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MINISTRY OF PUBLIC WORKS
THE GOVERNMENT OF THE REPUBLIC OF INDONESIA

THE PREPARATORY SURVEY ON BALI BEACH CONSERVATION PROJECT-PHASE II IN THE REPUBLIC OF INDONESIA

FINAL REPORT (SUMMARY)

[SIMPLE VERSION]

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JAPAN INTERNATIONAL COOPERATION AGENCY

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ABBREVIATIONS

BWS-BP	:	Department of River Region Bali-Penida (Balai Wilayah Sungai Bali-Penida)
BAPPEDA	:	Regional Agency for Planning and Development (Badan Perencana Pembangunan Daerah)
BAPPENAS	:	National Agency for Planning and Development (Badan Perencana Pembangunan Nasional)
BBCP	:	Bali Beach Conservation Project
BBCU	:	Bali Beach Cleaning Up
BLH	:	Environment Agency (Badan Lingkungan Hidup)
BTDC	:	Bali Tourism Development Center
CBR	:	Cost-Benefit Ratio
CCAI	:	Coca-Cola Amatil Indonesia
CSR	:	Corporate Social Responsibility
CVM	:	Contingent Valuation Method
DD	:	Detailed Design
DGWR	:	Directorate General of Water Resources
Dinas PU	:	Department of Public Works (Dinas Pekerjaan Umum)
DKP	:	Department of Sanitation and Landscaping (Dinas Kebersihan dan Pertamanan)
EIA	:	Environmental Impact Assessment
EIRR	:	Economic Internal Rate of Return
ESE	:	East South East
FIRR	:	Financial Internal Rate of Return
GOI	:	Government of Indonesia
GRDP	:	Gross Regional Domestic Products
HWL	:	High Water Level
HIS	:	Travel Agency in Japan
JICA	:	Japan International Cooperation Agency
JTB	:	Japan Travel Bureau
JTOA	:	Japan Tour Operator Association
Loka Pantai / Loka Penerapan Teknologi Pantai	:	Sub Experimental Station for Coastal Engineering
M/M	:	Minutes of Meeting
MPW	:	Regional Advisory Council (Majelis Pertimbangan Wilayah)
NGO	:	Non-Governmental Organization
NPV	:	Net-Present Value
O&M	:	Operations and Maintenance
OJT	:	On the Job Training
PHRI	:	Association of Hotel and Restaurant Indonesian (Perhimpunan Hotel Restaurant Indonesia)
PMU	:	Project Management Unit
PP	:	Coast Guard (Penjaga Pantai)
PPP	:	Public Private Partnership
PR	:	Public Relation
REPELITA	:	Development Plans on the Five Years (Rencana Pembangunan Lima Tahun)
S	:	South
SE	:	South East

SSE	:	South by South East
SSW	:	South by South West
TKMPP	:	Coordination Team for Beach Management (Tim Koordinasi Pengelolan dan Pemeliharaan Pantai)
W	:	West
WG	:	Working Groups
WNW	:	West North West
YPS	:	Sanur Development Foundation (Yayasan Pembangunan Sanur)

Summary

(1) Review of the Beach Monitoring and Maintenance System on Phase-1

a) Current Condition at Phase-1: Beaches and its Problems

- **Intended Purposes of Phase I:** The Bali Beach Conservation Project (the Phase-1 Project) serves a multi-function on the contribution for conservation of different fields; that is the "Conservation of property (effect on property protection)", "Conservation of tourism (effect on the economy)", "Conservation of Balinese culture and society", and "Conservation of coastal environment"
- **Achievements:** It was proven that the Phase-1 Project has a great contribution for the development and maintenance of tourism in Bali Island. These were proven based on collected information, tourism statistics data, and back analysis of economical contribution using actual data for the change of occupation rate of hotels after the completion of the project.
- **Problems Prevailed on Beach Maintenance:** On the other hand, several problems have been exposed regarding beach maintenance, monitoring, and management in the post project stages of the Phase-1 Project at Sanur, Nusa Dua, and Kuta. The problems on beach maintenance and management in the Phase-1 Project are; 1) insufficient and ineffective actions adapted for the partial beach retreats, 2) coastal facilities, such as revetments, groins and offshore breakwaters, and public facilities such as walkway, gazebo, light stand, etc., were left unfixed, 3) beach trash such as washed-up seaweeds, plastics, cans, and bottles were left at public beach areas, 4) encroachment of buildings on recovered sandy beach, such as the illegal construction of facilities and changes of alignment of walkways done not only by stakeholders but also by the local governments, 5) detailed definition of illegal construction practices and procedures on permission to construct the buildings were not clear, not only in the Phase-1 beaches, but also in other beaches in Bali. The encroachment of facilities into the beach induces the deterioration of its environment, loss of foreshore area which leads to new beach erosion.
- **Cause-1 (Lack of Engineering Skills and Experience):** For the technical part on beach management including beach monitoring and evaluation, Balai Wilayah Sungai Bali Penida (BWS-BP) has been responsible for its post-project stage. The BWS-BP has also made a contract with the local consultant to carry out continuous beach monitoring based on the topographic survey. However, due to lack of experience and skill of BWS-BP for understanding the adaptive management system on beach nourishment, the effective and systematic monitoring, evaluation, and countermeasures of maintenance

works have not been doing well. The accumulated monitoring data have not been well maintained and the obtained data have not been used appropriately.

- **Cause-2 (Unclear Division of Responsibilities Among Managing Bodies):** According to a Minute of Discussion (MOD) which was agreed by the central and local governments after the completion of the Phase-1 Project, it was decided that the local governments of Bali Province, Badung Regency, and Denpasar City would take responsibility for the maintenance work of the beaches after handing over the project area from the central government to the local government. However until now, no action has been undertaken by the local governments so far. Until now, the maintenance work in the Phase-1 Project area has been undertaken by the central government (BWS-BP) as required. The present condition on the beach maintenance was caused by the following reasons; 1) Previous MOD was concluded among the common rank of each party and was not authorized by higher officials. As a result, the responsibilities of managing bodies were remained unclear and the agreement became useless eventually; and 2) Actual and definite maintenance and management works were not clear enough for each related party. Each party actually did not understand the required actions and works on beach maintenance and management.

- **Cause-3 (Insufficient Participation of Stakeholders in Beach Maintenance and Management):** There were no active involvements from stakeholders (communities, hotels, restaurants, marine sports shops, etc., in each area) in the maintenance and management work of the beach after the completion of the Phase-1 Project (except beach cleaning at their territory area). A basic understanding of the stakeholders was that the governments would take care of all beach maintenance and management works using government budget.

- **Cause-4 (Lack of Understanding on the Importance of Maintaining Beach Environment among Stakeholders):** Beach cleaning, which is one of the beach management items, has been mostly conducted by the stakeholders in Sanur, Nusa Dua, and Kuta. Although the specific area (the South Kuta area) has been well controlled by stakeholders in cooperation with the private sector or/and NGOs, rubbishes, seaweeds, driftwoods, etc., were left on the beach at some local areas. These conditions were causing the deterioration of the beach environment and utilization of tourism resources. This problem was thought to be caused by the lack of understanding on the importance of a comprehensive beach management and maintenance among each stakeholder.

- **Cause-5 (Lack of Understanding on the Rule of Beach Use and Function of Walkway):** Illegal construction of facilities such as public facilities, souvenir shops, etc., which were constructed by hotels, communities, and sometimes by the local government, were identified on the recovered sandy beaches at Sanur, Nusa Dua, and

Kuta, even though the beach area is designated as a public space by the government. Furthermore, the alignment of walkways was illegally moved to the ocean in some areas, even though walkways have an important function in identifying the boundary between private and public properties. This problem was mainly caused by insufficient public understanding for the rule of beach use and unclear definition of the walkway as the boundary between public and private properties at beach area.

- **Cause-6 (Unclear Regulation at Foreshore Area as Buffer Zone and its Procedures):** The construction of facilities at the beach areas is not allowed by the regulation of each regency to keep the beach as a buffer zone in coastal areas. New construction of facilities such as fences, seawalls, and other coastal protection facilities, in addition to the construction of hotels, villas, shops, and restaurants, are being built at foreshore public areas even though it was prohibited by government regulations. This problem was mainly caused by unclear regulations on beach riparian, restrictions, procedure for permission, and punishment.

- **Particular Issue of Sand Outflow at Kuta:** Topographic change and volume of sand remains of the beach were reanalyzed by using shoreline monitoring data which has continuously carried out since the Phase-1 Project stage. The remaining rate of nourished sand at Sanur and Nusa Dua still maintained approximately 90% of its sand in eight years since the completion of the project. However, partial beach retreats were also observed at some sections which were protected by groins (headlands) at both sides. Some maintenance works such as sand relocation from deposit area to retreat area, and small-scale additional re-filling of sand were required at some sections. At Kuta, serious sand outflow after the beach nourishment and the decline of grand level at toe part of constructed revetment were observed at the northern part of the Kuta coral reef area (nearby the third offshore breakwater BWN3). Further, the beach recession between the south end sand stopper and the first offshore breakwater (BWN1) was also observed. These problems at Kuta were mainly due to the difference of beach conservation method between original design and actual which was caused by the social problems at Kuta during the Phase-1 Project.

b) Measures Implemented for the Improvement of Beach Management and Maintenance

- **Activity-1 (Categorizing the Issues):** In order to improve the current condition on beach maintenance and management, the beach maintenance and management were divided into five items, such as: 1) Monitoring and maintenance of beach fill area; 2) Maintenance of coastal facilities; 3) Maintenance of landscape and public facilities; 4) Beach cleaning; and 5) Beach utilization (Control of beach use). The necessary action and

the desirable responsibility for each maintenance and management item were examined by the JICA Study Team. The drafts of the beach management system and its action plan were also examined and presented in Chapter 5. This aims to achieve sustainable beach management based on the cooperation of public and private sectors.

- **Activity-2 (Active Involvement of Local Governments and Stakeholders to be Promoted):** Not only the central governments but also the local governments and related stakeholders, should take responsibilities of beach maintenance and management with their ownership. Based on the draft idea on beach maintenance and management examined by the JICA Study Team presented in Chapter 5, continuous and thorough discussions and consultations were conducted to the central and local governments through the working group meetings (WG1 to WG3) and to the related stakeholders through several individual and comprehensive stake holder's meeting, as shown in Chapter 4.

- **Activity-3 (Establishment of Inter-organizational Committee):** In order to achieve sustainable beach management activities among related parties, namely, the central and local governments, and representative stakeholders, the JICA Study Team proposed to establish a comprehensive coordination organization namely, "Coordination Team for Beach Management (TKMPP)" to discuss and make a decision for the required long-term beach maintenance and management for the Phase-1 Project beaches. The main objective of TKMPP is shown in Section 5.3 (2), Chapter 5.

  The organizational structure, task sharing on beach maintenance and management, as well as the legalization process of this TKMPP were outlined based on several case studies which were examined by the JICA Study Team through the discussions in WG1 to WG3.

- **Activity-4 (Transfer of Engineering Skills):** In order to improve the technical skills on beach monitoring and maintenance, which is especially necessary for the staff of the central government (BWS-BP and other related technical sectors in water resources, ex. Loka Pantai) for controlling the sandy beach after the nourishment, capacity development through lectures from the JICA Study Team and technical advisers (Dr Uda and Dr Seino), were held during this study. The previous O&M manual was also updated by employing the latest monitoring data. By using the newest monitoring data, a lecture on "adaptive management" for the project on beach nourishment was given. The transfer of knowledge for beach management to relative institutions was carried out through WG meetings and capacity building by lecture and OJT as described in Section 4.2 and 4.3, Chapter 4.

- **Activity-5 (Promoting Participation of Stakeholders on Beach Management):** In order to enhance the stakeholders' awareness on the importance of participating in beach maintenance and management, consultation and consensus building based on group discussions were conducted with the stakeholders at Sanur, Nusa Dua, and Kuta. The

stakeholder's meetings were held at each beach area to discuss the selected issue, such as: 1) small-scaled recovery of shoreline by stakeholder level through sand relocation from nearby accumulation area to retreat area in Sanur; 2) Beach cleaning issue of Kuta beaches; and 3) Prevention of illegal construction on the beach in Nusa Dua. Furthermore, a seminar was held on September 13, 2012 for the purpose to enhancing the awareness on the importance and necessity of sustainable beach management and maintenance, which was participated by both related stakeholders and governments. The methods and activities for stakeholder's meeting are described in Section 4.4, Chapter 4 in detail. The further discussion is necessary to achieve the involvement of stakeholders on beach maintenance trough individual discussion and TKMPP.

- **Activity-6 (Promoting Participation of Private Business Firms):** The possibility for cooperation of private sectors as CSR scheme on beach management or public relation (PR) was examined. Many private sectors are already participating in the management of the beaches. They are cleaning the beaches while some are already involved in minor transportation of sand, placing securities, and rising fund for beach management. Many private firms expressed positive opinions on cooperating with government sectors. As for public relation (PR), major Japanese tourist agencies agreed to support its PR activities. Further discussions including schedule and budget were required for new PR development with private firms. The approach and activities for promoting participation is described in Section 5.5, Chapter 5 in detail. It is necessary to discuss continuously about PR activities and establish new PR system for sustainable beach management among private companies during implementation of the Phase-2 Project because it takes for a long time to establish this system.

- **Activity-7 (Catalyzing Public and Private Sectors):** The action for beach maintenance and management in cooperation with the public and private sectors has just been proposed and started in Indonesia. The experience and skill of the public sectors in Indonesia for beach maintenance and management especially the adaptive management, which is required to the management to maintain the sandy beach, is still insufficient. In the Asian countries, only Japan has lessened and learned the beach maintenance and management trough both of excellent and inferior experiences. Thus, continuous support based on the experiences in Japan may be contributed to achieve the effective management system and to rise up technical skills which are necessary to proceed the suitable beach maintenance and management with the ownership of Indonesia.

c) Outcomes for the Study of Review of the Beach Monitoring and Maintenance System on Phase-1

- **TKMPP to be Formulated:** In the final working group meeting (WG3) held on July 20, 2012 it was concluded and agreed by the following top level management of the central and local governments to establish a "Coordination Team for Beach Management (TKMPP)" of which the function is to discuss and make decisions for necessary actions for beach maintenance and management for the Phase-1 Project beaches. The members of TKMPP will be authorized by governor of Bali Province in order to empower them to make a decision of countermeasures and implementations against beach management issues.

  - Mr N. Donny Azdan (Director of Watering and Irrigation , BAPPENAS)
  - Mr I Gusti Ngurah Raka (Head of BWS-BP)
  - Mr Tjol. Pemayum (Head of Bappeda, province of Bali)
  - Mr Wayan Suambara (Head of Bappeda, Badung Regency)
  - Mr I Gusti Anindya Putra (Head of Bappeda, Denpasar City)

  In this meeting, five management items as mentioned before were agreed. The central and local governments (provincial, regency and city) promised to clarify the task and responsibility for each management item. Furthermore, the government organizations have committed to take necessary actions for the establishment of TKMPP immediately.

- **TKMPP to be Managed and Organized:** The decree of the Governor of Bali to establish the beach management coordination team (No. 1.694/02-C/HK/2012) was issued on 19th October, 2012. According to this decree, BAPPEDA (Planning Department in Bali Provincial Government) is in charge to organize the TKMPP. The head of Public Works Services of Bali Province (Dinas PU of Bali Province) is the chairman for TKMPP in cooperation with BWS-BP. Regency governments (DINAS of Badung Regency and DINAS of Denpasar City) will also take action on the part of beach maintenance and management works as one of main players, including budget allocation. However, certain technical part such as monitoring, evaluation, planning, and design, will be handled by the central government (BWS-BP) which will give technical suggestions to the local governments. Details on the division of responsibilities and required actions shall be discussed and decisions will be made in the TKMPP.

- **Stakeholders' Participation is Confirmed:** Stakeholders for each beach fully understood the importance and necessity for beach maintenance and management. Stakeholders also understood the necessity for sharing the task of beach maintenance and management at their level. In the seminar, the representatives of each stakeholder including hotels and communities informed that they are ready to participate in the beach

maintenance works possibly at their level. To achieve this, they requested governments to take necessary action such as establishment of TKMPP and discussions, etc immediately.

(2) Feasibility Study of the Phase-2 Project

a) Condition at the Study Area

- **Definition of the Study Area:** The study area is divided into two coastal areas; the east coast and southeast coast. The study area in the east coast is defined in this study to extend from North Sanur (north end of the Phase-1 Project area at Sanur) up to Candidasa with approximately 30 km alongshore. The study area in the southwest coast is from North Kuta (north end of the Phase-1 Project Area at Kuta) up to Canggu with approximately 15 km alongshore.
- **General Information at East Coast:** In the east coast, there are more than ten beaches situated alongshore. Most of the beaches belong to the local tourism or residential area with volcanic sandy beaches. Serious beach erosion caused by the rapid decrease of sand inflow from rivers was identified at the area from the mouth of the Ayung River up to the mouth of the Unda River, with approximately 20 km alongshore. Padangbai and Candidasa, which is located 25 km and 30 km far from the south tourism area are international tourism areas with coral reef. Based on the previous technical reports and papers, beach erosion at Candidasa which has occurred since the 1980s due to tourism development was caused by large-scale coral mining.
- **General Information at Southwest Coast:** The southwest coast from North Kuta ~ Legian ~ Sminyak, which consists of sandy beaches with mixed corals and volcanic sand, is now the highest international beach resort area in Bali Island. A lot of foreign and domestic tourists visit there. Many kinds of beach and marine activities are performed such as sunbathing, walking, surfing, body boarding, and sightseeing as it is one of the best location to watch the sunset.

b) Selection of Three Candidate Sites

- **Requirement:** According to the Minute of Meeting between Indonesian Government and JICA, three candidate sites shall be selected in this study by employing an appropriate evaluation criteria and checking items. Further, it was required that the candidate beach shall contribute to further development of world tourism in Bali.
- **Procedure for Selection:** Two main criteria are firstly considered for the selection that are; a) contribution to tourism in Bali and b) beach condition that is degree of beach erosion and obstacle to beach activities. If the subject beaches fulfill above two criteria, the candidate sites are preliminary selected. Among the selected beaches, further three

checking points are considered, that are c) socio-environment, d) coastal environment, and e) realization of beach management. If these points are expected not to affect the negative impact to the preliminary selected beaches, these beaches finally become the candidate beaches for the Phase-2 Project.

- **Selected Sites:** Based on two main criteria, Candidasa, North Kuta ~ Legian, and Seminyak were selected as the first priority of candidate beaches for the Phase-2 Project. As the result for the evaluation of three checkpoints, no obstacle was expected for selected candidate beaches. The selected two beaches at the south west coast, which is North Kuta ~ Legian and Seminyak belong to continuous stretched sandy beach. Thus, it was combined as one package. The candidate sites for the Phase-2 Project are summarized as shown below.

  Package-1: Candidasa (East coast)
  Package-2: North Kuta ~ Legian ~ Seminyak (Southwest Coast)

- **Necessity for Improvement at Kuta:** Kuta is one of Phase-1 Project beaches. Beach nourishment with construction of three offshore breakwaters was undertaken from runway to the end of Kuta reef with 2.6km alongshore distance. Furthermore, beach nourishment without any kinds of coastal structures was undertaken from the north end of Kuta reef to the Alam Kul-kul Hotel with 1.6 km alongshore distance. However, as presented in Chapter 6, the significant sand outflow after undertaking the beach nourishment has been observed at the south reef area of Kuta. This was mainly due to the difference of beach conservation method between original design and actual which was caused by the social problems at Kuta during the Phase-1 Project as mentioned in (1), a) in Summary. Thus, it was recommended to conduct the improvement measures at Kuta to mitigate the further outflow of sand, even though Kuta belongs to the Phase-1 Project and it is out of the study area.

c) Beach Conservation Plan

- **Validity on the Future Development Policy:** The validity of the Phase-2 Project was examined based on the Indonesian development policy, contributions of the Phase-1 Project, and needs for the Phase-2 Project. From the Indonesian development policies such as the National Medium-Development Plan (RPJMN) in 2010-2014, Bali Province Medium-Development Plan in 2008-2013, Spatial Plan in Bali Province in 2009-2029, and Strategic Plan of Ministry of Public Works in 2010-2014, it was confirmed that the proposed beach conservation project has the same direction and follow the said policies.

- **Validity Based on the Contribution of the Phase-1 Project:** It was proved that the Phase-1 Project gave a great contribution not only to maintain and develop the tourism,

but also to enhance the welfare of residents to conserve the culture, religion, and their life. Similar contribution was expected for the Phase-2 Project.

Package-1: Candidasa

- **Beach Erosion:** The first selected area, in Candidasa is the most major tourism beach at the east coast area. On the other hand, the sandy beach has almost disappeared by beach erosion and the beach utilization, beach approaching and the landscaping as the tourism area has deteriorated by the existing vertical concrete seawalls, a lot of groins and offshore breakwaters. According to the long term shoreline change, the retreat of shoreline due to beach and land erosion was 20 m to 40 m in the east area, and 40 m to 60 m in the west area for 30 years. Even though the large-scale coral mining on the reef, which was carried out from 1969 to 1974, was the primary cause of beach erosion, uncontrolled construction of seawalls and groins caused further deterioration of the beach condition. The mechanism of littoral sand drift and cause of erosion are described in section 10.6, Chapter 10.
- **Beach Conservation Plan:** It was requested to recover the sandy beach as previous condition in order to maintain the beach utilization and landscaping as world tourism area. On the other hand, westward littoral drift due to oblique incident waves from the south to south-south-east direction exists at Candidasa. Thus, it was required to minimize the littoral sand movement by employing the groin system as the same method as that in Sanur and Nusa Dua in the Phase-1 Project. As the suitable beach conservation measures, sand nourishment with a combination of modification of the existing groins and seawalls was recommended. The detail of layout plan and design is described in Chapter 11.
- **Consideration in the Design:** The width of coral reef at Candidasa is narrower than that at Sanur and Nusa Dua. It is expected that the difficulty to maintain the sandy beach is as the same level as that for Sanur and Nusa Dua after the beach nourishment. To secure the maintenance of nourished sand as much as possible, the following considerations are recommended on planning beach conservation measures; 1) Sand nourishment is planned to recover the beach width not too much as the same level as that at Sanur and Nusa Dua, taking into account the original situation of the beach width at Candidasa (originally the beach width was not so wide). Basically, only recovering the foreshore part was considered, and recovering of the backshore was not expected, 2) Position of the modified revetment is planned to be set-back as much as possible. However, further consultation and consensus building is required to each hotel owner to finalize the alignment of revetment to obtain their agreements.
- **Subject to Project Distance:** There are two options for the project area. One is from the peninsula located at the east end of Candidasa (Tanjung Nti) to the temple (Pura

Dalem Samudra), 3 km alongshore (Case-1). Another is from the peninsula to Alilla Manggis Resort Hotel, 5 km alongshore in order to cover the whole problem area (Case-2). The extended area for Case-2 with 2 km alongshore belongs to mostly private properties, and the foreshore area was altered by the owners to construct the private villas. Taking into account of this social condition as well as the economical efficiency based on economic analysis, Case-1 was recommended as the first phase of the Candidasa project. However, further discussion is required with the Indonesian government to determine the scope of the project.

Package-2: North Kuta ~ Legian ~ Seminyak

- **Beach Erosion:** Beach erosion at this area seems not so serious compared to that of the east coast. However, according to the long term shoreline change, the beach recession for 30 years was observed at 5 m to 15 m at Legian-Seminyak and 10 m to 20 m at north Semiyak. The beach space becomes too narrow during high tide and is causing the disturbance of beach activities. The mechanism of littoral sand drift and cause of erosion are described in section 10.7, Chapter 10.
- **Beach Conservation Plan:** The most advantage of this beach area is still the maintenance of the natural sandy beach and without any kind of artificial coastal protection facilities. This present beach condition and its utilization shall be maintained in the long term as the highest beach resort area in Bali. This is the purpose of the proposal on beach conservation project at this area. This area was expected as a “balanced area” on littoral sand movement based on the technical study. Taking into account the abovementioned beach condition and technical point of view, beach nourishment without any kind of coastal structures is recommended. The detail of layout plan and design is described in Chapter 11.
- **Project Area and Design:** The recommended area for beach nourishment is from the north end of beach nourishment which is carried out in the Phase-1 Project (Alam Kul-kul Hotel) up to Kudeta Restaurant at Semiyak, 2.9 km alongshore. The target width of the beach is 20 m to recover almost the same condition of the beach 30 years ago. The beach slope is assumed at 1:10 taking into account the current beach slope and assumed grain size for filling sand.

Package-3: Improvement at Kuta

- **Issue after Completion of the Phase-1 Project:** Kuta is one of the Phase-1 Project beaches where beach nourishment was undertaken from the runway at the south end up to Alam Kul-kul Hotel at the north end, with a 4.2 km alongshore distance. Based on the monitoring result, undesirable outflow of sand was observed at the south part of the nourishment area which is located at the Kuta reef area. According to the monitoring result, the total amount of sand loss during the last three years was estimated roughly at 80,000 m^3 (20% from total quantity of nourishment). This quantity of sand loss was significantly higher than that in Sanur and Nusa Dua (10% for eight years)

- **Cause of the Issue:** The undesirable outflow of sand was mainly caused by the difference between the proposed design and the actual implemented layout due to social problems encountered during the Phase-1 Project. Originally, the beach nourishment with three headlands and one groin system were proposed in the detailed design in 1998. However, before commence of the implementation, strong objections on the construction of headland system was suddenly brought up by the communities and related NGO group. Due to this, the project was suspended for three years. After conducting the socialization for more than 100 times, the communities agreed to carry out the project to employ beach nourishment with three offshore breakwaters as well with their proposed crown height. Even though the effectiveness to maintain the nourished sand became low, the project side should agree on their conclusion in order to proceed with the implementation of the project.

- **Improvement Plan:** In order to reduce further outflow of nourished sand, it was recommended to improve the current beach condition at Kuta as Package-3, even though the proposed site is the Phase-1 Project area and is out of the study area. The recommended improved measures is to add the groin part at the onshore side of exiting offshore breakwaters; BWN1and BWN2, following the original design concept in the Phase-1 Project. In addition, based on the monitoring result after the beach nourishment, it was recommended to construct the new L-shape groin at the south part of the existing offshore breakwater (BWN3) in order to stop further beach recession surrounding this area.

- **No Possibility of Further Social Problem:** Local people and communities, who had strong objection in the Phase-1 Project, have already realized the insufficiency of the present structures to control the sand movement after identifying the different condition for maintaining nourished sand between Kuta and Sanur, Nusa Dua. Thus, it is expected that there will be no further social problems to undertake the recommended measures for improvement.

d) Implementation Plan

Package-1: Candidasa

- **Mitigation Measures for Natural Environment:** One of the attractive points of Candidasa for tourists is the transparency of seawater and the existence of coral habitat. This has to be fully taken into consideration for the planning and implementation of the project to maintain marine environmental conditions. Some of the existing corals which are attached at some parts of the surface will be affected by the removal of existing offshore breakwaters. To mitigate this, coral transplantation by utilizing a newly formed space at the head part of modified groins is proposed. In the implementation, turbidity should be minimized as much as possible during the excavation and filling of sand on the beach. Taking into account this point of view, the sand mining from the offshore area using trailer suction hopper dredger, which is the same method used in Phase-1 Project, is not recommended. The grab-dredger with attached special sealing type bucket to minimize the turbidity during sand mining is recommended. Furthermore, the double handling method for transport of mining sand, unloading on the land, land transportation and filling on the beach is recommended.
- **Mitigation Measures for Social Environment Problem:** During the sand filling work in Phase-1 Project, a serious discontentment was raised by the community nearby the sand borrow site because the sand is taken to benefit other communities on their sacrifice.. In order to avoid the same kind of problem, it is recommended to avoid transporting sand for outsiders' benefit: sand procurement should be done within the community.

Package-2: North Kuta ~ Legian ~ Seminyak

- **Availability of Sand Borrow:** Based on the results of the diving survey for the potential area for sand borrow pit, the fine grain size of sand, which is not suitable for stable sand nourishment, is predominant located offshore of the Legian - Seminyak area. On the other hand, there is a potential area to obtain suitable sand at the offshore area of the Kuta coral reef. Thorough explanation on sand excavation plan and the impact is necessary to the Kuta community.
- **Method for the Nourishment:** Taking into account the economical and environmental considerations as well as present beach use, direct pumping method using trailer suction hopper dredger, which is the same method used in Phase-1 Project, is recommended.

Package-3: Improvement at Kuta

- **Use of Stocked Sand for Sand filling:** Sand stockpile with 140,000 m^3 of sand was prepared south of Sanur, mainly taking into account the future possibility for refilling of sand at Kuta during the Phase-1 Project after the change of conservation plan due to social problems. This stocked sand can be available for refilling of sand which is required in this improvement.

e) Schedule and Engineering Services

- **Duration of Construction:** The estimated construction period is 36 months for Package-1, 10 months for Package-2, and 16 months for Package-3.
- **Road Map to Operate the Beach Maintenance and Management System:** The establishment of beach maintenance and management system was proposed in this study and the expected road map was proposed in section 5.4, Chapter 5. However the establishment of beach maintenance and management system is the first trial in Indonesia, and it is necessary to lesson and learn through the actual operation work on beach maintenance and management. To support the beach maintenance and management works in the Phase-1 and future implemented Phase-2 Project Beaches, the soft component was proposed as the engineering services in the Phase-2 Project. Detail is described in section 12.3, Chapter 12
- **Cost for Soft Component:** The cost for soft component is estimated at US$ 2.6 million.
- **Engineering Services:** The components of engineering services in the Phase-2 Project are; 1) Detailed Design, 2) Assistance in Bidding, 3) Construction Supervision and 4) Soft Component.

Chapter 1 Introduction

1.1 Background

More than 30% of the coastal area in Bali Island, Indonesia has been utilized as a tourist area and its beaches have been contributed to the country's tourism economic development. On the other hand, beach erosion problems have been serious due to tourism development since 1970. Several reasons were realized as causes of erosion such as; 1) sand mining from the river and river mouse to obtain the construction material, 2) coral mining on the coral reef flat to obtain the building material, and 3) uncontrolled construction of coastal facilities (seawall, groins, etc.) individually at foreshore area.

To recover the original natural coral sandy beaches, the beach conservation project, namely, "Bali Beach Conservation Project (BBCP)" (hereafter referred to as "the Phase-1 Project") was undertaken by Indonesian Government financed by Japanese government. Three seriously eroded beaches, namely, Sanur, Nusa Dua, and Kuta, with a total length of 18 km, and one sea cliff erosion area at Tanah Lot Temple were selected taking into consideration their tourism importance. The sand nourishment with supplementary coastal facilities in combination with groins, headlands, and offshore breakwaters were employed to recover the coral sandy beaches at the said three beaches except Tanah Lot. This project was first implemented in Tanah Lot in July 2000, while those for other beaches commenced subsequently. The project was finally completed in December 2008 with Kuta as the final package.

The recovered sandy beaches highly contributed to the maintenance of the tourism industry in Bali. On the other hand, several problems on beach maintenance and management were exposed after the completion of the project. Consequently, unsatisfactory beach conditions, which are related to beach maintenance and management system, were observed at several areas.

The international beach resort area is concentrated at the south part of Bali Island, which has adverse influence on tourism considering the constant increase of tourists. To relieve the concentration at the said area, a new resort site shall be developed as part of the tourism area extending towards the east and west coastal area. On the other hand, beach erosion problem has expanded to almost all the coast areas in Bali Island.

1.2 Objectives of the Study

The objectives of this study are as follows:

- **Component 1 (Review of the monitoring and maintenance system of the Phase-1 Project)**

  To review and study the sustainable monitoring and maintenance system for the beaches of the Phase-1 Project involving related stakeholders, to achieve a sustainable and appropriate beach maintenance after the project.

- **Component 2 (Feasibility study for the project)**

  To review and study the feasibility of the next beach conservation project (as Phase-2 Project) considering selection of a candidate beach, scale of project, and feasibility for sustainable beach maintenance based on the study result for component 1

1.3 Study Area

The study areas covered in this preparatory survey work are shown in Figure 1.3.1.

- For component 1:

  Sanur, Nusa Dua, and Kuta (nourishment of beaches in the Phase-1 Project)

- For component 2:

  East coast area (from north Sanur to Candidasa with approximately 30 km alongshore)

  West coast area (from north Kuta to Canggu with approximately 15 km alongshore)

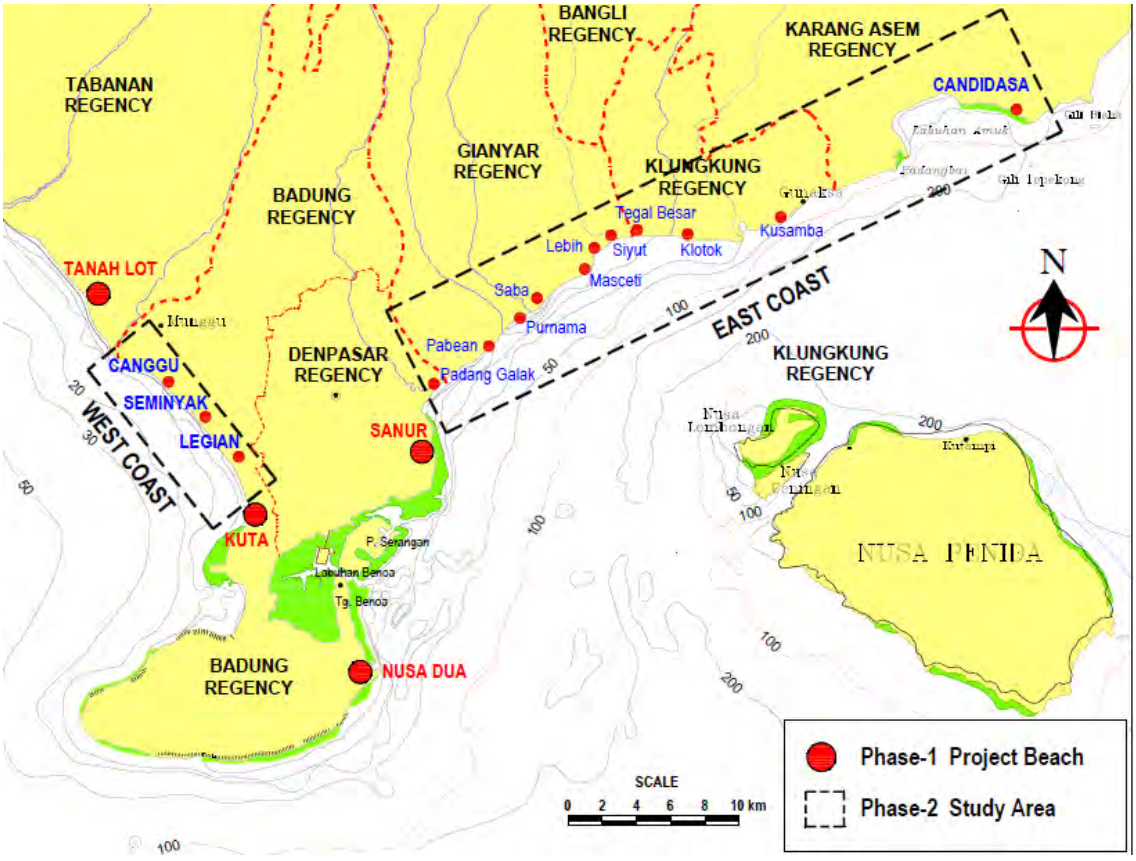


Figure 1.3.1 Location of Phase-1 Project and Phase-2 Study Area

(Source: JICA Study Team)

1.4 Outline of Previous Phase-1 Project

(1) Project Outline

The Bali Beach Conservation Project (Phase-1 Project) consists of four packages, namely, Sanur (Package-1), Nusa Dua (Package-2), Tanah Lot (Package-3), and Kuta (Package-4). Among these, Sanur, Nusa Dua, and Kuta are facing serious beach erosion problems on coral sandy beaches. On the other hand, Tanah Lot has cliff erosion problems.

The Bali project sites are highly populated with tourists. Hence, the project is expected to contribute in maintaining and further developing the tourism sites in Bali as a world famous

beach resort. To achieve this, it is required to consider not only the protection point of view, but also beach utilization, landscaping, and beach environment as a tourist area. Beach nourishment was the only measure to fulfill these requirements, and was undertaken to recover the coral sandy beach at Sanur, Nusa Dua, and Kuta.

(2) Problems

Beach nourishment is noted as a kind of "soft structure", with sand fill constantly moving (or sometimes flow out) due to wave and current, despite the existence of supplementary coastal facilities. Thus, beach maintenance and management based on an "adaptive management system" shown in Figure 1.4.1 is strongly recommended.

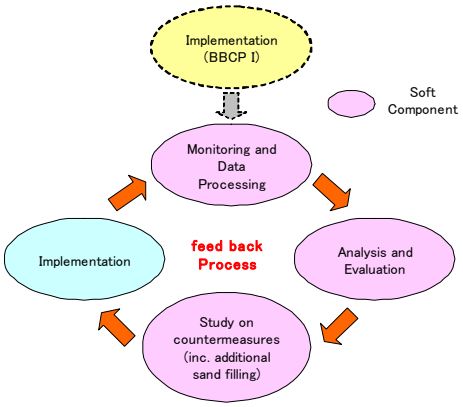


Figure 1.4.1 Coastal Management Based on "Adaptive Management System"

(Source: JICA Study Team)

After the completion of the Phase-1 Project, the issue for beach maintenance and management system was discussed. The sharing of responsibilities on beach maintenance and management were also discussed between the central and local governments. However, beach maintenance and management has not been doing well, and unsatisfactory beach conditions due to insufficient maintenance and management have been observed at several areas in the Phase-1. Such conditions include partial beach retreat, damaged coastal facilities, inefficient cleaning of beaches, and uncontrolled beach use, especially illegal construction activities along the beach.

These problems will cause the deterioration of beach conditions for Phase-1 beaches and might have negative effects on tourism development.

1.5 Understanding the Current Condition

Current Condition of Beach Maintenance and Management of Phase-1 Beaches

(1) Problems of the Governments in charge of Coastal Management

a) Insufficient skills and experience on beach maintenance and management

The beach monitoring and maintenance after the Phase-1 Project has been carried out basically by the Department of River Region Bali-Penida (Balai Wilayah Sungai Bali-Penida, hereinafter referred to as "BWS-BP"). However, the effective and useful monitoring, and undertaking of countermeasures did not seem to be carried out successfully. This was caused by insufficient capacity of beach management system (monitoring → evaluation → planning → execution) based on "Adaptive Management System" which was required to the beach nourishment project.

b) Unclear issues on sharing of responsibilities on beach maintenance and management between central and local governments.

According to the agreement between the central and local governments during the Phase-1 Project in the workshop, the beach maintenance work will be handed over by the central government (Dinas PU) to the local government (Bali province and regency). However, there was no activity by the local government in terms of beach maintenance and management.

(2) Problems of the Stakeholders

a) Insufficient involvement on beach maintenance and management

The cleaning of the beach, which is one of the periodic maintenance items, has been carried out continuously at most in the project beach areas by hotels and each community within their territory. A clean beach condition could be maintained at these areas. On the other hand, there exist some unsatisfactory cleaning conditions at some areas. Seaweeds and rubbishes have accumulated on the beach, which causes deterioration of beach's landscape and coastal environment.

b) Illegal construction on recovered sandy beach

The boundary between the private and beach areas under the government territory was defined by a newly constructed walkway. However, some illegal facilities were constructed by hotel owners and communities after the completion of the Phase-1 Project.

