

Multi-Criteria Assessment Tools for Water Management



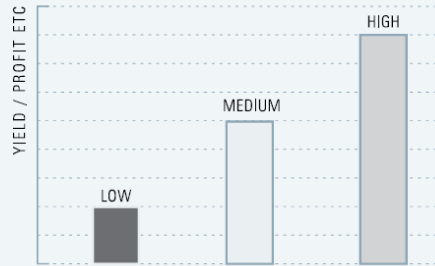
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*Deputy Director General –
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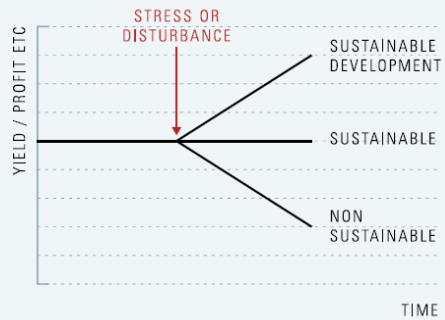
*International Water Management
Institute*

SYSTEM ATTRIBUTES

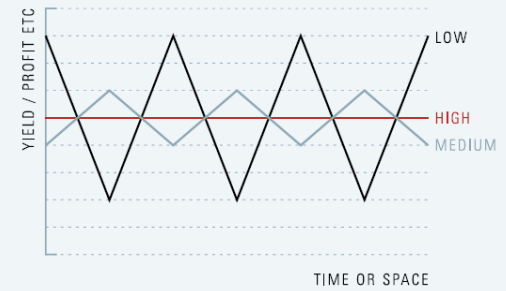
PRODUCTIVITY



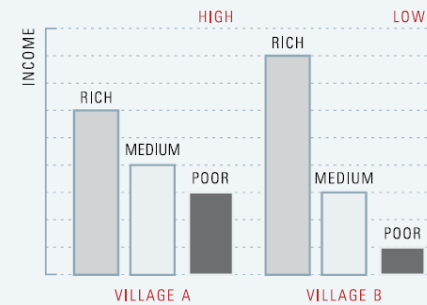
SUSTAINABILITY



STABILITY

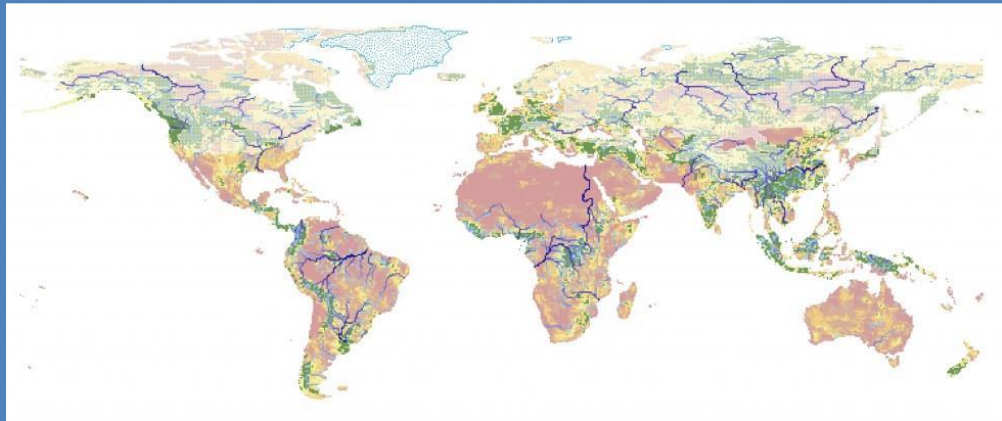
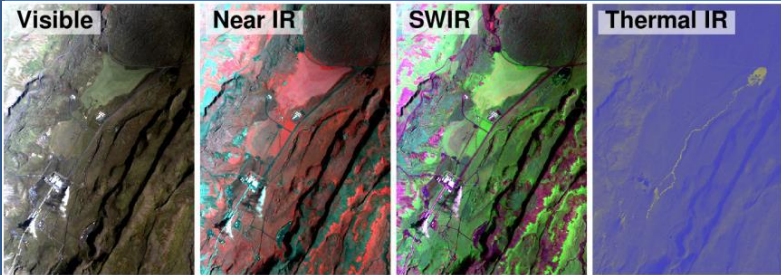


