International Water Management Institute

CGIAR

Water Accounting +

Introduction to Water Accounting + Framework- land use, water balance

October 27, 2022 - Session I

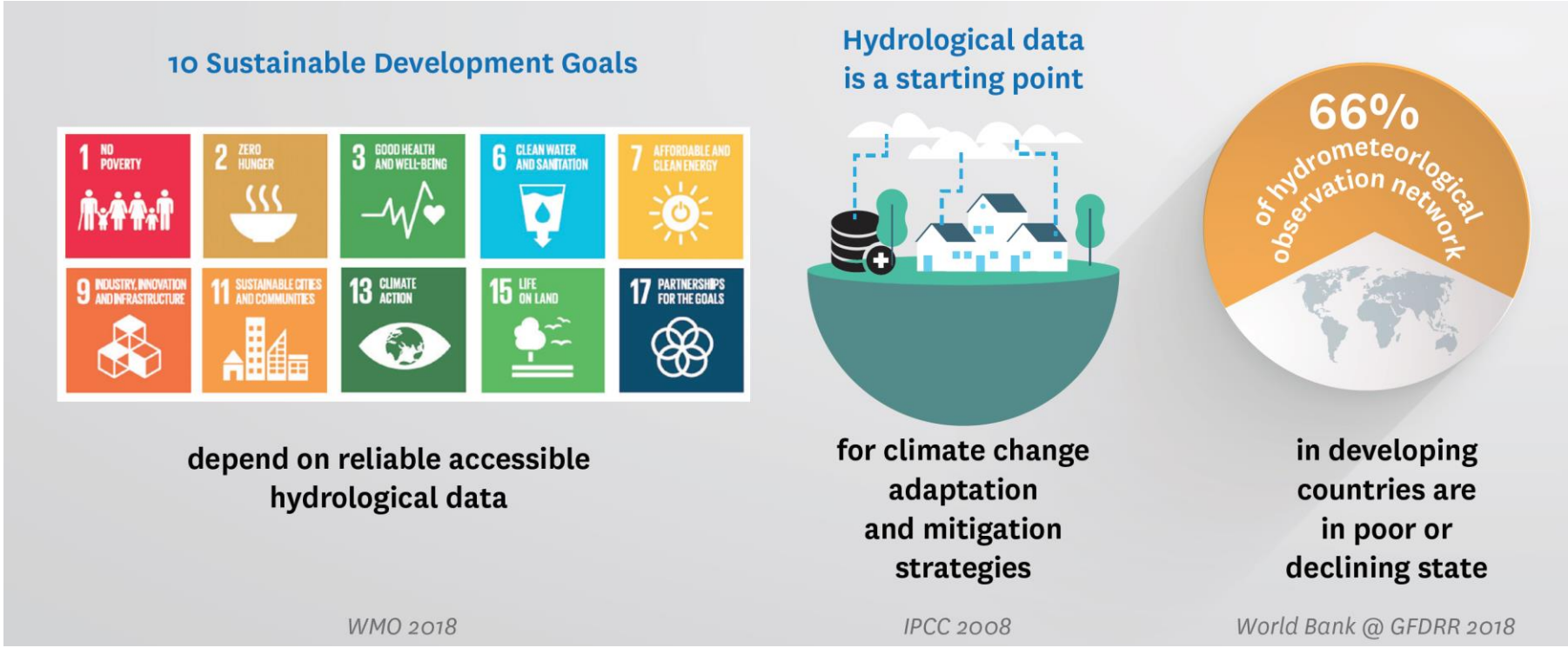
Dr. Mansoor Leh

Researcher

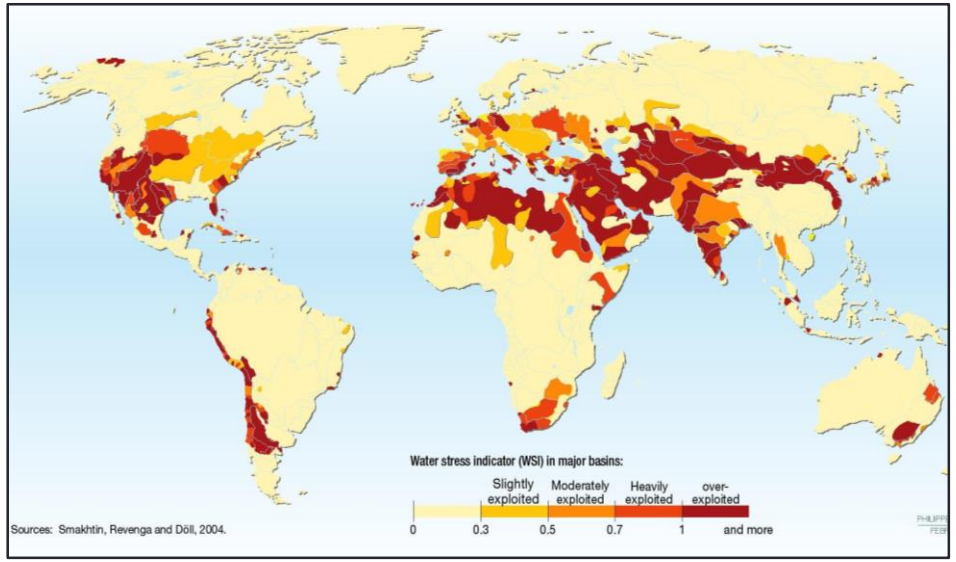
International Water Management Institute

