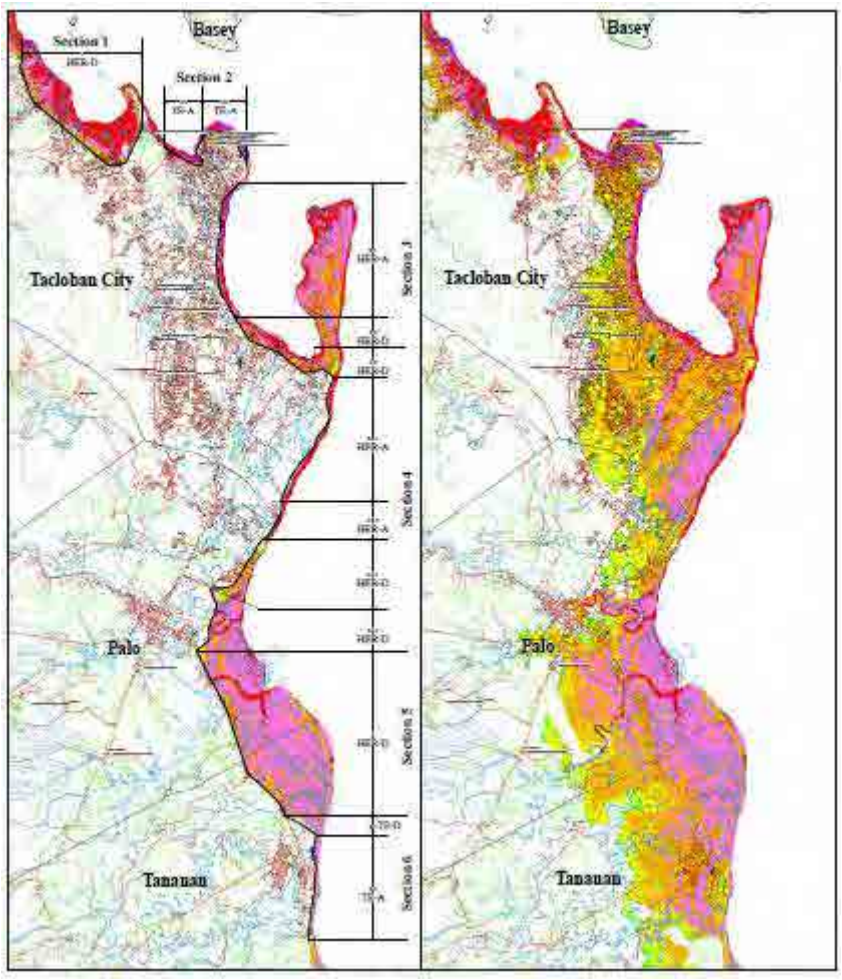
The resultant alignment is shown in Figure 7.3-1. In Tacloban, Palo and Tanauan, the alignment shall protect the central business area, most of the urban area while it remains large swamp area between Palo and Tanauan.

The alignment is divided into 6 sections from Tacloban to Tanauan. The total length of the 6 sections is 27.3 km as shown in Table 7.3-1.

Table 7.3-1 Section Name and Length for the Alignment

Section Name	Length (km)
Section 1: Tacloban	4.2
Section 2 : Tacloban	2.9
Section 3: Tacloban	5.2
Section 4 : Tacloban-Palo	7.8
Section 5: Palo-Tanauan	4.1
Section 6: Tanauan	3.1
Total	27.3

Source: JICA Study Team



Source: JICA Study Team

Figure 7.3-1 Proposed Alignment

7.3.4 Profile

The top elevation of the elevated road / tide embankment was set as shown in Table below based on the simulation result for 50 years return period. The top elevation was decided by the storm surge deviation and estimated wave while not considering free board and the over top wave is allowed.

The top elevations of elevated road and tide embankment were shown in Table 7.3-2. The top elevation varies from 4.5 m to 2.8 m above MSL. The section 2, 3, 4 and 6 were divided into 2 to 4 subsections because of indicating type of structure. “HER” means heightening of existing road and “TE” means tide embankment. “D” and “A” after the “HER” or “TE” are distant and adjacent, respectively.

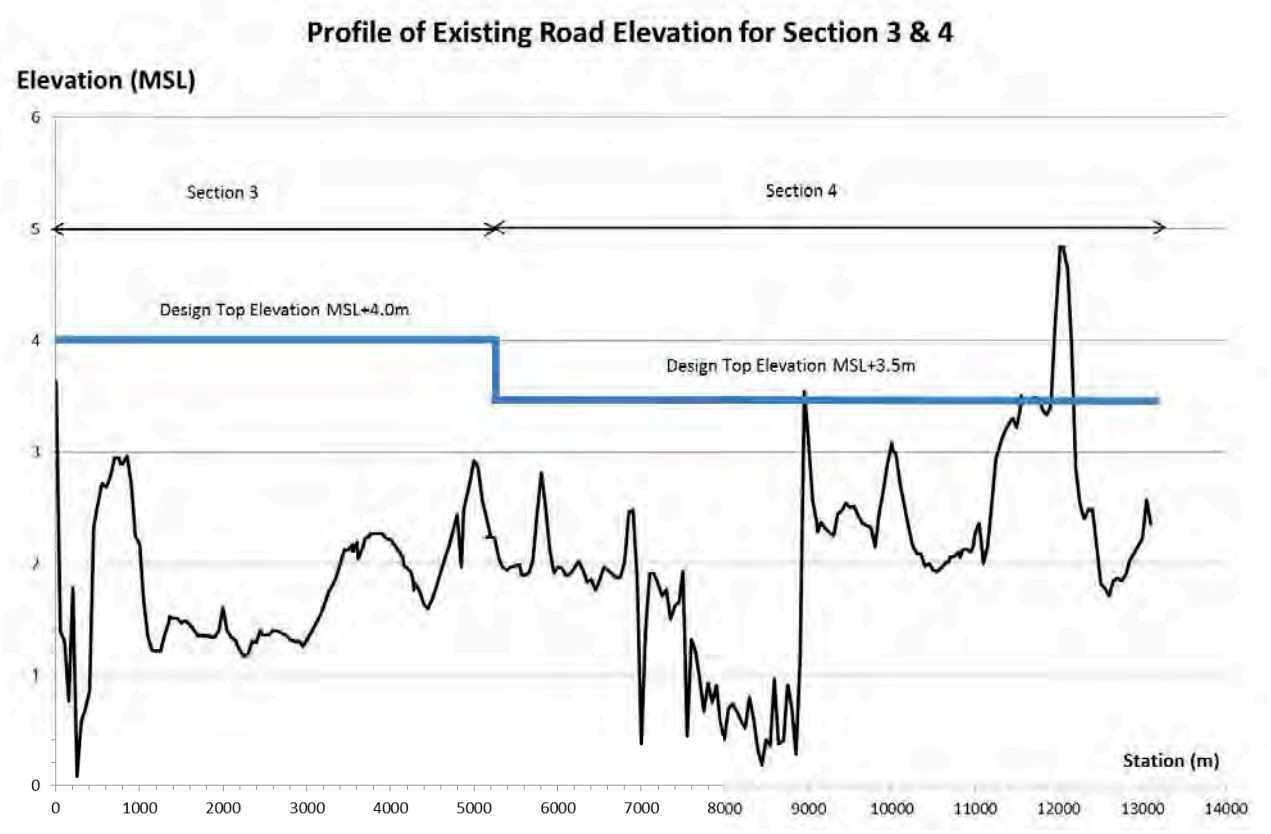
Table 7.3-2 Top Elevation of Elevated Road and Tide Embankment

Section	S-1	S-2		S-3		S-4				S-5	S-6	
	1	2-1	2-2	3-1	3-2	4-1	4-3-2	4-4-1	4-4-2	5	6-1	6-2
Required Height of Embankment*1	4.5m	4.0m	4.0m	4.0m	4.0m	3.5m	3.5m	3.5m	3.5m	3.0m	2.8m	2.8m
Inundation Height by Yolanda*1, *2	4.83m	5.10m	5.10m	5.10m	4.55m	3.53m	3.60m	3.53m	3.53m	3.20m	2.85m	3.20m
Type of Structure*3	HER-D	TE-A	TE-A	HER-A	HER-D	HER-D	HER-A	HER-D	HER-D	HER-D	TE-D	TE-A

*1: From MSL (Mean Sea Level)
*2: Based on Storm Surge Simulation
*3: HER (Heightening of Existing Road), TE (Tide Embankment), D (Distant from Shoreline), A (Adjacent to Shoreline)

Source: JICA Study Team

Figure 7.3-2 shows the profile of existing road top elevation for Section 3 & 4, based on the Lidar Survey result in the JICA Study. The figure also shows the proposed embankment top elevation for reference. The difference between the road elevation and the proposed top embankment elevation is regarded as the necessary heightening work in the Project. In Section 3, 2 meter heightening can be needed in most of the section, while locally 2.5 m heightening is needed in Section 4.



Source: JICA Study Team

Figure 7.3-2 Profile of Existing Road Elevation

7.4 Analysis of Effect of Structural Measure

7.4.1 Analysis Case

In order to estimate the effects of the structure measure, the following 2 cases were analyzed by inundation simulation for with and without projects.

- 50 years return period storm surge (the proposed)
- Yolanda case storm surge

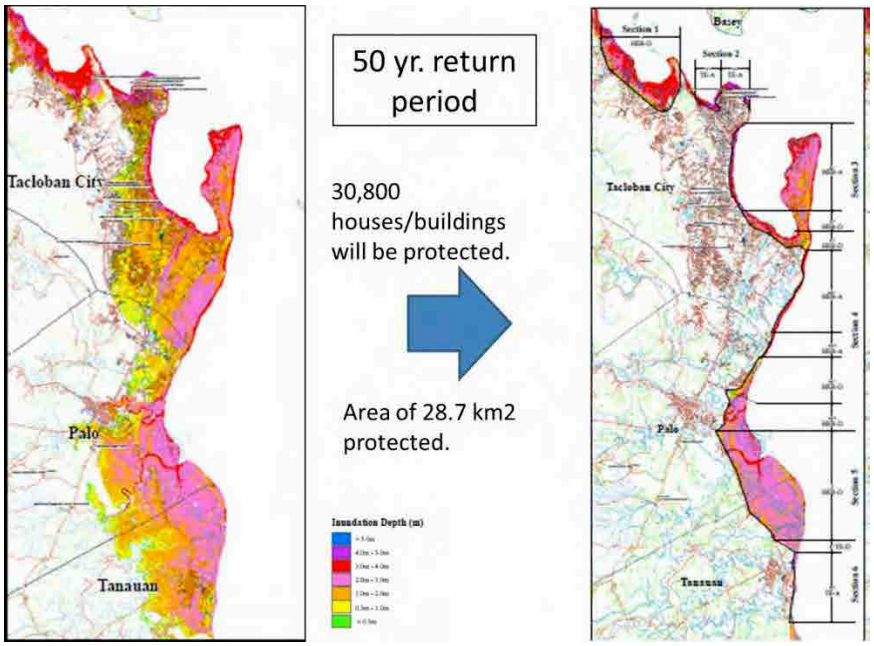
7.4.2 Effect of Structural Measure

By the proposed structure, for the 50 years return period storm surge, 30,800 houses/buildings will be protected from the inundation and the area of 27.3 km^2 will be protected (Figure 7.4-1).

For the Yolanda case, due to the flow over the structure, 6,900 houses/buildings will be protected from the inundation and the area of 10.0 km^2 will be protected (Figure 7.4-2).

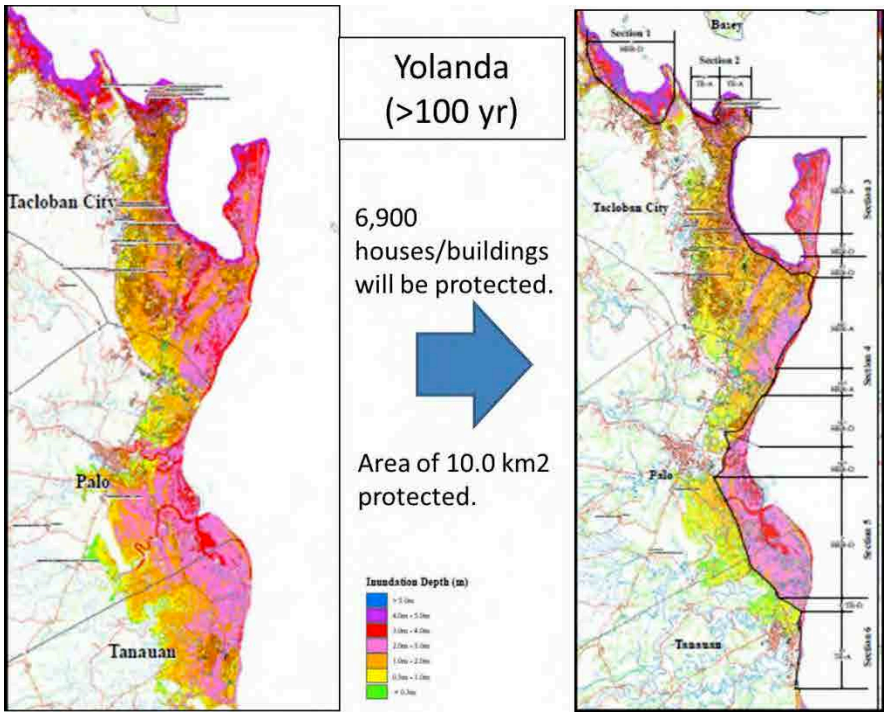
Figure 7.4-3 and Figure 7.4-4 shows the reduction of inundation area by depth for 50 years return period and the Yolanda case, respectively. It is obvious that for the 50 years return period case, the inundation will be eliminated. For the Yolanda case, the area whose inundation depth is more than 1m would be protected by mitigating deep inundation.

Figure 7.4-5 and Figure 7.4-6 shows the reduction of inundated houses/buildings by depth for 50 years return period and the Yolanda case, respectively. It is obvious that for the 50 years return period case, the inundated houses will be saved. For the Yolanda case, the houses/buildings at which inundation depth is more than 1m would be protected by mitigating deep inundation.



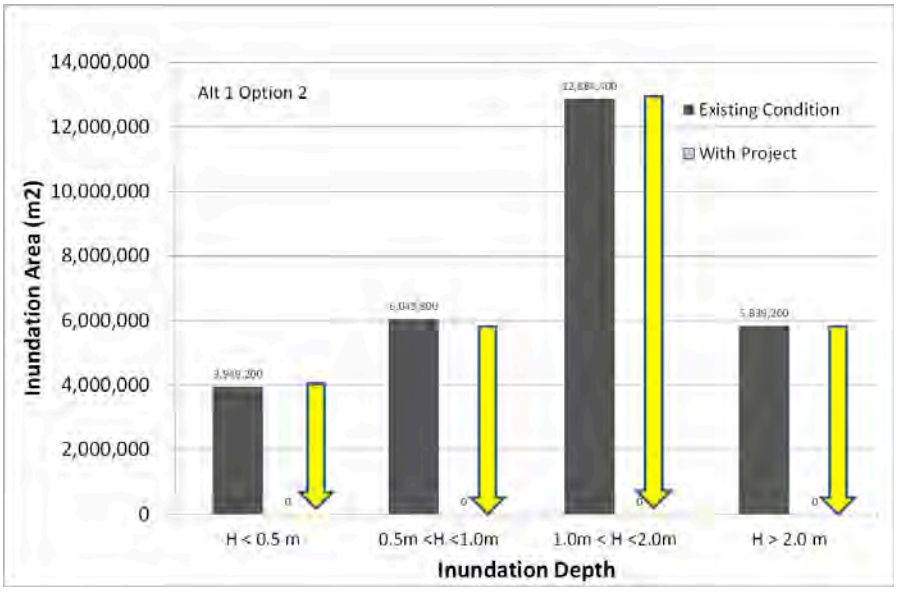
Source: JICA Study Team

Figure 7.4-1 Reduction of Inundation Area for 50 years return period



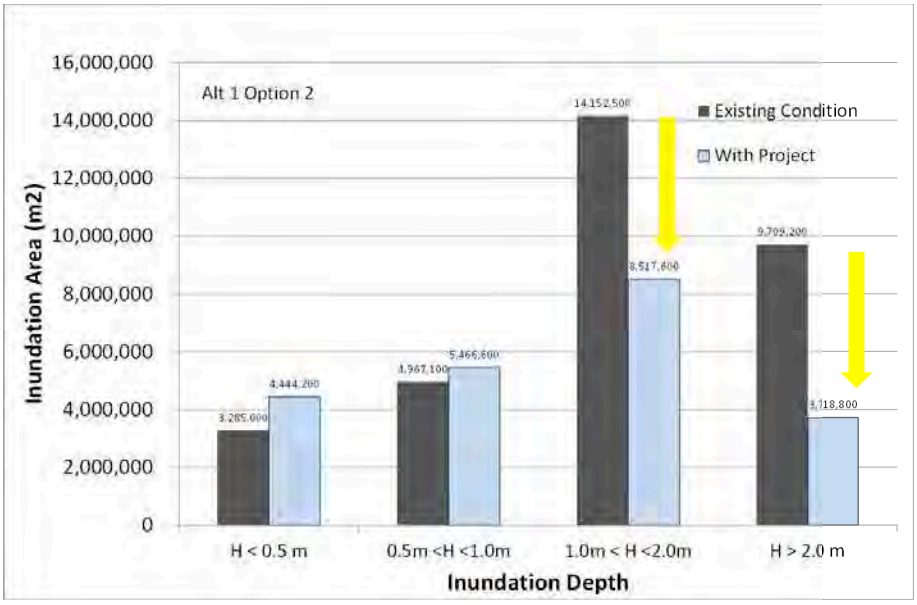
Source: JICA Study Team

Figure 7.4-2 Reduction of Inundation Area for Yolanda Case



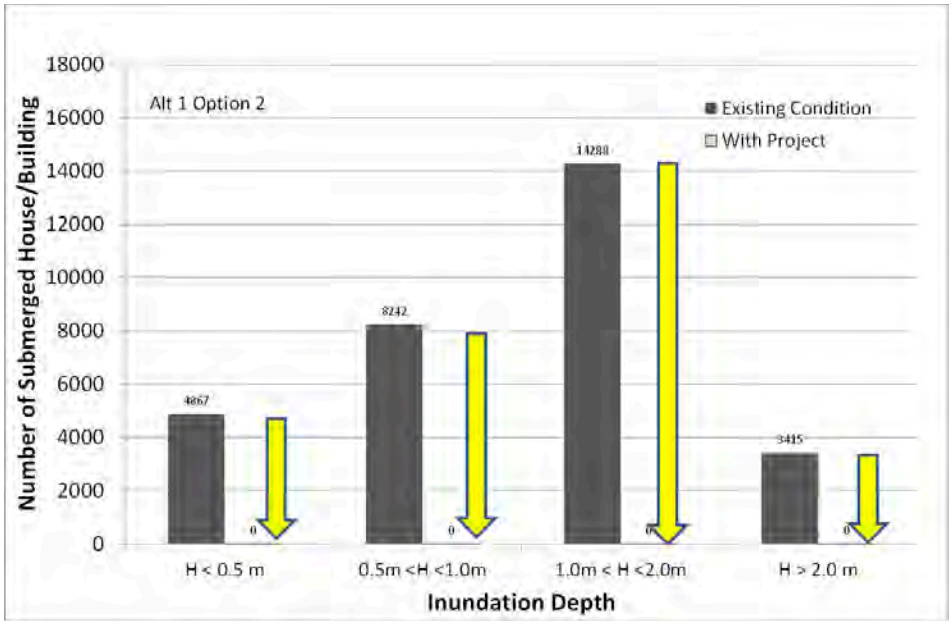
Source: JICA Study Team

Figure 7.4-3 Reduction of Inundation Area for various Depth range (50 years return period)



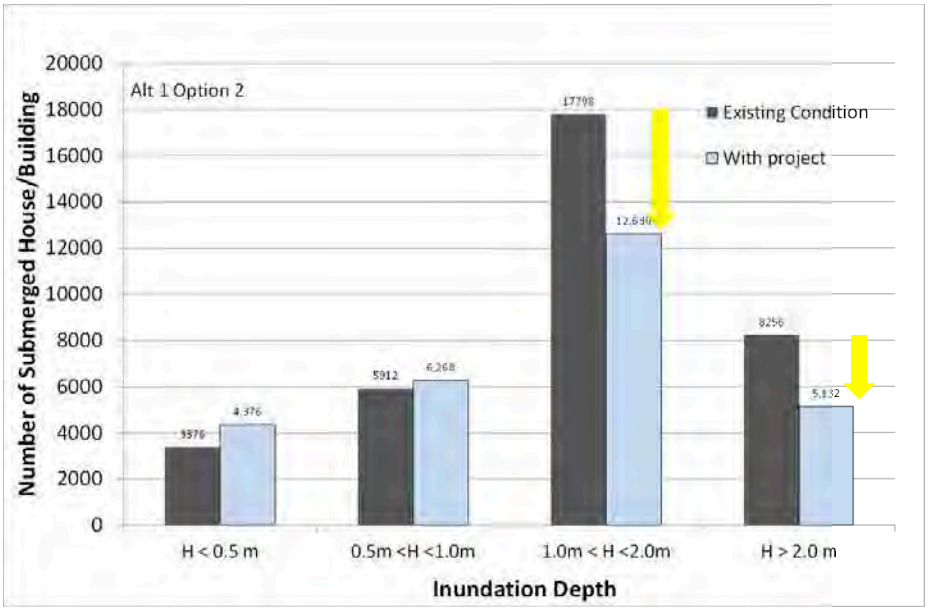
Source: JICA Study Team

Figure 7.4-4 Reduction of Inundation Area for various Depth range (Yolanda case)



Source: JICA Study Team

Figure 7.4-5 Reduction of Submerged Houses for various Depth range (50 years return period)



Source: JICA Study Team

Figure 7.4-6 Reduction of Submerged Houses for various Depth range (Yolanda case)

7.5 Preliminary Design

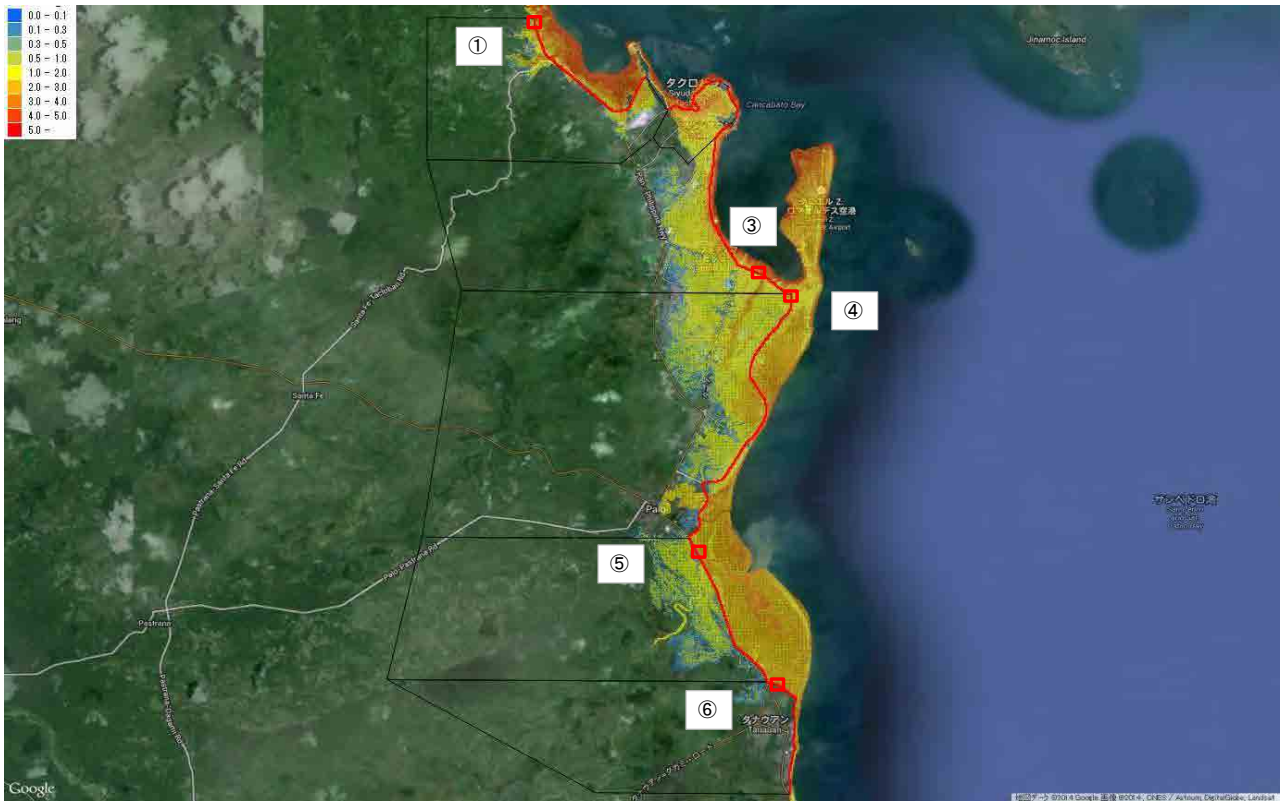
7.5.1 Design of Distant Section

Regarding the distant section, the structure design was conducted separately for seaside slope and land side slope.

(1) Design of Sea Side Slope

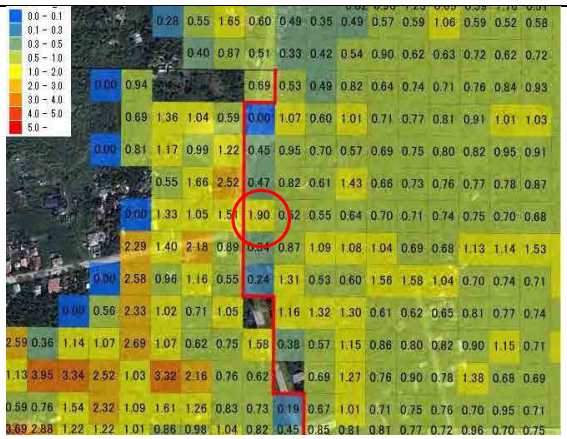
In this section, based on the storm surge simulation result on the velocities nearby the structure alignment, the design for the slope protection was conducted. The simulation case was the Yolanda case.

Figure 7.5-1 and Figure 7.5-2 show the location where maximum velocity occurred and the neighboring velocities (m/s), respectively.



Source: JICA Study Team

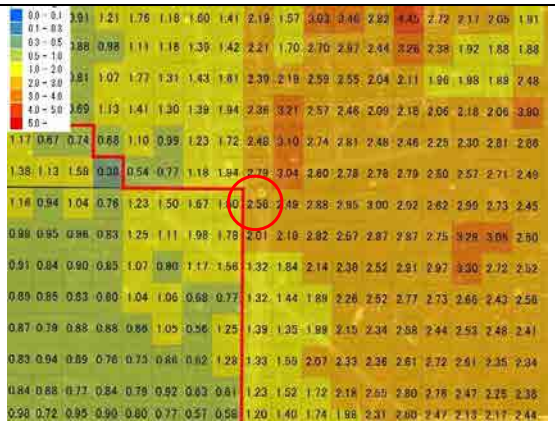
Figure 7.5-1 Location of Max. velocity by storm surge simulation for each Section (Distant Section)



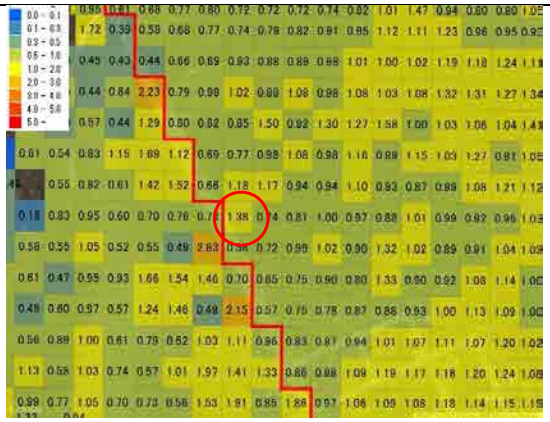
Section 1 （Max.1.90 m/s）

Section 2 （No distant section）

Section 3 （Max.1.85 m/s）



Section 4 （Max.2.56 m/s）



Section 5 （Max.1.38 m/s）

Section 6 （Max.1.25 m/s）

The values indicate the maximum velocity in each mesh, and ( ) indicates the maximum velocity in each Section.

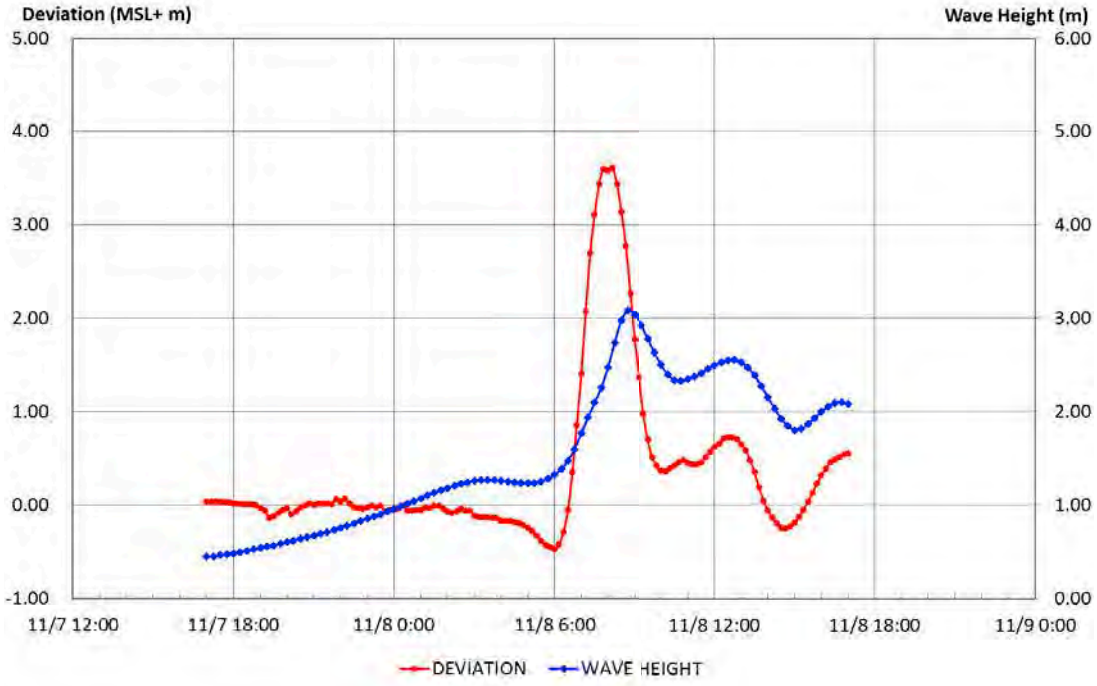
Source: JICA Study Team

Figure 7.5-2 Maximum Velocity (m/s) along Distant Section

While there are some locations whose maximum velocities are around 2 m/s locally, most of the area shows mild flow of maximum velocities 1.0 m/s.

According to the analysis result below (Figure 7.5-3), the peak times of the storm surge and wind

wave during the typhoon Yolanda do not match so that after the peak time of the storm surge the peak time of wind wave followed. Also since the alignment is distant, the effect of wind wave can be regarded small.



Source: JICA Study Team

Figure 7.5-3 Storm Surge and Wind Wave Analysis Result

Therefore, taking into consideration the above analysis result, grass sodding is proposed for the slope protection of seaside. In addition, dike foot waterway work is proposed in order to avoid the erosion by rainwater.

In Section 4, since there are some locations whose maximum velocities are around 2 m/s locally, which are corresponding to the boundary with Section 3. In this boundary, the alignment is bending sharply, resulting into the weak points, such alignment should be modified or some local protection work by concrete revetment should be considered.

(2) Design of Land Side Slope

In this section, based on the storm surge simulation result on the overflow discharge, the design for the slope protection of landside was conducted. The simulation case was the Yolanda case.

The maximum overflow discharge per unit width for each Section is shown in Table 7.5-1below.

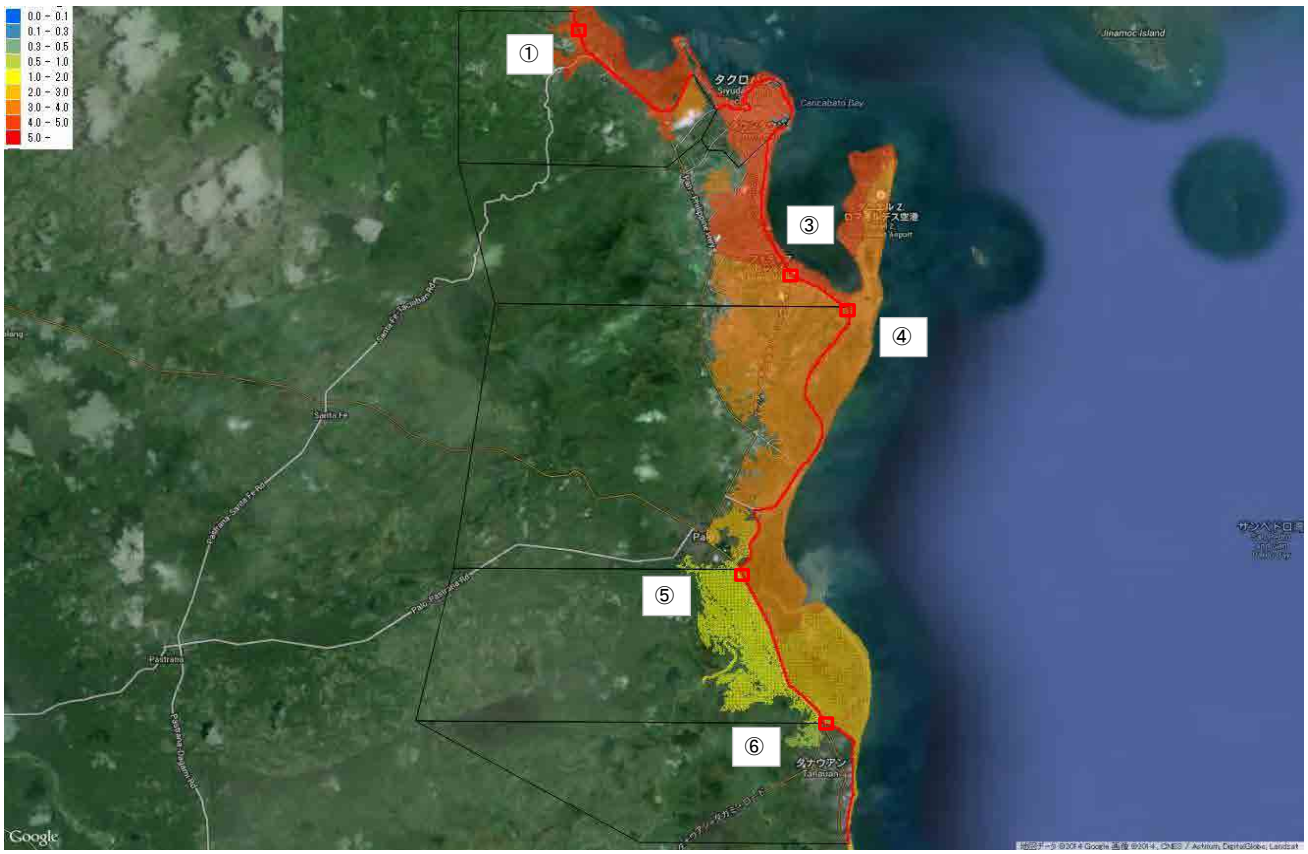
Table 7.5-1 Maximum Overflow Discharge per unit width for each Section

Location	Ground Elevation (m) (1)	Required Dike Elevation(m) (2)	Height of Storm Surge*1(m) (3)	Overflow Depth(m) (4)=(3)-(2)	Overflow Discharge (m^3/s/m) (5)	Duration of Overflow (min.) (6)	Total Overflow Discharge (m^3/m) (7)=60x(5)x(6)
S-1	2.77	4.50	4.83	0.33	0.29	16	139
S-3-2	2.72	4.00	4.55	0.55	0.63	25	469
S-4-1	2.07	3.50	3.53	0.03	0.01	3	1
S-4-4-1	2.07	3.50	3.53	0.03	0.01	3	1
S-4-4-2	2.07	3.50	3.53	0.03	0.01	3	1
S-5	1.31	3.00	3.20	0.20	0.14	41	297
S-6-1	0.67	2.80	2.85	0.05	0.02	17	9

: distant from shoreline

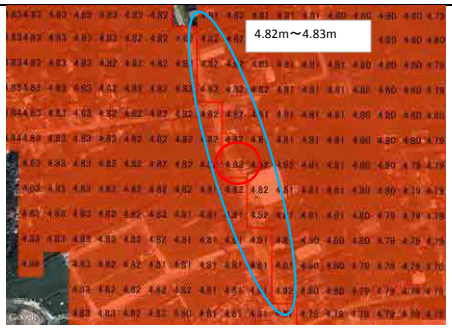
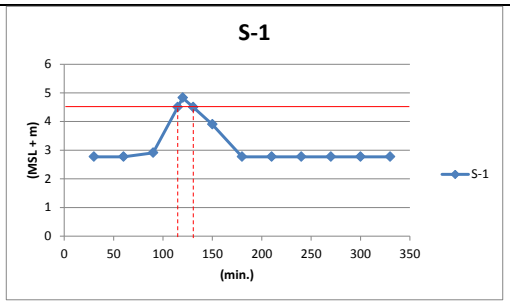
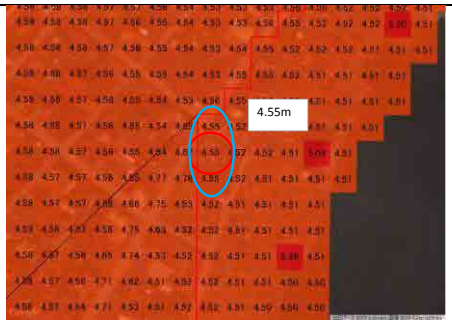
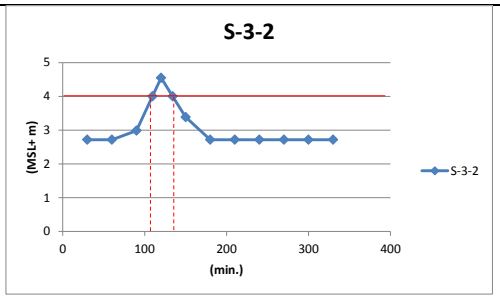
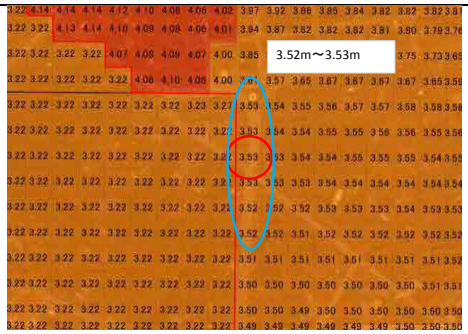
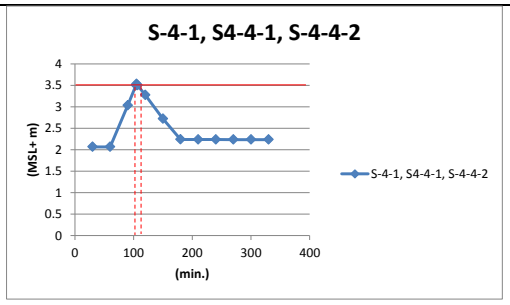
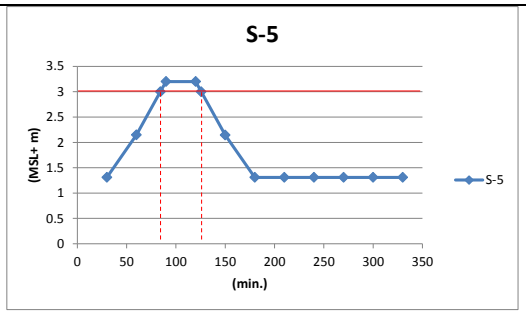
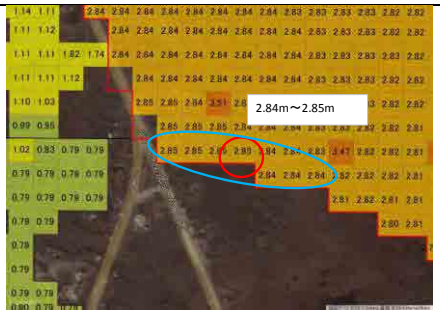
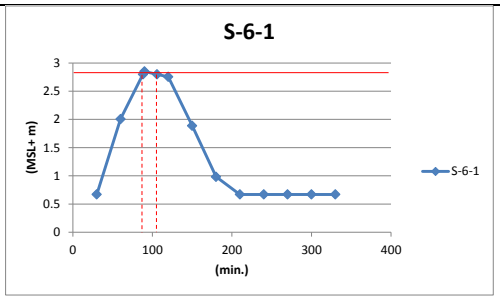
Source: JICA Study Team

The evidences of the above table are shown as maximum inundation elevation (MSL+ m) and the time series of inundation level in the following Figure 7.5-4 and Figure 7.5-5.



Source: JICA Study Team

Figure 7.5-4 Location of Maximum Inundation Level Occurrence for each Section (Distant)

Maximum Inundation Level	Time series of Inundation Level
	
	
	
	
	

Source: JICA Study Team

Figure 7.5-5 Max. Inundation Level and Time series of Inundation Level for each Section

According to Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping", the relationship between overflow discharge per unit width and embankment failure was analyzed by experiments. Some results show below.

In the case of grass sodding, immediately after the overflow the surface slope erosion occurs. When the overflow discharge reaches 100～500m3/m, the crown is eroded. When the overflow discharge reaches 200～800m^3/m, the dike breach occurs. It is mentioned in the report that the combination of Kanto loam (volcanic cohesive soil) and grass sodding is most resistant to erosion.

Also it is pointed out that according to the experimental result, the erosion on the landside slope is caused by sheet flow and the erosion near the crown is caused by the slope failure itself due to the slope surface erosion. This phenomenon contributes to the delay of the crown failure, however, once one location of the crown failures, afterwards the dike loses the resistance substantially.

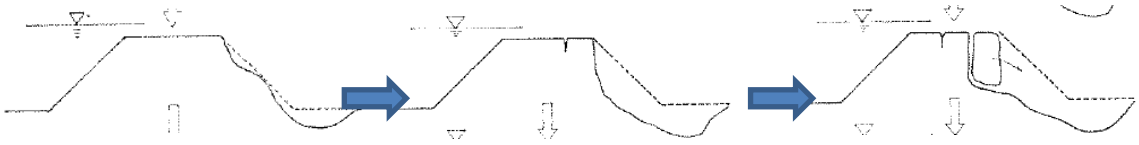


Figure 7.5-6 Failure Progress of Grass sodding Dike

(source: Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping")

Regarding the case in which the crown top is covered by asphalt, the result shows the wide variety. Figure 7.5-9 shows the result that when the overflow discharge exceeds 3,000m^3/m the dike breach occurs. Figure 7.5-10 shows when the overflow discharge exceeds 600m^3/m the crown starts the erosion and when exceeds 3,000m^3/m the entire breach occurs.

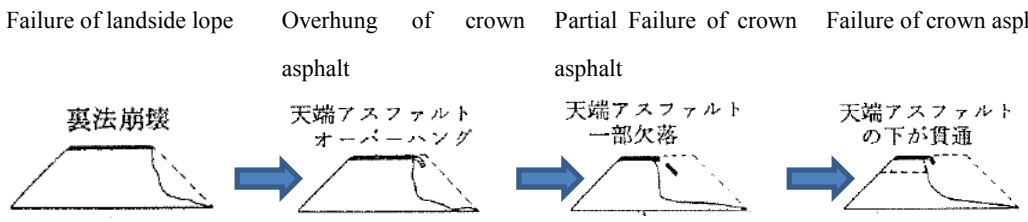


Figure 7.5-7 Failure Progress of Crown Asphalt Dike

(source: Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping")

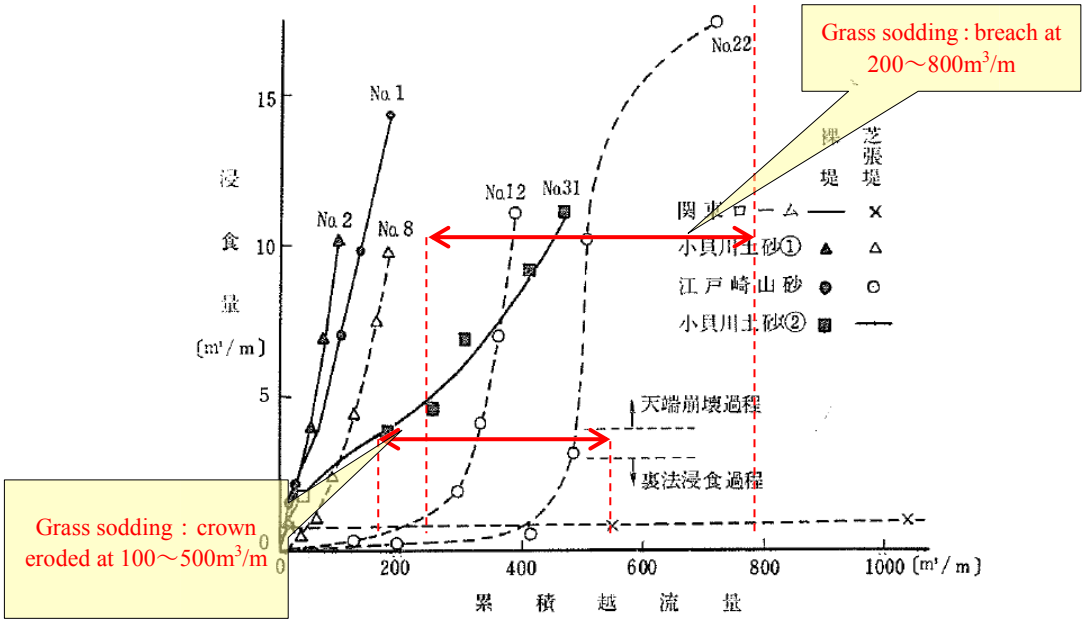


Figure 7.5-8 Relation between Overflow Discharge and Erosion

(source: Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping")

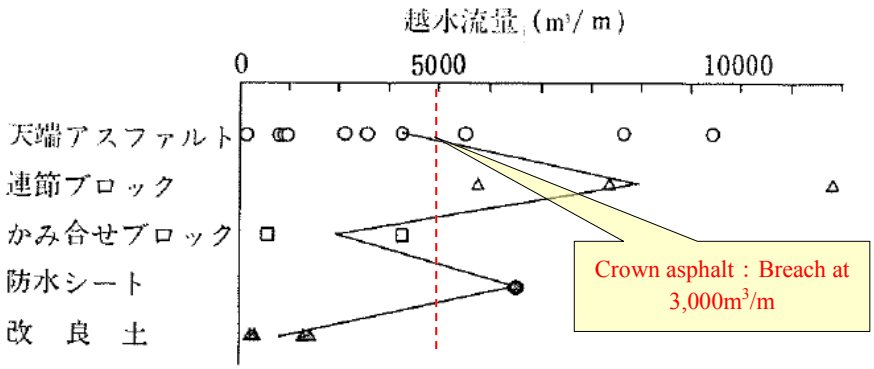


Figure 7.5-9 Total Overflow Volume per Unit Width until Dike Breach

(source: Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping")

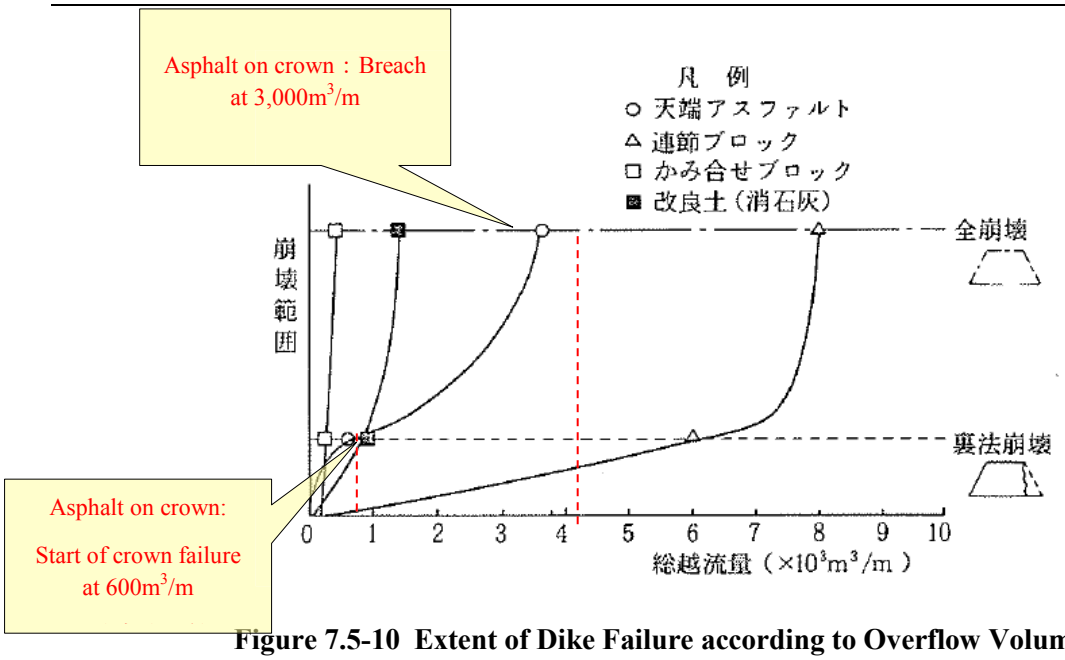


Figure 7.5-10 Extent of Dike Failure according to Overflow Volume

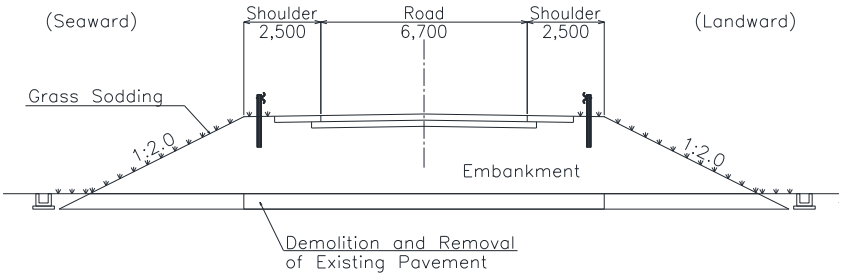
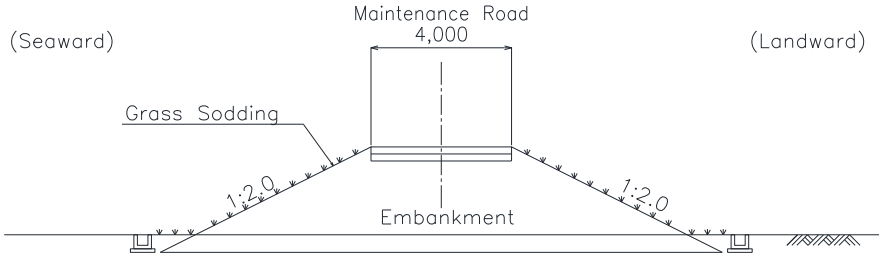
（Civil Engineering Technical Bulletin 27-7 (1985) "Experimental Study on Levee Reinforcement against Failure by Overtopping"）

While the experimental result shows the wide variety, the resistant effect to overflow by asphalt crown and grass sodding is large.

The maximum overflow discharge per unit width according to the storm surge simulation on typhoon Yolanda is 1 to 469m^3/m, and if the local erosion on landside slope and of crown is allowed, the combination of crown asphalt and grass sodding should be recommended as slope protection of the dike. However, in the referred report the experiment model used the asphalt for the crown, in Philippine concrete crown pavement shall consider.

(3) Standard Cross Section of Distant Section

Based on the above study results, the standard cross section of distant Section is as follows,

Section	Typical Cross-Section
S-1, S-3-2, S-4-1, S-4-4-1, S-4-4-2, S-5	 Grass Sodding
S-6-1	 Grass Sodding

Source: JICA Study Team

Figure 7.5-11 Standard Cross Section of Distant Section

7.5.2 Design of Adjacent Section

(1) General

The figure in the next page shows the condition of coastal area in Section 1-6.

Near coastal areas in Tacloban (Section 2-1, 2-2 and 3-1), most of the existing houses was damaged by typhoon Yolanda. In the backyard of these sections, there are many commercial facilities backing the city's economic activities that suffered from damage.

Near coastal areas in Palo (Section 4-3-2), while this area was damaged by typhoon Yolanda, even before the Yolanda, the concrete revetment was hit by wind wave, resulting into the wash out of the concrete surface including the crown. The backyard of the section has governmental building of Region VIII as well as the DPWH Regional Office.

Near coastal area in Tanauan (Section 6-2), the large tanks were fallen down and jetty for uploading and unloading was washed out (650 m decreased 50m) and the existing structure was heavily damaged. According to the interview, some structures along the coastal area was already damaged before typhoon "Yolanda" and the coast line shifted to land side compared with that before. In the backyard of the section, there were large factories such as New Leyte Edible Oil MFG., Corporation, Pepsi and Tanauan Municipal Office.

In general, coastal dike should have slope protection for both landside and seaside in order to

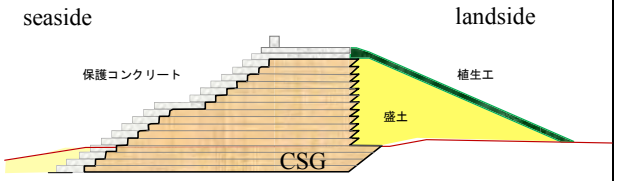
avoid the washing out and failure of embankment material by wind wave. In Japan, based on the damage assessment for Isewan Typhoon Disaster in 1959, the coastal dike are required to protect the both land side and sea side as well as the top of the crown by facing structure.

In the sections of 2-1, 2-2, 3-1, 4-3-2 and 6-2, the surface of the dike should be protected by concrete considering the damage condition before and the Yolanda as well as the importance and land use of backyard area. Especially, for Section 4-3-2 and 6-2, the alignment is very close to the coast line, and it is affected by wind wave in normal time, so that the scoring protection should be considered.

On the other hand, in Japan after East Japan Great Earthquake Disaster in 2011, for the coastal area with front beach, the coastal dike which has CSG（Cemented Sand and Gravel）was proposed as a resilient coastal dike and constructed as pilot project or implementation.

Tide Enbankment in Hamamatsu City

（http://www.pref.shizuoka.jp/kensetsu/ke-890/bouchoutei/gaiyo/kouzou.html）



Coastal Dike (CSG) at Natsui

（http://www.ctie.co.jp/csr/csr_report_2014.pdf）

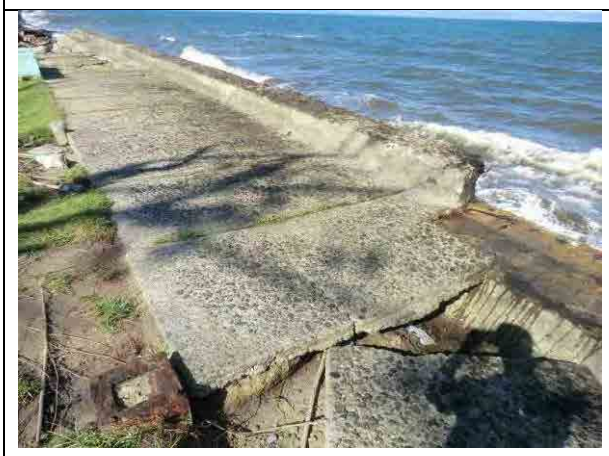
Source: JICA Study Team

Figure 7.5-12 Example of Coastal Dike with CSG Method

In Section 2-1, 2-2 and 3-1, if large front beach is available, the similar structure such as CSG method could be considered in this project as an alternative for the concrete facing structure. However, generally CGS method is also used for the dam embankment and the established quality control method is complicated. Therefore, instead of CGS, the soil improvement by cement mixture should proposed.

Vicinity of Tacloban shoreline-1
(Demolished by the Yolanda)

Vicinity of Tacloban shoreline-2
(Demolished by the Yolanda)



Existing damaged coastal revetment in Palo (Mostly demolished by the Yolanda. Concrete surface was scoured by wave action before the Yolanda)

Existing damaged coastal revetment in Palo (Zoomed concrete surface)

Existing damaged coastal revetment in Tanauan (Mostly demolished by the Yolanda. Partially damaged by wave action before the Yolanda)

Vicinity of Tanauan shoreline (New Leyte Edible Oil MFG., Corporation, giant tank was overturned by the storm surge of Yolanda)

Source: JICA Study Team

Figure 7.5-13 Condition of coastal area in Section 1 to Section 6

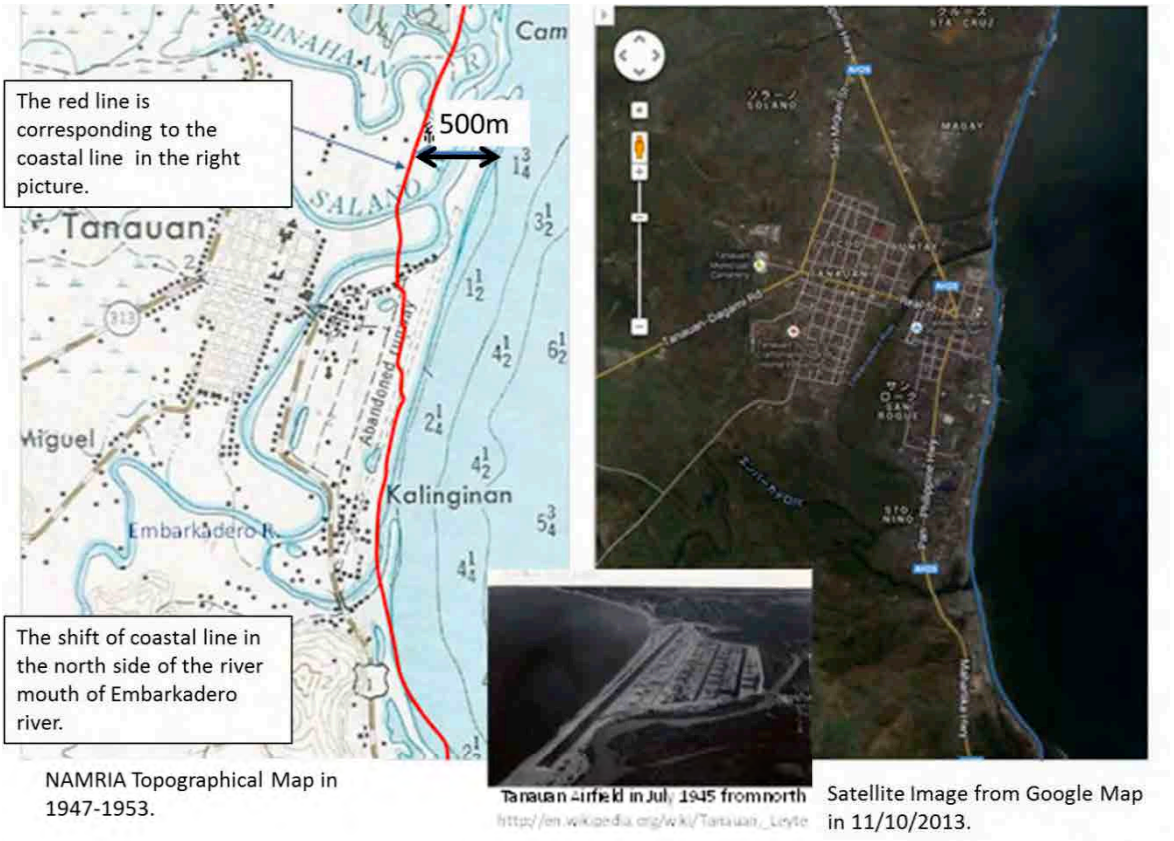
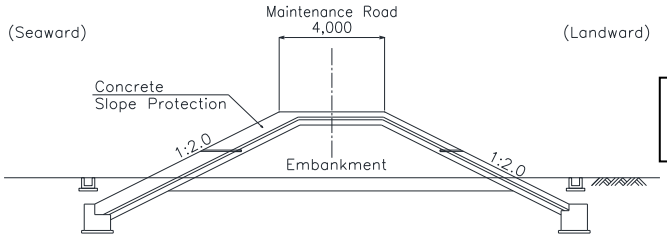
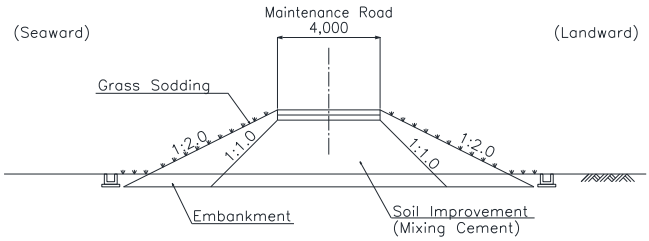
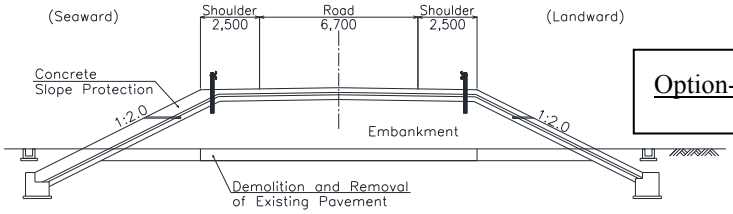
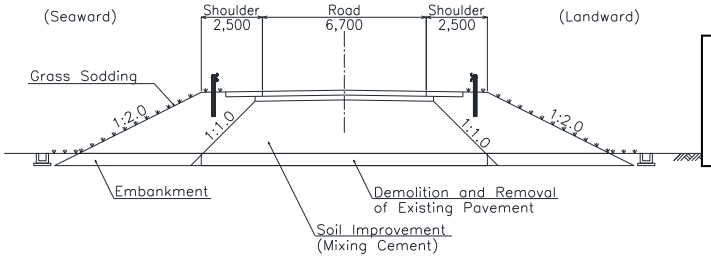
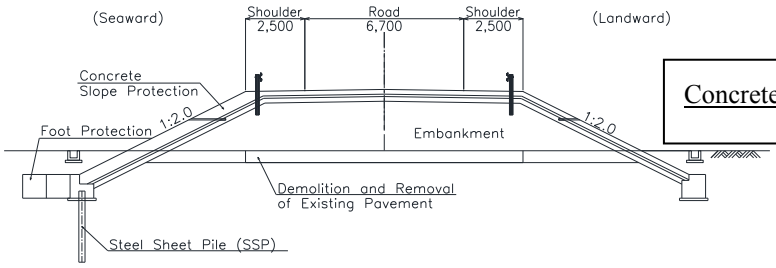
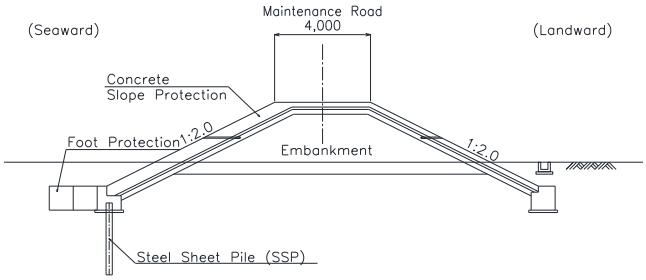


Figure 7.5-14 Change of Coastal Line in Tanauan(Comparison with Map in around 1950)

(2) Standard Cross Section of Adjacent Section

Based on the above study results, the standard cross section of distant Section is as follows,

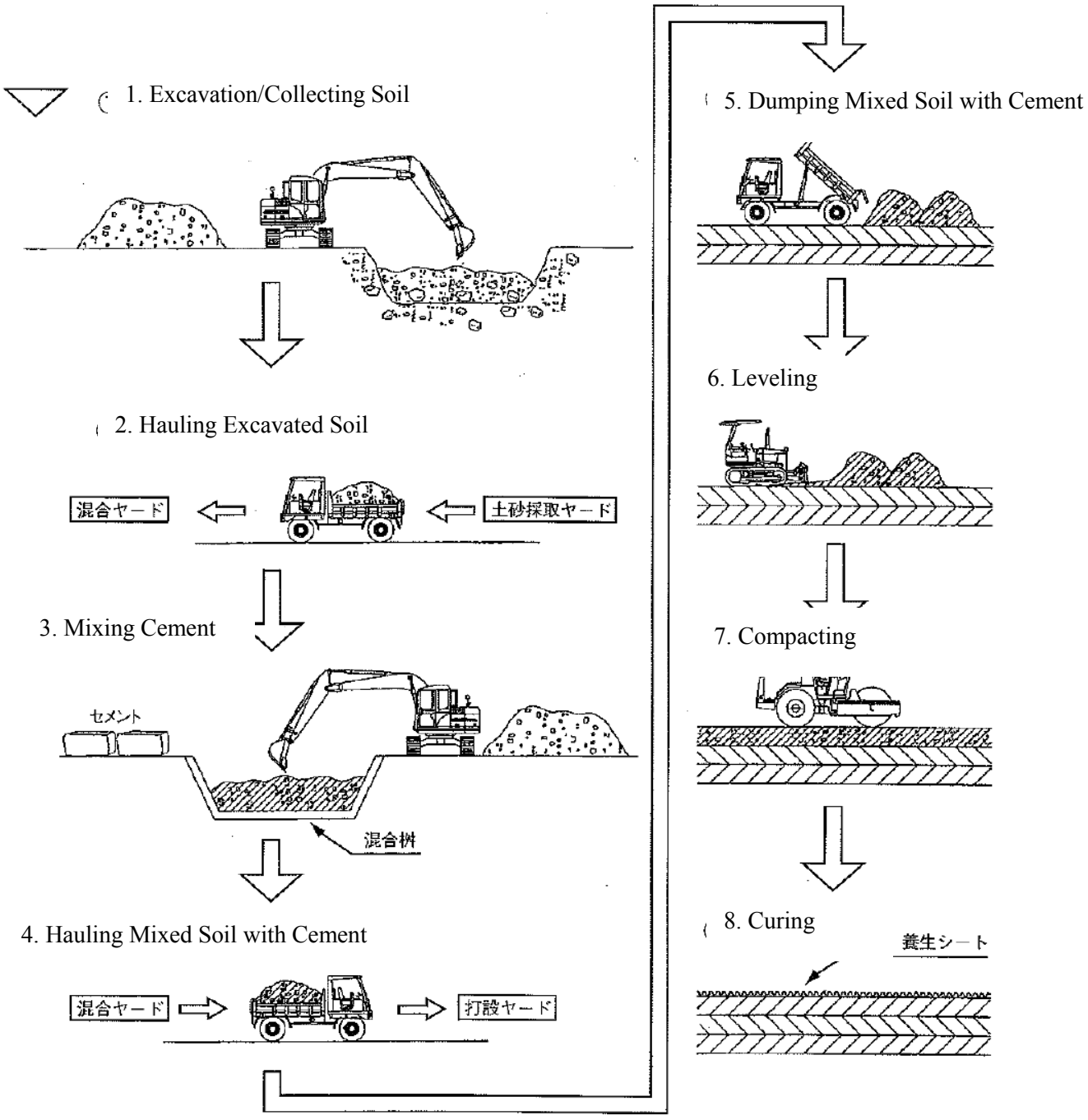
Section	Typical Cross-Section
S-2-1, S-2-2	 Option-1: Concrete Surface Protection  Option-2: Soil Improvement with Grass Sodding
S-3-1	 Option-1: Concrete Surface Protection  Option-2: Soil Improvement with Grass Sodding
4-3-2	 Concrete Surface Protection with SSP
S-6-2	 Concrete Surface Protection with SSP

Source: JICA Study Team

Figure 7.5-15 Standard Cross Section of Adjacent Section

(3) General Description of Soil Improvement Method by Cement Mixture

In Section 2-1, 2-2 and 3-1, if large front beach is available, the similar structure such as cement mixture method could be considered in this project as an alternative for the concrete facing structure. The general construction method is shown below.



