



Fisheries development and management plan of Chilaw lagoon



Department of Fisheries and Aquatic Resources

Maligawatte, Colombo 10, Sri Lanka

March 2013



**REGIONAL FISHERIES LIVELIHOODS PROGRAMME
FOR SOUTH AND SOUTHEAST ASIA (RFLP)**

Fisheries development and management plan of Chilaw lagoon

**(Activity 1.5.2 Prepare Fisheries Development and Management Plan through a
Stakeholder Task Force)**

For the Regional Fisheries Livelihoods Programme for South and Southeast Asia

Prepared by

Department of Fisheries and Aquatic Resources

Maligawatte, Colombo 10, Sri Lanka

March 2013

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Preface

Chilaw lagoon was declared as a Fishery Management Area in February 2012 and the twelve Fisheries Committees established for the lagoon have been officially registered with the Department of Fisheries and Aquatic Resources since August 2012.

The lagoon supports an important subsistence fishery, providing livelihoods to over thousand families. However, there is no history of fisheries management in Chilaw lagoon, except for the traditional stake net (*kattudel*) fishery.

The estuary is polluted by extensive dumping of domestic waste and sewage from a large number of settlements. In addition, many shrimp farms discharge polluted water containing nutrients and chemicals. Excesses of pesticides used indiscriminately in agriculture practices and fertilizers used in coconut plantations are washed into the lagoon with rain water and are potential sources of pollution and eutrophication of the lagoon waters. Mangroves have been felled and marshy land reclaimed for the unplanned construction of shrimp farms, homesteads and coconut plantations. Sea grass beds associated with lagoons and estuaries are damaged due to destructive fishing practices.

Recent amendments to the Fisheries and Aquatic Resources Act, No. 2 of 1996 provide for the integration of fisheries management with environmental conservation. As required by the Act, the Fisheries Development and Management Plan for the Chilaw lagoon has been developed to conserve the lagoon environment and to support sustainable development of fisheries in the lagoon.

The Fisheries Development and Management Plan for Chilaw lagoon presented here has been developed by a multi-agency Task Force appointed by the Interim Fisheries Management Coordinating Committee of Chilaw Lagoon, under the guidance of the Department of Fisheries and Aquatic Resources and with technical and financial support from the Regional Fisheries Livelihoods Programme of the Food and Agriculture Organization of the United Nations, which is funded by Spain.

Nimal Hettiarachchi
Director General
Department of Fisheries and Aquatic Resources

1: Fisheries in Chilaw lagoon

1.1 Description of the Fishery Management Area

Chilaw lagoon was declared as a Fishery Management Area, under Section 31 of the Fisheries and Aquatic Resources Act, No. 2 of 1996, by the Minister of Fisheries and Aquatic Resources and published in the Gazette Extraordinary, No. 1744/4 of the Democratic Socialist Republic of Sri Lanka dated 08th February 2012.

Chilaw lagoon, located about 80 km north of Colombo, on Sri Lanka's west coast in the Puttalam district of the North Western Province, is about 29.5 km in length and 2 km wide at its broadest end, with a surface area of approximately 1,800 ha and a depth range of 0.9-3.0 m (CEA, 1994). The depth varies over time due to both tidal movement and heavy rainfall in the catchment area. The greatest depth recorded at high water level (after heavy rains) was 3.9 m (Jayawickrema and Sideek, 1986). Tidal influences are small and extensive mud flats are exposed at low water level.

The main fresh water influx into the lagoon is from the Karambalan Oya (the most western section of which is named Lunu Oya), which flows through areas that are predominantly covered by coconut plantations, village gardens and paddy fields. The other fresh water inlet, the Deduru Oya has an open connection with the lagoon, but discharges into the ocean and, due to the prevailing northerly sea current, the inflow into the lagoon is small (CEA, 1994). The Chilaw lagoon opens out to the sea at two locations – at Chilaw and Thoduwawa (**Fig. 1**). The main outlet is situated north of Chilaw (where the Deduru Oya empties into the sea), and is partially blocked by sand bars during the dry season (January – March and June – August). The other outlet at Thoduwawa is totally blocked by a sand bar during most of the year.

Chilaw lagoon is bordered by four Divisional Secretary divisions. At the northern end, the estuary extends further northwards beyond its opening into the sea at Chilaw, coming under the Arachchikattuwa DS division. The main body of the Chilaw lagoon falls within the Chilaw DS division. The Chilaw DS division encloses two Urban Council (UC) areas: the Chilaw UC and the Madampe UC, responsible for matters such as residential and commercial establishments and public utilities. Consequently, the UCs have a direct impact on the control of urban sprawl that may affect the wetland. However, legalization of land ownership and land use is the responsibility of the DS divisions. South of Chilaw DS division, small parts of the lagoon are bordered by the Madampe DS division and the Mahawewa DS division.

1. 2 Fish resources and productivity

Chilaw lagoon supports an important subsistence fishery. The productivity of Chilaw lagoon is considered high and has been estimated at $83.5 \text{ kg}^{-1} \text{ ha}^{-1} \text{ year}^{-1}$ (Jayawickrema, 1992). The lagoon and the associated wetland support coastal marine and lagoon fisheries and income generating prospects for up to 2,000 families.

Investigations into fish resources in Chilaw lagoon have shown that species of pony fish or silver bellies (*Leiognathidae*), mullets (*Mugilidae*), cat fish (*Aridae*), sardines (*Clupeidae*), scads