Water and Digital Innovations at IWMI

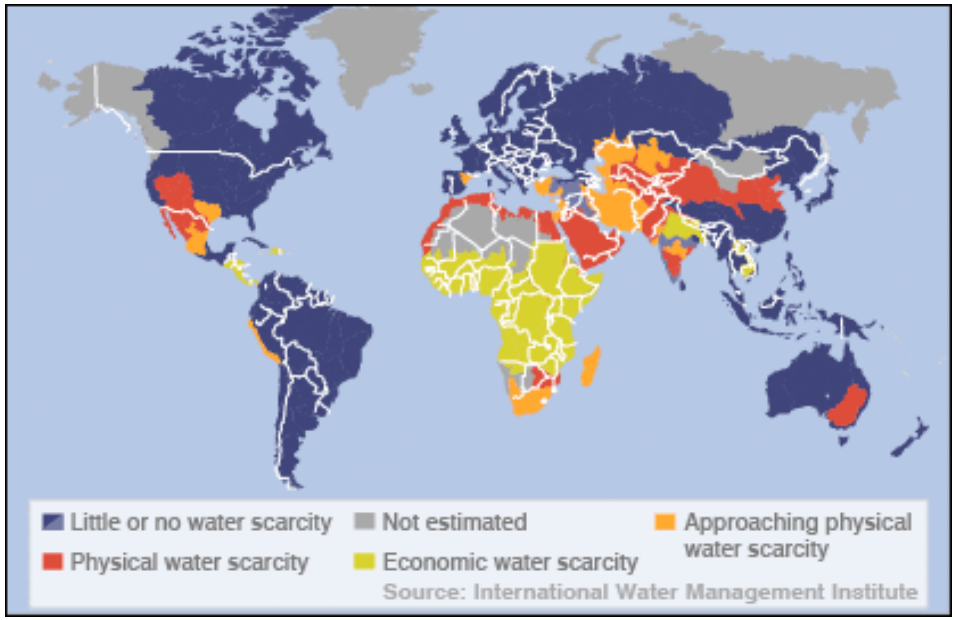
IWMI works with partners to identify the most pressing information and knowledge needs for different contexts and challenges. Areas of focus include digital extension services for agricultural water management, basin management and monitoring and reporting and verification for large-scale programs and investments.



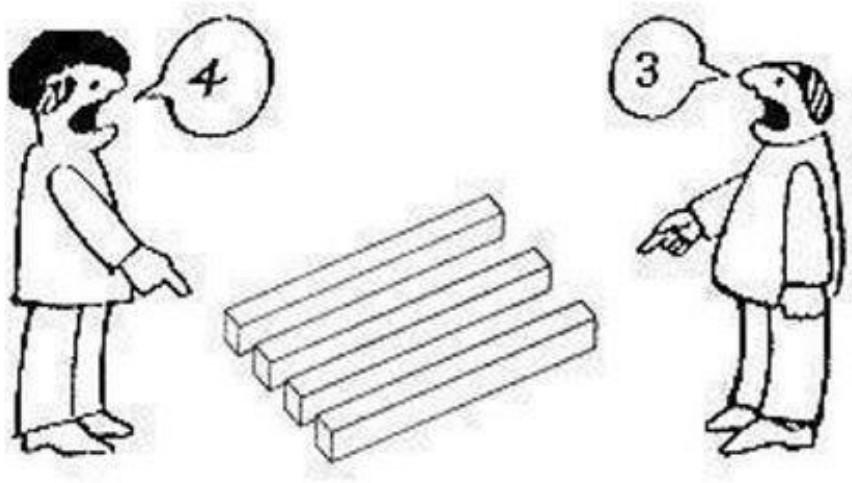
Basin scale water stress



National scale water scarcity



How much water can be withdrawn in a sustainable manner?



The need for an **independent, international standard** and **scientifically-sound** water accounting system that describes all flows and stocks, not only those that are measurable

More accurate water accounting aids a stronger dialogue about water

Definitions of water accounting:

- a **systematic** study of the **current status and future trends** in water supply, demand, accessibility and use within a specified spatial domain (**FAO)**
- process of **communicating water resources related information** and the services generated from consumptive use in a geographical domain, such as a river basin, a country or a land use class; to users such as policy makers, **water** authorities, managers (**FAO, IWMI, IHE, UN**)
- A **system provides a clear view of water resources in a river basin** it shows what and where water is going, how it's being used, and how much remain available for further use (**IWMI)**
- a **systematic process of identifying, recognising, quantifying, reporting, and assuring**: information about water; the rights and other claims to that water, and the obligations against that water (**Aus Gov)**

Who uses water accounting?

- Water accounting as a **discipline is not new**
- Several national and international organizations developed water accounting frameworks (UNSD, UN-Water, FAO, IWMI, IWMI-IHE, Aust Gov)
- The concept of water accounting is based on the argument that **knowledge of the current status** of water resources, the **capacity and condition** of water supply infrastructure and **trends** in water demand and use is a **precondition for successful water management**.
- At an international level, the **principle method** of water accounting is **statistical**.
  - water a **scarce resource**
  - water **sharing plan** in place that recognizes water rights and other claims
  - water information reports are **regularly published**

Water resource monitoring for sustainable use is still a challenge

- **Water resource monitoring is well below the levels needed**
- **Water monitoring networks have declined**
- **Incomplete and partially accessible water flow data in ungauged or poorly gauged basins:**
  - a fundamental problem in understanding hydrological processes and managed water flows in many parts of the world, and is one of the main reasons for the absence of operational national level WA systems
- **Integration of data and information across sectors that depend on access to water remains a challenge:**
  - Agriculture is the largest user of water globally
  - Efforts to improve agricultural yields and water productivity and enable reallocation of water from agriculture to other users
  - But often less successful than expected due to inadequate analysis of actual water consumption and the interaction of multiple water users at different scales

Water Accounting Approaches:

The different approaches to water accounting are typically referred to as:

- flow accounting - tracks actual water flows in a given system, mainly focused on blue water (i.e. measuring and monitoring water in streams, surface water bodies and aquifers
- depletion accounting – focuses on rainfall and tracks only the net water consumption instead of actual flows, focusing mostly on green water sources
- a combined approach - both flow accounting and depletion accounting by accounting for both green and blue water sources

The process of water accounting consists of several steps that need to be executed in a systematic way:

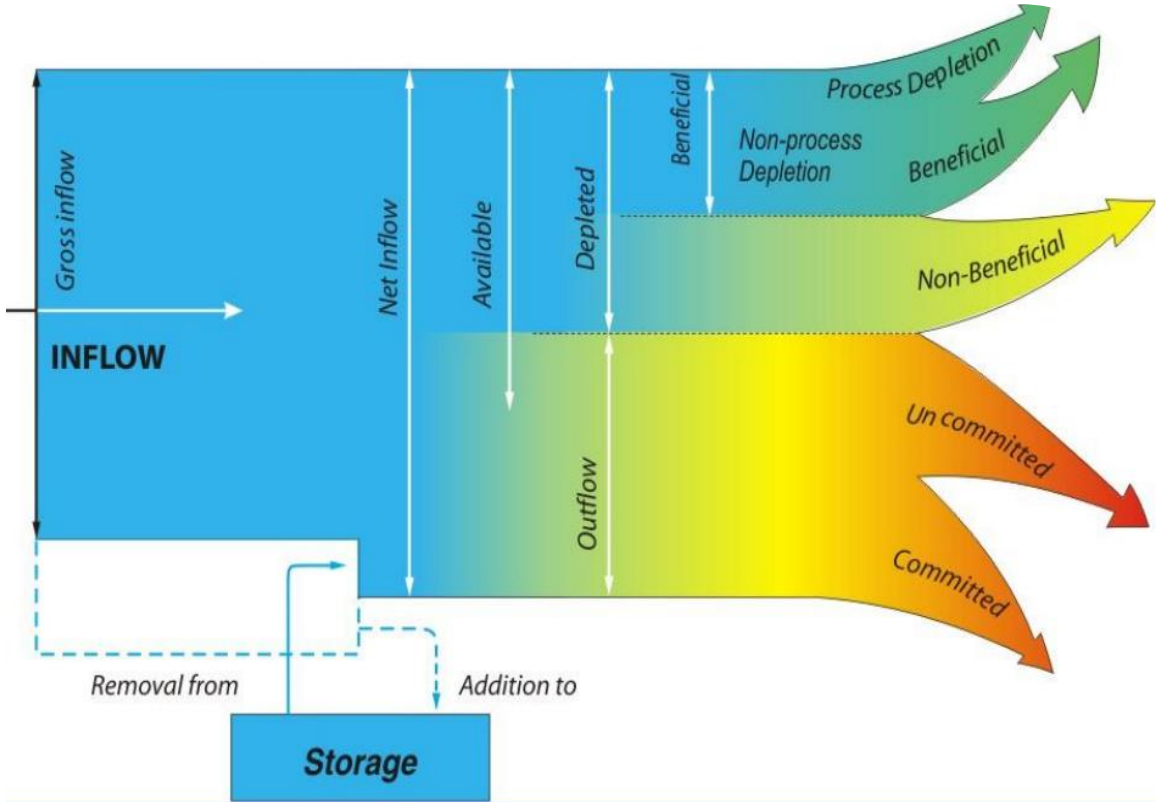
- Data acquisition; processing; analysis; visualization

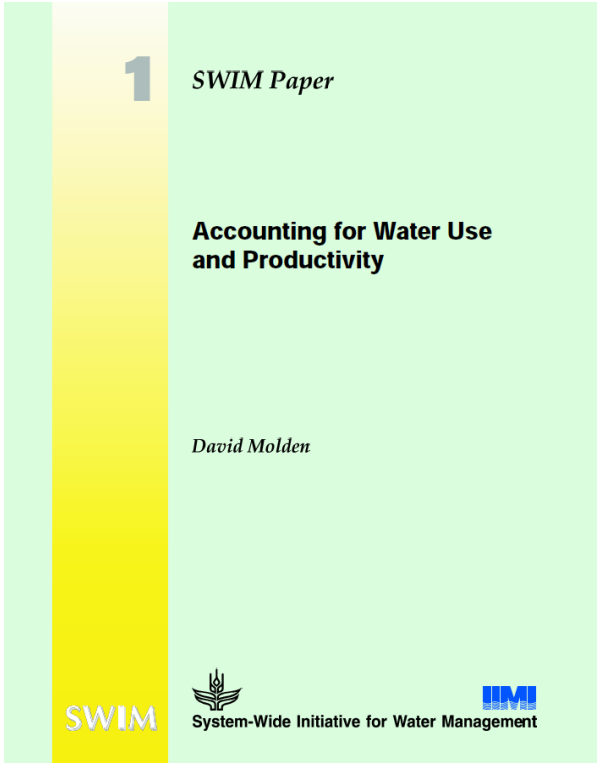
By systematically acquiring, analysing and communicating information related to water resources, water accounting can:

- ➢ provide a system to monitor and report on water use and availability in a regular and consistent manner
- ➢ assist in developing a common understanding of the state of basin water resources

History of water accounting at IWMI:

Based on a water balance approach, and a categorization of water based on how it is (re)used



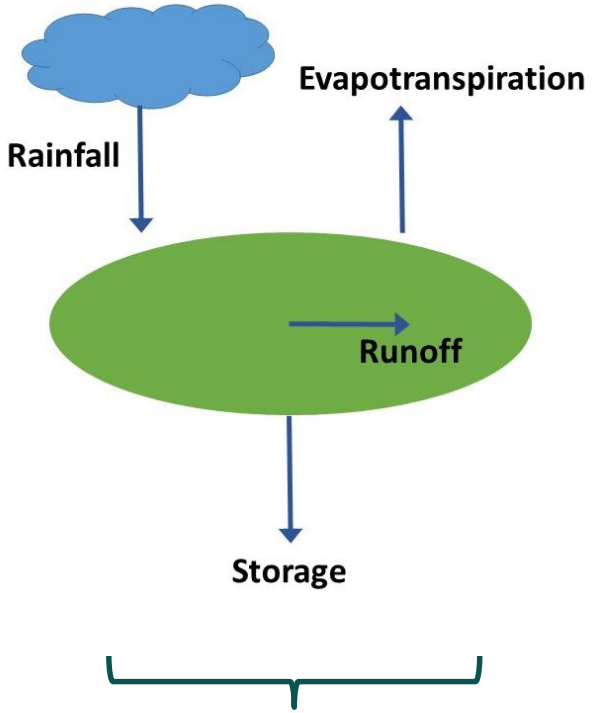


- **A means to demonstrate how much water is actually depleted in a given domain, where, and for what purpose, compared to what is available**

