PUB ACTIVE, BEAUTIFUL, CLEAN WATERS

PRIMARY

Learning Trail

@Sengkang Floating Wetland

TRAINER'S GUIDE

For more information, please visit us at www.abcwaterslearningtrails.sg
or email us at PUB_Learning_Trails@pub.gov.sg.

Contents

Objectives of the Active, Beautiful, Clean (ABC) Waters Learning Trail @ Sengkang Floating Wetland

This place-based inquiry experience aims to help students:

1. Foster a sense of national identity, pride as Singaporeans, and emotional rootedness to the nation.

2. Learn about the Singapore Water Story vis-a-vis Sengkang Floating Wetland. Appreciate Singapore's unique challenges, constraints, and where we have succeeded.

3. Develop leadership skills, instilling core values and the will to prevail, to ensure Singapore's continued success.

4. Understand PUB's ABC Waters Programme which will transform Singapore's pervasive network of drains, canals and reservoirs into beautiful and clean streams, rivers and lakes. By integrating the streams, rivers and lakes with the parks and gardens, new community spaces can be created. These will be bustling with life and activities, and transform Singapore into a City of Gardens and Water, a vision outlined by Singapore's Prime Minister Lee Hsien Loong.

5. Evoke a sense of wonder towards innovations, as students understand water treatment processes that give us clean water.

6. Promote stewardship for our strategic water resource and the need for everyone to play a part to keep our waterways and reservoirs active, beautiful and clean.

Details of the ABC Waters Learning Trail @ Sengkang Floating Wetland

Level: Primary Students (7 – 12 years old)
Programme Duration: 1.5 hours
Ratio of Facilitator to Students: 1 : 10 – 20 students
Recommended maximum group size: 80 students (or 2 classes)
Before the Trip:

- Show students and teachers the preparation brief (Annex 1) to help them prepare. Print these only if necessary.
- Fill in the information required for your Risk Assessment Management (RAM) form. Some information is given in Annex 2.

Educational Approaches

This trail uses inquire-based and experiential learning.

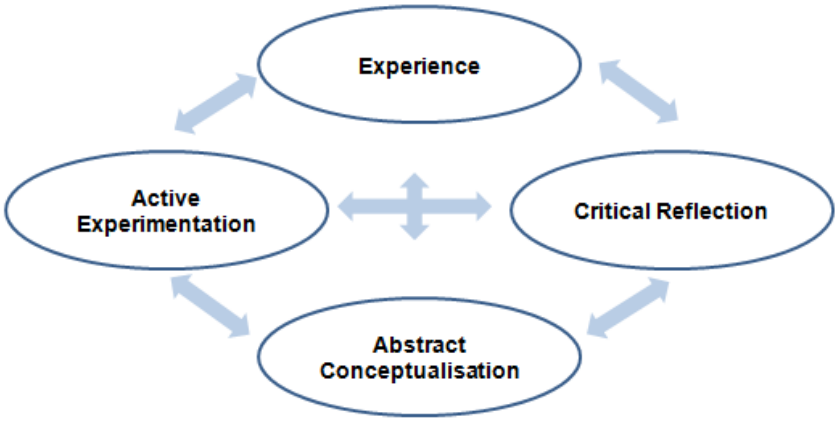
What is Inquiry-Based Learning?
The inquiry-based approach focuses on student constructed learning, as opposed to teacher or guide-transmitted information.

This process aims to enhance learning through:
1. Increased student involvement
2. Multiple ways of knowing

This is achieved by:

- Starting with an open-ended question or demonstration.
- Gather responses and subsequent questions from students with little comment or direction.
- Requiring students to collaborate on designing experiments or methods of inquiry.

What is Experiential Learning?
Experiential learning is the process of making meaning from direct experience.



Before the Trip

- Brief students on the field trip and what to bring and wear. Refer to Annex 1.
- To prepare students, show students the Pack List (Annex 1). Assign students to carry/be in charge of equipment/materials.
- Conduct a reconnaissance of Sengkang Floating Wetland and familiarise yourself with the area and stations.
- Fill in the Risk Assessment Management (RAM) form required by Ministry of Education (MOE). Suggested information is given in Annex 2.
- Inform the relevant authorities – PUB and NParks and make a booking for your school visit.

Wet Weather Procedure

On the day of the field trip:

- Check the weather forecast and lightning status 1 to 2 hours before the Learning Trail begins:
  - Visit the National Environment Agency website www.weather.gov.sg.
  - Dial the lightning advisory number at 6282-6821 (Sector 11 and 16)
- If there is a heavy downpour or the Lightning Category 1 is still not cleared:
  - Do not start the trail
  - Take shelter at the Anchorvale Community Club and conduct the extension learning activity and other indoor activities
- If lightning or heavy rain persists, stop the programme and plan for another make-up session if possible.
- Should a storm be expected during the Learning Trail, bring students back to the Anchorvale Community Club as soon as possible. If it is impossible to reach the sheltered area in time, students should wait under shelters along the trail and move back to indoor area as soon as they can. Conduct the extension learning activity at the Anchorvale Community Club.