(3) Problems of End Users and Private Sectors

The contribution and participation of end users (tourists and residents) and private sectors are desired through sharing some responsibilities on beach maintenance works. However, most visitors (including both Indonesian and foreign tourists) did not realize the execution of the Phase-1 Project, and misunderstood that the condition of the Phase-1 beaches were maintained without further effort. Due to this, people's awareness in participating in beach maintenance was regarded low.

Understanding the Phase-2 Study Area

(1) Development of Infrastructure at East Coast and Expansion of Resort Area at West Coast

The Government of Bali has developed the east and west coast area in order to disperse and expand the tourism area. The new development of infrastructures and tourist sites have been executed at the east coast area. The high grade villas, hotels, and restaurants are being developed at the south west coast area from north Seminak to Canggu.

(2) Proposed Area for Coastal Protection and Beach Conservation Measures by the Government of Indonesia (GOI)

The beaches, where coastal protection and beach conservation measures are required, has been identified by GOI based on site investigation. More than 20 eroded beaches were selected as beaches requiring coastal protection and beach conservation measures.

Lessons Learned from the Phase-1 Project

(1) Importance of Concensus Building to the Communities

As the Phase-1 Project was the first large-scale beach conservation project employing the method of beach nourishment, several social problems were exposed as follows:

- Strong objection from the Kuta community for employing groin system (This was caused by the negative image of this type of structure based on their previous experience).
- Strong objection from the neighborhood community for dredging sand from offshore area

- Hard negotiation with private owners of land properties and hotels regarding the identification of walkway alignment, which will serve as the boundary between the beach area (under the control of the government) and their property.

One of the uniqueness of Bali society is the strong power of the community. The area of the Phase-1 Project was widely spread with several different communities. Hence, individual consensus building for each community was required to obtain the final acceptance for the the project. To proceed with the consensus building smoothly, it was learned from the Phase-1 Project that frequent face to face explanation and discussion with each community to gain mutual trust is very important.

(2) Necessity of Understanding the Difference between "Beach Conservation" and "Coastal Protection"

The most important consideration for beach conservation is how to maintain the beach taking into account not only the functional point of view, but also utilization, landscaping, and coastal environment as a tourist area. Beach nourishment is the most common method for fulfilling the multi-purpose beach conservation measures. On the other hand, outflow of sand is anticipated and frequent maintenance work to re-fill the sand is commonly required. In order to reduce the outflow of sand and minimize maintenance cost, construction of coastal facilities such as groins, headlands, breakwaters, and revetments are sometimes excessive. Consequently, this leads to the deterioration of beach utilization, natural landscaping, and coastal environment, which are strongly required especially for the tourist beaches. Thus, it is very important to consider the balance between "functional and economical point of view" and "utilization, landscaping, and coastal environment" as beach conservation measures, especially at tourist beaches.

REVIEW OF THE BEACH MANAGEMENT SYSTEM ON PHASE-I

Chapter 2 Review of the Current Situation on Beach Management

2.1 Current Situation on Beach Monitoring and Maintenance

(1) Technical Skill for Monitoring and Data Archive System

- The current situation of beach monitoring becomes worse as capability of technical skill for monitoring has declined since the completion of the project. The objective of monitoring surveys and how to analyze/evaluate and conclude the required maintenance activity based on "Adaptive Management Concept" are not well understood by BWS-BP.
- Archiving of monitoring data by BWS-BP is also one of the problems. Data of long monitoring period is very important and useful to be able to evaluate and know the actual beach phenomena and shoreline movement. As recognized by the JICA Study Team, the data archiving of beach monitoring by BWS-BP is worse since it is difficult to collect the existing data.

(2) Technical Skill for Planning on Beach Maintenance

According to inventory survey and result of shoreline data, construction of groins in the Sanur area has an effect on controlling beach erosion. However, beach erosion has not reduced even though three additional groins which serve as countermeasures were constructed in the north of Nusa Dua. It is observed that the technical skills required for the evaluation of monitoring data and planning on beach maintenance are not enough.

(3) Capability of Beach Monitoring and Maintenance by Government Institutions Related to Beach Management

- Government institutions except for BWS-BP and Environmental Agency of Bali Province did not allocate a budget for monitoring activities for Phase-1 Project. Both budget of BWS-BP and Environmental Agency have increased gradually and their budget for 2011 were Rp.380,000,000 and Rp.50,000,000, respectively. The principal monitoring activities of BWS-BP and Environmental Agency were 1) beach profile survey and 2) monitoring of seawater, coral reef, sea grass, and mangrove based on EIA, respectively.
- Government institutions except for BWS-BP have never allocated budget for maintenance activities. The fiscal budget scale of BWS-BP is between Rp.8,000,000 and Rp.6,470,000,000 since 2007. BWS-BP allocated a maximum budget in 2007, and this consists of construction of groins and additional sand nourishment from sand stockpile in Sanur as countermeasure against partial retreat of the beach. In the 2010 and 2011 budget, comparatively, more budget was also allocated for the construction of groins and additional sand nourishment in the north of Nusa Dua (Tanjung Benoa Area) such as Rp.4,460,000,000 and Rp.3,330,000,000, respectively.

(4) Usage of Sand Stock for Maintenance of Phase-1 Beaches

In the Phase-1 Project, the sand stockpile was constructed at south Sanur (Mertasari Area), and 140,000m3 of sand was stocked taking into account future re-filling of sand as the maintenance of the Phase-1 Beaches for ten years. Main portion of the sand stock was expected to be used for the sand re-filling at Kuta Beach based on the predicted quantity of sand outflow. Until now, only roughly 21,000m3 of sand was utilized by BWS-BP for the sand re-filling at North of Nusa Dua. However as the beach monitoring after this measure was not conducted, the effectiveness for the measures was not clear.

There was no determined plan for the usage of sand stock based on the evaluation result of beach monitoring, and still 120,000m3 of sand was remaining, even though almost ten years has already passed since completion of the nourishment at Sanur and Nusa Dua.

The reason why the stock sand was not used effectively is;

- The beach change and the condition of beach retreat doesn't be well evaluated by BWS-BP based on the result of beach monitoring
- The ownership and usage of sand stockpile and stocked sand was not clear to the governments (local governments) and stakeholders. Due to this, even if some parties or hotels has a problem on the beach retreat in front of their property, and they want to consider some rehabilitations to recover the sandy beach, there is no chance to consider the usage of stock sand with cooperation of BWS-BP.

2.2 Current Situation on Beach Management System

(1) Current Situation on Management of Nourished Beach and Facilities

Some coastal and public facilities have been damaged after completion of the project due to progression of partial retreat of beach, wave overtopping, various human activities, etc. In order to reduce partial retreat of beach, some maintenance and construction works have been implemented by BWS-BP. However, these works have not reached the inclusive maintenance because only a small portion of countermeasures were done. Serious beach erosion has been occurring in the following areas; southern part of Sanur, northern part of Nusa Dua, and in front of Kartika Plaza Hotel in Kuta. Some parts of the revetment were damaged due to progressing beach erosion and scouring due to waves. Regarding public facilities, some pavement parts of the walkroad on the groin were damaged due to wave overtopping and some areas of the walkway were also damaged and washed out due to beach erosion.

Photo 2.2.1 Partial Retreat of Beaches

(Source: JICA Study Team)

Photo 2.2.2 Damages to Coastal Facilities

(Source: JICA Study Team)

Photo 2.2.3 Damages to Public Facilities

(Source: JICA Study Team)

(2) Current Situation on Beach Cleaning Control

Improper disposal of trashes is one of the major problems faced by Phase-1 beaches. Continuous cleanup is necessary to keep the beach clean since trashes are not only coming from the land but also from the ocean continuously. In most cases, the beach surroundings in front of a hotel is properly kept clean by hotel employees; on the other hand, public areas and fisherman's quarters located just next to the hotel are covered with trashes. The trashes degrade the area's tourism value which also affects the hotel business. In addition, some parts of the walkway are covered with sand where stakeholders neglect to clean.

Plastic wastes are scattered along Nusa Dua Beach Coastline

Walkway almost covered by the sand (Nusa Dua)

Dump site located in the public area of Kuta Beach

Beach cleaning was intermitted in some parts of Sanur Beach

Photo 2.2.4 Current Situation on Beach Cleaning

(Source: JICA Study Team)

In public beaches, there is a successful case of beach cleaning activity that was implemented by the corporate social responsibility (CSR), sellers, traditional village, and Badung Regency, etc., on a systematic basis. Since 2008, the Coca-Cola Amatil Indonesia (CCAI) and Quiksilver Indonesia (Quicksilver), a company that deals with surfing equipment and clothing have been providing funds for beach cleaning activities in Kuta, Legian, Seminyak, Jimbaran, and Kedonganan as a framework of corporate social responsibility. However, cleaning activities have not been implemented sufficiently in most public areas of Sanur, Nusa Dua, and Kuta except in the north of Kuta and Legan area. The unoccupied lands in between hotel properties especially in Nusa Dua are not kept clean due to unclear responsibilities.

(3) Current Situation on Beach Management with End Users Matter

For beach end users, mostly tourists and local residents, one of the most important beach management issues is a beach cleaning. The issue is inevitably connected with broader issues over environment/sanitation and education/awareness. Those issues have been treated and practiced by various groups of communities, that is to say governments, locals, business, schools, NGOs and volunteers.

Those groups collaborate each other in order to complement their advantages. Those advantages are, simply said, policies by governments, reality awareness by locals, financing by business, education by schools, expertise by NGOs and mobilization by volunteers. In those advantages, there is an emerging positive phenomenon from the business community. That is called a corporate social responsibility (CSR) derived from a spirit of donation by private companies to the social welfare. The CSR initiative has been actually observed within the Project in the field of beach cleaning activities. There is little doubt in Bali that the initiative has been growing and eventually benefits a beach management issue.

On the other hand, there is another encouraging phenomenon within the NGO community in Bali. More and more NGOs are united to work together for environmental causes. Such a movement eventually enhances and consolidates the knowledge and skills of environmental issues. It has been observed, therefore, that NGO enjoys a pivotal role in CSR beach cleaning activities and school environmental education. Furthermore, school in turn offers good opportunities for volunteer groups because volunteer spirits are friendly subjects easily taught among children and the youth. It is also with NGOs and schools that local communities can easily be mobilized.

Lastly accumulated experience with those collaborations reinforces the capacity of local government to deal with the beach management issues.

2.3 Current Situation on Beach Management Policy

(1) Chronology of Discussion for Beach Management System

The demarcation of responsibilities for beach management have been discussed and recorded since 2004 as shown in Figure 2.3.1. According to the Minutes of the Meeting (MoM) in March 2004, Badung Regency and the governor of Bali agreed to arrange budget allocation and implementation for the operation and maintenance of BBCP in combination with the change of design from headlands type to offshore breakwater type in Kuta Beach. After that, statement letters for budget allocation for related O&M were submitted by the Regent of Badung Regency and the Governor of Bali to JBIC. The beach management scheme and demarcation of responsibilities for beach management were discussed and determined among the central and local governments in the workshop held in February 2009.

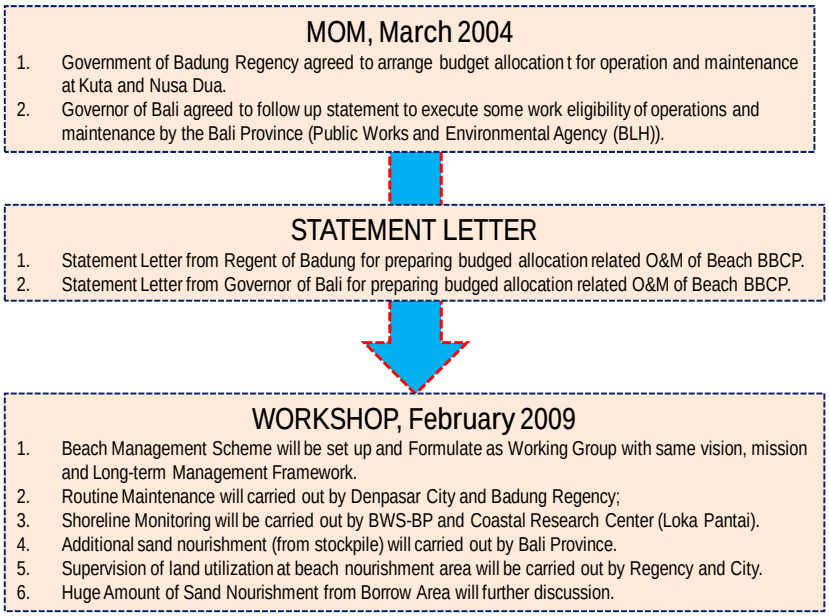


Figure 2.3.1 Chronology of Discussion for Beach Management System

(Source : JICA Study Team)

(2) Demarcation of Responsibility for Beach Management Set Up in the Workshop 2009

Table 2.3.1 shows the comparison of demarcation of responsibilities that was set up in the workshop in 2009 and present situation. The problem is that there are no further actions being done after the agreement/responsibility statement made by the governments (BWS-BP, Bali Province, Badung Regency and Denpasar City). As a reason why government institutions did not follow this agreement except BWS-BP, is thought to be that the signatories of this agreement were not the top level executives of each central and local government such as director class, mayor of Denpasar, regent of Badung Regency and governor of Bali considering the consuetude of Indonesia. However, government institutions related to beach management should consider and carry out continuous beach management to keep the beach in good condition for a long time based on the previous MoM and discussions in 2004 as mentioned above.

Table 2.3.1 Summary on the Ddemarcation of Rresponsibility for Beach Mmanagement

Category	Item	Demarcaton of responsibilities for beach management		
		Set up in Workshop in 2009	Present situation (2011)	
Routine maintenance work	Repairing work of coastal facilities (revetment, groin, headland, breakwater)	Province of Bali for all beaches	BWS-BP	
	Repairing work of other facilities (public facility, parking area, walkway, landscape)	Badung Regency, Denpasar City	BWS-BP	
	Cleaning work on the beach area	Badung Regency and Denpasar City with participation of stakeholder	Sanur	- Denpasar City
			Nusa Dua	- BTDC
			Kuta	- Kuta Village
				- CSR (Coca Cola,
				- Legan Village
	Controlling and permission of beach utilization	Badung Regency, Denpasar City	Sanur	Dinas PU, Province
				Denpasar City
			Nusa dua and Kuta	Dinas PU, Province
				Badung Regency
Reforming of Beach	Monitoring of shoreline	BWS-BP in coorperation with Loka Pantai, Water Resources Research Center, Department of Public Works	BWS-BP	
	Sand re-nourishment transported from permanent sand stockpile	Province of Bali for all beaches	BWS-BP	
Others	Controlling of air, water, beach utilization , coral, seagrass, etc based on AMDAL	None	Environmental Agency, Bali Province	

(Source: JICA Study Team)

(3) Regulation and Permission of Coastal Zone at Phase-1 Beaches

One of the main problems related to beach use are the permanent buildings constructed at the nourished beach area. Permanent structures are still being built at the beach area. In the Phase-1 area, the walkway was constructed for the purpose of demarcating the public area from the private area. This purpose was well considered by all stakeholders along the Phase-1 beaches.

The problems of the present beach use related to coastal zone regulation can be concluded as follows:

- The function of the walkway and rule on the beach area was never legalized by a government regulation for the Phase-1 beaches. And this rule was only known by BWS-BP as implementing unit during Phase-1;
- No coordination among government sides after completion of Phase-1 to manage the beach utilization;
- No legal regulation available for BWS-BP to manage the beach utilization referring to the basic concept of beach use at the nourished beach;
- Lack of knowledge and control by local government in making regulation (at natural beach and nourished beach);
- With no legal regulation, several stakeholders and local village authority disobeyed the rule of walkway.

(4) Summary of Beach Management with Policy Matter Issues

The function of the walkway was only understood by parties involved in the Phase-1 implementation stage, which were the BWS-BP, consultant, and stakeholders along the beach. Most of the stakeholders still follow the rule but some of stakeholders do not. Problems related to beach use can be described as follows:

- Difference in determining the distance of 'beach conservation area' by each level of government. In Phase-1 beaches (nourished beach), the rule on the walkway was not legalized as an official regulation. If the present regulation will be applied, it will not be suitable anymore because the beach width was extended from its original position.
- Lack of knowledge and low level of public awareness regarding beach use rule (as demarcated by walkway) to control the level of beach use. This condition still permits some illegal structures to be built at the beach area, same with motorcycles/cars passing through the walkway.

Chapter 3 Beach Management Issues and Improvement Plan

3.1 Improvement Plan on Beach Monitoring and Maintenance

Monitoring works have been continued by BWS-BP since it was handed over by each contactor after the completion of the project. However, quality and reliability of the monitoring data have a tendency to decline as compared with the monitoring data before it was handed over. To improve this condition, problems should be resolved in the capacity building program.

The following capacity building programs were conducted during the JICA Study to enhance the skills and understanding of government institutions (BWS-BP and Loka Pantai) which have the responsibility for technical management.

- Program-1: Technical support for "Enhancement of Understanding for Adaptive Management and Planning Skill on Beach Maintenance"
- Program-2: Technical Support for "Enhancement of Technical Skills for Monitoring Data Analysis and Archive System"

The main goals of the program are as follows:

- Improving technical skills of government institutions for monitoring and data archive works. It includes planning skills and monitoring skills; and
- Intensify understanding of the "Beach Adaptive Management" through iterative cycle.

3.2 Improvement Plan on Beach Management System

(1) Improvement of Overall Beach Management System

In order to establish a sustainable beach management system for Phase-1, it is important to 1) understand the original purpose of continuous beach monitoring and maintenance among government institutions, 2) establish organization under the cooperation between the public and private sectors, and 3) make clear demarcation of responsibility for beach management between public and public sectors. These actions and goals should be discussed and set up among government institutions and stakeholders in parallel to matters that are required to connect thoroughly among them. The following three points are pointed out as important matters to improve beach management system.

- Understanding the basic principle of integrated beach management;
- Establishment of beach management organization under the cooperation between government institutions and stakeholders; and
- Determination of demarcation of responsibility of beach management between government institutions and stakeholders.

a) Understanding the basic principle of integrated beach management

Integrated beach management covers the cycle of information collection, design of planning, decision making, management, and implementation, but the cycle is repeated as it is dynamic and iterative. This means that there is a need to review and adapt to the new conditions continuously so that the cycle can restart.

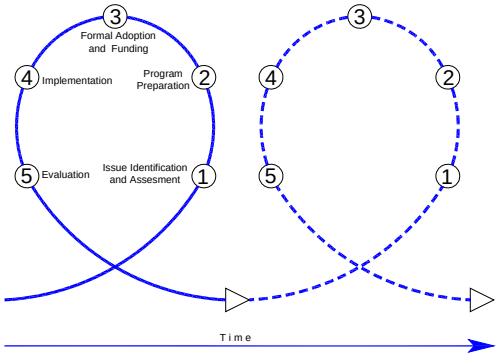


Figure 3.2.1 Steps of the Beach Management Cycle, Richter 2001

(Source: JICA Study Team)

b) Establishment of beach management organization under the cooperation between government institutions and stakeholders

In order to implement sustainable beach management based on the integrated beach management system as mentioned above, it is necessary to establish the organization under the cooperation between government institutions and stakeholders. The basic concept of this organization called "Coordination Team for Beach Management" (TKMPP) is proposed.

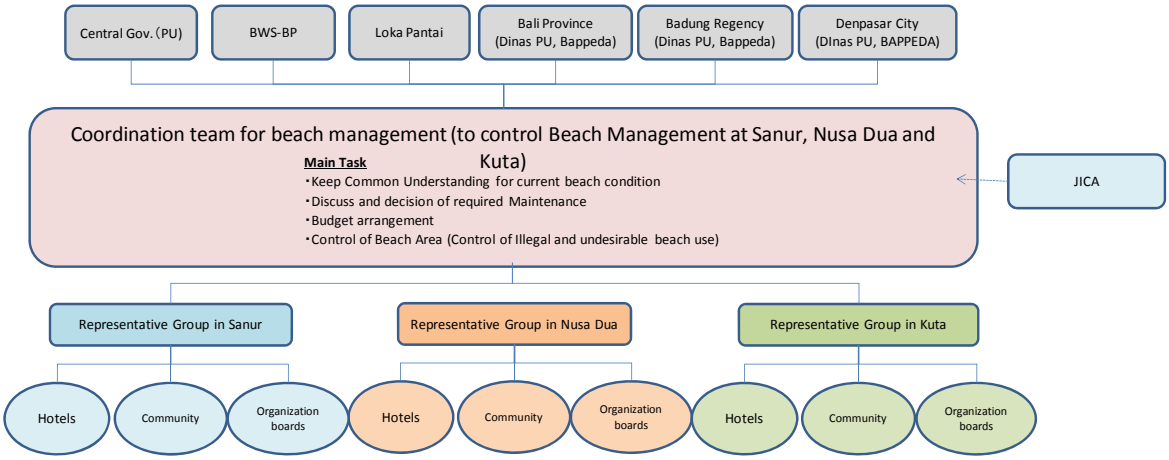


Figure 3.2.2 Organizational Structure of Coordination Team for Beach Management

(Source: JICA Study Team)

c) Determination of demarcation of responsibility between government institutions and stakeholders

In order to carry out beach management for a long period of time, one point to remember is to consider balance among three components such as beach protection, beach utilization, and beach environment as shown in Figure 3.2.3. It is possible to maintain the beaches in good condition by exchange and linkage among the three components. In order to maintain the beaches used by the general public, it is important to work together, share information, and clarify demarcation of responsibility among government institutions (central and local government) and stakeholders.

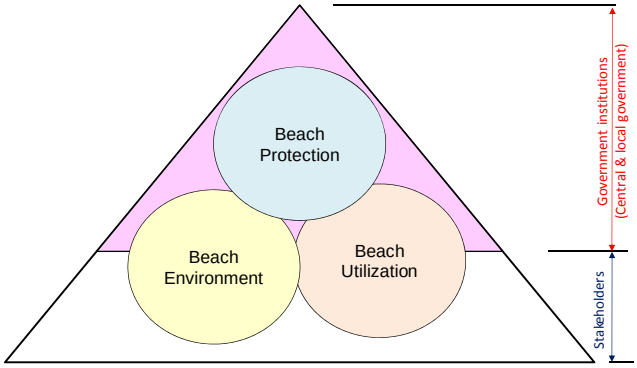


Figure 3.2.3 Basic Philosophy for Beach O&M Structure

(Source: JICA Study Team)

(2) Improvement Plan for Beach Cleaning Activities by Stakeholders

There is a clear difference in cases between cleaning the beach in front of hotels and other beach areas used by fishermen and village people. Beach garbage degrades the value of tourism resources, not only the beach but also of the surrounding areas. Despite the stakeholders' efforts, the beaches are receiving dishonorable reputation from the outside world. Raising the cleaning level of public areas closer to the level of hotels is an urgent task.

Table 3.2.1 Issues and Countermeasures of Beach Cleaning with Stakeholders

Subject	Cause of Problem	Preferable Improvement by Stakeholders
➢ Laws/ Regulations	Regulations for operation and maintenance of the respective beach are missing.	Propose necessary laws or regulations to the law makers or government organization.
➢ Organization	There are many organizations; however, the efforts to integrate them are weak and have just begun.	Establishment of stakeholder organization for each beach is recommended.
➢ Integrated Action Plan	There is no official plan which covers operation and maintenance of the respective beach. The Operation Manual of Phase-1: Bali Beach Conservation Project needs to be represented to the related organizations, and implemented with their agreement.	Formulation of beach O&M rules for each beach, which clarifies the responsibilities of the stakeholders, is recommended. Beach cleaning goals, method, number of personnel, subject area, responsibilities of each organization, monitoring plan, and section of contact to the responsible organization of the government need to be defined in the plan.
➢ Fund	Non-governmental organization (NGO) and traditional village lack fund for beach cleaning. These organizations require beach trash loaders and trucks for transporting the collected trash.	Fund allocation to implement beach O&M is necessary.
➢ Activities	There are a lot of beach cleaning activities but they do not cover the area systematically and continuously.	Activities integrated with the beach O&M under the proposed beach O&M board of stakeholders need to be established.
➢ Monitoring	Traditional villages are monitoring the beach every day.	Monitoring items and frequency of monitoring, evaluation and analysis of the monitored results, analysis, and feed back to action plan should be clarified in the plan.

(Source: JICA Study Team)

(3) Improvement Plan for Beach Management with End Users

Considering the current situation on beach management, one of the most critical steps toward a better beach management by the end users would be to establish a solid and sustainable complementary synergy among those communities. But there is an important lesson that all stakeholders should keep in mind recalling the past experience. The Project Phase I experience makes us remember that collaborative beach cleaning work has not been realized satisfactory as agreed in a consensus building and organization by all concerned stakeholders in February 2009. A fairly detailed plan on demarcation of the work plan had been laid out, but it has not been implemented as expected. A lesson learned from this experience was a necessity to incorporate a soft component of education and trainings into the plan before and during the implementation.

The basic issues over the education and trainings can converge into one question: What kind of countermeasures can be taken in order to make those users acquire environmentally-friendly knowledge that can be translated into some positive behaviors?

What ought to be challenging is to translate those educational achievement into actions for a beach management. Furthermore, this challenge should encompass beyond the Project stakeholders reaching the public in general. Therefore, the real countermeasures should be addressed to a matter of public education and awareness at the level of each individual. In other words, without long-term and far-reaching sustainable educational countermeasures there is no fundamental solution to improving the coastal environment. The education in this sense includes not only formal education within school but also non-formal one practiced by non-academic institutions such as NGOs and even informal one through information transmitted by the mass media and publicity by a private sector, for example.

The Study team, therefore, considers a formation of educational network on beach management as one of the most important countermeasures. A success of the formation would require a consolidation of at least three powers; (1) political, (2) knowledge/skills, and (3) financial. Relevant proponents to those powers can be simply represented by (1) a leadership with the maximum confidence by the local people, (2) schools and NGOs, and (3) the business community respectively.

Against this background, the Sanur beach should be able to provide a model case to establish such a network with comparatively more favorable factors to generate solid concerted efforts. There are at least four salient factors that satisfies three powers mentioned above: (1) Local population are more visible; (2) the Sanur Development Foundation (YPS) with people's strong confidence in their technical expertise of development/welfare work and a pronounced environmental policy called Blue and Green Program; (3) excellent achievements of environmental education in schools under the technical support from NGOs; and (4) a strong presence of local business community.

The Study team further employs two tools to bind the powers and the factors in networking: one is public relations (PR) and the other is corporate social responsibility (CSR). The tools can penetrate throughout a realm of informal education influencing upon the people's consciousness that can trigger a critical awareness among the masses.

Primary target groups of PR are threefold: tourists, the public, and children/the youth. The Study identifies over 150 candidate organizations as collaborators who would be able to engage in the activities of either PR or CSR.

3.3 Improvement Plan on Beach Management Policy

(1) Improvement of Policy Matter related to Beach Management

Various physical issues including damage of walkway and revetment due to partial retreat of beach and damage of walk road and gazebo, etc., caused by wave overtopping have become more serious as time advances. Actually, maintenance works have been carried out after the situation worsened. As a result, delay of correspondences has created an adverse result to beach utilization and environment.

The causes of these issues are pointed out as follows:

- Demarcation of responsibility for beach management was not clarified among government institutions which relate to beach management;
- Tasks for beach maintenance have not been followed up among central, provincial, regency, and city.
- Government institutions lack understanding of the significance of beach conservation, beach O&M, etc.

In order to discuss and make a conclusion for the abovementioned issues, it is necessary to establish a working group which consists of the following government institutions.

Central Government	Province of Bali	Denpasar City	Badung Regency
- BWS-BP - Coastal Research Center - PU, Jakarta	- BAPPEDA - Dinas PU - BLH	- BAPPEDA - Dinas PU	- BAPPEDA - Dinas PU

If necessary, the demarcation of responsibility for beach management will be legalized through a regulation.

(2) Improvement of Policy Matter and Stakeholder Consensus Building related to Beach Utilization and Regulation

As described in previous sections, illegal beach use or practices are still found at Phase-1 area. Illegal beach use is not limited only on the construction of permanent buildings on the nourished beach. Besides various beach utilization issues caused by built souvenir shops and water sport stalls, planting of lawn grass, flowers, and low trees are also serious. The main cause of this condition lies in the lack of knowledge of beach use regulations.

At the present condition, inconsistent regulation in defining the distance of beach conservation area was already pointed out. Regulations that are presently available did not mention the following:

- The function of walkway and rule of beach use as ruled during implementation of beach conservation works. This rule was only known by BWS-BP as implementing unit during Phase-1;
- No coordination between governments after completion of Phase-1 to manage the regulation and permission of beach use at Phase-1 area; and
- Lack of knowledge of the regulation on beach utilization at community level. Information from the government is not conveyed.

The WG among related parties as mentioned above should be established to discuss and formulate the beach conservation area based on fundamental understanding of nourished beach. The final goal is to revise or redefine the beach conservation area at Phase-1 beach

area. Definition of beach conservation area should be modeled on natural beach area in different ways. Consensus buildings related to beach use at stakeholder level should also be conducted. Beach use at stakeholder level such as planting of grass, flower, low tree and souvenir stall at nourished beach area should be discussed first and be concluded to build consensus at the stakeholder level, since all of these activities support the tourism business. Finally, the consensus relating to beach use should meet with the regulations concluded by the WG.

Chapter 4 Support for Consensus Building and Capacity Building

4.1 Outline of Programs for Consensus Building and Capacity Building

Figure 4.1.1 show the image of desirable integrated beach management and proposed programs based on the survey results by checking the current situation of beach monitoring, maintenance, and management. In order to simplify overlapping problems, beach management was divided into four categories as follows;

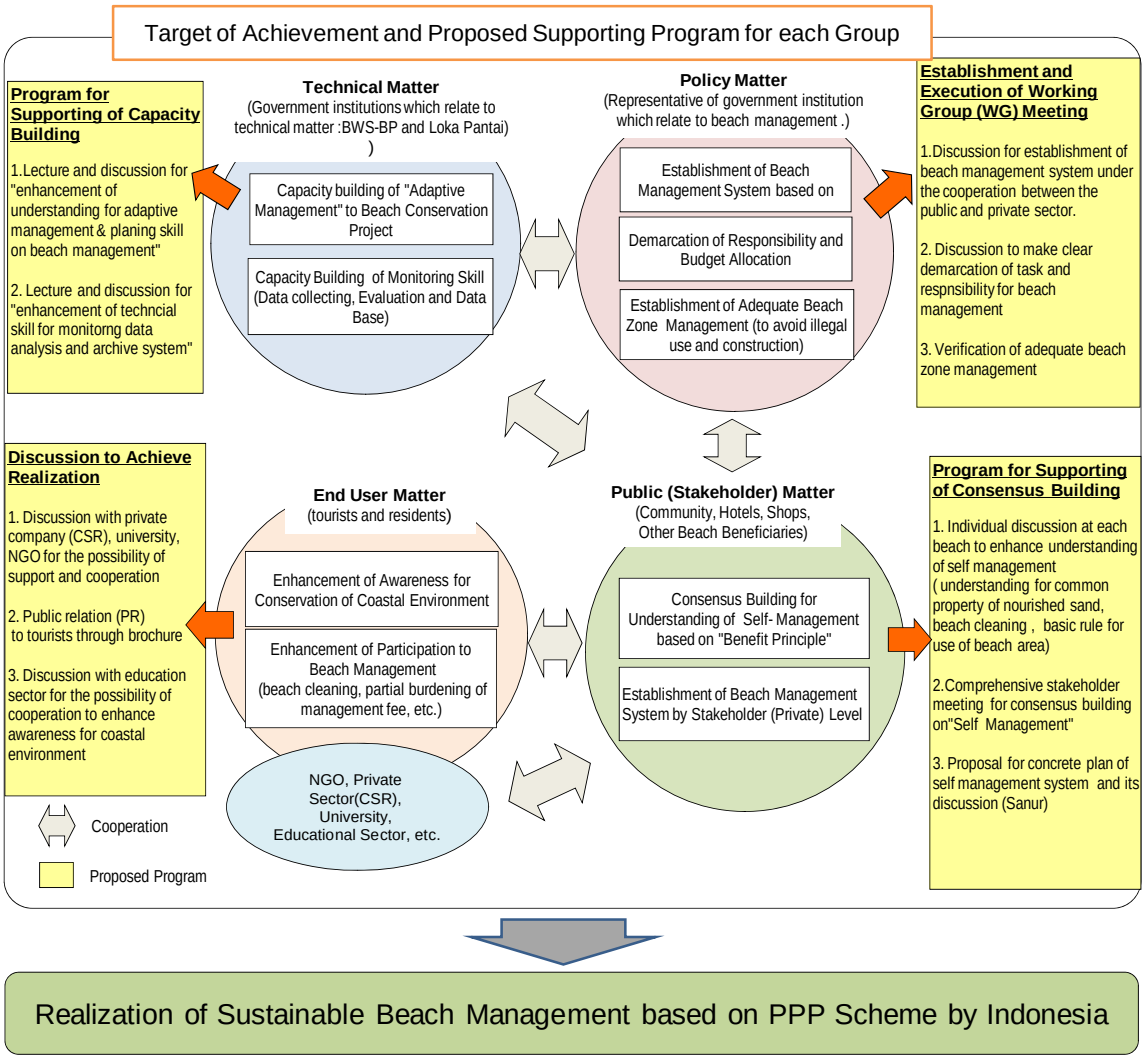


Figure 4.1.1 Proposed Programs for Each Group

(Source: JICA Study Team)

The programs for capacity building, consensus building, and establishment of working group (WG) are summarized in Table 4.1.1.

Table 4.1.1 Recommended Programs on Capacity Building and Consensus Building

Category	Title Name	Background	Participants	Suggest under Action Taken by JICA Study Team
Establishment of WG	WG for "Demarcation of beach management and beach area"	- Demarcation for the responsibility (Task and Budget Allocation) on beach maintenance is not clear - Demarcation of beach area is not clear and not effective (problem on regulation and permission). This causes intrusion of property into beach conserve area, and induce the damage of facility and acceleration of beach retreat	-BALAI -DINAS PU of Bali Province -DINAS PU of Denpasar City -DINAS PU of Badung Regency - BAPPEDA (if required from beginning)	- Support to establish WG - To coordinate for holding frequent WG meeting - Preparation of material to be discuss and presentation to explain current condition and problems
Capacity building of government institutions	Technical Support to "Enhancement of understanding for Adaptive Management and Planning skill on beach maintenance"	-Their understanding for Adaptive Management applying accumulated of monitoring data is insufficient. -Due to this, the effective and systematic planning and implementation of maintenance work didn't conduct	BWS-BP and Loka Pantai	- Periodical lecture based on OM Manual - Joint site inspection as on-the-job training and discussion
	Technical Support to "Enhancement of technical skill for monitoring and data analysis and archive system"	- Even though the monitoring has been carried out until now, the collected data was not well maintained by Management Body, and most of data cannot be well utilized. - The skill for checking of monitoring method, quality of data, etc. is insufficient. This is causing the misunderstanding of actual condition.		- Lecture for planning of data archive method - Lecture for data analysis, monitoring method and procedure
Consensus building of stakeholders	Consensus building on "Enhancement to understanding for *common property of nourished sand* among stakeholders" <Target Area> South Sanur between G39 and GN2	Most of property and building owners misunderstand that the accumulated sand at up-drift side of groin is his own property sand, and they want to keep this accumulated area. Sometimes, they construct their own facilities on this area.	Communities, Hotels and Private property owner	- Section of related stakeholders - Frequent discussion between related stakeholders to enhance their understanding for "sand movement" and "common property of sand", and possibility to improve by stakeholders level - Coordination between stakeholders and beach management body regarding implementation of required
	Consensus building on "Beach cleaning based on benefit principle" <Target Area> German Beach at Kuta	- Some area of beach cleaning condition seems not so good, especially at public area. - Some of beneficiary at public area didn't shear their responsibility and not cooperate for public-level beach management activities such as beach cleaning (benefit principle).	community, restaurant, fishery and marine sports beneficiary	- Selection of related stakeholders - Frequent discussion between related stakeholders to enhance their understanding for "advantage and necessity" and "benefit principle" - Introduce and site visit to show another success case - Coordination with NGO, private company and other sectors, if necessary
	Consensus building on " Basic rule for use of beach area in public level" <Target Area> Tanjung Benoa (North Nusa Dua)	- Illegal contraction on the recovered beach - Unsatisfied use of walkway (ex. Intrusion of motor bicycle into walkway)	Communities, Hotels and Private property owner	- Selection of related stakeholders - Frequent discussion between related stakeholders to enhance their understanding for "desirable beach use" and "basic rule" - Coordination with beach management body to control and punishment for illegal use

(Source: JICA Study Team)

4.2 Working Group (WG) Meeting

The main objective for the establishment of the WG is to discuss the following two main agenda related to policy matters of beach management:

1) Agenda-1 : The purpose of the following agenda is to discuss demarcation of responsibility on beach management including task sharing and budget allocation

- Clarification of category of beach management
- Demarcation and responsibility between governments and stakeholders for every beach management items
- Process of monitoring and maintenance of every beach management items

2) Agenda-2 : The purposes of the following agenda are to make clear the demarcation and boundary of space for Phase-I Project beaches, and to discuss control measures

- Legalization of walkway as the boundary between public space and private space
- Clarification of illegal structures on the beach

The members of WG consist of central/local government institutions related to beach management, observers (BAPPENAS, JICA) and organizers (JICA Study Team). The detailed members of WG are shown as follows. In the 3rd WG meeting, related stakeholders of Sanur, Nusa Dua, and Kuta also act as members of WG.

Government institutions related to coastal management

(Central government)

- Ministry of Public Works
  - Department of River and Coastal
  - Department of Operation and Maintenance
  - Department of Planning Program
  - Bali Penida-River Basin Bureau (BWS-BP)
  - Experimental Station for Coastal Engineering (Loka Pantai)

(Local government)

- Province of Bali
  - Regional Development Agency (BAPPEDA)
  - Public Works Service Agency (Dinas PU)
  - Environmental Agency (BLH)
- Denpasar City
  - BAPPEDA
  - Public Works Service (Dinas PU)
  - Urban Planning and Housing Service (Dinas Tata Kota and Perumahan)
  - Peace, Order and Civil Police Force Service (Dinas Trantib and Satpol PP)
- Badung Regency
  - BAPPEDA
  - Highways and Irrigation (Dinas Bina Marga and Pengairan)
  - Settlement Service (Dinas Cipta Karya and Perijinan)
  - Civil Police Force Government Service (Satuan Polisi Pamong Praja)

(WG Observers)

- Watering and Irrigation, National Development Planning Agency (BAPPENAS)
- Japan International Cooperation Agency (JICA)

In the 1st WG meeting, central government recommended that necessary budget for beach maintenance should be obtained from CSR by a private sector, direct beneficiary, beach user and so on, in consideration of lack of budget from government institutions and raising awareness of stakeholders. The implementation of beach monitoring and maintenance was also recommended to establish collaborative structure between government and stakeholder sectors.

In the 2nd WG meeting, importance of establishment of coordination team was confirmed between the central government and local government in order to determine a suitable beach management system and demarcation of responsibilities as it takes a long time to solve such outstanding matters. In addition, it is necessary to conduct discussions and coordination among government institutions and stakeholders related to beach management, through the coordination team.

