GEMS and the Use of Remote Sensing

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Key items

• GEMS and the ladder approach to water monitoring

• Monitoring water and sanitation in the 2030 Agenda (Arab region)

• Specifics of SDG 6.3.2 in relation to water quality

• The development stages of indicator 6.3
GEMS and the ladder approach to water monitoring

SDG 6 monitoring and reporting

GEMS/Water maintains databases with quality assurance (QA) and quality control (QC) which is integral components of the monitoring programme.
Monitoring water and sanitation in the 2030 Agenda (Arab region level)

SDG 6 targets and water-related indicators*

Table 6. Latest set of indicators proposed by the IAEG-SDGs

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Lead agencies</th>
<th>Indicator title</th>
<th>Status</th>
<th>Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1.1</td>
<td>WHO &amp; UNICEF</td>
<td>Proportion of population using safely managed drinking water services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2.1</td>
<td>WHO &amp; UNICEF</td>
<td>Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3.1</td>
<td>WHO &amp; UN-Habitat</td>
<td>Proportion of wastewater safely treated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3.2</td>
<td>UNEP</td>
<td>Proportion of bodies of water with good ambient water quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4.1</td>
<td>FAO</td>
<td>Change in water-use efficiency over time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4.2</td>
<td>FAO</td>
<td>Level of water stress: freshwater withdrawal as a proportion of available freshwater resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5.1</td>
<td>UNEP</td>
<td>Degree of integrated water resources management implementation (0-100)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5.2</td>
<td>UNECE &amp; UNESCO &amp; UNEP</td>
<td>Proportion of transboundary basin area with an operational arrangement for water cooperation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6.1</td>
<td>UNEP</td>
<td>Change in the extent of water-related ecosystems over time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6.1</td>
<td>OECD &amp; WHO &amp; UNEP</td>
<td>Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.6.1</td>
<td>WHO &amp; UNEP</td>
<td>Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifics of SDG 6.3.2 in relation to “Water Quality”

SDG 6.3.2 “Proportion of bodies of water with good ambient water quality”*

**Indicator 6.3.2**

The “Proportion of bodies of water with good ambient water quality” can be calculated using the GEMS/WATER water quality index approach. Details of the proposed method of calculation of this indicator could be found in UNSTATS (2016b).

**Data source:**

Data are available from UNEP’s GEMS/WATER and OECD. Additional information on water properties from remote sensing can be used as proxies for sediments and eutrophication/nutrient loading. For data-poor areas estimates can be generated using existing in situ data combined with modeled data and remote sensing information (UNSTATS, 2016b).

**Appropriateness for application in the Arab region:**

This indicator is appropriate for application in the Arab region.

GEMS/Water is only just starting to explore the utility of Remote sensing and satellite observation since one can only derive information on optically detectable water features such as chlorophyll which is an indicator for nutrients (i.e. indirectly for N and P).
The development stages of indicator 6.3 (1)

- Categorization
- Delimitation
- Characterisation

Classification
- Monitoring
- WQI

Screening
- FCB/E.Coli* (8-7)
- DO (8-1)
- EC/TDS (8-3/8-4)
- DIN/TN (8-6)
- DIP/TP (8-5)
- WQI (8-12)

Aggregation
- Waterbody
- Basin
- Country

6.3 Proportion of water bodies with good ambient water quality

6.3.2 Proportion of water bodies with good ambient water quality
### The development stages of indicator 6.3 (2)

#### Percentage of wastewater safely treated, disaggregated by economic activity

<table>
<thead>
<tr>
<th>Type of system (JMP definitions)</th>
<th>% of population (P)</th>
<th>Of which Contained (_C)</th>
<th>Of which safely disposed insitu (_S)</th>
<th>Of which Emptied for transport (_E)</th>
<th>Of which Transported &amp; delivered to treatment plants (_D)</th>
<th>Of which Treated at treatment plants (_T)</th>
<th>Safely managed (SM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>to piped sewers (PS)</td>
<td>PSP</td>
<td>PS_C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSSM</td>
</tr>
<tr>
<td>to septic tanks (ST)</td>
<td>STP</td>
<td>ST_C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>STSM</td>
</tr>
<tr>
<td>to pit latrines with slabs and ventilated improved pit latrines (VIPs) (PL)</td>
<td>PL_P</td>
<td>PL_C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PLSM</td>
</tr>
<tr>
<td>to other systems including composting toilets (OS)</td>
<td>OSP</td>
<td>OS_C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OSSM</td>
</tr>
</tbody>
</table>

**Total basic sanitation (BAP)**

- **BAP**

**Service provider surveys**

**Household surveys**

**New Sanitation Ladder (SDG 6.2)**

- **Safely managed services**
- **Basic services (BAP- SMaSS)**
- **Shared services**
- **Unimproved services (OSP + EWP)**
- **No sanitation services**
The development stages of indicator 6.3 (3)