Summary of the ABC Waters Learning Trail @ Sengkang Floating Wetland

Station	Duration	Location	Main Points	Subject Links	Page No.	Materials
	20min	Anchorvale Community Club	**Introduction** • Concept of the ABC Waters Programme. • Aims of the ABC Waters Learning Trail. • Our Water Story and the Four National Taps. • "Reservoirs in Singapore" game. • Punggol-Serangoon Reservoir Scheme. • The Water Cycle game. • Hi Trail Detective! • Safety briefing.	**National Education (NE)** – relates to key NE messages i.e. 'Singapore is our homeland; this is where we belong,' and 'No one owes Singapore a living' **Social Studies** – meeting Our (Water) Needs; how people adapt to and utilise the environment **Science** – identify patterns in nature; the water cycle (and the journey of water at Punggol Reservoir) and water treatment process. The importance of the water cycle to sustain life	1-5	Student booklets, long rope, reservoir cards, several sets of Water Cycle cards

Station	Duration	Location	Main Points	Subject Links	Page No.	Materials
1	10min	Viewing Gallery	**What is at Sengkang Floating Wetland?** • Mark the Learning Trail route – map reading, identifying the stations, navigating the site. • Observe and identify features found at Sengkang Floating Wetland. • Concept of ABC Waters Programme and sustainable ABC Waters design features.	**Science** – process skills (observing, inferring) **Others** – reading maps, navigation **Social Studies** – Singapore's progress: use of an engineered system in the form of this constructed floating wetland to cleanse reservoir water and improve water quality	6	
2	15min	Pedestrian bridge to Floating Wetland	**Physical Conditions at Sengkang Floating Wetland** • Take the air temperature. • Collect water from the reservoir and test for the following parameters – temperature, smell, colour and clarity. • Salinity is an optional parameter to test. • Evaluate water quality at the reservoir. • Relate water quality to water supply to homes and industries and for supporting aquatic life.	**Geography** – physical conditions of water in relation to biodiversity, habitats of aquatic life and fauna surrounding the waters; process skills (observing, comparing, using apparatus, analysing, inferring)	7	Pail (with rope attached), thermometer / data logger with temperature sensor (if available), turbidity discs, containers to hold water / biodegradable cups

Station	Duration	Location	Main Points	Subject Links	Page No.	Materials
3	20min	Rain Shelter / Educational Panels / Viewing Deck / Floating Wetland / Floating Boardwalk	**The Floating Wetland / Animals at Sengkang Floating Wetland** • Get up close and observe Sengkang Floating Wetland. • Build-A-Floating-Wetland activity to better understand the main parts and functions of the Floating Wetland. • Link the function of the floating wetland to the ABC Waters Programme concept. • What the floating wetland provides for animals. • Recognise some wetland plants and their uses. • Observe animals at and around the wetland.	**Science –** diversity of flora and fauna, habitat of plants and animals (at the Floating Wetland); process skills (observing, classifying, inferring functions of plant species)	8-11	Several sets of Build-A-Floating-Wetland coloured paper cut-outs Optional: nature guide books/cards
4	15min	End of the Floating Boardwalk / Edge of the Park	**Plants at Punggol Reservoir** • Look for the surrounding mangrove plants and fruits trees. **Keeping Punggol Reservoir Active, Beautiful and Clean** • Observe and identify human activities and their impact at Sengkang Floating Wetland.	**Science –** diversity of flora, habitat of plants at and surrounding the Floating Wetland **Geography –** habitats and man's impact on nature and the environment; science process skills (observing, inferring)	6, 12	

Station	Duration	Location	Main Points	Subject Links	Page No.	Materials
	10min	Anchorvale Community Club	**Debrief and Reflection** • Review and discuss all observable human impact at Sengkang Floating Wetland. • Recap the Journey of Water and how activities in urban areas can affect our water supply. • Share with your group what people can do to keep Punggol Reservoir active, beautiful and clean. • Reflections on their role as a responsible member of the community	**Science** – man's impact on the environment; the water cycle; science process skills (inferring, generating possibilities); attitude and ethics; relationships within the community – food chains and web (extension activity) **Social Studies** – identify; culture and community **National Education** – relating to the message 'We have confidence in the future'	5, 13-15	
Total Duration: 1 hour 30min						
EXTENSION ACTIVITY						
-	30min	As preferred	**Sengkang Floating Wetland Food Chains and Food Web** • Relationships within the community – food chains and web. • Man's inter-relationship with nature and the ecosystem.	**Science** – relationships within the community – food chains and web; mans' impact on the ecosystem	15	

Lesson Plan for the ABC Waters Learning Trail @ Sengkang Floating Wetland

Introduction

Duration: 20min
Location: Anchorvale Community Club
Learning Points:

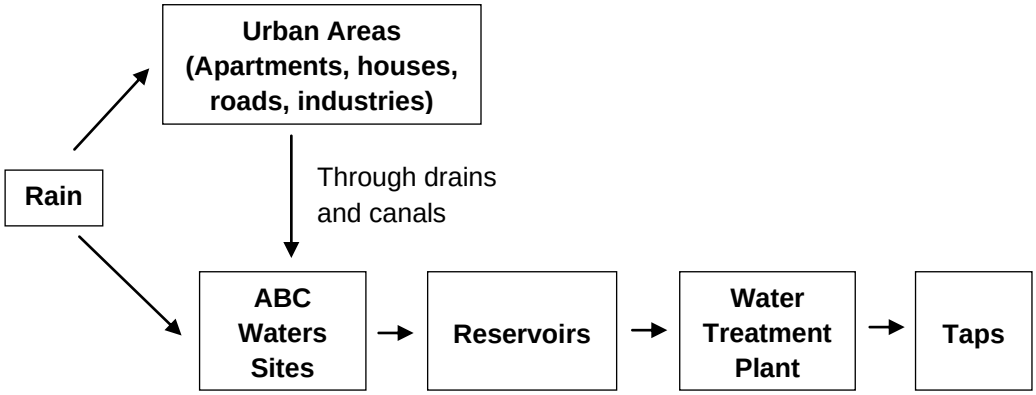
- Concept of the ABC Waters Programme
- Aims of the ABC Waters Learning Trail
- Our Water Story and the Four National Taps
- "Reservoirs in Singapore" game
- Punggol-Serangoon Reservoir Scheme
- The Water Cycle game
- Hi Trail Detective!
- Safety briefing