In the 3rd WG meeting, all participants (central government, local government, and stakeholders) basically agreed to establish a coordination team for beach management (TKMPP), and to discuss and decide demarcation of responsibilities based on the proposed five management items. However, some participants insisted on the necessity of follow-up and support to establish TKMPP, and prepare the technical and implementation guidance by experts from JICA. Their insistence is due to a concern that TKMPP will not be able to function after demobilization of JICA Study Team since there are few members among government officials and stakeholders related to beach management who have initiative and technical capabilities.

The signatories of above agreement through conclusion of the 3rd WG meeting for beach management of Phase-1 are as follows:

- Mr. N. Donny Azdan (Director of Watering and Irrigation , BAPPENAS)
- Mr. I Gusti Ngurah Raka (Head of BWS-BP)
- Mr. Tjol. Pemayum (Head of Bappeda, province of Bali)
- Mr. Wayan Suambara (Head of Bappeda, Badung Regency)
- Mr. I Gusti Anindya Putra (Head of Bappeda, Denpasar City)

4.3 Programs for Capacity Building for Government Institutions

(1) Technical Support for "Enhancement of Understanding for Adaptive Management and Planning Skill on Beach Maintenance"

The program was set up as follows:

- Joint site inspection as part of OJT and discussion about cause of erosion and countermeasures based on the basic concept of adaptive management (Lectured by Dr T. Uda).
- Adaptive sand management and human habitat sustainability (Lectured by Dr S. Seino).

All participants have deepened their understanding on the importance of continuous beach management based on the concept of “Adaptive Management”. Moreover, their skills for

monitoring and maintenance work were enhanced through presentation and discussion in these meetings. The final goal is to enable government institutions related to beach management prepare plans and perform maintenance works based on the adaptive management procedure.

(2) Technical Support for "Enhancement of Technical Skill for Monitoring, Data Analysis, and Archive System"

The program was set up as follows:

- Joint field investigation.
- Planning of data archive method (selection of required data as long term monitoring, fixing of format, etc.).
- The skills for checking monitoring method, quality of data, etc., are insufficient. This causes misunderstanding of actual condition.
- Conduct periodic lecture for data analysis, monitoring method, and procedure.

All participants have developed an advanced understanding as to the importance of continuous beach monitoring based on the concept of adaptive beach management using several study cases, through presentation and discussion in the meeting. The final goal is to develop the skills of government institutions to coastal monitoring in terms of checking monitoring method, quality of data, etc., which are insufficient for several actual conditions. Moreover, monitoring data with high reliability can be accumulated. Such data will be kept properly, and can be readily available anytime when needed.

4.4 Stakeholders' Meeting

(1) Background

The local stakeholders are the ones of biggest beneficiaries of BBCP-I project. In order to maintain the nourished beach in good condition, participation of the local stakeholders, whose interest is to maintain the beaches in good condition as tourism resources, are effective and indispensable.

(2) Purpose of Stakeholders Meeting

Providing the local stakeholders that the incentives to maintain the beaches by explanation of present issues and the estimated consequences of their beaches without appropriate maintenance activities. Then, their motivation was arisen by proposing what the local stakeholders can do to maintain the Beaches in the stakeholders meetings.

(3) Contents of Implementation

- Social surveys on local stakeholders were conducted for collecting baseline status of the beaches and present activities of the local stakeholders in maintaining the Phase-I beaches.
- Local stakeholder meeting was conducted in each beach (Sanur, Kuta, Nusa Dua) as shown in Table 4.4.1.

Table 4.4.1 Outline of Stakeholders Meeting for Beach Maintenance

Participants of	Agenda	Proposals by JICA Study Team	Date of Stakeholders Meeting
Sanur	Beach erosion	San-recycle by local stakeholders	Dec.22, 2011
Kuta	Beach trash	Beach cleaning by local stakeholders	Dec.21, 2011
Nusa Dua	Beach encroachment	Confirmation of Minutes of Understanding at before implementation of BBCP-I, and consequences of beach encroachment as degradation of important tourism resource: beach	Dec.20, 2011
All stakeholders of Sanur, Kuta, Nusa Dua	Reporting of stakeholders meetings	Proposals for each beaches are repeated again	Jan.26, 2012

- Series of discussions were held with representatives of Sanur beach for actual implementation of beach maintenance by local stakeholders. Application of "Adopt System" was proposed by JICA Study Team. If Adopt System is applicable with good results, then it will also be applied to other beaches.

4.5 Collaboration with Private and Other Sectors, and Public Relations

(1) Corporate Social Responsibility (CSR)

Along a CSR movement from a private sector, it is recommended that BWS-BP, Badung Regency and Denpasar City start joint coordination on beach maintenance activities taking into account the CSR initiatives. Necessity of such coordination involving important stakeholders has been consulted to BWS-BP with a view to organizing a committee. The BWS-BP has done a social study on beach maintenance in Bali, yet an application of the study results does not seem to be in practice at the moment. Considering the capacity of the institution (e.g., limited number of staff in charge of socialization of beach management), it would be more realistic at the moment to promote and encourage such coordination mechanism among local communities, NGOs, and related companies.

(2) Concrete Action of Public Relations (PR)

The BBCP PR activities shall be well accepted and adopted by all stakeholders of the project in particular, and the public in general. Furthermore, within a collaboration framework with CSR activities, the BBCP PR activities would be able to improve and expand, interacting with a certain company's PR expertise.

As to formulation of the BBCP PR strategies, three target groups have been identified; (1) tourist, (2) the public, and (3) the youth. Considering the project characteristics as Japan's ODA, priority has been given to Japanese tourists in terms of starting with concrete actions.

Among the member agencies of the Japan Tour Operator Association of Bali (JTOA), hearing surveys have been done with two well-known larger agencies, the Japan Travel Bureau (JTB) and the HIS. It has been confirmed that BBCP can be advertised in JTB's yearly publication (approximately 50,000 copies) called "My Bus Bali" for its 2013 fiscal year edition. In

principle, US$1,600 per page can be charged, but a negotiation is under way. It is also suggested that their supplier companies such as Dekom and Bali Kurabu can become effective by means of PR. HIS has a ten-year reputation of publishing 10,000-15,000 copies of free monthly publication on touristic information in the Japanese language called "*Bali Freak*". With a spirit of CSR, the head of its Bali office welcomes the BBCP publicity in the publication. A discussion with the "Bali Freak" editor-in-chief later poses a question about the style of writing. A further consultation has to be made with JICA to see if the style is characterized with a light-touch story-telling, consistent with some standards and criteria expected by JICA.

Besides the two Japanese tourism agencies, a groundwork has been laid out by contacting various institutions as follows: The Association of Indonesian Tourism Education Institutes, The International Bali Tourism Institute, The Wisnu Foundation, The Bali Japan Club, and The Triatma Surya Jaya Foundation.

(3) Educational Programs

Education program is treated as the basic issue and a key tool for maintaining a sustainable beach management for and by the end users. Based on the countermeasures proposed in Chapter 3.2.(3), a pilot educational program can be launched with more detailed studies on the actual situation of environmental education and practice in the Denpasar City area. According to the city statistics, there are 216 elementary schools, 44 junior high schools and 26 senior high schools in Denpasar City. Further consolidation and coordination with more intensified and enlarged efforts on the part of YPS is indispensable. The pilot program should be formulated with careful examinations of the proposed countermeasures and include the following components:

(1) The BBCP lecture is to be integrated in the Extension Program by the Denpasar City Tourism Office.

(2) The Bali Japan Club organizes for its Japanese school students a spring excursion every year. The excursion to the BBCP beaches and a prior special lecture on coastal environment is to be incorporated especially for its OB class students.

(3) Such activities in the Japanese school can be duplicated at Bali International School, the Australia International School, and other private local schools with English curriculum.

(4) Collaboration with the Bali Japan Club volunteers who have been implementing the "Bali Eco Karuta" project is to be done.

(5) In YPS standard environmental education program, a successful Japanese project entitled, "Foster Parent" beach management is to be introduced.

4.6 Seminar on the Sustainable Beach Management

The main objective to convene the seminar is to present the importance of the beach management for both governments and stakeholders, and enhance the coordination of TKMPP (Team of Beach Management and Maintenance). Overview of the seminar is shown the table below.

Table 4.6.1 Overview of the Seminar on the Sustainable Beach Management

Outline	• Date : 13 September, 2012 • Time : 09:00 – 14:40 • Venue : Meeting Room "Batukaru", Inna Sindhu Bali Hotel, Resort and Meeting, Sanur, Bali	
Contents of presentation	• Sustainable Beach Management (Head of Subdit of Technical Planning) • Bali Beach Conservation: A Beach Protection and Preservation Effort (Head of BWS Bali-Penida) • Integrated Beach Management Strategy for Bali Environmental Vision and Sustainable Development (Dr. K.G. Dharmaputra) • Natural and Cultural Beach Conservation and Multi-sectoral Collaboration are the Key to Sustainable Coastal Communities (Dr. Satoko SEINO) • Review & Activities of JICA Study on "Beach Maintenance & Management" • Comparison of Beach Management System Between Bali & Mauritius (Mr. Susumu ONAKA) • Impacts of Artificial Alteration to Beach Topography (Dr. Takaaki UDA)	
Conclusion	1. Stakeholders and Central Government (BWS-BP) realize that how the important is mutual coordination for beach management and maintenance. 2. Stakeholders are ready for involve actively and looking forward the further fast step for establishment and implementation the beach management program through the TKMPP. 3. The Central Government (BWS-BP) and Province Government promise to complete the establishment of TKMPP immediately.	
Participants	Affiliation	Number of participant
	Central government	8
	Bali Province	3
	Denpasar City	14
	Badung Regency	18
	Karangasem Regency	1
	Stakeholder	31
	Udayana University	1
	JICA study team	6
	Total	82

(Source: JICA Study team)

Chapter 5 Establishment of Sustainable Beach Management System

5.1 Summary of Conclusions in the 3rd Working Group Meeting

The final decision for the establishment of a beach management system was concluded in the 3rd Working Group Meeting (WG 3) as follows.

Final Agreement in WG 3 (September 20, 2012)

- Governments agreed to take necessary actions for the early establishment of the "Coordination Team on Beach Management (TKMPP)".
- Five management items related to beach management were accepted among the governments who are related to beach management.
- Governments and stakeholders agreed to establish a beach management system under the cooperation of the public and private sectors.

In addition, a road map consensus was obtained among government institutions and stakeholders as a milestone for the establishment of a sustainable beach management system in the WG 3 meeting. The following actions were also confirmed in the said meeting to be the next action of the public and private sectors:

- Establishment of TKMPP by 2012 at the latest;
- Continuous discussion and consultation to set up the demarcation of responsibilities of the TKMPP;
- Consultation to legalize walkways as the boundary between public and private properties;
- Consultation on how to control illegal buildings and structures built on nourished beaches;
- Budget allocation for related government institutions based on the fixed demarcation of responsibilities through discussions of the TKMPP;
- Consultation on the significance of sand stock pile and the role of sand utilization and transportation among government institutions and stakeholders;
- Consultation on the clarification of the permit's approval system, role, regulation, etc., to be used for beach utilization;
- Trial of pilot case study to show the beach management cooperate with public and private sectors that were indicated in the road map.

5.2 Establishment of Beach Management System Under Cooperation Between Public and Private Sectors

(1) Category and Required Actions for Beach Management

The categorized five management items and required actions for each are summarized in Table 5.2.1.

Table 5.2.1 Categorized Management Item and Required Actions

Category of Beach Management		Required actions
1	***Monitoring, Evaluation and Maintenance of Sandy Beach*** ***(Adaptive Management for Sandy Beach)***	Monitoring (by visual) and reporting
		Monitoring (by survey)
		Analysis and evaluation
		Planning and design for required adaptation
		Implementation of adaptation (rotation/refilling of sand)
2	***Maintenance of Coastal Facilities (Revetment, Groin, Breakwater)***	Monitoring and reporting
		Evaluation and repairing
3	***Maintenance of Landscaping and Public Facilities (walkway, gazebo, lamp, etc.)***	Monitoring and reporting
		Evaluation and repairing
4	***Beach cleaning***	Daily cleaning
		Disposal of gabage
		Public participation as environmental education program
5	***Control of beach utilization (for illegal construction on the Beach)***	Daily checking and self-control of beach use
		Sanction for violation of beach utilization

(Source: JICA Study Team)

(2) Objectives of the Coordination Team for Beach Management (TKMPP)

The main function of TKMPP is expected as follows:

- To enhance shared awareness on beach maintenance and management among all members.
- To maintain the same understanding for the problems on beach maintenance and management at the Phase-1 Beaches due to exposing from each parties (especially from stakeholders) in TKMPP
- To discuss and determine the measures for the issue on beach maintenance and management at the Phase-1 Beaches including sharing of responsibility and budget allocation.
- To determine the common roles on beach utilization among governments and stakeholders. Further, to control and to make clear the sanction for the violation on beach area such as illegal use of sandy beach in the Phase-1 Beaches and other beaches in Bali.
- To promote awareness programs to a wide range of beach users and enhance the ability of beach management
- To establishment the successful beach management system for the Phase-2 Project Beaches based on the experience of both implementation and activity of beach maintenance and management for the Phase-1 Beaches.
- To examine and if possible to establish the comprehensive beach management at whole Bali beaches.

(3) Members and Organization of TKMPP

The recommended member of TKMPP is shown in Figure 5.2.1. And the expected organization of TKMPP was indicated as shown in Figure 5.2.2. It was recommended that TKMPP will be organized by BAPPEDA in Bali Province as chairman, the provincial public

works as vice-chairman. BWS-BP was recommended as secretariat to lead the right way for beach maintenance and management, because only BWS-BP has undertaken the beach monitoring and maintenance after the completion of the Phase-1 Project. Other members from both governments and stakeholders were recommended as shown in Figure 5.2.1.

The final members and organization will be determined and legalized as Bali Governor's Decree as implementation body for sustainable beach management of the Phase-1 Beaches.

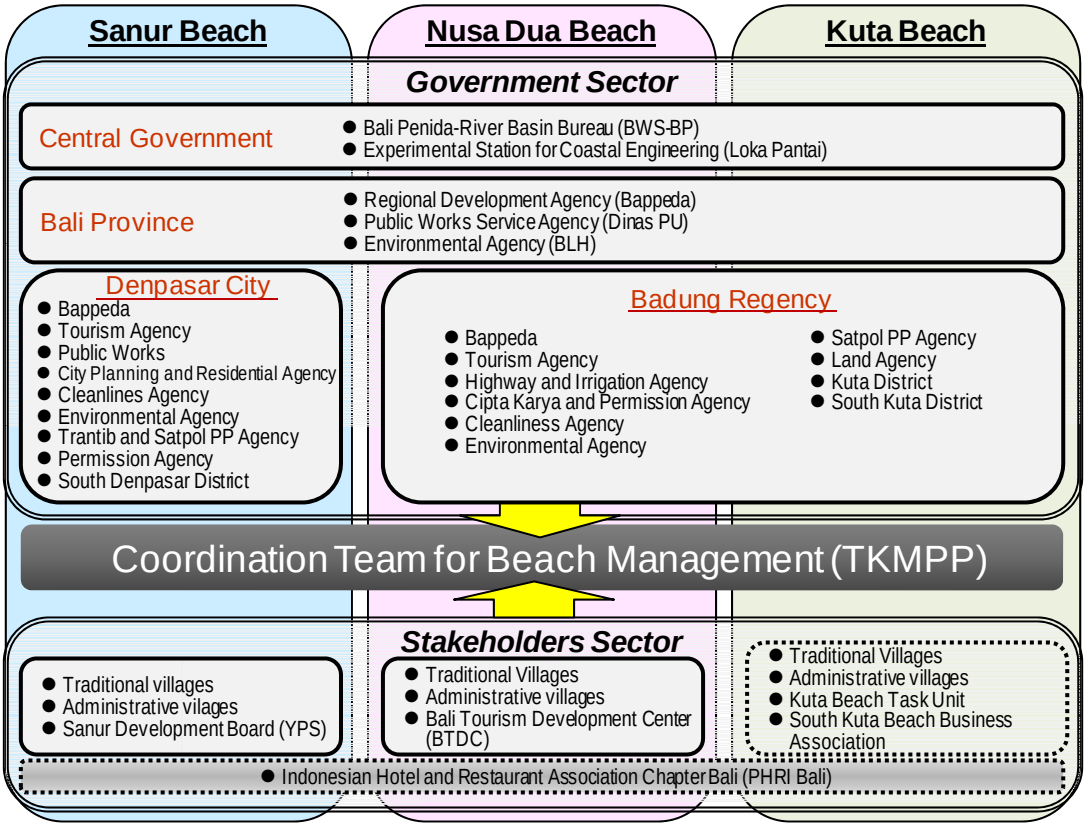


Figure 5.2.1 Members of the Coordination Team for Beach Management (TKMPP)

(Source: JICA Study Team)

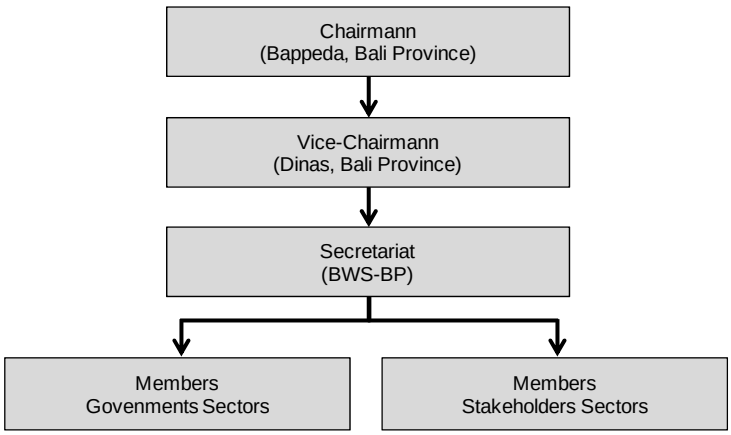


Figure 5.2.2 Expected Organizational Structure of TKMPP

(Source: JICA Study Team)

(4) Implementation Image of TKMPP and Draft Idea of Responsibility

The TKMPP meeting will be basically held periodically in the year by the official announcement of BAPPEDA with all members participate to discuss and determine the annual required beach maintenance and management. The image of the frequency for holding the meeting is three or four times per year. However, if it is necessary to discuss and determine the urgent issues regarding beach maintenance and management matters, the irregular meeting will be also considered to be held by the instruction of BAPPEDA.

The draft idea for the demarcation of responsibilities for each management item and its required action is summarized in Table 5.2.2. The final demarcation plan will be further discussed and concluded among all members of TKMPP.

Table 5.2.2 Demarcation of Responsibilities of TKMPP Members (Draft Idea)

Category of Beach Management		Required Actions	Main Responsibility
1	***Monitoring, Evaluation and Maintenance of Sandy Beach*** ***(Adaptive Management for Sandy Beach)***	Monitoring (by visual) and reporting	Stakeholders
		Monitoring (by survey)	Central Government (BWS-BP and Loka Pantai)
		Analysis and evaluation	
		Planning and design for required adaptation	
		Implementation of adaptation (rotation/refilling of sand)	
2	***Maintenance of Coastal Facilities (Revetment, Groin, Breakwater)***	Monitoring and reporting	Stakeholders
		Evaluation and repairing	Central Government (BWS-BP)
3	***Maintenance of Landscaping and Public Facilities (walkway, gazebo, lamp, etc.)***	Monitoring and reporting	Stakeholders
		Evaluation and repairing	Local Government (Badung Regency, Denpasar City)
4	***Beach cleaning***	Daily cleaning	Stakeholders
		Disposal of gabage	Local Government (Badung Regency, Denpasar City)
		Public participation as environmental education program	Stakeholders cooperate with NGO
5	***Control of beach utilization (for illegal construction on the Beach)***	Daily checking and self-control of beach use	Stakeholders
		Sanction for violation of beach utilization	Local Government (Bali Province, Badung Regency, Denpasar City)

(Source: JICA Study Team)

5.3 Proposed Road Map And Action Plan for Establishment of Beach Management System

It is expected that various beach management issues will be improved through the discussion and determination in TKMPP meeting hereafter. However, this activity is the first trial as beach management in Indonesia, and it was thought that they will have a difficulty in operating TKMPP and sustainable beach management as they have no specialist for coastal management and no experience on comprehensive beach management based on both technical and institutional point of view. To assist the activity conducted by Indonesia with their ownership, it is recommended to hold TKMPP meeting and required action for beach maintenance and management continuously in accordance with the proposed road map that describes the goals and action plans as a milestone in order to take initiative in solving problems.

Table 5.3.1 shows the proposed road map to show the target or achievement in each stage.

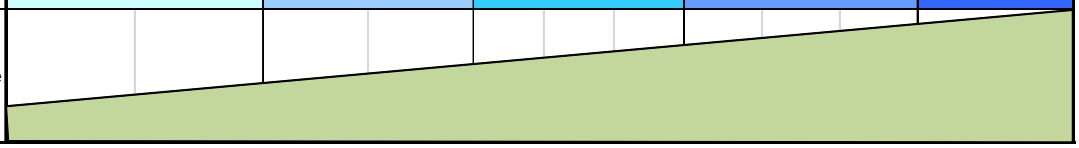
- The preliminary stage is divided into "1st term" and "2nd term". The 1st term is to set up a basic concept of suitable sustainable beach management system during the JICA study. 2nd term is to establish TKMPP and holding the regular meeting to discuss and implement countermeasures against beach management issues in the Phase-1 Beaches while basically there is no support of JICA experts from the completion of JICA study until starting of engineering services in the Phase-2 Project.

- The middle stage is divided into "3rd term" and "4th term". The 3rd term is to holding the regular meeting of TKMPP not only for the Phase-1 Beaches but also for the Phase-2 Beaches to establish the suitable beach management system before the commencement of implementation of the Phase-2 Project. Annual beach maintenance and management are undertaken in accordance with the decision of TKMPP. Capacity development for beach management are also conducted by the assist of Japanese experts as soft component programs in the Phase-2 Project (refer to Chapter 12). The 4th term is to holding the regular meeting of TKMPP for both Phase-1 and Phase-2 Project Beaches, and annual beach maintenance and management for both beaches are undertaken and monitored in TKMPP.

- The final stage (5th term) is the last term in the Phase-2 Project. The beach maintenance and management for Phase-1 and Phase-2 Beaches is expected going well only by Indonesian side. The beach management system including other beaches in Bali is discussed to expand the successful result of beach management for Phase-1 and Phase-2 Project.

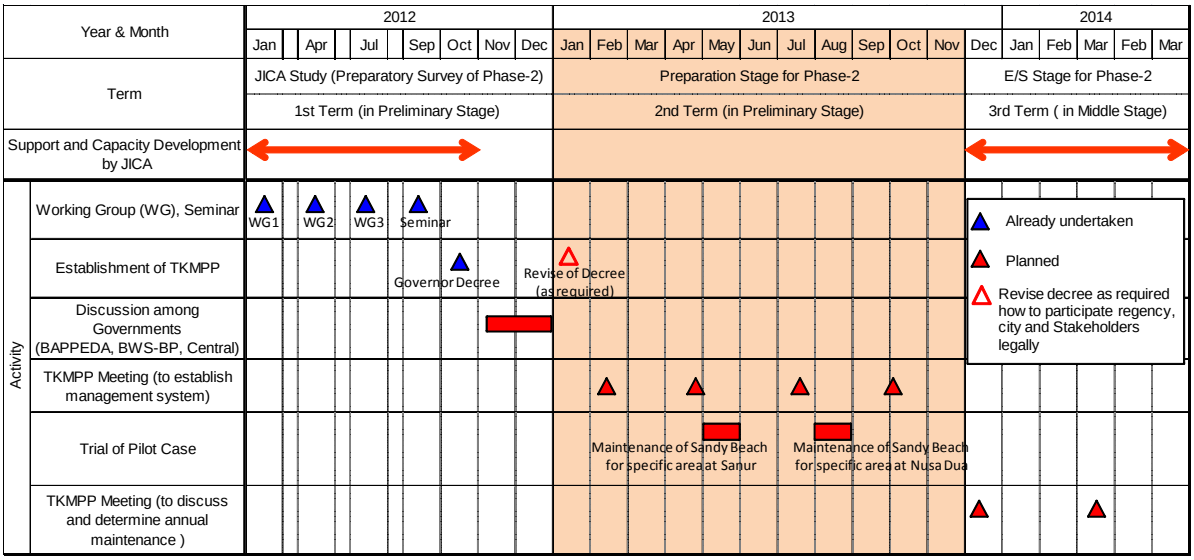
Specific action plan especially in the 2nd term of the preliminary stage is shown in Table 5.3.2. This stage is very important because TKMPP should be established, and some fundamental issues shall be discussed and determined in the TKMPP by Indonesian side without assistance of Japanese expert.

Table 5.3.1 Road Map for the Establishment of Beach Management System

Year	2011	2012	2013	2014	2015	2016	2017	2018
Stage	JICA Study (Preparatory Survey on BBCP-2)		Preparation Period for Phase-2	E/S for Phase-2 (DD & Bidding Assistance)		Implementation for Phase-2		
	1st term		2nd term	3rd term		4th term		5th term
	(Preliminary Stage)			(Middle Stage)				(Final Stage)
Main Activity	- Establishment of Working Group (WG) and holding meeting (WG1 -WG3) - Seminar		- Establishment of TKMPP and holding regular meeting (for Phase-1 Beaches)	-Holding regular meeting (for Phase-1 & 2 Beaches) - Capacity building for skill-up of beach management		-Holding regular meeting (for Phase-1 & 2 Beaches) - Capacity building for skill-up of beach management		ditto
Target or Achievement	- Obtaining common understanding for importance of Beach Maintenance and Management cooperate with Governments and Stakeholders - Agreement for sharing of responsibility on beach maintenance and management - Agreement to establish coordination team for beach management (TKMPP)		- Establishment of TKMPP - Finalization of responsibility for each management item - Determination of beach management system (common rule, control of beach area, etc.) - Trial of pilot case for maintenance of sandy beach with PPP scheme	- Identification of problems for each beach and to make decision for annual beach maintenance work - Establishment and determination of beach management system for Phase-2 beaches		- Continuous beach management at Phase-1 Beaches - Starting beach management at Phase-2 Beaches with PPP scheme		- Continuous beach management at Phase-1and 2 Beaches - Discussion to expand whole Bali beaches
Image for Skill-up & Experience of Indonesia								

(Source: JICA Study Team)

Table 5.3.2 Action Plan in the 2nd Term of Preliminary Stage in 2013 (Draft)



(Source: JICA Study Team)

Chapter 6 Beach Change After the Nourishment and Review of Adaptation Measures

6.1 Beach Change and Sand Remaining after the Nourishment

(1) Sanur

The project area at Sanur beach is shown in Figure 6.1.1. This area is divided into three sub-areas which are called S1, S2, and S3.

Figure 6.1.1 Layout of Sanur Beach

(Source: JICA Study Team)

Table 6.1.1 shows the comparison of evaluation result on beach condition between the previous (2007) and present (2011) beach conditions. Results for the volume of sand loss for both sections after 4 and 8 years are also shown.

Table 6.1.1 Comparison of Evaluation Result on Beach Condition at Sanur

Sub-area	Section	Previous Evaluation (by the Consultant of BBCP-1in 2007)	Present Evaluation (by the Study Team in 2011)	Volume of Sand Loss (Based on Initial Condition)	
				After 4 years	After 8 years
S1	G3-G4	Stable	Stable	-5%	0%
	G4-G5	Stable	Stable	-1%	0%
	South G6	Stable	Stable		
S2	North GN1	Unstable	Stable	-46%	-52%
	GN1-GN2	Stable	Stable	-8%	-10%
	GN2-GN3	Stable	Stable	-5%	-8%
	GN3-G7	Stable	Stable	-5%	-7%
	G7-GN4	Unstable	Unstable	-5%	-11%
	GN4-G16	Stable	Stable	-6%	-5%
	South G16	Stable	Stable	-7%	-8%
S3	North G32	Unstable	Unstable	-25%	-27%
	G32-G37*)	Stable	Stable	21%	30%
	G37*)-GN5*)		Unstable	11%	10%
	GN5*)-G38		Stable	-28%	-27%
	G38-G39	Unstable	Unstable	-18%	-21%
	G39-GA2	Unstable	Unstable	-18%	-23%
	GA2-GA1	Stable	Stable	-2%	5%
			Total	-9%	-9%

*) G37 and GN5 were constructed by BWS-BP in 2006

(Source: JICA Study Team)

(2) Nusa Dua

The project area at Nusa Dua beach is shown in Figure 6.1.2. This area is divided into three sub-areas which are called N1, N2, and N3. The comparison of beach condition in 2007 and 2011 is shown in Table 6.1.2

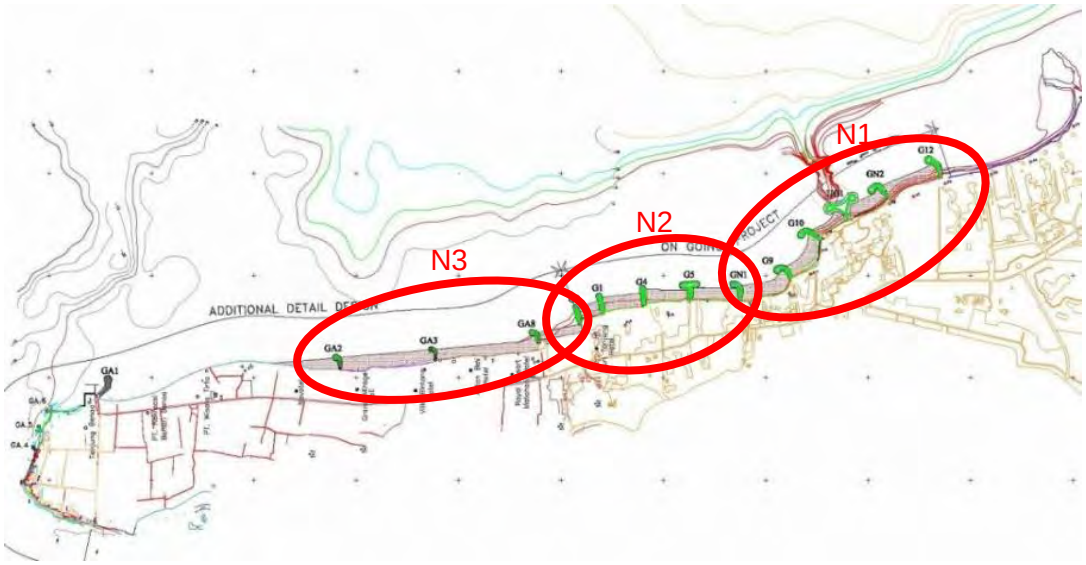


Figure 6.1.2 Nusa Dua Beach

(Source: JICA Study Team)

Table 6.1.2 Comparison of Evaluation Result on Beach Condition at Nusa Dua

Sub-area	Section	Previous Evaluation (by the consultant of BBCP-1in 2007)	Present Evaluation (by the Study Team in 2011)	Volume of Sand Loss (Based on Initial Condition)	
				After 4 years	After 8 years
N1	G12-GN2	Stable	Unstable	-8%	-11%
	GN2-UG1	Stable	Stable	-3%	-3%
	UG1-G10	Stable	Stable	-17%	-18%
	G10-G9	Stable	Stable	-4%	-4%
	G9-GN1	Stable	Stable	-9%	-9%
N2	GN1-G5	Stable	Stable	-14%	-14%
	G5-G4	Stable	Stable	-16%	-18%
	G4-G1	Stable	Stable	-5%	-5%
	G1-G0	Stable	Stable	-8%	-8%
N3	G0-GA8	Unstable	Unstable	-16%	-17%
	GA8-GTB[1)]	Unstable	Necessary for Checking	-4%	7% [3)]
	GTB[1)]-GN4[4)]				
	GN4[4)]-GA3				
	GA3-GN6[2)]	Unstable	Necessary for Checking	-19%	-22% [4)]
	GN6[2)]-GN5[2)]				
	GN5[2)]-GA2				
	North GA2	Unstable	Unstable	-77%	-98%
			Total	-12%	-12%

Remark
1) GTB was constructed by a private property owner in 2010
2) GN5 and GN6 was constructed by BWS-BP in 2009
3) Sand refilling was conducted by BWS-BP in 2009 (V= 8,000m^3)
4) GN4 was constructed by BWS-BP in 2011
5) Sand refilling was conducted by BWS-BP in 2011 (V= 13,000m^3)

(Source: JICA Study Team)

(3) Kuta

The area of nourishment at Kuta beach is divided into five sub-areas from K1 until K5 as shown in Figure 6.1.3.

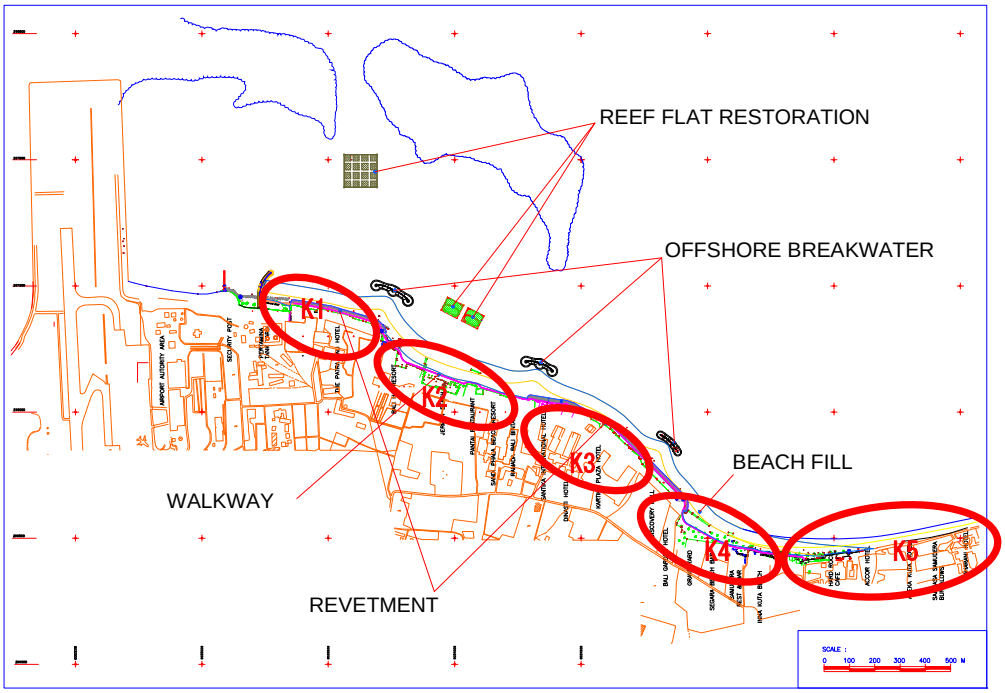


Figure 6.1.3 Area of Nourishment at Kuta Beach

(Source: JICA Study Team)

Figure 6.1.4 shows the volume of sand loss for each sub-area. At K1 and K2, even though some degree of sand loss was observed especially at K1, the beach is almost balanced. On the other hand, significant sand loss was observed with a volume of approximately 55,000 m^3 at K3 until September 2011. At K4, sand was balanced until November 2010. However on September 2011, the retreat area has intruded K4. More than 15,000 m^3 of sand loss was observed. At K5, sand has retreated until November 2010, although sand accumulation was observed during its monitoring period in 2011 (June and September 2011) with a volume of 13,000 m^3 by September 2011.

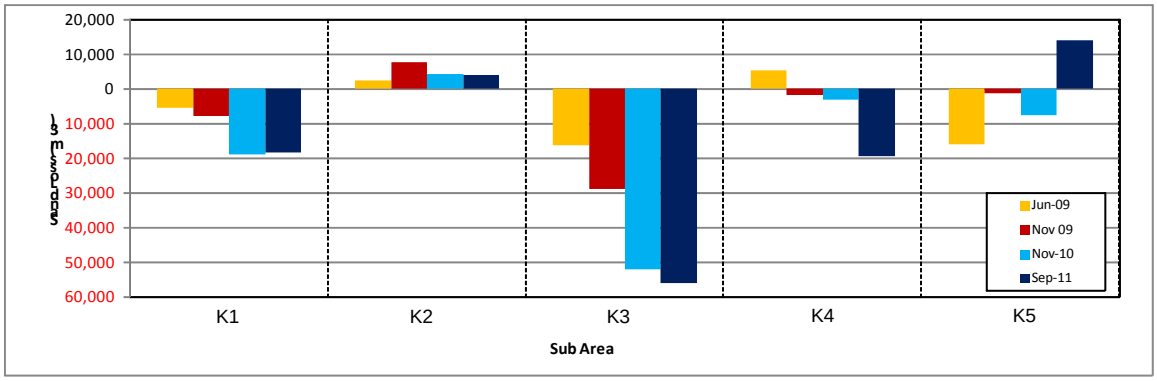


Figure 6.1.4 Sand Loss for Each Sub-Area

(Source: Nippon Koei Co., Ltd & BWS-BP)

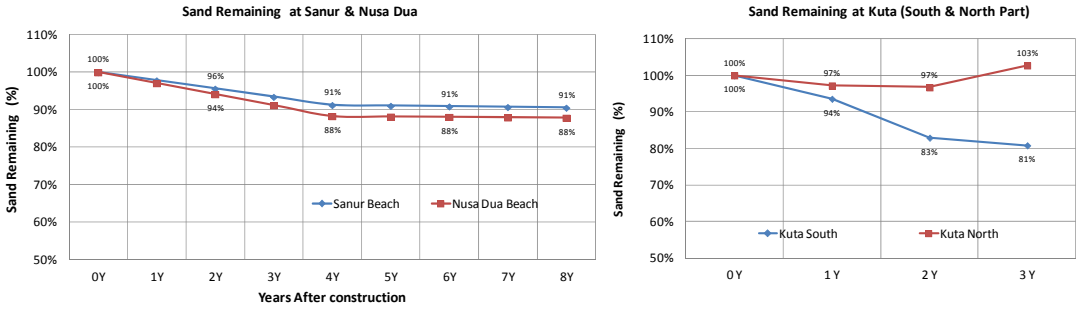
Table 6.1.3 Comparison of Evaluation Result on Beach Condition at Kuta

Sub-area	Previous Evaluation	Present Evaluation (by the JICA Study Team)
K1 (Sand Stopper - BWN1) G12 - GN2	No evaluation	Become worse, necessary careful checking
K2 (BWN1 - BWN2) GN2 – UG1		Good, but necessary continuous monitoring
K3 (BWN2 - BWN3) UG1 - (G10		Worse, adaptation is required
K4 (BWN3 - Hard Rock Café) G10 - G9		Become worse, necessary careful checking
K5 (Hard Rock Café -Alam Kul kul)		Good, but necessary continuous monitoring
K5 (Hard Rock Café -Alam Kul kul)		Good, but necessary continuous monitoring

(Source: Nippon Koei Co., Ltd & BWS-BP)

(4) Summary of Sand Remaining Rate

The rate of sand remaining after the nourishment for Samur, Nusa Dua and Kuta was summarized in Figure 6.1.5. High remaining rate of sand with approximately 90% can be secured at Sanur and Nusa Dua. On the other hand, significant outflow of sand was observed at the south part of nourishment area at Kuta. According to the monitoring result, the total amount of sand loss during the last three years since 2008 to 2011 was estimated at roughly 80,000 m^3 (20% of the total quantity of nourishment). This quantity of sand loss was significantly higher than that in Sanur and Kuta (10% for eight years) .