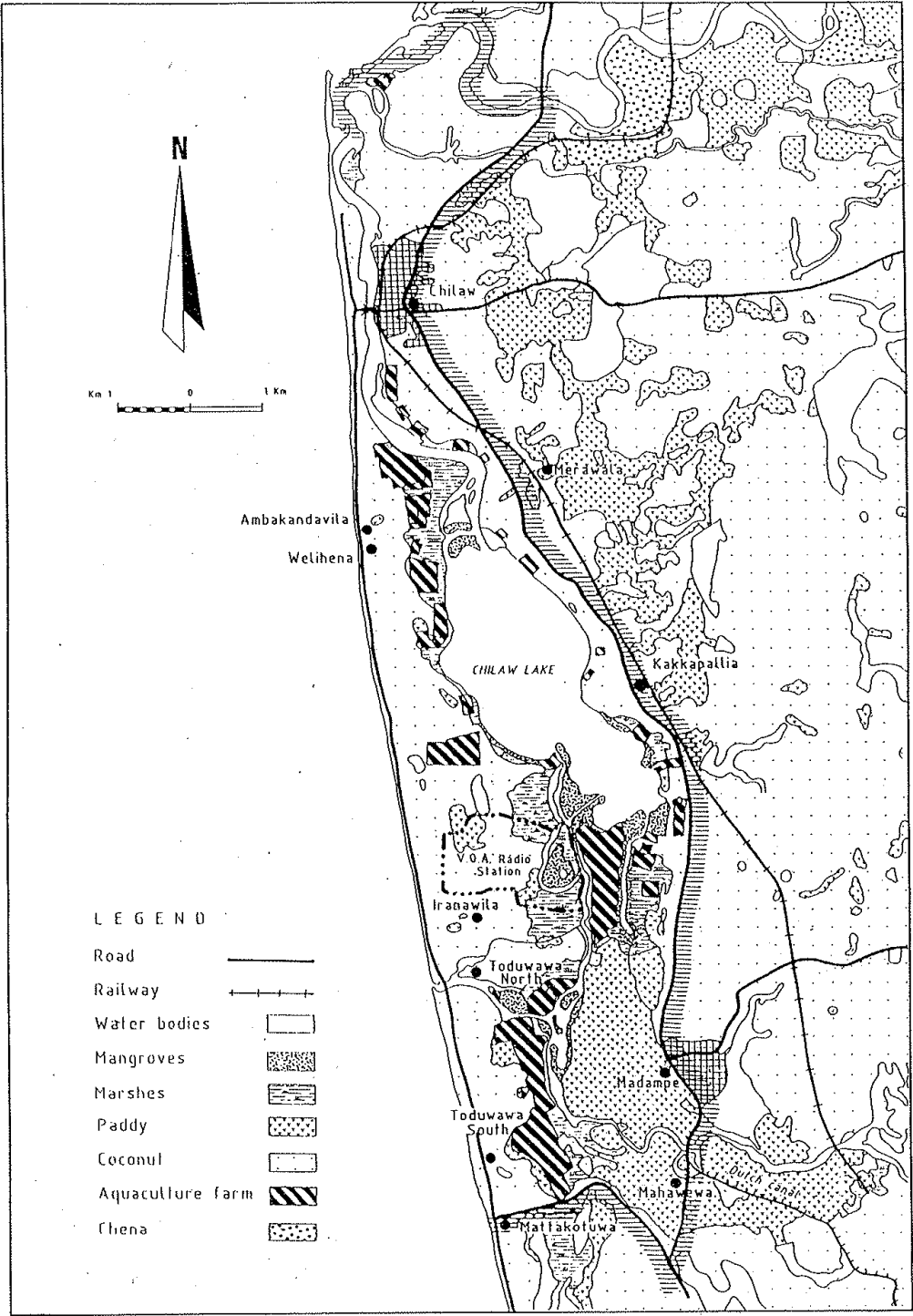


Fig. 1 – Chilaw lagoon and environs showing land use

(Carangidae), milk fish (Chanidae), snapper (Lutjanidae), breams (Sparidae), seabass (*Lates calcarifer*), silver whiting (*Sillago sihama*) and pearlspot (*Etroplus suratensis*) are the major catch species from Chilaw lagoon (Jayawickerema, 1992).

The shrimp catch from Chilaw lagoon is dominated by Indian prawn (*Penaeus indicus*), followed by giant tiger prawn (*P. monodon*), green tiger prawn (*P. semisulcatus*) and kadal shrimp (*Metapenaeus dobsoni*).

About 15 species of finfish, 04 species of shrimp and the estuarine mud crab (*Scylla serrata*) are considered to be commercially important in Chilaw lagoon.

1.3 Fishers involved in Chilaw lagoon fisheries

The fishing population associated with the Chilaw lagoon is distributed across 19 Grama Niladhari divisions within the four DS divisions. For fisheries administration, these 19 GN divisions are clustered into five Fisheries Inspector (FI) divisions. During 2010, an estimated total of 1,089 fisher families with a combined total population of 4,747 were dependent on Chilaw lagoon fisheries (**Table 1**).

Table 1: Fishing population associated with Chilaw lagoon, 2010.

FI Division	No. of GN divisions	No. of Fishing families	Fishing population	No. of fishers
Arachchikattuwa	05	225	1,130	338
Chilaw North	04	108	439	145
Chilaw Town	04	349	1476	369
Chilaw South	03	247	992	312
Mahawewa North	03	160	710	165
Total	19	1,089	4,747	1,329

(Source: District Fisheries Office, Chilaw)

1.4 Fishing fleet

The fishing fleet in 2010 was composed of 26 (4.5%) traditional, non-motorized outrigger canoes (*oru*) and 552 (95.5%) log rafts (*teppam*), i.e. a total of 578 fishing vessels. Fishing fleet distribution by Fishery Inspector division during 2010 is given in **Table 2**.

A rapid frame survey conducted by the Chilaw District Fisheries Office during 2011 indicated that there were 372 non-motorized traditional boats (NTRB) boats operating in Chilaw lagoon – 250 on a full-time basis and 122 on a part-time basis during the northwest monsoon months (Table 3). In addition, 107 fishers were engaged in fishing activities without using a craft,

Table 2: Fishing fleet distribution in Chilaw lagoon by FI division, 2010

FI division	Outrigger canoe (<i>Oru</i>)	Log raft (<i>Teppam</i>)	Total
Arachchikattuwa	26	118	144
Chilaw North		96	96
Chilaw Town		79	79
Chilaw South		185	185
Mahawewa North		74	74
Total	26	552	578

(Source: District Fisheries Office, Chilaw)

Table 3: Fishing fleet distribution in Chilaw lagoon by area of operation, 2011

FI division	Full-time (Lagoon only)	Part-time (Lagoon & sea)	Total	Fishing without craft
Arachchikattuwa	127	20	147	57
Chilaw North	09	-	09	08
Chilaw Town	68	09	77	16
Chilaw South	38	85	123	10
Mahawewa North	08	08	16	16
Total	250	122	372	107

(Source: DFAR, 2012)

1.5 Fishing gear and methods

The diverse types of fishing gear and methods used in Chilaw estuarine fisheries, as reported in literature (Jayawickereme, 1992; CEA, 1994 and SDC, 1998) and by fishers, are summarized below:

1. Trammel net for shrimp (*Disco dela*)
2. Trammel net for fish
3. Brush pile (*Mas athu*)
4. Crab pots (*Kakulu thattiya*)
5. Gillnet for crabs
6. Cast net (*Visi dela*)
7. Stake net (*Kattu dela*)
8. Fyke net (*Kudu dela*)
9. Mada mirikema
10. Bottom longline
11. Cover pot (*Karaak gediya*)
12. *Haras dela*
13. *Mural weta*
14. Podi del
15. Padu dela (similar to beach seine)
16. Fish cages
17. Net fishing for shrimp

The most common fishing gears used in Chilaw lagoon are the trammel net, cast net, gillnet, brush piles, crab traps, bottom-set gillnet for crab, Fyke net (*Kudu dela*) and stake nets.

Trammel netting for shrimp and fish is the major fishery in Chilaw lagoon for log rafts or *Teppams* and the second major fishery for the traditional non-motorized outrigger canoes or *orus*. The trammel net is locally referred to as the “*disco nei*” and the targeted species are the green tiger shrimp (*Penaeus semisulcatus*), the Karuma prawn (*P. japonicas*) and the banana shrimp (*P. merguensis*).

The bottom-set net fishery for mud crab or *kakulu dela* is the second major fishery for log rafts or *teppams*, followed by the small mesh gillnet fishery. Cast net fishing is the major fishery practiced using traditional non-motorized outrigger canoes or *orus*, all year round. The use of “*kakulu thatiya*”, a lift net to catch mud crabs is a simple but ancient and an important year round fishery, particularly for the traditional non-motorized outrigger canoes or *orus*.

Many fishers in Chilaw lagoon are engaged in fisheries that do not require the use of a fishing craft. The operation of fyke nets, aquarium fish collection using scoop nets, cast nets, etc., and cast netting for subsistence food fish and shrimp are conducted without the use of fishing crafts.