Trainer's Notes	Cross Reference/ Materials
1. **Welcome** students to Sengkang Floating Wetland. **Distribute the booklets to students** and ask them to write their names.	
2. Explain the **aims of the trail** and the **themes covered**. See page 2 of Trainer's Guide for the aims.	
3. Give students 1-2min to answer the question "Why is water precious to you?" Invite some students to share their answers. Remind them that water is not to be taken for granted.	Pg 2
4. Our Water Story – The Four National Taps • How many sources of water supply does Singapore have? (Four) • Water from our reservoirs represents the first National Tap (Local Catchment Water). Other taps are Imported Water, NEWater and Desalinated Water. • What does "Local Catchment Water" mean? Singapore uses two separate systems to collect rainwater and used water. Rainwater is collected through a comprehensive network of drains, canals, rivers and stormwater collection ponds and reservoirs before it is treated for our drinking water supply.	Pg 3
5. **"Reservoirs in Singapore" game** • Explain that the students will re-create the "Reservoirs in Singapore" illustration on page 3 using a long rope and with students. • Ask for eight students to be volunteers. Distribute the rope and reservoir cards out to these volunteers.	Pg 3

• Students will use the rope to form the outline of Singapore on the ground.
• They hold their reservoir card (e.g. MacRitchie, Marina, Kranji, Pandan, Punggol and Serangoon Reservoirs) and stand in their correct locations on "Singapore Island".
• Explain the concept of PUB's Active, Beautiful and Clean Waters Programme, where waterways and reservoirs which have been transformed into beautiful and clean streams, rivers and lakes, creating a vibrant City of Gardens and Water. At the same time, these new community spaces bring people closer to water so they better appreciate and cherish this precious resource.
• Explain the significance of some of these reservoirs:
  o MacRitchie Reservoir is Singapore's first reservoir.
  o The Punggol-Serangoon Reservoir Scheme which saw the creation of Singapore's newest reservoirs. Punggol Reservoir is the 16th reservoir and Serangoon Reservoirs is the 17th reservoir in Singapore that maximised local catchments by tapping stormwater surface run-off from north-eastern part of Singapore.
 	
6. **Punggol-Serangoon Reservoir Scheme (PSRS)**
• Explain the Punggol-Serangoon Reservoir Scheme (PSRS) and its significance:
  o It is a project to expand Singapore's water catchment area and increase water supply for Singapore.
  o The Scheme started its works in 2006 and was completed in 2011.
  o Together with the Marina Reservoir, these reservoirs have increased the water catchment area from half to two-thirds of Singapore's land area.
  o Punggol and Serangoon Reservoirs are linked by a transfer pipe so water in both reservoirs can be pumped from Punggol Reservoir to Upper Peirce Reservoir for storage. This allows us to realise the potential of collecting more water within the Punggol-Serangoon Catchment.
• Refer to the diagram on Page 4. To create Punggol Reservoir and Serangoon Reservoir, the mouths of **Punggol River** and **Serangoon River** were dammed up. Identify how many dams were needed. (**Five**.)
• Explain that in the past, around the mid of the 19th century, there were rubber plantations and pig farms in the area around Punggol River. Today, most of these farms have given way to the high-rise residential housing.
• Emphasise the role that individuals must play in the water cause. We can all play a part by not dirtying our waterways. Remind students that litter thrown in Sengkang and Punggol can potentially be washed into drains when it rains and end up in Punggol Reservoir.
 	
7. **The Water Cycle game**
• Distribute a set of the 'Journey of Water' cards to each team. See Annex 3.
	Pg 4

- Ask students to form teams to arrange the 6 cards to show the journey of water and what happens to rain in that area.
- Use the 'Journey of Water' diagram on Pg 5 to run through the answer.

Pg 5



8. Explain that they will be **Trail Detectives** with two stations to visit.
   - They are to observe things and answer questions in the booklet.
   - The map on Page 6 shows the location of each station.
   - One task is to draw or photograph two things along the trail.

Pg 6

9. **Conduct a safety briefing:**
   - Students should inform you or their teacher if they are not feeling well, or if they have been injured, bitten by an animal (monkey) or stung by an insect.
   - They need to look out for potentially dangerous animals like snakes, scorpion, centipede and move away from them if these are encountered.
   - They are not to enter the reservoir or pollute it.
   - They need to be aware of weather changes and listen to you or their teacher for instructions. Should there be an impending thunderstorm (lightning category 1 warning), the learning trail will be stopped and students will be asked to return to the Amenities Centre.

10. Give students 3 min of preparation time to:
    - Apply mosquito repellent
    - Use the washroom
    - Buy a drink or drink water

11. Start the trail – lead students to the first station (Viewing Gallery).

Station 1: What is Sengkang Floating Wetland?

Duration: 10min
Location: Viewing Gallery
Learning Points:

- Mark the learning trail route
- Concept of the ABC Waters Programme
- Observe and identify features found at Sengkang Floating Wetland

Trainer's Notes	Cross Reference/ Materials
1. Bring students to the Viewing Gallery. 2. Ask the students to **begin tracing the learning trail route**. Refer to the map on Page 6. • Where was the starting point? (Anchorvale Community Club.) • Mark "Start" over Anchorvale Community Club on the map. • Where are you now? (Station 1: Viewing Gallery.) • Trace the route taken so far, and continue for the rest of the trail. 3. **Observe and identify features at Sengkang Floating Wetland.** • Which main features can you spot? Tick those you can spot. • Explain a few of these features: o Viewing gallery – A space for holding events and for people to rest and enjoy nature. o Pedestrian bridge and floating boardwalk – Connecting Anchorvale Community Club to the Sengkang Riverside Park. o Floating deck – A fruity theme is reflected in the mangosteen pavilion and orange-shaped seats. • Sengkang Floating Wetland is a project under the ABC Waters Programme. 4. **Concept of the ABC Waters Programme** • What does ABC Waters Programme stand for? (**Active, Beautiful, Clean Waters Programme)** • What is the ABC Waters Programme? (To change our reservoirs and waterways to places where people can enjoy and for community bonding) Additional information: • Singapore has 17 reservoirs, 32 major rivers and more than 7,000 km of canals and drains for our water supply and drainage. • The ABC Waters Programme will see the transformation of our waterways and drains into beautiful lakes and streams. Over 100 projects will be realised in the next 10-15 years.	Pg 6 .

