



GEMS and the Use of Remote Sensing

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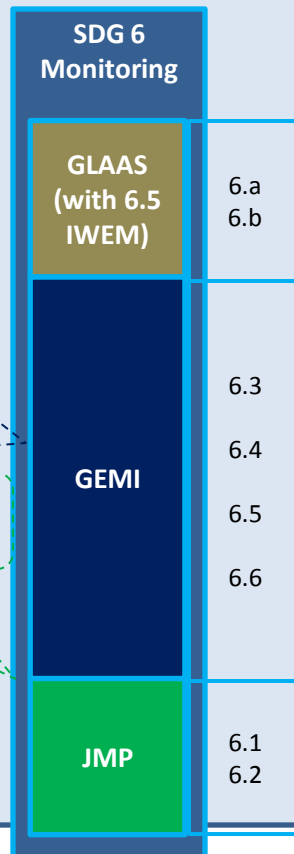
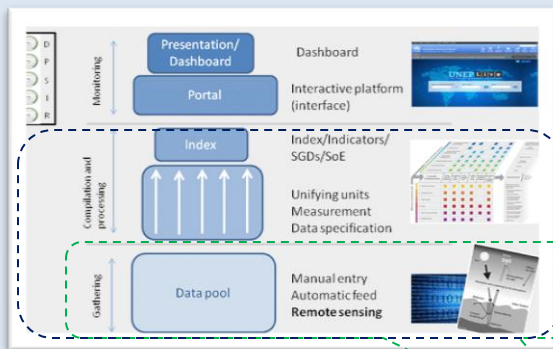
Key items

- 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

Monitoring and reporting Mechanism



UN-Water (2030 global agenda)



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 5. The SDG-6 targets

Target Number	Target Year	Target
6.1	2030	Achieve universal and equitable access to safe and affordable drinking water for all
6.2	2030	Achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
6.3	2030	Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally
6.4	2030	Substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity
6.5	2030	Implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
6.6	2020	Protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
Means of implementation indicators		
6.a	2030	Expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
6.b	-	Support and strengthen the participation of local communities for improving water and sanitation management

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












Indicator	Lead agencies	Indicator title	Status	Tier
6.1.1	WHO & UNICEF	Proportion of population using safely managed drinking water services		
6.2.1	WHO & UNICEF	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water		
6.3.1	WHO & UN-Habitat	Proportion of wastewater safely treated		
6.3.2	UNEP	Proportion of bodies of water with good ambient water quality		
6.4.1	FAO	Change in water-use efficiency over time		
6.4.2	FAO	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources		
6.5.1	UNEP	Degree of integrated water resources management implementation (0-100)		
6.5.2	UNECE & UNESCO & UNEP	Proportion of transboundary basin area with an operational arrangement for water cooperation		
6.6.1	UNEP	Change in the extent of water-related ecosystems over time		
6.a.1	OECD & WHO & UNEP	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan		
6.b.1	WHO & UNEP	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management		





 Indicators for which there is general agreement;  A first tier for which a methodology has been developed and data are already widely available;  A second tier for which a methodology has been developed but data are not easily available;  A third tier for which a methodology has not yet been developed.

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”*

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

Indicator	Lead agencies	Indicator title	Status	Tier
6.1.1	WHO & UNICEF	Proportion of population using safely managed drinking water services		II
6.2.1	WHO & UNICEF	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water		II
6.3.1	WHO & UN-Habitat	Proportion of wastewater safely treated		III
6.3.2	UNEP	Proportion of bodies of water with good ambient water quality		II
6.4.1	FAO	Change in water-use efficiency over time		I
6.4.2	FAO	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources		I
6.5.1	UNEP	Degree of integrated water resources management implementation (0-100)		I
6.5.2	UNECE & UNESCO & UNEP	Proportion of transboundary basin area with an operational arrangement for water cooperation		II
6.6.1	UNEP	Change in the extent of water-related ecosystems over time		II
6.a.1	OECD & WHO & UNEP	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan		II
6.b.1	WHO & UNEP	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management		II

 Indicators for which there is general agreement;  A first tier for which a methodology has been developed and data are already widely available;  A second tier for which a methodology has been developed but data are not easily available;  A third tier for which a methodology has not yet been developed.

