MEDRC

TRANSBOUNDARY WATERS

PRACTIONER BRIEFING

WATER ACCOUNTING+

Issue 1

Water Accounting+

"Complex water problems require negotiated solutions,"[i] and negotiation should begin by establishing the facts as understood by each stakeholder. Transboundary water resources present a variety of complex challenges to riparian nations, ranging from the natural to the technological, as well as political and economic factors. Common issues include the fair allocation of shared water resources, sustainable usage, and coordination of management.

Accurate information regarding water basins and transparency in their usage are critical components for cooperation in such complex water networks. **Water Accounting+** is a methodology that can assist riparians with cooperating on these fronts, and is a tool for the implementation of IWRM—Integrated Water Resource Management.

Water Accounting+ practices, along with Remote Sensing technology, can help to fill information gaps in a transparent manner using independently verifiable information, helping to generate buy-in from riparian partners. WA+ methodologies are part of this equation, but implementing these practices into actionable mechanisms is also required, to better disseminate water data and provide a common set of facts to work from.

Practical Summary

Water Accounting+ ("WA+"), looks to standardize the practice of measuring and presenting data on water resources, similar to public financial statements. For instance, publicly traded companies must have easily comparable and verifiable financial information that allows investors to value the company and make informed investment decisions. For water, it is about understanding what is available, and how it is used within the environment. WA+ seeks to present that information in clearly defined and concise way.

As water resources become increasingly stressed in a context of multiple users, it is then increasingly important to plan the development, allocation, and management of water resources, while considering the impact of domestic policies in a transboundary context. WA+ can aid policy makers to make decisions based on the actual amount of water available in a basin and with a greater understanding of the potential impacts for all sharing a water basin.

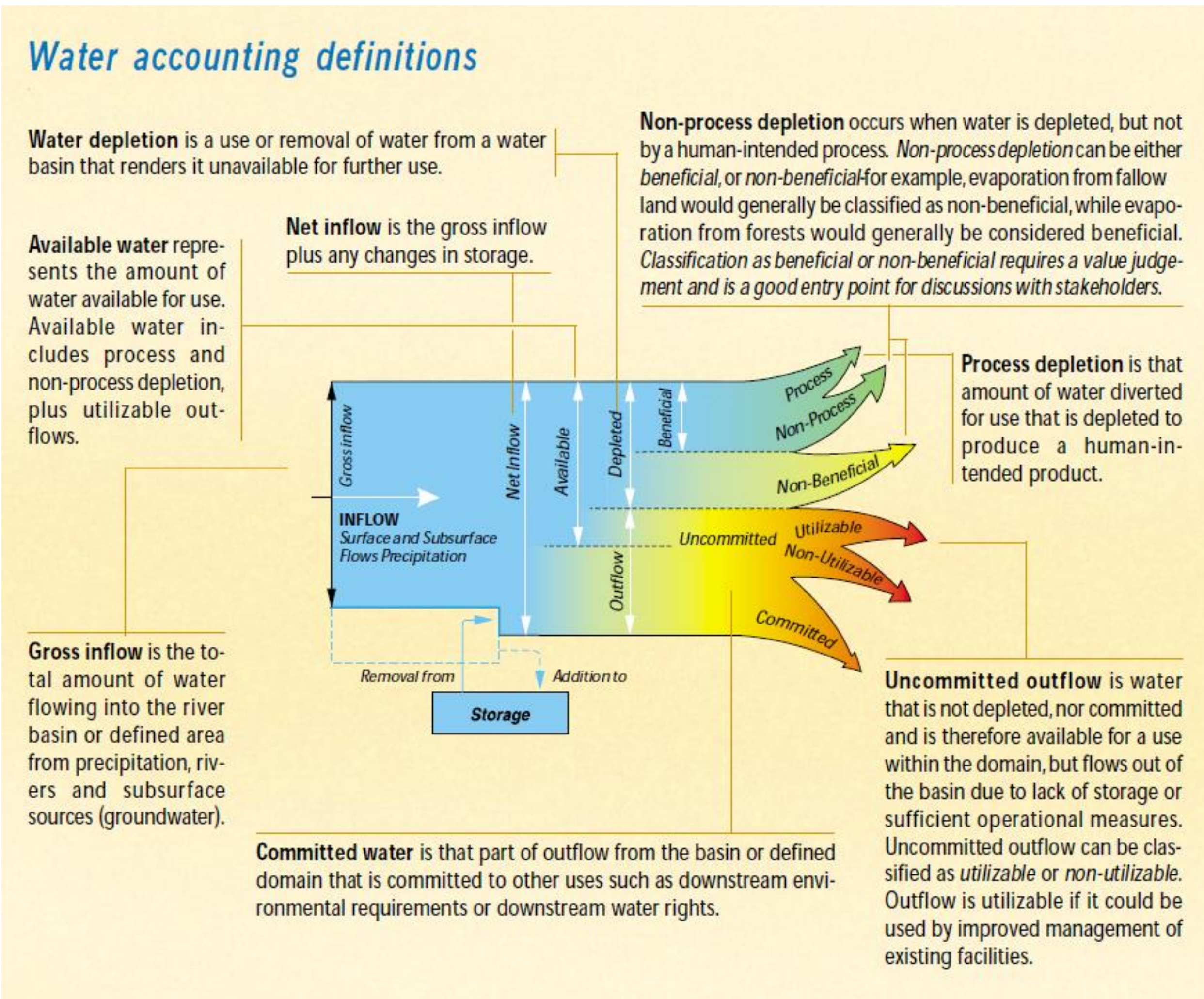
By standardizing the data, information can be more easily shared and leveraged for policy or strategic investment decisions. Water authorities operating on transboundary water basins need to have the right information, which is easily shared between riparian water partners, to make coordinated decisions that are also sustainable. Furthermore, having information that is transparent and independently verifiable, without some of the bureaucratic overhangs of disparate ministries or opposing data standards, will facilitate coordinated decision making between transboundary partners.