5. **Bring students to Station 2 (Pedestrian Bridge).**	

Station 2: Physical Conditions at Sengkang Floating Wetland

Duration: 15min
Location: Pedestrian Bridge to view the Floating Wetland
Learning Points:

- Measure the temperature of the air
- Collect water from the reservoir and test for some water parameters
- Evaluate water quality at the reservoir
- Relate water quality to water supply and aquatic life

Trainer's Notes	Cross Reference/ Materials
1. Bring students to the pedestrian bridge that leads to the Floating Wetland. 2. Observe the reservoir water below. Explain that at Station 2, the students will **use their senses and apparatus to study what the physical conditions** are like at Punggol Reservoir. 3. **Measure the temperature of the air** using a thermometer or data logger. 4. **Collect water from the reservoir and test for some parameters – temperature, smell, colour and clarity** • Tie the pail to the railing of the bridge. Collect some reservoir water to fill the water containers or biodegradable cups. • Ask students to sit in their teams and distribute a cup to each team. Use the thermometer or data logger to measure the temperature of the water in one cup. • Give teams 5 minutes to carry out the rest of the observations and fill in their findings on Page 7. 5. Gather under the shade to **evaluate Punggol Reservoir's water quality**. • **Temperature** – 28 – 30^{o}C. o Ask students what affects the temperature of the water. (Weather conditions, rain.) o Ask students what the temperature of water affects. (The amount of oxygen water can hold depends upon temperature – more oxygen can be dissolved in colder water) • **Smell** – There should not be any bad or foul smell. o No bad or foul smell has been observed at Punggol Reservoir. o Different types of algae growth can generally cause water to smell fishy, mouldy, grassy or even like cucumbers. • **Colour** – The water should be colourless or slightly green. o Due to the presence of some algae, the colour may be slightly green, which is normal in reservoirs.	Pg 7 Materials: pail attached with a rope, thermometer/ data logger with temperature sensor, turbidity discs, water containers/ biodegradable cups

- **Clarity** – The water should be clear, where most, if not all, of the numbers on the turbidity disc can be seen clearly.
    - There may be high turbidity as sediment levels entering water bodies during rain storms due to storm water runoff.

- The **overall quality of water** is generally good – within normal range.

6. What are some **limitations** of this measurement? (Only one measurement at one time. A better test would involve water testing at various points or locations along the reservoir, testing from different depths, time of day, etc.)

7. Where does the water in Punggol Reservoir come from? (The urban catchment. The **rain** that falls on the reservoir, as well as into the **drains within the Punggol and Sengkang housing areas**.)

8. **Relate water quality to water supply and aquatic life.** Why do we need to keep the water in our reservoirs and ABC Waters sites clean? (It is our water supply and the water here helps to support aquatic animal and plant life.)

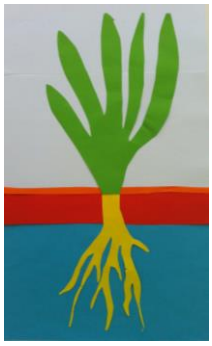
9. **Bring students to Station 3 (Rain shelter / Educational panels about the wetland).**

Station 3: The Floating Wetlands in Singapore / Animals at Sengkang Floating Wetland

Duration: 20min
Location: Rain shelter/ Educational Panels / Floating Deck/ Floating Boardwalk
Learning Points:

- Understanding the parts and functions of the floating wetland, and linking these to the concept of ABC Waters Programme
- What the floating wetland provides for animals
- Recognise some wetland plants (their adaptations and uses)
- Observe animals at and around the wetland

Trainer's Notes	Cross Reference/ Materials
1. Bring students to the rain shelter where the educational panels about the wetland are located.	
2. **Introduce the Sengkang Floating Wetland** • **Singapore's largest** floating wetland • Made up of 8 floating mats grown with special plants that clean the reservoir water by **absorbing extra nutrients and pollutants**. • 18 species of emergent plants with their roots growing on the floating mats and penetrating into the water. Their stems, leaves and flowers are above the water surface.	Pg 8,9
3. **Build-A-Floating-Wetland activity** • Distribute a set of five coloured paper cut-outs to each team. Explain that each cut-out represent a different part of the floating wetland. • You may make colour copies of coloured floating wetland parts in Annex 4. Cut out the coloured pieces to make sets for the desired number of teams. • Each team is to arrange the cut-outs to show what the cross-section of the floating wetland looks like. An example is shown on the right. • Students may refer to the poster or to Page 8 for clues on the different parts and functions of a floating wetland. • Check the floating cross-sections created by the teams and discuss the parts and functions of the floating wetland.	Several sets of Build-A-Floating-Wetland coloured paper cut-outs Pg 8



Coloured paper cut-out	Main Parts	Function(s)
Green	Wetland Plants	Clean the water, provide shelter and food for animals, and beautify the reservoir.
Orange	Planting	Made of coconut fibres to support and

	Media	anchor the plants grown on the floating mat.
Red	Floating Mat	Made of recycled plastic fibres so it can provide buoyancy for the wetland plants.
Yellow	Plant Roots	Clean the water by absorbing nutrients and the micro-organisms growing on them help to break down pollutants.
Blue	Water	Provide water for Singapore and wetland plants

4. **Discuss the functions of the floating wetland**. Pg 8
   - **Beautifies** the surroundings.
   - **Cleans** the reservoir water.
   - Provides a **habitat** for animal communities.