EQUITABILITY

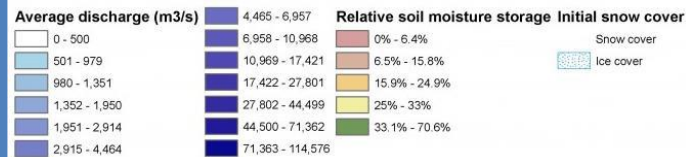


Remote Sensing

Hydrological models



Ground measurements



Inputs

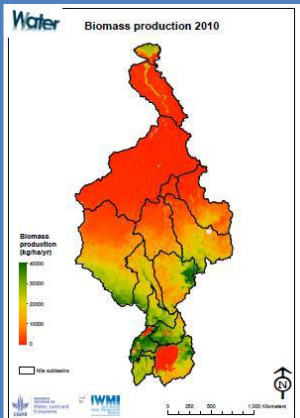
Outputs Sheets

Tables

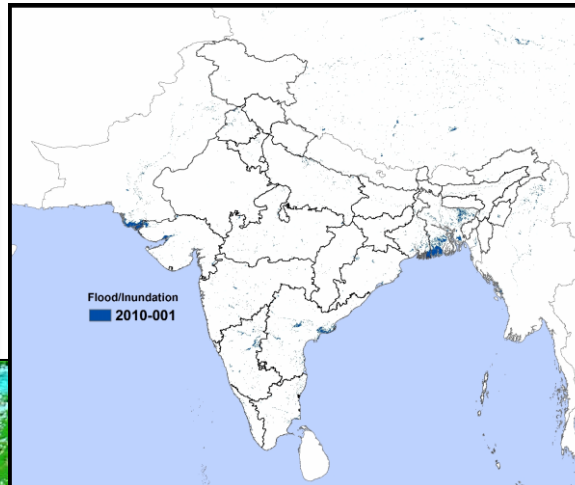
Maps

Sheet 2: Agricultural services									
Part 1: Agricultural water consumption (km ³ /yr)									
Basin: Nile basin									
Period: 2005									
Crop									
Cereals		Fruit & vegetables			Oil seeds		Other crops		Agricultural water consumption
2.0	0.0	16.3	2.0	0.0	16.3	0.0	0.0	0.0	32.6
3.3	0.0	12.0	1.7	5.3	6.2	0.0	0.0	0.0	25.2
12.9	0.0	18.3	2.1	5.3	15.9	0.0	0.0	0.0	48.0
Non-crop									
Fish/aquaculture		Timber		Other		Industrial/urban		Total ET	
0.016	0.005	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.027
0.016	0.005	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.027
12.9	0.016	18.3	2.1	5.3	15.9	0.016	0.005	0.006	48.027

Table 1: Breakdown of evaporation by land use class														
Land use class	Area	Transpiration	Evaporation	Interception	Non-vegetation evaporation	Total ET	Non-irrigated ET	Irrigated ET	Irrigated Agriculture	Irrigated Environment	Irrigated Basins	Irrigated Energy	Irrigated Urban	Irrigated Other
Unirrigated forests	1473386	14383	14383	0	0	14383	0	0	0	0	0	0	0	0
Forest cover/ shrublands	1432164	14383	14383	0	0	14383	0	0	0	0	0	0	0	0
Open wetlands	173360	3411	1384	466	0	5242	337	4904	0	4168	0	0	0	756
Wetlands cover/ shrublands	677690	763	667	68	0	1508	63	1445	763	667	0	0	0	613
Irrigated wetlands	1712186	14383	14383	0	0	14383	0	14383	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protected urban	643240	20316	1967	3279	0	23522	2	23520	31266	32430	0	0	0	4800
Urban built-up area	643240	20316	1967	3279	0	23522	2	23520	31266	32430	0	0	0	4800
Open built-up area	2898889	149338	120468	27468	0	187064	14	187050	270129	247968	0	0	0	28988
Closed water bodies	634610	4264	0	0	0	4264	0	0	0	0	0	0	0	0
Liquid water bodies	322219	2284	0	0	0	2284	0	0	0	0	0	0	0	0
Open water bodies	312391	1980	0	0	0	1980	0	0	0	0	0	0	0	0
Wetlands (crops)	6767710	56694	17360	6802	0	80856	4	80852	1687	8089	0	0	0	8089
Open wetlands	2092613	24469	4626	2290	0	23295	14	23281	14712	14712	0	0	0	7864
Cropland wetlands	1742095	9236	4846	1403	0	17687	9	17678	10377	10377	0	0	0	10377
Irrigated & non-irrigated	1432170	45970	1777	3684	0	78630	4	78626	14028	14028	0	0	0	14028
Irrigated & non-irrigated	1432170	45970	1777	3684	0	78630	4	78626	14028	14028	0	0	0	14028
Irrigated & non-irrigated	1432170	45970	1777	3684	0	78630	4	78626	14028	14028	0	0	0	14028
Agriculture (crops)	1432170	45970	1777	3684	0	78630	4	78626	14028	14028	0	0	0	14028
Others	42161	67	104	6	0	247	0	247	123	124	0	0	0	247
Basin (Sum total)	4847491	6918	21404	139	0	96529	2	96527	140278	140278	0	0	0	96529



REGIONAL FLOOD RISK MAPPING - SA and SEA



- Mapping algorithm based on MODIS data
- 8-days maps of inundation extent
- Annual maps of maximum inundation
- Inter-annual variation of regional flooding extent



