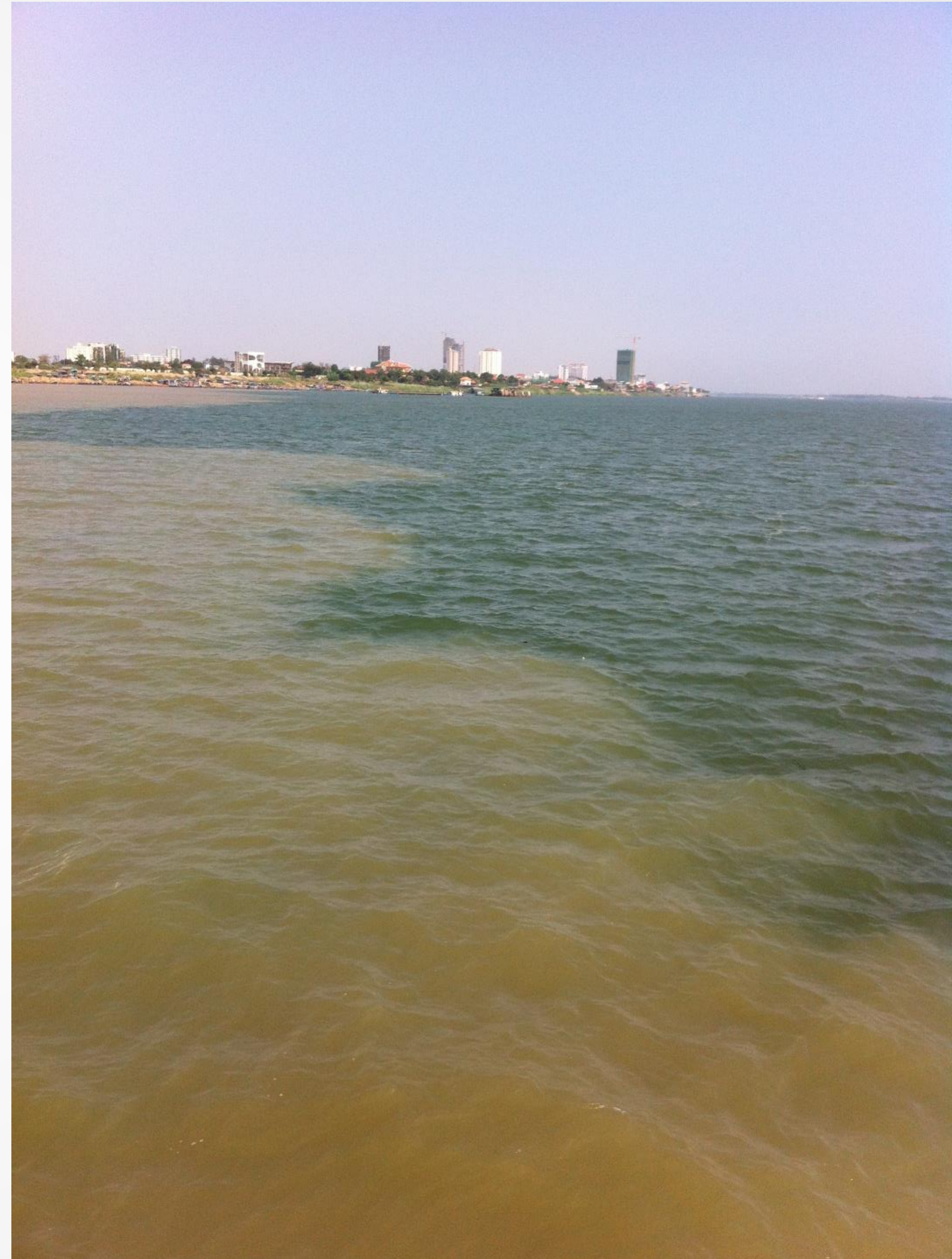


APPLYING THE FRESHWATER HEALTH INDEX TO THE 3S RIVER BASIN IN SOUTH-EAST ASIA

Dr. Nick Souter, presented today by Dr. Tracy A
Farrell

CONSERVATION
INTERNATIONAL



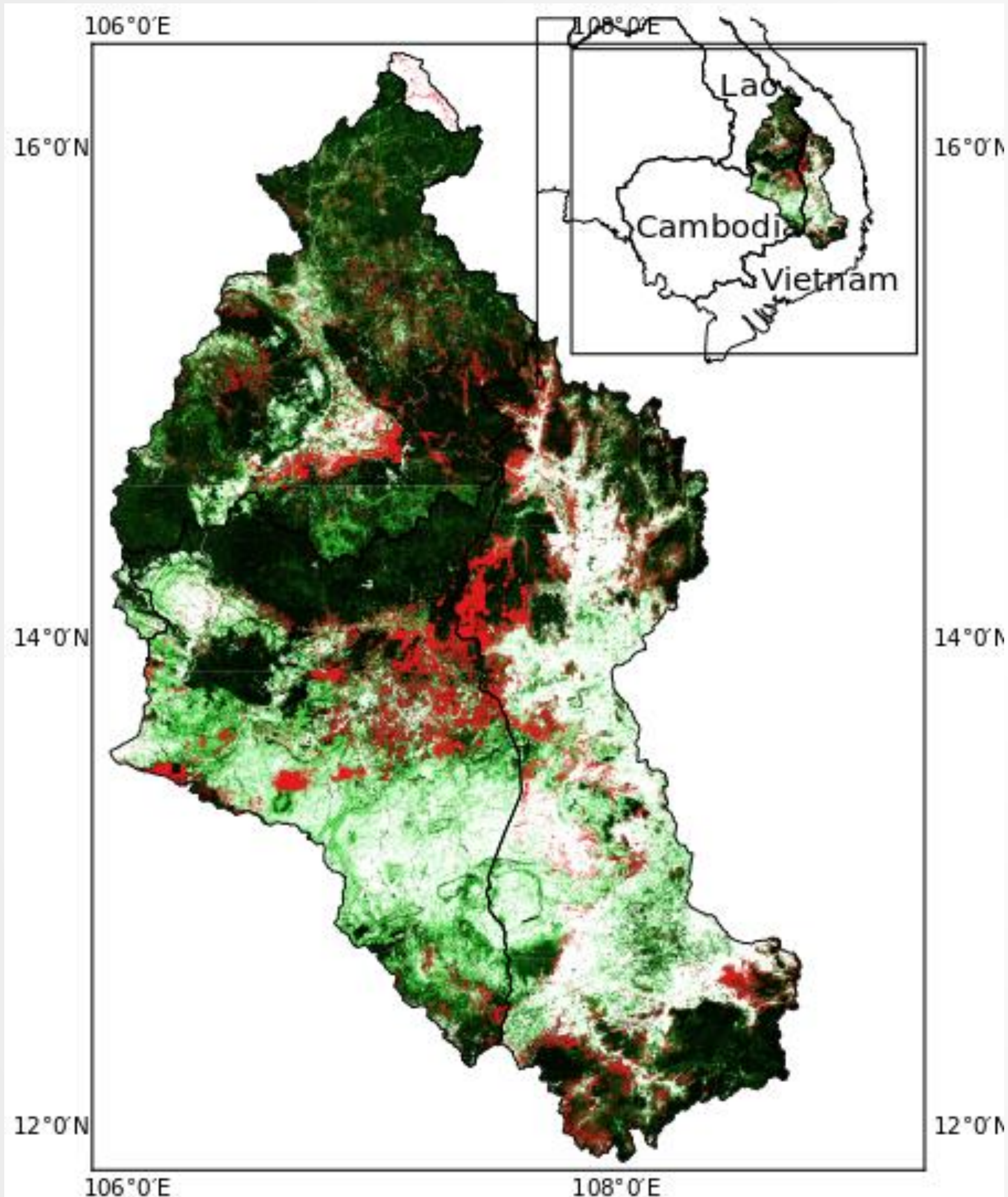


Importance of the 3S

- A transboundary river basin, within a transboundary river basin
- Home to ~3.4 million people, 24% live in poverty
- Home 329 native fish, 17 are endemic and 14 critically endangered or endangered
- The most important sub-basin for migratory fish in the Mekong basin
- Covers 10% of the Mekong River Basin but provides ~25% of its flow and 15% of its sediment
- Sediment is believed to drive the productivity of the Tonle Sap Lake, the world's largest inland fishery, and sustains Vietnam's rice bowl, the Mekong delta
- Contains a large number of hydropower dams and potential dam sites in an energy hungry region

