IWMI International Water Management Institute

CGIAR

Water Accounting: assessing water use and availability for allocation

Lisa-Maria Rebelo

Principal Researcher (Earth Observation for Sustainable Development)

Innovative water solutions for sustainable development

Food · Climate · Growth

Definitions:

Water productivity can be applied at different scales (crop, field, farm, irrigation system, basin) depending on the purpose and user of the analysis

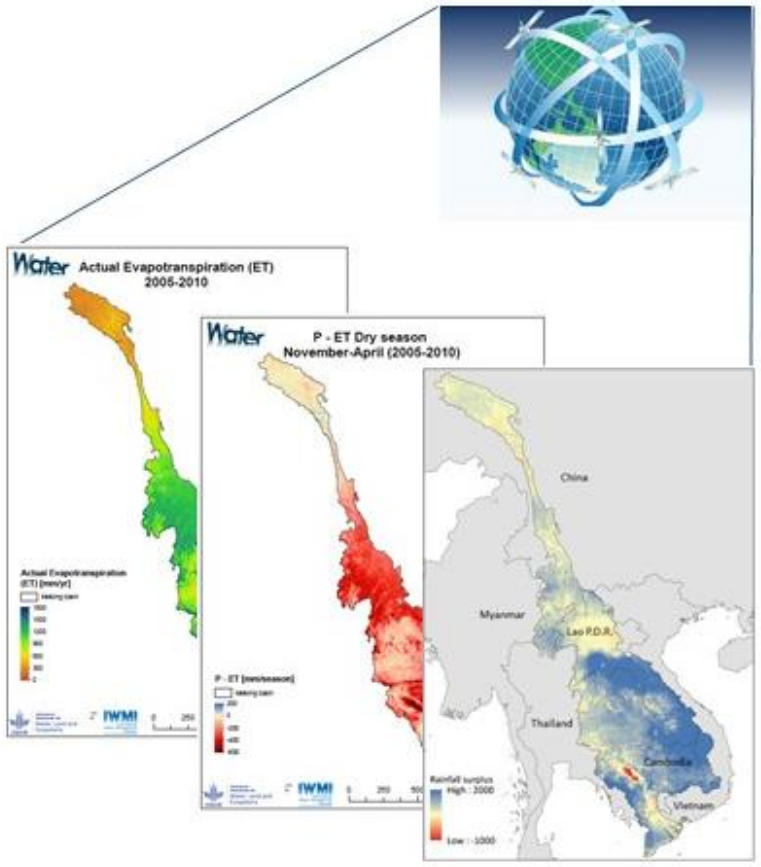
- Defined as the ratio between the obtained crop yield and the amount of water used (applied or consumed)

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

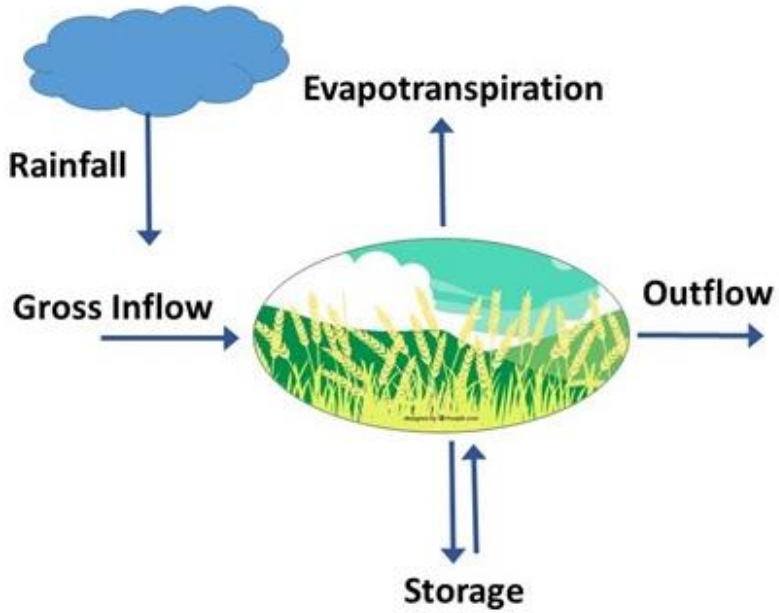
- A water account can be used to identify whether water is available for further allocation, and to identify the sustainability of interventions at the basin scale; it provides the information needed to optimize allocation, and develop WEF strategies.

