Guides to teachers

For the presentation :

THE IMPORTANCE OF MANGROVE

BY Foong Swee Yeok

Slide 2

- Introduction
- Mangroves are dominant coastal ecosystem in the warm tropics.
- Mostly flourish in the sheltered coast.
- Worldwide record of total number of mangrove species is around 114.
- Malaysia has 104 species and is one of the highest diversity spot for mangrove after Indonesia.

Slide 3

- Mangroves are constantly exposed to environmental stresses.
- Photo shows here is a baby Sonneratia tree (Berembang) totally submerged under a rising tide.
- Other challenges face by mangrove trees are:
  - Daily cycles of flooding by tidal water
  - Different level of salinity
  - Soft and anaerobic soil condition
  - Wave impact
  - Scorching sun
- Mangrove are called “HALOPHYTES” or salt tolerant plant.

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- To live in such harsh environment, mangrove have morphological features & adaptive mechanisms to survive:
  - Special root systems to provide better anchorage and stability
  - Photos in Slide 4 shows the PROP/STILT root of the *Rhizophora species* (example: Bakau Minyak & Bakau Kurap).

Slide 5

- Photos show the “Kneed roots” of *Bruguiera* (example: Bakau Putih/Berus & Tumu Merah) & *Ceriops* (example: Tengar).
- Plank roots of *Xylocarpus* species (example : Pokok Tengar).

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- Photo shows the finger like pneumatophores roots of *Avicennia* (Pokok Api-Api).
- *Avicennia* are the group of trees that thrive at coastal front and usually act as pioneer to reclaim land from sea.

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- Lenticels are the breathing pores on aerial roots and stems of mangrove trees. These lenticels help the plant to breath when tidal water is high.

Slide 8

- Viviporous is an adaptive feature of mangrove tree to make sure their baby grow as fast as they can in an ever changing coastal environment.
- The seeds germinate while still attach to the mother tree.
- When these seeds drop into the water, it can stay afloat for months and disperse over a long distance (up to 2 km along the coast!)

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- Mangroves play many important roles besides being fascinating to look at:
  - Maintenance of channel depth: Physical and chemical property of the mangrove roots and soil make it easy to trap and retain silt (very fine grain of sediment). This is important as all these silt will not end up accumulate at the bottom of rivers. (In another words, mangroves that grow along the river bank help to prevent shallowing of river.) Fishermen rely on the use of boat to move up and down the river so it's crucial to maintain the channal depth.

Slide 10

- Mangrove has very high growing rate. This help to absorb pollutants (excessive nutrients from adjacent land, example: over fertilized farm land).
- Mangrove roots help to trap and stabalise sediment, so the river water is less turbid. This aspect is important for the growth of phytoplankton (that needs clear water for better sun light penetration). And phytoplankton is the primary producer in aquatic ecosystems.

Slide 10 - continue

- Photo on the left in Slide 10 shows the experiment set up to study how mangrove seeds absorbed and used nutrients.
- Photo on the right shows how decomposed mangrove leaves return the nutrient back into the food webs in a coastal ecosystem.

Slide 11

- After the 2004 Indian Ocean Tsunami, many focused on the role of mangrove as buffer to protect the coast. Researchers showed that mangrove might have limited protection value at high tsunami impacted site as shown in the photos (Acheh, Indonesia on the right; Bangladesh on the left).

Slide 12

- However, in moderate to low Tsunami impacted areas (such as the west coast of Peninsula Malaysia), mangrove is proven to be a life saving belt that prevents lost of human lives and property.
- Photo in Slide 12 shows the massive underground root systems of mangrove trees that is very efficient in trapping and stabalising the coastal soil. Mangrove tree canopy also helps as wind breaker during storm events.

Slide 13

- The importance of mangrove as coastal protector is demonstrated in Penang: the enlarged Photo shown here the coastal area of Balik Pulau.
- The prawn aquaculture ponds at the left bottom of the picture (150 meter of mangrove belt) were totally damaged in 2004 Tsunami; whereas the ponds further north that had a 680 meter of mangrove buffer suffered no lost in the same event.

