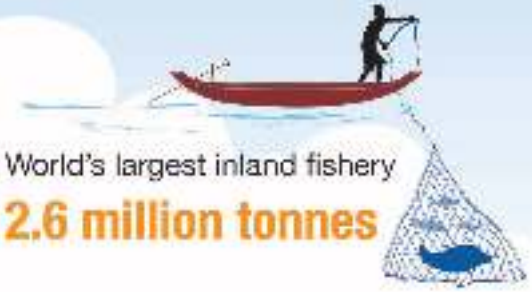
The Future of the Mekong's Aquatic Resources: Bending the Curve for Fisheries and Biodiversity

Dr. Zeb Hogan, University of Nevada, Reno

THE AMAZING FISH AND FISHERIES OF THE MEKONG RIVER

Sustainable Fisheries and Healthy Rivers Provide for People and Protect Biodiversity



World's largest inland fishery

2.6 million tonnes

Fish provide up to

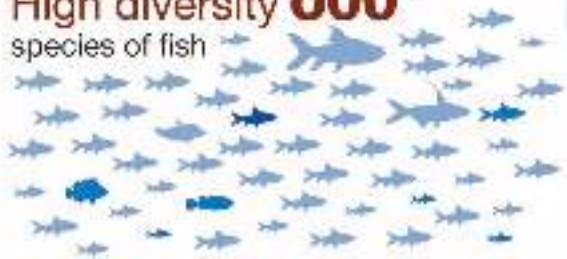
80%

of annual protein

The Tonle Sap River is a migration corridor for billions of fish.

30 - 70%

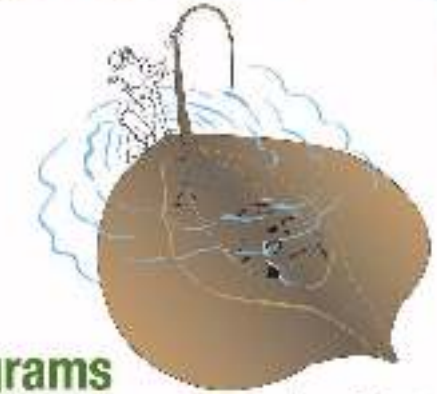
of Mekong fish are migratory



High diversity **800+**

species of fish

Past civilizations depended on wildlife, rice, and fisheries. Today, the Tonle Sap Lake remains the "beating heart" of Cambodia.



Up to

300 kilograms

The Mekong is home to many species of giant fish, including the current world record holder for largest freshwater fish on Earth

