Setting the Scene

Linking SDGs 6 + 14: From Source to Sea

THE SOURCE-TO-SEA MANAGEMENT WEBINAR SERIES

Facilitation:

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UNEP-DHI Partnership

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UNEP-DHI Partnership
Agenda

1. Birgitta Liss Lymer (SIWI): **Needs for source-to-sea management and links to the SDGs**


3. Jacob Opadeyi (The University of the West Indies): **The unique and interlinked Source-to sea issues facing SIDS**
Needs for source-to-sea management and links to the SDGs

Birgitta Liss Lymer
Coordinator of the S2S Platform Secretariat
Stockholm International Water Institute (SIWI)

Contributions by:
Swedish Agency of Marine and Water Management (SwAM),
GEF Scientific and Technical Advisory Panel (STAP) and UNDP
Why source-to-sea?

Documented degradation of freshwater, delta, coastal and marine systems, partly caused by important upstream/downstream connections

Persisting governance and management challenges of linkages

Increasing competition over resources – more critical trade-offs in decades to come

80% of global populations exposed to high levels of threat to human water security (Vörösmarty et al, 2010)

Virtually no marine area is unaffected by anthropogenic activities (Halpern et al, 2008)
Worlds apart?

**Fresh**
- Rivers, lakes and aquifers
- Hydrologists
- Water supply engineers
- Freshwater as resource
- IWRM
- Water allocation
- Floods and droughts
- SDG goal 6
- UN Watercourses and transboundary rivers conventions
- GWP, WWC, UN-Water

**Salty**
- Coastal and marine waters
- Marine scientists
- Coastal and port engineers
- Fish – and land - as resource
- ICM
- Marine spatial planning
- Shore protection
- SDG goal 14
- UNCLOS, MARPOL, London and Regional Seas Conventions,
- IOC, NOAA, UN-Oceans
The Sustainable Development Goals (SDGs)

Adopted 2015, providing a framework for development until 2030

"...an integrated and indivisible agenda, balancing the social, economic and environmental dimensions of sustainable development"
Economic growth
Consumption and production
Sustainable cities
Food
Energy
Water
Etc.
Climate change
Terrestrial ecosystems
Biodiversity
Oceans and fisheries
Sustainable
SDGs
Economic growth
Resource use
Social and environmental sustainability
SDG 6 and 14 – actual links

- Land systems
- Freshwater systems
- Estuaries deltas
- Coastline nearshore
- Adjoining sea, shelf
- Open ocean

Ecosystem services
water, sediment, pollutants, biota, materials

GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
How are upstream-downstream linkages captured by SDG 6 (W&S) and 14 (oceans)?

<table>
<thead>
<tr>
<th>Indicator</th>
<th>14.1.1</th>
<th>14.2.1</th>
<th>14.3.1</th>
<th>14.4.1</th>
<th>14.5.1</th>
<th>14.6.1</th>
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<th>14.a.1</th>
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<td>6.1.1 Drinking water</td>
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<td>6.6.1 Ecosystems</td>
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<td>6.a.1 Cooperation capacity</td>
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<td>6.b.1 Stakeholder part</td>
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Legend: Weaker 0.125 0.25 0.5 1 Stronger 2

Swedish Agency for Marine and Water Management

Work by Berggren/Liss Lymer
How do water issues figure across the overall SDG agenda?

- Improved freshwater and marine water quality
- Increased water use efficiency and reduced vulnerability to water scarcity
- Balanced demands between sectors and ecosystems from source to sea
- Access to W&S services
- Resilience to water-related extreme events
- Sustained water-related ecosystem goods and services – upstream and downstream

Work by Berggren/Liss Lymer
Implications – Don’t lose sight of the vision!

Indicators are sector-specific – they will not provide the framework needed for integration between multiple objectives.
The risk of compartmentalization of the SDGs
SDG 6 and 14 are the responsibility also of productive sectors

The SDG framework should provide an incentive for stronger integration across sectors
But substantial efforts will continue to be needed to address linkages!
Governance, collaboration, monitoring systems, capacity, trade-offs
Currently overlapping or weak governance & management frameworks: IWRM, planning and building acts, ICM, UNCLOS, MSP....

