

Toward Sustainable Komodo National Park Management: A 2002 Progress Report

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1. Brief introduction to Komodo National Park

Komodo National Park (KNP) was established in 1980 and was declared as a Man and Biosphere reserve in 1986 by UNESCO. Later on in 1990 UNESCO also declared the Park as a World Heritage Site. The Park was initially established as a reserve for the unique Komodo Dragon. Ora or dragon in local language was first discovered by the scientific world in 1911. P.A.Ouwens, curator at the Bogor Zoological Museum, received a report on the discovery of the dragon from J.K.H.van Steyn, an official of The Netherlands Indies Government. Ouwens gave the animal the scientific name *Varanus komodoensis* Ouwens in 1912 in an article in the 'Bulletin du Jardin Botanique de Buitenzorg', entitled "On a large *Varanus* species from the island of Komodo". KNP is located between the islands of Sumbawa and Flores at the border of the Nusa Tenggara Timur and Nusa Tenggara Barat provinces of Indonesia. KNP includes three major islands, Komodo, Rinca and Padar, and numerous smaller islands together totalling 41.000 ha of land. KNP also includes one of the world's richest marine environments.

The Park encompasses 510 square miles of exceptionally diverse marine habitats, including coral reefs, mangroves, seagrass beds, seamounts, and semi-enclosed bays. These habitats harbor more than 1.000 species of fish, some 260 species of reef-building coral, and 70 species of sponges. Numerous vulnerable and endangered large marine life species such as the Dugong (*Dugong dugon*), dolphins (10 species), whales (6 species) - including the blue whale (*Balaenoptera musculus*) and sperm whale (*Physeter macrocephalus*), marine turtles such as the hawksbill and green turtles (*Eretmochelys imbricata* and *Chelonia mydas*, respectively) are all occurring within the Park and its adjacent waters of the Flores and Sumba Seas.

KNP lies in the Wallacea Region of Indonesia, identified by both WWF and Conservation International as a global conservation priority area. The objective for the marine component of KNP is to protect its biodiversity and the breeding stocks of commercial fishes for replenishment of surrounding fishing grounds. The main challenge is to reduce both threats to the coastal marine resources and conflicts between incompatible activities.

There are presently almost 4.000 inhabitants living within the Park, spread out over 4 settlements (Komodo, Papagarang, Rinca and Kerora). An estimated 15.000 people live in fishing villages directly surrounding the Park. Park inhabitants mainly derive their income from a pelagic lift net ('bagan') fishery, which is targeting squid and small schooling pelagic fish. This fishing method is not affecting the sedentary marine ecosystem in the Park and is therefore not in conflict with the Park's objectives. Additional income and food is derived from hook and line fishing, trap fishing, reef gleaning, and other fishing methods. Non-inhabitant fishermen also use pelagic lift nets and a variety of other methods such as compressor fishing, hook & line fishing and gillnetting in KNP waters. Although bagan is the dominant gear-type in KNP, several destructive fishing practices (DPFs) such as dynamite-, cyanide-, and compressor fishing, reef gleaning and plain over-fishing, severely threaten the Park's marine resources.

Destructive fishing practices severely threaten the Park's demersal (bottom dwelling) and sedentary marine resources by destroying both the habitat (coral reefs) and the resource itself (fish and invertebrate stocks). The present situation in KNP is characterized by reduced but continuing destructive fishing practices, primarily by non-Park inhabitants, and high pressure on demersal stocks like lobsters, shellfish, groupers and napoleon wrasse. Terrestrial threats include the increasing pressure on forest cover for fuelwood and water resources as the local human population has increased 800% over the past 60 years. In addition, the Timor deer population, the preferred

prey source for the endangered Komodo dragon, is still being poached. Pollution inputs, ranging from raw sewage to chemicals, are increasing and may pose a major threat in the future.

2. Purposes and objectives

The goals of KNP are to protect its biodiversity (particularly the komodo dragon) and the breeding stocks of commercial fishes for replenishment of surrounding fishing grounds. The main challenge is to reduce both threats to the resources and conflicts between incompatible activities.

2.1 General objectives

- Establish a terrestrial and marine reserve in Komodo National Park, which fully protects the natural communities, species, as well as the terrestrial, coastal and marine ecosystems.
- Ensure the long-term survival of the Komodo dragon and maintain the quality of its habitat.
- Use the Park's natural resources in a sustainable way, for tourism, education, fisheries, and research.
- Protect the stocks of exploited reef fish and invertebrates in the reserve, thereby creating a source of recruits to enhance harvests on fishing grounds in and around KNP.

2.2 Detailed management objectives

- Establishment of a strong co-management structure which is more self reliant for the Park.
- Stop all destructive fishing practices, including reef blasting, compressor fishing, reef gleaning, over-fishing of spawning aggregation sites.
- Protect fish stocks by closing all known fish spawning aggregation sites to fisheries.
- Protect fish stocks by prohibiting demersal fishing in most areas of the Park.
- Promote a shift of fishing effort from demersal to pelagic fishing.
- Implement traditional use zones with exclusive fishing rights for Park inhabitants.
- Implement reforestation and other rehabilitation efforts where appropriate.
- Develop feasible methods to increase the rate of coral reef rehabilitation.
- Introduce a licensing system for all activities inside Komodo National Park.
- Support members of local communities to enter in enterprises which are compatible with the Park's management objectives and support conservation.
- Implement a sustainable system for tourism management and Park financing.
- Limit human population growth through restricting immigration and land use.
- Stabilize the human population size within the Park.
- Limit the extraction of firewood and water resources, and provide alternatives.
- Establish waste disposal systems and minimize or eliminate pollution inputs.
- Eliminate dogs and cats and prohibit the introduction of other alien species.
- Monitor populations of important species such as the Komodo dragon, the megapode, commercial reef fishes as well as vulnerable or endangered marine species such as sea turtles and cetaceans, and make management interventions as appropriate.
- Maintain sufficient grazing habitat for deer, a preferred prey item of the Komodo dragon.

2.3 Targets

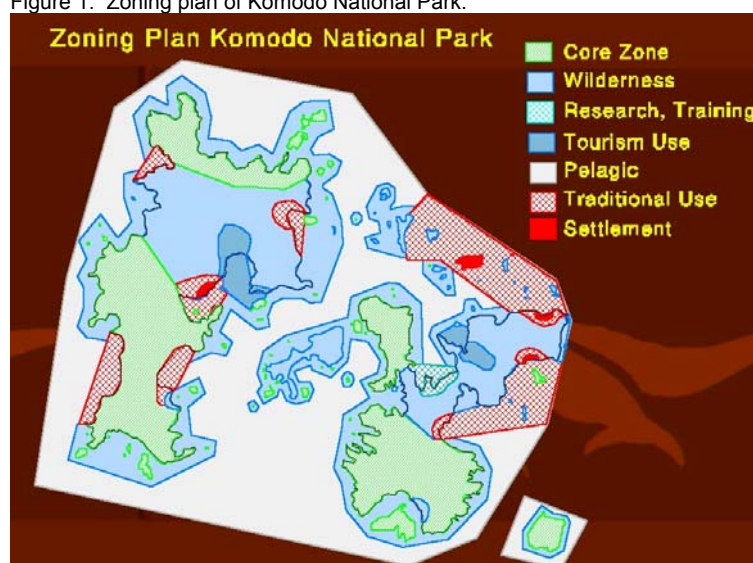
KNP must protect the fauna, flora, and ecosystems found in the area, and support sustainable development within the region. Co-ordination is required with government agencies in the region, as well as with local communities, research institutions and NGOs. Specific targets include:

2.3.1 Protection

- Legal confirmation of the External Boundary System of the terrestrial and marine areas.
- An operational zonation system in place, protecting all areas with high biological value.
- Park regulations are clear, enforceable, and ensure the protection of the natural resources.
- An effective surveillance system implemented by motivated Park staff, to enforce regulations.
- Spawning locations for fish and other marine biota are preserved and maintain their ecosystem functions.