Booming aquaculture in Vietnam Mekong Delta export to over

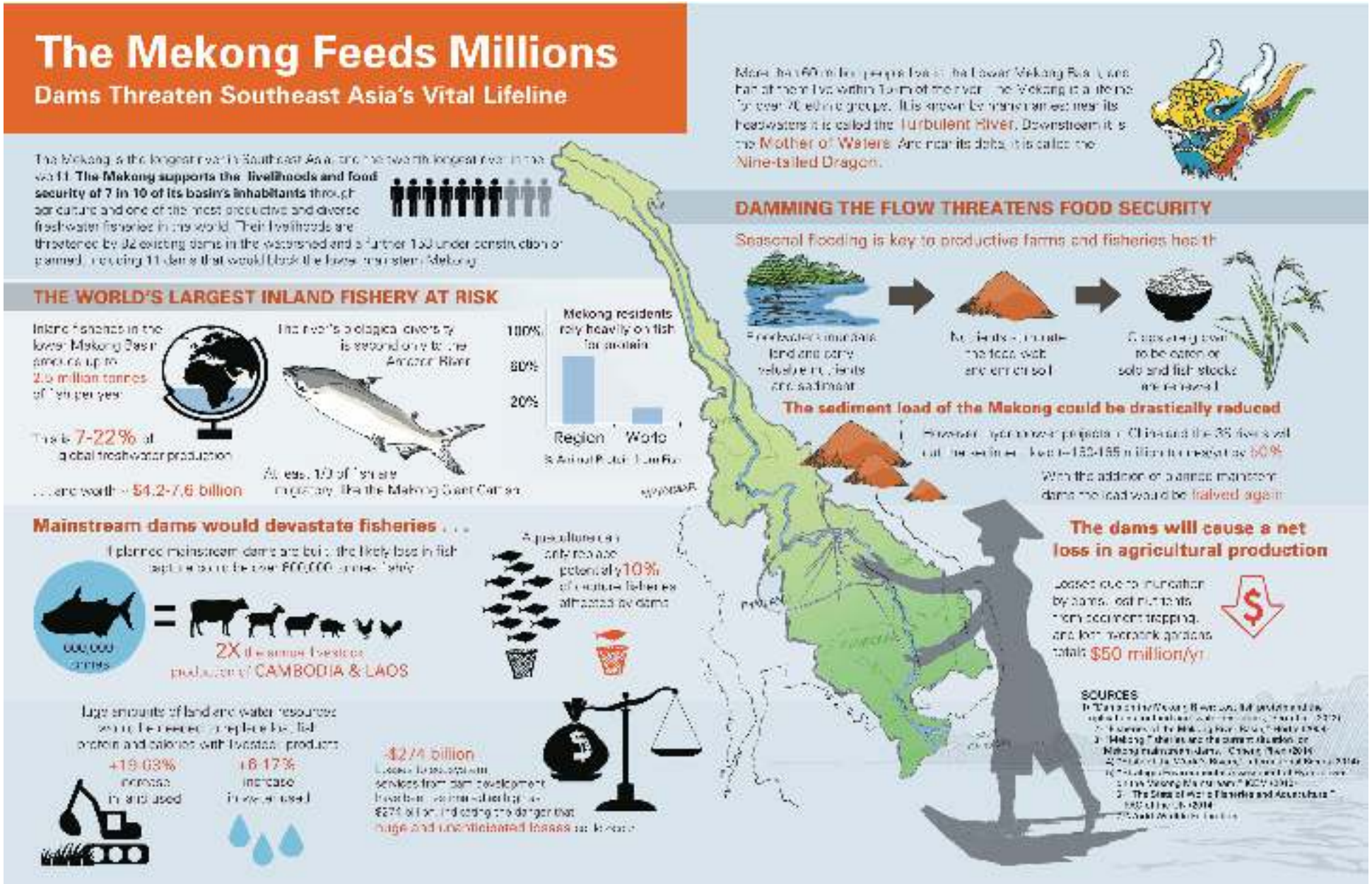
100

countries globally

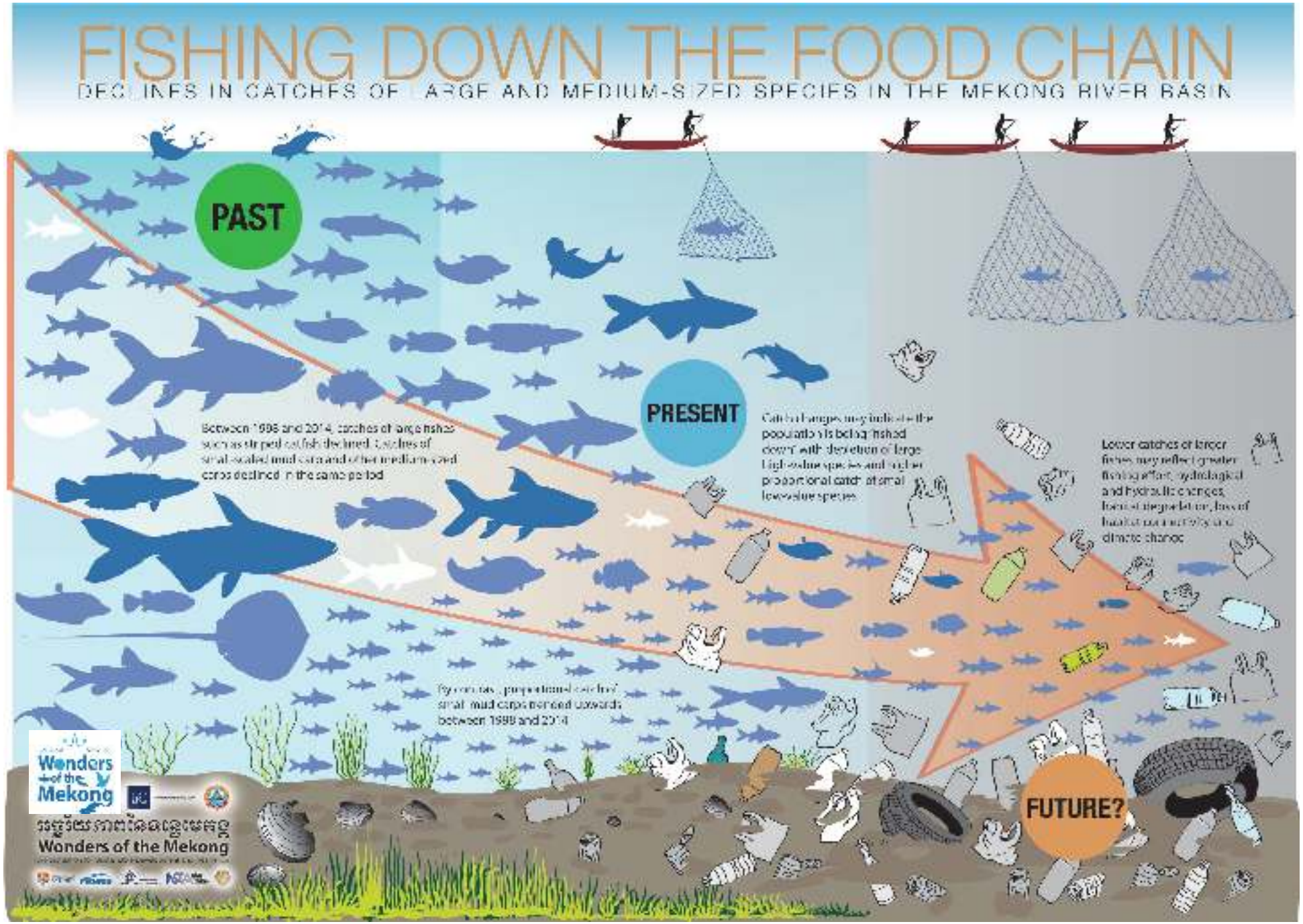
$11 billion

value of Mekong fisheries

Wonders of the Mekong



Source: World Rivers Review 2014


FISHING DOWN THE FOOD CHAIN
DECLINES IN CATCHES OF LARGE AND MEDIUM-SIZED SPECIES IN THE MEKONG RIVER BASIN