Brush pile fishing has a long history in Sri Lankan lagoons including Chilaw lagoon, with the first reference to it dating back to 1910 (Jayakody, 1996). A brush pile (*mas athu*) is an aggregating device made up of a pile of mangrove brushwood placed in shallow water and pegged down with sticks. The brush piles are visited every 3-4 days when targeting shrimp and every 20-30 days intervals when targeting finfish. Fish or shrimp are collected by encircling the brush pile with a net fixed to a number of sticks. The twigs of the brush pile are removed manually and the trapped fish or shrimp harvested. Brush pile fishing is meant to be licensed but the Chilaw Fisheries Office has not issued any licenses to date. There are however about 45 brush piles in Chilaw lagoon.

1.6 Fish production

In Sri Lanka, statistics on fish production from lagoons and estuaries are incorporated with those of coastal marine fisheries. As a result, there is no time series data on fish catches, fishing effort, catch composition, etc. from the Chilaw lagoon. Available data/information is limited to a few specific studies/investigations conducted over short periods at different times.

Fish production from Chilaw lagoon during 1985/86 was estimated at 151 MT with shrimp, fish and crabs contributing to 46%, 33% and 21% of the production (Jayawickerema, 1992). Gear-wise, the major contributions were from gillnets (28%), stake nets (20%), cast nets (20%) and crab traps (17%). Silver bellies or *karalla*, mullets or *godeya* and cat fish or *anguluwa* contributed 56% of the total finfish catch. Other finfish species in the catches included pearlspot or *koraliya*, silver whiting or *kalanda*, seabass or *modha*, seabream, *Acanthopagrus* sp. or *thiraliya* and jacks and trevallies or *parawa*.

Fish production from Chilaw lagoon in 2010 was estimated to have increased over five fold in 25 years to a total of 853 MT and the production by Fishery Inspector area is given in **Table 4**.

Table 4: Fish production from Chilaw lagoon by FI area in 2010 (MT)

FI area	Fish production (MT)
Arachchikattuwa	175
Chilaw North	190
Chilaw Town	160
Chilaw South	248
Mahawewa North	80
Total	853

(Source: District Fisheries Office, Chilaw)

Estimates of fish production from major fisheries conducted in the lagoon, based on data/information provided during the frame survey funded by the RFLP and conducted by the District office in 2011 are given in **Table 5**. The total production, which had further increased was estimated at approximately 930 MT.

Table 5: Fish production from Chilaw lagoon by FI area in 2010 (MT)

Fishery	Total catch (kg)
Trammel net fishery	365,760
Fyke net (<i>Haras dela</i>) fishery	212,520
Lagoon seine (<i>Gawana dela</i>) fishery	141,120
Stake net (<i>Kattu del</i>) fishery	21,000
Small-mesh gillnet fishery	109,368
Large-mesh gillnet fishery	32,400
Brush pile fishery	22,416
Cast net fishery	24,960
Total	929,544

(Source: DFAR, 2012)

2. Status of the Fishery

2.1 Assessments of relevant fish stocks and dependant species

No assessments of fish stock resources (specific shrimp and/or finfish species or species groups) have ever been conducted for Chilaw lagoon.

2.2 Socio-economic status of the fishery participants

The results of a profitability analysis conducted in late 1990s (SDC, 1998) for different types of fishing gear used in combination with the outrigger canoe (*oru*) and log raft (*teppam*) in Chilaw lagoon showed that in terms of annual surplus profit, the *Oru*/crab pot (Rs. 22,281) and *Oru* / cast net (Rs. 21,666) fisheries were the most profitable, while the returns from *oru*/trammel net

fishery (Rs. -4,689) were lowest and below the poverty line. The annual surplus profit was estimated to be Rs. 8,539 for the *Teppam*/trammel net fishery.

The stake net (*kattudel*) fishery in Chilaw lagoon dates back to 1816 and operates under a traditional management system in which fishing rights are handed down to male descendants of three clans or families. The three clans have joined hands in managing this fishery in Chilaw lagoon, through the Chilaw Traditional *Kattudel* Owners Association, which had a total membership of 475 in 1996.

Five areas in the lagoon have been officially reserved for stake net fishing which has to be conducted between 18.00 hours and 06.00 hours. The stake nets have to be made according to accepted standards/specifications, with the mesh size of net being not less than 38 mm. The average monthly income of a stake net fisher during late 1990s was estimated at Rs. 2,000 (Kurukulasuriya, 1996).

Although bivalve resources are considerable in Sri Lanka's estuaries, exploitation is far below the level of natural production, and is confined to wild stocks as bivalve culture is still in its infancy in Sri Lanka. The present utilization of bivalves, mostly clams and cockles is at subsistence levels in areas where the resources are plentiful. It was reported that about 75 people were engaged in bivalve collection (mostly *Meretrix* sp.) in Chilaw lagoon during early 1900s, for sale to the 09 lime kilns that were operating around the lagoon. At Rs. 14 per kg, the daily harvest per person averaging 5 kg provided an income of Rs. 70. It has also been reported that about 25 kg of mussel meat from bivalves collected from Chilaw lagoon was sold daily to nearby shrimp farms at Rs. 18-20 per kg (Joseph, 1993).

3 Ecological and environmental status of the Lagoon

3.1 Ecological importance of Chilaw lagoon

The Chilaw estuary is fringed by brackish water marshes and thin strands of remnant mangrove forests, large extents of which have been converted into aquaculture farms since the mid-1980s.

The lagoon stores flood water. However, during heavy rain fall the lagoon also overflows and causes serious flooding problems to residential areas.

The mangrove ecosystem associated with the lagoon provides an array of ecosystem services such as protection of coastal areas from erosion and storm surges, acting as a sink for a variety of heavy (trace) metals and providing a sheltered habitat for many organisms in their young stages including several commercially important species of fishes and crustaceans (shrimp and crabs).

Mangrove forests around Chilaw lagoon and the Dutch Canal and its tributaries exist as fragmented patches which are highly variable in extent. The Chilaw mangrove forests contain a healthy mix of mangrove species; about 14-16 true mangrove species and 13-16 mangrove associates. Excluding an introduced species (*Nypa fruticans*) and an as yet un-identified species of the genus *Rhizophora*, the 16 mangrove species associated with the

Chilaw lagoon and surrounding wetland is claimed to be the most species-divergent mangrove along the southwestern coast of Sri Lanka (Jayatissa et al. 2002).

The economic value of the fish breeding function of mangrove forests in Sri Lanka was estimated to be US\$ 218 per hectare per year, while the total economic value was estimated as US 1,229 per hectare per year (Batagoda, 2003). The total mangrove area associated with Chilaw lagoon is 400 hectares. On this basis the fishery value of mangrove in the Chilaw lagoon is estimated to be US \$ 87,200 per annum, while the total economic value is US \$ 491,600 per annum.

A patch of mangrove (48.87 ha) at Irranavila in the Chilaw lagoon area has been declared as a Forest Reserve by the Forest Department and thus receives protection under the Forest Ordinance. Another 18.99 ha in Pambala area has been proposed for declaration as a conservation area under the Forest Ordinance. A few NGOs have commenced mangrove rehabilitation programmes mobilizing local communities. A mangrove rehabilitation programme run by the Small Fisher Federation (an NGO located in Pambala area) has planted about 50,000 mangrove seedlings in the Pambala area of the Chilaw lagoon, which ultimately has yielded a mangrove cover of about 2.4 ha (Dahdouh-Guebas et al 2001).

