



# **MARINE ENVIRONMENT PROTECTION HANDBOOK**

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**Philippine Coast Guard Auxiliary  
Marine Environmental Protection Guidebook**

**April 2018**

**PHILIPPINE COAST GUARD AUXILIARY  
Units 8 & 9  
CCP Bay Terminal, CCP Complex  
Pasay City PHILIPPINES**

# INTRODUCTION

## MARINE ENVIRONMENTAL PROTECTION (MAREP)

The promulgation of the Philippine Coast Guard Law of 2009 vested in the PCG the power to enforce laws and promulgate and administer rules and regulations for the protection of the marine environment and resources from offshore sources of pollution within the maritime jurisdiction of the Philippines. In the performance of such functions, the PCGA may assist the PCG through the following:

1. When appropriate, provide technical assistance/expertise to the PCG on matters pertaining Marine Environment Protection (MEP)
2. Assist in the conduct of lectures and training to promote public awareness on Marine Environment Protection
3. Report and assist the PCG in the conduct of oil and chemical spill response operations.
4. Participate in marine pollution training and exercises
5. Assist the PCG in the protection and preservation of Marine Protected Areas (MPAs)
6. Conduct local and International river / coastal cleanup activities
7. Conduct mangrove-planting and rehabilitation activities
8. Conduct coral reef protection/reforestation/preservation
9. Promote eco-tourism in the country
10. Assist the PCG in rescuing and monitoring of stranded marine mammals

The PCGA is implementing mandatory projects which are practical and doable that will contribute to the mandate of assisting the Philippine Coast Guard in the preservation of the marine environment and its resources. These are the (1) Monthly Coastal Cleanup ( 2) Build-A-Reef Project and (3) Mangrove Out-planting Project. It is envisioned that these projects shall be institutionalized in the programs of the PCGA.

### 1. MONTHLY COASTAL CLEAN-UP



### 2. REEF ENHANCEMENT PROJECT



### 3. MANGROVE OUT-PLANTING PROJECT



## SECTION 1

### MANDATORY PROJECT 1: MONTHLY COASTAL CLEANUP

#### Guidelines for PCGA Coordinators

1. Identify a cleanup site

- Obtain permit to access the site for the cleanup (i.e. local government or barangay)



2. Invite volunteers

- Visit schools, barangays and people's organizations
- Use of promotional materials and tri-media



3. Conduct orientations on the following:

- The Marine Environment
- Marine Debris
- International Coastal Cleanup
- How to use the Data Form and Data Recording



4. Arrange for a trash hauler/ garbage truck. Ask assistance from the local government.

5. Prepare cleanup materials and tools before ICC Day

- Sacks and net bags
- Rubber or plastic gloves
- Copies of the Ocean Trash Data Form for Volunteers and Coordinators
- Ballpens/ pencils
- Rakes, spades, broom sticks and scoop nets



Sacks



Net Bags



Ocean Trash Data Form



Rubber/plastic gloves



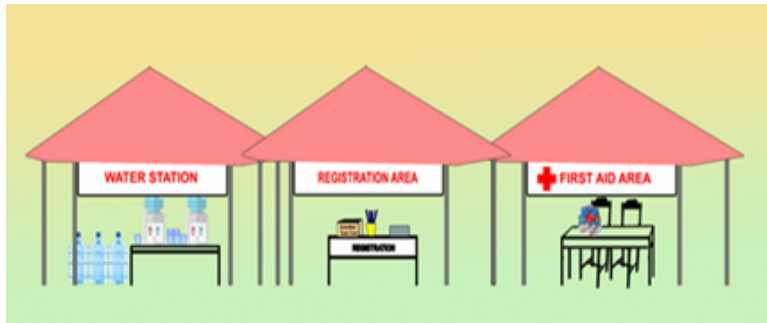
Ballpens/pencils

6. Conduct a general meeting for Group Coordinators to finalize plans for ICC.



7. Plan/ map designated areas for the following to be setup by 5:00 AM or earlier on cleanup day

- Registration/ Data Form Submission
- Water Station
- First-Aid Station
- Weighing Area
- Hauling Area
- Washing Area



### CLEANUP DAY ACTIVITIES:

1. Be at the site by 5:00 am

- Set-up your stations/tent and sound system
- Hang banners and signs to guide volunteers
- Prepare registration forms, cleanup materials & tools



2. Remind people manning the stations their responsibilities: safety of the volunteers, to assist with their ICC queries and other concerns and to oversee the cleanup activities.

3. Conduct a kick-off ceremony to welcome guests, to give final instructions to volunteers (i.e., on safety, emergencies and other ICC reminders) and to signal the start of the cleanup.



### AFTER CLEANUP ACTIVITIES:

1. Collect all data forms from group coordinators & volunteers. Summarize all data collected into the Coordinators Ocean Trash Data Form and submit, as soon as possible, to the PCGA NAMO by email or by mail.