3. Aggregation

<table>
<thead>
<tr>
<th>Basin-level</th>
<th>Country-level</th>
</tr>
</thead>
</table>

Percentage of classified water bodies in less than good ecological status or potential in rivers and lakes:
- < 10%
- 10-30%
- 30-50%
- 50-70%
- 70-90%
- ≥ 90%

EEA member countries not reporting under Water Framework Directive

No data

Outside coverage
Thank you
Indicator 6.5

SDG 6.5.1 “Degree of integrated water resources management implementation (0-100)”*

The “Degree of integrated water resources management implementation (0-100)” is calculated based on national surveys that are structured in 4 components: policies, institutions, management tools, and financing. Within each component there are questions with defined response options giving scores of 0-100. Questions scores are aggregated to the component level, and each component score is equally weighted to give an aggregated indicator score of 0-100. Details of the proposed method of calculation related to this indicator could found in UNSTATS (2016b).

Data source:
UNEP as part of the UN-Water monitoring framework GEMI will coordinate the UN-Water support to countries to collect the data for this indicator (UNSTATS, 2016b).

Appropriateness for application in the Arab region:
The surveys questions and their related defined response options should be discussed to ensure relevance for application in the Arab region.

6.5 (IWRM) which is under auspice of UNEP DHI

Water resources management using integrated approach

SDG 6.5 Targets

“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate”

1. **Enabling Environment**: Policy, laws, plans
2. **Institutions**: cross-sector coordination, stakeholder participation, capacity, gender and effectiveness
3. **Management Instruments**: programs, monitoring, knowledge sharing, capacity development
4. **Sustainable Financing**: for water resources development and management

Average score for "Enabling Environment" (6Q)

- + Average score for "Institutions" (9Q)
- + Average score for "Management Instruments" (6Q)
- + Average score for "Financing" (5Q)

Overall Score = SUM/4 (0-100%)
Indicator 6.6

**SDG 6.6.1 “Change in the extent of water-related ecosystems over time”**

The “Change in the extent of water-related ecosystems over time” is proposed to estimate percentage change in each major ecosystem present in a country, and the indicator will enable countries to report on those water-related ecosystems that are important to them. The structure of the indicator can be designed to align with the SEEA Water accounts and estimate percentage change in natural water capital available to society based on a) mean annual water availability; b) mean annual water withdrawals; c) environmental water requirements. Details of the proposed method of calculation related to this indicator could found in UNSTATS (2016b).

**Data source:**
UNEP as part of the UN-Water monitoring framework GEMI will coordinate the UN-Water support to countries to collect the data for this target (UNSTATS, 2016b).

**Appropriateness for application in the Arab region:**
The indicator could not be calculated for all Arab countries immediately. Existing data gaps and disagreement on delineation of aquifer systems; capacity building in data collection based on common methodologies in several Arab countries still needs to be developed.

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Ecosystem management becomes an easier task using remote sensing

**SDG 6.6 Targets**

“By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes”

- Change in the extent of water-related ecosystems over time

**6.3.2** Proportion of water bodies with good ambient water quality

**6.4.2** Level of water stress: freshwater withdrawal in percentage of available freshwater resources

**6.6.1a** Natural Water Capital

**6.6.1b** Spatial Extent of water-related ecosystems

**6.6.1c** Quantity of water in ecosystems

**6.6.1d** Quality of water in ecosystems

**6.6.1e** Resulting state/health of ecosystems
Advantages of remote sensing

• Data from remote sensing satellites can cover broad geographical areas **frequently and consistently**. Much of the relevant data may be accessed at **minimal cost** via international data sharing policies.

• Modern tools such as satellite Remote Sensing, Global Positioning System (GPS) and Geographical Information System (GIS) have been **providing newer dimensions to monitor** and manage water among other resources.

• Especially remote sensing techniques have **reduced our field work** to a considerable extent and soil boundaries are **more precisely** delineated than in conventional methods.
There are key challenges and limitations that may counter effects of all the gains

Challenges and limitation of remote sensing

• The UNEP and WCMC (World Conservation Monitoring Centre) and other partners concludes:*  

• Key challenges:  
  – Knowledge transfer and capacity building  
  – Product accuracy  
  – Uncertainty in long-term continuity  
  – Dialogue between EO community, biodiversity practitioners and decision makers*  

• Limitation of remote sensing:  
  – Cost of data acquisition and data access policy  
  – Data access: Internet and search systems  
  – The need for processing  
  – The need for more “derived products”  
  – Capacity in indicator development  
  – Effective data validation strategy  
  – Long temporal repeat of cycle  
  – Insufficient spatial resolution  
  – Cloud cover  
  – Harmonizations of methods  
  – Specific limitation:  
    • in terrestrial ecosystems)  
    • Limitation in aquatic ecosystems  
    • Intertidal zone


** Earth Observation (EO)