Source: Guideline for Usage of Soil Cement in Sediment Control Works（INSEM Method）

Figure 7.5-16 Soil Improvement Method by Cement Mixture

In general, the quantity of cement to be mixed is decided by mixing test based on the necessary strength and material for mixture.

In this study, since there is no mixing test result available, referring to the construction example of counterweight embankment using CSG method in the reservoir of Tanzawa Dam in Japan, assuming the unit cement volume 80(kg/m^3), the preliminary cost estimation was done.

7.5.3 Consideration for Tsunami in the Design

Regarding the Tsunami force, PHIVOLCS（Philippine Institute of Volcanology and Seismology）has been studying in READY project funded by UNDP. This JICA Project shall refer the result of READY Project.

Source: READY Project

Figure 7.5-17 Tsunami Hazard Map and Tsunami Level (MSL+ m) by READY project

Regarding the hazard map of the READY Project, while there are some unclear things on the simulation condition, the tsunami levels in Leyte and Eastern Samar are documented. According to this, the tsunami level is 4 to 5 m along the coastal areas in Tacloban, Palo and Tanauan.

Table 7.5-2 shows the Tsunami level and the top elevation of the storm surge height for 50 years return period. According to this, most of the Sections will be affected by the Tsunami and

especially the tsunami level of Palo and Tanauan is higher than the storm surge height for 50 years return period. Thus it is expected that the tsunami would overflow the structure (heightened road / tide embankment). As it was studied, the adjacent section along the coastline will be protected by slope protection heavily or given by soil improvement using cement mixture, so that the proposed structure is regarded as resilient to the tsunami to some extent. In the backyard of the adjacent section, there are central commercial areas and government complex in Tacloban, Palo and Tanauan. Such tsunami resilient structure could contribute to the assurance of evacuation time and damage reduction.

On the other hand, for the distant section, as it was discussed, the combination of grass sodding and crown concrete facing is proposed. This structure cannot expect enough resilience to the tsunami.

In this regard, for the tsunami hazard, the structure measure and non-structure measure should be planned together.

In the future, tsunami simulation should be conducted in order to study the combination of structure measure and non-structure measure.

Table 7.5-2 Tsunami level and Storm surge height for 50 years return period

Section	S-1	S-2		S-3		S-4				S-5	S-6	
	1	2-1	2-2	3-1	3-2	4-1	4-3-2	4-4-1	4-4-2	5	6-1	6-2
Height of Tide Embankment*1 (1)	4.5m	4.0m	4.0m	4.0m	4.0m	3.5m	3.5m	3.5m	3.5m	3.0m	2.8m	2.8m
Offshore Height of Tsunami*1 (2)	4.0m	4.0m	4.0m	4.0m	4.0m	5.0m	5.0m	5.0m	5.0m	5.0m	5.0m	5.0m
Overflow Depth (3)=(2)-(1)	-0.5m	0.0m	0.0m	0.0m	0.0m	1.5m	1.5m	1.5m	1.5m	2.0m	2.2m	2.2m
Type of Structure*2	HER-D	TE-A	TE-A	HER-A	HER-D	HER-D	HER-A	HER-D	HER-D	HER-D	TE-D	TE-A

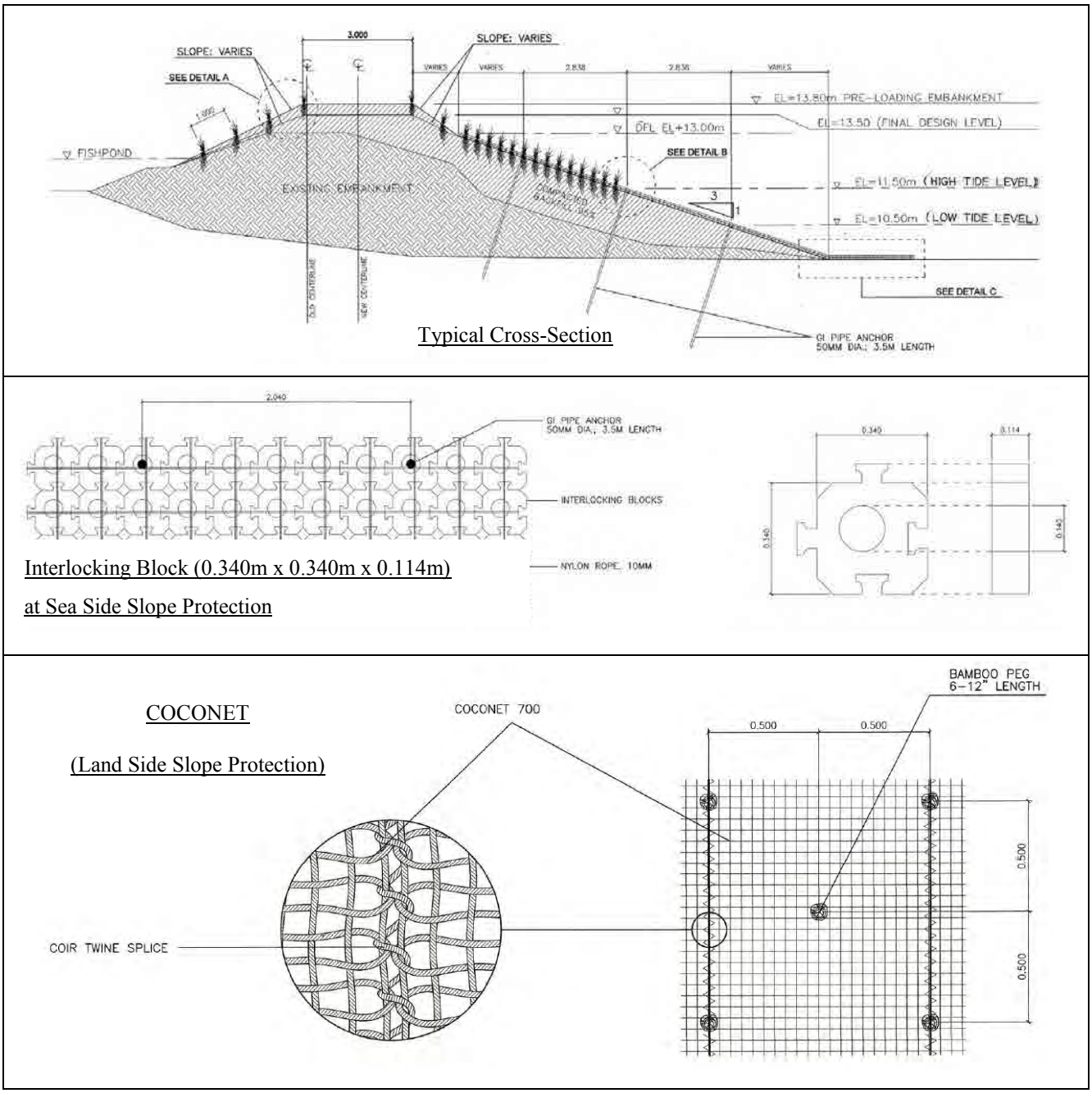
*1: From MSL (Mean Sea Level)

*2: HER (Heightening of Existing Road), TE (Tide Embankment), D (Distant from Shoreline), A (Adjacent to Shoreline)

Source: JICA Study Team

7.5.4 Slope Protection Work in KAMANAVA Project

The KAMANAVA Project (DPWH) has applied a coastal revetment for the ring dike.



Source: DPWH

Figure 7.5-18 Coastal Revetment in KAMANAVA Project

In the Project, since the slope protection work for distant section is the combination of grass sodding, it is cheaper than that of KAMANAVA Project. Here, regarding the adjacent section, the applicability of the slope protection in KAMANAVA Project was studied.

As it was explained, the adjacent sections are 2-1, 2-2, 3-1, 4-3-2 and 6-2. In the backyard of these sections, the following infrastructures exist.

- Section 2-1, 2-2 and 3-1 : Central commercial facilities of Tacloban city
- Section 4-3-2 : Governmental complex of Region VIII, DPWH Regional Office in Palo

 Section 6-2 : Large factories (New Leyte Edible Oil MFG. Corporation, Pepsi and Municipal government buildings

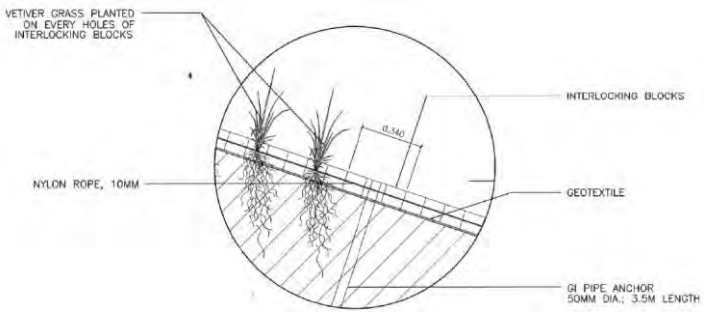
In those sections, even before Yolanda the existing structure (coastal revetment) has been damaged by wind wave and coastal erosion.

Considering such site condition, the structure of adjacent sections was proposed with resilient structure even if the Yolanda-like storm surge attacks. As to the structure type, the actually implemented one for storm surge and tsunami countermeasure in Japan was selected. Regarding the thickness of members, the Japanese standard for Coastal Revetment Design and Structure was referred.

Based on the experiences in Japan, the size of concrete blocks which were used for slope protection against storm surge and tsunami are

 Block for Sea side: thickness more than 50 cm, weight more than 2 ton with back-filling more than 50 cm

The concrete block size of KAMANAVA Project for seaside slope protection of ring dike is 0.340m x 0.340m x 0.114m and the weight of 1 unit is less than 0.04 ton, which are far light compared with those used in Japan. Unlike the slope protection during high tide, the structure of adjacent sections should resist against storm surge associated with large wind wave. Therefore, the concrete block in KAMANAVA Project is not proposed as the countermeasure for storm surge.

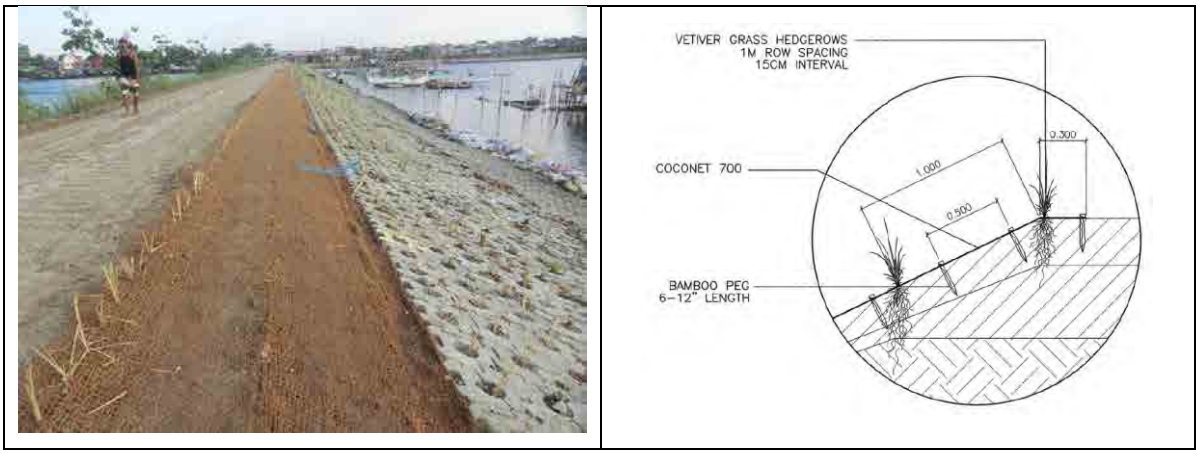


Source: DPWH

Figure 7.5-19 Concrete Blocks in KAMANAVA Project

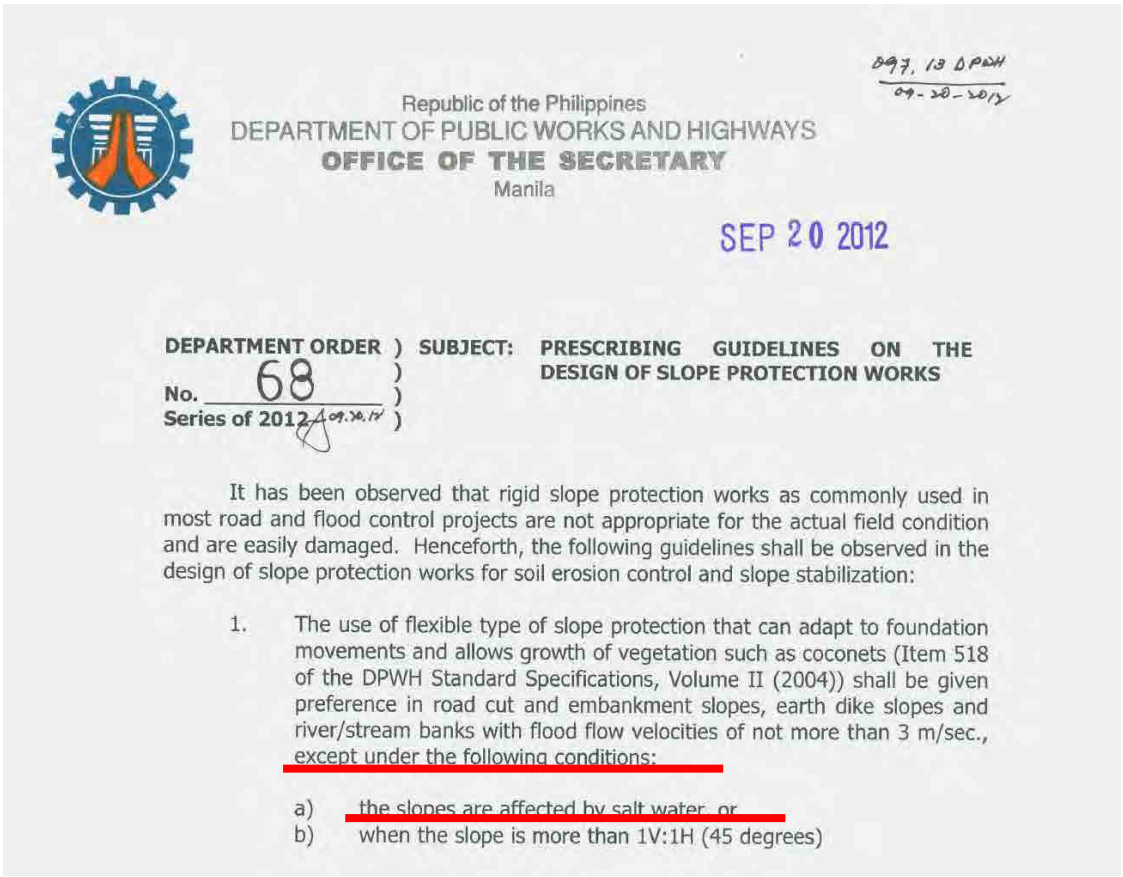
Also regarding the land side slope protection, KAMANAVA Project uses Coconet as the slope protection.

The proposed structure allows overflow when the Yolanda-like storm surge. The mesh size of coconet is coarse, so that it is anticipated that erosion would occur during the overflow or, the coconet itself would be turned up and washed out. Not only during overflow but also in normal time the coconet would be hit by wind wave. DPWH Department Order No.68 in 2012 instructed that coconet should not be used for the slope affected by salt water. Therefore, the coconet is not used for land side slope protection against storm surge countermeasure.



Source: DPWH

Figure 7.5-20 COCONET in KAMANAVA Project



Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

SEP 20 2012

DEPARTMENT ORDER) SUBJECT: PRESCRIBING GUIDELINES ON THE
No. 68) DESIGN OF SLOPE PROTECTION WORKS
Series of 2012) 09.20.12

It has been observed that rigid slope protection works as commonly used in most road and flood control projects are not appropriate for the actual field condition and are easily damaged. Henceforth, the following guidelines shall be observed in the design of slope protection works for soil erosion control and slope stabilization:

1. The use of flexible type of slope protection that can adapt to foundation movements and allows growth of vegetation such as coconets (Item 518 of the DPWH Standard Specifications, Volume II (2004)) shall be given preference in road cut and embankment slopes, earth dike slopes and river/stream banks with flood flow velocities of not more than 3 m/sec., except under the following conditions:

   a) the slopes are affected by salt water, or
   b) when the slope is more than 1V:1H (45 degrees)

Source: DPWH

Figure 7.5-21 Extraction of DPWH Department Order 68 (2012)

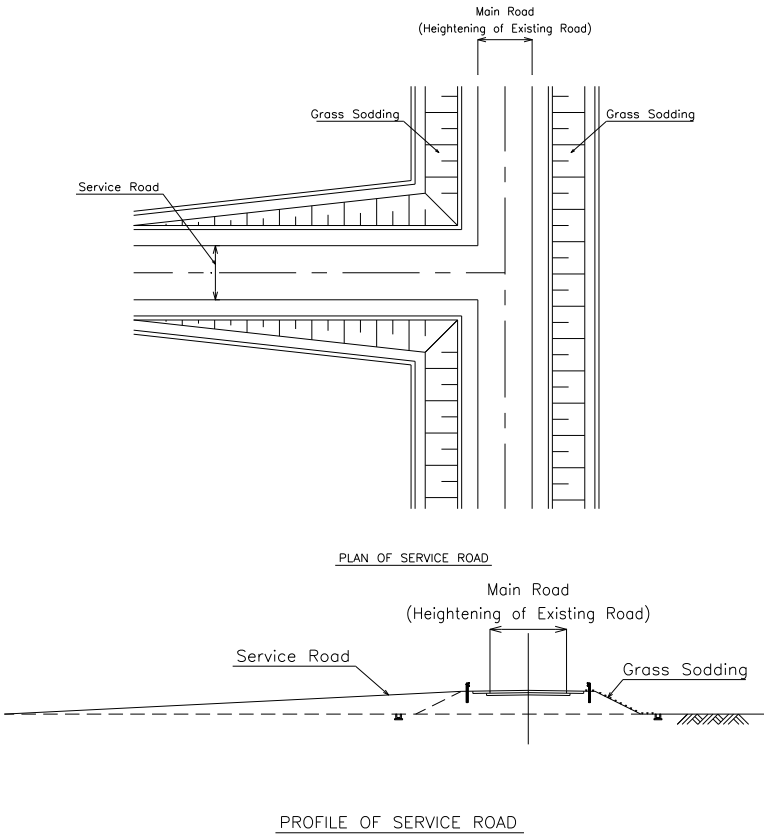
7.6 Summary of Work Quantity

The work quantity include the work for tide embankment and road heightening and the relevant structure. The relevant structure includes access road, sluiceways, detour road, demolition & removal of hoses, flood gate and back water dike. The preliminary work quantity is shown in Table 7.6-1. The general concept of structure are shown in Figure 7.6-1 to Figure 7.6-5.

Table 7.6-1 Work Quantity

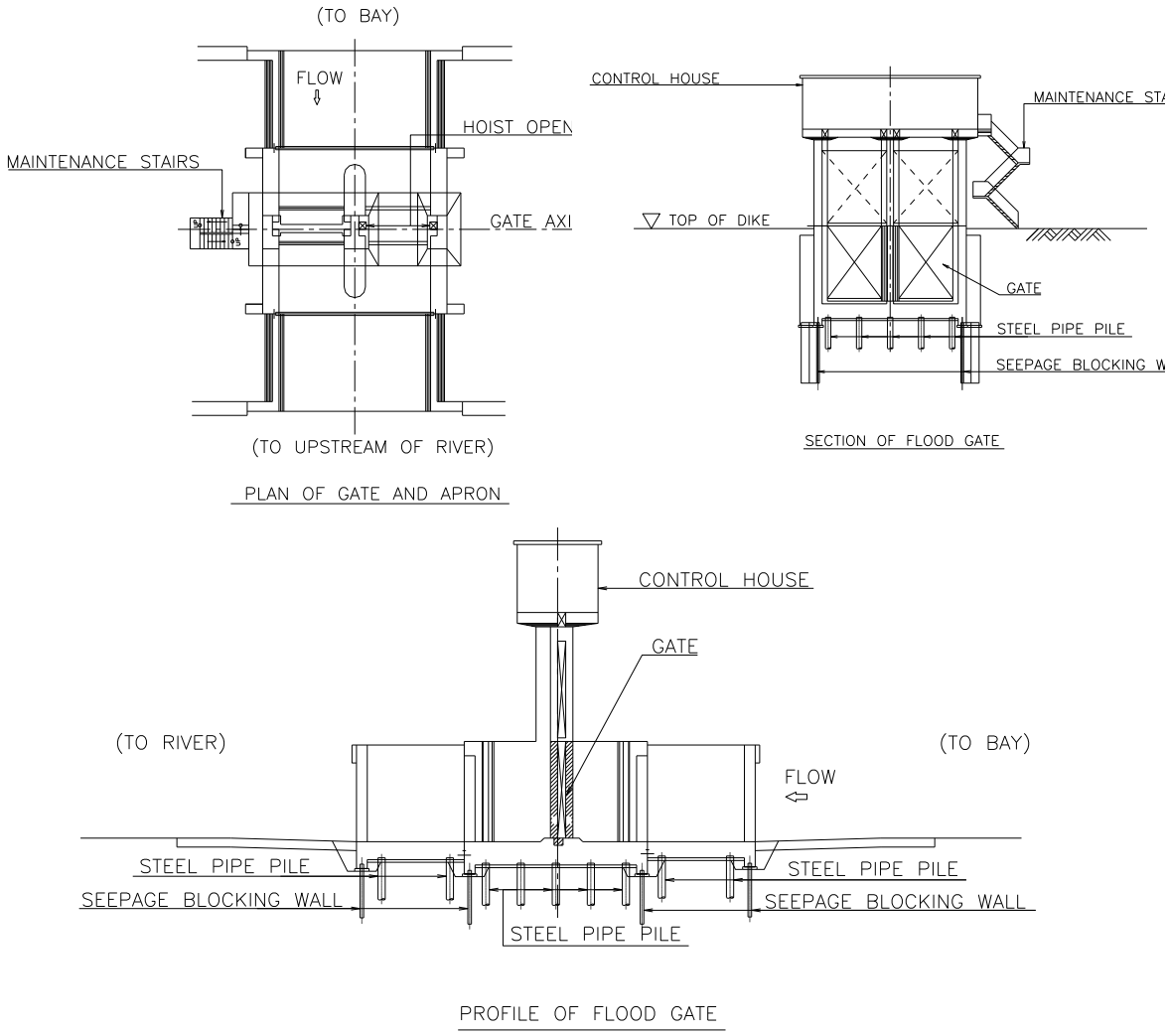
Section		1	2	3	4	5	6
Location from Shoreline		Distant	Adjacent	Adjacent/ Distant	Adjacent/ Distant	Distant	Adjacent/ Distant
Type of Structure		Heightening of Existing Road	Tide Embankment	Heightening of Existing Road	Heightening of Existing Road	Heightening of Existing Road	Tide Embankment
Required Height of Embankment(m)		4.5	4.0	4.0	3.5	3.0	2.8
Averaged Ground Elevation(m)		3.0	1.0/2.5	1.5/2.0	1.5/2.0	2.5	0.3/0.8
Embankment Height(m)		1.5	3.0/1.5	2.5/2.0	1.5/2.0	0.5	2.5/2.0
Length of Embankment(m)		4,200	2,900	5,200	7,400	4,100	3,100
Service Road	Interval (per m)	200	-	200	200	400	400
	Number (nos.)	21	-	27	27	11	2
Sluiceway	Interval (per m)	500	500	500	500	500	500
	Number (nos.)	9	7	12	16	9	7
Detour	Length (m)	4,200	2,900	5,200	7,400	4,100	3,100
Demolition & Removal of House	Number (nos.)	429	265	1,064	540	396	117
Flood Gate	Number (nos.)	2	1	1	1	1	3
Back Water Dike	Length (m)	3,600	0	0	4,800	9,400	0
	Sluice (nos.)	4	0	0	5	10	0

Source: JICA Study Team



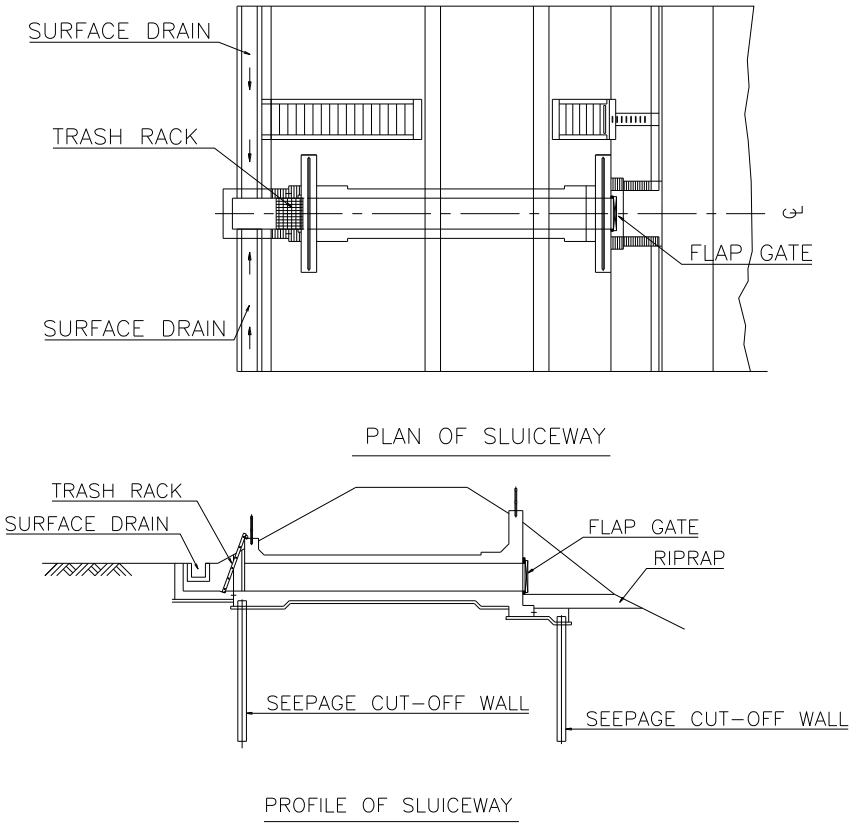
Source: JICA Study Team

Figure 7.6-1 Access Road



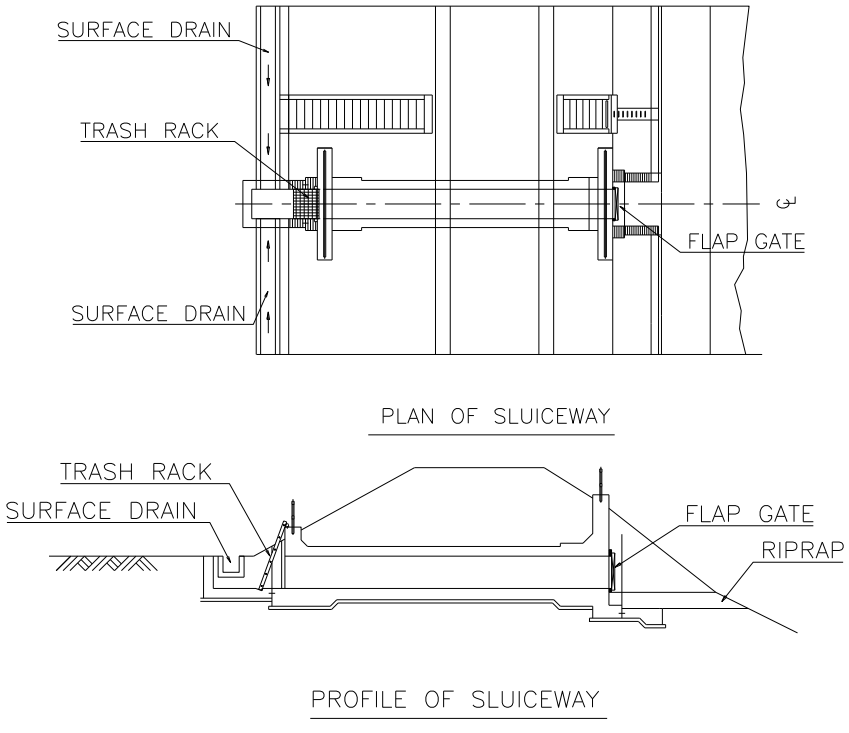
Source: JICA Study Team

Figure 7.6-2 Flood Gate



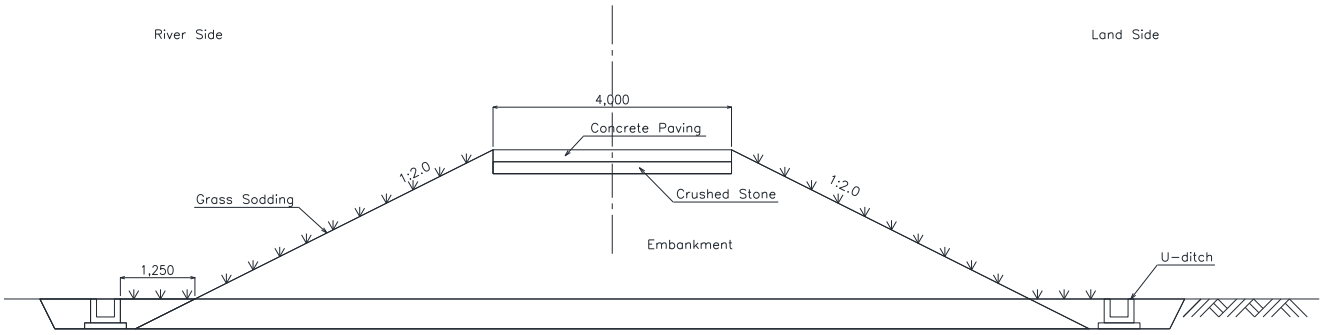
Source: JICA Study Team

Figure 7.6-3 Sluiceway (Adjacent Section)



Source: JICA Study Team

Figure 7.6-4 Sluiceway (Distant Section)



Source: JICA Study Team

Figure 7.6-5 Backwater Dike

7.7 Preliminary Cost Estimation

The preliminary cost estimate is shown in Table 7.7-1. The Option 1 means the case of earth dike & concrete facing for Section 2-1,2-2, 3-1. Option 2 means the case of soil improvement & grass sodding for section 2-1,2-2, 3-1.

Table 7.7-1 Preliminary Cost Estimate

Section		1	2	3	4	5	6	Total
Option 1 Concrete Surface Protection	Sectional Project Cost excluding VAT (Million PhP)	859	662	1,438	1,370	816	1,537	6,682
	VAT (Million PhP)	103	79	173	164	98	184	802
	Sectional Project Cost including VAT (Million PhP)	962	742	1,610	1,535	914	1,722	**7,484**
Option 2 Soil Improvement with Grass Sodding	Sectional Project Cost excluding VAT (Million PhP)	859	345	1,048	1,370	816	1,537	5,975
	VAT (Million PhP)	103	41	126	164	98	184	717
	Sectional Project Cost including VAT (Million PhP)	962	386	1,174	1,535	914	1,722	**6,692**

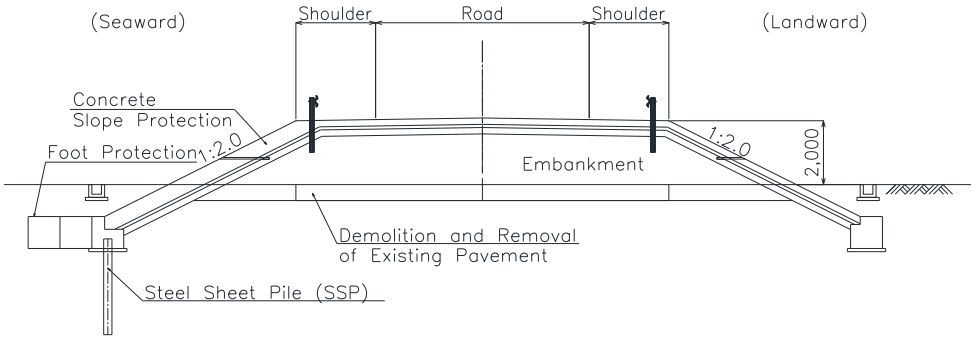
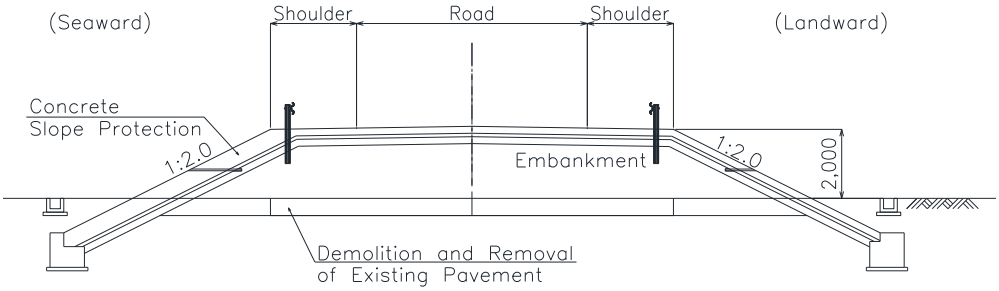
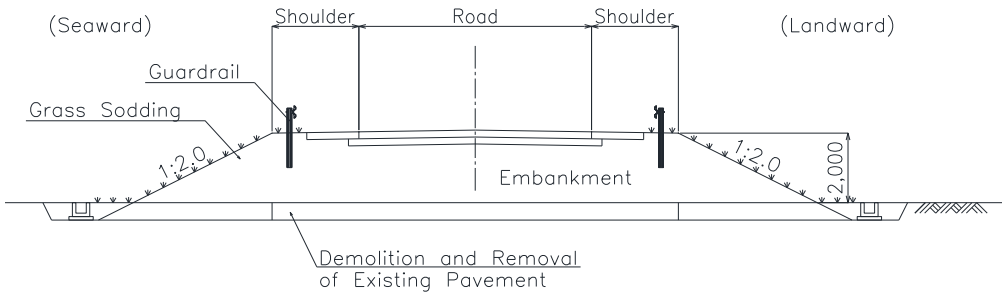
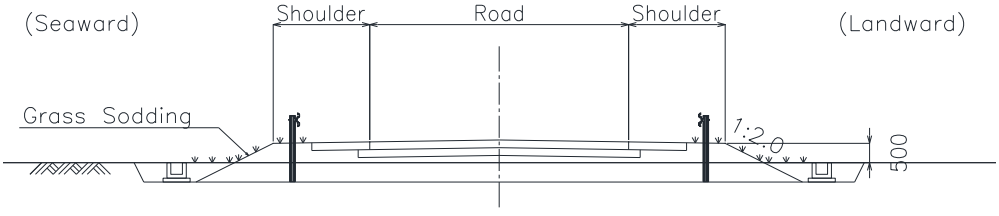
Source: JICA Study Team

The above cost includes Consulting Service (6% of Direct Cost for DD, 10% of Direct Cost for SV)[1] 、Overhead / Contingencies / Miscellaneous Expenses (6% of Direct Cost)[2]、Contractor's Profit Margin (8% of Direct Cost)[3].

1 「Implementing Rules and Regulations on the Procurement of Consulting Services for Government Projects (NEDA 1998)」
2 「DPWH D.O. (Department Order) Series of 2012 No.72」
3 「DPWH D.O. (Department Order) Series of 2012 No.72」

ANNEX 1

【Reference】Comparison of Preliminary Cost

HER-A (H=2m) Concrete Slope Protection with Scouring Prevention	 275 (Thousand Peso)
HER-D (H=2m) Concrete Slope Protection without Scouring Prevention	 188 (Thousand Peso)
HER-D (H=2m) Grass Sodding	 84 (Thousand Peso)
HER-D (H=0.5m) Grass Sodding	 51 (Thousand Peso)

Source: JICA Study Team

Chapter 8 Community Development

8.1 Community Restoration

8.1.1 Pre-Yolanda

In general, disaster preparedness at the community level was only capable of coping with the levels of disasters regularly experienced in the past. Although there were different sources of information on Yolanda, people did not have sufficient knowledge to interpret the information and tended to make their decisions based on their own experience. On the other hand, one of the problems with the source of information could be that much of the information sources were not in Warai language.

Barangay level administration was also not very active in increasing the level of disaster preparedness. With insufficient financial resources and lack of knowledge regarding Disaster Risk Reduction and Management (DRRM), their activities were quite limited. Some BLGUs were found without Barangay DRRM Committees, even though the administrators knew that it is mandatory under legislation. The interest regarding DRRM seemed to be generally low before the Super Typhoon hit the area. Under such circumstance, the actual measures taken by the BLGUs for DRRM were somewhat limited to procuring small quantities of minor equipment such as rain coats and flash lights.

In addition, although the Barangay Officials received training regarding DRRM from higher levels of authority (C/MLGUs, fire department), there were seldom if any activities aiming at the enlightenment of the local population.

8.1.2 Post-Yolanda

Although every possible effort was made by the community and Barangay level administration to survive the aftermaths of the disaster, they had to grope their way through the situation due to the lack of an effective standard protocol. Under such circumstance, efforts for recovery and reconstruction may not have been made in the most efficient manner. Coordination for recovery and reconstruction efforts was found to be a redundant process of being asked the same questions and for the same documents by numerous organizations.

Access to local resources (transportation, housing material, etc.) at the initial stage (several days) after the typhoon varied between Barangays since it was dependent on personal ties or knowledge of the Barangay Administration.

Although community activities for mutual support were not found to be a regular practice before the Yolanda, the spirit of mutual support, the sense of “Pintakasi” in Warai language, was commonly observed in the area and was found to bloom right after Yolanda. However, many opinions indicated that Pintakasi is becoming weaker in lockstep with the urbanization of the areas.

8.1.3 Strategy

(1) Dissemination of basic knowledge and raising awareness on DRRM among Barangay officials and local population

Dissemination of basic and practical knowledge on disasters and DRRM in order to enable the local population to interpret available information in order to decide their actions would be the first practical step towards a disaster resilient community. This also applied for the Barangay officials who are in the position of providing direct actions for the community in preparing / recovering from possible disasters based on ground conditions. Although the awareness of the community seems to have rocketed after the Super Typhoon, activities for enlightenment must be continued to maintain the level of awareness and preparedness for disasters for years and decades.

(2) Appropriate community level DRRM planning with the participation of Barangay constituents Being Prepared for disasters

An appropriate plan for DRRM, together with fostering the peoples' intentions to participate in its implementation will form the foundation for a disaster resilient community. A DRRM Plan at the Barangay level shall be prepared with the participation of the local community in order to identify the vulnerabilities of the Barangay, the available resources to cope with disasters, actions to be taken, and roles and responsibilities of the relevant stakeholders. Preparation of the DRRM Plan shall be coordinated by the BDRRMC, assigning representatives from all Sonas of the Barangay.

(3) Strengthening of community ties at Sona level

The community plays an important role in times of emergency response to disaster damage. In the case of the Hanshin-Awaji earthquake that hit western Japan in 1995, more than 75% of the people trapped in the debris of collapsed buildings were rescued by people of their local community before the arrival of external rescue teams. At such times, the closeness of people comprising the community is an important factor. Furthermore, the sense of unity within the community will function as one of the driving powers for recovery from disaster damage as well as for the implementation of the community level DRRM Plans. Since there are few active social / community organizations in the Target Area, community ties should be strengthened at the level of each Sona (Sitio / Purok).

8.1.4 Recommendations

The following actions are recommended for substantiating the above strategies.

(1) Training of Barangay Officials in DRRM activities

Trainings for Barangay Officials have been conducted in the past, but only sporadically on selected topics. A more comprehensive training program based on a phased and continuous approach should be conducted in order to improve the knowledge and awareness of Barangay Officials on DRRM. In conducting the training, timings of Barangay elections should also be

taken into consideration to mitigate the gap of knowledge when new Barangay Officials are elected.

(2) Training of local population

There have been few opportunities for the local population to obtain basic knowledge on disasters and DRRM. Primary level training courses widely open to the public should be held in order to provide knowledge to the local population so that majority of the people could make their own decisions on the basis that they know what risks they are facing. Local radio and television programs should also be utilized in providing basic knowledge on disasters and DRRM, as practiced in Guiuan. Apart from the basic trainings, local volunteers should be called to participate in more intensive trainings, so that they can act as leaders for community level DRRM.

(3) Preparation of Barangay Disaster Risk Reduction Management Plan

Practical and effective Barangay Disaster Risk Reduction Management Plans should be prepared and periodically improved with the participation of the local population. Voluntary representatives from each Sona (Sitio / Purok) or a certain number of constituents shall be appointed to the Barangay Disaster Risk Reduction Management Committee (BDRRMC), which shall function as the main actor for plan formulation. The BDRRMP shall be prepared in a phased approach, where at the initial stage, basic contents should be identified such as evacuation sites, means and routes of information dissemination, necessary preparation for supporting the vulnerable population during disasters, and roles and responsibilities of the Barangay Officials as well as those of the local population. After determining the basic contents, the plan should be further improved with more active participation of the local population in order to identify possible resources that could be accessed at times of calamities. Possibilities for involving external organizations such as social enterprises and corporates conducting CSR activities should also be sought.

(4) Strengthening of community ties through Sona / Barangay level events.

As described in the above strategy, strengthening of community ties is an important factor for increasing disaster resiliency at the community level. Community events shall be promoted to raise the sense of fellowship among the constituents of Sonas as well as Barangays. A simple example could be a Sona-wise fiesta with the theme of disaster risk reduction. Competition among Sonas such as banca (local boat) races or Christmas decoration contests could be another potential for increasing the sense of fellowship. Activities should be planned within the BDRRMP and could be called for in the Barangay Assembly. The voluntary representatives participating in the BDRRMC are expected to play a coordinating role for such activities.

Chapter 9 Shelter Recovery and Relocation

9.1 Background: Damage of Housing by Yolanda and No-Build Zone

Due to Yolanda, 156,500 houses were damaged in the study area covering 18 LGUs in Leyte, Samar, and Eastern Samar. Nearly a half of 156,500 houses were totally damaged. The significant damage of houses was observed in Dulag, MacArthur, Palo, Balangiga and Guian where totally destroyed houses reached more than 85% of the damaged houses (see Table 9.1-1). Therefore, needs for secure shelter assistance has been very high in the region since the beginning.

Table 9.1-1 No. of Damaged Houses by Yolanda

LGUs		2013 Population	Partially Damaged Houses	Totally Damaged/ Destroyed Houses	Total House Damaged	Share of Totally Damaged Houses in Total House Damaged
LEYTE	Abuyog	58,948	8,006	4,270	12,276	34.8%
	Dulag	43,073	780	8,104	8,884	91.2%
	Javier	24,631	1,921	3,159	5,080	62.2%
	MacArthur	19,314	243	3,741	3,984	93.9%
	Mayorga	15,157	1,191	2,063	3,254	63.4%
	Palo	64,705	1,435	13,481	14,916	90.4%
	Tanauan	51,699	3,994	6,670	10,664	62.5%
	Tolosa	18,486	1,416	2,397	3,813	62.9%
TACLOBAN CITY		228,147	46,553	12,270	58,823	20.9%
SAMAR	Basey	52,945		1,161	1,161	100.0%
	Marabut	15,871	858	2,727	3,585	76.1%
EASTERN SAMAR	Balangiga	13,272	370	2,919	3,289	88.8%
	Giporlos	12,527	2,971	1,000	3,971	25.2%
	Guiuan	48,939	1,601	10,008	11,609	86.2%
	Lawa-an	12,082	-	2,866	2,866	100.0%
	Mercedes	5,586	1,142	183	1,325	13.8%
	Quinapundan	14,401	582	2,538	3,120	81.3%
	Salcedo	20,777	1,344	2,561	3,905	65.6%
Total		720,560	74,407	82,118	156,525	52.5%

Source: Shelter Cluster Report Region VIII. June 2014

After Yolanda hit the study area, the President declared that the areas within 40 meters from the shoreline should be established as no-build zones. No-Build Zones (NBZ) are recommended for areas where a hazard is too serious to be mitigated and threatens people's lives and properties. In the Study Area, Tacloban City, Palo Municipality, and Tanauan Municipality enacted their ordinances to establish 40 meter no-build zones (and 50 meter no-build zones for Tanauan).[1]

[1] Tacloban City, City Ordinance No. 2013-12-15A. An Ordinance Providing for a 40-meter No-Build-Zone for Residential Housing within the Territorial Jurisdiction of the City of Tacloban. December 11. 2013.
Palo Municipality. Municipal Ordinance No. 2013-06. An Ordinance Declaring All Easements as "No Build Zones", Providing Fines and Penalties Thereof.
Tanauan Municipality, Resolution No. 2013-93-A. November 18, 2013. A Resolution Declaring the 50 Meters from the Shorelines or the Coastal Area from BRGY. Bislig down to BRGY. Sta. Crus of Tanauan Leyte as "No Build Zone"

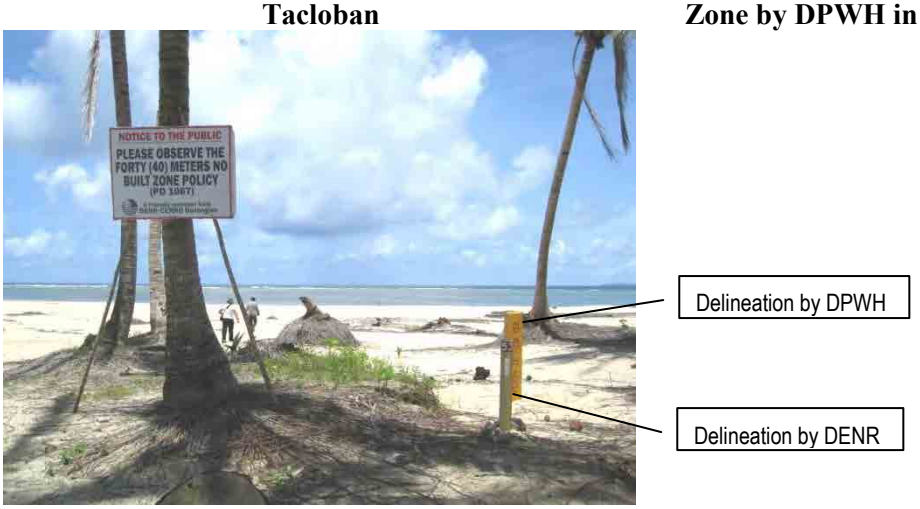
LGUs erected signboards to delineate No Build Zones (see Figure 9.1-1). The Department of Public Works and Highways (DPWH) and the Department of Environment and Natural Resources (DENR) have started delineation of No Build Zones (see Figure 9.1-2 and 9.1-3). Later NBZs were replaced by "safe zones," "unsafe zones," and "controlled zones" within unsafe zones, where no dwelling was allowed but buildings are permitted with installation of mitigation measures.[2]

Source: JICA Study Team

Figure 9.1-1 Signboard of No Build Zone in Tacloban

Source: JICA Study Team

Figure 9.1-2 Delineation of No Build Zone by DPWH in Marabut, Samar



Source: JICA Study Team

Figure 9.1-3 Delineation of No Build Zone by DPWH and DENR in Hernani, Eastern Samar

[2] Presidential Assistant for Rehabilitation and Recovery (PARR) PRESS RELEASE. March 14, 2014. "No dwelling zones" are replaced by "controlled zones" in June 2014.

Table 9.1-2 Number of Households within 40 meter No-Build Zones (as of April 2014)

Province	Municipalities/ Cities	No. of Households within 40 meter zone
Leyte	Abuyog	1,323
	Dulag	276
	Javier (Bugho)	16
	Macarthur	142
	Mayorga	N.A.
	Palo	N.A.
	Tacloban City*	14,443
	Tanauan	N.A.
	Tolosa**	334
	Sub-total	16,534
Eastern Samar	Balangiga	1,304
	Giporlos	437
	Guiuan	7,263
	Lawaan	-
	Mercedes	157
	Quinapundan	357
	Salcedo	957
	Sub-total	10,475
Samar	Basey	12,102
	Marabot	1,470
	Sub-total	13,572
Grand Total		40,581

Source: Department of Social Welfare and Development.
*Tacloban City data is from UN Habitat.
** Tolosa data is from the municipality, which indicates no. of households in easements of 40 meters and 3 meters from waterways no build zones.

Although a number of issues are involved in setting NBZs, LGUs are expected to relocate a large number of households from the danger zones and many of those families there are indeed willing to move to safe areas. Therefore, LGUs are under strong pressure to provide shelter assistance to the residents in safe zones. This chapter analyzes shelter assistance policies, programs and projects, and related issues, and proposes a shelter assistance policy at the end.

9.2 The Objectives and Principles of Shelter Assistance Programs

Shelter assistance begins with emergency shelter assistance and shifts to temporary shelter and permanent shelter assistance in steps from the occurrence of disaster. Emergency shelter assistance such as provision of tents was immediately provided after Yolanda hit the region. Shelter recovery assistance focuses on discussion of temporary and permanent shelter assistance.

Recovery Shelter Guidelines[3] prepared by the Shelter Cluster of the Philippines describes core principles and parameters to be considered in a range of shelter options. It states an overreaching aim of shelter assistance programs and two underlying principles, the right based approach and

[3] Shelter Cluster Philippines. 2014. Recovery Shelter Guidelines (draft 18/6/14).

do not harm. The guidelines recognize safe and adequate shelters as a right of all households and indicate a priority of the most vulnerable in assistance programs.

Overarching Aim of Shelter Assistance Programs:

To ensure that families have adequate appropriate and safe shelter supporting them to transition along the pathway to permanent durable housing, prioritizing the needs of the most vulnerable, ensuring participation, freedom of choice, and access to basic services to ensure a life of dignity.

The Rights Based Approach

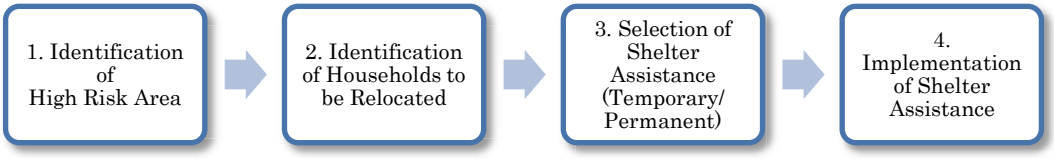
- All households have a right to adequate appropriate and safe shelter.
- All households have a right to access housing options that best suit their needs and desires.

Do Not Harm

- **Permanent Housing**: Prior to Yolanda, many families' houses were inadequately designed and constructed to address risk, particularly in high risk areas. The provision of recovery shelter assistance should address these risks, through risk mitigating designs, improving existing construction or relocating in lower risk areas.
- **Temporary Shelter** assistance should be provided in a way that assists families to transition smoothly to safe, appropriate, adequate, permanent shelter situation. Any temporary assistance in high risk areas should include clear strategies for dealing with immediate risk through integrated disaster risk reduction principles and ensuring transition to safer durable solutions.

9.3 Shelter Assistance Process and Identification of Beneficiaries

The process of temporary and permanent shelter assistance provision is shown in Figure 9.3-1. The process starts with identification of high risk areas to determine households to be relocated. Once a need of relocation is specified, temporary and permanent shelter options are proposed and then implemented. LGUs play a leading role in relocation process, specifically in identification of high risk areas and households to be relocated. Beneficiaries of the assistance are selected based on criteria, such as minimum term of residence or land title, among the households in high risk areas.

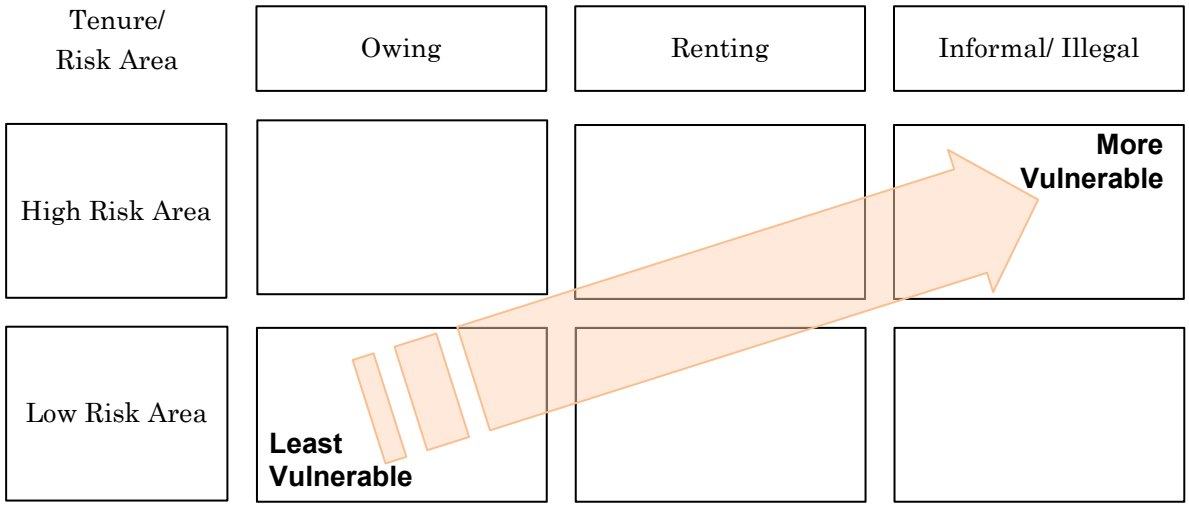


Source: JICA Study Team

Figure 9.3-1 Relocation Process

Pre-disaster tenure context and risk of land are two important factors to be considered in shelter

assistance programs. Pre-disaster tenure context is related to vulnerability of households. A lack of land and property tenure may constrain access to shelter assistance programs, since some shelter programs require a land title or certificate of residence to be eligible for the application. Households in high risk areas need to be relocated to risk free areas or should be provided with appropriate measures to cope with the risk. Accordingly temporary shelter assistance programs in high risk areas should include appropriate preparedness and evacuation plans (see Figure 9.3-2).



Source: JICA Study Team. Developed based on Figure 1 Pre-Disaster Tenure Context and Vulnerability in Recovery Shelter Guidelines. p.1. Shelter Cluster Philippines.

Figure 9.3-2 Level of Risk, Tenure and Vulnerability

9.4 Shelter Assistance Programs

9.4.1 Shelter Assistance Programs and Principles and Parameters

Nine (9) shelter assistance programs are identified in line with types of assistance (emergency, temporary, and permanent shelter assistance) and risk levels of land (high/low risk area) as shown in Figure 6. Those programs include: 1) emergency shelter replacement, 2) temporary shelter, 3) sharing program, 4) rental support, 5) bunkhouse, 6) repairs and retrofit, 7) core house, 8) permanent house, and 9) settlement planning. Selection of shelter programs is done by LGUs. Each LGU proposes a set of temporary and permanent shelter options appropriate for its condition, with various partners and donors. Each of shelter programs specifies their target beneficiaries and specific requirements or eligibility criteria. The principles and parameters of shelter assistance programs determined by the Shelter Cluster are described below.

Principles: All shelter recovery programs should be designed to support coordination, smooth transition, self-recovery, build back safer, participation, engagement, accountability and transparency, protection, gender and diversity, vulnerability, housing, land and property (HLP) rights, livelihoods, and specific needs of differing target groups.

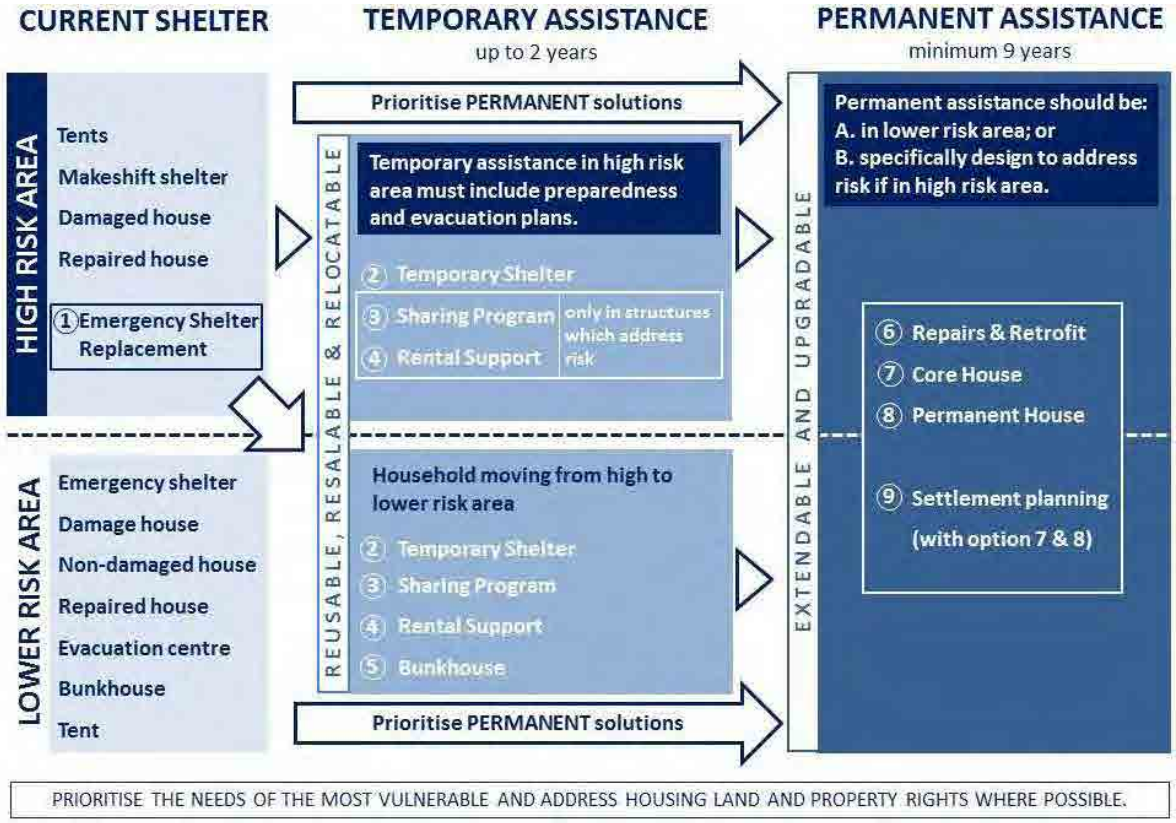
Parameters: All programs should satisfy all parameters of safe, adequate, appropriate and access.

Safe: Foundation, Tie-down, Bracing, Strong joints, Roofing, Site, Shape, and Preparedness.

Adequate: Space, Durability, Drainage, Ventilation, Ceiling height, Privacy, Security, Accessibility.

Appropriate: Culturally, Local context, Environmentally, Climatically,

Access*:* Cooking, WASH facilities, Livelihoods, Community facilities.[4]



Source: Shelter Cluster Philippines. Recovery Shelter Guidelines

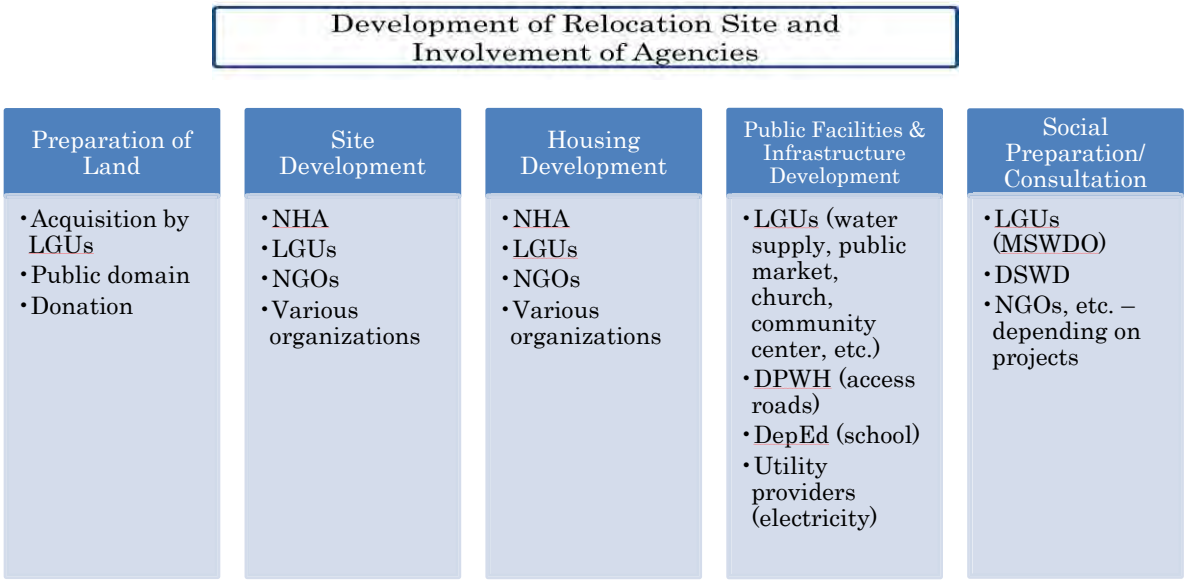
Figure 9.4-1 Recovery Shelter Targets

9.4.2 Development of Resettlement Sites

Resettlement sites are developed by various agencies. Primarily LGUs are responsible for identification of relocation sites. Land for settlement is acquired by LGUs, donated by organizations or individuals, or appropriated from public domain. Once the land is prepared, LGUs select appropriate partners such as the National Housing Authority, NGOs, the private sector, foundations, etc. Those organizations implement site development and/or construction of housing. Public facilities such as access road, water supply, schools, health center, community centers, churches, public markets, etc. are prepared by LGUs, line agencies, the private sector, and other relevant agencies/organizations. Social consultations are conducted by City/ Municipal Social Welfare and Development Office and the Department of Social Welfare and Development

[4] Source: Shelter Cluster Philippines. Recovery Shelter Guidelines

(DSWD) (see Figure 9.4-7).