A screenshot of the 'COORDINATOR OCEAN TRASH DATA FORM' from Ocean Conservancy. The form is titled 'DEAR CLEANUP COORDINATOR:' and includes a 'TRASH COLLECTED' table. The table has columns for 'TYPE' and 'QUANTITY'. It lists various types of trash such as Cigarette Butts, Food Wrappers, Beverage Bottles, etc., with checkboxes for 'MOST LIKELY TO FIND ITEM' and 'LEAST LIKELY TO FIND ITEM'. There are also sections for 'SPECIAL ITEMS' and 'PACKAGING MATERIALS'.

2. For appreciation of their effort, give certificates, t-shirts, or souvenirs to your coordinators.



## SECTION 2

### MANDATORY PROJECT 2: REEF ASSESSMENT/ MONITORING AND ENHANCEMENT

#### “BUILD-A-REEF” PROJECT

## GUIDELINES / REQUIREMENTS FOR BUILD-A-REEF PROJECT

### 1. Selection of Site

- Water depth – About 4 meters to 20 meters (66 ft) or sufficiently deep to avoid creating a hazard to navigation;
- Wave interaction – average wave energy to ensure stability of reef module
- Currents - should be minimal; reef module should be oriented parallel to or at shallow angles to the predominant current flow
- Water Quality - standard levels for water turbidity, salinity, dissolved oxygen, biological oxygen demand, water temperature, nutrient loads, pollution levels, and other water quality factors
- Substrate - The desired bottom habitat would be soft sediment with an under burden of rock. Soft sediments, such as, clays, fine silts, and loosely packed sands should be avoided. Also avoid hard rock or hardpan with a veneer of sand cover substrate since dense materials, such as concrete, cannot settle or scour excessively

### Specific Criteria:

- Site shall not be located on existing coral reef, beds of aquatic grasses or macroalgae and other hard bottom communities
- In some cases, can be sited on sparse live assemblages or on barren bottoms in proximity to biologically productive areas
- Not located within shipping lanes
- It should be within easy and safe access of recreational visitors and / or fishermen.



### 2. Selection of Materials

- Concrete blocks and all materials used in the construction must be free of: asphalt, petroleum, other hydrocarbons, and toxic substances that may be harmful to humans, animals or other aquatic life
- Lightweight reef materials should be used in deep water or in protected estuaries where the effect of waves and currents is not great.

Advantages:

- Concrete materials are compatible with the marine environment.
- Concrete is highly durable, stable and readily available.
- Concrete can be readily formed into any shape for the development of prefabricated units
- Concrete modules can provide adequate surfaces and habitats for the settlement and growth of organisms, which in turn provide a substrate, food and places of refuge for other invertebrates and fish



### 3. Design of the Reef Module

Some criteria in specific design are:

- Practicality - should be easy to acquire or manufacture, and their handling, transportation, preparation, and placement on the sea floor should be realistically accomplished within safe and relatively low-risk, cost-effective limits
- Adequate interstitial spaces are necessary to establish a rich diversity of motile invertebrates as well as numerous cryptic fish species



### 4. Testing of Reef Design Outside Water

- It is advisable to test your reef module design outside water to minimize time of placement underwater and to determine other concerns



### 5. Schedule Deployment of Materials to Site

- Plan deployments during seasons with relatively predictable calm weather.



## BUILDING THE REEF MODULE

### • FISHERMAN'S REEF MODULE



### REQUIREMENTS:

1. All materials used in the construction must be free of asphalt, petroleum, other hydrocarbons and toxic substances that may be harmful to humans, animals and aquatic life.
2. Reef module should be located at recommended depth, preferably in sheltered or leeward side where waves and currents are not strong unlike in high energy zones.

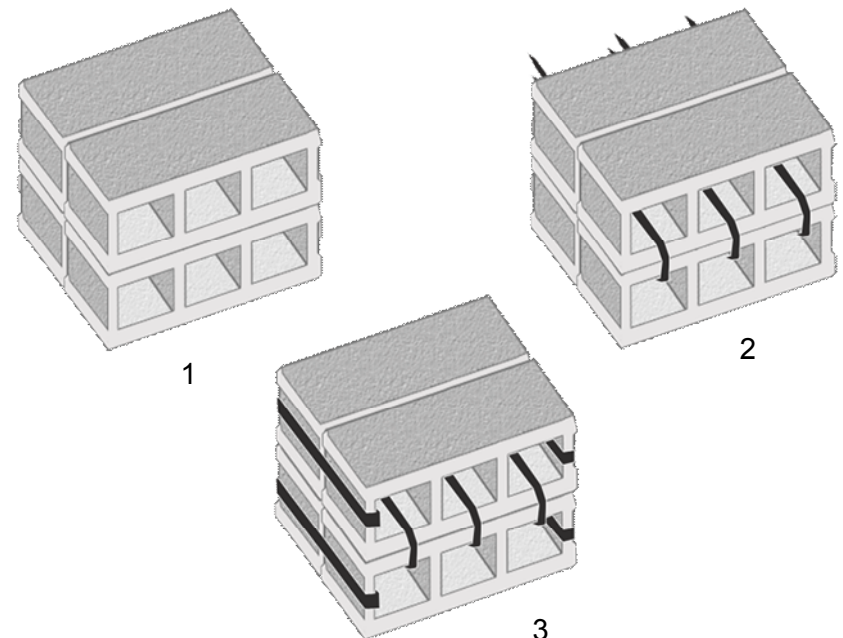
### MATERIALS AND TOOLS:

1. Concrete blocks - 6 pcs per module x 10 modules = 60 pcs  
Composition is 8 parts sand and 1 part cement.

2. Long plastic cable ties (about 54" at P28/pc) - 13- 15 pcs per module x 10 Modules = 130-150 pcs
3. Paper cutter

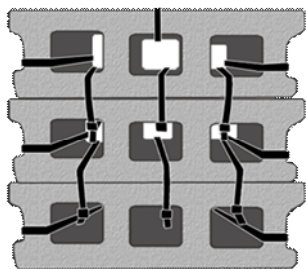
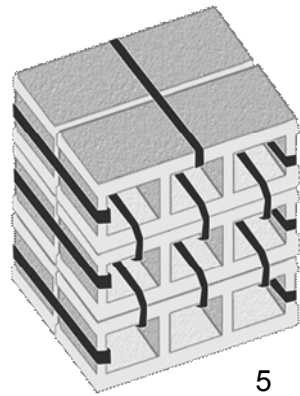
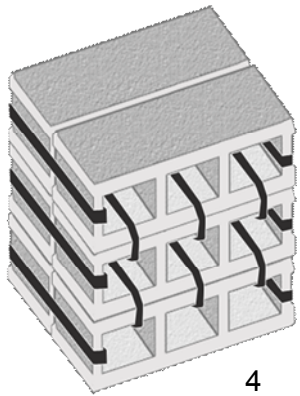
### LASHING OF BLOCKS PROCEDURE:

1. Arrange 4 blocks as shown below.
2. Connect the upper and lower blocks using long cable ties, each tie passing through the middle hole all the way through the back. Lock the ties and cut or trim excess tips.
3. Next, tie the sides of the blocks. Lock and trim excess tips.

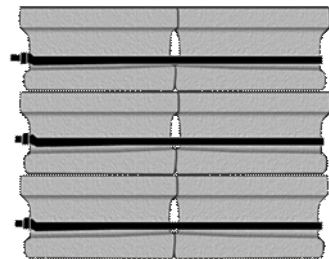




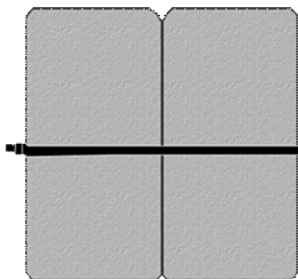
4. Add 2 blocks on top of the 2nd layer. Connect the top blocks to the 2nd layer with cable ties, the same way as in steps 2-3.
5. Secure the 2 upper blocks by using 1-2 cable ties.



Front View



Side View



Top View



Lashing of the reef module on land shall be done with an assistant which will take about 20 minutes

## DEPLOYMENT TO THE SITE

- One or two Auxiliarists can readily carry the assembled module on a paddle or motorized outrigger boat to the target site



- Dropping off the module in the target site marked by a buoy



- When planning to deploy the reef modules, it is important that the weather is good



- Assisting in the proper positioning of each reef module



- Fisherman’s reef modules can be arranged in any manner (circular or apart)



## MONITORING AND MAINTENANCE

- Make weekly visits to the site to monitor recruitment and check for structural integrity of the module
- Information gathered from monitoring can be used to test predictions made in the planning phase about the designs, materials, or total structure of the reef module.

Results of these tests can be used to:

1. Improve or refine sitting or design;
  2. evaluate benefits/costs;
  3. propose alternative management strategies or options
- Remove derelict fishing lines and other unwanted debris

## SECTION 3

### MANDATORY PROJECT 3: MANGROVE OUTPLANTING

#### Guidelines for Outplanting

#### 1. Selection of Site

- a. Schedule visit to potential rehabilitation site when it is neap (low) tide and the sea or tidal river is calm (consult a tidal calendar)

JANUARY 2017						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	☺	☺	☺	

Light Type: A-M BOLD TYPE: P-M

- b. Check for the following:
  - Occurring mangrove species and mother trees – to determine which mangrove species will succeed



- Type of substrate (soil) – mud, rocky or coralline, sandy substrate, muck



rocky or coralline



sandy



mud



muck

- Identify exposed areas during neap tide for planting site

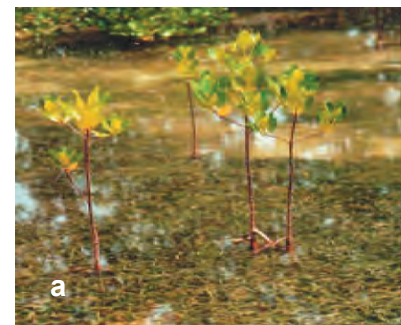


- Tidal height, duration and frequency of the tidal currents, as well as, water depth of the area to determine whether it will support growth
- Topography and elevation- note remarkable features such as creeks, water-logged portions (a) which may drown the seedlings, and any natural or artificial beach structures that may affect tidal flow