(1) Sanur and Nusa Dua (2) Kuta

Figure 6.1.5 Rate of Sand Remaining after the Nourishment in Phase-1 Project

(Source: JICA Study Team)

6.2 Evaluation and Necessity of Adaptation Measures

The necessity for the adaptation will be evaluated based on this result taking into account obstacles of beach use at the recession area.

Table 6.2.1 shows the evaluation result for the necessity of adaptation at Sanur, and Table 6.2.2 shows at Nusa Dua.

Table 6.2.1 Evaluation for Necessity of Adaptation at Sanur

Sub-area	Section	Present Evaluation (by the JICA Study Team)	Obstacle to Beach Activities	Necessity of Adaptation (Now)
S2	G7–GN4	Unstable	Yes	Yes
S3	North G32	Unstable	Yes	Yes
	G37–GN5	Unstable	Yes	Yes
	G38–G39	Unstable	No	
	G39–GA2	Unstable	Yes	Yes

(Source: JICA Study Team)

Table 6.2.2 Evaluation for Necessity of Adaptation at Nusa Dua

Sub-area	Section	Present Evaluation (by JICA Study Team)	Obstacle to Beach Activities	Necessity of Adaptation (Now)
N1	G12-GN2	Unstable	No	
N3	G0-GA8	Unstable	Yes	Yes
	GA8-GTB	Unstable	No	
	GTB-GN4		No	
	GN4-GA3		No	
	GA3-GN6	Unstable	No	
	GN6-GN5		No	
	GN5-GA2		No	
	North GN2	Unstable	Yes	Yes

(Source: JICA Study Team)

6.3 Recommended Adaptation Measures

The adaptation measures have been recommended in the O/M report (Technical Edition, Volume III, Monitoring and Maintenance Part of the Project Completion Report). Based on the monitoring data included in the latest result, the adaptation measures at unstable area was re-examined.

(1) Categorizing of Required Adaptation

As presented in the previous O/M report, the required adaptations for maintenance of the beaches are divided into several levels depending on the condition of the beach at each section.

1) Adaptation Level 1: No action (only continue beach monitoring, but not frequently)

2) Adaptation Level 2: Sand re-rotating from accumulation area to retreat area

3) Adaptation Level 3: Only refilling of sand without new construction or modification of existing coastal structures

4) Adaptation Level 4: Refilling of sand with new construction or modification of existing coastal structures

(2) Adaptation Plan at Sanur

Recommended adaptations at four sites in Sanur are as shown in Table 6.3.1to 6.3.4.

Table 6.3.1 Recommended Adaptation between Groin G7 and GN4

Adaptation Method	Combination of sand refilling from sand stockpile and sand rotation from accumulation areas to recession areas (Level-3)
Expected Volume	Refilling from sand stockpile: 1,200 m^3 Sand rotation: 500 m^3
Frequency for Refilling	Every 5 years

(Source: JICA Study Team)

Table 6.3.2 Recommended Adaptation Between Groin G32 to the North

Adaptation Method	Sand refilling from sand stockpile (Level-3)
Expected Volume	1,000 m^3
Frequency for Refilling	Every 5 years

(Source: JICA Study Team)

Table 6.3.3 Recommended Adaptation between Groin G37 and GN5

Adaptation Method	Sand refilling from sand stockpile with modification of existing groin (increase of crown elevation for GN5) (Level-4)
Expected Volume	1,000m^3
Frequency for Refilling	Every 5 years

(Source: JICA Study Team)

Table 6.3.4 Recommended Adaptation between Groin G38 and GA2

Adaptation Method	Sand rotation from accumulation area to recession area (Level-2)
Expected Volume	Sand rotation: 3,000 m^3
Frequency for Refilling	Every 3 years

(Source: JICA Study Team)

(3) Adaptation Plan at Nusa Dua

Recommended adaptations at two sites in Nusa Dua are as shown in Table 6.3.5and 6.3.6.

Table 6.3.5 Recommended Adaptation Between Groin G0 and GA8

Adaptation Method	Sand refilling from sand stockpile and modification of existing groin (increase groin GA8 crown elevation) (Level-4)
Expected Volume	Refilling from sand stockpile: 1,500 m^3
Frequency for Refilling	Every 5 years

(Source: JICA Study Team)

Table 6.3.6 Recommended Adaptation at GA2 to the North

Adaptation Method	Periodic sand rotation from northern side (Level-2)
Expected Volume	Rotating sand: 2,500 m^3
Frequency for Refilling	Every 5 years

(Source: JICA Study Team)

(4) Adaptation Plan at Kuta

Serious condition for the beach retreat was observed at the section of K3. Furthermore, the condition of the beach at the section of K1 and K4 became worse and still didn't obtain the stable condition.

It is necessary to do the continuous monitoring at Kuta beaches to check the beach behavior, and the suitable improvement to reduce the further beach retreat was recommended. Further explanation at Kuta was described in the Chapter 11 and 12 as one of the scopes for the Phase-2 Project.

FEASIBILITY STUDY ON PHASE-II PROJECT

Chapter 7 Basic Information about the Study Area

7.1 Review of Natural Conditions

(1) Geographical Conditions

Bali Island is located between Lombok Island and Java Island as shown in Figure 7.1.1. Nusa Penida Island is located at the southeast direction about 10 km away from Bali Island. The existence of this island causes sheltering effect on the offshore wave field on the east coastal area. The bottom slope at the southwest coast is milder than that on the east coast, and the bottom slope becomes milder toward the south. The average bottom slope from the coastline to a depth of 50 m is about 1/180 at Tanah Lot, and 1/220 at Kuta on the southwest coast. On the other hand, on the east coast, the bottom slope at Sanur is about 1/50 and 1/20 at Candidasa.

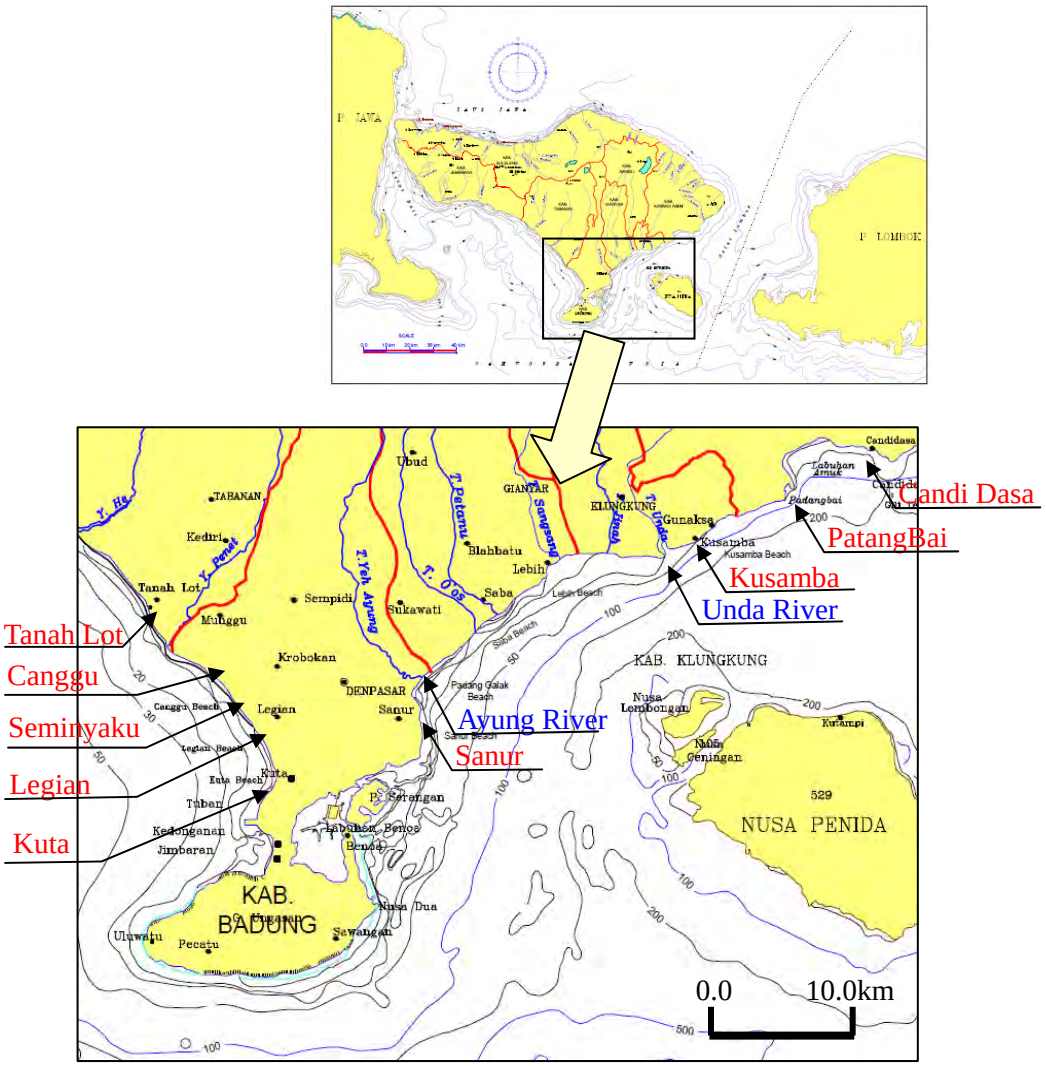


Figure 7.1.1 Coastal Geography and Seabed Topography

(Source: Sea Chart arranged by JICA Study Team)

Coral reefs are mainly distributed surrounding Bukit Island from Kuta on the southwest area to Sanur on the east area, and Nusa Penida. Further, some coral reefs exist in Padangbai Candidasa on the east coast.

The beach in the east coastal area is divided into two types with different characteristics. One is sandy beaches from north Sanur up to Kusanba, which are formed by volcanic sand inflow from the river. The other is coral reef beaches, which exist in Padangbai and Candidasa.

The southwest coast consists mostly of volcanic sandy beach. However, coral reef exists in Kuta, which is located on the south side of this study area.

(2) Metrological Conditions

The climate of Bali Island is divided into two seasons namely, rainy season and dry season as shown in Figure 7.1.2.

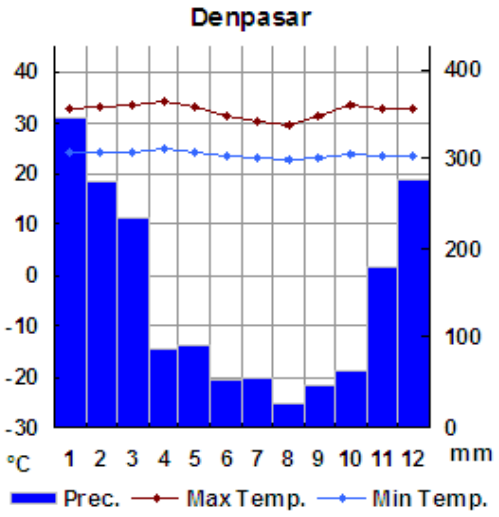


Figure 7.1.2 Monthly Rainfall and Temperature (1961 to 1990)

(Source: Wikipedia, WMO data)

The predominant monthly wind direction and average wind velocity observed in Kuta and Sanur, which are located in the southwest and southeast coast, respectively, of Bali Island, are shown in Table 7.1.1. In Kuta, the wind from SSE direction is dominant during the dry season from April to September. On the other hand, the wind from W direction is dominant during the rainy season from October to March. In Sanur, the wind from SSE to SE direction is dominant during the dry season, while the wind from WNW direction is dominant during the rainy season.

Table 7.1.1 Wind Characteristics

Kuta 12/2002-8/2011 7am-7pm

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
prev. wind direction	W	W	W	ESE	ESE	ESE	ESE	ESE	ESE	ESE	ESE	W
ave. wind speed(knot	9	8	7	8	7	9	9	10	8	8	8	8

Sanur 5/2010-8/2011 7am-7pm

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
prev. wind direction	WNW	WNW	WNW	SSE	SE	SE	SE	SSE	SSE	SSE	SSE	WNW
ave. wind speed(knot	5	5	5	4	5	9	8	9	8	6	5	4

(Source: Wave Site Windfinder.com)

(3) Hydraulic Conditions

a) Tide Change

A long term tidal observation has been carried out in Benoa Port located near Serangan Island in the southwest coast. The design tide condition at four sites for Phase-1 Project has been determined as shown in Table 7.1.2.

Table 7.1.2 Design Tidal Elevation for Phase-1 Project

(Unit: m)

Tide	Sanur	Nusa Dua	Kuta	Tanah Lot
H.W.L.	+2.6	+2.6	+2.6	+2.6
M.S.L	+1.3	+1.3	+1.3	+1.3
L.W.L	±0.0	±0.0	±0.0	±0.0

(Source: Project Completion Report -Technical Edition-)

b) Offshore Wave Characteristics

It was known from the previous report that the direction of offshore was distributed mainly from SSE to ESE. However, there was no permanent station for wave observation in Bali. The distribution of offshore waves has been predicted using numerical computation.

Figure 7.1.3 shows the results for the distribution of offshore waves for the case of T=16s.

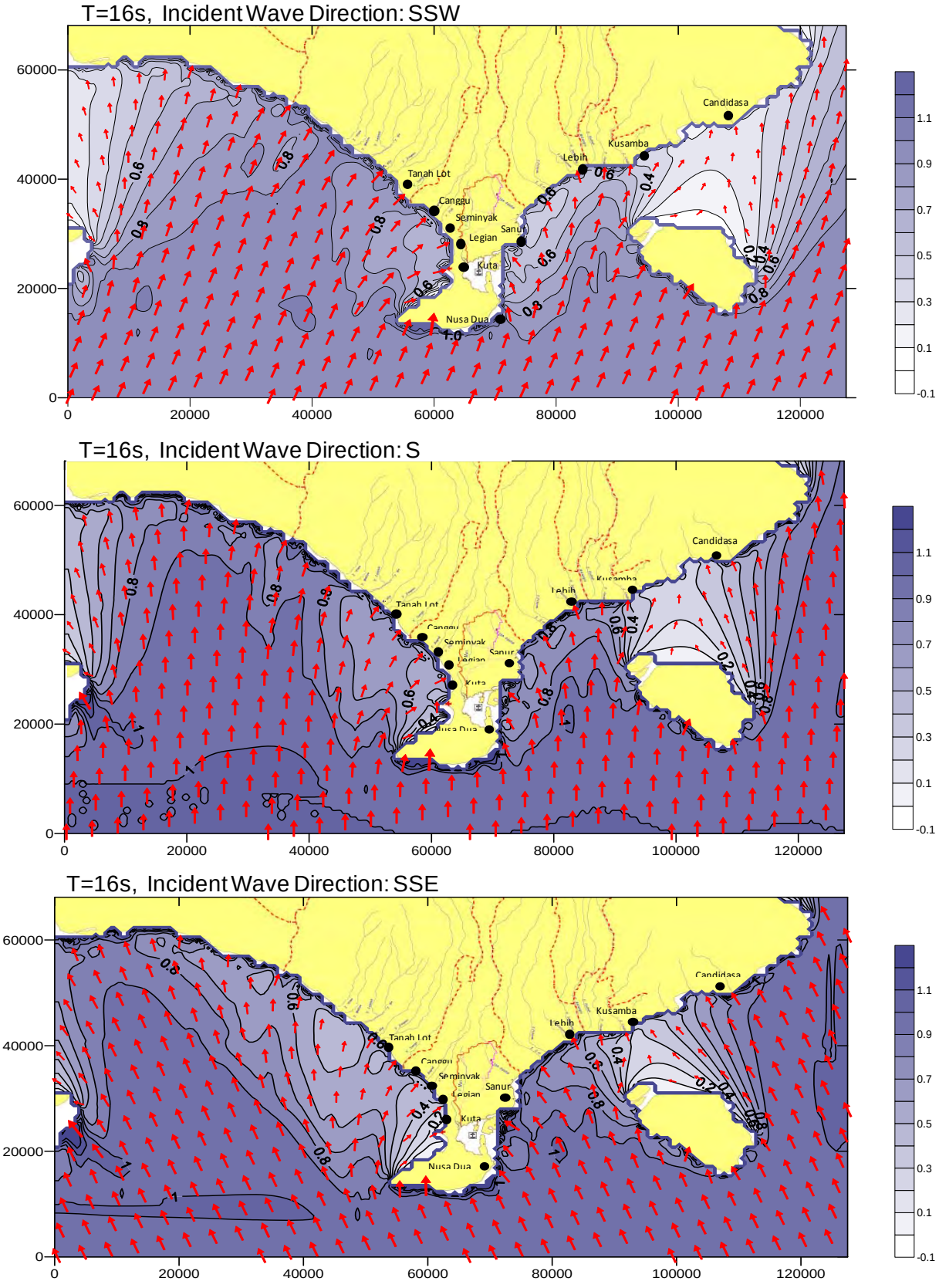


Figure 7.1.3 Offshore Wave Distribution (Period:16 sec)

(Source: JICA Study Team)

7.2 Review of Socio-Economic Conditions

(1) Tourism Development in Bali

a) Tourism Contribution on Industry in Bali

According to the gross regional domestic products (GRDP) in Bali Province, it showed that the industrial origin of "Trade, Hotel, and Restaurant", which is directly related to tourism industry, shared the highest portion at 30.0% among all other industrial origins in 2009. From this, tourism is the highest contributor to the economy of Bali Island.

b) Tourism Development

Figure 7.2.1 shows the number of foreign tourist arrivals in Indonesia and Bali in 1970 and 2010, respectively. The share of Bali increased with 35.6% of occupancy in 2010.

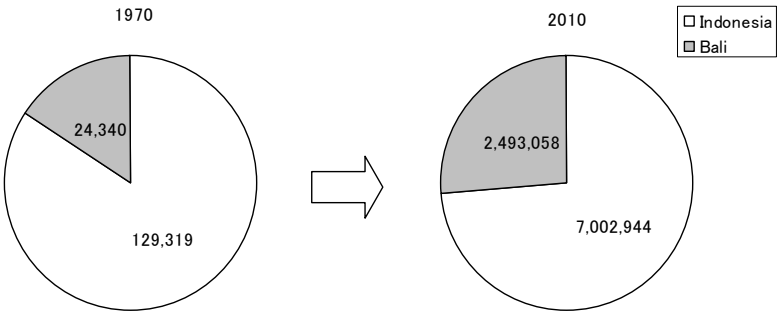


Figure 7.2.1 Share of Tourist Arrivals in Bali

(Source: Bali Government Tourism Office)

Figure 7.2.2 shows the growth rate of foreign and domestic tourist arrivals in Bali based on the data in 2004. Significant increase of the number of tourists was observed in recent 5 years.

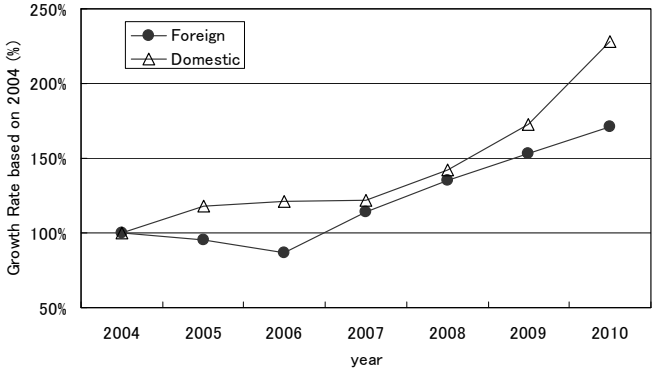


Figure 7.2.2 Growth Rate of Tourist Arrivals in Bali (based on 2004)

(Source: Bali Government Tourism Office)

Table 7.2.1 shows the top five ranking tourist arrival rates from each county from 2006 to 2010. Tourists from Japan and Australia highly contributed to the tourism development in Bali.

Table 7.2.1 Ranking of Tourist Arrivals from Each Country

Rank	2006		2007		2008		2009		2010	
	Country	(%)	Country	(%)	Country	(%)	Country	(%)	Country	(%)
1	Japan	20.29	Japan	21.12	Japan	18.02	Australia	20.00	Australia	25.99
2	Taiwan	11.27	Australia	12.28	Australia	15.68	Japan	14.33	Japan	9.89
3	Australia	10.49	Taiwan	8.34	South Korea	6.73	China	8.95	China	7.90
4	South Korea	7.13	South Korea	8.08	Malaysia	6.59	Malaysia	5.96	Malaysia	6.23
5	Malaysia	5.77	Malaysia	6.30	China	6.56	South Korea	5.56	South Korea	5.01

(Source: Bali Government Tourism Office)

Figure 7.2.3 show the number of accommodations and restaurants as well as the room occupancy rates from 2006 to 2010. The number of accommodations did not increase significantly for the last five years. However, room occupancy rates increased from 44% in 2006 to 61% in 2010. The number of restaurants also increased significantly from 2006 to 2008.

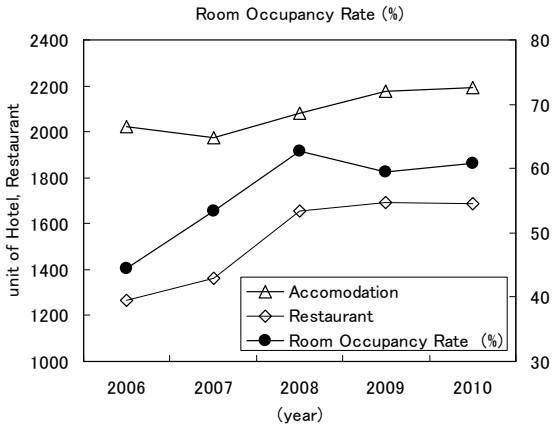


Figure 7.2.3 Number of Accommodations and Restaurants, and Room Occupancy Rates

(Source: Bali Government Tourism Office)

(2) Process of Tourism Development and Beach Erosion

Beaches selected as international resorts in Bali include Sanur, Nusa Dua, Kuta ~ Legian, Seminyak ~ Canggu, Jimbaran, Candidasa, Lovina, etc. Among these, 1) Candidasa, 2) Kuta ~ Legian, and 3) Seminyak ~ Canggu belong to the present study area. The beach erosion at these resort beaches has been occurred since 1970s owing to the tourism development. The large-scale coral mining has been also undertaken in 1970s.

a) Candidasa

The tourism development in Candidasa started since 1969, during the commencement of the Five-Year Development Plan (REPELITA). However, since no suitable regulations on beach preservation have been made, some hotels and cottages were built close to the shoreline. Furthermore, a large scale coral mining has been conducted since 1969 to 1974 to easily obtain construction materials.

The chronology of beach erosion and executed coastal protection measures in Candidasa is as shown in Table 7.2.2.

Table 7.2.2 Beach Erosion and Coastal Protection Measures in Candidasa

year	Chronology of beach erosion and its countermeasures
1969 ~ 1974	Significant coral mining
1970 ~	Started beach erosion problem
1989 ~ 1998	Construction of T-shape groins, breakwaters (by Public Works)
	Beach erosion was continue and expanded to east area
	Seawall construction individually by Hotel and Villa
2006 ~ 2007	Modification of T-shape groins and nourishment in limited area (by Karagasam Dinas PU using Central Gov. Budget))

(Source: Project Completion Report –Technical Edition-)

b) North Kuta ~ Legian

In the beginning of tourism development since the 1960s, north Kuta and Legian beaches were well-known to young generations who enjoy surfing as their sports, and other recreational activities. Significant tourism development has been ongoing since the 1970s after the construction of a runway at Ngurah Rai International Airport. At present, north Kuta to Legian beaches have the highest number of tourists among all tourist places in Bali. A lot of foreign and domestic tourists visit this area for marine activities such as surfing, swimming, sunbathing, walking, and sightseeing. This area is also one of the famous spots for sunset viewing. The chronology of beach erosion and coastal protection measures in north Kuta are summarized in Table 7.2.3.

Table 7.2.3 Beach Erosion and Coastal Protection Measures in North Kuta

year	Chronology of beach erosion and its countermeasures
1968	Completion of Runway Construction
1970 ~	Started beach erosion problem
1985	Construction of seawall and small groins in front of Santika Kartika Hotel
2003	Demolish all groins at Kuta by community
2007 ~ 2008	Construction of revetment and nourishment (by JICA Phase-I)
2009 ~	Beach retreat in front of Kartika Plaza Hotel (between BWN2 and BWN3)

(Source: Project Completion Report –Technical Edition-)

c) Seminyak ~ Canggu

Seminyak and Canggu is located in the north of Legian and Seminyak. Due to concentration of tourism in Kuta and Legian areas, the tourism development has expanded to the north. Consequently, many high class hotels, villas, restaurants, and spas have rapidly developed along the coastal area. The accommodation price around this area is the highest in Bali. The serious beach erosion seems not to happen in this area. However, The beach space becomes narrow during high tide, and this is causing the unsatisfied condition of beach use as highest beach resort area.

(3) Future Development and Strategic Plan in Bali

Figure 7.2.4 shows the spatial development plan of Bali Province for infrastructure network, which will enhance the tourism industry, and the area defined in the coastal zone.

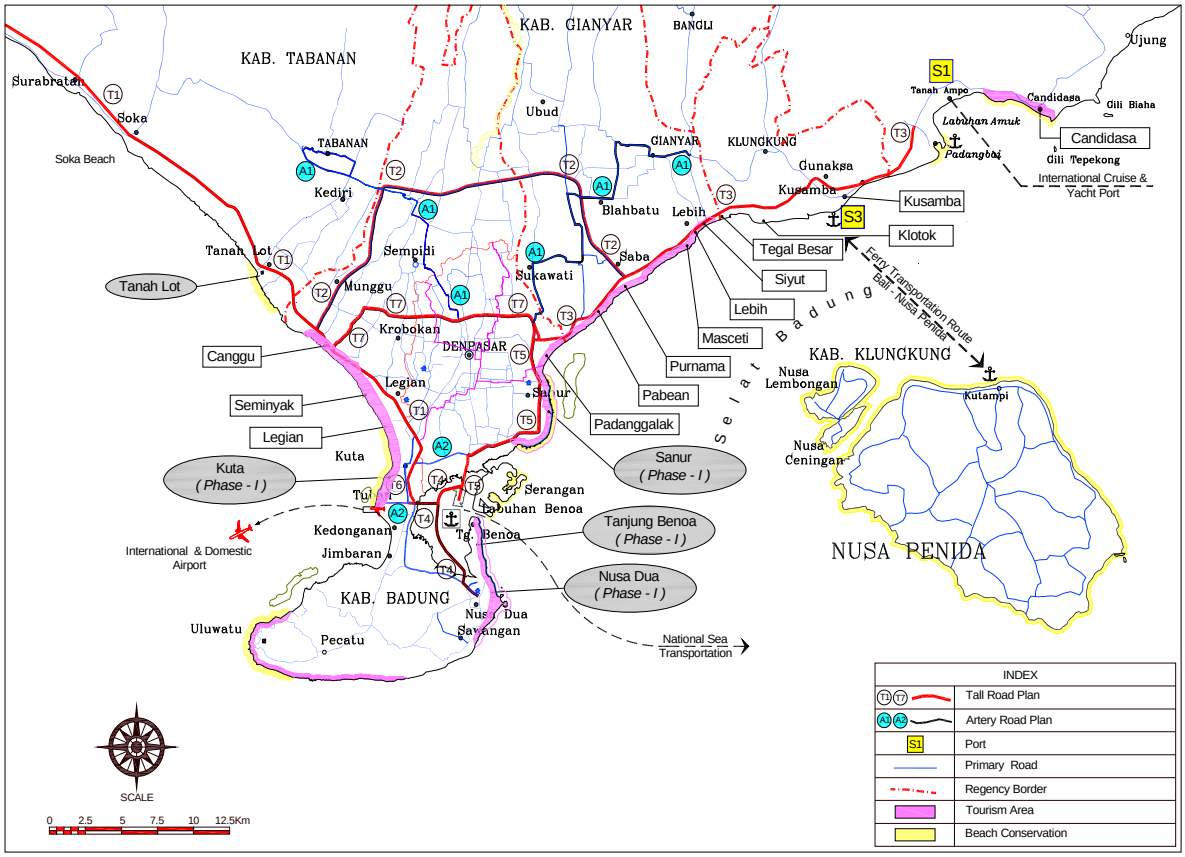


Figure 7.2.4 Spatial Plan

(Source: Bali Province Regulation No.16 in 2009 arranged by JICA Study Team)

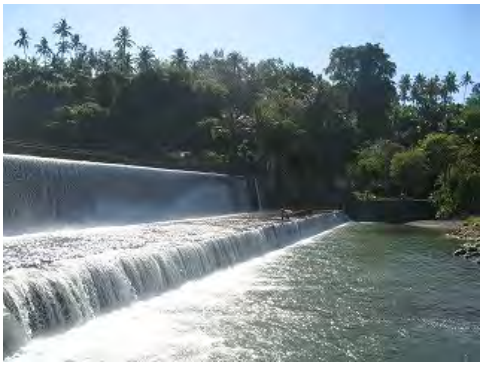
7.3 Review of External Conditions Related to Beach Erosion

The external conditions, which will cause negative impacts to the beach in the study area, are thought as; 1) Decrease of (volcanic) sand supply from river, 2) Volcanic sand and gravel mining from river mouth and coastal area and 3) Coral mining on the coral reef flat.

(1) Decrease of Sand Inflow from River

At the east coast of the study area, Ayung and Unda rivers significantly contributed to the supply of sand on the coast. Figure 7.3.1 shows the number of constructed check (Sabo) dams (shown in Photo 7.3.1) in Bali Island. Active construction of check dam was observed from 1990 to 1995. The beach erosion surrounding the river mouth might be arrested due to the construction of the check dam.

(1) Check (Sabo) Dam



(2) Weir for Irrigation

Photo 7.3.1 Check Dam and Weir (Unda River)

(Source: JICA Study Team)

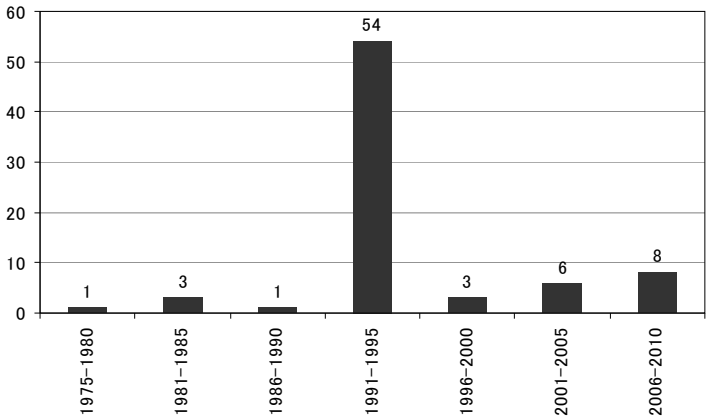


Figure 7.3.1 Number for Constructed Check Dams in Bali Island

(Source: BWSBP arranged by JICA Study Team)

(2) Sand and Gravel Mining from River Mouth and Coastal Area

Significant sand and gravel mining were undertaken at the upstream and river mouth of the Unda River. According to the collected information, active sand mining at the river mouth of the Unda River was undertaken since 2000. Although this activity has been already prohibited since 2007, illegal mining still continues as shown in Photo 7.3.2. Several ten thousand cubic meters per year of sand seem to have been obtained from mining annually from the Unda River mouth before such activities were prohibited. This quantity is the same level of the quantity of littoral transport in the east coast area.


Photo 7.3.2 Sand Mining at the River Mouth (Unda River)

(Source: JICA Study Team)

(3) Coral Mining on the Coral Reef Flat

Large scale coral mining was carried out in Sanur, Nusa Dua, Kuta and Candidasa beaches from 1960s to 1970s. The mining of coral rocks induces 1) increase of wave action inside of the reef due to deepening of reef flat with approximately 1m, 2) decrease of sand sources on coral reef beaches, and 3) sand trap at mining pocket area. Thus, the coral mining could be the primary factor that caused beach erosion on coral reef beaches.

According to the information from the previous report (Syamsdin, 1993), the coral mining areas at Sanur were 75,000 m^2, 200,000 m^2 and 600,000 m^2 in the north, middle and south areas, respectively. In Nusa Dua Beach, the total area of coral mining was estimated to be 200,000 m^2. In Candidasa Beach, the mining area as shown in Photo 7.3.3 was estimated to be about 200,000 m^2.

Photo 7.3.3 Trace of Coral Mining (Candidasa)

(Source: Data for BBCP Phase-1 Project)

Chapter 8 Review of Current Situation on Beach Management & Maintenance

8.1 Beach Maintenance & Monitoring by government institutions which relate for beach management

The beach monitoring has never conducted at Candidasa and Sanur North – Padang Galak and has conducted only once at other beaches until now. So it is difficult to analyze and evaluate shoreline change and tendency of erosion since the monitoring data has not been gathered at above-mentioned beaches. The maintenance work was just carried out at five beaches , that is, three beaches on the east coast (Candidasa, Lebih and Sanur North-Padang Galak) and two beaches on the southwest coast (Seminyak and Canggu).

The structure, organization and policy of beach management and Operation and Maintenance Manual required for suitable beach management were not prepared by government institutions which relate to beach management. As a result, monitoring and maintenance works from a strategic viewpoint have not been implemented both by central government and local government. It is necessary to establish beach management system as reference of experience of Phase-1 project.

8.2 Beach Violation due to Intrusion of Property on Beaches

One of the important points of view on beach management is use at beach area including regulation and permission matters for construction of building and structures such as seawall and revetment by the owner of property and building. At developed and under development beach area, a lot of structures such as seawall, fence, revetment, etc. and buildings which are positioned close to sea waterline are observed. And some of structures and buildings were damaged by wave action and accelerate the scouring in front of structures.

To conserve the beach area, the distance of built property from the waterline has been defined in the presidential, provincial and regency regulation as ‘beach conserve area’. And the fix distance from the waterline was defined as length of ‘beach conserve area’ measured from HHWS line. The meaning of “beach conserve area” is a conservation area along the coast which has function to preserve the natural and religious of the beach, the safeties of the building and the availability of public space. According to the provincial regulation (Spatial plan of Bali Province, No.16/2009), it is prohibited to construct any kinds of structures inside of “beach conserve area” except construction of structures which will be supported to beach recreation activities, beach protection, fishery and port activities.

Several definitions for “beach conserve area” are presented in each regulation among central, provincial, regency, city, etc. However, the following problems are pointed out.

- The definition of the distance for coastal area was different between each regulation of presidential, provincial and regency level.
- Even if the definition of the distance for coastal area exists, this distance didn’t meet with actual condition, especially at already developed and eroded beach.

- The authority for the permission of construction of building and coastal structure such as seawall, revetment is under responsibility of local government (regency). However it seems that they don't pay attention to about the regulated distance of the beach. Also, it is not clear how to measure certain distance from waterline and how to determine the waterline position.
- Lack of checking the land boundary state in the land certificate compare with actual condition (e.g. boundary at land certificate already loss by erosion).

Now, the active expansion of tourism development was undertaken, especially on east part of Candidasa and Seminyak & Canggu. New villas and hotels are constructed or under constructed. The position of seawall/revetment was advanced to the shore side. Sometimes, the seawall/revetment was constructed on the beach slope. This is one of the big issues on beach management to preserve the beach area.

At the west coast study area, especially at Seminyak to Canggu, the development at coastal area is on-going at many places. Some of the facilities for their property such as fence, revetment, swimming pool and building are located close to the shore.

8.3 Beach Cleaning by Communities, Hotels and Beach Users

Beach cleanings in Phase-II beaches are conducted intensely by traditional villages, hotels, fisherman groups and other beach users without payment. May be because of the numbers of visitors to the candidate sites are smaller than the beaches of Phase-I, trash on the beach are seldom seen and all of the beaches are in good condition.

8.4 Involvement from NGO, Private Company and Other Sectors

Since the last study for Progress Report, there have been little results of clear indications over the involvements along the candidate beaches for Phase II except a Bali Beach Clean Up (BBCU) program sponsored by Coca Cola Amatil and Quicksilver. Further studies of potential collaborators for PR and CSR will pave the way to identify clearer situations along the beaches.

Chapter 9 Selection of Three Candidate Sites

9.1 Procedure for Selection of Candidate Site

According to the minutes of meeting on the mission of this preparatory survey, which was agreed among MPW, BAPPENAS, and JICA, three candidate sites shall be selected by employing an appropriate evaluation criteria and checklist items.

(1) Premise Condition

According to the agreement between GOI and JICA, it is required that "the candidate beach will contribute further development to the world tourism in Bali".

(2) Subject Beach

Firstly, the subject beaches will be identified from the study area. Balai has already carried out a preliminary survey to check the condition of the entire coastal area with respect to coastal erosion in Bali Island including the study area. Using the said preliminary survey, 13 beaches were identified as subject beaches as shown in Table 9.1.1. The location for each beach is presented in Figure 9.1.1.

Table 9.1.1 Subject Beaches

Study Area	No	Subjected Beaches
South-East Coast	E1	Candidasa
	E2	Kusamba
	E3	Klotok
	E4	Tegal Besar
	E5	Siyut
	E6	Lebih
	E7	Masceti
	E8	Saba, Purnama
	E9	Pabean
	E10	North Sanur ~ Padang Galak
South-West Coast	W1	North Kuta (End of nourishment at Phase-1(Alam Kul-kul) ~ Legian
	W2	Seminyak
	W3	Canggu

(Source: JICA Study Team)

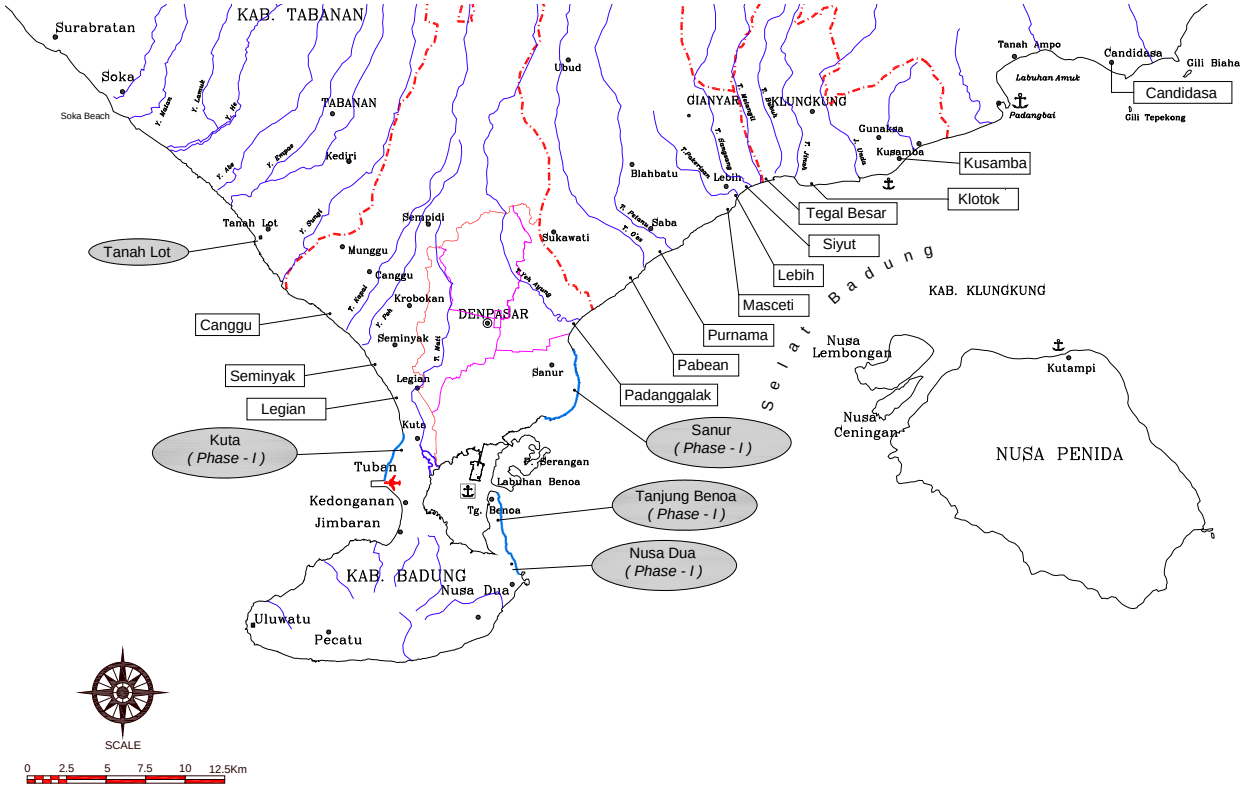


Figure 9.1.1 Location of Subject Beaches

(Source: JICA Study Team)

(3) Procedure for Selection

Figure 9.1.2 shows the basic procedure for the selection of candidate site for Phase-2 Project.