Source: JICA Study Team

Figure 9.4-2 Development of Relocation Site and Involvement of Agencies

9.5 Shelter Assistance Programs of 5 LGUs

9.5.1 Tacloban City

(1) Housing Needs

There are enormous housing needs in Tacloban City as shown in Table 9.5-1. Nearly 55,000 houses were damaged by Yolanda.[5] There are 31 barangays with no-dwelling zones where 12,231 and 2,202 houses were totally or partially damaged respectively. According to the Tacloban Recovery and Rehabilitation Plan, 39,798 shelters need on-site repair or reconstruction assistance in low risk areas, and 7,600 new permanent housing units should be built in relocation sites.

Table 9.5-1 Housing Needs Identified in Tacloban City

Type of Housing		No. of Families	Committed	Gap
Temporary housing needs	In transit sites	4,853	1,000	3,853
Permanent housing needs		5,855	6,833	7,600
	Potential permanent housing needs	8,578		
Shelter kit needs	Totally and partially damaged	39,798	5,946	33,852
	With request for support	5,547	-	-

Source: The Tacloban Recovery and Rehabilitation Plan, May 2014

To meet such strong needs for housing, Tacloban City set the overall goal and objectives of the shelter sector and proposed the shelter projects for short-term, mid-term and long-term (see Figure 9.5-1).

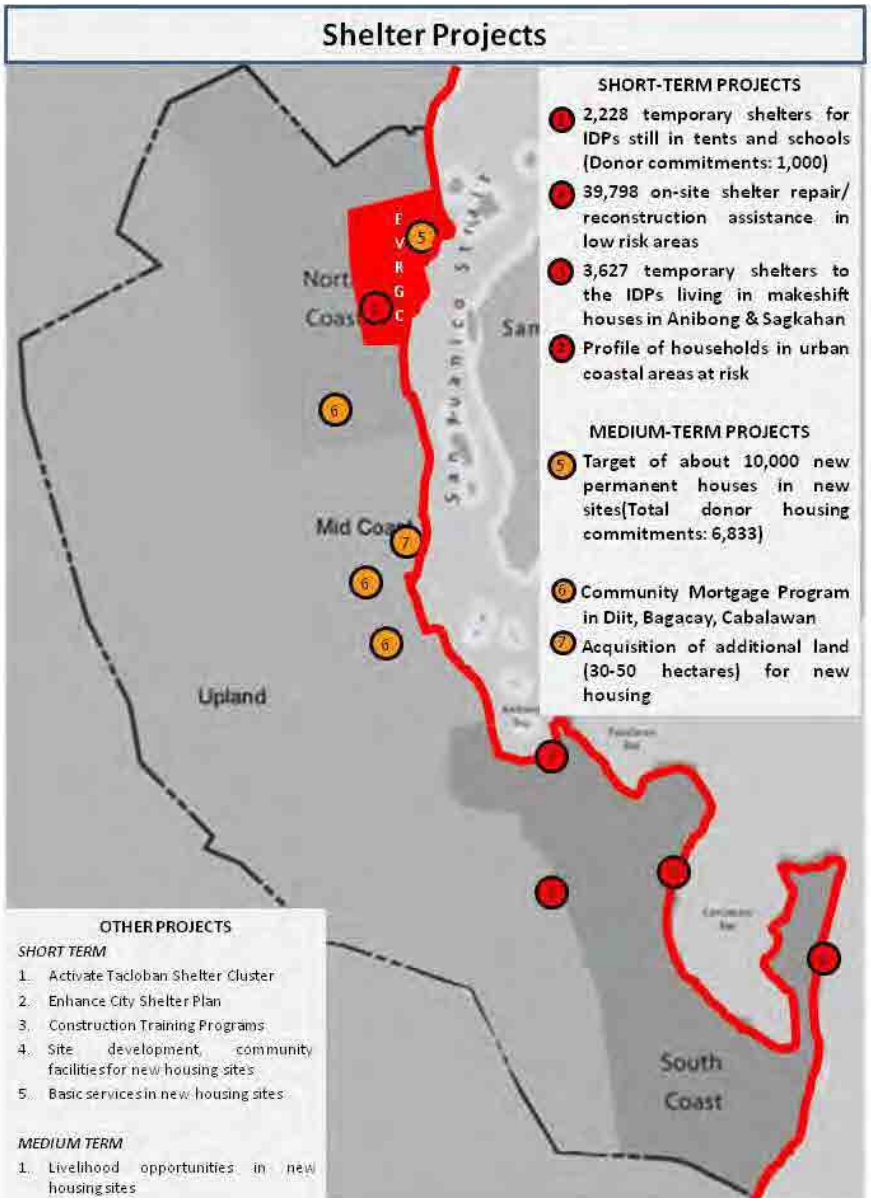
[5] According to the city's figure, 54,231 houses were damaged including 30,513 totally damaged houses.

Shelter Sector Goal:

- Provide housing options to affected families; ensure supply of adequate land; prepare supportive plans and policies; and ensure provision of basic services and economic opportunities to all.

Shelter Sector Objectives:

- To provide immediate services to affected households by pursuing planning and strengthening information database management.
- To construct permanent resilient houses with appropriate conditions supportive of resettlement in low risk/ disaster-free areas (Attainable within 12 months).
- To establish Tacloban New Township with appropriate support facilities in place (Attainable within 3 years up to 2016).
- To make Tacloban City a global model of livable and climate resilient city (Attainable within 9 years to 2022).



Source: The Tacloban Recovery and Rehabilitation Plan, May 2014

Figure 9.5-1 Shelter Project Locations in Tacloban City

(2) Development of a New Township in the North

1) Shelter Development

The City proposes development of a new township in the north as a permanent shelter site with employment opportunities and social services. This is the site of Eastern Visayas Regional Growth Center (EVRGC), which is approximately 11 km away from Downtown. The land of 85 ha available from the City government[6] is used for the development of approximately 3000 housing units. The other land is acquired by the City. Currently NHA is conducting site development of 10 ha of the land. The design standard specified by the City is 140 houses per hector and 20 square

[6] Data from Tacloban City. The recovery and reconstruction plan states that the city owns 86 ha.

meter floor area per house with 40 square meter lot.[7] However, developers can choose to apply their own housing standard for their site.[8] In addition to housing and basic public facilities, an eco-park, farms, agri-processing, and aquacultures and fishermen's village are planned to be developed for employment opportunities. The shelter development projects in EVRGC are summarized in Table 9.5-2.[9]

Table 9.5-2 Shelter Development Projects in EVRGC (as of July 2014)

Type of Shelter	Donor/ Partner	Location	No. of Units	Floor Area (sq. m)	Area Coverage (ha)	Note
Temporary	Operation Compassion	Brgy. 150 New Kawayan	400	4.5m * 4.5 m	0.3942	Bahay Kubo
	Operation Blessing	Brgy. 106 Sto. Nino	60	4.5m * 4.5 m	0.3564	Bahay Kubo
Permanent	PICE (Phil. Institute of Civil Engineers)	Lot 5399	50	20	-	
	Habitat for Humanity	5402, 4488	2500		14.147	
	Habitat for Humanity	4428	852	31	7	
	GMA Kapuso Foundation	4428	400	42	3	with 20 classroom
	Lions Club International	4466	50	20	0.55	
	Philippine Red Cross	5835, 4490, 4484, 4809, 1 (4476), 3 (4476), 5 (4470), 6 & 36	5000	22	36.161	
	DSWD	5400	134	20	0.5	
	Kimse Yok Mu	4466	50			with 1 school with 6 classrooms & medical clinic

Source: Housing Office, Tacloban City

Source: JICA Study Team

Figure 9.5-2 Temporary Shelter in EVRGC (as of July 2014)

Source: JICA Study Team

Figure 9.5-3 Temporary Shelter in EVRGC (as of July 2014)

2) Shelter Development Progress

As of February 2015, 625 temporary shelters and 212 permanent shelters were completed and 684 households moved to occupy the constrcrted shelters in Tacloban North (see Table 9.5-3). The completion rates reached 52% for the temporary shelters and 2% for the permanent shelters. The

[7] Housing Office, Tacloban City.
[8] GMA Kapuso Foundation develops houses of 32 sq. m. floor area in 50 sq. m lot, which are larger than NHA standard houses.
[9] According to this data, total housing units of all projects exceed the target of 3000 units.

most families were relocated from Barangay 88 near the Tacloban Airport.

Table 9.5-3 Progress of Shelter Development (as of February 2015)

No.	Resettlement Site	Shelter (Target Units)	Status				Beneficiaries		Builders/Partners
			Completed	Gaps	Occupied	Construction	No. of Families	Barangay	
TEMPORARY SHELTERS									
1	Tagpuro, Brgy 108	86	86	0	86		86	Brgy 88	46 units Operation Blessing, 40 IOM-DSWD
2	OC Site 1, Brgy 102	36	36	0	34		34	Brgy 88	Operation Compassion
3	OC Site 2	40	40	0	40		40	Brgy 88	Operation Compassion
4	LGU Site 1	149	149	0	146		146	Brgy 88	LGU Tacloban
5	OB Sto. Niño	60	60	0	55		55	Brgy 88	Operation Blessing
6	LGU Site 2	100	25	75	25	On-going	25	Brgy 88	LGU Tacloban
7	CALI Area	120	112	8	112	On-going	112	Brgy 88	IOM-DSWD
8	Yu Property Area	500	48	452	Not yet occupied	On-going			Operation Compassion, HUMEDICA
9	Badato, Brgy 105	120	69	51	69	On-going	69	Brgy 88	Operation Compassion-PDRF
Total		1,211	625	586	567		567		
PERMANENT SHELTERS									
1	Villa Sofia, Tagpuro, Brgy 108	640				On-going			National Housing Authority, LGU Tac
2	Villa Diana, New Kawayan	409				On-going			National Housing Authority, LGU Tac
3	North Hills Arbours 1 & 2, Greendale 1 & 2, Guadalupe Heights 1,2,3 Suhi Sto Niño	6333				On-going			National Housing Authority, LGU Tac
4	Kawayan Ville, Brgy Sto Niño 106	1,446	188-GMA	1258	99 -GMAKFI	On-going	99	Brgy 88	GMAKFI,HFHP,NHA,PICE,DOTC, Tacloban LGU
5	Sto. Niño-Malate, Brgy 106	80							Habitat for Humanity, LGU Tac
6	CALI, San Isidro Brgy 105	255	6-HFH	249		On-going			UNDP,Habitat for Humanity, LGU, NHA, Lions Int'l
7	Ridgeview Park 1 & 2, Cabalawan, Brgy 97	2,000	18	1982	18	On-going	18	Brgy 88	National Housing Authority, LGU Tac
8	Knightsbridge Heights, Camansihay	2,000							National Housing Authority, LGU Tac
9	Salvacion Heights, Salvacion & Tigbao	532							National Housing Authority, LGU Tac
Total		13,695	212	3489	117		117		

Source: City Housing and Community Development Office, Tacloban City

According to the interviews with the City Housing Office and residents of the temporary and permanent shelters, the issues in the relocation sites include piped water supply, transportation, livelihood, electricity supply, community spaces, and land acquisition. Leyte Metropolitan Water District rejected to expand their service to Tacloban North, because it is estimated to cost about PhP 500 million to extend the pipe to the relocation site which is more than 10 km away from the existing built-up areas. Currently, Mactan Rock, a private water supplier, provides water to the GMS Kaposo relocation site, because water resource is available on the site. However, it may not be sufficient to meet the future demand, because of expected increase of the population in the area. The City also provides the families in the temporary shelter sites with portable water by water wagons.

Temporary public transport service from and to the Tacloban North is operated in morning and evening by the City with the financial assistance from a congressman for time being. This may be continued until franchised private operators start operation of public utility vehicles when the population there increases and produces sufficient demand to make the operation of the public transport service profitable.

The residents of the permanent shelter commented on lack of livelihood, because the family's

breadwinner passed away due to the typhoon and the family had to move away from the coastal barangay where they lived. International donors and NGOs, such as USAID, OXFAM, IOM, and ILO launched livelihood programs such as provision of boats, seaweed culture, masonry, carpenter, electrical works, plumbing, among others.

In the temporary shelter, electricity is generated by solar system. However, provision of the power supply is not sufficient so that the residents anticipate the security of the site. It also pointed out that multi-purpose space is not disaster resilient and was indeed patricianly damaged by the past typhoons.

In order to construct a sufficient number of shelters, the City plans to purchase additional 28 ha of land in moderately slop areas; however the rise in land price has been a constraint to the land acquisition due to a lack of financial resources of the City, of which the revenue is still in the process of recovering from the disaster. The City officer commented that it would be helpful if the assistance from international donors is provided for site development, water pipe extension, road widening, and waste water treatment.

Figure 9.5-4 Permanent Shelters in GMA Kaposo Village

Figure 9.5-5 GMA Kaposo Village

Figure 9.5-6 Temporary Shelters in Tacloban North

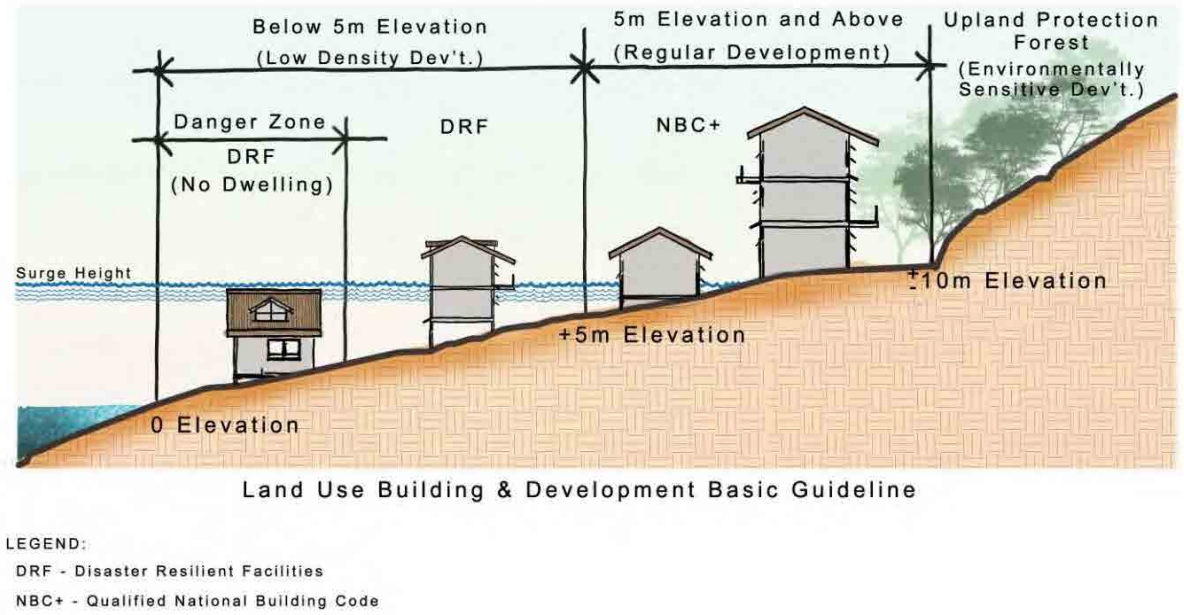
Figure 9.5-7 Well (undrinkable) in a Temporary Shelter Site

Figure 9.5-8 School in Tacloban North

Figure 9.5-9 Temporary Shelters in Cabalawan

Source of Photos from Figures 9.5-4 to 9.5-9: JICA Study Team taken on February 19, 2015

The City already proposed guidelines for building retrofitting and construction regarding no-build zones in the Tacloban Recovery and Rehabilitation Plan (see Figure 9.5-10). A City Official explained one idea to operationalize this guidelines, which is that the areas between the shoreline and 20 meters from there shall be no-build zones where no construction of residence is permitted and that are the easements delineated by the existing laws. On the other hand, if people own a lot in the areas between the mid-points to 40 meters from the shoreline, they would be allowed to build a specific type of house of which only 5 meter above part is inhabitable. It means that the first floor or the area below 5 meters can be used only for non-residential use, such as commercial or work spaces. In the reality, however, most of the families in 40 NBZ are informal settler families, who do not own the land. Further clarification is still awaited to delineate safe, unsafe and controlled zones. The new housing code is planned to develop to supplement to the national building code, including specification of the structures permissible in the NBZ, with the assistance from UN Habitat.



Source: The Tacloban Recovery and Rehabilitation Plan, May 2014, p. 61

Figure 9.5-10 Proposed Land Use Building and Development Guideline in TRRP

(3) Social Housing Programs

Tacloban City also offers a socialized housing program and Community Mortgage Program (CMP)[10] for informal settler families (ISFs) and low income families relatively. CMP targets a community rather than individual families and is offered by the Social Housing Finance Corporation.

Table 9.5-4 Eligibility of Socialized Housing Program Housing and Community Mortgage Program (CMP)

Socialized Housing Program Housing	Community Mortgage Program (CMP)
- Families living in areas at high risk to storm surge - Families with totally damaged houses - Informal-Settler Families (ISFs) with income below P10,000/ month - Families with vulnerable cases (as certified by the CSWD) - Orphaned or abandoned children with adult siblings or relatives	- Filipino citizen of legal age (18) at the time of loan application and not more than 55 years old at the time of loan release - Not a recipient of any CMP loan or other government housing program - Does not co-own a real property - Must be a structure owner, renter, or sharer at the site - A monthly income of not less than P7,000

(4) Self-Recovery Assistance and Temporary Shelter Assistance

In Tacloban, self-recovery assistance is provided by NGOs and international organizations, including AAR Japan, All Hands Volunteers, CARE, CRS, Enfants du Mekong, Habitat for Humanity, Handicap International, HOPE International Development, IOM, OXFAM, Plan

[10] Program under *Social Housing* Finance Corporation.

International, and TESDA. The assistance for self-recovery includes provision of roofing materials and other materials, assistance for transitional or core shelters, provision of tool kit and clean up kit, technical assistance, training of carpenters, and cash transfer of over 10,000 PHP or under 10,000 PHP per households. The current status of self-recovery assistance is presented in Table 9.5-5.

Table 9.5-5 The Status of Self-Recovery Assistance in Tacloban (as of June 9, 2014)

Self-Recovery Assistance	Planned	Reached
HH provided with roofing materials	5851	7138
Provision of other materials	420	1150
HH with transitional or core shelters	3131	627
ToolKit (HH with access to toolkits)	420	6844
CleanUpKit	0	0
Activities including technical assistance	20	6
Training of carpenters (no. of trained)	109	270
Cash (over 10,000 PHP per HH)	2500	50
Cash (under 10,000 PHP per HH)	0	0

Source: Shelter Cluster Report Region VIII on June 9, 2014

Catholic Relief Services (CRS), one of the most active organizations in Tacloban, in addition to IOM and OXFAM, is currently conducting "Tacloban Integrated Shelter/ WASH Recovery Program" with the funding from USAID. Targeting the Old Road Sagkahan area including NBZ/NDZ, the project aims to provide stable, safe transitional shelter (temporary shelter) options while waiting for relocation, training and technical support for build back safer construction, and document recovery support. It also intends to provide community level support to assist formulation of community disaster risk reduction plans and brarangay infrastructure improvement plans. The project components consist of household level and barangay level project support.

Shelter/ WASH support is divided into the families/ communities with lots, who mostly live in safe zones, and the families without lots and those in NDZ. For those families with lots are able to receive 33,000 PHP for shelter assistance and 22,000 PHP for WASH support for two years, in addition to materials for repair/ construction of houses. They are also entitled to receive 600 PHP for payment of the CMP. In the rental apartment and host family support programs, a family receives 3000 PHP per month for two years. The beneficiaries are required to identify a lot or rental unit and to prove that they can stay for two years at least.

Besides, the World Bank proposes a rental support cash grant program. This program intends to provide cash support for two years to the families without shelters, e.g., families in emergency shelters or with host families, in Tacloban and other municipalities where rental market exists. The project is implemented by DSWD and LGUs and expects to start in November 2014.

Table 9.5-6 Temporary Shelter Assistance by CRS (with Lots)

Support	1. Large lots for multiple HH's in safe area: Support for negotiating with landlord for new settlement 2. Individual Lots: Support for construction of a new shelter plus support in securing tenancy
Shelter (Category A) Cash Total	33,000 PhP
Shelter (Category A) Material Total	20 pieces CGI + 2 pieces plain sheets
Wash (Category 1) Cash Total	22,000 PhP
WASH (Category 1) Material Total	4 pieces CGI+ 6 pieces plain sheet + 1 toilet bowl

Additional assistance	Land rental subsidies of 600 PhP/month and Site planning and development

Source: CRS

Table 9.5-7 Rental Housing Assistance Program by CRS

	Rent apartment/house in safe area	Host Family in safe area
Support	Fixed rental subsidies for up to two years	Support for host family to accommodate your household (can be used for repair / maintenance/ extension)
Shelter Cash Total	3,000 PHP/month Beneficiary negotiates the price Money is transferred directly to the owner; if any difference in the amount of rent, then CRS transfers the "change" to the beneficiary	(Category A) 3,000 PHP/month A minimum of 50% must be used to upgrade, repair, or extend the house structure and the remaining 50% can be used to support ongoing household expenses.
Wash Cash Total	Case by case Wash repair (PHP amount TBD)	(Category 1) Case by case Wash repair (PHP amount TBD)

Source: CRS

9.5.2 Palo

(1) Temporary and Permanent Shelter Development

The Municipality of Palo enacted an ordinance declaring all easements as "No Build Zones," providing fines and penalties thereof (Municipal Ordinance No. 2013-06), after the President issuing 40 meter no-build zone policy in December 2013. In Palo, there are 741 households resided in NBZ (see Table 9.5-8). For the relocation of these families and other victims whose houses were totally destroyed, the LGU plans five temporary shelter and three permanent settlement development projects. Informal settler families are not included in the target of the projects (see Table 9.5-9 and 9.5-10). The land of relocation sites are donated by various organizations. For the permanent shelter, NHA is responsible for site development, and contractors, such as Habitat for Humanity will develop housing units in line with NHA housing standard. Yet, GMA Kapuso Foundation applies their own housing standard for construction of housing units.

Table 9.5-8 No. of Households in NBZ

Name of Barangays	Number of Households
Buri	27
Tacuranga	29
Cogon	135
Arado	25
San Miguel	41
Cabarasan Guti	36
San Antonio	82
Pawing	94
San Fernando	13
Candahug	33
San Joaquin	50
Baras	116
Salvacion	60
Total	741

Source: Palo Municipality

According to the MPDO and MSDW officer of the Municipality, residents of NBZs have to show a land title or tax declaration as an evidence to be eligible for the relocation. The families with

income below PhP 10,000 per month are given priority.[11] It would take 3 to 5 years to be relocated into permanent shelter. Social consultation is conducted for the residents before relocation. In new settlements, families from different barangays are mixed and reside next to each other. Some of relocation sites are located in mountainous areas far away from the Poblacion of the Municipality.

The status of the temporary and permanent shelter development is presented in Table 9.5-9 and 9.5-10. As of February 2015, a half of the families who lived in bunkhouses were relocated to the temporary shelters constructed by Tzu Chi Foundation. The temporary or transitional shelters of Tzu Chi Foundation were built to be used for five years, targeting the households in the bunkhouses and 40 meter no-build zones, and low income families. According to the Municipal Officers and the residents, the issues identified with the temporary shelters of Tzu Chi Foundation in Barangay San Jose include: school, livelihood, water supply, transportation, among others. Because the shelter site is located far from the Poblacion, some potential beneficiaries declined the offer of the shelters. The permanent shelter construction is on-going by GMA Kapuso and Don Bosco Foundation. However, several shelter projects have not started or canceled because of issues involved in the land acquisition, though the most of those lands belong to the national government agencies, or high risk of landslide. Those who own lots and prefer staying in the original place participate in the CRS's program or received DSWD's shelter assistance, as explained below.

Table 9.5-9 Temporary Shelter Projects and the Status of the Progress (as of February 2015)

Project Location	Project Description	No. Of Dwelling Units	Status (As of February 2015)	Donor
1.Government Center, Brgy. Candahug	bunkhouses with CR and bathrooms	360	100 households relocated to the transitional shelter of Tzu Chi Foundation. 50% of the bunkhouses were demolished	DPWH
2. Brgy. Tacuranga	1 hectare lot for single detached housing units; with 2 bedrooms for small families and 3 bedrooms for bigger families	384	193 (50% demolished)	DPWH
	1,500 sq. meter lot for single detached housing units	30	?	Tzu Chi Foundation
3. Brgy. Salvacion	1 hectare lot for single detached housing units	100	?	Tzu Chi Foundation
4. Sitio Caloogan, Brgy. San Jose	3.5 hectares lot for single detached housing units	350	245 units were handed over to the beneficiaries	Tzu Chi Foundation
5. Brgy. Castilla	Single detached housing units for selected families	20	Did not go through because the land is not available.	Tzu Chi Foundation
TOTAL NO. OF DWELLING UNITS		1,244		

Source: Palo Municipality. The status information was added by JICA Study Team based on the interviews.

[11] For a family of five members.

Figure 9.5-11 Bunkhouses at Brgy. Candahug

Figure 9.5-12 Bunkhouses at Brgy. Tacuranga

Source of Photos in Figures 9.5-11 and 12: Palo Municipality. Date unknown.

Figure 9.5-13 Transitional Shelters by Tsu Chi Foundation in BRG. San Jose

Figure 9.5-14 Portable Water Supply

Figure 9.5-15 Community Space

Figure 9.5-16 Transitional Shelters by Tsu Chi Foundation

Figure 9.5-17 Permanent Shelter Construction by GMA Kapuso in BRG. San Jose

Figure 9.5-18 Organic Farm next to the Permanent Shelter

Source of Photos from Figures 9.5-13 to 9.5-18: JICA Study Team taken on February 19, 2015.

Table 9.5-10 Permanent Shelter Projects and the Status of the Progress (as of February 2015)

PROJECT LOCATION	PROJECT DESCRIPTION	NO. OF UNITS	Status (as of February 2015)	DONOR	CONTRACTOR	SITE DEV'T.
1. Brgy. Barayong	**5** hectares for permanent housing units with production area for school buildings, chapel, talipapa & livelihood areas	500	Not started because the land of DAR is not cleared	San Miguel Corporation (SMC)	Habitat for Humanity	Nat'l. Housing Authority (NHA)
	5 hectares for permanent housing units with **5** hectares production area for school buildings, chapel, talipapa and livelihood area	500	Transferred to Brgy. Castilla	Filipino-Chinese Chamber of Commerce Inc. (FCCCI)	(to be undertaken by the Provincial Government)	NHA
2. Sitio Caloogan, Brgy San Jose	**2** hectares for permanent housing units with **1.5** has. production area	200	On-going, 169 families were identified as beneficiaries by the LGU	GMA Kapuso Foundation		NHA
3. Brgy. Candahug		360	On-going, 60 unites were handed over to the beneficiaries	Don Bosco Foundation		NHA

Source: Palo Municipality. The status information was added by JICA Study Team based on the interviews.

(2) Community Housing Assistance Program

As same as in Tacloban City, CRS has launched a community housing program in Palo. The program of CRS consists of two components: Type A and Type B. Type A assistance is that after a beneficiary identifies a lot in safe areas, CRS builds a house for them. The beneficiaries have to show a proof of land title in order to be eligible. On the other hand, Type B is to offer financial assistance with 20 CGI sheets for reconstruction. In this component, the beneficiaries have to organize a group of 10 families and identify a land. As the first assistance, the beneficiaries will receive PhP 16,500 and the group members buy construction materials and then construct houses. The group members are required to submit a receipt of the purchase of the materials to CRS and to finish construction of some part of the housing units with the materials. Once all of the members finish the construction, CRS offers additional PhP 11,000 to complete the housing units. The group members have to monitor the compliance of the other members and progress of the construction. If not all the members of the group finish the construction, the group would not

receive the second cash assistance until everyone of the group members completes it. The groups are organized by the CRS workers and barangay officials. The project period of CRS is two years. The CRS targets all the barangays in the LGU except Candahug, because Don Bosco Foundation is working on the construction of permanent shelters there.

9.5.3 Tanauan

Tanauan have been implementing three resettlement projects in Barangay Pago, Maribi, and Sacme for relocation of households living in NBZ, in cooperation with NHA and a non-government organization, Gawad Kalinga (GK). According to a city official, there are 714 households in 50 meter no-build zones.

NHA and GK have a partnership agreement for cost sharing of housing construction and shoulder 70% and 30% of the cost respectively. The housing units are constructed in line with the NHA standard. In this project, housing type is "rowhouse with loft". The lot size is 36 sq. m. and building footprint is 22 sq. m. The land was identified and is owned by the LGU. There is no construction of new school or other public facilities with the resettlement sites.

For selection of beneficiaries, the LGU prepared a list of beneficiaries at first and GK selects the beneficiaries in accordance with their selection criteria. The relocation site and community are developed and operated under GK's policy. To receive a house, a family is required to volunteer for housing construction for certain length of time such as 1000 to 1600 hours, which is adjusted to the minimum wage in the area. This is called "sweat equity" scheme. The beneficiaries are not allowed to sell or rent the property to the third party after the relocation. GK provides training for livelihoods and community organizing. The LGU plans to develop additional settlement for the relocation.

The Municipality was able to demolish all tents by the first anniversary of the typhoon in November 2014. As of February 2015, approximately 100 permanent shelters in Barangay Pago were already handed over and 250 shelters in Barangay Pago and Barangay Sacme were to be given to the beneficiaries on February 25, 2015 (see Table 9.5-11). Additional shelter development projects were planned in Barangay Pago and Barangay Sacme. In Pago, SOS Children Foundation plans to develop 300 permanent shelters; the Municipality intends to acquire 6.5 ha of land to develop 400 units in Barangay Sacme.

In the relocation site of Pago, livelihood facilities and programs are also developed, including skilled framing center, bakery, block marking, farming, carpentry, welding, fishing boat making, among others. In the farm, high value commercial crops, such as lettuce, cauliflower, broccoli, honey jean, beans, etc. are grown by a women's group. The land is leased for 7 years and the Governor provided seeds to the residents. GK offers a bicycle for each family as transport means. The relocation site in Barangay Pago was the first permanent shelters developed in the affected area in Region VIII, of which the first permanent shelters were handed over in May 2014. Unlike the other municipalities, Tanauan does not construct temporary shelters, but immediately started

construction of permanent shelters. The Governor considers the resettlement site in Barangay Pago as one of model cases due to its success.

After the landslide caused by Typhoon Seniang in December, 2014, which killed five persons in Barangay Sto. Nino, the LGU set up new NBZs for landslide in Barangays Cabuynan and Sto. Nino. There are 90 households identified in the landslide NBZs: 72 in Barangay Cabuynan and 18 in Barangay Sto. Nino. Among them, 30 households will be relocated in the relocation site in Barangay Sacme.

Table 9.5-11 Resettlement Projects in Tanauan

Site	BRGY. Pago	BRGY Maribi	BRGY. Sacme
Land Area	2.47 ha	3.31 ha	3.00 ha
Housing Units	366 units	456 units	400 units
Density	157 lots/ ha	133 lots/ha	133 lots/ ha
Status (as of February 2015)	97 units completed. 150 units are handed over on February 25, 2015.	Site development is on-going by NHA.	100 units are handed over on February 25, 2015 and 120 unites will be handed over in April, 2015.
Beneficiaries	Households in NBZs of BRY San Roque		Households in NBZs of BRY Bislig, Cabuynan and Sto. Nino.

Source: Tanauan Municipality

Figure 9.5-19 Completed Resettlement Housing in Barangay Pago, as of May 2014

Figure 9.5-20 Resettlement Housing Under Construction in Barangay Pago, as of May 2014

Figure 9.5-21 Resettlement Housing in Barangay Pago, as of February 2015 in Barangay Pago, Tanauan, as of May 2014

Figure 9.5-22 Block Making

Figure 9.5-23 High Value Commercial Crop Farm in Barangay Pago

Figure 9.5-24 Resettlement Housing Under Construction in Barangay Sacme

Source: JICA Study Team. Photos in Figure 9.5-19 and 20 were taken in May 2014, and the other photos were taken in February 2015.

9.5.4 Basay

In Basey, the beneficiaries of relocation are 6,000 families who live in no-build zones including 40 meter no-build zone, riverbanks, and road-right of way. This accounts for about 42% of the total households in Basay. A half of them reside within 40 meter no-build zones; two third of their houses are built by light materials, as shown in Table 9.5-12. The families in 40 meter no-build zones are mostly found in the Poblacion barangays within seawall and coastal rural barangays where nearly 49% and 63% of families dwell in the 40 meter no-build zones (see Table 9.5-12).

Basey Municipality plans the relocation of these families from the 40 meter no-build zones vulnerable to disaster to safe higher grounds. There are five relocation sites of which total area is 34.6 ha as shown in Figure 9.5-25. Three shelter development projects are in progress in Barangays of Basiao, Bacubac, and New Augustine with assistance from INGOs and NHA, as of February 2015. The Good People International funded by KOICA helps the construction of housing units of 135 in Barangay Basiao. In Barangay Bacubac, 113 units are to be constructed. A NGO purchased 1 ha and NHA will build shelters in Barangay New San Augustine. The beneficiaries are awarded the housing units but required to pay for lots.

To address livelihood issues, farmers will be assigned to the relocation sites where farm land is available such as in San Agustine; fishermen will be relocated to a coastal barangay such as Barangay Tingib. The beneficiaries of the relocation sites are selected by livelihoods, though some people may change their occupation. According to a municipal officer, all relocation sites are located along the highway so that there is no problem in terms of accessibility and transportation.

Table 9.5-12 No. of Families in No-Build Zones, Basey

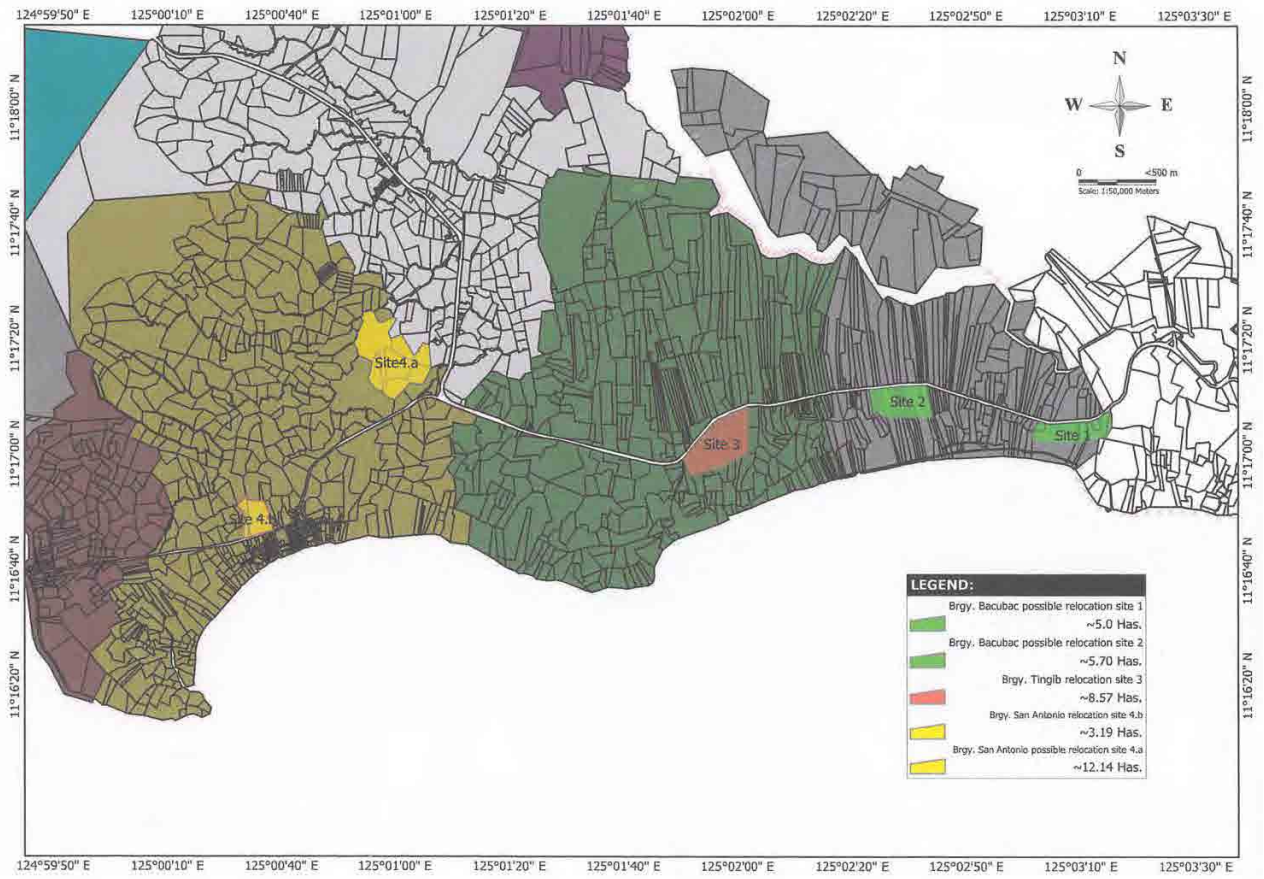
	Concrete Structure	Semi-Concrete	Light Materials	Total	
Within 40 m n- build zones	394	381	2,269	3,044	51%
Along riverbanks	48	50	1,039	1,137	19%
Along road-right of way	311	248	1,260	1,819	30%
Total	753	679	4,568	6,000	100%
	12.6%	11.3%	76.1%	100.0%	-

Source: Basey Municipality

Table 9.5-13 No. of Families in No Build Zones, Basey

Barangays	Population	No. of Families	No. of Families in No Build Zones	
			(No. of Families)	(Share)
Poblacion Barangays within Seawall	8,317	2,709	1,340	49%
Coastal Rural Barangays	16,184	4,164	2,614	63%
Rural Barangays along River	2,101	542	215	40%
Rural Barangays along National Highway	6,488	1,471	371	25%
Rural Barangays along Provincial Road	2,844	725	208	29%
Rural Barangays along Municipal Road	8,254	2,222	619	28%
Rural Barangays along Golden River & Municipal Road	6,016	1,589	305	19%
Interior Barangays	3,226	777	328	42%
Total	53,430	14,199	6,000	42%

Source: Basey Municipality



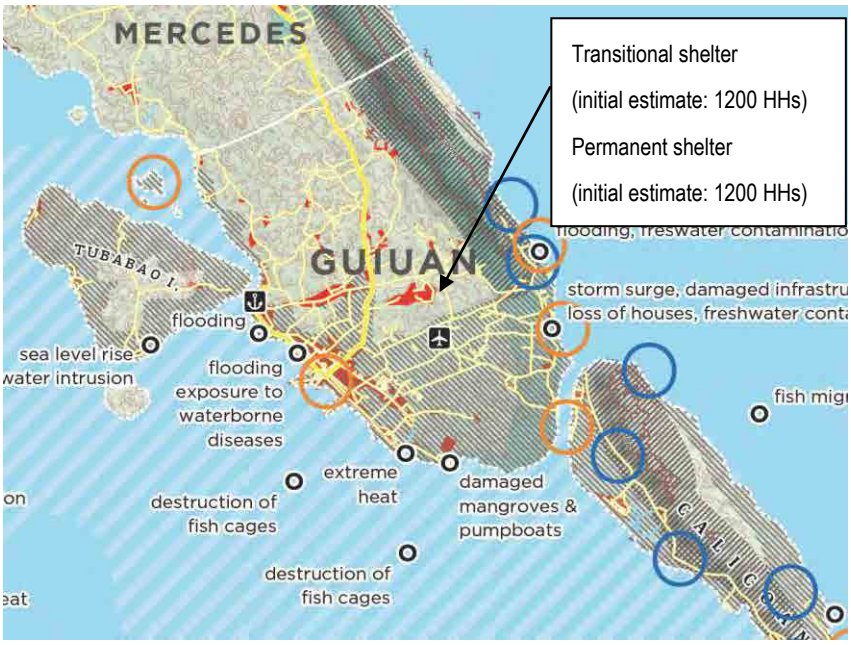
Source: Basey Municipality

Figure 9.5-25 Relocation Sites in Basey

9.5.5 Guiuan

According to the Guiuan Recovery and Reconstruction Plan, temporary and permanent shelters are planned to be developed in Tagporo for relocation of households in Barangay 6 and 7, and Hollywood. The relocation project includes construction of approximately 2400 temporary and permanent shelters (1,200 houses per each). This is planned as a new township in the airport area, developed in cooperation with NHA and the Province. Additional resettlement sites will be identified by the LGU. In addition, social housing is planned to be developed by financing of PAG-IBIG and CMP. The water and power supply will be expanded to provide the services to the new settlements. Skill training is also proposed, targeting the affected families.

As of February 2015, 132 temporary shelters were constructed in Barangay Cogon, while, permanent shelter development is undertaken by NHA to build 281 units on the land of 2.2 ha in Barangay Tagporo. In order to develop more shelters, a land of 16 ha is identified for temporary shelter developmet and additional 3 ha of land in Barangay Tagporo was acquired for a permanent shelter site. The target beneficiaries of the permanent shelters are approximately 700 informal settler families in Barangay 6, 7, and Hollywood. According to the Municipality, international NGOs are willing to support construction of shelters; however, land acquisition cost is a constraint to the development.



Source: Guiuan Recovery and Rehabilitation and Plan, June 2014

Figure 9.5-26 Location of Resettlement Sites in Guiuan

Figure 9.5-27 Informal Settlement in a Coastal Barangay

Figure 9.5-28 Temporary Shelters in Barangay Cogon

Figure 9.5-29 Temporary Shelters in Barangay Cogon

Figure 9.5-30 Water Supply Facility and a Community Facility in the Temporary Shelter Site

Source of Photos in Figures 9.5-27 to 30: JICA Study Team, taken on February 17, 2015.

9.5.6 National Compensation Package

Beside the shelter assistance by LGUs, a compensation package for Yolanda victims is proposed by the Government of the Philippines and expected to be approved in the end of July 2014.

. **Table 9.5-12 Compensation Package Proposed for Yolanda Victims**

Category	Affected Family Situation	Assistance Package
I	Affected family with own house/lot Affected family to rebuild on site but outside of NDZ	PARTIAL DAMAGE: materials to the value of 10,000 PHP
II		TOTAL DAMAGE: materials to the value of 30,000 PHP
III	Those that fulfill the government's vulnerability criteria, who live in a destroyed or damaged house in a no dwelling zone	To resettlement sites with the following options: • Temporary bunkhouse and then a • Permanent Row House • Displacement compensation 10,000 PHP

Source: Shelter Cluster Draft Strategy 3 2 SOFY on March 3, 2014.

On November 21, 2014, Soliman, the Secretary of DSWD, finally signed "the Guidelines for the Implementation of the Emergency Shelter Assistance (ESA) Project for Families with Partially and Totally Damaged Houses due to Typhoon "Yolanda"." In line with the Guidelines, the EAS distributes PhP 30,000 to the families whose houses were totally destroyed by Yoldanda, and PhP 10,000 to the families whose houses were partially destroyed houses. The families eligible for the project are the families who do not have permanent sources of income or whose income is lower than the poverty threshold of the region. Furthermore, the Guidelines provides additional requirements for the eligibility, including 1) the families' houses are located in the safe or controlled areas where residential use of the land is permitted, 2) families who are renting or sharing houses in safe and controlled areas which are totally or partially damaged are listed in the DSWD list through DSWD-Disaster Assistance Family Access Card (DAFAC), 3) the family heads do not have non-permanent or no regular jobs so that they are not able to access to housing loans, 4) the salary of the families are less than PhP 15,000 per month; they have not received the shelter assistance from other agencies; and they are identified as the beneficiaries by the DSWD-DAFAC; 5) lone survivors of families who are given the DSWD-DAFAC and are included in the master list of beneficiaries, and 6) the families who fulfill all the conditions from 1 to 5 conducted self-repair and self-reconstruction, if their name is in the master list of beneficiaries through the DSWD-DAFAC. The priorities are given to: 1) the families who lost household heads, 2) child survivors living alone or under the care of surrogate, 3) the families with perennially sick family heads, 4) a family with 3 or more members whose ages are below 12, 5) the families with differently-abled members, 6) a family with a senior citizen or with a caretaker, 7) female headed household, 8) single parent households, and 9) vulnerable families.

The ESA is implemented by the LGU in cooperation with the DSWD-Field Office. In order to validate the eligibility of applicants, the LGUs are required to confirm that the houses are located in safe or controlled areas based on their CLUPs and the multi-hazard maps. The announcement of the Guidelines disappointed the affected families, because the eligibility criteria exclude a number of the families who need assistance to rebuild their houses.

9.6 Issues in Relocation

Relocation is a complicated process and brings about various impacts on people's lives in different ways. A number of issues and problems involved in relocation are discussed below.

9.6.1 No-Build Zones (Unsafe, Safe and Controlled Zones)

Setting up 40 meter no-build zones involves issues of a legal base for a no-build zone and a difficulty in enforcement of NBZ. Although it is possible to establish no-build zones by passing a city/municipal ordinance, land titles are already issued and there are a number of land owners / residents within the 40 meter no-build zones, because the water code does not provide an easement of 40 meters from the shorelines. Thus, some citizens in Tacloban protested against the city

ordinance to establish 40 meter no-build zones from the shorelines. If no-build zones are established, the enforcement of eminent domain requires just compensation for the owners of the lands and properties and the residents. Because a blanket enforcement of no-build zones would increase the burden on LGUs to identify relocation sites and construct social housings, a new classification of unsafe, safe and controlled zones is introduced, though the delineation criteria have been still undecided. Meanwhile, a number of informal setter families (ISFs) reside in coastal areas and river banks. There are approximately 13,300 ISFs in Tacloban City. Because many of the informal settlements are located in high risk areas, LGUs are required to construct social housing for relocation of ISFs. It is anticipated to take a few years to relocate all the people in NBZs. Transitional measures to address the risks for rainy season during the waiting period should be considered for safety of those people.

Currently, the LGUs in the study area have been taking actions based on their own policies to deal with the issues of NBZs. There are no agreed assessment processes, relocation procedures, or approaches among those LGUs. For instance, Tanauan Municipality has prepared three relocation sites and constructed social housing in cooperation with NHA and an NGO. Tacloban City plans to define safe zones, unsafe zones, and no-dwelling zones by 2014 after vulnerability and risk assessment with UNHABITAT.[12] A new development regulation by land use for new buildings in NDZ is already proposed in the Recovery and Reconstruction Plan of Tacloban City. According to DSWD's shelter assistance policy, the households in NBZs are not eligible to receive shelter kit assistance or materials for repairmen of damaged houses from DSWD.[13] However, some NGOs provide temporary shelter assistance to the families in NBZs, with agreements from the LGUs. A prompt action of the governments is awaited to resolve the legal issues involved in NBZs. It is also crucial to build consensus among the governments, land and property owners, and residents on the procedures and other matters related to the NBZ policy.

9.6.2 Acquisition of land

LGUs are responsible to identify relocation sites and to resolve legal issues related to the land ownership. Only after the land title is secured by LGUs, NHA, donors, and NGOs start developing resettlement sites and shelters. Therefore, if LGUs are not able to identify appropriate land for relocation sites, the resettlement project is delayed.

A problem with land acquisition is more prominent in Tacloban City than other municipalities in the region, because there are a large number of families in high risk areas in Tacloban and available land is limited and expensive. While, there are more land available for development in less urbanized municipalities. Smaller municipalities such as Palo or Tanauan, are helped by the national government agencies and donors who donate land or provide assistance for acquisition. There is a case in which a municipality obtained land without acquisition cost.

Meanwhile, LGU's land ownership is also crucial for socialized housing development, according

[12] Region VIII Shelter Cluster Meeting. April 29, 2014. However, the delineation still has not finished as of February 2015.
[13] DSWD. Guidelines on the Distribution of Shelter Kits in Disaster-Affected Areas. January 30, 2014.

to a NGO, Gawad Kalinga. Because if land is publicly owned, residents are exempted from property tax payment. Otherwise, low income families living in social housing have to pay the tax. Hence, certain type of financial and legal assistance should be provided to LGUs to assist land acquisition and accelerate the process of resettlement development.

9.6.3 Lack of access to public facilities (water supply, electricity, drainage, school, health center, church, public market, community center, etc.)

Compared with development of housing units, public facilities may require more time to be developed. Although development of new resettlement sites are complete and people are relocated to new housing units, there are cases that public facilities are yet fully developed on the site. The photos below show the situation of newly developed temporary shelters in EVRGC. Since the site lacks the water supply facilities, a water wagon visits the shelter every other day. Because a landfill is located in the site, NHA stopped development of hand pump in the resettlement site for concerns with people's health. Nevertheless, a temporary shelter site was built without provision of any water supply system and residents there have to rely on water wagons for their potable water supply.

Figure 9.6-1 Water Supply by Water Wagon

Figure 9.6-2 Water Supply by Water Wagon

Source: JICA Study Team, taken in July 2014.

Besides water supply, public facilities such as electricity, drainage, schools, health centers, churches, public markets, or community centers should be developed adjacent to the relocation sites. Sudden increase of population in a community could lower the quality of public services and affect people's life. If a school is not developed near a settlement site, children have to commute long distance to school and may need to take public transportation every day to go to school. In that case, due to the distance and transportation cost, students of low income families might be forced to drop out from the school eventually.

According to hearing from NHA, a settlement site larger than 5 ha is required to develop a school on the site. Space for community facilities such as community centers is often included in the original design of settlement from the beginning. Nevertheless, development of public facilities

should be accompanied with development of the relocation site in order to assure access to public services.

9.6.4 Lack of livelihood

In addition to public facilities, a lack of livelihood is an important issue for the families to be relocated. Because the target population of relocation is those families who live in NBZs along the coast or waterway, the beneficiaries include a number of fisherfolk. However, relocation sites are often planed in mountainous areas so that fisherfolk have to commute to a fishing port every day. Other people who are working in the city center also have to travel by private or public transportation. Therefore, a LGU planning officer commented that some families are reluctant to move to relocation sites.

In the case of Tacloban, the City intends to develop the relocation site as a new township entailing a fishing port, commercial facilities, and light and agro-industry, with residential areas. Yet, an issue is that it takes years to develop a new township. The current residents are unlikely to find such employment opportunities in near future. In that case, some families chose to stay at their former residence in hazardous areas where livelihood is available. Hence, it is an urgent task for LGUs to secure livelihoods for the families in relocation sites.

9.6.5 Selection of Resettlement Sites

Relocation sites must be located in safe zones free from any type of hazard risk for safety of residents. Selecting appropriate sites not only provide security for the residents, but also leads to lower construction costs. EVRGC, the relocation site of Tacloban City includes some slope and hilly areas which might be susceptible to disaster. A NHA officer commented that hilly slopes are not appropriate for residential use and preparing residential sites with engineering measures to flatting slops significantly increases the cost of site development. Moreover, a landfill site in the site, where debris was transported, requires 200 meter set-back for public health protection, which also reduces the available land for housing development into almost half size.

Moreover, it is desirable that resettlement sites are located near the existing built-up areas or urban centers as much as possible. If the relocation sites are close to the existing built-up areas, the residents are able to access to public services and commercial facilities there and may find employment opportunities in the urban areas. Therefore, LGUs have to take account of safety and disaster risk, the quality of living environment, access to public services and social aspects in selection of resettlement sites, in addition to the costs of land acquisition and site development.

9.6.6 Waiting time and temporary shelter

According to the LGUs in the region, construction of permanent shelters in relocation sites would take from a few years to more than five years. The households in hazardous zones have to be relocated into temporary shelters in safe zones before the next typhoon season. Although the LGUs and NGOs are hurrying to provide temporary shelters in safe areas, preparation of

temporary shelters also needs some time. Meanwhile, certain families in NBZs are unwilling to move to temporary shelters until the government clarifies the status of the NBZ policy, because some are concerned with their properties and land in NBZs, while others make a living from activities in the area.

One temporary shelter option available is a rental program which provides cash assistance to families who stay in apartment. According to CRS, however, families in danger zones and families without lots are rarely interested in a rental program. This is because the families feel a rental program is less beneficial compared with the shelter assistance for the families with lots, in addition to the issue of uncertainty in the NBZ policy. The families who own or could find a lot available for long term lease are able to develop their own houses with the shelter assistance, though it might be still a temporary shelter. On the other hand, the families without lot have to leave with empty hand at the end of the rental program. Meanwhile, landlords are also reluctant to rend their apartments or housing units to those families, since they are not sure if the families will leave as promised at the end of the two year rental program. There is a risk that low-income families keep occupying the properties without payment after the rental support program is over. Therefore, the families have no choice but to live in danger zones while waiting for a temporary or permanent shelter is ready in a safe zone. For the sake of safety of the families in hazardous zones, waiting time for temporary/ permanent shelters should be shortened and it is in urgent need of provision of temporary shelters in safe area.

9.6.7 Beneficiary Selection –Eligibility Criteria and Priority

Selection of beneficiaries and confirmation of the eligibility of families for shelter assistance programs are a cumbersome task. LGUs are mandated to identify a list of beneficiaries in cooperation with DSWD. Depending on LGUs and shelter programs, eligibilities for the programs vary; however, the most programs require a proof of residence of certain duration, for example, from six months to one year, in NBZs, or other hazardous areas. This can be confirmed by land titles, tax declarations, certifications by barangay officials, etc. Some families are, however, facing difficulty in demonstrating their residency, since such documents were lost during the disaster. In some cases, it is reported that barangay captains are reluctant to certify residence of some households. Many of families also lost their IDs, driver licenses, and other important documents. The confirmation of elisibility needs to be flexibly applied or the assistance for recovery of documents should be provided for that purpose.

Most shelter assistance programs targets the most vulnerable, including informal settler families, landless families, low income families, and families with the handicapped, infant, children, or senior citizens. Thus, the families do not fit in the category have to wait for long time to receive shelters. Especially those families with the family income just above the threshold of criteria face the most difficult situation, because families with resources or other properties are able to find a solution by themselves.

9.6.8 No Other Option but Relocation to Settlement Sites Selected by the Government

A shelter choice offered to the families in danger zones is relocation to resettlement sits chosen by the government. There is no other option for the families but relocation to the government resettlement sites, even though the site is not a suitable option for them due to livelihood opportunities, access to certain services and facilities, or living environment. Moreover, in some LGUs the families cannot choose a relocation site among several resettlement sites, since a settlement site to be relocated is assigned by LGUs. A rental assistance program is an unpopular option as discussed before. If a household reject the government resettlement, they would not receive any shelter assistance from the government. Hence, it is necessary to provide more shelter options for the families so that people can choose their own settlement area in accordance with their preferences and needs.

9.6.9 Consideration of Community in Relocation

In the relocation process, families are relocated to new resettlement areas without considering the existing community or social ties in the original locations of the residence. Therefore, a sense of community would be lost by relocation and people have to develop a new community and build social ties and relationships from scratch in a new relocation site. Because of a lack of sense of community, occasionally problems or conflict appear between new residents, and between new residents and receiving communities. Besides, poor families often rely on locally developed social ties or connections with neighbors for making a living or various assistances and support. Losing community by relocation might adversely affect those vulnerable families especially, especially if livelihoods or social services are not sufficiently provided in the resettlement sites. Moreover, the residents of temporary shelters are isolated from the receiving community. Children residing in temporary shelter sometimes have to or choose to commute to the school in the previous residence.

Social consultation of sending and receiving communities are currently conducted by DSWD and LGUs. However, LGUs have to make more effort to preserve the existing community by relocating one community to the same resettlement site where they can live next each other, or implementing community development programs proactively, to build a new community and make the transition smoother and acceptable for incoming and receiving communities.

9.7 Policy Recommendation

In order to address issues and problems discussed above, policy recommendations are proposed below:

9.7.1 Development of Resettlement Sites:

- To accelerate land acquisition process by providing subsidies or legal assistance to LGUs to promote resettlement development and shorten waiting time
- To develop public facilities and infrastructure with construction of shelters

- To select appropriate resettlement sites location near existing build-up areas if possible, to provide better access to public services and livelihoods, and also select relocation sites without hazard for safety and reasonable development cost of relocation sites.
- To involve communities in design of resettlement sites so that the living environment of resettlement sites become more preferable to the residents and can meet people's needs and concerns, and community participation can also contribute to community development,
- To increase shelter assistance options as much as possible

9.7.2 Social Support:

- To provide livelihoods/ employment support and opportunities within or adjacent to resettlement sites,
- To develop and improve public transport service to and from resettlement sites
- To conduct effective community consultation for incoming and receiving communities and to provide social support to make relocation more acceptable and to mitigate negative impacts of relocation
- To relocate households previously living in one neighborhood or adjacent communities into the same relocation site or provide one block of neighborhood for them in order to maintain the existing community and social connections,
- To implement community development programs before/after relocation

9.7.3 Support for Transition

- To provide assistance to the families who lost documents to prove their eligibility for shelter assistance programs or to relax the eligibility criteria for those who lost required documents such as land title, tax declaration, ID, etc.
- To offer social support for residents in temporary shelters to prevent isolation from the originated community as well as the hosting community of the shelters
- To increase and accelerate provision of temporary shelters in safe areas
- To clarify the status of NBZs and to define the delineation criteria of unsafe, safe and controlled zones as soon as possible in order to reduce uncertainty and anxiety about residents' properties in the zones
- To disseminate information and increase communication with residents about shelter options and a relocation process

Chapter 10 Health and Social Welfare

10.1 Health and Medical Care

10.1.1 Pre-Yolanda

A medical system is fully established and technical supports are distributed from the national level to the barangay level. Medicines are basically procured using the LGU budget. Although DOH/RHO supplies basic medicines to RHUs, their frequency and quantity do not match RHUs' needs. Poor mental health is recognized as a psychiatric illness. It is not focused on, and the implementation capacity such as facilities and human resources is insufficient. Social workers and day care workers who belong to DSWD have activities in the communities. However, their work content is community support like family and child support but not mental health. Medical wastes are not properly managed in the hospitals or RHUs.

Roles and responsibilities of medical organizations such as LGUs and hospitals in emergency cases are clearly set up. Manuals for emergency cases are prepared and a communication and monitoring system with a mobile phone called a SPEED system has been introduced. In addition, the quantity of stored medicines and materials are specified. However, the capacity of human resources for emergency cases is insufficient due to a lack of manual utilization, training and involvement of all staff members and communities in the training. Also, the quantity of the stockpiles of medicines in medical organizations was lower than the standard.

10.1.2 Post-Yolanda

Medicines, materials, space, electricity, water and transportation were lost by collapse of a building due to high tide and strong wind. In addition, the communication system (SPEED system) was inactive because of a lack of signal. Therefore, hospitals and RHUs could not report their situation and ask DOH/RHO for logistics assistance, and they did not sufficiently implement medical treatments in spite of the fact that there were many patients. Although they have enough medicines and materials because of donors' support at present, the level of medical services is still not the same as pre-Yolanda due to a lack of space, equipment, electricity and water supply. Despite an increase of the number of patients, antipsychotic therapy (mental health) services are not at the same level as pre-Yolanda because of a lack of medicines, facilities and equipment. Mental health care has started to be recognized as important, but it is not sufficiently implemented because of the lack of knowledge, skills, human resources, equipment etc.

Recently, donors have been implementing various activities such as providing logistical support, implementation of medical treatment, dispatch of staff members, construction of facilities, monitoring and provision of training etc. However, DOH/RHO has not recognized all their activities, and duplication of activities has occurred.

DOH/RHO has been providing much training for both normal and emergency cases with donors,

but not all staff member are receiving the training. A great deal of the training for implementation of mental health treatment at the community level has been provided based on a WHO action plan, and the target trainees are not only doctors and nurses but also staff members at the barangay level such as health workers and barangay leaders. Unfortunately, trainees' specialty is not in the mental health area, so it is hard to build their capacity. DWSD has been also providing training to social workers. DOH/RHO and DWSU started collaborating for implementation of mental health treatment at the community level. Their activities still do not include mental health treatment, they are institutionalizing mental patients and dosing them with medicine. Although DOH/RHO is planning to involve other departments in order to implement mental health treatment in the near future, responsibilities between the departments is still unclear.

No recovery and rehabilitation plan has been prepared by DOH/RHO yet. It would be prepared based on the Post Disaster Needs Assessment issued by OCD. However, it does not mention mental health activities.

10.1.3 Strategy

(1) Health：Establishment of a Territorial Self-Contained Structure

Medical organizations such as RHUs and hospitals shall continuously treat disaster victims even if they are isolated because of no communication, no transportation and no logistics from others. In addition, they shall manage support activities implemented by others and coordinate them in order to reduce the gap between support activities and residents' needs. Establishment of a territorial self-contained structure is necessary in order to achieve the above condition. This activity is also stated in the statement "outcome 9" in NDRRMP as construction of a self-reliant system.

(2) Environment：Establishment of an Activity Implementation System with a Public Hygiene Aspect

An activity implementation system with the perspective of public hygiene such as sustainable and fundamental environmental management will be established to prevent health damage from improper environmental management. In addition, capacity building of SIs will be implemented. Main improvement points are 1) establishment of an organization structure, 2) capacity building of LGUs and 3) raising the awareness of communities.

(3) Health and Environment：Phased Activity Implementation

To achieve the above strategy for the health and environmental sectors, all activities will be implemented based on the following priority ranking. First priority is support activities for disaster victims. Community awareness and LGUs' capacity will be raised and developed through support activities for disaster victims. Meanwhile, support activities for disaster victims, and preparation and capacity building for emergency cases will be implemented.

10.1.4 Proposal

(1) Health

1) Enhancement of Community Support Activities (Priority: High, Period: Long term)

Collaboration between the government and citizens is needed for prompt recovery and rehabilitation from disasters. A sound mind is necessary to encourage community participation for implementation of recovery and rehabilitation activities.

Therefore, establishment of organizational and communication structures, securing of personnel, and capacity building for implementation of mental health care will be implemented. And then, mental patients will be treated through adequate mental health care treatments in order to encourage recovery and rehabilitation from the disaster.

This is a high priority and a long term activity up to 2030.

2) Establishment of Organizational Structures and Capacity Building for Emergency Cases (Priority: Middle, Period: Middle and Long terms)

Related organizations should thoroughly prepare not only on hard aspects such as design, construction, equipment and transportation etc., but also on the soft aspects such as budget, organizational structure (e.g. policy making, communication, collaboration, coordination etc.) and capacity of personnel for emergency cases.

The number of personnel in emergency cases generally decreases in both affected and unaffected areas compared with the normal situation due to damage and detachment of personnel respectively. Therefore, each LGU shall ensure sufficient personnel with consideration for emergency cases. Moreover, personnel shall thoroughly understand their own responsibilities and roles so as not to interfere with recovery and rehabilitation and normal activities by a shortage of personnel in emergency cases.

It is common for personnel to not contribute to activities different from normal cases under chaos and confusing situations. Thereby, the contents of activities for emergency cases should be an extension of those for normal cases. From this point of view, it is necessary to review all activities for normal cases and modify them to be utilized in emergency cases as well. Also, it is recommended to revise manuals so as to be in a utilizable structure for emergency cases.

The priority of this activity is middle, and establishment of organization structures is a middle term activity by 2020 and capacity building is a long term activity by 2030.

3) Establishment of personnel utilization structure and a collaboration system among related organizations and communities (priority: Middle, Period: Middle Term)

To define the responsibilities and roles and establish a collaboration system among related organizations are necessary for effective recovery and rehabilitation from a disaster. Moreover, integrated activities between LGUs and communities are required. Therefore, a collaboration

system with a personnel utilization structure among related organizations and communities will be developed.

This is a middle priority and middle term activity up to 2020.

4) Construction of Strong Buildings

Medical organizations should ensure the safety and health of not only in-patients but also out-patients, doctors and nurses and maintain their medical function and treatment spaces in emergency cases. Additionally, they should communicate with the outside (e.g. report their condition and ask for logistical support etc.) in order to maintain their proper medical function. Thus, medical organizations should be constructed strongly in a safe location to prevent damage as much as possible. The communication tools and systems should also be strong.

This is a short term activity to be completed by 2016.