3.2 Environmental issues

3.2.1 Waste disposal

The estuary is polluted by the discharge of liquid waste and dumping of solid waste, mainly by residents of the densely populated Chilaw town and area and suburbs. The Chilaw market, situated close to the estuary is an important pollution source within the lagoon.

3.2.2 Adverse impacts of shrimp farming

Much of the coastal pollution in the Northwestern province has been attributed to *ad hoc* development of aquaculture leading to the discharge of high amounts of effluents containing suspended solids, nutrients and chemicals used to prevent and/or treat diseases from shrimp ponds. High levels of nitrates and phosphates released from shrimp farms into the coastal waters have caused eutrophication of nearby water courses in the region and pollution of ground water. Shrimp farm effluents reaching the Dutch Canal are high in total suspended solids (200-600 mg/l) and have high BOD levels (60-180 mg/l). These effluents cause heavy siltation in the canal, increasing turbidity. High sulphides and ammonia levels in these waters are also attributed to shrimp farm effluents and domestic sewage.

3.2.3 Destruction of mangrove and sea grass beds

The greatest threat to the Chilaw lagoon wetland ecosystem comes from the rapid decimation of the mangroves and marshland that surrounds the lagoon. In the early 1980s, two thirds of the lagoon was surrounded by mangrove, while the remainder was surrounded by coconut plantations. By late 1993 however, most of the mangrove forest area had been decimated on the eastern side of the lagoon, while only a thin stand of mangroves existed in the western and southern sections of the lagoon. An aerial photographic survey conducted in mid-1994 to assess

the extent of mangrove cover provided a rough estimate of less than 100 ha of mangrove and mangrove-like vegetation remaining around Chilaw lagoon.

Mangrove has been felled and marshy land reclaimed for the construction of shrimp farms, homesteads and coconut plantations. Mangrove trees are also heavily exploited for domestic purposes such as for firewood, construction of homesteads; fishery purposes (poles, oars for outrigger canoes, stake seines, brush piles) and as fodder for cattle.

Mangrove destruction has been severe on the eastern and south sides of the estuary and on either side of the Dutch canal. Some narrow stretches of mangrove stands still exist on the southern and western parts of the estuary. The few mangrove patches in the east are heavily exploited for firewood, fencing material, etc.

In a study of changes in land-use pattern in the Pambala-Chilaw lagoon complex (southern part of Chilaw lagoon) using aerial photography has shown that shrimp farms have expanded by 25 ha during a four year period from 1994 to 1999, mainly at the expense of mangrove forest (approximately 13 ha) and coconut plantations (approximately 11 ha). In addition to over-fishing and pollution of the lagoon, the deterioration of mangrove vegetation is another cause attributed to a decrease in the fish catch per unit effort from the Chilaw lagoon, from 4 kg in 1994 to 1.5 kg in 1997.

Typical sea grasses found in abundance in certain parts of the estuary belong to the genus *Halophila*. Sea grass beds associated with the lagoon have been damaged due to destructive fishing practices. Digging for polychaete worms as feed for broodstock shrimp in shrimp hatcheries and the use of push nets to catch aquarium fish have caused severe damage to the sea grass beds in Chilaw lagoon.

3.2.4 Impact of upstream activities

Upstream deforestation in Karambalan Oya (and Deduru Oya) basin has led to serious flooding problems downstream; further exacerbated by the construction of shrimp ponds. In addition, flood waters wash down excess pesticides, disease prevention and treatment drugs and nutrients from shrimp ponds and sediments from rivers which raise the lagoon bed.

3.2.5 Siltation of lagoon bottom

Chilaw lagoon fishers perceive siltation as the biggest problem facing the lagoon. The main body of the lagoon in Pambala-Merawala area is heavily silted impeding movement of water. Due to excessive growth of sea weeds, fishers are unable to move and operate nets in these parts of the lagoon. Siltation combined with the periodic closure of the lagoon mouth restricts tidal exchange of water between the lagoon and the sea and is a threat to the sustenance of shrimp fisheries.

4. Co-management and legal provisions

4.1 Co-management

Co-management in fisheries allows fishers to fully participate in a shared decision making process with fisheries agencies for the sustainable management of fisheries resources. It focuses on establishing and empowering local level institutions with minor support from the government throughout the establishment and empowering process. In addition to focusing on establishing and empowering local level institutions, it involves the process of establishing partnership arrangements between the government and the local community and resource users.

Co-management brings together relevant levels of government and the users in pursuing a common set of goals to improve resource conditions and socio-economic conditions of the community. It allows the community to develop a management strategy with a higher probability of meeting local needs and conditions, and is more legitimate in their eyes because the community members understand their problems, needs and opportunities better than outsiders do.

In integrating environmental conservation into fisheries management, other stakeholder agencies mandated with natural resources management and environment conservation would need to be brought into the co-management process and partnerships.

4.2 Existing legislation affecting Chilaw lagoon fisheries

A summary of information on who is legally responsible for managing the fishery and legal obligations that needs to be met, institutional arrangements and, regulations and fisheries laws affecting the fishery in Chilaw lagoon are presented below.

Under the Fisheries and Aquatic Resources Act, No. 2 of 1996, including all the amendments made subsequently, the Department of Fisheries and Aquatic Resources has the overall mandate for the management, regulation, conservation and development of fisheries and aquatic resources in Sri Lanka. The following regulations, made under the provisions of the Fisheries and Aquatic Resources Act, No. 2 of 1996 provide for registration of fishing boats and fishers, licensing of fishing operations and establishment of Fisheries Committees and other institutional arrangements for collaborative management of fisheries.

- The **Registration of Fishing Boats Regulations of 1980** promulgated under the Fisheries Ordinance and amended in 1997 and 2006 under the Fisheries and Aquatic Resources Act No. 2 of 1996 require that every person operating or using a fishing boat in Sri Lankan waters obtains a certificate of registration in respect of his/her boat from the Director General, Department of Fisheries and Aquatic Resources or an authorized officer.
- The **Fishing Operations Regulations, 1996** published in the Government Gazette Extraordinary No. 948/25 dated 07th November 1996 and amended in April 2005 require every person conducting fishing operations in the sea, estuaries or coastal lagoons of Sri Lanka to obtain a Fishing Operations License from the Director General, Department of Fisheries and Aquatic Resources or an authorized officer.

- The **Fisheries Committee Regulations, 1997** published in the Government Gazette Extraordinary of 25th April 1997 provided for the establishment of Fisheries Committees in a fisheries management area. The following 12 Fisheries Committees have been established for Chilaw lagoon, as published in the Government Gazette Extraordinary No. 1772/29 dated 22nd August 2012.
 1. Muthupanthiya Fisheries Committee
 2. Nagul Eliya Fisheries Committee
 3. Aluthwatta Karmal Matha Fisheries Committee
 4. Palugastenna Ekamuthu Fisheries committee
 5. Welihena Fisheries Committee
 6. Merawala St. Joseph Fisheries Committee
 7. Iranawila Fisheries Committee
 8. Ambakandawila Fisheries Committee
 9. Taladiyawella Fisheries Committee
 10. St. Sebastian Fisheries Committee, Pambala
 11. Karukappone Fisheries Committee
 12. St. Michael Fisheries Committee, Chilaw Wella

- The **Fisheries (Register) Regulations, 1997** published in the Government Gazette Extraordinary of 25th April 1997 require that every fisher (resident or migrant), conducting fishing operations in a fisheries management area shall get him/herself included in the Register of Fishers maintained and regularly updated by the fisheries officials of the area.