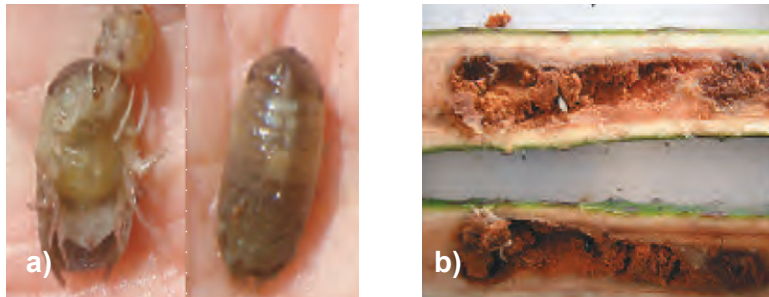


Water -logged area as indicated by yellow lines

- Areas with seagrass bed (a) and sites with pneumatophores or aerial roots (b) are ecologically incorrect sites



- Presence of pests, such as, boring isopods (a), beetle larvae (b), barnacles & crabs

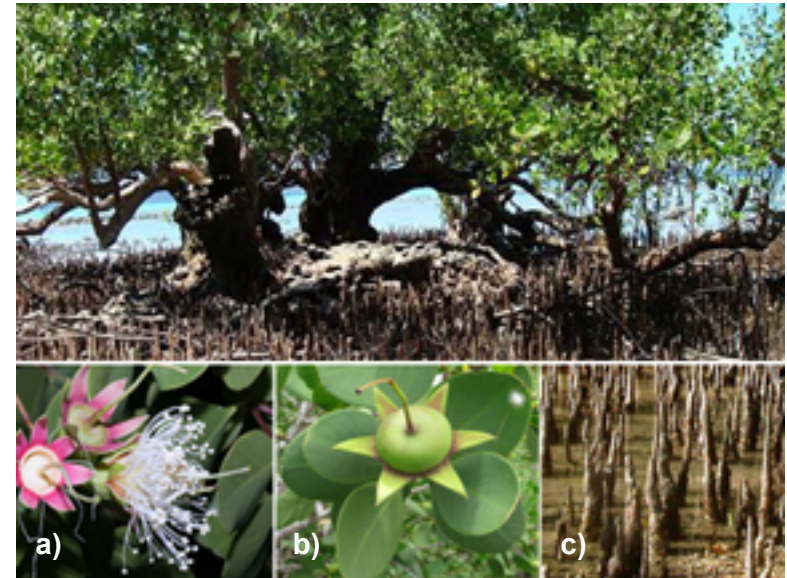


## 2. Identify mangrove species to use

- Selection will be based on naturally occurring mangrove species and mother trees in the area



Bungalon/Api-api (*Avicennia marina*): (a) flower (b) fruit (c) roots



Pagatpat/Pedada (*Sonneratia alba*): (a) flower (b) fruit (c) roots



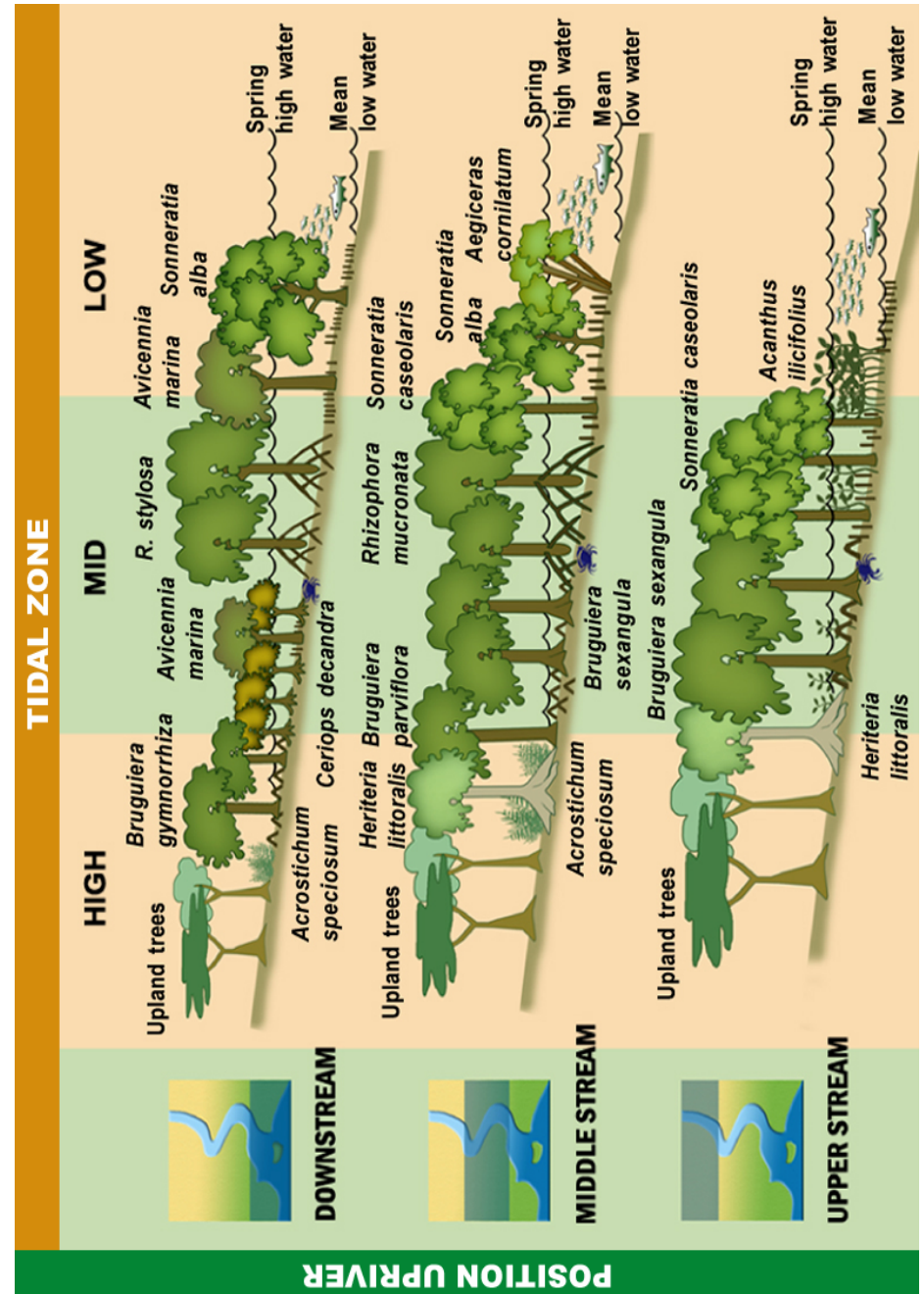
Bakhaw (*Rhizophora* spp.): (a) flower (b) fruit (c) roots