IWMI International Water Management Institute

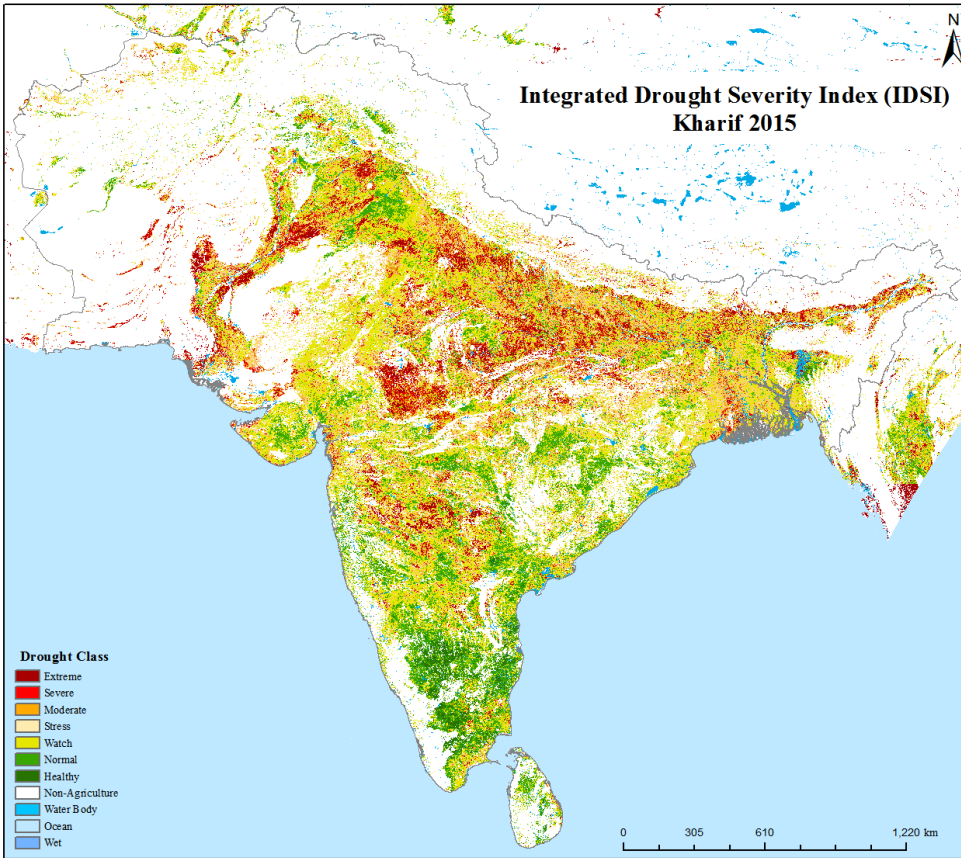
WATER DATA PORTAL

Integrated portal for IWMI research data

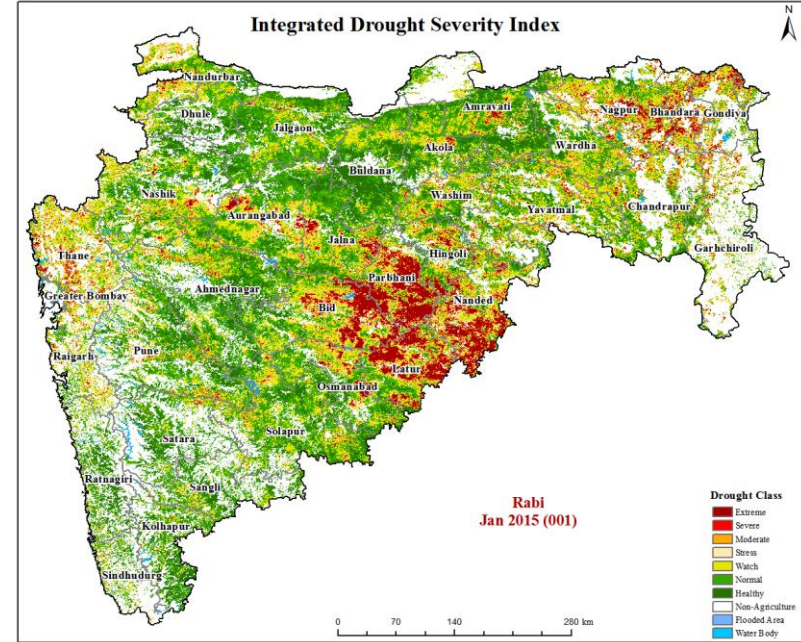
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Catastrophic Flood Risk Mapping: South Asia

SOUTH ASIA DROUGHT MONITOR SYSTEM (SA-DMS)



www.iwmi.org - UNREGISTEDED



2015 field observations in Jalna, Maharashtra

- First of its kind to establish for entire South Asia using multisource remote sensing observations;
- Historical drought risk mapping and assessment covering SA countries (2000 – Current);
- IDSI allows better understanding on drought frequency, duration over the 15years;
- Products are useful tools in drought mitigation studies and in decision-making process;