- The **Chilaw Lagoon Fisheries Regulations, 1996** published in the Government Gazette Extraordinary No. 916/12 dated 28th March 1996 provided guidelines for the operation of “*Haras del*”, “*Kattu del*” and “Cast net” in Chilaw lagoon. According to these regulations:
 - “*Haras del*” fishers shall lay their nets from one mile south of the Chilaw Bridge.
 - “*Haras del*” shall be laid on both sides of the channel (Ela maga) in the lagoon avoiding the area marked by means of posts fixed by the officers of the Department of Fisheries and Aquatic Resources.
 - The minimum gap between two units of “*Haras del*” shall be 100 metres.
 - The number of “*Haras del*” that may be tied shall be limited to the number of blocks of 100 metres to the south, leaving one mile from the Chilaw Bridge.
 - The mesh of the “*Haras del*” shall not be less than 4 cm (1.5 inches).
 - “*Kattu del*” fishers may erect their *Kattu del* between 18.00 hours and 06.00 hours.
 - “Cast net” fishers may cast their nets at any time during day time.

4.3 Legal and institutional provisions for co-management of Chilaw lagoon fisheries

The existing legal and institutional arrangements related to fisheries in Chilaw lagoon are not adequate to support ecosystem based fisheries co-management. The Fisheries Committees established for the lagoon lack legal powers and other stakeholders are also excluded from the co-management process, hampering proper conservation and management of the lagoon resources and its environment. To overcome these limitations, the Regional Fisheries Livelihoods Programme assisted the Department of Fisheries and Aquatic Resources Development in amending the Fisheries and Aquatic Resources Act, No. 2 of 1996 to bring in more stakeholders and the participation of women into the co-management process.

- The Fisheries Management Coordinating Committee of Chilaw lagoon has been established under Section 31A (1) of the Fisheries and Aquatic Resources (Amendment) Act, No. 1 of 2013, published in the Government Gazette Extraordinary No. 10000 dated 10/01/2013. The Fisheries Management Coordinating Committee of Chilaw lagoon consists of ex-officio members and/or nominees of the following stakeholder agencies.

1	Assistant Director	District Fisheries Office, Chilaw
2		District Fisheries Office, Chilaw
3		District Fisheries Office, Chilaw
4	Nominated member	Muthupanthiya Fisheries Committee
5	Nominated member	Nagul Eliya Fisheries Committee
6	Nominated member	Aluthwatta Karmal Matha Fisheries Committee
7	Nominated member	Palugastenna Ekamuthu Fisheries Committee
8	Nominated member	Welihena Fisheries Committee
9	Nominated member	Merawala St. Joseph Fisheries Committee
10	Nominated member	Iranawila Fisheries Committee
11	Nominated member	Ambakandawila Fisheries Committee
12	Nominated member	Taladiyawella Fisheries Committee
13	Nominated member	St. Sebastian Fisheries Committee, Pambala
14	Nominated member	Karukappone Fisheries Committee
15	Nominated member	St. Michael Fisheries Committee, Chilaw Wella
16	District Secretary	Puttalam
17	Divisional Secretary	Arachchikattuwa
18	Divisional Secretary	Chilaw
19	Divisional Secretary	Madampe
20	Divisional Secretary	Mahawewa
21	Chairman	Pradeshiya Sabha, Arachchikattuwa
22	Chairman	Pradeshiya Sabha, Chilaw
23	Chairman	Pradeshiya Sabha, Nattandiya
24	Mayor	Chilaw Municipal Council
25	Nominated member	Urban Development Authority

¹ When this version of the “Fisheries development and management plan of Chilaw lagoon” was drafted, the establishment of the Fisheries Management Coordinating Committee of Chilaw lagoon had still to be officially gazetted.

26	Director of Fisheries	Northwest Provincial Council
27	Nominated member	Coast Conservation & Coastal Resources Management Department
28	Nominated member	National Aquatic Resources Research and Development Agency
29	Nominated member	National Aquaculture Development Authority
30	Nominated member	Central Environment Authority
31	Nominated member	Department of Wildlife Conservation
32	Nominated member	Forest Department
33	Nominated member	Marine Environment Protection Authority
34	Nominated member	Ministry of Lands
34	Nominated member	Tourism Development Authority
36	Nominated member	Sri Lanka Police
37	Nominated member	Sri Lanka Navy

Under Section 31A (6) of the revised Fisheries Act, the Director General, Department of Fisheries and Aquatic Resources may appoint other persons, including representatives of Divisional Coordinating Committees, representatives of associations representing other commercial activities conducted within limits of the management area, representatives of the fisher women's' groups and, representatives of non –governmental organizations involved in natural resources management and the welfare of fishers, within the limits of the management area, to be members of the Coordinating Committee. The following persons have been appointed by the Director General, Department of Fisheries and Aquatic Resources as members of the Chilaw lagoon Fisheries Management Coordinating Committee:

1. Chairman, Divisional Coordinating Committee, Arachchikattuwa
2. Chairman, Divisional Coordinating Committee, Chilaw
3. Chairman, Divisional Coordinating Committee, Madampe
4. Chairman, Divisional Coordinating Committee, Mahawewa
- 5.
- 6.
- 7.

- Section 31B (1) of the Fisheries and Aquatic Resources (Amendment) Act, No. ... of 2013 requires a Fisheries Management Coordinating Committee constituted for a Fishery Management Area to submit to the Fisheries Advisory Council a fishery development and management plan for the area.
- According to Section 31B (2) of the Fisheries and Aquatic Resources (Amendment) Act, No. ... of 2013, a Fishery Development and Management Plan prepared by a Fisheries Management Coordinating Committee may contain proposals for the division of the Fishery Management Area (FMA) into zones for particular uses; prohibition or regulation of the use of particular types of fishing gear or equipment for the taking of fish and aquatic resources in the FMA; prohibition or regulation of the use of particular methods for taking of fish or aquatic resources in the FMA; prohibition of the taking of particular

species of fish or aquatic resources in the FMA; declaration of closed seasons for fishing in particular parts of the Fishery Management Area or for particular species of fish in the Fishery Management Area; regulating the times at which fish or aquatic resources may be taken in the Fishery Management Area; preservation of locations of scenic beauty or of cultural or ecological significance in the Fishery Management Area; improvement of the sustainability of fish and other aquatic resources in the Fishery Management Area; research, post-harvest and marketing and development aspects related to the fishery; monitoring, compliance and surveillance and, consultation and review.

- Under Section 31B (3) of the Fisheries and Aquatic Resources (Amendment) Act, No... of 2013, the Advisory Council is required to make modifications if any, to the plan and submit the plan to the Minister for his or her approval, within sixty days of a management plan being submitted to it by a Fisheries Management Coordinating Committee.
- Under Section 31B (4), the Minister may approve a plan within sixty days of it being submitted to him or her, and shall cause the plan to be published in the Gazette.
- Under Section 31B (5), it shall be the duty of the Minister to give effect to the provisions of the plan by making appropriate regulations under Section 61 and by the publication of appropriate Notices under Section 34.

