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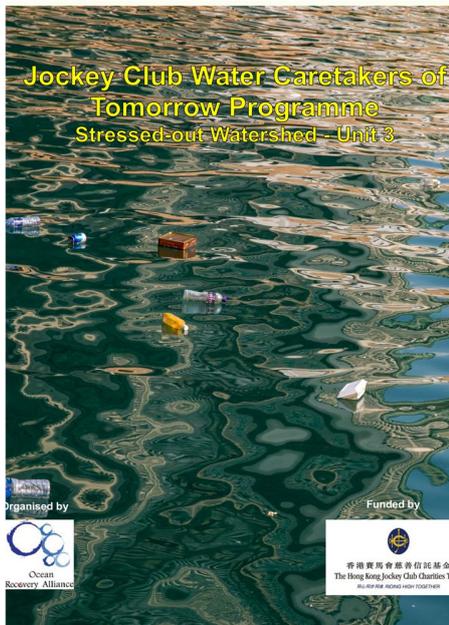
香港賽馬會慈善信託基金  
The Hong Kong Jockey Club Charities Trust  
同心同步同進 RIDING HIGH TOGETHER

## Teacher Notes for Unit 3: Stressed-out Watershed

### About the Jockey Club Water Caretakers of Tomorrow Programme:

*The Jockey Club Water Caretakers of Tomorrow Programme* is a collaboration funded by The Hong Kong Jockey Club Charities Trust and developed by Ocean Recovery Alliance, Ltd. It is an educational curriculum programme designed for students in Form 1-3 early secondary school in Hong Kong. Through a combination of both inquiry-based and project-based learning, students develop understanding and appreciation for our water systems and functions, at both the local and global levels. They learn how to assess threats such as pollution and habitat destruction, while also developing ways to mitigate them. This understanding will empower our youth to take an active role as caretakers of our water resources of the future, and to share their commitment with their families and communities.

### Using the Lessons in the Classroom



The Jockey Club Water Caretakers of Tomorrow Programme consists of eight units. The units have been developed to allow for using as many as your time and your curriculum will allow. Each unit can stand alone, although it is strongly recommended that Unit 1: Miraculous Water, be implemented first as it lays the groundwork for the other units. Please note that there is repetition in some of the topics covered in each of the units. This is intentional. As it is likely that most teachers will not be able to complete all of the eight units, the curriculum has been designed to contain as many of the important concepts as possible, within each unit. Teachers are encouraged to pick and choose from the range of topics and activities in each unit, such that unnecessary repetition is avoided.

## *Teacher Notes and Student Notes*

Each unit consists of Teacher Notes and Student Notes. The Teacher Notes include information about skills accessed, materials needed, recommended assessments, suggested extensions, cross-curricular links and other information that could help determine how the Unit and the individual lessons might fit into a teacher's curriculum. In addition to this, Teacher Notes will contain links to websites with background material that can deepen the teacher's understanding on the topics covered in the unit.

The Student Notes can be printed out for the students to use throughout the unit. It includes background information, instructions for all the activities, as well as space to record their learning. The students should also have access to the Student Notes online as many of the activities and additional information are linked to websites on the internet.

It is also recommended that students keep their own "learning log" or journal to record their progress in understanding the issues as well as the actions they might take.

## *Extensions*

All the lessons contain "Extensions" which provide additional rigor or challenges for students. These suggestions for enrichment can help to streamline the lessons to the grade level, curricular or differentiation needs of your own students. Some of the extensions utilize case studies or contain more photographic material or recommended websites, all of which might be suited to students with different learning styles.

## **Safety in the Classroom and in the Field**

Teachers will go over their school's rules for safe and responsible behaviour both inside and outside the classroom, before doing all of the activities in the units. The Teacher Notes will, however, identify particular safety concerns to be aware of in specific activities.

## **Student Action and Social Responsibility**

The aim of every unit in this project is to build student understanding of water resource issues. Through that understanding, it is hoped that they will be motivated to work toward positive change individually, locally and globally. It is, however, important that their teachers communicate the importance of their being sensitive to the complexities of cultural norms and political processes.