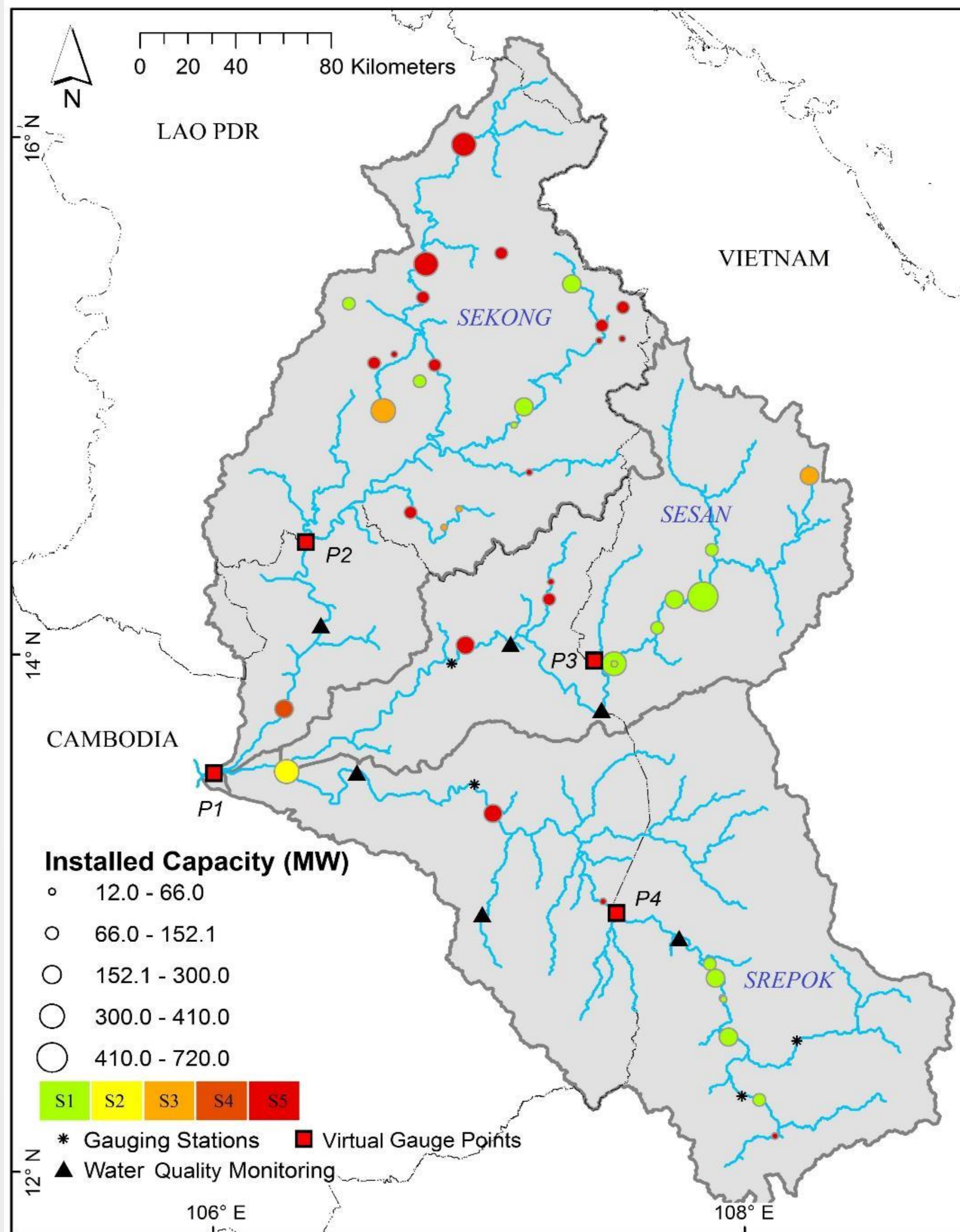


Three Countries - Vietnam



- Sesan and Srepok River headwaters
- Vietnam – 3 million people in the central highlands
- In-migration of ethnic lowland Vietnamese
- High level of land clearance for industrial plantations of coffee and soybean as well as seasonal rice
- Almost full dam development
- The most ‘advanced’ country
- Concerned about sediment supply to the delta

Three Countries - Laos



- Sekong River headwaters
- Low population density
- High poverty and dependence on natural resources
- Low level of land clearance
- Increasing level of dam development
- Wants to be the 'battery of Asia'

Three Countries - Cambodia



- Sekong, Sesan and Srepok
- Low population density
- High poverty and dependence on natural resources
- Rapid rate of land clearance, illegal logging and economic land concessions
- Limited dam sites in an energy poor country
- Integral part of the productivity and diversity of the Tonle Sap fishery



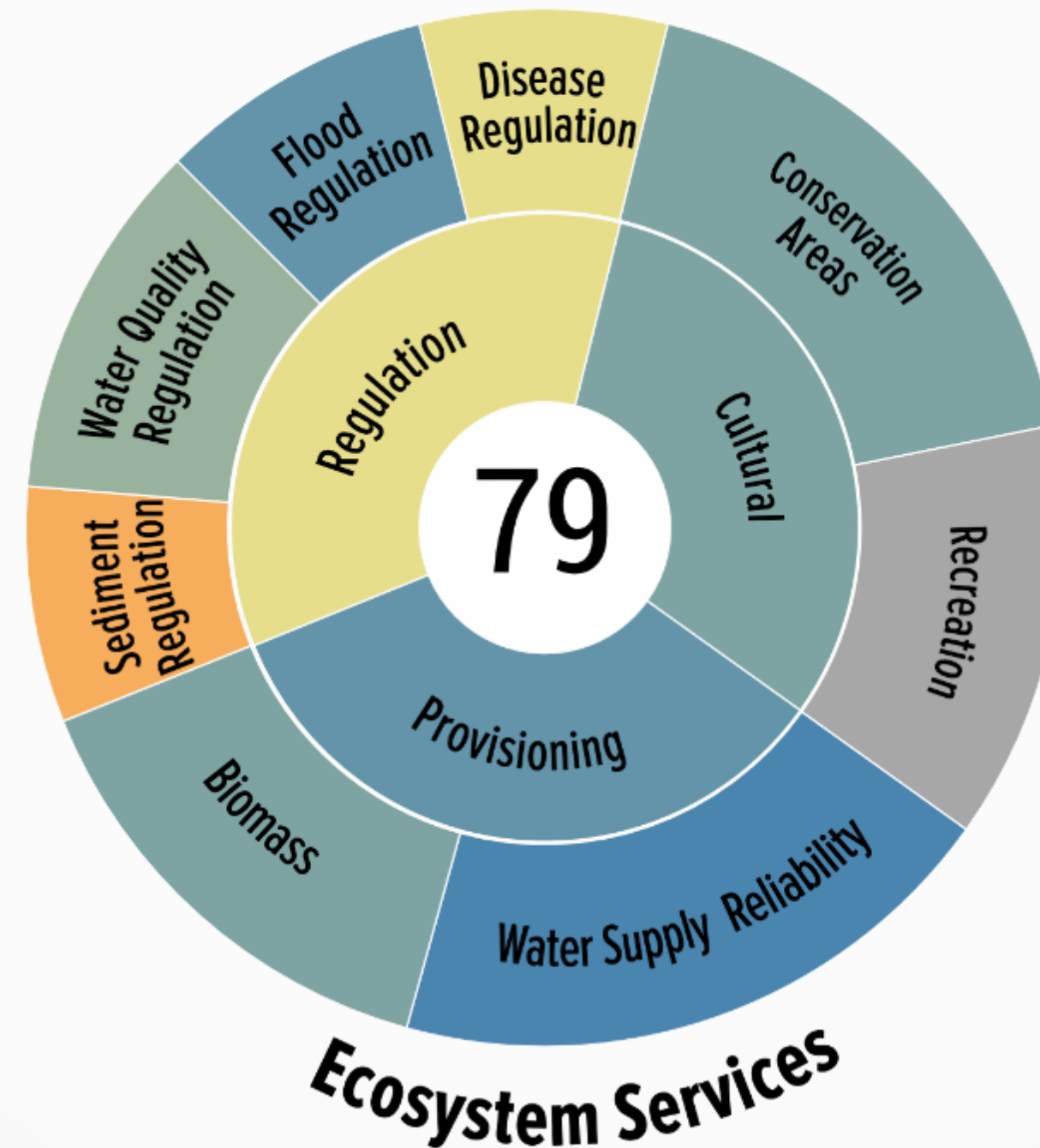
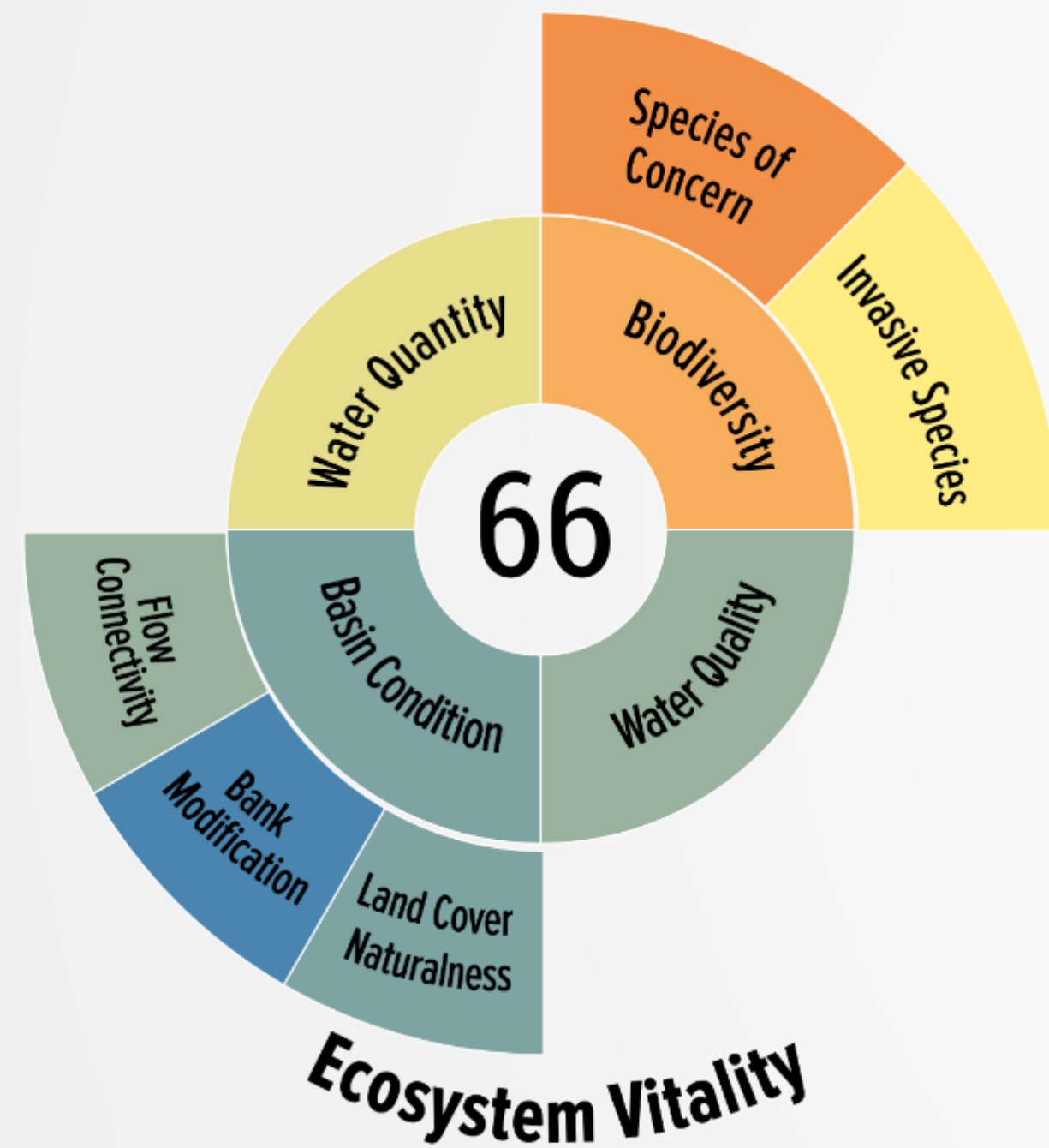
Consultation