 Leading

 Co-Leading

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)

6.3 Water quality

The development stages of indicator 6.3 (1)

6.3.2
Proportion of water bodies with
good ambient water quality

Classification

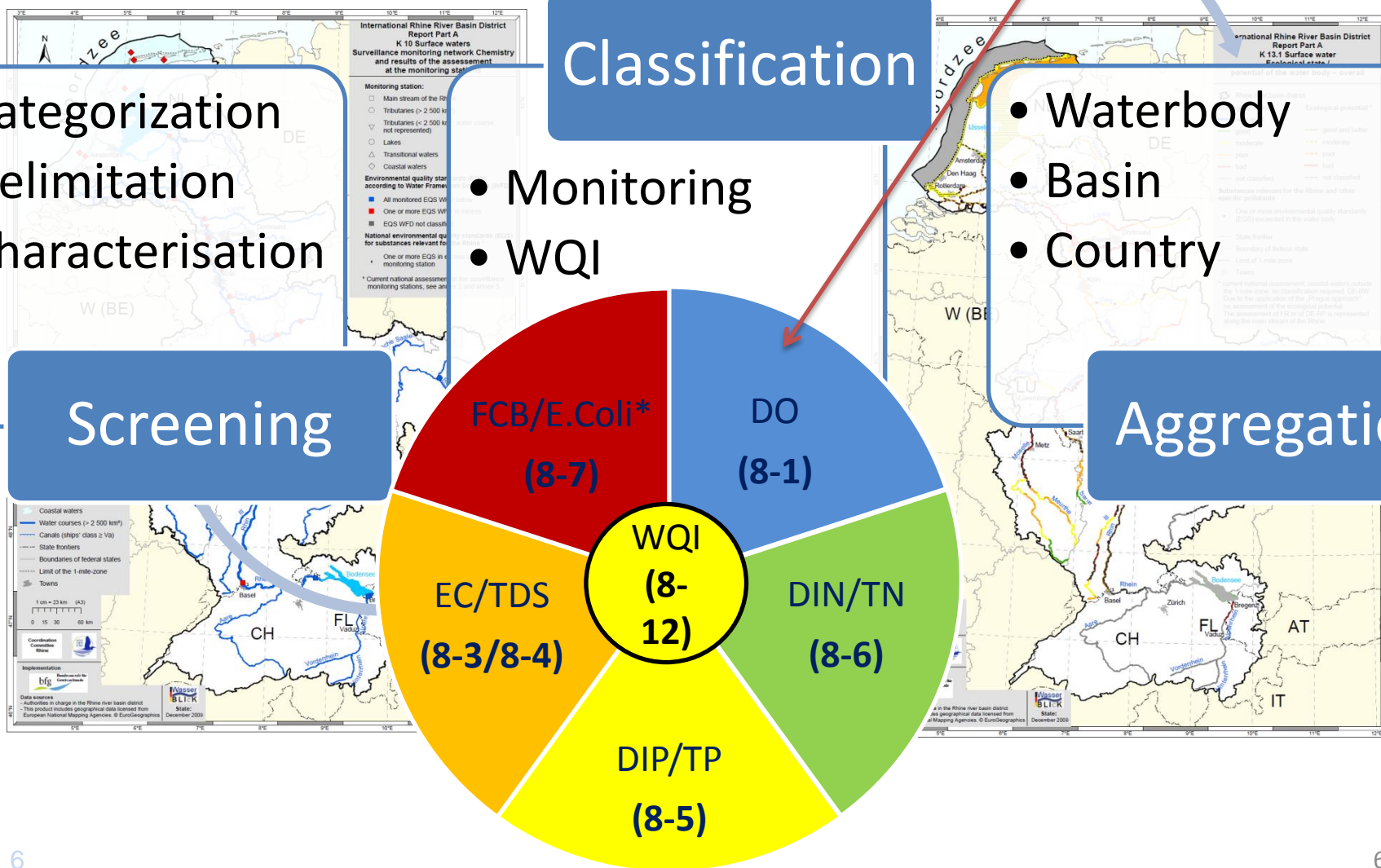
- Categorization
- Delimitation
- Characterisation

- Monitoring
- WQI

- Waterbody
- Basin
- Country

Screening

Aggregation



The development stages of indicator 6.3 (2)

6.3.1 ⇔ 6.2.1

Percentage of wastewater safely treated, disaggregated by economic activity

Type of system (JMP definitions)		% of population (P)	Of which Contained (C)	Of which safely disposed insitu (S)		Of which Emptied for transport (E)	Of which Transported & delivered to treatment plants (D)	Of which Treated at treatment plants (T)	Safely managed (SM)
				yes	no				
Basic sanitation	to piped sewers (PS)	PSP	PS_C				PS_D	PS_T	PSSM
	to septic tanks (ST)	STP	ST_C			ST_E	ST_D	ST_T	STSM
	to pit latrines with slabs and ventilated improved pit latrines (VIPs) (PL)	PLP	PL_C			PL_E	PL_D		PLSM
	to other systems including composting toilets (OS)	OSP	OS_C			OS_E	OS_D	OS_T	OSSM
	Total basic sanitation (BAP)	BAP					Total safely managed		SMaSS
Shared (SHS)	to shared or public latrines of an otherwise acceptable type (SH)	SHP							
Unimproved (USS)	to pit latrines without slab (e.g. open pits and traditional latrines) (OP)	OSP							
	to elsewhere, hanging latrines and bucket latrines (EW)	EWP							
OD (NSS)	to open defecation (OD)	ODP							
Total non-basic sanitation		NBP							
Total basic sanitation + total non-basic sanitation (BAP+NBP)		100%							

Household surveys?

