7 URBAN INFRASTRUCTURE AND UTILITIES PLAN

7.1 Main Considerations

7.1 There are three points commonly observed that must be attended in planning of urban infrastructure and utilities of the city. They are briefly as follows:

(a) Develop Efficient and Effective Network and Facilities

7.2 Access rate for the utilities varied from the sectors. Access rate for the power supply was almost 100%, while those of water supply and sewerage are about 60%. (The effectiveness of the sewerage is much lower, since only about 20% of the house connected to the sewerage system from the septic tank.) Clients are not fully satisfied with the service quality although in the service area. Low water pressure, fluctuation of power voltage and leachate from the dumping site are reported from the customer. The generation volume or demand is projected to increase drastically according to the population increase and better life quality in 2025. Therefore service providers are required to expand service coverage including planned urban development and to improve service quality with affordable cost.

(b) Improve Operation and Management Mechanism

7.3 Danang Power Company, which was established for operation of the power supply in the Danang, was a first equitized company in the utility services. DWSC, TDMC and URENCO followed from 2009 after a certain period of time. Main roles and responsibility of those company is operation of the existing system from supply qualified service and fee collection. There is not a centralized monitoring and control system for the facilities for them to easy to cope with accident and change of the unexpected conditions. In addition, customer relations including computerized system is lacking, even though it seems crucial for the operation. Furthermore there are some companies lacking of human resources, technical equipment and administrative instruments.

7.4 A rapid growth of the city and economic growth require huge investment and capacity to develop and operate the system for all the sectors in the urban utilities and infrastructures. Currently the capacity of the operation body seems limited. Capacity development for the operation body may take a time even so it is worth to conduct. One tactic to speed up the development is to involve private and foreign sector participation with certain skill and enough capacity of technical, financial, operation capacity. A mechanism shall be established for them to participate in the development and for government can monitor and advise their activity. Those issues need to be challenged in the area of operation.

(c) Promote User Paying Principle/Awareness Campaign for Saving Consumption

7.5 Danang Power Company had been collecting fee from the customer according to the tariff designated by the prime minister. DPC has responsibility to set tariff and establish collection system for rest of the utilities and infrastructures. Especially utilities for treatment are vulnerable in financial conditions. Income from the fee collection cannot meet their operation cost since tariffs for the domestic waste collection and sewerage is set low. A large difference was covered by the subsidy from the government. As a result, it was difficult to replace existing equipment like collection bins and trucks. Even though willingness to pay for the treatment is low as shown in the HIS results, a fair burden should be promoted through establishment of proper tariff system and awareness cam-

paign. Understanding from the users/customers are required to set up proper tariff system. Volume of the generation, opportunity and mechanism are the important factor to set up fair tariff and collection system. Therefore awareness campaign and set up opportunities to discuss these matter with citizens is required. In addition all of the utilities are related to the environment. and target beneficiaries are almost same. Therefore environmental education shall be integrated and conducted.

7.2 Power Supply Plan

1) The 6th National Power Development Master Plan

7.6 Development of power generation plants and national level of transmission network (500kV) was proposed in the master plan based on the projection. Basic demands projection of Danang City described in the following section follows this master plan. Therefore power plants and high voltage transmission network shall be developed in accordance with their plan.

2) Demand Projection

7.7 Future demand was projected based on the socio economic framework and current growth trend, as well as following factors:

(i) Energy consumption growth was projected by amount of different sectors and domestic consumption. Those sectors consumption will increase in proportion with economic growth. Meanwhile coefficient for the sector growth varies.

(ii) Energy consumption increase according to the new transportation system including electric car and high-speed train was excluded.

Projected consumption volume of third scenario in 2025 is ten times that of 2007. Development of power supply network shall be accelerated since average annual growth rate is more than twelve percent, which is higher than current growth rate (see Table 7.2.1).

Table 7.2.1 Power Demand Projection for the Three Scenarios

Item	Unit	2007	Scenario 1		Scenario 2			Scenario 3	
			2015	2025	2015	2020	2025	2015	2025
Industries									
Agriculture,Forestry,Aquaculture	GWh	1	1	2	1	1	2	1	3
Industrial ,Construction	GWh	452	894	3,262	976	1,694	3,221	1,064	4,688
Commerce, Hotel,Resturant	GWh	65	102	528	112	200	391	122	1,059
Consumer (Domestic)	GWh	350	891	1,316	977	1,300	2,166	1,273	3,153
Others	GWh	27	57	153	62	96	173	74	267
Total Consumption	GWh	907	1,945	5,261	2,127	3,291	5,954	2,533	9,170
Multiplicity	Times	1.0	2.1	5.8	2.3	3.6	6.6	2.8	10.1
Peak Load Factor		0.59	0.68	0.74	0.68	0.72	0.74	0.68	0.74
Peak Demand	MW	175.5	327.8	814.5	359.5	518.2	921.8	426.9	1,414.6
Multiplicity	Times	1.0	1.9	4.6	2.0	3.0	5.3	2.4	8.1
Consumption per capita	kwh/person	1,124	1,970	4,330	1,966	2,742	3,969	2,156	4,201

Source: DaCRISS Study Team

3) Expansion the Network and Development of Renewable Energy

7.8 Currently the power company developed increase capacity for the substations and distribution network based on the SEDP and the power sector 5 years plan. The DaCRISS proposed to enlarge urban area. This is thus power consumption is going to accelerated. Additional development of supply network including substations and distribution network shall cover newly development area.

7.9 At present there is no active movement was observed related to introduction of renewable energy though it was mentioned in the 6th national development plan. Substitution of fossil energy might be indispensable even in developing country in future. Those alternative energy sources have disadvantages compared with conventional sources. Those are lack of capacities, high cost and irregularity of the production. Hence develop-

ment of renewable energy shall be done in the context of redeeming to the current power's fault. Introduction shall be done with assistance of private and non-power oriented company participation. For example if factories in the industrial zone can take part in the system, issues related of unstable supply will be relieved. Subsidy or purchasing system for such factories should be established in order to maximize advantage of the renewable energy which can be distributed in the anywhere and connect to the network. Those mechanism shall be designed in consideration with assistance of CDM and environmental assistance fund from the international partners.

4) Improve Operation System for Stable Supply

7.10 Once transmission network was established in the nationwide, energy loss rate, which was succeeded to decrease less than ten percent although, is high compared with the other neighboring developing countries. Unstable supply aforementioned cause dissatisfaction for foreign direct investment or joint stock companies. The utility services in the rest of the sector are also affected. Power failure prevented operation of treatment plants and pumping stations. Those might cause environmental pollution. Internet facilities are also affected. Those are not only caused by the shortage of capacity of power generation plant or substation but also lacking of power control and monitoring system in power supply network.

7.11 A new concept of the transmission network is now proposed and discussed around the world. The concept is a smart grid[1]. This system utilize ICT technology that enables related facilities to exchange information and coordinate supply and demand automatically. It contributes to improve stability of the system even in the case of disaster and raise efficiency in the network. Therefore the system was said to be especially effective in the weak or old transmission network such as developing countries or countries which has not invested maintenance. The discussion has just begun recently in developed countries, so it might take a few years to set the standard in Vietnam. The introduction was proposed to start 2015.

5) Promote Awareness Campaign for Environmental Protection and Delay Demand

7.12 As mentioned in the previous chapter, saving consumption relieve rapid pace of facilities development. Only a few percent of the power saving can be expected from each consumer. Amount of those efforts from the consumer contribute to extend construction of thermal power plant. In addition saving benefits both consumers and supplier by decreasing fee from consumers and by saving investment amount from supplier.

7.13 A number of the measures can be considered. Those are dissemination of low power consumption electric devices, promotion of frequent cutting off and unplug, promotion of low power consumption of equipment. The promotion measures can be also selected or combined from the various levels from the community approach to by mass media. An environmental education at school seems effective, subject shall be composed from various environmental aspects and utility aspects.

[1] Smart Grid: A smart grid delivers electricity from suppliers to consumers using digital technology to save energy, reduce cost and increase reliability and transparency. Such a modernized electricity network is being promoted by many governments as a way of addressing energy independence, global warming and emergency resilience issues.
Source: Wikipedia

7.3 Water Supply Plan

1) Demand Projection

7.14 Future demand was projected based on the socio economic framework and current growth trend (see Table 7.3.1).

Table 7.3.1 Water Demand Projection for the Three Scenarios

Item	Unit	2007	Scenario 1		Scenario 2			Scenario 3	
			2020	2025	2015	2020	2025	2015	2025
Unit Rate	lit/person day	118	180	200	180	200	200	180	200
Coverage(service area)	%	60	80	90	80	90	95	80	99
Domestic Consumption	m3/day	49,549	118,455	202,377	124,560	195,156	235,540	146,243	363,488
Other Consumption	m3/day	14,950	29,164	50,594	31,140	48,789	58,885	36,561	90,872
Loss Rate	%	40	25	20	25	20	20	25	20
Water Consumed	m3/day	107,930	197,425	316,214	207,600	304,932	368,032	243,738	567,951
Multiplicity	Times	1	1.8	2.9	1.9	2.8	3.4	2.3	5.3

Source: DaCRISS Study Team

2) Water Resource Development and Management

7.15 It might be possible for ADB water supply project at Cu De River to satisfy water demand in 2015. Considering geographic condition, it is suspicious that farther large water source can be exploited in Danang City. Upstream of Vu Gia River is one of the prospective water sources in Quang Nam. However, there seems no function of coordinating water resources among local authority or different sectors. Power sector, irrigation and water supply in the different local government have their own development policies without any coordination is spite of only the one river. For example, A water intake for the supply system suffered saline in the dry season. Waste water treatment was planned to locate downstream of the river. However this might affect current water intake because the saline came from the estuary. This water intake was also affected waste water from the industrial park in the upstream. At least the measures for preventing water pollution shall be taken at the planning stage. An Integrated Water Resource Management (IWRM) proposed by DaCRISS enable stakeholders to coordinate water resource management and regulation of pollution. Issues to be discussed in the IWRM are demand adjustment by season, water source protection and strategic development and environmental protection and so on.

7.16 If the water resource exploit is difficult, independent water resource might be also considered. A rain water enable to supply daily life water (except cooking and drinking) to the beneficiaries. Main target is a building with big roof. A subsidy for the facility and technical assistance for construction and operation shall be introduced in the customer relation.

7.17 Rural clean water programme should be promoted since the centralized water supply system cannot cover the whole area.

3) Supply and Distribution Network Development

7.18 Supply and distribution network shall be expanded to cover the newly urban development area and non-serviced area.

4) Counter measures for Non Revenue Water

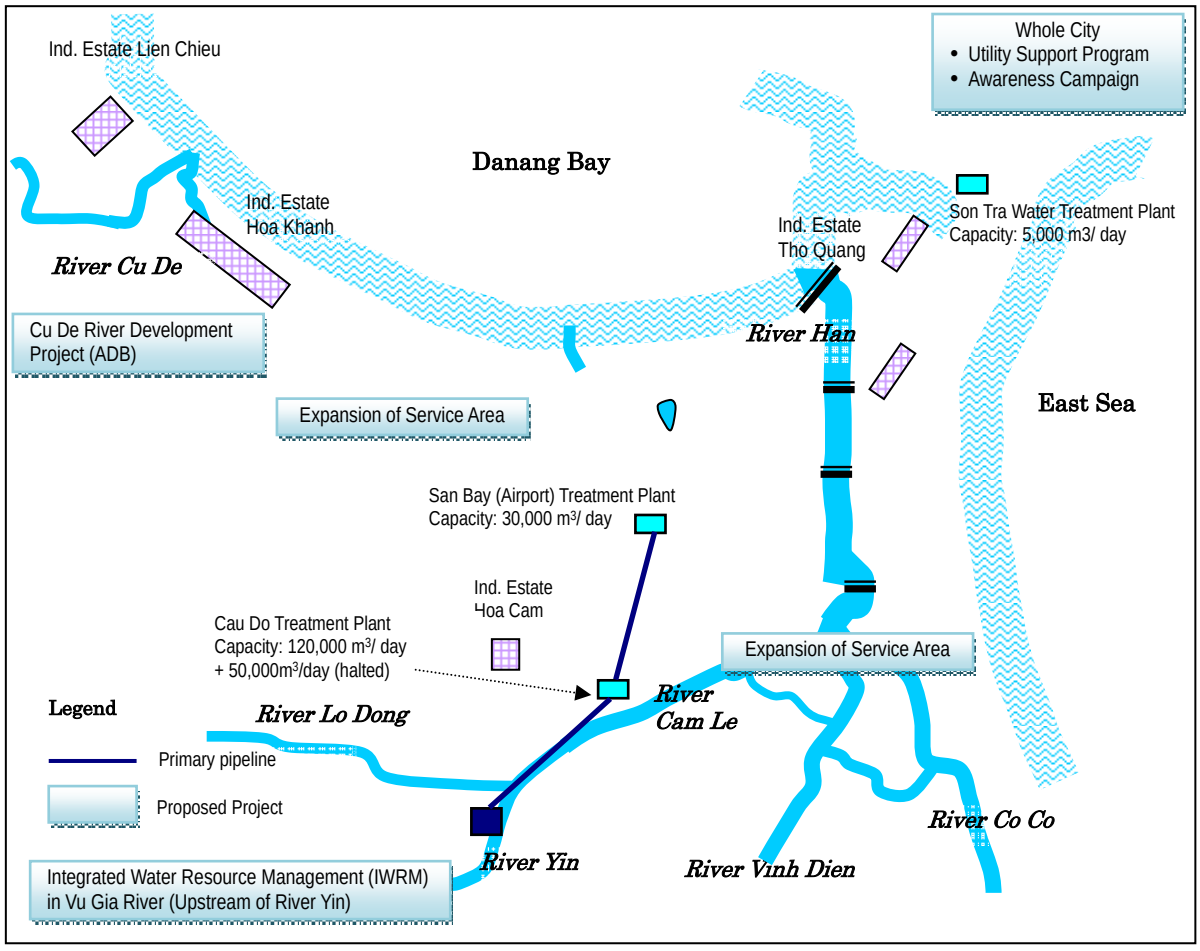
7.19 Netherlands and DWSC cooperated together for improving current network performance by conducting project of USP (Utility Service Programme). USP has significant

effects on improving non revenue water and customer relations. Loss rate became 36% from the 40% within one year. Current effort shall be continued.

5) Promotion of Awareness Campaign

7.20 Since water exploit seems not so simple, delaying demand is also effective from the beginning. Samples of the measures are introduction of auto flushing equipments, water saving tap and promotion of rain water system. The importance of the water source protection is also one aspects required for the awareness campaign. A cooperation with community, mass media and environmental education at school level can be taken into account.

Figure 7.3.1 Proposed Water Supply System in Danang City



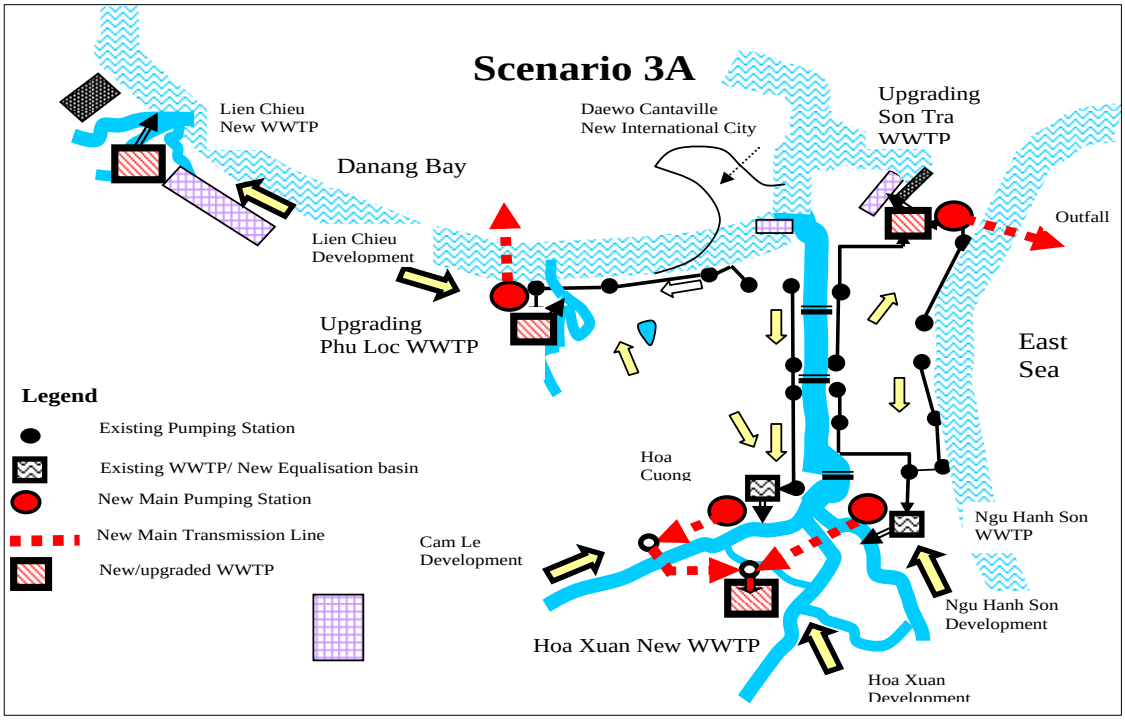
Source: DaCRISS Study Team.

7.4 Waste Water Treatment Plan and Drainage

7.21 The waste water treatment master plan was formulated in the PIIP project by the World Bank in April 2009. Objectives of this plan are 1) to assist local government for choice of comprehensive medium and long term strategies, 2) to recommend options for optimizing the performance of existing waste water treatment plants, 3) to identify the specific investment required to implement the recommend; and 4) to provide firm recommendations on the optimum wastewater treatment methods for existing and proposed waste water treatment plants. This plan is mainly focusing on domestic waste water. Detailed analysis on industrial and other type of waste water were not available.

7.22 Based on careful assessment of existing condition and data, four different wastewater management scenarios were analyzed with regard to overall feasibility. The most feasible management option proposed in the project is shown in Figure 7.4.1.

Figure 7.4.1 Proposed Wastewater System in Danang City (Scenario 3A)



Source: World Bank PIIP

7.23 The preferred Scenario divides Danang City into two logical catchments areas on a hydrologic basis. The two hydrological areas are Northern Danang and Southern Danang.

7.24 It is recommended that three WWTP (Waste Water Treatment Plant) are used to treat wastewater in Northern Danang, while only one central WWTP at Hoa Xuan is used in Southern Danang. Of the three northern WWTPs, the secondary treatment facility Lien Chieu is the only new WWTP. The existing Phu Loc and Son Tra WWTPs are proposed to be upgraded by CEPT (Chemically Enhanced Primary Treatment) technology in combination with sea out falls. According to the cost analysis, this scenario has the second most favorable investment and operational costs mainly due to the CEPT solutions for Phu Loc and Son Tra WWTPs.

7.25 Other features of the proposed wastewater management strategy include the following:

(i) integration into operation of existing WWTPs,

(ii) intensified efforts to connect household septic tanks to the existing sewerage system,

(iii) more active and efficient maintenance of existing systems,

(iv) introduction of separate wastewater collection system with priority to coastal areas and totally new development areas, and

(v) improvement of existing WWTPs in Northwest and Northeast Danang City.

7.26 For this study, a comparative analysis of 6 wastewater treatment processes was undertaken. The following treatment processes were considered. those are, Waste Stabilization Ponds (WSP), Trickling Filter (TF), Activated sludge (AS), Oxidation Ditch (OD), Sequencing Batch Reactor (SBR), Chemically Enhanced Primary Treatment (CEPT). For Da Nang City, the Oxidation Ditch process is determined to be the best technological option for the future establishment of secondary treatment. The Oxidation Ditch is recommended due to the following main reasons:

(i) proven reliable and simple technology,

(ii) primary sedimentation is unneeded,

(iii) stabilization of sludge is unneeded, and

(iv) good capability for nitrogen removal.

7.27 The main disadvantage of the Oxidation Ditch process is the relatively large area requirement. From an area requirement standpoint, the SBR process is the most favorable. However, due to operational complexity and costs of the SBR, it has not been regarded as the most viable wastewater treatment technology for the future of Da Nang City. For Phu Loc and Son Tra WWTPs, the addition of CEPT in combination with sea outfalls has been determined to be the best technological configuration.

7.28 The investment costs for full implementation of the proposed wastewater management strategy have been determined for the short term period (up to year 2020), medium term (from 2020 to year 2030), and the long term period (from 2030 to year 2040). The capital investment cost plan for construction and upgrading of the collection systems, WWTPs, and support facilities are large. The accumulated investment costs will increase from 47.3 million USD in 2020, to 68.7 million USD until year 2030, to 120.1 million USD until year 2040. Also, the operational costs for the Oxidation Ditch technology have been calculated for the short, medium and long term. The annual operational costs are considerable and will increase from about 0.78 million USD per year in 2020 to almost 3.0 million USD per year in 2040.

7.29 The following four issues were raised as recommendations:

(i) **Future Degree of Septic Tank Connections:** Information on present and future degrees of connection to the sewers is urgently required. Judging from current information, It is estimated that physical connection rate from the household is low. In order to propose promote connection, social and physical condition shall be assessed in advance.

(ii) **Improved Operation and Maintenance of Wastewater System:** For the stable and effective operation, Enhancement of human resource development, monitoring capacity enhancement and procurement of equipments are proposed. Periodical train-

ing related to specified operation and maintenance procedure shall be undergone for employees. Suction truck, lorries and cleaning device shall be procured for effective cleaning. Recording accurate flow data is essential for planning and monitoring. It is also recommended to install weir structure and flow measuring devices and conduct regular sampling for the influents/ effluents at all WWTPs.

(iii) **Public Awareness Program:** In order encourage direct connection and phasing out of septic tank, the public must aware the advantage of direct connection in the long term. A campaign and environmental education shall be planned.

(iv) **Buffer Zone Regulations:** In Danang City, complying with the strict buffer zone requirements for construction of wastewater treatment plants is a challenge. It is therefore recommended that a buffer zone design should be based on assessed environmental impact and not strictly on prescribed buffer zone distances.

7.30 Though the population framework of this plan is different from DaCRISS, the plan should be conducted with due cooperation and assessment. In addition to the master plan, DaCRISS team proposes to enhance remaining important aspects of this sector, namely i) enforcement of industrial waste water treatment, ii) promotion of independent sewerage system in rural area, and iii) awareness campaign and proper tariff setting. i) and ii) are currently being further studied.

7.5 Solid Waste Management Plan

1) Projection of Waste Generation Volume

(a) Domestic Waste

7.31 The volume of the treatment is projected to increase into four times in 2025. And current Kahn Son landfill site would be expected to be full during 2015–2020 in the third scenario (see Table 7.5.1).

Table 7.5.1 Project Volume of the Domestic Solid Waste

Item	Unit	2007	Scenario 1		Scenario 2			Scenario 3	
			2015	2025	2015	2020	2025	2015	2025
GRDP per capita	USD	1,200	2,015	4,000	3,000	3,500	5,000	3,000	5,000
Municipal Waste	Kg/person/day	0.8	1.1	1.2	1.1	1.15	1.2	1.1	1.2
Municipal Waste	Ton/day	645	1,086	1,458	1,190	1,380	1,800	1,292	2,619
Collection Rate(Municipal)	%	85	90	95	90	92	95	90	95
Collection(Municipal	Ton/day	549	977	1,385	1,071	1,270	1,710	1,163	2,489
Multiple Number	Times	1.0	1.8	2.5	2.0	2.3	3.1	2.1	4.5
Cumulative amount from 2007	1000Ton	-	2,228	6,352	2,364	4,313	7,419	2,499	9,977

Source: DaCRISS Study Team.

(b) Industrial Waste

7.32 Lack of current industrial waste information prevents to project future generation quantity and contents. A survey and establishment of the collection and treatment system can be proposed. There might be a type of waste which requires advanced treatment, while some type maybe useful for recycle or reused.

2) Intermediate Treatment and Final Treatment

7.33 As mentioned above new landfill site shall be proposed. Site selection for the landfill would be critical because of the limited land area in Danang. Selection from outside of Danang can be a one option. However, it seems difficult for neighboring local authority only to agree with receiving the generated waste. Some mechanism to receive reasonable benefits or measures could be discussed among stakeholders. For example, cost share for the development of intermediate treatment plants, priority to use the generated power or fuel and improvement of solid waste management system by the main polluter expense. Therefore joint survey and opportunity for discussion also proposed. Those process need to be shared with related local authorities.

7.34 Simultaneously, introduction of the intermediate treatment also shall be planned in order to decrease final treatment volume due to the reason aforementioned.

7.35 A compost type treatment is most common method in Vietnam, although fertilizer, outputs of the compost, is prohibited in the agricultural purposes through unexpected contamination of soil. There are some kinds of treatment method for intermediate treatment. Those are combustion, RDF (Refuse Derived Fuel), Biomass Gas, Biomass generation. Advantage and disadvantage of those methods are summarized below. For selecting method a careful study need to be conducted. Theoretically combustion is a last method to select. First reason is increase carbon emission. Second reason is material recycle and chemical recycle has priority for the environment. And third one is less human resources to operate combustion plant, which requires broad technical knowledge and sensitiveness. However, some combination can be also planned after the careful comparison of the me-

thods. Economical and financial aspects, life cycle assessment from environmental view and operation and maintenance including collection stage are the essential issues to be studied.

3) Industrial waste

7.36 A hazardous waste can be included in the industrial waste, those shall be treated after the proper source separation. Outsourcing from the city or cooperation among the other local government shall be planned in case that development of treatment facility is difficult because of the efficiency and effectiveness.

7.37 An incinerator for the hospital waste started operation in 2009. It is said that almost seventy to eighty percent of the hospital contracted with URENCO to collect and combust. Monitoring shall be done for their better implementation.

4) Promotion of Recycle in the Industrial Sector

7.38 Once the volume and type of industrial waste was surveyed. There seems various type of recycle can be proposed. For example, cement, which is a main industrial products in the central region, can mix sludge and ash at the producing stage easily. At least, an industrial standard for the cement shall be required for the realization, low pricing of the waste also need.

7.39 Construction waste also have high possibility for recycle, since construction industry seems prospective in the Danang City, although the various type of construction materials was existing..

5) Collection and Transportation Plan

7.40 The collection and transportation system might be designed according to the type of intermediate treatment and final dumping. A dynamic change might be required for introducing source separation, since no mechanical or chemical method can not be applied according to the effectiveness and efficiency. For the successful implementation, active participation from the beneficiaries for source separation is crucial. As mentioned below, 3R activity and awareness campaign can contribute those process. This is being further studied.

6) Financial Improvement

7.41 As shown in the HIS results, willingness to pay for the improved service was the lowest among utilities. Furthermore collection rate of fee was only about seventy percent. A low intention for investing treatment sector is general trend in the world. A combination of subsidy and fee collection is a solution for securing resource for the service. However, tariff shall be set taking into account users pays principle. Frequency of the service, quantity of the service, and the type of the collection shall be considered. Customer relation is also important to increase the collection rate. The introduction of the computerized system enables not only improving of record keeping but also information analysis of customer request which can be utilized for improvement of services.

7) Awareness Campaign for the People

7.42 An awareness campaign might include several objectives. Those are promotion of source separation and 3R (reuse, reduce, recycle), increase of fee collection rate and environmental education. Littering on the road or public area seems popular in Vietnam, although workers frequent cleaning may contribute to keep sanitary in the public space.

Promotion can change those customs in the long run. JICA's activity in Hanoi can be a sample of the project. For example dissemination of eco-bags was also conducted in order to decrease consumption of plastic bags given at the shops. Organizing free market is effective to decrease waste through exchange unused goods among users. Environmental education and promotion at the community level was also conducted. The advantage of 3R is to adapt comprehensive approach. In Danang, there are active organizations such as Woman's union etc. Those shall be a key to conduct those kinds of activities.

7.6 Identified Projects / Actions

7.43 After the assessment of the project proposed in the SEDP, the study team would propose the projects shown in Table 7.6.1.

Table 7.6.1 Identified Projects / Actions

Project Group	Code	Projects / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector
Provide better supply network (conventional energy)	Ut-1	Upgrade the Da Nang 500kV station from 450 MVA to 900 MVA and 1350 MVA and add a number of 220kV transformation station	5.0	G	If	**3**	L	D	-
	Ut-2	Develop a new 220kV station in Son Tra - Ngu Hanh Son (2 x 125 MVA)	5.0	G	If	**3**	L	D	-
	Ut-3	Upgrade capacity of 220kV station in Hoa Khanh to 2 x 125 MVA	3.0	G	If	**3**	L	D	-
	Ut-4	Upgrade capacity of Lien Tri 110kV station to 2 generators 25+40 MVA, which are to be installed in 2008-2010	3.0	G	If	**3**	L	D	-
	Ut-5	Upgrade capacity of Lien Chieu 110kV station to 2 x 40 MVA	3.0	G	If	**3**	L	D	-
	Ut-6	Start operating the double circuit 110kV line of Hoa Khanh – Lien Chieu – Hai Van Pass	2.0	G	If	**3**	L	D	-
	Ut-7	Upgrade capacity of Hoa Khanh 110kV station to 25+63 MVA, installation due in 2008 – 2010	3.0	G	If	**3**	L	D	-
	Ut-8	Upgrade capacity of Xuan Ha 110kV station, installation in 2008 – 2010	2.0	G	If	**3**	L	D	-
	Ut-9	Upgrade capacity of An Don 110kV station to 25 + 40 MVA	2.0	G	If	**3**	L	D	-
	Ut-10	Improve the single circuit 110 kV line of Ngu Hanh Son – An Don to double circuit line to improve electricity supply safety	3.0	G	If	**3**	L	D	-
	Ut-11	Develop a 110kV station in Hoa Khuong and upgrade of Cau Do 110kv sation to 25+40 MVA	3.0	G	If	**3**	L	D	-
	Ut-12	Develop a 110/22kv transformation station of Thuan Phuoc to cover Da Phuong New Town project	2.0	G	If	**3**	L	D	-
	Ut-13	Promotion of new power generation plants	100.0	G	If	**3**	L	D	-
	Ut-14	Supplementary upgrade power transmission and distribution network (substation and network (Compact Cable Box))	100.0	G	If	**3**	L	J	-
Develop supply network (new energy)	Ut-15	Introduction of solar power production	50.0	G	If	**3**, 5	L	J	En
	Ut-16	Introduce renewable energy production	3.3	G	If	**3**, 5	L	J	En
Provide better supply network (water supply)	Ut-17	Pure water supply project: Increase the capacity from 111,000m3/day in 2003 to 330,000m3/day in 2015	76.0	G	If	**4**	L	D	-
	Ut-18	Develop a new reservoir of Trung An	10.0	G	If	**4**	L	D	-
	Ut-19	Upgrade Cau Do, Son Tra and Airport Water Plants (Danang Water Plant Project)	79.1	G	If	**4**	L	D	-
	Ut-20	Water supply and environment sanitation project	84.6	G	If	4, **5**	M	D	En
	Ut-21	Water resource development at Cu De River (Danang water supply project)	50.0	G	If	**4**	L	D	En
	Ut-22	Improve water loss in the existing network (USP)	6.0	G	Mg	**4**	L	O	En
	Ut-23	Expand service area for newly development area	350.0	G	If	**4**	L	J	En
Provide better supply network (waste water)	Ut-24	Waste Water treatment system development (PIIP)	68.7	G	If	**5**, 6	L	O	En
	Ut-26	Improve 4 existing stations of urban waste water treatment in Hoa Xuan, building drain infrastructure in Son Tra Distr., Lien Chieu Distr., Cam Le Distr.	10.0	G	If	**5**, 6	L	D	En

Project Group	Code	Projects / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector
	Ut-27	Develop the sewage canal along the beach from eastern Son Tra to Non Nuoc and along Da Nang bay from Thuan Phuoc to Nam O, along east – west banks of Han River and 6 wastewater treatment stations at Thuan Phuoc Mouth, Hoa Minh, Hoa Khanh, Hoa Cuong, Hoa Hai and Tho Quang	5.0	G	If	**5**, 6	L	D	En
	Ut-28	Expand the service area for newly development area	5.0	G	If	**5**, 6	L	D	-
	Ut-29	Expand the four treatment station for demand increase	5.0	G	If	**5**, 6	L	D	-
	Ut-30	Promotion of septic tank in rural area	6.4	PFI	Mg	**5**, 6	L	J	En
	Ut-31	Promote the use of waste water treatment sludge (at cement factory, etc.) including opportunities for CDM	0.1	G	Mg	**5**, 6	L	J	En
	Ut-32	Establishment of industrial waste water treatment system	20.0	G	If	**5**	S	J	En
	Ut-33	Build central wastewater treatment systems in all industrial zones	2.4	G	If	3, **5**, 6	S	D	En
	Ut-34	Improve 4 existing urban wastewater treatment stations	33.3	G	If	**5**, 6	S	D	En
	Ut-35	Facilitate and expand the on-going Water Drainage and Environmental Sanitation Improvement Project	200.0	G	If	**5**, 6	L	J	En
	Ut-36	Build a comprehensive sewerage system in the designated urbanized area	120.0	G	If	**5**, 6	L	J	En
Provide better supply network (solid waste)	Ut-37	Introduction of intermediate treatment system for domestic waste	110.0	G	If	**5**	S	J	En
	Ut-38	Enhance industrial waste management	5.0	G	If	**5**	S	J	En
	Ut-39	Recycle of construction waste	0.4	G	If	**5**	S	D	En
	Ut-40	Establish a solid waste collection, transport and treatment system on a long-term perspective	0.6	G	If	**5**, 6	S	D	En
	Ut-41	Close the existing Khanh Son dumping site with proper engineering measures	0.6	G	Mg	**5**	S	D	En
	Ut-42	Develop a new Khanh Son dumping ground with additional solid waste leakage treatment facilites	0.4	G	If	**5**	S	D	En
	Ut-43	Facilitate medical waste, wastewater and toxic waste treatment project	4.1	G	Mg	5, **13**	S	D	En
Improve O&M (energy)	Ut-44	Promote energy saving and energy recycling model projects	4.1	G	Mg	**5**	S	D	En
	Ut-45	Smart Grid (integrated control system among power generation/ transmission facilities)	10.0	G	If	**3**	L	J	-
Improve O&M (water supply)	Ut-46	Utility Support Programme (USP)	3.9	G	Mg	**4**	L	O	-
	Ut-47	Integrated Water Resource Management	2.6	G	Mg	**5**	S	J	En
Improve O&M (waste water)	Ut-48	Introduce automatic and integrated operation system for draining chambers and pumping stations	1.0	G	If	**5**, 6	L	J	-
	Ut-49	Enforce the obligation of pre treatment system in the industrial zone and medical facilities	0.5	G	Mg	3, **5**, 6, 13	L	J	Ec
Improve O&M (solid waste)	Ut-50	Increase rate for the connection and enhance the night soil treatment	10.5	G	Mg	**5**, 6	L	J	En
	Ut-51	Integrated solid waste management among local authorities	0.6	G	Mg	**5**	S	J	En
	Ut-52	Implementation plan for solid waste management	0.6	G	TA	**5**	S	J	En
Improve O&M (regional)	Ut-53	Human Resource Development for environmental infrastructure management in the Central Region	0.5	G	Mg	**5**	L	J	Hr
Promote user - paying principle / awareness for saving consumption (energy)	Ut-54	Awareness campaign for saving energy consumption	2.6	G	Mg	3, **5**, 12	L	J	En

Project Group	Code	Projects / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector
Promote user - paying principle / awareness for saving consumption (water supply)	Ut-55	Promotion of small scale rainwater catchment system	0.5	G	If	**4**	L	J	En
	Ut-56	Awareness campaign for conserving water	2.6	G	Mg	**4**, 5, 12	L	J	En
Promote user - paying principle / awareness for saving consumption (waste water)	Ut-57	Awareness Campaign for waste water treatment	2.6	G	Mg	**5**, 6, 12	L	J	En
Promote user - paying principle / awareness for saving consumption (solid waste)	Ut-58	Tariff setting for solid waste management	0.3	G	Mg	**6**	L	J	En
	Ut-59	Segregate garbage at source and recycle solid waste (3R)	0.6	G	Mg	**5**	S	D/J	En
	Ut-60	Encourage 3R movement (recycling, reduction and reuse of solid waste resources) at community-level	20.0	G	Mg	**5**	M	J	En
	Ut-61	Encourage industrial investments for 3R activities (recycling, reduction and reuse of solid waste resources)	2.0	G	Mg	1, 3, **5**	M	J	Ec, En
Urban Infrastructure and Utilities Subtotal	Government		1,601						
	Private		0						
	Private Finance Initiative		6						
	Total		1,608						

Source: DaCRISS Study Team

1) G=Government, PFI=Private Fianance Initiative, P=Private

2) If=Infrastructure, Mg=Management, TA=Technical Assistance

3) 1=DPI, 2=DOF, 3=DOIT, 4=DOC, 5=DONRE, 6=DOT, 7=DOST, 8=DARD, 9=DOCST, 10=DOIA, 11=DOFA, 12=DOET, 13=DOH, 14=DOL, 15=DOJ, 16=DOIC, 17=DOI. The underlined number indicates the leading agency.

4) S=2010-2012, M=2013-2015, L=2015-2025

5) D=Danang City, J=JICA, O=Others

6) Ec=Economic Development, So= Social Development, En=Environmental Management, Sp=Spatial Development, Lc=Housing and Living Conditions, Tr=Transportation Development, Ut=Urban Infrastructure and Utilities, Hr=Human Resource Development, Mf=Municipal Finance Capacity Development and Management, Ca=Administrative Capacity Development and Management, To=Tourism Development

8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 Removing Pollutions

1) Current Issues

8.1 The environmental situation in Danang can be summarized as follows:

(i) Great concern with urban effluents, often mixed together with industrial effluents, and pollution caused by aquaculture, which affect rivers, urban lakes, and coastal zones (in particular Danang Bay);

(ii) Poor quality of groundwater and lack of database on the situation of aquifers[1];

(iii) Large number of construction projects (infrastructure, housing, commercial, and tourism facilities), resulting in land reclamation which in turn has affected coastal forests and riverbank stability;

(iv) Solid wastes dumped in water bodies, such as urban rivers, lakes, and sea, and problems raised by the partial treatment of medical and industrial wastes; and,

(v) Illegal activities such as forest cutting, hunting, and fishing, which are not quantified but which remain a matter of concern.

8.2 Risk management should be considered as part of the environmental review due to their direct or indirect effects on the natural milieu. Danang is not so much exposed to earthquakes and—according to authorities—tsunamis. But clearly, Danang is vulnerable to various other natural disasters, such as typhoons and floods, and potentially, to forest fires and industrial disasters due to the presence of harbors (e.g., petrol spill). Other parts of Danang, like Son Tran Island, are also vulnerable to landslides.

8.3 Today, the city still benefits from certain natural advantages and has taken appropriate decisions to preserve the environment, such as:

(i) Relocating polluting industries to industrial zones and planning to relocate petrol ports facilities;

(ii) Deciding not to develop the industrial sector excessively;

(iii) Conducting ODA projects, in particular those by the World Bank, the Dutch and Australian governments, in sectors such as solid waste, water supply, or wastewater;

(iv) Creating protected areas, such as the Ban Na forest zone, although the question on how these areas can be effectively protected remain; and,

(v) Keeping traffic at better levels than that in Hanoi or HCMC.

8.4 The main concern for the future is environmental management. With a population estimated to reach 2.1 million by 2025, the promotion of sectors such as tourism, and the effects of further land reclamation, infrastructure construction, air pollution from handicraft villages, among others, will create potential major environmental issues, as follows:

(i) Availability of water sources vis-à-vis increasing demand and, in particular, climate change;

(ii) Impact of future hydropower projects such as Song Nam Song Bac Dam and Tuy Lan

[1] According to a DONRE official, data exist but these “have not yet been approved by the People’s Committee”.

