

### **Mountain Lakes Case Study Scenario**

Suppose there are three countries, A, B and C, where A and B are at downstream and C is upstream of a river. C is a mining area with shanty towns. The water from C is polluted from mining and urban run-off. A and B have unique aquatic biodiversity and are members of the Ramsar Convention; their previous livelihoods were livestock keeping and fishing. Their new trend is eco-tourism. With pollution from Country C running into A and B, there is a need for intervention and engagement.

#### *Background Information*

The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. Sustainable water management (SWM) is the management of water resources under set policies and regulations that would preserve and conserve water for optimal use. Water, once an abundant natural resource, is becoming a more valuable commodity due to droughts and overuse. This presentation discusses the various challenges pertaining to water management, opportunities available, and provides a budget based on the above scenario.

#### *Challenges – Real Cases*

A typical Ramsar site that is receding in quality due to anthropogenic activities is the Sakumo Lagoon, located between Accra and Tema in Ghana. Solid waste from Accra and agricultural runoff from near the lagoon have caused significant pollution in estuaries in Tema. But the story did not begin at Sakumo. Recent development of industrial and urban estates in the upper catchment of the Akuoku River and subsequent discharges of the effluent with considerable pollution load has tended to degrade the water quality. Not only has the beauty of the lagoon been lost, the numbers of birds that usually stop there on their migration route keeps decreasing every year, reducing rather than increasing tourism in the area. Cholera and other poor sanitation-related disease are commonplace. Piailassa Baiona lagoon in the northern Adriatic Sea has also received its fair share of organic pollution moving from upstream.<sup>1</sup>

The scenario between Countries A, B and C is therefore a huge challenge which requires a thorough and systematically planned approach.

The environmental ecosystem has been threatened with runoff water pollution from a mining site, from ecotourism activities and increasing stress from population growth. However, water

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<sup>1</sup> Matteucci, G., Rossini, P., Arcangeli, A., De Falco, G., Fonti, P., & Guerzoni, S. (2001). Organic pollution in a Ramsar site (Piailassa Baiona, Northern Adriatic Sea). *Annali di Chimica-Roma*, 91(7/8), 445-458.

pollution is not isolated from other forms of pollution in their ecosystem. As land gets degraded, a ripple effect is seen on the water. Land cover and land use (LCLU) is a major challenge when looking at sustainable ways to manage water.

### *1. Land Degradation*

This is the deterioration in the quality of land, its topsoil, vegetation, and/or water resources, that is usually caused by anthropogenic activities. Various forms of land degradation are:

- Loss of vegetation cover;
- Loss of biodiversity;
- Invasive species;
- Sedimentation;
- Food security (pollution);
- Modification of hydrological regime; and
- Increasing slope failure and landslide hazards.

### *2. Conflict of Interest*

In trying to regulate the use of water and the activities around country C, there is a conflict of interest. This arises from different economic interest and priorities. When mining is a major economic activity in a country, it would not be easy to convince the country to let go of it just because it is polluting downstream water bodies.

Again, Country C has not signed up to the Ramsar Convention, so may feel it has no legal obligation to comply with pollution-control requests. Hence it is difficult, from Countries A and B, to control their activities.

### *3. Weak Institutional Framework*

There is no existence of a harmonized legal framework at international level. This still arises from the conflict of interest discussed. Countries are not willing to agree to policies which limit and do not favour their economic priorities.

There is also no agreement for sharing and responsibility. No single institution has been able to draw, implement and enforce rules that admonish countries to take responsibilities in managing upstream or other forms of cross-border pollution.

### *4. Livelihood and Socioeconomic Impacts*

When water is not managed sustainably, especially in Country C, livelihoods are transformed since the benefits Countries A and B derive from the water bodies are lost, leading to poor living standards, social inequality, increased vulnerability and potentially a cultural crisis.

As stated earlier, Countries A and B have unique biodiversities. Their previous livelihoods were livestock rearing and fishing, while they are now promoting ecotourism. As the polluted water finds its way into their rivers and lakes, the fish and other aquatic life die from eutrophication and turbidity. Impoverished fishermen become poorer and their standard of living drops.

As if that is not enough, the people become more vulnerable to pollution-related diseases (e.g. through heavy metal contamination from mine runoff), financial difficulties, cholera and its associated complications, and malnutrition, to mention but a few. To counter their rising poverty, they resort to any means possible – likely unsustainable – which leads to more pollution and further socioeconomic decline.