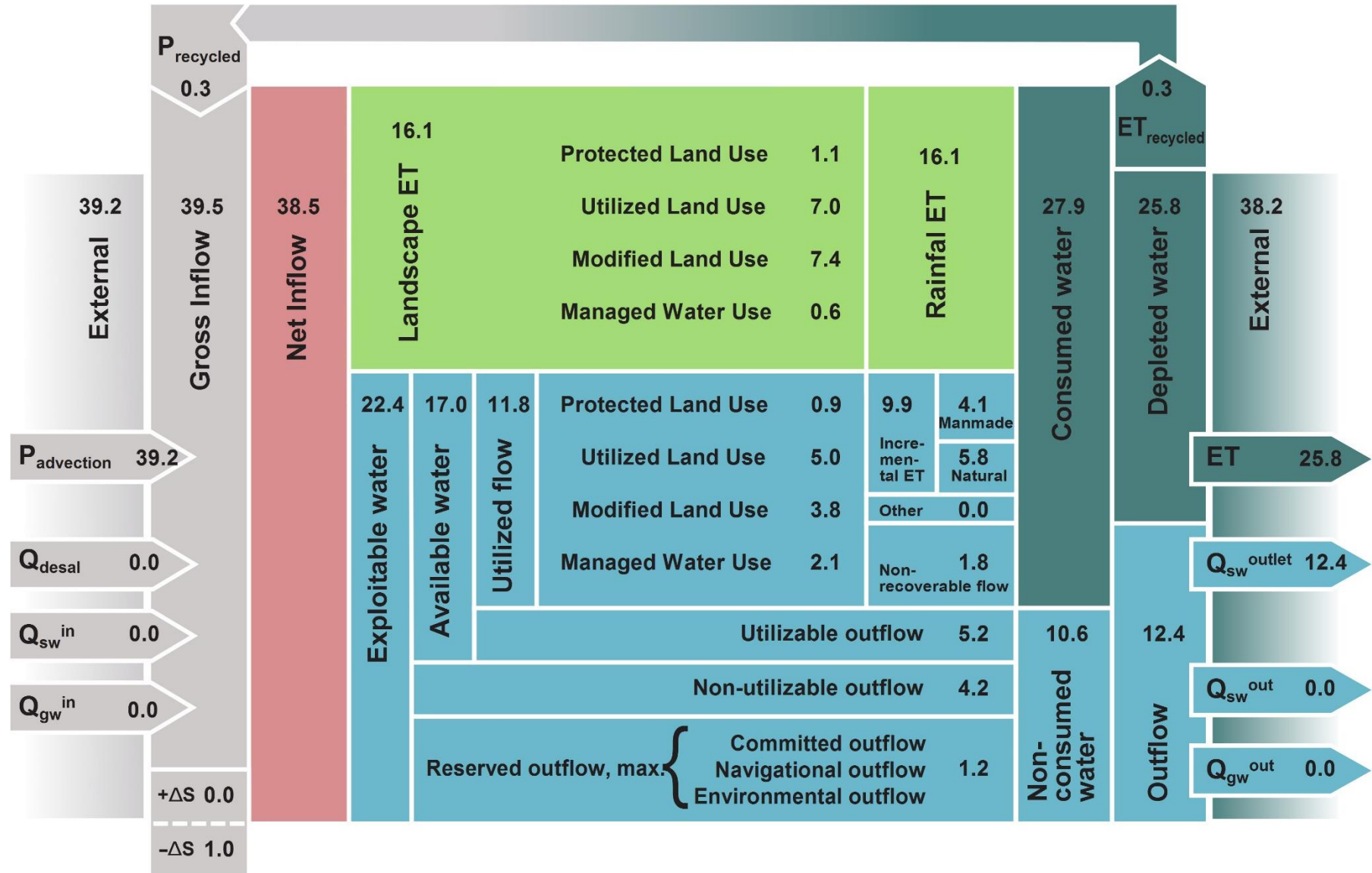


A water-secure world

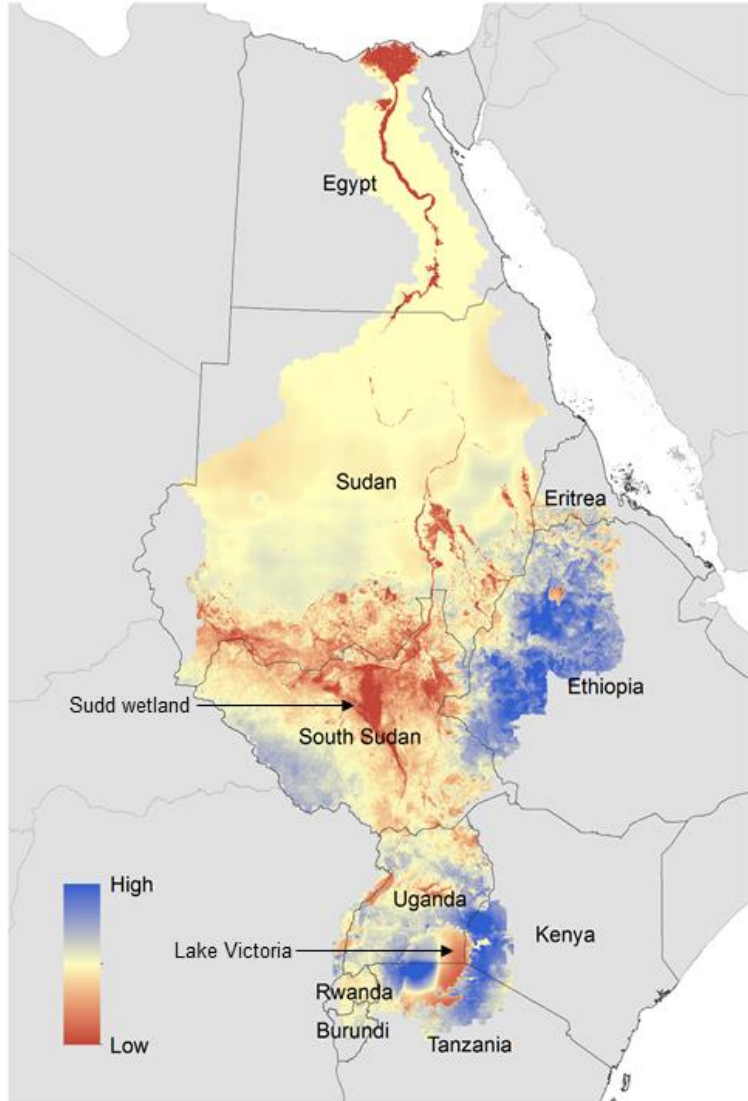
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Water Accounting: Basin Water Balance