10.1.5 Living Environment

(1) Pre-Yolanda

On-site sanitation (e.g. pit latrines, pour-flush latrines with a (closed) pit, flush latrines with a (closed) pit and hanging latrines) are common styles in the target area. Latrines are constructed close to water sources like the ocean, wells and rivers. In addition, open defecation becomes a problem in both rural and urban areas. A hand washing facility is not normally constructed with a latrine. Basically, sludge in a pit is disposed of in rural areas by covering with soil, and a new pit is excavated. In urban areas, it is common that sludge in a pit is emptied by a private company or the inhabitants and disposed of in open areas such as rivers, fields and the ocean. Nobody recognizes a sludge disposal location. LGUs do not establish a sludge management policy, so it is impossible to control sludge disposal at present.

A lot of solid wastes and wastewater is stored and scattered in the target area because of insufficient and improper management and poor installation of facilities, and then wastewater finally flows into the ocean. As a result of the current hygiene condition and a high groundwater level, there is a big risk of water resources pollution in the target area. Additionally, development of communicable diseases is a concern due to the current hygiene conditions.

Sanitary inspectors (SIs) working for the LGU are responsible for implementation of activities for improvement of sanitation and hygiene. Unfortunately, many SIs do not have proper/sufficient knowledge and skills in this regard. Moreover, the current activities implemented by SIs are short term benefits (e.g. open defecation free, hand wash with soap and vector control etc.) but not fundamental ones (e.g. latrine design, waste management etc.). In other words, it is difficult to create a sustainable, hygienic and healthy environment with the current activities.

Although each LGU shall establish a disaster response team/committee and implement activities in both normal and emergency cases in order to improve the environmental condition, there is no

LGU which recognizes the responsibility and implements any activities. There is no training about sanitation and hygiene for emergency cases.

(2) Post-Yolanda

There is a possibility that environmental pollution and spreading of pathogens would occurred due to leakage of sludge caused by damage to latrines/pits and also the environmental condition pre-Yolanda.

Activities implemented by each LGU are the same as in pre-Yolanda, and this means there is no activity in order to prevent secondary infections. Therefore, dengue fever, diarrhea and respiratory diseases have increased.

The ratio of users and latrines in temporary shelters satisfies the WHO recommendations but not the WASH cluster recommendations. Those of hand washing facilities and bathing facilities satisfy both recommendations. However, latrines and bathing facilities are unisex type and their design including an access route do not consider physical challenges. The environment in the premises is not hygienic since sludge overflows from a pit and a lot of solid waste and wastewater are accumulated. In the wet season, solid waste and wastewater accumulate in the premises with improper management and surely will become vector sources and communicable diseases will develope.

Many donors have implemented various kinds of activities such as installation of temporary latrines, distribution of sanitary kits, provision of hygiene promotions and training, monitoring etc. However, many latrines have been installed in the wrong locations and are of poor design. Contents of hygiene education implemented by donors are the same as those of pre-Yolanda, and they are not focused on the fundamental benefits either. DOH/RHO does not recognize all their activities and cannot thoroughly manage them. DOH/RHO does not plan to prepare an activity plan or strategy for recovery and rehabilitation, and DOH/RHO follows a WASH cluster strategy.

10.1.6 Challenges

Challenges of both the health and environmental sectors are follows:

(1) Provision of Hygiene Education based on the result of a fact-finding survey (Priority: High)

A fact-finding survey regarding the environmental condition and water related disease development will be implemented, and then hygiene education will be provided to communities according to the result of the survey. Provision of hygiene education will help to improve environmental hygiene through raising awareness and change of living attitude.

The fact finding survey is a short term activity to be completed in 2016, and provision of hygiene education is a continuous activity.

(2) Capacity Building for Public Hygiene and Implementation of Activities

(Priority: Middle, Period: Long term)

SIs' capacity will be developed through provision of hygiene education to communities. In addition, knowledge about adequate latrine construction and O&M will be developed. A prevention system against health hazards with a long term, sustainable and fundamental environmental management perspective will be developed by instruction and mobilization activities for the communities.

This is a Middle priority and a long term activity up to 2030.

(3) Establishment of Organizational Structures and Capacity Building for Emergency (Priority: Middle, Period: Middle and Long terms)

LGUs should thoroughly prepare their systems for emergency cases on soft aspects such as budget, organizational structure (e.g. policy making, communication, collaboration, coordination, activity implementation etc.) and improve the capacity of their personnel.

The number of personnel in emergency cases generally decreases in both affected and unaffected areas compared with the normal situation due to damage and detachment of personnel respectively. Therefore, each LGU shall ensure sufficient personnel with consideration of emergency cases. Moreover, personnel shall thoroughly understand their own responsibilities and roles so as not to interfere with recovery and rehabilitation by a shortage of personnel in emergency cases.

Priority of this activity is middle, and establishment of organization structures is a middle term activity by 2020 and capacity building is a long term activity by 2030.

(4) Establishment of a personnel utilization structure and a collaboration system among related organizations and communities (Priority: Middle, Period: Middle term)

Improvement of people's lifestyle attitude through raising people's awareness and continuous support to communities from LGUs are necessary to improve the environmental hygiene condition. Therefore, a collaboration system between LGUs and communities will be constructed in order to create a hygienic environment in the communities.

This is a middle priority and the middle term activity up to 2020.

10.2 Gender and Social Welfare

10.2.1 Before Yolanda

According to the Global Gender Gap Report 2012, the Philippines ranked 8th out of 135 countries for gender equality, making it the only Asian country to enter in the top ten since 2006. More women were basically literate and enrolled in elementary and higher education than men in the Philippines. On the other hand, with regard to employment, more men participated in the labor

force than women. While more women worked as government officials, corporate executives, managing proprietors, managers and supervisor than men, women receive less income than the men. Maternal mortality ratios have not improved in recent years, and it is deemed difficult for the country to achieve MDG to reduce the ratio to 52 by 2015.

Table 10.2-1 Key Sex-disaggregated Data of the Philippines[1]

	Women	Men
Basic literacy rates (2008)	96.1	95.1
Ratio of girls to boys in primary education (2011)	1.1	
Ratio of girls to boys in secondary education (2011)	1.0	
Ratio of girls to boys in tertiary education (2010)	1.2	
Labor force participation rates (2012)	49.7	78.3
Major industry division where most are employed (2011)	Wholesale & retail services	Agriculture hunting & forestry
Average annual income by sex of household head (in thousands) (2009)	PhP 206	PhP 230
Gender income index (2003)	0.3254	
Proportion of seats held by women in national parliament (2010)	21.4	N/A
Maternal mortality ratio per 100,000 live births (2011)	95-163	N/A
Percentage of deliveries at home	56.5	N/A

Additionally, the 2008 National Demographic and Health Survey reported that one in five Filipino women aged 15-29 had experienced physical violence and one in ten women had experienced sexual violence. The situation worsens in the aftermath of disasters in the Philippines. For example, trafficking reportedly increased by 10% in the areas affected by Typhoon Washi in 2011. After Typhoon Pablo in 2013, Gender-Based Violence (GBV) cases and adolescents involved in commercial sex work also increased.[2]

The data regarding women in Region VIII showed a picture similar to the national data. The labor force participation rate for men (80.7 percent) was significantly higher than women (49.8 percent) while white collar jobs such as professionals, technicians and associate professionals were dominated by women[3]. Women posted higher simple literacy rates than men and girls had higher net enrolment ratios than boys in both public elementary and secondary schools. Women occupied the majority (65.3 percent) of government positions in the region, but elective positions in the region were still male-dominated. Based on the National Statistical Coordination Board (NSCB) data, other gender issues in the region included the lack of participation of women in peacekeeping (10.5 percent of police personnel are women), fewer women beneficiaries of Agrarian Reform (3

[1] "Filipino Women and Men Factsheet", Philippine Commission on Women, March 2013.
[2] "Secondary Data Review Child Protection Yolanda Response", Child Protection Working Group.
[3] "Regional Gender Situation Eastern Visayas 2013", National Statistical Coordination Board.

out of 10) and women as main survivors of trafficking (87.5 percent). Community members and NGOs interviewed said that many women from the region worked in the service sector in other areas of the Philippines (e.g. Manila and Cebu) and overseas with the risk of abuse and exploitation. As married female migrant workers tended to leave their children with their husbands, parents and relatives at home, the children were at risk of losing parental care.

Table 10.2-2 Key Sex-disaggregated Data of Eastern Visayas[4]

	Women	Men
Simple literacy rates (2008)	95.0	92.2
Net enrolment ratio in public elementary schools (2011-2012)	91.6	89.4
Net enrolment ratio in public secondary schools (2011-2012)	55.0	42.4
Labor force participation rates (2011)	49.8	80.7
Most dominated industry	Wholesale & retail trade	Agriculture, hunting & forestry
Maternal mortality ratio per 100,000 live births (2010)	116	N/A
Total fertility rate	4.3	N/A
Number of women and men politicians by position (2010)	91	267
Number of government personnel (2010)	45,190	24,015

Source: "Gender Watch: Eastern Visayas", National Statistical Coordination Board, March 2013.

According to the Field Health Service Information System 2011, Region VIII had the fourth highest infant mortality rate (9.39 per 1,000 live births), maternal mortality rate (79.35 per 100,000 live births) and under-five mortality rate (1.35 per 1,000 live births) among all regions in the Philippines. An interview with JICA's MCH Project personnel revealed some of the challenges, including the lack of financial resources to support health facilities and the lack of appropriate skills of health staff. Weak capacity of Community Health Workers and a lack of political commitment and men's involvement in family planning were also identified as issues that had adverse effects on maternal and child health before Yolanda.

Data regarding children also showed a worrisome picture of children's status in Region VIII. Its Child Development Index recorded some reduction from 0.718 in 2000 and 0.708 in 2003 to 0.665 in 2006. While there was a slight improvement of the Child Health Index, the Child Education Index and Quantity of Life Index deteriorated when they were last collected in 2006. The region's Child Development Index in 2006 was the third worst in the entire country.

[4] "Gender Watch: Eastern Visayas", National Statistical Coordination Board, March 2013.

Table 10.2-3 Child Development Index in Region VIII by Component (2000, 2003, 2006)[5]

Indicator	2000	2003	2006
Child Development Index	**0.718**	**0.708**	**0.665**
Child Health Index	**0.979**	**0.981**	**0.982**
Infant Mortality Rate	15.8	15.3	13.0
Child Mortality Rate	26.0	22.0	22.0
Child Education Index	**0.737**	**0.664**	**0.595**
Elementary Enrolment Rate	91.4	83.7	76.4
Secondary Enrolment Rate	56.0	49.0	42.6
Quantity of Life Index	**0.439**	**0.478**	**0.418**
Poverty Incidence Among Children	56.1	52.2	58.2

In the Philippines, senior citizens made up 6.8 percent of the 92.1 million household population according to the 2010 Census of Population and Housing (CPH), an increase from the 6 percent in 2000. Females outnumbered males at 55.8 percent among senior citizens. Region VIII was the third highest region in the country (8.2 percent) with regard to the proportion of senior citizens. Based on the 2010 CPH, 1.57 percent of the household population had a disability. The proportion of PWD in Region VIII was higher than the national figure at 1.75 percent. While CPH identifies the populations of PWD and senior citizens in the country based on the document review and interviews with the Department of Social Welfare and Development (DSWD), there was a severe absence of data on the living standards of the groups, which is needed to understand their needs and challenges in the country, let alone in the region. Some of the issues among senior citizens and PWD pointed out in the interviews included poverty, discrimination, a lack of special education for children with disabilities, inaccessibility of public facilities including Rural Health Units (RHUs) and schools and a lack of rehabilitation programs, particularly outside metropolitan areas.

Within the Government of the Philippines, DSWD is the lead entity to address social welfare and development issues. DSWD develops policies, programs and services for specific groups such as women, children, youth, single parents, older persons and PWD and provides protective services in disaster settings. Programs of DSWD in Region VIII include social pensions, support to PWDs, alternative parental care, out-of-school youth, human trafficking and Gender-Based Violence (GBV). DSWD coordinates with other departments such as the Department of Justice, the Department of Education and the Department of Health (DoH) on inter-sectoral issues including GBV and child protection. DSWD's key community services for target groups are provided by Social Workers and Daycare Workers. Social Workers are responsible for various social services including protection of survivors of violence, livelihood support, social pension for senior citizens and special programs for PWD. The number of barangays each Social Worker is responsible for depends on the geographical area, ranging from 10 barangays in Basey to 30 barangays in Guiuan in Region VIII. All Social Workers interviewed at various offices of the City Social Welfare and Development (CSWD) and Municipal Social Welfare and Development (MSWD) said that their

[5] http://www.nscb.gov.ph/RU8/CDI/Child_Development_Index_2006.pdf

responsibilities were already overwhelming before Yolanda due to the wide coverage of social issues and communities. Daycare Workers manage Daycare Centers available in each barangay for children aged between 3 and 4. They also assist MSWD to collect relevant data and are members of the Barangay Councils for the Protection of Children (BCPC) that facilitate and implement children's programs at barangay level.

GBV is one of the priority issues addressed by DSWD. The Government Administrative Order sets forth at least one Women and Children Protection Unit (WCPU) to be established in every province/city, composed of a multidisciplinary team of trained physicians, social workers, mental health professionals and police. However, interviews with Social Workers in the region revealed not all the municipalities had WCPUs and none of them were multidisciplinary. Even the only one-stop shop in the region, WCPU in Eastern Visayas Regional Medical Center (EVRMC), did not have adequate manpower: physicians (1 obstetric/gynecologist and 1 pediatrician) were available on call and a psychologist was only available every Wednesday.[6] In a relatively small municipality such as Guiuan, there was no tertiary hospital but only one RHU. The nearest women's crisis center was in the neighboring city of Borongan with only one Social Worker. For legal support of GBV survivors, Women and Children Protection Desks (WCPD) were managed by female police officers in all municipal police stations. Nevertheless, WCPD in Palo pointed out the issue of lack of technical training for WCPD officers including psychosocial skills. Manpower and the environment to ensure confidentiality of the survivors were also considered insufficient. Additionally, referral pathways for GBV established at the provincial level lacked effective inter-sectoral coordination and safe houses for GBV survivors particularly in rural areas. The Violence Against Women (VAW) Desk created in every barangay for GBV survivors as part of the referral system was mostly dysfunctional. Overall, the laws and policies to protect survivors of GBV had yet to be translated into practice before Yolanda.

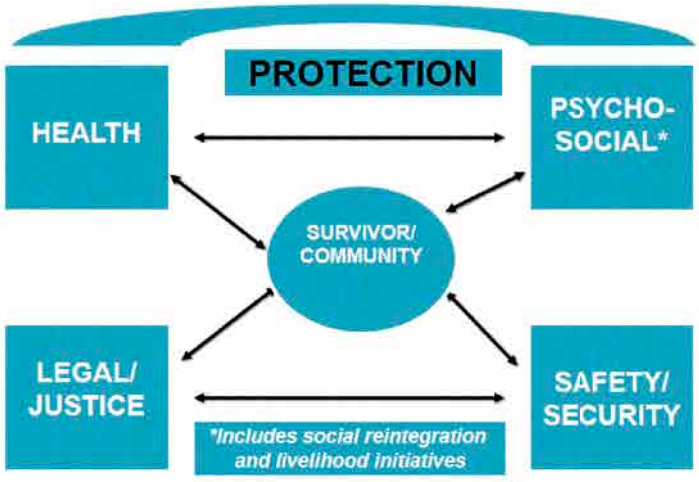


Figure 10.2-1 Concept of Multi-sectoral Response to GBV[7]

[6] A Social Worker and Police Officer are available full time at EVRMC.
[7] UNFPA's Briefing for Typhoon Yolanda Humanitarian Response.

DSWD's programs for PWD and senior citizens were largely inadequate to respond to the special needs. Under the Government system, Senior Citizens' Associations were established in all barangays and Federations for Senior Citizens' Associations were established in all municipalities and cities under the responsibility of the Offices of the Senior Citizens Affairs (OSCA). However, most of the Associations and Federations were inactive. The only safety net for general senior citizens was the issuance of senior citizen's ID that offered discounts for various services such as medicines. The pension system supported by the Government was only available for indigent senior citizens who are more than 77 years old.

MSWD and CSWD provided limited programs for PWD including livelihood, rehabilitation and social enhancement. Federations and Associations of PWD were established at national, regional, provincial and municipality levels to address their rights, privileges and concerns. However, most of them were inactive according to the interviews with NGOs and Social Workers. Similar to senior citizens, PWD were provided with special IDs to receive discounts for medical, dental, transportation and other services. Nevertheless, because PWD can only be officially accredited by physicians, there were many unreported/unregistered cases. One of the good practices of support for PWD was a cooperative for PWD organized by CSWD of Tacloban to produce school chairs as an effective income generating activity. However, the cooperative with 25 members was the only cooperative specifically targeting PWD in the entire region.

Similar to GBV prevention and response, while national laws such as the Accessibility Law and the Magna Carta for Disabled People and Senior Citizens supported various rights and privileges of senior citizens and PWDs, the Government lacked resources and priority to ensure the effective implementation of the laws. After all, LGUs were mandated to allocate only 1 percent of their budgets for senior citizens and PWD.

10.2.2 After Yolanda

(1) Government Response

The cluster system was activated in the aftermath of Yolanda to facilitate closer coordination between the Government and humanitarian agencies. The system was formally established in the Philippines in 2007 as a lesson learned from multiple disaster experiences. However, the roll out of the cluster system had not trickled down to the LGU level prior to Yolanda. Therefore, relevant departments and LGUs were not equipped with necessary knowledge and capacity to take appropriate leadership and coordination roles when Yolanda hit the region.

Issues of gender and social welfare were covered by various clusters such as protection[8], education, health, nutrition, water, hygiene and sanitation, shelter and early recovery, and livelihoods. Gender was not established as a stand-alone cluster but was addressed as a cross-cutting issue and technical guidance was provided to relevant clusters for integration of gender concerns as the need

[8] The Child Protection Working Group (CPWG) and GBV Working Group (GBVWG) were set up under the Protection Cluster. The Protection Cluster was established in Manila, Tacloban, Ormoc, Cebu, Borongan, Guiuan and Roxas. CPWG is operational in both Manila and Tacloban and GBV WG in Manila, Tacloban and Roxas.

arose. One of the key clusters that addressed the issue of vulnerable populations was the Protection Cluster[9] led by UNCHR and DSWD. It addressed the protection risks of children, women, girls, senior citizens, PWD, indigenous peoples in remote areas, and displaced persons. Within the Protection Cluster, the Child Protection Working Group and GBV Working Group were established at both national and local levels. The Aging and Disability Task Force was also activated under the Protection Cluster, but only at Manila level with limited activities to address the specific needs of senior citizens and PWD.

In the coordination hub of Tacloban, DSWD was a leading department for the Food Security and Agriculture Cluster, Protection Cluster and its two Sub-clusters (GBV Working Group and Child Protection Working Group), the Shelter Cluster, and Camp Coordination and Camp Management Cluster. The multiple coordination responsibilities overburdened DSWD staff who were also assigned to perform other unfamiliar roles such as Camp Managers. Social Workers were particularly overwhelmed by the numerous responsibilities including management of movement of Internally Displaced Persons (IDPs), food distribution, Women Friendly Spaces (WFSs) and Child Friendly Spaces (CFSs). They were concerned about not only the shortage of manpower but also their lack of expertise to perform added tasks such as psychosocial support. The cluster coordination handled by UN agencies and NGOs was handed over to the Government. However, the lack of capacity of the respective departments, including DSWD, to continue the ongoing humanitarian efforts remains a challenge.

Recovery and reconstruction plans recently developed by LGUs have a broad focus on the general population affected by Yolanda without priorities to address the specific needs of vulnerable groups, such as improvement of WCPU and inclusion of PWD and senior citizens in the livelihood support. DSWD has also developed a recovery plan for Region VIII including provision of shelters for IDPs, protection of children and women and provision of livelihood support. However, it has a limited scope in targeting some of the most vulnerable groups including senior citizens and PWD.

(2) Protection

Vulnerable populations not only have greater concerns of poor living conditions and lack of access to assistance but are also at risk of violence, abuse and exploitation. According to the Multi-Cluster Needs Assessment, food consumption of the majority of households improved as a result of the food assistance, but some female-headed and poorer-households continued to have difficulties in maintaining three meals per day. An NGO said there was concern that some of the displaced senior citizens were excluded from the list for aid distribution as they were living alone, not living with their children or lost their documentation. The Multi-Cluster Needs Assessment also revealed one quarter of women reported to have no access to reproductive health services. Concerns for children included infant and young child illnesses, decrease in breastfeeding, access

[9] According to the IASC definition of protection, protection encompasses activities aimed at obtaining full respect for the rights of all individuals in accordance with international law – international humanitarian, human rights, and refugee law – regardless of their age, gender, social ethnic, national, religious or other background.

to alternative feeding options and lack of health care support. Sixty-seven percent of the households responded that women were more at risk of physical injuries than men (34 percent) due to damaged houses and debris, uncollected solid waste and broken pavement and roads. The risk of physical and sexual violence was especially high in evacuation centers where one in every five households indicated that women were more at risk. Around 15 percent of the households stated that there was an increased risk of trafficking particularly among women, children and adolescents from poorer households. As of April 2014, there were 130 verified unaccompanied and separated children reported to UNICEF's Rapid Family Tracing and Reunification mechanism.[10] These children and out-of-school children were deemed particularly vulnerable to exploitation, labor and other forms of abuse.

In response to the protection needs, agencies such as UNICEF, UNFPA, Plan International, Save the Children and Oxfam supported the temporary establishment of WFSs, CFSs and WCPDs to improve the physical and psychological safety of affected women and children whose vulnerability to domestic violence, rape and other forms of sexual violence and trafficking increased as a result of the disaster. Thirty-eight female police officers specialized in women's and children's protection were deployed across Leyte and Eastern Samar to conduct not only patrols but also awareness-raising and psychosocial support. It was confirmed by interviews that their presence helped women in the community to feel safe and secure under the difficult circumstances. However, the geographical coverage of GBV prevention and response remains limited due to a lack of funding. One of the present concerns is that female police officers were not deployed to bunkhouses after IDPs left the evacuation centers. Additionally, because of the limited space and the lack of funding, WFSs and CFSs have yet to be set up at bunkhouse sites, increasing women and children's exposure to GBV.

Another key concern of vulnerable groups raised by humanitarian agencies was the condition of bunkhouses. It was validated through Protection Cluster meetings, interviews and site visits that accessibility to bunkhouses was very poor particularly for children, PWD and senior citizens. The issues include overcrowding, elevated houses without proper stairs, incomplete construction, latrines and shower rooms without locks, a lack of lights and water, unhygienic environment and absence of separate latrines for men and women. A blind couple interviewed at a bunkhouse in Tacloban shared their difficulty in using common facilities such as latrines and kitchens due to the poor accessibility. After the starting of a small fire in the compound, they were also concerned about their safety. The issue of the poor condition of bunkhouse sites was recurrent and LGUs need to urgently follow up on the minimum standards to ensure the safety and security of IDPs. In addition, some of the residents in bunkhouses expressed their fear that they will be forced to leave at any time due to the uncertainty of the duration of the arrangements and that their rights to return to their homes will be denied as per Government's unclear policy on the "no-build zone".

[10] "Protection Cluster Brief", 11 April 2014.

(3) Data

Overall, detailed data such as those segregated by sex, age and ethnic groups to understand the impacts on the lives of the vulnerable groups were limited. Data on senior citizens and PWD was particularly absent, further hampering the Government and humanitarian agencies to design appropriate programs to respond to their needs. Furthermore, there have been numerous reports of child trafficking, child abuse, prostitution, rape and domestic violence by DSWD, UN agencies, NGOs and the Protection Cluster, but comprehensive data has not been available to grasp the overall situation. In Region VIII, reported GBV cases were limited to the data at WCPU in EVRMC.[11] Some of the MSWD Social Workers thought the number of GBV cases increased after Yolanda only because people became more aware of the rights of women and children and available services as a result of awareness-raising efforts by humanitarian agencies.

(4) Livelihoods

Interviews with affected persons and government workers as well as assessments by humanitarian agencies confirmed that the main concern of the affected population, including the most vulnerable, is the lack of access to livelihoods. The issue could trigger increases of child labor, family separation, exploitation and abuse among vulnerable populations.

In response to their needs, recovery and reconstruction plans developed by LGUs and the Early Recovery, Livelihoods and Agriculture Plan developed by the Philippine Humanitarian Country Team identified various activities to fill the gap in restarting livelihoods at the community level. The latter in particular highlighted the importance of involving women as vulnerable workers in agricultural and fishery activities, which are the two key sectors in Region VIII. While rural women contribute 60 percent of food production[12], women's contribution in the agricultural and fishery sectors are less recognized than men. Women not only process and sell fish but also catch fish and repair fishing nets and boats. For farming activities, they are involved in planting, maintenance and harvesting. Despite their significant roles in the labor force, "fisherfolk" and "farmers" tend to only refer to men within the Government and communities. Women are often excluded from the Government's registration programs, such as for fishers and coconut farmers, due to the lack of understanding as to who should register and why. This could result in women's lack of access to government support programs. Providing coping mechanisms for women who have to support themselves and their children is also important in light of the fact that their economic vulnerability is associated with their risk of sexual abuse and violence.

Response to the livelihood needs of senior citizens and PWD is largely absent in the recovery and reconstruction plans by LGUs and humanitarian agencies. Without effective social safety net programs for the vulnerable groups, their socioeconomic situation has been aggravated by the disaster. While some LGUs are proposing livelihood support projects specifically for PWD and senior citizens, the implementation is dependent on the budget availability. Furthermore, rather

[11] 118 cases were reported by EVRMC during the first quarter of 2014.
[12] "Early Recovery, Livelihood and Agriculture Plan", The Philippine Humanitarian Country Team, February 2014.

than facilitating separate livelihood support for them that could further increase their social segregation, it is necessary to devise an inclusive approach in the livelihood support, integrating the vulnerable groups into the general community.

(5) Health

Health response in an emergency setting should be tailored to the specific needs of the vulnerable groups including pregnant and lactating women, children, senior citizens and PWD. One of the priority issues identified by the Health Cluster in the aftermath of Yolanda is Maternal Newborn and Child health (MNCH) services. The Health Cluster estimated that as of February 2014, in the next three months more than 70,000 births were expected, of which about 12.1 percent were from adolescent mothers under 19. According to one public health assessment[13], issues around health services included a lack of newborn screening, increased deliveries at home, diarrhea among children and limited availability of prenatal care. Because many health facilities have yet to become fully functional, continuity of health services remains a challenge. Agencies such as UNFPA dispatched medical missions in Region VIII with the focus on reproductive health services including pre- and post-natal checkups, health information sessions, and hygiene kit distribution. There are also bunkhouse sites with health stations providing basic medical services. However, the coverage of the assistance is far from sufficient, particularly for vulnerable groups living in remote areas and those who have impaired mobility.

A Rapid Health Needs Assessment conducted by Plan International also reported that very few health facilities were providing any form of mental health or psychosocial care. According to WHO's report, since the typhoon, EVRMC received more than 25 patients presenting with severe mental health disorders. The Joint Assessment by the Child Protection and Education Cluster also reported uncontrollable crying and screaming were reported by 68 percent of barangays as a change occurring in girls, and 55 percent as a change in boys. In order to respond to their needs, agencies such as WHO, Save the Children and International Medical Corp trained local health professionals on psychological first aid for emergency response and to identify and manage priority mental health conditions. Protection Cluster partners also started training of government personnel, community members and staff of NGO agencies on psychosocial first aid and psychosocial support techniques for young girls and boys in distress. The support for mental health and psychosocial care should be further accelerated with uniform standards.

Overall, the health needs of senior citizens and PWD were completely left out from the majority of health assessments conducted so far. The only data made available by the Assessment on Older People[14] reported that the immediate needs of senior citizens included access to health services, dissemination of information about available health services at the household level, psychosocial support and age-specific nutrition support. Their reported illnesses included diabetes, hypertension, arthritis and asthma (respiratory illnesses).

[13] "Public Health Assessment after the Typhoon Yolanda (Haiyan) in the Philippines (Preliminary Report as of 31 March 2014", Mari Sato, Rebeca Horiguchi, Hitoshi Oshitani.
[14] The assessment covered Tacloban, Tenauan, Guiuan, Salvacion Island and Basey.

(6) Education

As a result of Yolanda, more than 2,500 schools were totally or partially damaged. In addition, more than 500 daycare centers were totally damaged and more than 2,000 were partially damaged[15]. The devastating impact on the educational facilities posed the issue of structural vulnerability as community evacuation centers and the lack of capacity for Disaster Risk Reduction (DRR) in the education sector.

One of the main forms of assistance provided by the Government and humanitarian agencies was the establishment of CFSs and Temporary Learning Spaces (TLSs) to temporarily replace dysfunctional daycare centers and schools. They served as a much needed safe and healthy space for school-aged children. However, some of the CFSs and TLSs were faced with under-capacity. At CFSs, Daycare Workers and volunteers had to attend to a wide range of age groups between 3 and 17 years old. As a result, they were often unable to respond to individual needs of the children, particularly their psychosocial needs and children with disabilities.

Many displaced children in tent cities and bunkhouses are now forced to commute by walking a long distance or by means of transportation such as tricycles that create financial burdens for the displaced families. Given the lack of access and availability of functional educational facilities, these children, as well as other vulnerable children, including unaccompanied and separated children, disabled children and indigenous children are at risk of dropping out of school in the long term. Furthermore, many high school and college students were not going back to school due to the additional financial burden. This is aggravated by the situation that rehabilitation of schools by the Government and donors are more focused on elementary schools than high schools and colleges.

10.2.3 Strategies

(1) Strategies for the Vulnerable Populations

- The needs of the vulnerable populations should be better integrated in LGUs' recovery and reconstruction plans through advocacy and capacity building on protection in disaster settings. This includes ensuring a safe and accessible environment for PWD and senior citizens at transition and permanent sites through enforcement of minimum standards and establishment of safe spaces for vulnerable women and children.
- Systems of LGUs to respond to the needs of vulnerable groups in emergency settings should be improved including budget prioritization, staff deployment and cluster coordination mechanisms. Staffing and capacity of DSWD should also be strengthened to improve their cluster response and community-based activities including psychosocial support.
- DOH, DSWD and other relevant departments should be equipped with necessary skills and facilities to provide effective health services tailored to the specific needs of vulnerable

[15] "Education Cluster Brief", 14 February 2014.

groups, including MNCH, mental health and psychosocial support.

- Vulnerable populations should be included in designing and implementation of DRR at the community level. Local entities targeting specific groups such as Barangay Councils for the Protection of Children, Violence Against Women Desk, Associations of PWD and Senior Citizens can be effective entry points in this regard. These existing community mechanisms should be revitalized through capacity development.

(2) Strategies Specific to Women and Children

- The system to prevent and respond to GBV should be strengthened through advocacy, capacity building and improved facilities. Multi-disciplinary mechanisms should be enhanced at LGU level to operationalize the referral pathways.
- The vulnerability of women increased by Yolanda should be addressed by promoting their economic empowerment. Vulnerable women such as poor women, female heads of households, senior women and GBV survivors should be targeted for livelihood support.
- Rehabilitation of school facilities should include not only elementary schools but also daycare centers, high schools and colleges to mitigate the risk of increased drop-out rates, child labor and children with trauma as a result of Yolanda.

(3) Strategies Specific to Senior Citizens and PWD

- Advocacy for LGUs and humanitarian agencies should be accelerated to improve the prioritization of assistance for senior citizens and PWD including accessibility and availability of health services and inclusive livelihood programs. The advocacy efforts should also promote the integration of data on senior citizens and PWDs in post-disaster assessments and other data collection in order to develop appropriate programs and projects for the most vulnerable groups.

10.2.4 Recommendations

(1) Reducing vulnerability of target groups through inclusive livelihood support programs

- Skills and micro-enterprise development to improve the livelihoods of the affected population should be inclusive of willing and capable vulnerable groups such as female-headed households, households with pregnant and lactating women, senior citizens and PWD. Their participation in designing, planning, implementation and monitoring processes should be ensured to reflect their specific needs and skillsets. Approaches should also be devised to facilitate the inclusion of PWD and senior citizens in general livelihood programs rather than segregated programming.
- The livelihood assistance should not only involve women but address underlying gender issues such as income inequality between men and women and absence of women's

registration at government associations so as to recognize their economic contribution in the agricultural and fishery sectors. Women's empowerment can also be achieved through increasing their business skills on budgeting, price negotiation and management as well as technical skills on agriculture and fisheries.

(2) Inclusion of vulnerable populations in DRR

- DRR should integrate the specific needs of vulnerable populations and ensure their participation in the process. Possible activities include community vulnerability/hazard mapping, awareness raising and capacity building of the vulnerable populations, and integration into school education.

(3) Development of accessible and disaster resilient public facilities

- Public facilities including schools, RHUs and hospitals should be rehabilitated in a manner that will strengthen disaster resilience and improve accessibility, such as barrier-free structures for PWD and senior citizens and availability of separate latrines for boys and girls. These facilities should also serve as effective evacuation centers for local communities in times of disaster.

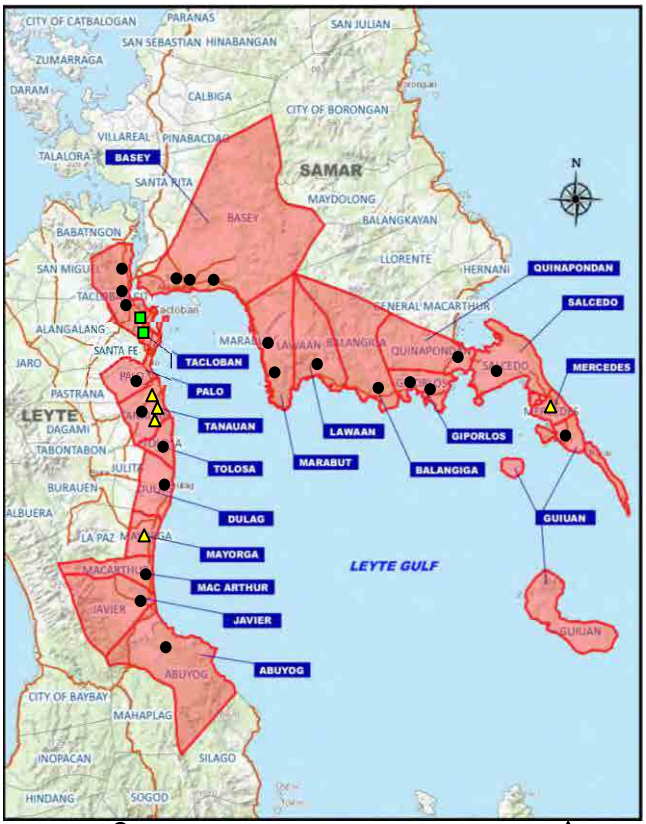
Chapter 11 Debris Disposal

11.1 Outline of Present Debris Disposal

According to legislation of the Philippines, each LGU has the responsibility for solid waste management. The debris generated by the Typhoon Yolanda seems to have been managed by LGUs basically with their own method according to the legislation. Basically the debris is said to have been transported to the existing dump sites for Municipal Solid Waste (hereinafter referred to as "MSW") owned by each LGU by various organizations such as LGUs, DPWH, MMDA, UNDP, CRS, etc. It was found that there were at least 24 dump sites, as of March 2014, which had been used for debris disposal within the project target areas (18 LGUs).

Therefore, in the investigation of debris disposal it is necessary to take into consideration 18 different management schemes and actual situations, and 24 dump sites in 18 LGUs.

This report will explain the situations of debris disposal as of March 2014. The locations of the 18 LGUs and 24 dump sites are as shown on Figure11.1-1 below.



Legend) ● Dump site (for MSW and debris) △ Dump site (for debris)
■ Temporary storage yard (for debris)

Source: JICA Study Team

Figure 11.1-1 Location of 18 LGUs and Dump Sites

11.2 Investigation Results

11.2.1 Transportation and Remains of Debris

The situation of transportation and remains of debris as of March 2014 is as follows.

(1) Overall Situation

The debris transportation in 18 LGUs seems to be being settled down as of March 2014. However, the LGUs except 4 LGUs (Mayorga, Mac Arthur, Javier and Abuyog) in the Leyte island and 2 LGUs (Salcedo and Mercedes) in the Samar island are still conducting some transportations. For instance, in Tacloban city approximately 100 trucks in a day (as of March 5, 2014) are transporting debris with international organizations' supports such as UNDP, CRS etc.

In addition, some LGUs in Leyte (such as Palo, Tanauan, Tolosa) and in Samar (such as Basey, Guiuan) are transporting debris with international organizations' supports as well. Other LGUs seem to be transporting debris by their own vehicles together with their MSW.

Debris discharged to road side

Debris being transported

Debris dumped to dump site

Transportation vehicle (2t class)

Transportation vehicle (5t class)

Transportation vehicle (10t class)

(2) Detailed Situation

1) Zoning of Project Area

The Project target area is composed of 18 LGUs. However, according to the interview results to each LGU, the Project area can be divided into the following 7 zones, judging from the situations of debris disposal as of March 2014, to simplify further discussions.

Zone-I Northern part of Leyte east coast area
(Tacloban, Palo,Tanauan)
Zone-II Middle part of Leyte east coast area
(Tolosa, Dulag)
Zone-III Southern part of Leyte east coast area
(Mayorga, Mac Arthur, Javier,Abuyog)
Zone-IV Western part of Samar south coast area
(Basey, Marabut)
Zone-V Middle part of Samar south coast area
(Lawaan, Balangiga, Giporlos, Quinapondan)
Zone-VI Eastern part of Samar south coast area
(Salcedo, Mercedes)
Zone-VII Extreme eastern part of Samar south coast area
(Guiuan)

General profile of each Zone of the Project target area based on the interview results are as shown on the Table 11.1-1.

Table 11.2-1 General Profile of LGUs of Project Target Area

Zone		LGU		No.	Area (ha)	Population	No. of Household	Casualty (Dead and Missing)		Damaged Household					
										Totally Damaged		Partially Damaged		Total	
								No. of Casualty	Ratio to Population	No.	Ratio to Household	No.	Ratio to Household	No.	Ratio to Household
I	North-East Reyte	1	Tacloban	1	20,172	221,174	219,314	3,264	1.48%	30,513	14%	23,718	11%	54,231	25%
		2	Palo	2	8,019	67,966	17,417	902	1.33%	11,607	67%	1,947	11%	13,554	78%
		3	Tanauan	3	6,789	53,310	12,301	1,413	2.65%	9,494	77%	2,807	23%	12,301	100%
II	Middle-East Reyte	1	Tolosa	4	2,172	19,098	4,822	19	0.10%	1,250	26%	3,528	73%	4,778	99%
		2	Durag	5	11,070	53,386	11,147	30	0.06%	7,588	68%	3,559	32%	11,147	100%
III	South-East Reyte	1	Mayorga	6	4,170	16,225	3,783	4	0.02%	3,135	83%	648	17%	3,783	100%
		2	Mac Arthur	7	7,331	19,320	5,064	1	0.01%	3,458	68%	1,606	32%	5,064	100%
		3	Javier	8	15,270	26,269	6,119	2	0.01%	4,467	73%	1,654	27%	6,121	100%
		4	Abuyog	9	38,330	57,146	12,847	2	0.00%	4,348	34%	9,572	75%	13,920	108%
IV	South-West Samar	1	Basey	10	57,300	55,356	12,725	291	0.53%	6,069	48%	6,702	53%	12,771	100%
		2	Marabut	11	14,825	18,451	4,385	31	0.17%	2,235	51%	2,010	46%	4,245	97%
V	South-Middle Samar	1	Lawaan	12	17,353	12,566	3,219	11	0.09%	2,011	62%	901	28%	2,912	90%
		2	Balangiga	13	19,005	14,041	3,044	13	0.09%	1,870	61%	1,174	39%	3,044	100%
		3	Giporlos	14	10,630	14,031	3,124	12	0.09%	2,269	73%	855	27%	3,124	100%
		4	Quinapondan	15	8,423	16,220	3,261	10	0.06%	2,403	74%	858	26%	3,261	100%
VI	South-East Samar	1	Salcedo	16	11,386	21,836	4,830	29	0.13%	2,806	58%	1,973	41%	4,779	99%
		2	Mercedes	17	2,063	9,445	1,426	1	0.01%	1,124	79%	302	21%	1,426	100%
VII	South-East Samar	1	Guiuan	18	17,549	48,431	14,193	116	0.24%	7,977	56%	3,422	24%	11,399	80%

Source: Results of interviews made in this Project

2) Debris Disposal of Each Zone

The situation of debris disposal of each zone as of March 2014 is as follows;

(The pictures of dump sites and temporary storage areas are shown on the following pages attached with locations maps.)

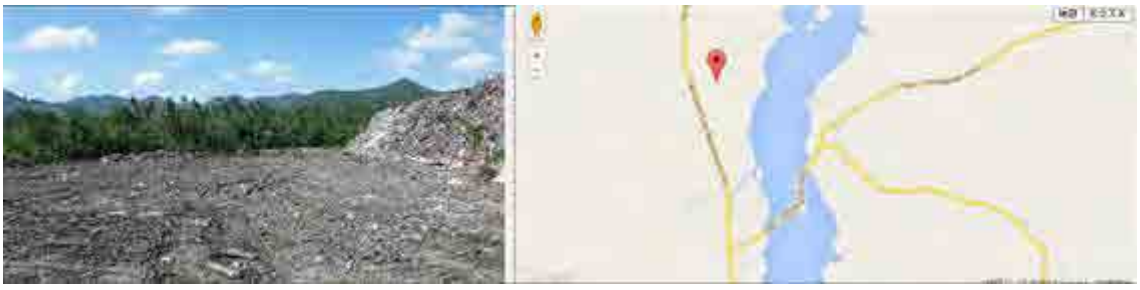
a) Zone I: Northern part of Leyte East Coast Area (Tacloban, Palo, Tanauan)

The debris transportation in the central area of each LGU in this zone seems to have been almost finished. However, in the areas surrounding the central area debris transportation is still being continued and many collapsed buildings remain untouched.

In the case of Tacloban city, about 100 vehicles per day (as of March 5, 2014) under the assistance of international agencies such as UNDP, CRS are transporting debris. But actually these 100 vehicles include the number for MSW transportation, so net number of debris transportation vehicle seems to be about 70.

In Palo and Tanauan, transportation of debris is being continued by the LGU under the support of UNDP, Korean agency and so forth. The debris is transported into the existing MSW dump site of each LGU in the case of Tacloban and Palo. There seem to be 2 more dump sites in Tacloban city as shown on the pictures below.

In the case of Tanauan, there seem to be 3 temporary storage areas and one existing authorized MSW dump site as shown on the pictures below. The debris generated by Yolanda is considered to have been transported to the 3 temporary storage areas but the possibility for the debris to be transported to the authorized MSW dump site from the temporary storage areas seem to be low. In that case, the possibility that these 3 storage areas become actually final dump site of debris seems to be high.



Tacloban MSW Dump Site-1

Tacloban MSW Dump Site-2

Tacloban MSW Dump Site-3

Palo MSW Dump Site

Tanauan Temporary Storage Area-1

Tanauan Temporary Storage Area-2

Tanauan Temporary Storage Area-3

Tanauan MSW Dump Site

b) Zone II: Middle part of Leyte East Coast Area (Tolosa, Dulag)

Though debris transportation is still being continued also in this area under the assistance of international agencies such as UNDP and using the vehicles rent from Makati city and Handicap International etc., the scale of disposal works seems to be not as big as Zone I (Tacloban, Palo and Tanauan). The debris is being transported to the existing MSW dump site of each LGU.

Tolosa MSW Dump Site

Dulag MSW Dump Site

c) Zone III: Southern part of Leyte East Coast Area (Mayorga, Mac Arthur, Javier, Abuyog)

Since the damages by Yolanda in this zone seem to be less serious than other zones, the amount of debris generated is considered to have been small in this area. The debris disposal in this area seems to have been almost finished as of March 2014. The debris in this area has been transported to the existing MSW dump site of each LGU except Mayorga. In the case of Mayorga a temporary debris dump site seems to have been established because Mayorga is not providing services of MSW collection to citizen and thus has not a dump site for the MSW.

Mayorga Temporary Debris Dump Site

Mac Arther Dump Site

Javier Dump Site

Abuyog Dump Site

d) Zone IV: Western Part of Samar South Coast Area (Basey, Marabut)

The damage by Yolanda in this Zone seems to have been more serious than that of other Zones of the Project target area except Zone I (which is the biggest Zone). Though Basey is conducting debris disposal under the assistance of international agencies (mainly UNDP), Marabut is doing it by its own LGU vehicle. Debris is transported to the existing MSW dump site of each LGU. There seem to be 3 dump sites in Basey and 2 in Marabut.

All dump sites exist beside public roads as shown on the following pictures.

Basey Dump Site-1

Basey Dump Site-2

Basey Dump Site-3

Marabut Dump Site-1

Marabut Dump Site-2

e) Zone V: Middle Part of Samar South Coast Area (Lawaan, Balangiga, Giporlos, Quinapondan)

In this Zone debris is still being transported by vehicles owned by each LGU together with MSW daily generated. However, since the damages inflicted by Yolanda in this Zone seem to have been smaller than that of Zone IV (Basey, Marabut), the scale of debris disposal work is so smaller as to be managed by vehicles owned by each LGU. The debris is transported to the existing MSW dump site of each LGU. There seem to be 2 dump sites in Giporlos.

Giporlos plans to close the existing dump sites and is preparing a new one.

Lawaan Dump Site

Balangiga Dump Site

Giporlos Dump Site-1

Giporlos Dump Site-2 (?)

Giporlos (Planned New Dump Site)

Quinapondan Dump Site

f) Zone-VI Eastern part of Samar south coast area (Salcedo, Mercedes)

In this Zone, debris transportation is not being done at present except in the Barangays. Though Salcedo has a MSW dump site for the people of the city center, this site is said to have not been used for debris disposal. The debris in Salcedo is said to be laid in the open spaces

around housing areas. And Mercedes is not providing collection services of MSW to residents, and thus not having MSW dump site of the LGU. Therefore debris generated by Yolanda has been transported to the area specially established for debris disposal.

Salcedo Dump Site

Mercedes Debris Disposal Area

g) Zone-VII Extreme eastern part of Samar south coast area (Guiuan)

In Samar, the damage by Yolanda in this Zone seems to be bigger than that of other Zones except Zone IV (Basey and Marabut) which is the biggest Zone in Samar. Debris is being transported by two dump trucks, e.g. one of LGU, the other leased from Makati city.

Many collapsed buildings and structures remain untouched in the city. As building materials such as timber, steel sheets, fragments of bricks and concrete are usually re-used or recycled, it is not clear how much debris will be discharged from those remained collapsed buildings and structures. Debris is transported to the MSW dump site of the LGU located north-east of the city.

Guiuan Dump Site

11.2.2 Contents of Generated Debris

Since debris transportation in 18 LGUs seems to be being settled down, it is difficult to see vivid situations of debris after the disaster. The debris being transported at present seems to be mixture which contains various materials such as humus soil, wood debris, clothes and soil etc. Recyclable materials such as metal, timbers, plastic bottles and some of the fragments of concrete and concrete blocks are separated by residents before discharging them as debris. After all, the debris includes all other materials than the recyclable ones.

Content of Debris (Example-1)

Content of Debris (Example-2)

11.2.3 Segregation

As mentioned above, the debris includes various materials but recyclables are segregated by residents at source before discharging them as debris. The residual waste is transported to dump sites and some materials are segregated by waste pickers there.

However biodegradable waste seems to be not segregated though the laws and regulations in the Philippines specify its segregation and recycling mainly as compost. But the segregation of biodegradable waste from debris seems to be quite difficult and not applicable.

One of the important and worried points is the separation of hazardous wastes including such materials as asbestos, PCB, acids etc. The hazardous wastes should have been separated before transporting debris to dump sites.

11.3 Evaluation and Recommendation

11.3.1 Evaluation of Debris Disposal

Evaluation on debris disposal as of March 2014 is as follows.

(1) Collection and Transportation

Debris transportation from Barangays to road sides is being done mainly by residents of Barangays. And from road sides to dump sites, many agencies such as DPWH, UNDP, CRS, TZUCHI, MMDA, NGOs and private sectors etc. are said to have transported debris. However, as mentioned in the section 7.1.1 of this report, debris transportation in 18 LGUs seems to be being

almost settled down as of March 2014. For example, in Tacloban city DPWH is said to have finished the transportation around January 19, 2014 and CRS finished it at the end of March 2014. In addition, UNDP is said to plan to finish debris transportation at the end of July, 2014. And thus, most of the assistances which have been rendered from outside is about to be finished.

Though the situations of debris transportation before February 2014 is not clear, the situations as of March 2014 seem to be well organized and operated under the total management of UNDP and cooperation of other agencies such as CRS.

As mentioned in item 7.2.3 of this report, one of the important and worried points is the treatment of hazardous wastes including such materials as asbestos, PCB, acids etc. Therefore this matter should be noted and detailed investigations should be conducted. After those investigations, necessary measures as required shall be taken as described in the section (3) below.

(2) Recycling

Recycling seems to be conducted in rather good conditions. At generation source of debris Barangay residents seem to be recycling as much material as possible, namely timbers, metal sheets, plastics, fragments of concrete and blocks etc. In addition, waste pickers are segregating mainly plastics at dump sites. Although recyclable materials are removed from mixed wastes like the dumped debris by machines in some countries like Japan, it seems not feasible in developing countries due to high capital and operation costs, low demands of segregated materials etc. However, further studies are required on this matter.

As mentioned above, biodegradable waste seems to be not segregated though the laws and regulations in the Philippines specify its segregation and recycling mainly as compost. But the segregation of biodegradable waste from debris seems to be quite difficult and not applicable.

As a result, totally recycling seems to be conducted in rather good conditions except biodegradable waste.

(3) Final Disposal

Now that debris transportation seems to be being settled down, main issues lie in final disposal. The Solid Waste Management (SWM) in the Philippines is controlled under the Republic Act No. 9003 (hereinafter referred to as "RA 9003") which is known as the “Ecological Solid Waste Management Act of 2000” and the related laws and regulations. According to RA 9003, all open dumps and controlled dumps should have been closed and phased out by February, 2006. However, almost all dump sites existing in the Project target area seem to be open dumps or controlled dumps. Therefore issues and measures on open dumps and introduction of sanitary landfills will be discussed in the following sections of this report.

As mentioned in items 7.2.3 and (1) of this section, one of the important and worried points is the treatment of hazardous wastes. If those wastes have not been separated and treated properly and

have been disposed to dump sites directly, the contamination of dump sites by them is predicted. In the case that there are households and other establishments nearby dump sites which are using groundwater as drinking water and similar future land uses are predicted, investigations on groundwater contamination including water quality analysis are recommended. And necessary measures should be taken such as not to use groundwater as drinking water if the groundwater quality exceeds the limits stipulated in the laws on Drinking Waters in the Philippines.

11.3.2 Issues and Measures on Open Dumping

(1) Environmental Problems

Environmental issues on open dumping are the possibilities of generation of offensive odor, occurrence of spontaneous combustion, spread of waste, outbreak of harmful insects and vermin, groundwater and surface water pollution, soil contamination etc. Since all these issues have the possibility to affect human health conditions living nearby open dumps, careful treatment must be taken.

Especially, if groundwater is used as drinking water, the contamination of it is directly connected to the health of residents around the dump sites as mentioned in (3) of section 11.3.1 above.

(2) Legislative Problems

As mentioned above the solid waste management in the Philippines is controlled under RA 9003 and the related laws and regulations. The agency which manage this Law is the National Solid Waste Management Commission (hereinafter referred to as "NSWMC") established under the Office of the President which is composed of 14 members from the government sector and 3 members from the private sector. The Secretary of the Department of Environment and Natural Resources and a private sector representative of the NSWMC serve as chairman and vice chairman, respectively.

Many developing countries divide the type of landfills into two categories, one of which is Sanitary Landfill and the other is Open Dump. However there are 3 types defined in the RA 9003, namely Sanitary Landfill, Controlled Dump and Open Dump. The difference between Controlled Dump and Open Dump is not a structural difference but an operational difference. Open Dump is a disposal area wherein the solid wastes are indiscriminately thrown or disposed of without due planning and consideration for environmental and health standards. On the other hand, Controlled Dump is a disposal site at which solid waste is deposited in accordance with the minimum prescribed standards of site operation, providing such as regular soil cover, surface water drainage, fence, access road etc.

Table 11.3-1 shows the number of the existing landfills by each type. Only about 10% of total number seems to be in compliance with the laws in the Philippines.

Table 11.3-1 Number of Existing Landfill by Type

Type of landfill	No. of site
1. Sanitary Landfill	113
2. Controlled Dump	340
3. Open Dump	606
Total	1,059

Source: NSWMC 2012 Data

Though the situations in the Philippines is as shown on the Table 11.3-1 above, Open Dumps and Controlled Dumps must have been closed and Sanitary Landfills must be introduced according to RA 9003. Therefore open dumps and controlled dumps which exist in the 18 LGUs of the Project target area must be closed. The main points which are stipulated in RA 9003 are follows;

- No open dumpsites shall be established and operated.
- Within 3 years following the effectivity of RA 9003 (which corresponds to "by January 2004"), all open dumpsites shall be converted to controlled dumpsites.
- No controlled dumpsites shall be allowed 5 years following effectivity of RA 9003 (which corresponds to "after February 2006").

(3) Measures against Problems

1) Measures according to Laws and Regulations

All open dumps and controlled dumps should have been closed and phased out as of February 2006 according to RA 9003 as mentioned above. On closure of open dumps and controlled dumps, DAO 2006-09 "General Guidelines in the Closure and Rehabilitation of Open Dumpsites and Controlled Dump Facilities" was issued in September 2006. Therefore, the closure shall be implemented according to these guidelines.

These guidelines adequately address and mitigate the possible effects/impacts of open dump sites and controlled dumps, thus ensuring that their closure will be done in a proper manner, with environmental protection measures and safeguards in place. The LGUs and/or private operators shall prepare and implement a "Closure and Rehabilitation Plan" for the existing open dump sites and/or controlled dumps. The said program shall be viewed as an integral part of the overall implementation of the LGU Solid Waste Management Plan. The major items which are required in the Guidelines are as follows.

[Role of LGUs and Private Sectors]

Role of the LGUs and private sectors stipulated is as follows;

(1) The LGU shall undertake the preliminary closure assessment and a complete rundown of all possible data that need to be covered to come up with a comprehensive and relevant assessment.

(2)	The LGU must submit the closure plan to the Environmental Management Bureau (EMB) Regional Office for review and approval and implement the same as soon as the Authority to Close (ATC) is issued.

[Pre-closure Assessment]

The activities covered by the pre-closure assessment shall include the followings;

(1)	Review of available records, files and information regarding the dump.
(2)	Evaluation of potential or existing impacts on the ecological and human environment.
(3)	Determination of potential contaminants (if any) which could get into the local environment and the formulation of appropriate mitigating and remedial measures.

[Assessment Parameters]

Assessment parameters shall be as follows;

(1) Review of the geology of the site, depth of groundwater, total volume/capacity and types of waste disposed, reports, studies, historical records concerning the dump site (operations, unusual events such as fires, dumping of hazardous wastes, etc.)
(2) Review of relevant available maps (map of the dumpsite and its surroundings, topographic, geologic, hydro-geologic land use)
(3) Identification of existing land uses around the area
(4) Interview of those directly involved with the operation of the dump site, waste pickers, and residents near site.
(5) Inventory of existing settlements, structures, surface water bodies, springs and water wells. If practical, water samples may be taken to determine extent of contamination.
(6) Determination of points of leachate seepage and ponding within and beyond the disposal facility.
(7) Where appropriate and for larger dump sites, conduct topographic survey of the dump site, extending some distance from its boundaries.
(8) Conduct geo-technical investigation of larger open dumps to determine stability of slopes.
(9) Identification of sources of soil or other cover material for the site.
(10) Determination, if practical, of the depths of the dumped wastes.
(11) Determination of gas leakage within and on the areas surrounding the dump site.
(12) Conduct leachate and gas sampling (if practical).

[Components of the Closure and Rehabilitation Plan]

After conducting the site assessment, the LGU shall prepare the Closure and Rehabilitation Plan which shall include the following basic components.

Table 11.3-2 Components of the Closure and Rehabilitation Plan

Item	Explanation
(1) Site Clearing	- Storage areas for recyclables, makeshift huts and other structures within the boundaries of the disposal facility should be removed. - The LGUs on the other hand may coordinate with the National Housing Authority, other government agencies, NGOs and POs to determine the assistance needed in the possible relocation and alternative livelihood for the

	families affected by the disposal site closure program.
(2) Site Grading and Stabilization of Critical Slopes	- The most critical aspect of the closure plan is the stabilization of the usually unstable slope within the site. - The closure plan shall make provisions for the identification of the areas within the dump sites with potential instability. - Side slopes can be generally set at the ratio of 1 vertical to 3 horizontal or gentler depending on the nature of waste and actual site conditions.
(3) Application and Maintenance of Soil Cover	- The graded site should be covered with soil, inert or stable material or clay material to prevent entry of water into the waste pile and access by vectors. - The final cover should be at least 60 centimeters which include 15 cm topsoil and 45 cm compacted soil. - The topsoil, which is usually not compacted, shall serve as protection layer for the compacted soil cover and as barrier to reduce entry of water into the waste pile, minimize gas migration if any, prevent animals from getting into the underlying waste, minimize the emission of odors and support vegetation growth.
(4) Provision of Drainage Control System	- Peripheral canals or ditches should be constructed around the site to divert runoff. - The intention is to prevent contact of the waste pile with water thereby reducing the potential for leachate.
(5) Leachate Management	- The pre-closure assessment should determine the points of exit of the leachate from the waste pile from which a canal or ditch can be built to facilitate collection. - The contaminated liquid must not be allowed to drain into streams or natural bodies of water. - The collected leachate may then be allowed to evaporate or sprayed back into the waste pile. Otherwise, the leachate must be treated through other appropriate process. - Natural attenuation may be resorted for small volume of leachate generated from old dump sites of small capacity or intermittently used.
(6) Gas Management	- Vents made up of appropriate materials such as bamboo or PVC pipes shall be installed at selected points within the waste pile. - As a general rule, vents may be spaced 50 meters apart. - A more extensive leachate and gas management program may be developed and implemented depending on the results of the assessment or on gas utilization program of the LGU.
(7) Fencing and Security	- A fence shall be constructed around the dumpsite to prevent unauthorized entry of waste pickers, children and illegal settlers and stray animals. - The extent of fencing shall be dictated by field conditions. - Natural materials such as shrubs or fast growing trees may be used particularly in rural areas. - Regular visits by an LGU designated security shall be undertaken to deter illegal dumping.
(8) Putting up of Signage	- An appropriate sign indicating containing the following messages should be put up at a conspicuous place near or at the entry section of the dump site: ➢ Name of Dump site ➢ Status of Operation ➢ Prohibition of burning, squatting, children and animal access
(9) Prohibition of Burning at the Dump site	- Burning of waste must be prohibited at the dump site.

2) Other Recommended Measures

a) Investigation on Groundwater considering Surrounding Land Use

In the case that there are households and other establishments nearby dump sites which are using groundwater as drinking water and similar future land uses are predicted, investigations on groundwater contamination including water quality analysis should be conducted. And necessary measures should be taken such as not to use groundwater as drinking water if the groundwater quality exceeds the limits stipulated in the laws on Drinking Waters in the Philippines.

Especially, if hazardous wastes have been directly dumped to the sites, groundwater pollution by them is anticipated. Therefore attention should be paid to this point also.

b) Social Consideration

Closure of dump sites associates with social problems, which could not be solved technically, on waste pickers who are living on the dump sites. RA 9003 seems not to specify the measures on waste pickers clearly. But waste pickers have side faces to have been with municipal administrative bodies and to have contributed segregation and recycling of recyclable. Therefore special care shall be taken in consideration of their society and organization and appropriate plan of rehabilitation and employment for them should be formulated. In addition, it is also important to provide them health care. Since there are waste pickers in some dump sites in the Project target area, sufficient care is required to be given to them on closing the dump sites.

c) Items to be confirmed after Structural Closure

In closing dump sites there are recommended items to be confirmed which can be used for Operation and Maintenance (O/M) of the closed dump sites. Those items are as follows;

(i) Final shape of dump sites after closing
(ii) Surface cracks of closed dump sites
(iii) Situation of gas generation
(iv) Quantity and quality of Leachate
(v) Temperature of Waste Layer

d) Items of O/M of Closed Dump Sites

Generation of leachate and landfill gas continue even after closing since degradation of dumped waste continues after closing. Therefore proper O/M of closed dump sites is important to prevent environmental impacts. Recommended items of O/M after structural closure of dump sites are as follows;

(i) O/M of Final Soil Cover
(ii) O/M of Gas Venting Facility
(iii) O/M of Leachate Treatment Facility
(iv) O.M of Stabilization Acceleration Facility

e) Establishment of Information Management System

For proper O/M of structurally closed dump sites to prevent environmental impacts, the information on the closure of the dump sites should be shared by stakeholders. For that purpose, establishment of an appropriate information management system is required. The items to be considered in the system are as follows;

(i) Necessary information to be shared and its manager

(ii) Measures for sharing

(iii) Data collection system on land use of closed dump sites

f) Definition of Roles of Related Agencies

Roles on O/M shall be defined clearly. Table 11.3-3 shows an idea of roles of related agencies to closure of dumps

Table 11.3-3 Idea of Roles of Related Agencies

Agency	Roles
Central Government	- Develop a program to assist LGUs - Monitor the implementation of closing - Provide technical assistances to LGUs - Provide financial assistances to LGUs
Province	- Provide the necessary logistical and operational support - Manage the information on closure
Municipality/City	- Execution of structural closure - O/M of closed dump sites

Source: JICA Study Team

11.3.3 Issues and Recommendations on Treatments of Temporary Storage Yards

(1) Present Situation and Issues

Big-scale temporary storage yards are said to have not been established in other LGUs than Tacloban city. In Tacloban city, there are two places which were used as big-scale temporary storage yards of debris generated by Yolanda. Debris has been transported from these temporary storage yards to the dump site located 16 km north of the city center. Since there is no debris at the places now, the conditions when they were in use are not clear. But problems such as soil contamination etc. are anticipated judging from the present surface water conditions as of March 2014. However, there seem to be no laws and regulations to control soil contamination in the Philippines.

Tacloban Temporary Storage Yard-1

Dirty Water Deposit at Yard-1

Tacloban Temporary Storage Yard-2

Dirty Water Deposit at Yard-2

(2) Measures against Soil Contamination

1) Law on Control of Soil Contamination in Japan

As mentioned above, there seem to be no laws and regulations on soil contamination in the Philippines. But in Japan there is a law on control of soil contamination called "Soil Contamination Countermeasures Act".

The purpose of this Act is to facilitate the implementation of countermeasures against soil contamination by formulating the measures to grasp situations of soil contamination by Designated Hazardous Substances and the measures for the prevention of harmful effects on human health by such contamination, and thereby to protect the health of the citizens. The term "Designated Hazardous Substance" used in this Act means any substance, including but not limited to lead, arsenic, trichloroethylene, and the like substances (but excluding radioactive substances), designated by the Cabinet Order, which are likely to bring harmful effects on human health if they exist in soil.

Targeted substances which should be treated are selected from the following 2 points of view of environmental risk.

【Risk by Direct Injection】

This is the risk that people might directly inject harmful substances by direct touch and/or intake to mouth. Heavy metals which are considered to have the potential to be thickly accumulated in the surface layer of soil are targeted.

【Risk by Indirect Injection】

This is the risk that people might indirectly inject harmful substances by drinking groundwater which is polluted by harmful substances coming out of contaminated soil. Harmful substances selected out of the Environmental Standard in Japan through the view point of drinking ground water are targeted

2) Environmental Measures against Potentially Polluted Temporary Storage Yards

After the Great East Japan Earthquake, some prefectures in Japan have formulated guidelines, according to the instructions issued by the Ministry of the Environment of Japan, on soil investigation of temporary storage yards of debris generated by the Earthquake. For example, Iwate prefecture in Japan has formulated its guidelines. According to it, the purpose of the guidelines is to specify necessary items of measures against soil contamination when temporary storage yards are returned to land owners. If measures are taken applying the guidelines presented by Iwate prefecture in Japan to the temporary storage yards in the Project target area, the brief procedure will be as follows;

(The following descriptions show brief procedures and not strict to the guidelines presented by Iwate prefecture and some parts are simplified and/or omitted from the original guidelines. Therefore detailed procedures and explanations shall be referred to the original guidelines on soil investigation of temporary storage yards by Iwate prefecture in Japan.)