Technical Approach: Definitions

A **water balance** describes the flow of water into and out of a system

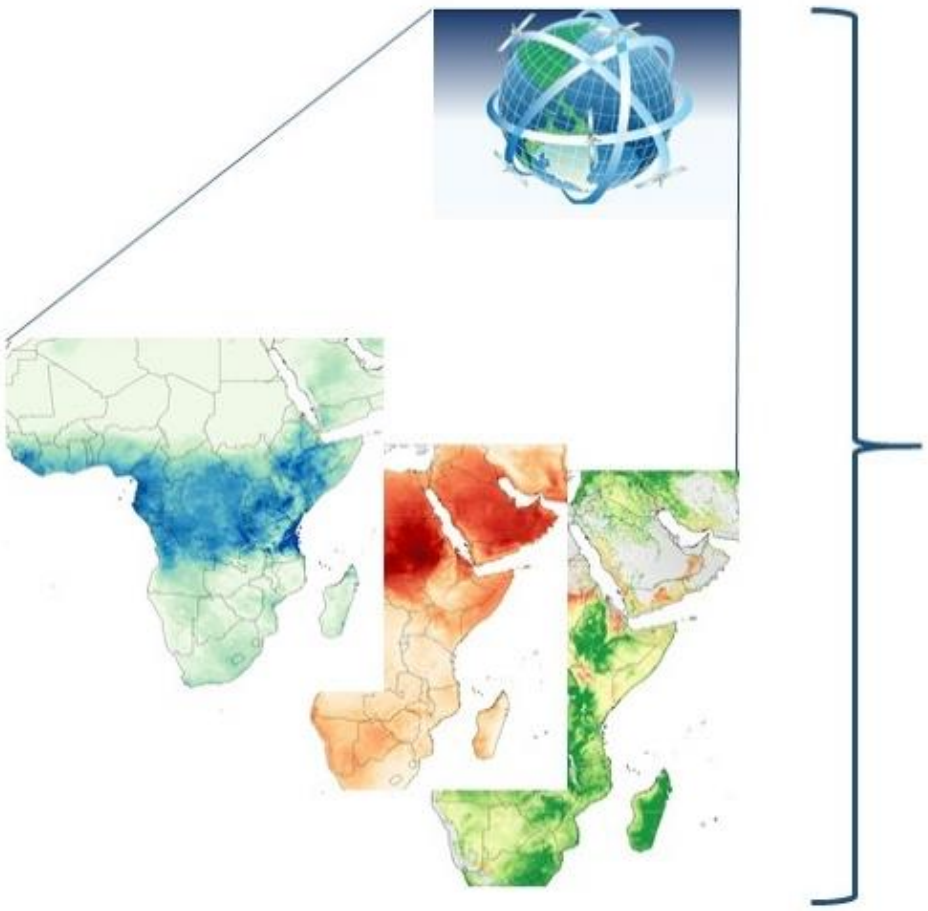
- A water balance can be used to help manage water supply and predict where there may be water shortages

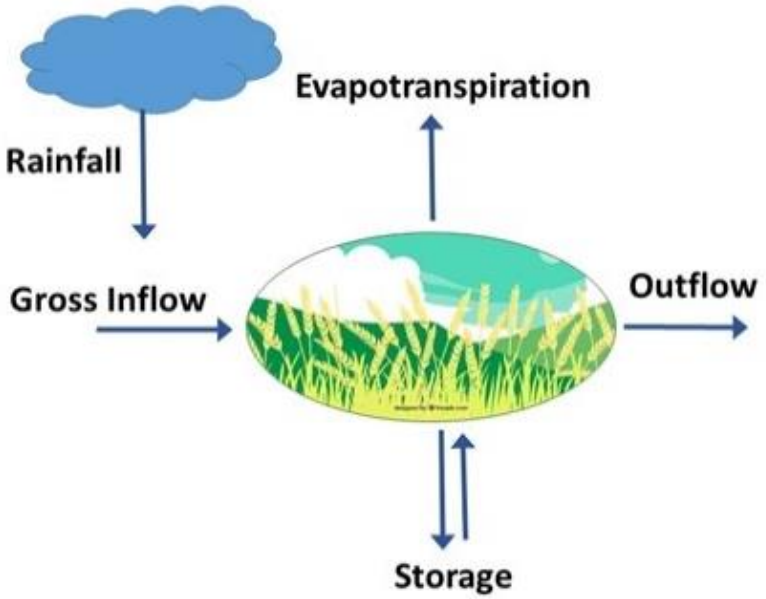


Water accounting is an approach which can be used to establish baselines of water resource availability and use, and to track changes in water flows and storage in a region over time

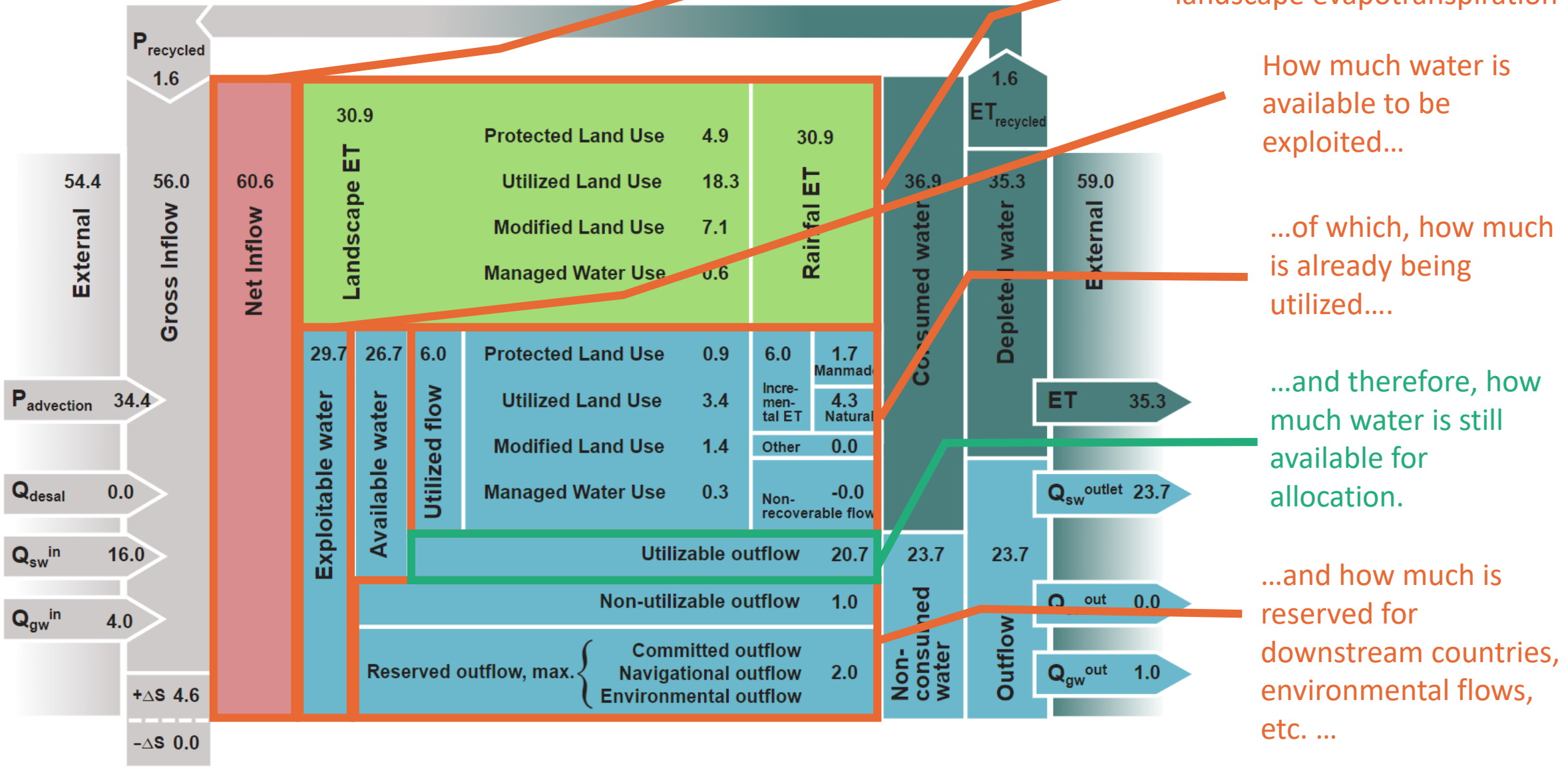
- A water account can be used to identify whether water is available for further allocation, and to identify the sustainability of interventions at the basin scale