- It will also depend on the substrate, tide elevation, and salinity (Refer to Table 1 & Figure 1)

Table 1- Mangrove Species Matching with Substratum Type and Zone Location

SPECIES	LOCAL NAME	TYPE OF SUBSTRATUM AND ZONE LOCATION
<i>Avicennia marina</i>	bungalon/api-api	Varied substrates, frontliner (usually sea front; can tolerate wide salinity range)
<i>Avicennia alba</i>	bungalon puti	Sandy-muddy substrate, front liner (usually sea front; can tolerate full seawater salinity). Sometimes can be found within the influence (mouth) of rivers
<i>Avicennia officinalis</i>	api-api	Stiff soil on river banks
<i>Sonneratia alba</i>	pagatpat	Loam to sandy substrate, front liner (usually sea front; can tolerate full seawater salinity). Can be found some distance from river banks
<i>Rhizophora mucronata</i>	bakhaw babae/ bakawan babae	Deep mud within the influence of rivers and along riverbanks. Prefers brackish water, not found on sea
<i>Rhizophora stylosa</i>	bakhaw/bakawan bato	Sandy substrate, prefers more sheltered sites. Found behind <i>A. marina</i> and <i>S. alba</i>
<i>Rhizophora apiculata</i>	bakhaw lalaki/bakawan lalaki	Sandy to muddy substrate, prefers more sheltered sites such as lagoons or behind <i>A. marina</i> - <i>S. alba</i> zone or along riverbanks.
<i>Bruguiera</i>	busain	Loam or sandy mud
<i>Excoecaria agallocha</i>	buta-but	Clay, often behind <i>Lumnitzera racemosa</i>
<i>Heritiera littoralis</i>	dungon-lati	Sandy loam, river banks and inland edge of mangrove

Figure 1 - Mangrove Zonation in the Tidal Zone



### 3. Preparation for Outplanting

- Clear the site of unwanted vegetation, debris / trash
- Put temporary physical structures made from natural materials (e.g. barriers, fences, breakwaters, etc.) to protect the plantation from waves and trespassers



- Plan the seedling density and spacing pattern by drawing it on a map (Inner sites along the seafront with little wave action can be planted at 1.5-2 m intervals. Seaward sites exposed to frequent wave action and debris brought by the incoming tide need to be planted at closer intervals of 0.5-1 m and/or in clusters of 2-3 seedlings each)
- Plan schedule for outplanting during season of least wave action. Consult a tidal calendar or tide table for daytime low tides. The ideal tide level for mangrove activity is 0.4m or lower. If the tide allows, plant in the early morning or later in the afternoon when temperatures are not too high
- Prepare the following materials (in numbers proportional to area / no. of planters:
  - o shovel, digging blades and trowels
  - o meter stick

- o nylon rope (preferably knotted with 1-meter interval)
- o bamboo stakes 1m long
- o pre-cut tie strings or plastic straws, ~20 cm long
- o seedlings (wildings not more than 40 cm, preferably 10-30 cm tall with at least 6 leaves or nursery-reared with 4-6 leaves for direct planting)
- o seedling carriers (plastic crates or sacks with sides attached to two bamboo poles)
- o large plastic trash bags
- o pen/pencil and notebook
- o camera (optional)
- o Global Positioning System (GPS) device, if available

- Give introductory lectures to volunteers about the importance of mangroves, proper field attire, species to be planted and planting steps to follow (Refer to the IEC materials downloadable at the PCGA website: [www.pcgauxiliary.com](http://www.pcgauxiliary.com))