Water Accounting+ frameworks and methodologies can help to alleviate points of conflict in shared water resources by increasing knowledge of the supply and nature of the demand of water basin resources, while encouraging transparency of usage that is independently verifiable and contributed to by all partners.

Current data sets on water resources are often incomplete, absent, or hidden, and their data points are often not comprehensive. Certified data sets are required for use at the negotiation table, standardizing terminologies and definitions, so they can be used by various decision makers—such as hydrologists, policy makers, lawyers, economists, or agronomists.

Water Accounting+ Methodology – WA+ uses a “water balance” approach to quantify the amount of water entering and leaving a system, classifying the use of water as it moves through the system. Once water is categorized, WA+ indicators refine the picture to inform policy decisions.

Depleted Fraction indicators reveal how much scope remains for water resources to be developed, how close they are to being fully committed, and how sustainable the system is. For example, for Pakistan’s Chishtian sub-basin, the depleted fraction (amount of water depleted divided by gross inflow) was 1.09—meaning more water is being depleted than is flowing into the system. This indicates



groundwater overdraft and therefore unsustainable water use.

Beneficial Utilization relates the amount of water depleted by all beneficial processes to the amount of water available for use. This indicator offers a more accurate view of basin efficiency than traditional indicators, because it takes into consideration the water consumed by valuable natural ecosystems as well as the water consumed by human activities (such as agriculture). For example, according to the classical definition, the Kirindi Oya sub-basin has an efficiency of 22 percent (counting only water used by crops), but its beneficial utilization is actually much higher—65 percent (counting water consumed by crops and beneficial natural vegetation).

Productivity of Water quantifies the value derived from the water used. In agriculture, it can be expressed as the yield (in kilograms) produced per cubic meter of water consumed by crops. More generally, it can be expressed as the economic value of production per unit of water consumed. These productivity values can also be related to the amount of water available, depleted, or diverted.[ii]

The provided WA+ methodology is separated into eight (8) categories, which can be grouped into three (3) major components:

Excessive Withdrawals | Multiple Water Users | Climate Change
Lack of Information | Management | Assessment & Control
Plan of Action | Implementation

1) <u>Basic Assumptions</u>: Excessive usage of limited water resources generates competition and competing interests between water users, which is further exacerbated and complicated by climate change.

2) <u>Identified Problems</u>: Lack of information hinders effective policy decisions and limits cooperation between water basin partners, negatively impacting the management of shared water resources, and limiting effective assessment and control across various water stakeholders.

3) <u>Policy Responses</u>: Plans of action must include standardized reporting to be effective, and must be implemented via a management system that is effective for the sustainable use of water as a public good. [iii]

Having provided a logical framework on the need for improved water data collection and reporting, the next challenge is over what form this should take. Large discrepancies in the capacities of riparian partners can create challenges for effective cooperation in IWRM. A common language and common data helps to alleviate this problem, but cooperative capacity development is critical as well.

Data is the first step. It needs to be collected in a comprehensive and transparent fashion at regular intervals in order to develop reliable data sets. Remote sensing techniques are improving capacity in this regard, but must still be supplemented by on the ground measurements of surface water, and integrated with ground water data for a truly complete picture.

Reporting is the second step. Data that is collected but not shared does not contribute to water diplomacy or further cooperation between partners. While many laws require the collection and monitoring of water resources, there is no standardized reporting system in place. Reporting water resource data to a centralized hub, which can be viewed and accessed by all parties contributes to cooperative decision making, while increasing transparency, thereby generating further buy-in for cooperation from riparian partners.

The next step is to increase water system capacity with the appropriate infrastructure, developed in cooperative manner, and to monitor its development against the collected data. Such a process is most effective with skin-in-the-game by all parties. The varied nature of water policy has typically led to weak coordination and integration, both within governments, and in particular between governments.

WA+ Transboundary Examples

- Nile basin
- Mekong
- Vu Gia Thu Bon
- Awash river basin
- Helmand
- East Rapti river basin
- Mara
- Naivasha
- Incomati
- Okavango river basin
- Sri Lanka basins

Water Accounting has been used in contexts such as India, Pakistan, Nepal, Sri Lanka, Indonesia, the Philippines, and China to more effectively deal with water scarcity and pollution challenges, and to measure the efficient usage of farming techniques.