The Water Accounting + framework:





Water Accounts help the user to understand:



How much water is flowing into the system

How much water is lost to landscape evapotranspiration

How much water is available to be exploited…

…of which, how much is already being utilized….

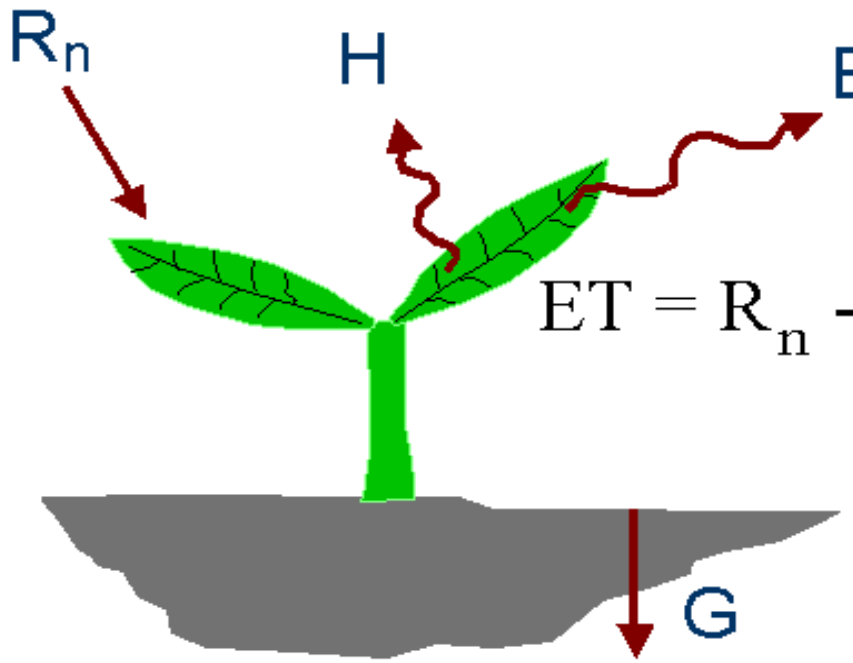
…and therefore, how much water is still available for allocation.