【Site Survey】

In the site survey, Visual Observation and Sampling of Test Specimens shall be executed as shown on (1) and (2) below. When it is obviously found out, through the visual observation, that no soil contamination has occurred, sampling of test specimens is not required and the yards can be returned to the land owners.

a) Visual Observation

First, visual observation shall be made to confirm that debris has been removed completely and to see if there are harmful substances such as oily substances, offensive odor, soil with curious color etc.

b) Sampling of Test Specimens

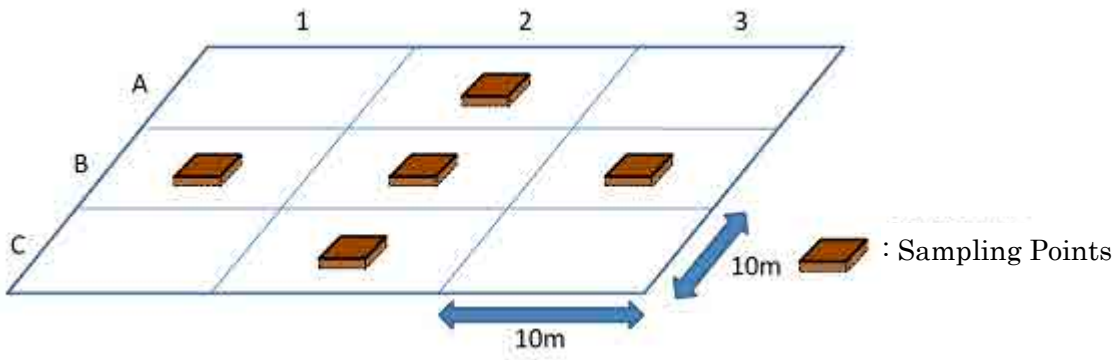
i) Arrangement of Sampling Points

Arrangement of Sampling Points for Area of 900m2

One point per every 900m2 (for example, 1 point for 900m2 and 2 points for 901 to 1,800m2) which is considered to be the most contaminated point shall be selected and shall be positioned as the center for sampling.

Based on this center 4 additional points located 5 to 10m apart from the center to 4 different cross directions shall be chosen. Sampling shall be conducted from these 5 points (i.e. the center and 4 additional points). If pavements are applied on some sampling points, those points can be omitted after confirming that there is no influence to the soil underneath through cracks etc.

Figure11.3-1 shows an example of arrangement in the case of 900m2 (30m x 30m). Sampling points are A-2, B-1, B-2, B-3 and C-2 as shown on this figure.



Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

Figure 11.3-1 Example of Sampling Points Arrangement[1]
(For area of 900 m^2: 30m x 30m)

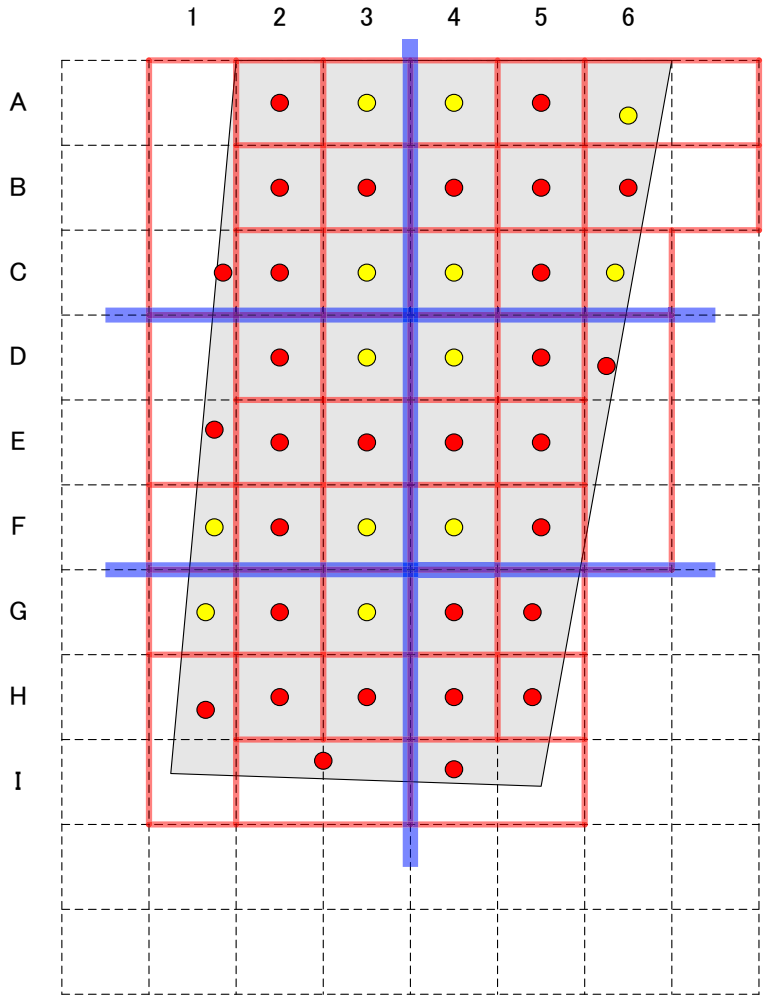
Arrangement of Sampling Points for Area exceeding 900m2

Figure 11.3-2 and Figure 11.3-3 show examples of arrangement of sampling points for areas exceeding 900m^2. Red points are the sampling points which shall be selected at the stage of site survey. Yellow points denote additional sampling points at Individual Investigation stage as shown in "【Measures in case of exceeding Standard Values】" of this report) which are to be conducted if contamination is confirmed by chemical analysis of samples taken at Site Survey stage.

Figure 11.3-2 shows an example of arrangement for a quadrangle shape land with perimeters of straight line. First the area is divided into 30m mesh with 9 cells (10m x 10m each) starting from one corner of the land. Five (5) points are arranged in each of the 30m mesh. Sampling points should be positioned at the center of each cell preferably.

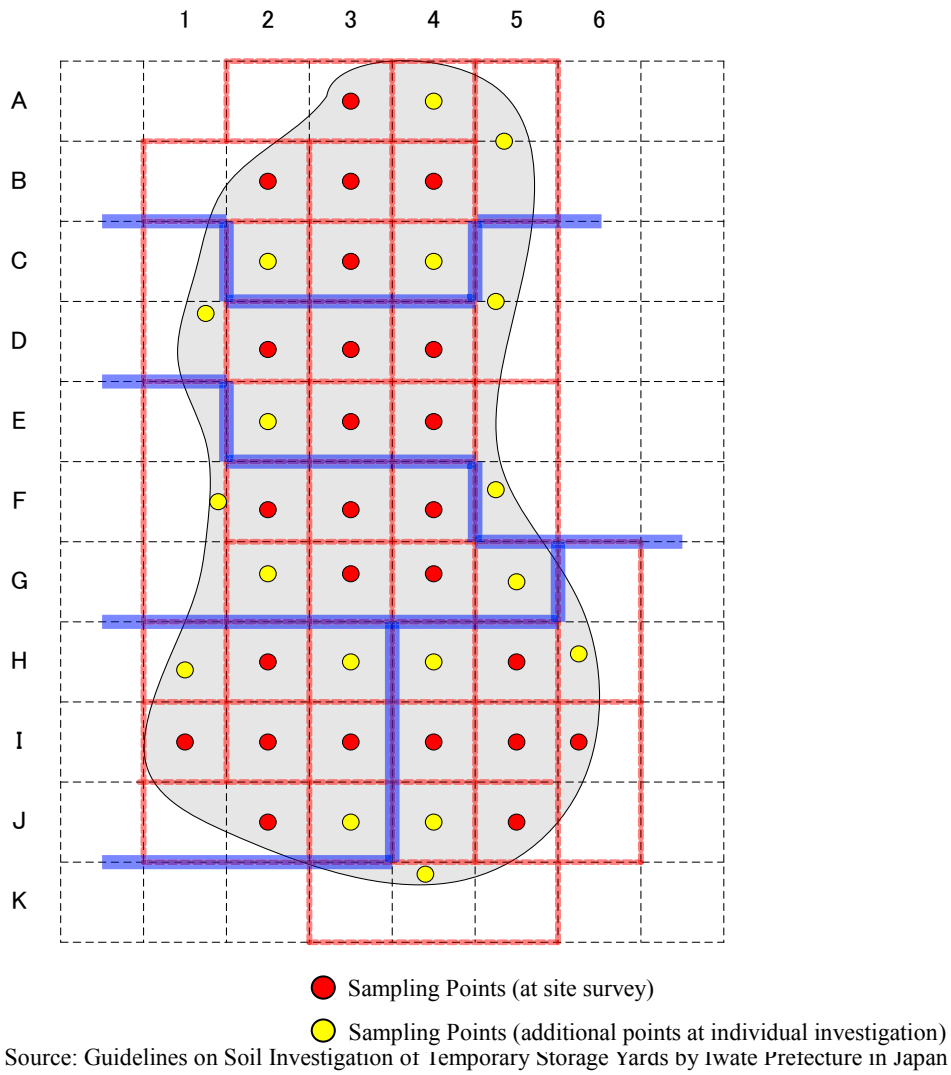
Figure 11.3-3 shows an example of arrangement for an irregular shape land with perimeters of irregular curve. First, the area is divided into cells of 100m^2 (10m x10m) and clusters composed of less than nine (9) cells (less than 900m2) are formulated.

Five (5) points per one (1) cluster (composed of less than nine (9) cells) are chosen as sampling points. Since the land is irregular shape, sampling points are not always arranged at the center of each cell.



Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

Figure 11.3-2 Example of Sampling Points Arrangement for Area exceeding 900m2 (1) (Quadrangle shape land)



Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

Figure 11.3-3 Example of Sampling Points Arrangement for Area exceeding 900m2 (2) (Irregular shape land)

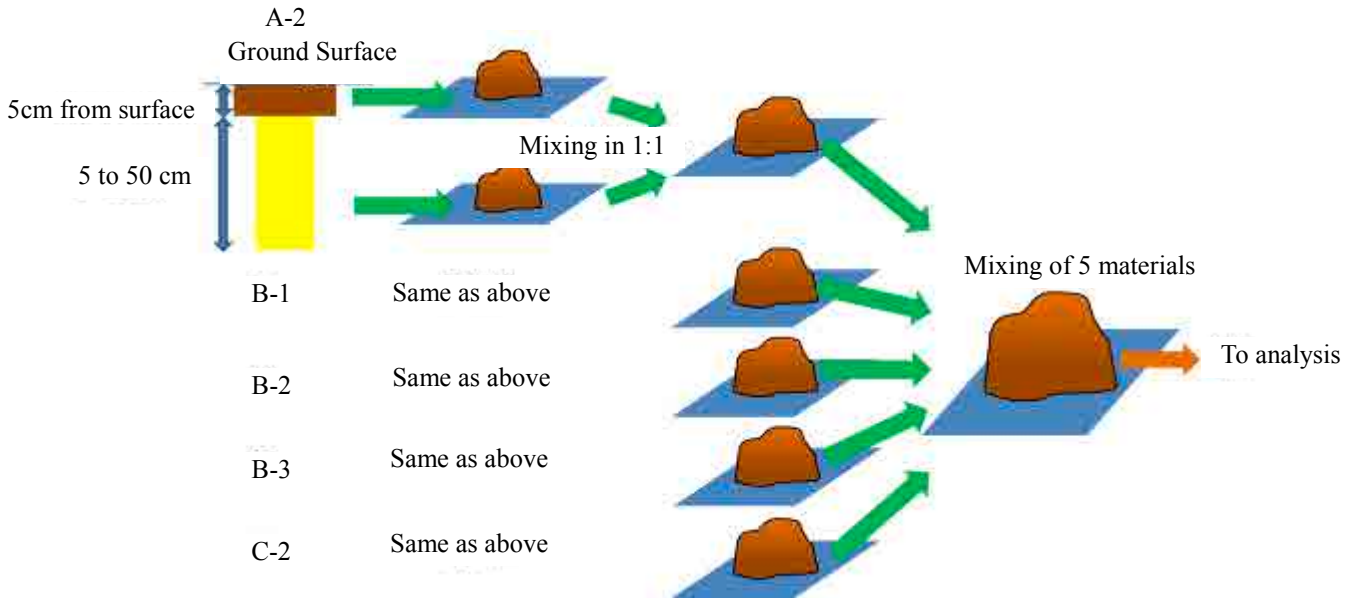
ii) Sampling Method

Figure 11.3-4 shows the sampling method for each sampling point such as depths of sampling of test specimens, mixing method of test specimens etc. The procedure is as follows;

a) At each point, soil of surface layer (depth: 0 to 5cm) and of underneath layer (5 to 50cm) shall be taken.

b) Soil taken by the method a) shall be mixed with the proportion of 1:1 in weight.

c) One (1) test specimen shall be made by mixing five (5) kinds of material mixed by the method b) above with same proportion in weight.



Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

Figure11.3-4 Procedure of Sampling and Mixing (1)
(For analysis of heavy metals: Item-1 through Item-8 of Table 11.3-4)

Sampling of soil contaminated by volatile organic compounds (corresponding to Items from 9 through 19 of Table 11.3-4) can be done only for one (1) point (at the center) of the land (e.g. point B-2 of Figure 11.3-1) at the depth of 0 to5cm from the ground surface. Figure 11.3-5 shows the procedure of sampling of soil contaminated by volatile organic compounds.

Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

Figure 11.3-5 Procedure of Sampling and Mixing (2)
(For analysis of volatile organic compound: Item-9 through Item-19 of Table 11.3-4)

【Analysis】

Users of temporary storage yards shall conduct chemical analysis of the samples taken through the procedure mentioned above, by asking a licensed agency. And the yards can be returned to the owner if it is proved that no contamination has occurred.

a) Items of Analysis

If the amount of debris originating from factories using harmful substances is small, the dissolution test and the organic matter content test on items 1 through 8 of Table 11.3-4 shall be done basically. If direct ingestions are not predicted in the land use after returning the land

to the owner by providing suitable measures such as pavements, embankment etc., the organic matter content test can be omitted with the consent of the land owner. If soil contamination by harmful substances listed in Table 11.3-4 is confirmed, additional investigations, as shown in "【Measures in case of exceeding Standard Values】" of this report are required.

Table 11.3-4 Analysis Item and Standard Value

No.	Item*1)	Standard Value*2)	
		Dissolution Test	Organic Matter Content Test
1	Cadmium and its compounds	< 0.01mg/ℓ	< 150mg/kg
2	Lead and its Compound	< 0.01mg/ℓ	< 150mg/kg
3	CHROMIUM (Hexavalent) Compounds	< 0.05mg/ℓ	< 250mg/kg
4	Mercury, Alkyl Mercury and other Mercury Compounds	< 0.0005mg/ℓ Alkyl Mercury: Not detected	< 15mg/kg
5	Selenium and its Compound	< 0.01mg/ℓ	< 150mg/kg
6	Arsenic and its Compound	< 0.01 mg/ℓ	< 150mg/kg
7	Fluorine and its Compound	< 0.8 mg/ℓ	< 4,000mg/kg
8	Boron and its Compound	< 1 mg/ℓ	< 4,000mg/kg
9	Carbon Tetrachloride	< 0.002mg/ℓ	—
10	1,2-Dichloroetene	< 0.004mg/ℓ	—
11	1,1-Dichloroethylene	< 0.02mg/ℓ	—
12	Cis-1,2-Dichloroethylene	< 0.04mg/ℓ	—
13	1,3-Dichloropropen	< 0.002mg/ℓ	—
14	Dichloromethane	< 0.02mg/ℓ	—
15	Tetrachloroethylene	< 0.01mg/ℓ	—
16	1,1,1-Trichloroethane	< 1mg/ℓ	—
17	1,1,2-Trichloroethane	< 0.006mg/ℓ	—
18	Trichloroethylene	< 0.03mg/ℓ	—
19	Benzene	< 0.01mg/ℓ	—
20	Cyan Compounds	Not detected.	< 50 mg/kg
21	Simazine	< 0.003mg/ℓ	—
22	Thiobencarb	< 0.02mg/ℓ	—
23	Thiuram	< 0.006mg/ℓ	—
24	Polychlorinated Biphenyl	Not detected.	—
25	Organo Phosphorus Compounds	Not detected.	

*1) Organic Matter Content Test of Dioxin can be added where fire happened.

*2) Values are equal to those of "Soil Contamination Countermeasures Act" of Japan.

3) Source: Guidelines on Soil Investigation of Temporary Storage Yards by Iwate Prefecture in Japan

b) Method of Tests

i) Dissolution Test

Method of the test shall follow the "Soil Contamination Countermeasures Act" of Japan.

ii) Organic Matter Content Test

Method of the test shall follow the "Soil Contamination Countermeasures Act" of Japan.

c) Evaluation of Analysis Results

The amount of organic matter content and that of dissolution shall be as shown on Table 11.3-4. And it shall be confirmed that no pollution has been detected judging from the existing

related documents. After these confirmations have been completed, the yard is regarded as not contaminated by debris.

【Measures in case of exceeding Standard Values】

If some items exceed the standard values, those items shall be investigated again. In the case that wells existing nearby used for drinking water and that urgent investigations and measures are required, before the results of Comparison Investigation as shown in a) below are obtained, Individual Investigation and Detailed Investigation as shown in b) and c) below can be conducted through discussions among stakeholders.

a) Comparison Investigation

In the case it is anticipated that the values will exceed due to the nature of original ground, a piece or some pieces of land nearby where they are not affected by debris shall be chosen and the Comparison Investigation shall be conducted. And the judgment of contamination shall be made according to this investigation. If investigations have been made before using the land for debris temporary storage, the results of those investigations can be used for comparison. And if no pollution is confirmed by the results of the investigations and judging from the existing related documents, Comparison Survey can be omitted.

b) Individual Investigation

In the case that the analysis result of the relevant values of the land nearby does not exceed the standard value (namely, the pollution does not originate from the nature of land), soil sampling and analysis shall be made for each cell (of 10m x 10m mesh), according to item b) of "【Site Survey】" mentioned above, in order to identify the contaminated area. However, the sampling points shown in i) of b) of "【Site Survey】" above shall be only the center and the sampling method shown in ii) of b) of "【Site Survey】" shall be mixed sample according to the procedure of i) and ii).

c) Detailed Investigation

If items exceeding standard values have been found in the individual investigation above, contamination range at every 1 m up to 10m depth from the ground surface shall be confirmed by soil investigations by means of machine boring.

【Measures against Soil Contamination】

In the case that soil contamination due to the storage of debris has been confirmed, measures against soil contamination shall be taken according to the "Soil Contamination Countermeasures Act" of Japan. Against the risks by direct injection, such measures as paving, embankment, soil replacement, removal of polluted soil etc. could be applied in consideration of individual land

conditions. And against the risks by indirect injection, such measures as containment of soil on the spot, containment of soil by water interception structures, measures preventing disperse of contamination substances, removal of contaminated soil, anti-resolution measures etc. could be applied. in consideration of contamination substances.

After the measures have been taken, the survey of the land shall be conducted again to confirm the values are within the allowable limits.

【Preservation of Records and Return of Land】

a) Compiling of Ledger

Documents obtained through the investigation shall be preserved. The following items are anticipated as documents.

1) Record of Investigation Results
2) Drawings (showing shape of land, sampling points etc.)
3) Documents showing location of the land, quantity and quality of debris etc.
4) Pictures
5) Results of chemical analysis
6) Contract documents on rental of the land
7) Other necessary documents

b) Reporting of survey Results

After the completion of site survey and analysis, the items 1) and 5) of Ledger shown in (1) above shall be reported to stakeholders in the following cases;

- In the case that no contamination has been found by the site survey and all values have passed the standard values safely.
- In the case it has been confirmed that the contamination has not resulted from debris storage due to the comparison analysis.

c) Return of used Land

After completion of the reporting of the survey results, whole survey is regarded to have been completed and the land can be returned to the owner. It is important, for the land use afterwards, to record that the land was used as the temporary storage yard and analysis was conducted before returning it to the land owner. And also final confirmation of the site and the related documents should be made in the presence of all stakeholders.

11.3.4 Recommendations on Segregation of Debris

As described above, the debris contains various matter and recyclable waste such as woods, metals, plastics, fragments of concrete and concrete blocks are segregated by residents before discharging them as debris. The residual mixed waste is transported to dump sites and some materials are segregated by waste pickers there. Although recyclable materials are removed from mixed wastes by machines in some countries like Japan, it seems not feasible in developing countries due

to high capital and operation costs, demands of segregated materials etc. However the applicability and feasibility of higher grade recycling methods than the present system should be studied taking into account institutions and demands of segregated materials etc. Therefore further investigation will be required.

As mentioned above, biodegradable waste seems to be not segregated though the laws and regulations in the Philippines specify its segregation and recycling mainly as compost. But the segregation of biodegradable waste from debris seems to be quite difficult and not applicable.

One of the important and worried points is the separation of hazardous wastes including such materials as asbestos, PCB, acids etc. The hazardous wastes should have been separated before transporting debris to dump sites.

11.3.5 Introduction of Sanitary Landfill for Municipal Solid Waste

The debris generated by the Typhoon Yolanda seems to have been managed by LGUs with their own method according to the legislation and basically the debris has been and will be transported to the existing dump sites for MSW owned by each LGU. However the laws (RA 9003 and the related laws and regulations) prohibit the use of open dumps/controlled dumps, and stipulate the introduction of sanitary landfills.

But introduction of sanitary landfills for MSW is a big theme requiring not only the construction of landfill facilities but also the improvement of whole SWM system including segregation of waste at source, recycling, improvement of collection and hauling system etc. And the construction of landfill sites itself requires many hard processes such as land acquisition, environment impact assessment, acquisition of residents' agreement, preparations of finance for construction and for Operation and Maintenance (O/M) of facilities at the operation stage. Therefore necessary actions and formalities should be taken immediately.

In addition there seem to be no laws or regulations on debris disposal. Though it is prohibited to dump biodegradable waste into MSW sanitary landfills of LGU, it is almost impossible to segregate biodegradable waste from debris. Therefore legal formalities and measures against these issues should be undertaken immediately.

(1) Points on introduction of Sanitary Landfill for MSW

As mentioned above, SWM in the Philippines are controlled according to RA 9003 and the related laws and regulations. These laws and regulations are applied to the introduction of sanitary landfills for MSW. Points to be paid attention in the introduction of Sanitary Landfills in consideration of the stipulations of the laws are as follows;

1) Formulation of Solid Waste Management Plan of LGU

The province, city/municipality, through its local solid waste management boards, shall prepare its

respective 10-year SWM plans consistent with the National Solid Waste Management Framework presented by the National Solid Waste Management Commission (NSWMC) according to RA 9003. And the plan shall be reviewed and updated every year by the provincial, city or municipal solid waste management board. For the preparation or review and update of SWM plan, the studies on city or municipal profiles, waste characterization, collection and transfer, waste processing, source reduction, recycling, composting, solid waste facility capacity and final disposal, education and public information, resource requirements and funding, privatization of solid waste management projects, incentive programs etc. are required. And the plan shall include all these components. Therefore the review and update of the plan, taking into account the introduction of sanitary landfills, should be conducted immediately if the plan has not been updated in that way. In the preparation or update of the plan, especially the following items 2) through 6) shall be considered;

2) Solid Waste Diversion

According to RA 9003, the SWM plan of each LGU shall include an implementation schedule, which shows that within five (5) years after the effectivity of RA 9003 the LGU shall divert at least 25% of all solid waste from waste disposal facilities through re-use, recycling, and composting activities and other resource recovery activities. The waste diversion goals shall be increased every three (3) years thereafter. Therefore, this matter shall be considered in the SWM plan of each LGU.

3) Segregation and Composting of Biodegradable Waste

Stipulations of PA 9003 mentioned above and the Implementing Rules and Regulations of RA 9003 (hereinafter referred to as "IRR") seem to suggest the segregation of biodegradable waste at source (e.g. at each household for household waste) to the extent which can be used as compost. According to IRR, organic fertilizers derived from compost and intended to be distributed commercially shall conform to the standards for organic fertilizers set by the Fertilizer and Pesticide Authority of the Department of Agriculture.

However segregation of biodegradable waste at household level requires the establishment of a firm cooperation system of citizens through awareness-raising by environmental education and guidance which will take a considerable period. And the segregation to the extent which can be used for compost is a hard issue that many countries are struggling to overcome. Therefore special attention should be paid to the establishment of a firm system and measures to cope with Segregation and Composting of Biodegradable Waste. The stipulations in RA 9003 and IRR are as follows;

According to RA 9003, there shall be established a Materials Recovery Facility (MRF) in every barangay or cluster of barangays. And the MRF shall receive mixed waste for final

sorting, segregation, composting, and recycling. The resulting residual wastes shall be transferred to a long-term storage or disposal facility or sanitary landfill.

And according to IRR, Barangays shall be responsible for the collection, segregation, recycling of biodegradable, recyclable, compostable and reusable wastes. The MRF shall receive biodegradable wastes for composting and mixed non-biodegradable wastes for final segregation, re-use and recycling. Provided, that each type of mixed waste is collected from the source and transported to the MRF in separate containers. The resulting residual wastes shall then be transferred to a long-term storage or disposal facility or sanitary landfill.

4) Selection of Land

As one of the minimum criteria for the siting of sanitary landfills, it is specified in RA 9003 that the site must be chosen with regard for the sensitivities of the community's residents. According to IRR, the site shall be chosen with regard to the sensitivities of the community's residents. And the Sangguniang Bayan/Lungsod of the host LGU shall adopt a resolution confirming compliance with the pertinent siting, design criteria and standards. And the resolution shall be deemed as having fully satisfied the public sensitivity requirement of this section. Usually, this matter associate with actually sensitive and hard faces, also special attention should be paid to this matter in the introduction of sanitary landfills.

In addition, it should be noted that obtainment an Environmental Compliance Certificate (ECC) from the Department pursuant to P.D. 1586 and other permits and clearances from concerned agencies are required for the introduction of sanitary landfills.

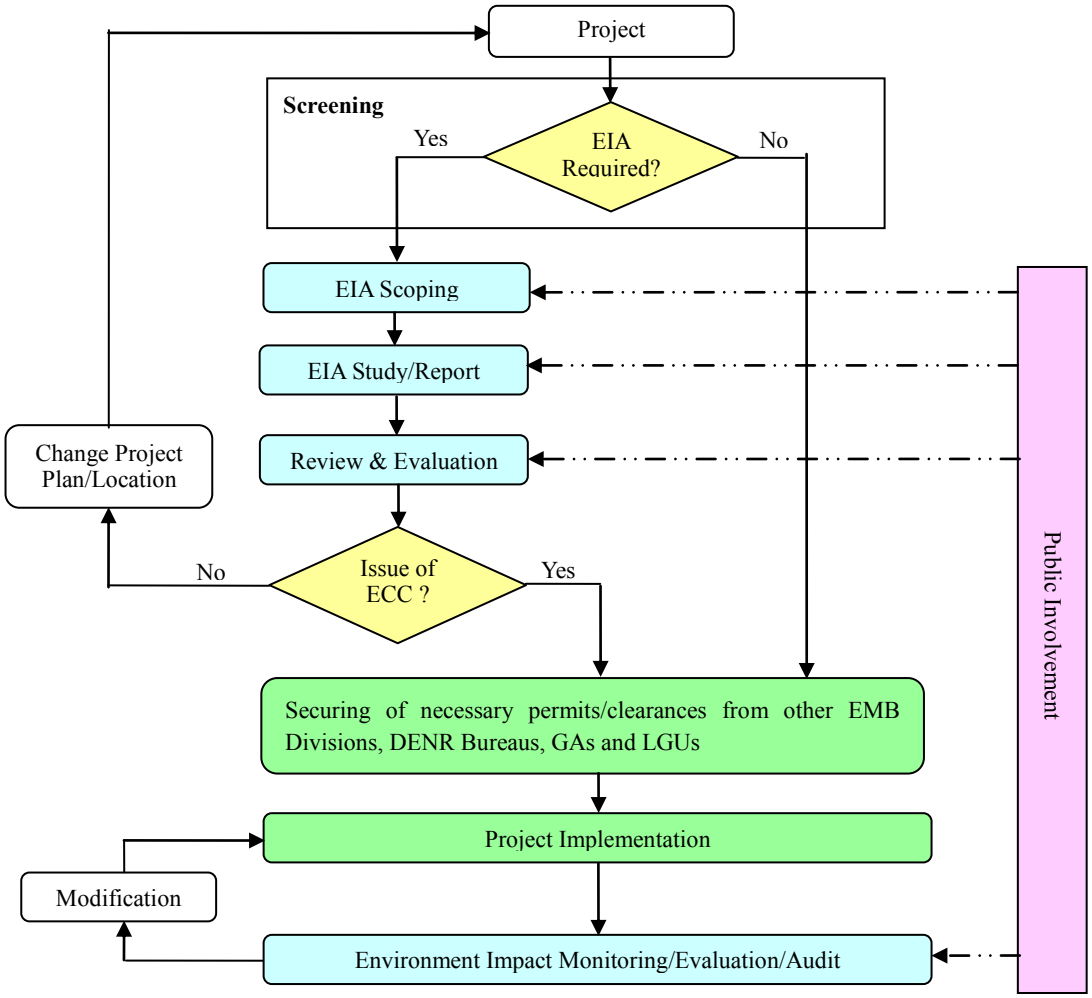
5) ECC and EIA

According to RA 9003, no person shall commence operation, including site preparation and construction of a new solid waste management facility or the expansion of an existing facility until said person obtains an Environmental Compliance Certificate (ECC) from the Department pursuant to P.D. 1586 and other permits and clearances from concerned agencies.

Therefore ECC and other permits are required for the introduction of sanitary landfills in the Philippines. For obtaining ECC, execution of Environmental Impact Assessment (EIA) is required. Environmental impact policy in the Philippines is said to have been started through the issuance of Presidential Decree (PD) 1151 and PD 1586 which are known as "The Philippine Environmental Impact Statement System (PEISS)". Department Administrative Order 2003 -30 is said to have been then issued by the department to rationalize and streamline the implementation of the PEISS.

The Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR) is said to be mandated to guide, in a nationwide scale, the strict compliance with them for all projects in the country. The procedure shown in Figure 11.3-6 is said to be the

process of EIA procedure in the country alongside the public involvement. In the case that the introduction of sanitary landfills is to be executed under the assistance of international agencies, it might be necessary to note that some additional requirements on EIA might be given.



Source: JICA Study Team

Figure 11.3-6 Said Process of EIA Procedure

6) Basic Study and Survey for Design of Sanitary Landfill

The construction of a sanitary landfill requires Detailed Design (D/D) of facilities after several due formalities mentioned hereinbefore. And for the detailed design, basic studies and surveys of the site are required to obtain necessary design parameters. Since the basic studies and surveys include, topographic survey, soil investigation, hydrological study and survey, meteorological study and survey, traffic survey and so forth, attention should be paid to the schedules and finances for them.

(2) Technical Requirements

The technical requirements as shown in Table 11.3-5 shall be applied in introduction of Sanitary Landfills according to RA 9003;

Table 11.3-5 Technical Requirements

Facility	Stipulations
(a) Liners	A system of clay layers and/or geo-synthetic membranes used to contain leachate and reduce or prevent contaminant flow to groundwater;
(b) Leachate collection and treatment system	Installation of pipes at the low areas of the liner to collect leachate for storage and eventual treatment and discharge;
(c) Gas control and recovery system	A series of vertical wells or horizontal trenches containing permeable materials and perforated piping placed in the landfill to collect gas for treatment or productive use as an energy source;
(d) Groundwater monitoring well system	Wells placed at an appropriate location and depth for taking water that are representative of ground water quality;
(e) Cover	Two (2) forms of cover consisting of soil and geo-synthetic materials to protect the waste from long-term contact with the environment: (i) A daily cover placed over the waste at the close of each day's operations, (ii) A final cover, or cap, which is the material placed over the completed landfill to control infiltration of water, gas emission to the atmosphere, and erosion.

Source: JICA Study Team

Concerning the liners, IRR specifies the basic requirements as shown in Table 11.3-6 below;

Table 11.3-6 Requirements on Liners

(a) For non-sensitive resources areas, one of the following base liner systems shall be provided.

No.	Base liner system	Permeability
1	Clay (Minimum of 0.75 meters)	$1x10^{-6}$ cm/sec or less
2	Geomembrane (1.5mm thick)	$1x10^{-14}$ cm/sec or less
3	Geosynthetic Clay Liner (6.4 mm)	$1x10^{-9}$ cm/sec or less

(b) For sensitive resources areas, composite base liner system (1.5mm HDPE + Underlain soil liner 0.6m with permeability $1x10^{-6}$ cm/sec or less) shall be provided.

(c) For leachate impoundment pond, geomembrane (more than 1.5mm thick) with permeability of $1x10^{-14}$ cm/sec or less, underlain by 0.3m soil layer of low permeability, shall be provided.

Source: JICA Study Team

All open dumps and controlled dumps should have been closed and phased out as of February 2006 according to RA 9003 as mentioned above and RA 9003 specifies the introduction of sanitary landfills.

In order to support LGUs in their planning and implementing strategies on ecological solid waste management, DAO 2006-10 "Guidelines on the Categorized Final Disposal Facilities" specifying realistic categories and reasonable conditions for meeting legal requirements was promulgated in September 2006.

These guidelines are based on the potential amount of net residual solid waste generation coming into disposal facilities, taking into account the environmental and financial, considerations. Table 11.3-7 shows the Categories of Final Disposal Facilities and Table 11.3-8 shows the Features of Final Disposal Facilities shown in DAO 2006-10.

Table 11.3-7 Categories of Final Disposal Facilities

Category	Net Residual Waste Generation (t/d)
1	Less than or equal to 15
2	15 – 75
3	75 – 200
4	Greater than 200

Source: JICA Study Team

Table 11.3-8 Features of Final Disposal Facilities

Features	Category 1	Category 2	Category 3	Category 4
Daily and Intermediate Soil Cover	Yes	Yes	Yes	Yes
Embankment/ Cell Separation	Yes	Yes	Yes	Yes
Drainage Facility	Yes	Yes	Yes	Yes
Gas Venting	Yes	Yes	Yes	Yes
Leachate Collection	Yes	Yes	Yes	Yes
Leachate Treatment	Pond system	Pond system	Pond system	Combination of physical, biological and chemical
Leachate Recirculation	At a later stage of operation	At a later stage of operation	At a later stage of operation	Treatment
Clay Liner	X *1	x *2		
Clay liner and/or Synthetic Liner			x *3	x *4

Notes;

*1 - Clay liner be at least 60 cm thick with permeability of 10^{-5} cm/sec

*2 - Clay liner be at least 75 cm thick with permeability of 10^{-6} cm/sec

*3 - Clay liner at least 75 cm thick with permeability of 10^{-7} cm/sec or less, if not available, a composite liner consisting of 1.5 mm thick HDPE membrane over at least 60 cm thick compacted fine materials with permeability not more than 10^{-6} cm/sec. or less

*4 - Synthetic liner at least 1.5mm thick HDPE membrane over at least 60 cm thick of compacted clay materials with permeability not more than 10^{-7} cm/sec.

Source: JICA Study Team

Leachate collection and removal system shall be provided and designed, according to IRR, so that the leachate buildup in the landfill will be minimized. For design purposes, an allowable leachate level of not more than 0.60 meter over the liner system shall be maintained. If leachate is discharged to a receiving body of water, the discharge shall meet effluent discharge and water

quality criteria prescribed by DENR.

Treatment system should be designed in compliance with the Clean Water Act (RA 9275) and DAO 1990-35. Table 11.3-9 shows effluent standards for various receiving bodies of water.

Table 11.3-9 Effluent Standards for Various Receiving Bodies of Water
(Extraction from DAO 1990-35)

TABLE 1 _ EFFLUENT STANDARDS: TOXIC AND OTHER DELETERIOUS SUBSTANCE
(Maximum Limits for the Protection of Public Health)

PARAMETER	UNIT	PROTECTED WATERS CATEGORY I (Class AA & SA)		PROTECTED WATERS CATEGORY II (Class A, B, & SB)		INLAND WATERS CLASS C		MARINE WATERS CLASS SC		MARINE WATERS CLASS SD	
		OEI	NPI	OEI	NPI	OEI	NPI	OEI	NPI	OEI	NPI
Arsenic	mg/L	(B)	(B)	0.2	0.1	0.5	0.2	1.0	0.5	1.0	0.5
Cadmium	mg/L	(B)	(B)	0.05	0.02	0.1	0.05	0.2	0.1	0.5	0.2
Chromium (hexavalent)	mg/L	(B)	(B)	0.1	0.05	0.2	0.1	0.5	0.2	1.0	0.5
Cyanide	mg/L	(B)	(B)	0.2	0.1	0.3	0.2	0.5	0.2	--	--
Lead	mg/L	(B)	(B)	0.2	0.1	0.5	0.3	1.0	0.5	--	--
Mercury	mg/L	(B)	(B)	0.005	0.005	0.005	0.005	0.005	0.005	0.05	0.01
PCB	mg/L	(B)	(B)	0.003	0.003	0.003	0.003	0.003	0.003	--	--
Formaldehyde	mg/L	(B)	(B)	2.0	1.0	0.2	1.0	2.0	1.0	--	--

TABLE 2A _ EFFLUENT STANDARDS: Conventional and Other Pollutants in Protected Waters Category I & II and in Inland Waters Class CA

PARAMETER	UNIT	PROTECTED WATERS CATEGORY I (CLASS AA & SA)		PROTECTED WATERS CATEGORY II (CLASS A,B, & SB)		INLAND WATERS CLASS C.	
		OEI	NPI	OEI	NPI	OEI	NPI
Color	PCU	(B)	(B)	150	100	200(C)	150(D)
Temperature oC rise (max. rise in deg.Celsius in RBW)		(B)	(B)	3	3	3	3
pH (range)		(B)	(B)	6.0-9.0	6.0-9.0	6.0-9.0	6.5-9.0
COD p 6 2	mg/L	(B)	(B)	100	60	150	100
Settleable Solids (1-hour)	mL/L	(B)	(B)	0.3	0.3	0.5	0.5
5-Day 20oC BOD	mg/L	(B)	(B)	50	30	80	50
Total Suspended Soils	mg/L	(B)	(B)	70	50	90	70
Total Dissolved Solids	mg/L	(B)	(B)	1,200	1,000	1,500	1,000
Surfactants	mg/L	(B)	(B)	5.0	2.0	7.0	5.0
Oil/Grease (Petroleum Ether Extract)	mg/L	(B)	(B)	5.0	5.0	10.0	5.0
Phenolic Substances as Phenols	mg/L	(B)	(B)	0.1	0.05	0.5(G)	0.1(G)
Total Coliforms	MPN/mL	(B)	(B)	5,000	3,000	15,000	10,000

TABLE 2B - EFFLUENT STANDARDS: Conventional and Other Pollutants in Inland Waters Class D,Coastal Waters Class SC and SD and Other Coastal Waters not yet Classified)

PARAMETER	UNIT	INLAND WATERS (CLASS D)		COASTAL WATERS (CLASS SC)		CLASS SD & OTHER COASTAL WATERS NOT CLASSIFIED	
		OEI	NPI	OEI	NPI	OEI	NPI
Color	PCU	—	—	(C)	(C)	(C)	(C)
Temperature (max. rise in deg. Celsiusin RBW)	oC rise	3	3	3	3	3	3
pH (range)		5.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	5.0-9.0	5.0-9.0
COD	mg/L	250	200	250	200	300	200
5-Day 20oC BOD	mg/L	150(D)	120	120(D)	100	150(D)	120
Total Suspended Solids	mg/L	200	150	200	150	(G)	(F)
Total Dissolved Solids	mg/L	2,000(H)	1,500(H)	---	---	---	---
Surfactants (MBAS)	mg/L	---	---	15	10	---	---
Oil/Grease (Petroleum Ether Extract)	mg/L	---	---	15	10	15	15
Phenolic Substances as Phenols	mg/L	---	---	1.0(I)	0.5(I)	5.0	1.0
Total Coliforms	MPN/ 100mL	(J)	(J)	---	---	---	---

Furthermore, classification of receiving bodies of water is defined in DAO 1990 -34 which classifies into two (2) categories; surface water and coastal water as shown in Table 11.3-10:

Table 11.3-10 Classification of Water Receiving Bodies

Surface Water	Coastal Water
Class AA – Public Water Supply Class I	Class SA – Tourist Zone, Marine Water Parks, Shellfish Farms
Class A – Public Water Supply Class II	Class SB - Recreational Water Class I/ Fishery Water Class I
Class B – Recreational water Class I	Class SC – Recreational Water Class II/ Fishery Water Class II
Class C – Recreational Water Class II/Industrial Water Supply Class I	Class SD – Industrial Water Supply Class II
Class D – Industrial Water Supply Class II	

Source: JICA Study Team

The purpose of the installation of liner system in the landfill is to protect groundwater from possible contamination due to leachate infiltrated into the ground. One way to develop and properly monitor possible groundwater contamination is the installation of groundwater monitoring well system. IRR prescribes that groundwater monitoring wells shall be placed at appropriate locations and depth for taking water samples that are representative of groundwater quality and for predicting groundwater flow.

Usually, the minimum numbers of monitoring well installed in typical landfill in the Philippines is one (1) upstream and one (1) downstream. Prior to the operation of landfills water quality tests by taking samples from the groundwater monitoring wells shall be conducted. The result of the water quality test will become the baseline data of the project.

If the groundwater within the project area is the source of drinking water of the community nearby, the standards for drinking water must be observed as prescribed by DAO 1994-26A. Table 11.3-11 shows the standard for drinking water.

Table 11.3-11 Standard Parameters and Values for Drinking Water (Extraction from DAO 1994-26A)

Section 3. STANDARD PARAMETERS AND VALUES FOR DRINKING-WATER QUALITY

Table 3.1 Standard Values for Bacteriological Quality

Source and Mode of Supply	Bacteria	Standard Value (No. / 100mL)
a. All drinking-water supplies under all circumstances (Level I, II, III, Bottled water and Emergency Water Supplies)	E. Coli or Thermotolerant (fecal) coliform bacteria	0
b. Treated water entering the distribution system	E. Coli or Thermotolerant (fecal) coliform bacterial	0
	Total Coliforms	0
c. Treated water in the distribution system	E. Coli or Thermotolerant (fecal) coliform bacteria	0
	Total Coliforms	Must not be detectable in any 100mL sample. In case of large supplies where sufficient samples are examined, it must not be present in 95% of samples taken throughout any twelve month period

Table 3.2 Standard Value for Biological Organisms

Constituents	Permissible Limit
Total Count/mL	10

Table 3.3 Standard Values for Physical and Chemical Quality: Health Significance

A. Inorganic Constituents

Constituent	Maximum Level (mg/L)
Antimony	0.005
Arsenic	0.01
Barium	0.7
Boron	0.3
Cadmium	0.003
Chromium	0.05
Cyanide	0.07
Flouride	1.0
Lead	0.01
Mercury (total)	0.001
Nitrate as NO_{3-}	50
Nitrate as NO_{2-}	3
Selenium	0.01

B. Organic Constituents (Pesticides)

Constituents	Maximum Level (µg/L)
Aldrin & Dieldrin	0.03
Chlordane	0.2
DDT	2
Endrin	0.2
Heptachlor and Heptachlor epoxide	0.03
Lindane	2
Methoxychlor	20
Petroleum oils & grease	nil
Toxyphane	5
2,4 - D	30
2,4,5 - T	9

Table 3.4 Standard Values for Physical and Chemical Quality : Aesthetic Quality

Constituent or Characteristic	Maximum Level (mg/L)
Taste	Unobjectionable
Odor	Unobjectionable
Color	5 TCU
Turbidity	5 NTU
Aluminum	0.2
Chloride	250
Copper	1
Hardness	300 (as CaCo3) *
Hydrogen Sulfide	0.05
Iron	1
Manganese	0.5
pH	6.5 - 8.5
Sodium	200 *
Sulfate	250
Total Dissolved Solids	500
Zinc	5 *

Table 3.5 Standard Values for Disinfectants and Disinfectant By - Products

Constituents	Maximum Level (mg/L)
a. Disinfectant Chlorine (residual)	0.2 -0.5
b. Disinfectant By-products	
Bromate	0.025
Chlorite	0.2
2,4,6 trichlorophenol	0.2
Formaldehyde	0.9
Phenolic substances	0.001
Bromoform	0.1
Dibromochloromethane	0.1
Bromodichloromethane	0.06
Chloroform	0.2

* ---- Secondary standards : compliance with the standard and analysis are not obligatory
TCU ---- True Color Unit
NTU ---- Nephelometric Turbidity Unit

Table 3.6 Chemicals of No Health Significance at Concentrations Normally Found in Drinking-Water

Asbestos Silver Tin	In consonance with the findings of WHO, the Department of Health does not prescribe any standard values for these compounds since they are not hazardous to human health at concentrations normally found in drinking-water.

Table 3.7 Standard Values for Radiological Constituents

Constituents	Activity Level (Bq/L)
gross alpha activity	0.1
gross beta activity	1

Source: JICA Study Team

(3) Required Permits in Introduction of Sanitary Landfill

Obtainment of Environmental Compliance Certificate (ECC) for the construction of a new solid waste management facility or the expansion of an existing facility is required in RA 9003 and the ECC procedures as shown on Table 11.3-12 are required in DAO 2006-10.

Table 11.3-12 Required ECC Procedure

Category	Required Procedure
For Categories 1 and 2:	The application for an Environmental Compliance Certificate (ECC) shall require the submission of an Initial Environmental Examination (IEE) Checklist. (The IEE Checklist may be secured from the regional offices of the Environmental Management Bureau.)
For Categories 3 and 4:	The documentary requirements for the application and issuance of the ECC shall be an Initial Environmental Examination (IEE) report.
Notes; In view further of the provisions of the Procedural Manual for DENR Administrative Order No. 30, ECC application for sanitary landfill projects with a daily capacity of 1,000 metric tons and above shall be required an Environmental Impact Study.	

Source: JICA Study Team

Other major permits necessary to be obtained from government agencies for the introduction of sanitary landfill are said to be as shown on the Table 11.3-13 below;

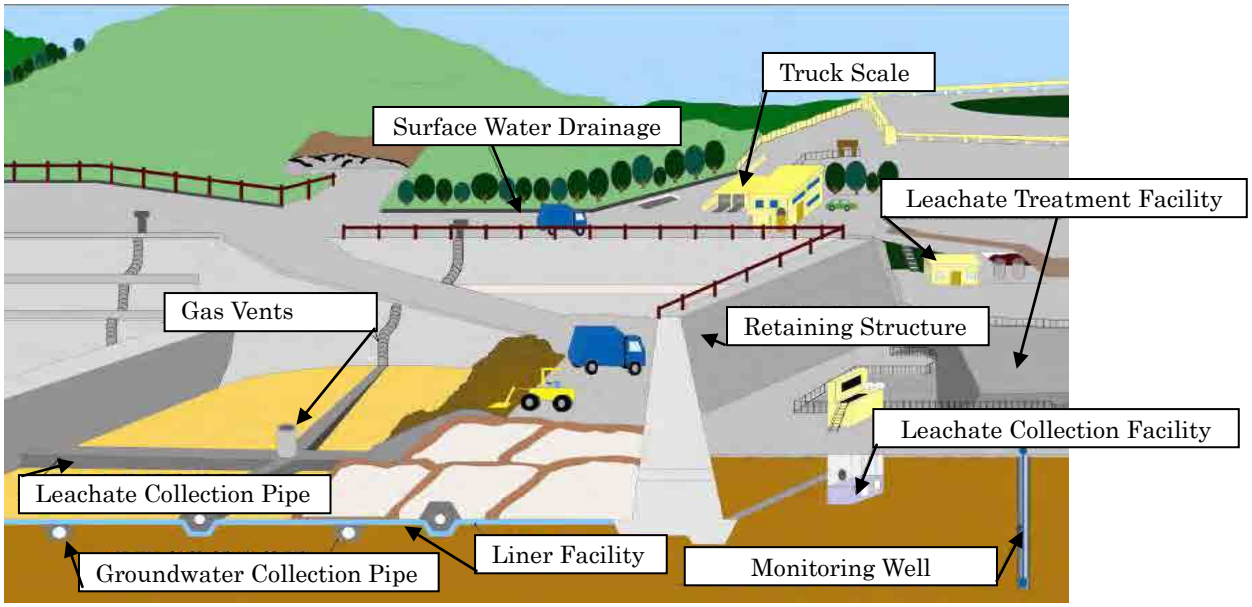
Table 11.3-13 Major Permits to be obtained from Government Agencies

Type of Permit	Issuing Agency/authority
Zoning Permit	LGU – City Planning and Land-use
Land Conversion (if the site is Agricultural land)	Department of Agriculture / Department of Agrarian Reform
Barangay Clearance	Host Barangay
City/Municipality Council Endorsement	LGU – City/Municipality Council
Building Permits	LGU – Department of Building Official

Source: JICA Study Team

(4) Image of Sanitary Landfill

Figure 11.3-7 through Figure 11.3-12 show just rough images of examples of a sanitary landfill. Since some of the figures might not be applicable to the situation of the Philippines, details shall be decided in detailed designs of respective project in consideration of the conditions in the Philippines.



Source: Modified from the web-page of Kinan Environmental Improvement Public Corporation in Japan

Figure 11.3-7 Image of Overall System of Sanitary Landfill

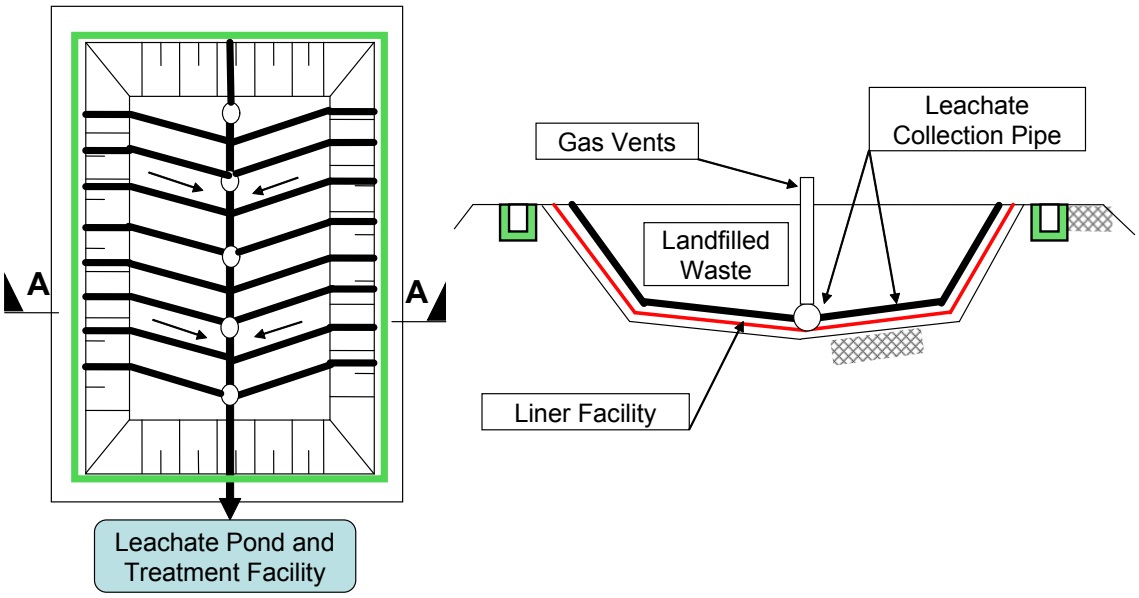
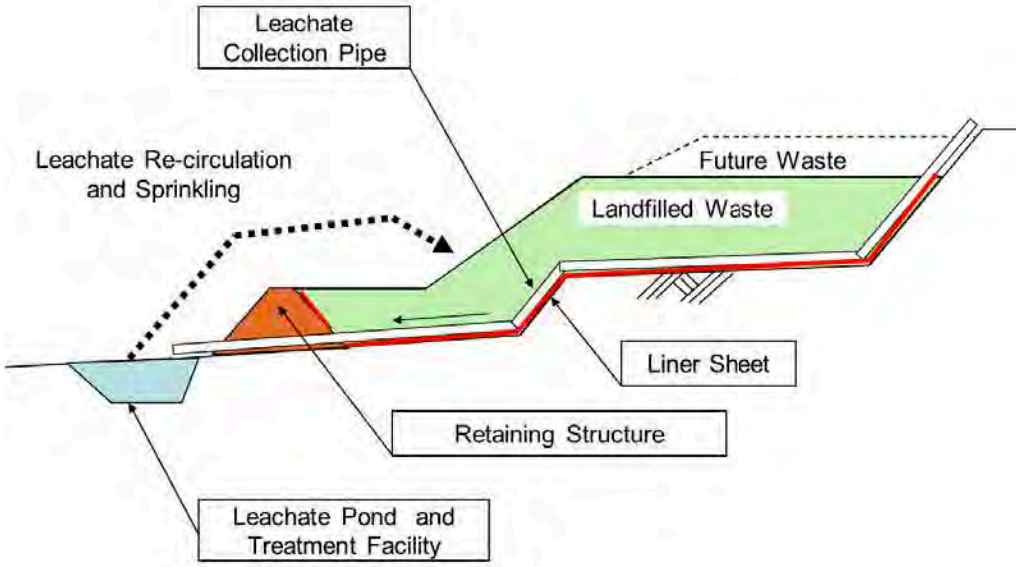
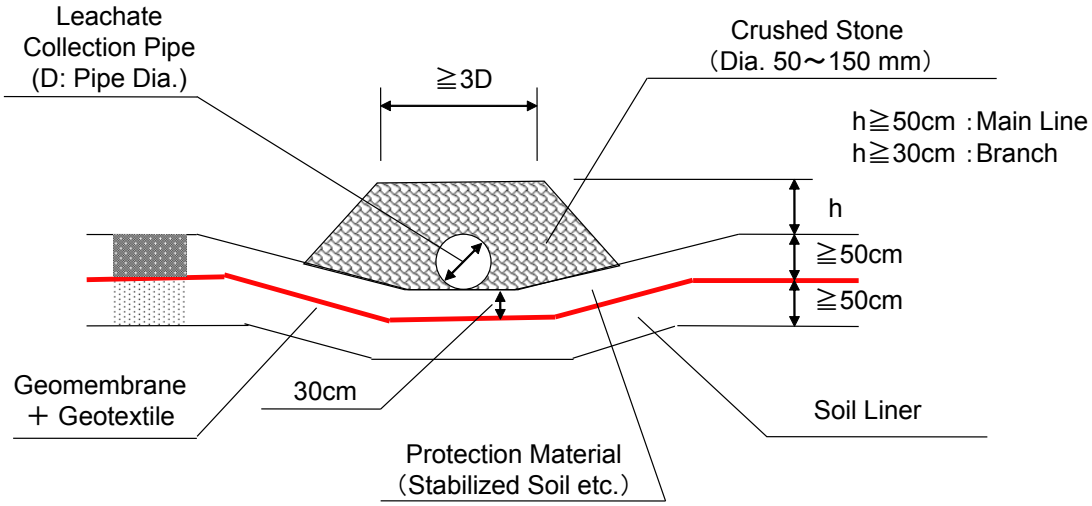


Figure 11.3-8 Image Plan and Lateral Section of Sanitary Landfill



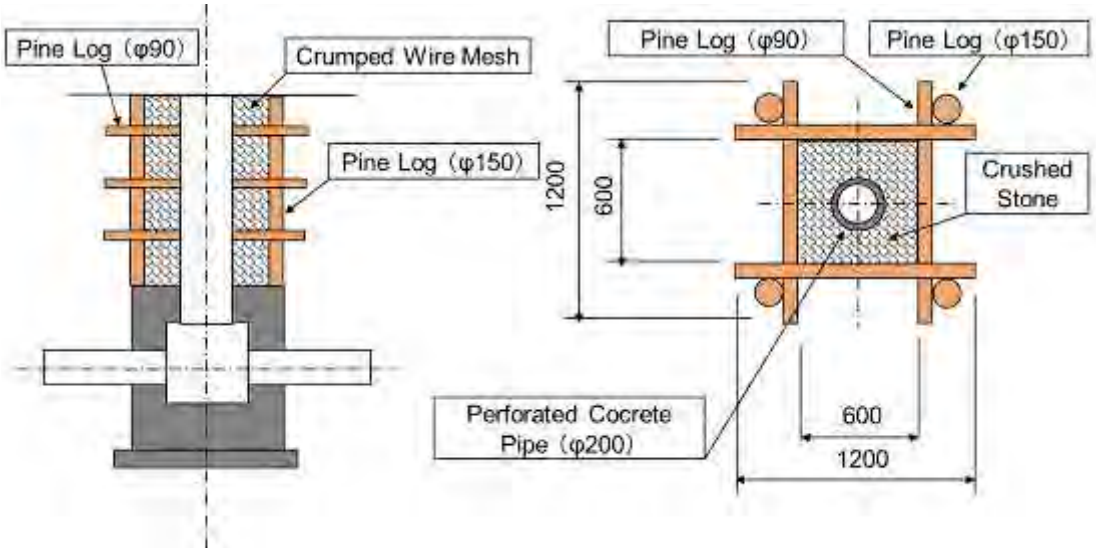
Source: JICA Study Team

Figure 11.3-9 Longitudinal Image Section of Sanitary Landfill



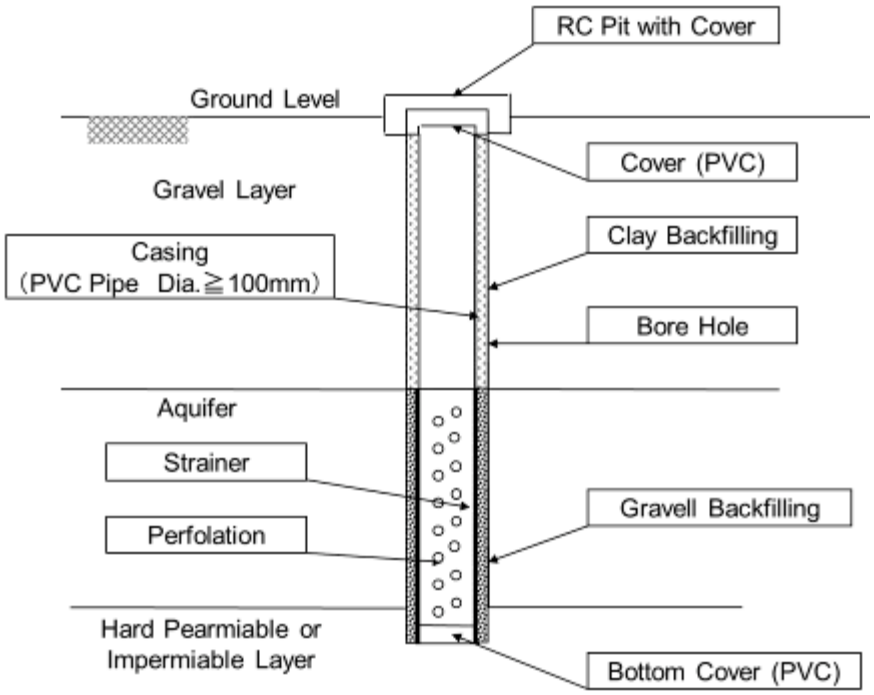
Source: JICA Study Team

Figure 11.3-10 Image of Leachate Collection Pipe (Cross Section) [1)]



Source: Represented referring to "Guideline for Plan and Design of MSW Landfill (Japan Waste Management Association 2001)"

Figure 11.3-11 Image of Example of Gas Vents



Source: JICA Study Team

Figure 11.3-12 Image of Monitoring Well

11.3.6 Points on Introduction of Sanitary Landfill for Mixture of Municipal Solid Waste and Debris

Most of the debris generated by Yolanda has been transported to the existing dump sites for MSW of each LGU. However most of the existing dump sites seem to be open dumping sites which are to be closed according to RA 9003. In consideration of these situations, the introduction of Sanitary Landfills for mixture of MSW and debris seem to be preferable.

However, the introduction of this type of sanitary landfill associates with two big issues. One is the same issue as the introduction of sanitary landfills for MSW mentioned above. Namely it requires whole improvement of solid waste management system including source separation etc.

And the other is that there seems to be no laws and regulations on debris disposal in the Philippines. Namely RA 9003 specifies MSW management only. And it is prohibited to dispose biodegradable waste into LGU's MSW dump sites according to RA 9003. However it is almost impossible to segregate biodegradable waste from debris. And as mentioned above, sanitary landfills to receive MSW in the Philippines are divided into 4 types based on the amount of Net Residual Waste Generation (t/d) of MSW according to DAO 10-2006. Therefore the introduction of sanitary landfills for mixture of MSW and debris requires urgent establishment of related laws and regulations and formulation of guidelines.

11.3.7 Points on introduction of Sanitary Landfill for Debris

Sanitary landfills to receive debris only seem to be easier than that for mixed waste of MSW and debris. Because the improvement of whole Solid Waste Management (SWM) system might not be fully required though such items are required as land acquisition, environment impact assessment, acquisition of residents' agreement, preparation of finance for construction and for O/M of facilities at the stage of operation.

However, one of the problems is that there seems to be no laws and regulations on debris disposal as mentioned 4.6 above.

And considerations should be given whether the preparation of sanitary landfills for debris only is appropriate and possible under the situation that even the introduction of sanitary landfills for MSW which are used for MSW generated in daily life has not been satisfactorily achieved.

Further discussions are required to settle these issues.

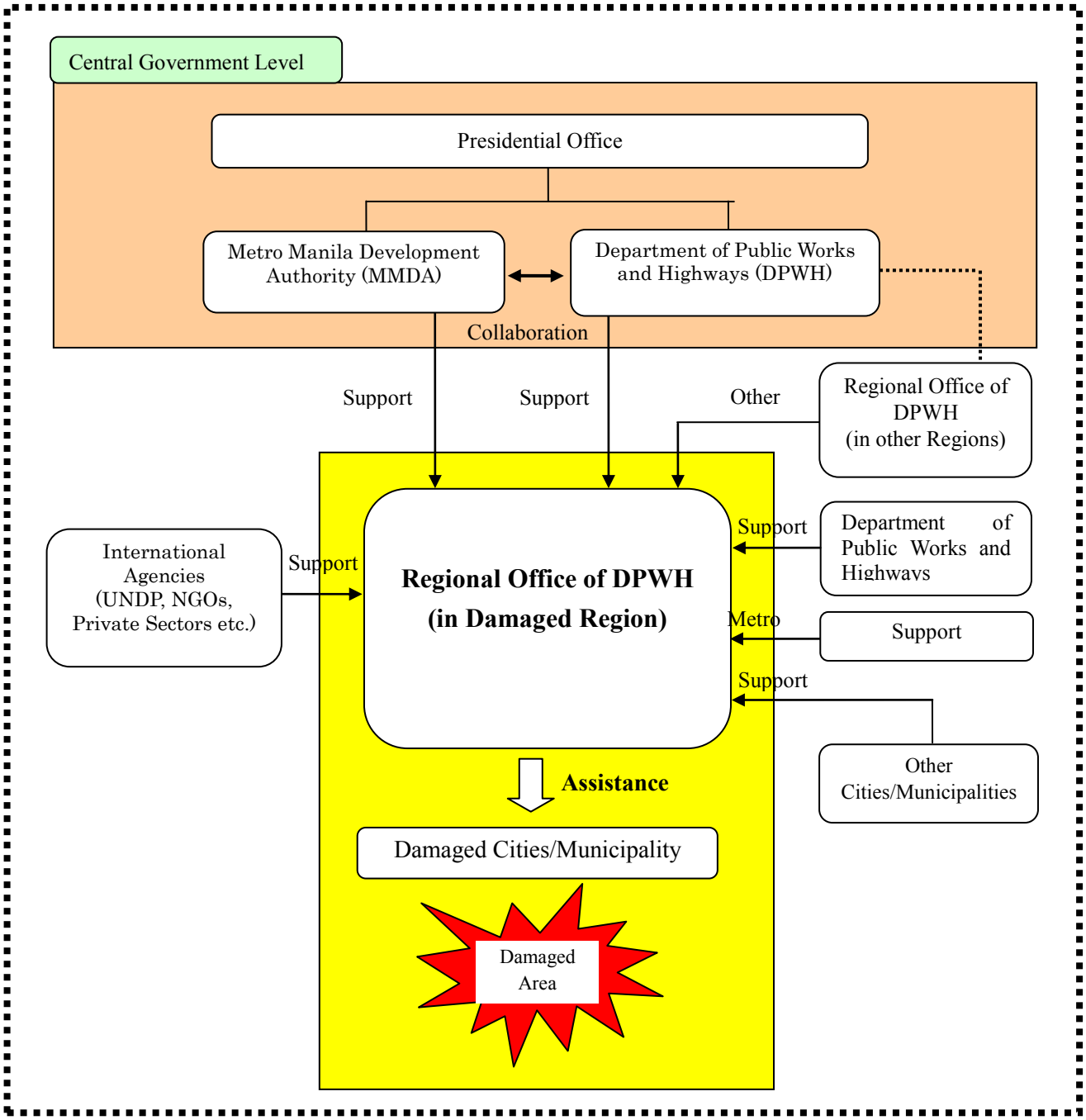
11.3.8 Establishment of Cross-regional Cooperation System for Disaster Waste Management

The debris generated by Yolanda is said to have been collected and transported by the assistance of many governmental agencies, international agencies, NGOs, private sectors etc. Though each

LGU has the responsibility on SWM in the Philippines, at the time of emergency after the occurrence of disasters, it seems quite difficult for damaged LGUs to manage debris by themselves. In consideration of these situations, it is recommended to establish Cross-regional Cooperation Systems for disaster waste management including central government level, provincial Level, city and municipal level, and cooperation with international agencies, NGOs, private sectors.