WA+ can be applied in either national or transboundary water contexts, helping to give a more complete picture of water resources, or providing standardized information that is comprehensive for transboundary water partners.

Joint-water commissions such as the Mekong River Commission (MRC) and the Nile Basin Initiative (NBI) have utilized these methods, to gather and present data, while serving as an information services resource hub—such as the MRC Data Hub or Nile Information System.

The Nile Basin Initiative (NBI) is an intergovernmental partnership of 10 Nile Basin countries—Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, The Sudan, Tanzania and Uganda. Eritrea participates as an observer. The all-inclusive basin-wide institution was established on 22nd February 1999 to provide a forum for consultation and coordination among the Basin States for the sustainable management and development of shared Nile Basin waters and related resources.[iv]

An example project, “Accounting for Nile Waters,” set out to explore how WA+ could guide decisions on water allocation, addressing problems from ambitious investments in irrigated agriculture and new irrigation systems in the region. The project explored whether such efforts have contributed to establishing sustainable ecosystem services and gender equality along the basin due to changes in water allocation, with case studies from Ethiopia, Egypt, and Sudan.

“Water use in the eastern Nile basin has grown by many folds due to different factors. However, problems of water accessibility remain unresolved. Water problems can be diagnosed in different ways, including by assessing the overall health of an ecosystem. While improving access to water for all is a mandate of institutions in the water sector, such efforts require information and buy-in from many disciplines.

Water accounting provides relevant and unequivocally understood data about water uses and value, which is central for effective communication with decision makers and other stakeholders. If WLE can demonstrate how water accounting provides information that eases decision making, equitable and transparent water governance for all water users and a sustainable water balance at scale might be possible.

Putting the water accounting methodology into use requires a good understanding of decision-making processes, which would enable WLE researchers to present the research outputs and demonstrate the value of Water accounting at the right place and at the right time. If done successfully, this approach could be an excellent vehicle for securing stakeholders’ buy-in.”

A product of this project is the Nile Water Lab website, which provides a central hub for case studies and multiple water projects along the Nile—Salam Canal Project (Egypt), Beles Sugar Development Project (Ethiopia), and Waha Irrigation Project (Sudan). The Nile Water Lab presents different stakeholders’ experiences of new investment projects and multiple encounters which shape their relations to other stakeholders and infrastructure along the Nile.

Another pilot project by CGIAR’s Water, Land, and Ecosystems research program is on the Greater Mekong region, proving project results, basin maps and information, and serving as central hub for a knowledge.

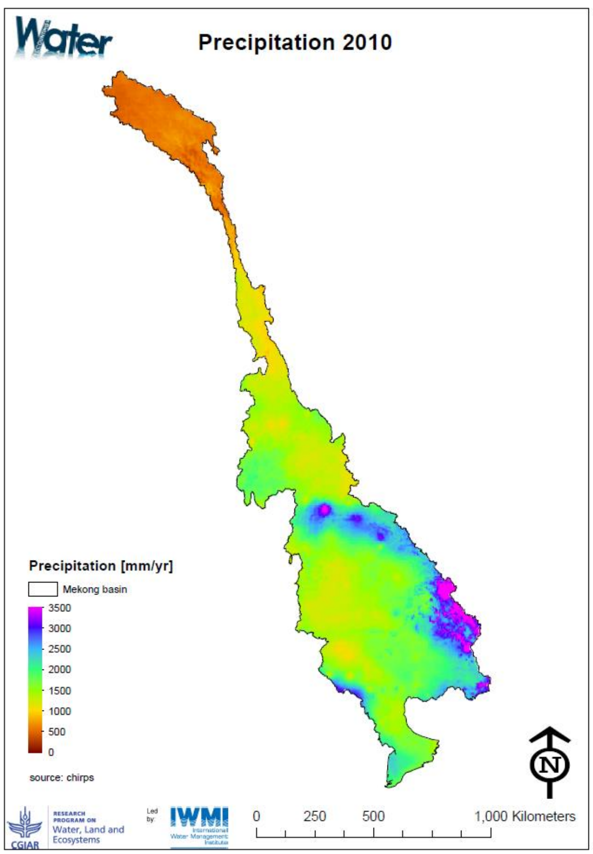
The Mekong River Commission is mandated to achieve strategic objectives in IWRM for the balanced and socially just development of the Mekong River Basin, while protecting the environment and maintaining the region’s ecological balance. The MRC Council has approved an IWRM-based Basin Development Strategy since 2010, updated in 2015 and endorsed in 2016. It provides a framework for transboundary governance of this development process, including alignment of national plans and projects, basin management processes and the identification of strategic analyses to address current knowledge gaps.

Approved procedures include Data and Information Exchange and Sharing (approved 2001), and Water Use Monitoring (approved 2003), to operationalize information exchange and basin monitoring data among MRC member countries. From the 2016 BDS, "The significant and long-term investment that the MRC has made in data and knowledge will greatly facilitate the early identification of opportunities for joint development and benefit sharing. The development of such projects will lead inevitably to higher levels of transboundary cooperation, benefiting many sectors (such as food, energy, navigation, tourism, and flood protection), and thus advance ASEAN integration."