5. Management issues

Management issues in terms of social, biological and environmental problems associated with fishers and the fishery, causes for such problems and possible solutions discussed during stakeholder consultations are presented in **Table 6** below:

Table 6: Analysis of management issues and proposed solutions for Chilaw lagoon fisheries

Problem	Causes	Solutions
Biological Depletion of shrimp, crab and fish resources	- Use of illegal /harmful fishing gear - Use of small mesh nets less than 1” - Illegal use of monofilament nets - Habitat destruction and degradation	- Ban use of harmful fishing gear - Strengthen monitoring, surveillance and enforcement capability - Establish institutional mechanism enabling coordination between agencies to minimize damage to the lagoon environment
Socio-economic Decreasing income from fishing and indebtedness	- No market for lagoon fish contaminated with waste oil/bilge from boats - Open access- non-fishers fish in the	- Minimize dumping of waste oil/bilge from fishing boats - Limit access only to fishers

Problem	Causes	Solutions
	lagoon - Increasing price of fishing gear and appliances - Loss of traditional landing centres due to illegal settlements - Alternative income generating opportunities associated with the lagoon not developed (e.g. tourism) - Lack of self employment for women	- Provide fishing gear and accessories at concessionary ² prices - Restore traditional landing centres - Introduce alternative livelihoods for fishers and fishing communities
Environmental Habitat destruction and degradation	- Illegal encroachment into the lagoon (no clearly defined reservation area) - Destruction of mangroves for aquaculture and other development activities - Effluent discharge from shrimp farms - Dumping of bilge water/waste oil from fishing boats - Pollution of lagoon water due to dumping of domestic waste and sewage disposal - Dumping of waste from hospital and fish market - Siltation of lagoon bottom in Pambala – Merawala area impeding water flow	- Establish lagoon boundaries to minimize illegal encroachment - Prepare and implement a mangrove management plan for the lagoon with community participation - Establish institutional mechanism enabling coordination between agencies to minimise damage to lagoon environment - Establishment of waste disposal programmes - Dredging ³ of the lagoon to facilitate tidal movement of water
Lack of data & information on lagoon fisheries	- Lack of catch and effort data collection of the lagoon fishery - Lack of research and investigations on fishery resources and lagoon ecosystem	- Introduce a fisheries data collection system for the lagoon - Carry out research on major fish and crustacean varieties (biology, population studies, etc.) and share results /information with concerned institutions

² Provision of government subsidies contravenes World Trade Organization recommendations. Subsidies can increase fishing pressure as fishers may continue to fish when it may be uneconomic to do so, because of the subsidy.

³ This option would be extremely expensive and is unlikely to be sustainable.

Problem	Causes	Solutions
		<ul style="list-style-type: none"> - Carry out periodic research/investigations on the status of the ecosystem/environment - Establish close integration (horizontal and vertical) between DFAR, NARA, NAQDA, etc.
Inadequate compliance	<ul style="list-style-type: none"> - Violation of rules and regulations - Lack of enforcement by concerned authorities - Lack of knowledge and awareness 	<ul style="list-style-type: none"> - Conduct awareness programmes for fishers and other stakeholders (On present status, regulations, management plans, etc.), through posters, advertisements, etc. - Conduct workshops, meetings and hold discussions with fishing communities - Fishers and other stakeholders to be organized to comply with a voluntary code of conduct - Strengthen enforcement capability

6. Objectives and Performance Indicators

The objectives of the plan listed below are what the stakeholders want to achieve by having the fishery managed. These are listed under biological, social, economic and environmental. In view of the multi-species nature of the resource and in the absence of data/information on stock structure of major species, the biological objective has been kept relatively simple and a precautionary approach to fishery management will be adopted, as recommended by FAO.

Performance Indicators relying on data that is simple and can be easily obtained have been selected against each of the objectives (**Table 7**).

The Trigger points or reference points listed against each objective and indicator provide the criteria that define the stage at which action needs to be taken when changes occur in the fishery. For example when the annual catch falls by more than 10%, the Fishery Management Coordinating Committee can either restrict the number of fishers or the fishing effort (number of boats and/or number of gear units used).

Table 7: Objectives and Performance Indicators

Objectives of the Plan	Performance Indicator	Trigger point
Biological – Maintain catch levels at +/- 10% of present level	- Annual production - Size of key species harvested - Proportion of juveniles or under-sized fish in catches	- Total catch falling by more than 10% over the previous year - Size of key species harvested decreased by an agreed proportion - Proportion of juveniles or under-sized fish in catches
Social – Employment opportunities in fishing increased or maintained at current levels	- Number of fishers fishing full-time in the lagoon	- Number of full-time fishers fall below an agreed proportion
Economic – Maintain income levels within 10% of present level Reduction of indebtedness of fishers	- Average annual income of fishers - Number of fishers in debt	- Income from fishing falls by more than 10% over the previous year - Number of fishers in debt has increased by more than 10% over the previous year
Environmental – Restoration of lagoon ecosystem	- Current extent of lagoon, mangrove, sea grass, etc. - Level of pollution	- Extent of lagoon area, mangroves, sea grass decreased by more than 10% over the previous year - Decrease in the number of large-scale (over 100 fish) fish kills - Suspended sediment levels above an agreed mg/L.
Governance – Increased participation of fishers in management	- Number of fishers and women on Committees - Attendance at meetings	- Attendance at management meetings decreased by an agreed proportion

7. Control Mechanisms (Management measures)

7.1 Access arrangements

7.1.1 Fishing Operations Licenses

- All fishers wishing to fish in Chilaw lagoon need to obtain a Fishing Operation License from the District Fisheries Office, Mahawewa.

- To obtain a Fishing Operation License, a fisher needs to be a member of one of the 12 Fisheries Committees established for Chilaw lagoon.
- The Executive Board of the Fisheries Committee and the relevant Fisheries Inspector shall jointly decide on who should be given Fishing Operation Licenses under that Fisheries Committee.
- Fishing Operation Licenses are issued free of charge. The District Fisheries Office and Fisheries Committees will work together and complete the issue of Fishing Operation Licenses to all selected Chilaw lagoon fishers by the end of December each year for the following calendar year.

7.1.2 Registration of fishing crafts

- All fishing boats operating in Sri Lanka have to be registered with DFAR. Boat registrations (new) and renewal of registrations are done free of charge. All boats operating in Chilaw lagoon shall be registered by the end of December each year for the following calendar year.