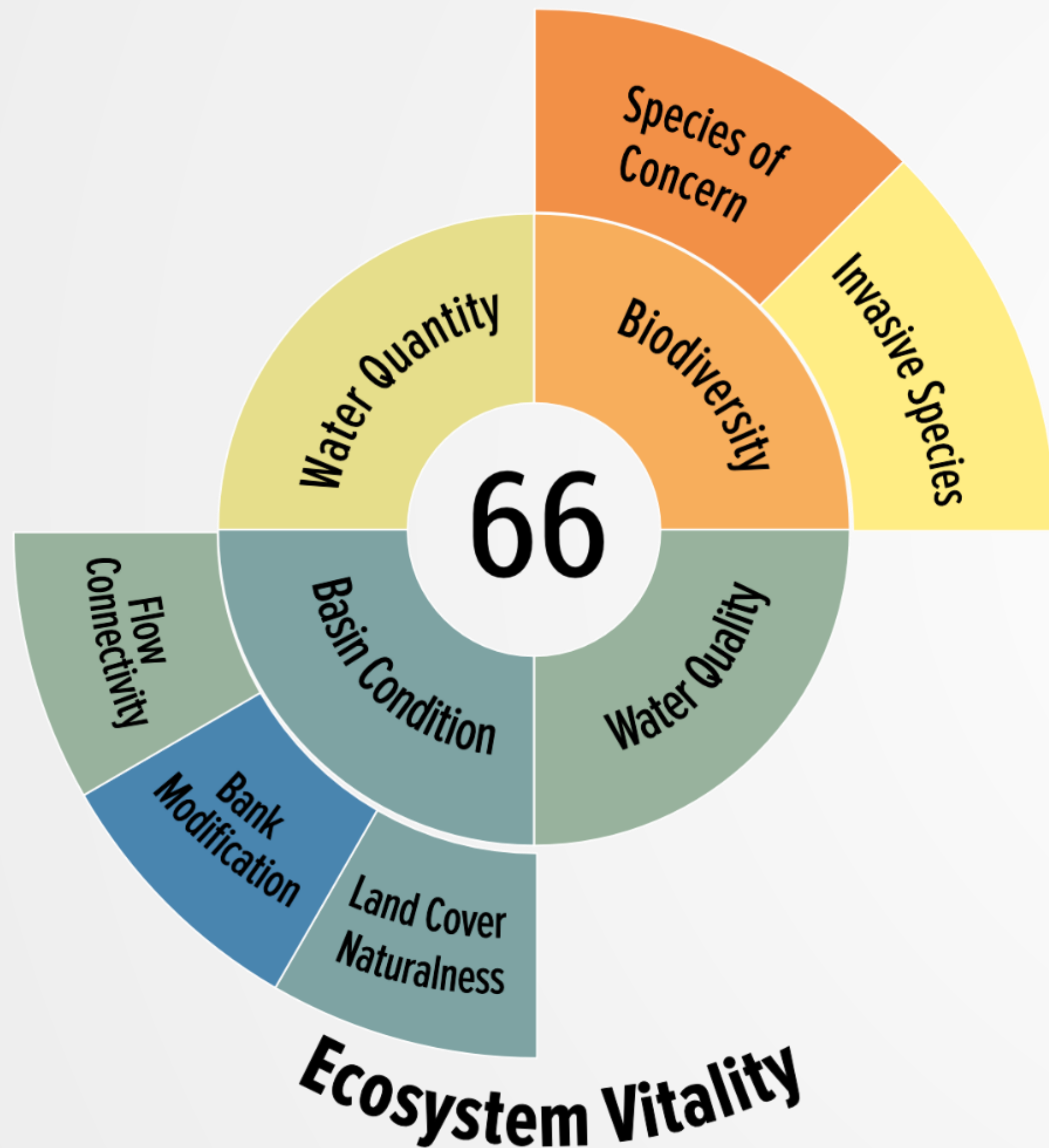
- Stakeholders group established from the IUCN Bridge Network
- Government, academic and NGO representatives from Lao PDR, Cambodia and Vietnam
- Two workshops (1) June 2016, introduced the FHI and obtained feedback on indicators and potential data sources; (2) April 2017, presented preliminary results, facilitated G&S survey and weighting exercise and ecosystem services weighting exercise



3S FHI ASSESSMENT



ECOSYSTEM VITALITY



- The status and trends of the condition of freshwater ecosystems, encompassing the aquatic (including groundwater), riparian and terrestrial realms, including their biotic and abiotic components and the biophysical processes affecting them.
- Each major indicator is weighted equally
- Functioning ecosystem that is showing signs of stress