PAST
PRESENT
FUTURE?
Between 1996 and 2014, catches of large fishes such as striped catfish declined. Catches of small-scaled mud carp and other medium-sized carps declined in the same period
Catch changes may indicate the population is being fished down with depletion of large high-value species and higher proportional catch of small low-value species
Lower catches of larger fishes may reflect greater fishing effort, hydrological and hydraulic changes, loss of vegetation, loss of habitat connectivity and climate change
Wonders of the Mekong
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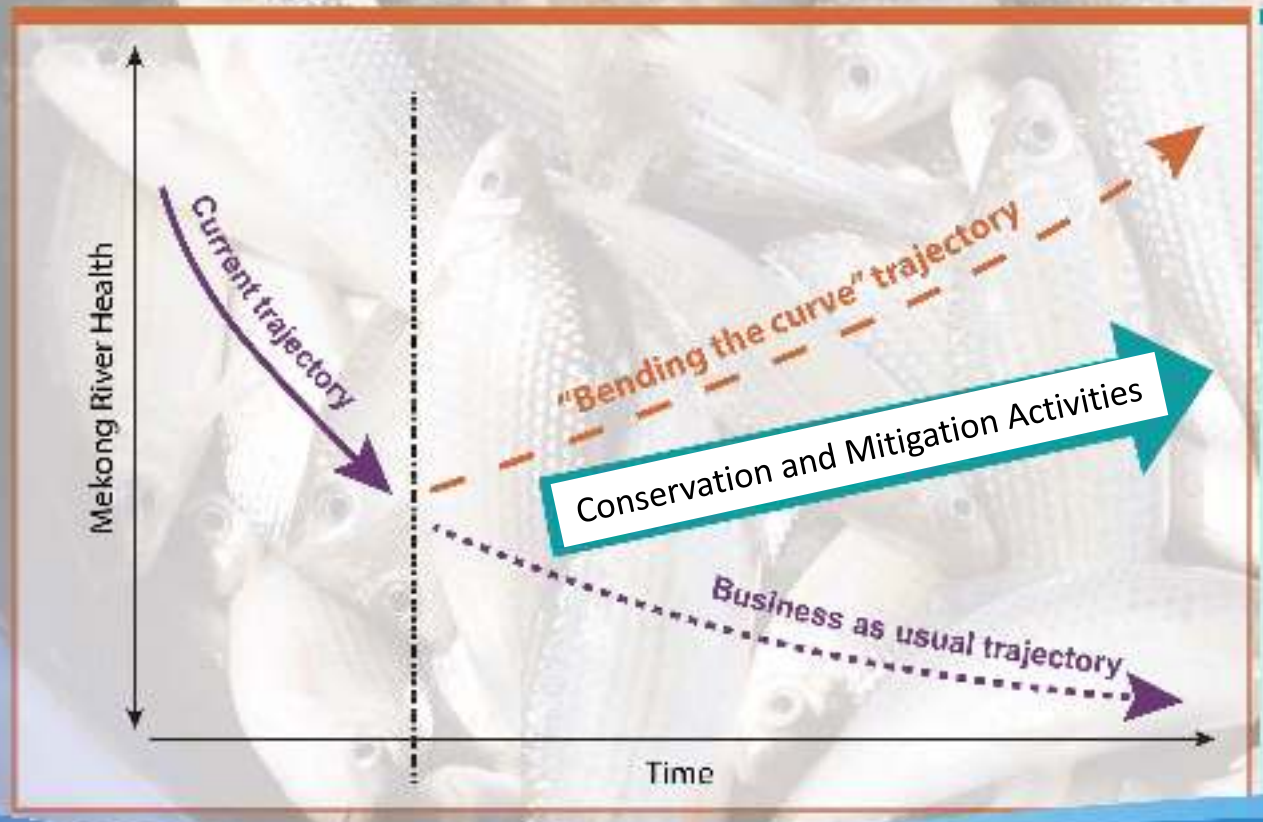
Wonders of the Mekong