Water Accounting +:

Data collection



Data analysis



$$\frac{dS}{dt} = P + Q_{in} - ET - Q_{out}$$

Communication

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Investment overview:

Basin Characteristics:

- Basin area of 14,000 km^2
- Transboundary between two countries (65%, 35%)
- Bimodal rainfall pattern that varies with elevation (600 mm – 1800 mm)
- Forests, savanna and agriculture are predominant land uses
- Destruction of forest cover, unsustainable farming practices, high population growth rate
- Changing climate
- Floods have become more common and seasonal wetlands in the downstream portion are now permanent

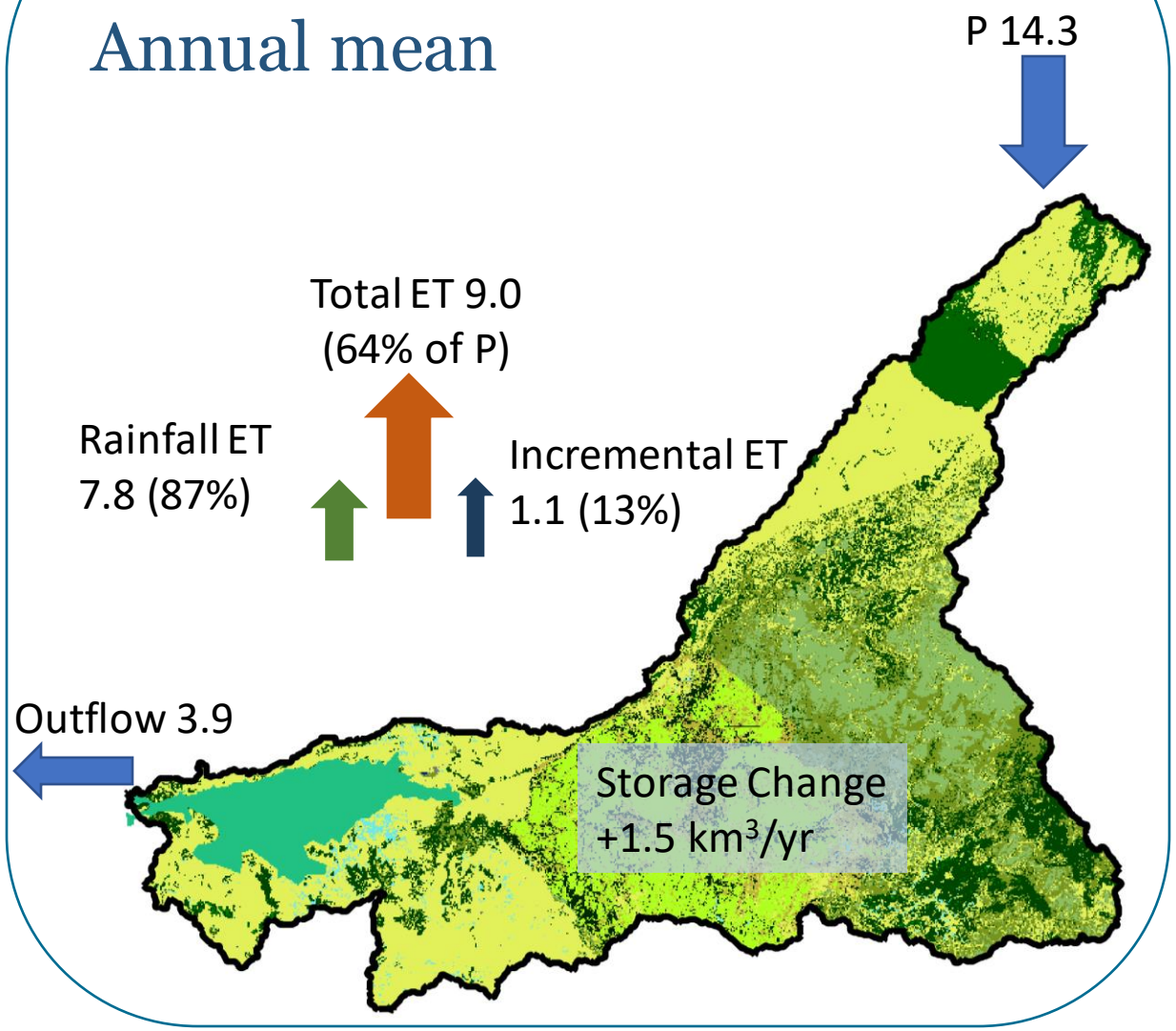
Investment overview:

- Multipurpose storage facility
- Domestic supply, irrigation and livestock

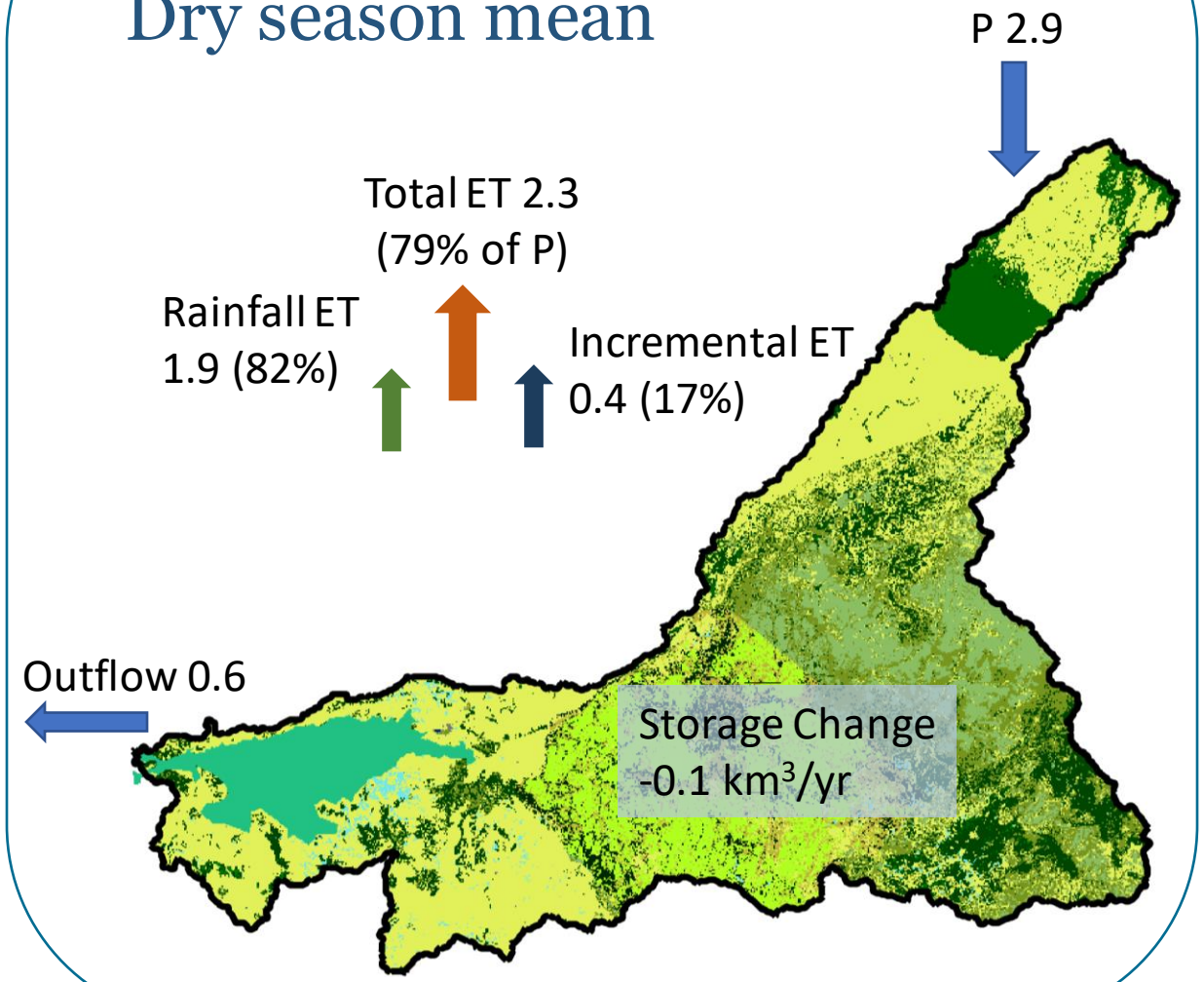
Broader portfolio:

- Target development within the region is a total irrigated area of 510,000 ha and hydropower production of 5,950MW by 2035.
- But conflicts already exist between sectors; energy resources limited within the basin

Basin Water Balance: Annual mean

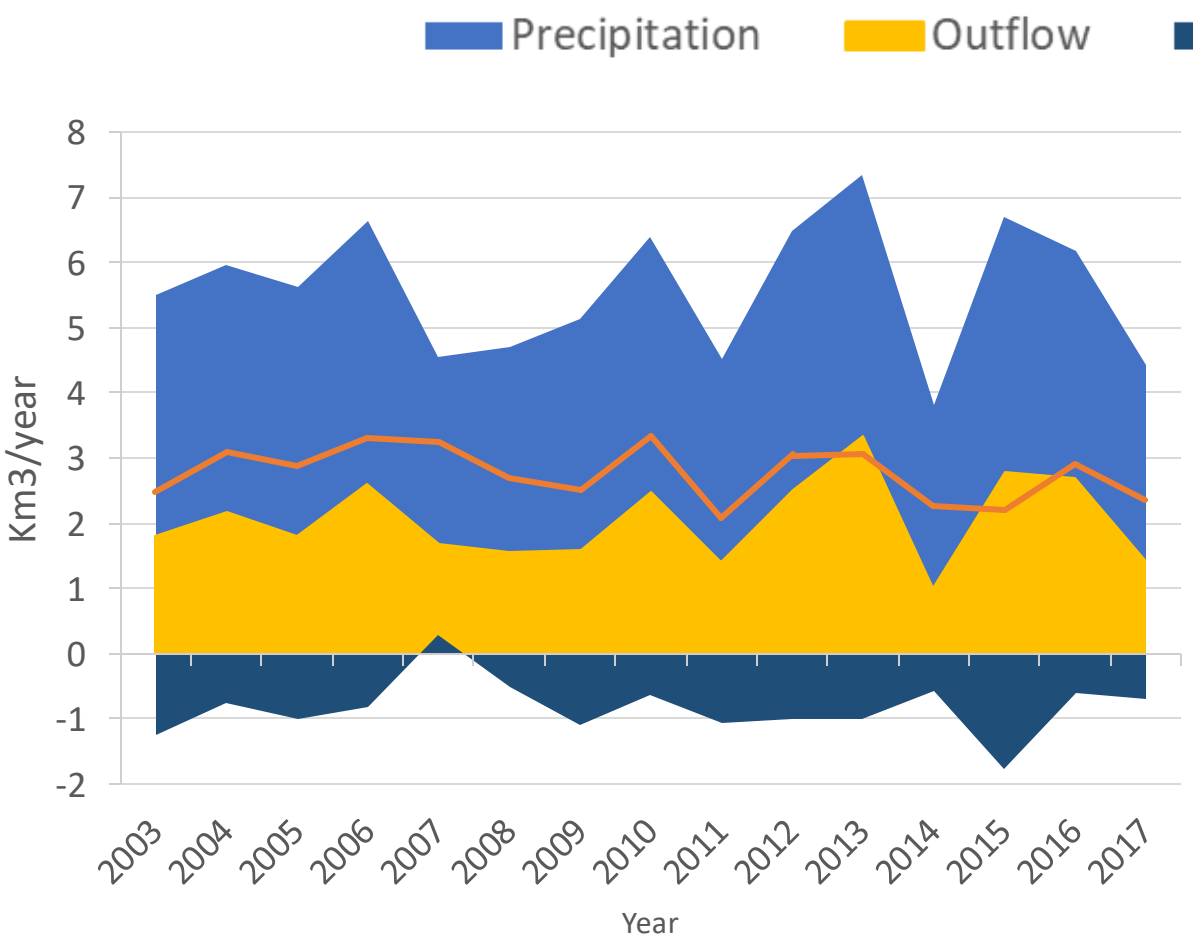


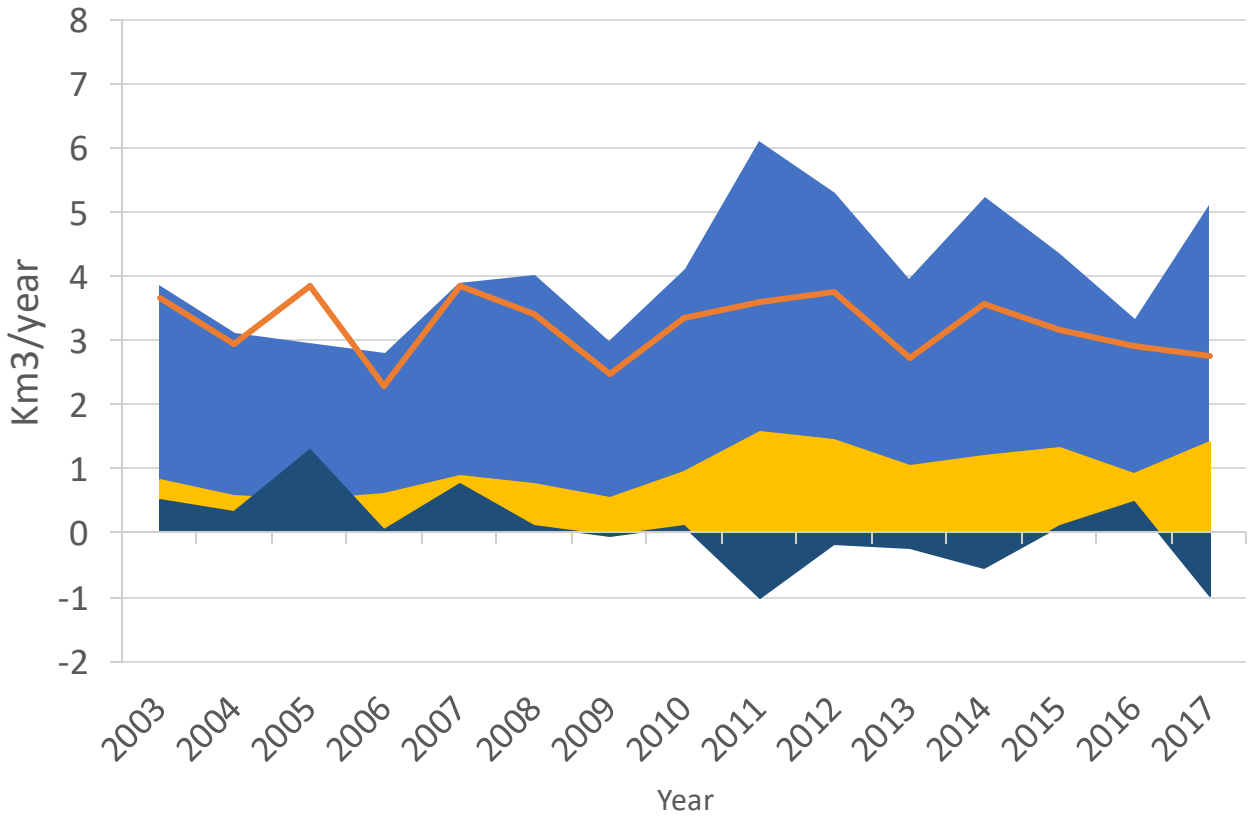
Basin Water Balance: Dry season mean



Units: km³/year

Basin Water Balance: Wet and Dry Season





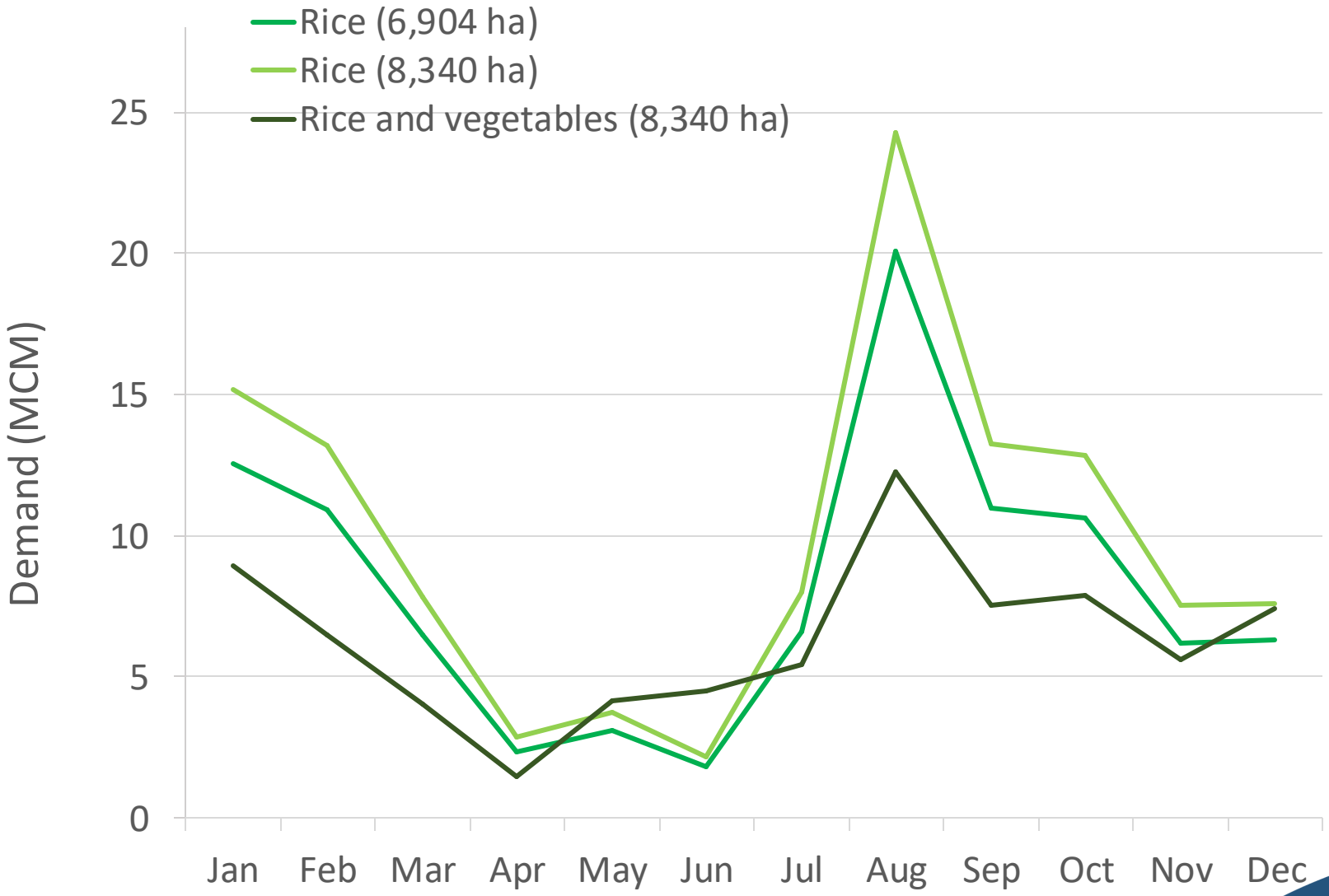
Basin Water Accounts: Key Indicators

	2004	2005	2006	…	2017
Exploitable water	6.22	5.39	8.94	…	4.21
Reserved flow	0.76	0.69	0.78	…	0.83
Utilized flow	1.57	1.11	2.51	…	1.48
Utilizable outflow	1.50	0.99	3.08	…	1.43