- The Park's fauna and flora are protected and conserved in their natural habitats.
- Limited harvesting activities do not threaten the populations of any species in the Park.

Figure 1. Zoning plan of Komodo National Park.



2.3.2 Conservation

- The Park's flora and fauna are preserved in their natural ecosystems.
- Effective management interventions are taken when species or eco-systems are threatened.
- Migration passages and routes for (often endangered) large marine life in the KNP area are maintained in good quality.
- Monitoring and evaluation systems are developed and effectively implemented.
- Environmentally degraded areas are rehabilitated or restored as necessary.

2.3.3 Resource use

2.3.3.1 Fisheries

- Pelagic resources in the Pelagic Use Zone and coastal resources in the Traditional Use Zones are used in a sustainable manner.
- Coral reefs and spawning sites are preserved, both within and outside KNP.
- Pelagic fishing methods are diversified, and post harvest methods are improved.
- Mariculture is sustainably developed in suitable areas surrounding KNP.

2.3.3.2 Tourism

- An overall tourism management plan is developed and implemented.
- Effective co-management of natural resources in the Buffer Zones is implemented in cooperation with the appropriate agencies.
- Park management facilities and future infrastructure are developed on the basis of an environmental impact assessment (EIA).
- Research is implemented on the impacts of tourism, and the needs of tourists.
- A trial system is implemented for charging of a progressive entrance fee for KNP, with revenues collected used to finance Park management.

2.3.3.3 Research and monitoring

- Agreements developed covering intellectual property rights.

- A biological monitoring and inventory plan for all marine and terrestrial habitats implemented, with special attention given to fragile habitats and threatened species.
- An overall research plan developed and implemented in collaboration with scientific partners which addresses key management issues for the Park.

2.3.4 *Education*

- Develop facilities and infrastructure for education and research on the conservation of natural resources in KNP's Special Research and Training Zone.
- Improvement of stakeholder awareness and responsibilities with respect to the Komodo National Park.
- Increased skill levels providing more job opportunities for the local community.

2.3.5 *Improved management system*

- Local on-site capacity in Park management is increased at KNP.
- Participation by local stakeholders is positively contributing to the management of KNP.
- A self-sustaining management system is developed and implemented for KNP.
- Management personnel are trained and skilled in the use of self-financing systems.

3. The Management Authority

The organizational structure of the Komodo National Park is based on the Decree of the Forestry Minister, under which the Park was designated as a Technical Implementation Unit of the PHKA Directorate General led by a Head. The organizational structure of the National Park is based upon the primary functions it must fulfill. The Park must protect the diversity of fauna and flora, and their ecosystems. In addition, it must use these natural resources in a sustainable manner for tourism, research, and to help benefit local communities.

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4. The management plans

4.1 *Planning*

To effectively manage KNP has to be equipped with the comprehensive management plans, based on ecological, resource use and social data. To provide the initial information for this several research and monitoring activities on the marine component of the Park were undertaken since 1994. Results and information from this comprehensive program have been compiled to formulate a draft framework for the long-term management plan. This resulted in a 25 year Management Plan of KNP in 2000. The plan was endorsed by both the local government of Manggarai District and the central government of the Ministry of Forestry in 2001 as the blueprint for Park management and implementation.

The 25-year management plan was developed in association with extensive coral and fish monitoring programs, surveys on vulnerable and endangered marine life such as cetaceans and marine turtles, comprehensive community outreach and conservation awareness campaigns and sustainable livelihood activities, and a strong cross-sectoral patrolling and enforcement program. The existing planning system of conservation areas of the Ministry of Forestry recognizes three levels of National

Park management plans: the 25 year Master Plan, a 5 year Management Plan and the annual operational plan. The implementation of the management plans and the ongoing conservation efforts will only be sustainable when the following critical constraints are addressed:

1. The limited Park management capacity,
2. The decline in the government budget to support of marine protected areas in Indonesia.

It is difficult under present circumstances for one single agency to manage a large number of protected areas. Collaborative management strengthens effective management of protected areas and has become the accepted practice worldwide. A collaborative management initiative and a long term financing plan have been developed to address the key constraints for professional and effective management of the Park. It is of crucial importance that a) the ongoing and upcoming major challenges to KNP as detailed in the management plan are addressed and b) the Plan's implementation continues to achieve the Park's core conservation goals including:

- protect the Park's area integrity and its resources,
- establish key zones of KNP as non-extractive use zone or no-take zone,
- develop a strong professional management system,
- build strong constituency among communities and stakeholders,
- minimize destruction and extraction over Park resources,
- minimize population pressures and terrestrial impacts (pollution, run-off),
- properly manage habitats and populations of threatened or endangered species,
- monitor the status of indicator species, critical habitats and overall ecosystem health to which the Park contributes.

Specific field activities including research and monitoring, surveillance, community development or other programs are geared towards realizing the goals set out in the 25 year KNP Management Plan:

1. Continue the positive trend of coral reef rehabilitation which was started in 1996,
2. Stop all destructive fishing practices, including reef bombing, compressor fishing, reef gleaning, etc.,
3. Protect fish stocks by closing all known fish spawning aggregation sites to fisheries,
4. Implement sustainable system for tourism management and Park financing,
5. Implement multiple use zones with exclusive fishing rights for Park inhabitants,
6. Introduce a licensing system for all activities inside Komodo National Park,
7. Promote a shift of fishing effort from demersal to pelagic fishing,
8. Support members of local communities to enter in compatible enterprises, and
9. Develop a feasible methodology for the enhancement of coral reef rehabilitation.
10. Surveys and research on migratory, and often CITES listed as endangered, large marine life in the KNP area contribute to national and (eco)regional conservation strategies for these species.

4.2 Park protection

4.2.1 Patrols and enforcement

A joint enforcement team was established in 1996 to cope with the pressing need of abating the destructive fishing practices, especially blast fishing or reef bombing. The enforcement measures included the provision of speedboats, radio communication system and logistical support, which enabled the Park Authority to conduct a more regular patrol and to provide a better response towards field circumstances.

In 1997, monitoring results showed that the enforcement efforts were effective in reducing such reef blasting practices by about 90%. The destructive cyanide fishing practices remains a challenge and could be increasing in KNP because of a) strong international market demand for live reef fish for consumption throughout major cities of Asia and b) the diminishing harvest of this (and other demersal fisheries) elsewhere in Indonesian waters. New legislation was passed in 2001 to halt all destructive fishing practices in KNP, including cyanide fishing and the on-board presence of crucial

equipment such as compressors. These regulations were the key to addressing this threat and recent indications are that such activities are decreasing.

Expansions to the routine KNP patrol system were initiated in 2000. There are currently 4 modes of patrol namely:

1. terrestrial ranger stations,
2. routine sea patrol,
3. incidental sea patrol and
4. floating ranger station patrol or periodic positioning at vulnerable sites.

The first floating ranger station, KM FRS Kerapu, was launched in mid 2000 with the aim to continuously patrol and to monitor the Park waters. The patrol team comprised of park rangers, police, army and navy personnel, some armed with weapons. This enforcement system so far proved to be very effective, especially by increasing the reaction to apprehend suspects and by reducing illegal activities, both in the Park's islands (deer poaching) and waters (illegal/destructive fishing). The team also successfully handled several cases from the arrests up to their prosecutions in the court.