Sheet 1: Resource Base (km³/year)

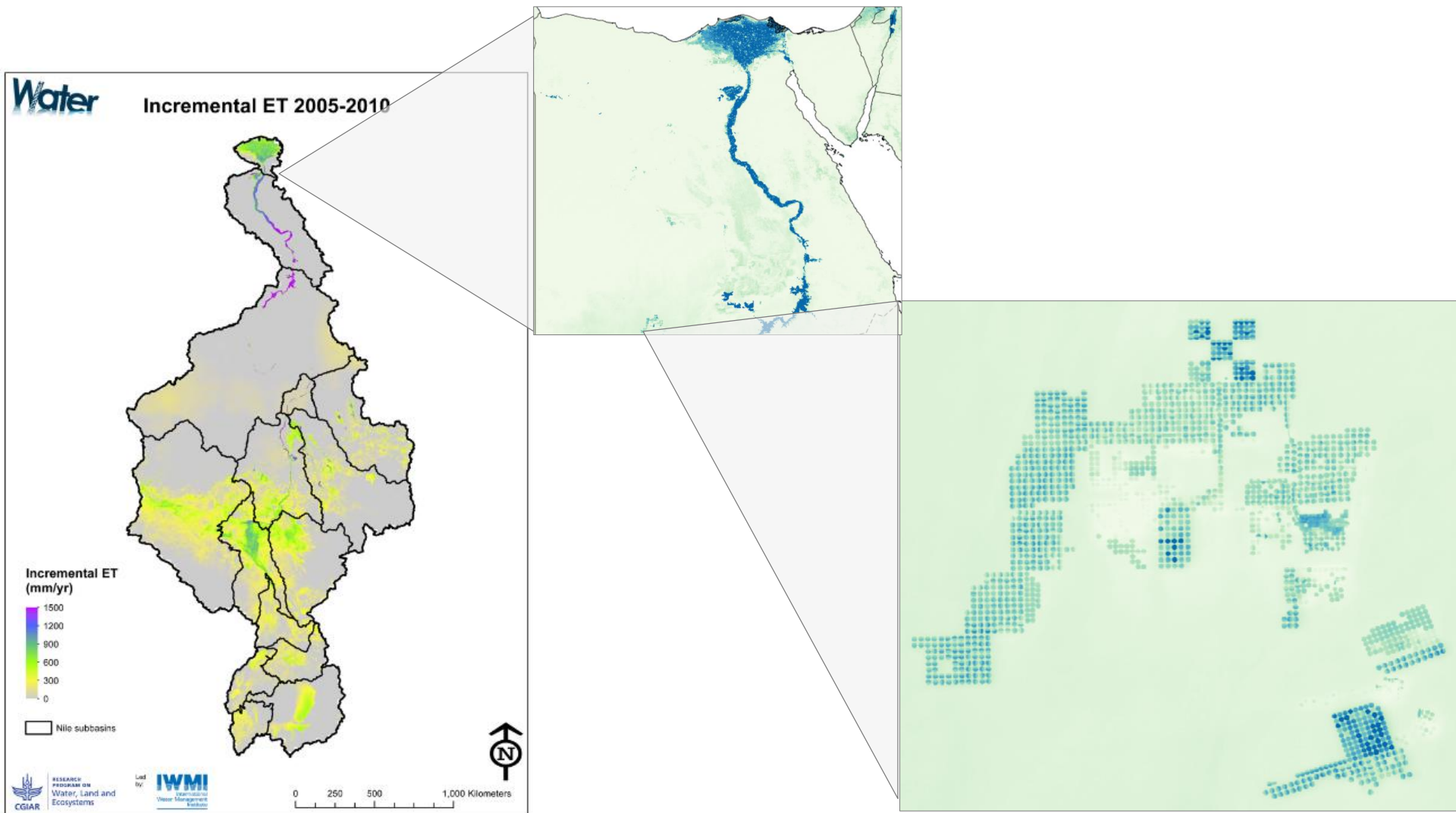


Nile Basin Water Accounts



- Almost all of the rainfall within the basin is consumed through evapotranspiration, with between 2% (dry year) to 3.6% (wet year) available as runoff (blue water) for allocation
- Map of rainfall surplus provides an indication of the areas that are important for generating runoff (and thus supporting water availability for downstream users) and those that support natural processes and have a high ET
- 20% of the net inflow originates from atmospheric moisture recycling; 26% of ET is recycled through rainfall within Nile boundaries (nb 40% in SE Nile region)

Water Accounting Across Scales



Water accounting...to water productivity...to irrigation performance

Solar suitability mapping framework

Parameters:

- Solar irradiation
- Landscape & crop
- Water resources (gw & sw)
- Proximity to markets
- Solar PV pump type