## **Objectives of Unit 3: Stressed-out Watershed**

At the end of the lessons in this unit, students will be able to:

- Sequence change in land use in their watershed
- Track the sources and effects of pollution in their watershed
- Suggest ways to balance uses in a watershed and provide reasons for best practices

- Appreciate the changes in attitude about watershed modifications
- Create a video that informs the community about the stresses in their watershed

**Student skills table**

Lesson	Critical thinking	Supporting Opinions with evidence	Applying scientific principles	Data collection	Graphing and Data Analysis	Reading for Understanding	Using technologies for mapping	Research and/or Presentation
1								
2								
3								
4								

**Cross-curricular Links:**

**Lesson 1:** *Humanities/Geography* (identifying topographic features, land use, municipal planning), *History* (historic changes in watersheds)

**Lesson 2:** *Chemistry* (experiment on chemical dispersion, understanding water quality parameters), *Humanities/Geography* (researching the tasks of government agencies for environmental protection and public safety, learning about major rivers in the world), *Science/Mathematics* (analysing graphs)

**Lesson 3:** *Humanities/Geography* (values clarification activities, debate Extension activity and looking at advantages and disadvantages of projects)

**Lesson 4:** Depending on the projects selected by the students, this lesson can include an emphasis on *Humanities/Civics* (looking at role of government agencies, and reimagining land use), *Science* (researching about migratory waders) or *Language Arts/Film* (producing an oral history of their watershed)

**Unit Vocabulary - refer to Student Notes**

Student Notes includes all the vocabulary and definitions that the students should know in order to understand the topics covered.

## Materials and Technology Needed

Activity						
Lesson	1	2	3	4	5	6
1	Access to internet	Access to internet	Access to internet	Access to internet		Access to internet
2	Access to internet, Food coloring, clear bowl, water, timer, smart phone with video capability	Access to internet	Litmus paper with color chart, pH indicator solution with chart, lemon juice, vinegar, 3 small beakers, tap water	Access to internet	Access to internet	Access to internet
3			Access to internet	Might need to make larger copies of the watershed diagram provided.	Access to internet	
4	Access to internet	Access to internet		Access to internet. Additional materials such as camera, depend on the project selected.		

## **Unit Introduction:**

- 1- Go over the Student Aims and the Vocabulary with the students.
- 2- Go over the students' ideas about the effects of the different activities on the watershed. Have them add any ideas they might have left out.
- 3- At the end of the unit, students can review their prior learning, make changes and add further detail.

## **Lesson 1: Go With The Flow**

**Objectives:** In this lesson, students will understand:

- Some of the effects of erosion
- The importance of vegetation on slopes
- How watersheds change through time
- The effects of agricultural practices on water resources
- Some of the ways wise use of water and land management are implemented

Students do the reading about water in the Hong Kong landscape. Ask students to share if they have seen similar areas to those pictured.

### Activity 1: Hong Kong Landscape

- 1- Students read about the landscapes around Hong Kong and summarize the different types described.
- 2- Students make a conclusion about land use based on the pie chart.

### Activity 2: Why Isn't Hong Kong a Disaster?

Students follow the prompts. After learning about how Hong Kong's landscape has changed historically, they consider the ways in which landscape features of Hong Kong have been protected and why this has been important.

### Activity 3: The Big Transformation

Follow the instructions in the Student Notes. Discuss what makes for an effective newspaper headline. What focus do they want their facts to have? The headline should reflect this, i.e. are the changes mostly for the better or for the worse? Students should share their headlines and some of their facts. It is important to get across the idea that there are always tradeoffs in land use decisions.

### Activity 4: Water Detour

This activity focuses on how we harvest water for our needs. The students access websites that deal with some of the different ways Hong Kong meets its water needs. The diagram can be labelled based on what they learned from the websites.

### Activity 5: Agriculture

Students get a brief overview of the significance of agriculture's effects on the environment, past and present. They look at the differences of traditional versus modern methods of agriculture and how agriculture affects water. An extension involves researching the collapse of some ancient civilizations, in part due to poor agricultural practices.

### Activity 6: What's Happening with Water Supplies?

Students label a diagram which shows sources of water contamination in a watershed. Then they are asked to consider ways in which we can reuse some of our wastewater.