5. **Reiterate the aims of the ABC Waters Programmme** in keeping our water bodies **active, beautiful and clean**. Does the Sengkang Floating Wetland fulfil its aims? Pg 9

6. **What are the three things that the Floating Wetland can provide for animals?** Pg 9
   - Shelter (from predators, weather conditions.)
   - Food
   - Breeding grounds

7. Ask students to **point out the 5 wetland plants** featured in Page 9. They should tick the ones they can spot. Ask them if they know the **uses for some of these plants**: Pg 9
   - **Fragrant Pandan** – Used to flavour desserts.
   - **Mangrove Ferns** – The young shoots can be eaten raw as a salad or cooked. The leaves are also used as cattle feed. Older leaves when dried are parchment-like and used as fire-resistant roof thatch. The fibers of old leaves may also be used to make cord.
   - **Papyrus Reed** – Used in ancient paper-making.
   - **Umbrella Plant** – Used in water gardens and as a potted plant.
   - **Water Canna** – Used to decorate water gardens and ponds as they have brightly coloured flowers.

8. Bring students to the fruit-themed floating deck and pavilion.

9. Along the trail, ask the students to **spot and record animals that live in the reservoir and on the floating wetlands.** Pg 10-11
   - Tick the animals they see on Pages 10 and 11.
   - The animals are classified into two groups – invertebrates (animals without backbones) and vertebrates (animals with backbones).
   - Point out some animals around you and help identify them using nature guide books, if available.
   - Stop to observe interesting animal behaviours, if any.

10. Highlight that the **floating wetland has become a home** to some of these animals (e.g. birds, snails, dragonflies). **11. Bring students to Station 4 (End of the Floating Boardwalk / Edge of the Park).**	

Station 4: Plants at Punggol Reservoir

Duration: 15min
Location: End of the Floating Boardwalk / Edge of the Park
Learning Points:

- A fruity theme
- Look for mangrove plants and fruit trees

Trainer's Notes	Cross Reference/ Materials
1. Bring students towards the end of the bridge where they can have a better view of the mangrove plants.	
2. Explain that **mangrove plants that were on the banks of Punggol River** still continue to grow there even after the transformation to Punggol Reservoir.	
3. Ask the students to **identify and point out the three types of mangrove plants** featured on Page 12. Tick those they see. • **Bakau** – prop roots that support the plant in the mud and absorb air. • **Api-Api Putih** – pencil roots that stick out of the mud and absorb air. • **Sea Hibiscus** – heart-shaped leaves and yellow flowers.	Pg 12
4. **Discuss what visitors can do at the park**. (Jogging, exercising, enjoying the outdoors, picnicking, etc.)	
5. Highlight that **the Sengkang Floating Wetland has a "fruity" theme**. • Sengkang Floating Wetland features orange and mangosteen structures • The park located behind the Floating Wetland is also planted with many edible **fruit trees (e.g. mangosteens, pineapples, mangoes.)**	
6. Students are to **record some of the fruit trees they can see**.	
7. Ask the students to **use the map on Page 6 to retrace their route back** to the Anchorvale Community Club.	Pg 6
8. Explain that there are many facilities around Sengkang Floating Wetland. On the way back, students are to **observe and identify as many human activities in the area**. • On returning to the Anchorvale Community Club, find a quiet shaded spot to conduct a debrief of the Learning Trail.	

Debrief and Reflection

Duration: 10min
Location: Anchorvale Community Club
Learning Points:

- Review and discuss all the human activities observed at Sengkang Floating Wetland
- Recap the Journey of Water and how activities in urban areas can affect our water supply
- What people can do to keep Punggol Reservoir Active, Beautiful and Clean

Trainer's Notes	Cross Reference/ Materials
1. **Discuss the impact of the human activities observed** around Sengkang Floating Wetland. • What types of activities did you observe? (E.g. People jogging, cycling, enjoying the outdoors, walking their dogs.) • Which activities have a negative impact on the reservoir? Why? (E.g. Littering – pollute the reservoir water, skate boarding on the boardwalk – loud noises can scare the fauna at the wetland, feeding the fishes – leftover food can cause algae to grow excessively.)	Pg 13
2. **Recap the Journey of Water.** • For rain that falls over urban areas, how does it end up in the reservoir? (Through drains and canals.) • What happens when we pollute by throwing rubbish and soapy water into canals in our urban areas or neighbourhoods? (The pollution will end up in our reservoirs and dirty our water supply.) • Emphasise the importance of keeping both our urban areas and reservoirs clean to protect our water supply.	Pg 5
3. **Discuss what people can do to keep Punggol Reservoir Active, Beautiful and Clean.** • Active – to involve the community living around Punggol Reservoir in activities in, on and by our waters. (For e.g. leisure activities such as cycling and having picnics, concerts at the viewing gallery, nature walks.) • Beautiful – to ensure the reservoir is kept clean and attractive (e.g. do not litter, do not vandalise the facilities.) • Clean – to ensure that the quality reservoir water is good (e.g. do not litter, do not swim in the reservoir, and do not feed the animals.)	Pg 13
4. **Use the questions listed in Reflection and go through what the students have learnt on this Learning Trail.** • Why is water important? (For survival, showering, cooking, washing our clothes, brushing our teeth, etc.) • How can you make sure that your family and friends do not waste water? (E.g. take shorter baths, re-use water for washing rice and	

vegetables to water home plants, and use the half-flush.) • What have you learnt about wetland plants? (They are plants that can clean the water by absorbing extra nutrients and pollutants.) • What are the most common animals at Sengkang Floating Wetland? (Birds, dragonflies, fish, etc.) • How can you and your friends help to keep the waters in our reservoirs clean? (E.g. throw our rubbish in the bins, do not feed animals and fishes at the reservoir.) 5. **Concluding points for the Learning Trail.** • The importance of the Active, Beautiful, Clean Waters (ABC Waters) programme. • The significance of the Punggol-Serangoon Reservoir Scheme. • The innovative use of wetland plants at Sengkang Floating Wetland. ○ We all need to do our part to care for our waterways and reservoirs and keep them clean.	