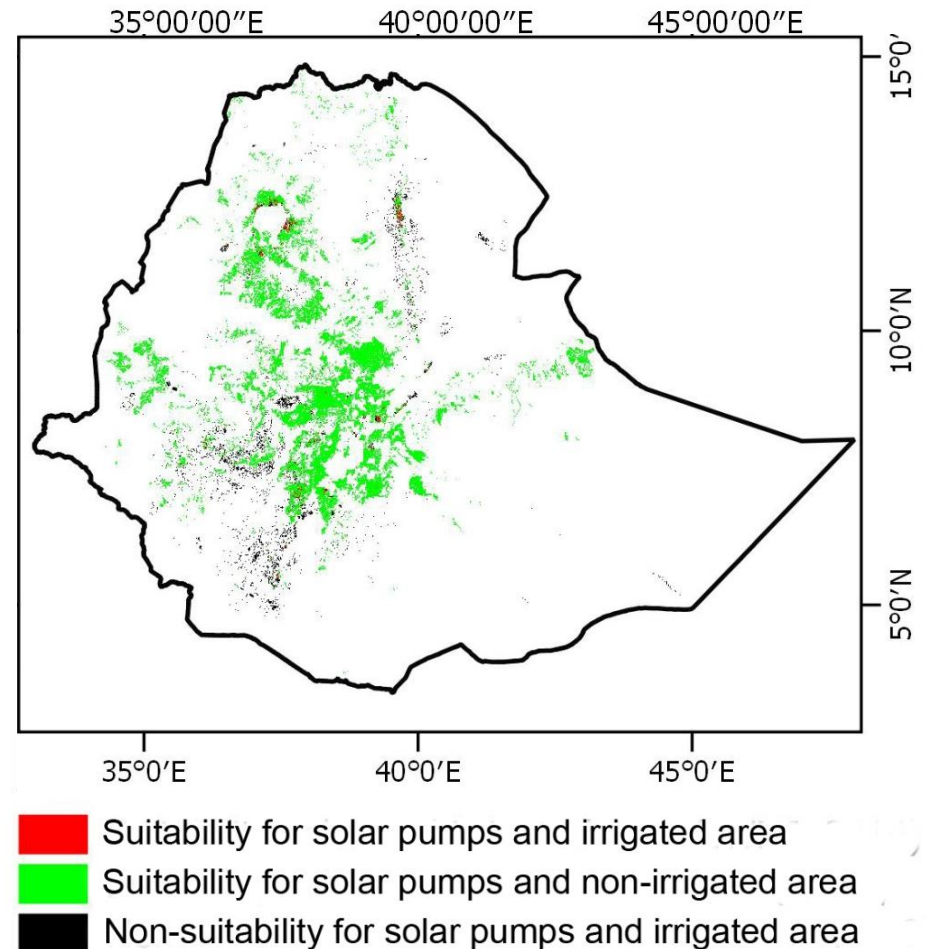
Steps:

- Constraints
- Reclassification & weighing
- Suitability analysis check (well depth, irrigated land)

Allows for specific solar pump type (solar energy requirement and dynamic pumping head limitation) to assess suitability for specific pump types

Suitability of solar PV irrigation Ethiopia

- Ethiopian government aims at irrigation expansion to 11M ha
- Solar irrigation potential :
 - GW (7m): **~2.1 M ha**
 - GW (25m): **~ 6.3 M ha**
 - GW & SW: **~ 6.8 M ha**
- Solar pump potential to support irrigated land is ~167,000 ha (15%)
- Solar pump potential to transform rain-fed agriculture is ~ 6.6 million ha (32%)