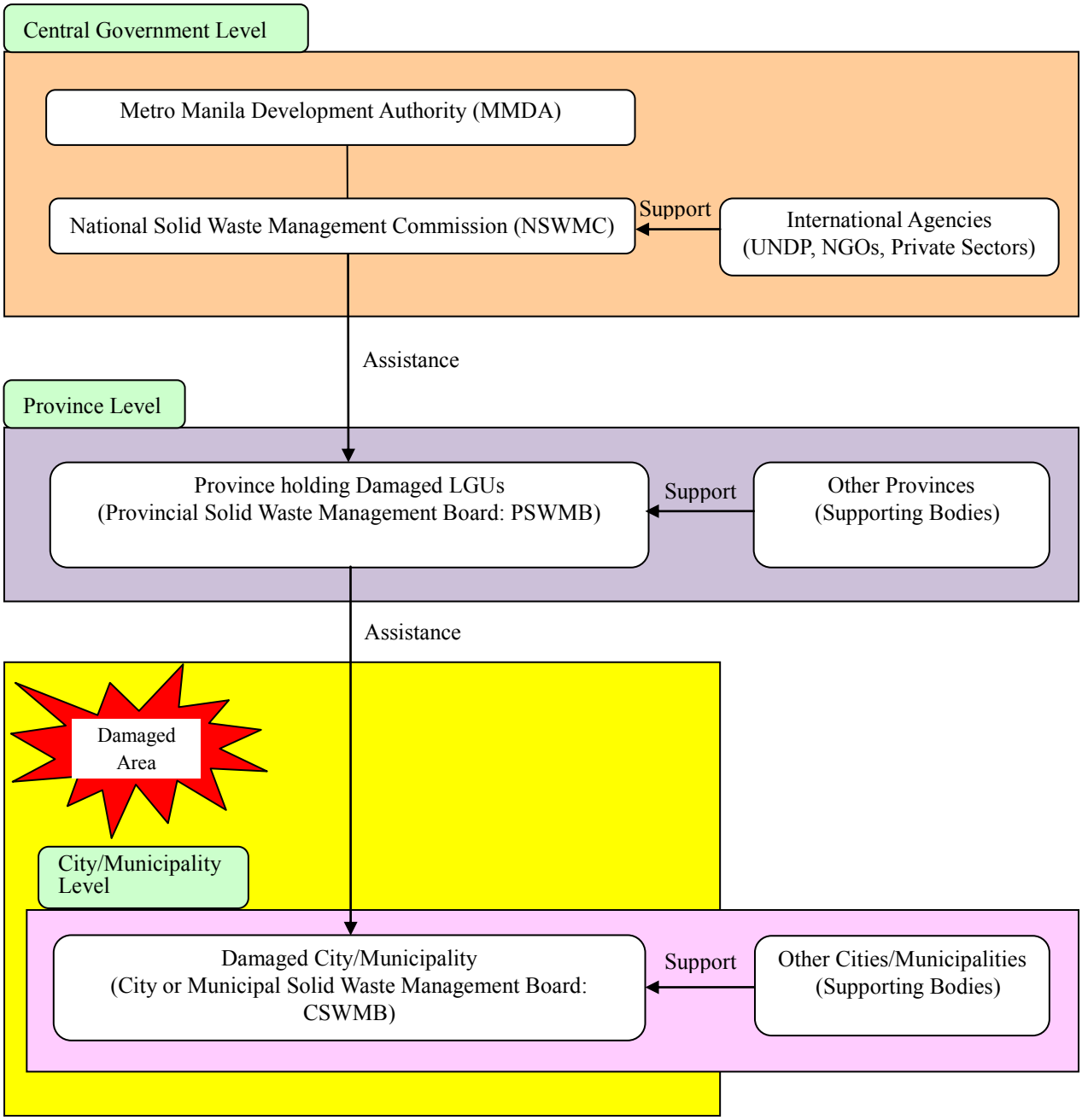
Figure 11.3-13 shows an image of Cross-regional Cooperation System in consideration of the present situations of the Philippines taking into account the system which is said to have been taken in the case of Yolanda. However, it seems not clear whether this system will be applied for future disasters since the legislative ground of this system seems not clear. Figure 11.3-14 is another idea which might be taken in the future. If the abilities of related agencies are enhanced in the future, it might be preferable to establish a cooperation system among LGUs nearby as shown on Figure 11.3-14 in line with the concept of the existing laws and regulations on SWM in the Philippines. However the present abilities of related agencies seem to be not so high as to realize the system shown on Figure 11.3-14 in the near future. Namely, at present, the related agencies shown on the Figure 11.3-14 do not seem to possess sufficient equipment and machines to cope with disaster waste disposal for example. If realization in the near future is considered, another system as shown on Figure 11.3-15 might be one idea which includes the Department of Public Works and Highways possessing considerable number of machines and equipment.

However, since the systems shown on these figures are just imaginal ideas without understanding or grasping the actual conditions of Philippines, they might be far from the realistic and applicable ones. Therefore the establishment of an applicable and realistic system through the discussions and studies among related agencies and other stakeholders are recommended providing for the debris disposal of future disasters referring to these figures.



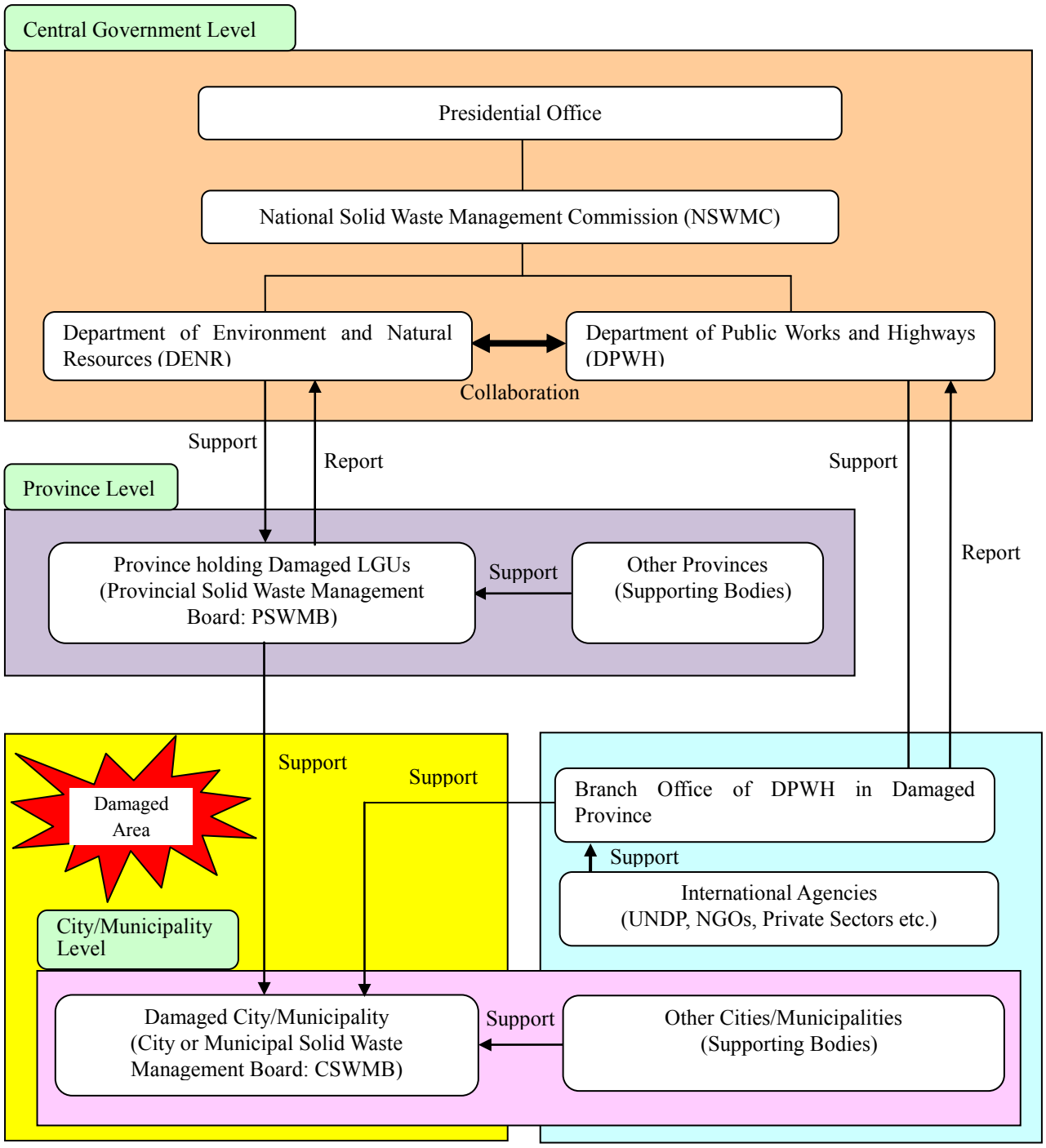
Source: JICA Study Team

Figure 11.3-13 Imaginal Idea of Cross-regional Cooperation System (1)



Source: JICA Study Team

Figure 11.3-14 Imaginal Idea of Cross-regional Cooperation System (2)



Source: JICA Study Team

Figure 11.3-15 Imaginal Idea of Cross-regional Cooperation System (3)

11.3.9 Recommendation on Formulation of National Disaster Solid Waste Management Guidelines

It is recommended that Each LGU should prepare its Disaster Solid Waste Management Plan providing for future potential disaster solid waste management as shown in section 7.3.10 below. To facilitate the formulation of the plan of each LGU, it is recommended that the central government (NSWMC) should formulate National Disaster Solid Waste Management Guidelines. The recommended contents of the Guidelines are as shown in Table 11.3-14.

Table 11.3-14 Contents of Disaster Solid Waste Management Guideline (Recommendation)

Contents
1. General
1.1 Background and purpose
1.2 Basic items
1.2.1 Targeted disaster
1.2.2 Measures by size and kind of disaster
1.2.3 Basic way of thinking of management plan
1.2.4 Disaster waste management body
1.2.5 Positioning of disaster management plan and action plan
1.2.6 Action to be taken by each body after disaster
2. Precautious measures against disaster (Prevention and reduction of damage)
2.1 Organization and chain of command
2.2 Collection of information and communication
2.3 Frame of cooperation and assistance (Central government, LGUs, International agencies, NGOs, Private sectors, etc.)
2.4 Training of governmental staff
2.5 Disaster solid waste disposal
(1) Generation and disposal amount
(2) Schedule
(3) Flow
(4) Collection and transportation
(5) Temporary storage yard
(6) Environmental measures and monitoring
(7) Demolition and removal of collapsed buildings
(8) Segregation and recycling
(9) Final disposal

(10) Cross-regional disposal
(11) Measures against hazardous waste
(12) Measures against Tsunami waste
(13) Certificates and permits on disposal
2.6 Establishment of advisory desks
2.7 Public relations
2.8 Resource management

3. Measures at emergency stage
3.1 Action to be taken by each body
3.2 Decision of management body
3.3 Organization and chain of command
3.4 Collection of information and communication
3.5 Frame of cooperation and assistance
3.6 Disaster solid waste disposal
Basically the items of description should be the same as the items mentioned above 2.1 through 2.8. However, "Formulation of Action Plan" should be added with top priority on the top of the line.

4. Measures at rehabilitation/recovery stage
Basically the items of description should be the same as the items mentioned in above 2.1 through 2.8.

Source: JICA Study Team

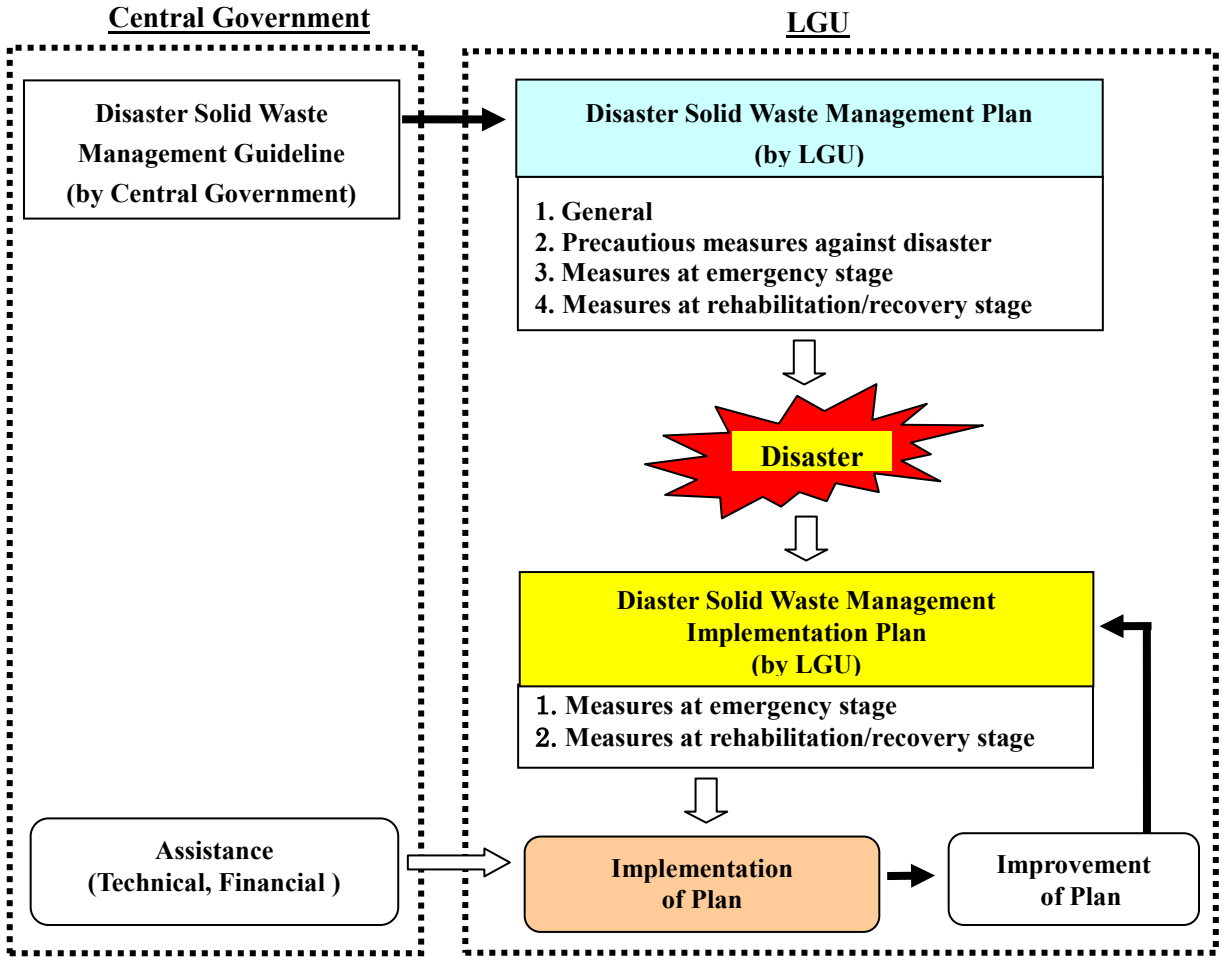
11.3.10 Recommendation on Formulation of Disaster Solid Waste Management Plan of LGUs

It is recommended that Each LGU should prepare a Disaster Solid Waste Management Plan (DSWM Plan) providing for future potential disasters based on the National Disaster Solid Waste Management Guidelines formulated by the Central Government (NSWMC). And immediately after the occurrence of a disaster a Disaster Solid Waste Management Implementation Plan (DSWM-I Plan) should be formulated by means of simple extraction from the DSWM Plan, which has been prepared in advance, giving slight modifications.

The items of descriptions to be incorporated in the DSWM Plan should be the same as those of the Disaster Solid Waste Management Guidelines mentioned in 4.9 above. ADSWM-I Plan could be immediately formulated, after the occurrence of disaster, by extracting the sections of "Measures at emergency stage" and "Measures at rehabilitation/recovery stage" of the DSWM Plan and giving slight modifications in consideration of the actual magnitude of damage.

The amount of debris generated by a disaster is very important factor to control and manage debris

disposal totally. Therefore it is immediately required to estimate the amount after the occurrence of the disaster. However it is not easy to estimate it without preparation in advance. In consideration of these conditions, in the DSWM Plan stage the estimation of potential amounts of debris generation should be prepared based on the data of the existing houses and other structures, area by area. If such estimation has been prepared in advance, it would be much easier to estimate debris amount immediately after the occurrence of the disaster, for example by judging rough percentage of damage of each area. Figure 11.3-16 shows the recommended idea of DSWM Plan and DSWM-I Plan of LGU and their Positioning.



Source: JICA Study Team

Figure 11.3-16 DSWM Plan, DSWM-I Plan of LGU and their Positioning (Recommended Idea)

11.3.11 Others

It is recommended that the problems and issues which have been encountered through debris disposal of Yolanda including collection, transportation temporary storage and disposal should be collected from all agencies involved in the debris disposal, and measures against them should be discussed providing for future disasters. It is recommended that the results of such discussions should be taken into account in the DSWM Pan. Then the plan will become useful and helpful one

against future disasters.

11.4 Solid Waste Management (SWM)

The JST surveyed overall SWM operation system of Tacloban City and 4 LGUs (Palo, Tanauan, Basey and Guiuan) in September through questionnaires and interviews to the responsible office heads. The results of the survey are summarized below.

11.4.1 Outline of Present SWM Operation

The debris generated by the Yolanda were completely removed and transported to dumpsite by March and April. The regular SWM services of the City and LGUs have come back though some of vehicles and heavy equipment were totally collapsed.

The present SWM system of the City and 4 LGUs is summarized in Table XXX. The served population ratio, that is service coverage ratio, varies from 20% of Basey to 70% of Tacloban and Palo. Tacloban City collects the commercial in the night time in order to avoid the traffic congestion of the downtown. Tacloban City and Palo dispose of the wastes in the controlled dumpsite; on the other hand, other 3 LGUs use the open dumpsites. The waste segregation at source in the households is a key issue for diversion of waste, but the City and 4 LGUs have not yet implemented it. Meanwhile, the junk shops are actively collecting the recyclables in every area.

11.4.2 Problems and Issues

The Republic Act (RA) 9003 requires local governments to formulate and update the "10-years' Solid Waste Management Plan". The plan constitutes fundamentally sectorial policies and strategies of SWM, and should assume an important role also in formulating RRP, DRRMP, CLUP and annual budget.

The plan of Tacloban was prepared in 2007 and submitted to the Department of Environment and Natural Resources (DNER), which was prepared with assistance of GIZ and slightly updated in 2012. The other 4 LGUs have only the draft plans, neither completed nor submitted to the DNER; Palo drafted in 2001, Guiuan in 2005, and Basey in 2010. So, these 3 LGUs should re-prepare the plans and submit to the DNER. The plan of Tanauan, probably drafted in 2009 was washed out by the Yolanda, neither hard copy nor soft copy existing at moment; so, the new plan should be formulated. In formulating the plans, the 4 LGUs have to study and analyze SWM comprehensively from waste characterization survey to final disposal

The RA 9003 requires also closing safely the open dumpsite and developing the sanitary landfill. The all governments understand this as keen crucial issues; the development plan has not advanced due to financial and technical constraints. According to the DENR, currently in the Leyte Province, Ormoc City is the only government that has developed the sanitary landfill.

The cost must be covered by the fee to provide better service to citizen. However, the waste fees have been set far below the costs, besides not collected from residential houses in LGUs.

The RA 9003 requires also diverting the wastes. The reduction and segregation at source in cooperation with all waste generators is inevitable; however, these activities have been stagnant.

11.4.3 Recommendation

Immediate start of updating and reviewing the "10-years' Solid Waste Management Plan" is recommended. The plan contains also:

- Development plan of sanitary landfill site from the viewpoint of short, medium and long term
- The revision of waste fee table by reviewing the ordinance, and promotion of waste fee collection from residence as cited in the current ordinances.
- Medium and long term planning for promotion of 3R (reduce, recycle and re-use) along with its persistent implementation schedule

Table 11.4-1 Summary of Present SWM System (as of February 2015)

Items		Tacloban	Palo	Tanauan	Basey	Guiuan
1.Responsible Office		Environment and Natural Recourses	General Service	General Services Agriculture (composting)	Solid Waste Management	General Service
2.Manpower		9 persons (Collection and disposal service are contracted out to private sectors)	31 persons	15 persons	31 persons	29 persons
3.Collection Vehicles	B/Y[1)]	8-10 trucks (owned by private sectors)	3 (4 ton)	2 (6 m3, 3.4 m3), totally collapsed	2 (4m3, totally damaged)	3 (8m3, 2X6m3_1 totally damaged)
	A/Y[2)]		3 (4 ton)	2 (3.5 ton): purchased	2 (4 m3, purchased)	2 (8m3, 6m3)
4.Heavy Equipment		1 Bulldozer (owned by private sectors)	1 Bulldozer (LGU) 1 Backhoe (UNDP)	1 Bulldozer owned by LGU was damaged, and pay loader of Makati assisting	None (currently 1 excavator and 2 big trucks of UNDP in operation)	None (sometimes borrow from Provincial Gov.)
5.Dumpsite		6.6 Ha in total, 1.1 HA now in operation, Controlled DS, installation of truck scale (besides, 0.75 HA occupied by Yolanda debris)	1 HA, Controlled DS	1 HA, Open DS	2 HA (rent), Open DS	1.8 HA, Open DS
6.Recycling		Segregation at source in some areas	No segregation at source	No segregation at source	No segregation at source	Segregation at source started in Nov.2015
		20 Scavengers	9 scavengers	3 Scavengers	10 Scavengers	10-12 Scavengers
		Active behavior of junk shops	Active behavior of junk shops	Active behavior of junk shops	Active behavior of junk shops	Active behavior of junk shops
7.Generation of Waste[3)]		150 ton/day (estimate by city)	Estimated at 19 ton/day	Estimated at 15 ton/day	Estimated at 15 ton/day	Estimated at 9 ton/day
8.Service Coverage		70% of waste amount	70% of population	50% of population	20% of population	60% of population
9.SWM Expenses		70.0 million	2.9 million in 2013	1.3 million in 2015	1.1 million in 2013 and 2.5 million in 2014	2.7 million in 2015
10.SWF Fee		Collection based on property assessment value Fee was revised to increase.by 250% from 2015.	Category-wise collection	Ind. 850P/year, Market 150P/year, Residential 60P/year	50 P/year only for business sector	50 P/year only for business sector (20 P/y for HH under the progress)

Note: 1) Before the Yolanda, 2) After the Yolanda, 3) kg/capita data of 4 LGUs was applied from "2009 Regional State of Browned Environment, Eastern Visayas, DENR"

Source: Questionnaires and interviews by JST

Chapter 12 General Situation of Economy

12.1 Basic Conditions

The local economy of the Study Area is heavily dependent on agriculture and fishery. Main crops of the agriculture are rice and coconut while fishery embraces aqua culturing and catching both shore fishes and pelagic migratory fishes. Farmers and fisher-folks in the Study Area serve not only their respective main farming/ fishing/ aqua-culturing activities but also other income earning activities like tricycle driver, ferrying, carpentry, manual labor works and so on including other farming and fishing.

Exception of limited industrial, mining, and tourism sectors' earning and remittances from the outside the Study Area, copra (core product from coconut) is a sole exporting commodity from the Area while cultured seaweed, Kappaphycus, for extracting Carrageenan, thickening agent for food and personal care products, is existing limited trading fishery product to the outside. In addition high value fishery harvests like Lapu Lapu (Grouper) and Mud Crab are exported lively to the prospering Asian markets including Singapore and Hong Kong as well as Manila and Cebu.

Most of the harvests both from agriculture and fishery except the above items are basically consumed locally due to underdeveloped marketing logistic chain characterized by lack of cold storage in each local market gathering harvests, absence of cold van transport, and deficiencies in slaughtering and processing. Rice is also consumed domestically in the Area owing to general low productivity rice farming.

Substantial amount of livestock animals such as swine and fishes are imported from Mindanao due to incompetent swine raising due to high price of feed and under-equipped fish market in the Study Area respectively. Higher price milkfish cultured in sea/ brackish water due to higher cost of fish feeds is surviving owing to its non-smelling feature loved by local/ regional customers.

12.2 Damages and Issues

Yolanda left serious damages on the coconuts trees planted ubiquitously in the Study Area by strong winds and its Tsunami-like storm surge washed away the fisher-folks' boats and fishing gears, artificial fish reefs, and aqua culturing facilities. Its strong winds and Tsunami-like storm surge also devastated many of local markets and fish landing places as well as most of business entities' base building structures and their yielding equipment/ facilities.

Wholesale-based commercial system distributing commodities from regional/ national center suffered substantial capital losses due to dispossession of stocked commodities after the disaster in addition to the physical damages on the warehouses and other structures and facilities.

The disaster in association with consequent power cut-off and communication breakdown hampered the entire economic activities in the Study Area seriously.

Most of affected people in the Area have been complemented by the national and international livelihood support programs such as entrepreneurial skills trainings and supports, farm input

provisions for vegetable and root crop cultivation, livestock promotion support, fishing boats and gear provisions, fish culturing equipment provisions, and so on, while they are basically dependent on the domestic/ local demand except for cash for work type programs bringing external funds into the Area. It is getting apparent that their effects are confined by targeting local markets' limited extent.

Most of the current livelihood programs may not complement the lost external earning capability achieved by fallen coconut trees with sustainability in long run. Only with the restoration of the external earning capacity by immediate alternative products/ services, the livelihood programs may promote economy of the Study Area by monetary circulation.

The followings are the issues for economic restoration and enhancement to attain resilience and sustainability of the Study Area:

- Limited product(s)/ service(s) with external earning capability other than copra,
- Local market oriented basic commodities produced in the Area, and
- Higher prices of commodities and farm inputs/ feeds imported from outside the Area.

12.3 Directions for Restoration and Enhancement

Based on the general and damage conditions with the issues described above the basic directions for the economic restoration and enhancement of the Study Area are derived as follow:

- To find/ create and to promote products/ services retaining capabilities of external earning to complement missing copra production for a coming half decade,
- To create regional market to absorb production fluctuation of the locals based on logistic chain equipped with cold storages and delivery vans,
- To restore and to enhance wholesale-based commodity distribution system for eliminating higher priced importing commodities and agricultural/ fishery inputs,
- To foster substituting product productions with imported items for increasing self-sustainability and competitiveness, and
- To promote tourism for increasing external earnings.

12.4 Basic Approach for Economic Recovery

For improving the resilience and enhancing the economy in the Study Area following three basic approaches are important according to the Japanese experience:

- To "Enhance Linkages" in the Area among primary sector producers of farmers and fisher-folks, other domestic economic activities including tourism, markets, and the outside economies,
- To "Add Extra Values" on primary products in the Area by increasing Total Factor

Productivity (TFP) through creation of synergy effects of harvests, agro-processing, and trade/ commerce/ tourism, or fostering so called Sixtiary Industry, and

- To "Promote Participation/ Activate Human Resources" especially local farmers/ fisher-folks in activities for formulating the Sixtiary Industry.

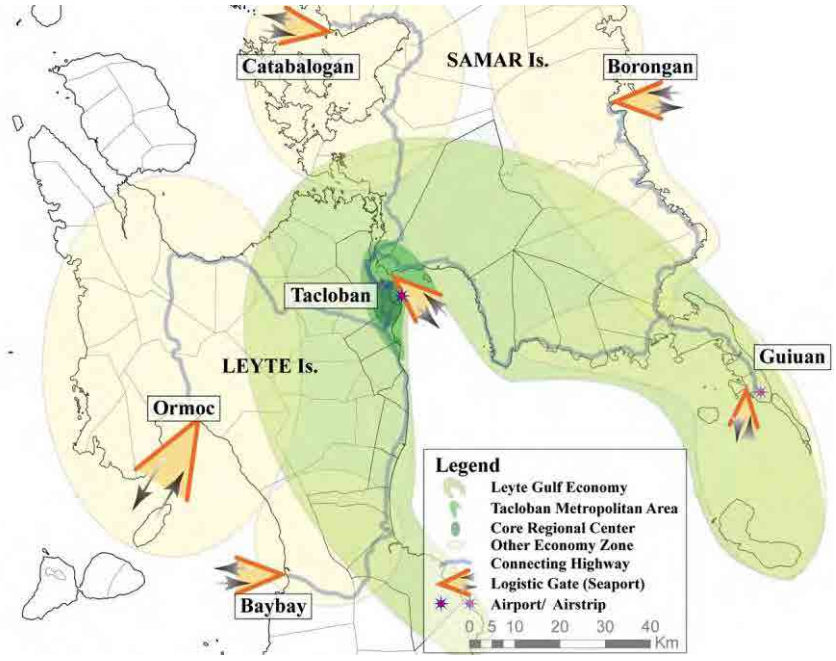
Increase of employment opportunity is duly expected through the economic enhancement achieved by the strategy with the above mentioned approach.

12.5 Leyte Gulf Area Economy

12.5.1 Latest Development

As one year passed from the time of incident efforts for re-development of the economy sector became focal and conspicuous while emergency relief type activities have significantly decreased. People have become aware of the importance of the re-development/ re-structuring of the regional economy for pursuing further progress to the recovery as well as enhanced resilience against the disaster impacts.

The Leyte Gulf Area where Yolanda hit most seriously among the affected areas has a potential of formulating a united economy area considering the geographic and transport system development conditions.



Source: JICA Study Team

Figure 12.6-1 Economy Cluster and Possible Leyte Gulf Area Economy

12.5.2 Five Directions

Considering the potential for formulating the economy area following directions for re-development of the area economy have become evident among stakeholders other than the

directions of re-planting of coconut trees and modernization of traditional crop farming such as paddy:

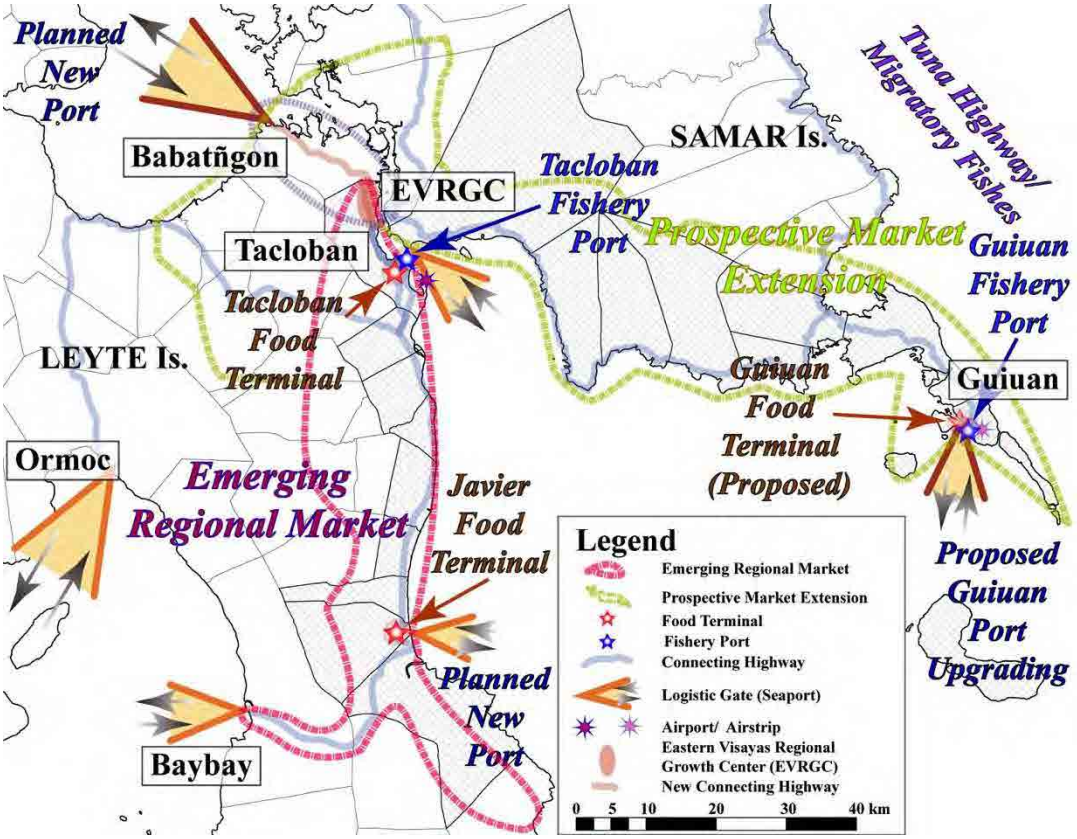
1) Formulation of regional market as a base for the efficient economy activities,
2) Agro/ fishery enhancement by crop diversification and value chain fostering,
3) Coordinated tourism promotion and development with Tacloban Gateway Town,
4) ICT industry promotion utilizing advanced ICT infrastructure covering Tacloban and Palo with existing 2 ICT industrial parks, and
5) Innovative technology based industry promotion.

Brief explanations of the 5 directions are described below.

(1) Regional Market Formulation for Economic Opportunity Materialization

1) Regional Market for Agriculture and Fishery Products

First direction of formulating regional market intends to enable the local producers to access the wider market for more stable sales of their agriculture and fishery products. The established regional market is expected to absorb gaps between fluctuated volume concentrations of their products and rather steady local demands preventing from associating significantly low prices at converged harvesting. Mitigations of convergence of harvests are dealt by basically two directions of 1) use of longer storage facilities and advanced logistic systems, and 2) coordinated harvest timings by use of information exchange and coordination system envisaging outside region markets.



Source: JICA Study Team

Figure 12.6-2 Formulation of Regional Market and Key Facilities

Food terminal initiatives in Tacloban and Javier, which are expected to be materialized within this year, are envisaging to be wider area wholesale trading centers with facilities such as cold/ cool storages, logistic systems including transport, and ICT based sales and production coordination systems. Their expected initial market coverage is shown in the above. Tacloban initiative is centered by BRC (Business Recovery Center established) under PCCI (Philippine Chamber of Commerce and Industry) with expected support from ILO and GIZ while Javier initiative called "North Eastern Leyte (NEL) Agri Pinoy Trading Center" is led by Mayor of Javier, who is also a prominent businessman, with support of Provincial Marketing Unit of DA Regional Field Office VIII.

The NEL Agri Pinoy Trading Center is organizing farmers associations in 13 Municipalities ranging North from 1) Tanauan, 2) Dagami, 3) Tabon Tabon, 4) Tolosa, 5) Burauren, 6) Julita, 7) Dulag, 8) La Paz, 9) Mayorga, 10) Macarthur, 11) Javier, 12) Abuyog, and 13) Mahaplag as producers of various crops while intra-/ inter-regional marketing and sales transaction information/ data are being handled with ICT system. The Center's main function is wholesale trading envisaging regional exports as well as the regional trades. At the same time it is planned to accommodate functions of direct retail outlet and training of producers for cropping efficiency and diversification in association with post harvesting works and farming management. Associating accommodation facilities for buyers are planned to be established in the phase II period.

Collaboration between two centers is recommended for functional and spatial segregation. Tacloban is preferred to be rather intra-region wholesale/ retail outlet center while NEL Agri Pinoy Center is more emphasized in inter-region wholesale with production coordination and training functions. Mutually interactive development in operation/ management system for operation, buyer relation, production coordination, marketing and sales information/ data handling, farming training and research, and so on is desired.

2) **Utilizing Market for Agro-Fishery Industry Development**

Counting on the planned Babatñgon regional port (part of CRRP), the market could be expanded to the extent shown in the above map as Prospective Market Extension with establishment of Guiuan Food Terminal (proposed). At the same time the upgrading of the Guiuan Port is recommended for balanced development of the Area.

In connection with the being implemented new fishery port development in Tacloban, the approved construction of a new fishery port in Guiuan may play key function in the Market. The Tacloban fishery port shall be a trading center for domestic consumption of the region while the Guiuan fishery port is expected to be an exporting hub for the high value fresh marine products including migratory fishes, groupers, lobsters, crabs, abalones, and so on utilizing its serviceable airstrip.

Food processing industry development shall become possible by utilizing the market systems for wider capacity of consumption in and outside the region and strengthened raw material supply. Processing industries includes the high standard slaughterhouses with meat processing businesses. Eastern Visayas Regional Growth Center (EVRGC) as a PEZA economic zone can be a focal point for the development in conjunction with the Babatñgon regional port development.

3) **Further Utilization for Commodity Distribution**

The logistic infrastructures of the agro-fishery based regional market could be utilized for distribution of commodities imported from the upper-regional/ national economy centers. Wholesale and retail commercial linkages with logistic infrastructures including enhanced transport system may lower the prices of such commodities for the final clients i.e. local people.

Although it is ambitious establishment of regional integrated wholesale entities specialized to supply necessary commodity items to Sari-Sari Stores with wholesaler prices may reduce their sales prices to the customers.

(2) Agro/ Fishery Enhancement by Crop Diversification and Value Chain Fostering

Second direction is diversification of crops and agricultural activities with considerations for disaster resilience. The activities fall in the direction include not only simple transformation of coconut tree planting to the other trees and/ or crops including inter cropping but also linked cropping with or value chain creation of livestock/ fish-culturing business as well as the market linked cropping/ fishery/ agro-fishery industries stated in the previous section.

There are two approaches of intra community level linkages and inter local/ municipal linkages. Intra community approach is to link corn/ root crop producer within the community and swine/ poultry growers through an outside milling operator as a community development project, while the latter approach is to promote corn/ soy/ root crops production in locals and to connect the other locals' swine/ poultry growers through small scale milling business investments.

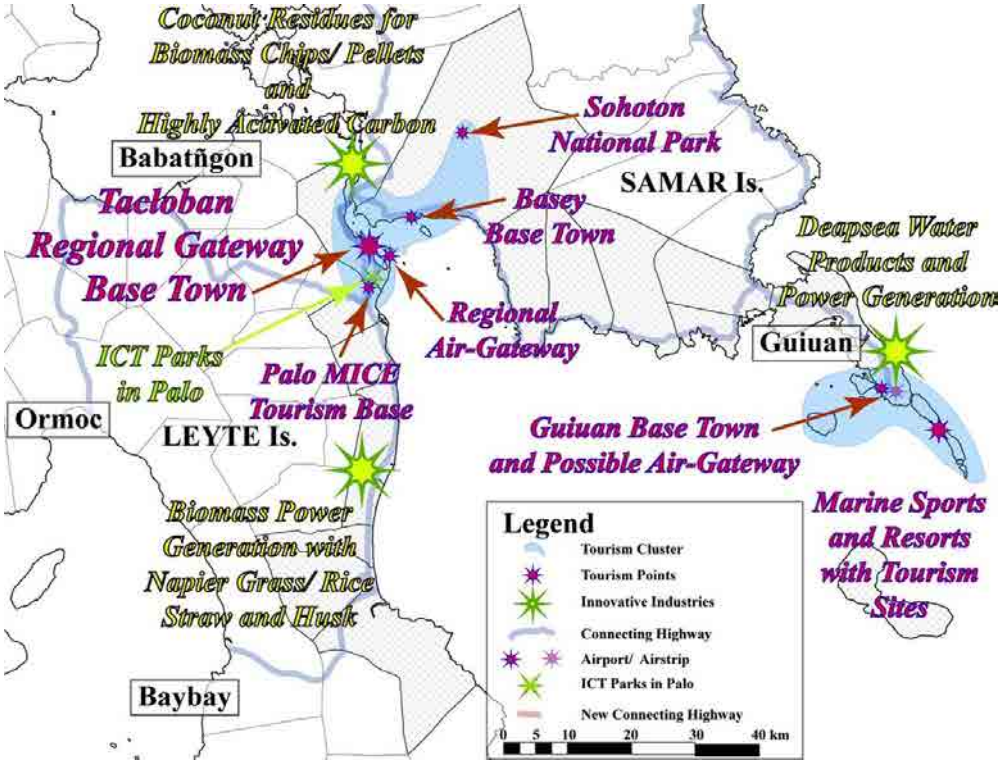
In Guiuan Philippines NGO called EcoWEB is conducting community linkage approach while BCR (Business Recovery/ Resource Center) established under PCCI (Philippine Chamber of Commerce and Industry) and DA are conducting the local-to-local approach.

(3) Coordinated Tourism Promotion and Development with Tacloban Gateway Town

Tourism promotion and development activities in the area have been planned and conducted independently by City/ Municipality in basic to establish closed set of tours within their jurisdiction. It is, however, much more attractive for the potential tourist visiting the area to conduct tour much more broader in terms of area, attractions, and experiences.

It is recommended to clarify the roles of the sub-areas and towns such as a) Gateway Base Town of Tacloban with gateway airport, b) Sohoton Geographical Scenery and Local Experience Short Trip Tourism with Base Town Basey, c) Marine Sports and Resort with Tourism Site with Base Town Guiuan, and MICE (Meeting, Incentive, Conference, and Exhibition) Tourism with Base Town Palo embracing regional NGA office agglomeration and provincial office complex (See chart 3).

Promotion of the sub-area tourism has to be in conjunction with the Gateway Base Town Tacloban. Then Tacloban has to promote the sub-area tours by its sake for own prosperity since the all the tourists may contribute in its economy in some manner.



Source: JICA Study Team

Figure 12.6-3 Tourism Clusters and Potentials for New Industries

(4) ICT Industry Promotion Utilizing ICT Infrastructure in Palo and Tacloban

ICT infrastructure is already well installed in the area covering integrated part of Tacloban and Palo as same potential performance as Cebu Metropolitan Area. Palo embraces 2 PEZA authorized ICT industrial parks with 1 outstanding BOC (Business Outsourcing Company). There was a seriously damaged call center building accommodated more than 700 employees in one of the ICT industrial park

Promotion of individual and SME (Small and Medium-sized Enterprise) ICT service provider could be an option aside from the alluring investments in industrial parks.

(5) Innovative Technology Based Industry Promotion

There are potentials, which are able to be tapped by use of innovative technologies. Following 3 resources are apparently subject to the innovative technology applications: 1) Coconut residues including fallen trees and their stamps as well as husks and shells for biomass energy source, chips/ pellets, and highly activated carbon, b) Rice husk and straws which are basically wasted currently, and napier grass, which is prospective variety for biomass production and as fodder crop, for biomass power generation, and c) Deep-sea water, which is colder and nutritious comparing with the surface-sea water, for heat-exchange power generation, and food and cosmetics taking the locational advantage of vicinity to Philippine Trench.

12.5.3 Re-development Direction

For materializing the above-mentioned re-development directions of the economy there are 4 issues for solving: 1) Uprooting of seriously damaged coconut trees, 2) Needs for scientific identification of crops for proper diversification, and 3) Coordinated regional planning between National-Regional, and City and Provincial-Municipal/ City, and 4) Utilization of Regional Academic Resources including Establishment of Testing Laboratories.

Brief explanations of the 4 issues are described below.

(1) Uprooting of Seriously Damaged Coconut Trees

Fallen tree disposal works have conducted successfully for the 200m widths areas along the national highways in the Area and been being conducted in further areas with more than 2,000 chainsaw operators under supervision of Barangays in Region VIII. Inter cropping promotion and re-planting activities have been conducted with some results.

Uprooting and disposal of the seriously damaged coconut trees' stamps are still untouched in basic. Full-scale diversification of the use of land previously covered by coconut trees and replanting of coconut trees require smooth surface land without stamps.

(2) Scientifically Identified Crops for Diversification

There have been arguments for the suitable crops for inter-cropping and crop diversification while scientific proves for suitability of prospective crops for the subject lands including marketability are rarely seen.

Although experiments are indispensable for the identification, identification of commercially prospective crops by scientific approaches natural conditions of the subject lands including soil, precipitation, temperature, winds and so on, in relation with characteristics of crops as well as their market demands in regional and national contexts may help farmers significantly in their decision of farming crops in advance to the experiments.

(3) Regionally Coordinated Planning Process

The coordinated efforts for re-development are indispensable to materialize the options especially for the Leyte Gulf Area, since the Area involves three provinces. At the same time planning framework of the Region is not directly connected with Provincial/ City plans. While the Provincial Plan reflects its jurisdiction's Municipal/ City plans in the manner like an aggregate of the plans, the Regional Plan is not necessarily to reflect the Provincial Plans.

This means that there are limited provincial level coordinating opportunities among Governments for common goals retaining their development opportunities within their jurisdiction. This is one of the major constraints for the Leyte Gulf Area for re-development.

Currently RDC (Regional Development Council) VIII has commenced the activities to overcome the above-mentioned problems in association with PCCI-EV (Eastern Visayas). The planning activities aiming preparation of RDP employing people inclusive development approach with measurements of objectively verifiable achievement indicators are being supported by PIDS (Phillipine Institute for Development Studies) in technical aspects and GIZ in financial. The activities include efforts to integrate provincial level development plans/ initiatives in to RDP.

(4) Utilization of Regional Academic Resources including Laboratory Establishments

Currently involvement of the regional academic entities such as state universities and colleges is limited though they have ample experiences and knowledge regarding local resources through their academic researches and pragmatic surveys including CBMS (Community Based Monitoring System) survey implementations.

Their experiences and knowledge may contribute in RDP achievement measurement including baseline surveys and study on identifying prospective crops for diversification. Their academic advantage has to be utilized for establishment of certified testing laboratories for facilitating shorter time requirements in attaining official certificates and experimental results for the areas include food quality and agricultural soil composition testing.

Chapter 13 Fisheries Sector

13.1 Existing Conditions of Fishing in Eastern Visayas (Region VIII)

In 2011, total volume of fish production in Eastern Visayas (Region 8) reached 209,778 metric tons (MT) or 4.2% of the country's fish production. At the provincial level, Leyte achieved the highest fish production among all provinces with 68,574 MT, followed by Eastern Samar with 53,739 MT, and Samar with 47,947 MT (National Statistical Coordination Board, 2012).

Table 13.1-1 Fish production by type and province in 2011 (in metric tons)

	Province						
	Leyte	Biliran	S. Leyte	Samar	N. Samar	E. Samar	Total
No. of coastal barangays	379	94	253	405	200	253	1587
No. of registered fisherfolk	18,582	3,167	10,004	16,774	4,344	16,774	60,284
Municipal fisheries prod'n	14,533	3,215	8,120	31,104	15,815	25,425	98,212
Commercial fisheries prod'n	28,657	3,266	4,664	6,384	2,734	15,524	61,229
Aquaculture prod'n	25,384	22	315	10,459	1,367	12,790	50,337

Reference: National Statistical Coordination Board (2012)
List of LGUs with Fisherfolk Registry as of November 28, 2013

Fisheries are classified into three sectors. The municipal fisheries (using bancas of 3 tons or less) produced 98,212 MT, while the commercial fisheries (using larger boats of more than 3 tons) and the aquaculture sectors were 61,229 MT and 50,337 MT, respectively. Aquaculture has expanded by almost three times in the last ten years (2002-2011). Aquaculture production in fresh-, brackish- and marine waters include those from fish ponds, fish cages and fish pens. Production of municipal and commercial fisheries slowed down as a result of a decline in fisheries resources (described below).

To date, the following species are being cultured in Region 8: milkfish (bangus), tilapia (tilapia), tiger prawn (sugpo), mud crab (alimango), grouper (lapu-lapu), siganid (samaral), catfish (hito), oyster (talaba), mussel (tahong) and seaweed (guso). Production contributed by seaweed (primarily Eucheuma) and milkfish was 63% and 24%, respectively. The bulk of seaweeds was absorbed by the local processors and export traders (National Statistical Coordination Board, 2012). Fresh milkfish is destined to local markets as post-harvest processing techniques are not widely used in Region 8. High value products like grouper and mud crab are brought to city markets like Manila and Cebu (Granali, pers. comm.).

Fugure 13.1-1 Milkfish sold at Tacloban market

Figure 13.1-2 Grouper buying station in Guiuan

The number of municipal fishing bancas in Region 8 was 58,068 in 2000. Of this total number, 28% were motorized, while remaining 72% were non-motorized (Philippine Fisheries Profile, 2011). Gill net, hook and line, fish corral are the most frequently used gear in municipal fisheries. The main target species are threadfin bream (bisugo), frigate tuna (tulingan), indo-pacific mackerel (hasa-hasa) and indian sardines (tamban) (Leyte Fisheries Profile).

For commercial fisheries, the number of vessels was 350 in 2007 (Philippine Fisheries Profile, 2011). Fishing gear being used are trawl, danish seine, ring net and bag net. Fish species being landed are yellowfin tuna (tambakol), skipjack (gulysan), spanish mackerel (tangigue) and indian sardines (tamban) (Leyte Fisheries Profile).

An attached agency to the Department of Agriculture (DA), the Bureau of Fisheries and Aquatic Resources (BFAR) Regional Office 8 functions as a technical arm involved in the conduct of research, formulations of policies and designing of fisheries programs and projects at the regional level. The Philippine Fisheries Development Authority (PFDA) implements the government program for the establishment and improvement of regional and municipal fish ports/landings, ice plant and cold storage and other post-harvest and marketing support facilities (CNFIDP, 2005).

13.2 Damages and losses due to Typhoon Yolanda

BFAR reported that 49,090 fisherfolks, consisting of those involved in capture fisheries, aquaculture and post-harvest, were affected by Typhoon Yolanda in Region 8. The most severely damaged provinces are Leyte and Eastern Samar. It was estimated that, in Leyte, 10,264 bancas and 24 commercial fishing boats were lost or destroyed by tidal waves, while 1,723 fish cages were washed out in Eastern Samar. Fisherfolk in Biliran, Southern Leyte and Samar have also lost fishing capacity due to damaged or lost fishing boats, fishing gears and aquaculture infrastructures (Food Security Cluster, 2014).

Table 13.2-1 Fisherfolk affected by Typhoon Yolanda

	Leyte	Biliran	S. Leyte	Samar	E. Samar	Regional total
Capture fisheries	10,648	391	0	1,654	8,369	21,062
Aquaculture	4,659	72	61	4,796	17,670	27,260
Post-harvest	656	10	0	20	132	818

Total	15,913	473	61	6,472	26,171	49,090

Food Security Cluster Net (accessed 2014-04-24)

The estimated total cost of damage of the fishery sector in Region 8 is about P1.66 billion, according to a Typhoon Yolanda Damage Report (BFAR, 2014). Of the five provinces in the region, Eastern Samar was most affected with an estimated cost of P648 million, followed by Leyte, Samar, Biliran and Southern Leyte.

Figure 13.2-1 Damaged fish cages (Brgy. Cambayan, Basey, Samar)

BFAR facilities were also badly hit by very strong winds, which blew off the roofs, and heavy rain coming through, soaking everything inside. The damage could cost P244 million. Yolanda-hit BFAR facilities are BFAR Regional Office, Guiuan Marine Fisheries Development Center, Regional Freshwater Aquaculture Production Center, Southern Leyte Provincial Fishery Office, Laoang Mariculture Park, Leyte West Fisherfolk Center, Carigara Fisherfolk Center, etc.

Figure 13.2-2 Hatcheries of Guiuan Marine Fisheries Development Center

For information on damages of fisheries and aquaculture in 18 municipalities in Leyte and Samar, see in Table 13.2-2.

Table 13.2-2 Typhoon Yolanda damage

Municipality/ City	Motorized Banca	Non-Motorized Banca	Commercial Fishing Boats	Mariculture Park	Seeweed Culture	Tilapia Hatcheries
【Leyte】						
Tacloban	500	500	○	○	○	
Palo	100	150				
Tanauan	300	600				○
Tolosa	200	300				
Dulag	200	350				
Mayorga	70	158				○
Mc Arthur	90	105				○
Javier	12	36				
Abuyog	77	122				

【Samar】						
Basey	15	250		○	○	
Marabut	20	180			○	
【East Samar】						
Lawaan	194	168				
Balangiga	184	11				
Giporlos	210	120				
Quinapondan	209	238				
Salcedo	242	314				
Mercedes	65	90				
Guiuan	4,020	4,020				

*Leyte and Samar are from Typhoon Damage Report received from BFAR Manila. East Samar is from Fisheries Profile of Province of Eastern Samar also received from BFAR Manila. Numbers are registered boats, not damaged boats.

13.3 Support for Typhoon Yolanda survivors

13.3.1 Bureau of Fisheries and Aquatic Resources (BFAR)

BFAR launched AHON (Rise in English) Project, an initiative to distribute basic boat-building materials like plywood, copper nails, epoxy, paint and engines to the affected fisherfolk. This project has been carried out under a public-private partnership (PPP), involving government agencies, NGOs, the private sector and individual volunteers to work together in addressing the immediate need of the fisherfolk. In an interview with JICA Project Team, Ms Melannie Guerra, National Coordinator, explained that AHON is targeting 32,000 boats of which 18,904 will be distributed in Region 8. As of April 11, 2014, 11,546 fishing boats (61%) are already delivered on the ground.

BFAR Director Asis Perez said that many of fisherfolk-beneficiaries have already resumed their fishing activities through AHON. BFAR will now cover post-harvest equipment, particularly freezers to help fisherfolk preserve their catch (Tuklasin Natin, 2014-03-26).

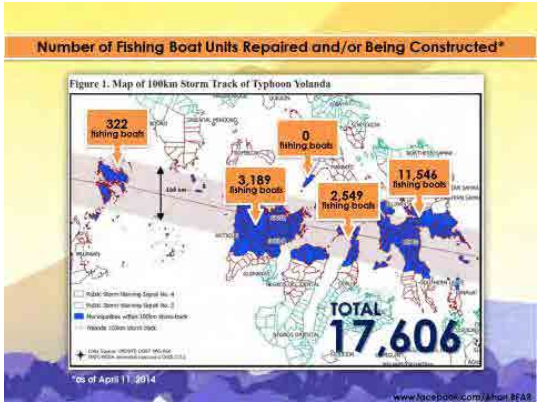


Figure 13.3-1 Number of fishing boats distributed through AHON (as of April 11, 2014)

Figure 13.3-2 Boat building (Brgy. Tagpuro, Tacloban)

13.3.2 Japan International Cooperation Agency (JICA)

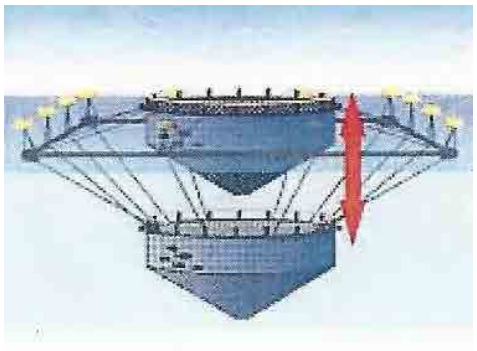
JICA's Urgent Development Study on the Project on Rehabilitation and Recovery from Typhoon Yolanda in the Philippines has extended an emergency assistance to fisheries sector in Region 8.

(1) Rehabilitation of Equipment for the Guiuan Marine Fisheries Development Center

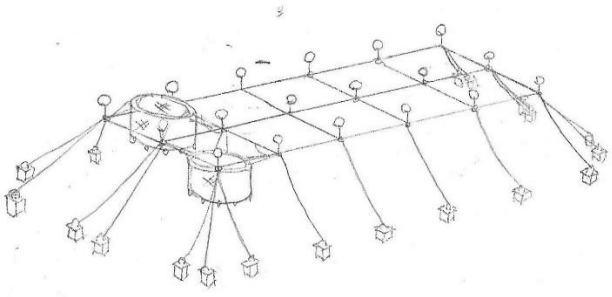
The project aims to rehabilitate the seed production activities at GMFDC by providing the damaged/loss equipment used in the hatchery/seed production operations. This covers the damaged/loss equipment at milkfish, blue swimming crab, abalone, sea cucumber, scallop and giant clam hatcheries; phycology (natural food production), fish health and environmental monitoring laboratory and seaweed tissue culture laboratory; regional seaweed nursery and Pearl Island experimental farms; and the administration. To fully operate, together with the rehabilitation of buildings and facilities, these equipment are vital for the immediate and continuous operation of abovementioned hatcheries and support-facilities.

(2) Rehabilitation of Basey Mariculture Park

The Basey Mariculture Park located in San Juanico Strait is one of the successfully managed Mariculture Parks in the Philippines. A total of 885 fishing families are directly dependent on the Mariculture Parks for their livelihood, thus when Typhoon Yolanda completely ravaged the area and destroyed all cages and other structures there, these fishing families and cage operators were totally left without livelihood and sources of income. Prices of milkfish went to as high as P180-200/kilo sourced from Davao compared to the pre-Yolanda prices of P100-120/kilo. The purpose of this project is to restore and improve the livelihood of fishing families by rehabilitation of Basey Mariculture Park. The different cooperating agencies will have a specialized sector to bring support to, such as the Food and Agriculture Organization (FAO) for post-harvest, processing and marketing, and JICA for the Japanese typhoon resistant technologies for mariculture and the technical trainings for fishing families. BFAR has also allocated funds for the basic structures (cages and mooring systems), fingerlings and feeds in cooperation with the Municipal Government of Basey.



Submersible cage



Gawabari

Figure 13.3-3 Japanese typhoon resistant technologies for mariculture (Nitto Seimo Co., Ltd.)

13.3.3 NGOs and Private Sectors

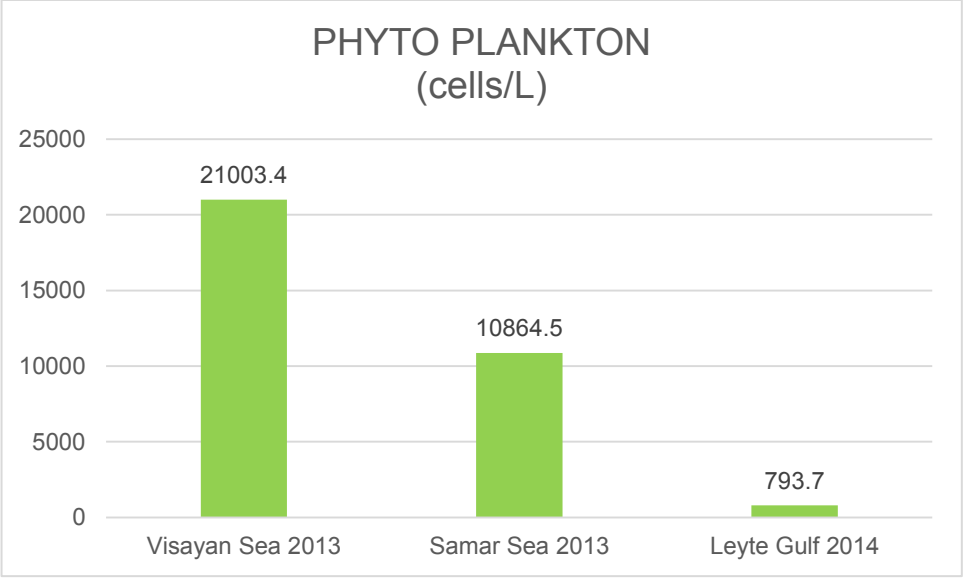
NGOs and private sectors are actively involved in fisheries rehabilitation work (mainly provision of fishing boats) in the Yolanda-hit areas. Names of NGOs and private sectors appearing in the food security cluster net are as follows: Christian Aid, Concern Worldwide, iRelief, Oxfam, International Rescue, Active Citizenship Foundation, World Renew, Triangle GH, CARE, International Institute of Rural Reconstruction, Food for the Hungry Philippines and Save the Children.

13.4 Issues

13.4.1 Fisheries Resources are Scarce in Leyte Gulf

Preliminary result of the Demersal (Trawl) Fisheries Assessment of Leyte Gulf conducted by M/V (Motor Vessel) DA-BFAR, the government research vessel, on March 17-25, 2014 indicates that fish biomass is at relatively low level (1.72 tons/km^2) in comparison to that in Visayan Sea (2.46 tons/km^2) and Samar Sea (2.88 tons/km^2). Two reasons are being raised by BFAR researchers.

1. Leyte Gulf typically has very low phytoplankton densities. This is probably because *there are few rivers* that *flow* into the Leyte Gulf. In general, low river flow can lead to low nutrient delivery, and as a result, low phytoplankton abundance.



Source: BFAR (2014)

Figure 13.4-1 River Flow into the Leyte Gulf

2. There is too much fishing effort. Since early 1990's, researchers have cautioned that Leyte Gulf is showing overexploitation characteristic. Legislative and institutional framework and policies have been improved with a view to managing the fisheries, but its enforcement remains a major problem.

BFAR is trying to adopt a precautionary approach to the management of both municipal and commercial fisheries in Leyte Gulf (Tumabiene, pers. comm.).

Box. 1 Leyte Gulf and Tokyo Bay
The average fish catch from Leyte Gulf in 1992-1995 was 36,587 MT (FAO, 2000). Tokyo Bay, as compared with Leyte Gulf, has less catch (20,000 MT). Tokyo Bay has an area of 1,320 square kilometers only, while Leyte Gulf is about 6,000 square kilometers or just under five times of Tokyo Bay. This indicates very low productivity at Leyte Gulf.

13.4.2 Middlemen and Low-value Fish Making Fisherfolks Poor

Among the many reasons why fisherfolks are always poor, one reason is the purchase prices offered by middlemen for marine products. The control of the distribution channels by middlemen creates a buyer's market. The low prices paid for marine products mean that the only way fisherfolks can secure a stable income is to increase the catch, causing the depletion of fisheries resources. Such livelihood improvement activities as group selling of marine products are necessary to build a stronger negotiation base. Another reason is a low-value fresh fish chain. For example, in Region 8, most milkfish is sold fresh to local consumers at the landing sites. To increase market value, post-harvest processing is needed. Milkfish could be canned or sold as "*boneless bangus*" which is very popular in Bulacan, Region 1.

13.4.3 Fisheries Infrastructures are Vulnerable to Typhoons

As mentioned earlier, fishing infrastructures such as fishing boats and fish cages along the coast of Leyte Gulf were totally or partially washed out by super typhoon (see the next page). Although Yolanda can be described as a once-in-a-hundred-years storm, typhoons hit the Philippines every year. Therefore, there is a need to develop new design that could withstand the typhoon storm conditions that impact the coastal regions of the Philippines. In this JICA Project, a proposal has been made to develop new aquaculture system that would include development of a submersible, typhoon-resistant fish cage and appropriate fish culture techniques.

Figure 13.4-2 Brgy. Tinaogan in Basey (2011-04-07)

Figure 13.4-3 Brgy. Tinaogan in Basey (2014-01-25)

13.5 Recovery and Reconstruction Directions

13.5.1 BFAR's Recovery and Reconstruction Plan

Fisherfolk in Region 8 need to be supported in the process of recovery and rehabilitation so as to regain their productive capacities, and so that the fisheries could rebound to their pre-Yolanda production levels. In order for this to materialize, BFAR has already developed strategies and action plan that includes immediate-, short- and long-term recovery for fisheries sector.

Immediate Term

- Inventory of fisherfolk and assessment of fisheries damages
- Distributions of food packs
- AHON Program (provision of materials for the repair of fishing boats)
- Replacement of engine and fishing gears
- Rehabilitation of cages in Mariculture Parks
- Rehabilitation of tilapia cages in Lake Bito, McArthur, Leyte
- Rehabilitation of women-related livelihood activities (seaweed farm implements, etc.)
- Provision of fiberglass fishing boats
- Purchase of IT equipment for the Regional Office

Short Term

- Operation and maintenance of Mariculture Parks
- Provision of patrol boats
- Fingerlings/seedstock distribution (high value & milkfish fingerlings)
- Distribution of fishing gears
- Distribution of fishing banca
- Reconstruction/rehabilitation of government facilities (BFAR 8 Regional Office, Guiuan Marine Fisheries Research and Development Center, Pearl Island)

Long Term

- Rehabilitation and establishment of infrastructure and post-harvest facilities (fishing ports, ice plants, fishery products value-adding facilities)
- Assessment of ecological habitats (mangrove, coral reefs and seagrass beds)
- Rehabilitation of fish sanctuaries

The need for fishing boats has been considered a high-priority and thousands of boats have already been built/repaired under the AHON Program. NGO activities have also concentrated on fishing boats. However, these projects are seemingly uncoordinated. Piecemeal efforts to provide fishing boats to coastal fisherfolk may be good for emergency assistance but could be harmful in the long run because of the possibility of overfishing.