Extension Activity: Sengkang Floating Wetland Food Chains and Food Web

Duration: 30min

This can be conducted as a post trip activity or a wet weather programme at the Anchorvale Community Club.

Trainer's Notes	Cross Reference/ Materials
1. Divide the class into small teams to work on the extension activity. 2. Explain that they will form a food web for the community living at Sengkang Floating Wetland by drawing connections for "who-eats-who". 3. First, form three food chains based on the living organisms (plants and animals) spotted along the Learning Trail. For wet weather programme, refer to the plant and animal lists found on Pages 9 - 12. 4. Next, generate a food web by combining the three food chains formed. 5. Discuss the basis of a food chain: Primary producer (make food using sunlight; usually plants) → Primary consumer → Secondary consumer → Tertiary consumer 6. Discuss how the wetland plants are involved in the food web, as well as how the wetland life interacts with and affect each other. 7. If time permits, you can select students to represent each member of the food web and re-create a 'live' food web. Students can hold hands to represent the food chain arrows.	Pg 15

References

- *Water for All: Conserve, Value, Enjoy – Meeting our water needs for the next 50 years.* PUB Public Document.

- Tan Yong Soon, Lee Tun Jean and Karen Tan (2009) Clean, Green and Blue. *Singapore's Journey Towards Environmental and Water Sustainability*, Ministry of the Environment and Water Resource.

Annexes

Annex 1: Preparation Brief for ABC Waters Learning Trail

Suggested What-to-bring List for Students (Print only if you have to)

1. A fieldtrip bag (small bag for items below)
2. Water bottle
3. Insect repellent
4. Raincoat or umbrella (in case of rain)
5. Ziploc bag for waterproofing valuables (e.g. camera, hand phone)
6. A pen, or pencil and eraser
7. Cap

Do not bring:
Digital hand held gaming devices, text books, sports equipment for the fieldtrip.

Optional

- Snacks
- Digital camera or camera hand phone
- Sunscreen

Suggested Attire for Students

- T-shirt
- Shorts, or track pants (lighter colours preferable)
- Covered shoes (no slippers)

Annex 2: Suggested Information for Risk Assessment Management (RAM) Form

Risk Assessment Management System
'W Checklist'

PROGRAMME DETAILS			
Activity:	ABC Waters Learning Trail	**Venue:**	Sengkang Floating Wetland, Punggol Reservoir
Outgoing		**Returning**	
Date:	To be filled by teacher	**Date:**	To be filled by teacher
Estimated Time of Departure:	To be filled by teacher	**Estimated Time of Arrival:**	To be filled by teacher
Person-in-charge:	To be filled by teacher	**Assistant(s):**	To be filled by teacher

LOCAL VENDOR CONTACT DETAILS (IF ANY)			
Company name & full address:	Facilitator's Name Singapore Environment Council 1 Kay Siang Road #04-02 Singapore 248922		
Office number:		**Mobile number:**	HP of facilitator
Contact person:	Facilitator's name		

OVERSEAS VENDOR CONTACT DETAILS (IF ANY)			
Company name & full address:	NA		
Office number:	NA	**Mobile number:**	NA
Contact Person:	NA		

WHY
State learning objectives: This programme aims to: 1. Foster a sense of national identity and emotional rootedness to Singapore 2. Learn about the Singapore Water Story, appreciating Singapore's unique challenges and successes 3. Understand one of PUB's long term initiatives – the ABC Waters Programme, which will transform Singapore's pervasive network of drains, canals and reservoirs into beautiful and clean streams, rivers and lakes 4. Better understand ecological and water topics in the Science syllabus 5. Promote stewardship for our strategic water resource and the need for everyone to play a part to keep our waterways and reservoirs active, beautiful and clean
Does the activity meet learning objectives? (Yes / No)

Note: *Please attach the programme / itinerary.*

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
WHAT (GENERAL)									
1.	**Equipment**								
	a) Appropriate equipment is available.								
	b) Appropriate equipment is serviceable.								
	c) Others :								
2.	**Transport**								
	a) Transportation service is reliable (e.g. driver, vehicle).						To be filled by teacher		
	b) Chartered vehicle is appropriate (e.g. using a 4WD for off-road terrain).						To be filled by teacher		
	c) Others :								
3.	**Food**								
	a) Food is provided by licensed caterer / restaurants.								
	b) Nutrition is appropriate.								
	c) Special dietary needs are met.								

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
	d) If self-catering, additional hygiene measures are in place.								
	e) Water is potable.								
	f) Others :								
WHEN (TIMING)									
4.	**Programme**								
	a) Duration of activity is appropriate (e.g. start/stop/rest time).	Participants tired out from the activity	Dehydration/ Physical exhaustion	2	1	2	- The trail will last for 2 hours in the outdoors, with activity stops at the stations.		
	b) Timing of activity is appropriate (e.g. 5km run conducted before 10.30am or after 3.30pm).	Possible heat injuries due to weather	Dehydration/ Physical exhaustion	2	1	2	- Activities at stations will be conducted in shady areas or under available shelter. - Students will not be under the sun for a prolong period of time. - Students will be reminded to hydrate frequently.		
	c) Possible delay in activity (e.g. day hike extended into night).	NA							
	d) Others :								
WHO (PEOPLE)									
5.	**Teachers and Adult Supervisors**								