- At first, the subject beach shall be evaluated based on the two main points of view, i.e., economic contribution as world tourism and beach condition (degree of beach erosion and obstacle to beach activities);
- The preliminary selected beaches will come from the subject beaches who met the above two requirements. This means that even if the beach is not under serious condition of beach erosion but its potential as world tourist area might be low or its vice versa, it will not be selected as candidate site for Phase-2 Project;
- The selected beaches that met the above two criteria will undergo another set of three-point evaluation on the following areas; a) socio-environment, b) coastal environment, and c) realization of beach management; and
- If there will be no issues or negative impact on the above areas to the preliminary selected beaches, these beaches will finally become the candidate beaches for Phase-2 Project.

Table 9.1.2 shows the checklist items for each evaluation criteria. .With application of these criteria, three candidate sites are selected.

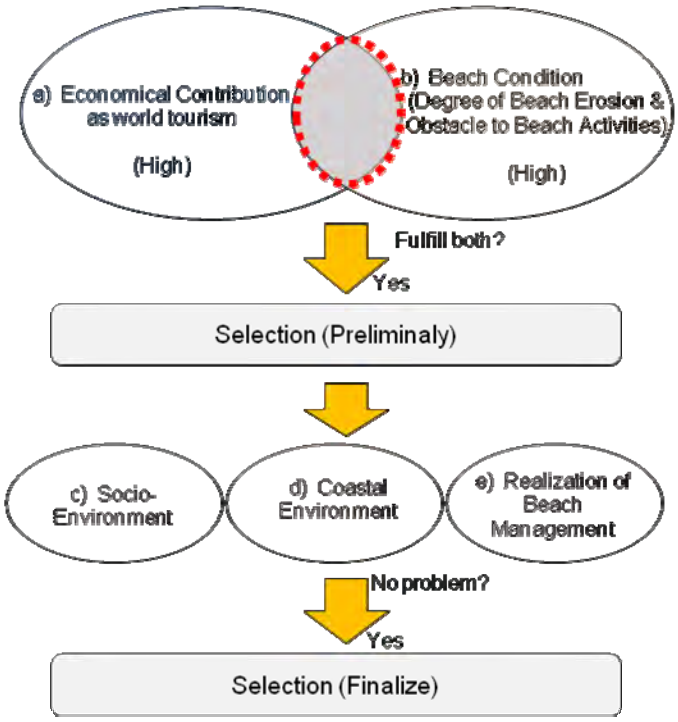


Figure 9.1.2 Basic Procedure for the Selection of Candidate Site

(Source: JICA Study Team)

Table 9.1.2 Checklist Items for Each Evaluation Criteria

Evaluation Criteria	No	Check Item
a) Economical Contribution as world tourism	a-1	Identification of world-famous tourism area (Information from tourism statistic data and site visit)
	a-2	Land use at coastal area (Number of existing Hotel & restaurant, important facilities)
	a-3	Contribution of development Plan on tourism (Spatial Plan in Bali Province))
b) Beach Condition	b-1	Degree of beach erosion (Long term shoreline change)
	b-2	Obstruction on beach activities and utilization (Purpose of beach use and required width)
	b-3	Obstruction on land facilities (Wave intrusion, overtopping to the property)
c) Socio-Environment	c-1	Request of beach conservation from hotels and communities
	c-2	Relation between hotels and communities
d) Coastal Environment	d-1	Impact to coastal environment (coral, fish, fauna & flora, water quality)
	d-2	Restriction on regulation, rule for coastal environment
e) Realization of Beach Management	e-1	Management system (government)
	e-2	Self-management by stakeholders
Conclusion for Evaluation		

(Source: JICA Study Team)

9.2 Evaluation Result

Table 9.2.1 shows the evaluation result of the preliminary selection of candidate beaches for Phase-2 Project using the two main criteria. Based on the results, Candidasa got the highest score, followed by North Kuta～Legian (2nd), and Seminyak (2nd), which were selected as first priority of candidate beaches for Phase-2 Project. As to the second priority, Canggu and Lebih were selected. North Sanur～Padang Galak was selected as third priority. Table 9.2.2 shows the final evaluation result for the selected five beaches by checking three aspects. No negative issue was expected for the selected candidate beaches.

Table 9.2.1 Evaluation Results (Preliminary)

Study Area	No	Subjected Beaches	a) Economical Condition as World Tourism			b) Degree of Beach Erosion & Obstacle to Beach Activities		Total Score	Evaluation (Priority as Phase-2)
			a-1	a-2	a-3	b-1	b-2		
			Identification of world-famous tourism area	Land use along coast	Development Plan & its contribution	Degree of Beach Erosion	Obstruction on beach activities, ladn facilities		
South East Coast	E1	Candidasa	4	4	4	5	5	**22**	**1**
	E2	Kusamba	1	2	1	1	0	**5**	
	E3	Klotok	1	1	2	5	1	**10**	
	E4	Tegal Besar	1	2	1	5	1	**10**	
	E5	Siyut	1	2	2	5	1	**11**	
	E6	Lebih	3	2	2	5	3	**15**	**3**
	E7	Masceti	1	1	2	2	1	**7**	
	E8	Saba, Purnama	1	1	2	3	1	**8**	
	E9	Pabean	1	1	2	5	1	**10**	
	E10	North Sanur ~ Padang Galak	3	2	2	5	1	**13**	**5**
South West Coast	W1	North Kuta ~ Legian	5	5	2	3	3	**18**	**2**
	W2	Seminyak	5	5	2	3	3	**18**	**2**
	W3	Canggu	4	5	2	2	2	**15**	**3**

(Source: JICA Study Team)

Table 9.2.2 Evaluation Results (Final)

Priority	No	Selected Beach	c) Social Environment		d) Coastal Environment		e) Beach Management		Final Result
			c-1	c-2	d-1	d-2	e-1	e-2	
			Request for Project	Relation between hotel & community	Impact to Coastal Environment	Restriction, Regulation and Rules	Management system	Self-management by stakeholders	
1st	E1	Candidasa	High	No problem	Need careful attention	No	Ready	Medium	Selected
	W1	North Kuta ~Legian	High	No problem	Not impacted	No	Ready	High	Selected
	W2	Seminyak	High	No problem	Not impacted	No	Ready	High	Selected
2nd	W3	Canggu	High	-	Not impacted	No	Ready	Medium	
	E6	Lebih	High	-	Not impacted	No	Low	Medium	
3rd	E10	North Sanur~ Padang Galak	Medium	-	Not impacted	No	Medium	Medium	

(Source: JICA Study Team)

Chapter 10 Field Survey and Sediment Analysis for the Candidate Site

10.1 Tide Measurements along the Southwest and East Coast

Measurement of sea water level was carried out to check the difference in tidal change between the southwest (Kuta) and east coast (Candidasa). The measured data were compared with the tide prediction for Benoa Port. As the result, significant difference in maximum sea water levels (HWL) was not observed. Thus, the same tide condition can be employed for both the southwest coast and east coast (Candidasa) .

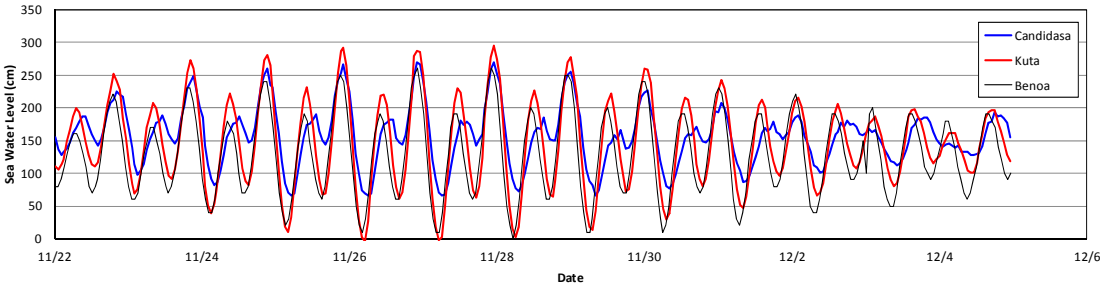


Figure 10.1.1 Result of Sea Water Level Measurements in Candidasa and Kuta

(Source: JICA Study Team)

10.2 Sounding (Bathymetric and Topographic Survey)

Bathymetric survey was carried out at Candidasa and from North Kuta to part of Canggu as shown in Figure 10.2.1 and 10.2.2.

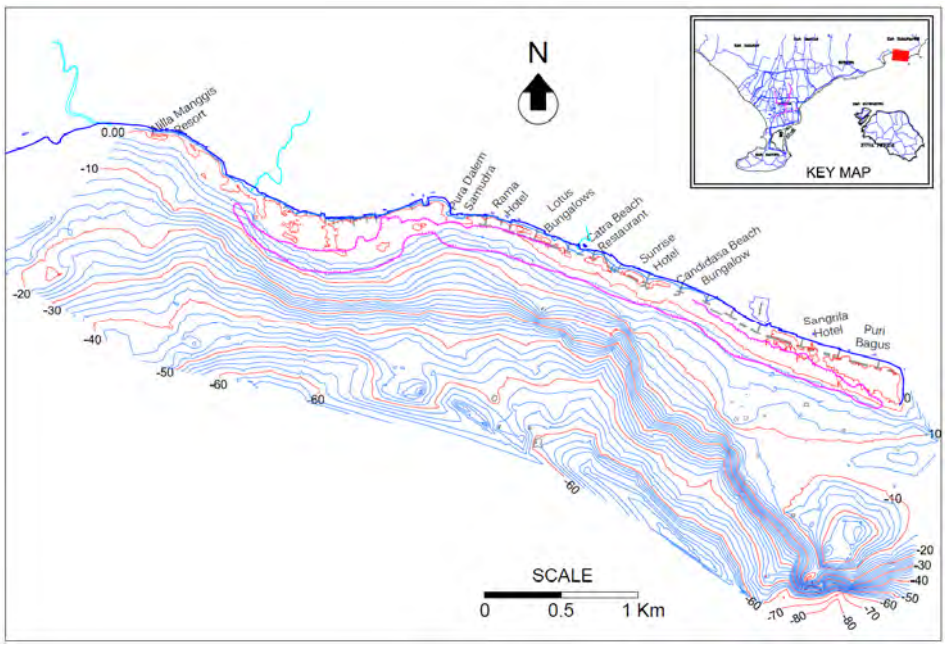


Figure 10.2.1 Bathymetric Chart at Candidasa

(Source: JICA Study Team)

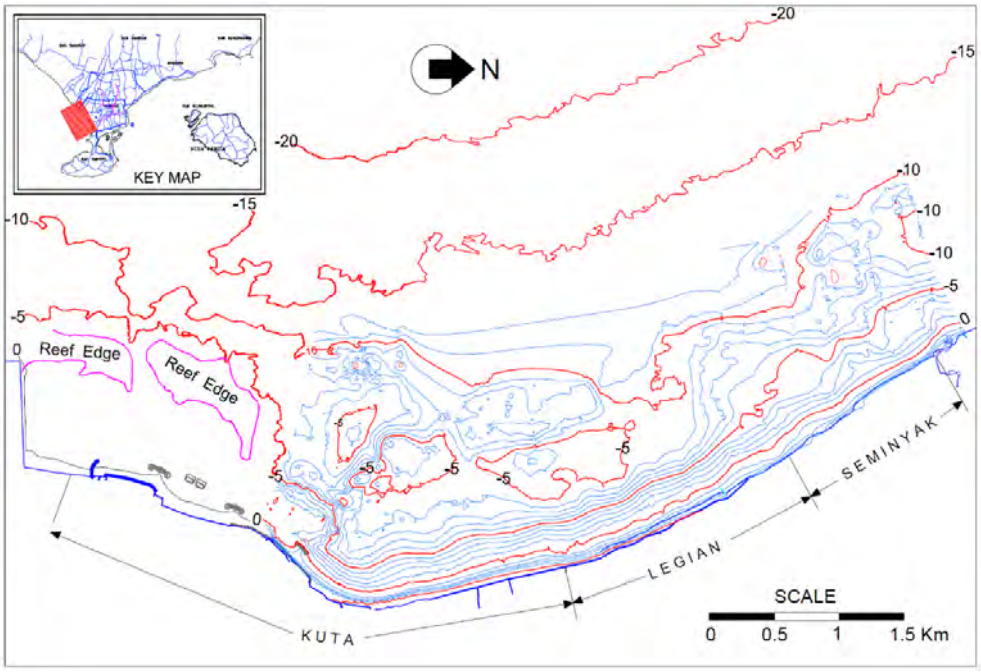


Figure 10.2.2 Bathymetric Chart at the South East Coast from North Kuta to Part of Canggu

(Source: JICA Study Team)

10.3 Beach Profile Survey and Sand Sampling on the Beach

Beach profile survey and sand sampling on the beach were carried out at two candidate sites namely, Candidasa and from North Kuta to part of Canggu as shown in Figure 10.3.1 and Figure 10.3.2. Obtained beach profile was compared to the previous profile as shown in Figure 10.3.3 and 10.3.4.

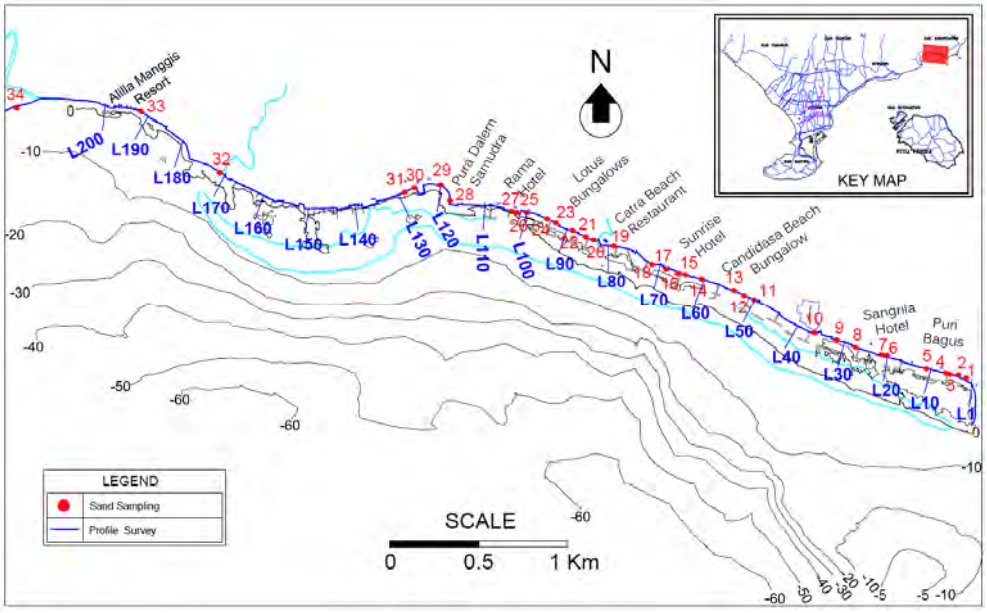


Figure 10.3.1 Location of Beach Profile Survey and Sand Sampling at Candidasa

(Source: JICA Study Team)

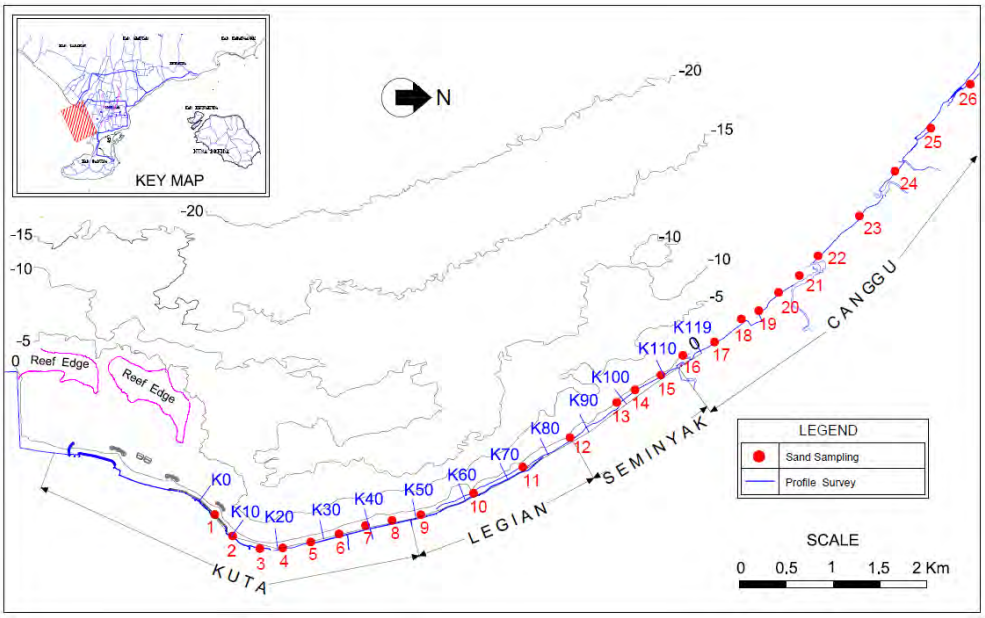


Figure 10.3.2 Location of Beach Profile Survey and Sand Sampling at the South East Coast from North Kuta to Part of Canggu

(Source: JICA Study Team)

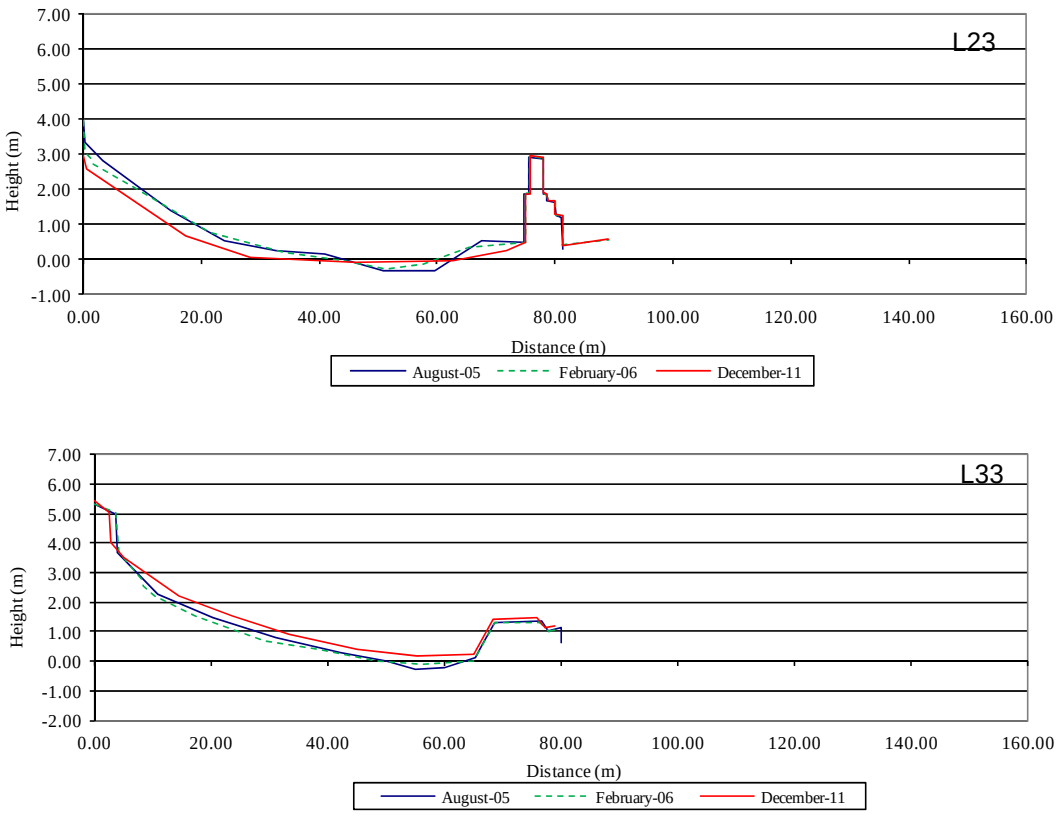


Figure 10.3.3 Comparison on the Beach Profile Taken at Typical Survey Lines in Candidasa (Example)

(Source: JICA Study Team)

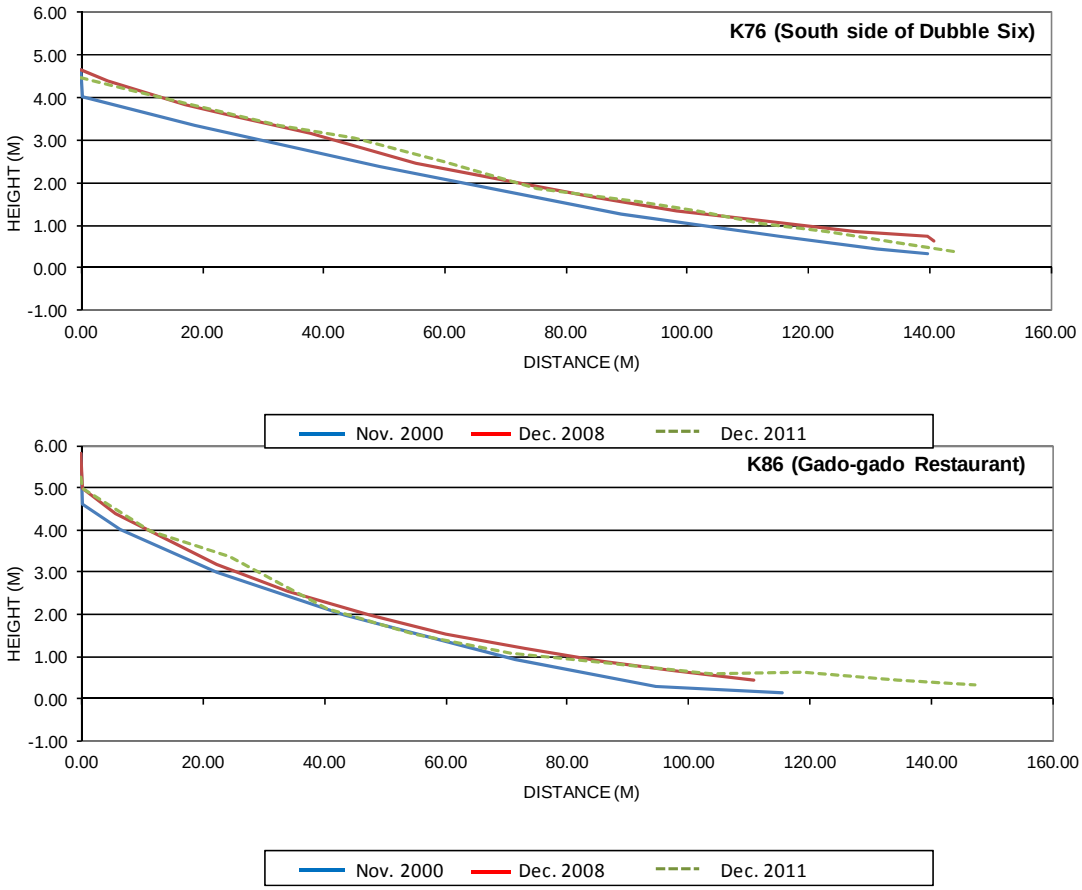


Figure 10.3.4 Comparison on the Beach Profile Taken at Typical Survey Lines from North Kuta to Seminyak (Example)

(Source: JICA Study Team)

The compositions of seabed materials on the foreshore slope in Candidasa and the southwest coast (North Kuta to part of Canggu) are shown Figure 10.3.5 and 10.3.6.

- They are composed of a high percentage of volcanic matter from land in the eastern and central parts of Candidasa. Other parts have a high percentage of biogenic matter such as shell and foraminifera.
- Seabed materials at the southwest coast are composed of a high percentage of biogenic matter in the eastern part, and appeared that the percentage of volcanic matter from land is increasing towards the north.

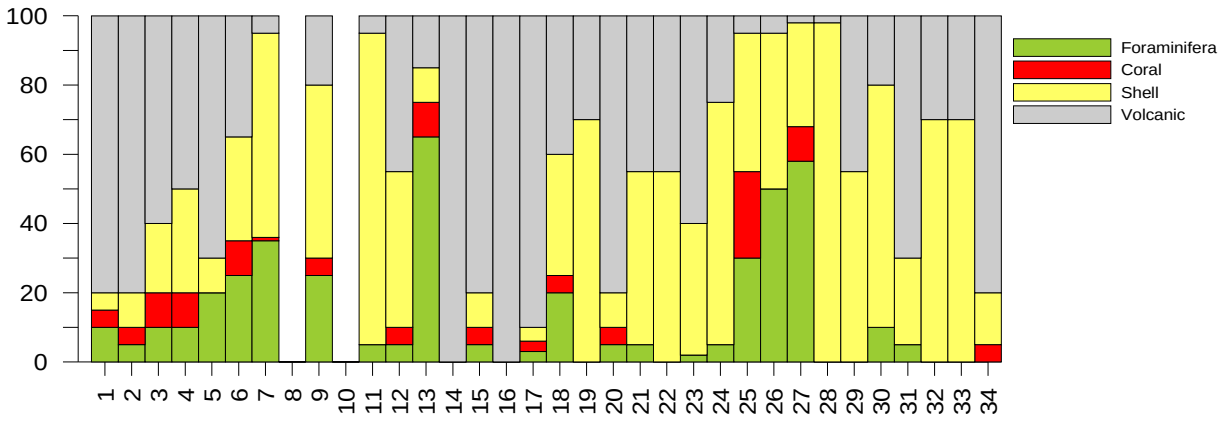


Figure 10.3.5 Seabed Material Composition in Candidasa

(Source: JICA Study Team)

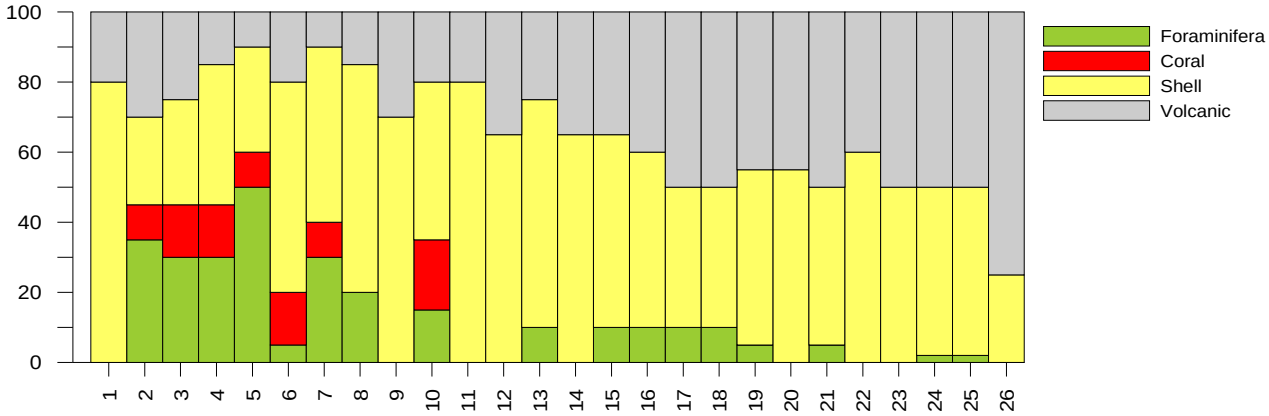


Figure 10.3.6 Seabed Material Composition in the Southwest Coast from North Kuta to Part of Canggu

(Source: JICA Study Team)

10.4 Diving Survey for Potential Area of Sand Borrow

In order to understand the potential areas of sand borrow, a diving survey was carried out in the offshore area of nearby Candidasa and Kuta~Legian~Sminyak as shown in Figure 10.4.1 and 10.4.2. Obtained results are summarized in Table 10.4.1 and 10.4.2.

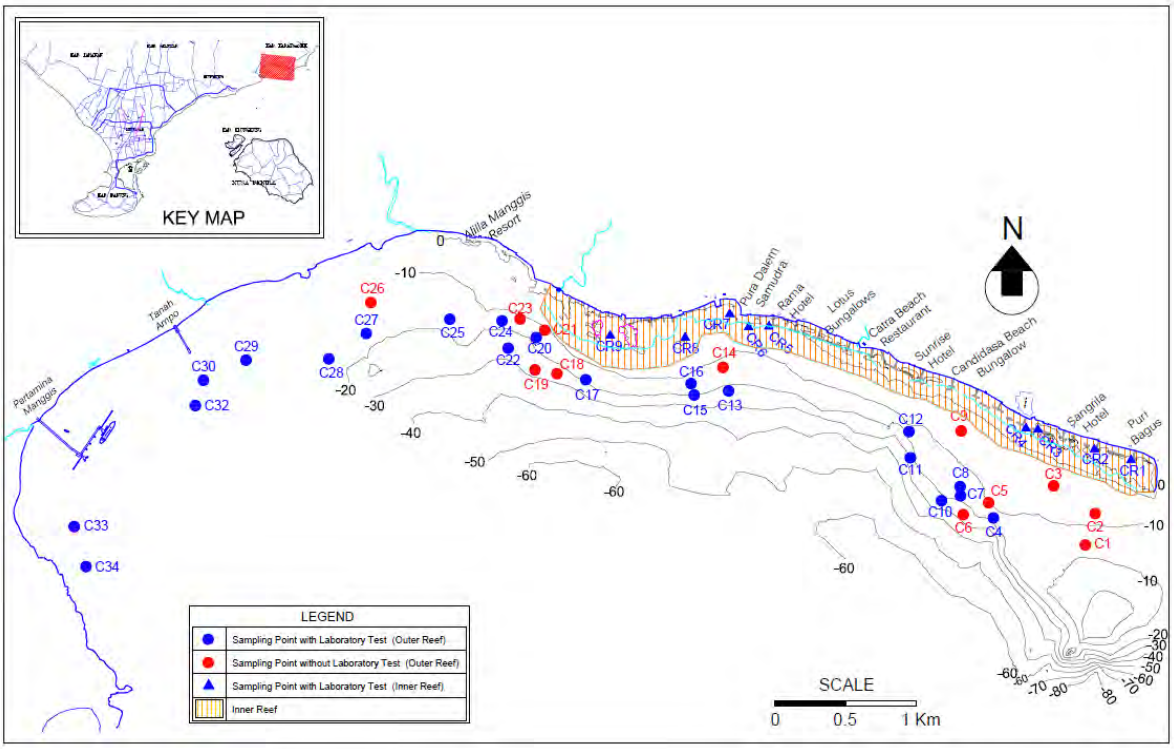


Figure 10.4.1 Diving Survey Area in Candidasa

(Source: JICA Study Team)

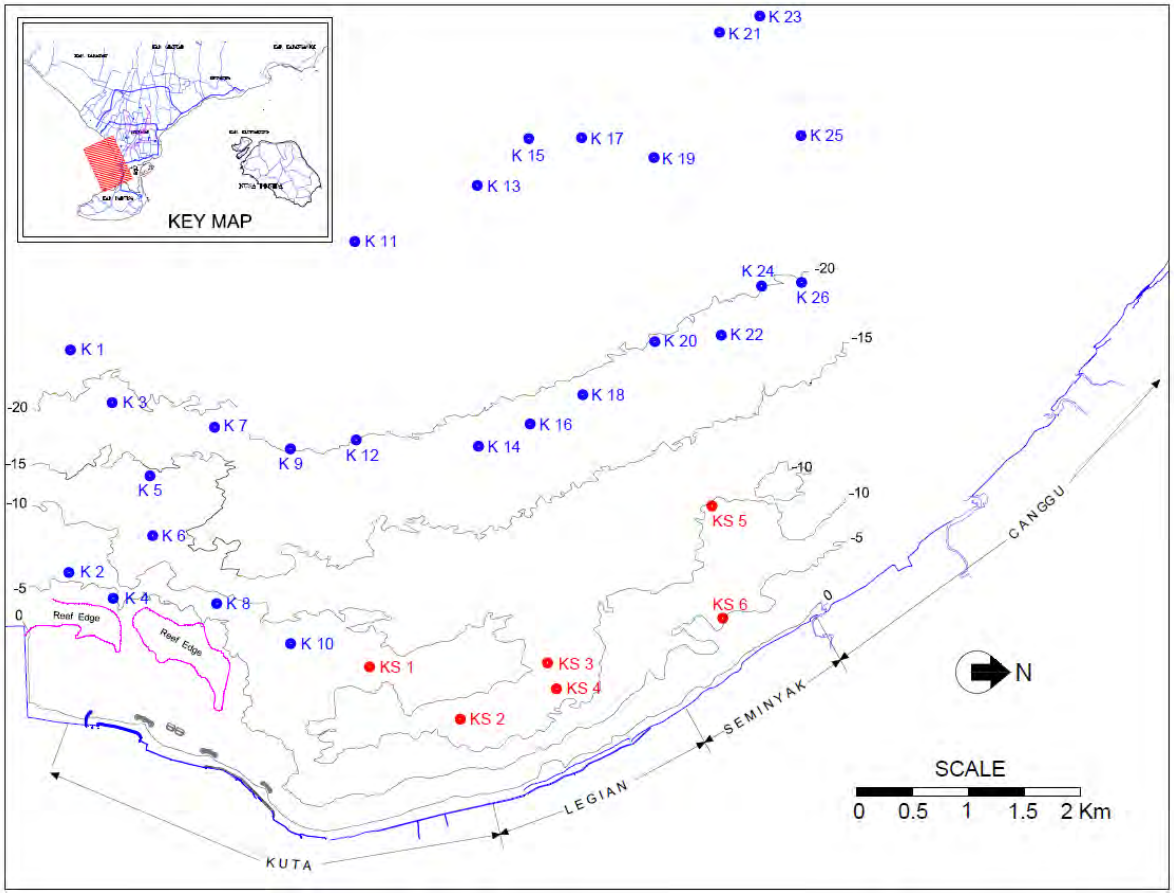


Figure 10.4.2 Diving Survey Area in the Southwest Coast (Kuta~Legian~Sminyak)

(Source: JICA Study Team)

Table 10.4.1 Results of the Diving Survey of Seabed Materials in Candidasa

Location: CANDIDASA

No.	EL. (m)	Thickness (cm)	Surface or Below	Color	Description (Main contents)		Result of sieve analysis Contents of Fine Sand %	D50 (mm)	Gs (kg/cm3)
C1	-12.6	50	SURFACE	Light Brown	Shell	55%			
			BELOW	Light Brown	Shell	55%			
C2	-8.3	33	SURFACE	Dark Grey	Volcanic	50%			
			BELOW	Dark Grey	Volcanic	50%			
C3	-7.9	40	SURFACE	Light Brown	Shell	60%			
			BELOW	Light Brown	Shell	60%			
C4	-26.2	100	SURFACE	Dark Grey	Shell	50%	91%	0.25	2.87
			BELOW	Dark Grey	Coral & Shell	45%	75%	0.28	2.89
C5	-15.1	100	SURFACE	Grey	Volcanic	45%			
			BELOW	Grey	Volcanic	45%			
C6	-25.3	55	SURFACE	Grey	Volcanic	70%			
			BELOW	Light Grey	Coral	50%			
C7	-19.3	50	SURFACE	Grey	Coral	50%	73%	0.30	2.85
			BELOW	Light Grey	Coral	90%	40%	1.05	3.00
C8	-16.6	60	SURFACE	Light Brown	Coral	60%	48%	0.43	2.81
			BELOW	Light Brown	Coral	90%	28%	1.10	2.81
C9	-7.2	70	SURFACE	Light Brown	Shell	70%			
			BELOW	Light Brown	Shell	70%			
C10	-25.4	100	SURFACE	Grey	Shell	55%	70%	0.29	2.86
C11	-26.8	100	SURFACE	Grey	Coral	50%	56%	0.36	2.91
C12	-21.7	120	SURFACE	Grey	Coral	60%	45%	0.50	2.82
C13	-22.2	85	SURFACE	Grey	Shell	45%	82%	0.24	2.96
			BELOW	Grey	Shell	55%	61%	0.30	2.94
C14	-13.8	48	SURFACE	Grey	Volcanic	90%			
			BELOW	Grey	Volcanic	65%			
C15	-23.3	80	SURFACE	Brown	Coral	90%	46%	0.46	2.90
			BELOW	Brown	Coral	90%	15%	3.00	2.50
C16	-13.9	50	SURFACE	Light Brown	Coral	90%	18%	1.70	2.91
			BELOW	Light Brown	Coral	85%	8%	2.45	2.86
C17	-18.0	120	SURFACE	Light Brown	Coral	80%	15%	1.85	2.86
			BELOW	Light Brown	Coral	90%	9%	3.10	2.82
C18	-26.1	90	SURFACE	Brown	Coral	90%			
			BELOW	Brown	Coral	90%			
C19	-30.1	80	SURFACE	Brown	Coral	90%	21%	1.00	2.82
			BELOW	Brown	Coral	90%	6%	6.50	2.83
C20	-18.4	120	SURFACE	Grey	Volcanic	55%	88%	0.25	2.92
			BELOW	Grey	Shell	55%	87%	0.27	2.98
C21	-11.9	85	SURFACE	Dark Grey	Volcanic	95%			
			BELOW	Dark Grey	Volcanic	95%			
C22	-27.5	> 120	SURFACE	Grey	Coral	85%	40%	0.70	3.05
			BELOW	Grey	Coral	85%	36%	0.70	2.99
C23	-13.6	80	SURFACE	Grey	Volcanic	80%			
			BELOW	Grey	Volcanic	90%			
C24	-17.9	95	SURFACE	Grey	Shell	65%	90%	0.25	2.99
			BELOW	Light Grey	Coral	80%	62%	0.32	2.95
C25	-20.1	95	SURFACE	Light Grey	Shell	75%	86%	0.30	2.92
			BELOW	Light Brown	Coral	50%	25%	2.20	2.88
C26	-13.0	48	SURFACE	Grey	Volcanic	80%			
			BELOW	Grey	Volcanic	60%			
C27	-19.1	110	SURFACE	Light Grey	Shell	55%	79%	0.31	2.93
			BELOW	Light Grey	Shell	50%	53%	0.40	2.89
C28	-18.9	120	SURFACE	Light Brown	Shell	55%	36%	0.52	2.88
			BELOW	Light Brown	Coral	50%	29%	0.60	2.84
C29	-21.4	120	SURFACE	Light Grey	Volc & Shell	45%	92%		2.89
			BELOW	Light Grey	Volcanic	50%	75%		2.91
C30	-19.4	120	SURFACE	Light Grey	Shell	50%	91%	0.22	2.85
			BELOW	Light Grey	Shell	75%	61%	0.30	2.92
C31	-18.9	90	SURFACE	Light Brown	Coral	60%	62%	0.32	2.85
C32	-25.0	100	SURFACE	Grey	Volcanic	60%	87%	0.28	2.92
			BELOW	Grey	Volcanic	50%	75%	0.31	2.80
C33	-25.0	> 120	SURFACE	Dark Grey	Volcanic	55%	92%	0.21	2.78
			BELOW	Dark Grey	Volc & Shell	50%	91%	0.22	2.73
C34	-23.0	100	SURFACE	Light Brown	Coral	80%	22%	1.75	2.88
			BELOW	Light Brown	Coral	80%	15%	2.75	2.94
CR1	-0.8	30	SURFACE	Light Brown	Foraminifera	70%	16%	1.50	2.80
CR2	-0.8	40	SURFACE	Light Grey	Shell	40%	67%	0.29	2.86
CR3	-0.5	30	SURFACE	Light Brown	Foraminifera	65%	8%	1.40	2.80
CR4	-0.8	30	SURFACE	Light Brown	Coral	40%	56%	0.38	2.84
CR5	-0.7	50	SURFACE	Light Grey	Coral	70%	36%	0.55	2.86
CR6	-0.6	50	SURFACE	Light Brown	Coral	60%	22%	0.90	2.86
CR7	-1.1	40	SURFACE	Light Brown	Coral	40%	95%	0.22	2.82
CR8	-0.5	50	SURFACE	Light Brown	Shell	55%	57%	0.38	2.84
CR9	-0.5	55	SURFACE	Light Brown	Shell	65%	81%	0.27	2.89

(Source: JICA Study Team)

Table 10.4.2 Results of the Diving Survey of Seabed Materials from Kuta to Canggu

Location: KUTA

No.	EL. (m)	Thickness (cm)	Surface or Below	Color	Description (Main contents)		Result of sieve analysis: Contents of Fine Sand (0 – 50% – 100%) (%)	D50 (mm)	Gs (kg/cm3)
K1	-20.8	5	Surface	Light Brown	Shell	70%	14%	1.20	2.81
K2	-8.1	40	Surface	Brown			77%	0.35	2.79
K3	-19.3	5	Surface	Light Brown	Shell	60%	11%	2.10	2.85
K4	-9.7	10	Surface	Light Brown	Shell	50%	4%	1.85	2.76
K5	-17.1	120	Surface	Light Grey	Shell	80%	82%	0.30	2.92
K6	-10.9	120	Surface	Brown	Shell	80%	14%	0.60	2.89
K7	-19.1	5	Surface	Brown	Shell	60%	59%	0.38	2.81
K8	-11.3	40	Surface	Light Brown	Shell	60%	66%	0.37	2.81
K9	-20.7	90	Surface	Grey	Volcanic	90%	89%	0.19	-0.51
K10	-9.1	5	Surface	Light Grey	Shell	90%	96%	0.20	2.84
K11	-16.9	120	Surface	Dark Grey	Volcanic	80%	94%	0.21	2.89
K12	-19.9	80	Surface	Dark Grey	Volcanic	80%	98%	0.20	2.83
K13	-30.0	55	Surface	Grey			97%	0.22	2.92
K14	-18.7	> 120	Surface	Dark Grey	Volcanic	90%	94%	0.16	2.83
K15	-31.2	120	Surface	Light Grey	Shell	70%	60%	0.35	2.83
K16	-19.0	> 120	Surface	Grey	Volcanic	90%	96%	0.16	2.79
K17	-29.0	10	Surface	Light Grey	Shell	50%	29%	1.30	2.85
K18	-19.6	90	Surface	Light Grey	Shell	70%	91%	0.30	2.97
K19	-28.2	90	Surface	Grey	Volcanic	95%	83%	0.20	2.74
K20	-20.0	> 120	Surface	Grey	Volcanic	70%	99%	0.14	2.79
K21	-29.3	85	Surface	Grey	Coral	65%	16%	14.00	2.75
K22	-18.9	> 120	Surface	Grey	Volcanic	80%	99%	0.16	2.66
K23	-30.0	> 120	Surface	Light Grey	Shell	50%	20%	0.75	2.74
K24	-19.5	85	Surface	Grey	Volcanic	90%	97%	0.19	2.61
K25	-24.5	60	Surface	Grey	Volcanic	70%	95%	0.75	2.69
K26	-19.4	> 120	Surface	Grey	Volcanic	90%	93%	0.18	2.71
KS1	-8.8	90	Surface	Light Brown	Shell	90%	73%	0.35	2.75
KS2	-7.9	10	Surface	Brown	Shell	70%	19%	0.62	2.86
KS3	-10.8	5	Surface	Light Grey	Volcanic	100%	93%	0.10	2.80
KS4	-10.4	20	Surface	Light Grey	Volcanic	90%	99%	0.17	2.93
KS5	-10.3	40	Surface	Grey	Volcanic	80%	96%	0.29	2.97
KS6	-3.9	110	Surface	Grey	Volcanic	80%	99%	0.22	3.02

(Source: JICA Study Team)

10.5 Comprehensive Analysis for Sediment Transport in Candidasa

The following data and information were applied for the comprehensive analysis of sediment transport in two candidate areas:

- Site investigation data;
- Results of shoreline change and topography analysis based on aerial and satellite photos;
- Sounding data (bathymetric and topographic data);
- Shoreline monitoring data;
- Sand sampling and sieve analysis results; and
- Numerical analysis results (computation for waves and longshore sediment transport).