…and how much is reserved for downstream countries, environmental flows, etc. …

Estimating water consumption

Energy Balance Methods

ET is calculated as a "residual" of the energy balance



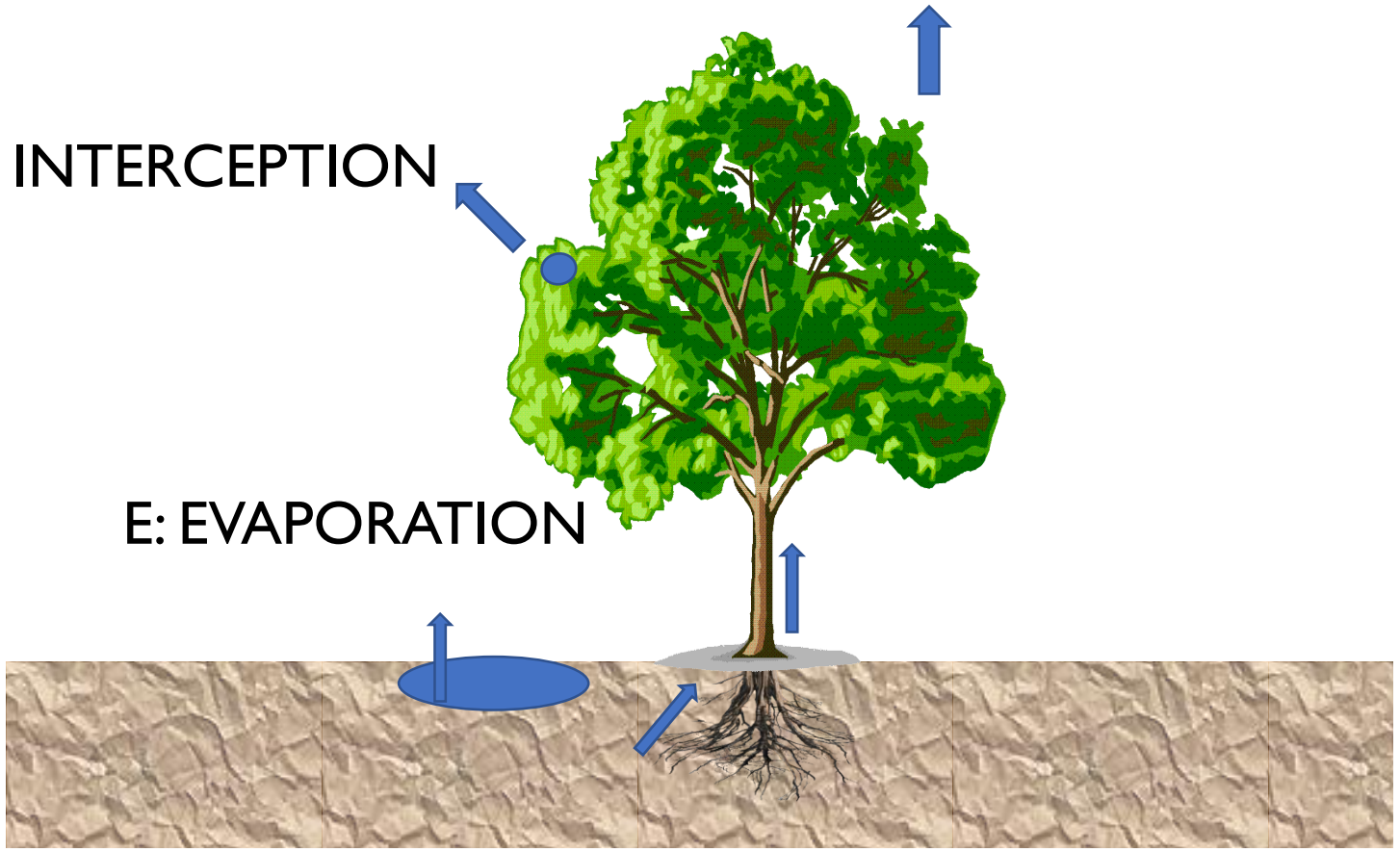
$$ET = R_n - G - H$$

The energy balance includes all major sources (R_n) and consumers (ET, G, H) of energy