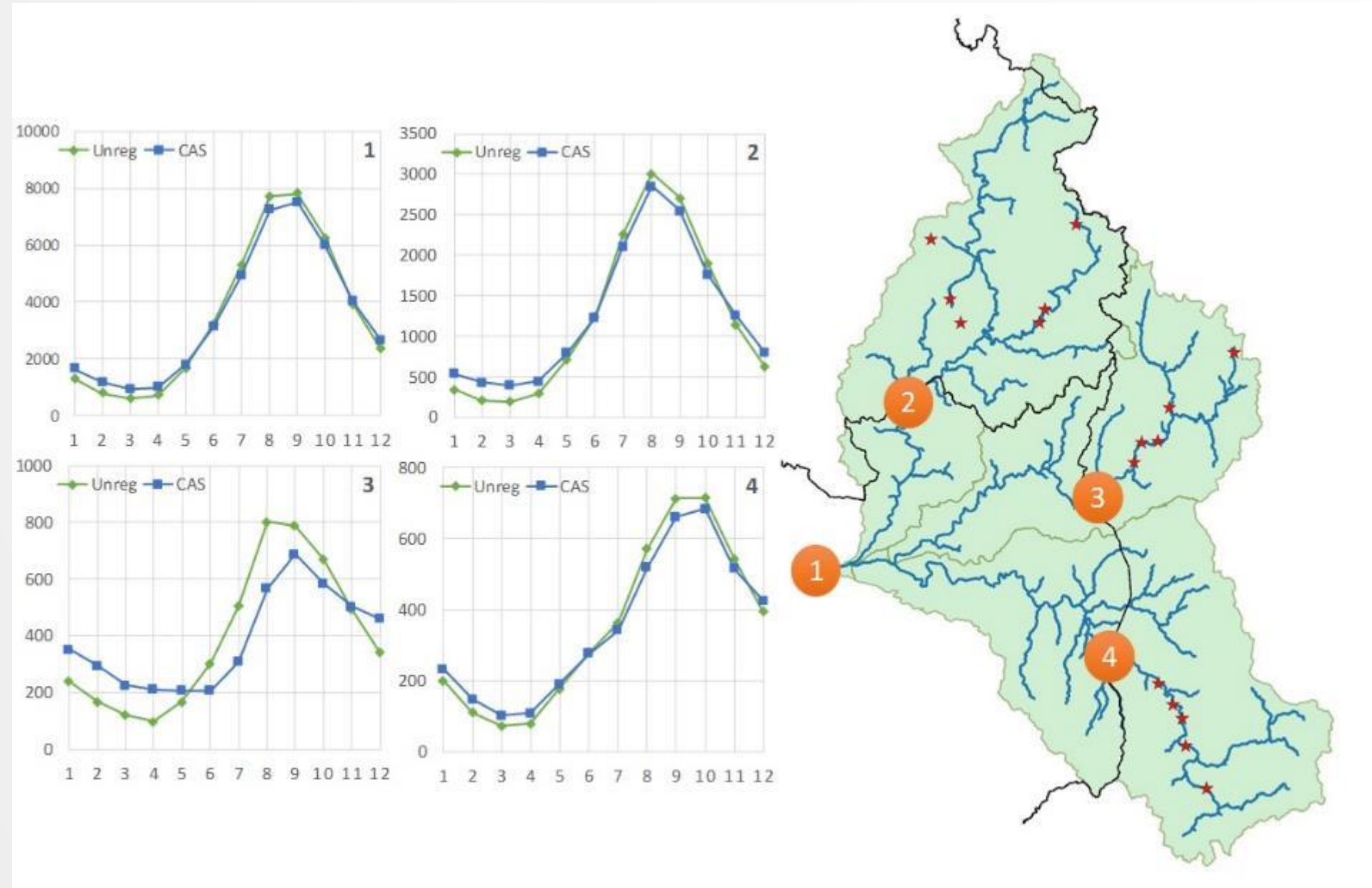
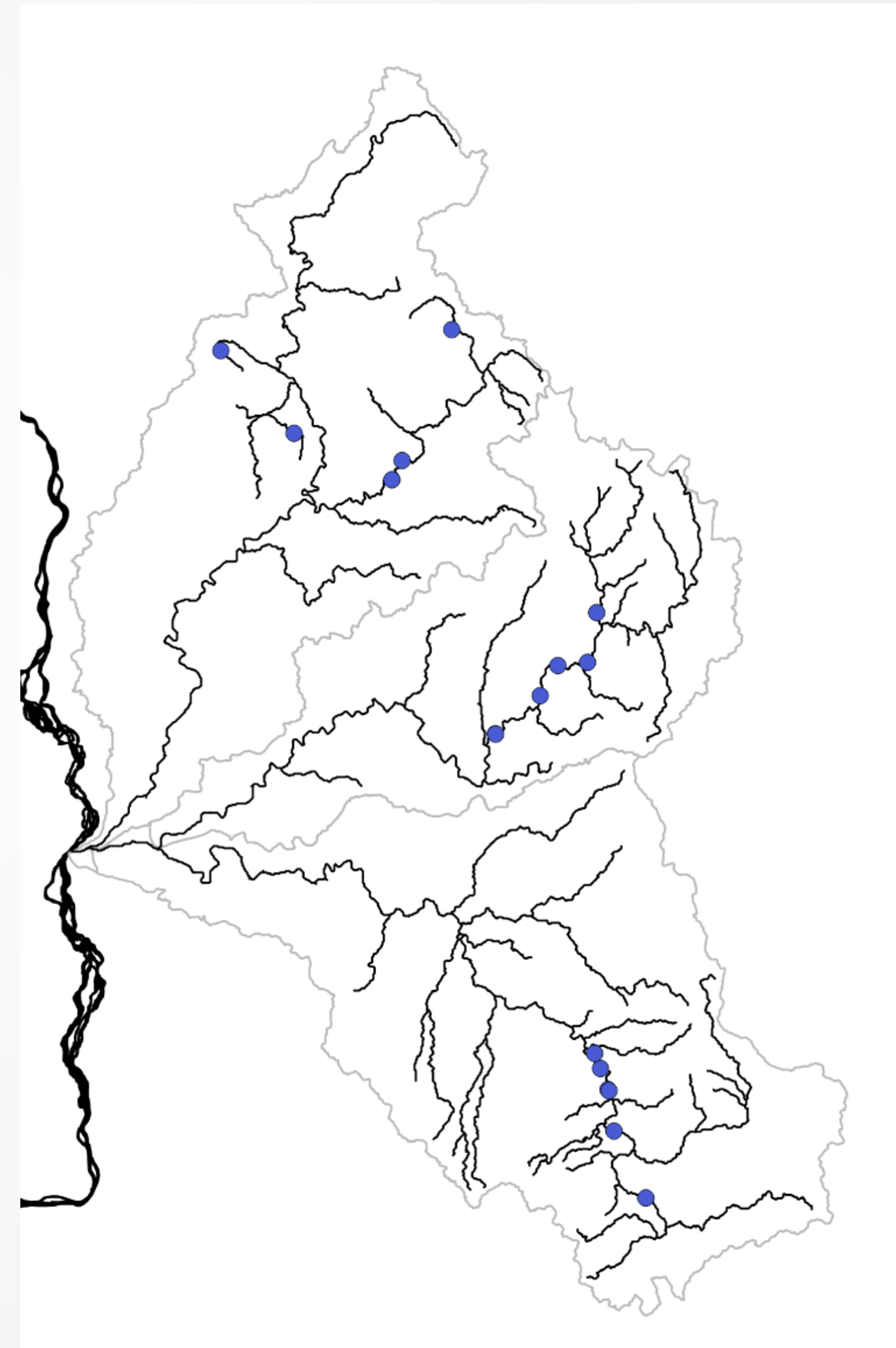


WATER QUANTITY: Deviation from natural flow regime

Basin score: **66**

Border sub-scores:

- Sekong - Lao/Cambodia: 70
- Sesan - Vietnam/Cambodia: 42
- Srepok - Vietnam/Cambodia: 54



Biodiversity in the 3S

- Overall score: **42**
- Species of concern: **32**
 - 90 IUCN Red List threatened species out of 862 assessed, fish were most threatened group and had highest number of critically endangered species.
- Invasive and nuisance species: **55**
 - 8 invasive species.



ECOSYSTEM SERVICES



- Ecosystem services are the benefits people receive from freshwater ecosystems such as water capture, storage and provision, bioremediation of waste, hazard mitigation (e.g. flood control), food and raw materials, and cultural services.
- There are three major indicators each comprised of one or more sub-indicators.
- The importance of these indicators (major and sub) to stakeholders is assessed via a weighting exercise.



ECOSYSTEM SERVICES



- Calculated using an index based on the Canadian Water Quality Index.
- F1 = spatial scope the percentage of sites that fail to provide the service;
- F2 = frequency, the percentage of instances that fail to provide the service; and
- F3 = amplitude, the amount by which failed instances do not meet the service
- Calculated as F1, or a combination of F1 and F2 , or F1 and F3
- Ecosystem providing desired services



