



# The blue trinity: freshwater, oceans and climate change

Source-to-sea management addresses a vital development and environmental challenge of our time. Coastal communities and Small Island Developing States (SIDS) face increasing risks as a result of climate change. These risks are amplified when upstream activities impact coastal areas. Source-to-sea management will increase resilience of these vulnerable communities.

## Freshwater and oceans – working together to face climate change

The impacts of climate shifts continue to affect lives and livelihoods through both extreme and slow-onset events. Water disasters, such as floods and drought, increased frequency and intensity of extreme and unpredictable precipitation, have severe implications for our ecosystems, economies and societies. There is a need to address climate change through a water lens and to integrate water wise and climate resilient approaches in global development strategies. Pressures posed on land, freshwater and marine resources are exacerbated by negative effects of climate change (and vice versa) – and often closely interlinked by the hydrological cycle.

Resilience and disaster risk reduction are fundamental perspectives when creating sustainable development paths for urban and rural landscapes and communities. The key to successful development initiatives, with potential to sustain well beyond our generation, lies in realizing how responsible water management is linked to the preservation and restoration of healthy ecosystems for their buffering effects on disasters, and the use of sustainable energy sources enabling ambitious carbon emission reductions.

Of the world's megacities, 70 per cent are coastal and more than 80 per cent of total global wastewater is released into the environment without adequate treatment (WWAP, 2012; UN-Water 2015). As coastal cities are supporting the heavy demographic shift of urbanization and population growth, they need to adjust

to increasing consumption patterns, water withdrawals and wastewater discharges. They are also responding to climate-related changes to rainfall patterns, sea-level rise, storm surges and risks of saltwater intrusion into coastal aquifers. Many deltas experience a “double squeeze” when sediments are trapped by upstream reservoirs resulting in delta starvation and erosion that is further exacerbated by sea level rise.

## Marine protection – pollution

The oceans are the end recipient of our waste; whether it is solid waste from plastic, micro-pollutants or liquid waste coming from sewage and wastewater due to agriculture, industries and domestic/city usages.

Solid and liquid pollution leads to a loss of biodiversity: 39 per cent of marine species and 25 per cent of corals are estimated to have already disappeared between 1970 and 2010. Micro-residues and microbeads of plastics or hormonal disruptors, are some of the main, but invisible causes of irreparable damages to the reproductive capacities of many species, and also contaminate the food chain. Unfortunately, these residues are often untreated in wastewaters.

The oceans produce 50 per cent of our oxygen. Increased sea level temperatures and water pollution are tempering this by destroying phytoplankton. Concurrently, oceans tend to absorb up to 30 per cent of CO<sub>2</sub> but this capacity has decreased by 10 per cent since 2004.

The discharge of untreated wastewater into seas and oceans partially explains why de-oxygenated dead zones are rapidly growing: an estimated 245,000 square kilometres of marine ecosystems are affected, impacting fisheries, livelihoods, and food chains (Corcoran et al., 2010). Therefore, creating marine protected areas and preventing the discharge of waste and polluted wastewaters into our seas are a matter of urgency.

## NDCs of Pacific Island nations focus on securing freshwater

Climate change has put severe pressure on Pacific Island nations, causing losses and damages to land, water resources and biodiversity. The small islands/big ocean states are among the most vulnerable to pressures from climate change and growing resource demands. Their often-vulnerable water and natural resources, relatively low agricultural capacity and unique infrastructure challenges, compounded by geographic remoteness make the risks even more acute.

The Nationally Determined Contributions (NDCs), submitted by the countries for the Paris Climate Agreement, illustrate that a majority of the island states in the South Pacific have ongoing adaptation projects to help increase resilience to the impacts of climate change at the global, regional and national levels.

## Addressing climate change from source to sea

Source-to-sea management considers the entire source-to-sea system – land, freshwater, deltas, estuaries, coasts and the oceans – highlighting the linkages between upstream and downstream

ecosystems. It establishes governance, operations, practices and finance that increase collaboration and coherence across the source-to-sea system and reduces alteration of key flows resulting in measurable economic, social and environmental improvement.

Source-to-sea management has great potential for contributing to climate change adaptation and mitigation. As sea levels rise, hydrologic regimes are altered, water chemistry shifts, etc., the linkages between segments of the source-to-sea system become ever more evident and the need to address these changes from a broader perspective grows. For example, the importance of maintaining sediment flows to deltas and coastlines as sea levels rise links material flows such as upstream dams that provide energy, irrigation or flood control to disaster risk reduction in downstream coastal communities.

By expanding the view from individual to multiple segments and from one to several sectors, source-to-sea management enables better understanding of the interrelationships across the source-to-sea continuum and opens up new partnerships for addressing social, economic and environmental impacts of climate change.