4.2.1.1 Success in prosecution of KNP offenders

Illustrative of the enforcement teams positive impact is the fact that from mid-2000 to mid-2001 there were 12 arrests cases recorded involving around 60 suspects. Most those cases were prosecuted with success and included convictions on blast fishing, poaching, protected marine animal fishing, and cyanide fishing. Not every single case and arrest ended up to the court mostly due to lack of strong prove required for further legal process. Overall, 8 cases were successfully brought to justice and 38 suspects were prosecuted and sentenced from 6 months to a maximum of 3 years in jail. It is important to note that public pressure was instrumental to bring those cases to justice.

When a court sent 6 suspects convicted in a crucial cyanide fishing case to 2 ½ years jail sentence, it was widely considered most notable legal precedent in Indonesia on illegal fisheries in protected areas. The evidence in this case was supported by a criminal laboratory test to prove a cyanide solution was used for fishing practices. This successful case proved to be effective in drawing special attention regionally and nationally to the problems of cyanide fishing, the risks fishermen take by fishing illegally, and the potential of effective enforcement for other protected areas in Indonesia – terrestrial and marine.

The KNP patrol and enforcement program is scheduled to deploy a total of four Floating Ranger Stations. Additional activities include a comprehensive ranger training, to be conducted twice a year according to a special enforcement training module. Improvements of the radio communication system and the terrestrial patrol system are also priorities for the coming year.

4.2.2 Mooring buoys for high use anchorages

In addition to these active protective measures, the installation of mooring buoys was started in 1995, specifically to halt the damages caused to popular and highly diverse coral reef areas by anchoring of tourist vessel and bagan fishing boats which operate mostly at night. To date more than 40 buoys are installed in Park waters. Such protective measures are also gradually and significantly changing the behavior of boaters visiting the Park. Some indications show that coral growth and reef recovery in the anchor damaged sites is occurring due to the mooring buoy program.

4.3 Legislation for on-the-ground implementation

There are two recent regulations which were crucial for the implementation of the 25 year management plan. Firstly, the regulation on the Park zoning system was issued by the Ministry of Forestry in May 2001. This regulation stipulates the boundaries of each zone and details what activities are allowed and prohibited in each zone.

The second important regulation for implementation is the District Manggarai Regulation No. 11 of 2001 on 'The use of catching and/or supporting gears for marine products taken in the marine waters

territory of Manggarai Regency'. Importantly, this particular regulation also recognized Komodo National Park as a special area, in need of very specific rules. It was enacted on June 14, 2001. After enactment, it took three weeks to become officially gazetted and an additional six weeks for its required registration in the provincial legal office.

The District Manggarai Perda No. 11 is a local law that regulates the use of fishing gear in Manggarai District and inside the Park and specifically bans all fishing gears which are potentially destructive to fisheries. Inside Park boundaries 5 types of fishing gear are allowed: mobile lift net, hand line, pole and line, Payang and trawl line. In addition, the regulation, gives authority for fisheries management inside the national park to the Park Management Office (BKNP), instead of the local Marine Affairs and Fisheries office (Dinas DKP). This is a significant step forward for the part of the local government since various fisheries problems in the Park stemmed from the dispute over fishing authority in Park waters.

These two recent regulations are particularly significant, since both are very much in accordance with the park management plan and strengthen its implementation. Still, a lot of work remains before they can be effectively implemented. Currently the Park Authority, in cooperation with the local government, are undertaking an extensive socialization process for both regulations. In addition, the Park Authority is also about to finalize the markings for the various zone boundaries.

4.3.1 Effective implementation of the management plan

These regulations regarding the definition of the park zoning boundaries and allowed and restricted activities in each zone have strengthened the management plan and provided the needed tools for effectively implementation. The working procedure is to map physical, ecological and sociological details for all boundaries and to legally describe the regulations for each zone. The Ministry of Forestry through DG PKA Decree has legalized these documentations. This type of fine-scale zoning map with detailed and government endorsed regulations (at local, provincial and national levels) is to be the first of its kind in Indonesia.

Already, recognition from high national authorities, namely from the Minister of Marine Affairs and Fisheries and the Minister of Forestry, have been accepted by District Manggarai for its unprecedented initiative. The regulations for implementation of the KNP management plan has also attracted attention in the neighbouring districts and islands; Pemda Bima, Sumbawa will closely monitor the implementation efforts and if proved successful, considers emulating it. In addition, a request for more information exchanges on the Park's management plan and its strengthening legislation was also received by Pemda Kabupaten Sumba Barat, Sumba. The effective socialization of these regulations to all stakeholders will be key to the implementation of the KNP 25 year management plan. A series of educational materials as well as community awareness and development activities are already underway and expansions are under development.

4.4 Rehabilitation

Several specific terrestrial and marine habitats within the Park have been severely degraded. Approximately 150 km² or 25% of the terrestrial ecosystem of KNP has been severely degraded by fire and the poaching of lontar palms. All mangrove habitat present has been damaged in the search for fuelwood by local residents. Large parts of the coral reefs have been damaged by destructive fisheries practices, including bombing and cyanide fishing.

Restoration efforts should only be undertaken in severely degraded areas which are unlikely to return to their original condition without intervention. For rehabilitation of reef destruction due to extensive bombing activities, these include areas where there is a strong current and no hard substrate. Preliminary data indicate that the provision of hard substrate in damaged areas greatly increases the rate of coral recovery.

Restoration regimes should be based on the best available data, and pilot studies should be undertaken prior to any large-scale efforts. If possible, local people should be hired to do the work. The rehabilitation work started in 1999 with a pilot research project to find the most efficient substrate to enhance larvae settlement in cooperation with UC at Berkeley. The study found that rock piles were the most efficient and suitable substrate to cope with Komodo waters. In 2002, the coral reef

rehabilitation work at larger, ecological scales was initiated. For this program four areas of mostly degraded by blast fishing have been selected for rehabilitation. About 2000 m³ of rock is being placed to cover these four sites of about 10 hectares total area (Papagarang, Padar, Karang Makassar and Gililawa Darat). About 80% of the work has been carried out and the rock placements are expected to finish by the end of October 2002.

4.5 Monitoring

Monitoring activities on ecosystems and indicator species are devised as a management tool to provide feedback on the effectiveness of management measures taken and assess whether the desired outcomes have been realised. Periodic monitoring also provides base-line data for various purposes, such as scientific uses. To date the Park's long-term monitoring program focuses on Komodo dragons, groupers and wrasses spawning aggregation sites, coral reefs, large marine life - cetaceans, sea turtles and manta rays - and marine resource uses. Recent pilot programs have been initiated on seagrass and mangroves assessment and monitoring.

4.5.1 Reef fish – Spawning aggregations

Grouper and Napoleon Wrasses spawning aggregation sites are being monitored to provide information on trends in the populations of economically important fish species, and to obtain feedback on the effects of management activities. The current fish monitoring program focuses on 12 key species out of two families: the Serranidae (groupers) and the Labridae (wrasses). These species have been heavily targeted by the commercial fisheries and can therefore serve as indicators for the impact of these fisheries. Data are collected to a) determine if and how fish populations are changing over time and in space and b) identify spawning locations and spawning seasons for key fish species.

Potential management responses include adjustment of zoning and regulations for fisheries and other activities. The 12 species in the fish monitoring program are: 1) *Epinephelus tukula*, 2) *E. polyphkadion*, 3) *E. fuscoguttatus*, 4) *E. malabaricus*, 5) *E. chlorostigma*, 6) *Plectropomus leopardus*, 7) *P. laevis*, 8) *P. areolatus*, 9) *P. oligocanthus*, 10) *Variola louti*, 11) *Cromileptes altivelis* and 12) *Cheilinus undulatus*.

