Environmental context will affect achieving long-term Sustainable Development Goals: 
The case of coastal deltas

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Methods: overview

Case study of 49 coastal river deltas

Tessler et al. (2015) Science

Three plausible future scenarios

- SSP1 – Sustainability
- SSP2 – Middle of the road
- SSP3 – Regional rivalry

O’Neill et al. (2016) Glob. Env. Change

Integrated Assessment Modelling (IMAGE)

- Global gridded population and land use to 2100

O’Neill et al. (2016) Glob. Env. Change

Drivers (Population, economy, policies, technology, lifestyle, resources)

Agriculture and land use

Energy supply and demand

Land cover and land use

Emissions

Climate policy

Air pollution and energy policies

Land and biodiversity policies

Human system

Forest management

Agriculture

Livestock systems

Energy demand

Energy supply

Water

Nutrients

Atmospheric composition and climate

Land cover and land use

Terrestrial biodiversity

Aquatic biodiversity

Impacts

Climate impacts

Agricultural impacts

Water stress

Ressources

Ecosystem services

Human development

Source: PBL 2014
Results: deltas highly important for achieving the SDGs past 2030

Population density much higher in deltas, affecting many SDGs through health, access to clean water, food demand, migration, and risk from extreme events.

Many deltas already saturated with cropland important for food security; but SLR and salinization threaten agricultural productivity.

Many deltas rapidly urbanising, accelerating land subsidence and increasing risk from extreme events.
SDG challenges in deltas: hydrological disconnection

Hydropower for clean energy (SDG 7) and levees to protect settlements (SDG 11) impact catchment sediment flow, accretion, nutrient delivery, and threaten food security (SDG 2)

E.g., future reservoirs

SDG challenges in deltas: groundwater extraction and subsidence

Groundwater an important source of fresh water (SDG 6) but extraction causes land subsidence and leads to increased risk of flooding and salinization, with negative consequences for crop production (SDG 2) and cities (SDG 11).

E.g., Mekong delta

SDG challenges in deltas: migration and long-term goals

Exposure to threats and loss of rural livelihoods could drive massive migration to urban areas; how to effectively manage such migration in deltas beyond the 2030 SDG horizon?

E.g., Mekong delta urban/rural population

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 to 8m</td>
<td>-0.5 to 0m</td>
<td>-3 to -1.5m</td>
</tr>
<tr>
<td>1.5 to 2m</td>
<td>-1 to -0.5m</td>
<td>-2 to -1.5m</td>
</tr>
<tr>
<td>1 to 1.5m</td>
<td>-1.5 to -1m</td>
<td>-1 to -0.5m</td>
</tr>
<tr>
<td>0.5 to 1m</td>
<td>-2 to -1.5m</td>
<td>-1.5 to -1m</td>
</tr>
<tr>
<td>0 to 0.5m</td>
<td>&lt;-2m</td>
<td>&lt;-1 to -0.5m</td>
</tr>
</tbody>
</table>

- SSP1/RCP2.6 + subsidence
- SSP2/RCP4.5 + subsidence
- SSP3/RCP4.5 + subsidence
If researchers know the environmental challenges, can inform policy

1. Researchers: get environmental context on the 2030 Agenda
   - Start thinking about environmental processes for local SDG implementation, not just socio-economic context

2. Policy makers: think longer term, because of feedbacks
   - Timescales of environmental processes extend way beyond 2030, so actions pushing for a short-term goal could have long-term consequences

3. Geoscientists: contribute to SDGs research and action
   - Discussion currently dominated by policy makers and social scientists

Sustainability rooted in science

Jane Lubchenco, Allison K. Barner, Elizabeth B. Cerny-Chipman & Jessica N. Reimer

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