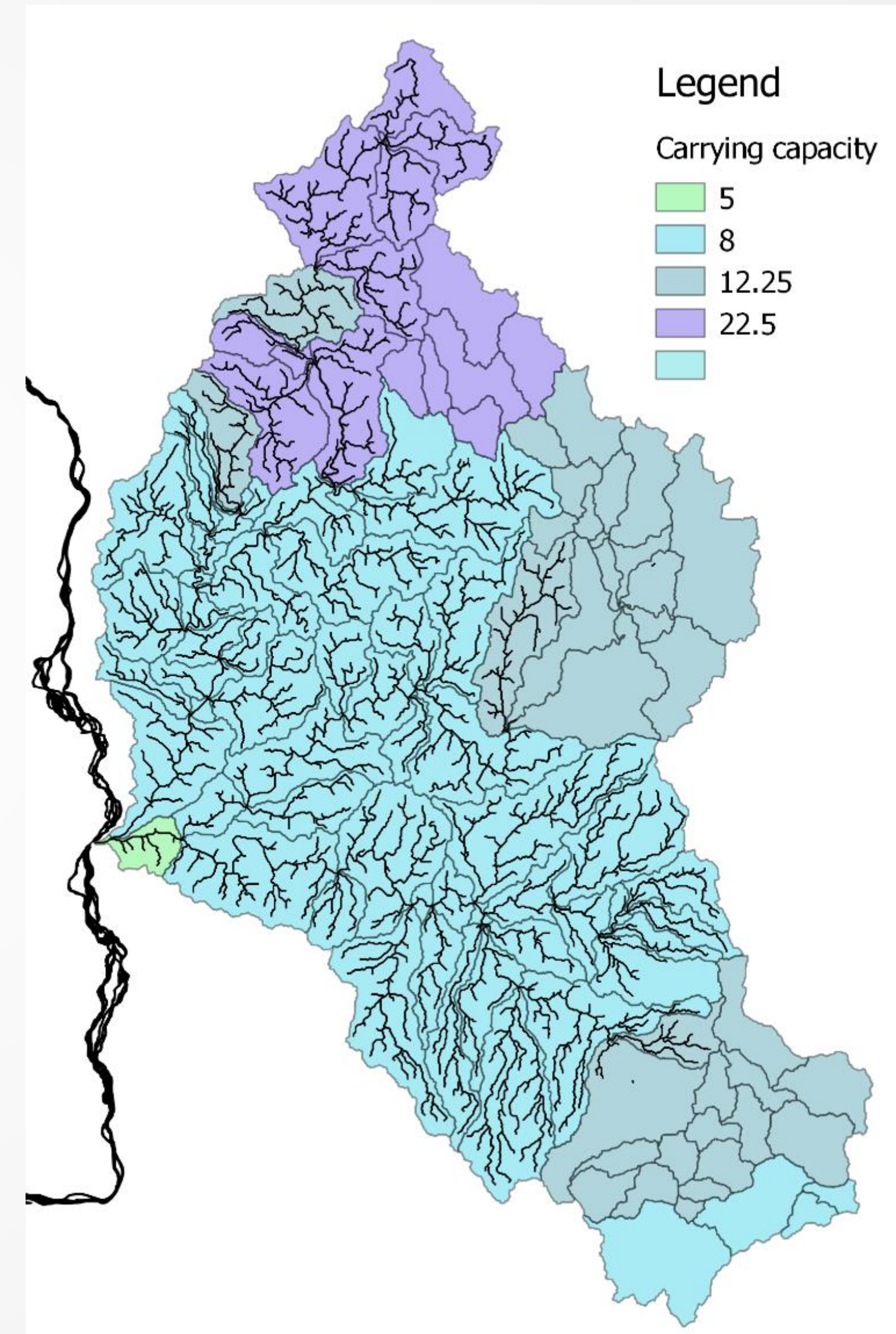
Provisioning Services

Overall score:

91

Sub-scores:

- Water supply relative to demand: **95**
- Biomass for consumption: **87**



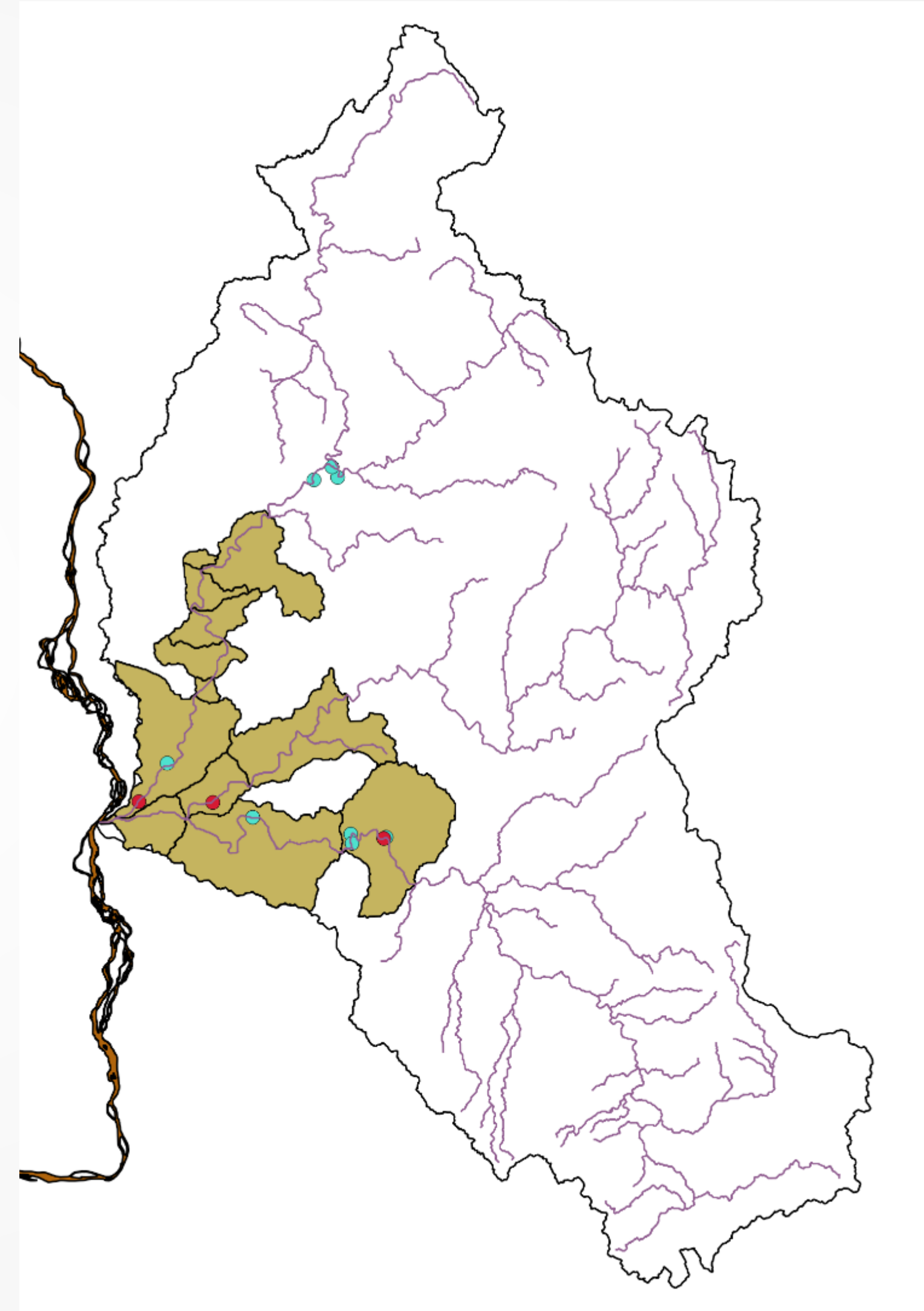
Regulating and Support Services

Overall score:

66

Sub-scores:

- Sediment regulation : **39**
- Deviation of water quality metrics from benchmarks: **81**
- Flood regulation: **88**
- Water associated diseases (Dengue: 13; *S. mekongi*: 83): **67**



GOVERNANCE & STAKEHOLDERS



- **Governance:** structures and processes by which people in societies make decisions and share power, creating the conditions for ordered rule and collective action, or institutions of social coordination.
- **Stakeholders:** actors who depend on freshwater services from a basin, or are involved in the decisions that affect these services: individuals, community groups, government agencies, municipalities, corporations and NGOs
- Stakeholders operate within the constraints of a governance system which affects their behavior.
- Stakeholders may alter the governance system.



GOVERNANCE & STAKEHOLDERS



- Governance & Stakeholders is made up of 4 major indicators, each with multiple sub-indicators.
- Governance & Stakeholders implemented via a targeted survey.
- Fifty-one questions, which takes up to an hour to complete.
- Stakeholders can also weigh the relative importance of the major and sub-indicators.
- Weak institutions and capacity to respond to rapid change