Dam in Hoa Vang District;

(iii) Solid waste management due to the fragile institutional arrangement opted for by URENCO due to the uncertainty of its financial resources;

(iv) Effects of land reclamation on the natural environment due to the development of infrastructure, tourism and service facilities, and housing;

(v) Management of risks, in particular floods, possibly the transportation of hazardous matters, and airplane accidents due to the expected increase in air traffic; and

(vi) Air pollution from traffic due to the expected growth of motorization and tourism (e.g., traffic jam on coastal roads as well as in Hai Chau and Thanh Khe districts). Also, while Danang benefits from dispersing winds this will not reduce the levels of CO_2 and heavy metals released into the atmosphere.

8.5 In addition, and from the perspective of developing tourism, the question of preserving land and marine biodiversity, as well as the protection of forests, should be considered urgent.

2) Development Prospects

8.6 It is a fact that Danang City will become bigger in the future due to its location advantages and economic potentials supported by rich cultural and natural resource ideal for tourism. Based on a study of alternative scenarios by the DaCRISS Study Team, Scenario 3, the most ambitious and the target case, indicates that Danang will continuously attract migrants at a considerably high growth rate. By 2025, its population will be 2,183 thousand, compared to 806 thousands in 2007. The average increase rate is 5.7% per annum.

8.7 Needless to say, such a rapid population increase will impose a lot of physical pressure on the city's environment. The total environmental load will eventually become heavier in terms of increases in land use, water use, solid waste generation, and generation of pollutants through economic activities. For instance, solid waste which will be generated by 2025 will be 2,570 tons a day compared to 645 tons/day in 2007. Given an improved collection rate of 95% from the current 85%, the solid waste amount to be treated in 2025 will be 4.5 times as much as that in 2007. Thus, huge efforts should be made to keep the environment in good condition. Otherwise, Danang City will not be able to achieve its vision of becoming an environmental city.

8.8 Taking into account the increasing environmental load on the city, some vital issues need to be recognized and resolved. These are:

(a) **More Enforceable Regulations:** Available legal tools should be clear and enforceable while sanctions should be heavy to protect the environment from degradation and to discourage offenders for fear of government retribution and/or public censure.

(b) **Increased Public Participation:** The governmental sector cannot take all responsibilities for the environmental management, so all stakeholders shall be involved in movements in a well-organized manner to perform such a task. Community-based mobilization is a key to encourage the participatory activities, fostering capable and reliable community leaders.

(c) **Higher Contribution from Business Entities:** A variety of CSR (corporate social responsibility) initiative should be encouraged, giving priority to support for environmental conservation. It has widely been recognized that environment-conscious business entities are socially appreciated, resulting in a sustainably profitable operation

even if profits partially go to CSR activities. Provision of a government incentive scheme (e.g., tax holidays or award conferment) will be effective to encourage this initiative.

(d) **Aggressive Introduction and R&D on Environmental Technologies:** Engineering technologies for pollution control and mitigation are fast-evolving, and renewable energy generation systems will be practical soon. However, advanced technologies are not always appropriate for the local realities in Vietnam. Selective introduction of appropriate ones is important, and R&D for locally invented technologies, for instance, for 3Rs in solid waste management, should be proactively accelerated through an enhanced government policy for this purpose.

(e) **Improved Intergovernmental and Interprovincial Coordination:** Danang City has to make a concerted effort to tackle current environmental problems and prevent future ones. For the sake of rational and efficient resource inputs, cross-departmental and interprovincial coordination shall be pursued based on shared objectives and targets rather than competition. This will get more important political backing and ensure socioeconomic development.

(f) **More Funding and Human Resource Development:** Investments and budgets to be appropriated for environmental management will/shall be increased as economic activities become even more dynamic. HRD is also a critical factor in the face of serious environmental problems. For a sustainable solution for these issues, a clear-cut policy commitment by the Central Government is necessary to provide local governments with financial and technical support. External inputs through international donors' contributions should also be strategically utilized under a coherent institutional basis and policy.

8.2 Pre-Feasibility Study for Priority Measures

8.2.1 Industrial and Medical Wastewater Treatment

8.9 Environmental management for water improvement shall include infrastructure development as well as capacity development of operators and monitoring and inspection as shown by the experiences of many large and medium-size cities around the world.

1) Current Conditions and Issues

(1) Wastewater Treatment

8.10 The rate of treatment for both industrial and domestic wastewater is low. Industrial wastewater treated is only at 15% (2,000 m^3/day out of 13,000 m^3/day at highest), which is lower than domestic wastewater treated at 28% (17,000 m^3/day out of 60,000 m^3/day). The PIIP project supported by World Bank has already proposed to improve domestic wastewater, while only a small-scale improvement of industrial and medical wastewater was implemented by the Danang City government. Furthermore, only a few plants were properly operated in Danang. So the establishment of a proper model for operation should be established. A model shall consist of standard quality of facility, qualified operators, as well as proper monitoring and inspection.

Table 8.2.1 Estimated Amount of Water Source, Usage, and Treatment

Unit: 1,000 m^3/day

Source	Source		Usage		Treatment	
	Capacity	Actual	Objective of Usage		Capacity	Actual
Rivers			Domestic, Governmental, Service [1]	60	68	17
Cau Do	90 – 155	60				
Son Tra	5	5				
Cu De	5	1	Industrial	13 – 40	5.1	2
Underground Water			Medical		Unknown	2
Total	100 - 165	73 -	Total	73 -	73 -	21

Source: DONRE and others.

1) Excluding resort hotels (which use private water sources)

8.11 **Industrial Park Operation:** There are six industrial parks and six industrial clusters existing in Danang. Out of the six industrial parks, two have their wastewater treatment facilities. One park has an approved investment plan.

Table 8.2.2 Wastewater Treatment Condition in Industrial Parks

Industrial Park	Area (ha)	No. of Companies (Under construction)	Type of industry	Wastewater treatment plants	Estimated Volume (m3/day)	Operating Company	Remarks
Danang IZ	63	-	Manufacturing, Textile, Assembly	Yes/ 40m^3/day	40m^3	MASSADA	
Hoa Khanh	693	-	Chemicals, Manufacturing etc.	Yes/ 5000m^3/day	2000 Connected 10000 Expected	DAIZCO	
Hoa Khanh Extension	400	-	Chemicals, Manufacturing etc.	None	N.A.	DAIZCO	
Hoa Cam	137 (306)	22 (18 additional)	Metal, Heavy industry	None	N.A.	DAIZCO	Sewer required
Lien Chieu	373	18 (1 additional)	Metal, Heavy industry	None	3300 – 5200	DAIZCO	Sewer required
Tho Quang	66	12 (68 lots)	Seafood industry	Planned	2500 – 4500	DAIZCO	Investment approval

							for HCMC company

Source: DONRE, Danang Industrial Zone and EPZ authority, Interview to URENCO, Danang City Webpage

(2) Industrial Wastewater Treatment

8.12 A new standard, QCVN 24:2009/MoNRE, was in force instead of TCVN 5945. The significant changes from the latter are that the indicators have become obligatory when before these were nonbinding targets. Standard classification was also grouped into two levels from three. Responsibility was demarcated between factory and industrial park operators by using this classification in the Hoa Khanh industrial park. Therefore, legal and operational agreements shall be made after the new standard has been in practice. The current condition for each industrial park is summarized in the following pages.

(a) Hoa Khanh Industrial Park

8.13 Almost all the land has been occupied. Some Japanese companies are also located in the park and operating. DAIZCO is the management company. In 2005, a wastewater plant was developed in 2005 by DAIZCO.

(i) **Wastewater Facility:** The plant includes oil separation, biological pressure filtration, disinfection and sedimentation pond. However, since the capacity within DAIZCO to operate it is not enough, it contracted Hanoi URENCO to operate it of including providing customer relation. They started operation in 2007 and the period of service is 20 years.

(ii) **Investment:** URENCO Hanoi invested VND1 billion for the improvement of the facility to cope with the difference between designed wastewater quality and actual one. For example, COD value was much higher than planned one which was initially set 600 p.m. URENCO improved the water dilution of influent system with treated water.

(iii) **Personnel:** 17 staff are working in the plants. 16 of whom were recruited in Danang. Since there is no training opportunity and similar facility in Danang, training for the staff was conducted by URENCO staff dispatched from Hanoi. Central management equipment and information board were damaged by the typhoon so that machinery was manually operated.

(iv) **Wastewater Volume:** Although the plant was designed to treat 5,000 m^3/day, only 2,000 m^3 was treated due to the low rate of connection by companies. Some 27 companies had connected sewers to the treatment plant. The operations company assumes that all effluents volume including those not connected to the plant is 10,000 m^3/day.

(v) **Pollutants:** Basic indicators, such as BOD, SS, and DO, are measured and monitored well. However, effluents might include other heavy metals judging from effluent colors. A careful examination might be required, and further improvement is a must. One operator pointed out that the content from the supplied water might include harmful pollutants from the sources. Supplied water quality is an issue to be solved.

(vi) **Tariff:** Tariff was set for investors to pay USD0.73 per m^3 (once the company exceeds more than 100 m^3/day). However, this price was set after the operation of Hanoi URENCO without any agreement by investors at the investment stage. Investors pointed out that the Danang People's Committee and each investor agreed on the standard of the effluent. Accordingly, investors shall discharge wastewater meeting TCVN C class standards. In this case, the cost for wastewater treatment was included in the operat-

ing fee. So careful measure shall be taken to ensure cost recovery by investors.

(b) Tho Quang

(i) The main polluting sources of this area include, among others, the following: i) wastewater untreated or unqualifiedly treated by food processing enterprises who discharge directly to the anchorage area via the drainage system, ii) waste from ship repair and building enterprises, and iii) solid waste and wastewater from ships.

(ii) Monitoring results show the following factors exceed TCVN 5945 standards: BOD5: 12.6 times, COD5: 10.48 times, N total: 2.17 times, and P total: 2.76 times.

(iii) Inhabitants in the surrounding area frequently complain of foul odors from the park. DAIZCO almost finished constructing sewer discharge pipe from the planned area for the treatment plant. Currently, the company in HCMC obtained investment approval to construct and operate treatment plants by BOT scheme with 20 years operation period. However, Danang City had also submitted a request to the Japanese government for a grant aid program. Therefore, careful monitoring of movements in the BOT scheme is required.

(iv) Therefore, the government is planning a project to improve the environmental conditions of Tho Quang. Main project components are as follows: i) separated wastewater treatment system, ii) dredging, iii) improve roads, iv) reallocation / planning of area (including zoning), v) underground collection system for hazardous wastewater and waste, vi) overall solid waste collection system, and vii) regulations for environmental protection.

(c) Danang Industrial Zone

8.14 The park was established in 1993, this was the oldest industrial park in Danang. Selection of the factory was carefully done since this industrial zone was located near residential areas. As a result, there are no heavy industrial factories. Hazardous and toxic wastewater is not discharged into sewers.

8.15 In order to meet the former TCVN standard class C, each factory has simple treatment facilities which can be simple filtration or sedimentation ponds, while the central treatment plant was designed to meet TCVN standard B. Integrated sewers were developed in the industrial park. Effluents from each factory need to satisfy Class C standard in TCVN 5945, while the facility in the industrial zone is operated to satisfy Class B in TCVN 5945. However, there are few persons who have technical knowledge of the facility. So sometimes effluent from the factory cannot meet the standard.

8.16 The characteristics of the facility in the industrial zones are listed below.

(i) Oil separation, biological pressure filtration, aeration, disinfection;

(ii) Design flow: 40 m^3/day; and,

(iii) Discharge to drainage in the city.

(3) Medical Wastewater

8.17 General wastewater treatment condition in medical facilities was mentioned in Part III. DaCRISS made a rapid assessment of wastewater treatment in two district medical centers. Observations regarding improvements are listed below.

(i) Basic activation sludge process was installed but has limits in removing some indica-

tors listed in TCVN regulation;

(ii) Medical wastewater was not connected to wastewater treatment facility;

(iii) Medical centers could not be connected to the sewer system because the latter was just planned;

(iv) There was no one who has knowledge of the equipment;

(v) Centers cannot operate treatment facility in the rainy season because the height of the drain outlet is lower than the water level; and,

(vi) Not all the indicators are monitored by the EPC.

8.18 Ten facilities are proposed for Danang City to improve (see Table 8.2.3). Total capacity for wastewater is 1,430 m^3/day. Challenges for improvement are listed below.

(i) Installation of wastewater treatment facility in all large medical facilities;

(ii) Improvement of current facilities;

(iii) Appointment of suitable person for facility operation in all medical facilities; and,

(iv) Training in wastewater treatment and monitoring for all stakeholders.

Table 8.2.3 Medical Facilities needing Wastewater Improvement (in gray color)

No.	Hospital	Type	Beds	Treatment Facility	Volume (m3/day)	Note
1	Cam Le Hospital	district	160	yes	120	
2	Hai Chau hospital	district	150	yes	120	
3	Lien Chieu hospital	district	100	yes	90	
4	Hoa Vang Hospital	district	Unkown			planned
5	Ngu Hanh Son hospital	district	80	yes	170	
6	Sơn Tra hospital	district	130	no	120	fund preparation
7	Thanh Khe Hospital	district	130	no	120	fund preparation
8	Binh Dan hospital	Private	70	yes	90	
9	Hoan My hospital	Private	100	yes	90	
10	Nguyen Van Thai hospital	Private	25	yes	70	
11	Vinh Toan hospital	Private	30	yes	70	
12	Women Hospital	Private	Unkown	yes	70	
13	Da Nang Mental hospital	City	180	no	150	fund request
14	Da Nang hospital	City	Unkown	yes	1150	
15	Dermatology Hospital	City	70	yes	90	
16	Eye Hospital	City	100	no	90	Under construction
17	Sanatorium & Rehabilitation Center	City	70	no	90	fund request
18	Traditional medicine Hospital	City	100	yes	90	
19	Tuberculosis hospital	City	70	yes	150	
20	199 Hospital	central	150	yes	90	
21	C17 Hospital	central	350	yes	300	
22	C Hospital	central	860	yes	600	
23	Transportation Hospital V	central	100	yes	120	
24	Rehabilitation Center	central	Unkown	yes	120	not sure about capacity

Source: DOH, PIIP

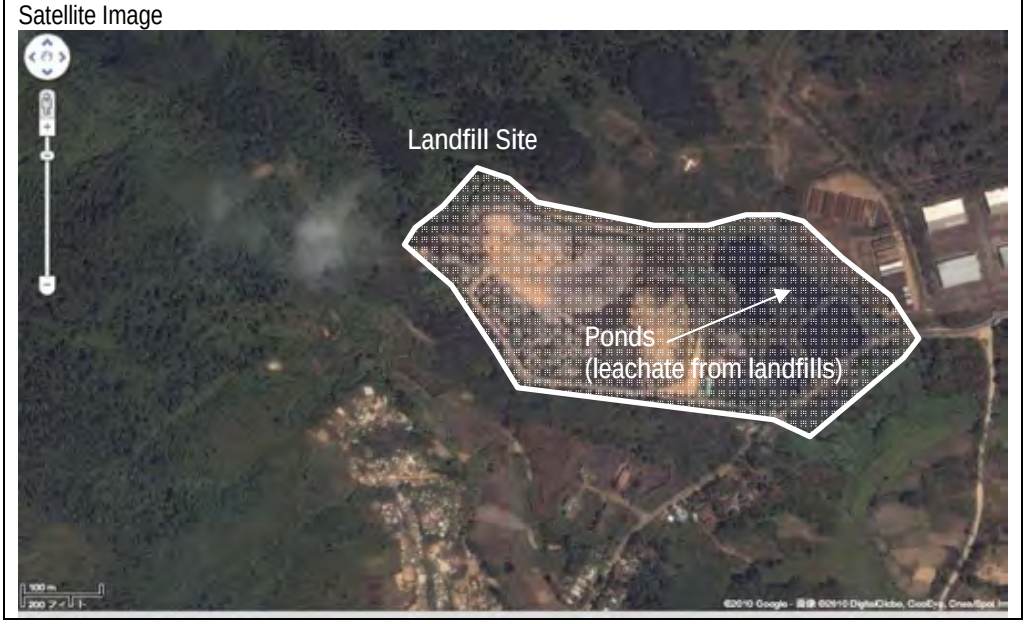
(4) Khanh Son Landfill Site

8.19 This current dumping site is designed as a sanitary landfill. Bottoms are covered with thick rubber, and leachate collecting pipe was installed. Drained water is treated through anaerobic lagoon and microbiological treatment. This landfill was designed much better than the old one. However, BOD and COD values for leachate are high because

the filled waste is kept in an anaerobic condition. It makes treatment costly. Methane gas, which affects air quality is generated 21 times higher than carbon dioxide. The amount of greenhouse gases in 2006 is 27,000 CO_2t/year, and this is estimated to become 120,000 CO_2t/year. Treatment facility is required for treatment. A combined treatment in the Khanh Son new landfill site is one option.

Table 8.2.4 Profile of Old Khanh Son Landfill Site

Item	Note
Location	Lien Chieu District
Area	9.8 ha
Operation Period	1992 to 2006
Number of Cells	9
Applied Technology	Simple dumping
Estimated Volume	1.47 million tons
Waste Layers	Estimated to 20 to 25m
Satellite Image	



Source: URENCO Interview, Google Map (Photo on 2002)

Table 8.2.5 Leachate from Khanh Son Dumpsite and Related Indicators

Indicator	Before Treatment	After Treatment	Vietnam Environmental Standards (QCVN24: 2009 / BTNMT)[1)]
BOD (mg / Lit)	2500 - 2800	710 - 975	50
COD (mg / Lit)	3500 - 4700	1220 - 1570	100
TSS (mg / Lit)	2795 - 3760	386 - 520	100
pH	7.1 - 7.6	9.8 - 10.1	5.5 - 9.0

Source: DONRE, QCVN24

1) Figure differs by amount of discharge.

8.20 The site was closed end of 2006. Soil was used to cover it to improve sanitation, while no stabilization measure for the inside was taken. Leachate from the site poured into two ponds near the dump site. Most of the water was estimated to be contaminated since there was no stream outside of the ponds. Currently, maximum volume of leachate was estimated to be 100 m3/ day. The quality of wastewater was not analyzed. The new landfill site also has similar conditions. Current wastewater from Khanh Son landfill was recorded to have the following indicators: BOD5: 2500mg/l, COD: 3500mg/l, TSS: 2800mg/l, and pH 7.1-7.6.

8.21 Wastewater treatment should be planned in parallel with the stabilization of filled waste in order to minimize effect. The volume of filled waste was estimated to be 1.4 million tons. Methane gas was also estimated to be generated, since the inside of the filled waste was kept in anaerobic conditions. Methane produces 20 times larger greenhouse effects than carbon dioxide. The collection of methane with CDM (Clean Development Mechanism) scheme can also be taken into account, although collection and estimation are difficult.

(5) Environmental Monitoring

8.22 Periodic monitoring was made for industrial wastewater. However, the following three issues are reported as challenges:

(i) Historical analysis was not done since database was not developed;

(ii) Equipment has become old and rapid assessment equipment and telemeter system are needed for a more effective monitoring; and,

(iii) Technical advice for the factory is required.

2) Objectives

8.23 This project focuses on water sector improvement which is the most serious environmental issue in Danang City. In order to improve the conditions mentioned above, this project aims at establishing a holistic wastewater treatment system including monitoring through the following subobjectives:

(i) Improve wastewater facilities in medical centers and industrial parks to meet regulations;

(ii) Enforce regulations on operators through the introduction of part of CPCM (Environmental Manager) systems;

(iii) Improve operating performance through capacity building for operators; and

(iv) Establish more reliable wastewater monitoring system through the enhancement of monitoring and inspection capacities of DONRE.

8.24 Once a holistic water improvement model was established in Danang City, this model can be applied in the other sectors such as air, soil, or neighboring areas.

3) Proposed Measures

8.25 This project on improving water environment and sanitation in the industrial and medical sectors consists of three components. These are support for facilities, capacity development for operators and DONRE.

(1) Facility Support

(a) **Formation of Operation Structure by Identifying Operators for Industrial Parks:** Currently, industrial park management companies lack operations skills for wastewater facilities. Inviting companies who have such skills by contract basis or PPP scheme is one alternative. Operating schemes shall be developed under a feasibility study and facilities shall be developed also taking into account operations aspects. Demarcation between each factory and operator is also important. The standard of effluents for both shall be agreed. As mentioned below, each factory and medical facility shall assign an environmental manager for the operation.

(b) **Detailed Design and Construction for Development and Improvement of Waste-**

water Facilities: Target for the facility is four industrial parks (i.e., Hoa Khanh Extension, Lien Chieu, Hoa Cam, and Tho Quang), old Khanh Son landfill site, medical facilities (maximum of 10), and existing factories (soft loan). Whether Hoa Khanh is included depends on the operating company and its investment plan. A treatment system would be designed at this stage based on the analysis of discharged wastewater from the sources and agreement between stakeholders. Especially the target for the improvement facility shall be carefully done since conditions vary.

(c) **Low Interest Loan and Technical Advice for Private Companies:** Because improvement was required according to new QCVN introduction and governmental regulations, soft loan for the companies and technical assistance might be taken into account. Target for soft loan shall be basically existing factories and organizations. Minimum standard for the loan need to be set and technical advice based on the current operation is also given to the factory. Monitoring also required for construction and operation of the facility. During construction, training for operation shall be planned. This might be included in subsequent activities.

(2) Capacity Development for Operators

(a) **Establishment of Environmental Manager System:** This is an obligation system for all the polluter company to assign certified environmental managers, who are in charge of environmental treatment and regulations. The regulation shall be authorized by DPC decree or regulations. Environmental managers shall have basic knowledge or background of environmental measures. Basically those system shall be implemented by national level. This is a pilot level of implementation done by local government level. To establish national level system, an understanding of ministry level is also required. At the initial stage at pilot project stage, training and examination shall be planned this project.

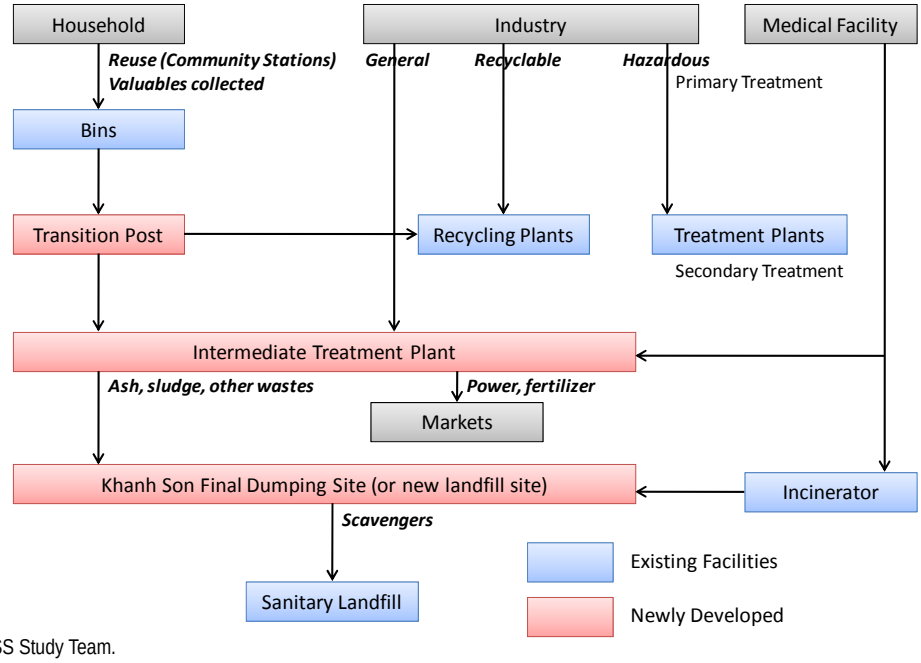
(b) **Training Course:** Project provides training course for environmental managers who are assigned by the previous section. Course shall consists of basic scientific knowledge, current environmental regulations, operation and maintenance for equipment, measurement of quality, planning of system development and monitoring and reporting system. Opinion exchange among stakeholders is also a good opportunity for the improvement.

(3) Management Enhancement for DONRE

(a) **Policy Enforcement for Operator:** Pre treatment shall be enforced since it is not cost effective to install all pollution removal facility for centralized system is not effective. If necessary soft loan for removal for the additional facility development and technical assistance for the operator shall be conducted.

(b) **Monitoring and Inspection Enhancement:** Monitoring and inspection shall be enhanced through capacity building and renovation of technologies. Some equipment for monitoring and inspection shall be procured. Targets are the on line monitoring and recording system, brief measurement equipment and renewal of old fashioned facilities.

Figure 8.2.1 Conceptual Image of Future Industrial/Medical Wastewater Treatment System



Source: DaCRISS Study Team.

Table 8.2.6 Project Sheet for Priority Measure 1

Title of Program		**Industrial and Medical Wastewater Treatment**
Objectives		• Improving waste water facilities in medical organizations and industrial parks to meet regulations • Enforcement of regulations to operator through introduction of part of CPCM (Certified Pollution Control Manager) system • Improving operating performance through capacity building for operators • Establishing a more reliable waste water monitoring system through the enhancement of monitoring and inspection capacities for DONRE
Outline	Period	2010 – 2015
	Location	Danang City
	Beneficiaries (target group)	Industrial waste water dischargers and water users
	Sub Components	• Facility Support • Capacity Development for Operators • Management Enhancement for DONRE
	Plan and Layout	
	Operation and Management	• Monitoring and Inspection: DONRE, EPA, EPC, Inspection Department in association with DOI (Danang Industrial Zone and EPZ Authority) • Wastewater Treatment: TMDC, URENCO Hanoi, etc. • Supervision: MONRE
	Cost (investment, recurrent)	52 million USD
	Revenue (if any)	
	Rationale	• **Industrial Wastewater:** Wastewater treatment facilities in industrial parks are insufficient. 3 industrial parks in Danang have no wastewater treatment facilities (Hoa Cam, Hoa Khanh Extension, Lien Chieu), and 1 industrial park has commitment for investment but no construction yet (Tho Quang), and 1 industrial park has contract with Hanoi URENCO but the facility is required to be upgraded. • **Medical Facilities:** Currently, Danang City is planning to construct or improve treatment plants in 8 medical centers. • **Khanh Son Landfill Site:** Effluent from the old dumping site

		shall be treated. Stabilization of filled waste also needed.
Implementation	Agency	Danang People's Committee, DONRE, DOI
	Planning Requirement	
	Funding	DPC, ODA Technical Assistance
	Resettlement Requirement	No resettlement required (all major lands for facility prepared)
	Institutional Arrangement	
Critical Factors / Conditions for Success		• Offensive odor might increase near treatment facilities
Recommendation		• According to JICA Guideline[2], Environmental Impact Category B (medium scale) to be applied, but may need to apply Category A in the case wider impact on environment is expected.

Source: DaCRISS Study Team.

Table 8.2.7 Preliminary Cost Estimation for Priority Measure 1

Thousand USD

Component・Activity/Schedule	Unit	Number	Unit Rate	Price	Remarks
1 Preparation					
Environmental Impact Assessment (Physical Survey)	Set	4	30	120	Done by DONRE
Preparation Work for Action Plan Dispatch Experts (Foreign)	Set	12	40	480	
2 Facility Support (Industrial Parks and Public Facilities)					
Survey, Detailed Design and Tender		1	500	500	
Improvement of existing facilites (Medical)		10	500	5,000	Medical facilities
Improvement of Current Treatment Plants		1	2,000	2,000	Hoa Khanh
Construction of Treatment Facilities	Set	4	7,000	28,000	Hoa Cam, Hoa Khanh Extension, Lien Chieu, and Tho Quang
Construction of Khanh Son Treatment Facility	Set	1	10,000	10,000	
3 Facility Support (Private)					
Survey and Basic Design and Monitoring	Set	500	1	500	
Low Interests loan		150	10	1,500	
4 Capacity Development for Operators					
Dispatch of Experts (Foreign)	M/M	36	40	1,440	
Dispatch of Experts (Local)	M/M	120	10	1,200	
5 Capacity Development for DONRE					
Procurement of Equipment	Set	1	100	100	
Dispatch Expert (Domestic)	MM	36	10	360	
Dispatch Expert(Foreign)	MM	20	40	800	
Total				52,000	

8.2.2 Intermediate Solid Waste Treatment

1) Current Conditions and Issues

8.26 Current status of the solid waste was mentioned in Part III. Challenges for this sector was summarized as listed below.

(i) Once domestic solid waste management system was established by the support of

[2] Category A: Project has significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts. Category B: Their potential adverse impacts on the environment and society are less adverse than those of Category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily (Source: JICA Environmental Guideline 2010).

World Bank. Currently, domestic waste volume is 0.8 kg/person-day, however this is expected to increase to 1.1 kg/person-day in 2015, and 1.2 kg/person-day in 2020. Population will also increase to 2.1 million in 2025. The current Khanh Son Dumpsite is 45ha, and estimated treatment volume is 3 million tons. If no measures are taken, the dumpsite will become full around 2017. Yearly treatment volume will become 2.5 times the current volume, and cannot treat all waste even if another dumpsite the same size as Khanh Son is constructed, if this estimated yearly waste volume is accumulated to 2025. Therefore, further improvement is required for extension of life period of dumping site in response to increase volume of waste.

Table 8.2.8 Projected Solid Waste to be Treated in the Future

	2007	2010	2015	2017	2020	2025
Population (000)	807	945	1,175	1,360	1,637	2,100
Volume (kg / person-day)	0.8	0.9	1.1	1.1	1.2	1.2
Rate of Collection	0.85	0.87	0.90	0.91	0.93	0.95
Total Volume (t / day)	549	749	1,163	1,386	1,742	2,394
Landfill Waste (t / day)	466	637	989	1,178	1,481	2,035
Landfill Waste (t / year)	170,202	232,381	360,897	430,040	540,421	742,739
Cumulative Landfill Waste (t)	170,202	802,764	2,337,409	3,162,480	4,671,565	7,971,289

Source: Worked out by DaCRISS Study Team.

(ii) Currently only communities and social organization collect valuable waste and no systematic measures are taken for three Rs (reduce, reuse, and recycle). As a result, rate of recovery from domestic waste is low.

(iii) 3R Project was mentioned in the environment city plan formulated by Danang City. Central government has a policy for reduction of the domestic waste.

8.27 The introduced system by the support of World Bank was carefully studied to fit Vietnamese practices and operational cost. However, the introduced anaerobic treatment has negative aspects as listed below.

(i) Generating methane gas, which can contribute 20 times to greenhouse effect when compared to carbon dioxide.

(ii) Leachate from the waste contains high values of BOD and COD. Therefore, wastewater treatment cost might increase.

8.28 Currently, Danang City had been improving the treatment process of leachate in order to meet water quality standard.

8.29 Methane collection projects had been recognized by Vietnamese Government. MONRE presented that this project was a candidate for introducing CDM (Clean Development Mechanism) process. Ministry of Environment of Japan conducted the study for introducing compost plant by contracting Kajima Corporation in 2007. The target was Danang, Hai Phong and Bac Ninh. As a conclusion Danang has a highest potential among them. The study was mainly focusing on formulating CDM mechanism because of the principle that ODA investment and CDM shall clearly demarcated at that time. Therefore, the study has not including improvement of waste collection and reduction of the waste such as 3R and source separation.

8.30 After the study, Vietnamese government announced “58/2008/TTLT-BTC-BTNMT of July 4, 2008, guiding the implementation of a number of articles of the Prime Minister’s Decision No. 130/2007/QD-TTg of August 2, 2007, on a number of financial mechanisms and policies applicable to investment projects under the clean development mechanism”.

In this, CERs(Certified Emission Reductions) obtained by the project utilizing ODA loan shall be preserved in the Vietnam environmental protection fund. In short, obstacles for conducting CDM process by utilizing ODA fund were removed.

2) Objectives

8.31 This project is aiming at reduction of final dumping volume of waste and green house effect gas through achieving following subobjectives:

(i) Efficiently operate intermediate plant including source separation activities and increase rate of recovery from waste;

(ii) Reduce waste generated from domestic waste by promotion of 3R activities; and

(iii) Support CDM mechanism through improvement and waste collection process.

8.32 This project also supports improvement of investment environment for Methane gas collection and introduction of CDM.

3) Proposed Measures

8.33 This project consists of three components. Those are preparation study, operation of intermediate plants and 3R activities. This report was prepared based on the assumption that compost plant is adopted, since type of the plants will be deeply studied in the preparation study.

(1) Facility Support

8.34 Basically, preliminary study for the CDM was done in the previous study aforementioned. This study needs to update information and reinforce it according to the progress of the implementation environment. Study item might include following issues.

(a) **Comparison Analysis for the Type of Plant:** As mentioned in the rapid assessment, compost has an advantage in terms of initial investment cost, operation cost and experience in Vietnam. The previous study also proposed to introduce a compost plant with capacity of 500t/day. Compost is thought to be a most prospective type of intermediate treatment, although careful studies for comparison are required in the next step. Stabilization of old dumping site needs to be taken into account also.

Table 8.2.9 Comparison of Intermediate Treatment for Solid Waste Management

Type of Treatment	Main Source of Waste	Method of Collection and Separation	Outputs and Waste Generated after the Process*	Operation	Remarks
Compost	Organic waste (raw garbage) Volume 60% = 360t (maximum)	Source separation at household or limited to restaurant only	fertilizer, 30% of waste (Sample Case in Hanoi 3R, wastewater	Time for treatment is long, so vast land is required. Temperature, water, carbon/nitrogen, oxygen shall be monitored.	Fertilizer cannot be used for agricultural purposes in Vietnam.
Methane fermentation Biomass methane plant	Organic waste (wood based waste)	Source separation at household and factory	methane 10%, for Natural gas car fertilizer polluted water 80% of waste	Temperature, water, carbon/nitrogen, oxygen shall be monitored.	Use of methane is not prospective in the area.
Combustion With power plant Incinerator	If Higher calorific wastes can be combusted from the source, efficiency may increase.	Separation of valuable and metals needs to be done before combustion.	thermal recovery, (Electricity and Heat) 15% of Weight, 10-20% of Volume	Measures for exhaust gas and dioxins must be introduced) Operation cost might be expensive Efficiency is relatively low, at 10%.	Separation and material recycle might be studied before selecting this process. There are several types of facilities according to waste type and volume.
Combustion	Combustible waste	A new collection system	liquid slug (in aggregate	Stabilized operation might	Feasible if introducing at

(RDF: Biomass) RDF production plant, incinerator	(Papers, raw garbage). Dry and Before combustion	must be established	as construction material) Waste	be difficult in EDF production plant. New plants are not built nowadays.	regional level (in the case of Japan).

Source: DaCRISS Study Team
*1 volume and composition might differ according to source of waste.

(b) **Planning for the Collection Method:** Regardless of the treatment type, source separation contributes efficient operation of the plants and production of qualitative by-products. Method of classification of wastes for the collection shall be studied by conducting survey for the substance of waste and social condition. Collecting method including time and details of classification shall be planned in this process. Requirement for the facility improvement also summarized this step. Implementing pilot projects is thought to be effective. Treatment method adopted in this project would be an advanced model, compared with neighboring province. Therefore, inter provincial cooperation might be taken into account.

(c) **Marketing for By-products:** An intermediate plant produces by-products. Products vary by types of plant. A compost plant produces fertilizers. A biomass plant, and an incinerator produces energy. Those products shall be utilized to maximum extent. Market price, demand, supply chain and logistics shall be studied. Selling price shall be set to recover a part of operation cost. In case of compost, fertilizers are not permitted to use in the field for food production by the environmental regulations. Hence, those can be utilized only for planting and landscaping purpose. If market is small, produced by product can be used for soil covering waste in the dumping site.

(d) **Procurement Plan:** As number of classification would increase, number of opportunities for collection and transportation would also increase. Additional trucks, bins and containers are required to procure. Number and specification shall be determined this stage.

(e) **Construction Plan and Construction:** Basically, construction cost was estimated by the previous study. That was about two to three million USD. Capacity for the treatment plant shall be decided based on the future demand estimation. Basic specification, installed facility and equipments drawing and cost estimation shall be made. In case of compost plant, yard for biological treatment, administration area was required. 3-4 ha was estimated in the previous study. Procurement of trommels, conveyors, wheel loaders are required for operation of the plant. The refurbish for the transition post also need to be planned, if necessary.

(f) **Tariff System /Operation Plan and Legislation:** Operation of the intermediate plan and tariff system shall be designed in this stage.

(g) **EIA:** All the facilities reprocessing wastes are required to conduct EIA by the environmental protection law. In this project no resettlement and large scale of land acquisition was not anticipated. However, impact during the construction and operation stage shall be assessed and minimized.

(2) Introduction of Clean Development Mechanism (CDM)

(a) **Methane Collection and Registration for CDM:** According to the previous survey," Avoided emissions from organic waste through alternative waste treatment process" would be applicable. The total CER for 7 years is 460 thousands [tCO2]. Draft application form which was called Project Design Document Form(PPD) was prepared by

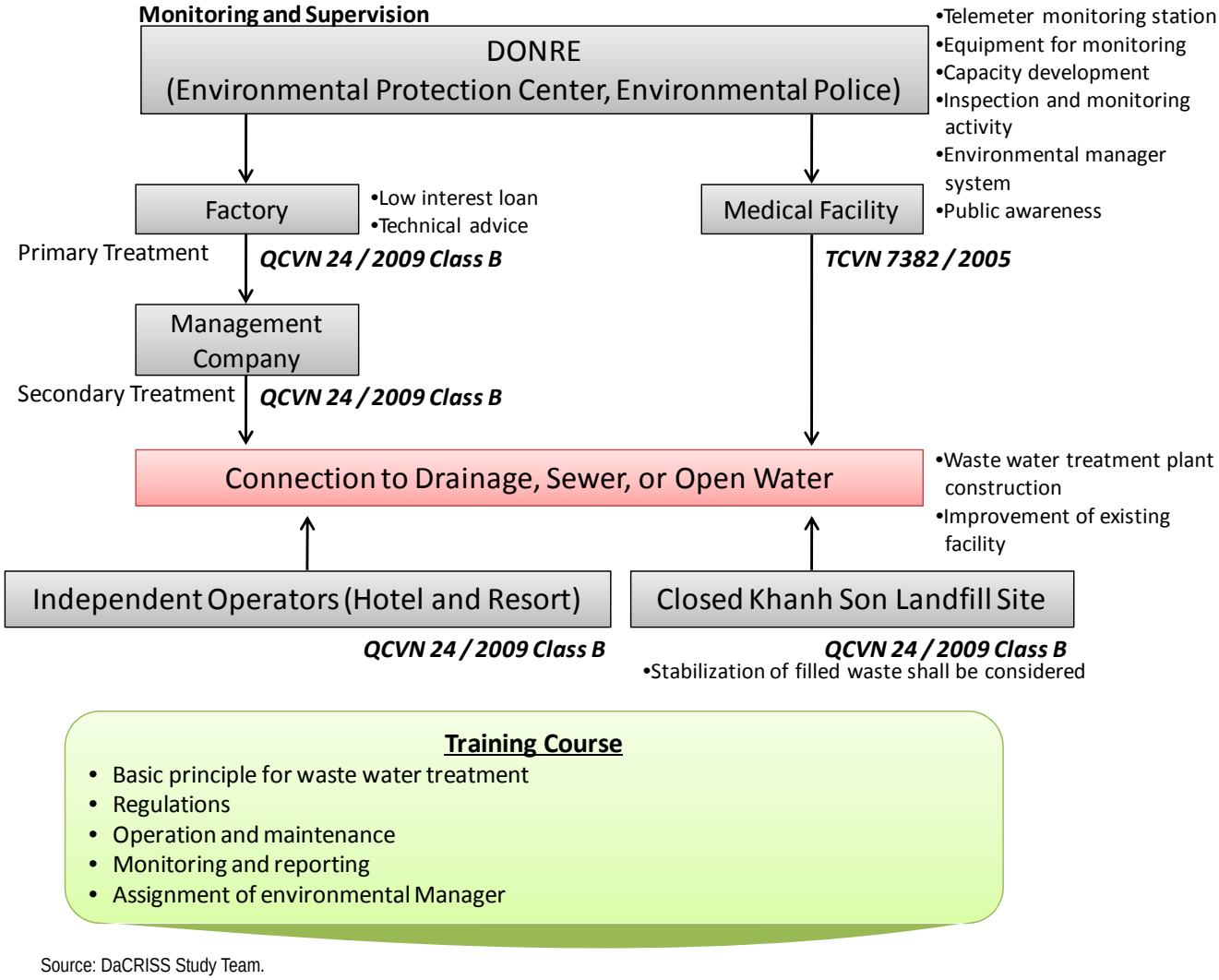
the study. Thus the required task is to conduct baseline survey and revise the form based on the study mentioned above.