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
	a) Teacher(s)/adult supervisor(s) are competent to supervise activity and manage participants (e.g. teacher/adult supervisor: participant ratio met for specific activity, female adult supervisor present for overnight activity involving female participants).	Participants fall sick and need attention/ evacuation	Not enough teachers/ adult supervisors	2	1	2	- Facilitators are experienced in supervising/managing students - Program ratio will be 1 facilitator to 20 maximum students.		
	b) Personnel is certified and competent to conduct activity.	Participants risk possible danger when outdoors	Participants may injure themselves	2	1	2	- Facilitators are experienced in conducting activities for students in indoor and outdoor settings.		
	c) Certified First Aider or paramedic is on site.	Injured students do not get the proper first aid.	Minor injuries could manifest to major injuries if not treated well.	3	1	3	- Facilitators are first-aid certified. (please verify) - Should there be any student who is injured, he/she will be accompanied by a teacher/parent volunteer to the nearest shelter to be attended to by the main facilitator.		
	d) Personnel is competent to co-ordinate/execute emergency evacuation plan (e.g. search and rescue).	Students with serious injuries cannot get to the hospital in time.	Injuries could be life threatening.	4	1	4	- Should there be a medical emergency involving the injured student, the main facilitator will call for an ambulance and the teacher/parent volunteer will		

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
							accompany him/her to the hospital.		
	e) Others :								
6.	**Participants**								
	a) Participants understand the objectives of activity.						- A briefing will be given at the start of the Learning Trail.		
	b) Participants are competent for activity (e.g. participate in pre-activity training).								
	c) Participants are aware of and adhere to safety requirements of activity.						- A SAFETY briefing will be given at the start of the programme. Facilitators will reiterate safety points during the programme, when necessary. - Students will be briefed to react if they encounter potentially dangerous animals e.g. snake, monkeys, etc. - Students will be briefed not to enter water bodies; not cause anyone to fall into the water bodies. - Water collection for testing will not be carried out by students, but only by facilitators or teachers.		
	d) Special needs of participants are met.								

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
	e) Medical declaration and information of participants are documented and disseminated to relevant personnel.						- Teacher/s to inform facilitators about any special cases – students with medical conditions.		
	f) Others :								
WHERE (LOCATION)									
7.	**Venue**								
	a) Accommodation is adequate (e.g. number of rooms).								
	b) Fire safety and evacuation route is communicated to all.								
	c) Area map is available for use during activity.	Students find themselves lost.	Injuries may ensue.	1	1	1	- Map of location is included in the student booklets. These are carried by both facilitators and students during the programme. - Students should be with the facilitators at all times.		
	d) Reconnaissance of area is conducted.	Dangerous hazards appear in between time of recon and actual	Injuries may ensue due to unforeseen hazards.	1	1	1	- Facilitators would have conducted a reconnaissance of the location before the date of the learning trail.		

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
		day							
	e) In-country authorities and facilities (e.g. police, national park rangers and hospital) are accessible and/or contactable for assistance and support in the event of an emergency.								
	f) Water conditions (e.g. tides, currents, flash floods) and traffic (e.g. ships, power boats).								
	g) Others :								
WEATHER									
8.	**Inclement Weather**								
	a) Weather forecast and warning (e.g. lightning, flash flood, hot or cold spell, haze).	Sudden down-pour	Participants get drenched which will cause participants to fall ill eventually.	1	1	1	- Facilitators to check NEA Rain animation and PSI level at these timings: o 2 hours before LT o 1 hour before LT o During LT if needed		
		Lightning	Participants strike by lightning	4	2	8	- Before students board bus for the location: In the case of **impending thunderstorm, heavy rain or**		

S/n	Categories to consider:	Hazards Identification		Risk Evaluation Score			Risk Control: Strategies to reduce risk to an acceptable level	Implementation	
		Possible hazards	Potential incidents/ accidents	Severity (a)	Likelihood (b)	Risk level (a) x (b)		Action Officer	Follow-Up Date
							levels of PSI above 100, it is advised to delay the departure for the location, until Lightning Category 1 is lifted. - If there is **Lightning category 1 or PSI level of equal or greater than 100 during the Learning Trail,** all activities will be stopped and students will be led to take shelter. - If the conditions persist, the programme will be aborted and students brought back to school.		
	b) Others :								

***Note**: Please indicate "N.A." in cells that are not applicable.*

Excursion Checklist		Action Plan	Implementation	
			Action Officer	Follow-up Date
1.	**Communication**			
	a) Establish communication with school and service provider via hand phone, satellite phone and/or other appropriate devices.			
	b) Establish communication with in-country authorities and facilities (e.g. police, national park rangers, hospital) for assistance and support in the event of an emergency.			
	c) Compile contact list of stakeholders (e.g. parents, MFA Duty Office, and in-country medical facilities).			
2.	**Medical**			
	a) Arrange for medical screening and vaccinations for teachers/adult supervisors and participants (if necessary).			
	b) Procure comprehensive travel insurance for all (e.g. International SOS for emergency evacuation).			
	c) Ensure accessibility to medical facilities or personnel in the event of an emergency.			
3.	**Overseas Travel**			
	a) E-register with MFA at least 3 days before departure.			
	b) Monitor and comply with MFA travel advisory on natural disasters, pandemic outbreak, social-political unrest.			
4.	**Others**			
	a)			

Risk Assessment Team comprises:

Name of Officer(s)	Designation

Name of Person-in-charge	Signature	Date

Vetted by:

Name of HOD	Signature	Date

Chief Safety Officer/Principal Checklist

To ensure that the following are completed prior to the programme:

- ☐ Communicate programme details to parents and participants
- ☐ Compile medical information and consent forms
- ☐ Ensure that personnel conducting activity is qualified
- ☐ Ensure that pre-activity training is carried out
- ☐ Ensure that relevant safety and emergency procedures are in place

Submission of Overseas Excursion details to MFA via MFA eRegister (if applicable):

- ☐ Prepare details of itinerary and participants for overseas excursion
- ☐ Enter details for BF01_MFA-MOE form via the Overseas Excursion Management (OEM) Module in the School Cockpit
- ☐ Generate the BF01_MFA-MOE form from the Reports Portal in the School Cockpit
- ☐ Submit BF01_MFA-MOE form as an attachment at www.mfa.gov.sg at least 3 days before departure

Approved by:

Name of Chief Safety Officer/Principal	Signature	Date
Comments:		

Assessment Review:

Name of Person-in-charge	Signature	Date

Annex 3: “Journey of Water” Cards

Rain

Urban Areas

(Apartments, houses, town facilities roads, etc.)