R_n = net radiation [W/m^2], G = soil heat flux [W/m^2], H = sensible heat flux

T: TRANSPIRATION

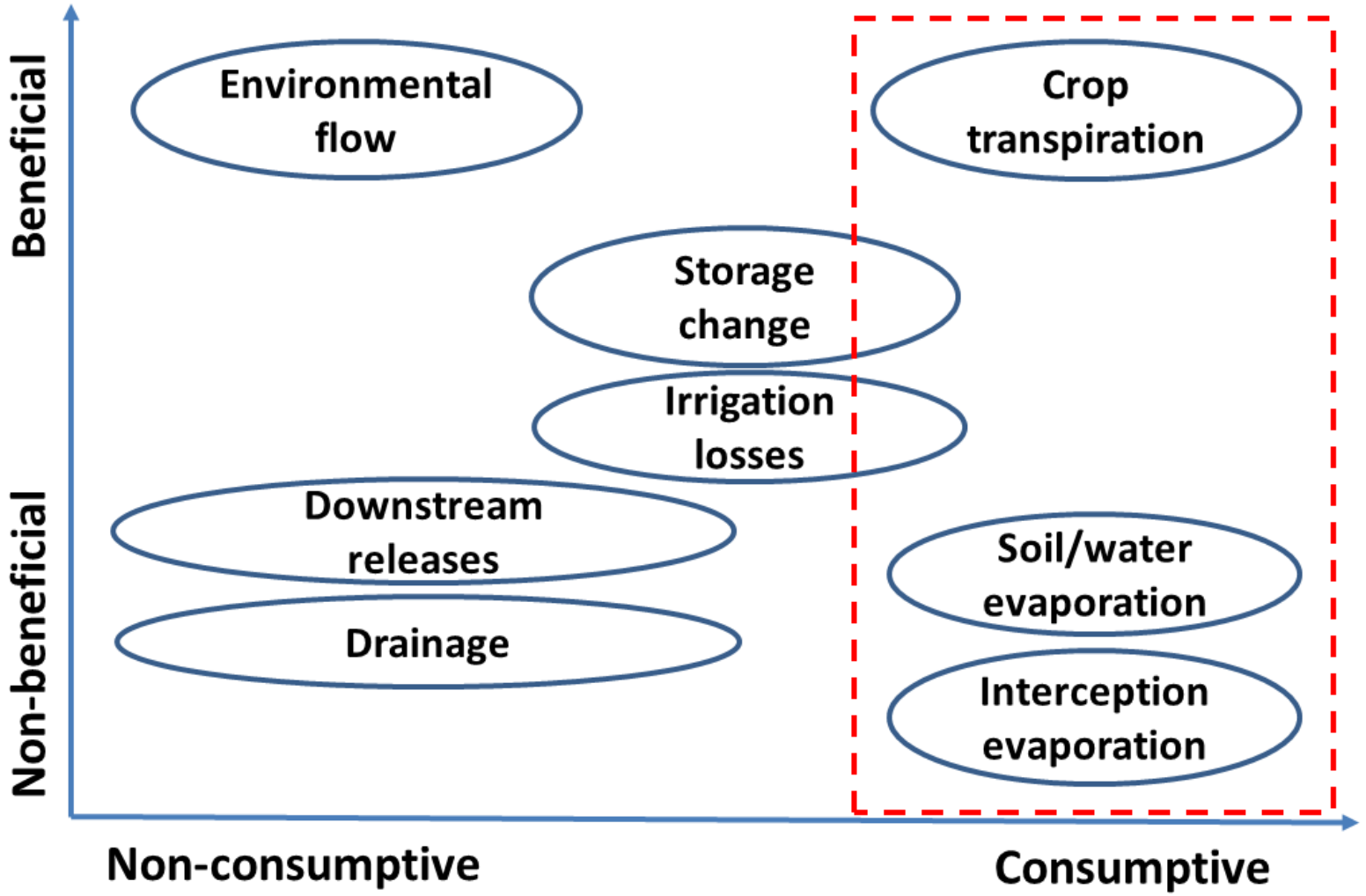
I: INTERCEPTION



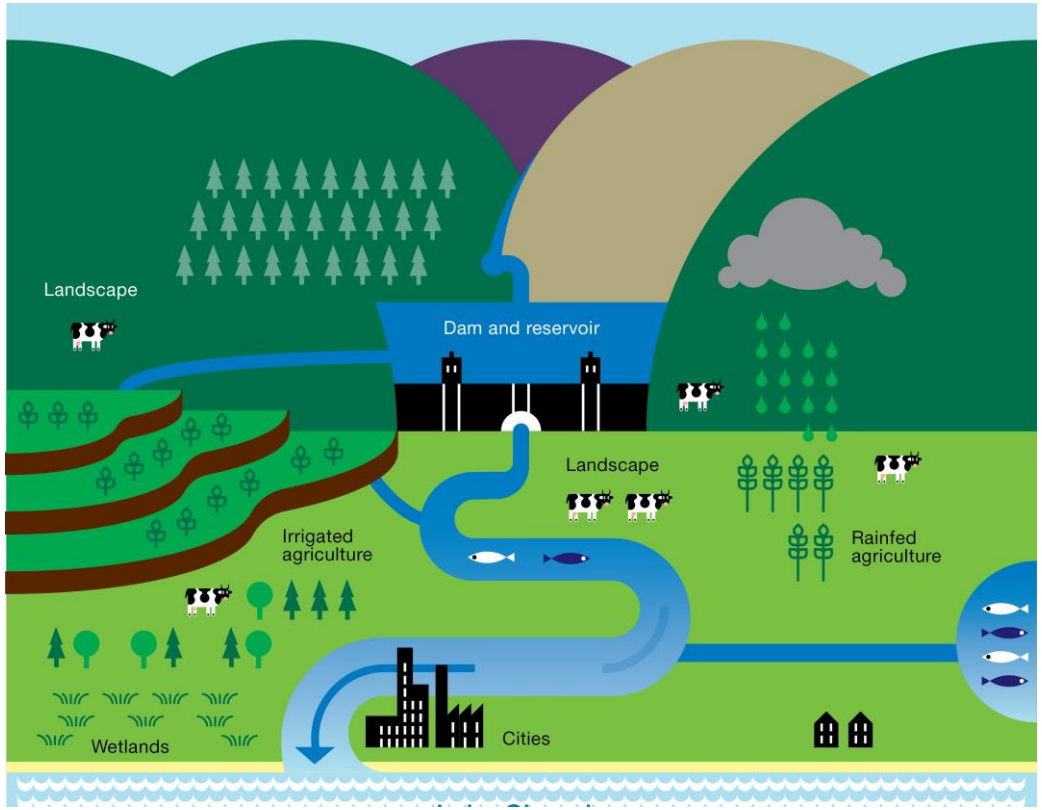
E: EVAPORATION

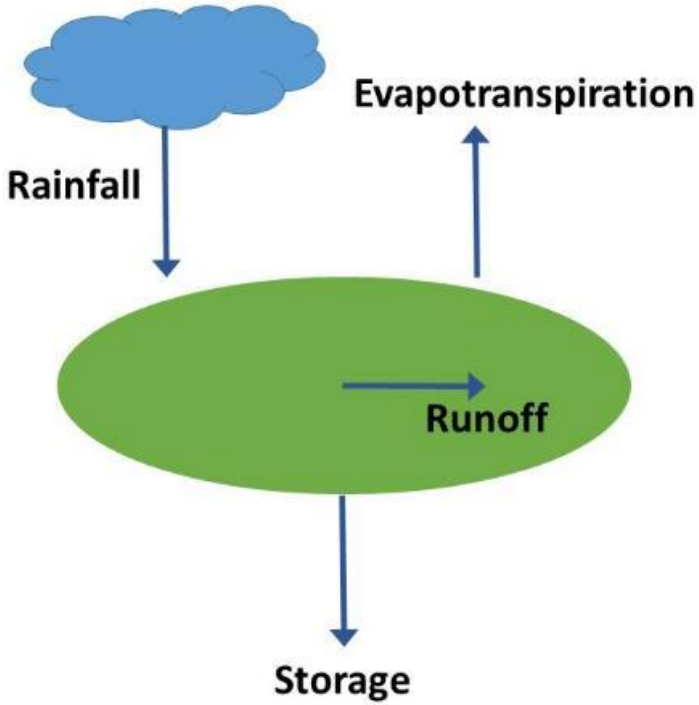
ET = I + E + T

When is water consumption non-beneficial?