The estimated characteristics of sediment transport in Candidasa were summarized as follows:

- Westward littoral drift due to S to SSE incident wave direction occurred over the whole area of Candidasa.
- The strength of the littoral drift was influenced by the change of geometry of shoreline and by the difference in wave action mainly due to the changing width of coral reef flat.
- The sand source in Candidasa was mainly from organic origin, which was produced on the coral reef flat. However, the volcanic origin sand was also included in the westside nearby the peninsula. This means that some portions of volcanic sand were due to inflow occurrence through the peninsula.
- Possibility to increase the organic sand was not expected.

10.6 Comprehensive Analysis for Sediment Transport in the Southwest Coast

A comprehensive analysis on sediment transport in the southwest coast (from north Kuta to Canggu) was carried out. There are no remarkable coastal structures and obstacles to identify the dominant littoral sand transport. Thus, careful analysis based on several data and information is required to determine the characteristics of sediment transport in this area.

The estimated characteristics of sediment transport in the southwest coast were summarized as follows:

- It is evident that northward littoral drift occurs in Kuta's reef area. Moreover, most of the transported sand in the north has probably flown out to offshore through the reef gap in the north edge of the coral reef. A part of the sand from the south area flows to the north Kuta area; however the quantity of such inflow is limited.
- It is obvious that littoral drift does not occur from North Kuta~Legian~Seminyak area due to change of alignment of the beach perpendicular to the dominant incident wave direction.
- The slight southward littoral drift was expected in the North Canggu area, especially the north part.
- The northward littoral drift was observed again from Tanah Lot to the north direction.

Chapter 11 Planning and Design for Beach Conservation Measures

11.1 Validity of the Project

(1) Validity from the Indonesian Development Policy

The validity of Phase-2 Project was examined by checking the Indonesian development policy such as "National Medium-Development Plan (RPJMN), 2010-2014", "Bali Province Medium Development Plan, 2008-2013", "Spatial Plan in Bali Province 2009-2029" and "Strategic Plan of the Ministry of Public Works (MoPW), 2010-2014". It was proved that the proposed Phase-2 Project which is a beach conservation work was in accordance with these Indonesian development policy.

(2) Validity from the Contribution of the Phase-1 Project

It was proved from the Phase-1 Project that he contribution of the beach conservation project was not only on tourism, but also on the welfare of the residents to conserve the culture, religion, and their life.

(3) Needs for Phase-2 Project

The Phase-2 Project sites were selected mainly taking into account two points, such as "contribution to the economy" and "condition of beach erosion and utilization as world beach resort area" as presented in Chapter 9. The selected two sites, which are Candidasa and North Kuta ~ Legian ~ Seminyak fulfilled several criteria on the necessity of above mentioned points of view.

(4) Necessity for Improvement at Kuta

Significant sand outflow after undertaking the beach nourishment has been observed at the south reef area of Kuta. This problem was induced mainly by the difference of proposed design and actual implementation due to social problems during the Phase-1 Project. Local people and communities, who have strong objection in the Phase-1 Project, have already realized the insufficiency of the present structures to control the sand movement after they identified the difference in maintaining the nourished sand between Kuta and Sanur, Nusa Dua. Based on the chronology and resulting current situation at the beach, it is recommended to conduct the improvement measures at Kuta to mitigate the further outflow of sand, even though Kuta belongs to the Phase-1 Project and it is out of the study area.

(5) Necessity of Japanese Technology and Experience on Beach Conservation Project

Indonesia's recent economic growth is significant. On the other hand, several adverse impacts to the ecosystem have been exposed. The beach erosion problem and its control based on the required technology and management system is one of the urgent issues to be solved. Only Japan has many experiences on this process of beach conservation including not only successful but also unsuccessful experiences in Asian countries for both technical and management field.

11.2 Objectives of the Project

(1) Candidasa

a) Facing Problems

Protection

- Loss of land due to the beach erosion; and
- Damage to facilities and vegetation due to wave overtopping and decrease of life cycle of facilities (hotel facilities and houses) due to splash water.

Beach Utilization

- Disturbance of free walking across the beach due to existence of seawalls, groins, and brick walls;
- Disturbance of easy access to the beach due to the absence of suitable access road and the existence of brick walls;
- No space for beach activities for tourists such as sunbathing, swimming, etc.;
- No space for religious events for residents; and
- Insufficient boat parking area.

Environment and Landscaping

- Deterioration of natural view as an international beach resort due to the existence of seawall and a lot of groins; and
- Disturbance of open view due to the existence of brick walls.

b) Objectives of the Project

- To prevent further beach and land erosion and to minimize the damage of facilities due to wave overtopping and splash water;
- To achieve easy access to the beach and free walking along the beach;
- To recover the beach space to be utilized for marine activities of tourists as international beach resort, and for religious events for residents;
- To recover the natural landscape as international beach resort; and
- To maintain the present coastal environment such as good sea water quality and coral habitat.

(2) North Kuta∽Legian∽Seminyak

a) Facing Problems

- Wave run-up sometimes intrudes into the properties of hotels and restaurants during high tide, and it disturbs their operation.
- During the high tide, beach space at this area becomes significantly narrow. The beach recession was estimated at 5 m to 15 m in Legian, Seminak for 30 years. The narrowness of the beach disturbs the activities of tourists on the beach.
- Some public facilities were damaged by wave action at Canggu area.

- The illegal constructions and developments in foreshore area of the beach were observed at several points.

b) Objectives of the Project

- In order to maintain the beach activities at this area as the most attractive beach resort area in Bali Island, the sufficient beach space shall be secured. The target area for recovering the beach is from Alam Kul Kul Hotel at north Kuta (end of beach nourishment area in the Phase-1 Project) up to Kudeta at Seminyak with 2.9 km alongshore distance. The target of recovering beach width was assumed as the same level as that of 30 years ago, which is 15 m to 20 m increase of the width compared to the present condition; and
- As the principle of requirements on beach utilization and landscaping, 1) the natural viewing, which is the most advantageous point, shall be maintained, 2) present wave breaking condition shall be maintained as the world's famous surfing spot.

(3) Improvement at Kuta (the Phase-1 Project Area)

a) Facing Problems

The quantity of outflow at the south part of Kuta is significant (20% for 3 years) compared to that of Sanur and Nusa Dua (10% for eight years), and it is required to reduce the outflow of sand at this area.

b) Objective of the Project

The objective of the improvement at Kuta is to reduce the sand outflow than its present condition, especially at the area between the south end of sand stopper and 1st Offshore Breakwater (BWN1), and between 2nd Breakwater (BWN2) and last Breakwater (BWN3). The aim of the countermeasure surrounding BWN3 is not to recover the sandy beach, but to maintain certain thickness of sand layer at the toe part of revetment to avoid damage of the revetment.

11.3 Scope of the Project

(1) Candidasa

a) It is recommended to modify the existing revetment to permeable slope-type revetment as the same type as that of the Phase-1 Project. The alignment of the revetment is recommended to have set-back at a certain distance to enhance and maintain the sand.

b) It is recommended to modify the exiting T-groins to function effectively and interrupt the littoral drift sand and enhance the effective utilization of the crown part. Some of the existing groins will be removed or changed the position based on the result of future conducted detailed design.

c) It is definitely required to fill the sand in recovering the sandy beach. On the other hand, it may be difficult to secure the sandy beach as the same image as Sanur and Nusa Dua. To minimize the sand outflow after the nourishment, it is necessary to consider the appropriate width of the beach not to be wide

d) The crown part of the revetment is recommended to be used as walkway. The purpose of the walkway is not only to enhance the beach utilization to be able to walk continuously

along the beach, but also to identify the boundary between private and public areas after the nourishment.

e) Public facilities such as toilet, lamp, dust box, chair, gazebo, etc., are recommended to enhance the convenience of beach utilization for both tourists and residents.

(2) North Kuta∽Legian∽Seminyak

a) Beach nourishment without artificial structures is recommended. The area for the beach nourishment will be determined taking into account the present use of the beach and the degree of beach retreat for long term

b) Construction of the walkway is recommended partially to identify the boundary between private and public properties.

c) Public facilities such as toilet, lamp, dust box, chair, gazebo, etc., are recommended to enhance the convenience of beach utilization for both tourists and residents.

(3) Improvement at Kuta (the Phase-1 Project Area)

a) Modification of Existing Offshore Breakwaters

From the monitoring result after the nourishment, it was observed that the tombolo behind BWN3 has almost disappeared. Further, the area exposing the revetment surrounding BWN3 is still expanded slightly for both sides and it was concerned to affect the stable condition of the tombolo behind BWN2. Thus, it is recommended to modify the exiting offshore breakwaters to add the groin part in order to enhance the interruption effect.

b) Construction of Additional L-shape Groin with Refilling of Sand at BWN3

The requirement at nearby BWN3 is to avoid the further retreat of the beach and to secure the revetment. It is recommended to construct the additional L-shape groin at the south side of BWN3 as well as conducting the sand filling at shadow area (north side of the L-shape groin).

11.4 Basic Layout and Design at Candidasa

(1) Design Principle

a) Modification of Existing Seawall

The image for the modification of existing revetment is as shown in 11.4.1. Here, the slope gradient is set at 1:2.5, the elevation is set at +5.0 m. The alignment of modified revetment will be set back as much as possible to enhance the securing of nourished sand. The limestone with light yellow color is recommended as armor material taking into account the harmony on landscaping.

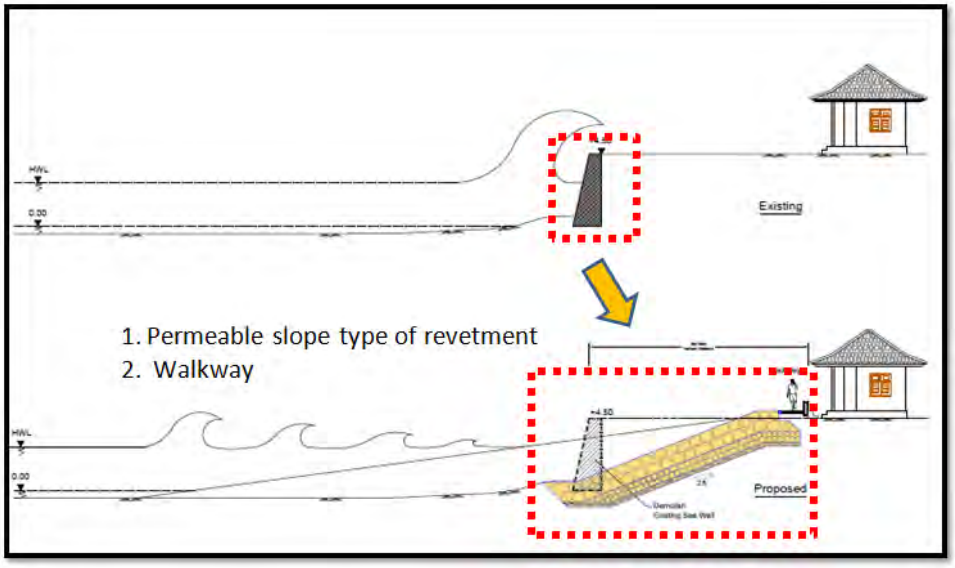


Figure 11.4.1 Image for Modification of Existing Seawall

(Source: JICA Study Team)

b) Modification and Demolition of Existing T-shape Groin

The image for the modification and demolition of existing T-shape groin is as shown in Figure 11.4.2. Here, the elevation at trunk part of the groin shall be kept at the same elevation as that for the revetment (+5.0 m). To minimize the construction cost, the crown elevation is planned to gradually decrease toward the head part. The limestone is recommended as armor material as the same as modofication of revetment. The side slope gradient is set to keep the same value as that for revetment, 1:2.5. The beach width is presumed to be 40 m to 50 m. Thus, the length of the groin is assumed at 60 m to 70 m. It is possible to utilize the head part of modified groin as the media for coral transplantation.

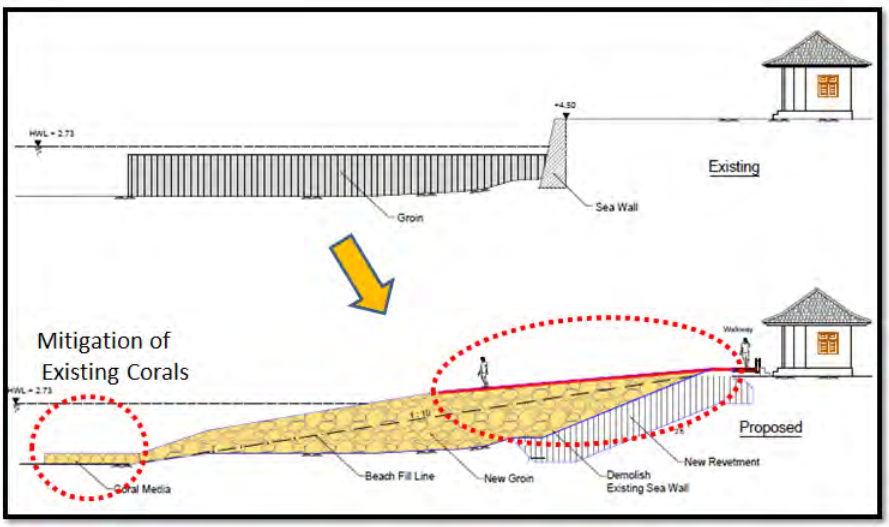


Figure 11.4.2 Image for Modification of Existing Groins

(Source: JICA Study Team)

c) Beach Nourishment

As the required beach width, it is planned to recover only foreshore part to minimize the sand outflow after the nourishment. The sand for beach nourishment shall keep the same characteristics of the existing sand on the beach as much as possible. The high priority for the requirement is grain size and color. The beach slope is assumed at 1:10 in case that the grain size (D50) is assumed to be 0.3 mm-0.4 mm. The top elevation of the nourishment is set at +4.5 m to assume the same elevation of existing berm top. As the elevation of coral reef flat is -0.5 m to +0.5 m, the beach width from toe part to the top is assumed from 40 m to 50 m in average. White or yellow colored sand is required to secure the image as resort beach on coral reef.

d) Walkway

The walkway will be set at crest part of modified revetment. The width of the walkway is set at 1.5 m taking into account the available space behind the revetment, and the required width that the pedestrians can pass each other. To minimize the wave run-up into the properties, flower boxes with 60 cm height and 30 cm width is planned to be installed at the land side of the walkway as prevention facility against wave run-up.

(2) Layout Plan

The basic layout image for the case of 3km of the project area (Area 1) is shown in Figure 11.4.3. In case of 5km as the project area, Area 2 is added as shown in Figure 11.4.4.

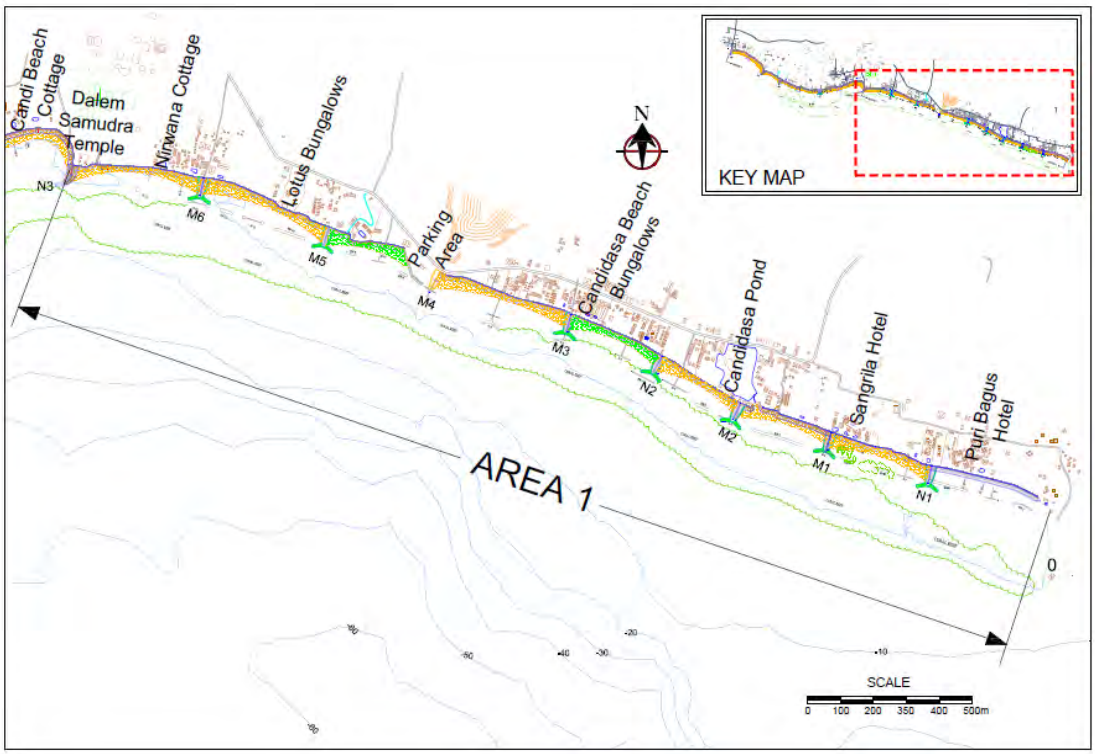


Figure 11.4.3 Layout Plan at Candidasa (Area 1)

(Source: JICA Study Team)

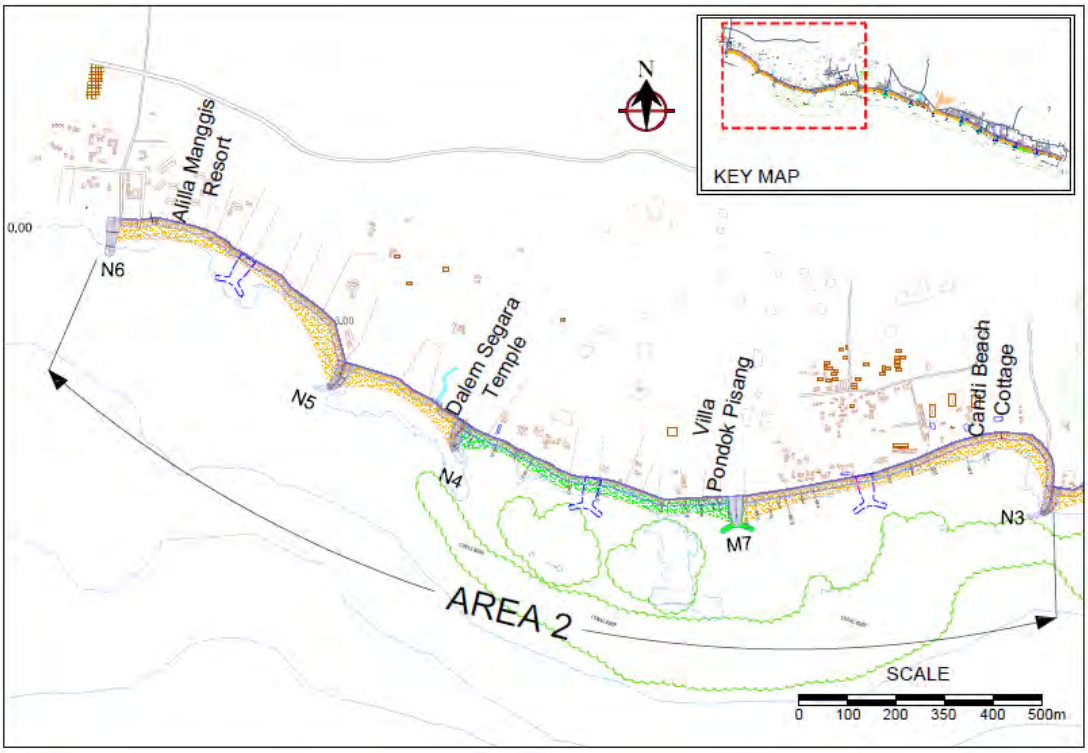


Figure 11.4.4 Layout Plan at Candidasa (Area 2)

(Source: JICA Study Team)

(3) Structure Design

a) Design Criteria

i) Design Tide Condition

H.W.L. : +2.6 m
M.W.L. : +1.3 m
L.W.L. : 0.0 m

ii) Offshore Design Waves

Table 11.4.1 Offshore Design Waves (50-year Return Period)

H_0 (m)	T_0 (s)	θ_0
5.5	16	SW to SE

(Source: PCR in Phase-1 Project)

iii) Design Waves for Coastal Structures

Prior to setting up the design waves for coastal structures, the equivalent deep water wave height (Ho') shall be estimated. Using the numerical computation for offshore wave field as shown in Chapter 7, the obtained equivalent offshore waves for each wave direction are shown in Table 11.4.2. The design waves for coastal structures such as revetment, groin, and headland are calculated by using the Takayama formula (1977) as shown in Table 11.4.3.

Table 11.4.2 Equivalent Offshore Wave Height for Each Wave Direction

H_0 (m)	5.5		
T_0 (s)	16		
θ_0	SSW	S	SE
Kr	0.25	0.38	0.74
H_0'(m)	1.4	2.1	4.1
$T_{1/3}$ (s)	16		
θ	S	SSE	SSE

(Source: JICA Study Team)

Table 11.4.3 Design Wave Height for Coastal Structures

H_0'(m)	4.1
$T_{1/3}$ (s)	16
G.L. (m) (at reef edge)	0.0
H.W.L. (m)	+2.6
depth (m)	2.6
Bottom slope at offshore	1:20
H_0'/L_0	0.01
η_{max}/H_0'	0.17
Reef Width (m)	150
$H_{1/3}$ (m)	1.4

(Source: JICA Study Team)

b) Structure Design for Groins and Headlands

The required weight of armor material for groins and headlands was calculated by using the Hudson formula. The calculated required weight for armor material and the resulting size of armor material for each part of groins and headlands are set as shown in Table 11.4.4 and 11.4.5.

Table 11.4.4 Required Weight for Armor Material

Kd	2.0 (rough, breaking waves)
$H_{1/3}$ (m)	1.4
Slope	1:2.5
W (ton)	0.47

(Source: JICA Study Team)

Table 11.4.5 Armor Size for Each Part of Groin, Headland

Trunk Part	0.5 ton
Head Part	0.7 ton

(Source: JICA Study Team)

c) Structure Design for Revetment

The required weight of armor material for revetment was basically the same as that for groins and headlands. Therefore, the size of the armor for revetment was set at 0.5 tons.

d) Design for Beach Nourishment

i) Selection of Beach Nourishment Materials

i-1) Potential of Sand Borrow Site

Based on the results of diving survey at offshore area of nearby Candidasa, some locations have potential, which is at the eastern part of Candidasa and near Patangbai. Further detailed investigation shall be required to ensure the potential for sand borrow.

i-2) Relation between Grain Size and Foreshore Slope

It is very important on the design of beach nourishment to know the relation between the grain size and foreshore slope on the beach. By taking the sand samples and checking the foreshore slope at the points where the sandy beach still remain, the relation between the grain size and foreshore slope is shown in Figure 11.4.5. From the result, representative grain size at foreshore slope was set at 0.35 mm for the foreshore slope is 1/10.

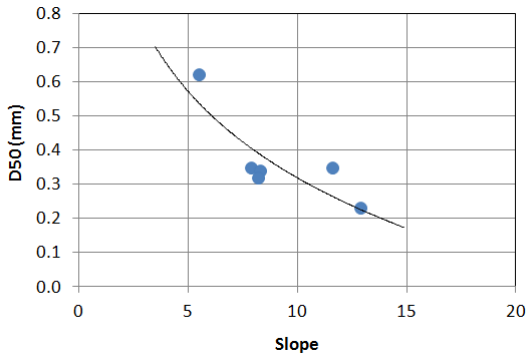


Figure 11.4.5 Relation Between Grain Size(D50) and Foreshore Slope

(Source: JICA Study Team)

ii) Cross Section Dimension of Beach Nourishment

The following dimensions are mainly required to be determined for the design of beach nourishment, which are beach width, backshore elevation and foreshore slope as shown in Figure 11.4.6. The beach width was set at approximately 40 m to 50 m. The back shore elevation was set at +4.5m to keep the same elevation of existing elevation at backshore area. The foreshore slope was set at S=1/10.

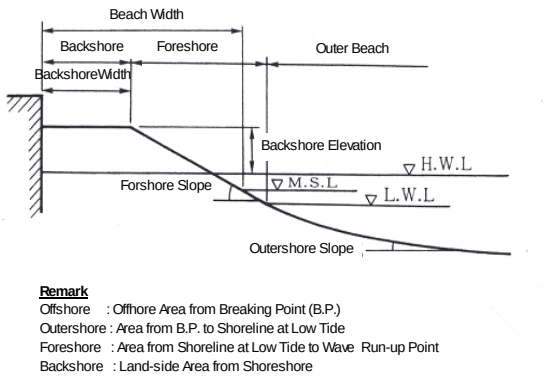


Figure 11.4.6 Determination of Cross Section Dimension

(Source: Coastal Engineering Manual (CEM), 2006)

(4) Typical Cross Section Drawing

The typical cross section drawing for beach nourishment, revetment, and groin are shown in Figures 11.4.7 to 11.4.9.

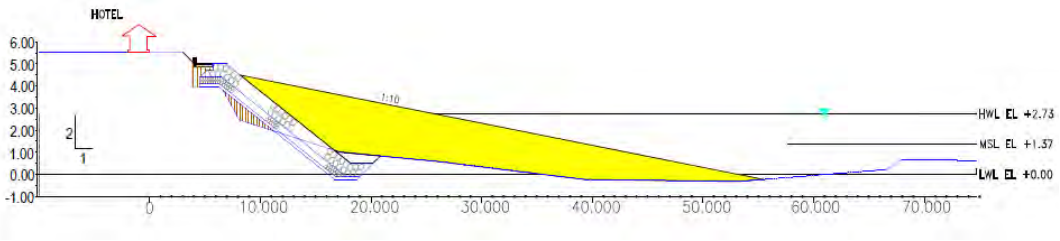


Figure 11.4.7 Typical Cross Section for Beach Nourishment

(Source: JICA Study Team)

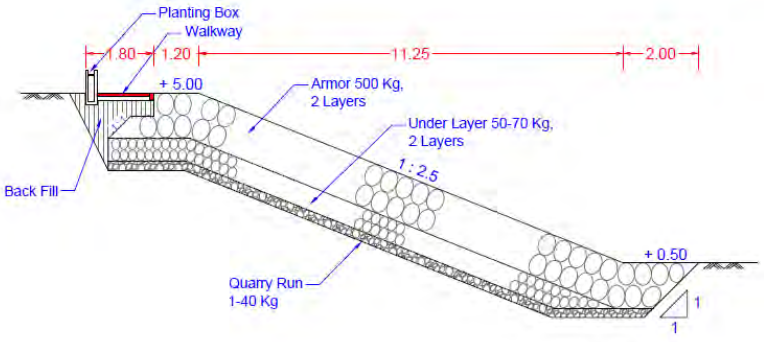


Figure 11.4.8 Typical Cross Section for Revetment

(Source: JICA Study Team)

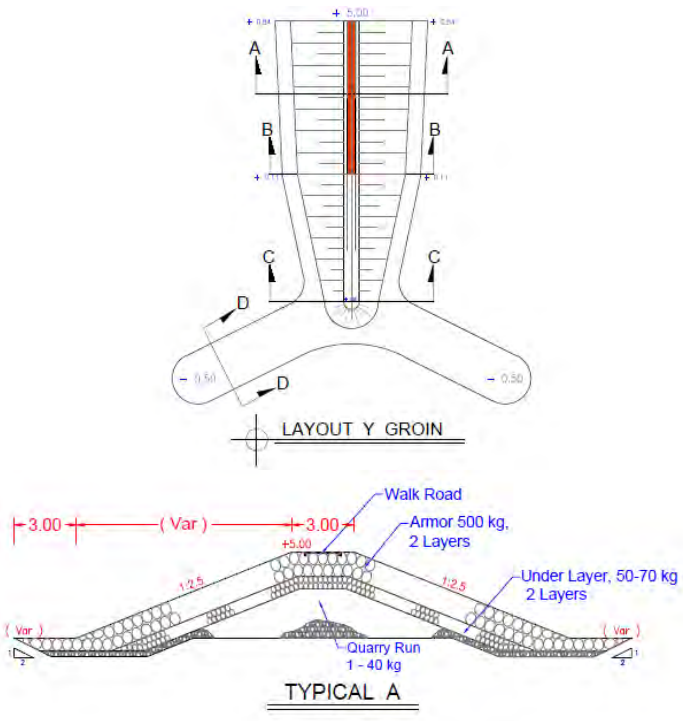


Figure 11.4.9 Typical Cross Section for Groin

(Source: JICA Study Team)

11.5 Basic Layout and Design at North Kuta～Legian～Seminyak

(1) Design Principle

Considering the technical point of view on expected direction of littoral drift and the advantage of beach in this area, the beach nourishment with no coastal structure is planned.

The wall, road, and walkway exist at most part of the target area. Thus, the walkway is only set at some parts of the northern area.

(2) Layout Plan

The target area for beach nourishment is from the north boundary at the end of beach nourishment at the Phase-1 Project until Kudeta at Seminyak with 2.9 km alongshore as shown in Figure 11.5.1.

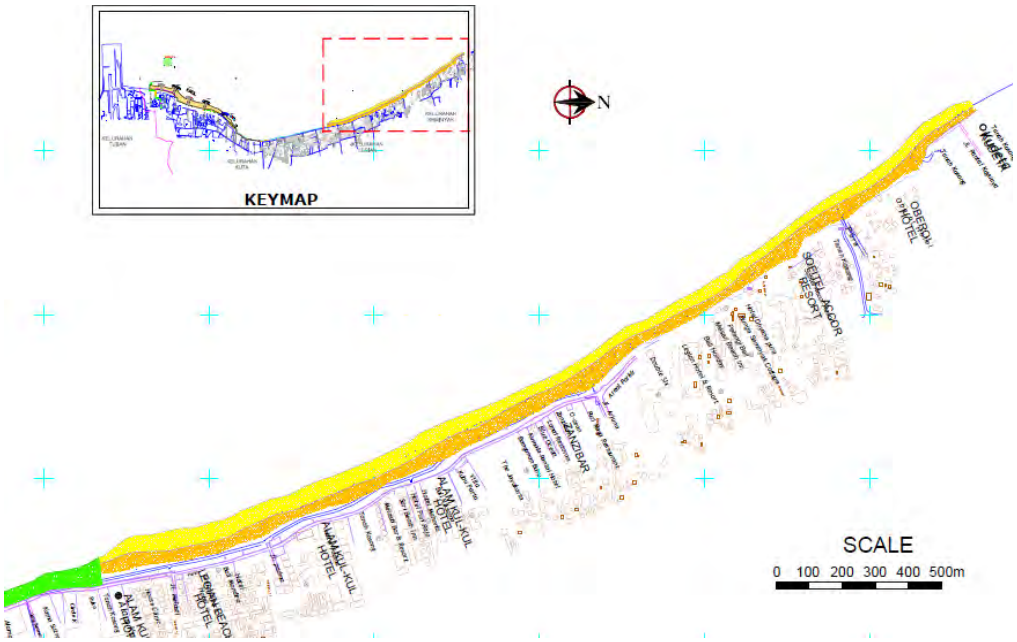


Figure 11.5.1 Layout Plan for Beach Nourishment at Southwest Coast (North Kuta - Legian - Seminyak))

(Source: JICA Study Team)

(3) Design for Beach Nourishment

a) Selection of Beach Nourishment Materials

i) Potential of Sand Borrow Site

Based on the results of diving survey at offshore area of nearby this area, the suitable fine sand and grain size can be found at the outer reef area of Kuta. Further detailed investigation will be required to ensure its potential for sand borrows.

ii) Relation between Grain Size and Foreshore Slope

The relation between the grain size and foreshore slope at this area as shown in Figure 11.5.2, the representative grain size at foreshore slope is 0.35 mm for the foreshore slope S=1/10.

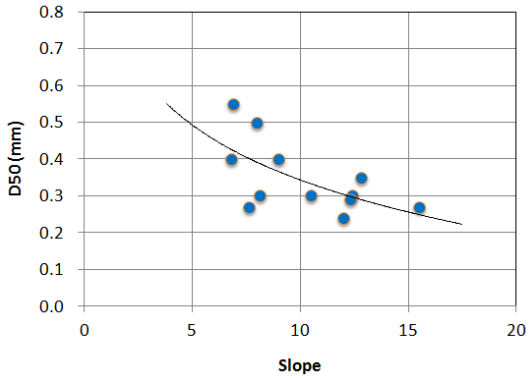


Figure 11.5.2 Relation between Grain Size (D50) and Foreshore Slope

(Source: JICA Study Team)

b) Cross Section Dimension of Beach Nourishment

The target width for beach nourishment is set at 20 m increase at the elevation of HWL taking into account the beach retreat for the past 30 years. The back shore elevation was set at +5.5m to keep the same elevation of existing elevation at backshore area. The foreshore slope was set at S=1/10.

(4) Typical Cross Section Drawing

The typical cross section drawing for beach nourishment is shown in Figure 11.5.3.

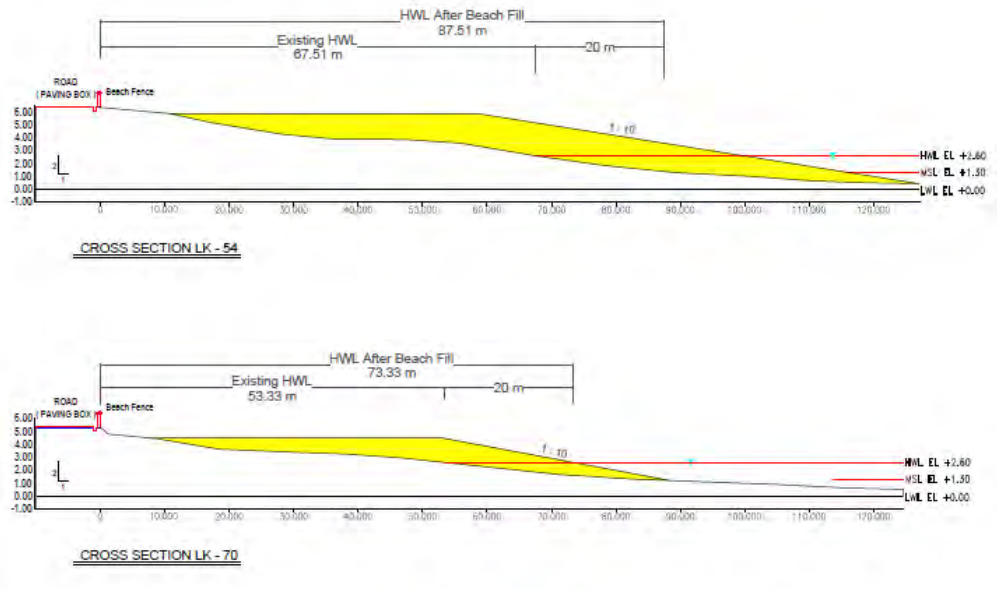


Figure 11.5.3 Typical Cross Section for Beach Nourishment

(Source: JICA Study Team)

11.6 Basic Layout and Design for Improvement at Kuta

(1) Design Principle

The objective for the improvement at Kuta is to reduce sand outflow and to maintain the sandy beach from the south end of sand stopper to BWN2, and to avoid further decrease of elevation at the toe part of revetment surrounding BWN3 area.