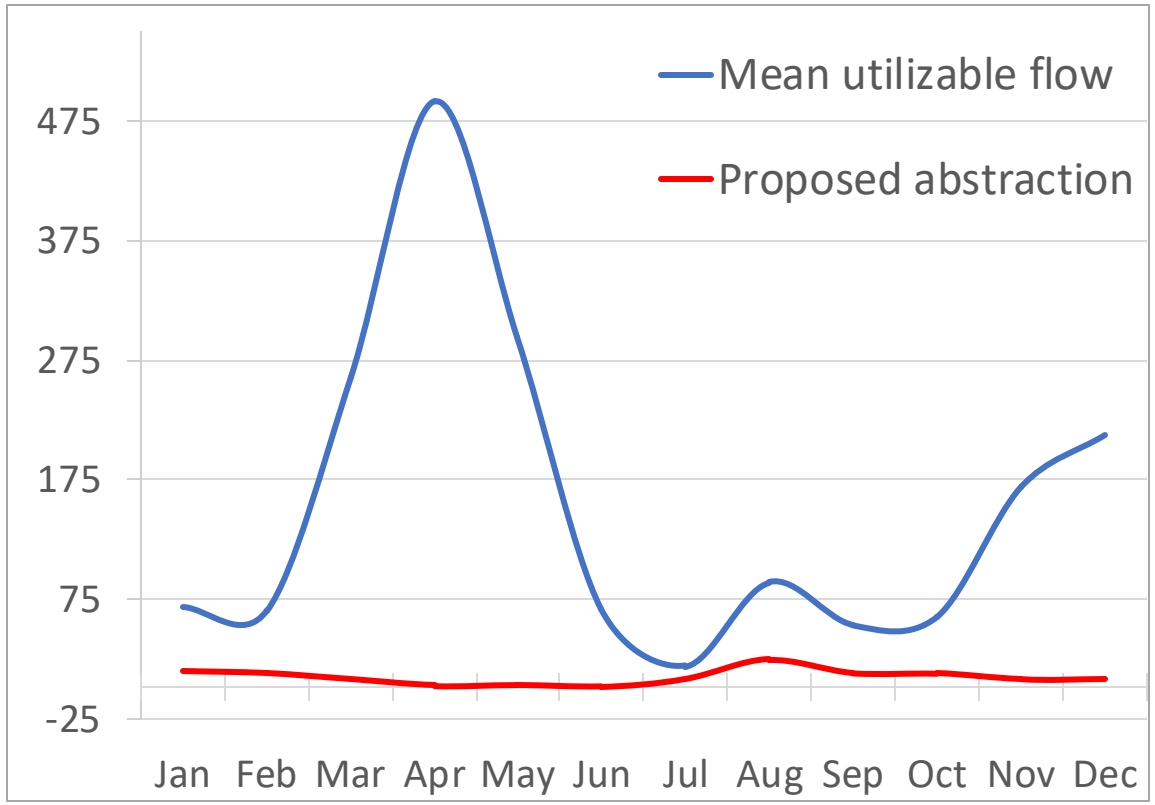
Units: km^3/year

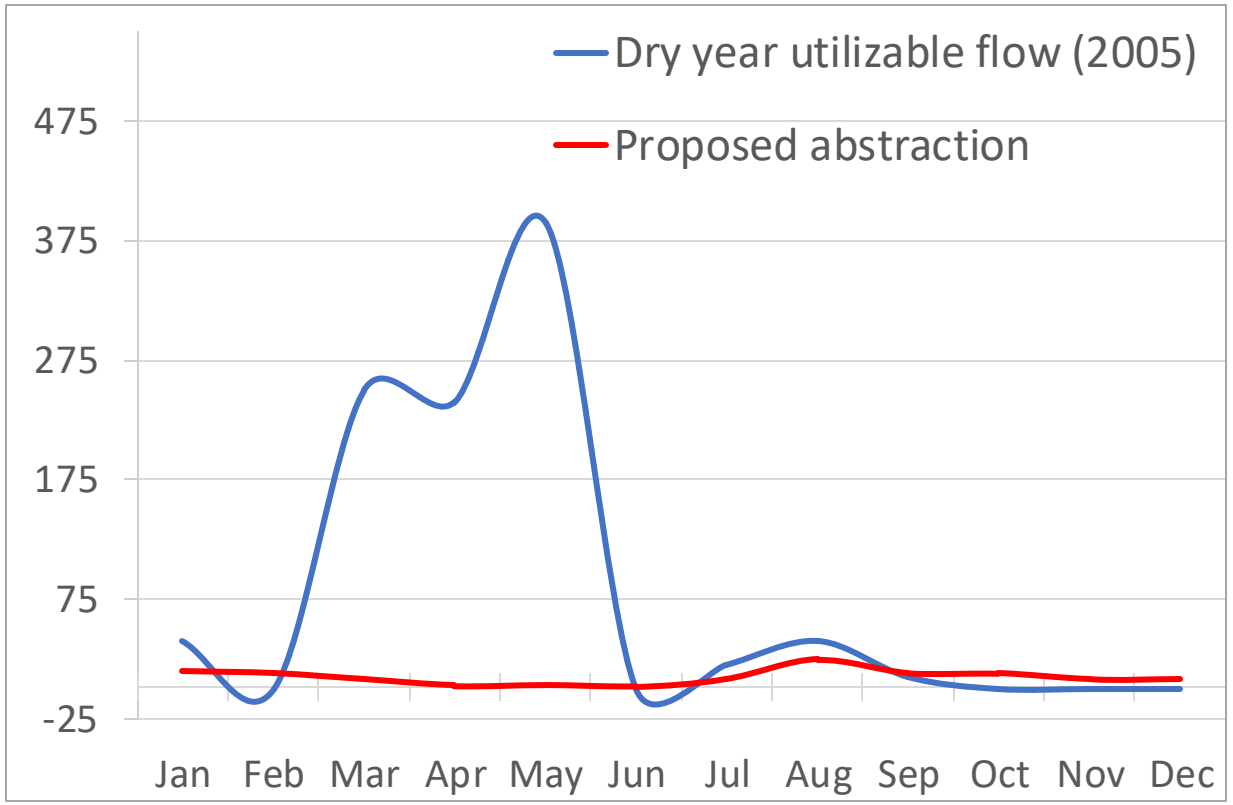
The "***Utilizable flow***" provides an estimate of the potential for additional water resources development

Irrigation Demand: Scenarios



Proposed abstraction vs available resource (MCM 2003-2017)





Summary and recommendations:

Water is available for allocation – but mostly in the wet season

- Growing abstractions in the basin are resulting in reduced low flows during the dry seasons
- While there is sufficient water at an annual time scale, the inter-annual variability shows a different picture

Current water allocation plans will need careful monitoring

- Low dry season flows are a concern; to ensure future EF requirements are met future investments should consider dry season releases

Most water used is not 'productive'; expanding irrigation makes sense

- A substantial amount of the water consumed within the basin is through evaporation with a large proportion of this from the soil
- Given the scarcity of water and the extreme variability during the dry season, food security could be improved through an expansion of irrigated agriculture

The investment project will be impacted by extreme dry seasons

- The total abstraction requirement for the project is satisfied for most seasons over the 15-year time series analysed, but not during unusually dry periods

Key messages:

1. Increasing demand for water, food, energy and infrastructure development; resource use and potential trade-offs have only been assessed through simulations, due to lack of in situ data.
2. By systematically acquiring, analysing and communicating information related to water resources, water accounting can assist in developing a common understanding of the state of water resources
3. The recent Asian Water Development Outlook (Key Dimension 2 – Economic Water Security) specifically recommends enhancing the monitoring, measurement and data availability on supply and demand as well as improving water productivity.
4. Water Accounting and Water Productivity assessments using remote sensing can contribute towards attaining these goals, as well as providing the baseline context for WFE strategies.

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Thank You

Email: l.rebelo@cigar.org

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