Granit et al, 2012

GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
Integrating approaches progressing, but challenges with sectoral management in the S2S continuum persist

<table>
<thead>
<tr>
<th>Common goals</th>
<th>Sustainable use and long-term productivity of ecosystems</th>
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<tr>
<td>Examples of different areas of focus</td>
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<td>Increased productivity (e.g. food), housing, infrastructure</td>
<td>Water allocation</td>
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<td>Different mgmt mechanisms</td>
<td>Land/forest management, urban and land use planning</td>
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</table>

Key flows
Illustrative examples of what’s at stake

“None of the open basins of the Baltic Sea has an acceptable ecosystem health status”

- Biodiversity
- Hazardous substances
- Eutrophication
- Maritime activities
- Climate change


GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
**Water and sediment flows - too much or too little?**

**Too much** Flood risk, smothering of coastal habitats, land slides,..

**Too little** Delta starvation, erosion,..

Eg. Amur Darya, Syr Darya & Aral Sea, Colorado river & delta, Yellow river & Bo Hai sea, Nile river & Mediterranean, Orange river & Benguela

Yellow river delta 1989 (NASA, Landsat)

Yellow river delta 2009 (NASA, Landsat)
Pollution flows to oceans & the Areas Beyond National Jurisdiction (ABNJ) - Marine debris

- 45% of all species of marine mammals & 21% of all species of sea birds are affected by ingestion or entanglement

- The number of species of fish affected has roughly doubled since 1997


ABNJ, 43% of world’s surface
Material flows
Moving from land to the coast and sea

• Demand for land for housing, industry & recreation along the coasts is growing
  – Land reclamation
  – Artificial islands, expansion of sea ports and terminals
  – Aquaculture

• Technology development, new opportunities for exploitation of marine space
  – Cheaper dredging technologies
  – Large-scale infrastructure development projects
  – Natural gas pipelines, submarine power cables, offshore windfarms, seabed mining
Drivers in the S2S continuum needs to be understood and defined
Urbanization & consumption patterns

Megacities 1950
>5 million people
UN Population division

Megacities 2015

GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
Climate change (4 degrees warmer world in 2050?)
Will impact the key flows in the S2S continuum

• Stronger heat waves
• Changing precipitation patterns
• Increased water scarcity
• Increased flood risk
• Increased frequency of tropical cyclones
• Biodiversity & habitat loss
• Ocean acidification
• Damage to coral reef ecosystems
• Sea-level rise
• Crop patterns will change
• Health risks

Based on World Bank 2012, GEF/STAP, 2012, IPCC 2015, etc

GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
Economic development & employment creation

**Green economy**
“greening” economic sectors such as agriculture, energy, consumption and production, waste processing, etc.

**Blue economy**
to support sustainable growth in marine and maritime sectors like aquaculture, tourism, marine transport, ocean energy, seabed mining, etc.

GEF STAP writing team: Granit/Lysse/Olsen/Tengberg/Nömmann/Clausen
A conceptual framework for the governance and management of key flows in a source-to-sea continuum

**Drivers**
e.g. unsustainable resource use, development needs

**Pressures** transmitted via key flows: water, sediment, pollutants, biota, material and ecosystem service flows

**Characterizing the source-to-sea system**
- State of segments and system as a whole
  - Land resources and terrestrial systems
  - Freshwater systems
  - Estuaries and deltas
  - Coastline and nearshore waters
  - Adjoining sea and continental shelf
  - Open ocean

**Impacts**
Economic, social and environmental

**Governance and management response**

**Defining the appropriate scale**

**Engaging key stakeholders**

**Assembling a governance baseline**

**Defining a theory of change – grouped into four orders of outcomes**
- **First Order:** Enabling conditions
  - Support for common objectives, institutional capacity
- **Second Order:** Changed behaviour
  - Among institutions, stakeholders, investment flows
- **Third Order:** Attaining programme goals
  - Economic, social and environmental targets met
- **Fourth Order:** Sustainability
  - Sustainable development, green and blue growth

GEF STAP writing team: Granit/Liss Lymer/Olsen/Tengberg/Nömmann/Clausen
Action Platform on Source to Sea Management – stimulating partnership and catalyzing action

- Launched at World Water Week 2014 as an informal platform to
  - Support integrated and innovative approaches to governance and management from source to sea
  - Generate and share knowledge on effective approaches and valuable experiences