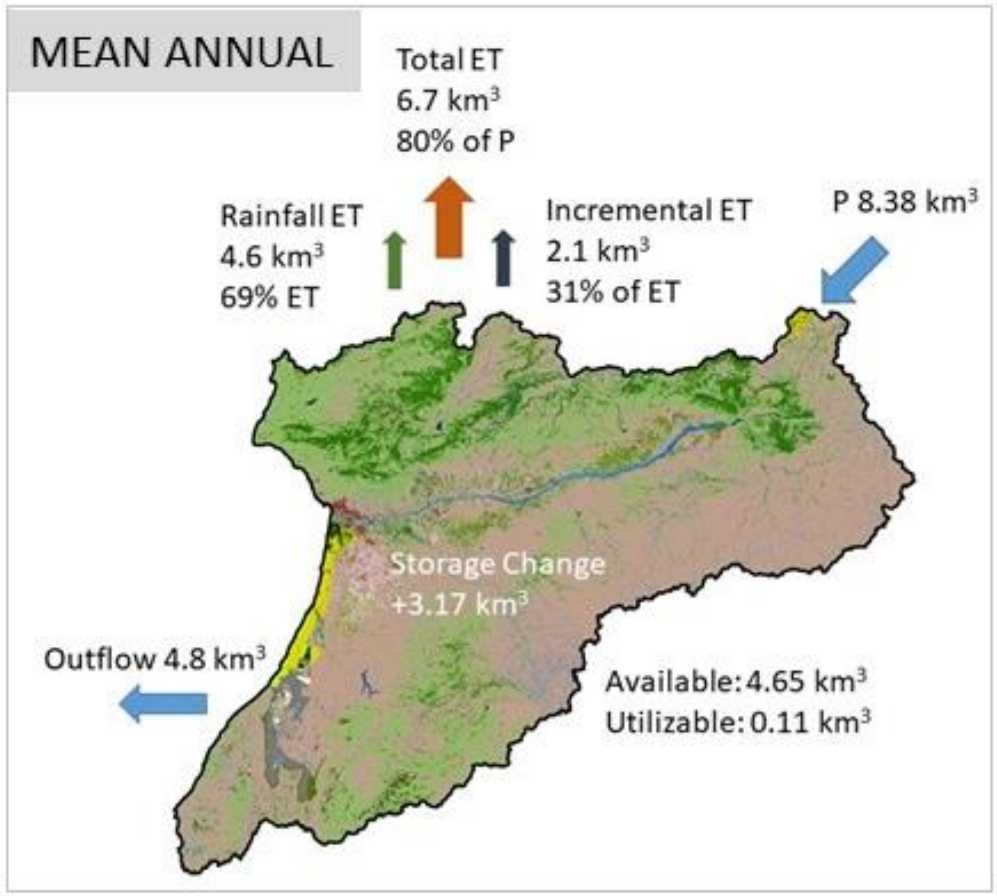


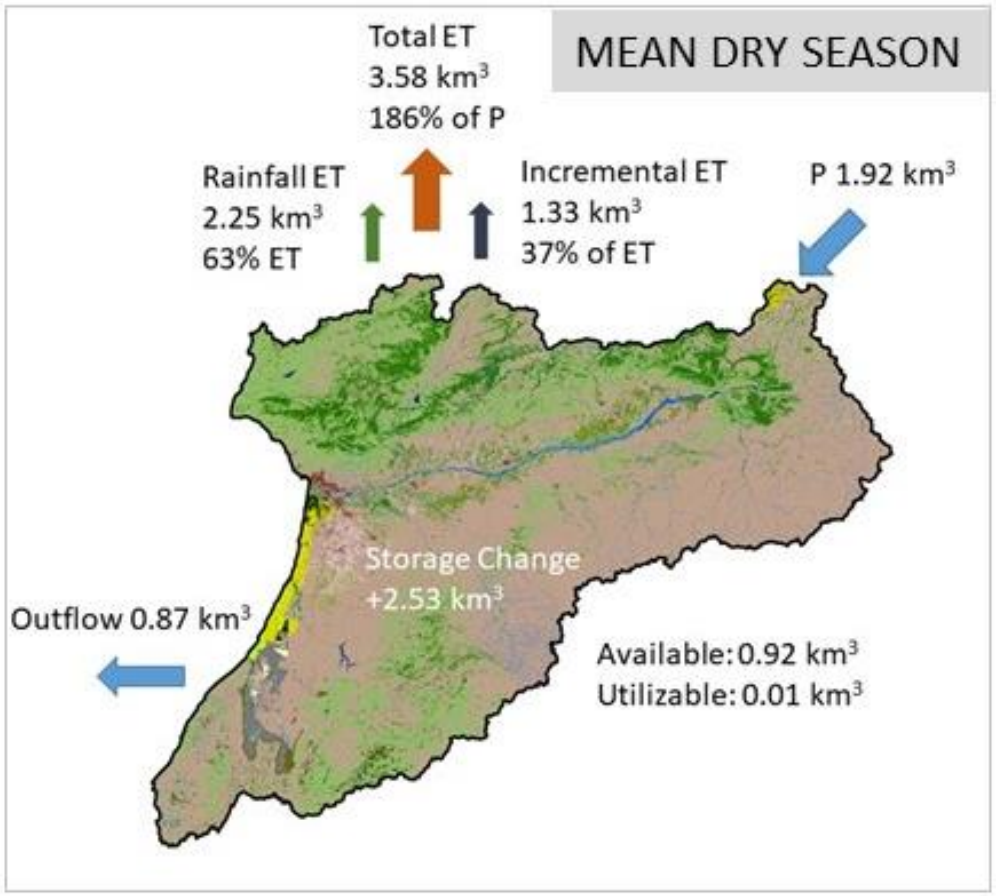
Water resources modelling and management: basin scale

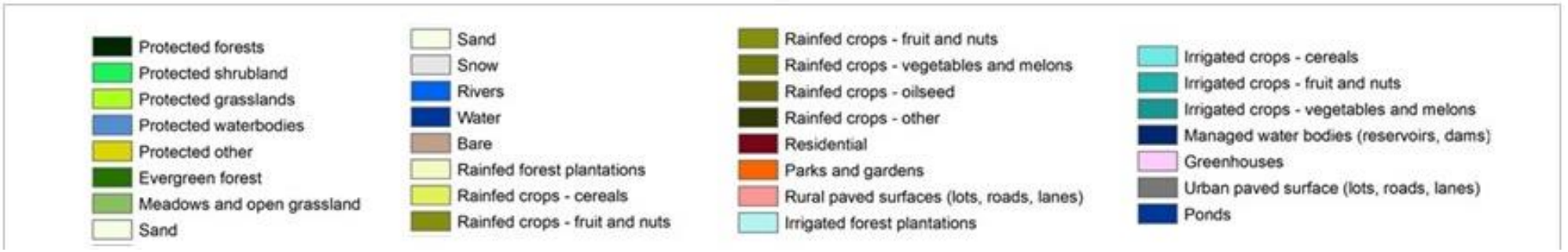




Basin scale water resources assessment and management







Key messages:

1. Assessing the productive use of water is a key objective of IWMI's work on water accounting
2. WA+ is a water accounting framework designed for use in data scarce basins
3. It is an indicator framework which can be used to quantify and report on the water resource status for a river basin and sub-basins. The approach consists of a set of open source methodologies which are applied to open access global datasets, to compute the water balance and to derive further related indicators;
4. A water balance is at the core of the water accounting + approach;
5. Satellite data is used as input; it can therefore be implemented using the same indicators, time periods, and with similar levels of uncertainty across regions;
6. The outputs from the water account are used to assess water use and availability on an annual and seasonal basis for each sub-basin

Key messages:

Water accounting can be used to:

- Quantify and report on the status of water resources in a domain
- Identify how much is available, how much is being used, what are the main uses
- Identify opportunities for more sustainable management
- Ensure environmental flows are being met
- Identify how much is available for further use
- Determine the potential impact of planned interventions

➢ By systematically acquiring, analysing and communicating information related to water resources, water accounting provides a tool to evaluate and plan water resources management, to monitor changes in water resources and to assess the impacts of future interventions and assists in developing a common understanding of the state of water resources

> 300 journal articles, reports and other documents on water productivity:

methods, tools and applied research in diverse settings

International Water Management Institute

Thank You

Email: M.Leh@cgiar.org

Innovative water solutions for sustainable development

Food · Climate · Growth

CGIAR