(b) **Government Registration and UN Registration:** MONRE is the authorized representative organization for CDM in Vietnam. Registration shall be done.

(3) 3R Activities

(a) **Promotion Plan for Conducting 3R:** As mentioned above, although mechanical sort can be introduced at the intermediate plant, source separation is effective. The lessons learnt from 3R project in Hanoi can be applied for the planning. Various approaches can be applied. Based on the approaches and effectiveness, following activities can be combined. Those are environmental education in school, free market for exchange second hands goods, advertisement on TV and newspapers, delivery of brochure, distribution of Eco-Bag and study-tours for dumping site. Some activities shall be cooperated with relevant organization and community groups. Environmental education shall be cooperated with Department of Education and Schools. Advertisement on TV might be cooperated with newspapers and media. Currently Woman's groups and social groups were active about collection of valuable waste. Those groups might be interested in these kinds of activities. Key to success lies in active involvement.

Figure 8.2.2 Conceptual Image of Future Waste Collection System



Source: DaCRISS Study Team.

Table 8.2.10 Project Sheet for Priority Measure 2

Title of Program		**Intermediate Solid Waste Treatment**
Objectives		• Efficient operation of intermediate plant including source separation activities • Support CDM mechanism through improvement and waste collection process • Reduction of waste generated from domestic waste by promotion of 3R activities
Outline	Period	2010 - 2015
	Location	Danang City
	Beneficiaries (target group)	All domestic solid waste dischargers
	Sub Components	• Facility Support • Introduction of Clean Development Mechanism (CDM) • 3R Activities
	Plan and Layout	
	Operation and Management	URENCO (establish joint stock company if needed)
	Cost (investment, recurrent)	10.3 million USD
	Revenue (if any)	
	Rationale	• Once domestic solid waste management system was established by the support of World Bank. However, further improvement was required for extension of life period of dumping site in response to increase volume of waste. • Currently only communities and social organization conduct collecting valuable waste and no systematic measures are taken for three R (Reduce Reuse and Recycle). As a result, rate of recovery from domestic waste is low. • 3R Project was mentioned in the environment city plan formulated by Danang City. Central government has a policy for reduction of domestic waste.
Implementation	Agency	DONRE, URENCO
	Planning Requirement	
	Funding	DPC, ODA Technical Assistance
	Resettlement Requirement	No resettlement required (all major lands for facility prepared)
	Institutional Arrangement	
Critical Factors / Conditions for Success		• EIA required for 3 stages: planning, construction, operation
Recommendation		• The previous report, "Municipal Solid Waste 3R Promotion & Stabilization In Viet Nam", concludes that this project is feasible with FIRR 7%. Inputs of ODA and technical assistance may increase efficiency. Revisions required.

Source: DaCRISS Study Team.

Table 8.2.11 Preliminary Cost Estimation for Priority Measure 2

Thousand USD

Component・Activity/Schedule		Unit	Number	Unit Rate	Price	Remarks
1	Operation of Intermediate Treatment Plant					
	Feasibility Study and Registration of CDM	Set	1	1,000	1,000	
	Detailed Design	Set	1	200	200	
	Compost Plant	Set	1	1,000	1,000	In Khanh Son Landfill Site
	Equipment for Compost Plant	Set	1	1,500	1,500	
	Equipment for Waste Collection		1	2,000	2,000	
2	Introduction of CDM					
	Application and Monitoring	Set	1	1,000	1,000	
3	3R Activities					
	Dispatch Local Experts	MM	240	5	1,200	5 personx12monthx4Year
	Dispacth Foreign Experts	MM	48	40	1,920	2 personx6month x 4Year
	Project cost	Set	1	500	500	Promotion cost etc
	Total				10,320	

8.2.3 Wastewater Treatment for Urban and Rural Areas

1) Current Conditions and Issues

(1) Urban Area

8.35 Combined sewer system was introduced by the World Bank project in 2006. However, wastewater treatment was not effectively operated due to low inflow to the treatment plant. According to the study on wastewater management strategy done by World Bank, the reason was supposed to 1) damaged culverts, 2) low housing connection, 3) obstacles in the culvert and 4) non reliable inflow data.

8.36 Results of the monitoring indicate that ground water was polluted by high value of coliform. One of the causes of the pollution was believed infiltration of domestic wastewater.

8.37 HIS results also indicated that the rate of connection supposed to be low less than 20%. Promotion of the connection and phasing out of septic tank might be effective after the physical survey for identifying the causes.

8.38 Meanwhile, a number of the septic tank was still supposed to be utilized. However, Danang city had stopped collection of sludge from septic tank after the operation of the current sewer system in 2007. Therefore septic tanks are supposed to be full in near future. Collection of sludge also needs to be conducted to prevent ground water pollution.

8.39 Construction of Interceptor sewer and housing connection was recommended to PIIP by the consultants, while no collection was mentioned. Furthermore, only a one night soil treatment facilities existing in Danang city. The capacity is only 20m3/day and located in the Khanh son landfill site. Once the night soil treatment is constructed, the facility can be used for the sludge collection in the rural which is proposed in this project.

8.40 Before the treatment plants operation, sludge collection was implemented by URENCO. According to the interview to URENCO, URENCO subcontracted to private company to collect. Summary is listed below.

(i) Target: 100,000 houses

(ii) Average size of septic tank: $4m^3$

(iii) 20,000 household/year, once in five years

(iv) 300,000VND was subsided from the government to URENCO

(v) Current treatment of night soil: 20 m^3/day

(vi) Termination of night soil collection: end of 2006

(2) Rural Area

8.41 In Danang, more than 70,000 live in the rural district in Hoa Vang. Currently no centralized wastewater treatment system exists in rural area. Only a limited houses and community equipped septic tank. Assessment of the degree of the pollution, the priority for this issues followed by improvement of existing sewer network, industrial and medical wastewater treatment and extension of the network in the rest of urban area. However, some hot spot or tourism promotion area has a priority to install treatment system for the economical development.

2) Objectives

8.42 This project is aiming at improving domestic wastewater treatment conditions in urban and rural areas.

3) Proposed Measures

(1) Facility Support

(a) **Coordination between World Bank:** World Bank shall have improvement program in the service area. Basically they are required to conduct a physical condition survey including the network and housing connection and social condition survey for septic tank owners. Based on the results, plan of housing connection and phasing out of septic tank would be required. Coordination shall be made to synchronize with their plan.

(b) **Housing Connection to Centralized Wastewater Treatment:** For effective operation, housing connection is a must. Obligation shall be set in advance. A soft loan for the owner or connection itself can be included in the project.

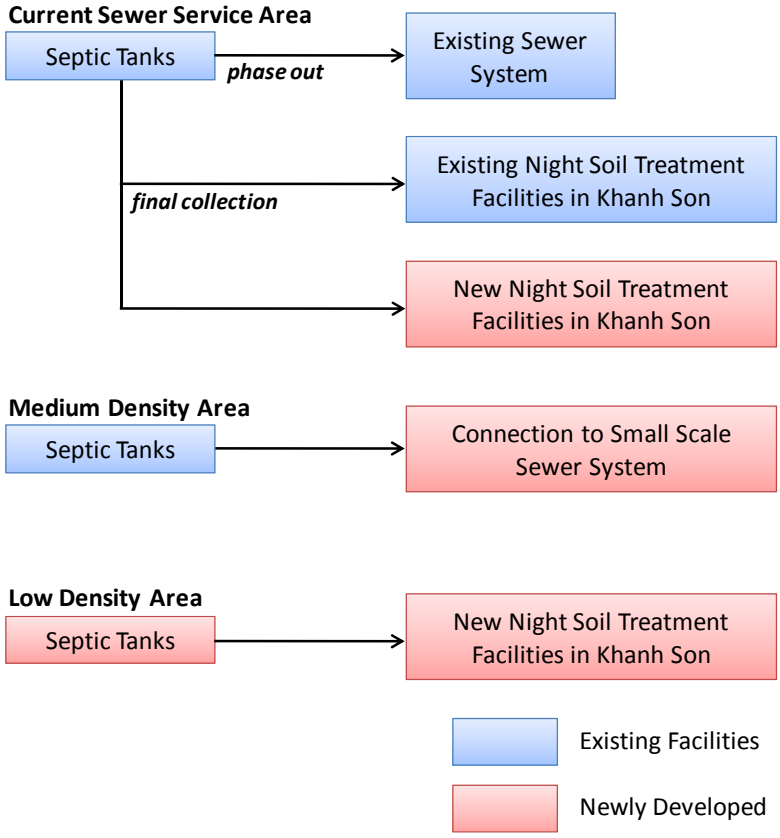
(c) **Introduction of Wastewater Facilities:** For medium density rural areas, small scale treatment system shall be installed. A small scale oxidation ditch type would be a suitable wastewater system in terms of easy operation and low installation cost. In low density areas, septic tanks are suitable. A borehole survey and topographic surveys are required before design stage for both cases. Currently, no management company exist for operation in the rural area, however TMDC is expected to be in charge of wastewater treatment operation.

(d) **Night Soil Treatment in the Khanh Son Landfill Site:** Current night soil treatment facilities can treat 20 m^3/day. Target capacity shall be decided based on the number of the septic tank installed in the rural area and phasing out program of septic tanks in the urban area. Currently a night soil treatment facility is operating in Khanh Son. Therefore extension or construction of additional treatment site may be done by applying current operation experiences. Sludge collection can be subcontracted to the private companies; however feasible financial source shall be confirmed.

(2) Legislative Enforcement

(a) Measures for legislative enforcement shall be taken, in coordination with the World Bank.

Figure 8.2.3 Conceptual Image of Future Domestic Wastewater Treatment System



Source: DaCRISS Study Team.

Table 8.2.12 Project Sheet for Priority Measure 3

Title of Program		**Wastewater Treatment for Urban and Rural Areas**
Objectives		• Promotion of domestic wastewater treatment
Outline	Period	2010 - 2015
	Location	Danang City
	Beneficiaries (target group)	**Urban:** Existing septic tank users **Rural:** 11 medium density area (One from each rural commune) will be selected for rural water supply and waste water treatment
	Sub Components	• Facility Support • Legislative Enforcement
	Plan and Layout	
	Operation and Management	• Operation of night soil treatment facility and managing sludge collection: URENCO • Waste water treatment facility: TMDC • Monitoring for waste water quality: DONRE
	Cost (investment, recurrent)	24.7 million USD
	Revenue (if any)	
	Rationale	**Urban Area** • Wastewater treatment is not effectively operated, and HIS results also indicate that connection to wastewater treatment is less than 20%. • While phasing out of septic tanks is needed, collection of sludge for the existing septic tanks is important as well to prevent groundwater pollution. The construction of night soil treatment facilities will help solve this problem. **Rural Area**

		• Few houses are equipped with septic tanks.
Implementation	Agency	DONRE, URENCO
	Planning Requirement	
	Funding	DPC, ODA Technical Assistance
	Resettlement Requirement	No resettlement required (all major lands for facility prepared)
	Institutional Arrangement	
Critical Factors / Conditions for Success		• EIA required for 3 stages: planning, construction, operation
Recommendation		•

Source: DaCRISS Study Team.

Table 8.2.13 Preliminary Cost Estimation for Priority Measure 3

Thousand USD

Component・Activity/Schedule	Unit	Number	Unit Rate	Price	Remarks
1 (1)Facility Support(Housing Connection)					
Coordination with World Bank	MM	2	40	80	
Support for Housing Connection	Set	50,000	0.3	15,000	Soft loan for households
Capacity Development	Set	1	100	100	for small scale contractor,
(2)Facility Support(Rural Area)					
Selection of area and type of treatment	MM	4	40	160	
EIA	Set	11	20	220	
Survey and Detailed Design	MM	11	50	550	
Tender&Supervision	MM	11	20	220	
Construction	MM	11	500	5,500	
(3)Facility Support(Rural Area)					
Housing connection	MM	11	100	1,100	500USD*200household*10
Capacity Development	MM	11	100	1,100	
(4)Facility Support(Night Soil Treatment)					
EIA	Set	1	50	50	
Detailed Design for Night Soil treatment facilities	Set	1	50	50	
Tender&Supervision	Set	1	10	10	
Construction	Set	1	300	300	200m3/day
Capacity Development	Set	1	100	100	Equipments
2 Legislative Enforcement					
Dispatch Experts	MM	6	40	240	
Total				24,700	

8.3 Disaster Management

1) Flood and Typhoon Disasters in Danang City

8.43 There are two major river systems in Danang city. Cu De river system is developed in northern part of the study area. Han river system has three big tributaries such as Cam Le, Vinh Dien and Co Co river. Yen river and Tuy Loan river meet at Hoa Tho Tay commune area and become Cam Le river. In Vinh Dien river, Qua Giang river flows into Vinh Dien river at Hoa Phuoc commune. Cam Le river and Vinh Dien river systems originates in Quang Guai are flowing into Han river system in Danang city. These river systems together with Co Co river system are finally joined together and flowing into Han river.

8.44 Alluvial lowland is extensively developed at lower reach of these rivers. In Han river basin, flood plain is developed at middle reach around junction point of Tuy Loan and Yen river including a part of Cam Le river. Old abandoned river channels and natural levee are distributed in this flood plain. These micro-topographies are representing historical flood and sedimentation processes by rivers in flood plain. Deltaic lowland is developed around upper reach of three rivers junction area of Han river. Extensive alluvial lowland is not developed in Cu De river basin due to limitation of free flowing by mountain topography. Only lagoon lowland is developed at river mouth.

8.45 Flood of rivers cause extensive inundation from middle to lower reach. Flood occurs mainly in rainy season from September to November. This season is also a season of typhoon originating in the Philippine Sea. Intensive rainfall of rainy season or typhoon causes severe flood in rural area of Danang city.

8.46 According to flood disaster data (Table 8.3.1) in recent eleven years (1998-2008) provided by FSCC (Flood and Storm Control Committee of Danang), flood occurs from 2 to 4 times in a year. Human casualty by flood disaster is not so many, but in 1998, 32 dead and 27 injured were recorded and in 1999, 37 dead and 61 injured were recorded. Flooded houses are 19,029 in 1998 disaster and 46,333 in 1999 disaster. In 2007 flood disaster case, flooded houses are recorded at 28,269, however, human casualty including injured is only 6. Total evacuation people are recorded at 108,000. Agricultural damage such as rice field, vegetables, crops, poultry and cattle is also rather heavy in severe flood case.

8.47 Typhoon disaster data (Table 8.3.2) is also provided by FSCC in recent twelve years (1997-2008). Strong wind accompanied by typhoon causes house damage. In 2006, totally 107,962 houses were damaged by roof broken and 104 dead. Most dead is due to wreck of small fishing boat by typhoon wind and wave.

8.48 FSCC provided flood depth data on November 2007 flood which is showing only commune name and flood depth in the report. Flood area map is not attached to this report and also flood prone area map cannot be collected. Study team plotted flood water depth on the map based on FSCC report (Figure 8.3.1).

Table 8.3.1 Statistics on Damage by Flood in Danang

No	Damage flood	Unit	Total	1998	1999	2000-2003	2004	2005-2006	2007-2009
1	Number of floods	flood	29	2	2	12	2	4	7
2	Number of the dead	person	80	32	37	5	2	1	3
3	Number of the injured	person	92	27	61	0	1	0	3
4	Number of missing people	person		-	-	0		0	0
5	The houses swept away	house	578	158	412	0		0	8
6	Broken houses	house	4,215	564	3,651	0		0	0
7	Flooded houses	house	93,631	19,029	46,333	0		0	28,269
8	Evacuated households	household	10,348			0	2,000	0	8,348
9	Evacuated population	person	108,000			0		0	108,000
10	Flooded villages/groups	person	86			0	52	0	34
11	Flooded communes/wards	number	35			0		0	35
12	Dead cattle	number	274,582	210,000	46,144	0	35	3	18,400
13	Dead poultry	number	2,512,840	2,000,000	473,000	0	3,840	0	36,000
14	Area of rice field damaged	ha	660		625	0	35	0	0
15	Damaged vegetables and crops	ha	1,549	1,300		0	170	25	54
16	Rice volume spoiled	ton	9,000	9,000		0		0	0
17	Transport utilities blown off	m3	1,000,000			0		0	1,000,000
18	Irrigation system blown off	m3	1,181,500	430,000		0		0	751,500
19	Broken bridges	bridge	8			0		1	7
20	Broken culverts	culvert	250			0		0	250
21	Sunk ships and boats	boat	8			0	8	0	0
22	Missed ships and boats	boat				0		0	0
23	Break down ships and boats	boat	31	28		0	3	0	0
	Total	bil VND	814.18	182.3		0	18	0.8	2.08

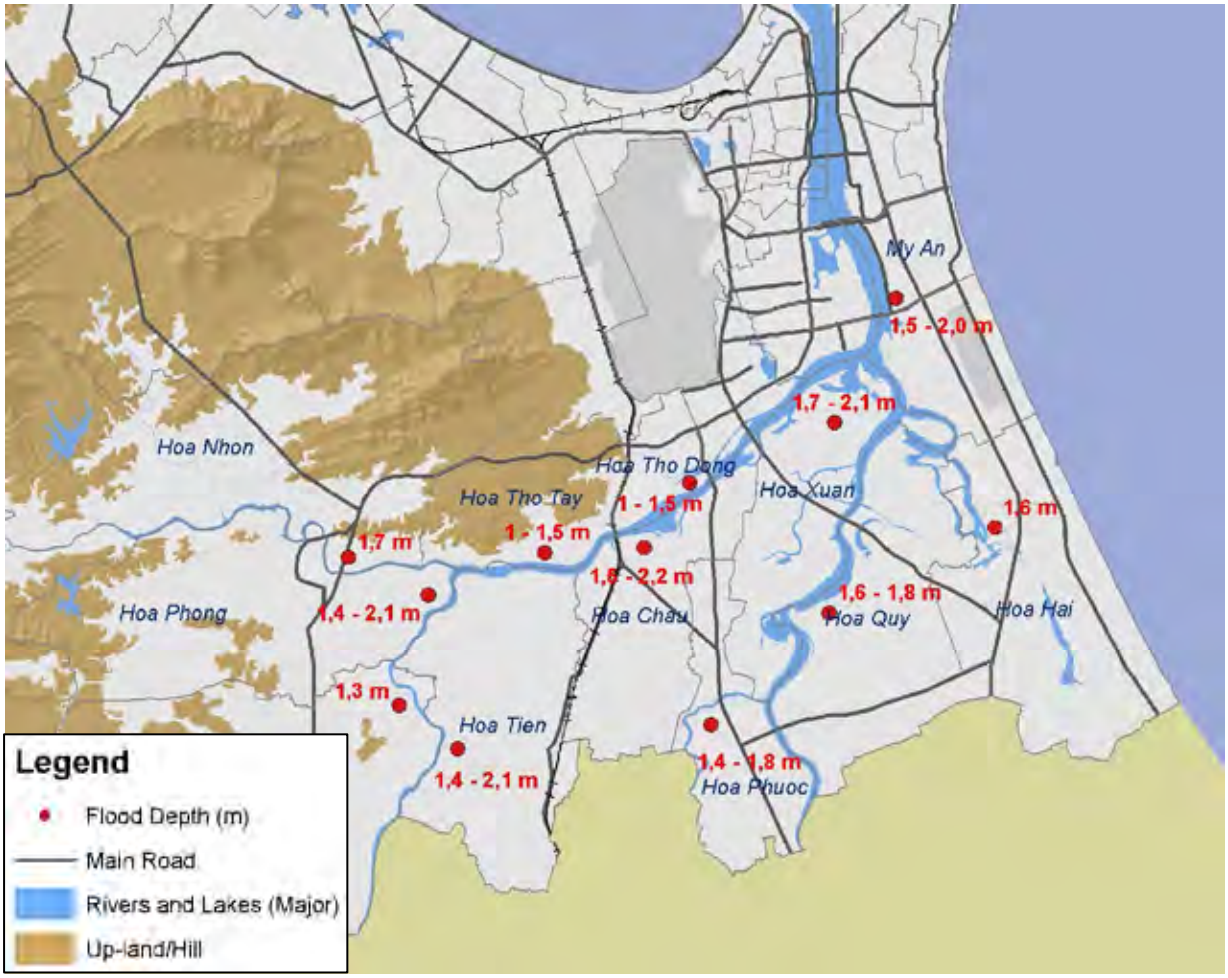
Source: FSCC

Table 8.3.2 Statistics on Damage by Typhoon in Danang

No	Damages by typhoons	Unit	Total	1997	1998-1999	2000	2001	2002	2003-2004	2005	2006	2007-2008
I	Number of typhoons	storm	84	5	18	7	9	5	12		10	19
1	Number of influencing typhoon	storm	21	2	2	1	2	2	3		3	4
2	Number of the dead	person	111	2	0	2			2		104	0
3	Number of the injured	person	93	20	0				1	11	61	0
4	Number of missing people	person	165		16				1	146	2	0
5	Sunk ships and boats	boat	81		0		4	2	10		65	0
6	Missed ships and boats	boat	1		1				0			0
7	Broken down ships and boats	boat	115		0	45	12		3		55	0
8	Caved houses	house	14,549	139	0	15	11		0	246	14,138	0
9	Houses Broken or blown roof up	house	111,317	858	0	136	131		0	2,230	107,962	0
10	Destroyed forests	ha	18,623		0				0	157	18,466	0
11	Area of nursery swept away	ha	301		0	138		55	70	38		0
12	Transport utilities blown off	m3	2,500		0				0	2,500		0
13	Irrigation system blown off	m3	11,700		0		10,200		0	1,500		0
14	Area of rice field damaged	ha	7,449	1,737	0	1,800		3,912	0			0
15	Damaged vegetables and crops	ha	2,540	1,126	0	682	522		0	210		0
16	Rice volume swept away or spoiled	ton			0				0			0
17	Transport utilities blown off	m3	8,506	8,506	0				0			0
18	Irrigation system blown off	m3	7,122	7,122	0				0			0
19	Broken bridges	bridge			0				0			0
20	Broken culverts	culvert			0				0			0
	Total	mil VND	5,407	26	2	12	5	6	1	41	5,314	0

Source: FSCC

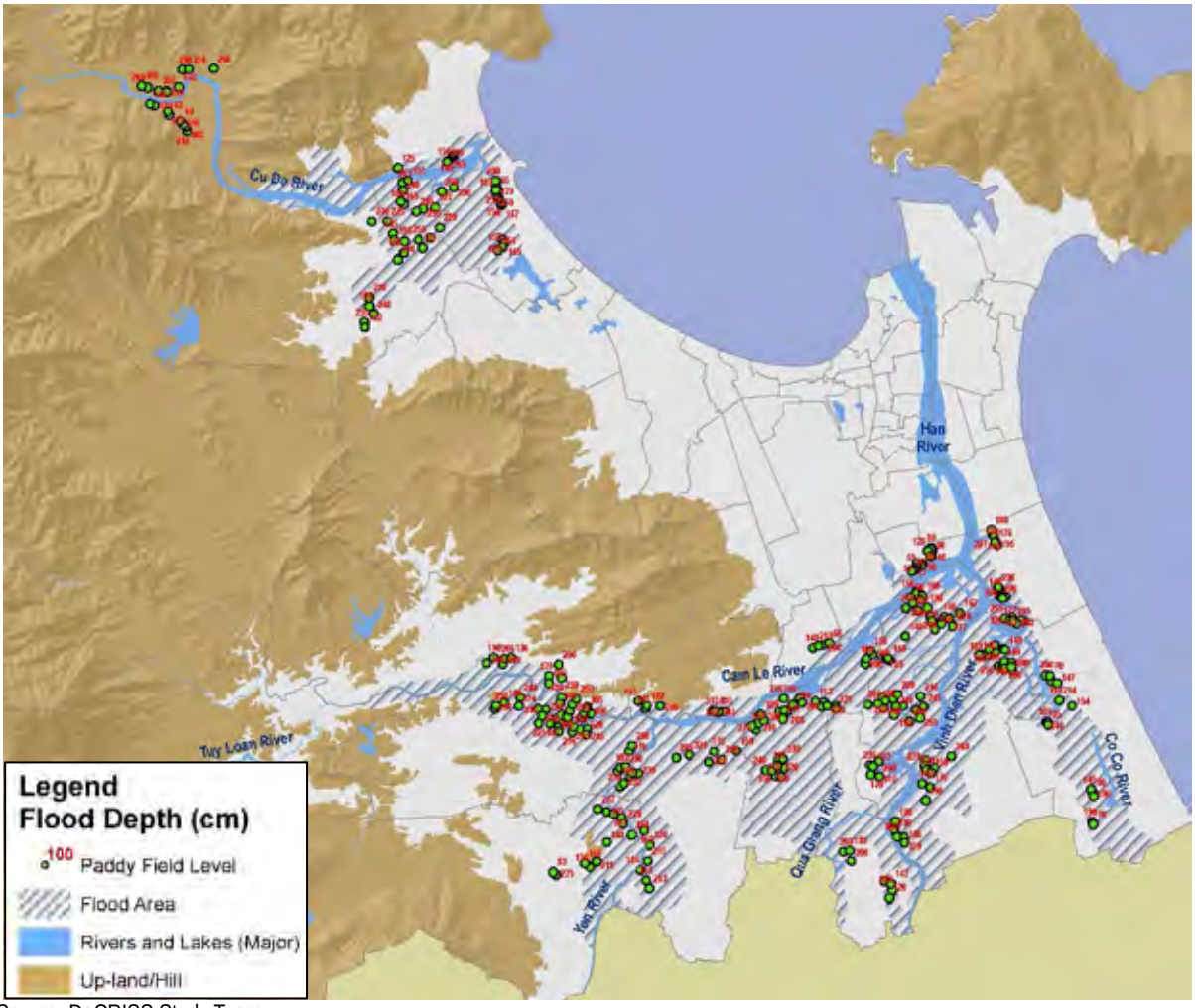
Figure 8.3.1 Flood Water Depth in November 2007 by Commune



Source: FSCC, Nov. 2007

8.49 **Flood by Typhoon Ketsana:** In September 28th, 29th, 30th of 2009, typhoon Ketsana landed at Danang area bringing strong wind and heavy rainfall. Severe flood was caused by this typhoon. Study team prepared survey plan for this flood, to clarify inundation area, flood water depth and damages. Flood depth from paddy level, road level, and house floor level were surveyed by field survey. Possible past highest flood level is also checked by interview survey. Totally 300 survey points were set (see Figure 8.3.2).

Figure 8.3.2 Flood Affected Area by Typhoon Ketsana 2009

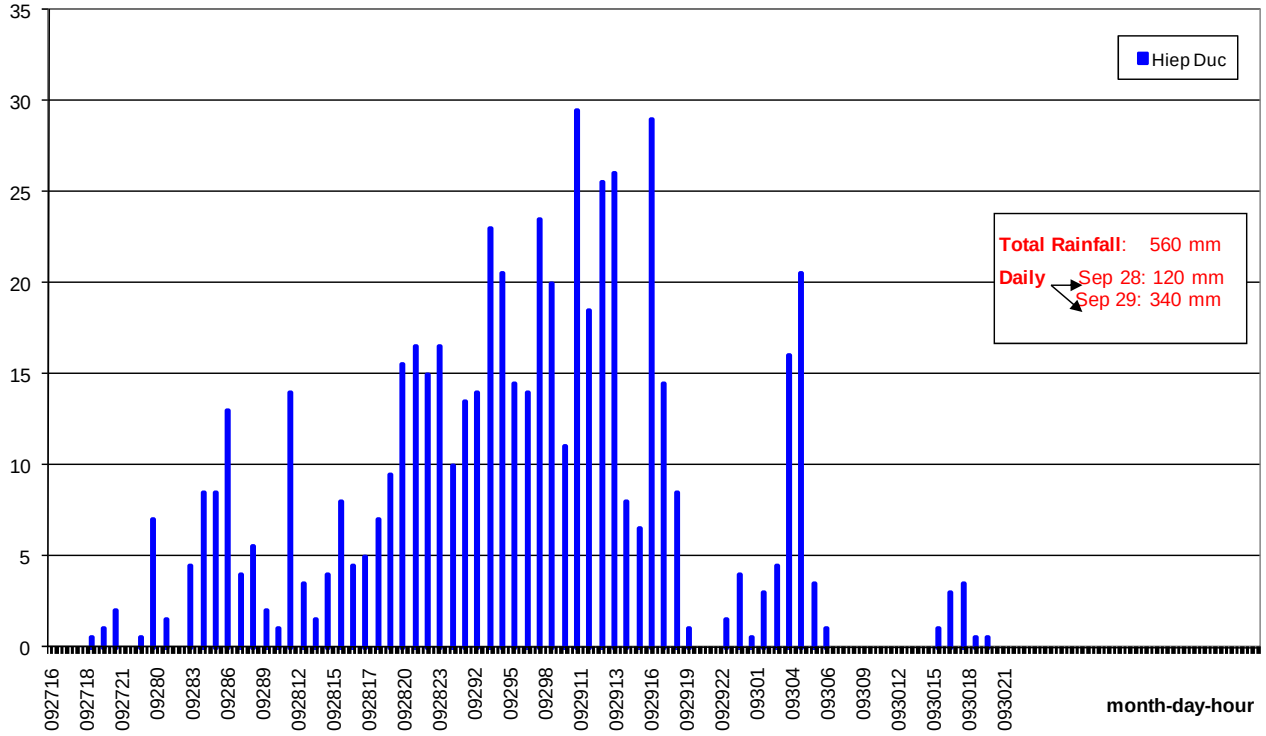


Source: DaCRISS Study Team.

1) Maximum extent of inundated area together with flood water depth from paddy level.

8.50 According to hourly rainfall data collected at Hiep Duc (Figure 8.2.3), rainfall begun on the evening of 27th of September and cleared in the morning of 30th of September. Total rainfall amount in four days recorded at 560mm. Out of this amount, 340mm is recorded on 29th of September. Most intensive hourly rainfall is 30mm.

Figure 8.3.3 Hourly Rainfall for Typhoon Ketsana (mm)

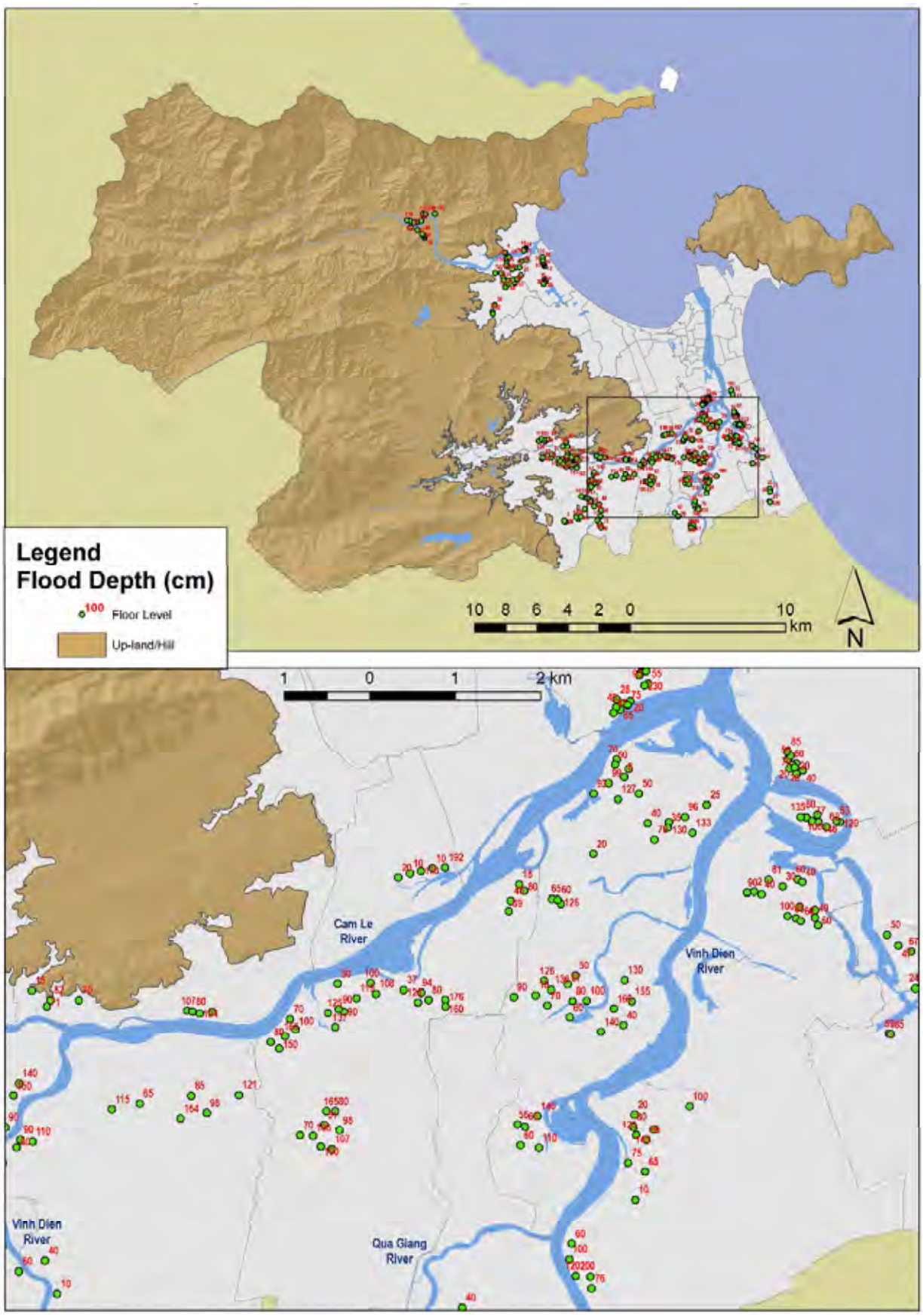


Source: MAHASRI.

8.51 Flood water over flow river channel and flooded into surrounding paddy field. Local houses located in the flood plain are generally constructed on relatively higher topographic area such as natural levee to avoid flooding, however, even these houses near the river channel were inundated up to 50cm to 100cm. Flood water depth in paddy field level is showing 100cm to 200cm, and deepest is showing 260cm in partly. Flood duration is changing from one day to five days according to topographical condition. Lowland area of paddy field is mainly flooding for several days in general (Figure 8.3.5). Flood water depth in deltaic area at lower reach of Cam Le river and Vinh Dien river, and Co Co river is showing almost 200cm depth in general. Multi-purpose shelter is constructed by commune government as temporally evacuation site. Children and elder people will be evacuated to this site at severe flood time. Measurement pole for flood water level is constructed along the road side showing the change of flood level. Community people can understand flood level according to color index of the pole. Small kitchen and necessary rescue materials are equipped in flood shelter building.

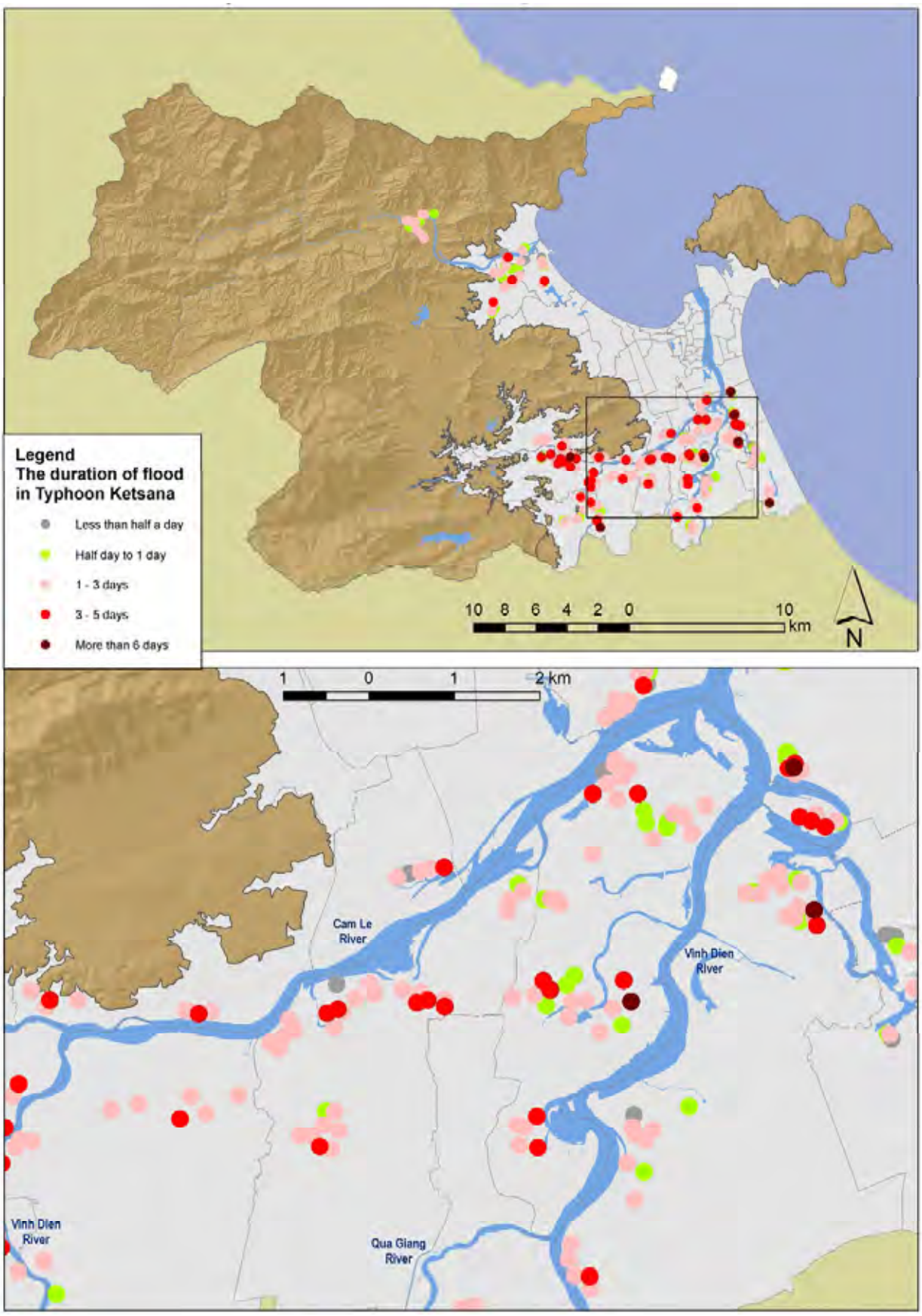
8.52 Flooding in Cu De river is showing rather deeper inundation along the river channel. At the lowest reach of the river, lagoon lowland is developed where the flooding occurs frequently according to the rise of river water level. Inundation depth is also deeper from 100cm up to 200cm.