The fish monitoring program is a continuous program with monitoring activities taking place twice every month. Spawning sites were chosen as sampling sites based on the following criteria: representative numbers of target species were likely to be observed, and recorded numbers and sizes could effectively be followed over time and in space. Since March 1998, eight sites have been monitored twice a month, once during new moon and once during full moon. Each site is searched for target fish at a specific depth profile, which has been established for that site.

Preliminary results indicate that different species spawn at different lunar phases. Spawning seasons and timing in the lunar phases have been identified for most important species in Komodo. The main spawning season for target species is from October to January, with small differences between species. Different species use the spawning sites at different moon phases and many other reef species, including important food and ornamental fishes use the same spawning sites. All spawning sites have strong currents directed away from the reef. Fishermen supplying the live reef fish trade (LRFT) all target the spawning sites in Komodo National Park. If fishermen identify the aggregation sites and the sites are not protected effectively, they will probably be fished out within 1 or 2 seasons. The few sites with spawning populations of the main target species in the live reef fish trade are of great importance to KNP's function as a source of recruits for surrounding fishing grounds. The monitoring data have been instrumental in the development of the park zoning system. In 2001 arrangements were made to disseminate the techniques and expertise of KNP monitoring team to various partners and sites such as field exchanges and visits with other marine protected areas. Trainings in Spawning Aggregations Sites (SPAGS) monitoring were also given to Komodo National Park partners in Pohnpei, Federate States of Micronesia; Bunaken National Park, off Manado, North Sulawesi and Karimunjawa National Park, Indonesia.

4.5.2 *Coral reefs*

An on-going coral reef monitoring program provides information on spatial and temporal patterns in reef status and reef rehabilitation inside and outside the Park, with particular focus given to changes in the percentage of damaged coral. An intensive survey of the coral reefs (185 locations) made every two years, enables mapping of damage by destructive fishing methods and other causes. This information provides feedback on the effects of management measures and on the rehabilitation of the reefs. All sampling sites have coral reefs and range in depth from 4 to 12 meters. All sites are surveyed by snorkeling (bottom at 4 m deep) and by SCUBA diving (bottom at 8 m and at 12 m deep). Five observations are made at each depth and each observation lasts four minutes. The observer records the estimated percentages (minimum step size 5%) of four habitat categories (totaling 100%) namely hard coral live, hard coral dead, soft coral, other (rock, sand, sponges, tunicates, algae, weeds, anemones, clams, other invertebrates).

For each dive or snorkel-swim, the following information is recorded on the standard (UW) data sheets: date, site number, location (GPS), depth and name of observer. The total survey takes approximately 8 to 9 months. For the 185 sites, approximately 2775 observations on reef status are made over each 2 year period. Based on preliminary data, coral recovery was greater outside the Park than within the Park. Overall destruction of the coral reefs in and around KNP appears to have stopped as of 1996 and a slow recovery (2% increase in hard coral cover per year) has started. This is most likely the result of the enormous decline in dynamite fishing in the area since early 1996. Reef recovery is fastest near the center of protective activity, which is in the town of Labuan Bajo, outside Park boundaries. Recovery is generally slower inside the Park, where many remote areas are still difficult to control.

Potential management responses to monitoring results include:

- Revision of KNP regulations and zoning designations as necessary to reflect the impact of use activities on the coral reef and eliminate or reduce damage (e.g., allocation of specific sites for dive-tourism, artisanal fisheries, full protection, or other purposes.),
- Adjustment of the enforcement program in terms of effort allocation in space and/or time (adjustment of surveillance routine) to protect areas at risk, and
- Identification of locations and implementation of activities at places where active management is needed for reef rehabilitation.

4.5.3 *Cetaceans – Visual and acoustic surveys*

To assess Komodo National Park's ecological significance for cetaceans (the collective name for all whales and dolphins), visual and acoustic cetacean surveys have been conducted by partner organization APEX Environmental twice a year since 1999. The program focuses on several Park management and conservation priorities:

1. To provide base-line data on cetacean diversity, distribution and abundance in all marine habitats of Komodo National Park (KNP) including coastal habitats, inter-island straits, oceanic areas to the north and south of KNP (Flores and Suma Seas).
2. To monitor seasonal patterns in KNP cetacean diversity, distribution and abundance to identify resident or transient populations.
3. To identify critical habitats for cetaceans, including preferred feeding grounds, mating locations and migration corridors.
4. To identify and assess the major local and regional environmental impacts that threaten eastern Indonesia's whales and dolphins. regional marine environmental impacts affecting KNP cetaceans.
5. Evaluate which protective measures can be implemented by Park management authorities to minimize the environmental impacts on cetacean habitats, including coral reefs, mangroves and the open ocean.
6. To establish community-based cetacean monitoring programs, as well as outreach activities through the active participation of management agencies and stakeholders.
7. To provide site and species-specific information on KNP cetaceans for marine resource and park management purposes, environmental awareness and educational, support to the Park's marine tourism and dive industry programs.

8. To share the survey results and research outcomes with the Indonesian National Park Authorities, environmental organisations and local communities.

Surveys are carried out from a 8m half-cabin speedboat, as well as from live-aboard vessels. Time, location, sea state, species, abundance, group composition, distance, direction, behaviours and associations are recorded. Listening stations are conducted using a directional hydrophone. In the May 1999 - April 2001 survey periods a total of 18 cetacean species were identified during 207 survey hours over 71 field days during 5 intermonsoon field seasons. An estimated total of 7082 individual cetaceans were sighted during 299 encounters. The surveys covered an estimated 4706 nautical miles. Acoustic contact with cetaceans was recorded during 38.1% of the 217 listening stations. The species encountered were predominantly oceanic odontocetes, but also included a several balaenopterid species. The whale and dolphin species that have been recorded in the Park's and adjacent waters include the long-nosed spinner dolphin, bottlenosed dolphin, Indo-Pacific humpbacked dolphin, pan-tropical spotted dolphin, common dolphin, melon-headed whale, Risso's dolphin, Fraser's and rough-toothed dolphins, false and pygmy killer whales, the sperm whale, dwarf sperm whale, the Cuvier's beaked whale, the blue whale, orcas and the pygmy Bryde's whale.

The pygmy Bryde's whale *Balaenoptera edeni*, is morphologically and genetically distinct from other known balaenopterid whale species in the South East Asia region. It was positively identified in KNP using photographic and genetic profiling techniques. Partly because of these efforts the whale is now considered to be a separate species. The presence of newborn calves was observed for seven dolphin species as well as the sperm whale. This indicates the KNP area is likely to be an important cetacean calving ground. The relative abundance, group sizes, as well as habitat preferences have been investigated for eight cetacean species using survey encounter rates and 'group follows'. Temporal and spatial patterns are apparent on the species level. Critical habitats including regional migration corridors have been identified. This is the first time this kind of species-specific and comparative data for large migratory marine mammals is available for Indonesia.

Major environmental impacts observed include reef bombing (acoustic habitat degradation) and other fisheries interactions. Cetacean watching potential has increased due to the survey results. However, this may not be an appropriate tourism activity without strict controls and enforcement in place first. Significant extensions to KNP's legislative boundaries have been designed to include preferred habitats of the Park's cetaceans. These extensions are incorporated in the 25-year management plan and will increase the protective status of cetaceans in KNP and Indonesia. The long-term cetacean surveys have resulted in major improvements in our knowledge of Indonesia's cetaceans and proved that the Komodo region is an important habitat for whales and dolphins.