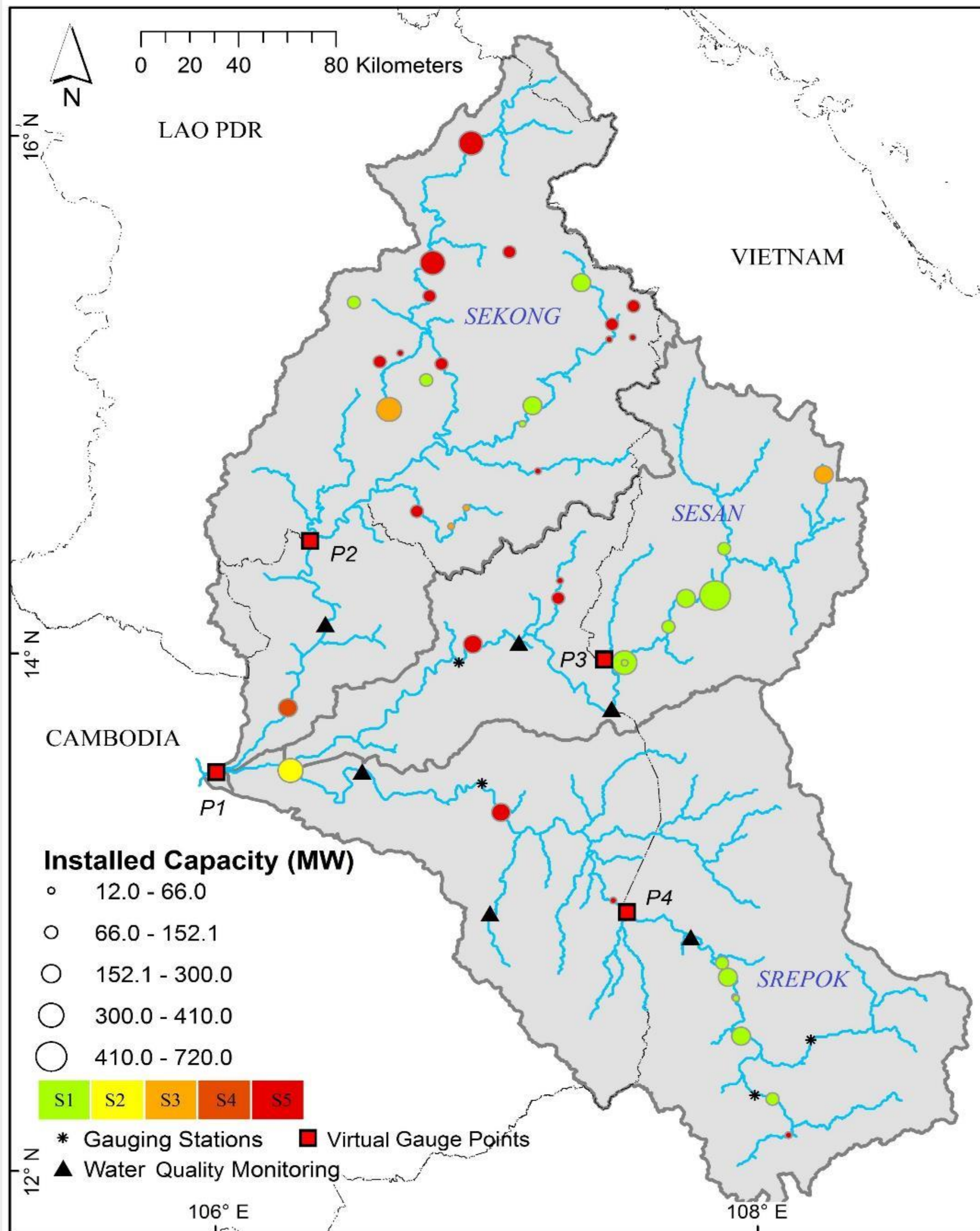


GOVERNANCE & STAKEHOLDERS



- Financial capacity, wastewater treatment
- Information accessibility
- Biological and ecological monitoring
- Disagreement on a shared vision guiding development
- Rules for groundwater extraction

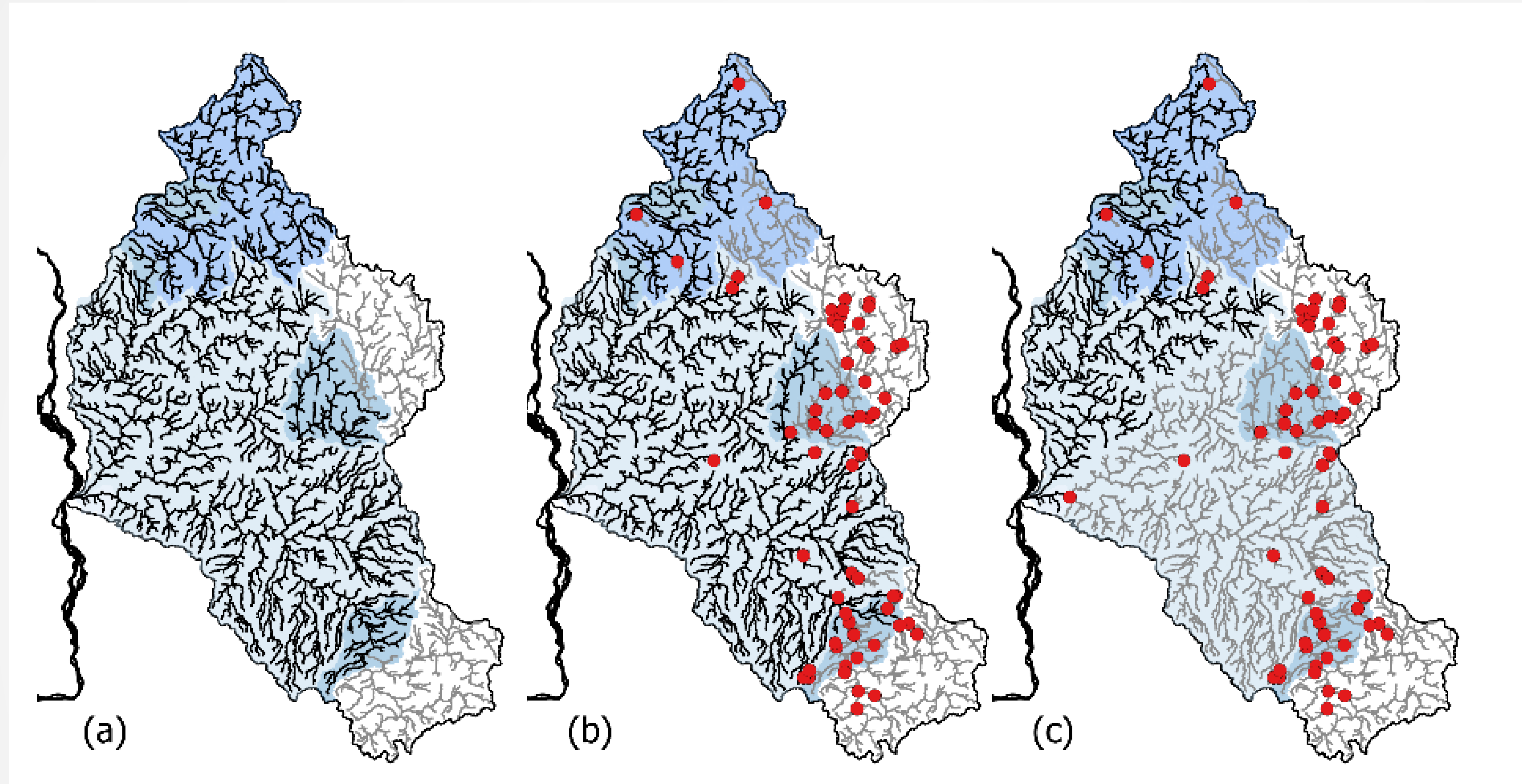




3S - Hydropower development

- Sekong (Viet Nam, Lao PDR, Cambodia)
- Sesan (Viet Nam, Cambodia)
- Srepok (Viet Nam, Cambodia)
- S1 - Dam development (65) Dec 2016
- S2 – Lower Sesan II (commissioned)
- S3 – Under construction (8)
- S4 – Lower Sekong
- S5 – Full development (111)