Service provider surveys?

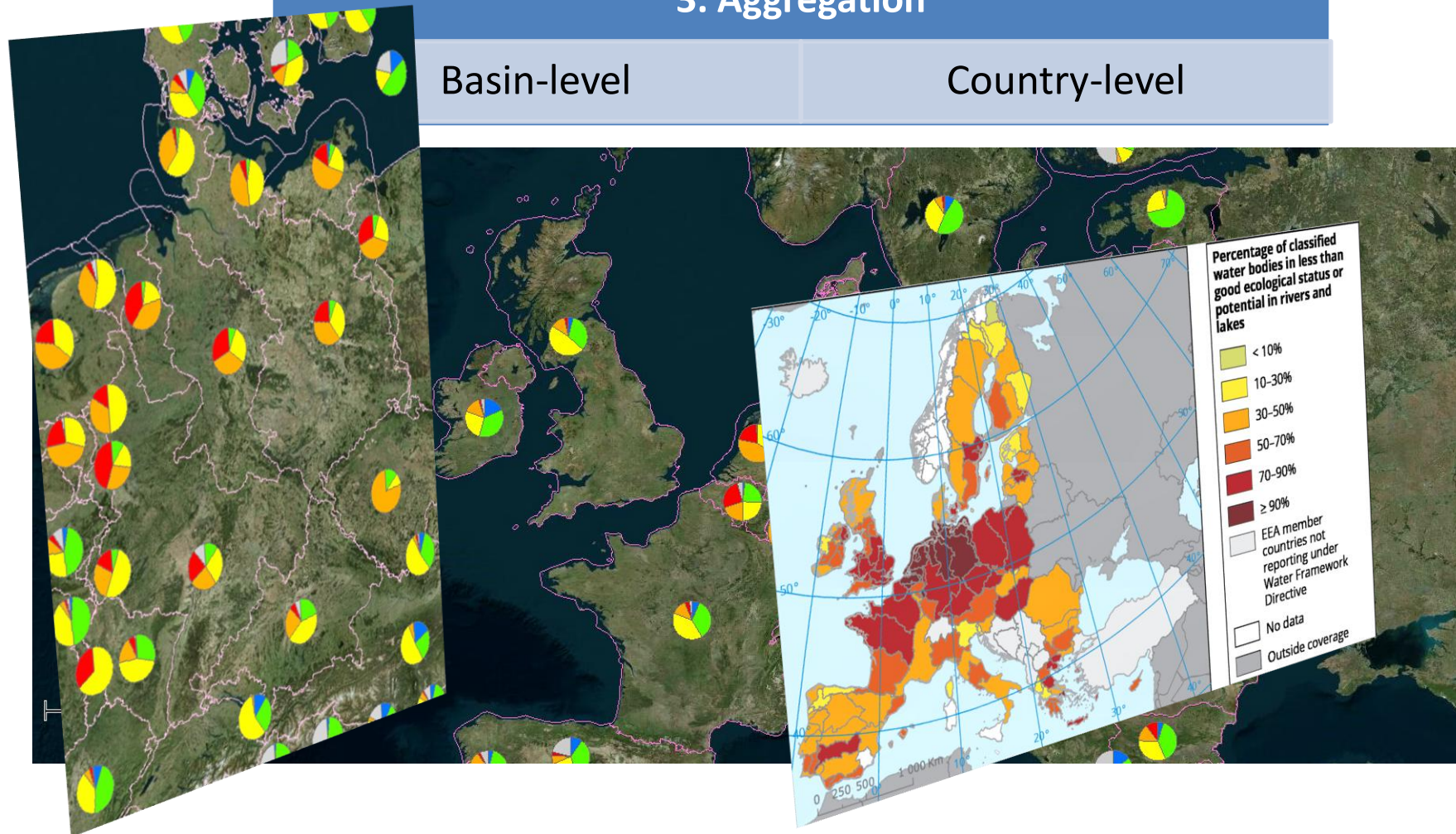
New Sanitation Ladder (SDG 6.2)	
Safely managed services	SMaSS
Basic services (BAP- SMaSS)	BSS
Shared services	SHS
Unimproved services (OSP + EWP)	USS
No sanitation services	NSS