Overall, cetaceans are an important aspect of resource management plans as they allow a focus on large migratory marine life issues and are often listed as vulnerable or endangered species by national species conservation programs or international treaties (i.e. CITES). In addition, cetaceans can provide high-revenue alternative livelihood options through site promotion and environmentally sound cetacean watching for marine protected areas in eastern Indonesia. Komodo and Alor cetacean survey and research outcomes have been used to support provincial and central government (Ministry of Forestry, Ministry of Marine Affairs and Fisheries) in formulating Indonesia's national marine mammal conservation initiatives and migratory marine life management strategies.

4.5.4 *Manta rays*

In October of 2000 a pilot project was initiated to study the giant manta rays (*Manta birostris*) in Komodo Marine Park. Scientists from the Pfleger Institute of Environmental Research, The Nature Conservancy and rangers from the Park joined together in the two-week effort. The goals of the project were several fold:

- 1) Adapt techniques established for other species to study the mantas.
- 2) Characterize the movement patterns and habitat use in the Park.
- 3) Determine whether movements extend beyond the Park boundaries and to document migratory routes.

To achieve these goals a range of techniques were used including visual surveys, photo ID, and acoustic and satellite telemetry. Some findings based on the preliminary observations on 4 sites

surveyed are recorded such as: The occurrence and behavior of the mantas appears to be influenced by tidal fluctuations and the associated currents. The mantas were more common when the tide was rising and currents were south to north. During this time a large number of individuals were seen from the surface to the bottom. While the tide was falling few or no individuals were observed. In all locations surface feeding was generally associated with surface slicks, sea foam and accumulated particulate matter, likely representing convergence zone. Favorable conditions for surface feeding were often established downstream of islands or along cliff walls. While on the bottom the mantas were also observed to be feeding, drafting behind bottom structures, visiting cleaning stations or simply swimming along, generally up current. Additional observations are critical to determine whether the patterns observed during our brief study are valid.

Despite this brief time period the program was able to photograph individuals at sites 1, 2 and 3. It was possible to identify at least 30 different individuals and a number of individuals were seen on successive days in the same area. More work is needed to extract all the images obtained and to complete construction of the Photo ID data base.

Tagged mantas were documented at all three sites and the patterns of occurrence were the same as those identified from visual observation. Although the project described is in its infancy, it achieved a number of important goals during the initial phase including to successfully obtain images for photo ID, to deploy both acoustic and satellite tags and document the occurrence of individuals using the receivers. This represents an important foundation for launching a larger, long-term program to study the mantas in the Komodo Marine Park. The data collected will not only contribute important biological information for this poorly understood species but will also be critical to manta conservation inside and outside the Park.

4.5.5 *Marine resource utilization*

The objective of this monitoring program is to determine which community groups are involved in which fishing activities, where they fish, and when they fish. Over time these data will also show any changes in the behavior of fishermen due to management measures and it will indicate which groups of fishermen or areas in the Park may need extra attention. Each non-bagan (non-lift net) fishing vessel or fishing group encountered during the routine patrols is investigated. Bagan (the local pelagic lift-net) are excluded since a) they operate only at night (with lights) and b) form a separate type of pelagic fishery which is not currently considered threatening to the demersal and sedentary marine resources of KNP.

Bagan boats are investigated whenever they engage in non-bagan activities during the day. All non-bagan activities are investigated since they are considered potentially threatening to the demersal and sedentary marine resources in KNP. Data collected from fishing vessels encountered during patrols include:

- date and position (using GPS coordinates),
- type of boat and engine according to categories,
- number of fishermen on the boat or in the fishing group,
- method or fishing gear according to categories,
- species in the catch according to categories,
- quantity and quality of the catch according to categories, and
- origin of the fishing vessel or group according to categories.

The routine patrolling program has led to a significant decline in destructive fishing practices, and should be maintained. The primary threat comes from outside communities. Local communities pose less of a threat, since they generally use 'bagan' lift-nets that are not destructive to the coral reef ecosystem. The bagan fishery of local communities should also be monitored in the future, to avoid overfishing and collapse of stocks of small pelagics.

Important threats to the coral reef ecosystem include the use of hookah compressors in combination with dynamite and cyanide. Demersal trolling lines or 'kedo kedon' are wiping out the coral trout stocks. Bottom hook and lines take all predators, and bottom longlines are decimating the sharks and large groupers. Gillnets catch the largest volume of fish in the Park and are a threat to many species, including turtles and marine mammals. At minimum, management responses should include:

- Appropriate zoning and implementation of regulations that achieve management objectives with a minimum of conflict with local resource users (e.g., local exclusive use rights),
- Targeting enforcement efforts and alternative livelihood programs on the fishing groups and communities that pose the greatest threats to the Park,
- Prohibition of fishing activities threatening the coral reefs and demersal species,
- A ban on hookah compressors and other destructive gear types, and
- Complete protection of spawning aggregation sites within no-take zones of the Park.
- Effective protection for endangered marine species which frequent the Park (whales, sea turtles)

4.5.6 Marine turtles

The Park marine waters cover approx. 479 km² and are inhabited by several species of marine turtles. Hawksbill turtles (*Eretmochelys imbricata*) and green turtles (*Chelonia mydas*) have been known to nest on 18 locations within the Park. The females lay eggs in nests on KNP beaches between April and November. Many of the eggs do not survive because of predation by crabs, monkeys, wild boar, Komodo dragons and local people. As an initial action, a monitoring program for marine turtles has been started to gather the necessary data in this area. The initial survey visits were conducted in late 2001 and early 2002 to observe possible nesting beaches and several turtle nesting sites were mapped. The survey objectives are as follows:

- 1) To describe the spatial distribution of turtle nesting sites/beaches/species laying eggs, and their nest density.
- 2) To describe the temporal variation in nesting behavior
- 3) To evaluate the natural nesting success
- 4) To assess local and regional threats to the nesting marine turtle populations within KNP.
- 5) To train the field staff of KNP and TNC-KFO in identification of tracks, nests, eggs, false crawls, and necessary conservation actions on nests, eggs as well as juvenile and adult turtles.
- 6) To identify a good nesting site for implementing the Satellite Transmitter Tracking study on post nesting hawksbill turtles (*Eretmochelys imbricata*) in order to determine the post nesting movements and migration routes.
- 7) To set up a Marine Turtle Monitoring Program for Komodo NP.
- 8) To provide base-line data on marine turtles for future research and management reference.

The activities conducted include nesting beach surveys, nests flagging, and staff training practices. The staff were trained on how to find and identify the following: a) nests and/or body pits of marine turtles on beaches, b) eggs or eggshells, c) turtle tracks, d) false nests and e) threats. Staff were also trained on how to calculate natural nesting success by counting the eggshells in the eggs chambers on nesting beaches. The training also included a video presentation on how to hatch, rear and maintain the turtle hatchling in captivity, best practices for flipper tagging, transmitters installation on post nesting hawksbill, measurement of hatchings. The main aspects of the scheduled tagging program were introduced to the staff of both TNC-KFO and PHKA-KNP. The tags and an applicator have been delivered to TNC-KFO staff and are scheduled for deployment later in 2002/early 2003.

Interesting results were gathered during the two surveys period: A total of 145 beaches have been surveyed within and outside the Komodo National Park areas (120 beaches within KNP area, 13 beaches proposed extension, and 12 beaches outside the Park area). The majority (93 beaches) was observed during the second survey period. From the total of 145 beaches, 65 beaches were used by Green turtles and Hawksbill turtles for nesting. The density of nest occurrence varied from minimal of 10-2 to 13 nests per 100 meter length of beach. Of these 65 beaching with nesting activity, the Hawksbill turtle nested on 43 beaches and 23 beaches were used by Green turtles.