## Sea walls to help Kiribati adapt

The Kiribati Adaptation Programme ran from 2012 to 2016. The first two phases – KAPI and KAPII – piloted a number of critical adaptation measures such as mangrove planting, construction of sea walls and rainwater harvesting. KAPIII sought to strengthen Kiribati's ability to provide safe drinking water and maintain resilient coastal infrastructure. KAPIII improved water management by installing groundwater and roof rainwater harvesting systems. Thereby water leakages and waste in existing systems were reduced and water reserves protected, resulting in long-term planning for local water management, ensuring cleaner, safer drinking water.







Photo: istock

## Source-to-sea management in action

- The [Action Platform for Source-to-Sea Management](#) was established in response to the Manila Declaration to bridge the gap between land, water and marine management communities and to generate knowledge on integrated and innovative management approaches in the continuum from source to sea. Coordinated by SIWI, the S2S Platform has established itself as a key player in the international policy arena by connecting actors in terrestrial, freshwater and marine management, developing a common problem formulation and knowledge-base in the form of a source-to-sea conceptual framework and guide for implementation and building commitment at global and regional levels for using a source-to-sea approach to resource management. The S2S Platform now includes more than 25 of the key UN organizations, research institutes, international environmental NGOs, conventions, intergovernmental sea and river basin commissions which are actively contributing to climate change adaptation and mitigation.
- Addressing marine pollution is critical for a stable climate. With as much as 4 to 12 million tons of plastic entering the oceans annually, much of it from land-based sources, SIWI and the Action Platform for Source-to-Sea Management is developing a Source-to-Sea Framework for Marine Litter Prevention. With rivers as conveyors of large quantities of plastic litter, a framework for explicitly linking land, freshwater and marine systems will be useful in determining governance, management and operations interventions that speed progress toward reducing the quantities of plastic entering the oceans.
- The Baltic Marine Environment Protection Commission (HELCOM) Baltic Sea Action Plan (BSAP) aims to restore the ecological status of the Baltic Sea by 2021. Part of the Plan's approach is to leverage the collective power of the 1,500 municipalities and regional authorities within the catchment area to share in the responsibility of managing pollution. Upstream management of pollution will reduce the amounts entering the Baltic Sea, which otherwise will lead to further eutrophication, species loss and environmental degradation. Cost-efficient reduction of pollution in the Baltic Sea watershed therefore requires an upstream-downstream (source-to-sea) approach including strategic decisions at local, national and regional levels. An analysis of the HELCOM BSAP, conducted by SIWI, has suggested that a mechanism to intensify connectivity and result-sharing of various measures across municipal actors in the catchment could significantly improve awareness and engagement in water quality, better engage decision makers and bolster climate resilience.

## Recommendations

- Policy responses need to recognize the interdependencies between SDG 6, 11, 13 and 14. For instance, water use efficiency and minimized water pollution are necessary to achieve healthy oceans and a progress towards sustainable development in a changing climate future. Approaching the whole SDG framework with a holistic, hydro-lens would allow for reinforced action from source to sea and balance trade-offs between different priorities.
- Integrated basin-scale management from source waters to coastal and estuarine and marine systems and their surrounding lands is essential to ensure that a full range of fresh and saltwater ecosystem services are sustained. Actors within agriculture, energy, fisheries, cities, infrastructure, water abstraction and treatment must all be collectively engaged as stakeholders in planning, operations, and management from source to sea.
- In many cases, these sectors will also span political boundaries within and between basins; integrated management should share data and decision making across governance levels from local to national and global. Investments in governance processes and institutional capacity is therefore crucial to ensure informed, transparent, equitable and sustainable resource allocation decisions that strengthen adaptation to climate change.
- Since many aspects of climate impacts are uncertain, integrated freshwater-marine solutions should be robust (spanning a wide range of potential futures) and flexible (capable of responding to unexpected or alternative futures). Financing, engineering, science, and governance are critical for climate change to be embedded in long-term decision making processes.
- Marine, riparian, and aquatic ecosystems provision critical adaptation and ecosystem services for communities and economies. Thus, these ecosystems should also be represented as stakeholders with explicit water allocations, such as environmental flows.

## About this brief

This policy brief, prepared by SIWI, Action Platform for Source-to-Sea Management (S2S Platform) and Alliance for Global Water Adaptation (AGWA), is a contribution to the discussions and activities at UNFCCC meetings and Conference of Parties (CoP) in order to improve understanding and application of water knowledge in the climate arena.

*This policy brief has been authored by Ruth Mathews, Coordinator of the Action Platform for Source-to-Sea Management, Birgitta Liss Lymer, Director, Water Governance Dept., SIWI, Maggie White, Senior Manager, International Policies, SIWI and AGWA Co-Chair, John Matthews, coordinator AGWA.*