Slide 4

- Beside this, a well managed mangrove ecosystem (such as the Matang/Kuala Sepetang Mangrove off coast from Taiping) could generate good revenue in terms of charcoal production in a long run.
- In Matang Mangrove forests, wood harvesting on a rotation basis and couple with sound replanting scheme ensure sustainable use of this precious resource.

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- Mangrove ecosystems are very important as nursery and feeding ground for many important marine species (pomfrets/ikan bawal, mud crab, white prawn..just to name a few!).

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- Two German scientists (Watzke & Lesing,2003) though their work in tracking the movement of fruit bats, shown that mangrove trees provide food in all other months when durian is not flowering. Without mangrove, these bats could not survive and subsequently human will loose these important pollinators that help to fruit important trees such as durian.

Slide 17

- These are the more important direct harvestable from the mangrove
- Of these, blood cockle (kerang) alone in West coast of Peninsula Malaysia (Kedah,Penang, Perak,Selangor) produced more than 40,000 tonnes in 2013. Equavalent to RM68,136,000 of wholesale value in a year.

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- Mangroves and its adjacent mudflats are important nesting and stop-over site for many bird species (migratory and resident).
- The Teluk Ayer Tawar and Kuala Muda coastal area in North Seberang Perai area alone (size around 200 football field) received 12,000-15,000 birds in one migratory season!

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- Mangrove has great ecotourism potential
- MaiPo Mangrove Reserve in Hong Kong charged RM60 per visitor to visit the 250 hectares wetland.

Slide 20

- However, mangrove extent has been rapidly decrease as many still fail to see its importance and values.
- The main destruction of mangrove is conversion into other landuse.
- Shown in picture is the lost of mangrove area in Pulau Redang to a Golf course. The golf course was then closed due to shortage of fresh water supply to maintain the lawn!

Slide 21

- In Northern Peninsula Malaysia, especially in the state of Kedah, many mangrove areas were converted into paddy field.

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- For the past 15 years, mangrove was lost mainly to aquaculture.
- Photo shows the size of one aquaculture pond of around 1 hectare in area.

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- The conversion of mangrove ecosystem to other uses always poses problem due to the acid potential in the soil.
- When mangrove soil is disturbed (i.e. :excavation process to build a pond), sulfuric acid is slowly released from the soil and cause problems such as diseases outbreak and low productivity in prawn ponds and rice fields.

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- And when it is no longer profitable to work on these acid soil, farmers usually abandon the site.
- Unfortunately the first species that naturally fill up these abandoned sites is the invasive fern, Piai Raya.
- These ferns are so massive that mangrove trees are prevented from re-habilitating invaded site without human help.

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- Mangrove is also not spare from being converted to airport, seaport, housing area as its strategic location at the seafront is highly sort after by developer.

Slide 26

- Oil pollution (i.e. release of crude oil from sinking tanker) spells trouble for mangrove along the coast.
- Oil will cover the breathing holes on mangrove trunk and root.
- Take years for mangrove to recover from such environmental disaster.

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- Penang lost more than 60% of its mangrove area since 1960.
- What's left, no matter what is the status of conservation (private land, forest reserve or state land), need to be guarded fiercely.

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- However, most of the mangrove replanting projects at tsunami affected area recorded a very low successful rate (only 5%).
- This is due partly to planting the wrong species at the wrong places.
- For instance, Bakau Minyak trees (a riverine species) are planted at Api-api site that has higher salinity and wave energy.

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- Choosing the right species of mangrove seedlings to plant is crucial.
- Tsunami impacted coasts are usually high in rubble (debris from damaged house).
- As you can see from the photos on the left of the slide, Api-api (*Avicennia* species) thrives better in both substrates that are sandy and high in rubble content, as compared to Bakau Minyak seedlings (*Rhizophora* species).

Slide 30

- This slide shows some idea that could be adopted for mangrove replanting project.

Slide 31

- All these factors have to be investigate before the start of a mangrove replanting projects.

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- Self explanatory

End of Presentation