Figure 8.3.4 Flood Depth in Typhoon Ketsana in 2009



Source: DaCRISS Study Team.

Figure 8.3.5 Flood Duration Period in Typhoon Ketsana in 2009

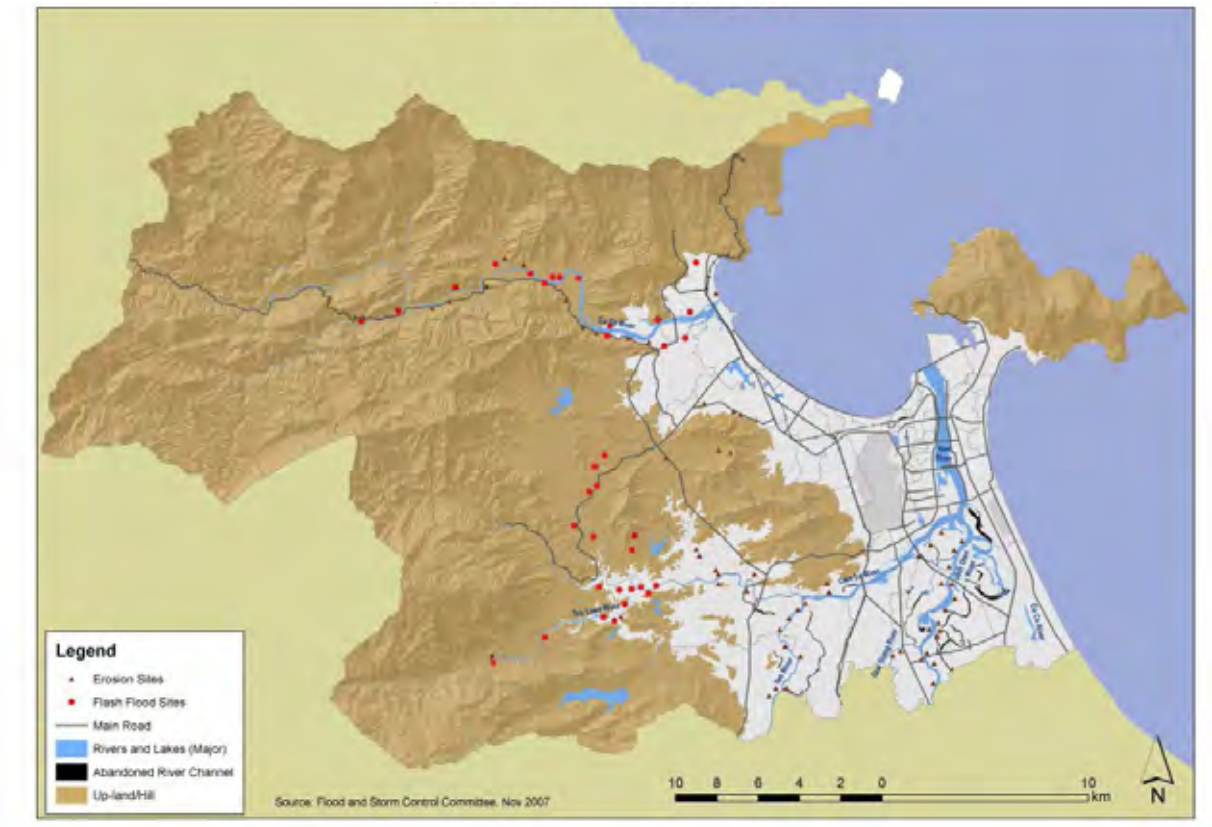


Source: DaCRISS Study Team.

8.53 In order to avoid and minimize agricultural damage by flood disaster, crop pattern is established. The first rice planting start at end of November and harvested by April and the second rice planting start after April and harvested by September. Paddy field is vacant during three month period from September to November to avoid damages by flood disaster in this area. Extensive paddy field works as a temporally reservoir for flood water retention.

8.54 River bank erosion is observed along the main river channel. Especially in flood plain area, river channel erodes river bank laterally. Big bamboo forest and trees growing along the river channel severely eroded and a block of river bank is swept away at Yen river. Through this lateral erosion accompanied by severe flood, river channel changed and sift gradually. This will eventually cause a big damage to houses, road and agricultural land located close to river channel. River bank erosion sites are indicated in Figure 8.3.6 by FSCC.

Figure 8.3.6 River Bank Erosion Sites



Source: FSCC.

2) Flood Mitigation Measures

8.55 In the study area, although flooding is the most frequently occurred natural disaster and causing sizable damage to the community people almost every year (see Figure 10.1), sufficient flood mitigation measures have yet been taken. Necessary flood mitigation measures should also be taken into consideration upon formulating urban development plans.

8.56 Mitigation measures for flood disaster protection should be implemented, such as 1) river dyke construction for main river channel, 2) promotion of integrated watershed management to control runoff including tree plantation and erosion control in upper reach of the river basin, 3) implementation of early warning system for flood disaster management, and 4) promotion of community based flood disaster management.

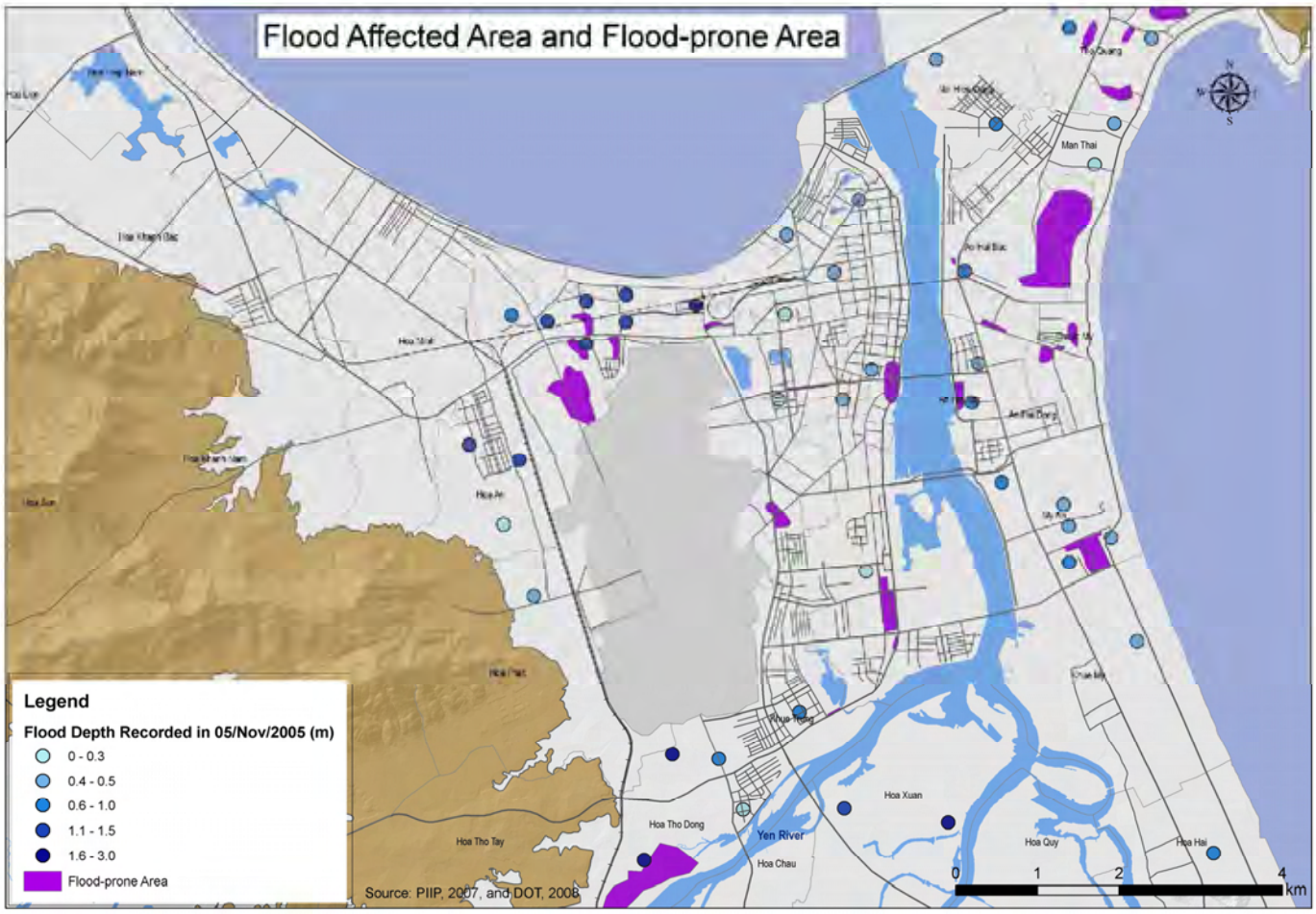
8.57 According to DARD, river dyke construction is not planned in rural area. Concrete and stone wall for river bank protection from lateral erosion are constructed in necessary part of the main river channels.

3) Flood Protection in Urban Areas

8.58 Flood mitigation in urban areas is also important in Danang City. Flooding in urban areas is mainly due to inundation of inner water due to an ineffective drainage system. According to DOT, one of the reasons causing inner water inundation in urban areas is related to the lack of drainage connection to the existing network at large construction sites. Large bare land or under construction sites generate a significant volume of draining water without proper networking to the existing drainage system. Water at construction sites which flow to surrounding areas causes inner water inundation on the occasion of strong rainfalls. Frequent inundation spot in urban area is shown in Figure 8.3.7. Flood mitigation in urban area is also important in Danang city. Flooding in urban area is mainly inundation of inner water due to ineffective drainage system. According to DOT, one of the reasons causing inner water inundation in urban area is related to no drainage connection to existing network at big construction site. Large bare land or under construction site generate a significant volume of draining water without proper networking of existing drainage system. Water at construction site flowing freely to surrounding area causing inner water inundation at the time of strong rainfall.

8.59 Drainage system master plan for Danang city is now progressed by PIIP. This master plan covers improvement of drainage system of existing urban area and newly developed area as well. Implementation of pipeline network, pumping station and wastewater treatment plant are planned. Master plan will be completed by the year 2011.

Figure 8.3.7 Flood Affected Area and Flood-prone Area



Source: DaCRISS Study Team.

8.4 Preparedness to the Impact of Global Warming

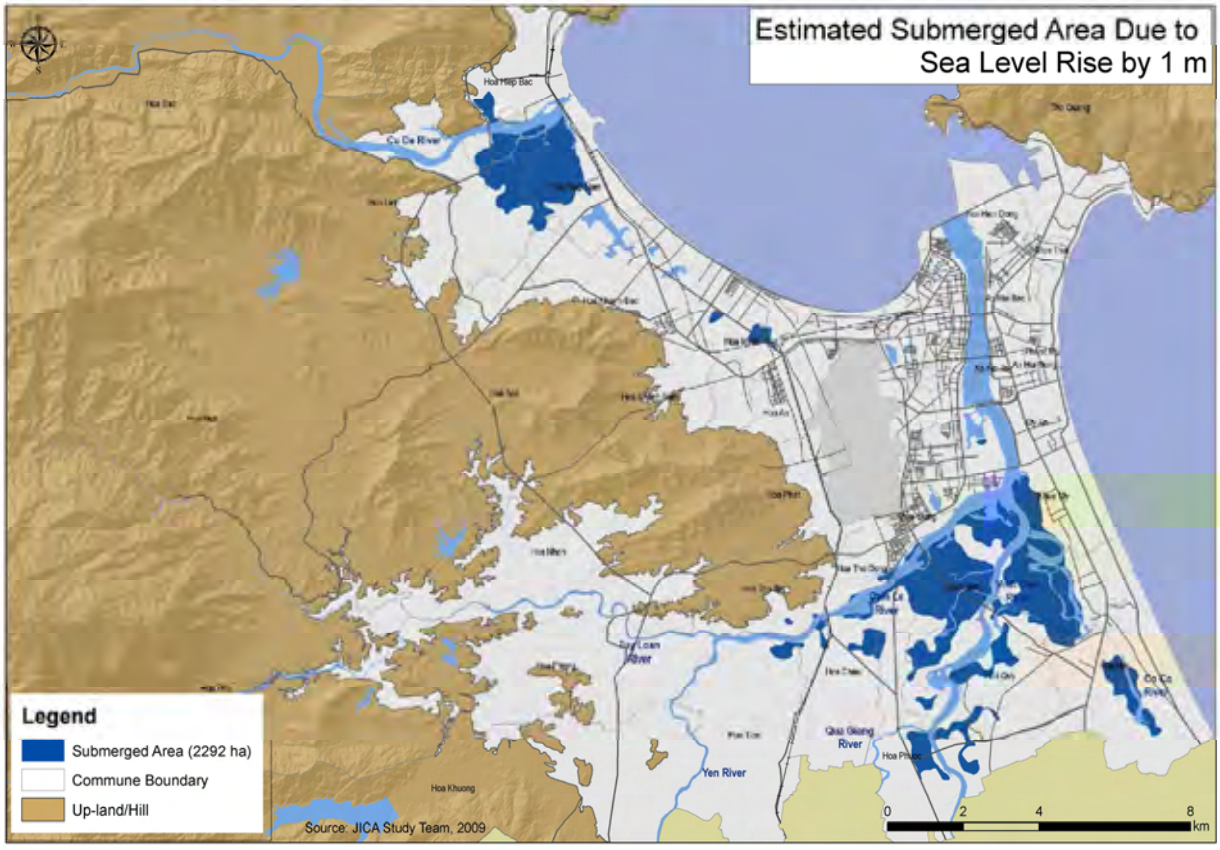
8.60 In relation to global warming and climate change, land use management in low-land area is now becoming most important subject from middle to long term point of view. Climate change represented by change of rainfall intensity, total amount of rainfall, occurrence of severe drought, change of typhoon intensity and frequency of occurrence, and change of typhoon route, will cause unpredictable flood or typhoon disaster in future.

8.61 As a part of global warming effect, it is pointed that sea level will rise approximately 1m at maximum value by the end of this century. Estimated submerged area by sea level rise based on this scenario is mapped in Figure 8.4.1. Sea level rise will affect on lowland area, such as increasing of flood depth, expansion of salt water intrusion area, change of water environment in deltaic area including ecological system. Coastal erosion and sedimentation balance will also be changed. This phenomena will make impact on coastal facilities such as road, offshore dyke, port, tourism facility and reclamation area.

8.62 Existing urban area developed in lowland need to construct protection measures such as dyke, improvement of drainage system and capacity, water gate to protect salt water intrusion and so on. Proper land use management is also necessary to maintain quality of urban environment. Main road network should have an embankment function to protect urban area from flood inundation. Effective drainage canal network also need to be constructed. Well coordinated land use and disaster protection measures will be necessary to combine effectively for the reduction of various impact by climate change.

8.63 Scientific data acquisition and research on climate change is another important activity to clarify, assess and evaluate an impact on future society.

Figure 8.4.1 Estimated Submerged Area Due to Sea Level Rise by 1m



Source: DaCRISS Study Team.

8.5 Integrated Water Resources Management

1) Context

8.64 The key objectives of IWRM are both i) to ensure the quality and quantity of the water resources and ii) to protect the environment to be considered as a patrimony. In a perspective of development of the CEFZ, which is the target of the concerned provinces in the next 20 years, IWRM should be considered as a compliance with the precaution principle, which is one of the pillars of the sustainable development approach.

8.65 IWRM is defined by the Global Water Partnership (GWP) as “a process which promotes the coordinated development and the management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”.

8.66 The trend in Vietnam should be the strengthening IWRM approach. To this regards, the country has been recently encouraged by several donors, in particular the ADB (water sector review with MONRE in 2007/2008, Water for the Poor in Quang Nam province, etc.), Australia (participation to ADB’s water sector review), Japan (Cau river basin, with the Vietnam Environment Agency of MONRE), Germany (Dong Nai river basin and IWRM Project Vietnam 2006-2010), France (in preparation, IWRM project in the Dong Nai river basin, with Department of water Resources of MONRE), Denmark, or the Dutch cooperation (Vietnam Netherlands Partnership “Water for Food and Ecosystems” with MARD in 2007/2008, Huong River basin), and many other international organizations such as FAO, IUCN, INBO or the MRC or the International Commission of Dams. However, these various initiatives have faced with the institutional difficulties represented by the lack of clarification regarding the effective supervision of the river basin management in Vietnam.

8.67 Until a recent past, RBO have not been established for all river basins, but this option is being planned now by the MONRE. Therefore, only the largest basins have had their own organisations in a first stage, such as Hong Thai Binh, Cuu Long (Mekong), Dong Nai. Multiplication of RBO is now on the agenda, but it is still not sure whether MONRE will follow the same institutional arrangement than MARD, which until now has established several RBO, such as in Cau basin or Vu Gia Thu Bon. According to the most current institutional arrangement, RBO were until the recent years headed by one Vice Minister of MARD (MONRE should now take the lead, as suggest the cases of Cau and Dong Nai basins) composed by representatives of various departments of concerned provinces, and a management board is placed under it authority to deal with management of catchment / sub catchment.

2) River Basins in the CFEZ

8.68 IWRM is still developing in Vietnam and more time will be needed to make it fully operational in all river basins. For the time being, the river basin institutional framework is under construction, one of the most important progresses accomplished being the delineation of river basins and organisations. The CFEZ counts four RBO, from north to south:

(i) The Huong river system (3,300km2), in Thuan Thien Hue province

(ii) The Vu Gia Thu Bon rivers systems (10,350km2), encompassing both Quang Nam Province and a part of Danang Municipality

(iii) The Tra Khuc river system (5,200km2), in Quang Ngai province

(iv) The Kone - Ha Thanh river system (10,350km2), in Binh Ninh province

8.69 The hydro-geomorphology of Vietnamese rivers and the shape of land and coastal boundaries of the country make in several cases relatively simple to delineate the limits of several river basins (however, excluded Red River, Mekong and Dong Nai). It also explains that several rivers do not apparently depend on any specific river basin organization. Presumably, these RBO have been established when encompassing, among other areas, major economic/urban centres. This is the case for instance of the Cu De river in Danang. Actually, the definition of responsibilities of RBO, an even the RBO approach itself, were unclear, at least until the promulgation in 2008 of the governmental decree 120. In a perspective of large urbanization process centred on Danang and economic growth of Danang region, two main river basins should be considered the Huong River Basin and the Vu Gia Thu Bon river basin.

3) Vu Gia Thu Bon River Basin Organization

8.70 **Description:** This basin covers two sub-river basins, Vu Gia (5,180km2, length of 204km until Danang) and Thu Bon (3,825km2, length of 152km), mostly encompassing Quang Nam province, but also expanding in Kontum province (520km2) and in southern Danang Municipality. The two sub-basins are relatively independent, although Quang Hue river flows from the Vu Gia to the Thu Bon and conversely for the Ving Dien river. Rainfalls concentrate between September and December (70% of the total rainfalls), which make the other months relatively dry, and dryer on the coast than in the mountains. A series of major hydropower projects are located along the course of Vu Gia, in particular Vuong, Song Tranh 2, Dak Mi 4 and Son Con 2. The map of the whole basin is inserted below.

Figure 8.5.1 Outline of the Vu Gia Thu Bon River Basin

Source: ICEM, 2008.

8.71 The Vu Gia Thu Bon river basin plays a key role in the economy of the CEFZ. It provides not only water to the major parts part of Quang Nam province, with an important role played by agriculture (rice in particular), but also a large part of the water resources of Danang.

8.72 **Main Issues:** The economic growth of Danang and CEFZ raises some crucial questions which deal totally or partially with the logics of IWRM:

(i) The satisfaction of the water demand in Danang and northern Quang Nam by the supply of raw water coming from the Vu Gia Thu Bon river basin. Among explanations is not only the demographic evolution in Danang, but the change in domestic water consumption, from 80 (2005) to 180 litres per person per day in 2020 (according to MOC. Cf. ADB, 2008). This question is even more crucial in the dry season when salinity intrusion increases, and in a context of global increases in temperature which will increase evapo-transpiration and lead to decreased flows during the dry season.

(ii) The supply in power to the region based on an extensive hydropower development and interaction with the downstream uses: the effects on the water course regimes, impacts on ecosystems, potential for flood management and volume of water available for other uses (emerging conflicts with agricultural uses such as irrigation for instance).

(iii) The management of water quality: there are many concerns over water quality deteriorating, surface water as well as ground water, due to domestic, agricultural and industrial pollution.

(iv) Occasionally, the share responsibilities for ground water protection

8.73 Furthermore, one of the main issues in the river basin is management of natural disasters. The impacts of disasters on the river basin are high, with 23 people per million killed on average each year, and damage costs equivalent to about 7% of the basin GDP per year (ADB, 2008).

8.74 **Initiatives:** In 2006, following the MARD's decision to establish a Vu Gia Thu Bon Planning Management Board (Decision of MARD 2-/2005/QD-BNN dated 13 April 2005), the Provincial People's Committee of Quang Nam, with the support of the ADB (cf. description of the project in Appendix 2), established a "Committee for the Management and Control of the Integrated Water Resources of Vu Gia Basin" (Decision n°458/QD-UBND, dated Feb. 14, 2006), with representatives of neighbouring provinces as observers. The main roles expected from the new organization were to achieve a plan for the river basins, to coordinate water management activities and to resolute disputes between water users. The initial number of Committee members was 15 (mostly high ranked officers of provincial administrations and vice chairmen of districts), plus the Vice Chairman of the Quang Nam Province (Head of the Committee), and the Director of the DONRE (Permanent Deputy Head of the Committee). The Committee cannot therefore be considered as an operational body.

8.75 The tasks and powers of the Committee, as defined in the Regulation Execution having followed Decision n°458 are listed in the following box. Its prerogatives remain however relatively distant from decision and implementation processes and are mainly limited to the formulation of proposals, advisory, coordination and reporting roles. Unlike river basin organizations in other countries, the Committee has neither direct project owner role for investments, nor financial capacities. It has so far also benefited from the operational assistance of the provincial DONRE of Quang Nam. As a matter of fact, much

remains to be done to make the Committee in a capacity to effectively stimulate and implement IWRM. The technical and regulatory keys for actions remain in the hands of provincial departments, various levels of deciders (districts, province, etc.) and water users, such as power companies, remain nearly excluded from the planning management process. This may change with the elaboration of the Strategic Plan by the Committee, since the involvement of users of concerned districts is planned (ABD, 2006). Attempts have also been made to strengthen the dialogue between the Management Board and Danang as concerns the two basins. To this regard, progresses have apparently been accomplished with the creation of a specific River Management Board by Danang People's Committee. However, operational results of this emerging cooperation process have still to be concretized in the next years.

8.76 The process of strengthening the IWRM in Vu Gia Thu Bon basin is ongoing, but much has still to be done regarding the exact role of the RBO, considering the leading role played now by the MONRE. Process to establish Strategic Plan has been apparently delayed and there is a lack of staff specifically dedicated to IWRM. It seems that the political bases are good to progressively develop an IWRM approach, including the capacity of Danang and Quang Nam to collaborate. Among the delicate subjects to be settled are the impacts of hydropower facilities located upstream to Vu Gia basin on the availability of water resources in Danang, but also the effects of a continuing fast economic growth of Danang on the quality of water resources in northern Quang Nam (pollution of ground water, impacts of flood control infrastructure in Danang on upstream inundation in Quang Nam province, etc.).

4) Orientations for Action

8.77 Developing IWRM should be a progressive process since its factors of success are not only governmental supports and legal measures but also participation of administrations and users. Several measures should be put on the agenda, which are listed below.

(a) **Strengthening Specific Operational River Basin Management Teams**, one for Vu Gia Thu Bon, one for Huong, one for Tra Khuc, one for Kone - Ha Thanh with tasks such as:

  (i) Compilation and processing of data transmitted by provincial DONRE or DARD, but also by MONRE (such as results of remote sensing based monitoring) in order to elaborate and update Strategic Plans

  (ii) Monitoring implementation of Strategic Plans on the basis of indicators

  (iii) Independent advices to River Basin Management Committees, provincial government, MONRE and MARD, as concerns water disputes and majors issues related to water (temporary water shortage, intrusion of saline waters, floods…)

(b) **Integrated Water Management at Specific Sublevels:** Planning tools must be implemented not only at the largest level of each largest river basin, but also at the level of major sub-basins, such as Vu Gia river, and Thu Bon sub-basins in Quang nam, Cu De and Cam Le / Yen sub-basins in Danang, etc. Several countries have developed such planning tools, such as the example of SAGE in France (cf. example below) usually with shorter terms than for the whole river basin Strategic Plan. Such tools should be based on a cautious baseline of the physical, environmental and socio-economic (water uses with functional zoning as adopted in China) characteristics of each sub-basin, and include monitoring plan related to water quantity and quality.

At the very local level (each tributary or each lake/reservoir), specific plans can also be implemented, involving residents and water users. Needless to say, these sub-basins plans must be elaborated in full coherence with the river basin Strategic Plan. This planning process must be based on a clear nomenclature and classification of each water body in one given river basin, as suggest the example recently provided by JICA in the case of the Cau River basin.

(c) **Planning Tools Related to All Sectors (in Particular Energy, Infrastructure, Tourism, etc.) must Comply with Water Resources Management Plans:** Ideally in an IWRM and sustainable development perspective, all planning documents related to socio-economic sectors, urban development, infrastructure etc. should comply with the Strategic Plans, declined at sub-basin levels, mentioned above. Such compliance could be checked during Environmental Impact Assessment or Strategic Environment Assessment processes to limit negative impacts of economic development on availability and quality of the water resource and environment (as suggested the SEA report provided by ICEM concerning hydropower projects on Vu Gia river [ADB, 2008]).. In fact, this principle is extremely difficult to put in practice due to the priority given to economic priorities and resistance of economic stakeholders. Even countries having already a strong experience with IWRM still face with this difficulty. Yet, the principle of this compliance should be at least recognized by authorities and all efforts to avoid contradiction between economic development and sustainable water resources management should be made. It is a long but certainly unavoidable process for all countries in the world, in particular for those particularly exposed to the effects of climate change, such as Vietnam.

(d) **Polluters Pays Principles and Monitoring System (Police of Water):** Polluter pays principle is a pillar for a smooth implementation of IWRM. Some countries such as France have implemented it through the now famous system of water agencies, as described in Appendix 4. This principle is already integrated in the Vietnamese regulation (see the Decrees 67/2003/ND-CP and 04/2007/ND-CP or Decisions n°07-2007 QD-UBND and 60/2007/QD-UBND in Danang for instance), but still not enough dissuasive for many polluters. Application of this principle means that authorities develop a system of wastewater police under DONRE with the ability to heavily sanction those who do not comply with effluent discharge regulation. Such a police needs itself a reliable monitoring system which is still lacking, in particular in industrial zones. It is worth noting that Vietnam is continuously trying to improve its regulation regarding discharge of effluents and standards (see also regulation under preparation by MOC regarding discharges into sewerage system), but the key question remains the application of the regulation. However, Polluters Pays Principles cannot be only based on obligations defined by the law. To successfully contribute to IWRM, it should progressively involve water users and general public to make them fully understanding this principle and participating to the efforts to manage the water resources on a sustainable manner. In the future, contracts can be arranged in Danang and neighbouring provinces whereby some residents located within areas targeted by sub-basin level plans or sensitive areas (industrial or tourism zones) could benefit from advantages (fees reduction of environmental fees, right to use the land, financial supports from specific funds to acquire these facilities), by fulfilling some obligations such as – according to the cases - maintenance of river banks, acquisition of pre-treatment facilities (industrialists) or investments in water saving systems. In general, residents

should be involved in the consultation process to be carried out by organizations in charge of IWRM.

(e) **Establish a Water Information System on Water Bodies:** A Water Information System should be composed of a various databases and mapping representations (ground water, surface water, economic approach, etc.). Such information system could be partially accessible through internet to water users and partially with access limited to agencies in charge of water resources management. Ideally, it would provide for each water body of each river basin a characteristics including size, length of water courses, land use, water usages, pollution loads, pollution discharge points, etc. but also results of monitoring campaigns with a view to inform the public and decision makers about the improvement of water quality and possibly water ecosystems. The experience of Water Information System in countries such as France, set-up at the level of each major river basin, have proved extremely useful to increase public awareness concerning the preservation of the collective patrimony represented by water bodies. Once again, implementing such an information system cannot be a short term objective in CEFZ since it requires first the implementation of a comprehensive monitoring system based on a clear water bodies nomenclatures (e.g. 4 levels in Cau river basin) and delineation , and agreement between relevant agencies regarding water bodies nomenclatures, data formatting and exchanges protocols, compliance with confidentiality principles, etc. Through experimentation, a first phase can be to establish systems limited to the scale of pilot sub-river basins and coordinated by MONRE, based on an agreement related to database framework and data exchange protocols with a view to make results comparable.

(f) The main strategic tools for developing basin information systems and monitoring include:

(i) Monitoring and evaluation indicators

(ii) Geographic Information Systems (GIS)

(iii) Decision-Support Systems (DSS)

(iv) Remote sensing technologies

(v) Database sharing

(g) **Strengthening Capacities of Water and Hydropower Sector Companies:** Performances of these companies are a key factor of success of IWRM due to their role in water resources catchment and discharges of effluents into water bodies. Modernization is ongoing, particularly in the cases of Danang and Hue water supply companies with the assistance of foreign experts and donors. Domains concerned are Non Revenue Water reduction (networks operating and maintenance with implementation of adequate MIS, metering, collection of fees), design capacities for facilities (including use of technological innovation), tariff setting capacities in relation with increase in investment and operation costs, costs analysis, improvement of the quality of service and public relation initiatives to increase consumers' willingness to pay and limit wasting water, etc. For instance, solutions to the adverse effects of the functioning of dams planned on the Vu Gia river basin, with effects of diversion of waters to Thu Bon river basin are certainly not easy and relates to both design and operating of dams. Although not directly related to IWRM (but clearly indirectly), hydropower companies should develop operation and maintenance of the dam with the view to limit emissions of greenhouse gases by water bodies, not speaking about their capacity to

dialogue with other stakeholders to face with occasional conflicts of interest (for the example of Quang Nam, see International Water Centre, 2009).

(h) **Public Awareness / Information Campaigns:** Awareness / information campaigns related to the rationale of IWRM must be addressed to the general public (households, small enterprises, farmers and aqua-farmers, schools,…) but also to major water users such as hydropower companies, industrial zones management boards, large industries, hospitals, hotel and resorts groups, agencies responsible for irrigation and dams, etc. Campaigns should not only insist on issues but also provide solutions and show how individual behaviors (water saving, willingness to pay, ordinary behaviors to limit pollutions) wherever in each river basin can contribute to improve the general capacity of each sub-region of CEFZ to match with water availability and environment protection. To this regard, public awareness / information campaign will be much more efficient if based on economic indicators demonstrating the benefit of adopting individual behaviors in full consistence with each river basin Strategic Plans.

(i) **Infrastructure Construction:** IWRM should help determining location and types of structural investments such as water intakes, WWTP, reservoirs and dams, etc. To this regards IWRM should be considered as a tools for the efficient use of resources to be dedicated to this type of infrastructure, not excluding soft techniques-based options (such as lagooning, natural protection of rivers through rehabilitation of stretches, flooding areas…). Importantly, IWRM, because based on the long term performance of the facilities and efficient allocation of financial resources to the water sector, should lead to stress on operating and maintenance and capacity building right from the project preparation phase. Another critical result of IWRM can be the decision to plan a raw water transfer system at the level of one province or several provinces, with a view to secure availability of water for the treatment plants located in the area targeted (due to pollution accident or temporary diminution of water resource due to climatic events). Such a system exists or is under construction in large urban areas such as London, Shanghai or Tokyo. In a perspective of rapid and massive urbanization, it could be considered in the future for the Danang only, Danang / North Quang Nam area or, possibly, between Thua Thien Hue and Danang/Quang Nam.

(j) **Planning and Management Tools:** IWRM development should go together with the sophistication of specific tools which are only partially developed, or on a pilot project basis, in CEFZ. Among these tools are database and maps, simulation and forecasting modeling, economics (cost benefit analysis, cost effectiveness analysis, risk benefit analysis, etc.), performance indicators … Economic approach in particular related to the cost of the resources for the collectivity and the value of ecosystems is certainly of a great importance to IWRM because economic arguments are critical to convince stakeholders, in particular authorities themselves, of the rationale of integrated water resources planning. To this regard, although they need to be improved, methods are now in use in the world (such as valuation methods, such as market valuation, indirect market valuation, contingent valuation, group valuation; cf. Appendix 7). Two key issues are the availability of data and the skills of economists specialized in quantification of the water sector economy. Another perspective, also very ambitious but feasible, is to adapt the concept of hydro-eco-regions (cf. box below) to the situation of CEFZ with a view to strengthen the bridge between water management and environmental concerns and to help comparing performances within the 4 large

basins of central Vietnam.

(k) **Recommended Action:** Danang could start implementing pilot projects for IWRM on the Cu De sub basin, possibly with the assistance of ADB which is supporting the Water Supply Project in this area. If conducted rapidly, Danang could make this experience useful to the Strategic Plan to be formulated by the Vu Gia Thu Bon river basin Committee: Clearly, the successful cooperation between Danang and Quang Nam will be the key to face with the major water issue in CEFZ. The scope of possible measures to be initiated in Danang with a view to be replicated in Quang Nam has been proposed in November 2008 by DaCRISS team.

8.6 Integrated Coastal Marine Management

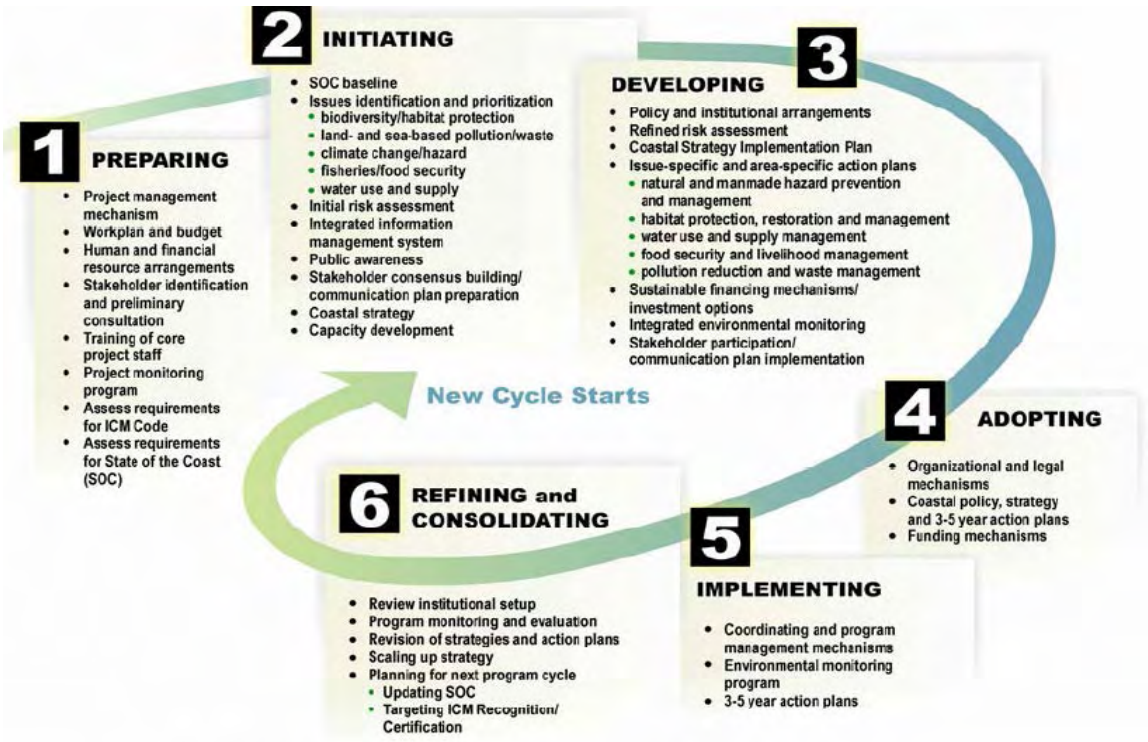
1) Context

8.78 As an important prerequisite for successful integrated coastal zone management, the limits, i.e., the definition of the coastal zone encompassing both land and sea, always have to be set by taking into account the specific conditions of concerned areas, both regarding marine and terrestrial environment, and the development of human activities.

8.79 Integrated Coastal Zone Management (ICZM) is a process for the management of the coast using an integrated approach, regarding all aspects of the coastal zone, including geographical and administrative boundaries, in an attempt to achieve sustainability. The European Commission defines ICZM as “a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics. 'Integrated' in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives, including all relevant policy areas, sectors, and administrative levels, terrestrial and marine components of the target territory, in both time and space.

8.80 According to PEMSEA, “Integrated Coastal Management (ICM) is a management framework, which has proven to be effective at enhancing the sustainable development of coastal resources and the marine environment at the local government level. ICZM provides local government units with a mechanism and process to harmonize both the economic development and environmental management of marine and coastal resources”.

Figure 8.6.1 The ICM Development and Implementation Cycle



Source: PEMSEA.

2) Institutional and Regulatory Context in CFEZ

(1) Institutional Context at the National Level

8.81 At the national level, MONRE is responsible for the, ICZM among other tasks as the implementation of the Biodiversity Law, water resources management, land use management, etc. In 2006, the MONRE launched the master Plan on Basic Survey and Management of Marine Resources and Environment until 2010 and vision until 2020, which includes a specific action on developing a sustainable development strategy for Vietnam's coastal and marine areas (PEMSEA, 2006).

8.82 Within VEPA, a Center for Environmental Monitoring Data and Information (CEMDI) has been created in August 2004 and is managing, among other data, information on coatsal management (host a pilot project on Developing an East Asian Seas Knowledge Base for Coastal and Marine Information and Resources).. Also under MONRE, the Vietnam Remote Sensing Center (VNRSC) function is to monitor natural ressources and environment by using remote sensing technology. Among various projects, three are directly focusing on ICZM:

(i) Establishment of basic geographical information frame for comprehensive management of coastal zone;

(ii) Application of remote sensing technology for coastal management;

(iii) Assessment of environmental threats in coastal zone.

(2) Institutional Context at the Provincial Level (Danang)

8.83 At the provincial levels, the same scheme is replicated: DONRE is the responsible department for ICZM, in cooperation with other departments, such as DARD, DTCS, DOC, and DPI. In Danang, a specific Project Management Office for ICM was created in 2000 and based in DONRE's office to conduct the PEMSEA Pilot project. For this project, a Project Coordination Committee (PCC), still in function, was also established, headed by the Vice Chairman of the People's Committee and composed of members from related department concerned. An ICM Training Center has been established recently in Danang, as one of the main outcome of ICM activities. In collaboration with Danang University, the Center will train ICM staffs of the 14 others Vietnamese coastal provinces. The first training session should take place in Summer 2009 to help other provinces to develop ICM strategies, in accordance with the Decision 159 of the Government. (Decision No. 158/2007/QD-TTg of October 9, 2007). The Environment Protection Center EPC (DONRE) is responsible of the collection of data to be transferred into an Integrated Environmental Monitoring System (IEMS) established by the ICM office (monthly reports provided to the PMO ICM).

8.84 The exploration and management of preserved zones are conducted by various agencies such as: Forest Protection Agency, Forest Management Board, Cultural and Historical Remains Management Board. Management boards under the Department of Tourism are assigned for the exploration of tourism potentials in some locations.