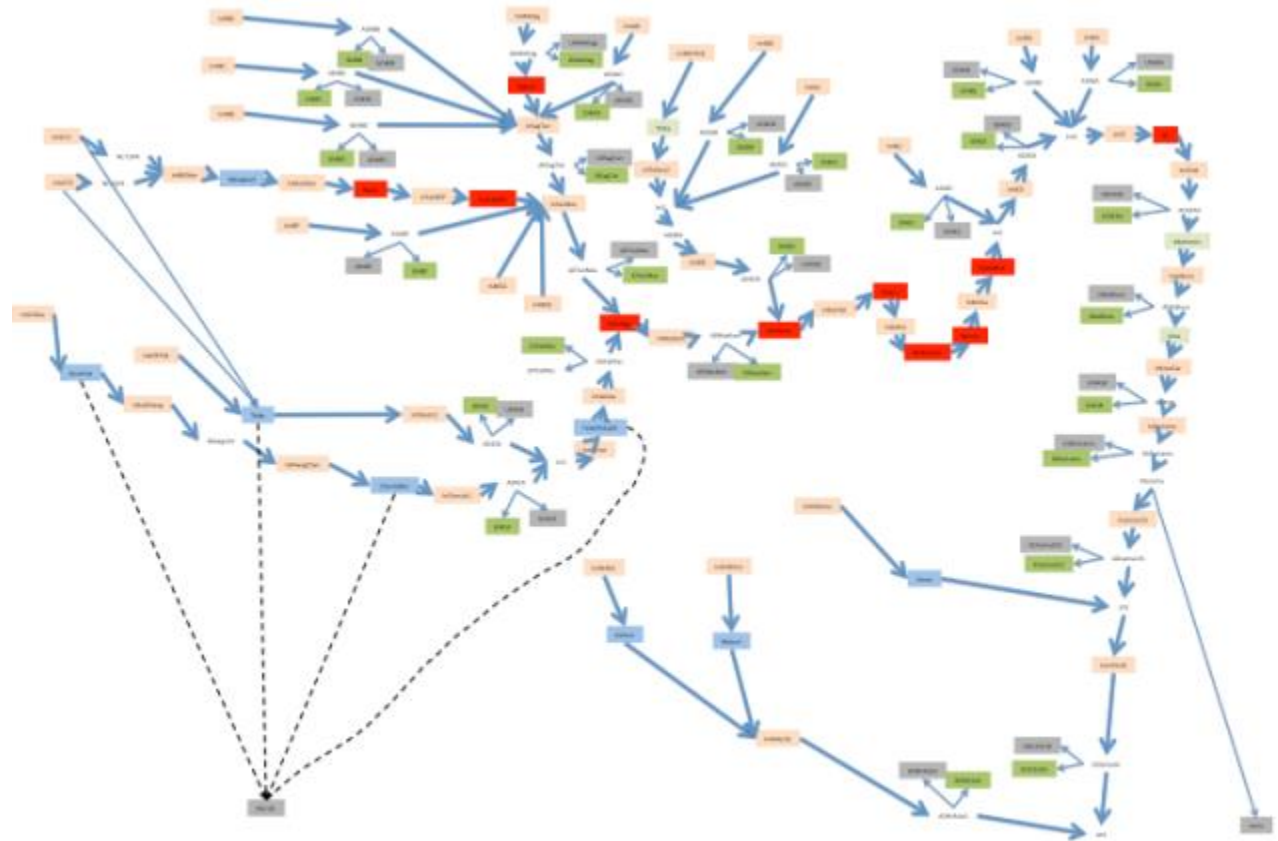


Schmitter, P., et al. 2018. Suitability mapping framework for solar photovoltaic pumps for smallholder farmers in sub-Saharan Africa Applied Geography, 94: 41-57

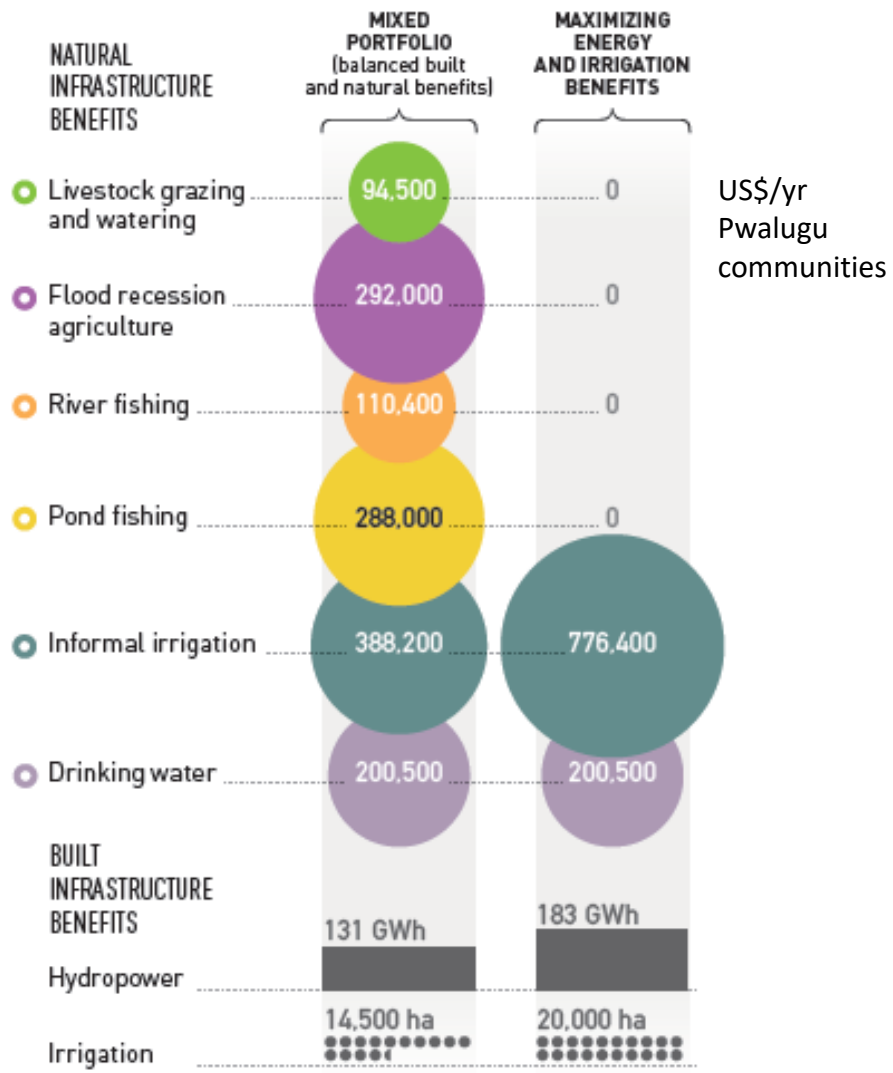
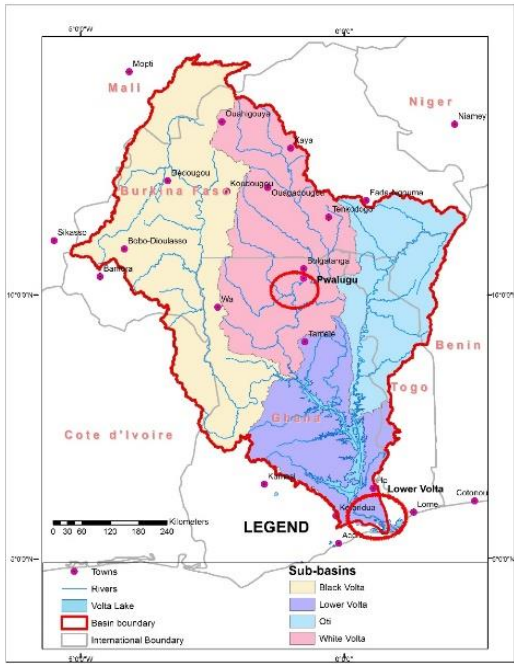