7.2 Input controls – Controls to enter fishing in the lagoon

- Motorized crafts – No motorized fishing boats will be allowed to conduct any type of fishing operations in Chilaw lagoon.
- Fishing gear controls –
 - Fyke net or *Kudu dela* is considered environmentally harmful as parts of the net have very small mesh ($< \frac{1}{4}$ "") and there is indiscriminate harvesting of small and juvenile fish. It is recommended that this type of fishing gear be banned.
 - Trammel net used for shrimp is 1" mesh, single ply. A total of 30 nets (3,000 mesh / pieces x 30 pieces) per boat are recommended.
 - Although prohibited by law, monofilament nets are still used in the lagoon and need to be stopped.
 - All gears that are operated by dragging along the lagoon bottom are recommended to be totally banned (e.g. *Padu dela*).
 - A minimum mesh size for nets harvesting brush piles to increase survival of juveniles of commercially important species
- Fishing times -

- Trammel nets should only be allowed in the water for 02 hours twice per day. Recommended fishing times are 04.00 – 06.00 hours in the morning and 18.00 – 20.00 hours in the evening
- Fishing areas -
 - Trammel nets for shrimp and fish operate all day and nets are often laid around mangrove patches and shrub vegetation. This needs to be stopped as indiscriminate removal of juvenile and small fish and crustaceans occur.
 - Brush pile fishery – When a brush pile is replaced, the old one is left intact while a new one appears in an adjoining place. There should be a condition in the Fishing Operations License to ensure that old brush piles are removed⁴ before a new one is allowed.
 - Some brush piles are erected in established routes of fishing boats. The location of brush piles should be decided by Fisheries Committee / Fisheries Inspectors to avoid such incidents.
 - When brush pile harvest is brought ashore for sorting, there is heavy mortality of small and juvenile organisms. Sorting brush pile harvest on site should be encouraged to ensure that unwanted small/juvenile organisms are thrown back into the lagoon alive.

7.3 Voluntary Code of conduct –

Some of the input controls agreed by stakeholders that cannot be easily incorporated into the legislation need to be included in a voluntary “Code of Conduct for Chilaw lagoon fishery”, to be agreed upon by the Fisheries Committees and other groups and associations representing fishers and other stakeholders; pledging voluntary compliance by fishers to do the right thing with no sanctions except social and moral obligations. These include the following:

- In order to minimize pollution of lagoon waters, all motorized boats should strive to dump bilge water/waste oil out at sea before reaching Chilaw fishery harbour.

8. Monitoring of the Fishery (data collection and analysis)

- The District Fisheries Office, Chilaw will register all fishers and craft and issue Fishing Operation Licenses to all members of Fisheries Committees during the month of December for the following calendar year.

⁴ Fishers claim that unused or abandoned brush piles obstruct movement of boats, laying of nets and also contribute to siltation.

- **Fish catch data collection:** Current data collection system adopted by the Department of Fisheries and Aquatic Resources does not allow adequate data collection from lagoons and estuaries. The Ministry of Fisheries and Aquatic Resources, Department of Fisheries and Aquatic Resources and the National Aquatic Resources Research and Development Agency (NARA) shall jointly develop a fisheries data collection system specifically for the lagoon, including new data collection forms giving priority to lagoon fishing gear and key indicator species. The data collection system will also mobilize Fisheries Committees and fishers to be actively involved in fisheries data collection. Data analysis and reporting shall also be a joint responsibility of the National Aquatic Resources Research and Development Agency and the Department of Fisheries and Aquatic Resources. The RFLP Sri Lanka will fund pilot development and testing of the data collection system by DFAR in Negombo lagoon and if successful DFAR will expand the system to other lagoons.
- Periodic (once every two years/three years?) monitoring shall be conducted by the National Aquatic Resources Research and Development Agency to assess the adverse environmental/ecological impacts on the lagoon ecosystem from fishing as well as the impact of other anthropological activities and natural phenomenon on Chilaw lagoon fisheries and fisher livelihoods.

9. Compliance (surveillance and enforcement)

- A Sub-committee comprising members from the district fisheries office and members representing the Fisheries Committees will coordinate and take decisions regarding enforcement of regulations. xx members from the district fisheries office and at least xx members from Fisheries Committees should be involved in any decision taken by the Sub-committee
- Funds and facilities (boats, engines, capacity building, trainings, etc.) are needed to operate and maintain a successful enforcement mechanism. There is a need to establish a fund to meet expenses involved during surveillance and enforcement activities. Funds should be requested from the Department of Fisheries and Aquatic Resources, Provincial Council, District Development Council and Divisional Secretariat. At a later stage, Fisheries Committees also need to contribute to such a fund.
- The Sri Lanka Police and the Sri Lanka Navy are represented in the Fisheries Management Coordinating Committee of Chilaw lagoon and they are expected to assist the district fisheries office and the Fisheries Committees in enforcing the management regulations in the Plan.

10. Research and investigations

The National Aquatic Resources Research and Development Agency (NARA), through its regional research centre in Kalpitiya, Puttalam is expected to coordinate all fisheries and environment related research in Chilaw lagoon. The regional aquaculture extension office of the National Aquaculture Development Authority (NAQDA) at Baththuluoya is expected to be

involved in monitoring and other investigations related to shrimp farming around Chilaw lagoon. As the implementation of the fishery development and management plan needs to be based on sound legal and scientific basis, a research plan needs to be prepared and implemented. The following research and investigation needs have been identified by NARA, NAQDA and the fishing community as high priority.

Fishery related:

- Assessment of fish and shellfish stocks and biological / population studies; and,
- Investigations on fishing gear used in the lagoon to identify and remove environmentally harmful fishing gear and methods from the lagoon⁵.

Environment/ecosystem related:

- Study of changes in mangrove and sea grass beds areas (area, distribution, species composition and abundance);
- Conduct research/investigations identified in the “Collaborative Plan for the Conservation and Management of Mangrove associated with Chilaw Lagoon”;
- Assess current pollution levels of the lagoon ecosystem and identification of pollution sources;
- Study of hydrology and hydro-dynamics of the lagoon in relation to sedimentation;
- Rapid ecological assessment on fisheries, environment and socio-economics; and,
- Prepare a zonal use plan for the lagoon and its environment, include no-take protected areas which are important to the life cycle (breeding and/or nursing) of key aquatic species.

11. Fisheries development

11.1 Infrastructure facilities

Provision of sheltered fish landing/net mending facilities at following sites has been identified as a priority need:

- Palugastenna;
- Ambakandawila;
- Welihena;
- Alutwatte;
- Wattakkaliya; and,
- Merawala.

⁵ RFLP Sri Lanka is currently funding national consultant input to assess which fishing gear types used in Negombo and Puttalam lagoons are destructive and to make recommendations on which gear types should be banned. The findings of this report will be relevant to Chilaw lagoon.

11.2 Lagoon and ecosystem rehabilitation

- Dredging of the heavily silted Pambala-Merawala stretch of the lagoon bottom; and,
- Dredging of the lagoon mouth.

12. Consultation and extension with stakeholders

- The Fisheries Committees shall meet once every month and minutes of the meetings will be kept. The Fisheries Inspector of the area is expected to attend these monthly meetings.
- The Fisheries Management Coordinating Committee of Chilaw lagoon shall meet once every four months, under a chair-person nominated by the Director General, Department of Fisheries and Aquatic Resources (DFAR). The Assistant Director, District Fisheries Office, Mahawewa will act as the Convener and the Secretary to the Committee.
- The District Development Council, attended by the District Secretary, Puttalam and representatives of the Fisheries Management Coordinating Committee of Chilaw lagoon will provide a forum for regular sensitizing of political leaders and senior government officials of the area.

13. Plan monitoring and review

Performance indicators

Performance indicators are given in **Table 7**.

13.1 Monitoring of the Fishery Development and Management Plan

Meetings of the Fisheries Management Coordinating Committee should be held once every four months to review the success/failure of management measures in meeting the objectives of the Chilaw lagoon Fishery Development and Management Plan and to decide what further actions need to be taken.