The development stages of indicator 6.3 (3)

3. Aggregation

Basin-level

Country-level





Thank you

Indicator 6.5

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

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

Indicator	Lead agencies	Indicator title	Status	Tier
6.1.1	WHO & UNICEF	Proportion of population using safely managed drinking water services	●	II
6.2.1	WHO & UNICEF	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	●	II
6.3.1	WHO & UN-Habitat	Proportion of wastewater safely treated	●	II
6.3.2	UNEP	Proportion of bodies of water with good ambient quality	●	III
6.4.1	FAO	Change in water-use efficiency over time	●	II
6.4.2	FAO	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	●	I
6.5.1	UNEP	Degree of integrated water resources management implementation (0-100)	●	I
6.5.2	UNECE & UNESCO & UNEP	Proportion of transboundary basin area with an operational arrangement for water cooperation	●	I
6.6.1	UNEP	Change in the extent of water-related ecosystems over time	●	II
6.a.1	OECD & WHO & UNEP	Amount of water- and sanitation-related development assistance that is part of a government-coordinated spending plan	●	II
6.b.1	WHO & UNEP	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	●	II

● Indicators for which there is general agreement: ● A first tier for which a methodology has been developed and data are already widely available. ● A second tier for which a methodology has been developed but data are not easily available. ● A third tier for which a methodology has not yet been developed.

Leading (blue box)
Co-Leading (yellow box)

Indicator 6.5.1

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).d 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”

- Degree of integrated water resources management implementation (0-100)
- Proportion of transboundary basin area with an operational arrangement for water cooperation

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” (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”*

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

Indicator	Lead agencies	Indicator title	Status	Tier
6.1.1	WHO & UNICEF	Proportion of population using safely managed drinking water services	●	II
6.2.1	WHO & UNICEF	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	●	II
6.3.1	WHO & UN-Habitat	Proportion of wastewater safely treated	●	III
6.3.2	UNEP	Proportion of bodies of water with good ambient water quality	●	II
6.4.1	FAO	Change in water-use efficiency over time	●	I
6.4.2	FAO	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	●	I
6.5.1	UNEP	Degree of integrated water resources management implementation (0-100)	●	I
6.5.2	UNEP & UNESCO	Proportion of transboundary basin area with an operational arrangement for water cooperation	●	I
6.6.1	UNEP	Change in the extent of water-related ecosystems over time	●	II
6.a.1	OECD & WHO & UNEP	Amount of water- and sanitation-related development assistance that is part of a government-coordinated spending plan	●	II
6.b.1	WHO & UNEP	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management	●	II

● Indicators for which there is general agreement; data are already widely available. ● A first tier for which a methodology has been developed and data are not easily available. ● A second tier for which a methodology has been developed but data are not easily available. ● A third tier for which a methodology has not yet been developed.

Leading

Co-Leading

Indicator 6.6.1

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.

6.6
Eco-
systems

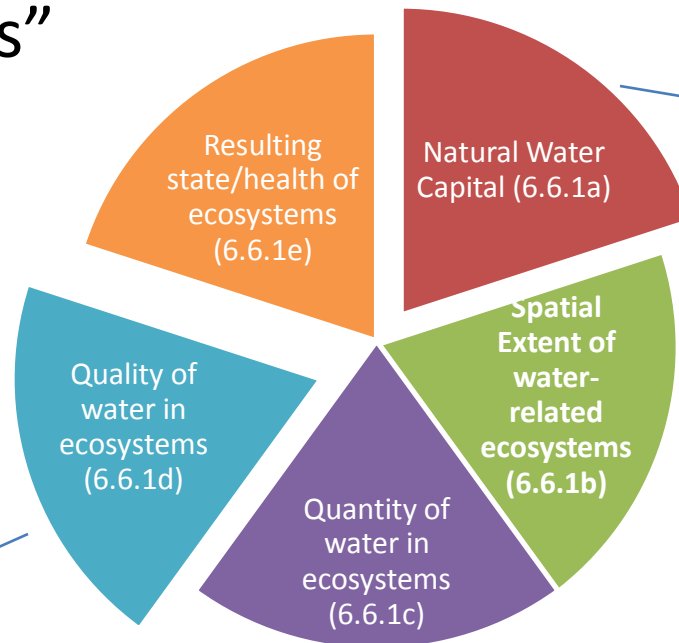
Ecosystem management becomes an easier task using remote sensing



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



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

6.3.2
Proportion of water bodies with good ambient water quality



The use of remote sensing have many advantages however,

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

* <https://www.cbd.int/doc/publications/cbd-ts-72-en.pdf>

** Earth Observation (EO)