Modeling basin-level trade-offs

- Inflow (subcatchment)
- Water supply
- Hydropower
- Irrigation
- Urban demand
- River
- Abstraction/diversion
- Inter-basin transfer

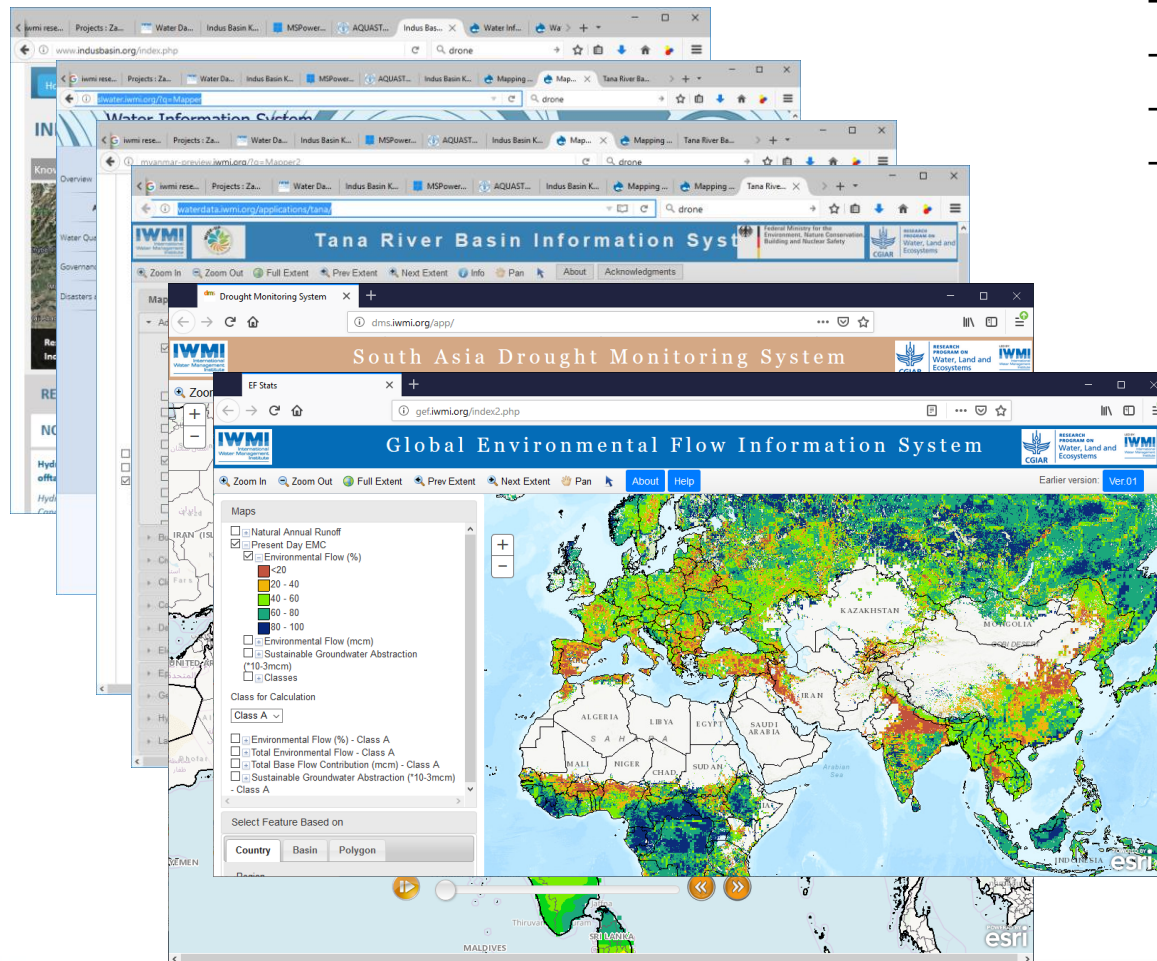


Pwalugu Multipurpose Dam, Ghana



Information and Decision Support Systems

- Web-based information systems and options analysis
- Hydro-economic modeling and Decision Support



- Systematic, network analysis
- Modular
- Multi-objective optimization
- Water valuation, pricing, subsidies