13.5.2 JICA's Cooperation for Fisheries Rehabilitation

Taking the low abundance of fish in Leyte Gulf into consideration, mariculture development

should be one area of priority assistance. Thus, the JICA Project Team is currently working on the following mariculture projects:

- Rehabilitation of Equipment for the Guiuan Marine Fisheries Development Center
- Rehabilitation of Basey Mariculture Park
- Sustainable Grouper Cage Culture using Disaster Resilient and Environmentally-Friendly Technologies

The characteristics of the JICA projects include:

- Restore and improve the livelihood of fishing families by rehabilitation of mariculture
- Bring Japanese typhoon resistant mariculture technology to substantiate the concept of "Build-Back-Better"
- Create opportunities for fisherfolk (including women) to work on marketing, processing and value-adding of fish
- Reduce the dependence on the utilization of wild juveniles and trash fish
- Design the project with special consideration on easiness in operation and maintenance as well as reduction in operational cost

This approach has been evaluated highly by DA, BFAR, Donor Working Group and other quarters, drawing attention as a model of fisheries cooperation.

13.5.3 Other Recommendations

In addition to the mariculture development, recovery and reconstruction efforts must include re-establishing marine protected area, releasing effort of fingerlings in the Leyte Gulf, developing the capacity of fisherfolk leaders and organization members, and awareness raising and training in fisheries management. FAO, the UN Food and Agriculture Organization, is stressing that any fisheries and aquaculture response in the Philippines must follow sustainable and good management practice (FAO Urgent Appeal).

Chapter 14 Agriculture Sector

14.1 Existing Conditions of the Agriculture Sector

14.1.1 Overall of the Sector in Eastern Visayas (Region 8)

(1) Topography and Climate

The islands of Leyte, Samar are characterized by flat lands near and along the coastlines, and mountains and hills in the interior. It has Types II and IV climates, both of which are defined by wet or rainy weather in most of the year. Both climates are ideal for agricultural production.

A majority (61%) of the region's lands is forest land and the rest is alienable and disposable. Of the region's provinces, Leyte has the biggest alienable and disposable lands while Samar has the biggest forest lands. More than a third (39%) of the region's land has a slope of 0%-18%, these areas being described as from level to rolling. Meanwhile, a majority (51%) has slopes ranging from 18% to 50%. The rest has slopes in excess of 50% and is protected forest lands.

Leyte Province: The terrain of Leyte Province is relatively flat to gently rolling and becoming mountainous and rough towards the center where a mountain range begins. This cordillera divides the province into its eastern and western plains. Peaks of approximately 2,300 to 3,300 feet high extend from north to south.

Samar Province: The Physical environment of Samar Province includes almost every kind of topography: mountains, forests, rivers, lakes, plains, coasts and islands. It has a much lower highland system compared to other provinces. The central upland core is formed from a broad plateau with local relief sight ranging from 700 to 1,000 feet. Numerous streams in the island have cut sharp valleys on the surface of this plateau and the overall landscape is hilly and rugged.

Eastern Samar Province: The interior part of the Eastern Samar Province is rough and hilly and covered with dense tropical vegetation but drained by numerous rivers and creeks. Mountain ranges and peaks abound in an interior. The highest among them located at the northwestern part of the province is at 2,600 feet above sea level. Narrow plains are in most of the coastal areas and in some instances the banks of its principal rivers and their tributaries. Most of the coastal towns are located on narrow deltaic plains.

The climate of the Philippines, though not the same throughout the country due to diversified geographical features, can be said to be broadly representing a rainy season between July and October, a dry season between December and May and a period of variable climate in June and November. Climatically, the Philippines can be broadly classified into four types of regions as follows;

Type I: The region where the dry season (Nov.-Apr.) and the wet season (May-Oct.) are district; the west part of Luzon Island and the west part of Visayan Islands.

Type II: The regions where there is no distinct dry season but a pronounced maximum rainfall from November to January; South eastern coastal areas of Luzon island, entire Samar Island, Eastern half of Leyte Island and eastern part of Mindanao Island.

Type III: The regions where there is short dry spell from November to April but without a distinct rainy season; Central Part of Luzon Island, western part and central coastal part of Mindanao Island.

Type IV: The regions without A DISTINCT DRY SEASON AND PRONOunced maximum rainfall; Eastern plains of Luzon Island, coastal areas of Visayan Islands and central part of Mindanao Island.

The region of Eastern Visayas falls under Type II and IV of above classification. Although there is no distinct dry season nor a wet season, rainfall is relatively a little from April to August and significantly high from November to February.

(2) Geological Features

The Basic topography of the Philippine islands is considered to have been formed as a result of repeated tectonic activities. The Philippine Fault which extends from Luzon Island through Leyte Island to Mindanao Island was formed during the Tertiary Period. Leyte Island is inferred to be a product of magmatic and tectonic movements and upheavals of the Philippine Sea Plate.

Leyte Island: In Leyte, cretaceous volcanic rocks generated by these plate actions are observed and these are overlain by intercalated shale, sandstone, chert and other sedimentary rocks. Intrusion of serpentinized peridotite and associated gabbro has occurred during the Paleocene to Eocene time. These basement rocks are unconformably overlain by Early to Middle Miocene San Ricardo Formation which consists of conglomerate, sandstone, shale, lime stone and intercalated volcanic flows. Dikes of andesitic composition have intruded this formation at a later stage. The San Ricardo Formation occupies the low ridge along the western side of Tacloban City and extends up north to the vicinity of Cabalawan. The Upper Miocene to Pliocene Bagahupi Formation which overlies the San Ricardo Formation unconformably is composed of conglomerate, sandstone and marly, tuffaceous shale beds. The Pliocene to Quaternary Dolores Formation covers the slopes of volcanic cones, and its general development in a radial pattern is evident particularly along the eastern slope of Mt. Lobi at Dagami Burauen area. This formation is composed mainly of pyroclastic rocks and the Quaternary volcanoes that occur within the Central Highlands are mainly of andesite. Alluvial and beach deposits consist of clay, silt, sand and gravel with some boulders at the upstream area.

Samar Island: The geology of Samar Island is characterized by an extremely varied physiography, due probably to its complex mountain building process involving a series of differential diastrophisms. The central highlands with marked accordant peaks, is almost surrounded by karst topography where sinkholes of different dimensions are widespread while the coastal area is noted

for its gently rolling terrain. The central highlands of Samar consist of peneplaned surface that has attained a minimum elevation of 600m above sea level. It is made up principally of na igneous complex intercalated with slightly metamorphosed rock, dated as Cretaceous-Paleogene. As indicated by the presence of a thick mantle of laterite soil, the igneous rocks have been subjected to intense mechanical and chemical weathering. The drainage systems in the area deeply incised into the bedrock characteristic V-shaped valleys and broad-crested ridges. Most of the river courses are structurally controlled. The lime stone that rims the central highlands displays various karst formations. This is evidently shown because of the presence of numerous sinkholes, caves adorned by stalagmites and stalactites in the early stages of formation, and underground solution channels. Various sinkholes of different dimensions have relatively flat bottoms with steep walls and are filled with reddish to yellowish brown soil. Some valleys of the main drainage systems are filled with soil and at times accumulated to a thickness of about 10 meters. The coastline of Samar is very irregular. Along the northwestern areas, where relatively older rock types are exposed, steep walls define the coastline. Low rolling hills with elevation rarely exceeding 300 meters above sea level, characterized the coast parts of the island. It is underlain by a thick sequence of gently folded with shale, silt stone and thin beds of calcarenite.

The lithographic units of Samar are classed under two general rock groups: 1) the group of igneous rocks of Cretaceous-Oligocene age, comprising the island's core; and 2)the clastic and non-clastic sequence of rocks dated from early Miocene to Pliocene, found surrounding the core.

(3) Soil Type

Topographic variations characterize the region due to its archipelagic nature. The geographical history of the archipelago shows that the islands are actually the peaks of mountains uplifted from the seafloor by horizontal pressure exerted by the Indo-Australian plate on the eastern borders of the Philippine plate during the Miocene Period. Other peaks are volcanic in origin. The region is fully exposed to the typhoons from the Pacific and hard rains which have formed the landscape. The background of the formation of soils depends on the geographical profiles and parent rock.

The table and the map below show existing soil types along Leyte Gulf.

Table 14.1-1 Soil Type along Leyte Gulf

Province	Soil Type
Leyte	San Manuel Silt loam, San Manuel fine sandy loam, Umingan clay loam, Pawiing fine sandu lam, Palo clay loam, Tacloban clay, Obando fine sand, Luisiana clay, Hydrosol
Samar	Catbalogon clay loam, Faraon clay, Mountain soil, Tacloban clay loam, Dolongan lamy sand, Tingib clay loam, Catbalogon-Tingib complex, Hydrosol, Beach sand
Eastern Samar	Bolinao clay, Luisiana clay, Quingua clay loam, Hydrosol, Umingan loam, Maydolong sandy clay loam, San Mannuel clay loam, Tacloban clay loam, Mountain soil

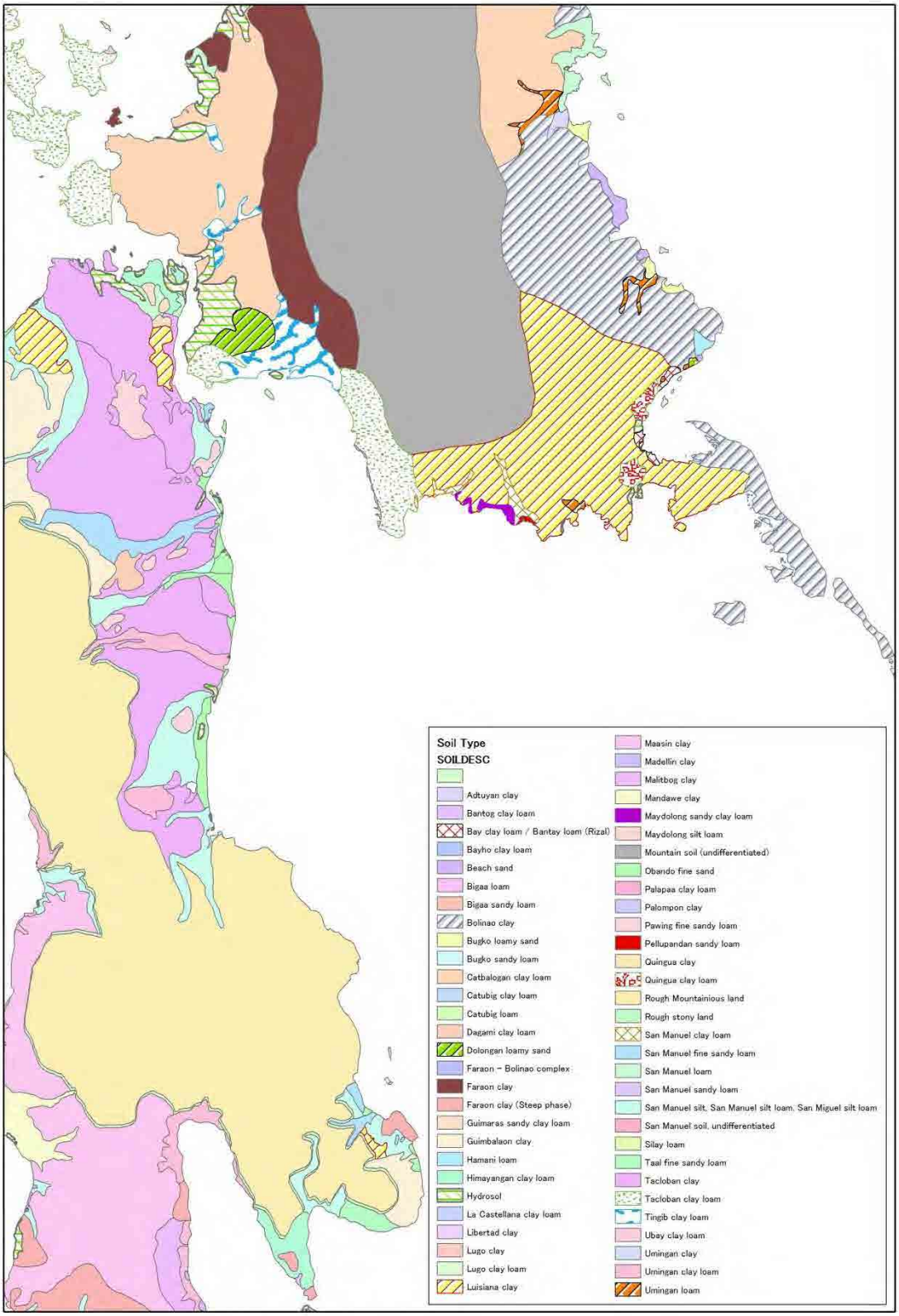


Figure 14.1-1 Soil Map along Leyte Gulf

(4) Farms and Land Use in Eastern Visayas

Eastern Visayas is an agricultural region. More than half of its population directly and indirectly earn livelihood from agriculture. The sector derives 20.5 % of the economy in the region.

According to the 2002 Census of Agriculture and Fisheries, Eastern Visayas registered 330.1 thousand farms for agricultural use, covering 723.0 thousand ha. The region's total agricultural land area comprised 32.5 % of the region's total land area. As the number of farms in the region increased by 2.9 % and the corresponding farm area by 3.9 % over the 1991 estimates, the average farm size slightly increased, from 2.16 ha per farm in 1991 to 2.19 ha per farm in 2002.

Among the provinces in Eastern Visayas, Leyte shared the highest number of farms with 136.2 thousand, covering 258.6 thousand ha of agricultural land. In fact, the total farms in the province accounted for 41.2 % of the total farms in the region. The agricultural land comprised 35.8 % of the total land area of the province. Biliran [1], on the other hand, had 12.4 thousand farms covering 19.5 thousand ha of land. These two provinces combined registered 148.6 thousand farms and 278.1 thousand ha, lower than the 1991 estimates by 4.0 % and 4.8 %, respectively.

Samar ranked second with 57.0 thousand farms, covering 102.0 thousand ha, while Northern Samar came in third with 49.9 thousand farms, covering 179.5 thousand ha.

[1] Biliran: formerly a sub-province of Leyte, it became an independent province in 1992.

Table 14.1-2 Number and Area of Farms by Province: Eastern Visayas, 1991 and 2002

Province	2002	1991
Eastern Visayas		
Number of Farms	330,750	321,456
Area of Farms (ha)	723,048	695,711
Eastern Samar		
Number of Farms	35,856	29,848
Area of Farms (ha)	101,255	77,001
Leyte (including Biliran)		
Number of Farms	148,598	154,805
Area of Farms (ha)	278,115	292,197
Leyte (excluding Biliran)		
Number of Farms	136,209	
Area of Farms (ha)	258,632	
Biliran		
Number of Farms	12,389	
Area of Farms (ha)	19,483	
Northern Samar		
Number of Farms	49,886	41,656
Area of Farms (ha)	179,503	152,445
Samar		
Number of Farms	57,033	53,168
Area of Farms (ha)	101,954	104,913
Southern Leyte		
Number of Farms	39,377	41,978
Area of Farms (ha)	62,220	69,155

Source: National Statistics Office:
1991 Census of Agriculture and Fisheries
2002 Census of Agriculture

Table 14.1-3 Number and Area of Farms by Main Use of the Land and Province: 1991 and 2002

Main Use of Land	Region 8			Biliran	Eastern Samar		Leyte		Northern Samar		Samar		Southern Leyte	
	2002	1991	% change	2002	2002	1991	2002	1991	2002	1991	2002	1991	2002	1991
Number of Farms														
All Classes	575,025	540,192	6.4%	22,044	60,794	51,750	233,709	239,997	88,193	75,191	94,840	93,834	75,445	79,317
Homelot	207,599	139,995	48.3%	8,486	19,026	13,052	88,984	51,386	28,331	20,921	31,948	29,420	30,824	25,216
Under Temporary Crops	179,329	201,242	-10.9%	7,248	16,722	16,428	81,199	104,153	20,004	19,987	37,851	39,437	16,305	21,236
Under Permanent Crops	182,616	191,217	-4.5%	6,105	24,502	21,877	61,348	80,386	38,641	32,854	24,442	23,770	27,578	32,330
Temporarily Fallow	840	2,051	-59.0%	9	92	117	449	1,417	82	111	129	256	79	150
Under Temporary Meadows and Pasture	544	1,100	-50.5%	35	45	70	272	415	51	40	89	421	52	154
Under Permanent Meadows and Pasture	520	379	37.2%	4	29	27	147	223	247	27	25	27	68	75
Woodland and Forest (Not Commercial)	576	1,138	-49.4%	4	74	29	132	179	179	625	67	140	120	64
All Other Lands	498	3,070	-83.8%	10	61	150	209	1,838	35	626	71	363	112	92
Not Reported	2,503	0	-	143	243	0	969	0	623	0	218	0	307	0
Area of Farms (ha)														
All Classes	725,311	695,711	4.3%	19,483	101,254	77,001	260,520	292,199	179,856	152,445	101,705	104,913	62,220	69,154
Homelot	34,945	3,305	957.3%	1,213	4,771	268	17,206	1,435	2,917	457	4,986	474	3,851	671
Under Temporary Crops	229,405	248,391	-7.6%	6,346	25,471	21,633	99,859	129,088	43,362	38,191	44,037	46,706	10,059	12,773
Under Permanent Crops	439,299	428,071	2.6%	10,784	69,868	53,452	129,989	155,304	130,074	109,149	51,350	55,254	47,233	54,912
Temporarily Fallow	1,417	2,618	-45.9%	7	140	196	763	1,665	141	145	256	405	110	207
Under Temporary Meadows and Pasture	1,296	2,165	-40.1%	11	41	195	778	479	121	156	154	1,069	190	267
Under Permanent Meadows and Pasture	8,022	2,827	183.8%	920	117	145	6,089	2,374	709	59	66	64	121	185
Woodland and Forest (Not Commercial)	2,320	6,152	-62.3%	10	235	845	440	776	886	3,895	456	538	294	99
All Other Lands	4,320	2,182	98.0%	11	174	267	3,903	1,078	62	393	103	403	67	40
Not Reported	4,287	0	-	181	437	0	1,493	0	1,584	0	297	0	295	0

Source: National Statistics Office:
1991 Census of Agriculture and Fisheries
2002 Census of Agriculture

(5) Agricultural Production in Eastern Visayas

1) Major crops

Before Typhoon Yolanda struck, Eastern Visayas was the 8th largest rice producing region (5.5 % of national production, 2012) and the 3rd largest coconut producer (11.2%, 2012) in the country, with 285,000 ha of rice field and 46 million bearing coconut trees growing on 420,000 ha.

This Coconut farm land occupies 58 percent of agricultural land area in Eastern Visayas and almost 1.7 million people depend on the industry. And intercrops under coconut palm trees were also important, ranking 2nd largest producer for abaca (28.0 %, 2012), 5th for banana (6.72 %, 2012) and 1st for sweet potato (24.4 %). These crops traditionally protect farmers' income from the highly fluctuating copra prices, which are generally low.

The situation on production of major crops in the region in 2012 is shown the table below. Two major crops in the region are coconut and rice.

Table 14.1-4 Cultivated Area, Volume of Production and Value by Crop (2012)

Crop	Eastern Samar		Leyte		Samar		Eastern Visayas			Pjilippines		
	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Area (ha)	Production (ton)	Value ('000 peso)	Area (ha)	Production (ton)	Value ('000 peso)
Temporary Crop												
Rice	21,054	59,413	133,090	521,115	54,698	140,529	285,394	994,972	7,969,710	4,689,960	18,032,422	151,111,760
Corn	250	593	40,328	55,392	6,656	9,133	61,699	87,333	571,140	2,593,825	7,377,076	49,033,280
Water melon	8	39.7	50	300.4	34	244.0	110	775.5	--	6,240	105,040.9	--
Squash	77	187.5	146	805.2	98	257.9	393	2,210.2	--	12,868	222,584.1	--
Sweet potato	2,274	7,296.8	4,872	62,068.7	3,647	7,254.2	24,655	123,349.9	726,530	100,736	516,365.5	2,406,330
Cassava	2,173	15,471.7	7,022	37,366.1	4,440	9,808.0	21,441	81,918.1	326,860	217,978	2,223,144.3	7,958,810
Gabi	30	214.2	1,378	7,048.2	473	4,771.3	4,566	22,113.3	--	16,352	111,481.9	--
Ubi	24	44.7	133	621.7	30	12.5	241	947.4	--	2,622	15,799.3	--
Ginger	10	37.3	181	1,556.9	40	190.9	284	2,206.4	--	4,004	27,630.9	--
Bitterv Squash	12	34.8	170	726.1	38	130.0	297	1,196.4	--	10,893	87,059.2	--
Kangkong	10	24.7	168	6,900.1	62	1,995.0	366	9,732.4	--	6,963	77,408.1	--
Mongo	12	11.7	372	232.7	22	7.4	436	270.6	5,850	44,324	32,364.5	735,450
Peanut	49	20.6	479	257.7	216	187.0	849	579.1	13,980	26,108	29,133.9	515,780
String bean	16	10.5	296	1,408.5	25	78.8	392	1,911.4	--	14,200	117,243.1	--
Abaca	2,875	401.0	13,020	6,606.7	2,128	1,382.4	37,780	19,190.9	446,550	138,523	68,510.5	1,279,080
Banana	1,434	5,708.4	6,328	51,456.2	4,965	116,236.8	30,542	280,439.1	1,046,040	454,179	9,225,998.0	39,118,240
Pinapple	32	592.7	178	1,990.7	275	4,236.5	583	7,456.6	57,960	58,442	2,397,627.6	16,207,980
Permanent Crop												
Coconut	62,357	274,851.9	167,973	676,021.1	50,510	292,607.4	419,540	1,771,459.4	6,979,550	3,573,806	15,862,385.8	32,517,880
Cacao	35	23.1	56	16.3	15	2.3	334	114.4	--	9,338	4,831.1	--
Mango	86	80.2	251	450.1	34	44.5	910	882.7	13,940	188,617	768,234.5	13,974,290
Papaya	98	924.3	93	876.7	32	538.3	474	3,109.4	--	8,564	164,820.5	--

Source: Statistical Database on website of Philippine Statistics Authority

The cropping calendar in the region is indicated in the following figure.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rice, irrigated	----------	----------	----------	□□	○...	.....×--	----------	----------	----------	□□	○...	...--...×----
Rice, rainfed/upland			○---	----------	----------	----------	----------	----------	□□			
Corn					○------	------- ○------	□□ ------- ○------	□□ -------	□□			
Coconut	----------	----------	□□□	----------	----------	□□□	----------	----------	□□□	----------	----------	□□□
Banana	all season, maturity: 8-9 months after transplanting											
Pineapple	----------	----------	--□□□	□□□□	□□□□	□□□--	----------	----------	----------	----------	----------	----------
Mango	----------	----------	----------	--□□□	□□□□	□□□□	□□□--	----------	----------	----------	----------	----------
Jackfruits	----------	----------	----------	----------	--□□□	□□□--	----------	----------	----------	----------	----------	----------
Rambutan	----------	----------	----------	----------	----------	----□□□	□□□□	□□□□	□□□--	----------	----------	----------
Durian	----------	----------	----------	----------	----------	----------	----------	--□□□	□□□□	□□□□	□□□--	----------
Mungbean		○○	○○--------	------□	□□□ ○○	○○--------	--------□	□□□	○○	○○--------	------□	□□□
Bitter squash	all season, maturity: 60-75 days after sowing											
Kangkong	all season, maturity: 30-50 days after sowing											
Gabi	all season, maturity: 6-12 months after transplanting											
Sweet potato	all season, maturity: 90-120days after transplanting											
Ginger	□□□□	□□□□	□□□□	××	××--------	----------	----------	----------	----------	----------	----------	----------

○ sowing ・・・ nursery × transplanting □ harvest

Figure 14.1-2 Cropping Calendar in Eastern Visayas

2) Major livestock

Livestock production is also an important agricultural activity in rural areas in the Eastern Visayas. Livestock rearing is an integrated activity of the economic structure at farm and village level and it largely contributes to food security, rural income and to the efficient use of the local natural resources by use of local biomass for feeds and nutrient recycling through animal manure.

The dominant livestock raised in Eastern Visayas is hog. A total of 170.6 thousand farms reported to have reared 421.0 thousand hogs. In terms of the number of hogs reared, the figure decreased by 12.9 % as compared to 1991 hog population.

Carabao raising ranked second with 215.3 thousand heads tended, showing an increase over the 1991 figure (169.9 thousand heads). Goat raising ranked third with 40.2 thousand heads, experiencing a 22.4 % decrease over the 1991 figure.

Hog raising was also the top livestock activity in all provinces of Eastern Visayas, with Leyte

sharing the highest number of hogs tended (50.3 % of the region). Carabao raising ranked second in all provinces.

Table 14.1-5 Number of Farms with Livestock and Number of Livestock Reared or Tended as of March 2003 by Type of Livestock and Province, Eastern Visayas, 1991 and 2002

Livestock	Eastern Visayas		Eastern Samar		Northern Samar		Samar		Southern Leyte		Leyte (excluding Biliran)	Biliran	Leyte (including Biliran)	
	2002	1991	2002	1991	2002	1991	2002	1991	2002	1991	2002	2002	2002	1991
Carabaos														
Number of Farms Reporting	80,632	98,195	7,385	8,699	14,132	13,355	11,477	11,768	6,137	8,644	38,853	2,648	41,501	55,729
Number of Carabaos	215,343	169,922	18,957	21,431	62,036	31,027	18,129	18,381	9,853	12,808	102,507	3,861	106,368	86,275
Cattle														
Number of Farms Reporting	12,947	10,869	999	1,144	1,137	800	292	339	2,479	2,105	6,674	1,366	8,040	6,481
Number of Cattle	32,188	26,426	2,427	2,433	3,058	1,878	684	782	5,101	4,088	17,388	3,530	20,918	17,245
Horses														
Number of Farms Reporting	2,889	3,265	14	57	135	111	22	94	803	644	1,823	92	1,915	2,359
Number of Horses	4,447	4,838	26	82	217	168	22	159	1,260	870	2,790	132	2,922	3,559
Hogs														
Number of Farms Reporting	170,646	214,598	14,280	17,072	29,902	29,515	26,572	30,829	18,215	30,251	74,877	6,800	81,677	106,931
Number of Hogs	420,975	483,370	28,816	34,480	62,690	64,034	57,546	56,622	43,743	66,914	211,753	16,427	228,180	261,320
Goats														
Number of Farms Reporting	11,430	19,984	203	599	668	1,534	429	1,188	1,194	2,598	8,263	673	8,936	14,065
Number of Goats	40,198	51,788	1,279	1,671	2,814	4,912	1,505	2,688	3,410	6,322	29,435	1,755	31,190	36,195
Other Livestock														
Number of Farms Reporting	820	409	76	47	110	32	240	21	92	47	266	36	302	262
Number of Livestock	4,600	2,840	196	134	365	75	588	61	287	93	2,987	177	3,164	2,477

Source: National Statistics Office:
1991 Census of Agriculture and Fisheries
2002 Census of Agriculture

Raising of chicken was the primary poultry raising activity in Eastern Visayas. About 222.3 thousand farms reported to have raised 4.1 million chickens in the region. In terms of the number of chicken raised, the 2002 level is almost twice as the 1991 inventory.

Raising of ducks ranked second with 9.0 thousand farms reporting to have raised 125.3 thousand ducks. This registered a 40.4 % decrease over the 1991 figure of 210.2 thousand heads. Similarly, quail raising slightly decreased to 532 farms reporting but increased to 9.8 thousand in terms of headcount in 2002.

Among the provinces in the region, Leyte had the largest contribution (40.1 %) to the total chicken population, followed by Northern Samar (24.6 %), and Samar (13.0 %).

Table 14.1-6 Number of Farms with Poultry and Number of Poultry Reared or Tended as of March 2003 by Type of Poultry and Province, Eastern Visayas, 1991 and 2002

Type of Poultry	Eastern Visayas		Eastern Samar		Northern Samar		Samar		Southern Leyte		Leyte (excluding Biliran)	Biliran	Leyte (including Biliran)	
	2002	1991	2002	1991	2002	1991	2002	1991	2002	1991	2002	2002	2002	1991
Chicken														
Number of Farms Reporting	222,326	229,001	19,284	17,160	32,386	28,690	34,684	32,751	26,493	31,506	100,503	8,976	109,479	118,894
Number of Chicken	4,144,060	2,542,577	169,092	154,191	1,020,441	269,421	536,821	261,952	267,244	303,193	1,661,561	488,901	2,150,462	1,553,820
Ducks														
Number of Farms Reporting	9,031	19,108	428	665	1,246	2,173	795	1,626	858	2,135	5,382	322	5,704	12,509
Number of Ducks	125,324	210,208	2,549	4,393	6,689	11,762	4,610	8,728	11,868	40,650	95,160	4,448	99,608	144,675
Quails														
Number of Farms Reporting	532	567	58	10	79	33	68	31	40	14	262	25	287	479
Number of Quails	9,767	6,670	427	133	1,269	209	929	341	220	62	6,824	98	6,922	5,925
Geese														
Number of Farms Reporting	65	1,239	7	38	21	77	0	50	16	72	21	0	21	1,002
Number of Geese	364	9,723	73	182	130	345	0	326	56	328	105	0	105	8,542
Turkey														
Number of Farms Reporting	98	4,331	10	64	0	374	0	162	73	226	12	3	15	3,505
Number of Turkey	779	21,816	139	320	0	1,389	0	807	387	1,316	232	21	253	17,984
Pigeons														
Number of Farms Reporting	21	2,019	14	84	0	389	0	306	4	105	3	0	3	1,135
Number of Pigeons	224	18,679	133	535	0	2,319	0	2,160	16	1,306	75	0	75	12,359
Other Paultry														
Number of Farms Reporting	36	313	0	35	6	32	0	31	12	27	15	3	18	188
Number of Paultry	585	3,507	0	125	31	871	0	237	132	85	122	300	422	2,189

Source: National Statistics Office:
1991 Census of Agriculture and Fisheries
2002 Census of Agriculture

(6) Infrastructure for Agricultural Production

Irrigation is an indispensable means for producing agricultural crops. In 2013, Eastern Visayas had irrigated area of 67.4 thousand ha, or 80.2 % of the total irrigable agricultural land. The most common irrigation system used by farms in Eastern Visayas was the communal system of irrigation that covered 37.0 thousand ha of land. Next to this was the national irrigation system, supplying water to 20.9 thousand ha of lands. There were other irrigation systems used by farms in Eastern Visayas such as waterwheels or other ways, which supplied water to 9.5 thousand ha.

Table 14.1-7 Status of Irrigation Development based on As of December 2013

Province	Estimated Total Irrigable Area (ha)	Firmed-up Service Area (ha)					Irrigation Development
		Ntional Irrigation System	Communal Irrigation System	Pivate Irrigation System	Other System	Total	
Region 8	**84,081**	**20,883**	**37,031**	**6,197**	**3,286**	**67,397**	**80.2%**
Leyte	55,379	18,287	18,891	4,521	2,323	44,022	79.5%
Eastern Samar	4,070	-	6,451	-	-	6,451	158.5%
Northern Samar	10,860	800	3,756	-	452	5,008	46.1%
Southern Sama	5,690	386	4,553	1,286	497	6,722	118.1%
Samar	8,082	1,410	3,380	390	14	5,194	64.3%

Source:
National Irrigation Administration

The Maharlika Highway links Samar to Luzon and Mindanao with barges available in Allen, Northern Samar crossing San Bernardino Strait to Bicol in going north. On the other hand, passage to Mindanao is through Tacloban City with a ferryboat ride in Liloan, Southern Leyte in crossing to Surigao.

Leyte's roads are generally of concrete-cemented conditions with a total road length of 3,158 km. The main artery is 830 km which includes 474 km of national and 474 km of provincial roads. Along the road system, there are bridges totaling 12,153 meters of which 10,596 meters are national and 1,557 meters are provincial bridges.

The road network in Samar Province is 903 km long. Bridges connecting the national and provincial roads have a total length of 3,633 lineal meters made of steel, 1,425 lineal meters of concrete, 64 lineal meters of bailey and 97 lineal meters made of timber.

On the other hand, the farm road network is not well developed. It makes difficult to access the markets or middlemen especially for coconut producers.

(7) Agricultural Operator

There were more male operators engaged in agricultural operations than females. In 2002, male operators (290.3 thousand) accounted for 87.8 % of the total agricultural operators in the region.

Majority of the operators in the region (55.2 %) belonged to the 30 to 54 year age group.

Table 14.1-8 Number of Agricultural Operators by Age Group and Sex: Eastern Visayas, 2002

Age Group	Total	Male	Female	Not Reported
All Age	**330,750**	**290,289**	**36,017**	**4,444**
15 - 19	887	837	38	12
20 - 24	8,594	8,198	304	92
25 - 29	21,432	20,464	730	238
30 - 34	31,594	29,705	1,547	342
35 - 39	36,950	34,502	2,083	365
40 - 44	39,059	35,762	2,875	422
45 - 49	37,810	34,166	3,301	343
50 - 54	36,997	32,545	4,036	416
55 - 59	31,062	26,486	4,221	355
60 - 64	31,300	26,015	4,990	295
65 - 69	23,406	18,704	4,423	279
70 - 74	15,896	12,100	3,641	155
75 and over	13,645	9,818	3,673	154
Not Reported	2,118	987	155	976

Source: National Statistics Office: 2002 Census of Agriculture

Household members of the agricultural operators were asked if they were engaged in any agricultural activity, whether in their own holding, in other holding or both.

In 2002, a total of 425.0 thousand household members were engaged in agricultural activities. Of this number, 360.4 thousand (84.8 percent) were employed in own holding, 39.3 thousand (9.2

percent) both in own holding and in the holding of others, and 25.4thousand (6.0 percent) in other holdings.

Table 14.1-9 Number of Household Members of Agricultural Operators by Age Group, Sex and Whether Engaged in Agricultural Activity or Not: Eastern Visayas, 2002

Age Group and Sex	Engaged				Not Engaged
	Total	Own Holding	Other Holding	Both	
Both Sexes	**425,041**	**360,404**	**25,374**	**39,263**	**472,039**
10 - 14	68,926	61,045	2,810	5,071	150,890
15 - 19	76,582	62,263	5,237	9,082	91,838
20 - 24	54,400	43,301	4,409	6,690	52,022
25 - 29	38,655	31,631	3,010	4,014	32,578
30 - 34	32,632	27,468	2,199	2,965	24,363
35 - 39	29,222	24,940	1,738	2,544	18,335
40 - 44	27,921	24,174	1,420	2,327	16,217
45 - 49	23,558	20,645	1,211	1,702	13,111
50 - 54	21,238	18,672	1,003	1,563	12,010
55 - 59	16,114	14,335	798	981	8,897
60 - 64	14,468	12,985	631	852	9,552
65 and over	18,464	16,661	652	1,151	19,791
Not Reported	2,861	2,284	256	321	22,435
Male	**170,173**	**135,424**	**13,199**	**21,550**	**174,843**
10 - 14	39,940	34,958	1,713	3,269	72,389
15 - 19	49,884	39,169	3,767	6,948	41,884
20 - 24	33,447	25,049	3,234	5,164	21,969
25 - 29	17,015	12,775	1,769	2,471	11,226
30 - 34	9,181	6,902	959	1,320	6,440
35 - 39	5,315	4,029	537	749	3,447
40 - 44	3,585	2,844	256	485	2,329
45 - 49	2,494	2,013	225	256	1,297
50 - 54	2,162	1,779	174	209	1,048
55 - 59	1,504	1,188	174	142	682
60 - 64	1,353	1,136	105	112	750
65 and over	2,774	2,463	123	188	3,684
Not Reported	1,519	1,119	163	237	7,698
	0				
Female	**254,868**	**224,980**	**12,175**	**17,713**	**297,196**
10 - 14	28,986	26,087	1,097	1,802	78,501
15 - 19	26,698	23,094	1,470	2,134	49,954
20 - 24	20,953	18,252	1,175	1,526	30,053
25 - 29	21,640	18,856	1,241	1,543	21,352
30 - 34	23,451	20,566	1,240	1,645	17,923
35 - 39	23,907	20,911	1,201	1,795	14,888
40 - 44	24,336	21,330	1,164	1,842	13,888
45 - 49	21,064	18,632	986	1,446	11,814
50 - 54	19,076	16,893	829	1,354	10,962
55 - 59	14,610	13,147	624	839	8,215
60 - 64	13,115	11,849	526	740	8,802
65 and over	15,690	14,198	529	963	16,107
Not Reported	1,342	1,165	93	84	14,737

Source: National Statistics Office: 2002 Census of Agriculture

(8) Marketing

The marketing system in the region is very simple. The producers sell the surplus of products to middlemen or the consumers directly in same or neighboring communities. Middlemen transport the commodities to small scale wholesalers in the retail markets in towns as large scale consumption places. And wholesalers sell them to retailers within the same markets. In this way, the way of pricing of agricultural commodities are done by negotiated transaction. There is no auction system along the chain of distribution. That is the reason why both the producers and consumers have complaint on the pricing of agricultural products.

The distribution of coconuts is different from other agricultural products. The detail of it is shown in 14.1.2.

(9) Farmers' Organization

There are lots of types of traditional farmers' associations in local areas. But the major and functional ones are only Cooperative and Irrigation Association in the region. The main objective of establishment of cooperatives is marketing of products for members. And the main function of Irrigation Associations is to maintain the irrigation system by irrigation water users. In Leyte province, more than ten National Irrigation Systems developed by National Irrigation Administration (NIA) exists and each system has one Irrigators' Group. And another type of organization is Communal Irrigation Association. This is formulated to maintain the local small-scale irrigation systems.

(10) Supporting Organization in Philippines

1) Department Agriculture (DA)

As stipulated in the Philippine Development Plan (PDP) 2011-2016, Chapter 4, Competitive and Sustainable Agriculture and Fisheries Sector, the agriculture and fisheries sector provides food and vital raw materials for the rest of the economy. As the sector matures and modernizes, it releases surplus labor to the industry and services sectors. Raising productivity and efficiency in the sector are critical in maintaining the affordability of food and purchasing power, especially among the resource-poor. The sector's development is therefore vital in achieving inclusive growth and poverty reduction as well as attaining the targets under the Millennium Development Goals (MDGs).

MDGs are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions-income poverty, hunger, disease, lack of adequate shelter, and exclusion-while promoting gender equality, education, and environmental sustainability.

Vision: A modernized smallholder agriculture and fisheries; a diversified rural economy that is dynamic, technologically advanced and internationally competitive. Its transformation is guided by the sound practices of resource sustainability, the principles of social justice, and a strong private sector participation.

Mission: To help and empower the farming and fishing communities and the private sector to produce enough, accessible and affordable food for every Filipino and a decent income for all.

Mandate: The Department is the government agency responsible for the promotion of agricultural development by providing the policy framework, public investments, and support services needed for domestic and export-oriented business enterprises.

In the fulfillment of this mandate, it shall be the primary concern of the Department to improve farm income and generate work opportunities for farmers, fishermen and other rural workers. It shall encourage people's participation in agricultural development through sectoral representation in agricultural policy-making bodies so that the policies, plans and programs of the Department are formulated and executed to satisfy their needs.

It shall also use a bottom-up self-reliant farm system approach that will emphasize social justice, equity, productivity and sustainability in the use of agricultural resources.

2) Department of Agrarian Reform (DAR)

Department of Agrarian Reform is the lead implementing agency of Comprehensive Agrarian Reform Program (CARP). It undertakes land tenure improvement, development of program beneficiaries, and agrarian justice delivery.

Vision: "A nation where there is equitable land ownership and empowered agrarian reform beneficiaries who are effectively managing their economic and social development for a better quality of life".

Mission: "To lead in the implementation of agrarian reform and sustainable rural development in the country through land tenure improvement, the provision of integrated development services to landless farmers, farm workers, small landowner and landowner-cultivators, and the delivery of agrarian justice, as key to long lasting peace and development in the countryside".

Mandate: To lead in the implementation of the Comprehensive Agrarian Reform Program (CARP) through Land Tenure Improvement, (LTI), Agrarian Justice and coordinated delivery of essential Support Services to client beneficiaries.

Functions:

- ✧ To provide Land Tenure security to landless farmers through land acquisition and distribution; leasehold arrangements' implementation and other LTI services;
- ✧ To provide legal intervention to Agrarian Reform Beneficiaries (ARBs) through adjudication of agrarian cases and agrarian legal assistance;
- ✧ To implement, facilitate and coordinate the delivery of support services to ARBs through Social Infrastructure and Local Capability Building (SILCAB); Sustainable Agribusiness and Rural Enterprise Development (SARED); and Access Facilitation and Enhancement Services (AFAES).

3) Philippine Coconut Authority (PCA)

The Philippine Coconut Authority is the sole government agency that is tasked to develop the industry to its full potential in line with the new vision of a united, globally competitive and efficient coconut industry.

- Formulate and promote a strategic and comprehensive development program for the coconut and other palm oil industry in all its aspects;
- Implement and sustain a nationwide coconut planting and replanting, fertilization and rehabilitation, and other farm productivity programs;
- Conduct research and extension works on farm productivity and process development for product quality and diversification;
- Establish quality standards for coconut and palm products and by- products; and, develop and expand the domestic and foreign markets;
- Enhance the capacities and ensure the socio-economic welfare of coconut and palm farmers and farm workers.

Vision: The Philippine Coconut Authority shall ensure the development and implementation of high value programs carried out in transparent, responsible and accountable manner and with utmost degree of professionalism and effectiveness.

Mission: To promote the development of a globally competitive coconut and other palm oil industry that would contribute to food security, improved income and enhanced participation of stakeholders.

Mandate: To oversee the development of the coconut and other palm oil industry in all its aspects and ensure that the coconut farmers become direct participants in, and beneficiaries of, such development and growth. (PD 1468, Art. I, Sec. 2)

4) National Irrigation Administration (NIA)

The National Irrigation Administration is a government-operated and controlled corporation primarily responsible for irrigation development and management. It was created underRepublic Act (RA) 3601 on 22 June 1963. Its charter was amended byPresidential Decree (PD) 552 on 11 September 1974 and PD 1702 on 17 July 1980. Both increased the capitalization and broadened the authority of the Agency.

NIA's forerunner was the Irrigation Division of the defunct Bureau of Public Works. NIA was placed under the Office of the President (OP) upon its creation. It was attached to the Department of Public Works, Transportation, and Communication under PD No.1, dated 23 September 1972. The issuance also integrated all irrigation activities under the Agency. The Administrative Code of 1987, dated 25 July 1987, attached NIA to both the Department of Public Works and Highways (DPWH), and Department of Agriculture (DA). But NIA remained attached to DPWH. It was transferred to OP pursuant to Executive Order No. 22, dated 14 September 1992. Then, it was

attached to DA under Administrative Order No. 17, dated 14 October 1992.

The authorities and functions of NIA under RA 3601, as amended by PD 552 and PD 1702, include the following:

1. To investigate, study, and develop all available water resources in the country, primarily for irrigation purposes;
2. To plan, design, construct, and/or improve all types of irrigation projects and appurtenant structures;
3. To operate, maintain, and administer all national irrigation systems (NIS);
4. To supervise the operation, maintenance, and repair, or otherwise, administer temporarily all communal and pump irrigation systems constructed, improved, and/or repaired wholly or partially with government funds;
5. To delegate the partial or full management of NIS to duly organized cooperatives or associations;
6. To construct multiple-purpose water resources projects designed primarily for irrigation, and secondarily for hydraulic power development and/or other uses such as flood control, drainage, land reclamation, domestic water supply, roads and highway construction, and reforestation, among others, Provided, that the plans, designs, and the construction thereof, shall be undertaken in coordination with the agencies concerned;
7. To charge and collect from the beneficiaries of the water from all irrigation systems constructed by or under its administration, such fees or administration charges as may be necessary to:
    - cover the cost of operation, maintenance, and insurance;
    - recover the costs of construction within a reasonable period of time to the extent consistent with government policy;
    - recover funds or portions thereof expended for the construction and/or rehabilitation of communal irrigation systems (CIS) which shall accrue to a special fund for irrigation development.

Vision: A dynamic, viable and world-class government corporation, rendering irrigation and related services contributing to the inclusive growth of the country.

Mission: Sustainable development and management of water resources for irrigation consistent with the agricultural program of Department of Agriculture in particular and the national government in general.

Objectives:

- ✧ To develop and maintain irrigation systems in support of the agricultural program of the government;
- ✧ To provide adequate level of irrigation service on a sustainable basis in partnership with the farmers and local government units;

- ✧ To provide technical assistance to institutions in the development of water resources for irrigation;
- ✧ To improve and sustain the operation of NIA as a viable corporation and service-oriented agency.

5) National Coconut Research Center - Visayas (NCRC-V)

NCRC-V is one of research centers in Visaya State University located in Baybay city, Leyte. NCRC-V has important role for development of coconut production and related industry. And NCRC-V is multiplying coconut seedlings under contract with PCA.

Vision: A center of relevant coconut technologies in the Visayas

Mission: Develop relevant coconut technologies to enhance the development in coconut growing communities in the Visayas.

Thrusts:

- ✧ Varietal improvement
  - ✓ Implement research and development projects on genetic conservation and varietal improvement
  - ✓ Develop means of producing good quality planting materials of different coconut cultivars and hybrids
- ✧ Coconut production
  - ✓ Take charge of the production aspects of coconut
  - ✓ Manage and control occurrence of coconut pests and diseases
- ✧ Farming system
  - ✓ Manage the different crops grown under coconut and their cultural management practices
  - ✓ Establish on-campus demonstration farms on coconut-based cropping systems
  - ✓ Take charge of the coconut and livestock integration
- ✧ Processing and utilization
  - ✓ Develop equipment for production, processing and utilization of coconut products and by-products
  - ✓ Improve copra processing technology and develop products and by-products for food, feed and industrial uses
  - ✓ Develop technologies for Barangay-based coconut products/by-products enterprises
- ✧ Socio-economic and utilization
  - ✓ Facilitate the dissemination of coconut technologies to various end-users in partnership with LGUs and other agencies
  - ✓ Conduct monitoring, evaluation and documentation of all extension activities
  - ✓ Conduct assessment of socio-economic impact of coconut technologies
  - ✓ Promote and market coconut products and by-products

(11) International Cooperation

Each international organization or nation for assistance has following themes in agricultural sector:

Table 14.1-10 Theme of Assistance by International Donor

Organization / Nation	Theme for cooperation in Agriculture Sector
ADB	・Decentralization of the service delivery ・Natural resource management ・Support for agrarian reform community (including social development) ・Improvement of irrigation system ・Improvement of highland agricultural productivity ・Rural infrastructure ・Microcredit ・Stability of production ・Commercial crops and post harvest technology for improvement of revenue opportunity
World Bank	・Development of human resources (including health, education) ・Rural roads, electrification, small-scale irrigation ・Improvement of agricultural productivity ・Community Driven Development : social infrastructure ・Natural resource management ・Diversification of agricultural production ・Strengthening of agricultural cooperatives and micro-credit provision organization
UNDP	・Support for agrarian reform community (including social development) ・Microcredit ・Improving access to services and livelihood ・Organizational reform/Capacity development
FAO	・Productivity improvement and creation of income opportunity (farming, marketing, cost reduction, operational management of the organization itself, etc.)
EC/EU	・Support for agrarian reform community (including social development) ・Agriculture (agricultural technology and dissemination, irrigation rehabilitation, rural roads, natural resource management) ・Microcredit ・Organization reinforcement ・Marketing ・Integration of social development into regional development
USA	・Creating economic opportunities in Mindanao (link with the market, sophistication of cropping, support for commercial organizations, small and medium infrastructure, governance, education opportunities, etc.) ・Natural resource management and rural electrification
Canada	・Capacity building of the organization ・Sustainable agricultural development ・Improvement of livelihood and live ・Support for agrarian reform community (including social development)
Germany	・Agricultural development as agricultural resource management ・Support for agrarian reform community (including social development, especially health and sanitation)
Australia	・Improvement of livelihood and live in rural area (including social development) ・The service delivery in rural area ・Financial capacity development of the organization（local government unit, NGO, resident organization） ・Support for agrarian reform community (including social development)

14.1.2 The Coconut Related Industry in Eastern Visayas

1) Hectarage planted to coconut

Eastern Visayas has a total of 420,000 ha of coconut lands. Of this area, the largest portion (40.01%) is in Leyte. The second and third largest portions, meantime, are in Northern Samar and Eastern Samar.

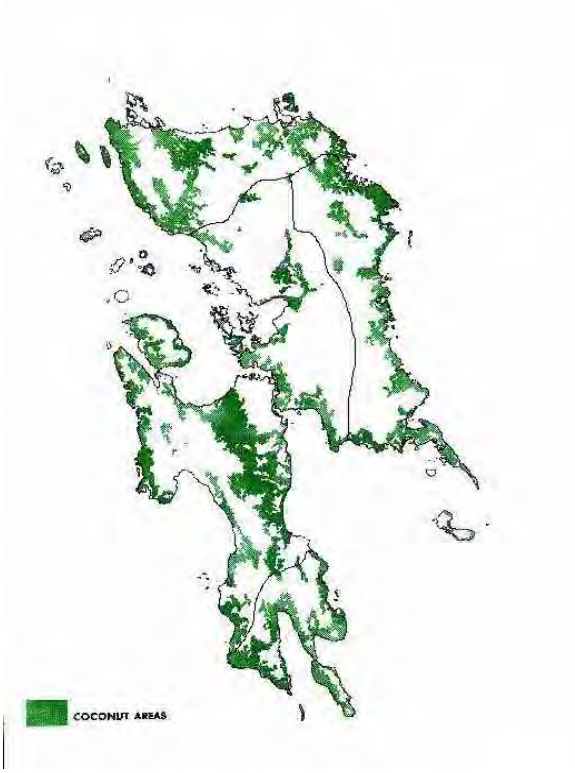


Figure 14.1-3 Coconut Plantation in Eastern Visayas

Before Typhoon Yolanda, a tota1 of 46.3 million of palm trees in the region were bearing trees. However, Northern Samar had the highest percentage of bearing trees. Of the 46.3 million bearing trees in the region, 13.0% were senile.

2) Tenure status in coconut lands

A total of 260,292 ha or 64.1 % of the coconut lands in the region are owned while the rest is tenanted or leased. Of the provinces in the region, Southern Leyte and Eastern Samar have the largest coconut lands that are owner-operated.

Table 14.1-11 Tenure of Coconut Farmlands (2002)

(upper: in ha, lower: % shared)

Province	Tenure of Parcels					Total Physical Area of Farm
	Fully Owned / Ownerlike Possession	Tenanted	Leased	Rent Free	Others	
(((Coconut)))						
Region VIII (Eastern Visayas)	**260,292 (64.1%)**	**121,909 (30.0%)**	**9,360 (2.3%)**	**9,063 (2.2%)**	**5,238 (1.3%)**	**405,862 (100.0%)**
Eastern Samar	47,679 (68.0%)	18,004 (25.7%)	1,791 (2.6%)	1,980 (2.8%)	624 (0.9%)	70,078 (100.0%)
Leyte	75,426 (59.8%)	43,921 (34.8%)	3,041 (2.4%)	2,396 (1.9%)	1,359 (1.1%)	126,143 (100.0%)
Samar	30,323 (66.1%)	11,321 (24.7%)	1,734 (3.8%)	2,043 (4.5%)	473 (1.0%)	45,894 (100.0%)

3) Production

Region VIII produced a total of 2 billion nuts of coconut in 2009. At a conversion rate of 4.5 nuts to a kilogram of dried copra, Region VIII's production in 2009 totaled 444,000 MT of copra.

Copra is processed into crude coconut oil. From the processing of the copra, copra meal is produced. The meal is used as ingredients in animal feeds. The crude coconut oil is processed into oleochemicals, which are used in the food and cosmetics industries. Aside from those of copra and copra-based products, there are other uses for other parts of the coconut, namely, coconut shell, husk, water and white meat. Most coconut shells are burned as charcoal and used as fuel. They are also used to make various handicrafts. Recently however, they have been used to make granulated charcoal, which is then turned into activated carbon. Activated carbon is used to purify water, air and food; recover solvents; and make various pharmaceutical products. Moreover, most coconut oil mills in the region have started to use coconut shell as a source of fuel. It is estimated that Region VIII produced a total of 360,000 MT of coconut shells in 2009, with 5,555 nuts needed to produce a metric ton of shells.

Meanwhile, coconut husk which has usually been used either as scrub for household use or dried and used as fuel, is now being used to produce coconut coir. Coconut coir is used as material for upholstery padding, floor mats, mattresses and handicraft, and as a soil erosion control material. At a conversion rate of 12,500 nuts per 1 MT, Region 8 could have produced 160 MT of coir in 2009 if it converted all the nuts it produced into coir. However, it is estimated by PCA Region 8 that half of the nuts produced in the region are used to dry copra. The potential coir production for the region is therefore 80 MT a year.

Aside from copra, coconut meat is also used for other products. Currently the more popular of these other uses are Virgin Coconut Oil and coco methyl ester or coco biodiesel. Virgin Coconut Oil has been tested to be effective in retarding Dementia, besides other health benefits, fetching good prices in the developed countries. Coco methyl ester, on the other hand, is used either as diesel-fuel or diesel-fuel enhancer. Finally coconut water has been used to make vinegar and

wines. A new product from it is coco sap brown sugar.

4) Trade

Trade in copra in Eastern Visayas changed dramatically in recent years. In 2002, PCA 8 estimated that 63% of all copra produced in the region was exported out of the region but used in the country, 24% was used for local products, and 13% was processed and then exported out of the country. In 2007, 80% of all copra produced in the region was processed for exports outside the country. Sixteen percent (16%) was processed and used for the local market, and only 4% was sold outside the region but still within the Philippines.

Table 14.1-12 Destination of Copra, Eastern Visayas

Destination of Copra	2002	2007
Outside the Region	63%	4%
Inside the Region	24%	16%
Outside the Country	13%	80%
Total	100%	100%

In 2010, the region exported 176,260 MT of coconut products outside the country. Nearly half (45.3%) of these exports was crude coconut oil while a fourth (25.8%) was copra cakes. The rest of the exports were cochin oil, low color oil, and Refined, Bleached, and Deodorized (RBD) oil, From these exports, the region earned a total of US$ 180 million, almost twice what it earned the previous year.

5) Stakeholder

a) **Farmers**

Coconut farmer –landowners in Eastern Visayas in 2009 numbered 368,524. Of these farmers, 33.3% were in Leyte while 21.7% were in Eastern Samar. With coconut lands totaling 649,030 ha, these farmers have farms averaging 1.76 ha in size. Meanwhile, there were 1,395,431 tenants and workers.

It was estimated that copra yield in 2006 was 0.86 MT/ha. An average farming family, farming an average of 1.76 ha of land therefore produces 1.51 MT of copra a year. Copra is proccessed four times a year in the region, usually in the months of March, June, September and December.

Based on the average production of 1.51 MT and the average farm gate price of copra in the first half of 2010, an average coconut farming family running an owner-operated farm would earn for the year a gross income of Php 59,787 a year or Php 4,982 a month, However, the cost of running the farm averaged Php 24,429 in 2006. The net income of a coconut farming family would therefore be Php 35,358 for this year or Php 2,947 a month.

This level of income is less than a third (28.9%) of the average family income in the region in 2006, It is also less than half (44.0%) of the average family expenditure in the region in the same

year.

The situation is much worse for tenants. It is the common practice in the region that tenants receive 50% of the harvest of the farm they operate.

This subsistence level of living has made most coconut farmers constantly dependent on the credit line extended to them by traders in exchange for the assurance that their future harvest would be sold to the creditor. This' dependence on the trader for credit needs is only one of the factors why the coconut farmer has no other options but to accept the price the trader dictates. One other factor is the farmer's lack of access to the knowledge, skill, or technology to challenge the grade /quality assessment of the trader. Another is his lack of access to market information to enable him to bargain better with the trader or to have the choice of changing traders. Still1 another factor is his lack of savings that would enable him to tie over while waiting for better prices. The other factors include the absence of other traders in the area and the farmer's lack of access to transportation facilities and the production volume to enable him to look for more advantageous markets.

b) **Traders**

There are two to three hierarchical tiers of copra traders in Region VIII, who act mainly as consolidators and transporters of copra before these are sold to the oil mills. From the farm gate, copra is sold to village or barangay traders who, in turn, sell them to municipal traders who then sell them to lead traders. It is the lead traders who sell directly to the oil mills.

A majority of traders in Region VIII work independently of any network and sell to any other traders or to mills that offers the best deal. There are, however, traders who operate within a network. In these networks, the lead traders provide funds to the municipal trader who, in turn, distributes the funds to municipal traders who then lends capital to barangay or village traders working within the network. The funds enable these traders to provide credit to farmers, and also to buy copra from the farmers.

The trading system for raw coconut shell and charcoal is more complex than that for copra. There are at least four routes that could be taken in selling coconut shell, depending on who are the ultimate users, and these routes intersect with one another. These users are the oil millers who use coconut shell as substitute for bunker fuel, the households who use charcoal as household fuel and buy it at the town plaza, the charcoal processing p]ants, and the activated carbon plants.

c) **The Processors**

Before Typhoon Yolanda struck, there were eight oil mills operating in Eastern Visayas. The capacity of these oil mills had registered with the Philippine Coconut Authority (PCA) totals 380,300 MT a year. And there were four activated carbon manufacturing plants in Region VIII, with a total capacity of 15 MT per day.

14.2 Damage on Agriculture

(1) Agricultural Damage except Coconut

Typhoon Yolanda caused devastation of great proportions to Eastern Visayas. About 80% of the area was destroyed. Crops were dislodged, trees uprooted, and mortality to poultry and livestock was very high. The damage to agricultural crops, especially coconut, has affected the regional economy. Fruit trees suffered stress such that it will take 4–5 years for them to recover and regain their pre–disaster productivity level. This aggravated the yield loss, investment loss, opportunity cost, clearing operation, etc. that farmers have to cope with while waiting for conditions to normalize.

The typhoon flattened millions of coconut trees, and the country's third largest coconut-producing region was one of the area most affected. In this region alone about 34 million coconut palm trees were damaged or destroyed and more than a million coconut farmers impacted. The devastation created drastic effects along the entire value chain, affecting people who were engaged both directly and indirectly – from farm owners, tenant farmers, workers, to traders and processors.

The damage data in agriculture in Region VIII, which is studied by DA, is shown on the next page (except the data of coconut).

Table 14.2-1 Agricultural damage in Eastern Visayas (except coconut)

Province	No. of Farmers Affected	Area Affected (ha)	Production Loss	
			Volume (Mt)	Value (Pesos)
REGIONAL TOTALS	***1,287,479***	***1,011,677***	***1,315,423.85***	***18,859,879,924.66***
Rice	28,497	30,284	34,570.33	227,026,707.91
Corn	5,722	3,875	5,352.74	96,918,430.00
Vegetables	51,001	2,221	4,461.50	125,998,397.75
Fruit Trees	2,390	1,407	2,837.10	22,374,375.00
Root Crops	4,037	3,712	18,998.64	82,923,725.00
Banana	16,993	17,652	42,032.90	317,444,186.00
Organic	-	-	-	6,559,000.00
Livestock (head)	12,406	648,940	1,201,121.27	206,431,860.00
Infrastructure	-	-	-	834,780,435.00
FIDA (Abaca)	4,759	8,364	6,049.38	233,643,625.00
LEYTE	***712,621.88***	***799,660***	***576,131.41***	***13,639,552,418.00***
Rice	17,596	18,434	22,419.76	141,169,875.00
Corn	4,246	2,981	4,083.45	74,858,000.00
Vegetables	27,720	1,155	1,153.70	81,655,000.00
Fruit trees	1,170	786	1,449.14	11,796,675.00
Root Crops	2,178	1,826	4,756.28	63,582,900.00
Banana	8,163	7,394	15,195.50	154,967,340.00
Organic				3,130,000.00
Livestock (head)	1,564	590,246	523,358.27	110,458,700.00
Infrastructure				629,524,005.00
FIDA (Abaca)	2,478	4,953	3,715.32	105,766,000.00
SAMAR	***162,592.56***	***70,124***	***82,168.98***	***742,158,229.91***
Rice	3,987	3,445	2,716.01	24,600,432.91
Corn	938	571	713.40	14,268,000.00
Vegetables	11,767.56	490	2,314.14	14,562,669.00
Fruit Trees	-	-	-	-
Root Crops	-	-	-	-
Banana	1,598.00	2,072	4,143.56	41,435,600.00
Organic				1,009,000.00
Livestock (head)	6879	35,824	72,080.00	6,368,900.00
Infrastructure				40,846,405.00
FIDA (Abaca)	136	269	201.87	10,093,500.00
EASTERN SAMAR	***304,303.66***	***87,884***	***466,982.12***	***3,518,414,420.75***
Rice	3,296	4,332	4,432.10	32,454,000.00
Corn	199	110	261.10	2,724,430.00
Vegetables	7,661.52	319	638.46	20,473,668.75
Fruit Trees	812.14	406	812.56	6,094,200.00
Root Crops	1,619.00	1,691	13,561.56	16,913,200.00
Banana	1,335.00	1,451	2,936.34	29,019,400.00
Organic				2,420,000.00
Livestock (head)	3,813	22,464	444,340.00	89,022,860.00
Infrastructure				22,824,850.00
FIDA (Abaca)				

Source: NDRRMC April 03, 2014 prepared by DA 8 command center

(2) Damage on Coconut

The Philippines is the second largest coconut producer, followed by Indonesia and India, and produced 26.6% of world production in 2013. According to the Philippines Coconut Authority, Region VIII had 46 million coconut trees and was the third largest coconut producer before Yolanda hit. Yolanda left 15 million coconut palm trees damaged beyond recovery and another 20

million trees severely damaged, resulting in total losses of 396 million US dollars equivalent to 17.7 million Pesos. And almost 1.7 million people depended on the coconut industry including copra traders and wage earners in the various coconut value chains in the region, which resulted in economic losses multiplied by many-fold.

The coconut trees damaged by Typhoon Yolanda in the region were announced by PCA as follows:

Table 14.2-2 Coconut damage by Province Targeted

Province	Before Yolanda			Affected by Yolanda					
				Number of Damaged Trees					
	Area Planted (ha)	No. of Farmers	No. of Trees	Damaged, Recoverable		Damaged, Deadly		Total	
Region VIII, total	**925,651**	**780,412**	**74,607,354**	**19,711,813**	**(26.4%)**	**13,891,173**	**(18.6%)**	**33,602,986**	**(45.0%)**
Eastern Samr	302,591	142,138	13,192,227	3,244,157	(24.6%)	3,057,358	(23.2%)	6,301,515	(47.8%)
Leyte	217,436	406,500	27,506,848	9,588,207	(34.9%)	10,172,724	(37.0%)	19,760,931	(71.8%)
Samar	120,078	69,556	11,667,709	2,819,805	(24.2%)	276,556	(2.4%)	3,096,361	(26.5%)

Source: Coconut damage report prepared by PCA

Leyte had the largest number of damaged coconut trees among targeted three provinces. However, the municipalities targeted by the Study Team are only coastal ones. The damages varied with the distance from the pass of Typhoon Yolanda and geographical conditions as follows;.