### 4. Sources of Propagules

- Wildings-found at the base of mother trees



- Nurseries organized with the coastal communities which can also be an alternative source of income



- Seeds collection from mother trees or beach strands



#### a. When collecting wildings:

- Select those with **4-6 leaves**
- Use 4x4x10 inch plastic bag
- Fill up the plastic bag with at least ¼ of the substrate



- Dig up the wilding together with the attached ball of soil
- Place the collected wildings in your nursery until they are stable if will not be used for direct planting
- Make sure not to expose the roots of the wildings during collection



#### b. Steps in Seed Propagation for *Sonneratia alba*

1. Collect mature, viable fruits from identified parent trees.



2. Extract the seeds by macerating and soaking in fresh water or rainwater. Discard non-viable floaters and collect viable seeds (those that sank)
3. Dry for no more than 2 hours under direct sunlight





- The seeds are sown on a thin layer of mud lined below with canvas, are germinated and after 3-5 days, are removed and broadcasted on a suitable substrate (e.g. abandoned ponds at ~50 seedlings/sq.m).



- After 4 months, the seedlings are mudballed (removed with soil and roots system intact) for transplanting nearby or for transport to other rehabilitation site.
- For nursery (bagging) operation, transplant the seedling one to two weeks or when the seedlings have at least 2-3 leaves. Allow them to grow for 4-5 months, regularly watering them with mud and saltwater, before outplanting.
- When planting in seaward areas, start from the last existing mangroves and extend up to 5 meters only. Consider planting smaller seedlings adjacent to existing mangrove while taller seedlings in seaward areas. Remove plastic bags and dispose them accordingly.
- Protect and monitor the planted seedlings regularly (at least every 3 months).

## 5. Planting steps

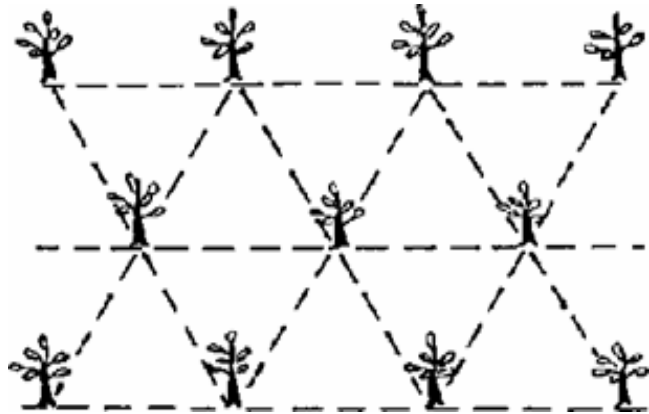
- Prior to planting, brief volunteers on the basic procedures, safety and disposal of trash from the activity.



- Mark parallel rows with 1m distance intervals for seaward sites using a meter stick or 1.5 - 2 m intervals for abandoned ponds. *(Tip: Use a nylon rope knotted with pre-measured 1 m intervals for quick marking)*, For enrichment planting of sparse mangrove sites, give at least 2 sq m wide distance between open/ vacant spaces.



- c. Within the same row, mark out 1, 1.5 or 2 m distances with bamboo stakes. Alternatively, seafront planting may use clusters of 2-3 instead of single seedlings. Plants in consecutive rows should be offset by 0.5-0.75 m to create a zigzag pattern for the columns.



- d. Next to the stakes, dig holes about 30 cm (= 1 foot) deep using a shovel or a digging blade. For direct planting, place the wilding together with the attached ball of soil inside the hole and fill up with soil up to the same level as the ground.



- e. If potted seedlings are used, even in replacing dead propagules, select those with 4-6 leaves. Dig holes deep enough (1 foot) using a long, heavy and pointer pole. Remove the plastic and slowly bury the seedling with the soil attached. Fill up with soil up to the same level as the ground to stabilize the newly-planted seedlings.



- f. For seafronts and on muddy substrates, place a bamboo stake securely beside the plant and tie it just loose enough (to avoid breakage) at mid-stem to the stake for support, e.g., during strong wave action.



- g. For frontline species, like *Avicennia* (bungalon/api-api) and *Sonneratia* (pagatpat) species, protective structures or barriers made of rocks or closely spaced bamboo poles are important. Such barriers also help in soil accretion, further enhancing plant growth.



- h. For *Rhizophora* spp. (bakauan) planted behind rows of *Avicennia* and *Sonneratia* species, direct seeding is recommended.

The brownish cap at the top of the propagule is removed and burrowed at 4-7 cm deep or one-fourth to one-third of the total length of the body (hypocotyl).



Rhizophora propagules reared on polybags

- i. Collect discarded polybags and other garbage inside a large trash bag for proper disposal.

## 6. Maintenance and Protection

- Visit the site regularly to monitor the growth of the seedlings.



- Maintain the cleanliness of the plantation by removing debris that might hamper the growth of the seedlings.



- Replace dead seedlings to maintain the spacing of the plantation. Replace fleshy, discolored and barnacle-covered propagules or seedlings at once and discard far from the plantation.