Five important nesting sites within Komodo National Park were identified as priorities areas. In addition, there are four important nesting sites located outside the Park for the Hawksbill turtle in particular. Several research and management recommendations are considered including: a satellite tracking study on post nesting hawksbill; Adopt-A-Nest outreach program for saving the turtle eggs on beaches outside of KNP area; and an expanded Marine Turtle Monitoring Program.

4.6.7 *Seagrass beds*

Seagrass beds are found in the northern area of the Park, but their spatial distribution has not been properly assessed (see also Fig. 3 in Book 2 of the 25 Year Management Plan, which is mostly based on anecdotal information). These highly productive systems are important nutrient traps and also stabilize the sandy bottoms of bays and lagoons. Furthermore, they are an important shelter for young fish and invertebrates, and they are a food source for the endangered dugong (occasionally spotted in- and outside the Park), sea turtles, mollusks and sea urchins.

Preliminary surveys on species distribution has been carried out in seagrass ecosystems in KNP. Species diversity is high and several commercially important species are present. A series of underwater transects should be established for monitoring of seagrass beds. Transects should be marked using permanent markers (rebar stakes) or natural markers, if available.

Equal numbers of transects should be randomly located within a) existing seagrass beds, b) adjacent areas without seagrass, and c) remote areas without seagrass. Exact transect numbers, locations, lengths and shapes should be determined, based on the degree of diversity in the area, and logistical and financial constraints. Cover, species abundance and diversity should be measured, using point sampling or fixed area sampling. These plots should be monitored every three months to obtain data on mortality, recruitment, growth rates, and changes in seagrass distribution.

4.6 **Community awareness & education**

There are 5 different activities that have already accomplished under the Community Awareness and Education (CAE) program. These activities can be grouped into:

1. Community Action Plan (CAP);
2. Constituency Building;
3. Capacity Building;
4. Socialization of new Fisheries Regulation (PERDA No. 11/2001); and
5. Conservation Marketing and Campaign.

The former Community Awareness & Development program (CAD) facilitated with finding solutions to community problems in and around KNP, particularly in relation to marine conservation issues. These were translated into the Community Action Plan (CAP). There were three main public participation events held under the CAP 1) the beach cleaning, 2) the COT (Crown of Thorn) clean-up, and 3) the conservation music tour. The beach clean-up was initiated within fisher community on the main island (Flores), as these communities had already realised that action was needed to solve the pollution problem that had occurred in their living environment. The participatory COT clean-up was mainly supported by the Conservancy's staff, HPI (Tourism Association) and KNP staff, State Tourism Office staff, numerous dive operator staff and local fishermen. The activity focused on Sebayur Island, located within the Park.

During the activity, the Community Awareness team explained the likely causes of COT population explosions and solicited more community participation. During a TNC staff field visit to Mesa Island in July 2002, the team found that the head of sub-village had already conducted a COT clean up previously, during the low fisheries season (full moon).

Constituency building was conducted in the form of: (1) Informal meeting; (2) Focus Group Discussion; (3) Stakeholder Coordination Meeting; and (4) Workshop. Informal meetings during preparation period were done with the Conservancy's staff, from which the team then facilitated informal meetings at the sub-village level. The subjects discussed were marine conservation and its benefits to eco-tourism in particular. Representatives from each village were selected to participate in the Stakeholder Coordination Meeting in Labuan Bajo. Main stakeholders such as the Tourism Association HPI, travel agencies, hoteliers and restaurateurs discussed and agreed upon the real positive effect of marine conservation on tourism development. However, the involvement of local community, especially fishermen and related groups was not yet assured. Fishers still need further socialization and involvement on which terms they may benefit from eco-tourism development.

The Site Conservation Planning (SCP) was accomplished under the program of Capacity Building. Conservancy's staff was trained to work with communities, identifying problems, as well as assessing and formulating solutions to these problems. The SCP was completed in all 18 villages within KNP and its neighboring District (Sape, Bima). The most crucial issues were catch result (i.e. fish harvests) and income reduction, and the strong TNC support for the surveillance team. Apart from the fact that blast fishing and compressor-based cyanide fishing for live reef fish being reduced, a potential and economically efficient alternative livelihood has yet to be introduced to fully replace destructive fishing practices.

A conservation puppet show is the main public activity under the Conservation Marketing & Campaign program. The puppet show's goal is to introduce and explain the need for the continued existence of KNP, and to promote the ban on destructive fishing practices. The first target beneficiaries were primary school students, KNP and Conservancy staff, local NGOs, and Tourism Office and Police personnel.

A local conservation song was compiled during the preparatory workshop, '*Laut Milik Anak Cucu Kita*'. It was usually sung to enhance the group dynamics. The puppet show intends to stimulate the student's awareness. They often realize that the destructive fishing gear used by their parents was inappropriate and damaging to the marine environment in and around the Park.

In addition, the new District Regulation No. 11 on fishing gear has been introduced and explained to communities and local fishers by the community team. This regulation will restrict fishing activities in the District' waters, especially within KNP' zones. It also gives KNP the mandate to act as the Park's authority to actively manage the area in coordination with local government. Initially this regulation was rejected by some local fishers, especially those previously practicing destructive fishing methods, which was said to have low operational cost and yield better catch.

Figure 2. Building community awareness.



4.7 Alternative livelihoods

4.7.1 Mariculture project

The main drive to of the mariculture project is to develop a fish culture or fish farming facility and show that this can be done in an economically viable and environmentally sound manner. Fish culture may encourage fishers to shift from catching fish to culturing or farming fish, thereby reducing the threat of over-exploitation of coastal fish stocks and marine resources, while at the same time providing for similar if not better incomes. In particular, the development of full circle mariculture (i.e. larvae to marketable fish) of high quality food fish will provide an alternative to wild capture with cyanide for the

Live Reef Fish Trade. A partnership has been established between KNP, the local district government of Manggarai and The Nature Conservancy to begin implementation. Additional partnerships with relevant NGOs and the business community may be needed in order to fully implement this alternative livelihood activity.

Local hatcheries outside the Park can supply fingerlings for grow-out to community-based grow-out enterprises, which are low-tech and low-investment activities and are therefore ideal alternative livelihoods for local communities (which mostly already have the experience of raising wild-caught fish in sea cages). The hatcheries themselves are moderate- to high-tech and relatively high investment activities, and modern companies need to be attracted to this industry. In the long term a considerable part of the market could be supplied with high quality food fish from full-circle aquaculture. The Komodo area is ideal for grow-out in terms of production costs, environmental factors and space.

Phase I of the program has been completed to develop a business plan for a hatchery outside but near Komodo National Park, for the production of grouper, sea bass and other fish fingerlings for later grow-out in cages by local communities. Phase II is about to complete the construction of a hatchery. Meanwhile the program has started Phase III fish grow-out enterprises to develop in local communities, with participation of all stakeholders, and taking into consideration the Park zonation plans and regulations. A thriving mariculture industry will sustainably increase the standard of living for the villagers in the vicinity.

The program should support the establishment of a small hatchery for care of broodstock, egg fertilization, larval rearing and the production of fingerlings. These fingerlings can then be used as 'seed' supply for local grow-out enterprises. A 3 year pilot project is needed to assess whether steady production of fingerlings is feasible and to train local staff in hatchery practices. Fingerlings should be supplied to local community-based grow-out enterprises that can sell the full-grown product back to the mariculture enterprise. The enterprise should collect larger quantities of grown-out fish to sell to fish trading companies (these are already visiting the area with live fish transport vessels).