One of the main reasons that causes continuous beach retreat between BWN1 and BWN2 was due to insufficient function to interrupt the northward littoral drift. To improve this, it is recommended to add the groin part for BWN1 and BWN2.

To improve the present condition surrounding the BWN3 area, the construction of a new L-shape groin at the south side of BWN3 was recommended as shown in Figure 11.6.1. In addition, the sand filling was also recommended at shadow area for this L-shape groin to recover the present urgent condition. However, it is recommended not to overfill sand at the shadow area of L-shape groin in order to avoid sand loss.

(2) Layout and Typical Cross Section Drawing

The layout and typical cross section drawing for the recommended improvement at Kuta are shown in Figures 11.6.1 to 11.6.3.

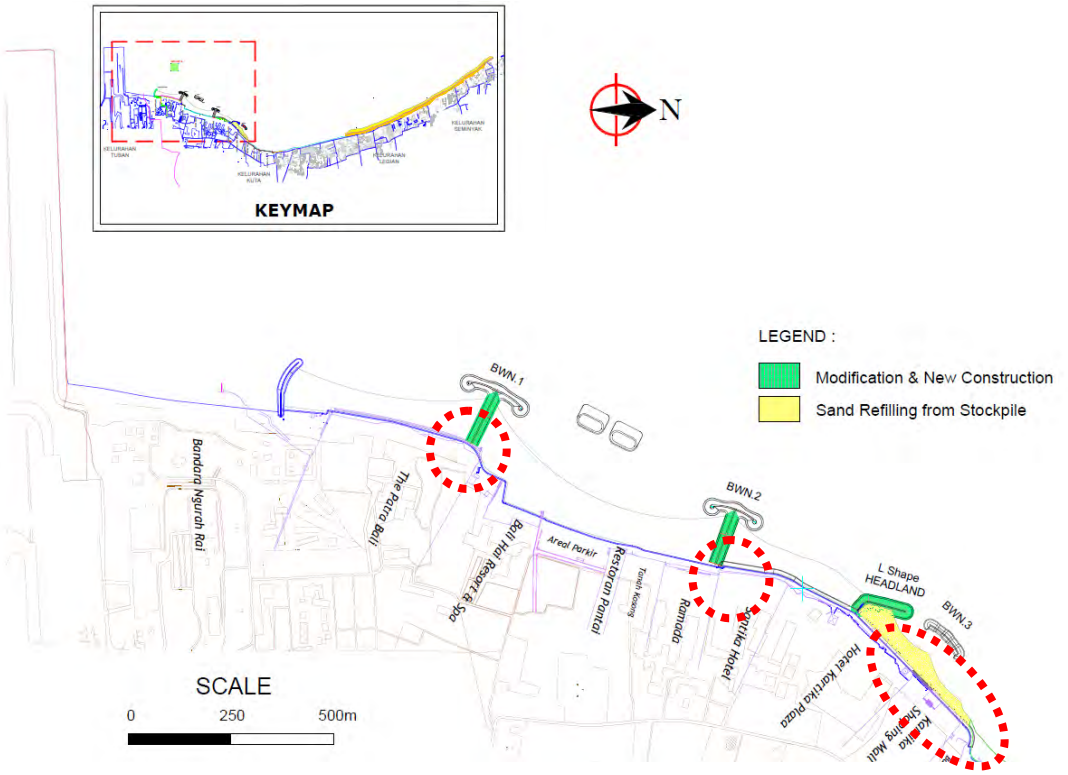
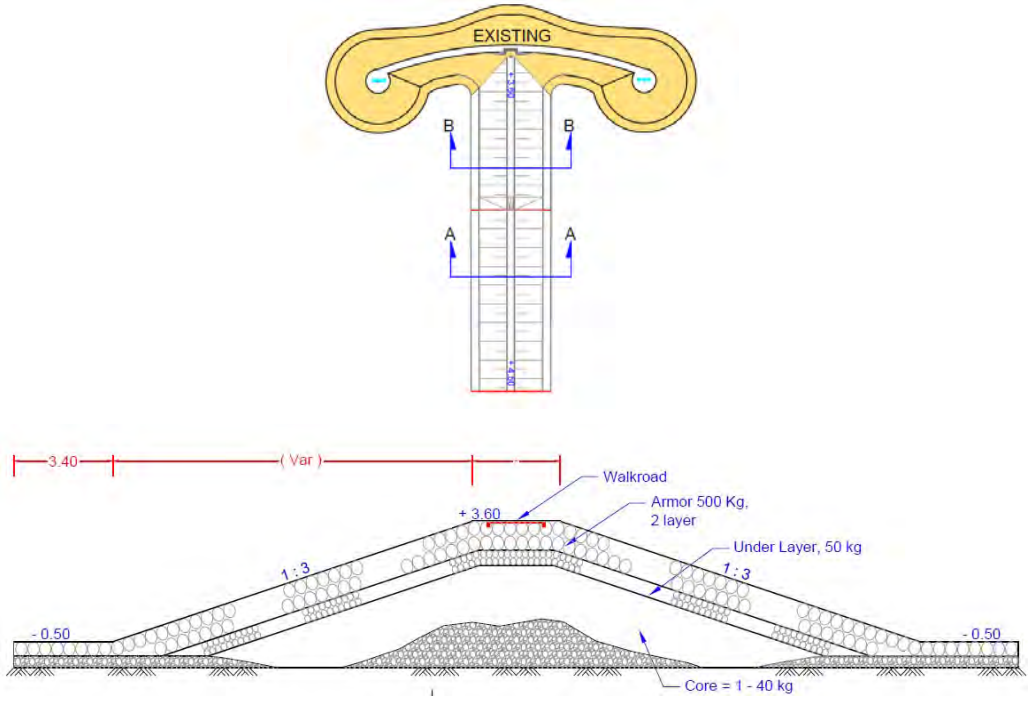


Figure 11.6.1 Layout Drawing for the Improvement at Kuta

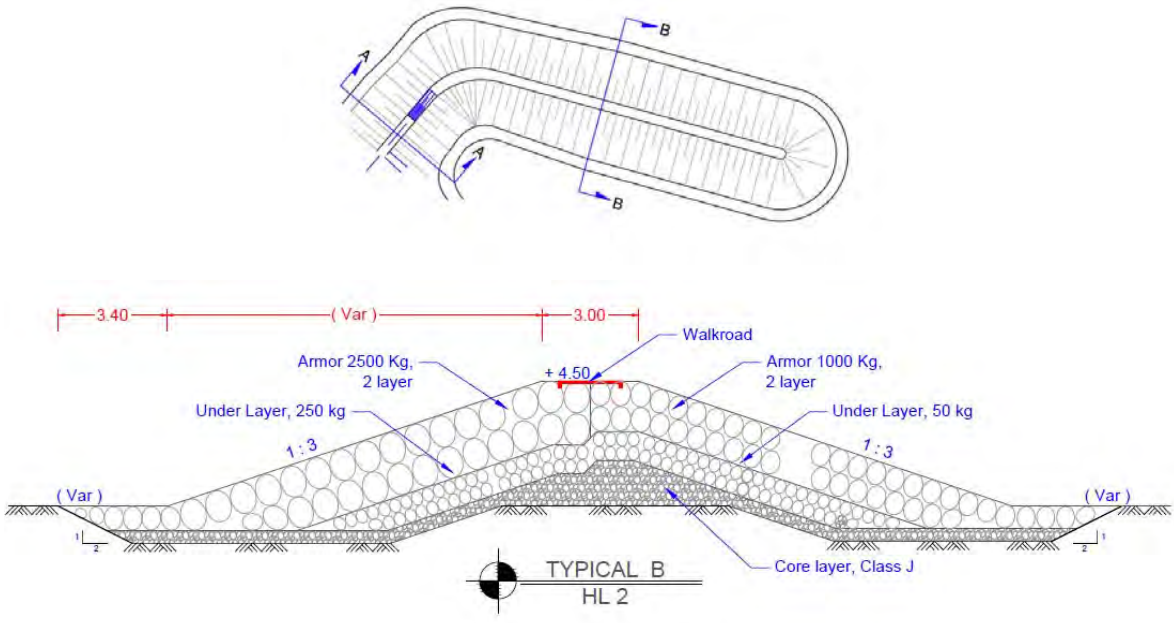
(Source: JICA Study Team)



B - B

Figure 11.6.2 Typical Cross Section for the Improvement of Existing Offshore Breakwater (BWN2)

(Source: JICA Study Team)



B - B

Figure 11.6.3 Typical Cross Section for New L-shape Groin

(Source: JICA Study Team)

11.7 Principle for Planning of Beach Control at Other East Coast Area

Beach erosion has seriously occurred in this area from Unda River mouth to Ayung River mouth with 25 km alongshore as shown in Figure 11.7.1.

The serious beach erosion with more than 200 m retreat of the beach at a maximum at this area was caused by significant decrease of sand inflow from the river, which was mainly caused by the improvement of water control for the river and large scale sand mining at the river mouth.

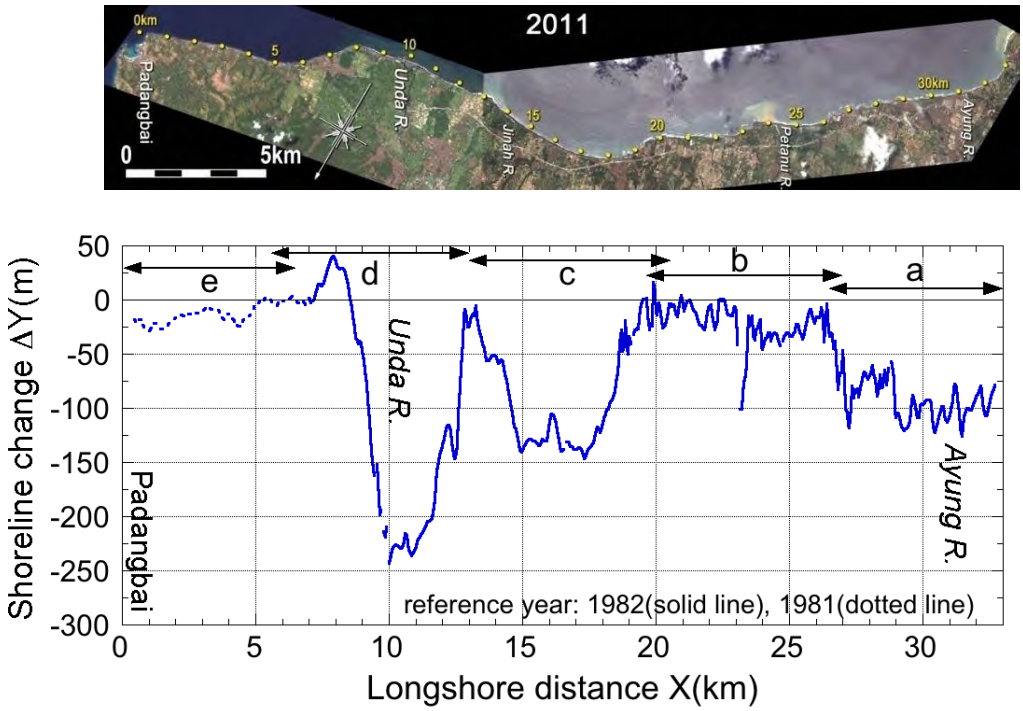


Figure 11.7.1 Shoreline Change at East Coast between 1981 and 2011

(Source: JICA Study Team)

The principle for planning the beach conservation under progress of beach erosion is as follows:

1) Basically, there was no alternative to reduce beach erosion and beach retreat without solving the potential causes, which is to prevent the decrease of sand inflow from the river. To achieve this, it is strongly required to control the transfer of sand between river and coast, without causing further decrease on the inflow of sand;

2) If it is still difficult to conduct sand control at the river, the following two possibilities should be considered; (i) one is to keep the buffer zone for further beach retreat based on the prediction on future beach retreat and (ii) no construction of land facilities should be planned in the future development plan of this area;

3) The other is to reduce the external forces (waves) which directly induced the drift of sand. For this, it is necessary to construct some hard structures at offshore side such as offshore breakwaters. However, the construction of offshore facility might cause further problems and change the movement of littoral sand. Also, the cost to construct the coastal facility at offshore area is high. Thus, the costs and benefits shall be compared carefully.

Chapter 12 Implementation Plan

12.1 Implementation Plan for Hard Component

The main scope of works for the hard component of this project according to the plan set-up in Section 10 is shown in Table 12.1.1.

In Package 1 (Candidasa), the case study with two different study areas was examined, which are Cases 1 and 2. Case-1 has a 3 km alongshore stretch from the Peninsula (Tanjung Nti) to the temple (Pura Dalem Samudra) while Case-2 has a 5 km alongshore stretch from the Peninsula to Alilla Manggis Resort Hotel. Furthermore, taking into account the request from the directorate of river and coastal in the Directorate General of Water Resources (DGWR), two different scopes of works (with and without beach nourishment) in Package-1 were also compared in the study. The main scope of works and its quantity for each package are also presented in Table 12.2.1.

Table 12.1.1 Scope of Works for Hard Component

Package and Objective Area		Scope of Works	Quantity
Package-1: Candidasa	Case-1 : 3 km From the Peninsula (Tanjung Nti) to the temple (Pura Dalem Samudra)	Beach nourishment	188,140 m^3
		Construction of revetment	3,100 lin. m
		New groin	3 groins
		Groin modification	6 groins
	Case-2 : 5 km From the Peninsula to Alilla Manggis Resort Hotel	Beach nourishment	341,960 m^3
		Construction of revetment	5,261 lin. m
		New groin	6 groins
		Groin modification	7 groins
Package-2: North Kuta-Legian-Seminyak		Beach nourishment	280,300 m^3
Package-3: Improvement at Kuta		Modification of existing BWN-1&2	2 BWN
		New L-shape Headland	1 Headland
		Sand refilling	15,700 m^3

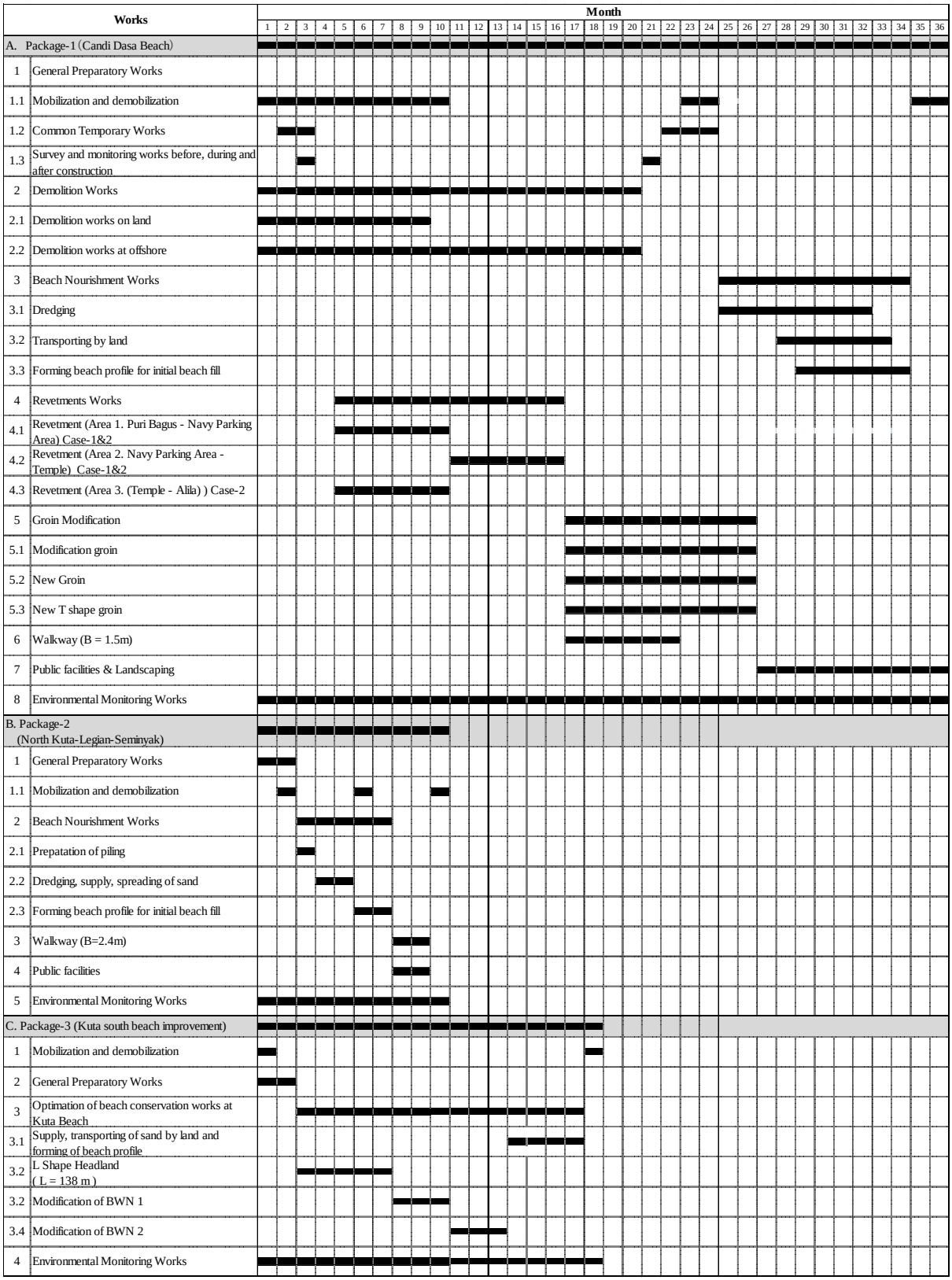
(Source: JICA Study Team)

The expected construction schedule for the three packages is shown in Table 12.1.2. The construction schedule which applies to Case-1 (3 km alongshore, with beach nourishment) for Package-1 (Candidasa) is shown as a recommended package. The total construction period for this case is expected to be 36 months.

Even if Case-2 (5 km alongshore, with beach nourishment) is assumed to be applied for Package-1, the total construction period is expected to be of the same period as that of Case-1 (36 months) considering the employment of the two parties of construction, and proceeding with the construction work in parallel at two different areas.

In case there is no beach nourishment for Package-1, the construction period will be shortened from 36 months to 28 months.

Table 12.1.2 Construction Schedule (Package-1 with Beach Nourishment)



(Source: JICA Study Team)

12.2 Implementation Plan for Soft Component

(1) Objective

The objective of the soft component in the Phase-2 Project is to establish a suitable and sustainable beach management system for both Phase-1 and Phase-2 beaches, considering the review of the present situation and implementation conditions after the establishment of TKMPP during the middle and final stages. In accordance with the actual achievement in the Phase-1 Project, the soft component will be spread out horizontally to establish beach management system for the Phase-2 Project, and to some places with serious problems against beach erosion in order to integrate the principle and methods of beach management in Bali.

It is important to consider that various activities that may result to the establishment of beach management in the Phase-2 Project will contribute to the establishment of a beach management system not only in Bali, but also in the whole of Indonesia as a model for integrating coastal management.

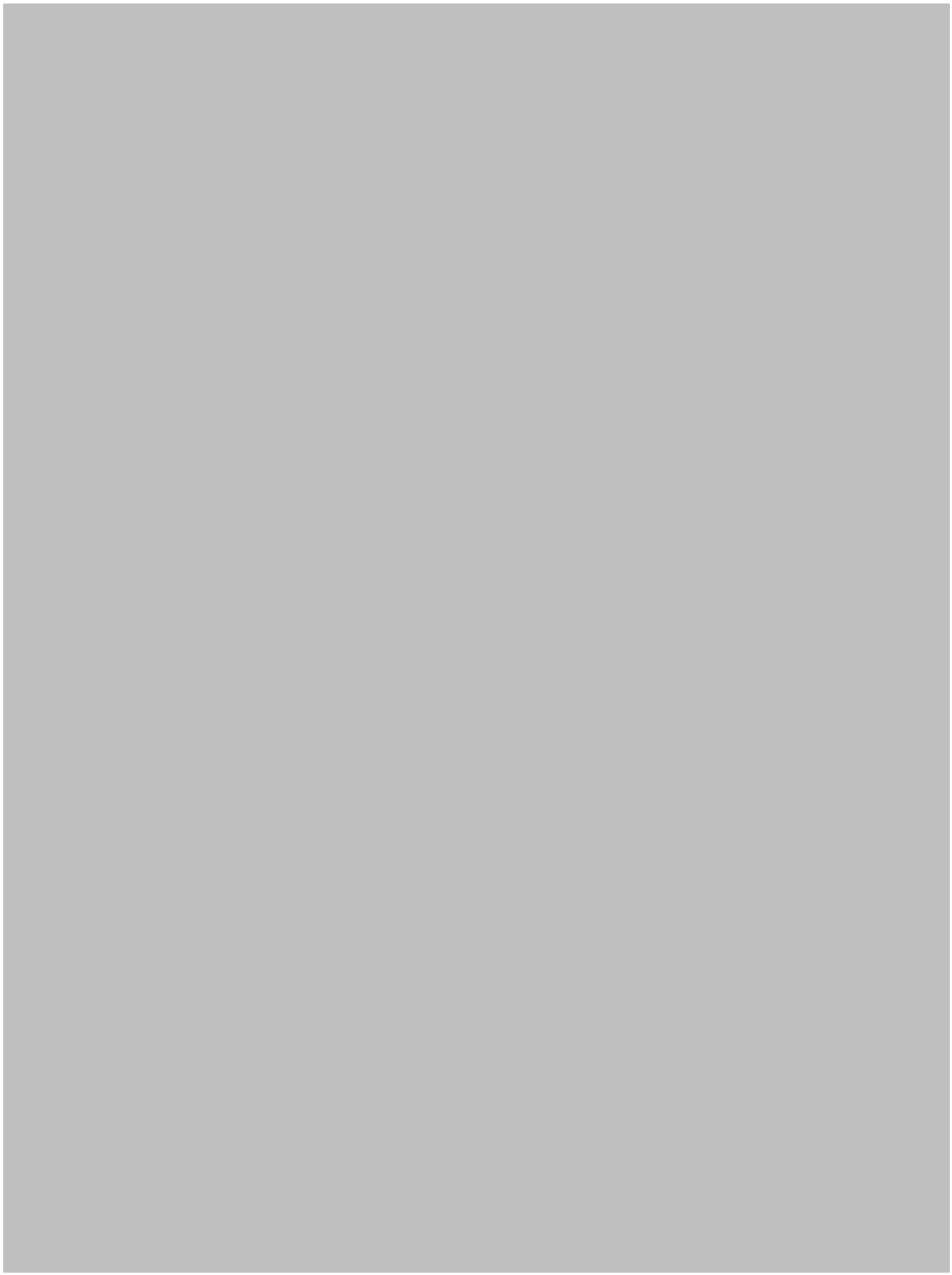
(2) Contents

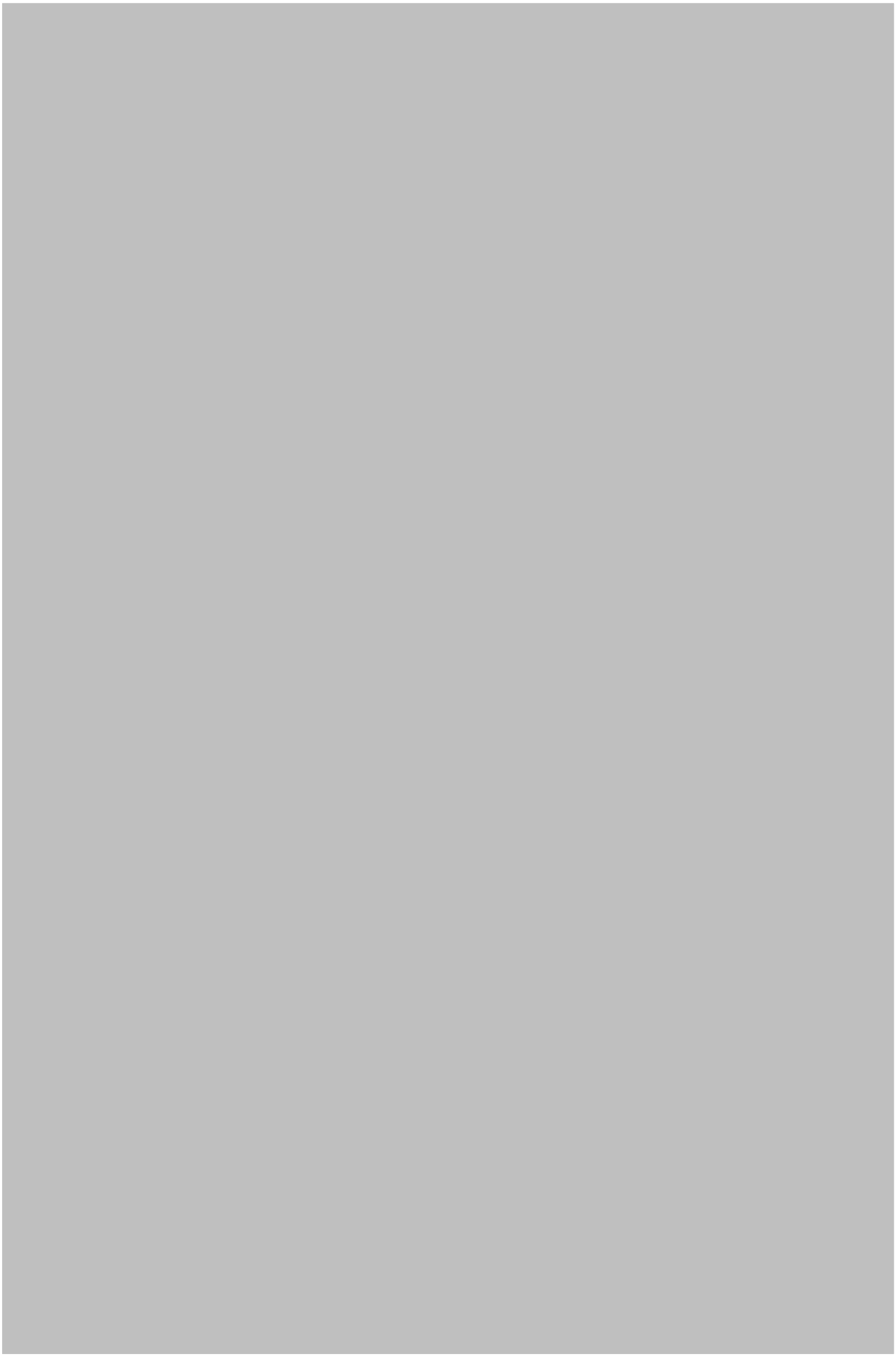
Contents of soft component are as follows:

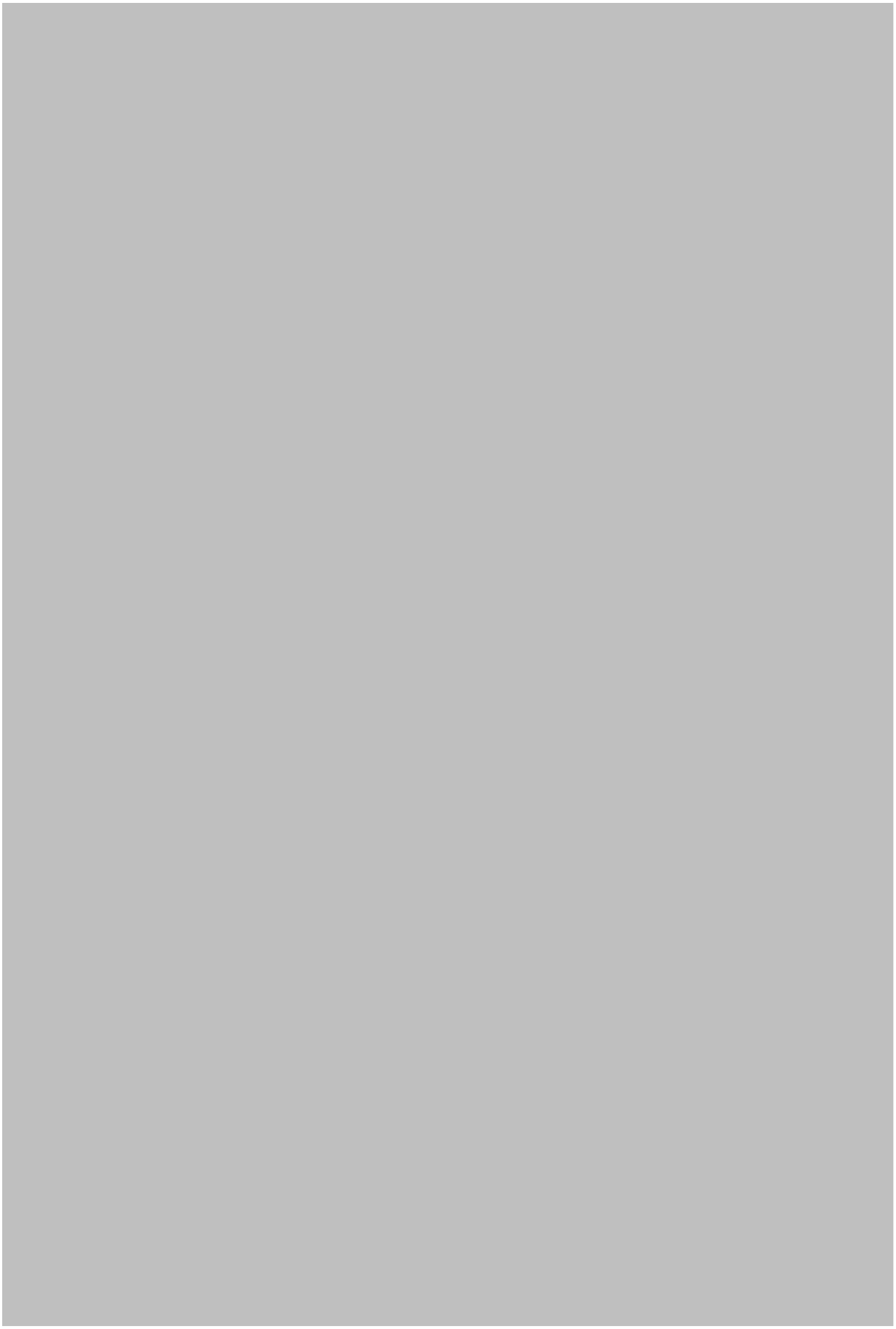
- Establishment of beach management system for Phase-1 beaches;
- Establishment of beach management system for Phase-2 beaches; and
- Beach conservation plan for seriously eroded areas in Bali.

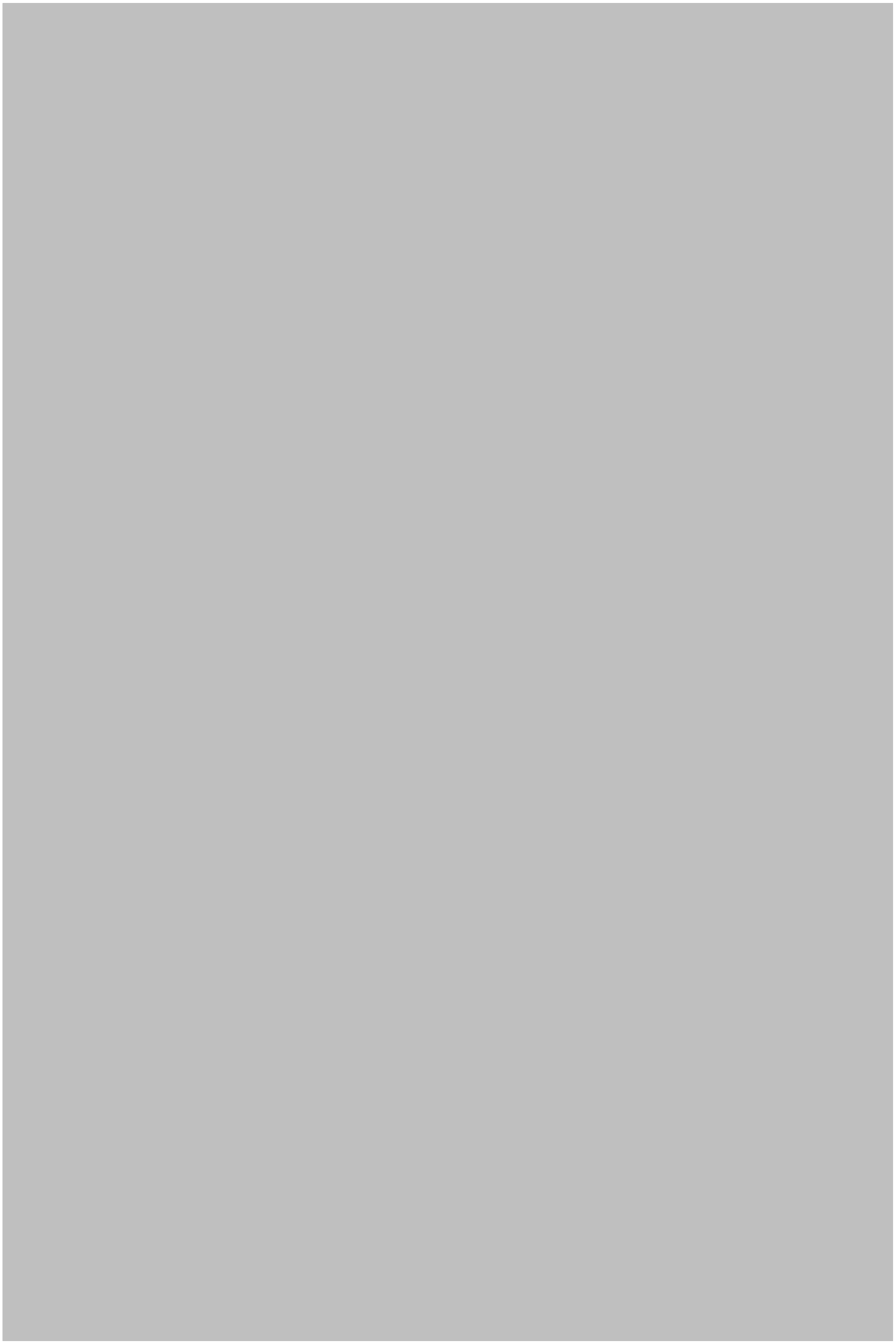
(3) Assignment Schedule

The assignments schedule for the plan of beach management system is considered as shown in Table 12.2.1.









12.5 Executive Structure and Financial Condition

(1) Proposal for Executive Structure (PMU)

Review of the ability of the execution agency in terms of the following issues is conducted.

a) Confirmation of Execution Structure

b) Responsibility and Staff Condition of Executing Agency

c) Financial and Budget Conditions

d) O&M Cost Allocated for the Phase-1 Project in the Post Project Stage

e) Technical Level for Execution

f) Experience for Similar Project

Based on the results of review, the executive structure (PMU) during project implementation is proposed to ensure the effectiveness and efficiency of the execution of the project. The organizational structure is proposed considering the coordination of project among the DGWR, other concerned agencies, JICA, and the Consultant.

In the proposed PMU for project implementation, there are two alternatives:

Alternative 1. The Consultant for the Phase-2 Project will work hand in hand with the existing project manager (PM River and Coastal II).

Alternative 2. BWS-BP will establish the new project manager for Phase-2 Project if the existing project manager is not capable of performing the scope of work.

Both schemes of PMU (Alternatives 1 and 2) have the potential to be applied based on the BWS-BP condition at the time of the implementation of the Phase-2 Project. The proposed structure of PMU is shown in Figure 12.5.1.

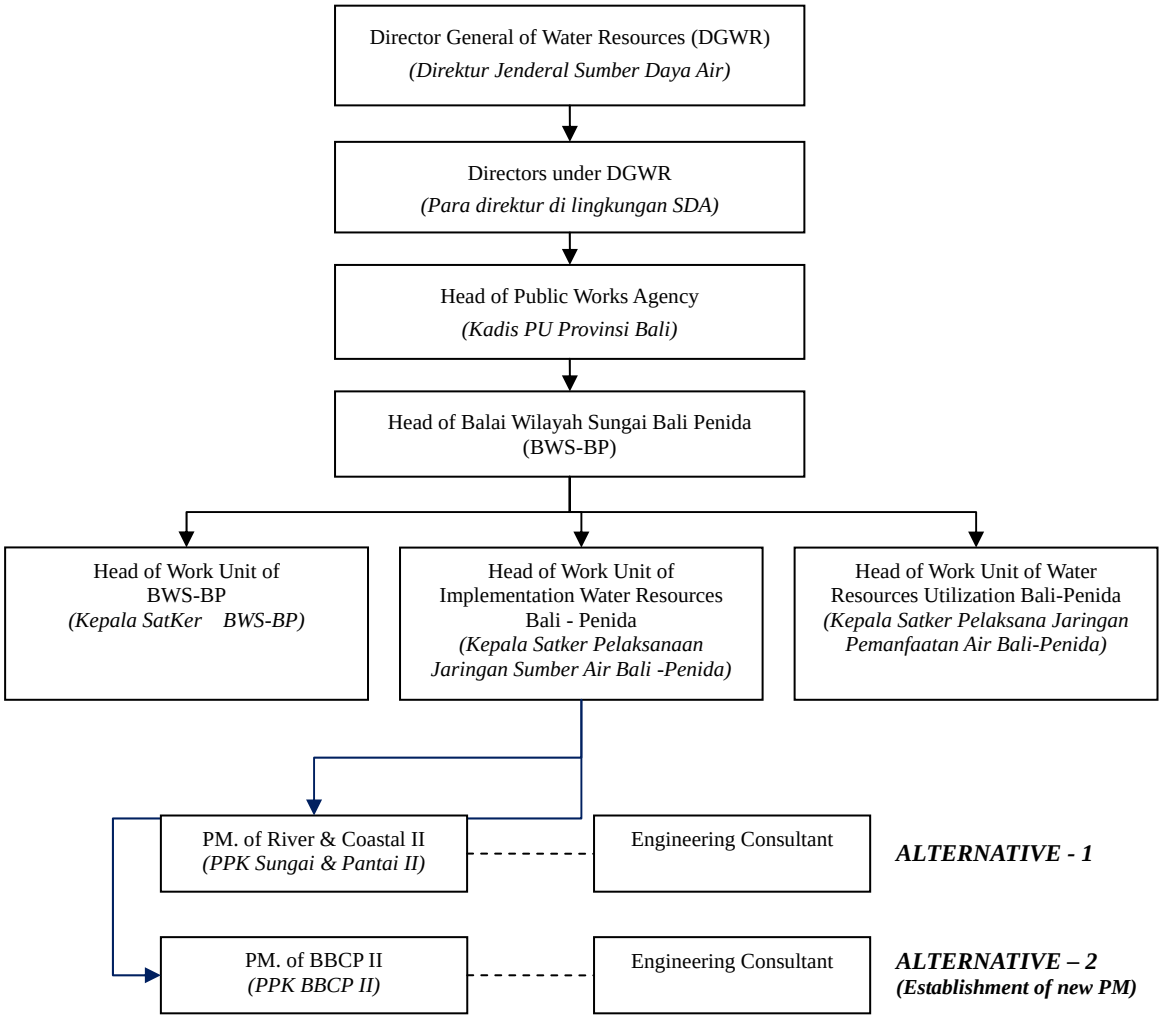


Figure 12.5.1 Proposed Structure of PMU

(Source: JICA Study Team)

(2) Proposal for the Operations and Manteca of the Project

In order to understand the capability of beach management body for Phase-2, investigations about the past records of O&M activities and the corresponding budget are conducted. Based in these results, the beach management plan required after the completion of the Phase-2 is proposed in Table. 12.5.1. The structure for beach management consists of BWS-BP and Loka Pantai as the central government, and province of Bali, Badung and Karangasem regencies as the local government and stakeholders. The establishment of a coordination team (TKMPP-2) for beach management is required in order to implement sustainable beach management in the same way as Phase-1. The detailed beach management plan will be prepared after the completion of the detailed design, in consideration of the final scope of works of Phase-2, with some issues and improvement plan to be undertaken after the establishment of TKMPP-1. It will be reviewed in detail during the final stage of the construction period.