Eventually, they may lose their cultural identity. The Argungu Fishing Festival of northern Nigeria and Edina Bakatue of the central region of Ghana, for example, are traditional festivals that celebrate fishing and the importance of water in countries. Pollution to water bodies reduces fish stocks, thereby delaying the festivals or stopping the celebrations in certain years. With time, there would be emigration, e.g. to nearby cities, and subsequent cultural crises.

As it now stands, all the impacts of unsustainable water use are interrelated and possibly contribute to the higher stress on the ecosystem and the conflict among the Countries A, B and C.

### *Opportunities*

The opportunities are grouped into three dimensions.

#### *1. Institutional Dimension*

There is an opportunity to enhance dialogue for understanding and building trust between the parties. There are also the added benefits of building institutional and relational mechanisms for regional cooperation as well as communicating for shared benefits.

#### *2. Technological Dimension*

In the technological sense, there could be the development of environmental-friendly technology for the treatment of industrial pollution and agricultural and urban runoff. Hydro-power could be also developed jointly. There could also be a joint watershed-ecosystem management programme developed to suit all parties.

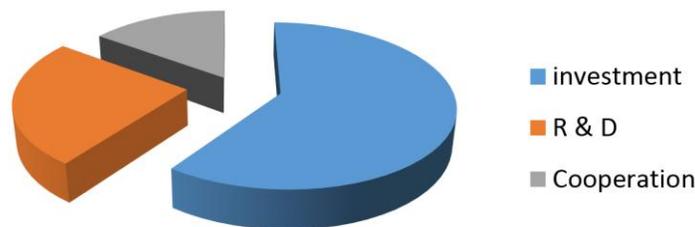
#### *3. Local Infrastructure*

This programme could promote education and capacity building of the individuals. Infrastructure envisaged here covers a broad dimension such as transportation, sanitation, tourism, schooling and cultural restoration. Transportation, both land and water, would be enhanced since the water would have less sediment to restrict vessel movement. Cultural restoration would also be an

opportunity to improve the lives of people. It is expected that, with reduced pollution, many cultural activities that had lost their essence could bounce back.

### *Budget Allocation*

The following budget breakdown of the areas with potential opportunities in Countries A, B and C is proposed. A higher proportion of the budget is allocated to investment in environmental conservation and the construction of local infrastructure. These are the first steps to improve local quality of life and citizen’s awareness about the environment. Research and development is also necessary to study the impacts of the polluted environment on human health, the ecosystem and society, as well as to explore the opportunity to reduce the pollution and to transform livelihoods. A budget of cooperation is also emphasized for building a cross-border institutional framework for dialogue and cooperation on resolving issues at national and international levels. Regarding the budget allocation among the three countries, the institutional budget is evenly distributed for the countries. For the technology dimension, Country C is allocated a higher budget than Countries A and B since Country C is expected to need more money for pollution treatment and watershed management. Countries A and B, which bear higher negative impacts from mining and depend on the ecosystem to earn livelihoods, are allocated with the necessary budget for enhancing local infrastructure to improve the quality of tourism and people’s wellbeing.



**Figure 1. Budget allocation**

	Country A	Country B	Country C	Total
Institutional Dimension	5	5	5	15
Technology Dimension	7.5	7.5	10	25
Local Infrastructure	22.5	22.5	15	60
<i>Total per country</i>	35	35	30	100

**Table 1. Budget breakdown (%) by country and sector**

**Authors**

Kuan-Hui Elaine **Lin**, Research Centre for Environmental Changes, Academia Sinica, Taipei, Taiwan, China

Amos T. **Kabo-bah**, Earth Observation Research and Innovation Centre, University of Energy and Natural Resources, Sunyani, Ghana

Emily J. **Chenoiwa**, University of Eldoret, Department of Biological Sciences, Eldoret, Kenya

Derrick S. **Dlamin**, Nanotechnology and Water Sustainability (NanoWS) Research Unit, College of Science Engineering and Technology, University of South Africa, Johannesburg, South Africa. Modreck **Gomo**, Institute for Groundwater Studies (IGS), Faculty of Natural and Agricultural Sciences, Bloemfontein, South Africa

Hubert **Onibon**, WASH-UNICEF, Yaounde Cameroon

Haytham **Mohamed**, Desert Research Center (DRC), Mataria, Egypt.

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