The program is now focusing on sea-bass (*Lates calcarifer*) and the mangrove jack (*Lutjanus argentimaculatus*) The culture of sea bass will at least serve to achieve the goal of developing an alternative livelihood for local fishers. The Queensland Department of Primary Industry is currently the prime partner for developing the culture of this species. The program also works with several species of grouper, especially the estuary grouper (*Epinephelus coioides*) and the tiger grouper (*E. fuscoguttatus*), and mouse grouper (*Cromileptes altivelis*) which is the most highly prized grouper in the live reef fish trade, and which has been successfully reproduced and raised by the Gondol Research Center for Coastal Fisheries in Bali. All the above species occur naturally in the Komodo area and the brood-stock has already successfully spawned in the cages.

The program contracts Indonesian experts from the Gondol Research Station of Coastal Fisheries (RSCF), and is aided by experts from the Queensland Department of Primary Industries (DPI). With the expertise and practical experience of partners, the hatchery should be well managed and show the feasibility of full-cycle fingerling production from local broodstock for one or more species within three years. The hatchery also serves as a training ground and active learning center for local staff.

4.7.2 Seaweed culture

Seaweed production is a potentially rewarding activity for fishermen in the Komodo area. Many potential participants have already indicated their interest in seaweed culture when they were interviewed in 1997. Some communities have already requested permits for seaweed culture from KNP authorities and are already engaged in rudimentary operations. The seaweed-based activities and their socio-economics had been analyzed thoroughly including an Environmental Impact Assessment. A pilot study and assessment on the seaweed- and seagrass-resources in the Komodo area carried out by The Nature Conservancy in May 1988 identified 8 seagrass species and 43 seaweeds. In general, the plant habitats were relatively healthy and showed very high diversities. This pilot study revealed that some use of seaweed resources was already taking place, but not in an efficient, sustainable manner.

The pilot study concluded that there is a high potential for the development of seaweed- and seagrass-based economic activities, based on:

- the abundance of the natural stocks of the carageenophytes *Eucheuma* and *Kappaphycus*, and of the seaweed salad *Caulerpa lentillifera*, and
- the technology for optimized utilization and commercialization of these species is readily available from neighboring countries in Asia, especially the Philippines.

The project started in 2000 and identified 9 potential locations surrounding the Park in Komodo and Sape areas. Several agencies, such as the Fisheries Services, sub district governments, tourism agencies, the Park Authority and TNC, are cooperating in the project. It also cooperates with a research center for quality control and with a producer association for marketing. The program trained 34 fishers who were willing to cooperate in the program. To date approximately 100 households of 8 villages produce about 20 tons of dried seaweeds per month out of their farms. Each household generates additional income of around USD 50-80 per month.

4.7.3 *Pelagic fisheries*

The joint KNP and TNC pelagic fisheries development program is working together with local fish traders, fishermen and expert contractors, to enhance the establishment of the fisheries, and improve post harvest practices, fish processing techniques and marketing of large pelagic fish. In order to increase the number of fishing locations, to hold migrating pelagics (mainly tuna) in the area, and to increase overall catch rates, several deep- (1,000 – 1,200 m) water Fishing Aggregation Devices (FADs) are being deployed in the oceanic waters of the Flores Sea, located to north of the Park.

The program includes a training program for fishermen, sponsored by TNC. Participants in the training program and their moneylenders (local traders) have signed an agreement to refrain from destructive fishing practices in the future. Fishermen from different areas in Indonesia have been hired to teach a variety of skills needed for offshore fishing. The training program for fishing communities also contains a post-harvest component, covering a variety of techniques from fish handling on the boats to fish processing on shore. Although a large portion of the catch is destined for sale as a fresh chilled product, there is also considerable potential for the production of other products. The program has been training local fishing communities, including many women, to prepare these products. Post-harvest techniques that have been included in the training program include: pengasinan (dried salted fish), pindang (salt boiled fish), ikan kayu (katsubushi), dendeng (spiced dried fish), and ikan abon (a fish-based product that is used as a spice). A variety of basic processing tools were supplied. By introducing these 'new' high-quality products, fishing communities now have a better chance of increasing their income in the pelagic fishery.

At least 10 FADs were deployed out side the Park waters since the program started in 1998. Nowadays there are about two groups of 300 fishers joining the program. They operate 5 FADs in two sub districts. They generate about 70 kg of pelagic fish per trip per fisher and are starting to build their own FADs. Those groups are also instrumental in socializing the Park regulations, especially those related to the conservation of fisheries resources.

4.7.4 *Ecotourism*

Perhaps the most obvious opportunity for the development of compatible enterprises lies in the field of eco-tourism. Through partnerships with the private sector, local dive operators and tourist guides, KNP is initiating to develop high quality eco-tourism micro-enterprises, building on the existing foundation of tourism in the Komodo area.

The spectacular scenery and marine biodiversity of the Park offers absolute world-class diving, snorkeling, sea kayaking, sailing, (sea-) bird watching and blue water catch-and-release fishing. Dolphins are frequently sighted within the Park's waters and (sperm) whales are occasionally sighted in the deeper southern section of KNP.

In a study on alternative livelihood preferences conducted by TNC, villagers from Kampung Komodo expressed an interest in tourism activities. Villagers have requested assistance in training to become Park staff, handicraft development, and tourism business skills. The villagers would also like to see the quality of their environment improved in order to increase their chances of attracting tourists.

Working with the Tourist Office and TNC, KNP authority have supported the implementation of training programs for local villagers to enhance their chances of finding work in eco-tourism.

Villagers are trained in handicraft skill such as sculpture and weaving and their management. Two groups of 20 dragon crafters have been developed in Kampung Komodo. A woman group of 5 weavers is also recently established in that village. At least two other villages around the Park are requesting to have such trainings. The UNESCO/RARE program is going to support the development of the program and intends to train local entrepreneurs to be professional, responsible eco-tour operators. These training programs have been successful, not only in preparing the participants for jobs in tourism, but also in raising awareness among the younger generation on new job possibilities and in building a constituency for the protection of KNP.

The training programs have also increased the quality, quantity, and environmental responsibility of tourism operators in Labuan Bajo and KNP. Visitor revenues captured by the local economy will increase the motivation, political will, and commitment to protect the Park. Park management will continue to support training activities for the local villagers. Eco-tourism activities and training programs will be expanded into surrounding towns such as Labuan Bajo, Sape and Bima, so that cultural and economic opportunities and benefits will be enjoyed by communities surrounding the Park. Various meetings and joint actions have been developed with the local tour operators and their respective associations to promote conservation as well as sustainable tourism. Examples include public participation campaigns on COT starfish clean ups and waste collections.

5. Current legislation

As mentioned earlier there are several key regulations which determine the management of KNP, mainly the Act on Conservation of Biological Resources and Their Ecosystems, the Fisheries Law, the Government Regulation concerning Natural Resources Tourism in the Use Zone of National Parks, Community Forest Parks and Natural Resources Parks, Government Regulation on Conservation Areas, and the Government of District Manggarai Regulation on Fishing Gear, plus the Ministry of Forestry Decree on Zoning of KNP. To support the long term effective management of the Park there is an urgent need to overview those regulations and to develop a comprehensive legal framework which specifically addresses the objectives of the collaborative management initiative. Such needs have been previously identified and detailed in the 25 year Park management plan.

6. Komodo Collaborative Management Initiative

The 25 year management plan for the Park and the ongoing conservation efforts will only be sustainable when the following critical constraints are addressed: 1) the limited institutional capacity, 2) the decline in the government budget to support a network of marine protected areas in Indonesia. It is impossible for one single agency to manage a large number of protected areas and it has become more accepted that a collaborative management approach with other partners would strengthen effective management in protected areas.