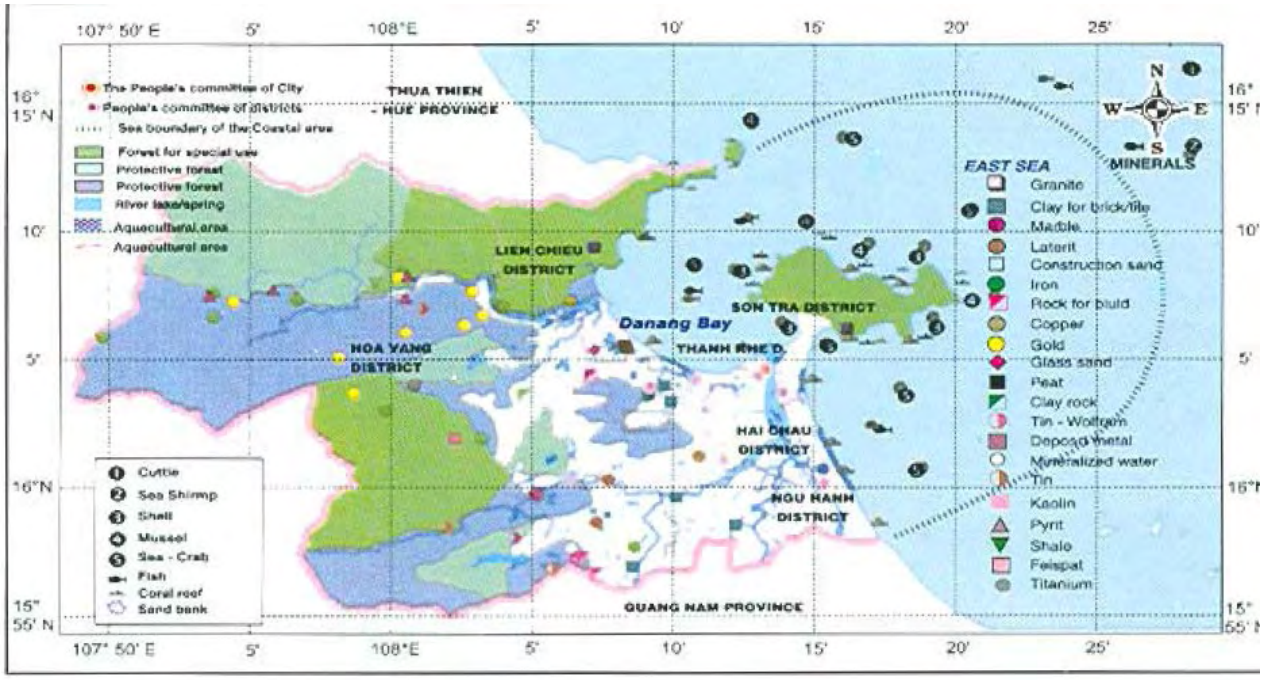
3) Main ICZM issues to be considered

(1) Coastal Zones Main Issues in Danang

8.85 Several basic information about the coastal and marine ecosystems in Danang have already been provided in the Coastal Strategic (Danang People's Committee, 2001)

and in the Initial Risk Assessment (Danang People's Committee, PEMSEA, 2004). Ecologically, the coastal areas of Danang support a variety of aquatic habitats and resources such as coral reefs (about 55 species of hard corals) and associated invertebrates as lobsters and bivalves which are present at the northern coast of Danang Bay and along Son Tra Peninsula. This later contains very diverse habitats, both on shore and in the sea and its ecological interest has been recognized by its classification as Nature Reserve in1992. Danang coastal waters also contain more than 500 species of fishes of which 30 with high economic value providing important source of income for fisheries and related seafood processing industry. Natural resources also include forest, agricultural land and sand deposit.

Figure 8.6.2 Natural Resources in Danang



Source: Danang People's Committee.

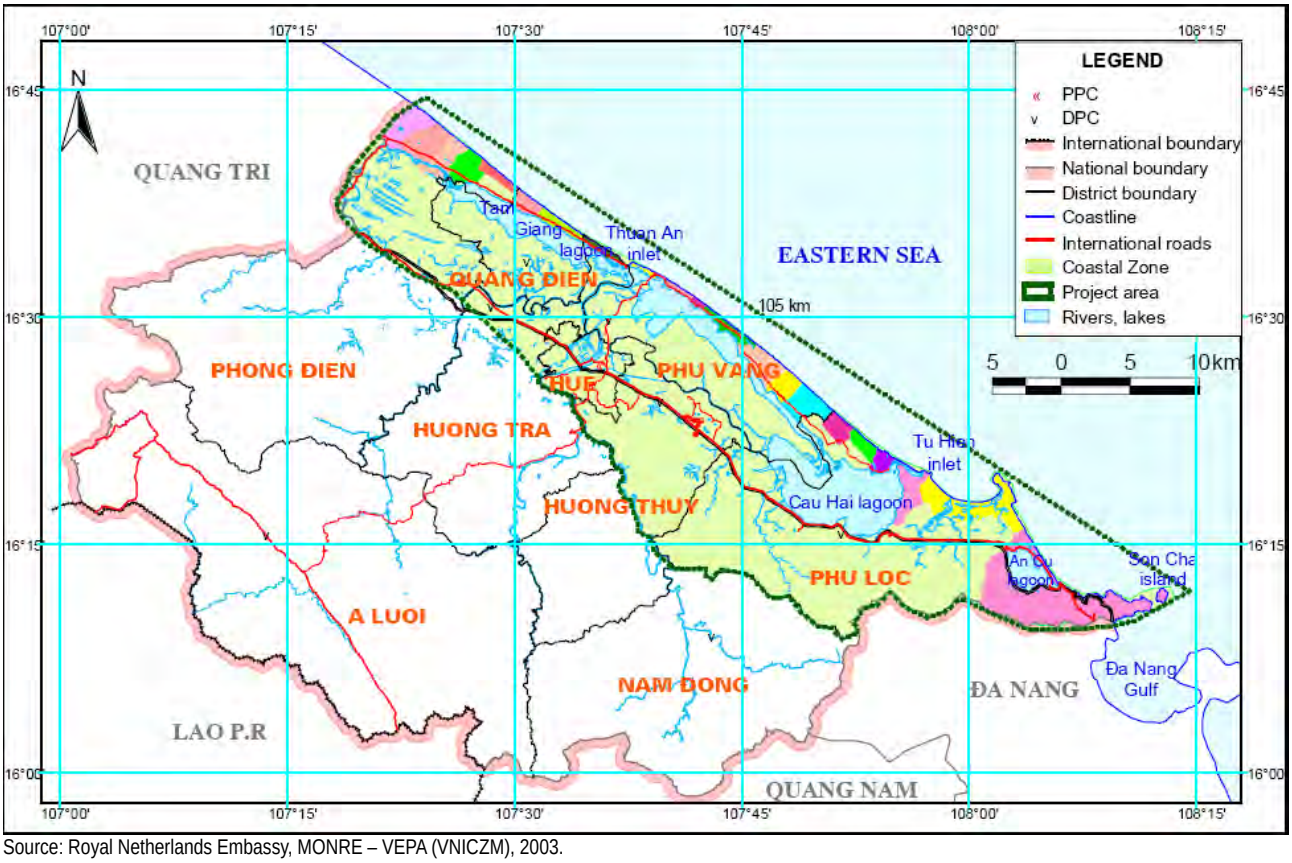
8.86 Rapid urbanization and industrialization in Danang has brought corresponding pressures on the environment. Many economic activities took place and are still developing along the coast, and polluting industries, location of industrial parks, ports and harbors have unfortunately occupied large parts of coastal areas. During the first stage of the ICM project in Danang in the early 2000s, the main issues/threats identified regarding coastal environment were pollutions from the river basin (e.g., domestic, industrial, hospitals, mining, agricultural, tourism) and associated infrastructure and construction works (=> land reclamation, destruction of habitats, pollution, increase the risk of erosion, etc.), dredging and sand mining activities, flooding and typhoons, resource exploitation (e.g. over fishing) and natural habitats / biodiversity losses (e.g., mangrove conversion, destructive fishing). The institutional issues were weak local management capacity, low public awareness and inadequate/poor planning for the coastal and marine areas (ADB, 2009).

8.87 The simplified risk pathway for the Danang Coastal Zone presented in Danang Initial Risk Assessment highlights the interrelations between the various activities of Danang coastal zone, the agents of pollution/habitat degradation and the targets (Danang People's Committee, PEMSEA, 2004).

(2) Coastal zones main issues in Thua Thien Hue

8.88 The Coastal zone of TT Hue encompasses 34% of the total provincial area and 81% of its population. It is largely dominated by the Tam Giang - Cau Hai lagoon, the largest lagoon in Vietnam. With its area of 21,600 ha and 5 districts related to the lagoon system, and 300,000 people depending directly on the lagoon's resources, the Tam Giang - Cau Hai lagoon plays a critical role in the province's economic activities.

Figure 8.6.3 Coastal Zone in Thua Thien Hue Province



Source: Royal Netherlands Embassy, MONRE – VEPA (VNICZM), 2003.

8.89 Thua Thien Hue Province presents a lot of resource and potential, from tourism of course with impressive natural landscapes (Bach Ma national park, lagoons, Hai Van pass, etc.), ancient vestiges and unique traditional cultural, but also from its coastal zone. The biological and ecological value of the coastal zone is also very important. The Tam Giang – Cau Hai lagoon (biggest coastal lagoon system in the Southeast Asia region), stretching from the boundary of the Province with Quang Tri to the Chan May bay, is of international and regional importance, and plays a special role in the strategic socio-economic development of the Province, particularly for agriculture and fishery sectors. The coastal zone presents abundant aquatic resources, including coral, sea grass, seaweed, and different species of shrimp, fishes and benthos. The Tam Giang – Cau Hai lagoon has many important ecosystems, including amongst others seagrass beds, mangrove forests and tidal flats.

8.90 Besides the important biological, environmental, economic, cultural and social values stated above, Tam Giang - Cau Hai lagoon is being subject to negative effects from activities occurred in and around the area. Indeed, the growing urban population of Hue is exerting more and more pressure on the lagoon system, through increased agriculture, aquaculture, fishing, transportation and cargo handling, in a limited and confined area.

Thua Thien Hue's coastal zone is facing a number of issues that are having a negative impact on the sustainable development of its marine and coastal resources, including:

(i) Pollution of the lagoon from industry, tourism, agriculture , aquaculture and human activities around the lagoon;

(ii) Overexploitation and destructive use of aquatic resources, particularly in the lagoon area;

(iii) Unregulated/uncontrolled mining of minerals, sand and gravel in the coastal area, wetlands, and rivers;

(iv) Natural disasters, including floods, coastal erosion and inlet instability;

(v) Salinity intrusion into the Huong River, causing water supply problems for domestic and manufacturing use;

(vi) Conflicting uses of resources in the lagoon among fisheries, tourism, agriculture and domestic sectors.

(3) Coastal zones main issues in Quang Nam

8.91 So far, the coastal zone of Quang Nam province was composed of rich patrimony of wetlands (14% of the total area of the province), sands and dunes (also 14% of the total area), islands, relatively spared by the economic growth. This may change in the next decades, in line with the whole economic development of the central region and, possibly, by indirect effects of the Hydropower Plan. Until now, only the Cham Islands (Cu Lao Cham) have been delineated as protected area (in 2004), in particular to protect coral reefs.

8.92 The key issues within the Quang Nam coastal zone : excess of water in the winter time (flood and maximum flows), dry season minimal flows and effect on salinity intrusion, sediment transportation and sand excavation, aquatic biodiversity and fisheries, forest management and terrestrial biodiversity, agriculture and irrigation, industrial development, tourism development, mining and waste management. The main threats on Quang Nam coastal areas are listed hereafter:

(i) Over exploitation, unreasonable use of marine resources; reduce in coral reefs, sea grass beds, mangroves areas (Thu Bon Delta); degradation of biodiversity;

(ii) Disasters and environmental risks (floods, typhoons, droughts, oil spilling, erosion);

(iii) River water pollution in some location and sometime; Truong Giang river was narrowed in flow; An Hoa Bay sedimentation; Hoi An river domestic wastewater, and garbage;

(iv) Interest conflict between different stakeholders (tourism, fisheries, aquaculture, industry, and local communities);

(v) Multi-sector economic development but mono-sector management;

(vi) Low management capacity;

(vii) Lack of database.

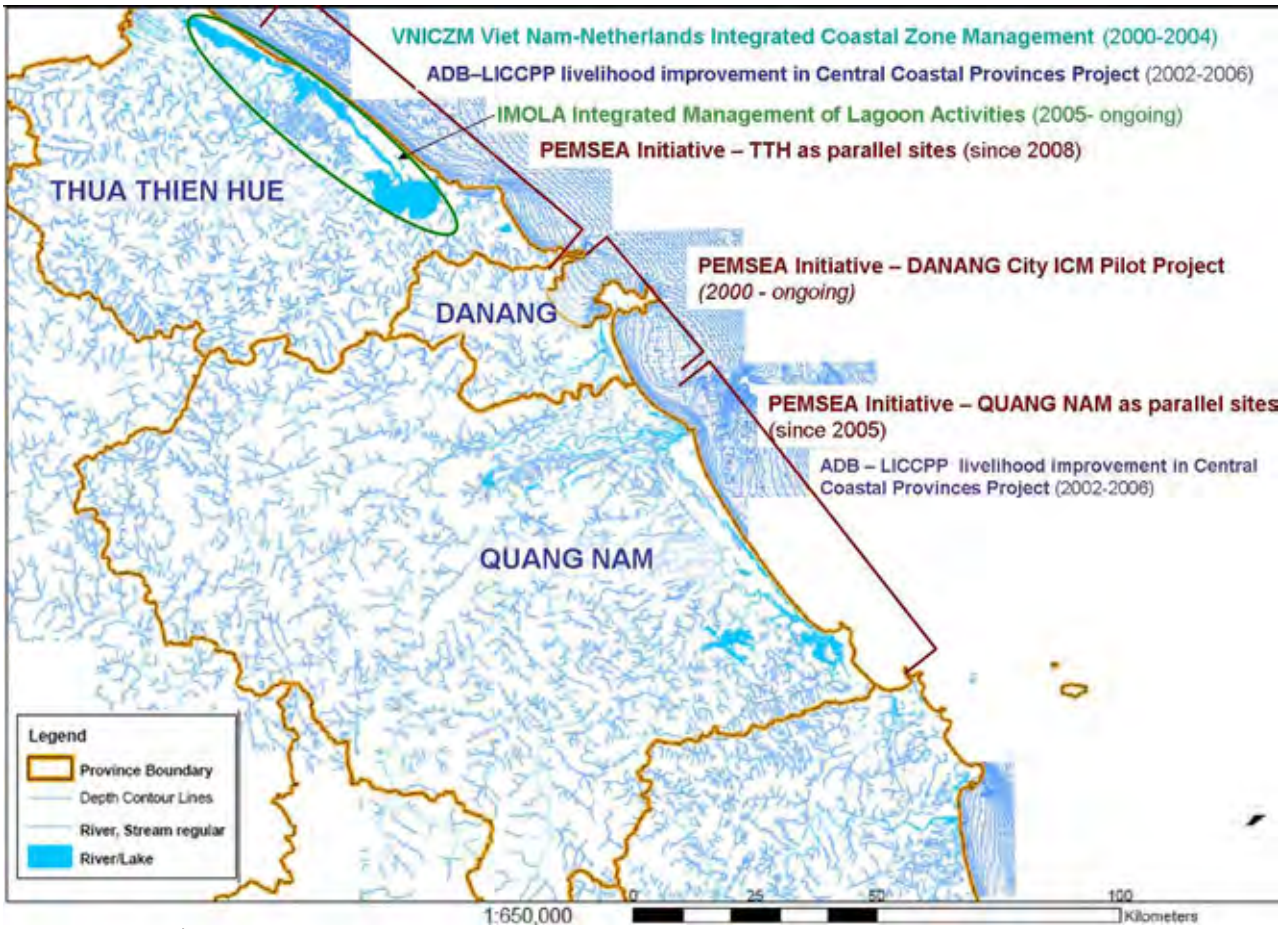
8.93 In the future, several trends may seriously affect the marine and coastal ecosystems, in particular the development of Chu Lai Economic Zone, if not controlled on the environmental viewpoint, the water discharges coming from Dung Quat Economic Zone, again if not controlled and depending on the dominant marine streams, the densification of agriculture and aquaculture in northern Quang Nam and the urban development of Tam

Ky. Tourism, of course, should be added as a potential threat to environment, in particular in the north (Dien Ngoc Cam An and Co Co river side, Hoi An and neighboring mangroves) or on the north south axis (Truong Giang river).

4) Initiatives of ICZM in Danang and the neighbouring provinces

8.94 ICZM is considered as a relatively new approach in Vietnam. Its importance and benefits has been increasingly recognized resulting in the multiplication of coastal management-related initiatives in the country in general, and in central Vietnam in particular, with the choice of Danang as ICM pilote project in the PEMSEA initiative. The map hereafter shows the ICZM initiatives identified in the region.

Figure 8.6.4 Map of ICZM Initiatives in Thua Thien Hue, Danang, and Quang Nam



Source: DaCRISS Study Team.

5) Orientations and recommendations regarding ICZM

8.95 In spite of the unavoidable difficulties and delays, the experience of ICZM in Danang and neighbouring provinces appears as interesting and encouraging to many regards. At this stage, relevant orientations according to DaCRISS team can be formulated as following:

(a) **Utilization of tools to support ICZM strategic planning processes:** Planning itself should be supported by powerful tools facilitating coastal zoning, identification of priorities and the decision process, such as GIS, socio-economic surveys, multi-criteria analysis, DSS or modelling, and satellite visualisation.

(b) **Establishment of a solid institutional framework at the provincial level:** The im-

plementation of strategic plan should be coordinated by one Project Committee with strong political support, as already experienced in Danang.

(c) **Application of an inter-provincial approach:** The exchange of experiences between provinces will help them to prepare and implement their plan in a perspective benefitable to all. MONRE should play a strong assitance role with a view to homogenize approaches to ICM in the whole Vietnam.

(d) **Attention to rise in sea levels:** Though the situation is yet clarified, the crucial question is to make orientations expressed by the plan applied with direct influence on land occupation, including modification of other plans or present zoning on coastal areas and islands. In other words, planning tools related to all sectors (in particular energy, transport infrastructure, tourism, etc.) and structural measures to take (beach dykes, dunes barriers, off shore reefs, etc.) must comply with the ICZM.

(e) **Enforcement of established laws and regulations:** Regulations issued at the national level related to coastal and marine areas are now quite substantial and the problem is rather the enforcement than the lack of law and regulations.

(f) **Coordination between ICZM and IWRM information systems:** Considering very strong interactions between water resources and coastal/marine management, it is recommendable to consider from now on bridges between ICZM and IWRM information systems (e.g. water pollutions, humid zones, ground water, river outlets, river sedimentation, etc.)

(g) **Establishment of a coastal / marine and climate change regional observatory network:** This can be established with the support of the Central Government (MONRE and the Institute of Hydrology and Meteorology in Hanoi among scientific partners at national level and ministries in charge of emergency in case of natural hazards) and as a part of a general observatory system to be implemented in the most vulnerable (storms, floods and sometimes droughts) regions of Vietnam.

(h) **Funding issues:** In addition to the measures already taken by NGOs and donors, different options of private involvement in protection of ICM might be considered, such as the financial participation of private promoters to the protection of coastal/marine environment, such as wastewater facilities, commercial bank loans conditionalities in favour of marine environment, or charts related to behaviours of tourists. Another interesting and promising way is the creation of specific trust funds, strongly supported by international donors, which have until now faced with difficulties for implementation in Vietnam due to the strong role of governmental agencies and the lack of involvement of local communities.

8.7 Identified Projects / Actions

1) Identification and Classification of Environmental Projects / Actions

8.96 Projects which are included in environmental sector have been identified from two sources, one from the plan of Danang City and the other from DaCRISS. For each project/action, estimated investment cost, possible fund sources, type of project, implementing body, relationship with other subsectors are made.

8.97 Projects/actions are classified into the following goals to ensure a comprehensive approach:

(i) To reduce hotspots for a pollution-free city;
(ii) To preserve the ecosystem;
(iii) To enhance public awareness;
(iv) To expand environmental education;
(v) To improve the environment at the community level;
(vi) To strengthen technical and monitoring / research capacities;
(vii) To attend to global environmental issues; and
(viii) To strengthen environmental management capacity.

8.98 The total investment cost of these projects is estimated at USD254 million, USD170 million of which will be shouldered by the government.

8.99 Since capacity of DONRE is limited. It seems difficult to conduct number of projects simultaneously, conducting programmes consists of related projects may decrease administration and coordination work volume. Once success model was established, it become easy to apply that model to neighboring sector. A programme shall be formulated by those approaches.

Table 8.7.1 Project Long List for Environmental Management Sector

Project Group	Code	Project / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector [6]
Reduce hotspots for a pollution free city [7]	En-1	Pollution Free Enhancement Project	55.0	G	Mg	1, 3, **5**, 7	S	D/J	So
	En-2	Facilitate and continue the industrial air pollution management program	7.6	G	Mg	3, **5**	S	D/J	Ec
	En-3	Promotion of Compliance with Posting "Certified Pollution Control Manager"	2.0	G	Mg	1, 3, **5**, 7	S	J	Ca
	Ut-25	Implement a project of building central wastewater treatment system at environmental standards in industrial zones	5.0	G	If	**5**	M	D	En
	Ut-32	Establishment of industrial wastewater treatment system	20.0	G	If	**5**	M	J	En
	Ut-33	Build central wastewater treatment systems in all industrial zones	2.4	G	If	4, **5**	S	D	En
	Ut-38	Enhance industrial waste management	5.0	G	If	**5**	M	J	En
	Ut-43	Facilitate medical waste, wastewater and toxic waste treatment project	4.1	G	Mg	**5**	S	D	En
Preserve eco system	En-4	Facilitate bio-diversification preservation and nature reserve management	0.04	G	Mg	4, **5**	S	D	So, Sp
	En-5	Promote afforest projects	23.5	G	If	**5**, 16	S	D	So, Sp
	En-6	Facilitate public green tree development projects	1.8	G	Mg	**5**, 12	S	D	So, Sp
	En-7	Improve the Phu Loc River's environment (PIIP)	7.8	G	Mg	3, **5**, 9	S	D	So, Ut

Project Group	Code	Project / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector [6]
	En-8	Develop & promote fresh and environment-friendly agriculture	11.8	PFI	Mg	**5**, 9	S	D	So, Ec
	En-9	Strengthen a comprehensive water resources protection program for lakes, ponds and river watershed management	7.2	G	Mg	**5**, 9	S	D/J	So, Ut
Enhance public awareness	En-10	Involve roles of mass media to enhance acknowledgement of environment protection	1.6	G	Mg	**5**, 8, 12	S	D	Lc, Ca
	En-11	Promote environmental awareness and environment-conscious activities in linked with the municipal educational system	0.3	G	Mg	4, **5**	S	D	Lc, Hr
	En-12	Promote an official awarding and recognition system for "good environmental practice" in commercial and tourism business, industrial, R & D, community and NGOs	0.5	G	Mg	**5**	S	D/J	Ec, Lc, To
Expand environmental education	En-13	Develop "Environmental Education Curriculums" for different levels of education, including compulsory, high and vocational education	1.2	G	TA	**5**, 7	M	J	Hr
	En-14	Develop "Social Education System", involving NGOs, schools and universities	1.5	PFI	TA	**5**, 7, 12	M	J	Hr
Improve environment at community level	En-15	Community Leaders Training Program for Community-driven Environmental Management	2.0	G	Mg	**5**, 7	S	J	Lc, Ca
	En-16	Develop an ecological community model in line with a concept of "Green-Clean-Beautiful Communes"	20.6	PFI	Mg	**5**, 7	M	D	Sp, Lc
	En-17	Strengthen environmental management system at district level with (a) placing 2-3 environmental management officials at each district; (b) organizing community-based environmental management teams/committees in cooperation with Women's Union, Youth Unions and other CBOs	0.5	G	Mg	**5**, 7	M	J	Lc, Ca
Strengthen technical basis and monitoring / research capacity	En-18	Establishment of Comprehensive Monitoring System for Major Environmental Factors	15.0	G	Mg	**5**, 7	S	J	Ec, Ut, Tr
	En-19	Development/Enhancement of National Center for Environmental Science and Technology (NCEST-Danang)	25.0	G	If	**5**	S	J	Ec, Ut, Tr
	En-20	Build an ambient air pollution automatic severance system and information network system	1.5	G	If	1, **5**, 6, 7	S	D	Ec, Ut, Tr
	En-21	Plan and build an automatic severance/monitoring system for water and air pollution, and information network system	0.9	G	If	**5**	S	D	Ec, Ut, Tr
	En-22	Build a database for the environment assessment and monitored results	0.1	G	TA	**5**	S	D	Ec, Ut, Tr
	En-23	Promote environment research collaboration with universities (NCEST-Danang) and international institutes	0.5	G	TA	**5**	M	J	Ec, Ut, Tr
Attend global environmental issues	En-24	Promote public relation (PR) on global environmental issues and commitment to participation in global activities	0.5	G	Mg	1, 3, **5**, 7	M	J	-
	En-25	Encouragement of CDM Projects for Commitment to Global Issues	0.5	G	Mg	3, **5**	S	D/J	-
Strengthen environmental management capacity	En-26	Strengthen technological knowledge basis and inspection-monitoring capacity in the environmental administration at DONRE	1.0	G	Mg	1, 2, **5**	S	D/J	Ca
	En-27	Increase and trained environmental officers to be assigned at district level	0.5	G	Mg	**5**	M	D	Ca
	En-28	Strengthen training programs for managers and technicians in charge of pollution control at manufacturing entities in the industrial sector	1.0	G	Mg	**5**, 9	S	D/J	Ca
	En-29	Development of an Official Qualification System for Certified Pollution Control Managers (CPCM)	2.0	G	Mg	**5**	S	J	Hr, Ca
	En-30	Strengthen the monitoring system for industrial effluent water quality at all industrial parks/estates	2.0	G	Mg	**5**	S	J	Ec, Ut, Ca
	En-31	Establishment of a "District Environmental Protection Fund" System	5.0	G	Mg	3, **5**, 9	S	D/J	Mf, Ca
	En-32	Functionalize the Steering Committee, which has been proposed and established in the officially committed policy of "Environmen-	0.5	G	Mg	1, 2, **5**	M	J	Ca

Project Group	Code	Project / Action	Cost (mil. USD)	Fund Source [1]	Type of Project [2]	Implementing Body [3]	Implementation Timing [4]	Proposed by [5]	Related Subsector [6]
		tal City Danang"							
	En-33	Organize an Interprovincial Committee for Environmental Conservation and Eco-tourism Promotion, with neighboring provinces	0.5	G	Mg	2, **5**	M	J	Ca, To
	En-34	Organize Working Taskforce Groups at District Level for the implementation of projects/programs aiming at the Environmental City	0.5	G	Mg	1, 3, **5**, 7	M	J	Ca
	En-35	Enhance legal enforcement against violation of Environmental Laws and Regulations, through: (a) Conduct of Strategic Environmental Assessment (SEA) of the Socio-economic Development Plan (SEDP) of Danang City up to 2020; (b) Strict Governance for compliance of the EIA system; and (c) Inspection of Industrial Activities based on the Vietnamese environmental standards	0.9	G	Mg	3, **5**	S	D/J	Ca
	En-36	Review and strengthen the existing legal and institutional basis for industrial, tourism and construction sectors in particular, and establish a standardized legal documentation system for those activities in terms of enforcement measures by environmental administrations	1.0	G	Mg	1, 3, **5**, 7	M	J	Ec, Ca, To
	En-37	Review and Reform of Current Privatization Policies	0.5	G	Mg	**5**	M	J	Ec
	En-38	Establishment of the "Danang City Environmental Conservation Fund System"	50.0	PFI	Mg	**5**	S	D/J	Mf
Environmental Management Subtotal	**Government**		**170**						
	Private		**0**						
	Private Finance Initiative		**84**						
	Total		**254**						

Source: DaCRISS Study Team

1) G=Government, PFI=Private Fianance Initiative, P=Private

2) If=Infrastructure, Mg=Management, TA=Technical Assistance

3) 1=DPI, 2=DOF, 3=DOIT, 4=DOC, 5=DONRE, 6=DOT, 7=DOST, 8=DARD, 9=DOCST, 10=DOIA, 11=DOFA, 12=DOET, 13=DOH, 14=DOL, 15=DOJ, 16=DOIC, 17=DOI. The underlined number indicates the leading agency.

4) S=2010-2012, M=2013-2015, L=2015-2025

5) D=Danang City, J=JICA, O=Others

6) Ec=Economic Development, So= Social Development, En=Environmental Management, Sp=Spatial Development, Lc=Housing and Living Conditions, Tr=Transportation Development, Ut=Urban Infrastructure and Utilities, Hr=Human Resource Development, Mf=Municipal Finance Capacity Development and Management, Ca=Administrative Capacity Development and Management, To=Tourism Development

7) Projects from other sectors are included to show a more comprehensive program.

8.8 Institutional Structure for Environmental Management

1) Institutional Aspects

8.100 Environmental management, infrastructure planning, and institutional arrangement are closely linked, as shown by the experiences of many large and medium-size cities around the world. Experience also suggests that the institutional matter is not an easy issue to deal with.

8.101 Apart from Japan (JICA), other countries and institutions which have supported Danang through ODA initiatives are separately working with less institutional coordination, including the World Bank, Australia, the Netherlands, and recently the ADB and Germany. ODA projects, besides DaCRISS, are the recently completed port rehabilitation project, the PIIP supported by the World Bank, and the water resource project financed by the ADB.

8.102 The institutional situation in Danang City can be characterized as follows:

(1) Recent Transfer of Tasks, Duties, and Enterprises

(i) Management of URENCO (solid waste management) has been under DONRE's control and drainage and wastewater treatment services company was transferred to DONRE;

(ii) Transfer of land-use administration from DONRE to other offices or to specific bodies under DONRE;

(iii) Transfer of 50% of DOT staff to other offices in 2008;

(iv) Department of Fisheries and Forests was absorbed by DARD; and,

(v) Transfer of water resources tasks from DARD to DONRE (this occurred several years ago following the creation of MONRE at the national level).

(2) Planned Changes

(i) Equitization of the DWSC in 2009, and

(ii) Equitization of URENCO in 2009.

8.103 Many departments have: (i) one administrative body composed of divisions with a rather limited staff dedicated to administrative and regulatory work, and (ii) technical bodies, which are often enterprises with the status of subsidiaries, laboratories, institutes, etc. Presumably, this structure enables re-organization, such as the transfer of the department's responsibilities to technical bodies.

8.104 Reviewing the institutional aspects, it was found that departmental responsibilities and tasks are not fully clear. Below are some examples.

(a) **Protection of Flora and Fauna Biodiversity and Marine Resources:** In practice, these tasks are under DARD's mandate, but it should also partially be under DONRE.

(b) **Responsibility for Water Resource Management:** In rural areas, DARD has authority over the use of water resources. Meanwhile, DONRE has no monitoring stations to ensure water quality, although it is responsible for taking actions when water quality deteriorates. Another department whose role should be delineated vis-à-vis DARD and DONRE is the Department of Trade which is responsible for hydropower facilities (i.e., dams).

(c) **Risk Prevention and Management:** Some steering committees have occasionally been organized to oversee petroleum safety or floods and storms mitigation; but the roles of these committees need further clarification.

8.105 The institutional trend in Danang is clearly oriented toward the corporatization or equitization of infrastructures and environment companies. This follows a global trend of providing economically efficient public services. Therefore, the Danang People's Committee needs to shift its function from being a public service provider to being a manager/controller of public services, considering the currently enhanced Vietnamese policy to facilitate a public-private partnership (PPP) scheme for infrastructure development.

8.106 Changes and reforms to the institutional setup are ongoing. The urban development master plan will confirm or modify the existing institutional arrangements, for instance that for the drainage sector which apparently does not follow an integrated approach to urban water management. As expected, the question of tariff remains critical since prices/fees of water, drainage, and solid waste are considered low and inadequate to enable the companies to recover their investments. Moreover, the decision of changing the tariffs/fees remains a political issue and rests with the People's Committee, and not an issue of commercial and/or social viability.

8.107 Today, Danang City lacks planning tools. Moreover, most of the existing plans either have a planning horizon of up to 2010 only or do not feature a spatial approach. There is no general long-term master plan for the environment in line with the long-term socioeconomic development of Danang City. At the level of the companies involved in pollution prevention or water resources management, namely the DWSC, URENCO, and the Transport Management and Drainage Company, there are no business plans to make their operations sustainable.

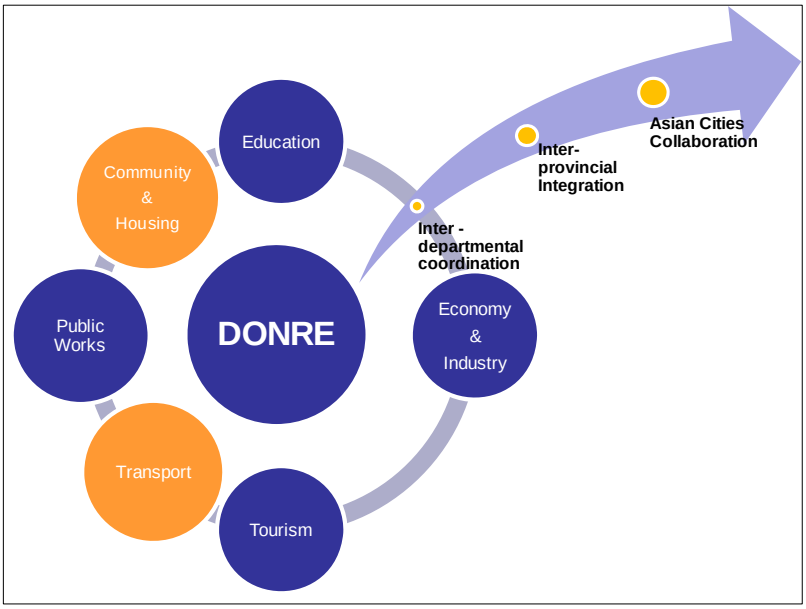
8.108 Environmental management and infrastructure development in Danang and its neighboring provinces are being carried out independently and separately. Some interprovincial initiatives have been done only under the authority of the central government such as the creation of the Vu Gia Thu Bon Management Board and the linking of Danang, Quang Nam, and Kon Tum provinces. It is always expected to establish an integrated environmental management with an interprovincial approach, which is efficient and rational, simply because the environment is borderless and requires coherence in its conservation plan.

2) Organizational Structure to Implement the Environmental City Concept

8.109 In order to implement the strategies and projects discussed earlier, a number of environmental management tools/measures are proposed within the context of measures proposed in other sectors. All the proposed measures, as illustrated in Figure 8.5.1, form circles like a "mandala," where all measures are linked with causal relations in a revolving circle. The environmental city concept is recognized as a result of such integrated efforts by all stakeholders from relevant government departments, the community, and business sectors. An interdepartmental approach is a must under this concept, although a pivotal function is assumed by DONRE, and based on such a robust organizational entity, interprovincial coordination with neighboring provinces was formulated, as shown in Figure 8.7.1. Such interprovincial alliance is expected to facilitate collaboration with Asian cities in policy building and R&D activities to pursue the environmental city concept.

8.110 It can be noted that this organizational concept has been partially materialized in Danang City to implement programs for an environmental city, as the Steering Committee, chaired by the DPC Chairman and the standing deputy chairperson, the director of DONRE. The members come from all relevant departments and authorities, such as DPI, DOF, DPC, DOT, DFAs, DIT, DOE (Education), DOST, DCST (Culture, Sport & Tourism), DARD, PMU of Industrial Zones and EPZ, PCs of 7 Districts. It is expected that this Steering Committee will function as conceptualized.

Figure 8.8.1 Interdepartmental Approach to Achieving an Environmental City



Source: DaCRISS Study Team

8.111 In order to assure the steady implementation of planned and designed strategies and projects, three organizational arrangements are proposed to cover vertical (spatially hierarchical) and horizontal (cross-sector) coordination. The strong leadership of DONRE is indispensable to organize the entire system.

(i) Establishment of a cross-sectoral working groups under the steering committee;

(ii) Establishment of task force teams for the environmental city in each district; and,

(iii) Establishment of steering committees at district level.

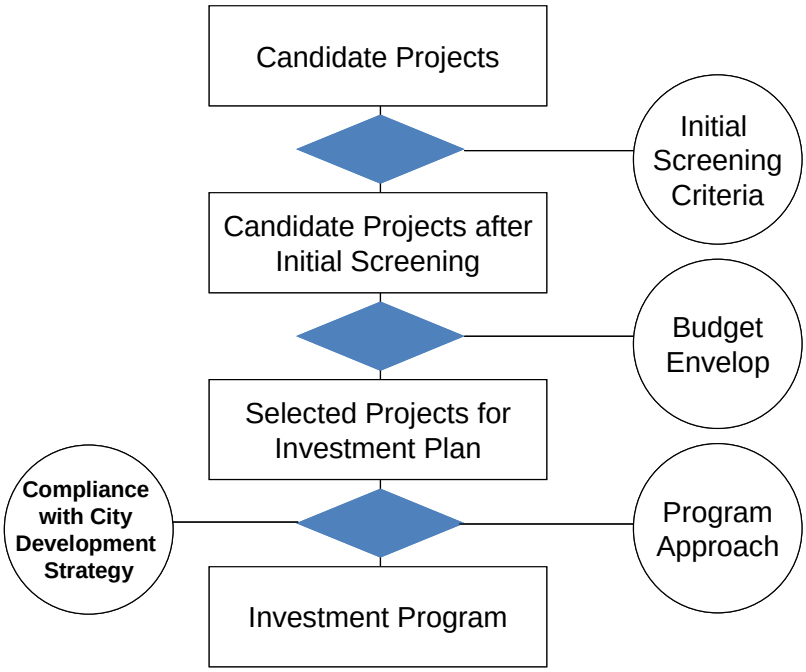
9 INVESTMENT PLAN

9.1 Evaluation of Candidate Projects

1) Approach

9.1 In order to promote Danang City to become a truly environmental city, projects and actions proposed in various subsectors need to be farther integrated as strategic programs through which synergy is enhanced and objectives are made clear. Candidate projects are evaluated comprehensively for prioritization and compliance with overall city development strategies (see Figure 9.1.1).

Figure 9.1.1 Process of Project Screening and Investment Program Formulation



2) Characteristics of Candidate Projects

9.2 Projects proposed by Danang City in the SEDP, Construction Plan, Environmental City Plan, and other relevant plans were carefully studied by the Study Team. Additional projects needed to achieve the core strategies for each subsector identified in Chapter 5 were proposed to formulate a long list of the projects. Projects that do not conform to the Master Plan were excepted from the list in this process[1]. Characteristics of the candidate projects are briefly as follows:

i) **Source of project identification:** There are a total of 295 candidate projects identified in the study of which 184 (62%) are listed in official documents of Danang City while 108 (37%) projects are identified in DaCRISS and 3 are identified by others (see Table 9.1.1).

ii) **Type of projects:** Of 295 projects, 193 (65%) are infrastructure projects, while 91 (31%) are management and 11 (4%) are technical assistance (see Table 9.1.1).

[1] An example of this is the reclamation of lowland areas to develop new urban areas in the western part of the city, proposed in the Construction Plan. This was excepted since the Master Plan of DaCRISS aims to develop to the south and preserve the western part of the city, rich in natural resources and suitable for tourism.