- Growing membership including UN agencies, research institutions, NGOs, river basins, LMEs

- SIWI acts as Chair and hosts the Secretariat

- For more information, visit www.siwi.org/source-to-sea
Thanks to the **S2S Platform**

*The writing teams:*


Jens Berggren and Birgitta Liss Lymer (Source to Sea and the Sustainable Development Goals - linkages between freshwater and marine targets, 2016)

and;
River Deltas: The Stepchildren of Water Resources Development

Professor A. Dan Tarlock
Illinois Tech Chicago-Kent College of Law
Why Are Deltas Stressed?

- For the late 19th Century through most of the 20th century the dominant river basin development paradigm was the maximum development of the basins’ water resources. Maximum development meant
  
  - Water that flowed to the ocean was wasted water
  
  - Thus, should be dammed and diverted before it reached its delta
Major Dams Colorado River Basin United States
The Paradigm is Very Alive in Africa, Asia and Latin America
Stressed Deltas: Three of Many

1. Colorado River United States: inadequate flow

2. Sacramento-San Joaquin: diversions increase salt water instrument from Pacific Ocean

3. Mekong: Salt water instrument resulting from dikes in Lower Mekong, dams in Upper Mekong Basin, and climate change
Rice Field Dike Vietnam
Pressures for Conservation

1. Economic Value Land Uses in Delta
2. The Conservation of Biodiversity
3. The Ramsar Wetlands Convention allows countries to designate wetlands and to pledge to conserve them. Many Ramsar designated wetlands are in river deltas, and the designation puts pressure on governments to include protection in any river basin development plans.
4. Protection of indigenous delta populations
Strategies

1. Establishment of Minimum Flow Releases from Upstream Dams

2. Retirement of Upstream Water Entitlements to Increase Delta Flows

- The Australian Federal government compensates entitlement holders
- NGOs helped develop a plan to purchase water rights to restore Colorado Delta Flows and to make restoration of the delta the responsibility of the Mexico and the United States.
Water Flowing to Colorado River Delta 2014 as a Result of Pulse Flows from Mexican Dam
The unique and interlinked Source-to-sea issues facing SIDS

Jacob Opadeyi, PhD
Professor of Geomatics Engineering and Land Management
Faculty of Engineering, The University of the West Indies, St. Augustine, Trinidad, WI

Source-to-Sea Management Webinars
#1: Setting the Scene. Linking SDGs 6 + 14: From Source to Sea
SIDS: The Caribbean
 Mostly mountainous
 Beautiful beaches
 Limited land space for development
 Intensive coastal development
## Physical Realities: Population densities

<table>
<thead>
<tr>
<th>Island State</th>
<th>Area</th>
<th>Population</th>
<th>Pop Density</th>
<th>Coastline</th>
<th>Highest Elevation</th>
<th>GDP per capita PPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cayman Island</td>
<td>29 km² (11 sq mi)</td>
<td>28,836</td>
<td>990/km²</td>
<td>3 m (10 ft)</td>
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<td>Barbados</td>
<td>430 km² (170 sq mi)</td>
<td>279,000 (2006)</td>
<td>648.84 /km²</td>
<td>97 km (60.3 mi)</td>
<td>336 m (1,102 ft)</td>
<td>16,500.31</td>
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<tr>
<td>Aruba</td>
<td>193 km² (75 sq mi)</td>
<td>103,900 (2013)</td>
<td>575/km²</td>
<td>68.5 km (42.6 mi)</td>
<td>188 m (617 ft)</td>
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<tr>
<td>Grenada</td>
<td>348.5 km² (134.6 sq mi)</td>
<td>109,100 (2012)</td>
<td>313 /km²</td>
<td>121 km (75.2 mi)</td>
<td>840 m (2,760 ft)</td>
<td>12,091.83</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>616 km² (238 sq mi)</td>
<td>160,765 (2005)</td>
<td>260.98 /km²</td>
<td>158 km (98.2 mi)</td>
<td>950 m (3,120 ft)</td>
<td>11,432.50</td>
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<tr>
<td>Jamaica</td>
<td>10,911 km² (4,213 sq mi)</td>
<td>2,804,332 (2008)</td>
<td>252 /km²</td>
<td>1,022 km (635 mi)</td>
<td>2,256 m (7,402 ft)</td>
<td>8,941.65</td>
</tr>
<tr>
<td>Antigua</td>
<td>440 km² (170 sq mi)</td>
<td>91,295</td>
<td>186/km²</td>
<td>153 km</td>
<td>402m</td>
<td>23,071.33</td>
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<tr>
<td>Dominica</td>
<td>750 km² (290 sq mi)</td>
<td>72,660</td>
<td>105/km²</td>
<td>148 km</td>
<td>1,447m</td>
<td>11,029.40</td>
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<tr>
<td>Cuba</td>
<td>109,884 km² (42,426 sq mi)</td>
<td>11,239,004 (2015)</td>
<td>102 /km²</td>
<td>5,746 km (3,570.4 mi)</td>
<td>1,974 m (6,476 ft)</td>
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<tr>
<td>Montserrat</td>
<td>102 km² (39 sq mi)</td>
<td>4,488</td>
<td>44.88 /km²</td>
<td>40 km (25 mi)</td>
<td>914.2 m (2,999.3 ft)</td>
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ENVIRONMENTAL AND SOCIAL FACTORS CONTRIBUTING TO ITS VULNERABILITY