Table 12.5.1 Summary of Beach Management Plan

Category of beach management	Required actions		Task	Responsibility	Frequency
Management 1 (Monitoring and maintenance of beach fill area)	Monitoring (Visual & technical/survey)	Adaptive beach management	Visual checking and reporting to Coordination Team for Beach Management (TKMPP-2), if any problem	Stakeholders	Every 2 months
			Beach profile survey & fixed point photo	BWS-BP & Loka Pantai	Unstable area : every 6 months Stable area : every 1 year
	Evaluation / technical study		Data processing & analysis of shoreline change and sand lost	BWS-BP & Loka Pantai	Unstable area : every 6 months Stable area : every 1 year
	Planning & Design for required adaptations		Planning of shoreline alignment and cross section Calculation of sand volume and Construction plan and cost estimation	BWS-BP & Loka Pantai	As required
	Implementation		*Large Scale* - Supplementary beach fill to permanent stock pipe - Transportation of sand with large scale from stockpile to the beach	BWS-BP	As required
			Small Scale - Sand rotation (sand bypass) and - Additional beach fill with small scale that is used by sand in stock pipe under technical support by BWS-BP	Stakeholders	As required
Management 2 (Maintenance of coastal protection structure : Revetment, Groin, Breakwater)	Monitoring of coastal protection structure		Visual checking and reporting to Coordination Team for Beach Management (TKMPP), if any problem	Stakeholders	Every 6 months
			Level survey & fixed point photo	BWS-BP & Loka Pantai	
	Evaluation of need of maintenance and implementation		- Analysis of level change and cause of damage - Planning of repairing method - Calculation of repairing volume - Construction plan and cost estimation	BWS-BP & Loka Pantai	As required
Management 3 (Maintenance of landscape and public facilities : Walkway, gazebo, parking area, public building)	Monitoring of landscape and public facilities		Visual checking and reporting to Coordination Team for Beach Management (TKMPP-2), if any problem	Stakeholders	Every 6 months
	Evaluation on required maintenance and implementation		*Indirect benefit area (empty, temple, shop, etc)* - Planning of repairing method - Calculation of repairing method - Construction plan and cost estimate	Badung & Karangasem regency	As required
			Direct benefit area (Hotel area) and Direct utilization (Public building) - Planning of repairing method - Construction plan and cost estimate	Stakeholders	As required
Management 4 (Beach cleaning)	Daily beach cleaning	Indirect benefit area	*Indirect benefit area (empty, temple, shop, etc)* - Financing of beach cleaning activities for stakeholders	Badung & Karangasem regency	Daily
			Indirect benefit area (empty, temple, shop, etc) - Daily beach cleaning - Collecting garbage to collecting point	Stakeholders	
		Direct benefit area	*Direct benefit area (Hotel area)* - Financing of beach cleaning activities - Daily beach cleaning - Collecting garbage to collecting point	Stakeholders	Daily
	Transport to disposal area		Transporting garbage from collecting point to disposal area	Badung & Karangasem regency	Daily
Management 5 (Beach utilization)	Daily monitoring of the beach utilization		Visual checking and reporting to Coordination Team for Beach Management (TKMPP-2), if any illegal activities and facilities are found	Stakeholders	Daily
				Badung & Karangasem regency	Monthly
	Sanction for violations of the beach utilization		Arrangement of socialization meeting for widely known, if necessary	Stakeholders	As required
			Enforcement of beach utilization rules	Province & Regency	As required

(Source: JICA Study Team)

12.6 Study of Appropriate Contract Package

In the construction plan mentioned earlier in this chapter, it is proposed that the project area be divided into three packages.

Table 12.6.1 Contract Packages

Package-1:		Package-2:	Package-3:
Candidasa Case-1 : 3 km	Candidasa Case-2 : 5 km	North Kuta ~ Legian ~ Seminyak	Improvement at Kuta
Project Scope - General and preparatory works (including temporary jetty) - Demolition works - Revetment works - Construction of groin - Beach fill (188,140 m^3) - Groin modification (6 groins) - New groin (3 groins) - Walkway and walk road above groin - Landscape - Environmental monitoring works - Coral transplantation	Project Scop - General and preparatory works (including temporary jetty) - Demolition works - Revetment works - Construction of groin - Beach fill (341,960 m^3) - Groin modification (7 groins) - New groin (6 groins) - Walkway and walk road above groin - Landscape - Environmental monitoring works - Coral transplantation	Project Scope - General and preparatory works - Beach fill (280,300m^3) - Construction of walk way - Environmental monitoring works - Temple protection works	Project Scope - General and preparatory works - Modification of existing BWN-1&2 - New L-shaped headland - Sand re-nourishment (15,700 m^3) - Environmental monitoring works
Construction Period 36 months *(with beach nourishment)* 28 months *(without beach nourishment)*	Construction Period 36 months *(with beach nourishment)* 28 months *(without beach nourishment)*	Construction Period 10 months	Construction Period 16 months

(Source: JICA Study Team)

12.7 Proposed Sustainable Beach Management System

(1) Study of Suitable Beach Management System

The beach management system for Phase-2 is covered at Candidasa on the east coast and Kuta North – Seminyak on the south west coast. It is assumed that beach management between Kuta North and Seminyak will be carried on into beach management system that was established in Phase-1 because the beach is located in Badung regency. On the other hand, Candidasa is located in Karangsem regency out of Phase-1 area and they are inexperience in full-scale beach management under the cooperation between the public and the private. Therefore it is necessary to establish suitable beach management system considering not only their capability and actual achievement but also the result of consensus building and enlightenment program that will be carried out in design and construction period in reference to experience and process of Phase-1. Coordination Team for Phase-2 is proposed to combine with TKMPP that will be established for beach management system on Phase-1.

(2) Support for implementation of beach management

To undertake the task of beach management on a systematic basis is a first case for Karangsem regency. It is necessary to establish beach management system considering reality of the situation of Candidasa and Karangesem regency and by using examples obtainable from TKMPP, such as implementation structure and demarcation of responsibilities.

In this study, we invited staff persons of Bappeda and Dinas PU of Karangsem regency who will fulfill their important role as observer in 3rd WG for Phase-1 in order to give them an opportunity to enhance understanding, especially from following points of view;

- Objective of beach management
- Organization and structure for sustainable beach management
- Beach utilization issues
- Necessity of institutionalization, etc.

Chapter 13 Economic Impact Analysis and Operation and Effect Outcome Measure

13.1 Overview of the Economic Impact Analysis

(1) Objective of Economic Analysis

In general, there are two representative methods to evaluate the project effect; economic analysis and financial analysis. The purpose of the economic analysis is to evaluate the proposed project from the viewpoint of the national economy. On the other hand, financial analysis is aimed to appraise the financial viability of the proposed project from the viewpoint of capital investment whether it could yield sufficient returns. The former is evaluated with EIRR (Economic Internal Rate of Return) and the latter is evaluated with FIRR (Financial Internal Rate of Return).

A beach conservation project is generally implemented as public works since it contributes to the national economy by protecting national land, saving people's lives, enhancing the tourism industry and so on. In this study, therefore, the economic analysis evaluated with EIRR is applied to evaluate the project effects. The project effect on Candidasa, Legian~Seminyak, and Kuta Beach in Phase II are evaluated through economic analysis as a pre-project evaluation.

(2) Benefits Evaluated in this Study

Table 13.1.1 shows the general benefit items for a beach conservation project and the evaluated items in this study.

Table 13.1.1 List of Benefits Evaluated in this Study

Type of Benefit	Category	Description	Evaluation			Note
			Candi-dasa	Legian -Seminyak	Kuta	
Protection	Storm damage reduction	Storm damage reduction	-	-	-	Not evaluated. There is little inundation damage
	Erosion prevention	Land loss prevention	◎	◎	◎	Evaluated by shoreline change from survey
Environment	Protection of Nature landscape	Protection of Nature landscape	○	○	-	For Candidasa and Legian~Seminyak, evaluated with other benefits uniformly by CVM*[1] method
	Continuation of ecosystem	Continuation of ecosystem	○	○	-	Evaluated by CVM uniformly
Availability	Recreational effect	Recreational effect	○	○	-	Evaluated by CVM uniformly
	Activation of a local industry	Increased tourism income of commercial facilities	◎	◎	◎	Evaluated by case-based reasoning of Sanur and Nusa Dua area
		Increased Entrance fee / parking fee	-	-	-	Not evaluated. The value is assumed to be more or less resident in willingness to pay (CVM)
		Increased tax revenue	-	-	-	Not evaluated with same reason above
	Fishery industry use	Protection of area to keep fish boats, fisheries conservation	-	-	-	Not evaluated. There is little use of fish boats on the beach

◎ : Evaluated directly
○ : Evaluated with other benefits uniformly by CVM

Note:
*[1]CVM(Contingent Valuation Method)
CVM is used to estimate economic values for all kinds of ecosystem and environmental services. It can be widely used to estimate non-use values. CVM involves directly asking people, in a survey, how much they would be willing to pay for specific environmental services. Sufficient publicity to related organizations is needed before conducting a survey.

(Source: JICA Study Team)

13.2 Operation and Effect Outcome Measure

In general, the operation outcome measure is used to evaluate the management situation of the project and the effect outcome measure is used to evaluate the effect situation of the project. In other words, they are used to evaluate the effectiveness of the implementation of the project. Since the project effect is estimated as benefits in cost-benefit analysis, the basic conditions used to calculate the benefits are selected as operation and effect outcome measures. In addition, some effect to the public beach area, which is not directly included in project area, is also assumed as the measures. In this study, operation and effect measures were proposed as shown in Table 13.2.1 for each project area.

Table 13.2.1 Operation and Effect Outcome Measure

Types of Outcome Measure		Project Area	Present (2012)	After 3 Years from the Project Completion (2021)	Confirmation method of outcome measure
Operation 1	Rate of sand flow	Candidasa	-	5～10%*	Comparison of shoreline change (e.g. aerial photos)
		Legian~Seminyak	-	10～15%*	
		Kuta	-	5～10%*	
Operation 2	Erosion prevention of the land by the revetment	Candidasa	Erosion intruded into the land at some area	Erosion would be completely prevented by the revetment	Periodic site investigation
Operation 3	Reduction on the frequency of wave overtopping by the revetment	Candidasa	4-5 times per month	Decrease to almost nothing	Periodic interview to hotel owners behind the project area
Effect 1 (Private area)	Increase on the occupancy rate of hotels near the project area	Candidasa	Less than 70%	More than 80%	Periodic interview to hotel owners behind the project area
		Legian~Seminyak	Less than 80%	More than 85%	
	Avoidance on the decrease of occupancy rate of hotels at eroded area	Kuta	Less than 65%	More than 70%	
Effect 2 (Public area)	Increase of parking fee for public beach	Candidasa	-	10%* increase based on the present	Periodic interview to corresponding regency
		Legian~Seminyak	-	10%* increase based on the present	
	Avoidance on the decrease of parking fee for public beach	Kuta	-	No decrease from the present	

* Applied with actual effect from Phase I Project

(Source: JICA Study Team)

Chapter 14 Environmental and Social Considerations

14.1 Project and Site Description

(1) Project Description

Subjects of this environmental and social considerations are as follows: 1) Sand Nourishment in the Southwest Coast; 2) Sand nourishment, walkway, and maximum 12 meters of setback of the coastal protection line; and sand excavations at the offshore areas.

(2) Site Description

- Biological preservation area or the equivalent are not existing at the sites or in the project sites and the surroundings.
- There are not any residents living in the project area; therefore, involuntary resettlement will not occur in both of the project areas. It is not necessary for land acquisition in the project sites.
- The projects which JICA Study Team has proposed are conforming to the Spatial Plan of Bali Province, Karangasem Regency (for Candidasa coastal area) and Badung Regency (for the Southwest coastal area).
- The biggest existing environmental issue in the Southwest coast is probably the water quality of the shore area. There is a big algae bloom in the shallow water, and thus it is making the area unsuitable for tourist area. Since this water quality issue will remain after completion of sand nourishment, sewerage water treatment project should be implemented besides coastal protection works.

14.2 Screening Results

Results of screening for the proposed projects are as follows.

- Environmental Department of Bali Provincial Government has decided that proposed project requires full-EIA (AMDAL). Schedule-II of Law No.11/2006 is applied for the screening, which requires any project interferes with public land behind the beach. The outlines of AMDAL are as follows.
- Project Proponent (PP): Bali-Penida River Regional Bureau (Balai), Ministry of Public Works
- AMDAL reviewer: Environmental Agency of Bali Province (BLH). Regency governments (Karangasem Regency for Candidasa, and Badung Regency for the Southwest Coast) also have their own environmental divisions for AMDAL review, and it is lawfully possible co convey AMDAL review if it is a project within its authority.
- Stakeholders' meeting: Stakeholders' meeting is required once during TOR for EIA study according to the law No.27/2012 (Environmental Permit). For sake of the meeting, 30 days of public disclosure is required. In practice, more thorough and many occasions of public consultations are indispensable for determining and explaining specifications of setback of protection line, sand dredging, transportation routes, and sand nourishment procedures.
- Length of time necessary for the AMDAL procedure: usually 3 to 6 months if evaluated by the Government of Bali Province. The duration might be shorter if it is done by the Regency.

- Compiler of AMDAL report: the AMDAL compiler must have an official certificate of AMDAL engineer, registered under Ministry of Environment.
- As other permission needed for this project, concession rights of sand excavation will be necessary. According to the Bali Government, the right is not difficult to obtain by the contractor before construction.

14.3 Scoping and Survey Results

(1) Scoping Results

Table 14.3.1 shows the results of scoping for coastal protection works at Candidasa and the Southwest Coast.

Table 14.3.1 Scoping for Candidasa and Southwest Coast

Field	No.	Subject	Estimation		Justification
			Pre/During Construction	During Operation	
Pollution	1.	Air	d	d	**During Construction**: Although emission from dredging ship and sand transportation machines in the offshore area are expected during sand transportation, impacts on residents are negligibly small. **During Operation:** There is no machine to be operated after construction.
	2.	Water	b-	b-	**During Construction**: Turbidity of shallow water area becomes higher at the dredging point and sand nourishment area. **During Operation:** Fine particles attached to the dredged sand will be washed out by tidal action and waves gradually to the shallow area for long period of time.
	3.	Solid waste	d	d	**During Construction**: Sand dredging, sand nourishment, and construction of embankment will not produce solid waste. **During Operation**: Nothing really operates at the coastal area after construction.
	4.	Soil	d	d	**During Construction**: Soil contamination is not likely during sand nourishment works. Leakage from trucks and ships may occur but only at a negligible level **During Operation:** There would be no source of pollution after the civil works.
	5.	Noise/ vibration	b-	d	**During Construction**: Dump trucks give noise impacts along the access road; bulldozers are planned to be operated to push the sand into the water. The noise and vibration along the access road, nearby sand nourishment area are expected. **During Operation:** There would be no source of noise and vibration after the civil works.
	6.	Ground subsidence	d	d	**During Construction and Operation**: There would be no construction works or operation practices which will cause ground subsidence.
	7.	Offensive odor	d	d	**During Construction and Operation**: There would be no construction works or operation activities which will cause offensive odor.

Field	No.	Subject	Estimation		Justification
			Pre/During Construction	During Operation	
	8.	Sedimenta-tion	d	c	**During Operation**: No significant impact by sedimentation is foreseen at the southwest coast, but nourished sand may affect corals in reef flat of Candidasa. Specific positions of corals were examined in this study.
Natural Environ-ment	9.	Preservation area	d	b+	**During Construction and Operation**: Both the southwest coast and Candidasa area are designated as "coastal conservation area" and "strategic tourism area" by Bali RTRW 2009-2029. This does not mean the usage is prohibited but wise conservation for the resource utilization is obligated.
	10.	Biodiversity	b-	b-	**During Construction**: Coral clusters in the reef-flat area exist in Candidasa.. Dredging activity and beach creation will change the sea bottom environment. **During Operation:** The same with No.8 above.
	11.	Water flow	d	d	**During Construction and Operation**: Littoral current will not be changed but power of incursion waves will be decreased by nourished sand. However, if new groins are constructed, water circulation between the groins will be altered.
	12.	Topography/ Geology	d	d	**During Construction and Operation**: Although dredging activity and beach creation will change the sea bottom environment, but the changes are not significant because the sand has been drifted and accumulated in the present place from other area.
Social Environ-ment	13.	Involuntary resettlement and/ or Land aquisition	b-	d	**During Construction**: There would be no involuntary resettlement that will occur in Candidasa area and in the Southwest coast area by the proposed coastal conservation work plans. In case of implementation of setback in Candidasa, facilities/buildings will be removed in exchange for creating beach area. The choice is selected by the owners/investors of the hinterland area. **During Operation**: There would be no operation practices which will cause involuntary resettlement.
	14.	Low income group	d	d	**During Construction and Operation**: Since the project proposed areas have been utilized as important tourist areas, and the land is subject to land speculation, low income people are not living in and the surrounding area.
	15.	Minority/ indigenous people	d	d	**During Construction and Operation**: The same with No.14.
	16.	Employment/ income source/ regional economy	c	b+	**During Construction**: Dredging activity may require alternation of fishing practices at nearby area. Fishing activities are studied. **During Operation**: Creation of beaches will give remarkable and positive impacts on the hinterland tourism business.
	17.	Land use/ natural resources	c	b+	**During Construction**: The same with No.16 above. **During Operation:** Creation of beaches will give remarkable and positive impacts on the hinterland tourism business.

Field	No.	Subject	Estimation		Justification
			Pre/During Construction	During Operation	
	18.	Water use/ rights	d	d	**During Construction and Operation**: There would be no construction works or operation activities which will limit water use, or cause impact on water use.
	19.	Infrastructure, social service	d	d	**During Construction and Operation**: There would be no construction works or operation activities which will cause impact on infrastructures.
	20.	Social infrastructure, local organization	d	d	**During Construction and Operation**: There would be no construction works or operation activities which will cause impact on social infrastructure and local organizations.
	21.	Unfair distribution of cost and benefit	c	d	**During Construction**: Beneficiaries of the proposed projects are the communities as a whole by increasing the number of tourists. However, for the southwest coast, sand accumulated in the offshore area of Kuta is planned to be dredged and conveyed to Legian and Seminyak area. This may develop to inter-community argument, such as the Nusa Dua community showed annoyance for sand dredging in Phase-I. Fishermen in Kuta may also feel discontent.
	22.	Social conflicts	c	d	**During Construction and Operation**: The same with No.21 above.
	23.	Archaeolo-gical/ historical heritage	d	d	**During Construction and Operation**: Although there is a famous temple in the hinterland area of Candidasa, no archaeological or historical heritage site in the project proposed site.
	24.	Landscape	d	b+	**During Construction**: Construction machineries will be utilized to push out sand to form a beach in Candidasa; however, the duration is limited to few days, and the impact on landscape is negligible. Machines are not necessary for the southwest coast because direct sand nourishment using pressured pipes are planned. **During Operation** The landscape of the southwest and Candidasa area will be improved by the creation of a sandy beach.
	25.	Gender	d	d	**During Construction and Operation**: There would be no construction works or operation activities which stimulates inequality of gender or exploitation.
	26.	Children's rights	d	d	**During Construction and Operation**: There would be no construction works or operation activities which undermine children's rights.
	27.	Transmitting disease, i.e., HIV/AIDS	d	d	**During Construction and Operation**: There is a large number of population influx to the proposed areas compared to the construction workers because they are popular tourist areas. The impact on increasing incidents of transmitting disease is small.
	28.	Working environment/ safety	d	d	**During Construction and Operation**: There would be no construction works or operation activities which degrade working environment/ safety.

Field	No.	Subject	Estimation		Justification
			Pre/During Construction	During Operation	
	29.	Accidents	c	c	**During Construction**: Since construction vehicles will share hinterland roads with tourists, possibility of accidents chould be higher. The access routes will be confirmed. **During Operation** New walkway along the coast in Candidasa attracts tourists but they may see high waves hit the walkway.
Others	30.	Climate change, inter- national impacts	d	d	**During Construction and Operation**: There would be no construction works or operation activities which will cause climate change or cross-border impacts.

A+/-: Significant positive/negative impact is expected.
B+/-: Positive/negative impact is expected to some extent.
C: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

(Source: JICA Study Team)

(2) Results of Survey

a) Impacts on Corals (in relation to No.2 Water pollution, No.8 Sedimentation, and 10. Biodiversity, in Table 14.3.1)

Most of the Candidasa corals are attached on the fore reef of reef limestone which receive abundant water from offshore area by land bound current (Source: Environmental Status in 2010 Bali Province). Although corals are not seen in the reef flat and reef edge, some coral clusters are observable on artificial structures.

- Sand dredging works require about 3 months but the precise dredging point and the amount is not determined yet. If dredging works will be at Padan Bai area, fore reef corals of the area may receive impacts from turbidity which arises by the dredging as consequences of coastal current, specific location of the corals, and dredging location.
- The width of cross section of the nourished beach will be about 40-50m at the maximum. Cluster of corals which attached on breakwaters may well be buried by sand, or their polip get damaged by friction of the sand during high waves.
- Decreasing of incoming light by turbidity may affect zooxanthella and eventually damage the host coral.
- Demolishment of the bases (breakwaters) causes elimination of corals directly in reef flat.

b) Expected Impact on Fishing Activities (in relation to No.16 Employment/ income source/ regional economy, No. 17 Land Use/ natural resources, No.21 Unfair distribution of cost and benefit, and No.22 Social conflicts, in Table 14.3.1)

The offshore areas of the proposed sites, Candidasa, and the southwest coast are being utilized as fishing ground for local fishermen. Although the number of fishermen numbers 150 in Candidasa and 180 in the southwest coast area approximately.

- Although turbidity will be increased at the dredging point which will be 2-5 km offshore area of Kuta, the turbid area will be limited to the proximity area and the duration is limited within a month. The impact is negligibly small because the dredging area is homogeneous with surrounding ocean area; and pelagic fish can swim way easily to where it is favorable environment.

- There was no opinion against the sand dredging works, which will not affect fishery activities significantly, from the representatives of fisherman during stakeholders meeting; however, other fisherman may express discontentment during the construction if information proliferation by PP is not enough.
- Sand dredging requires agreement Karangasem Regency (for Candidasa) and Badung Regency (for the Southwest Coast) if dredging point is located within 4 miles (6.44 km).
- Demersal fish or shellfish are not the target fish in Candidasa. The southwest coast is not the main lobster fishery area: the impacts of the dredging activities are negligibly small.

c) Resettlement and Land Acquisition (in relation to No.13 Land Acquisition)

- Involuntary resettlement will not occur in both Candidasa and the Southwest coast. There is no inhabitant in the project area of the southwest coast because the site is limited only on the beach. Likewise, in Candidasa, no inhabitants are recognized in the area of setback (12 m from the present coastal line).

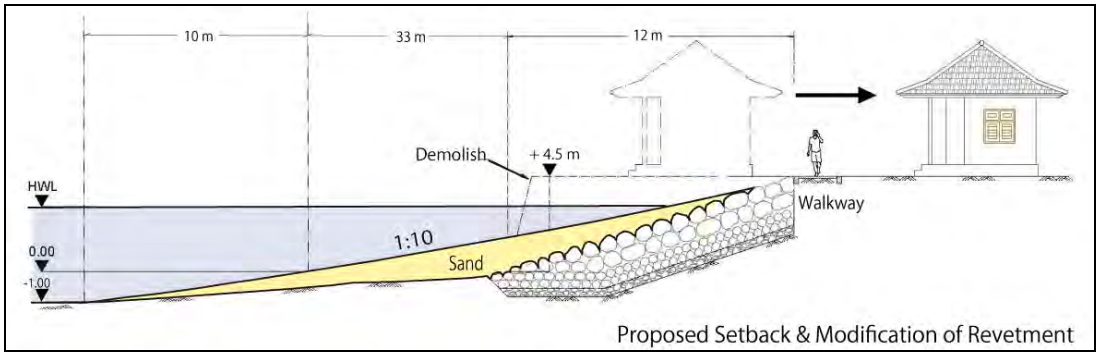


Figure 14.3.1 Alternation of Protection Line (Setback)

(Source: JICA Study Team)

- Land Acquisition

  Land acquisition will not occur in both Candidasa and the Southwest coast. For land requires for setback in Candidasa, the same procedure will be taken by Phase-I. Thorough discussions will be held with business firms in hinterland, and the boundary line between private and public areas will be determined. If the business firms are not willing to provide land for beach, setback and nourishment will not be implemented.

  Extension of land necessary for the Proposal-1 (the shoreline length: 3.1km) is 3.72 hectors, 6.12 hectors for Proposal-2 (the shoreline length: 5.1km).

  Compensation for the land should not be paid to the hinterland business firms in order to maintain equality among the business firms who cooperated in Phase-I beaches.

d) Noise and Vibration (in relation to No.5 Noise and Vibration)

- Distance between hotels in hinterland of the Southwest Coast and the construction area is more than 50-70m in average. The impacts of noise and vibration are small because the construction works are sand grading and distribution of sand by using pressured conduit.

- On the contrary to the Southwest Coast, project site of Candidasa is at proximity to the hotel. In addition, sand will be embarked on to the land and pushed out to the beach in order to reduce sand stirred and the turbidity. Noise and vibration affects the business firms (hotels) along the transportation routes and behind the construction site of the embankment.

e) Accidents (in relation to No.29 Accidents)

- Construction area can be separated from the hotels in hinterland because the sand will be transported from the offshore area.
- The sand transportation road in the Candidasa will have to be used by sand transportation trucks; however, this road is also serving as the only trunk road along the east coast of the Bali Island, and the traffic volume is high and the noise and vibration is being already offensive. Therefore the impacts to be added by the trucks are not large compare to the existing traffic.

14.4 Mitigation Measures

a) For turbidity problem on fore reef corals in Candidasa (in relation to No.2 Water pollution, No.8 Sedimentation, and 10. Biodiversity, in Table 14.3.1)

- Careful selection of sand dredging location in order to reduce impacts on fishery

  In Candidasa, selection of sand dredging area should be carefully chosen; the location of coral reef and oceanic current should be taken into consideration when choosing the points. As for the Southwest coast, surface current bounds toward land from December to March. If dredging works will be taken place during this period, fisherman and beach users should be well consulted of the dredging plan.

- Selection of sand dredging method

  Dredging method that disturbs less will be selected for Candidasa, such as bucket type dredger that is equipped with screen according to the necessity. The capacity is usually smaller and takes time than suction types, but it can dredge dredging points precisely.

b) Sand coverage problem for corals in Candidasa lagoon and rising turbidity (in relation to No.2 Water pollution, No.8 Sedimentation, and 10. Biodiversity, in Table 14.3.1)

- There is already a good sandy section behind the breakwater No.5 and No.6 on which living corals are attached. The layout plan of coastal protection structures should be carefully studied by reviewing position of coral clusters (1.1 ha), remained beach section, positions of encroached private facilities, and necessity of moors for fisherman boats. If removal of the corals is required by the plan, coral transplantation, as the mitigation measure, should also be considered together with Balinese experts, such as Reef Check Foundation.
- Direct discharge from pressured conduit or ship should be avoided. Pushing sand out from the land is more preferable than direct discharge in order to decrease turbidity.
- Installation of separation screens in order to confine turbid water should be considered for sand nourishment works in Candidasa. In case of the Southwest coast, exchange of water bodies between that of shallow area and off shore area is freer, and turbid water can diffuse easily. In addition, since swimming in the area is basically prohibited, separation screen is not necessary.

c) Disturbance on fishery by dredging activities (in relation to No.16 Employment/ income source/ regional economy, No. 17 Land Use/ natural resources, No.21 Unfair distribution of cost and benefit, and No.22 Social conflicts, in Table 14.3.1)

- Balai should consult first the fisherman's association and responsible offices of Karangasem and Badung districts before making a dredging plan for choosing the month, specific location, and provide dredging implementation information to fisherman association.
- In order to decrease impact of turbidity arises by sand dredging and nourishment, selection of appropriate dredging method; installation of separation screen; and cleaning of dredged sand etc. should be studied and compared in terms of their cost and effectiveness.
- Balai should limit the amount of sand to be dredged at appropriate level, and shorten the duration of dredging and sand nourishment as possible.

d) Disturbance on hotels by noise, vibration of through trucks, and leveling machineries (in relation to No.5 Noise and Vibrations and No29 Accidents, in Table 14.3.1)

- Transporting routes should be carefully examined and planned with stakeholders in order to decrease impact of noise and vibration. Good understanding of stakeholders on the working period, method, and impacts (the best possible work plan, expected noise and vibration, and possibility of accidents) should be obtained.
- Safety education should be compulsory curricula for all workers including drivers and security personnel, and it should be mandatory item in the contracts with construction companies.

e) Land Acquisition (in relation to No. 13 Involuntary Resettlement and Land Acquisition, in Table 14.3.1)

- Private facilities do not exist in the construction site of the Southwest coast, and land acquisition will not be an issue.
- The same practices as Phase I beaches are planned to be conducted for setback plan of coastal protection line in Candidasa. During detailed design phase, thorough discussions with each land owners will be held and agreements will be made. If agreement is not obtained, the section will not be the subject area for sand nourishment. However, since certain length is required for practical sand nourishment measure, cooperation among the adjacent hotels will be required for determining the suitable type of coastal protection measure.
- Land should not be compensated in order to be fair with all stakeholders, including Phase I beaches; however, the facilities being subjects for removal could be the subjects of negotiation for the compensation.

14.5 Environmental Monitoring Plan

In order to monitor the effectiveness of mitigation plans, a draft monitoring sheet is proposed. This monitoring practice is to be implemented by the project proponent, Balai. The most important issues are: 1) turbidity at dredging site, 2) turbidity at sand nourishment site, especially impacts on the coral clusters in reef flat of Candidasa, 3) development of 'adopt system' for the beach maintenance and the results, 4) process of consensus building on setback plan and results of the implementation. However, the monitoring sheet should be reviewed, and the monitoring items and ways of monitoring should be revised during detailed design stage.

14.6 Stakeholders Meetings

Outlines of coastal protection plan including the alternatives for Candidasa and the Southwest coast are explained to the local stake holders together with the respective government officials. In addition, new operation and management system, "Adopt System," recommended for Phase I beaches also are explained, and discussed. The followings are the summary of the discussions.

- Proposed outlines of beach conservation plans for Candidasa and the Southwest Coast gained strong reputation and agreed by the stakeholders.
- Discussions with individual stakeholders on setback plan are essential for Candidasa.
- Similar beach maintenance practices as "Adopt System" are already being implemented by the local stakeholders, and it is possible to implement the system.
- There is no objection arisen from the representatives of fisherman's organization.

Recommendation

(1) Review of the Beach Monitoring and Maintenance System on Phase-1

a) Continuous support for beach management activities in the viewpoint of long-term basis through the scheme of “soft component ” during the Phase-2 Project

As one of the results of this study, it was proposed and agreed to establish the “Coordination Team for Beach Management (TKMPP)” to make a decision and control the beach management of the Phase-1 Project beaches in cooperation with public and private sectors. However, Indonesia has no experience in beach management system until now, and this is the first trial for a beach management system to be conducted. Considering the current actual conditions for beach management in Indonesia, technical know-how is absolutely insufficient. Continuous support is surely required. Two kinds of support are mainly required on beach management, i.e., 1) capacity development to obtain technical skills in “adaptive management system“ to manage the sandy beach and 2) capacity development for beach management and control. Beach management is to be run by the Indonesian themselves. Continuous support in the point of long-term basis is still required. To achieve this, it is strongly recommended to carry out a continuous and long-term basis capacity development through the scheme of “soft component” during the Phase-2 Project.

b) Technical assistance until the time the “Coordination Team for Beach Management (TKMPP)” can independently operate well.

According to the agreement which was obtained in the working group meeting (WG3) in this study, the local governments of Bali will take a necessary action for the establishment of the TKMPP. Furthermore, after the establishment of TKMPP, the Indonesian government promised to continue the discussion for required issues on beach management, such as sharing of the responsibility for each management item, budgeting which is required to conduct the beach maintenance, legalization for necessary beach rule, etc. However, it is uncertain whether the Indonesian government can operate by themselves without any support from JICA. Taking into consideration the actual condition, it is recommended to consider some assistance to be provided to the local governments and BWS-BP who are the main players of beach management and maintenance.

c) Cooperation with Coastal Research Center with BWS-BP to support the technical part

It is planned that the Institute of Coastal Research Center of the Ministry of Public Works will move from Bandung to the new laboratory situated at north of Bali, and start the research

work by next year. This institution shall become the top organization who will manage and handle all technical matters on coastal engineering in the Ministry of Public Works. Loka Pantai is the primary organization already doing coastal research works at north of Bali. However, it seems that their main works now are mainly focusing on research work based on laboratory and small-scale field test, not emphasizing on the actual practical problems of the coastal fields including the issue of beach management. As mentioned several times in this report, "Adaptive Management System", which is a cyclic system based on monitoring, evaluation, planning, and execution, is strongly required for the nourished beach management. There will be no success on beach management without fully understanding the system. The "lessons learned" based on the actual problems on the site is required to obtain adaptive management skills. According to the agreement for the establishment of TKMPP, BWS-BP shall take care all the technical part on beach management. However, it is anticipated to carry it out surely with appropriate judgment based on sufficient experience and skill for coastal engineering. Considering the abovementioned current conditions, it is recommended to cooperate with the Coastal Research Center to share the technical part together with BWS-BP. To have a sufficient experience and skill to manage the actual coastal problems, capacity development of the Coastal Research Center especially on the adaptive management system for the beach is strongly required through actual coastal practice.

d) Legalization for the definition of walkway and ownership of sand stock pile

One of the problems on beach management for the Phase-1 Project is the unauthorized boundary between public and private properties. Basically, the position of walkway is defined as the boundary between public and private properties. However, this definition has not been understood by both related parties due to the non-legalization of the walkway function. This has caused several illegal use and construction at the beach area which is under the control of the government. Based on this condition, it is recommended to legalize the function of the walkway to avoid further illegal beach use.

The sand stockpile was constructed at the south of Sanur in the Phase-1 Project. About 140,000 m^3 of sand has been stocked as the required sand filling for maintenance work of the Phase-1 Project beaches. During the four years after the completion of the Phase-1 Project, the stocked sand has been utilized for additional countermeasures at the north of Nusa Dua area with the order of 10,000 m^3, while most of the stocked sand still remain. Even though the ownership for the area of sand stockpile and usage of stock sand were already discussed and agreed between the central government and related communities in Sanur, both the ownership and the usage of sand are unclear. The different understanding of the ownership and the usage for sand stock pile has appeared not only on the stakeholders side but also from the government side. This has caused unclearness and dissatisfactory individual planning for the

use of the sand stock area and its stocked sand. An immediate discussion and authorization (if necessary) for the ownership and the usage of sand stockpile are recommended

e) Institutionalization of the buffer zone in the coastal area and clarification on the authorization and permission for construction at the beach area

Unsatisfied construction of permanent facilities such as buildings, seawalls, etc., for hotels, villas, restaurants, and communities were observed especially at the newly developing area for tourism (e.g., Candidasa, north Seminyak, Canggu). These constructions have sometimes affected the long shore sediment transport and induced new beach erosion problems. These problems were caused mainly by unclearness of the coastal buffer zone (beach riparian area) and unsystematic control system on the permission for construction at the coastal area. It is strongly requested that the institutionalization of the coastal buffer zone and clarification on the authorization and permission of construction at beach area be put in place. This issue is one the important discussion items in the TKMPP.

(2) Feasibility Study of the Phase-2 Project

a) Combined the implementation of beach nourishment and construction of coastal facilities as one package for Candidasa

There is an opinion from the Indonesian side that the implementation of beach nourishment in Candidasa will be separated from other implementation works such as the construction of revetments and groins. In this case, the implementation of beach nourishment will be separated from the loan project and conducted by the local contractor and will be supervised by the local consultant. As mentioned before, high attention to the coastal and marine environment is strongly required for the implementation of the project in Candidasa in order to secure the present coastal and marine conditions. The suitable construction method based on experience with high technology and appropriate supervision during the implementation work is strongly required. Furthermore, several heavy equipment such as barge, tag boat, etc., and countermeasures to mitigate the turbidity such as silt protector, etc., can be shared for the implementation of both beach nourishment work and construction of coastal facilities, if the implementation will be carried out as one package. This will achieve the effective use of equipment and reduce the cost of implementation. Taking into account these factors, it is recommended to do the implementation of beach nourishment and construction of coastal facilities at the same time as one package.

c) Consideration for additional sand stock during implementation stage in Phase-2 Project

It is difficult to find a sand source with suitable color and grain size specifications from the inland side. Thus, the seabed sand at the offshore area will be utilized as the material for beach nourishment as the same concept used in the Phase-1 Project. For the digging of sand from the seabed with a depth of more than 20 m, a specified dredger (trailer suction hopper dredger) with a sufficient pump capacity is commonly used. There is no such type of dredger with sufficient pump capacity in Indonesia. The opportunity for digging sand from the offshore area is very limited, and only during a big-scale beach conservation project like Phase-1 can it be utilized. On the other hand, the present stock sand will be utilized for beach maintenance for several years, and further stock sand will be required for future maintenance of the beach. Thus, taking advantage of the opportunity for the implementation period of the Phase-2 Project, it is recommended to consider the preparation of additional stock of sand.

d) Effective technical transfer during the Phase-2 Project (Necessity for the involvement of C/P into the consultant team as OJT)

Through the Phase-1 Project, it is a lesson learned that the effect of occasional opportunity on technical transfer such as workshop, seminar, short training in other countries, etc., which are common technical transfer methods, was limited mainly on capacity development. The most effective method for capacity development of the technical part is the involvement of selected C/P into the consultant team, where they will examine, do analysis, prepare technical document as one of the engineers in the consultant team. It is also recommended to put into practice such system during the detailed design and the implementation stage.