Table 9.1.1 Summary of Candidate Projects by Source and Type

		Danang City	DaCRISS[1)]	Others	Total	%
Technical Assistance		4	7 (1)	0	11	4
Infrastructure		160	32 (5)	1	193	65
Management		20	69 (14)	2	91	31
Total	No.	184	108 (20)	3	295	100
	%	62	37	1	100	

Source: DaCRISS Study Team.

1) The numbers in brackets show the projects which are originally projects proposed by Danang City but elaborated further in DaCRISS.

iii) **Projects by target sector and possible fund source:** Of 295 projects, 201 (68%) will be funded by the government, while 41 (14%) are PFI projects, and 53 (18%) will be funded by the private sector (see Table 9.1.2).

Table 9.1.2 Summary of Candidate Projects by Target Sector and Possible Fund Source

Sector		No. of Projects by Fund Source [1)]				% of Projects by Fund Source		
		Government	PFI	Private	Total	Government	PFI	Private
1. Economic Development		5	1	19	25	20	4	76
2. Social Development		27	18	4	49	55	37	8
3. Environmental Management		34	4	0	38	89	11	0
4. Spatial Development		15	6	0	21	71	29	0
5. Housing and Living Conditions Environment		4	0	0	4	100	0	0
6. Transportation Development		30	2	0	32	94	6	0
7. Urban Infrastructure and Utilities Development		59	1	0	60	98	2	0
8. Human Resource Development		5	2	0	7	71	29	0
9. Municipal Finance Capacity Development and Management		3	0	0	3	100	0	0
10. Administrative Capacity Development		11	0	0	11	100	0	0
11. Tourism Development		8	7	30	45	18	16	67
Total	No.	201	41	53	295	68	14	18
	%	68	14	18	100			

Source: DaCRISS Study Team.

1) The projects are categorized by the type of implementing agency (PFI is private finance initiative).

iv) **Projects by level of investment cost:** Projects for infrastructure development is apt to become costly. Therefore, such projects are screened and categorized to 3 levels, namely i) high cost group= over 10 million USD, ii) medium cost group = 1 – 10 million USD, iii) low cost group= under 1 million USD. (see Table 9.1.3)

Table 9.1.3 Summary of Candidate Projects by Level of Investment Cost

		Possible Fund Source			
		Government	PFI [1)]	Private	Total
High: USD 10 million and above	No.	54	23	45	122
	USD million	3,866	908	4,820	9,594
Medium: USD 1.0 – 10 million	No.	91	13	8	112
	USD million	383	69	49	501
Low: USD 1.0 million or less	No.	56	5	0	61
	USD million	19	3	0	22
Total	No.	201	41	53	295
	USD million (%)	4,268 (42)	980 (10)	4,869 (48)	10,117 (100)

Source: DaCRISS Study Team.

1) PFI = private finance initiative

3) Prioritization of Candidate Projects

9.3 **Methodology of Prioritization:** The proposed projects were evaluated by 5 main scopes, namely i) overall policy, ii) economic aspect, iii) social impact, iv) environmental aspects, v) implementation and management. Each project was evaluated from a range of 5 to 1: affirmative impact, 0: neutral (no effect), and -1 to -5: negative impact. Projects that give the most affirmative impact to the respective criteria are given the highest score, 5. On the contrary, those that give the most negative impact are given -5. In cases where there is neither affirmative nor negative impact, 0 is applied. Total score will potentially range from -75 to 75. Figure 9.1.2 is a matrix showing the detailed indicators used in the evaluation.

9.4 DaCRISS adopts a sustainability index, which corresponds to the scope and criteria used in project evaluation in Figure 9.1.2 as follows: B. Economic Aspect (economic sustainability index), C. Social Impact (social sustainability index), D. Environmental Aspect (environment sustainability index), E. Implementation and Management (governance sustainability index). A. Overall Policy evaluates the compliance to the overall city development policy, enhancement of city image and identity, and contribution to climate change. More detailed explanations are provided below.

(a) Overall Policy

(i) Compliance to overall city development policy: Although all proposed projects are relevant to the city development policy, projects with more direct relevance are given a higher priority.

(ii) Enhancement of city image and identity: Projects that are expected to enhance the city's image and help create a unique identity of the city are given a higher priority.

(iii) Contribution to climate change: Projects that are expected to directly contribute to climate change (e.g. reduction of emissions) are given a higher priority.

(b) Economic Aspect

(i) Contribution to city's economic growth: Projects that are expected to have a strong aspect of promoting economic growth are given a higher priority.

(ii) Cost-effectiveness: Projects that are expected to be implemented by relatively low costs in comparison to its impacts are given a higher priority. In the case this is difficult to predict, score 0 is given.

(iii) Increase in employment opportunities: Projects that are expected to be labour-intensive and tend to provide more employment opportunities than other projects are given a higher priority.

(c) Social Impact

(i) Reduction in poverty: Projects that are expected to be favourable to the poor and low-income are given a higher priority. Irrelevant projects are given score 0.

(ii) Impact on resettlement: Negative scores are applied in proportionate to the scale of resettlement (the larger the resettlement, the lower the score). Irrelevant projects are given score 0.

(iii) Improvement of living environment: Projects that are expected to directly contribute to the improvement of people's living environments are given a higher priority.

(d) Environmental Aspect

(i) Removal / reduction in pollutions: Projects that are expected to directly help remove or reduce pollution are given a higher priority. Irrelevant projects are given score 0.

(ii) Preservation of natural environment: Projects that are expected to directly help preserve the natural environment are given a higher priority. Irrelevant projects are given score 0.

(iii) Prevention of natural disasters: Projects that are expected to directly help prevent natural disasters are given a higher priority. Irrelevant projects are given score 0.

(e) Implementation and Management

(i) Maturity of projects including funding: Committed projects (listed in SEDP, Construction Plan, Environmental City Plan, ODA funding agreements, etc.) are given a higher priority.

(ii) Availability of implementing mechanism: Projects which its implementing mechanisms are clear and solid (e.g. the responsible agency and staff for the project is decided) are given a higher priority.

(iii) Urgency of projects / actions: Projects that are expected to contribute to more urgent issues (issues stated in SEDP, Construction Plan, Environmental City Plan, raised by donors, etc.) are given a higher priority.

Figure 9.1.2 Criteria for Project Evaluation

Scope	Main Criteria	Scoring		
		Affirmative Impact	Neutral	Negative Impact
		Highly Significant ◄——► Insignificant (5) ◄——► (1)	(0)	(-1) ◄——► (-5)
A. Overall Policy	• Compliance to overall city development policy • Enhancement of city image and identity • Contribution to climate change			
B. Economic Aspect	• Contribution to city's economic growth • Cost-effectiveness • Increase in employment opportunities			
C. Social Impact	• Reduction in poverty • Impact on resettlement • Improvement of living environment			
D. Environmental Aspect	• Removal / reduction in pollutions • Preservation of natural environment • Prevention of natural disasters			
E. Implementation and Management	• Maturity of projects including funding • Availability of implementing mechanism • Urgency of projects / actions			

Source: DaCRISS Study Team.

4) Budget Envelope

9.5 The DaCRISS estimation of capital investment expenditure (CI)[2] is totally 5,576 billion VND (328 million USD) for 2010 – 2012, 13,579 billion VND (799 million USD) for 2010 – 2015, and 75,200 billion VND (4,424 million USD) for 2010 – 2025 (see Table 9.1.4 to 9.1.6) for medium scenario. The CI for 2010 – 2015 in the medium scenario is equivalent to the total initial cost of top 66 projects[3] put in order of priority scored according to the secondary screening criteria shown in Figure 9.1.2 (projects over score "34"[4]). The total cost of all projects in the list is 9,940 million USD (4,493 million USD to Danang City).

9.6 Therefore, not all projects could be implemented by 2025 by governmental budget along with utilizing PFI schemes or utilizing private sector investment. In addition, there are potential problems as follows: i) the GRDP may not increase as much as projected, ii) the proportion of capital investment to the GRDP may not reach the level projected, iii) political and environmental changes may bring about the necessity for early project implementation even for those not identified as "priority" projects in this analysis. It is in these cases that central governmental subsidies and ODA funds can be utilized to increase the budget envelope for the city.

Table 9.1.4 GRDP Forecast (3 scenarios)

	unit: billion VND (at constant 2007 price)				Accumulated		
	2010	2012	2015	2025	10 - 12	13 - 15	16 - 25
High Case (annual 14.8% real growth)	23,048	30,375	45,957	182,712	79,883	120,860	1,060,780
Medium Case (annual 12.8% real growth)	21,865	27,820	39,929	133,161	74,348	106,708	821,610
Low Case (annual 10.8% real growth)	20,722	25,440	34,604	96,501	69,122	94,023	635,008

Source: DaCRISS Study Team.

Table 9.1.5 Municipal Budget Forecast under Medium GRDP Scenario

	unit: billion VND (at constant 2007 price)				Accumulated		
	2010	2012	2015	2025	10 - 12	13 - 15	16 - 25
High Case (Ratio to GRDP 35%)	7,653	9,737	13,975	46,606	26,022	37,348	287,564
Medium Case (Ratio to GRDP 25%)	5,466	6,955	9,982	33,290	18,587	26,677	205,403
Low Case (Ratio to GRDP 15%)	3,280	4,173	5,989	19,974	11,152	16,006	123,242

Source: DaCRISS Study Team.

Table 9.1.6 Capital Investment Expenditure Forecast under Medium Municipal Budget Scenario

	unit: billion VND (at constant 2007 price)				Accumulated		
	2010	2012	2015	2025	10 - 12	13 - 15	16 - 25
High Case (Ratio to Municipal Budget 40%)	2,186	2,782	3,993	13,316	7,435	10,671	82,161
Medium Case (Ratio to Municipal Budget 30%)	1,640	2,087	2,995	9,987	5,576	8,003	61,621
Low Case (Ratio to Municipal Budget 20%)	1,093	1,391	1,996	6,658	3,717	5,335	41,081

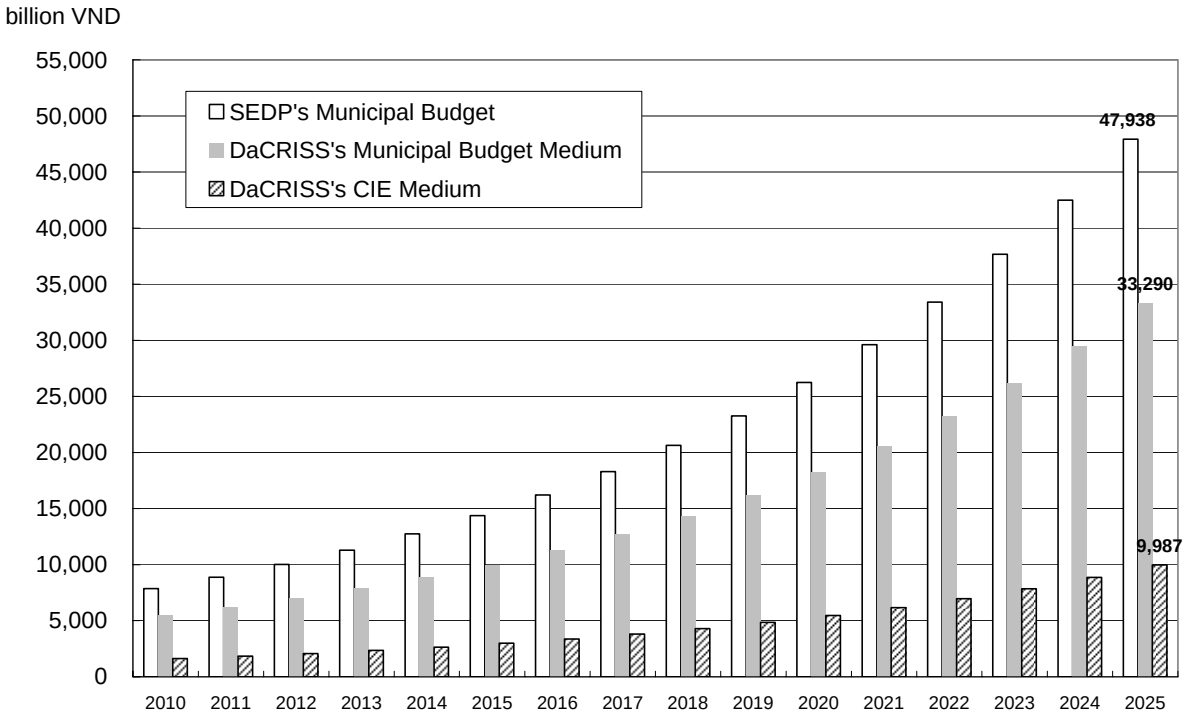
Source: DaCRISS Study Team.

[2] CI refers to money used by a business to purchase fixed assets, such as land, machinery, or buildings, rather than used to cover the business' day-to-day operating expenses. Therefore, initial project costs are considered.

[3] All ongoing/committed transportation projects and projects listed in Environmental City Plan included.

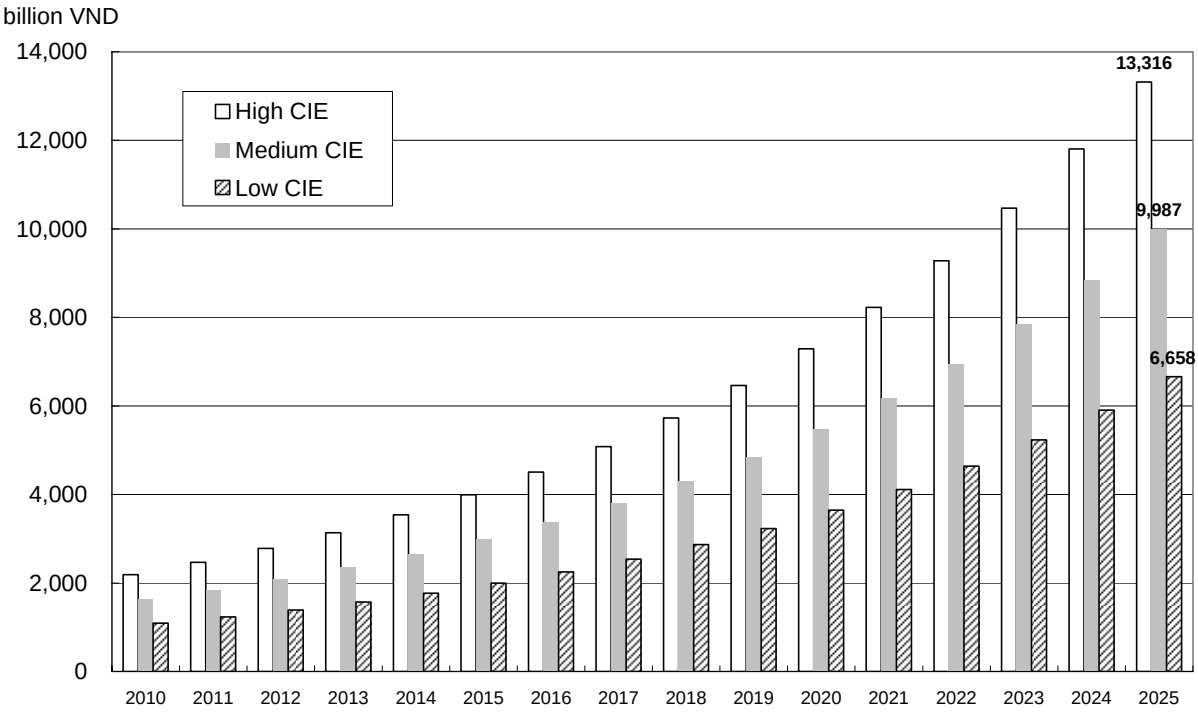
[4] Total initial cost of projects over score "34" is **717 million USD**, total initial cost of projects over score "33" is **1,070 million USD**. Costs for governmental projects are calculated at **100%** of cost for government, for PFI projects at **50%**, for private sector projects at **0%**.

Figure 9.1.3 Municipal Budget Forecast



Source: SEDP and DaCRISS

Figure 9.1.4 Comparison of Capital Investment Expenditure Scenarios



Source: SEDP and DaCRISS

Table 9.1.7 Summary of Project Cost to Danang City by Term (no) [1)]

	Short Term (2010 – 2012)		Medium Term (2013 – 2015)		Long Term (2016 – 2025)		Total	
	No.	%	No.	%	No.	%	No.	%
1. Economic Development	0	0	3	6	22	9	25	8
2. Social Development	0	0	2	4	47	20	49	17
3. Environmental Management	1	6	25	53	12	5	38	13
4. Spatial Development	0	0	2	4	19	8	21	7
5. Housing and Living Conditions Environment	0	0	0	0	4	2	4	1
6. Transportation Development	8	50	4	9	20	9	32	11
7. Urban Infrastructure and Utilities Development	7	44	8	17	45	19	60	20
8. Human Resource Development	0	0	0	0	7	3	7	2
9. Municipal Finance Capacity Development	0	0	0	0	3	1	3	1
10. Administrative Capacity Development	0	0	0	0	11	5	11	4
11. Tourism Development	0	0	3	6	42	18	45	15
Total	16	100	47	100	232	100	295	100
Percentage by Term		5		16		79		100

Source: DaCRISS Study Team.

1) Costs for governmental projects are calculated at 100% of cost for government, for PFI projects at 50%, for private sector projects at 0%.

Table 9.1.8 Summary of Project Cost to Danang City by Term (VND billion) [1)]

		Short Term (2010 – 2012)		Medium Term (2013 – 2015)		Long Term (2016 – 2025)		Total	
		USD million	%	USD million	%	USD million	%	USD million	%
1. Economic Development		77	36	1	0	78	2	0	0
2. Social Development		0	0	14	3	781	19	794	17
3. Environmental Management		1	1	194	36	17	0	212	4
4. Spatial Development		0	0	1	0	272	7	273	6
5. Housing and Living Conditions Environment		0	0	0	0	26	1	26	1
6. Transportation Development		171	80	79	15	1,026	26	1,277	27
7. Urban Infrastructure and Utilities Development		42	20	143	27	1,419	35	1,604	34
8. Human Resource Development		0	0	0	0	329	8	329	7
9. Municipal Finance Capacity Development		0	0	0	0	0	0	0	0
10. Administrative Capacity Development		0	0	0	0	53	1	53	1
11. Tourism Development		0	0	31	6	80	2	111	2
Total		215	100	539	100	4,004	100	4,758	100
Percentage by Term			5		11		84		100
Total Budget Envelope	Period	2010 - 2012		2013 - 2015		2016 - 2025		2010 - 2025	
	VND billion	5,576		8,003		61,621		75,200	
	USD million	328		471		3,625		4,424	

Source: DaCRISS Study Team.

1) Costs for governmental projects are calculated at 100% of cost for government, for PFI projects at 50%, for private sector projects at 0%.

5) Results of Initial Evaluation of Candidate Projects

Table 9.1.9 Summary of Project Cost to Danang City by Priority Rank

Subsector	Priority Rank											
	5		4		3		2		1		Total	
	No.	USD mil.	No.	USD mil.	No.	USD mil.	No.	USD mil.	No.	USD mil.	No.	USD mil.
1. Economic Development	3	77	0	0	3	1	0	0	19	0	25	78
2. Social Development	2	14	9	49	16	566	17	154	5	12	49	794
3. Environmental Management	25	194	13	18	0	0	0	0	0	0	38	212
4. Spatial Development	2	1	7	3	2	150	0	0	10	119	21	273
5. Housing and Living Conditions Environment	0	0	4	26	0	0	0	0	0	0	4	26
6. Transportation Development	9	197	9	438	10	560	0	0	4	81	32	1,277
7. Urban Infrastructure and Utilities Development	15	185	9	248	14	1,096	7	29	15	47	60	1,604
8. Human Resource Development	0	0	0	0	6	270	1	59	0	0	7	329
9. Municipal Finance Capacity Development	0	0	1	0	2	0	0	0	0	0	3	0
10. Administrative Capacity Development	0	0	4	0	0	0	1	52	6	1	11	53
11. Tourism Development	3	31	3	30	6	27	33	23	0	0	45	111
Total	59	700	59	813	59	2,671	59	316	59	259	295	4,758

Source: DaCRISS Study Team.

9.7 A total of US$ 4.8 billion required for implementation of all candidate projects, those with high and medium rank require a total of US$ 4.2 billion. On the other hand, estimated budget envelope for 2010 – 2025 is US$ 3.0 – 5.9 billion. This implies that open economic growth conditions at relatively high rate, the city can afford to shoulder capital costs for future projects.

9.2 Formulation of Program

9.8 In order to maximize synergy of implementing the projects while minimizing conflicts and waste of resources, the projects were farther grouped into a number of strategic programs, wherein following approach is taken: Vision of the city as "Competitive Environmental City beyond being Pollution Free" was interpreted into following five main goals.

A. **Economic development goal:** Eco - industries / business promoted and developed to accelerate growth of Danang and CFEZ

B. **Urban development and infrastructure goal:** Compact and efficient urban areas developed to provide competitive base for investment and socio – economic activities

C. **Environmental management goal:** Quality of environment is preserved to create a sustainable environmental city

D. **Livability goal:** Living conditions and quality of life of the people enhanced which can also benefit visitors

E. **Management goal:** City is properly managed under concerted vision and leadership

9.9 Under each goal, a set of key strategies and corresponding 20 strategic programs were developed (see Table 9.2.1). Many of the programs are composed of several numbers of projects of different subsectors and implementing agencies.

Table 9.2.1 Proposed Strategic Programs

Vision	Goal / Objectives	Strategies	Proposed Strategic Program
Competitive Environmental City beyond being Pollution Free	A. **Economic development:** Eco - industries / business promoted and developed to accelerate growth of Danang and CFEZ	A1. Promote location of eco – industries and business by providing adequate infrastructure, investment environment and active marketing. A2. Expand eco – tourism and cultural tourism on close coordination with adjoining provinces A3. Develop quality human resources to meet increasing demand	P1. Program to promote eco – business / environmental industries and those on healthcare and human resource P2. Program to develop and promote eco – tourism P3. Program to develop higher – education on environment, high – tech, medical, and those. related to new industries
	B. **Urban development and infrastructure provision:** Compact and efficient urban areas developed to provide competitive base for investment and socio – economic activities	B1. Build urban structure and enforce urban plan in a way that socio - economic activities can be accommodated efficiently and effectively in a compact urban areas B2. Develop high – quality public transport system to ensure mobility of the people and positive impacts on environment B3. Provide and operate infrastructure and utilities in a way to encourage development of compact urban area	P4. Program to strengthen enforcement of updated Urban Master Plan, development permit process and environmental zoning P5. Program to develop attractive public transportation P6. Program to develop effective urban roads P7. Program to further develop facilities and utilities including waste water treatment and drainage system and to improve their operation and management P8. Program to upgrade existing IZ and develop new green and clean industrial / business parks
	C. **Environmental management:** Environmental sustainability is ensured in the process of rapid urban growth	C1. Protect and enhance ecosystems C2. Remove pollutions from socio - economic activities in the city C3. Strengthen energy – saving measures and emission control to contribute to climate change C4. Strengthen preparedness against natural disasters and hazards	P9. Program to remove pollutions in identified hot spots and strengthen monitoring and enforcement P10. Program to strengthen policy dialogue at regional and international levels P11. Program to develop flood free urban lands and settlements P12. Program to establish and operate cross sector participatory mechanism to monitor and manage environment
	D. **Livability:** Living conditions and quality of life of the people enhanced which can also benefit visitors	D1. Provide affordable collective housing which is disaster proof and energy saving D2. Enhance landscape and amenity in urban and rural areas in the city for the people and visitors D3. Enhance quality of living environment at community level	P13. Program to develop new collective eco – housing (affordable, disaster – proof, energy saving) to meet increasing demand by citizens and immigrants P14. Program to establish landscape and urban design guidelines and enforcement mechanism to enhance city image and identity P15. Program to improve / enhance rural villages and quality of life in rural areas P16. Program to establish participatory mechanism to assess living environment and implement needed measures at community level
	E. **Management:** City is properly managed under concerted vision and leadership	E1. Establish transparency and accountable city management system involving all stakeholders E2. Strengthen municipal funding basis by expanding user charges, private sector involvement, etc. E3. Strengthen inter – provincial coordination to accelerate growth of the city and help development of CFEZ	P17. Program to expand application of IT in city management including GIS to promote e-government and e-city P18. Program to establish improved user charge and PPP mechanism with city's initiative to expand funding sources P19. Program to strengthen investment promotion P20. Program to strengthen inter – provincial coordination on integrated planning and policy implementation

Source: DaCRISS Study Team.

9.10 In order to formulate an action plan, candidate projects were then grouped in 3 phases as below:

i) Short Term (2010 – 2012): basic solutions for urgent issues (pollution control, provision of basic infrastructure, disaster management, etc.)

ii) Medium Term (2013 – 2015): continuation of short term projects and connecting to long term solutions.

iii) Long Term (2016 – 2025): fundamental solutions for issues in the city.

9.11 Tables 9.2.2 to 9.2.4 summarizes the projects by be implemented by term and goal / objective group. Table 9.2.5 is a summary of projected budget envelop. All proposed projects can be implemented in the high growth case, however if else, the deficit shall be supplemented by ODA loan or other source of funds.

Table 9.2.2 Number of Projects by Implementation Term (no.)

	S	M	L	Total
A	4	5	26	35
B	17	19	75	111
C	6	16	18	40
D	3	8	26	37
E	2	3	15	20
Total	32	51	160	243

Table 9.2.3 Percentage of Projects by Implementation Term (%)

	S	M	L	Total
A	13	10	16	14
B	53	37	47	46
C	19	31	11	16
D	9	16	16	15
E	6	6	9	8
Total	100	100	100	100

Table 9.2.4 Cost to Danang City by Implementation Term (USD million)

	S	M	L	Total
A	14	129	424	568
B	301	246	2,727	3,274
C	23	127	92	242
D	25	13	108	145
E	75	33	389	497
Total	438	548	3,740	4,726

Table 9.2.5 Municipal Budget Forecast in Danang City (USD million)

	unit: million USD (at constant 2007 price)				Accumulated		
	2010	2012	2015	2025	10 - 12	13 - 15	16 - 25
High Case (Ratio to Municipal Budget 40%)	129	164	235	783	437	628	4,833
Medium Case (Ratio to Municipal Budget 30%)	96	123	176	587	328	471	3,625
Low Case (Ratio to Municipal Budget 20%)	64	82	117	392	219	314	2,417

9.12 In Table 9.2.6 to 9.2.8, 5 priority programs (2 transportation and 3 environmental) are included and shown as follows: i) UMRT F/S (pink), ii) Transportation Management (yellow), iii) Industrial / Medical Wastewater Treatment (green), iv) Intermediate Solid Waste Management (blue), v) Wastewater Management (purple).

Table 9.2.6 Short Term Projects (2010 - 2012)

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
A	Ec-5	Promotion of existing industrial zones	0.5	G	Mg	1	J	-
	So-1	Build a new general hospital and an advanced medical technology center (supply facilities)	24.5	PFI	If	13	D	-
	So-2	Privatize the healthcare sector to better satisfy medical prevention, examination and treatment needs of the public	0.5	PFI	Mg	13	D	-
	To-2	Preserve and restore coral reefs and ecological system of the area from Son Tra Peninsula and Lien Chieu	1.0	G	Mg	5, 9	D	En
B	Tr-9	Promote traffic dust reduction projects	1.1	G	Mg	5, 6	J	Lc, En
	Tr-10	Develop public transport (bus and rails) network development	19.3	G	If	5, 6	D	So, Lc, En
	Tr-11	Promote the use of pure fuel and reduce polluted exhaust fumes	3.1	G	Mg	5, 6	D	Lc, En, Ut
	Tr-13	A1 Main Roads in Lien Chieu New CBD	29.1	G	If	6	D	Sp
	Tr-14	A2 Main Roads in Lien Chieu New CBD	12.0	G	If	6	D	Sp
	Tr-21	S2 North-South Highway 1	38.9	G	If	6	D	Sp
	Tr-25	Improvement of District Road No. 601	25.0	G	If	6	D	Sp
	Tr-26	Improvement of District Road No. 604	43.0	G	If	6	D/J	Sp
	Tr-29	Comprehensive Transportation Management in City Center and Main Corridors (Transportation Environment Improvement)	67.8	G	Mg	6	J	Ec, Sp, Hr, Ca
	Ut-32	Establishment of industrial waste water treatment system	20.0	G	If	5	D	En
	Ut-33	Build central wastewater treatment systems in all industrial zones	2.4	G	If	3, 5, 6	D	En
	Ut-34	Improve 4 existing urban wastewater treatment stations	33.3	G	If	5, 6	D	En
	Ut-40	Establish a solid waste collection, transport and treatment system on a long-term perspective	0.6	G	If	5, 6	D	En
	Ut-41	Close the existing Khanh Son dumping site with proper engineering measures	0.6	G	Mg	5	D	En
	Ut-42	Develop a new Khanh Son dumping ground with additional solid waste leakage treatment facilites	0.4	G	If	5	D	En
	Ut-43	Facilitate medical waste, wastewater and toxic waste treatment project	4.1	G	Mg	5, 13	D/J	En
	Ut-59	Segregate garbage at source and recycle solid waste (3R)	0.6	G	Mg	5	J	En
C	So-40	Establishment of Disaster Prevention Center and Strengthening of Emergency Response	11.5	G	If	10	D	En
	So-41	Facilitate the conduct of hazard-mapping and risk analyses against natural disasters, covering all districts and communes	2.0	G	TA	10	D/J	En
	So-42	Study comprehensive engineering measures for flood damage mitigation (storms and tropical low pressures), and facilitate priority flood mitigation projects	0.5	G	TA	10	D	En
	So-43	Review and reorganize the existing administrative preparatory system against emergency and disaster occurrence	0.5	G	TA	10	D	En
	So-44	Organization and Promotion of Community-based Disaster	5.0	G	Mg	5, 6,	D/J	En

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		Management and Preparedness Activities				8, 12		
	So-45	Reallocate, resettle inhabitants in landslide-risky areas	3.0	G	If	10	D	En
D	Lc-1	Expand public housing provision	10.0	G	If	4, 5	J	Sp
	Lc-2	Provision of adequate resettlement housing, industrial workers housing and accommodations for students	5.0	G	If	4, 5	J	Sp
	Lc-4	Promote public or semi-public housing for the new urban areas	10.0	G	If	1, 4, 5	J	Sp
E	Tr-2	Improve capacity of Danang Airport to 4 million passengers per year (upgrading of passenger terminal, freight terminal, runway 35R/17L (3500m*45m), construction of aircraft maintenance workshop, improvement of apron)	75.0	G	If	6	D	Sp, To
	Mf-1	Eco-Fund-Raising Project	0.01	G	Mg	2, 5	J	En

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4) D=Danang City, J=JICA, O=Others
5) Ec=Economic Development, So= Social Development, En=Environmental Management, Sp=Spatial Development, Lc=Housing and Living Conditions, Tr=Transportation Development, Ut=Urban Infrastructure and Utilities, Hr=Human Resource Development, Mf=Municipal Finance Capacity Development and Management, Ca=Administrative Capacity Development and Management, To=Tourism Development

Table 9.2.7 Medium Term Projects (2013 - 2015)

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
A	Ec-3	Promotion of recycling business	0.5	G	Mg	1, 5	J	En
	Ec-4	Strategically promote environment-friendly industries and business and technological innovation with special incentives	73.6	G	Mg	1	D/J	En
	En-19	Development/Enhancement of National Center for Environmental Science and Technology (NCEST-Danang)	25.0	G	If	5, 7, 12	J	Ec, Ut, Tr
	To-3	Promote sea and river valley management	2.5	G	Mg	5, 9	D	En
	To-6	Encourage eco-tourism development, ecological village model establishment and expansion	27.8	G	Mg	5, 9	D	En
B	En-3	Promotion of Compliance with Posting “Certified Pollution Control Manager”	2.0	G	Mg	1, 3, 5, 7	J	Ca
	En-8	Develop & promote fresh and environment-friendly agriculture	11.8	PFI	Mg	5	D	So, Ec
	Sp-1	Update of construction plan to "master plan"	0.5	G	TA	1, 4	J	-
	Sp-2	Utilize the master plan to be a development framework for all city departments and private sector	0.2	G	TA	1, 4	J	-
	Tr-6	Urban Bus Expansion Project	52.0	PFI	If	6	D/J	So, Sp, En
	Tr-17	P3 University Avenue	9.2	G	If	6	D	Sp
	Tr-22	S3 North-South Highway Extension	36.6	G	If	6	D	Sp
	Tr-23	S4 Eastside Hoa Xuan – Ngu Hanh Son Road	7.6	G	If	6	D	Sp

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
	Ut-30	Promotion of septic tank in rural area	6.4	PFI	Mg	5, 6	J	En
	Ut-37	Introduction of intermediate treatment system for domestic waste	110.0	G	If	5	J	En
	Ut-38	Enhance industrial waste management	5.0	G	If	5	J	En
	Ut-39	Recycle of construction waste	0.4	G	If	5	D	En
	Ut-44	Promote energy saving and energy recycling model projects	4.1	G	Mg	5	D	En
	Ut-47	Integrated Water Resource Management	2.6	G	Mg	5	J	En
	Ut-49	Enforce the obligation of pre treatment system in the industrial zone and medical facilities	0.5	G	Mg	3, 5, 6, 13	J	Ec
	Ut-50	Increase rate for the connection and enhance the night soil treatment	10.5	G	Mg	5, 6	J	En
	Ut-51	Integrated solid waste management among local authorities	0.6	G	Mg	5	J	En
	Ut-52	Implementation plan for solid waste management	0.6	G	TA	5	J	En
	Ut-60	Encourage 3R movement (recycling, reduction and reuse of solid waste resources) at community-level	20.0	G	Mg	5	J	En
C	En-1	Pollution Free Enhancement Project	55.0	G	Mg	1, 3, 5, 7	D/J	So
	En-2	Facilitate and continue the industrial air pollution management program	7.6	G	Mg	3, 5	D/J	Ec
	En-4	Facilitate bio-diversification preservation and nature reserve management	0.04	G	Mg	5	D	So, Sp
	En-5	Promote afforest projects	23.5	G	If	5	D	So, Sp
	En-6	Facilitate public green tree development projects	1.8	G	Mg	4, 5	D	So, Sp
	En-7	Improve the Phu Loc River's environment (PIIP)	7.8	G	Mg	5	D	So, Ut
	En-9	Strengthen a comprehensive water resources protection program for lakes, ponds and river watershed management	7.2	G	Mg	4, 5	D/J	So, Ut
	En-18	Establishment of Comprehensive Monitoring System for Major Environmental Factors	15.0	G	Mg	5, 7	J	Ec, Ut, Tr
	En-20	Build an ambient air pollution automatic severance system and information network system	1.5	G	If	5, 7	D	Ec, Ut, Tr
	En-21	Plan and build an automatic severance/monitoring system for water and air pollution, and information network system	0.9	G	If	5, 7	D	Ec, Ut, Tr
	En-22	Build a database for the environment assessment and monitored results	0.1	G	TA	5, 7	D	Ec, Ut, Tr
	En-26	Strengthen technological knowledge basis and inspection-monitoring capacity in the environmental administration at DONRE	1.0	G	Mg	5	D/J	Ca
	En-28	Strengthen training programs for managers and technicians in charge of pollution control at manufacturing entities in the industrial sector	1.0	G	Mg	5	D/J	Ca
	En-29	Development of an Official Qualification System for Certified Pollution Control Managers (CPCM)	2.0	G	Mg	1, 3, 5, 7	J	Hr, Ca
	En-30	Strengthen the monitoring system for industrial effluent water quality at all industrial parks/estates	2.0	G	Mg	3, 5	J	Ec, Ut, Ca
	En-35	Enhance legal enforcement against violation of Environmental Laws and Regulations	0.9	G	Mg	5	D/J	Ca
D	En-10	Involve roles of mass media to enhance acknowledgement of environment protection	1.6	G	Mg	5, 16	D	Lc, Ca

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
	En-11	Promote environmental awareness and environment-conscious activities in linked with the municipal educational system	0.3	G	Mg	5, 12	D	Lc, Hr
	En-12	Promote an official awarding and recognition system for "good environmental practice" in commercial and tourism business, industrial, R & D, community and NGOs	0.5	G	Mg	3, 5, 9	D/J	Ec, Lc, To
	En-15	Community Leaders Training Program for Community-driven Environmental Management	2.0	G	Mg	5, 8, 12	J	Lc, Ca
	En-25	Encouragement of CDM Projects for Commitment to Global Issues	0.5	G	Mg	1, 5, 6, 7	D/J	-
	Ut-54	Awareness campaign for saving energy consumption	2.6	G	Mg	3, 5, 12	J	En
	Ut-56	Awareness campaign for conserving water	2.6	G	Mg	4, 5, 12	J	En
	Ut-57	Awareness Campaign for waste water treatment	2.6	G	Mg	5, 6, 12	J	En
E	Ec-2	E-City initiative	3.0	G	Mg	16	J	Ca
	En-31	Establishment of a "District Environmental Protection Fund" System	5.0	G	Mg	1, 2, 5	D/J	Mf, Ca
	En-38	Establishment of the "Danang City Environmental Conservation Fund System"	50.0	PFI	Mg	2, 5	D/J	Mf

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4) D=Danang City, J=JICA, O=Others
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Table 9.2.8 Long Term Projects (2016 - 2025)

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
A	Ec-24	Private entrepreneurship support	0.5	G	Mg	1	J	-
	So-3	Develop a lab for nutrition test and food sanitation and safety control (biological equivalency test center)	0.6	PFI	If	13	D	-
	So-4	Build nuclear medicine and radioactivity center	12.0	PFI	If	13	D	-
	So-5	Build tuberculosis hospital	29.4	PFI	If	13	D	-
	So-6	Build geriatric hospital	8.8	PFI	If	13	D	-
	So-7	Develop pediatric & obstetric department	0.3	PFI	If	13	D	-
	So-8	Develop a pre – diagnostic department	0.9	PFI	If	13	D	-
	En-13	Develop "Environmental Education Curriculums" for different levels of education, including compulsory, high and vocational education	1.2	G	TA	5, 9	J	Hr
	En-36	Review and strengthen the existing legal and institutional basis	1.0	G	Mg	3, 5,	J	Ec, Ca,