Water Accounting+ Exhibits

The following exhibits provide examples of Water Accounting+ sheets used for various tailored contexts, including Resource Base, Evapotranspiration, Agricultural Uses, Utilized Flow, Surface Water, Ground Water, Hydrological Ecosystem, and Sustainability.

Examples of these documents are available on the Water Accounting+ website, including for the Nile, Mekong, and other water basins.



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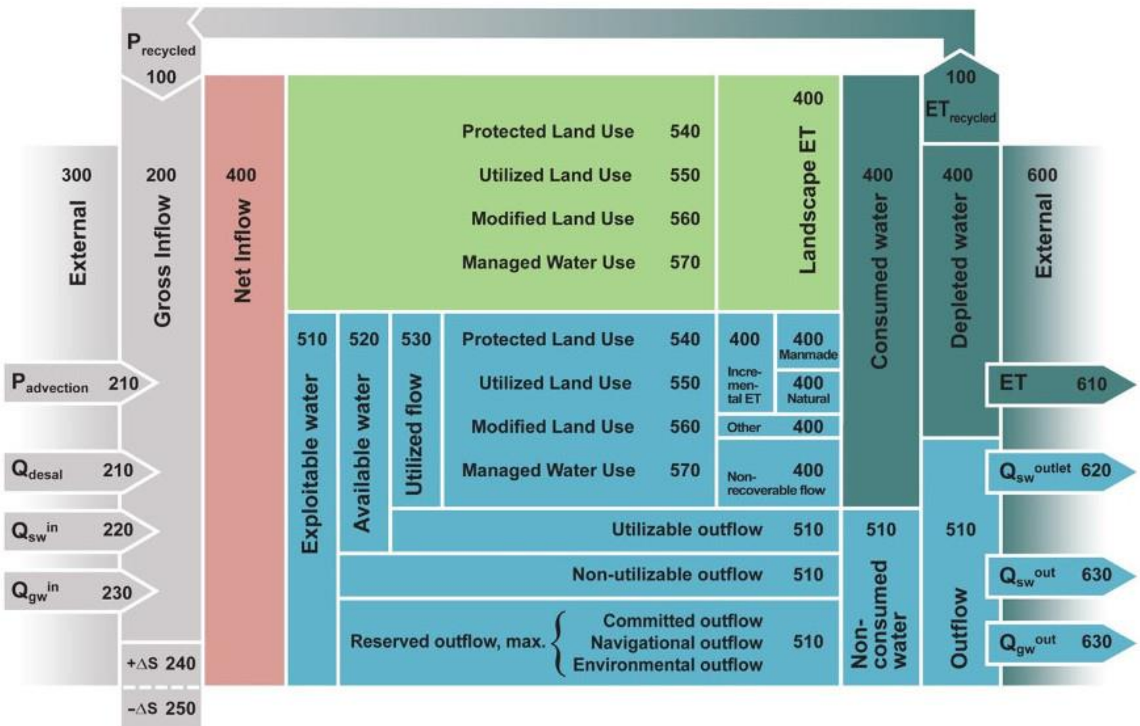
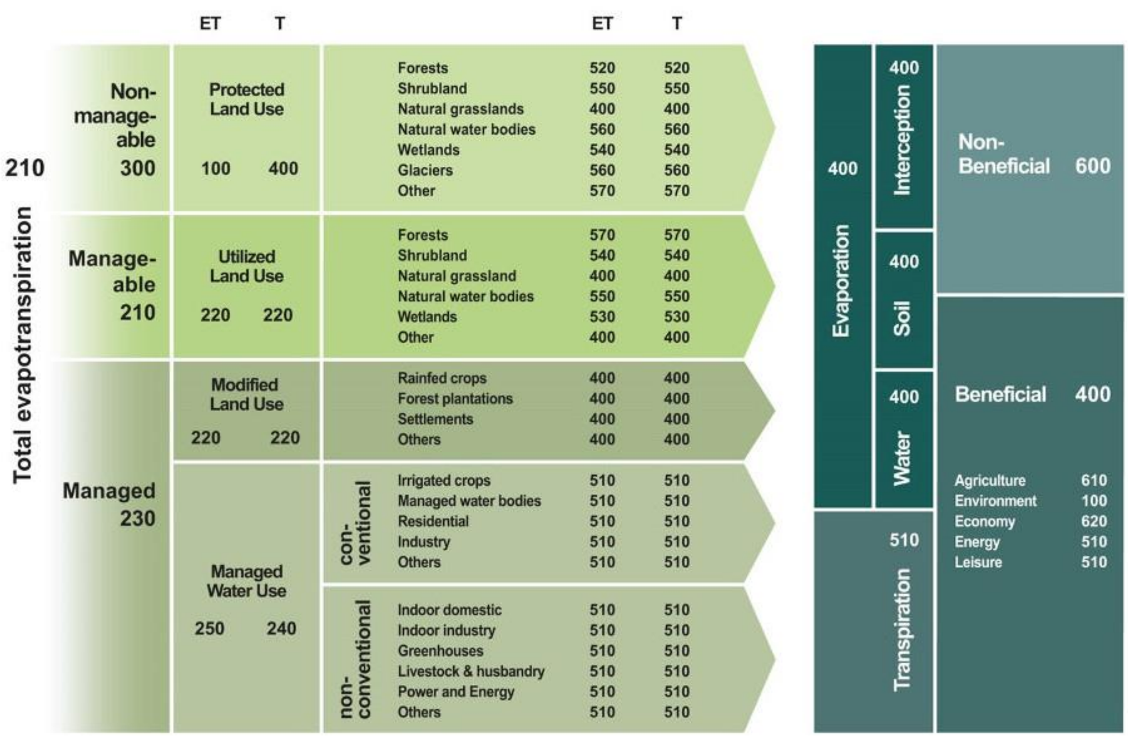
Sheet 1: Resource Base (km³/yr)