## **Lesson 2: Changing Waterways -- Water Pollution and Channelization**

### **Objectives: In this lesson, students will understand:**

- Some of the common causes of water pollution
- The tasks of environmental protection agencies
- Parameters for measuring water quality
- How land use affects water quality in a watershed
- Effects of channelization
- Examples of river modification around the world and appreciate how rivers have a social as well as geographical context

### Activity 1: What is HKEPD?

- 1- Students research the role of the Hong Kong Environmental Protection Department.
- 2- Use the picture prompt to discuss some of the pollutants we might find in Hong Kong's water.
- 3- Follow the instructions for the experiment about chemical dispersion. They should infer that cleaning up some of the pollutants in water is more difficult than land-based pollution.

### Activity 2: Hong Kong Water Quality

Students follow the prompts to learn about water quality parameters. They will choose a Hong Kong river system from the website and interpret the graph to report on various parameters.

### Activity 3: Acid Rain

Students learn about some of the effects of acid rain and conduct an experiment to see how lowering of pH affects the biota in a body of water. They should understand that an organism can be affected by the change in pH, not only directly, but also if its food source can no longer survive.

### Activity 4: Case Study: A Hong Kong River

In this case study of the Lam Tsuen River in Hong Kong, students follow the prompts to analyse land use around and modification to this river.

### Activity 5: Channelisation - is it the Death of a River?

Students watch a video and the Shan Pui River and an online powerpoint. Students are encouraged to form their own opinions about the pros and cons of channelising a river.

### Activity 6: Visiting One of the World's Major Rivers

1. Students find Google images of the rivers listed and try to get an idea of what the different rivers are like based on the first 50 photos that they find.
2. Divide up students to research each of the rivers and make a short guide for tourists. This can be in the form of a brochure or a video.

**Extension:** If there is additional time or interest, students can try to look at the causes for different places in the world being the biggest pollution hotspots. They should be looking for any similarities between these places in terms of causes.

## **Lesson 3: Is there a perfect solution?**

### **Objectives: In this lesson students will understand**

- The positive and negative effects of different forms of flood control
- The difference between opinions that affect others and those which don't
- Factors to take into consideration when making changes to a watershed

### Activity 1: Values Activity - Control Flooding

Students follow the prompts for this activity in values clarification about modification of landscape to prevent flooding. Discuss what, if anything, prompted the students to change their points of view.

### Activity 2: My Opinion

Students fill out the chart and consider the effects that some opinions might have on other people. Discuss how opinions can affect the way we manage the environment. What suggestions might the students have for determining the best courses of action?

### Activity 3: Do I Need Evidence?

Students are asked to consider the role of evidence in determining the truth about some issues such as water pollution and human-induced climate change.

Divide the class into half. Half the class uses the web to find evidence that humans are causing climate change. The other half of the class searches for evidence or research that shows humans are not causing climate change.

### Activity 4: Managing a Watershed

Students follow the prompts to develop a simple plan for a watershed. This activity can be adjusted in terms of complexity, depending upon the amount of time and interest in the class.

#### Activity 5: Is This a Good Project?

- 1- Students read online about the Shing Mun River project.
- 2- Small groups work on the chart summarizing the positive and negative aspects of the project.
- 3- Require the groups to reach a consensus on whether or not this is a good project to proceed with.

#### Extension

Students can continue the activity above by developing a debate around the issue.

### **Lesson 4: We Can't Do This Alone**

#### **Objectives: In this lesson, students will understand**

- The need for regulations to protect the watershed
- The role of non-governmental organizations in helping the environment
- How to carry out a project that addresses the stresses and possible solutions to these stresses in their watershed

#### Activity 1: Our Government and Their Agencies

Students research the role of different environmental protection agencies in Hong Kong with respect to protecting watersheds.

#### Activity 2: Working Together

Students research the role of different NGOs in protecting our watersheds.

#### Activity 3: Now I Know Better

Students review what they wrote in their first activity and discuss how their understanding has changed.

#### Activity 4: Looking Forward

Students choose one of three projects which include developing an oral history of their watershed, redesigning their local area, or researching and presenting on migratory waders.