Impact of dams on connectivity and biomass



NATURAL

EXISTING

+LOWER SESAN

Connectivity

100

78

38

Biomass

100

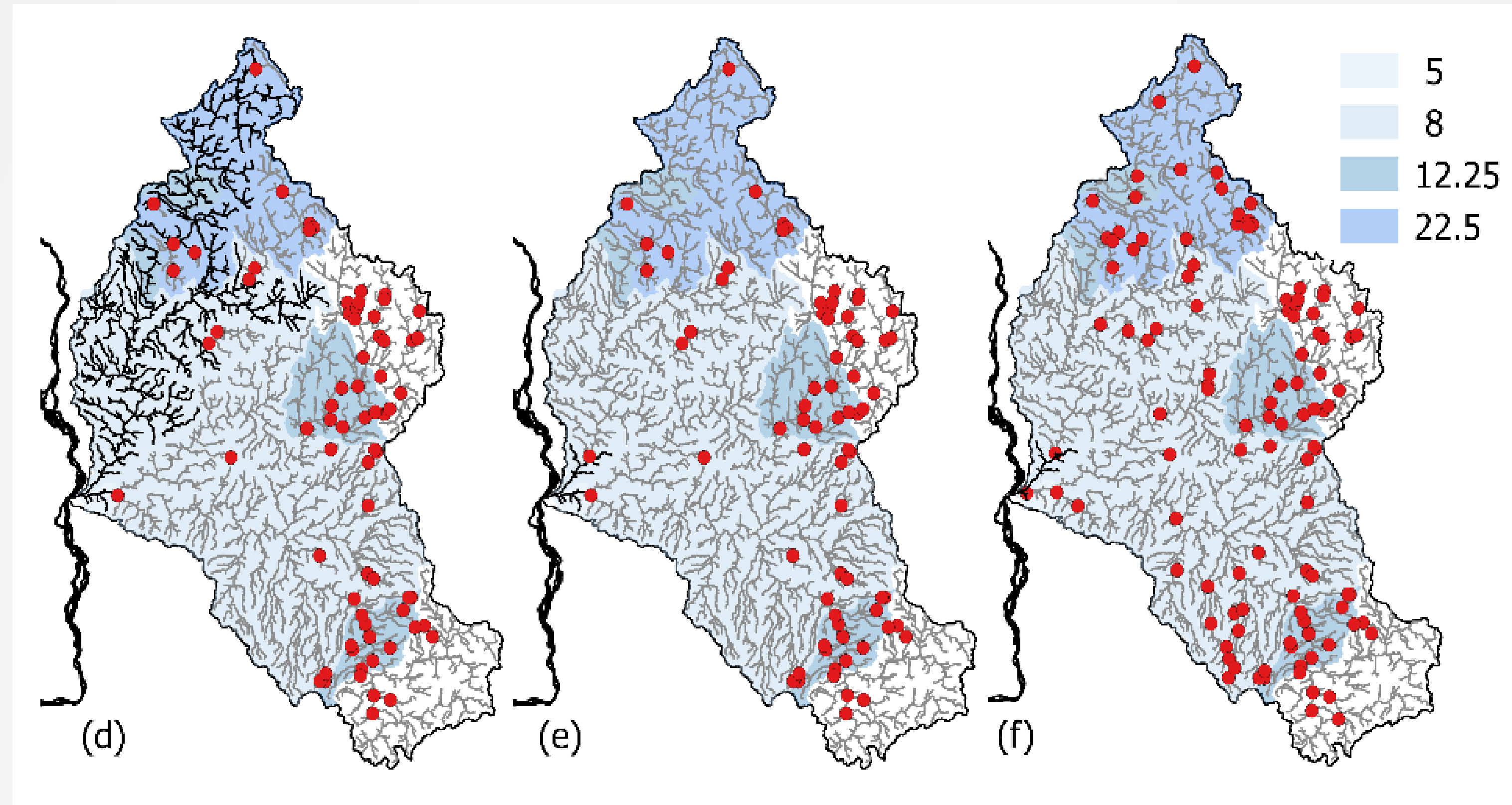
87

27

- Dam location
- Connected stream
- Disconnected stream



Impact of dams on connectivity and biomass



+UNDER CONSTRUCTION

+SEKONG

+FULL DEVELOPMENT

Connectivity

36

25

6

Biomass

27

1

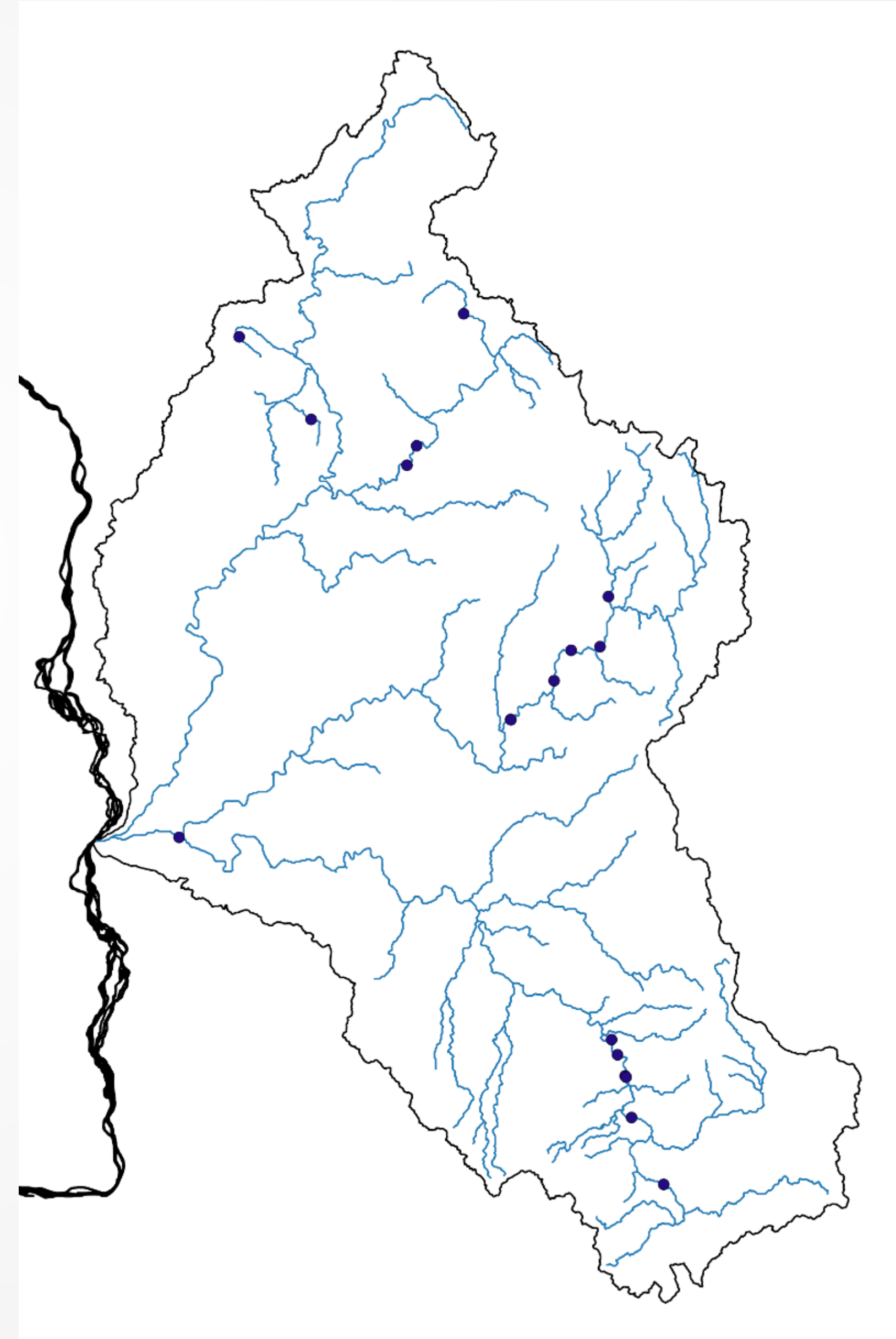
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- Dam location
- Connected stream
- Disconnected stream



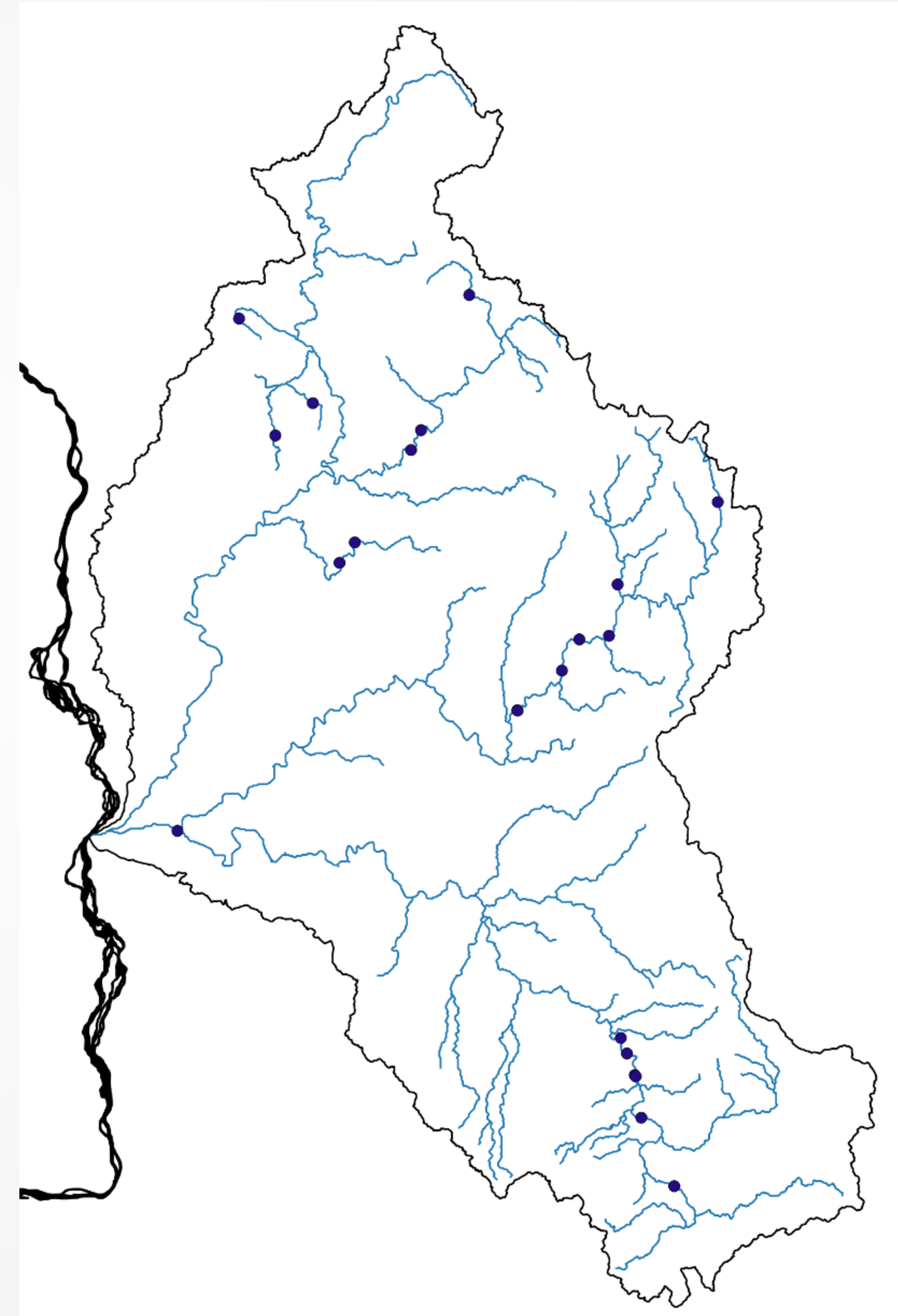
Deviation from natural flow regime

	Dec 16	LS2	UC	Sekong	Full
Basin score	66	66			
Sekong (Lao/Kh)	70	70			
Sesan (Vn/Kh)	42	42			
Srepok (Vn/Kh)	54	54			