Basin:
Period:



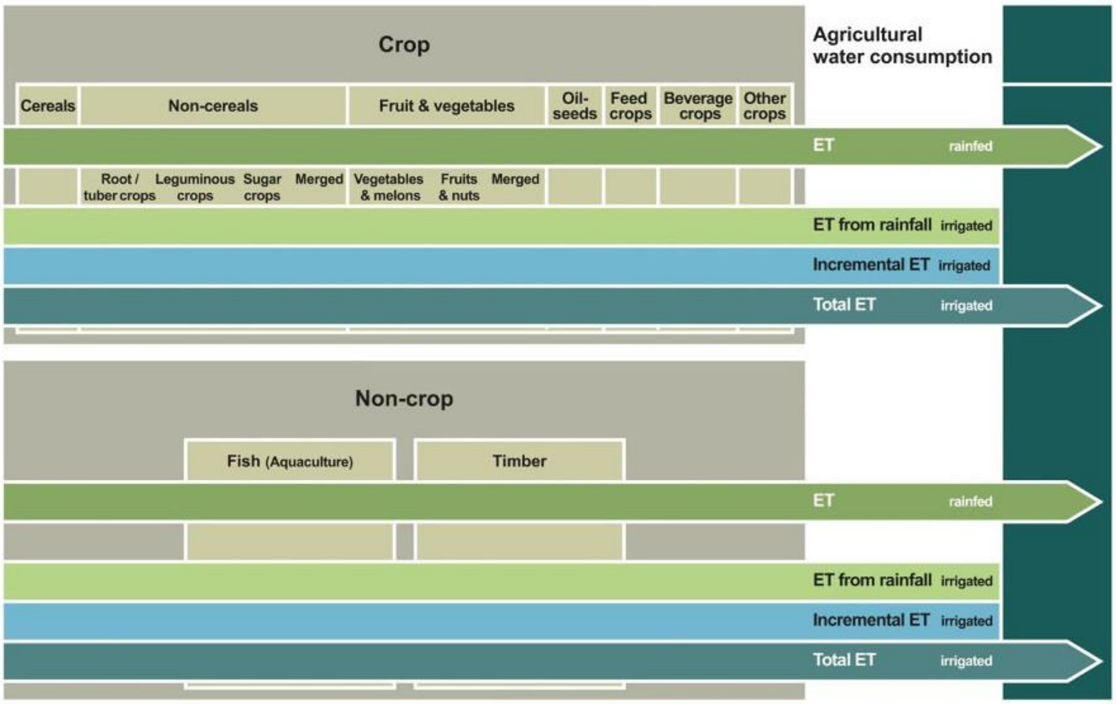
Sheet 2: Evapotranspiration (km³/yr)

Basin:
Period:



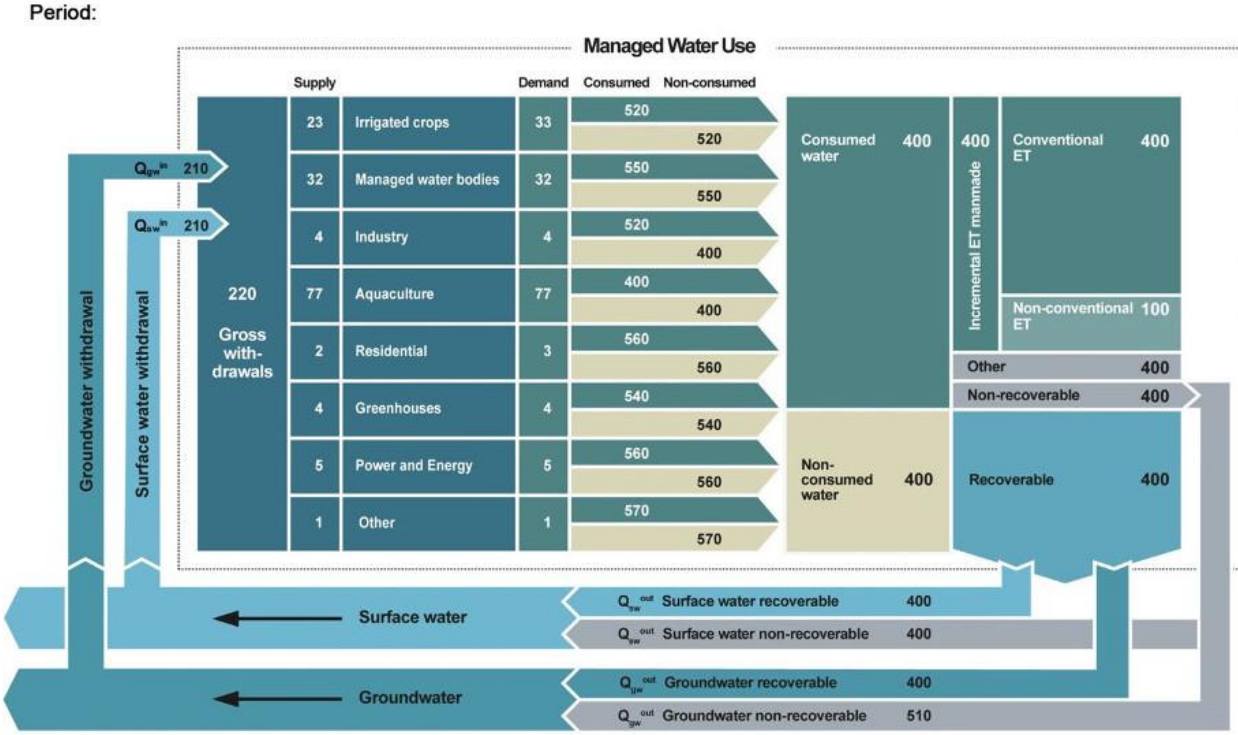
Sheet 3: Agricultural services
Part 1: Agricultural water consumption (km³/yr)