Bending the Curve for Conservation



1. Collaborative science (add knowledge)
2. Community-engaged field research (empower communities)
3. Conservation action (Protect biodiversity)
4. Training and capacity building (develop skills / leadership)
5. Educational exchanges
6. Outreach and media partnerships (local impact / global reach)

Wonders of the Mekong Approach

- Collaborative, community-engaged science
- Training, capacity building (especially university and student support), and exchanges
- Outreach and media products for broader impact

WONDERS OF THE MEKONG
A FOUNDATION FOR SUSTAINABLE DEVELOPMENT AND RESILIENCE

The Wonders of the Mekong project will conduct applied research, build capacity, and develo outreach and communications products to highlight the economic, ecological, and cultural values of biodiversity and ecosystem services associated with the Lower Mekong River. The outputs and resulting products, developed as an integrated package, will lead to better protection of a vibrant and healthy Lower Mekong system.

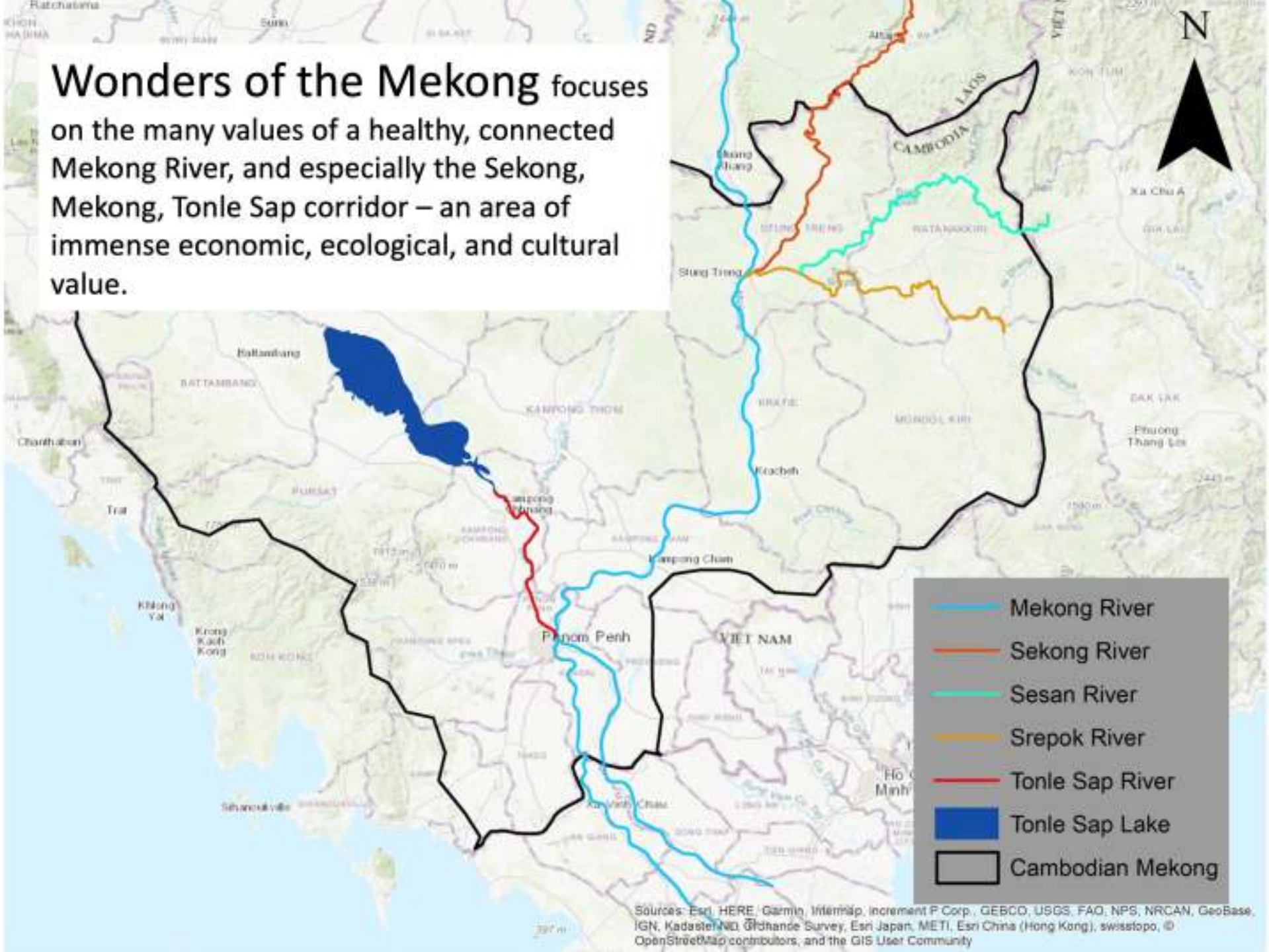
NHY THE LOWER MEKONG RIVER BASIN?

biodiversity hotspot, the Mekong is the most productive river on Earth, supporting over 70 llion people. From the tributary headwaters to the fertile delta and "rice bowl" Mekong supports almost 1000 species of freshwater fish cies, flood plains and flooded forest zations, like A