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		for industrial, tourism and construction sectors in particular, and establish a standardized legal documentation system for those activities in terms of enforcement measures by environmental administrations				9		To
	Tr-33	Cruising Service Development Project	2.0	PFI	If	6	J	Sp, To
	Hr-1	Danang University Village Town Development Project (including resettlement)	74.7	PFI	If	1, 12	D	So
	Hr-2	Promote international - standard university to establish its ex-tension campus	176.5	G	If	4, 12	D	So
	Hr-3	Build Medical and Pharmacy University	58.8	G	If	13	D	So
	Hr-4	Build Social Sciences and Humanities Center	2.9	G	If	9	D	So
	Hr-5	Build Science Technology Center	2.9	G	If	7	D	So
	Hr-6	Develop 10 technical high schools, 8 regular education centers and 56 training centers for languages and strategic industry, i.e. tourism	100.0	PFI	If	12	D	So
	Hr-7	Human resource development in quantity and quality for hospi-tality and tourism industry	0.02	G	Mg	9	J	To
	To-1	Integrated tourism infrastructure development along Da Nang Beach Resort Area	10.0	G	If	5, 9	D/J	-
	To-4	Integrated tourism infrastructure development at the Ba Na mountaintop	10.0	G	If	5, 9	D/J	En
	To-5	Integrated Eco-tourism Promotion Program	20.0	PFI	Mg	2, 5, 6, 9, 10	D/J	En
	To-7	Public Marina Development Project	3.0	PFI	If	5, 9	D/J	En
	To-9	Tourism Cruise Ship Project	12.0	PFI	If	5, 9	J	En
	To-10	Development of outdoor sports ground	5.0	PFI	If	5, 9	J	En
	To-11	Tourism Train Project	12.0	PFI	If	5, 9	J	En
	To-16	Develop Ngu Han Son Hot Mineral Water tourism site	11.8	PFI	If	9	D	Sp
	To-18	Develop Tien Sa tourism site	28.2	PFI	If	9	D	Sp
B	Ec-25	Establishment of sector based business associations	0.5	PFI	Mg	1	J	-
	So-11	Upgrade Chi Lang Stadium, Nguyen Tri Phuong Sport and Gymnastic Center	5.0	G	If	4, 9	D	Sp
	So-12	Develop the sport and gymnastic complex in Hoa Minh linking with the national sport center No. 3	5.0	PFI	If	4, 9	D	Sp
	So-13	Build 50 – 60 thousand seat stadium, roofed swimming pool, multi – purpose sports hall, sport hospital, rifle range	93.2	PFI	If	4, 9	D	Sp
	So-14	Build a high – class sports center	5.3	PFI	If	4, 9	D	Sp
	So-16	Preparation of a development plan for a library network	9.4	G	TA	1, 9	D	Hr
	So-17	Build Information Culture Center	2.9	G	If	9	D	Sp
	So-18	Build City Monument	3.5	G	If	9	D	Sp
	So-19	Build City Museum	3.5	G	If	9	D	Sp
	So-20	Build Military Zone – 5 Museum	3.5	G	If	9	D	Sp
	So-21	Build Cultural Centers for 6 districts	5.9	G	If	9	D	Sp
	So-22	Build national standard schools for 2008 - 2010 (preschool, primary, secondary and high schools)	136.5	G	If	12	D	Hr
	So-23	Build Phan Chau Trinh High School (2nd phase), Tran Phu	7.6	G	If	12	D	Hr

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		High School						
	So-24	Build Nguyen Khuyen Secondary School	2.9	G	If	12	D	Hr
	So-25	Promote and develop non-public nursery centers to admit 80% of infants and 100% of 5 year old children by 2020	3.0	PFI	If	12	D	Hr
	So-26	Basic education facilities development project	322.6	G	If	12	D	Hr
	So-27	Set up community learning centers / community college for residents to foster extension/lifelong study, foreign language and IT	1.0	G	If	4, 12	D	Sp, Hr
	So-28	Construct Con Market Commerce Center	23.5	PFI	If	4	D	Sp
	So-29	Construct Han Market Shopping Center	11.8	PFI	If	4	D	Sp
	So-30	Construct Meridian Far East Twin Tower	152.9	PFI	If	4	D	Sp
	So-31	Construct Hoa Minh Commerce Center	17.6	PFI	If	4	D	Sp
	So-33	Construct City Bus Station Commerce Center	5.9	PFI	If	6	D	Sp, Tr
	So-34	Construct Commerce center in new Danang Railway Station	5.9	PFI	If	6	D	Sp, Tr
	Sp-3	Disclose and disseminate the detailed plan to citizens	0.2	G	Mg	4	J	-
	Sp-4	Establish the building regulation and construction permission system to embody master plan	0.2	G	Mg	4	J	-
	Sp-5	Regulate the provision of LUR (Land Use Right)	0.2	G	Mg	5	J	-
	Tr-3	Develop new Danang Railway station by 2020 (45 ha)	100.7	G	If	6	D	Sp, To
	Tr-4	Improve Trans – Vietnam Railway and relocate the railway station to Minh Hoa – Hoa Phat near Phuoc Tuong Mountain foot	5.0	G	If	6	D	Sp, To
	Tr-5	Develop inter-provincial bus stations: Northern station in northern Bau Tram; southern station in Tu Cau Bridge (NH1A); south east station in Ngu Hanh Son district center; north east station in northern aquaculture service industrial park	3.0	G	If	6	D	Sp, En
	Tr-12	UMRT Line 1	-	G	If	6	J	Sp, En
	Tr-15	P1 Danang Urban Bypass	119.4	G	If	6	D	Sp
	Tr-16	P2 University Avenue	40.8	G	If	6	D	Sp
	Tr-18	P4 North-South Highway	20.3	G	If	6	D	Sp
	Tr-19	P5 Access road of North–South Expressway – Bus terminal	22.8	G	If	6	D	Sp
	Tr-20	S1 North-South Highway 1	214.7	G	If	6	D	Sp
	Tr-24	S5 Westside Hoa Chau – Hoa Xuan - Ngu Hanh Son Road	51.3	G	If	6	J	Sp
	Tr-27	Interchange Development Project	99.1	G	If	6	J	Ec, Sp
	Tr-28	Establish a driving license examination center in Hoa Cam	1.0	G	If	6	D	Ec, Sp, Hr
	Ut-1	Upgrade the Da Nang 500kV station from 450 MVA to 900 MVA and 1350 MVA and add a number of 220kV transformation station	5.0	G	If	3	D	-
	Ut-2	Develop a new 220kV station in Son Tra - Ngu Hanh Son (2 x 125 MVA)	5.0	G	If	3	D	-
	Ut-3	Upgrade capacity of 220kV station in Hoa Khanh to 2 x 125 MVA	3.0	G	If	3	D	-
	Ut-4	Upgrade capacity of Lien Tri 110kV station to 2 generators 25+40 MVA, which are to be installed in 2008-2010	3.0	G	If	3	D	-
	Ut-5	Upgrade capacity of Lien Chieu 110kV station to 2 x 40 MVA	3.0	G	If	3	D	-
	Ut-6	Start operating the double circuit 110kV line of Hoa Khanh –	2.0	G	If	3	D	-

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		Lien Chieu – Hai Van Pass						
	Ut-7	Upgrade capacity of Hoa Khanh 110kV station to 25+63 MVA, installation due in 2008 – 2010	3.0	G	If	3	D	-
	Ut-8	Upgrade capacity of Xuan Ha 110kV station, installation in 2008 – 2010	2.0	G	If	3	D	-
	Ut-9	Upgrade capacity of An Don 110kV station to 25 + 40 MVA	2.0	G	If	3	D	-
	Ut-10	Improve the single circuit 110 kV line of Ngu Hanh Son – An Don to double circuit line to improve electricity supply safety	3.0	G	If	3	D	-
	Ut-11	Develop a 110kV station in Hoa Khuong and upgrade of Cau Do 110kv sation to 25+40 MVA	3.0	G	If	3	D	-
	Ut-12	Develop a 110/22kv transformation station of Thuan Phuoc to cover Da Phuoc New Town project	2.0	G	If	3	D	-
	Ut-13	Promotion of new power generation plants	100.0	G	If	3	D	-
	Ut-14	Supplementary upgrade power transmission and distribution network (substation and network (Compact Cable Box))	100.0	G	If	3	J	-
	Ut-15	Introduction of solar power production	50.0	G	If	3, 5	J	En
	Ut-16	Introduce renewable energy production	3.3	G	If	3, 5	J	En
	Ut-17	Pure water supply project: Increase the capacity from 111,000m3/day in 2003 to 330,000m3/day in 2015	76.0	G	If	4	D	-
	Ut-18	Develop a new reservoir of Trung An	10.0	G	If	4	D	-
	Ut-19	Upgrade Cau Do, Son Tra and Airport Water Plants (Danang Water Plant Project)	79.1	G	If	4	D	-
	Ut-20	Water supply and environment sanitation project	84.6	G	If	4, 5	D	En
	Ut-21	Water resource development at Cu De River (Danang water supply project)	50.0	G	If	4	D	En
	Ut-22	Improve water loss in the existing network (USP)	6.0	G	Mg	4	O	En
	Ut-23	Expand service area for newly development area	350.0	G	If	4	J	En
	Ut-24	Waste Water treatment system development (PIIP)	68.7	G	If	5, 6	O	En
	Ut-26	Improve 4 existing stations of urban waste water treatment in Hoa Xuan, building drain infrastructure in Son Tra Distr., Lien Chieu Distr., Cam Le Distr.	10.0	G	If	5, 6	D	En
	Ut-27	Develop the sewage canal along the beach from eastern Son Tra to Non Nuoc and along Da Nang bay from Thuan Phuoc to Nam O, along east – west banks of Han River and 6 wastewater treatment stations at Thuan Phuoc Mouth, Hoa Minh, Hoa Khanh, Hoa Cuong, Hoa Hai and Tho Quang	5.0	G	If	5, 6	D	En
	Ut-28	Expand the service area for newly development area	5.0	G	If	5, 6	D	-
	Ut-29	Expand the four treatment station for demand increase	5.0	G	If	5, 6	D	-
	Ut-31	Promote the use of waste water treatment sludge (at cement factory, etc.) including opportunities for CDM	0.1	G	Mg	5, 6	J	En
	Ut-35	Facilitate and expand the on-going Water Drainage and Environmental Sanitation Improvement Project	200.0	G	If	5, 6	J	En
	Ut-36	Build a comprehensive sewerage system in the designated urbanized area	120.0	G	If	5, 6	J	En
	Ut-45	Smart Grid (integrated control system among power generation/ transmission facilities)	10.0	G	If	3	J	-
	Ut-46	Utility Support Programme (USP)	3.9	G	Mg	4	O	-
	Ut-48	Introduce automatic and integrated operation system for drain-	1.0	G	If	5, 6	J	-

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		ing chambers and pumping stations						
	Ut-53	Human Resource Development for environmental infrastructure management in the Central Region	0.5	G	Mg	5	J	Hr
	Ut-61	Encourage industrial investments for 3R activities (recycling, reduction and reuse of solid waste resources)	2.0	G	Mg	1, 3, 5	J	Ec, En
	To-8	Improvement of Local Port	5.0	G	If	5, 9	D/J	En
C	So-46	Build embankment at Lien Chieu – Thuan Phuoc Beach	10.0	G	If	10	D	En
	So-47	Build embankment and Han River estuary	10.0	G	If	10	D	En
	So-48	Implement embankment project for Cu De, Tuy Loan, and Cam Le River	5.0	G	If	10	D	En
	So-49	Plant trees along coastal areas for obstructing wave	1.0	G	Mg	10	D	En
	En-14	Develop “Social Education System”, involving NGOs, schools and universities	1.5	PFI	TA	5, 9	J	Hr
	En-23	Promote environment research collaboration with universities (NCEST-Danang) and international institutes	0.5	G	TA	5, 7	J	Ec, Ut, Tr
	En-27	Increase and trained environmental officers to be assigned at district level	0.5	G	Mg	5	D	Ca
	En-32	Functionalize the Steering Committee, which has been proposed and established in the officially committed policy of “Environmental City Danang”	0.5	G	Mg	5	J	Ca
	En-33	Organize an Inter-provincial Committee for Environmental Conservation and Eco-tourism Promotion, with neighboring provinces	0.5	G	Mg	5, 9	J	Ca, To
	En-34	Organize Working Taskforce Groups at District Level for the implementation of projects/programs aiming at the Environmental City	0.5	G	Mg	5	J	Ca
	En-37	Review and Reform of Current Privatization Policies	0.5	G	Mg	1, 2, 5	J	Ec
	Tr-7	Pedestrian Environment Improvement Project	5.0	G	Mg	6	J	Sp, En
	Tr-8	Bicycle Network Development Project	5.0	G	Mg	6	J	Sp, En
	Ca-1	Review planning process and institutional framework for urban development and management, and set up clear measurable goals for short and medium term in order to overcome the problems identified in the review process	0.2	G	Mg	1, 4	J	-
	Ca-2	Establish appropriate performance measures to monitor the reform process.	0.1	G	Mg	1 - 17	J	-
	Ca-3	Establishment of Special Task Force for environmental protection in each department	0.1	G	Mg	1 - 17	J	En
	Ca-4	Establishment of Cross-sectional Working Groups	0.1	G	Mg	1 - 17	J	-
	Ca-11	Construct City Administration Center	51.8	G	If	4	D	Sp
D	So-9	Develop 2/9 road park, Khue Trung park and Hoa Cuong	3.0	G	If	4, 9	D	Sp
	So-10	Development of cultural and sport parks in urban and rural districts	0.1	G	If	4, 9	J	Sp
	So-15	Develop neighborhood park, community park and large urban park	14.0	G	If	4	J	Sp
	En-16	Develop an ecological community model in line with a concept of “Green-Clean-Beautiful Communes”	20.6	PFI	Mg	4, 5	D	Sp, Lc
	En-17	Strengthen environmental management system at district level	0.5	G	Mg	5	J	Lc, Ca

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		with (a) placing 2-3 environmental management officials at each district; (b) organizing community-based environmental management teams/committees in cooperation with Women's Union, Youth Unions and other CBOs						
	En-24	Promote public relation (PR) on global environmental issues and commitment to participation in global activities	0.5	G	Mg	5	J	-
	Sp-6	Transfer low productivity agricultural areas to urban land	10.0	PFI	If	4	D	-
	Sp-10	Complete development of residential areas in Bac My An, Tay Nam – Hoa Cuong, An Cu 1 and 2, May Thai, An Hai Bac, etc.	50.0	PFI	If	4	D	Tr
	Sp-12	Infrastructure for Ba Tung residential area (2nd phase)	16.5	G	If	4	D	Tr
	Sp-13	Infrastructure for Block A – residential area in the south of Cam Le Bridge	17.6	G	If	4	D	Tr
	Sp-16	Select prominent ten landscape sceneries in Danang	0.01	G	Mg	1, 4, 5, 9	J	So
	Sp-17	Reconsider street design to enhance urban landscape	0.5	G	Mg	4, 6	J	So
	Sp-18	Improve waterfront accessibility design	2.0	G	Mg	5, 6, 9	J	So
	Sp-19	Identify preservation of modern architecture in old quarters	0.1	G	Mg	4, 9	J	So
	Sp-20	Increase the floor to land ratio in some areas in order to reduce building to land ratio, improving the greenery space in the city	0.5	G	Mg	4	D	-
	Sp-21	Plant trees on medians of urban roads of Class 1 and 2, and on sidewalks, in parking lots and stations to improve townscape and environmental conditions	1.0	G	Mg	4	D	Tr
	Lc-3	Provision of housing residential land to the market	1.0	G	Mg	4, 5	J	Sp
	Ut-55	Promotion of small scale rainwater catchment system	0.5	G	If	4	J	En
	Ca-5	Institutionalize a number of participatory mechanisms that systematically involve stakeholders in development planning, development and monitoring process	0.1	G	Mg	1 - 17	J	-
	Ca-6	Formulate long and mid-term sector planning in each department of city administration through the participation of representatives of related private sector and civil society	0.1	G	Mg	1 - 17	J	-
	Ca-7	Formulate long and mid-term local planning at each level of local administration through active participation of local stakeholders	0.1	G	Mg	1 - 17	J	-
	Ca-8	Establish advisory groups for each important policy formulation that consists of national experts, representatives of private and civil society who are relevant for specific policy topic	0.1	G	Mg	1 - 17	J	-
	Ca-9	Establishment of Steering Committee at District and Commune levels for environment city project	0.1	G	Mg	5	J	En
	Ca-10	Promotion of more contests and events for environmental protection	0.1	G	Mg	5	J	En
	To-12	Improve landscape and environment in tourism areas along My Khe beach and Han River	3.0	G	If	4, 5, 9	D	Sp
	To-13	Rehabilitate Ngu Han Son beautiful landscape Area	5.9	G	If	4, 5, 9	D	Sp
E	So-32	Construct Logistics Center	5.9	G	If	4	D	Sp
	So-35	Construct Lien Chieu General Storage	17.6	G	If	4	D	Sp
	Sp-7	Develop areas in Hoa Xuan, Hoa Chau, Hoa Tien, Hoa Tho and Hoa Phat and some urban residential areas near Hoa	30.0	PFI	If	4	D	Tr

Group	Code	Projects / Action	Cost (mil. USD)	Fund Source[1]	Type of Project[2]	Implementing Agency[3]	Proposed by[4]	Related Subsector[5]
		Khuong Industrial area along NH14B to the Central Highland Region						
	Sp-8	Expand the city toward the western, northern west, southern west, southern and eastern sides; in the coming time, give priority to develop toward the northern west direction – the area between NH1A and Lien Chieu – Thuan Phuoc Road	20.0	PFI	If	4	D	Tr
	Sp-9	Expand urban area based on the development of satellite urban areas, district/commune towns and large-scale urban infrastructures to create Da Nang satellite urban area cluster	50.0	PFI	If	4	D	Tr
	Sp-11	Construct new urban area west of Truong Chinh Road	7.1	PFI	If	4	D	Tr
	Sp-14	Designate new urban centers in Da Nang and Quang Nam Province	100.0	G	If	1, 4	J	Ec
	Sp-15	Develop business districts in new urban centers	50.0	G	If	1, 4, 5	J	Ec
	Tr-1	Commuter Road (to expressway)	81.9	G	If	6	J	Sp
	Tr-30	Develop Lien Chieu Port to serve exportation – importation as well as transit cargos in the East – West Corridor	50.0	G	If	6	D	Sp
	Tr-31	Develop Tho Quang Port to accommodate vessels of less than 20,000 DWT as a replacement of Song Han Port	20.0	G	If	6	D	Sp
	Tr-32	Expand capacity of Tien Sa Port to 6 – 7 million tons and receipt of 60,000 DWT vessels	10.0	G	If	6	D	Sp
	Ut-58	Tariff setting for solid waste management	0.3	G	Mg	6	J	En
	Mf-2	Project for promotion of PPP scheme in Danang City	0.03	G	Mg	1, 2	J	Ec
	Mf-3	Project for strengthening public relations of tax information	0.02	G	Mg	2	J	-

1) G=Government, PFI=Private Finance Initiative, P=Private)
2) If=Infrastructure, Mg=Management, TA=Technical Assistance
3) 1=DPI, 2=DOF, 3=DOIT, 4=DOC, 5=DONRE, 6=DOT, 7=DOST, 8=DARD, 9=DOCST, 10=DOIA, 11=DOFA, 12=DOET, 13=DOH, 14=DOL, 15=DOJ, 16=DOIC, 17=DOI (The bold and underlined number indicates the leading agency.)
4) D=Danang City, J=JICA, O=Others
5) Ec=Economic Development, So= Social Development, En=Environmental Management, Sp=Spatial Development, Lc=Housing and Living Conditions, Tr=Transportation Development, Ut=Urban Infrastructure and Utilities, Hr=Human Resource Development, Mf=Municipal Finance Capacity Development and Management, Ca=Administrative Capacity Development and Management, To=Tourism Development

10 STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

10.1 SEA in Vietnam

10.1 Strategic Environmental Assessment, SEA, is defined in Law on Environmental Protection enacted in 2005. SEA means the analysis and prediction of potential environmental impacts of development strategy and project planning prior to approval, in order to ensure the achievement of sustainable development. Environmental Protection Law mandates that socio-economic development strategies, planning and plans at all governmental levels, land-use, planning for key economic regions, forest protection and development, exploitation and utilization of other natural resources need to formulate a SEA report.

10.2 The primary purposes of the SEA is to incorporate potential environmental impacts into a planning process and to facilitate a transparent and participatory decision-making,[1] and to establish a SEA model for urban development planning process in terms of DaCRISS project and to reflect mitigation measures and monitoring plans raised in the SEA process on an environmental management. A distinctive feature of the Vietnamese system is that SEA need to cover environment, social and economic aspects of a strategy or plan, i.e. all three pillars of sustainable development as defined in the Strategic Orientation for Sustainable Development in Vietnam, 2004.[2]

10.3 SEA regulations are stipulated in the following laws and decisions, not exclusive; yet because the SEA is relatively a new concept and not many have been practiced in Vietnam so far. Although the law was established in 2005, technical guidance for financial framework, task sharing, stakeholder identification, and contents of report and so on, was not set until January 2008 by Department of Environmental Impact Assessment and Appraisal, DEIAA, MONRE.

(a) Law on Environmental Protection in 2005

(b) Decree No.80/2006/ND-CP dated August 2006 regarding detailed regulations and guidelines for implementing some articles of Law on Environmental Protection

(c) Circular No.08/2006/TT-BTNMT of the Ministry of Natural Resources and Environment (MONRE) providing Guidelines on Strategic Environmental Assessment, Environmental Impact Assessment and Environmental Protection Commitment

(d) Circular No.13/2006/TT-BTNMT of the Ministry of Natural Resources and Environment (MONRE) providing Guidelines on Organization and Operation of Appraisal Council for Strategic Environmental Assessment Report and Environmental Impact Assessment Report

(e) General Technical Guidance for Strategic Environmental Assessment (SEA) Guidance, Department of Environmental Impact Assessment and Appraisal (DEIAA), Ministry of Natural Resources and Environment (MONRE)

10.4 In the context of DaCRISS project, a SEA report will be formulated by the People's Committee of Danang City, PCD, who is responsible for the strategy and plan development; at the same time, PCD needs to appoint an appraisal committee under its jurisdic-

[1] General Technical Guidance for SEA, MONRE.
[2] SEA of the Quang Nam Province Hydropower Plan for the Vu Gia-Thu Bon River Basin–Final SEA Report, MONRE, January 2008.

tion. The appraisal committee shall be organized with members of environment experts, academic experts, NGOs and so on.

10.2 Review of SEA for Danang City

10.5 Department of Planning and Investment (DPI) has issued an ordinance regarding the "outline of tasks for the strategic environmental assessment for master plan of Danang social and economic development unto 2020 (SEDP 2020) on October 15, 2008, which is about four months later that the first draft of SEDP was formulated. The ordinance clearly indicates what should be written in the SEA based on the Circular No.08/2006/TT-BKHCNMT issued on September 8, 2006. The contents of the SEA should include (i) legal and technical methods adopted for the assessment of SEA, (ii) the process of the assessment, (iii) an interpretation of SEDP and its environmental impacts, (iv) general description of current natural, economic and social conditions in Danang City, and (v) recommendations for mitigating adverse environment impacts, which might be caused by implementing the SEDP.

10.6 Although the practice of SEA started a little bit behind the formulation of the SEDP, it is still undergoing discussions and revision process among related governmental agencies, so it would be fair to say that the SEA for the SEDP Danang is taking proper steps as the laws stipulated.

10.7 The first meeting for the SEA was conducted in April 2009 inviting governmental officials, professors and experts at related fields. According to the Environment Technology Centre (ENTEC) who has been formulating the report and organized the meeting, the meeting was not held as for a stakeholders meeting, as stated in the "general technical guidance for strategic environmental assessment (SEA)" but merely as a technical consultation workshop, in order to get inputs and comments from the experts in various fields. Besides local governmental officials, representatives from Fatherland Front Union, Science and Technology Association, the Association of Conservation of Nature and Environment have participated to the meeting.

10.8 The SEA report is quite comprehensive and covers all items indicated in the circular; yet, there is still some room to work on. The essence of SEA is (i) to analyze potential natural and social environmental adverse impacts, (ii) to listen into people's opinions in the course of the planning process and (iii) to propose possible mitigation or enhancement measures and propose environmental monitoring arrangements. It is widely understood that a SEA scoping is quite challenging because the target areas in both geographic and sector-wise are broad, so that it can be easily go over all possible environmental impacts, and as a result, make no differences among alternatives of master plan. If this is a case of single project or a program where its sites are already identified, it would be much easier to set a scoping and identify adverse impacts to environment and social affairs.

10.9 It seems, therefore, ENTEC has adopted a strategy by concentrating on the integrated impacts caused by the main sectors, like industrial zone development, urbanization process, infrastructure construction, tourism activities and then proposed strategic mitigation measures.

10.10 One notable analysis is a comparison and contrast in environmental protection according to the concept of forthcoming community party congress resolution. It examines the SEDP with the congress resolution from environmental protection and issues. Another one is to illustrate the forecast on environment issue by potential pollutant and by

sector-wise.

10.11 Only drawback of the SEA was that it does not give analyses of environmental and social impacts for other two alternative scenarios. The general technical guideline states that analysis of environmental trends without the SEDP should be carried out as a comparison to the proposed development plan. Since the SEA is still under preparation in accordance with the progress of the SEDP, it is immature to conclude, but another possible drawback is that there were no stakeholders meeting held so far. The general technical guidance evidently indicates that consultation with the relevant authorities and with affected and interested stakeholders is a key element in a good SEA practice to increase transparency and accountability of SEA process and it might also reduce a potential risk of overlooking important information.

10.12 Despite of immense efforts, there are yet challenges and difficulties to formulate a SEA report for a long-term grand design like the SEDP, such as a time-gap between the times that the SEA was formulated in accordance with the SEDP, and various projects and countermeasures to adverse environmental impacts currently in progress; in other words, it would be difficult to keep up with all on-going basic infrastructure projects that will significantly affect environmental conditions, and frequently. Thus, instead of focusing on individual on-going project or planned project, it is suggested, as mentioned before, to take environmental impacts by group and/or sector as integrated impacts to perceive them as more reasonable probable impacts.

10.13 Another significant challenge is a correlation with a construction plan. The “construction plan up to 2010” was approved by the central government in 1993, and its amendment was approved in 2002, and its second amendment was approved in 2005; yet since they were all made before the Environmental Protection Law was enforced in 2006, none of plans has SEA report. However, June 23, 2009, the central government approved the adjustment of “Danang City Construction Plan up to 2025” by issuing the Decision No. 882/QD-TTg. This means the third amendment of the construction plan might also need a strategic environmental assessment to comply with the current environmental protection law and regulations. Because the SEDP is still underway, and the construction will definitely refer to the SEDP, and it could be easily imagine that vice versa will happen, which makes more difficult to complete the analysis of potential environmental impacts. One solution to that is to complete the SEA for SEDP first and incorporate the analysis and suggestions into the planning of the construction plan, in that way, there would be no conflict in planning and environmental and social impact analyses between two fundamental plans.

10.14 The last challenge is how to incorporate related plans into the consideration. At the workshop in April, one participant proposed to study “Environmental City” concept and take it into the consideration for the SEA.

10.3 SEA in the Planning Process of Danang Development Master Plan

1) Initial Environmental Examination (IEE) of the Master Plan

10.15 Environmental and social considerations were undertaken in accordance with the JICA environmental and social considerations guidelines. Strategic Environmental Assessment (SEA) is defined in the JICA guidelines issued in 2004 as an assessment to be implemented at the policy, planning and program level, so as defined in the Environmental Law 2005 in Vietnam. The SEA is to address a broad range of environmental and social factors and analyses of alternatives from the early planning stage of the development. In accordance with the role sharing between the counterpart and the DaCRISS Study Team, the SEA will fall under the responsibility of the Vietnam side supported by the Study Team, and the Study Team has conducted Initial Environmental Examination (IEE), which is the product of the preliminary assessment of possible environmental and social impacts of the master plan, regulated by the JICA guidelines. Environmental category for this master plan is considered as category "B" which means a study including analysis of alternative plans, prediction and assessment of environmental impacts, and preparation of mitigation measures and monitoring plans on the basis of secondary data and simple field surveys, since there are no significant environmental and social impacts are anticipated at the stage of the master planning.

(1) Natural and Social Profile of Danang City

10.16 Danang City is located at 15°15" to 16°14" northern latitude and 107°18" to 108°20" eastern longitude ,a largest port city in the central region sharing the border with Thua Thien–Hue on the north, Quan Nam Province on the west and south, and the East Sea on the east. The hilly and mountainous land shares a large portion of the city, which has the elevation of 700m to 1,500m with a steep slope, where primitive forests are reserved to protect and surround the city. The western area is separated to central highland and East-West corridor connects through Laos, northeast Cambodia, Thailand and Myanmar. The total land area of the city is 125,654,4km^2, in which land area of Hai Chau District is 1.68%, Thanh Khe District 0.74%, Son Tra District 4.84%, Cam Le District 2.64%, Ngu Hanh Son District 2.91%, Lien Chieu District 6.56%, and Hoa Vang District 56.3%. (Hoang Sa islands consists of 30,500km^2 of the total, which is 24.3%).

(a) **Hydrometeorology and Water Resources:** Danang City has the typical tropical monsoon climate with high and stable temperature. There are two distinguished seasons, the dry season begin from January to July and rainy season lasts from August to December. The rainy season is also a typhoon season when the city encounters floods, affecting adverse impacts to people's life. On the other hand, drought occurs in the dry season, which affects the adverse current of sea water and cause soil salinity and also water salinity to the groundwater affecting agricultural productions as well as daily water supply to the people who use groundwater as the only source in watershed areas in Cam Le and Ngu Han Son districts. Over the past decade, due to the climate change, the city has experienced a long intensive high temperature in dry season and lengthy heavy rain in rainy season. Since 1997, the city experienced flooding incidents 20 times, of which three of them are alarming level III, occurred in 1998, 1999 and 2004 causing casualties, economical and social damages. Besides those, when the storm No. 5 and No.6 landed, they severely damaged with 5,000 billion VND and destroyed more than 10,000 houses, many schools and public infrastructure.

10.17 Water sources, surface water, are mainly from Cu De, Cam Le and Vinh Dien Rivers, and thousands of household where piped water supply has not reached use dug well for drinking and daily life. Some households in mountainous area in Hoa Vang District channel water from streams.

(b) **Soil and Forest Resources:** There are several soil types, silted soil, coastal soil, salinity soil, alluvium soil, yellow soil, eroded soil, and etc. The alluvium soil area is appropriate for agricultural production while the yellow soil areas are used to plan industrial crops. The city forestry land is 60,998.8ha, accounting the largest share of the natural area, 48.5%. It comprises 36,658ha specific forest, 7,823.7ha protective forest and 14,506.6ha production forest. The natural forest mainly is in western Hoa Vang District and a part in Lien Chiue and Son Tra, and the forest cover ratio is 42.7%.

(c) **Coastal Recourse:** The coastline of the city is 92km long with a deep water bay. The city is surrounded by Danang Bay at the north and China Sea coastal line at the east, where beautiful beaches appropriate for tourism spread over. The deep water bay, Danang Bay, and estuaries of Lien Chieu and Tien Sa with 200m deep continental shelf are an advantage for marine economic development.

(d) **Social Issues:** Danang City provides the people with relatively good social environment and services compared to other cities in the country; yet, there is still a room for an improvement, such as (i) further reduction in poverty and inequality, (ii) expand demand-driven improved basic infrastructure and services as well as safety net for all, and 3) improved security against crimes, food and health.

10.18 Current estimates from the SEDP suggest a rapid population growth due to migration into the city. Unofficial population estimates have also suggested that the city is already home to a large number of unregistered immigrants, and that official statistics have generally underestimated the number of immigrants. Unemployment rates have shown a slow but steady decline in recent years, and the size of the workforce employed in regular, stable jobs has also increased in absolute terms. The unemployment rate underestimates underemployment, both in rural and urban areas (estimates suggest that in rural areas in particular underemployment can be a significant problem with farmers typically using only 70–80% of their productive time). Much of the labor force is still engaged in low-value-added production; and 23% of respondents in the HIS are in full-time education, while many of those between 15 and 65 are not working.

10.19 In terms of poverty alleviation, Danang's SEDP reports a rapid decline in poverty from 5.1% in 2001 to zero by 2005. However, this is based on DoLISA poverty definitions which use a poverty line of VND 300,000/person/month in urban areas and VND 150,000/person/month in rural areas, which has since been revised. HIS estimates of household poverty levels in the city are considerably higher, at 5.1%, reflecting the revision of the poverty rate. These figures contrast somewhat with the evidence on income distribution and that on the ownership of durable goods. While Hoa Vang and Ngu Hanh Son have the highest poverty rates, Son Tra and Thanh Khe also show relatively high levels of poverty. In terms of absolute numbers of the poor, there is little difference between Hoa Vang, Thanh Khe, and Ngu Hanh Son. This is one indication despite rapidly rising incomes in urban areas of persistent inequality.

(2) Initial Environment Examination (IEE)

10.20 The Initial Environmental Examination (IEE) was carried out in order to ensure the

social and environmental acceptability of the proposed projects early on in master plan stage. The IEE is intended to ensure that negative impact caused by proposed project and activities will be prevented or minimized.

10.21 The specific objectives of the IEE are (i) to analyze the existing conditions of the study site, (ii) to identify possible environmental impacts that might be caused by implementation of the master plan, (iii) to recommend measures to minimize the impacts and (iv) to determine the necessity of a possible comprehensive environmental study for respective proposed project.

(a) **Environmental Laws and Regulations:** The following laws, rules and regulations of Vietnam supported the conduct of the initial environmental study.

  (i) Law on Environmental Protection in 2005

  (ii) Decree No.80/2006/ND-CP dated August 2006 regarding detailed regulations and guidelines for implementing some articles of Law on Environmental Protection

(b) **Approach and Methodology:** Preliminary environmental literature analyses involved collection of primary and secondary data on the physical, biological and socio-demographic characteristics of the project areas. Several data, maps on geography, topography, geology, soil, land use, river and drainage basins, meteorology, hydrology, and socio-economic conditions have been gathered. These data were analyzed and used in the preliminary environmental assessment.

(c) **Screening and Scoping:** Screening was undertaken as specified in the JICA Environmental Guidelines (2004). A scoping was undertaken by studying a comprehensive assessment of environmental status of Danang City in the past ten years, “Ten Years Environmental Status Report (1997–2007)” issued in September 2008, i.e., as to figure out what particulars of environment and social impacts to be considered under the master planning. A scoping matrix was completed and three scenarios, scenario 1 (Base Case), scenario 2 (Current Construction Plan) and scenario 3 (Accelerated Growth Strategy) were studied based on the scoping particulars. The scoping matrix is divided in three parts; pollution, natural environment and social environment. The pollution items include an impact caused by various pollutants, the natural environment concerns flora and fauna (biodiversity), and social environment items include all social issues concerned in urban development. The following shows the particulars of each category.

  (i) **Pollution:** Air quality, noise and vibration, water quality (groundwater and surface water), wastewater, solid waste and coastal area (drifted waste, contaminated discharged water and industry-origin waste).

  (ii) **Natural Environment:** Forest conservation and management, flora and fauna (biodiversity), ecosystem, global warming.

  (iii) **Social Environment:** Involuntary resettlement, regional severance and community dividend, socially vulnerable group (poverty, indigenous and ethnic), cultural and historical heritage (remains, cultural and historical assets), landscape, greenery, park and open space, healthcare and public health (hygiene), living environment, safe and security (crime rate and disaster management), local economy (commercial business), existing social infrastructure and social services, uneven distribution of benefit and damage, offensive odor and accidents.

(d) **Assessment of Current Environmental Conditions and the Analysis for IEE:**

The analysis of IEE involves gathering/collecting primary data through site reconnaissance and secondary data from existing reports and statistics regarding the current environmental conditions in the project area. Analysis and comparison of potential environmental impacts among three scenarios involves identifying environmental hotspots at existing conditions and then predicting and analyzing probable impacts in natural and social aspects. It can be only done through predicting the future environmental conditions based on development trend, assumption of the development and proposed projects by each scenario. The impacts are assessed not by project base proposed by each scenario, except the first scenario, which shows a future urban development situation where in the current trend continues without significant intervention to the growth of urban areas, but also by integrated impacts by core strategic sector. Predicting future environmental condition without the project will help sort out the changes in the environment that are part of the natural cycles against those that are caused by human-induced conditions. Impact assessment, assuming "with the project" scenario involves three processes: impact identification, impact prediction and impact evaluation. Impact identification involves determining the likely direct, indirect and cumulative effects or changes in the various attributes of the environment that will likely be caused by activities. Impact prediction involves characterizing the type, magnitude or spatial dimension of the effect or changes on an environmental resource and the likelihood of their occurrence due to the project. Impact evaluation involves analyzing the importance or significance of the impacts predicted, whether beneficial or adverse.

10.22 The analysis was conducted based on the following assumptions, in brief, (a) Base Case Scenario has no strategic intervention to urban and transportation development was implemented, (b) Current Construction Plan Scenario has (i) relatively low density, (ii) unclear city center and (iii) unclear transit-oriented development concept, and (c) Accelerated Urban Growth Scenario has (i) North-South development direction (Hoi An to be integrated), (ii) compact and high-density mixed land-use integrated with strong public transport corridors, (iii) multiple urban centers with hierarchy, (iv) extensive green and open space network and (v) well managed urban design and landscape. With regard to the scenario 2, "SEDP Danang up to 2020" is also taken into account, since the current construction plan was re-amended and approved in 2005, while the SEDP is based on the up-to-dated city's situations and formulated in 2008, which is still under discussion before submitted to the central government. The table below shows the summary of the integrated impacts of each environmental and social impact, compiled from core strategies and their proposed projects in the SEDP for the scenario 2, and those in this report for the scenario 3. It is, however, assumed that proposed projects in the SEDP are taken also into the consideration for the assessment of the scenario 3; yet, the core strategies and projects proposed for the scenario 3 are given higher priority for the assessment of the impacts.