- With the use of knife, scrape off the barnacle attached to the propagules/seedlings. Handpick pests found infesting the seedlings.



- Post warning signs in the plantation to drive away unauthorized persons.



### Sample Budget (Outplanting)

Materials	Quantity	Cost
Seedlings		
• Avicennia marina (piapi/bungalon)	10,000	Free
• Sonneratia alba (pagatpat)	10,000	free
Coconut husk/Plastic bags		3,000
Strawless/Swak	10 pcs	1,000
Transportation		5,000
Labor		Volunteers
Food		5,000
<b>TOTAL EXPENSES</b>		<b>14,000</b>

### Sample Schedule

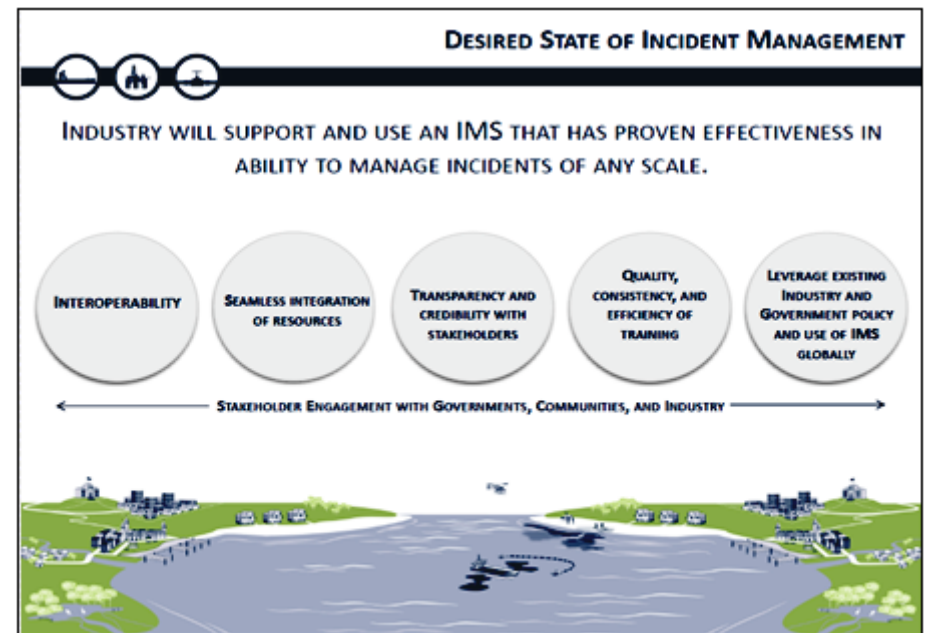
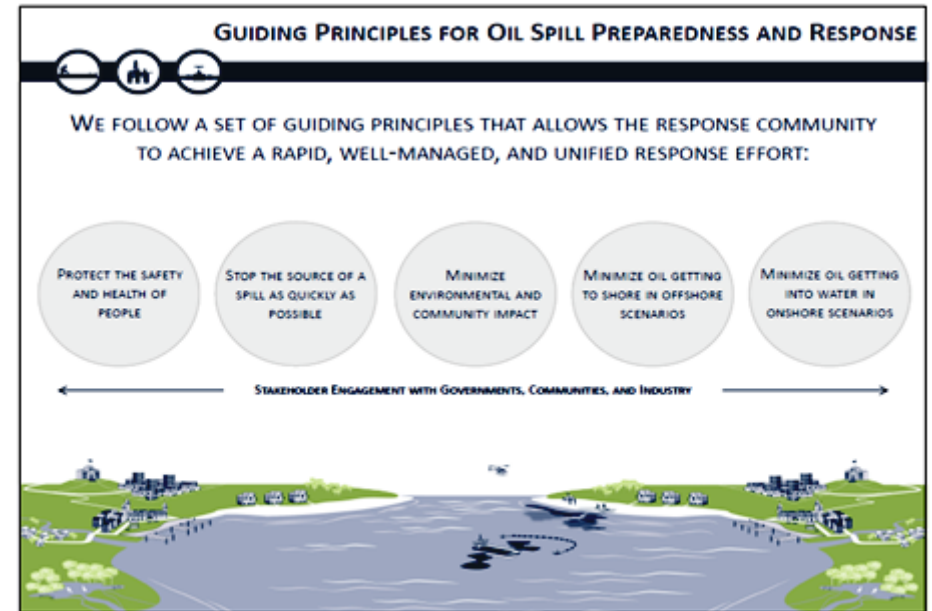
Activity	Time Frame	Responsible Group/Person	Budget
Site Preparation	June-July	PO	
Collecting of seeds	Year round	PO	
Bagging/Re-bagging	June 2015-Dec 2016	All sectors in community	
Outplanting	October 2015	All sectors in community	

## SECTION 4 OIL SPILL RESPONSE



Oil spill may come from a sunken ship, broken oil depot pipes and other sources. This incident can ruin the livelihood of coastal communities.

Hazardous chemical spill may not only affect the environment but the human and animal health as well.