13.2 Monitoring protocols

Monitoring protocols established in the Action Plan are given in Tables 8, 9 and 10.

Action plan

- **Management goal** - Sustainable utilization of lagoon fish resources.
- **Management measure** – In the first instance and in the absence of reliable stock data and potential annual yields, maintain current production. Thereafter adjust fishing effort based on more reliable estimates of annual potential yield.

Tasks and responsible agencies for following up on the action plan for sustainable utilization of fish resources in Chilaw lagoon is given in **Table 8**.

Table 8: Action Plan for sustainable utilization of fish resources in Chilaw lagoon

	Tasks	Responsible for implementation	Completion date	Responsible for checking
1	Review current status of fishery	NARA District Fisheries Office	End Dec. 2014	DG / NARA DD (Mgmt) / DFAR
2	Assess annual fish potential of Chilaw lagoon	NARA	End Dec. 2014	DG / NARA DD (Mgmt) / DFAR FMCC
3	Implement regular fish catch monitoring programme	NARA District Fisheries Office Fisheries Committees	2014 onwards	DG / NARA DD (Mgmt) / DFAR FMCC
4	Enforce existing regulations on fishing gear, fishing times, areas, etc.	District Fisheries Office / FMCC / /Fisheries Committees Police /Navy	Continuous	DD (Mgmt) / DFAR FMCC
5	Introduce new regulations to ban harmful fishing gear and operation of trammel net and brush piles as recommended under Section 7.2 of the Plan	District Fisheries Office	2014 onwards	DG / DFAR DD (Mgmt) / DFAR FMCC

* DD (Mgmt) - Deputy Director (Management Division); DG - Director General; DFAR – Department of Fisheries and Aquatic Resources; NARA- National Aquatic Resources Research and Development Agency; FMCC- Fisheries Management Coordinating Committee

- **Management goal** - Maximize income of Chilaw lagoon fishers
- **Management measure** - Control fishing effort by restricting access to the fishery

Table 9 lists the tasks and responsible agencies for following up on the action plan for maximizing income of Negombo lagoon fishers.

Table 9: Action plan for maximizing income of fishers engaged in Chilaw lagoon fishing

	Tasks	Responsible for implementation	Completion date	Responsible for checking
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	Tasks	Responsible for implementation	Completion date	Responsible for checking
1	Issue of Fishing Operations Licenses only to members of Fisheries Committees	District Fisheries Office / Fisheries Committees	Issue/renewal in January every year	DD (Mgmt) / DFAR FMCC
2	Preparation of Register of Fishers	District Fisheries Office	Update every January	DD (Mgmt) / DFAR
3	Registration of all lagoon fishing craft	District Fisheries Office	Issue/renewal in January every year	DD (Mgmt) / DFAR FMCC
4	Strengthen monitoring, control and surveillance mechanism	DFAR Fisheries Committees Sri Lanka Police Sri Lanka Navy	Continuous	DD (Mgmt) / DFAR FMCC
5	Introduce alternative livelihoods	Divisional Secretaries	Continuous	District Secretary/ FMCC

* DD (Mgmt) - Deputy Director (Management Division); DG - Director General; DFAR – Department of Fisheries and Aquatic Resources; FMCC- Fisheries Management Coordinating Committee

- **Management goal** – Conservation of lagoon environment and bio-diversity.
- **Management measure** – Control adverse environmental impacts.

The tasks and responsible agencies for following up on the action plan for conserving Chilaw lagoon environment and biodiversity are presented in **Table 10**.

Table 10: Action plan for conserving environment and bio-diversity in Chilaw lagoon

	Tasks	Responsible for implementation	Completion date	Responsible for checking
1	Implementation of a participatory mangrove management plan	Forest Dept. / CCD District Fisheries Office / FMCC Fisheries Committees	Continuous / 2014 onwards	DG/Forest Dept. District Secretary /Puttalam
2	Establish lagoon boundaries to minimize illegal encroachment	DFAR / CCD District Secretariat Divisional Secretariats Survey Dept.	End Dec. 2014	District Secretary /Puttalam FMCC

	Tasks	Responsible for implementation	Completion date	Responsible for checking
3	Control effluent discharge from shrimp farms	NAQDA / North-Western Prov. Council / CEA /FMCC	Continuous	Divisional Secretaries FMCC
4	Minimize pollution of lagoon water due to sewage disposal	CEA / Chilaw MC/ Pradeshiya Sabha / MEPA / NWSDB	Continuous	Divisional Secretaries FMCC
5	Minimize pollution of lagoon water due to solid waste disposal	CEA / Chilaw MC / Pradeshiya Sabha / MEPA	Continuous	Divisional Secretaries FMCC
6	Minimize pollution of lagoon water due to bilge water/waste oil from fishing boats	District Fisheries Office	Continuous	Divisional Secretaries FMCC
7	Introduce a waste management programme at Chilaw fishery harbour	CFHC / Chilaw MC / UDA	Continuous from 2014	Chilaw Divisional Secretary / FMCC
8	Undertake dredging of lagoon mouth and lagoon bottom of Pambala-Merawala area	DFAR/NARA/CCD/FD/CEA	End Dec. 2014	District Secretary/ Divisional Secretaries FMCC

CC& CRMD – Coast Conservation & Coastal Resources Management Department; CEA – Central Environment Authority; DFAR – Dept. Fisheries and Aquatic Resources; FD- Forest Dept.; NAQDA – National Aquaculture Development Authority; FMCC- Fisheries Management Coordinating Committee, MEPA-Marine Environment Protection Authority; NWSDB – National Water Supply & Drainage Board; Chilaw MC – Chilaw Municipal Council

14. Review and amendment of the Plan

The Department of Fisheries and Aquatic Resources is the lead agency responsible for the implementation of the Chilaw lagoon Fisheries Development and Management Plan.

The Plan should be reviewed/improved and updated every five years, based on the best available information from monitoring of the fishery and research carried out by concerned agencies.

In the first instance, since the plan has been developed based on somewhat outdated secondary data and adopting a precautionary approach, the first review can be done after two years, with the consensus of all stakeholders.

The Department of Fisheries and Aquatic Resources, through the Fisheries Management Coordinating Committee has the responsibility to arrange for the review and amendment of the Plan.

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The Fisheries Development and Management Plan of Chilaw lagoon provides a legal framework for the implementation of fisheries resource management with a strong focus on environment conservation and a public statement of the intent of agreed actions by the key stakeholders. The development of the Plan involved extensive consultations between fishers, fisheries officials, local administrative officials and other stakeholder agencies responsible for natural resources management and environment conservation. It identifies what needs to be implemented to achieve sustainable fisheries resources management and environment conservation in Chilaw lagoon and persons/agencies responsible for each specific action.

In the development of the Plan, the Department of Fisheries and Aquatic Resources was supported by the Spanish Agency of International Cooperation for Development (AECID) through a Food and Agriculture Organization (FAO) of the United Nations trust-fund project, the Regional Fisheries Livelihoods Programme (RFLP) for South and Southeast Asia.

Besides financial and technical support, RFLP also provided logistical assistance for consultation meetings as well as support for the printing and translation of the Plan into Sinhalese.

The content of the Plan does not necessarily reflect the opinion of FAO, AECID or RFLP.