Basin:
Period:



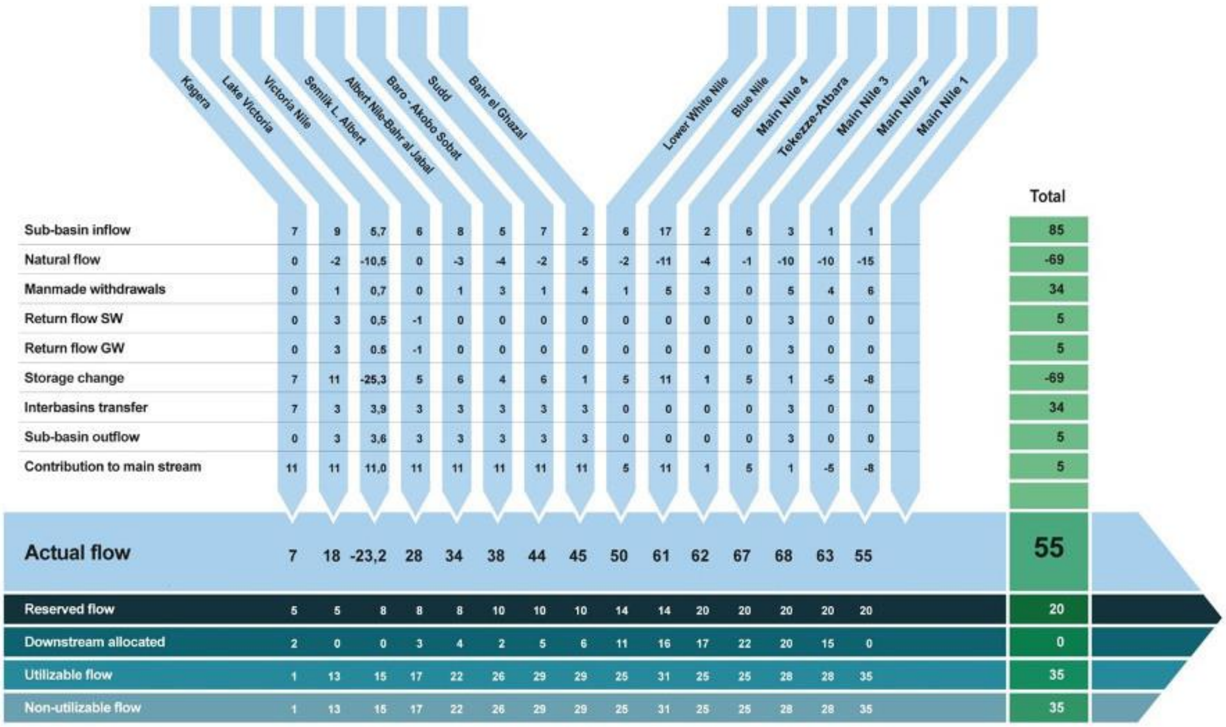
Sheet 4: Utilized Flow
Part 1: Manmade (Mm³/yr)

Basin:
Period:



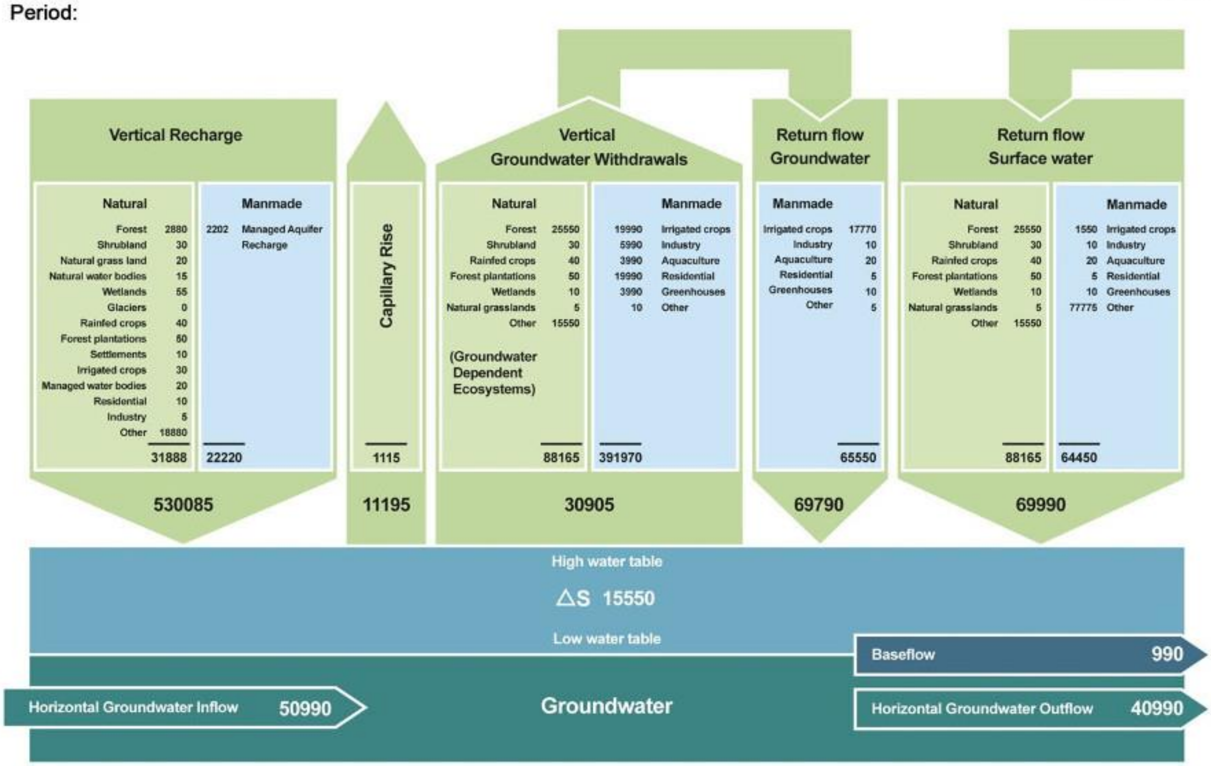
Sheet 5: Surface water (km^3/yr)

Basin:
Period:



Sheet 6: Groundwater (Mm^3/yr)

Basin:
Period:



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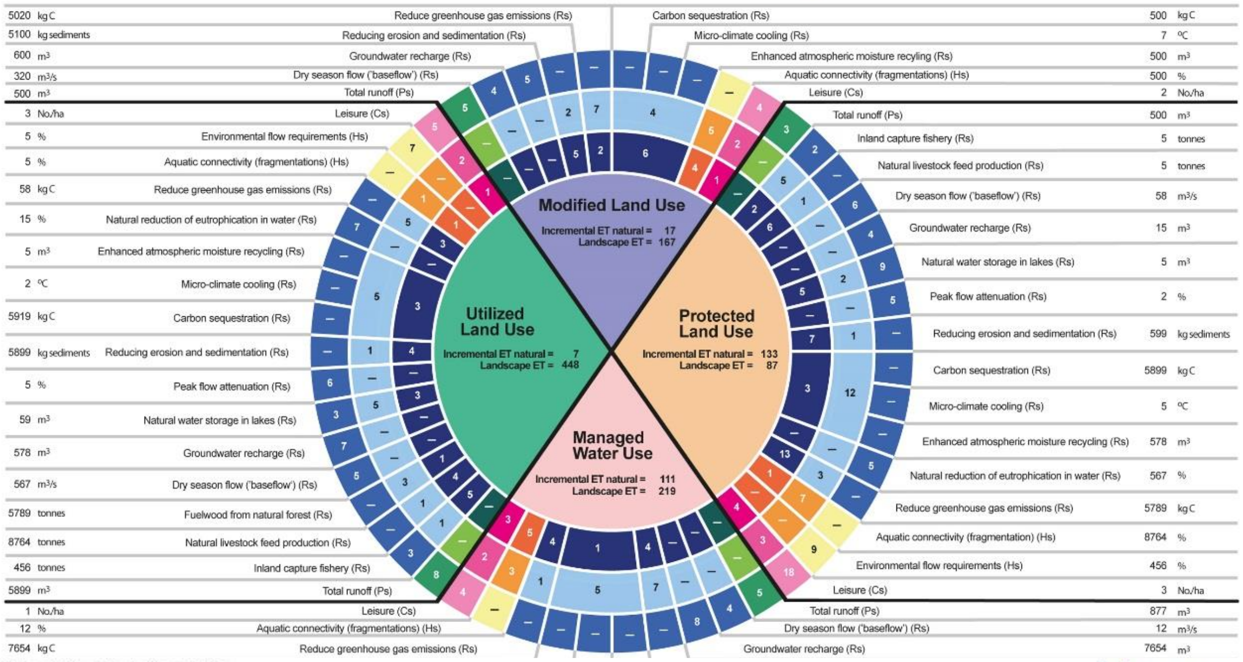
Sheet 7: Hydrological Ecosystem Services (Mm^3/yr)