Source: National Oil Spill Contingency Plan (NOSCOP), PCG

### STAKEHOLDER ENGAGEMENT

STAKEHOLDER ENGAGEMENT WITH GOVERNMENTS AND COMMUNITIES IS ESSENTIAL BEFORE, DURING, AND AFTER A SPILL, AND INCLUDES:

- THREE-WAY COMMUNICATION BETWEEN INDUSTRY, GOVERNMENT, AND THE COMMUNITY
- UNDERSTANDING OF STAKEHOLDER PRIORITIES
- A SHARED VIEW OF THE SITUATION
- TRANSPARENCY OF DECISION-MAKING
- COLLABORATION WITHIN AN INCIDENT MANAGEMENT SYSTEM

### REQUEST OF STAKEHOLDERS

FOR SUCCESSFUL IMPLEMENTATION OF THE OIL SPILL PREPAREDNESS AND RESPONSE FRAMEWORK – AND TO EFFECTIVELY PROTECT OUR SHARED VALUES – WE REQUEST THE FOLLOWING OF GOVERNMENT AND COMMUNITY STAKEHOLDERS:

PRE-APPROVE RESPONSE STRATEGIES

HELP OVERCOME BARRIERS DURING A RESPONSE

LEVERAGE INDUSTRY EXPERTISE AS WE WORK TOGETHER

Source: National Oil Spill Contingency Plan (NOSCOP), PCG

### Preparing for Improvised Booms:

- Coastal communities which experienced oil spill in their area use bamboo poles, sacks, coconut husks, corncob or husk or banana trunk to contain oil spill

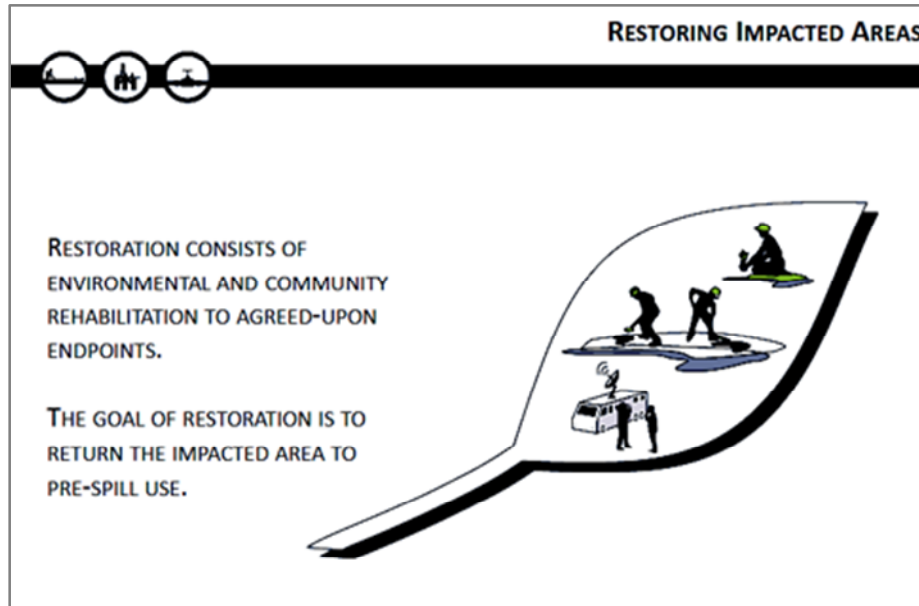


### INDUSTRY'S RESPONSES TO OIL SPILL: ON SHORE

1. Shoreline flushing or washing- water hoses can rinse oil from the shoreline into the water where it can be easily collected
2. Booms-long floating interconnected barriers used to minimize the spread of spilled oil



3. Vacuums-industry sized vacuum that can suction oil from the shoreline or on the water surface
4. Sorbents-specialized absorbent material act like a sponge to pick up oil but not water
5. Shoreline cleaners or Biodegradation Agents-chemical cleaners that act like soaps but requires special permission
6. Burning- "in situ" burning of freshly spilled oil
7. Manual Removal-clean-up crews with shovels and other hand tools removing the spill
8. Mechanical removal- heavy machineries are used



Source: National Oil Spill Contingency Plan (NOSCOP), PCG

## GUIDELINES FOR COASTAL COMMUNITY AUXILIARIST OIL SPILL REPOSE

1. Immediately report to the Philippine Coast Guard any oil spill observed along the shore and at sea . (fisher folks on their fishing vessels)
2. Inform your division or squadron and director auxiliary district of the updated status of the incident.
3. Be ready to render assistance as a division or squadron to the PCG if required to do so.
4. Alert the community and have the improvised booms on standby for possible deployment to prevent the spill to reach the shoreline or other sensitive areas of the community.
5. Assess and prioritize areas in your community to protect from oil spill (corals, beaches, mangrove forest, MPA)
6. Unless otherwise declared by the authorities, consider all oil and chemical spills as hazardous and toxic.
7. Assist in the restoration of the affected areas in the community
8. Submit post-op reports signed by your partner CG Station.

\*Observe SAFETY FIRST AT ALL TIMES

Source: National Oil Spill Contingency Plan (NOSCOP), PCG

## REFERENCES

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## UNDER THE LEADERSHIP OF:



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