Table 14.2-3 Coconut damage by LGU Targeted

Before Yolanda			Affected by Yolanda					
			Number of Damaged Trees					
Area Planted (ha)	No. of Farmers	No. of Trees	Damaged, Recoverable		Damaged, Deadly		Total	
925,651	**780,412**	**74,607,354**	**19,711,813**	**(26.4%)**	**13,891,173**	**(18.6%)**	**33,602,986**	**(45.0%)**
302,591	**142,138**	**13,192,227**	**3,244,157**	**(24.6%)**	**3,057,358**	**(23.2%)**	**6,301,515**	**(47.8%)**
6,636	9,080	822,864	100,215	(12.2%)	567,885	(69.0%)	668,100	(81.2%)
7,310	2,175	906,439	101,340	(11.2%)	574,260	(63.4%)	675,600	(74.5%)
5,610	32,949	1,385,453	94,360	(6.8%)	754,880	(54.5%)	849,240	(61.3%)
3,338	8,398	413,911	39,620	(9.6%)	356,580	(86.1%)	396,200	(95.7%)
2,218	4,137	201,997	60,640	(30.0%)	90,960	(45.0%)	151,600	(75.1%)
5,475	9,962	655,724	50,650	(7.7%)	455,800	(69.5%)	506,450	(77.2%)
3,483	3,610	419,325	151,968	(36.2%)	164,632	(39.3%)	316,600	(75.5%)
217,436	**406,500**	**27,506,848**	**9,588,207**	**(34.9%)**	**10,172,724**	**(37.0%)**	**19,760,931**	**(71.8%)**
2,654	10,729	267,156	49,352	(18.5%)	156,281	(58.5%)	205,633	(77.0%)
12,533	26,548	1,355,936	646,066	(47.6%)	656,370	(48.4%)	1,302,436	(96.1%)
4,874	7,993	522,032	98,566	(18.9%)	413,466	(79.2%)	512,032	(98.1%)
6,615	16,124	699,563	423,331	(60.5%)	232,733	(33.3%)	656,065	(93.8%)
2,959	5,486	419,421	98,222	(23.4%)	311,159	(74.2%)	409,381	(97.6%)
1,990	10,518	236,665	50,379	(21.3%)	183,032	(77.3%)	233,411	(98.6%)
2,178	19,815	227,088	21,167	(9.3%)	195,921	(86.3%)	217,088	(95.6%)
2,116	17,844	233,532	32,413	(13.9%)	191,119	(81.8%)	223,532	(95.7%)
1,341	6,340	156,162	21,919	(14.0%)	129,243	(82.8%)	151,162	(96.8%)
120,078	**69,556**	**11,667,709**	**2,819,805**	**(24.2%)**	**276,556**	**(2.4%)**	**3,096,361**	**(26.5%)**
15,234	4,252	1,521,513	1,499,400	(98.5%)	15,200	(1.0%)	1,514,601	(99.5%)
2,886	1,935	293,416	21,850	(7.4%)	254,750	(86.8%)	276,600	(94.3%)

Source: Coconut damage report prepared by PCA

And to make matter worse, one of the most serious diseases for coconut, rhinoceros beetle, is multiplying at inside of the fallen coco trees, and the adults have been attacking the shoots of survived coconut trees and coconut seedlings replanted newly. The secondary harm of Typhoon Yolanda is still extending.

	
Damaged coconut	Serious disease for coconut

(3) Damage of Agricultural Facility

According to NIA Regional Office, some facilities of dams, canals, milling houses, storages were damaged seriously in Leyte and Samar province. The broken dams will make a big problem to provide irrigation water especially in dry season when river water level is lower, while the selling price of harvested rice is higher than in rainy season. Basically the facilities of National Irrigation Systems are maintained by NIA funded by irrigation fee from beneficial farmers. However, rice farmers cannot afford the irrigation fee after Yolanda hit. So the rehabilitation of irrigation facilities has not launched yet.

	
Damaged weir of Ibawon Dam Mac Arthur, Leyte	Damaged facility for post-harvest, Bito National Irrigation System in Abuyog, Leyte

(4) Damage on Agriculture Sector in Targeted 18 LGUS

The damage in agriculture sector according to the documents on "Reconstruction and Rehabilitation Plan" issued by each LGU is indicated in the tables below. However, since the LGUs described the damages in several ways, the data cannot be simply compared.

Table 14.2-4 Crop Damage announced by LGUs

City / Municipality	Rice			Coconut				Vegetable		Other Crops	
	ha	Mt	Peso ('000)	no. of tree	ha	Mt	Peso ('000)	Mt	Peso ('000)	ha	Peso ('000)
01_Tacloban											
02_Palo			173,547				228,540		-		
03_Tanauan		5,693	79,900			1,900	9,600	21,000	850		
04_Tolosa	522				1,033						
05_Dulag	3,472			2,111						1,260	
06_Mayorga			16,759				54,630			1,000	
07_MacArthur			30,000				343,310			4,578	
08_Javier											
09_Abuyog											
10_Basey	1,818	5,889	105,998		4,369	524,256	13,106				
11_Marabut			900				50,000		250		
12_Lawaan											
13_Balangiga											
14_Giporlos			1,722							8,545	
15_Quinapondan											
16_Salcedo											
17_Mercedes				126,603							70
18_Guiuan	11				5,900					231	

Source: Recovery and Reconstruction Plan issued by each Municipality

Table 14.2-5 Livestock Damage announced by LGUs

City / Municipality	Livestock									
	Carabao/Cattle		Swine		Poultry(Commercial)		Local Poultry		Goat/Sheep	
	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)
01_Tacloban										
02_Palo	110	3,630	1,754	6,139	80,000	6,000	12,630	1,302	82	164
03_Tanauan	100	25,000	150	1,100						
04_Tolosa	50		363		1,681		56		40	
05_Dulag										
06_Mayorga										
07_MacArthur		280		150		200				
08_Javier										
09_Abuyog										
10_Basey		2,570		5,924				920		20
11_Marabut		400		200				165		
12_Lawaan										
13_Balangiga										
14_Giporlos										
15_Quinapondan										
16_Salcedo										
17_Mercedes										
18_Guiuan										

Source: Recovery and Reconstruction Plan issued by each Municipality

On the other hand, Department of Agriculture presented the damage of agricultural sector by LGU as follows;

Table 14.2-6 Crop Damage announced by DA (1/2)

City / Municipality	Rice			Corn			Vegetable			Banana		
	ha	Mt	million Peso	ha	Mt	million Peso	ha	Mt	million Peso	ha	Mt	million Peso
01_Tacloban	150	175	1.1	14.3	20	0.4	250	500	13			
02_Palo	1,522	1,776	11.4									
03_Tanauan	392	457	2.9									
04_Tolosa												
05_Dulag	535	2807	18.0	630	863	15.8				244	488	4.9
06_Mayorga	215	1,768	11.4							35	70	0.7
07_MacArthur	704	822	5.3	11	16	0.3				24	49	0.5
08_Javier				26	36	0.7						
09_Abuyog												
10_Basey				34	43	0.9	7	28	0.2	100	200	2.0
11_Marabut	200	164	1.5	13	17	0.3	6	100	0.2	10	19	0.2
12_Lawaan	16	16	0.1	38	90	1.0	25	50	0	89	178	1.8
13_Balangiga												
14_Giporlos	42	42	0.3	0	0	0				31	62	0.6
15_Quinapondan	24	25	0.2				8	16	1.1			
16_Salcedo				1	2	0	46	91	1.3	15	30	0.3
17_Mercedes				0	0	0	2	4	0			
18_Guiuan	11	12	0	8	18	0.2	40	80	3.0	90	180	1.8

Table 14.2-7 Crop Damage announced by DA (2/2)

City / Municipality	Cassava			Sweet Potato			Purple Yam		
	ha	Mt	million Peso	ha	Mt	million Peso	ha	Mt	million Peso
01_Tacloban									
02_Palo									
03_Tanauan									
04_Tolosa									
05_Dulag	100	160	1.0	180	288	1.8	80	128	0.8
06_Mayorga									
07_MacArthur									
08_Javier									
09_Abuyog									
10_Basey									
11_Marabut									
12_Lawaan	100	420	1.1	105	400	1.0			
13_Balangiga									
14_Giporlos	61	200	0.5						
15_Quinapondan	76	280	0.7						
16_Salcedo				43	140	0.4			
17_Mercedes	0.5	4	0						
18_Guiuan				20	80	0.2			

Table 14.2-8 Livestock Damage announced by DA

City / Municipality	Livestock									
	Carabao		Cattle		Swine		Poultry		Goat/Sheep	
	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)	head	Peso ('000)
01_Tacloban										
02_Palo										
03_Tanauan										
04_Tolosa										
05_Dulag	455	9,100	345	6,900	31	124	60,302	9,030	4	10
06_Mayorga	7	175	1	25			1,530	316	173	433
07_MacArthur										
08_Javier										
09_Abuyog										
10_Basey	20	270	15	180	100	480	10,000	600	20	50
11_Marabut	6	81			650	3,120	995	60	3	8
12_Lawaan	6	150	5	125	87	696	2,312	464	20	60
13_Balangiga	2	50	1	25	179	2,685	212	42		
14_Giporlos	32	800	14	210	98	784	968	195	3	9
15_Quinapondan	17	425	11	275	94	1,395	457	91	3	9
16_Salcedo			11	275	1	15	285	57	30	90
17_Mercedes			8	200	20	300	357	71		
18_Guiuan	50	1,250	480	12,000	3511	52,665	9,900	1,980	180	540

14.3 Situation of Assistance for Agriculture Sector

After the hit of Yolanda, the support to the recovery of agricultural industry started immediately. Several governmental organizations of Philippines were involved directly or indirectly in activities on agricultural assistance, because a huge number of agricultural producers were affected by Yolanda. And also international institutions, foreign governmental agencies, NGOs and private firms have been giving helping hands to affected people. The major components are Cash-for-Work, food, domestic water, agricultural input, repair of rural infrastructure, supply chain, vocational training and education for educationally displaced children etc.

And some cluster meetings have been established to serve as an opportunity to exchange information and opinions among administrations and donors concerned, and meetings are held weekly in affected areas, namely, at Tacloban and Ormoc in Leyte, and Guiuan in East Samar. Also Central cluster meetings are in Manila. Especially "Food Security & Agriculture Cluster" and "Early Recovery & Livelihoods Cluster" are intimately connected with assistance to agricultural sector. "Early Recovery & Livelihoods Cluster" has discussion in divided five working groups i) Coconut、ii) Enterprise、iii) Skill Development、iv) Environment、v) Governance.

According to the announcement from Department of Agriculture (DA), the progress of the government's rehabilitation program in the agri-fishery sector showed as follows;

The DA's rehabilitation interventions named "Reconstruction Assistance on Yoland" (DA-RAY) gave assistance to around 640 thousand farmers and fishermen. The implementation of DA-RAY generated around 168 thousand jobs and livelihood opportunities for farmers and fishermen in the area heavily affected by Typhoon Yolanda. The DA-RAY thrust prioritizes the rehabilitation of the crop, livestock and fishery sector, to give beneficiaries the means to get back on track with their lives. DA distributed 142.4 thousand bags of certified and hybrid rice seeds, 24.7 bags of corn seeds and 2.3 thousand kg of assorted vegetable seeds. Additionally, farmers who were provided rice and corn seeds have been also gotten fertilizers, with a total of 162.9 thousand bags of various types of fertilizers have been distributed. For livestock raisers, more than 2.2 thousand heads of animals have been already distributed. And DA is planning to make livestock multiplication farms in each LGUs.

NIA and LGUs have already been cleared debris and desilted in most of the affected irrigation canals.

14.4 Issues

Crop production is done on fixed lands and cannot be transferred, making agriculture fragile against natural disasters such as typhoon or tsunami. The damages to agriculture and farm lands directly result in the reduction of income for farming households, undersupply of food for survivors and raw materials for the secondary sector of industry.

The disaster damage assessment on agriculture is the essential information for designing relief for affected farmers and restoring crop production. But the ways to present the collected data are

various by LGU. Each LGU was using different units to scale the damage, for example hectarage, tonnage, value, number of farms and so on. Hence, the method of counting and interpreting disaster damage is to be formatted.

- Central government has not formatted the data collection sheet. And also the method of data processing has not formulated yet. Those made difficult to compare the degree of damage among affected LGUs and to give the priority to assist.

The quick restart of agricultural production is important for not only securing livelihood of devastated farmers but also food supply for the community people affected.

- Non-availability of soft loan service for affected farmers delays to restart agricultural production.

The marketing system of fruit and vegetables is still lagging behind. Modernizing this system would be mutually beneficial to producers and consumers. Wholesale markets can set up stable distribution routes, and improving the transparency of price formation at the same time.

- Lack of wholesale markets causes unfair transaction on agricultural products.

The secondary sector of industry which utilizes the local primary products must be promoted. The enterprise can create employment opportunities for rural women and demand of raw materials for processing.

- Insufficiency of processing enterprises in the area.

<u>In Coconut Producing Area</u>

In some area, the population of coconut tree is too dense. It disturbs intercrop and mix culture with livestock. Though to restore the coconut industry requires accelerating the cleaning of debris in coconut farms, it has progressed at slow speed caused by lack of farm road and the heaviness of fallen coconut plant. Rhinoceros Beetle which is one of the most serious pests propagates at inside of fallen palm trees attacks survived coconut trees.

Old varieties of coconut are only for harvesting copra, and the productivity is low. And New varieties have the advantages on short-height, high-yielding ability, food processing ability. However, it will take time to prepare the seedlings of those new varieties.

The target area is vulnerable to typhoon, the study to establish the resilient coconut farms will be helpful.

The issues identified in coconut area include:

- Planting density of coconut is too high to intercrop for improvement of land productivity.
- No renewal from old varieties which are by low yield and not adequate for food processing
- Insufficient supply of seedlings of new hybrid varieties
- Little involvement of rural women in coconut related industry

- Delay of debris removal of coconut farms caused by immobility of heavy fallen trees and lack of farm roads
- Propagation of Rhino Beetle which kills standing coconut trees
- Vulnerability to strong wind

In Rice Producing Area

- Lack of fund to restore the irrigation facilities
- Insufficient utilization of local resources such as rice straw, women labor force

14.5 Strategy

(1) Restart of perennial crop production based on the mid and long term outlook

In coconut producing area, it is necessary to speed up planting of the seedlings for restoration of coconut production. However, the replanting of old varieties that were grown before Yoland hit must be avoided. The old varieties have characters of longer period of productive stage, lower productivity and lower resistance against pests in comparison with new and advanced varieties. And the planting density before Yolanda was too high for intercropping to increase land productivity. Therefore, it is very important to replant with appropriate density in restoring the damaged areas. New varieties have the advantages on dwarfism, high-yielding ability, food processing ability and so on by variety. The choice of varieties must meet the type of farming, because they cannot be altered for decades after transplanting.

(2) Improvement of livelihood with utilization of organic resources in the area

In rice cultivation area, to utilize rice straw that is generally incinerated makes better livelihood of the population. The cost of input for rice cultivation is very high; it is one of the constraints for rice production. However, rice straw that is treated as organic residue is to be utilized for the material of the primary industry again to improve the livelihood, and it means the implementation of recycling-oriented agriculture.

(3) Activation of female labor force in rural area

Women in rural area must be more involved in productive activities to process primary agricultural products or reuse of the residue for improvement of livelihood such as food processing from crops or animal products, mushroom cultivation, charcoal and briquette making.

(4) Increasing transparency of distribution and transmission of market information

The distortion of price formation process in agricultural products distribution must be corrected. Ensuring transparency will be a common profit for all, including producers, traders and consumers. To inform the producers of demand in the market is also important for rural development.

14.6 Recovery and Reconstruction Framework

14.6.1 Recommendable Policies for 18 LGUs

(1) Emergency Measures and Policies:

- Damage assessment of on agricultural products, lands, households and infrastructures

It is important to grasp the damages related to the agricultural industry. After Yolanda, the damage assessment done by each LGU was presented. The unification of the assessment results would be helpful in comparing between affected LGUs.

- Support for food security and livelihood of affected farmers

It is necessary to evaluate whether the relief food and water are fairly delivered to affected people after Yolanda hit and whether much needs to be improved in the support system.

- Support for restart of agricultural activities

Also another evaluation is needed on the provision of farming materials to restart agricultural activities as regards the appropriateness of the types of materials and its timeliness. Also the introduction of a soft loan system to restart these activities can give supportive push to affected farmers.

(2) Short-term Measures and Policies:

- Cocowood charcoal and wood vinegar making

Tens of millions of coconut trees were brought down by the strong winds. Though cocowood is processed to coco lumber and utilized as building material, debris disposal to clean up huge number of fallen trees has been taking time. One of the reasons of this delay is the difficulty of transportation around the coconut farms, as most of these farms do not have access roads. Trucks cannot access to pick up the processed lumbers especially in hilly areas. However, getting charcoal out of cocowood can make it lighter and more portable. Charcoal making requires a little investment and short training. And women group can be involved, making charcoal briquette, because it is not so heavy. Charcoal business can generate employment for women in rural areas. And wood vinegar is encouraged to be used for crops diseases control, which is another possibility of income generation from the byproduct of charcoal making.

(3) Medium-term Measures and Policies:

- Mushroom cultivation

Rice cultivation thrived in Leyte. Though huge amount of rice straw is available, it is not well utilized. Rice straw can be utilized as good mushroom bed under humid climate like Leyte. Mushroom production can increase the work opportunity for rural women. And the disposed mushroom bed after cultivation is a very good organic fertilizer for farms. Municipality

Tabontabon in Leyte Province had a good practice in 2010 to 2012 period under the support from ex-mayor.

- Dwarf variety of coconut

A lot of tall coconut trees have fallen down through the strong wind of Yolanda. Dwarf varieties of coconut must be introduced into the storm prone areas. Dwarf coconut has slender trunk, so it is not resistant to storm itself. But mix cropping with other wood crops can weaken the wind effect of typhoon.

- Coconut variety for processing enterprise

Before Yolanda, the coconut variety cultivated was only for copra. Currently the Philippine Coconut Authority is preparing coconut seedlings for copra, but other varieties which are bred for food processing must be included. These varieties can provide raw material for rural small-scale enterprises which can contribute to women's' employment and livelihood improvement.

- Mass production of seedlings of advanced varieties

Some advanced varieties are developed by Philippine Coconut Authority (PCA) and National Coconut Research Center – Visayas (NCRC-V). But the multiplication capacity of seedlings in the region is limited. One laboratory which can do mass propagation of coconut seedlings through tissue culture is under construction, which belongs to the National Coconut Research Center in Baybay city, Leyte. However, the construction of the laboratory was planned before Yolanda. The massive damage by Yolanda on coconut was not considered when the laboratory designed. Hence, the expansion of the laboratory can accelerate the preparation of virus-free seedlings of advanced varieties, and contribute to the restoration of coconut industry in the region. And the local government of Leyte Province has a plan to build a new laboratory for tissue culture of banana and abaca in the Municipality of Kananga located in the north-western part of the province. The budget for the two laboratories has not been yet found. However, when these laboratories are functioning, the mass propagation of advanced varieties can be done.

Traditional coconut nursery, NCRC-V, Baybay city, Leyte

Coconut tissue culture laboratory under construction, NCRC-V, Baybay city, Leyte

- Sales promotion of products from affected areas

The establishment of direct sale stores in big cities can be helpful to affected farmers in the region.

- Dairy processing of carabao milk

Most of the affected LGUs in Samar are located in mountainous areas. Planting annual crops in farms located on steep hillsides may cause soil erosion. Animal breeding under coconut trees can increase land productivity. Philippine Carabao Center plans to provide female carabao and training on how to breed it to farmers' associations. This project also includes dairy processing training and can promote rural agri-business.

(4) Long-term Measures and Policies:

- Installation of wholesale markets

Agricultural producers showed concerns on the shortage of buyer and the farm gate prices, while consumers on the quality of products and prices. Wholesale markets can set up a stable distribution route for farmers, and improving at the same time the transparency of price formation. The raw information of wholesale market price can help farmers decide which crop to be grown and when. The market price basically depends on the quality of commodities and the demand -and- supply balance. The price can be reasonable for consumers, and the competition among producers or producing areas will bring benefits such as quality improvement.

- Improvement of farm roads

Farm roads are important, enabling transportation of farming materials, daily access of farmers, and marketing of the products. The improvement of farm roads can assist farmers and production.

- Crop insurance / Farmers mutual insurance

Philippine Crop Insurance Corporation provides crop insurance as a governmental service. But the scheme does not cover all the crops. If the coverage of targeted crops can be expanded, it will be helpful to the restoration of agricultural activities after disaster. Japan has a farmer's mutual aid fund system which is based on member farmers' premium. It is aimed to protect the agricultural activities of member farmers through the payment from a fund to affected members. Introducing a similar system here may be one of challenges.

- Utilizing agricultural lands and infrastructure in disaster damage reduction

It is possible to utilize the farmlands and agricultural facilities in the fight against natural disasters, combining "the detailed hazard map" and "the geographical and social condition of farmland location". For example paddy fields can be utilized as flood water reservoirs. Tree crops can protect against storm and landslide, irrigation water can be used for fire-fighting and farm space to prevent the spread of the fire. Therefore, the LGUs may consider the farmlands and agricultural infrastructure as a part of social capital in the community and build up the maintenance system on them.

14.6.2 Recommendable Projects for Model LGUs:

The recommendable projects must be based on the features of the targeted area. Leyte Province and Samar Province can be characterized as rice producing area, and Eastern Samar is as coconut producing area. Out of five model LGUs, the municipalities of Tacloban, Palo, Tanauan and Basey which have large area of paddy fields can be reconstructed through the utilization of residue after rice cultivation. And the agriculture in Guiuan is recommended to rehabilitate with coconut based project.

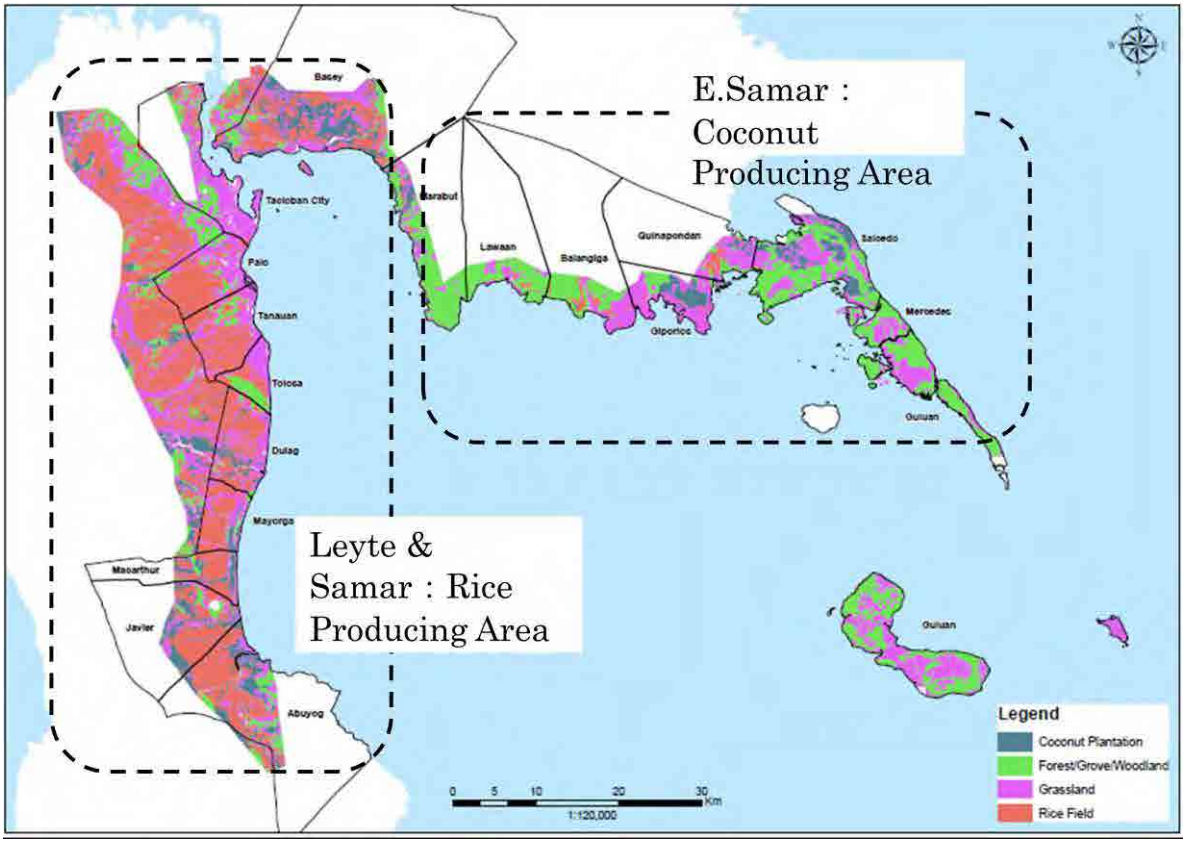


Figure 14.6-1 Major Crop Production Map

(1) For Rice Producing Area

- Mushroom Cultivation Project: Oyster mushroom (*Pleurotus florida*)

Objectives:

To generate additional income by recycling rice straw and mushroom bed as compost for rice field

Target beneficiaries:

Women's' group, people staying in temporary shelter

Expected LGU response:

Maintain laboratory and spore, and guidance on cultivation technique and marketing for group members

Target output:

Cultivation and sales of mushroom, and utilization of rice straw to fertilize farmlands

Justification:

Wise use of rice straw to generate more income and to fertilize soil. Stop burning straw. Mushroom is high value commodity. Even shelter people who do not own land can cultivate it

Task of beneficiaries:

Work out in laboratory, and cultivation of mushroom

Applicability:

Anywhere rice straw is available at

	
Spore inoculum	Floating bags as mushroom beds

(2) For Coconut Producing Area

- Coco-wood Charcoal Making and Briquetting Project

Objectives:

to accelerate in clearing up and utilize the fallen coco trees;

to generate work opportunity of coconut farming survivors;

to prevent illegal deforestation and

to reduce damage by Rhinoceros Beetle

Target beneficiaries:

Farmers' group

Expected LGU response:

Guidance on technique and marketing for group members

Target output:

stable quality and sales of charcoal;

acceleration of coco debris clearing and

reduction of expansion of damage by Rhinoceros Beetle

Justification:

coco seedling replanting can be done only after debris clearing;

heavily hit coconut trees and newly planted seedlings take time to start bearing nuts for 5-10 years and

illegal deforestation caused by no availability of coco-shell charcoal in market

Task of beneficiaries:

Group work out

Applicability:

Anywhere fallen coco wood is available at

	
Arrangement of cocowood	Harvest of charcoal

- Storm Resilient Coconut Farm Project

Objectives:

To make storm resistant coconut farm to sustain coconut industries, to develop coco- base processing (food processing, virgin coconut oil), and to improve farm intensity and labor efficiency

Target beneficiaries:

Coconut farmers

Expected PCA response:

Provision of seedlings of dwarf coconut varieties

Expected LGU response:

Provision of seedlings of fruit trees for mix cropping

Target output:

Mix cropping of dwarf coconut and fruit trees

Justification:

Solution of heavy dependence on coconut mono cultivation and

strong wind suspends nuts bearing for 5 years

Task of beneficiaries:

Maintenance of the mixing crop farm

Applicability:

Any coconut farms that locates in storm- prone area

Chapter 15 Tourism Development

15.1 Current Situation and Issues on Tourism Industry

- Annual numbers of visitors
- Numbers of domestic tourist and foreign tourist
- Staying style such as overnight or one day trip, etc.

The data for current situation are shown as below based on the document of REBUILDING EASTERN VISAYAS TOURISM.

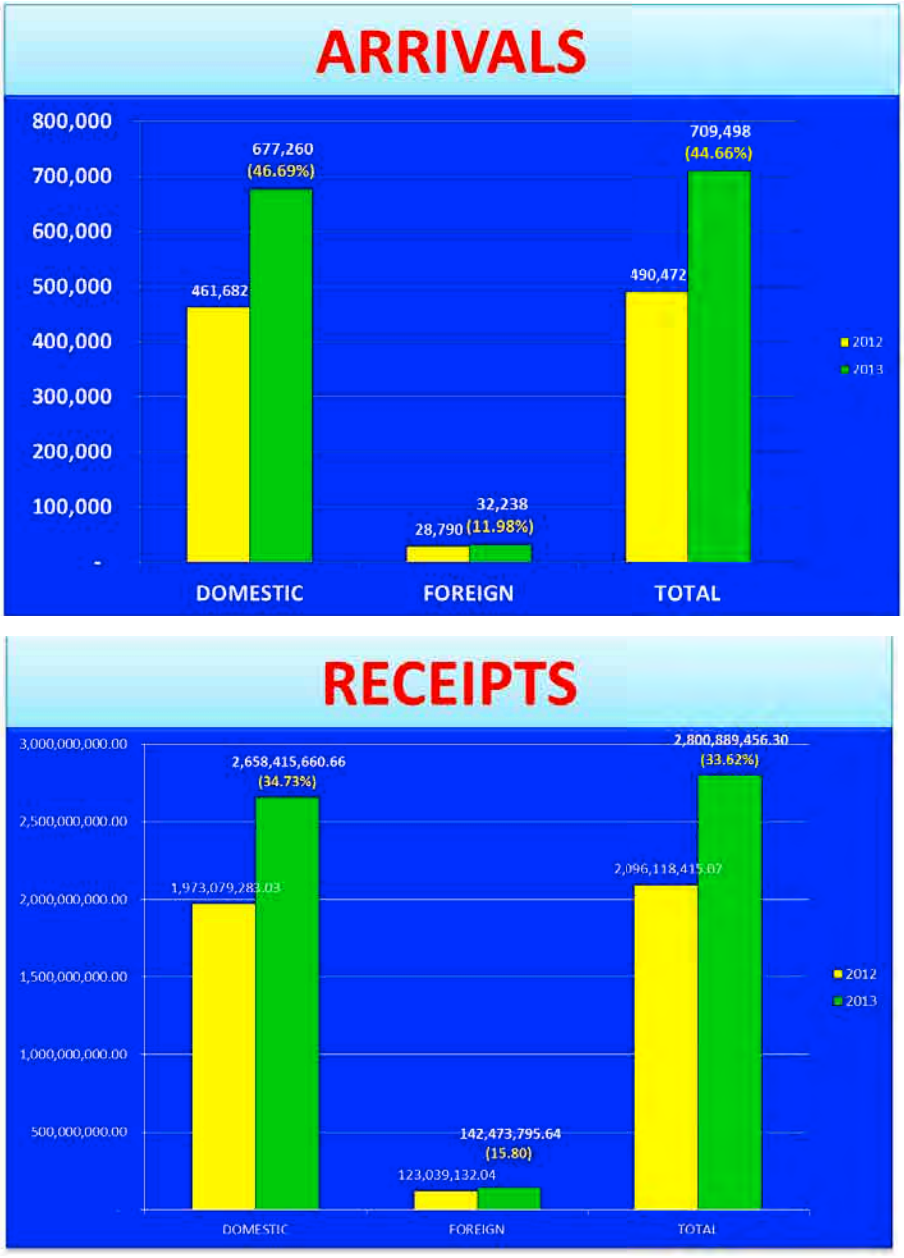
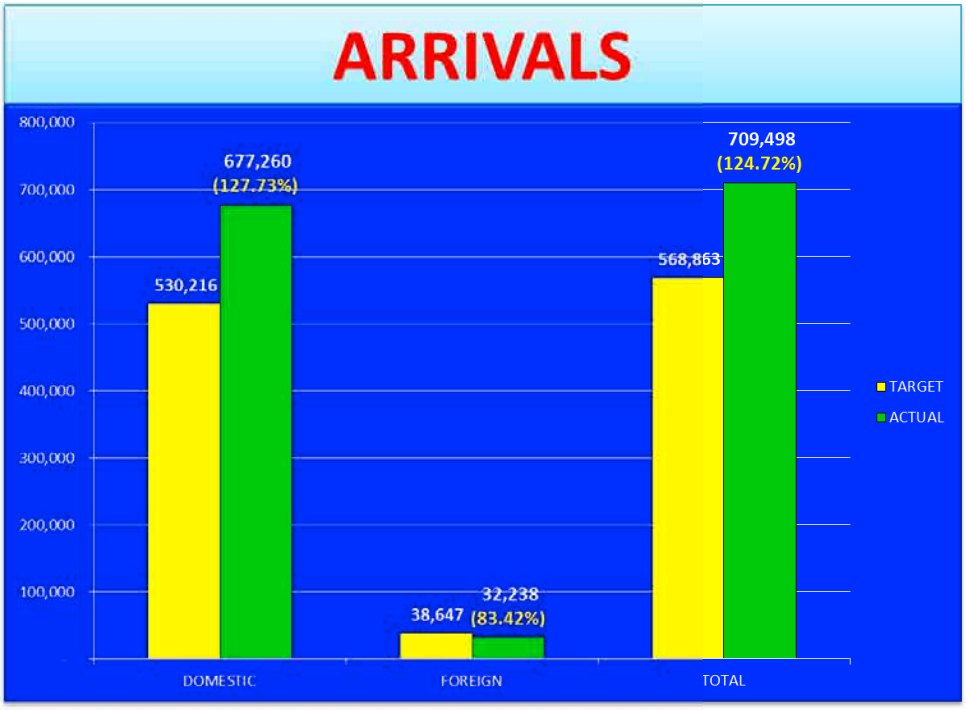


Figure 15.1-1 Arrivals and Receipts 2012 - 2013



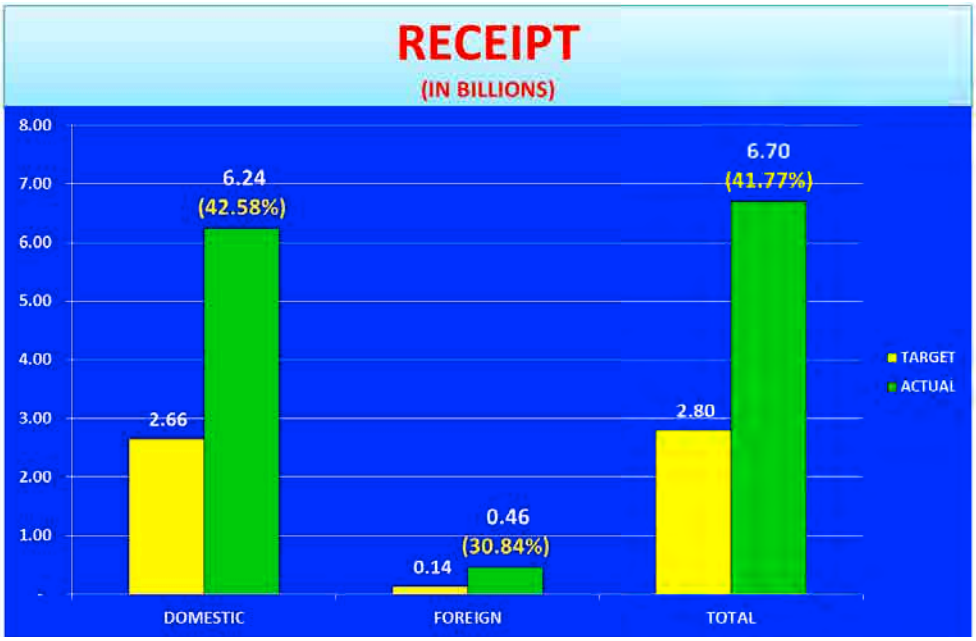


Figure 15.1-2 ACTUAL VS TARGETS in 2013

Table 15.1-1 Accommodation Facilities

Affected Cities / Municipalities	No. of Accommodation Facilities operating prior to Typhoon Yolanda	No. of Accommodation Facilities operating immediately after Typhoon Yolanda	No. of Operating Accommodation Facilities at present
Tacloban City	50	27	33
Ormoc City	26	15	15
Palo, Leyte	2	0	1
Marabut, Samar	5	0	0
Basey, Samar	5	0	0
Guiuan, Eastern Samar	11	1	1

Table 15.1-2 Travel and Tour Services

Affected Province / Cities	No. of Travel and Tour Services operating prior to Typhoon Yolanda	No. of Travel and Tour Services operating immediately after Typhoon Yolanda	No. of Operating Travel and Tour Services at present
Biliran Province	2	2	2
Tacloban City	8	0	8
Ormoc City	6	0	6
Maasin City	1	1	1

15.2 Targets of Promotion of Tourism（as Rehabilitation Targets）

15.2.1 Targets of Promotion of Tourism

- Target1：Rediscovery from the existing tourism resources for creation of attractive tourism in Leyte and Samar, by which people will be attracted to visit
- Target2：Development of tourism infrastructure and Realization of more attractive tourist resort in order to attract and increase the number of domestic and foreign visitors
- Target3：Promotion of tourism for higher standard of safety, security and high hospitality, with which tourists will be satisfied and want to visit again

15.2.2 Target Level

Table 15.2-1 THE EASTERN VISAYAS ROADMAP

	2011	2016
Foreign Visitor Arrivals:	27,368	47,013
Domestic Visitor Arrival	338,099	658,686

Average Length of Stay	2 days / 1 night	4 days / 3 nights
Average Expenditure/day	P 3,984.52	P 4,185.90
Tourist Receipts Generated	P 2,332,972,912.00	P 11,650,964,352.00

15.3 Proposal of Policy Measures on Promotion of Tourism

A policy measures system on promotuion of tourism is proposed as follows.

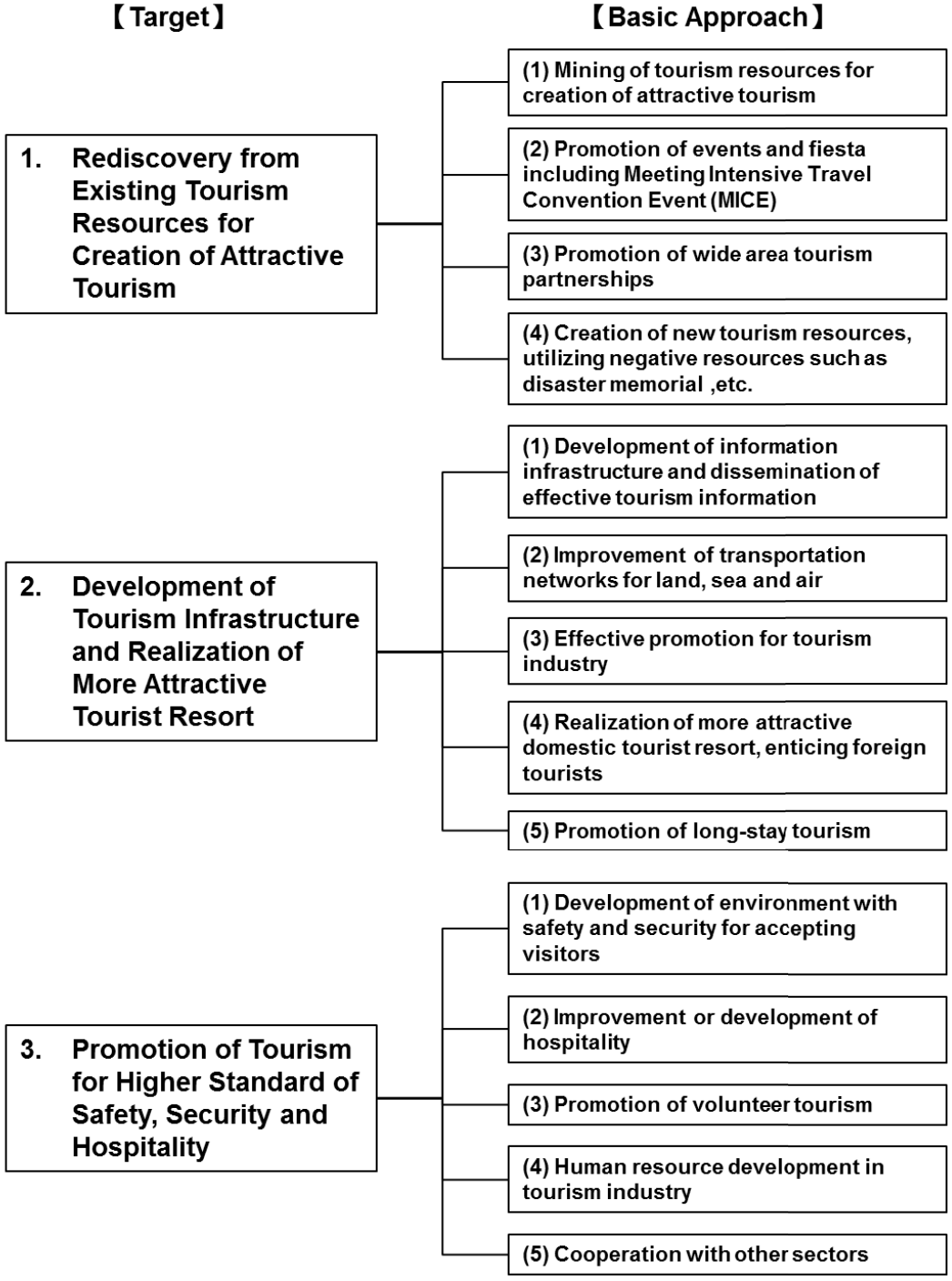


Figure 15.3-1 Policy Measures on Promotion of Tourism

15.3.1 Rediscovery from Existing Tourism Resources for Creation of Attractive Tourism

(1) Mining of tourism resources for creation of attractive tourism

The attractive or appealing tourism resources of Leyte and Samar are remarkably important, which makes people enticed to visit the area. In fact, there are some famous resources well known both in the Philippines and abroad such as abundant natural (*e.g.* water, forest, *etc*.), historical and cultural resources, *etc*., while some of them are not yet known enough. Thus, it is proposed that the existing tourism resources, first of all, should be rediscovered or enlightened for creation or promotion of more attractive tourism.

A. Utilization of tourism resources of sea (Blue tourism, ecotourism)
B. Utilization of tourism resources on land (Green tourism, ecotourism)
C. Utilization of historical and cultural resources (Ecotourism, Ecomuseum)
D. Promotion of life & cultural learning experiences in downtown, market, etc. as tourism resources (Ecotourism, Ecomuseum, Night life, Hand-made meal workshop)

Table 15.3-1 Actions for Mining of tourism resources for creation of attractive tourism

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Mining or rediscovery of tourism resources Re-investigation of tourism resources in Leyte and Samar and re-arrangement of data and information systematically in an archive database	Preparation	Implemen-tation	Review	
2. Formulation of experimental workshop program Utilizing the results of the above investigation, experimental workshop program will be formulated by local residents		Preparation	Implemen-tation	Review

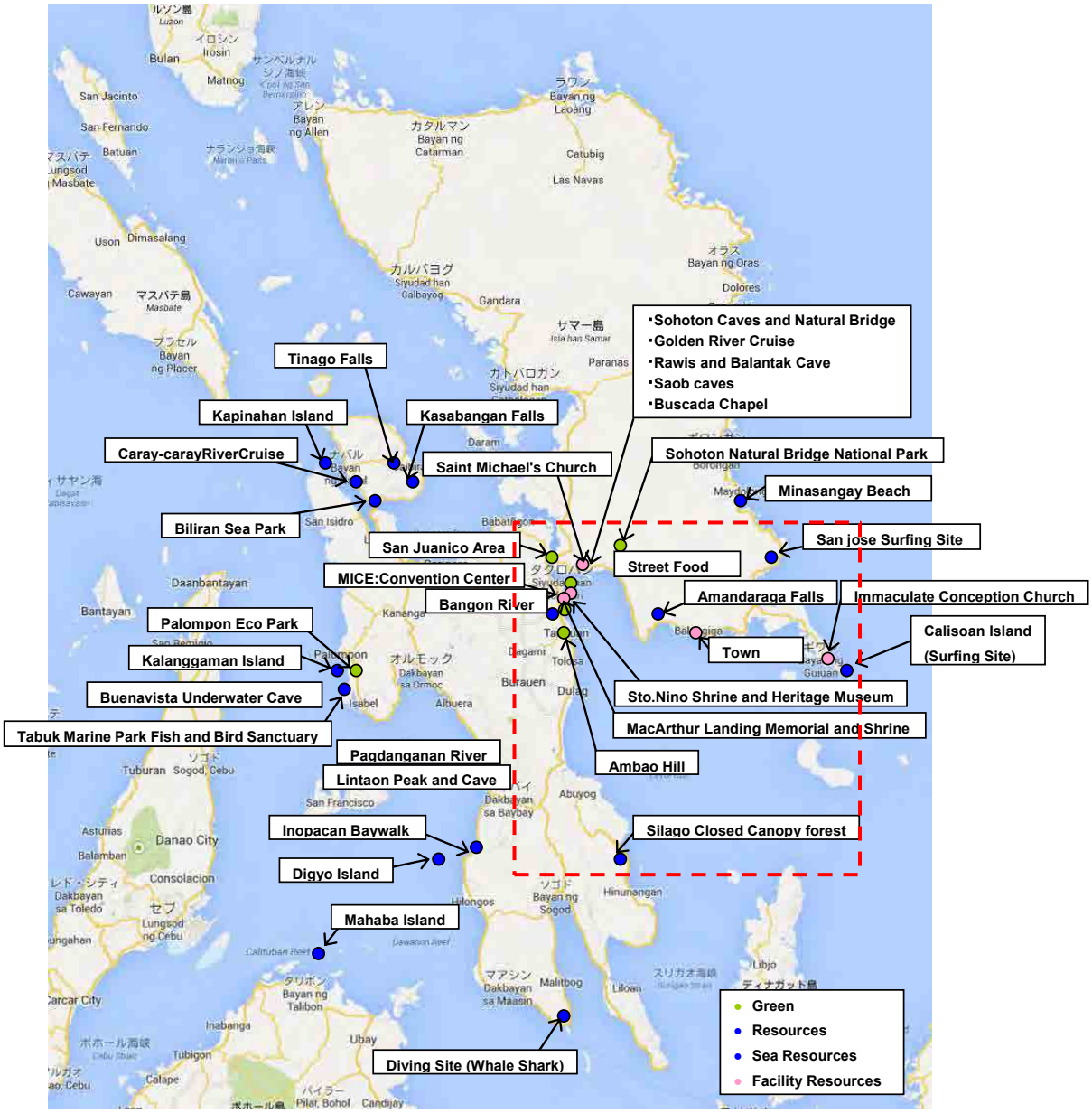


Figure 15.3-2 The attractive or appealing tourism resources of Leyte and Samar

(2) Promotion of events, fiesta and Meeting Intensive Travel Convention Event (MICE)

Creation of lively scenes by holding events and festivals is an important factor for attracting tourists. In general in the Philippines, the “Fiesta”, particularly, is a major event with enthusiastic atmosphere. Since such fiestas are to be held in various places in Leyte and Samar, the events should be promoted or improved in a way that tourists can enjoy from the bottom of their hearts. In addition, convention events such as Meeting Intensive Travel Convention Event (MICE) should be promoted since the economic effectiveness from such events (*e.g.* visitors from domestic and overseas, accommodations, foods, *etc*.) is expected to be significant. Then, a strategic program should be formulated in order to increase the number of the visitors throughout the year by reviewing the past achievements of Tacloban city, Palo city, *etc*.

Table 15.3-2 Actions for Promotion of events, fiesta and Meeting Intensive Travel Convention Event (MICE)

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Development of cooperation of festivals A huge festival system will be promoted by cooperating festivals in Leyte and Samar.	Preparation	Implementation	Review	
2. Promotion of MICE Preparation is to be carried out by establishing the organization for promotion of MICE. Then, a number of MICE will be invited and realized.		Organization	Implementation	Review

(3) Promotion of wide area tourism partnerships

Wide area tourism partnerships are necessary to be promoted both within and outside of the Leyte and Samar region so that the attractiveness of the entire region will be raised up, with which accessibility of tourist in the region is to be improved and the length of one's stay in the region can be expected to be longer.

Table 15.3-3 Actions for Promotion of wide area tourism partnerships

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Organization for tourism partnerships within the region of Leyte and Samar Establishment of regional cooperation council for information exchange and formulation of partnership program	Preparation	Implementation	Review	
2. Strengthening of partnerships outside of the region Promotion of alliance relationships with Cebu, Manila, *etc.* and proposition of detailed action plan of the partnership program to travel agents		Preparation	Implementation	Review

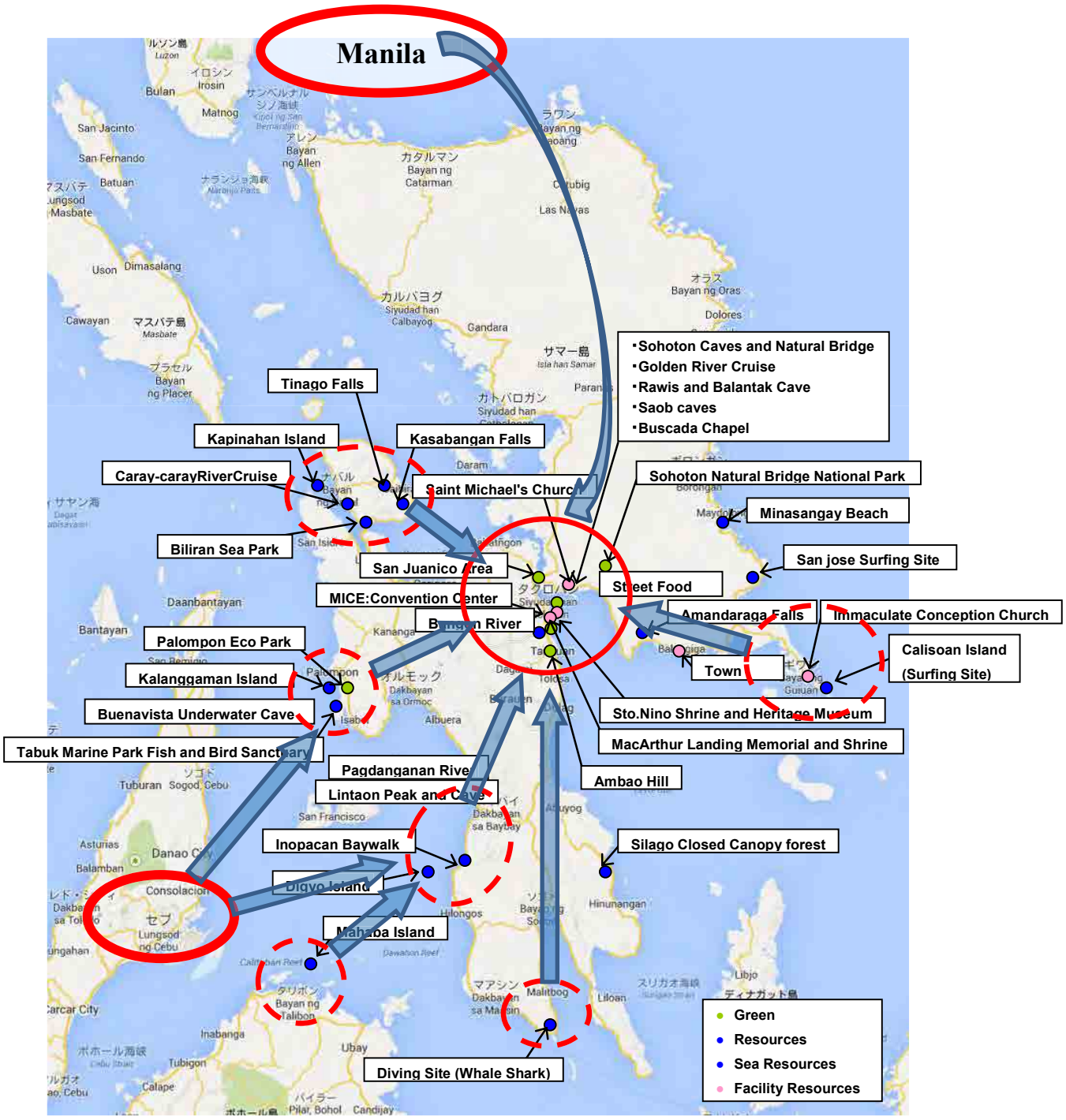


Figure 15.3-3 Promotion of wide area tourism partnerships

(4) Creation of new tourism resources, utilizing negative resources such as disaster memorial ,*etc.*

In the disaster struck area, there are still salient scars by the typhoon Yolanda such as stranded ships along coastal line. It is proposed that some of them should be maintained as disaster memorial in order to convey the memory or lessons learnt from the disaster to future generations without forgotten gradually. In addition, such memorials can be defined as “negative resources” to be utilized for creation of new tourism resources.

Table 15.3-4 Actions for Creation of new tourism resources

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Utilization of disaster memorial Possible "negative resources" are to be listed for utilization of disaster memorial prior to planning and actual utilization.	Preparation	Investiga-tion	Plannning for utilization	Implemen-tation
2. Implementation of program for conquering weak points Program for conquering weak points will be planned and implemented. And, such activities are to be proposed to travel agents as new tourism resources by the local initiatives.		Preparation	Planning & Proposal	Implemen-tation

15.3.2 Development of Tourism Infrastructure and Realization of More Attractive Tourist Resort

(1) Development of information infrastructure and dissemination of effective tourism information

Recently, many of the tourists have been making use of SNS or the Internet for obtaining relevant tourism information. In view of this current situation, it is quite indispensable to develop a sophisticated information infrastructure including dissemination of effective tourism information. In Leyte and Samar region, such information infrastructure is not unfortunately insufficient, steady development of the infrastructure is needed to be realized such as 1) attractive website with sufficient quality and quantity of information ,2) utilization or provision of information exchange platform through Social Network Service (SNS) and 3) development of the attractive contents, *etc*.

Besides the issues on information technology mentioned above, the tourist information facility (*e.g.* tourist information board, guiding plate, information center, *etc*.) is also necessary to be installed.

Table 15.3-5 Actions for Development of information infrastructure and dissemination of effective tourism information

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Development of tourism information platform The systematic tourism information platform is developed which enables one-stop services for not only information provisions but various types of reservations, *etc*.	Preparation	Development of Platform	Platform Operation	Revision, if necessary
2. Installations of tourist information boards Tourist information boards will be installed at necessary locations after the investigation of the necessary locations.	Preparation	Investigation or inspection	Installation when necessary	

(2) Improvement of transportation networks for land, sea and air

The existing transportation networks for land, sea and air in Leyte and Samar are needed to be improved in view of attraction of tourists. The important issues are itemized as below:

- Improvement of accessibility between major cities and the Tacloban airport
- Total solution for traffic jams in the major cities such as Tacloban city, Palo City, Tanauan City, *etc*.
- Abundant means of ground transportation so that tourist can use freely
- Improvement of ship transport network, considering accessibility among isolated islands and various ports in a island

Table 15.3-6 Actions for Improvement of transportation networks for land, sea and air

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Improvement of land transportation Improvement of land transportation in terms of integrated point of view including industry promotion, securing accessibility for local residents, *etc.*	Preparation	Improvement Study	Implementation for improvement associated with urban plan	
2. Improvement of sea transportation First of all, a study is to be carried out for improvement of sea transportation network centered on Tacloban port. The study covers accessibility among isolated islands as well as cruse network for both domestic and international.	Preparation	Study and Survey	Construction if feasible	

(3) Effective promotion for tourism industry

For the effective promotion for tourism, it is important to understand the needs of potential tourists. Efforts are required for the effective promotion such as needs survey, improvement of the way of provision the relevant information to travel agencies, *etc*.

Table 15.3-7 Actions for Effective promotion for tourism industry

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Needs survey Regular needs survey will be conducted at certain intervals as well as collection of basic tourism information including data and information storage.	Preparation	Needs assessment	Implementation of the monitoring	
2. Establishment of liaison council, cooperating with relevant organizations including travel agencies Promoting activities will be effectively performed through the periodic information exchange meetings. .	Preparation	Establishment of liaison council	Implementation of the promotion	

(4) Realization of more attractive domestic tourist resort, enticing foreign tourists

In view of the best domestic tourist resort of Leyte and Samar compared with the various domestic tourist places, the establishment of attractive characteristics is indispensable. It is important to prepare a flexible tourism items or programs available such as education travel program combined with disaster education to any style of stay (*e.g.* one day trip, short-term stay, *etc*.).

As for the promotion to tourists from overseas, the regional hospitality is needed to be improved through effective organization of volunteer guides for the foreign tourists.

Table 15.3-8 Actions for Realization of more attractive domestic tourist resort, enticing foreign tourists

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Establishment of committee for raising up the attraction of the region Regular meetings will be held for raising up the attraction of the region, including marketing activities associated with travel agencies such as educational tour, *etc*.	Preparation	Establishment of committee	Marketing activity	Review
2. Strategic meeting for increasing foreign tourists For increasing the number of foreign tourists, strategic meetings will be held including infrastructure development, needs assessment, *etc*. Then, concrete actions will be implemented to achieve the goals.	Preparation	Establishment of meetings	Concrete actions	Review

(5) Promotion of long-stay tourism

Long-stay tourism has abundant positive aspects such as economic ripple effect, interaction of local people, repeat customers, *etc*. For the effective promotion of long-stay tourism, the improvement of accommodation, tourism resources, transportation and information provision are quite important. Moreover, the various types of experimental programs for the tourists are needed to be developed by the local initiatives.

Table 15.3-9 Actions for Promotion of long-stay tourism

Action	Term			
	Urgent Within 1 year	Short-Term Up to 3 years	Mid-Term 3 to 6 years	Long-Term Beyond 6 years
1. Planning for long-stay tourism program the various types of experimental programs for the tourists will be developed	Preparation	Development of programs	Execution of programs	Review

15.3.3 Promotion of Tourism with Safety, Security and High Hospitality

(1) Development of an environment with safety and security for accepting visitors

The most important thing is development of an environment with safety and security for accepting visitors for the tourist or visitors to enjoy their comfortable stay in Leyte and Samar.

Securing safety for tourists or visitors when natural disasters occur

From the view point of securing safety for tourists or visitors when natural disasters occur, the countermeasures (*i.e.* emergency plan, organization, basic procedure, roles, *etc.*) are necessary to be formulated/ developed and shared among related organizations (*i.e.* police, fire and disaster management agencies, *etc.*). Such countermeasures need to be consistent with the other relevant emergency plans.

For foreigners

When natural disaster occur, foreign visitors are possibly tend to be information have-nots, then strengthening of assistance to foreigners are necessary such as instant information provision, *etc*.

(2) Improvement or development of hospitality

For further improvement of customer's satisfaction, the whole regional hospitality to each tourist or visitor is needed to be improved by not only tourism organizations but also administration, public organization, citizens, *etc*.

(3) Promotion of volunteer tourism

In Japan, "volunteer tourism" in the disaster affected area from the Great East Japan Earthquake is systematically adopted, which combines volunteer activities and sightseeing tour. More effective economic rehabilitation is expected due to not only volunteer activities but also sightseeing.

(4) Human resource development in tourism industry

There are quite a number of people engaging for tourism services such as transportation, accommodation, foods & drinks, entertainment, information services, *etc*. Thus, human resource development, engaging multiple roles in tourism industry, is urgent issue since the numbers of various visitors or tourists are expected to increase. The management ability is also expected to be strengthened. In the region of Leyte and Samar, mutual educational system may be practical methodology for effective development of human resources, cooperating with the region and relevant sectors.

(5) Cooperation with the other sectors

Cooperation with the other sectors (*e.g*. agriculture, forestry, fisheries, manufacturer,*etc*.) is also important issue. Cooperative activities such as experimental tourism in agriculture, forestry and fisheries including hand-made goods for souvenirs are recommended in terms of development of attractive tourism symbols.

Chapter 16 Trade and Innovative Industry

16.1 Damages and Issues

Yolanda severely damaged many of local markets and fish landing places as well as most of business entities' base building structures and their yielding equipment/ facilities by its strong winds and Tsunami-like storm surge. At the same time physical damages on warehouses and subsequent disposition of stocked commodities caused directly and indirectly by Yolanda resulted in disruption of wholesale-based commercial system for distributing commodities from regional/ national center mainly due to enormous capital loss of the business entities.

The huge building structure within the ICT industrial park located in Palo, which accommodated the call center business with 1,000 jobs, was devastated by Yolanda. The ICT park, which took advantage of existing backbone telecommunication line connecting Luzon and Mindanao, lost its advantage and the call center business.

Lack of regional market system supported by the logistic chain including cold storage and delivery vans, qualified slaughterhouse, processing facilities, and market trading system limits the effects of livelihood support programs especially production supports such as farm input provisions for promoting coconut inter-cropping and livestock. Harvests from these supports easily fill up the local demands, which means sales failure or cheaper price of the harvests.

Even boats and fishing gears have been restored high value fishes caught by local fisher-folks in Eastern Samar including tuna, blue marine, bonito, and so on, are sold in local market/ landing center since they have no access to the national and regional markets of Manila and Cebu neither to Tacloban where these fishes are highly appreciated. At the same time many of fisher-folks are engaged in coconuts farming and have been experienced income reduction due to the damage caused by Yolanda.

Primary sector's productions including farming, livestock raising, and fish culturing have been suffering higher price of inputs due to lack of locally available inputs. Most of inputs are imported from the outside the Area. Current destruction of the wholesale-based commercial system seems to exaggerate the high cost input problem in primary sector.

The followings are the issues for trade and industry in achieving economic restoration and enhancement to attain resilience and sustainability of the Study Area:

- Limited trade and industry activities to support creating product(s)/ service(s) with external earning capability other than copra,
- Local market oriented basic commodities produced in the Area, and
- Higher prices of commodities and farm inputs/ feeds imported from outside the Area.

16.2 Objectives for the Trade and Industry

The followings are the objectives for trade and industry to pursue economic restoration and

enhancement through external earning increase and resilience increase in regional economy:

- Enhancement of Access to External Higher Hierarchy Markets,
- Creation of Regional Market for Locally Produced Commodities,
- Restoration of Wholesale-based Commercial System Restoration for Imported Commodity Distribution, and
- Employment of Innovative Technology/ System for Creation of External Earning and Import Substituting Products.

16.3 Measures for Realization

(1) Enhancement of Access to External Higher Hierarchy Markets

The enhancement of access to the external higher hierarchy markets is important to increase external earnings of local products with high-level appreciation by the international market. The efforts may partly overlap with the creation of regional market in terms of logistic chain building such as cold chain establishment. It has to pay attention to the current benefiting stakeholders like middlemen to attain their cooperation.

The efforts may start with the followings:

- Formulation of producers' local cooperative/ association for collective shipping/ marketing activities on products/ harvests like Lapu Lapu (Grouper)、Tuna and Blue Marine and other appreciated items by international market, and
- Establishment of regional initiative for connecting the local cooperatives/ associations and for coordinating existing traders/ middlemen and customers/ suppliers in the destination markets for trade expansion.

The envisaged project is to create pelagic migratory fishery base/ market in Guiuan to accept and to export tuna, bleu marine, and bonito, which are caught nearby sea areas and are carried for landing at General Santos, Mindanao currently. Rehabilitation and utilization of existing airport may associate.

(2) Creation of Regional Market for Locally Produced Commodities

Creation of the regional market for locally produced commodities is indispensable to absorb fluctuation and concentration of product supplies and to widen economic base of the Area. Its requirement to establish logistic chain for product gathering and distribution including cold chain contributes to support higher market access enhancement and restoration of wholesale-based distribution system of imported commodities.

Regional market center has to be equipped with qualified slaughterhouses and other quality food processing facilities for regional distributions and possible export. Linkage with the industrial zone in Tacloban North has to be considered for synergy effects.

The efforts may start with the followings:

- Formulation of uniform local market associations for basic commodity gathering and trading with installation of cold storage facilities, and
- Establishment of regional network of local markets centered by Tacloban.

Utilization of converted leftover container vans to cold storage with mobility is viable option for implementing the physical facility development.

Establishment of regional fish landing center/ central market is expectable project as well as the establishment of the central vegetable and meet market.

(3) Restoration of Wholesale-based Commercial System for Imported Commodity Distribution

Disruption of wholesale-based commercial system seems to result in commodity price rise in general due to import of them from the super regional/national center by retail prices. The situation regarding farm inputs and feeds for livestock and fishes seems similar.

Followings are the commencing measures for restoration of the system:

- Establishment of the large scale public warehouse for leasing spaces and facilities to wholesale traders in Palo
- Studying possibility of utilizing Eastern Visayas Regional Growth Center (EVRGC) in Tacloban North, which has been approved as eco-industrial zone by Philippine Economic Zone Authority (PEZA), as regional logistic center with processing activities using opportunity of the feasibility study on the EVRGC by Philippine Chamber of Commerce and Industry (PCCI) with international assistances, and
- Encouraging business society to commence wholesale trading in the Area with attractive incentives.

Coordinated shipping from super-regional center, Cebu, of wholesale traders in association with the planned and opened supermarkets could be an option for minimizing transport cost.

(4) Employment of Innovative Technology/ System for Creating External Earning and Import Substituting Products

Recovery and reconstruction efforts delivering is a good opportunity to employ new technology/ system for creating new product/ service. As build back better implies the devastation of the built-up practices is a chance to create new practices.

The followings are the prospective businesses for planning, preparation, and implementation with recommendation of considering opportunities in EVRGC:

- Fish and livestock feed production system establishment utilizing the Study Area and vicinity areas' local products including corn and root crop cultivation promotion,

- Alteration of leftover container vans to cold storage by attaching solar panel and battery, heat converter, and insulator, for the local market installation,
- Milkfish and other fishery harvests processing for outside the Area marketing with no-smelling fish meat branding,
- Enhancing branding marketing promotion and design oriented improvement of handicraftsß such as “Tikog” products in Basey,
- Charcoal briquette and/ or highly activated carbon production utilizing coconut related resources including fallen trees and their residue of lumber, and coconut husks, and
- Deep-Sea Water utilization for power generation, sea water nutrition, bottling, cosmetics, etc.