Table 10.3.1 Evaluation of Environmental Plan

	Items	Base Case	Current Construction Plan	Accelerated Growth Strategy
Pollution	Air Quality	B	B	E
	Noise and Vibration	D	D	D
	Water Quality (groundwater and surface water)	B	E	E
	Soil	-	-	-
	Wastewater	B	E	E
	Solid Waste	B	E	E
	Coastal Area	C	C	C
Natural Environment	Forest Conservation & Management	C	C	C
	Flora and Fauna (Biodiversity)	C	C	C
	Ecosystem	B	C	C
	Global Warming	B	B	E
Social Environment	Involuntary Resettlement	B	B	A
	Regional Severance & Community Dividend	-	-	-
	Socially Vulnerable Group (poverty, indigenous & ethnic)	B	E	E
	Cultural & Historical Heritage (remains, cultural & historical assets)	-	E	E
	Landscape	A	A	E
	Greenery, Park & Open Space	A	E	E
	Healthcare & Public Health (Hygiene)	C	C	C
	Living Environment	B	C	E
	Safe & Security (crime, disaster management, etc)	C	E	E
	Local Economy (commercial business)	C	+	+
	Existing Social Infrastructure & Social Services	C	+	+
	Uneven Distribution of Benefit & Damage	-	-	-
	Offensive Odor	-	-	-
	Accidents	B	B	+
	Other Social Issues (social stability, inequality, etc)	-	-	-
	Overall Evaluation	√	√√	√√

Source: DaCRISS Study Team.
Note:
Categories for evaluating each environmental item
A: Significant negative environmental impact is expected
B: Negative environmental impacts is expected to some extent
C: Negative environmental impact is not known at this study stage (possible impact is expected)
D: Negative environmental impacts are currently seen and there is no significant measure will be taken to alleviate it, or no clear direction is indicated.
E: Alleviation of negative environmental impact is expected or at least a direction of negative impact alleviation can be anticipated from the strategies and/or associate proposed projects
+: Positive environmental impact is expected to some extent
-: No impact is expected
Categories for overall evaluation
√: Current environmental trend is expanding and scaling up, and/or significant adverse impacts are expected for some of the environmental items
√√: Negative environmental impacts are expected to some extent and/or negative impact alleviation measures are appropriately taken into consideration on proposed strategies and projects
√√√: Minimal or no adverse impact is expected

Table 10.3.2 Evaluation by Scenario

Category & Items	Scenario 1	Scenario 2	Scenario 3
Pollution			
Air quality	(-) weak law enforcement and monitoring (-) Increased vehicles cause more CO^2 emission	(-) no concrete plan to decrease the number of vehicles (-) insignificant countermeasures against ceasing air pollution at Industrial zones	(+) foster the use of public transportation and reduce the number of vehicles (+) expedite human resource development for air quality monitoring and enhance law enforcement to factories at industrial zones

Noise and vibration	(-) no significant countermeasures or policy, in particular, against aircraft noise	(-) no significant countermeasures or policy, in particular, against aircraft noise	(-) no significant countermeasures or policy, in particular, against aircraft noise
Water quality	(-) weak law enforcement and monitoring (-) no specific countermeasures for groundwater (+) PIIP project	(+) decisive countermeasures will be taken to improve water quality (+) PIIP project (-) no specific countermeasures for groundwater	(+) decisive countermeasures will be taken to improve water quality (+) PIIP project (-) no specific countermeasures for groundwater
Soil	-) no significant countermeasures or policy are expected	(+) countermeasures of polluted water leakage at the solid waste dumping site	-) no significant countermeasures or policy are expected
Wastewater	(-) discharge untreated wastewater to lake, river and sea (-) sprawling of residential areas where wastewater treatment facilities are not installed	(+) PIIP project (+) decisive countermeasures against hospital wastewater discharge	(+) PIIP project (+) strict law enforcement against industrial zones, hazardous wastewater discharge, hospital wastewater discharge
Solid waste	(-) no decisive measures to overcome solid waste issues	(+) 3R (recycling, reduction and reuse) activities	(+) 3R (recycling, reduction and reuse) activities
Coastal area	possible negative impacts are expected, if necessary measures to alleviate wastewater pollution are not taken, and tourism development without any environment considerations is undergone, and so on	possible negative impacts are expected, if necessary measures to alleviate wastewater pollution are not taken, and tourism development without any environment considerations is undergone, and so on	possible negative impacts are expected, if necessary measures to alleviate wastewater pollution are not taken, and tourism development without any environment considerations is undergone, and so on
Natural Environment			
Forest conservation	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate and tourism	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate and tourism	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate and tourism
Flora and Fauna (Biodiversity)	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate, and tourism in mountainous and coastal areas	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate, and tourism in mountainous and coastal areas	considerable negative impacts are not foreseen at this point, but possible negative impacts due to the expansion of development toward mountainous areas for residential estate, and tourism in mountainous and coastal areas
Ecosystem	(-) negative impacts are expected from compounded impacts of air, surface water, ground water and soil.	considerable negative impacts are not foreseen at this point, but possible negative impacts are expected if planned measures are not taken	considerable negative impacts are not foreseen at this point, but possible negative impacts are expected if planned measures are not taken
Global warming	(-) no significant countermeasures or policy	(-) no significant countermeasures or policy	(+) foster the use of public transportation and reduce the number of vehicles

Social Environment			
Involuntary resettlement	(-) construction of infrastructure requires a range of degrees of involuntary resettlement	(-) construction of infrastructure requires a range of degrees of involuntary resettlement	(-) construction of infrastructure requires a range of degrees of involuntary resettlement (-) compared to scenario 1 and 2, scenario 3 requires further land acquisition because of road, park and other infrastructure development plans are proposed; yet, it does not necessary mean adverse impacts will be expected to PAPs
Regional severance & community dividend	no impact is expected	no impact is expected	no impact is expected
Socially vulnerable group	(-) no specific policy is perceived for socially vulnerable group	(+) policies and tangible projects are planned for physically impaired, ethnic group, and elderly people	(+) policies and tangible projects are planned for physically impaired, ethnic group, and elderly people
Culture & historical heritage	(-) no specific policy is perceived	(+) policies and tangible projects are planned for preserving historical heritage and culture, such as culture center, library and parks	(+) policies and tangible projects are planned for preserving historical heritage and culture, such as culture center, library and parks
Landscape	(-) no specific policy is perceived to control landscape	(-) no specific policy is perceived to control landscape	(+) strategic policy and institutional arrangement are proposed to control and preserve the landscape
Greenery, park and open space	(-) no specific policy or tangible project is perceived to develop greenery and park	(+) policies for greenery and park development are suggested, but no tangible plans are perceived	(+) strategic policy, institutional arrangement and set-up are proposed to develop greenery and parks
Living environment	(-) without proper residential development plan along with basic infrastructure development might cause negative impacts	(-) basic infrastructure development will bring better living environment; yet, uncontrolled urban and residential area development might cause negative impacts	(+) basic infrastructure, such as water supply, wastewater treatment, greenery and park development will conduce better living environment
Healthcare & public health	considerable negative impact is not know at this moment	considerable negative impact is not know at this moment	considerable negative impact is not know at this moment
Safe & security	considerable negative impact is not know at this moment	(+) affirmative disaster management will reduce the damage of natural disaster	(+) affirmative disaster management will reduce the damage of natural disaster
Local economy	considerable negative impact is not know at this moment	(+) constructive and tangible economic investments will bring positive impacts; high-tech industrial park, tourism,	(+) constructive and tangible economic investments will bring positive impacts; high-tech industrial park, tourism,
Existing social infrastructure	considerable negative impact is not know at this moment	(+) existing infrastructure will be upgraded or expanded	(+) existing infrastructure will be upgraded or expanded
Uneven distribution of benefit & damage	no impact is expected	no impact is expected	no impact is expected
Offensive odor	no impact is expected	no impact is expected	no impact is expected
Accidents	(-) no specific policy is perceived	(-) no specific policy is perceived	(+) new road network, use of public transportation, traffic management and traffic safety education projects will contribute to positive impacts

Source: DaCRISS Study Team.

(e) **Land Acquisition and Involuntary Resettlement:** Vietnam has well-designed and quite comprehensive land acquisition and involuntary related regulations.

(i) Land Law dated 26 November, 2003

(ii) Decree No.181/2004/ND-CP dated 29 October, 2004 on the implementation of Land Law

(iii) Resolution No. 22/1998/ND-CP dated 24 April, 1998 on compensating when the state collect the land for national defense and security, national and public benefits, issued by the central government

(iv) Decision No. 122/2003/QĐ-UB dated 24 July, 2003 of DPC on compensating for the damages and support the households' resettlement fee when the state takes back the land in Danang City

(v) Decision No.58/2004/BD-UB/QD-UBND dated 5 October 2004 of DPC on Amending Article 33 of the Law of Compensating for the damages and support the households' resettlement fee when the state takes back the land in Danang City issued enclosed with Decision No. 122/2003/QD-UB dated 24 July, 2003 of DPC

(vi) Decree No.188/2004/ND-CP dated 16 November, 2004 on methods of determining land prices and assorted-land price frame

(vii) Decree No.197/2004/ND-CP dated 3 December, 2004 regarding compensation, support, and resettlement where land is recovered by the state

(viii) Decision No.47/2006/QD-UBND dated 18 May 2006 of DPC on framework of compensation and resettlement for organizations and Individuals affected by land acquisition

(ix) Decision No.107/2006/QD-UBND dated 20 December, 2006 providing regulations on prices of different types of land in Danang City.

(x) Decision No.108/2006/QD-UBND dated 20 December, 2006 providing regulations on damages compensation, support and resettlement when the State recovers land in Danang City.

(xi) Decision No.71/2007/QD-UB/QD-UBND dated 20 December 2007 of DPC on compensating costs and supporting households' resettlement fee when the state acquires a land in Danang

(xii) Decree No 84/2007/CP dated 25 May, 2007, providing additional regulations on issuing certificate of right of land use, land acquisition, implementation of right of land use, procedures of compensation, supports and resettlement when the State acquires land and grievance redress about land.

10.23 Observations and interviews with administrative officials, political social association and project affected persons indicated that land acquisition and resettlement committees have been set up properly according to the regulations, and most people are satisfied with the procedures, monetary compensation and lands provided for relocation. For example, the resettlements in Hai Chau District has been smoothly carried out in scheduled time, due mainly to the fact that the district government has prepared relocated land within its district, so project affected households have little interference in their living life compared to that of previous house location. Evidences from interviews suggests that many affected people in the central urban areas are well-off after the relocation because they can now face their houses to wider road and land value is higher in such locations, while farmers who lost their production lands are somehow suffered from the transforma-

tion of occupation in rural areas, pointed out by both Women's and Farmers Unions. Likewise farmers, project affected peoples who did not have proper land certificate were suffered from less monetary compensation compared to those who hold it; yet, it is inevitable consequence, considering the fairness of application of laws. It is suggested, however, that non-monetary compensation, to some extent, should be provided to those people, in particular, those who lost their farming land. Interviews with such people suggested that those affected people could not only find a decent job, but also had to bear financial burden to build a new house, or pay for a rent for a social housing arranged by the local government. As for legal bases, the local government has well-shaped and advanced land acquisition regulations and guidelines, so that an issue to be raised here is to properly carry out and monitor the progress. Since Danang City already has established several committees for this purpose, it is suggested to let civil society organizations involve actively on this matter.

(f) **Considerations on Environment and Social Impacts against Scenario 3:** The major adverse environmental impact of the scenario 3 comes from land acquisition and involuntary resettlement; for example, almost all proposed transportation projects, and physical facilities construction projects, such as hospitals, schools and parks, need land acquisition and involuntary resettlement to some extent. However, considering the its system have been carried out effortlessly in Danang City, it is fair to presume that it will not be a significant cause of environment and social impacts; yet, it should be carefully monitored. It is suggested to set-up a non-governmental watch-dog organization, in order to farther ensure the safety net of project affected peoples because the evidences of interviews and observations suggest none of institution oversees the implications of project affected persons from cross-cutting perspectives. Women's union, farmers' union, respective project or district's committee have respectively confronted and solved problems, yet some common issues, such as job training for farmers and elderly, consultation for people who has difficulty fitting in new living environment, or financial issues, could be discussed and sought solutions from broader perspectives.

10.24 Another expected adverse impact is water pollution. Water supply and wastewater treatment plant construction projects are underway, and Danang City is planning to cover almost all areas by 2020, but until the projects are completed, untreated wastewater discharge will be inevitable incident. It is suggested, meanwhile, to focus on industrial and medical wastewater discharge and take necessary efforts, much further law enforcement, to mitigate water pollution. Since the Study Team could not collect any information about the financial resources of water quality management at DONRE, it is difficult to conclusively mention, but according to the its environmental report, it is fair to say DONRE does not seem to have enough financial and human resources to conduct necessary monitoring for water resource quality management. Besides that, it is understood from the collected data that DONRE and other related governmental agencies, like DOH do not have proper database system to maintain and utilize the collected data. For example, DOH does poses huge amount of data about the water quality of wells in Danang City, but it is not ready for data analysis or mapping down to GIS, so it is suggested to improve data processing and utilize existing data.

10.25 As known in Vietnam, a trend of motorcycle and vehicle increase will account for the increased risk of ambient air pollution, besides the smoke from industrial estates. The Study Team, therefore, proposed a public transportation and modal shift from private to

public mode to mitigate the overall amount of exhaust gas emission.

10.26 Forest and biodiversity protection should be also taken into account. A road construction project and tourism projects are considered as a risk to environment. Danang City is surrounded by precious natural environment and it is also an asset for the city to attract tourists, so there must be careful planning to balance between natural protection and developments. There are 14 species of endangered flora and one fauna in Hoa Vang District and Son Tra Peninsula. Although Son Tra Peninsula is designated as Natural Park, a development for tourism is also planned and underway at fringe area of the park.

2) Stakeholder Meeting

10.27 Stakeholder meeting was planned and conducted twice in August, 2009. The Primary objective of the meeting was to listen into public opinions about various issues related to the master planning, in particular, spatial structure, transportation and environmental issues. The meeting was also aimed to fulfill the requirement set by the "JICA Environmental and Social Consideration Guidelines" as well as "General Technical Guidance for Strategic Environmental Assessment (SEA)" stipulated by the Vietnam government.

10.28 As for the stakeholder meeting, a participatory planning approach was adopted to encourage affirmative involvement of stakeholders, namely civil society, business entity, public corporation and local authority, to the planning process of the Study. One of the expected results from such meeting was to have better understanding over the city's social issues, and more importantly it will be an opportunity for the public to raise their opinions and to participate to the process of the planning of the urban city master for the first time in Danang City. The preparation started from an identification of key stakeholders to be invited to the meeting.

10.29 A list of stakeholders that Danang City usually invites to such meeting was requested, but there was no such list; furthermore, a concept of stakeholders seems to be merely understood by related agencies, so that the first step was to identify public corporations, civil societies and any kind of organizations that related to urban planning. It was a quite a challenge to identify such organizations, especially considering the selected organizations should represent and acknowledge by the public, to some extent. Unlike other neighboring countries, it was difficult task to find social groups not attached to politics in Danang City, which is also widely understood fact in Vietnam, though. As widely known, Fatherland Front Union, Women's Union, Youth Union and Farmers Union are so-called political social groups since they are officially recognized organization and receive annual financial resources from the government. The following table shows the selected participants for the stakeholder meetings. Except the city and district government agencies, most of organizations were visited in advance to the meetings to know about their activities and to explain about the objective of stakeholder meetings to ask for the attendance. The meetings were conducted twice, August 15, and 22, 2009. Both meetings were conducted in Saturday, considering most participants their own business during the weekday. Although about 70 participants were listed up, the attendance of the meetings was quite low, in particular, the second meeting. The reasons of low attendance are seemed to be 1) low recognition of the Study and the meaning of stakeholder meeting, 2) broad and unfamiliar issued discussed in the meeting and 3) insufficient preparation and/or the meetings should be adjusted or modified in a way the people are more familiar to participate, i.e., a question and answer session between the public verses the government.

Table 10.3.3 Participant List of Meetings

No.	Name	Category	Position	Organization	15-Aug	22-Aug
1	Nguyen Le Giang Thien	Academic	Dean	Faculty of Tourism, Duy Tan university	X	
2	Nguyen Dang Tuyen	Academic	Chief	Faculty of Tourism, Duy Tan university		X
3	Hoang Hai	Academic	Professor	Department of Environment, Danang Polytechnic University	X	X
4	Phan Cao Tho	Academic	Vice Dean	Highway and Bridge Department, Danang Polytechnic University	X	
5	Ha Van Tho	Academic	Vice Director	Economic university - Danang University		
6	Nguyen Hiep	Academic	Rector	Danang University		
7	Pham Tiem	Academic	Engineer	Danang Vocational Training college		
8	Nguyen Dac Loc	Academic	Engineer	Environmental Protection Branch in Central Vietnam	X	
9	Tran Van Quang	Academic	Dean	Danang Polytechnic University	X	
10	Nguyen Thi Le	Academic	Vice Dean	Danang Polytechnic University	X	X
11	Nguyen Hoang Long	Association	Chairman	Danang city Society for the Support of Handicapped and Orphans	X	
12	Huynh Tan Vinh	Association	Chairman	Danang Tourism Association		
13	Le Van Kien	Association	Representative	Senior Citizens Association		
14	Ton That Thanh	Association	Chairman	Public Health Association		
15	To Van Hung	Association	Chairman	Danang University		
16	Tran Viet Hoe	Business	Chairman	Danang Road Freight Transportation Association	X	
17	Nguyen Thanh Ngoc	Business	Director	Vietnam Small and Medium Enterprise Association	X	
18	Tran Ky Nam	Business	Staff	Vietnam Commerce and Industry Chamber		
19	Thai Ba Canh	Business	Vice Chairman	Danang Industrial & Export Processing Zone Management Board	X	
20	Huynh Ba Luc	Business	Architect	Central Urban - Rural Planning Center	X	X
21	Dang Le Quang	Business	Engineer	Quang Nam Post Office Building and Developing Co.	X	X
22	Thai Quoc Phong	Business	Engineer	Danang International Airport	X	X
23	Vo Nguyen Thanh Binh	Business	Engineer	Agriculture - Forestry Consultancy and Design Co.	X	X
24	Doan Ngoc Son	City government	Manager	PC of Hai Chau district	X	
25		District government	Manager	PC of Hai Chau district		
26		District government		PC of Thanh Khe district		
27	Luu Van Hao	District government	Vice chairman	PC of Son Tra district	X	
28	Nguyen Thanh Linh	District government		PC of Ngu Hanh Son district	X	
29		District government		PC of Lien Chieu district		
30		District government		PC of Cam Le district		
31		District government		PC of Hoa Vang district		
32	Le Thi Thuan	District government		Hai Chau district	X	X
33	Luong Nguyen Minh Triet	Political Social Society	Chairman	Danang Youth Union		
34	Ha Thi Minh Phuong	Political Social Society	Vice chairman	Fatherland Front, Danang Branch		X

No.	Name	Category	Position	Organization	15-Aug	22-Aug
35	Do Thi Kim Linh	Political Social Society	Chairman	Danang Women's Union		
36	Nguyen Quang Nga	Political Social Society		Danang Famers Union		
37	Phan Thi Nu	Public Corporation	Manager	URENCO	X	X
38	Lam Quang Minh	Public Corporation	Director	Investment Promotion Center	X	
39	Le Ngoc Thuy	Public Corporation		Danang Park Corporation	X	
40	Le Thi Nam Phuong			Danang Young Business Association		X
51	Hoang Tran Minh Nguyet		Vice manager	HRI Institute		X
52	Phan Chau Tuan	District government	Vice Chairman	Lien Chieu district		
53	Tran Dao	Political Social Society	Vice Chairman	Lien Chieu district		X
54	Nguyen Thi Bich Van	Ward government	Chairman	Thanh Khe district		
55	Tran Tien Hung	Ward government	Staff	Thanh Khe district		
56	Vo Van Hoa	Community leader	Head	Thanh Khe district		
57	Nguyen Dinh Ca	Community leader	Head	Thanh Khe district		
58	Nguyen Van Tinh	District government	Head	Thanh Khe district		
59	Dang Le Thu Minh	City government	Expert	DOST		X
60	Nguyen Huu Sy	City government	Vice manager	DOC		
61	Dinh Van Tinh	City government	Vice manager	DOT		
62	Huynh Thi Thuy Van	City government	Expert	DPI	X	
63	Tran Xuan Thang	City government	Expert	DOCST	X	
64	Vo Thi Hoa	City government	Expert	DOF	X	
65	Nguyen Thi Kim Ha	City government	Deputy Manager	DONRE		
66	Nguyen Van Hung	City government	Deputy Director	Urban Planning Institute		

Source: Summarized by the DaCRISS Study Team.

10.30 At the first meeting, the reason, concept and the objective of a stakeholder meeting were explained to the participant and then three scenarios were introduced. It was intended to have discussions among the participants regarding visions and a picture of future city and their expectations toward the urban city planning, but from the beginning, the meeting was more or less like questions and answers about the details of scenarios. Besides that, some of participants have more concerns on the methodology of the Study and the process of the formulation of the scenario 3 and the analyses made by the Study Team, which are not the Study Team's intention at all to discuss with the stakeholders but with the counterparts.

10.31 At the second meeting, mainly three topics, spatial planning, transportation and environmental issues are discussed. The followings show the excerpt of the first and second meeting discussions.

- The scenarios do not refer to Danang City's role and functions to the surrounding cities as well as the role of those provinces. The vision of developing Danang City is weak.
- The results of the Study Team bring some confusion to the participants who do not have prior knowledge or information about the proposed master plan and scenarios.
- The scenario 3 mentions to focus on developing the central district (CBD), yet where is CBD and is it already agreed area?
- Are the public in favor of the "compact city?" Isn't preferable to live in more space for comfortable living conditions?
- Population forecast in the scenario 3 seems to be too ambitious to reach.

- Public transportation should be planned. Why there is no plan for underground transportation system in the plan?
- There is no parking space for motorcycles. If we do not plan about public transportation and parking space now, Danang City will soon become like Hanoi and Ho Chi Min.
- The environment of Danang City is considered well, one of the good cities in the world, but it is not really sustainable. Investment is not necessary more than current conditions. If we start 3R by segregating garbage at house, it would help URENCO collect and recycle garbage more efficiently.
- The Study Team should pay more attention to surrounding cities and their development.
- In order to reach the planned population, the city should increase it by increasing the immigrants and also attack more tourists and its spin-off business.
- The Study Team should also consider about religious issue. There are four main religions in Danang City. There should be a plan to save land for churches and other religious buildings. In addition, there should also be land to be reserved for social areas and grave yard.
- Planning for apartment and residential area should be carried out more carefully, in sense of space, architecture, green space and social infrastructure in neighborhood.
- Being an international city is one of vision to be taken into account and the Study Team should have long-term vision for it.
- In Danang City, there are also ethnic group (Katu) and the poor, so some consideration should be taken for them.
- It is shame that there is no one from the governmental agencies who should be here and listen to the opinions of the resident. (As a matter of fact, there were some governmental officials attended the meetings).
- Danang City has already approved and set the population forecast to 2.5 million by year 2025, so why we need to discuss and the scenario 3, which has quite ambitious population forecast?

10.32 Most of the participants had knowledge about the master plan designed by the Danang City government, and they expressed their discussion points and questions toward the scenario 3, which the Study Team formulated, mentioning the city plan is the approved one to be carried out. Based on this fact, it is fair to say that the city government had successfully disseminated its plan to the public through existing organizations, i.e. the accountability of the city government should be well praised; yet, the other hand, as one of participants mentioned in the meeting, the stakeholder meeting was the first occasion for them to express their opinions about the master plan, and being in the master planning process. The stakeholder meeting was aid to listen to and observe the opinions and reactions of the participants, so in that sense, it can be said the meeting was succeeded, but there are some issues remained.

10.33 Challenges and Lesson Learned: It is not an easy task in Vietnam to identify stakeholders who are not attached to governmental and/or political institutions. Although there is a law laying down all civil society organization must register to local government, the Study Team could not obtain such information from the city government. In advance to the meeting, although the Study Team has visited identified organizations as many as possible and explained about the stakeholder meeting and requested for its attendance, it seems the significance of the participation to the planning process was not much recognized or understood, which ended up with low attendance.

10.34 Since population forecast was announced recently by the city government, ques-

tions raised and time for discussion in the first meeting was mostly taken regarding the population forecast estimated by the Study Team and its estimated method and credibility. Besides that, some of participants focused more on technical matters, such as methodology of study and the grounds of analyses and plan itself, which is supposed to be discussed at technical committee. It is suggested to plan small discussion groups next time separating participants by topic and issue, and participants' profession for the first time, and then followed by a stakeholder meeting like the one conducted this time because the people in Vietnam seem to want background information, more details and preparation time for discussion at a meeting like stakeholder meeting.

11 CONCLUSION AND RECOMMENDATIONS

11.1 Central Focal Economic Zone (CFEZ)

11.1 CFEZ is much more at a disadvantage compared to NFEZ and SFEZ due to various factors including (i) small population, (ii) lack of infrastructure, (iii) vulnerability to natural disasters, (iv) weak private sector and (v) weak connectivity with global market and growth hubs which are farther weakened due to (vi) lack of adequate coordination among the provinces.

11.2 However, CFEZ is also provided with strength and opportunities which have not been fully tapped including (i) diverse and rich natural environment and cultural heritages, (ii) strategic location in Vietnam and GMS region, and (iii) strong policy commitment of the Government for the growth of CFEZ.

11.3 In order to accelerate the CFEZ growth in a competitive and balanced manner among the provinces in the CFEZ, vision, goals, and basic development strategies are to be refined as follows:

(a) A vision for CFEZ is for the region to pursue the realization of being an “Eco-Tech region,” meaning CFEZ will promote economic development, ecological balance, and ethnological harmony based on the maximum use of modern technology. The idea refers to achieving the vision through technology-oriented solutions, enhanced environmental management, cultural value preservation, human resource development, and provision of strategic infrastructure.

(b) In order to enhance capacity of CFEZ, a key is to strengthen regional integration at all levels, as explained as follows:

  (i) Establish a complementary but competitive role of the CFEZ in the national development strategy;

  (ii) Strengthen connectivity with international community;

  (iii) Strengthen interprovincial coordination; and

  (iv) Attend jointly to common issues among provinces.

11.4 The importance of integration and coordination among the city and provinces in the CFEZ region as a prerequisite to sustainable development has been commonly recognized and accepted by the participants of the 2nd Steering Committee meeting where an initial delineation of roles was presented by the DaCRISS Study Team. While this initial delineation was not yet agreed upon by concerned parties and further dialogs with the provinces are suggested.

Table 11.1.1 Possible Role-sharing Among CFEZ Provinces (Tentative)

Main Agenda		T.T. Hue	Danang City	Quang Nam	Quang Ngai	Binh Dinh
Gateway Function		B	Ⓐ	B	Ⓐ	A
Strategic Development Themes	Tourism	Ⓐ	Ⓐ	Ⓐ	A	A
	Conventional Industry (heavy industry)	B	B	B	Ⓐ	B
	Services	A	Ⓐ	B	A	A
	New Business (health, education, environment)	Ⓐ	Ⓐ	A	B	B
	Human Resource Development	Ⓐ	Ⓐ	A	A	A
	Environmental Management	A	A	A	A	A
	Cultural Value Enhancement	Ⓐ	A	Ⓐ	A	A
Urban Development		A	Ⓐ	A	A	Ⓐ
Rural Development		A	B	A	A	A

Source: DaCRISS Study Team.
Note: Ⓐ = Regional role, A = Main role, B = Secondary role.

11.2 Danang City

11.5 At present it is observed that Danang City has been relatively well developed and managed, though the situation varies by area. The overall assessment of the people on living conditions and performance of services is also affirmative (see Figure 11.2.1, 11.2.2, and Figure 11.2.3).

11.6 Main issues facing the city with regard to its sustainability are more related to the future which will be amplified due to the fact that urbanization is expected to accelerate and development investments and pressures increase. They are briefly as follows:

(a) Growth and expansion of urban areas which has been already taking place. Current type of developments may create (i) insufficient landuse through low density residential developments in peri-urban areas, (ii) congestions due to high-rise developments in the city centre, and (iii) adverse environmental impacts due to resorts development along the coast.

(b) Environmental situation may degrade farther due to the following:

  (i) Urban effluents, often mixed together with industrial effluents, and pollution caused by aquaculture, which affect rivers, urban lakes, and coastal zones (in particular Danang Bay);

  (ii) Observed poor quality of groundwater and lack of systematic data on the situation of aquifers. According to a DONRE official, data exist but these “have not yet been approved by the People’s Committee”;

  (iii) Large number of construction projects (infrastructure, housing, commercial, and tour-ism facilities), resulting in land reclamation which in turn has adversely affected coast-al forests and riverbank stability;

  (iv) Solid wastes dumped in water bodies, such as urban rivers, lakes, and sea, and problems raised by the partial treatment of medical and industrial wastes; and

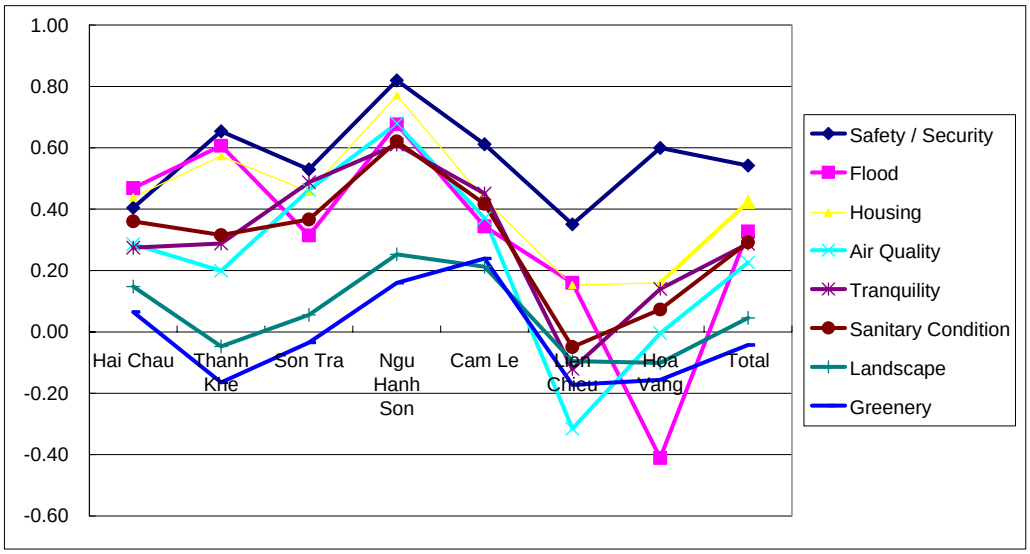
  (v) Illegal activities such as forest cutting, hunting, and fishing, which are not quantified but which remain a matter of concern.

(c) Traffic situation will worsen quickly due to unavailability of competitive public transport, shift from motorcycles to cars, farther concentration of activities due to concentration of high-rise commercial / business facilities in existing city centre. Lack of traffic management will farther amplify traffic problems in all over the city.

(d) For sustainable economic growth, the city must be prepared for creating employment opportunities to match increase in demand due to population increase and change in industrial structure from agriculture to industry and services.

(e) As urban area is expanded and development activities are intensified, vulnerability to natural disasters may increase and spoil ecosystems.

Figure 11.2.1 People's Assessment of the Living Conditions in Danang City by District, 2008

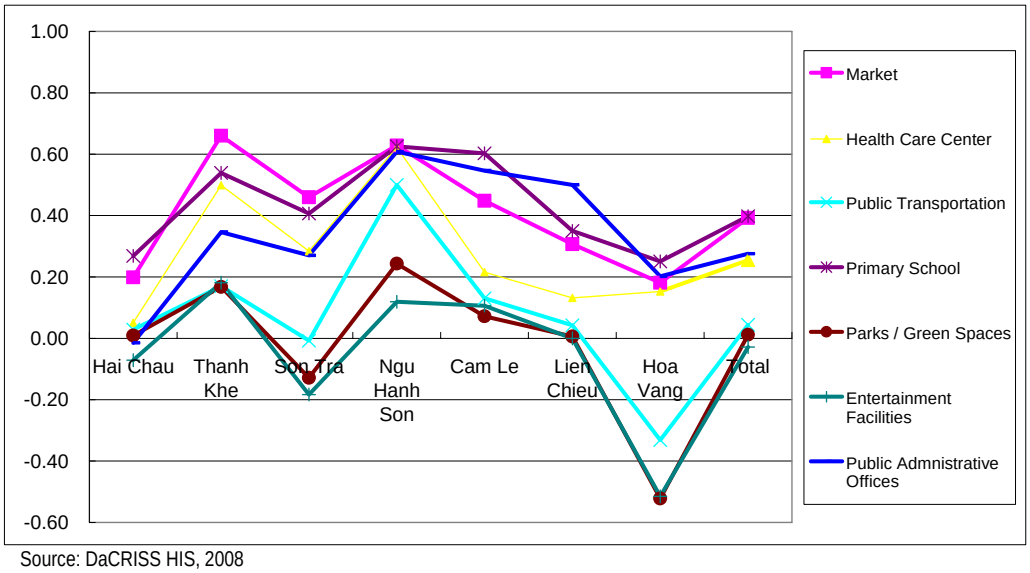


Source: DaCRISS HIS, 2008

Figure 11.2.2 People's Assessment of Utilities in Danang City by District, 2008

Source: DaCRISS HIS, 2008

Figure 11.2.3 People's Assessment of Access to Urban Services in Danang City by District, 2008



Source: DaCRISS HIS, 2008

(f) While it is clear that the people, enterprises across all sectors, and city authorities accept the "Environmental City" concept, there is a need to further elaborate the concept by formulating strategies, plans, and concrete mechanisms for implementation. Consolidating survey results, the review of current policies and plans, as well as the discussions among experts, it is thus proposed to redefine the vision and goals of Danang City as follows:

"Danang to be an Internationally Competitive Environmental City

Beyond being Pollution-free"

(i) For Danang City to become not only free from pollution but also to ensure broader environmental sustainability by preserving ecosystems and cultural assets; protecting itself from natural and manmade calamities; responding to global climate change calls; shifting the economic structure to new technology-based environmental businesses and industries, tourism, education, health care and services; and promoting an environment-friendly urban system;

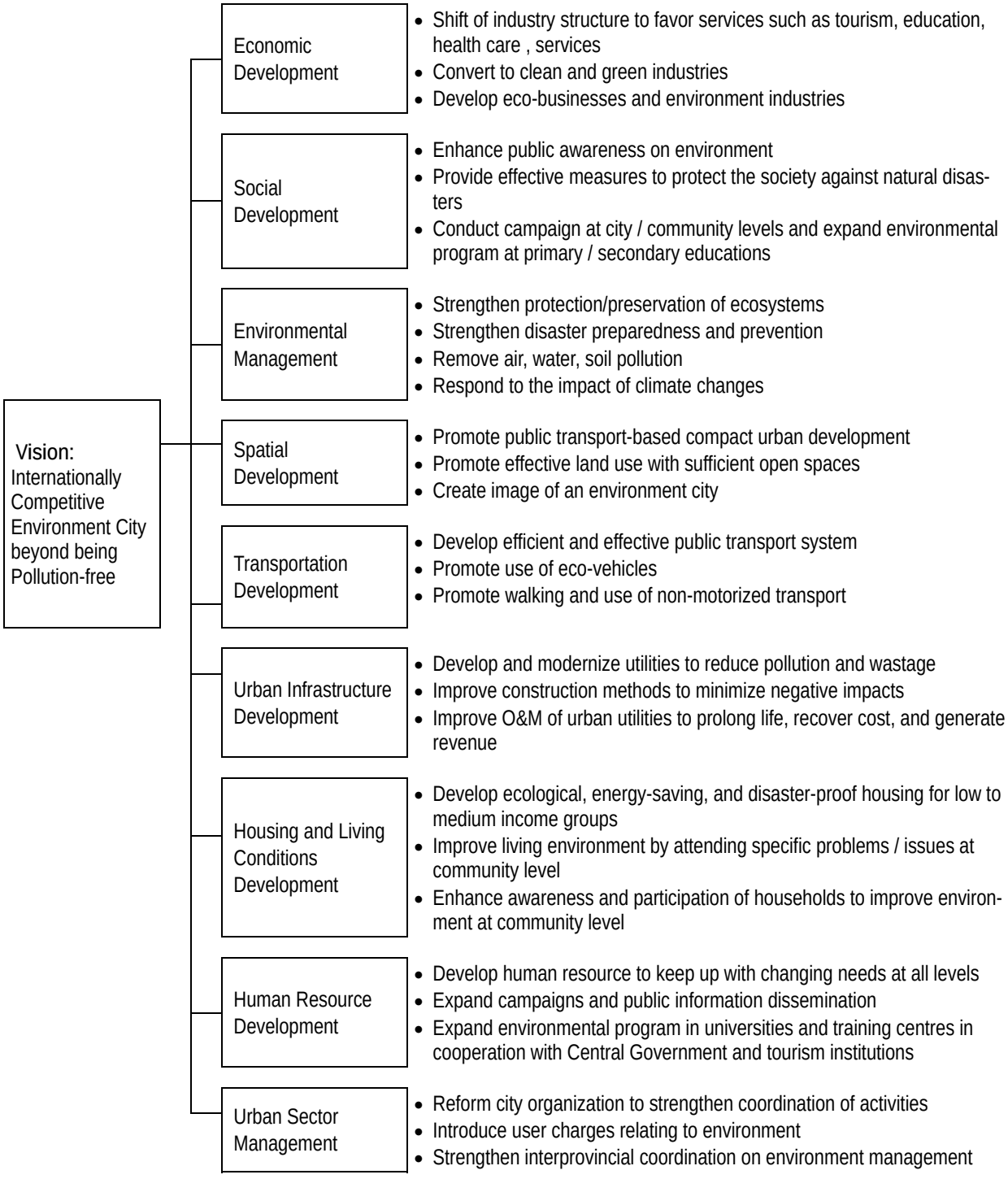
(ii) For Danang City to develop a distinct identity and an appealing image as a significant urban core in the Asia-Pacific region with a key role of connecting CFEZ with the world; and

(iii) For Danang City to become a national center for developing new industries which the country must promote in the 21st century such as new technology-based environmental industries, health care businesses, and human resource development for eco-tourism, MICE, environmental protection, disaster management, and support services.

11.7 In order for Danang City to function as a competitive third national hub to lead the growth of CFEZ and Vietnam, it is assumed that future population will be 2.1 million in 2025 and larger thereafter. It is also highly likely that updated development strategies of the study indicate that Danang will attract an increasing number of migration from various parts of the country.

11.8 A weakness in urban development planning by many Vietnamese cities is seen in the uncoordinated implementation of policies and projects among them. Lack of coordination brings about not only wastage of limited resources but also ineffective outputs. In order for Danang City to promote its envisioned development in the most effective manner, there is a need for an integration of strategies and close coordination among implementation bodies. Thus, under the vision of an environmental city, the environment should not merely be an appendage to development; rather, it should be the driving force to promote the city's sustainable development. To realize this, strategies for each urban subsector should have environment components in synergy with those in other subsectors (see Figure 1.4).

Figure 11.2.4 Integrated Subsector Strategies towards Environment City



11.9 It is also important to implement projects in a coordinated manner. For this identified projects are programmed (see Table 11.2.1).

Table 11.2.1 Proposed Strategic Programs

Goal / Objectives	Strategies	Proposed Strategic Program
A. **Economic development:** Eco - industries / business promoted and developed to accelerate growth of Danang and CFEZ	A1. Promote location of eco – industries and business by providing adequate infrastructure, investment environment and active marketing. A2. Expand eco – tourism and cultural tourism on close coordination with adjoining provinces A3. Develop quality human resources to meet increasing demand	P1. Program to promote eco – business / environmental industries and those on healthcare and human resource P2. Program to develop and promote eco – tourism P3. Program to develop higher – education on environment, high – tech, medical, and those. related to new industries
B. **Urban development and infrastructure provision:** Compact and efficient urban areas developed to provide competitive base for investment and socio – economic activities	B1. Build urban structure and enforce urban plan in a way that socio - economic activities can be accommodated efficiently and effectively in a compact urban areas B2. Develop high – quality public transport system to ensure mobility of the people and positive impacts on environment B3. Provide and operate infrastructure and utilities in a way to encourage development of compact urban area	P4. Program to strengthen enforcement of updated Urban Master Plan, development permit process and environmental zoning P5. Program to develop attractive public transportation P6. Program to develop effective urban roads P7. Program to further develop facilities and utilities including waste water treatment and drainage system and to improve their operation and management P8. Program to upgrade existing IZ and develop new green and clean industrial / business parks
C. **Environmental management:** Environmental sustainability is ensured in the process of rapid urban growth	C1. Protect and enhance ecosystems C2. Remove pollutions from socio - economic activities in the city C3. Strengthen energy – saving measures and emission control to contribute to climate change C4. Strengthen preparedness against natural disasters and hazards	P9. Program to remove pollutions in identified hot spots and strengthen monitoring and enforcement P10. Program to strengthen policy dialogue at regional and international levels P11. Program to develop flood free urban lands and settlements P12. Program to establish and operate cross sector participatory mechanism to monitor and manage environment
D. **Livability:** Living conditions and quality of life of the people enhanced which can also benefit visitors	D1. Provide affordable collective housing which is disaster proof and energy saving D2. Enhance landscape and amenity in urban and rural areas in the city for the people and visitors D3. Enhance quality of living environment at community level	P13. Program to develop new collective eco – housing (affordable, disaster – proof, energy saving) to meet increasing demand by citizens and immigrants P14. Program to establish landscape and urban design guidelines and enforcement mechanism to enhance city image and identity P15. Program to improve / enhance rural villages and quality of life in rural areas P16. Program to establish participatory mechanism to assess living environment and implement needed measures at community level
E. **Management:** City is properly managed under concerted vision and leadership	E1. Establish transparency and accountable city management system involving all stakeholders E2. Strengthen municipal funding basis by expanding user charges, private sector involvement, etc. E3. Strengthen inter – provincial coordination to accelerate growth of the city and help development of CFEZ	P17. Program to expand application of IT in city management including GIS to promote e-government and e-city P18. Program to establish improved user charge and PPP mechanism with city's initiative to expand funding sources P19. Program to strengthen investment promotion P20. Program to strengthen inter – provincial coordination on integrated planning and policy implementation

Source: DaCRISS Study Team.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