ABC Waters Site(s)

Reservoirs

Water Treatment Plant

Taps

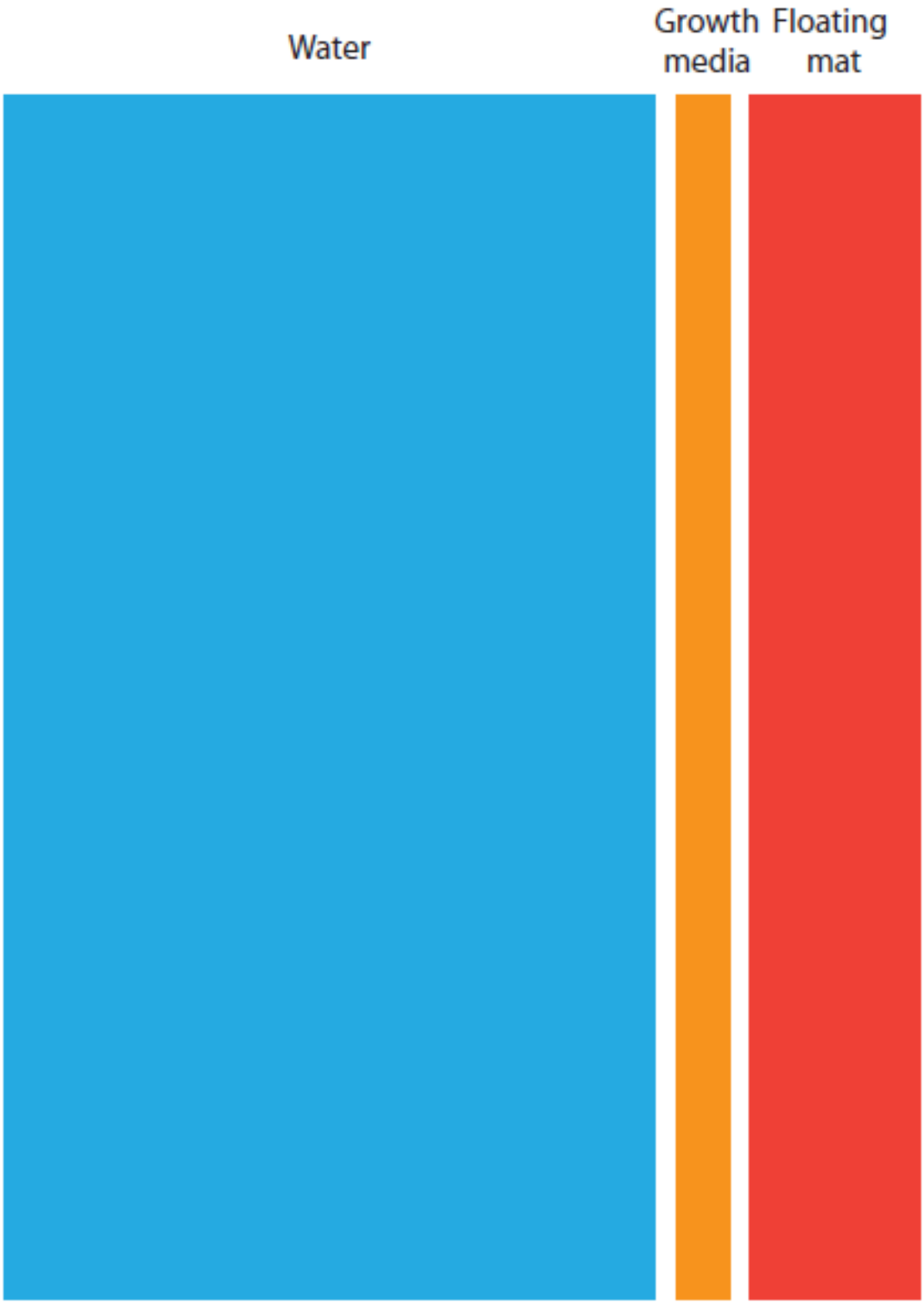
Annex 4: Build-A-Floating-Wetland Activity

Make coloured copies of this template. Cut out the parts to ‘build’ a floating wetland.

Plant body

Plant roots

Make copies of the template and cut out the parts to build your floating wetland.


Water
Growth media
Floating mat

Annex 5: Suggested Packing List (of Resources) – for Trainers

1. First Aid Kit
2. Insect repellent
3. 4-5 sets of ‘Journey of Water’ Cards (Annex 3)
4. 4-5 pails with rope attached (for collection of water)
5. Water Monitoring Kits with turbidity discs and thermometer

Optional:

6. Charged data loggers including temperature sensors
7. Bird and insect cards, nature guide books
8. Camera
9. 4-5 Compasses

Acknowledgements

Anchor Green Primary School

Fernvale Primary School

Nan Chiau Primary School

Compassvale Secondary School

Nan Chiau High School

Pei Hwa Secondary School

Ministry of Education, Curriculum Planning and Development Division,
Humanities Branch and Sciences Branch

FairPrice Water Education Fund

PUB, Singapore's national water agency

PUB is the national water agency that manages Singapore's water supply, water catchment and used water network in an integrated way. PUB won the 2007 Stockholm Industry Water Award and was named Water Agency of the Year at the Global Water Awards 2006.

About PUB's tagline: Water for All: Conserve, Value, Enjoy

PUB has ensured a diversified and sustainable supply of water for Singapore with the Four National Taps (local catchment water, imported water, NEWater, desalinated water).

To provide water for all, PUB calls on all Singaporeans to play our part to conserve water, keep our water catchments and waterways clean and build a relationship with water so we can enjoy our water resources. We can then have enough water for all uses – for industry, for living, for life.

PUB SINGAPORE'S NATIONAL WATER AGENCY

www.pub.gov.sg