- Exposure to high incidence of natural hazards: tropical storms, volcanic eruptions, tsunamis, earthquake, flooding and landslides
- Geography and geology limits extensive use of land, and agricultural productions.
- Limited or absence of surface and ground waters constraints water supply.
- Steep topography and volcanic rocks accelerate surface run-offs to the sea.
- Inadequate land supply influences informal settlements on fragile lands.
- Economic conditions constraints provision of adequate provision of social and economic infrastructure: drainage and sewerage systems
Atlantic Tropical Storm/Hurricane Paths: 2000-2005

Source: Caribbean Hurricane Network: Climatology of Caribbean Hurricanes www.stormCARIB.com
Key Water Resources Concerns

- Water shortage due to limited freshwater resources is exacerbated by limited rainfall and high incidence of drought.
- Existing water supply is threatened by pollution from distilleries, food processing facilities, and industrial operations.
- Deforestation resulting from the nation’s energy demands, combined with agricultural development, contributes to soil erosion, as rainfall, which is concentrated in a short season, quickly runs off, compounding the water shortage problem on the islands.
- Unregulated waste disposal.
- Untreated sewage from hotels travels in open sewage lines across the land and empties into the sea.
Hillside formal and informal developments
Coastal and near coast intensive formal development
Impacts on the Environment

Expensive housing and agricultural activities have led to forest destruction

- Leading to increasing runoff and slope instability.
- Destruction of wildlife habitats.
- Coastal erosion
- Salt water intrusion.
- Ground water pollution
- Beach pollution
Permitted or illegal outfalls
Source to Sea: It all ends up here
Coastal erosion
Impact of Coral reef: before and after
Impact of Sea Mammals
Rivers and Coastal Pollutions
Opportunities

- Improve and update Landuse plans
- Upgrade legislations and regulation to protect coastal and marine ecosystems
- Incentives for use the of environmentally sensitive solid waste disposal systems
- Upgrade and expansion of sewerage treatment plants
- Active public awareness and public education programmes
- Active monitoring of coastal and marine ecosystems
Thank you!
Upcoming webinars in S2S series

**S2S #1 (April 20th, 2017):** Linking SDGs 6 + 14: From Source to Sea

**S2S #2 (May 11th, 2017):** Water quality and marine pollution

**S2S #3 (June 13th, 2017):** Too Little or too much? Mitigating downstream impacts from altered water flows

**S2S #4 (July 5th, 2017):** Financing source-to-sea action

**S2S #5 (August 15th):** Approaches to assessment, tracking and modelling the Source-to-Sea interactions

Registration and session recordings at [http://www.unepdhi.org/webinars/s2s-webinars](http://www.unepdhi.org/webinars/s2s-webinars)
Thank you for attending!

- Questions/comments to Maija Bertule mabe@dhigroup.com

- Webinar recordings and slides on YouTube (UNEP-DHI) and http://www.unepdhi.org

- Short feedback survey in follow-up email – please take 3 minutes to fill in – we value your opinion!