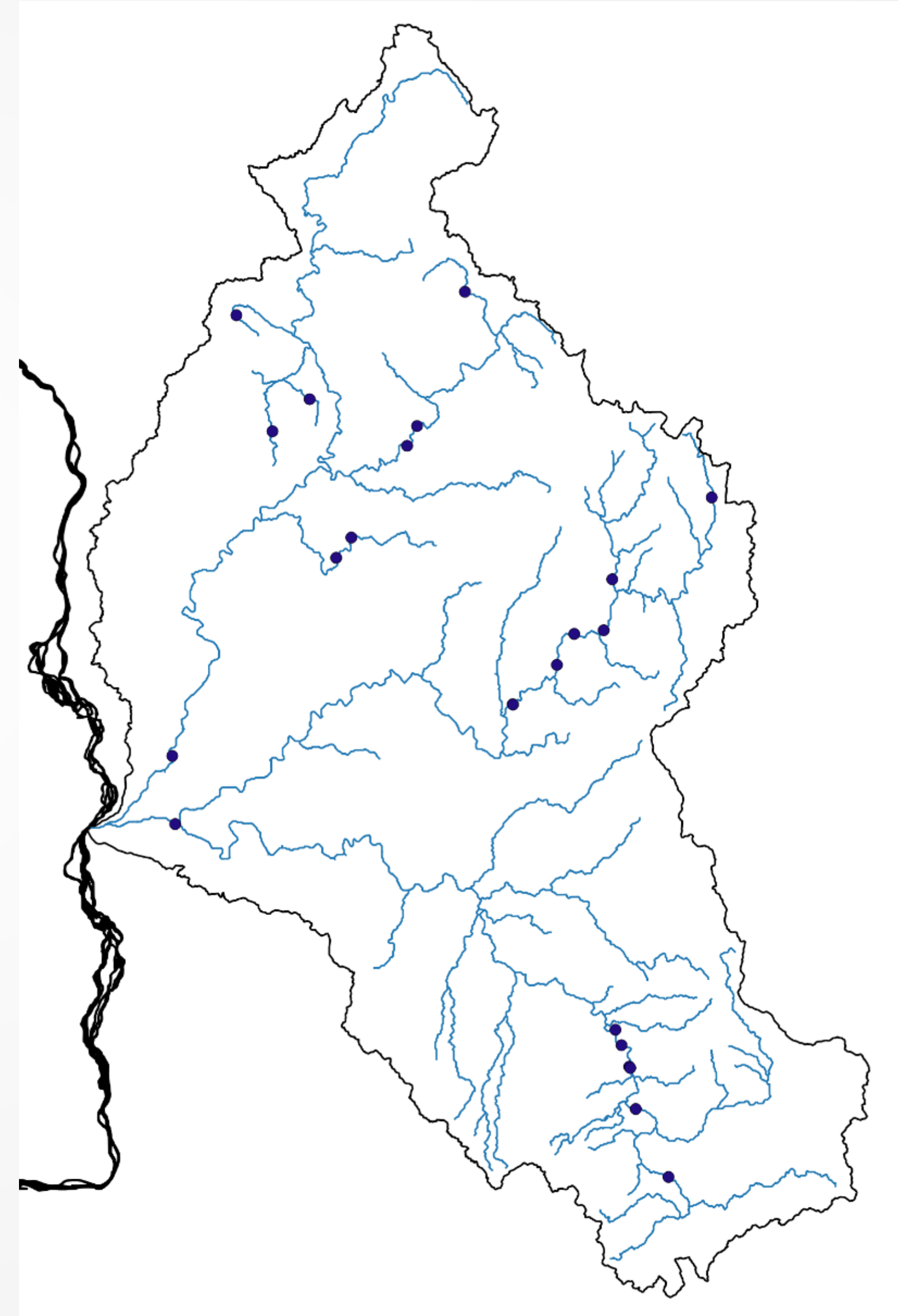
Deviation from natural flow regime

	Dec 16	LS2	UC	Sekong	Full
Basin score	66	66	61		
Sekong (Lao/Kh)	70	70	59		
Sesan (Vn/Kh)	42	42	41		
Srepok (Vn/Kh)	54	54	54		



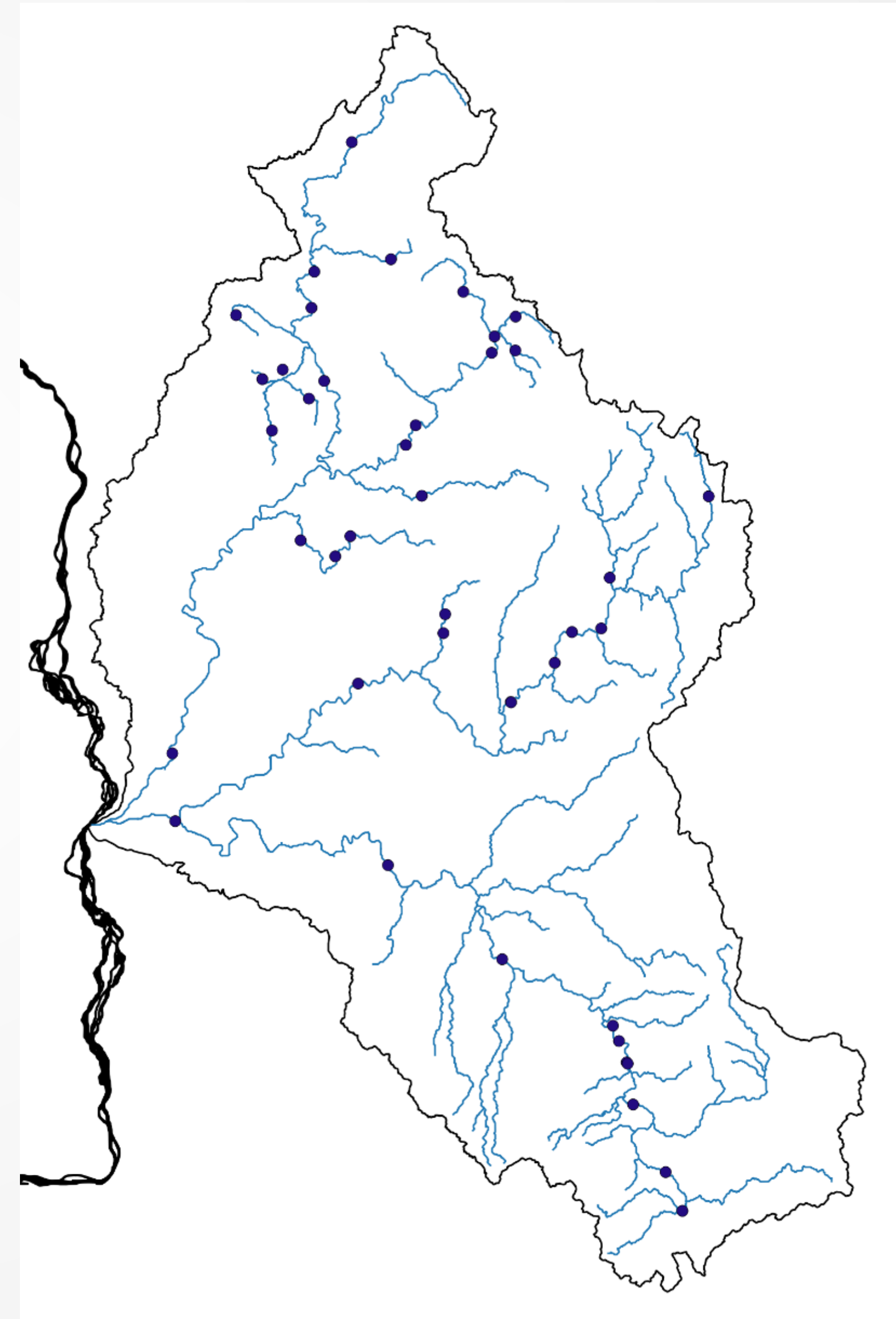
Deviation from natural flow regime

	Dec 16	LS2	UC	Sekong	Full
Basin score	66	66	61	61	
Sekong (Lao/Kh)	70	70	59	59	
Sesan (Vn/Kh)	42	42	41	41	
Srepok (Vn/Kh)	54	54	54	54	



Deviation from natural flow regime

	Dec 16	LS2	UC	Sekong	Full
Basin score	66	66	61	61	22
Sekong (Lao/Kh)	70	70	59	59	15
Sesan (Vn/Kh)	42	42	41	41	41
Srepok (Vn/Kh)	54	54	54	54	43



Outcomes and next steps

- Data and results used in 3S food, water, energy nexus assessment
- FHI adopted by the IUCN Bridge group as a common indicator framework
- Work with the 3S stakeholders group to turn the indicators into targets and thresholds (game theory, optimization)
- Work with the 3S group to refine hydropower scenarios
- Conduct further FHI assessments in Cambodia, Lao PDR and Vietnam
- Build local capacity in Cambodia, Lao PDR and Vietnam
- Further develop the FHI as an assessment, scenario and target setting tool
- Conduct case studies in larger catchments (e.g. whole of Mekong), diverse geographies (e.g. temperate, arid), data rich catchments, complete a whole of country assessment (SDGs)
- Publish and improve water management



THANK YOU!



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