A collaborative management initiative and a long term financing plan have been developed to address these key constraints for professional and effective management of the Park. Komodo National Park (KNP) is embarking on a collaborative management approach, involving all key stakeholder groups in the management of the protected area. These include the Park Authority (PHKA), local government, a Joint Venture between an international NGO (The Nature Conservancy – TNC) and a local tourism company (JPU), as well as local communities, government agencies, and private sector organizations. A tri-partite collaborative management agreement between PHKA, the Joint Venture and the local government is being developed to strengthen the Park's capacity in conservation management, monitoring and enforcement and sustainable livelihood activities, awareness programs and eco-tourism activities. The involvement of the public sector, tourism sector and local communities will be assured through their representation in the Park management council, tourism council and the community council that are currently being set up and strengthened.

The 25 year management plan establishes an Eco-tourism Concession with the goal of a) protecting Komodo National Park's bio-diversity and b) generating revenues required for the Park's adequate

management in a way that is environmentally sound, socially responsible and economically viable. The Tourism Concession will be responsible for financial management, investments in Park infrastructure and marketing. A Joint Venture (JV) has been established to run the concession, as a company whose charter directs that any profits and revenues earned will be invested back into conservation. This will give the JV due respect among other commercial bodies involved in the area, while maintaining its credibility as an institution with conservation as its bottom line. The JV has applied for long term funding from GEF/IFC to set up this tourism concession. This concept has been presented at various national and local meetings for government audiences, NGOs, tourism sector, and local communities, and at several international and national conferences and workshops to solicit feedback and comments.

A majority position by TNC in the Concession ensures that the Joint Venture can fulfill its conservation goals and other obligations. The Government of Indonesia, public financial auditors and international organizations (IUCN, UNESCO) will periodically conduct independent evaluations on the Tourism Concession's performance to ensure compliance with agreements and biodiversity conservation benchmarks.

There are several reasons for the establishment of the JV. For one, Indonesian law requires that the Concession include an Indonesian shareholder. In addition, TNC does not have expertise in the tourism industry. Thus, a partner is needed with specific and proven tourism development knowledge if we are to achieve the objectives of raising the standard and quality of visitation facilities. Ultimately, such facilities must enhance the visitor's experience and guarantee most visitors are highly satisfied about their stay in Komodo National Park.

Therefore an Indonesian company with extensive tourism expertise and experience will be a minority shareholder in the Concession. We expect that an enhanced visitor experience will justify increased user fees to support protection of the Park. At appropriate user fee levels the Park is expected to achieve financial self-sustainability in 5 - 7 years. Positive incentive mechanisms are being developed to ensure the sustainable use and protection of the Park's valuable resources. These include:

- micro-enterprise funding for local family-based businesses,
- research and development of sustainable methods of marine resource use,
- community development grants to finance urgent welfare needs.

Regulation and fines systems will also be put in place and/or strengthened. As the Concession terms are still under negotiation with the Ministry of Forestry they are not yet available in detail. We can state equivocally, however, that the terms and conditions explicitly state that:

The objective of the concession is to sustain the preservation of bio-diversity in the Park by generating revenues based on eco-tourism activities and building on-site capacity. Shareholders will not, under any circumstances, make any financial gain from the company established for this purpose as stated in the JV articles of association:

1. All revenue generated in and from the use of the Park will be used specifically and only for management and conservation of the Park, and to continue to fund existing local communities and government interests.
2. The Indonesian National Park Authorities under the Ministry of Forestry will have the full mandate over to Park management and enforcement activity.
3. A micro-enterprise fund for local family-based businesses and a community development grant system will be developed to finance urgent welfare needs.
4. No exclusive or preferential rights to any aspect of Park entry or use will exist in any form, to anyone.
5. Equal access to the Park by all users is assured, subject only to total visitation numbers from all sources not exceeding a rigorous science-based assessment of that the sustainable carrying capacity of the Park.
6. There will be no hotel or resort development in the National Park and concession area.

The collaborative management approach represents a groundbreaking nature conservation policy initiative for the government of Indonesia, and for management of protected areas in general. The rationale behind the agreement was based on a proven track record of each partner's long term

commitment to KNP, as well as complementary interests between conservation NGO and the environmentally responsible sector of the tourism industry.

6.1 Further needs - Collaborative Management Initiative

The implementation of the Park 25 years management plan needs strong, broad-based community support as well as political will from the key government stakeholders. This is especially important, as it requires some substantial (and radical) changes to the status quo. As detailed in the government approved management plan, KNP can only survive and succeed in the future if its management can be transformed into a professional and self reliant system.

This goal is inherent to the collaborative management initiative, and strongly supported by various respected international agencies. Due to its unprecedented nature the co-management approach would require several key actions:

1. Legal reform necessary to allow private sector co-manage a conservation area.
2. Special arrangements need to be made to collect revenue and directly reinvest it into the Park management.
3. Central government agreement to share the Park management responsibility with local stakeholders.

Overall, for co-management to succeed it needs the political will and strong support from all of the executives of the central government as well as the legislative and the political players to reform the Park management with all its consequences. A gradual approach to transform the management system may have to be exercised. On the other hand, any mediocre or halfhearted effort will not be effective in realizing the Park's long term survival and success as a well-managed, well-visited protected area that assists and promotes the prosperity of nearby coastal communities.

Another determinant and critical factor of this initiative is the timing, since most of the advocates and active partners of this approach have set a certain time line upon their commitment. Other issues which pertain to the Management plan is the proposed extension of the Park area, which would include Gili Banta islands and surrounding waters in the adjacent District of Bima in KNP. This expansion is important for several reasons, not the least being the added protection of a major Indo-Pacific migratory corridor for large marine life such as whales. The central government has to put more effort to materialize the plan, since the local government is very supportive to the proposal.

7. Future management plans

The Komodo Collaborative Management Initiative (KCMI) will guide and implement the development of the management plans of the Park, including its 5 years plans and the following operational plans. The exclusive authority of the park manager over fisheries resources in Komodo National Park waters requires strict guidelines on the licensing systems on fishing boat, pelagic fishing, milk fish collection, criteria on fishing operation eligibility, and permit control.

Other issues related to fishing rights are also being addressed, including possibility of granting exclusive use rights to local communities. These have to be closely and carefully designed in order to enhance the sense of belonging and sense of protection over the Park's resources among the local communities. A thorough assessment should also be carried out in order to optimize the benefits to the indigenous/local community and not to stimulate further immigration to the Park and surrounding villages. Therefore, the endorsement of KCMI by the government will be very crucial to the Park's future. The 25 years management plan of the Park provides specific guidance for the development of the surrounding areas as follows:

1. Redesign the spatial allocation of surrounding towns to optimize benefits from ecotourism and sustainable fisheries, and to defuse population pressures away from the Park.
2. Spatial planning for Labuan Bajo should express the town's function as the main entrance to KNP.

3. In order to defuse population pressures away from the Park, multidisciplinary and cross-sectoral approaches should be implemented to explore the possibility of a voluntary resettlement scheme on the coastal mainland of Flores.
4. Develop sustainable fisheries by creating alternative harvest centers outside the Park for pelagic fisheries, actively supporting mariculture initiatives when recommended by proper EIA, and establishing community training programs on fisheries post harvest techniques.
5. Explore the possibility to develop a center for marine biodiversity research, education and training in Labuan Bajo.

The Nature Conservancy has been invited to develop a proposal for the so-called Komodo Gateway Urban Development project. This project will develop a development blueprint for the wider Komodo area, based on extensive supporting data and will also include a feasibility analysis for its implementation. These preparatory studies should then be endorsed by various key stakeholders. The first stage, which is now underway, will develop a design on the planning process of the Komodo Gateway Urban Development project. It will contain project vision, details on recommended approaches, a network plan, identification of stakeholders and their expected roles and contributions, recommended team structure, drafts of terms of reference for second phase project consultants, identification of project constraints, resources required and time line, amongst other issues.