Basin:
Period:



Sheet 8: Sustainability

Basin: Katmandu Basin
Period: 2004 - 2014

Cause

System behaviour

	Anomalies		10 Year change (%/yr)
Rainfall (mm)	+403	(+22.2%)	
Surface temp (ºC)	-1.7	(-12.1%)	
Soil mois (cm^3/cm^3)	-0.02	(-2.1%)	
ET (mm)	+76	(+0.9%)	
Open water (ha)	+331	(+1.1%)	
Vegetation cov (%)	-7.2	(-8.4%)	
NPP (kg/ha)	-1531	(-7.3%)	
TSS (mg/l)	+5.4	(+8.8%)	
Chlorophyl (mg/l)	+1.3	(+4.4%)	
Forest (ha/yr)	-32	(-6.4%)	
Urban (ha/yr)	+140	(+2.2%)	
Crop (ha/yr)	+32	(+2.3%)	

% represents A/mean

Response

Reliability

Category	I	II	III
Number of wet events			
A (NPP)	7	5	2
A (ET)	8	4	1
Mean A	8	5	2
10 yr mean	9	11	5
Number of dry events			
A (NPP)	7	2	1
A (ET)	4	8	1
Mean A	6	5	1
10 yr mean	6	5	2

Resilience

Category	I	II	III
Duration of wet events (d)			
A (veg cover)	11	5	2
A (LST)	7	4	1
A (theta)	8		
Mean A	8	5	2
10 yr mean	9	11	5
Duration of dry events (d)			
A (veg cover)	18	2	1
A (LST)	23	8	1
A (theta)	17		
Mean A	21	5	1
10 yr mean	20	5	2

Vulnerability

	A(NPP) tonnes	A(ET) m^3
PLU	+343(+34.7%)	+343(+34.7%)
ULU	+223 (+2.2%)	+223 (+2.2%)
MLU	-33 (-0.3%)	-33 (-0.3%)
MWU	+83 (+7.2%)	+83 (+7.2%)

% represents A/mean

Effect

Water resources status and ecosystem services

Arrow is 10 year change

Blue water availability A (+6 km^3/yr)	Safeguarding env water A (-1.1 km^3/yr)	Atmospheric cooling A (-1.8 ºC)
Utilizable outflow A (+2.3 km^3/yr)	Storage change A (-2.7km^3/yr)	Carbon sequestration A (-11.31 ton C/yr)
Water scarcity A (-2.2 km^3/yr)	Agr. water productivity A (-2.4 kg/m^3)	Sustaining rainfall A (+3.3 km^3/yr)

Sources for Further Learning

Websites

Food and Agriculture Organization of the United Nations (FAO)

India Water Portal

International Water Management Institute (IWMI) – CGIAR Research Center

Mekong River Commission

Nile Basin Initiative

Nile Water Lab

UNESCO-IHE Institute for Water Education

Water Accounting methodology (WA+) – Initiative by IWMI, CGIAR, UNESCO-IHE, FAO & WWAP

Water Diplomacy – Cambridge-based water group focused on water diplomacy frameworks

Water, Land and Ecosystems – Greater Mekong

World Water Assessment Program (WWAP)

Organization Reports

Mekong River Commission Publications

Nile Basin Initiative – Trans-boundary Policies

Articles & Journals

P. Karimi, W. G. M. Bastiaanssen, and D. Molden. Water Accounting Plus (WA+) – a water accounting procedure for complex river basins based on satellite measurements.

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Bastiaanssen, Wim G. M., Lan Than Ha, and Mark Fenn.
(2015). Water Accounting Plus (WA+) for Reporting Water Resources Conditions and Management: A Case Study in the Ca River Basin, Vietnam.

Peiser, Livia, and Wim G. M. Bastiaanssen. (2015). Analysis on Water Availability and Uses in Afghanistan River Basins: Water Accounting through Remote Sensing (WA+) in Helmand River Basin.

Molden, David. (1997). Accounting for Water Use and Productivity. Swim Paper. Colombo, Sri Lanka.

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[i] Islam, Shafiqul, Lawrence Susskind. Water Diplomacy: A Negotiated Approach to Managing Complex Water Networks. RFF Press, 2013. waterdiplomacy.org

[ii] "Water Accounting for Integrated Water Resources Management," International Water Management Institute www.iwmi.org

[iii] WA+ Methodology, wateraccounting.org/methodology

[iv] Nile Basin Initiative, www.nilebasin.org

Acknowledgements

The MEDRC Transboundary Waters Practitioner Briefing series has been developed for water industry practitioners and government officials at the request of MEDRC's member countries, with sponsorship provided by the Netherlands and Sweden. The briefings are meant to be informative and practical, providing an overview of the subject matter material, while remaining accessible to various backgrounds and disciplines. The briefings serve to develop shared knowledge and serve as a basis of further discussions between partners. If you would like to learn more about these subjects, please see the section "Sources for Further Learning."