Wonders of the Mekong

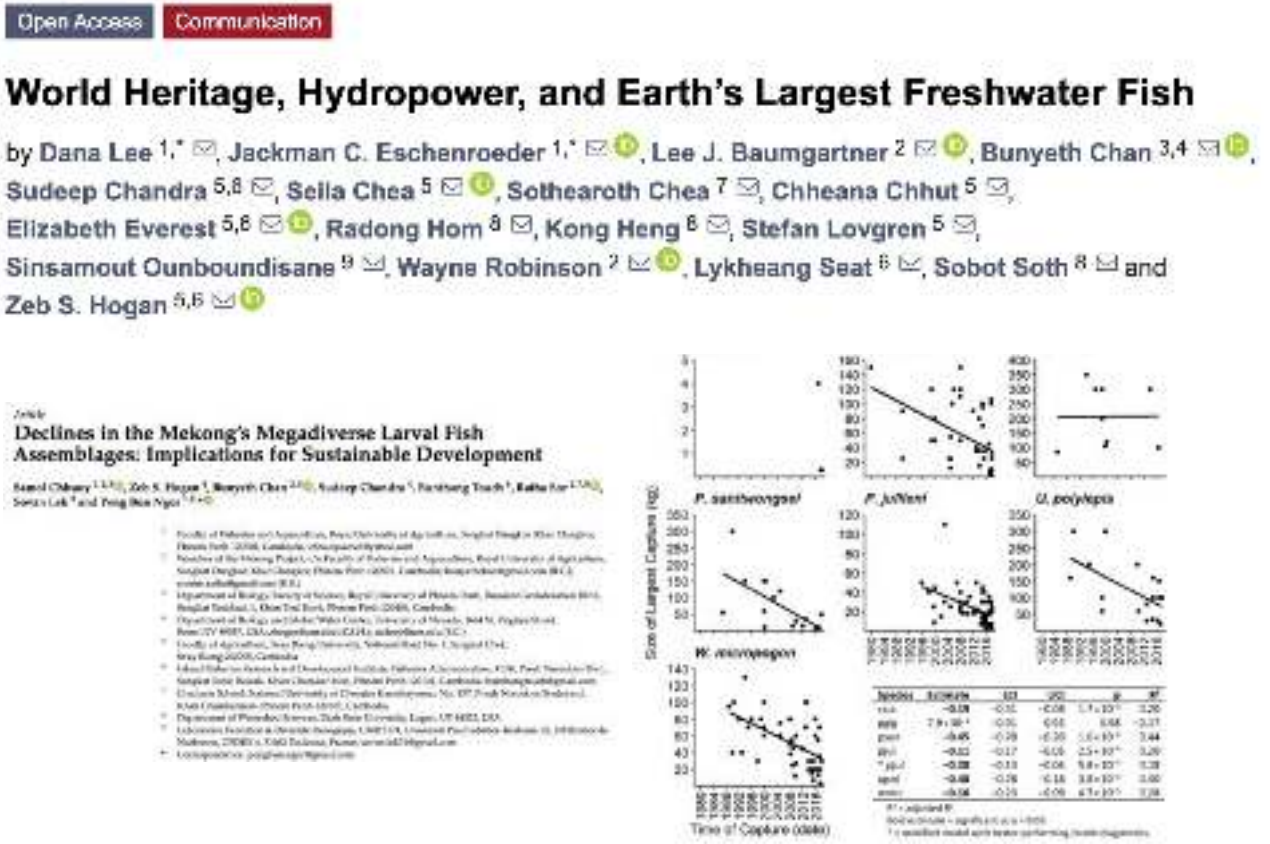
University of Nevada, Reno

1. Increased understanding by the public and government in Cambodia about value of a healthy Mekong River and its watershed and biodiversity;
2. Enriched body of scientific information of the importance of the Mekong's natural ecosystem services and the consequences of their degradation;
3. Improved capacity within Cambodia's educational institutions, government, and civil society organizations to conduct research and promote the active participation of citizen scientists;
4. Increased demonstration the importance of conservation through the development of new and effective ways to mobilize public understanding of and appreciation for the biodiversity values at risk from unsustainable development in the Mekong region.


Wonders of the Mekong focuses on the many values of a healthy, connected Mekong River, and especially the Sekong, Mekong, Tonle Sap corridor – an area of immense economic, ecological, and cultural value.
N
Mekong River
Sekong River
Sesan River
Srepok River
Tonle Sap River
Tonle Sap Lake
Cambodian Mekong
Phnom Penh
VIET NAM
CAMBODIA
LAOS
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Collaborative Science: Research Results

- 50+ open-access, peer-reviewed studies published since 2017
- Most studies authored by Cambodian scientists
- Most studies involved Cambodian students as part of their degree
- Many studies involved community participation



Open Access Communication

World Heritage, Hydropower, and Earth's Largest Freshwater Fish

by Dana Lee [1,*], Jackman C. Eschenroeder [1,*], Lee J. Baumgartner [2], Bunyeth Chan [3,4], Sudeep Chandra [5,6], Seila Chea [5], Sothearoth Chea [7], Chheana Chhut [5], Elizabeth Everest [5,6], Radong Hom [8], Kong Heng [8], Stefan Lovgren [5], Sinsamout Ounboundisane [9], Wayne Robinson [2], Lykheang Seat [8], Sobot Soth [8] and Zeb S. Hogan [5,6]

Declines in the Mekong's Megadiverse Larval Fish Assemblages: Implications for Sustainable Development

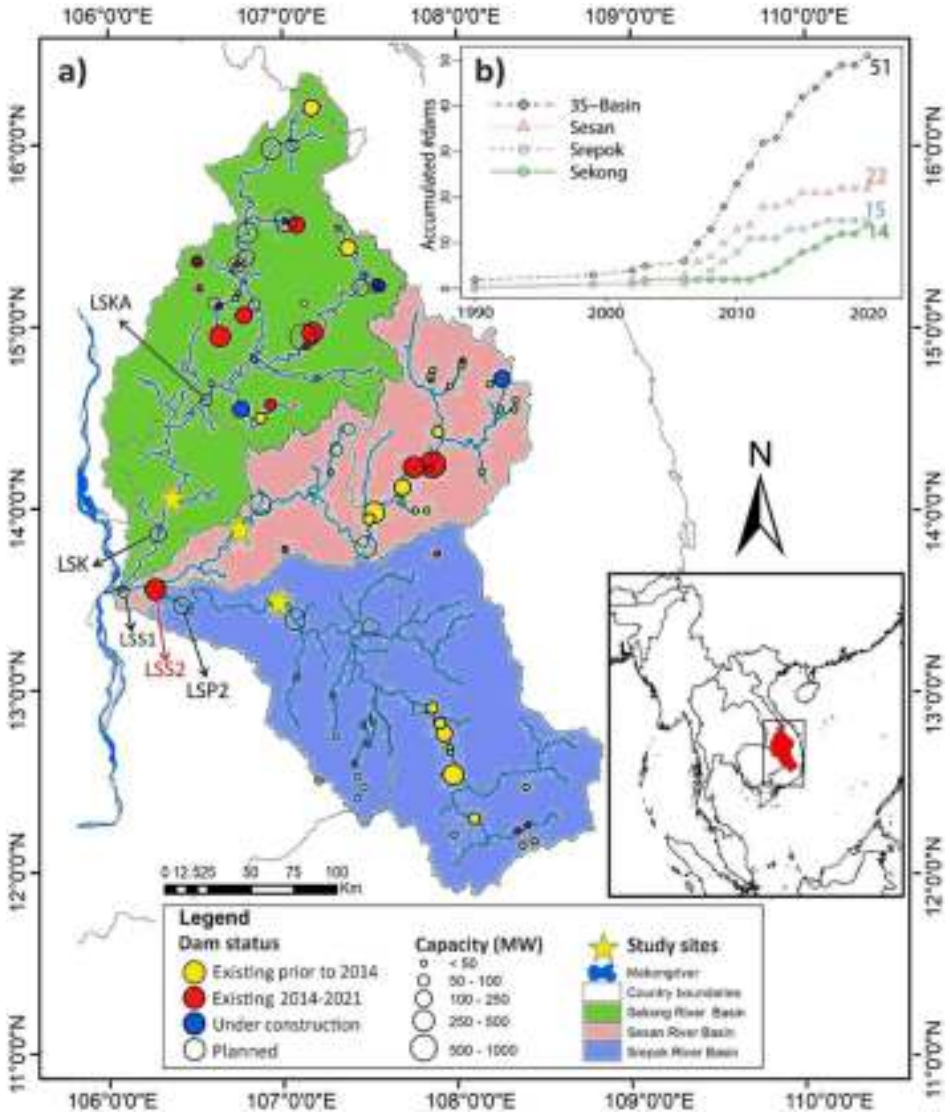


Figure 1. (**a**) Sampling sites and hydropower dams built in the 3S Basin and (**b**) number of dams from 1990 to 2021. Data source: Mekong Dam Monitor platform[13]. Lower Sesan 2 Dam (LSS2) began operations in 2018, and thus did not exist during the study period. (*LSK* Lower Sekong Dam, *LSKA* Lower Sekong A Dam, *LSS1* Lower Sesan 1 Dam, *LSP2* Lower Srepok 2 Dam). Map was created using ArcMap 10.4.1.

Fish biodiversity declines with dam development in the Lower Mekong Basin

2023 Scientific Reports

Ratha Sor[1,2,3]✉, Peng Bun Ngor[3,4], Sovan Lek[5], Kimsan Chann[6], Romduol Khoeun[6], Sudeep Chandra[7], Zeb S. Hogan[7] & Sarah E. Null[1]

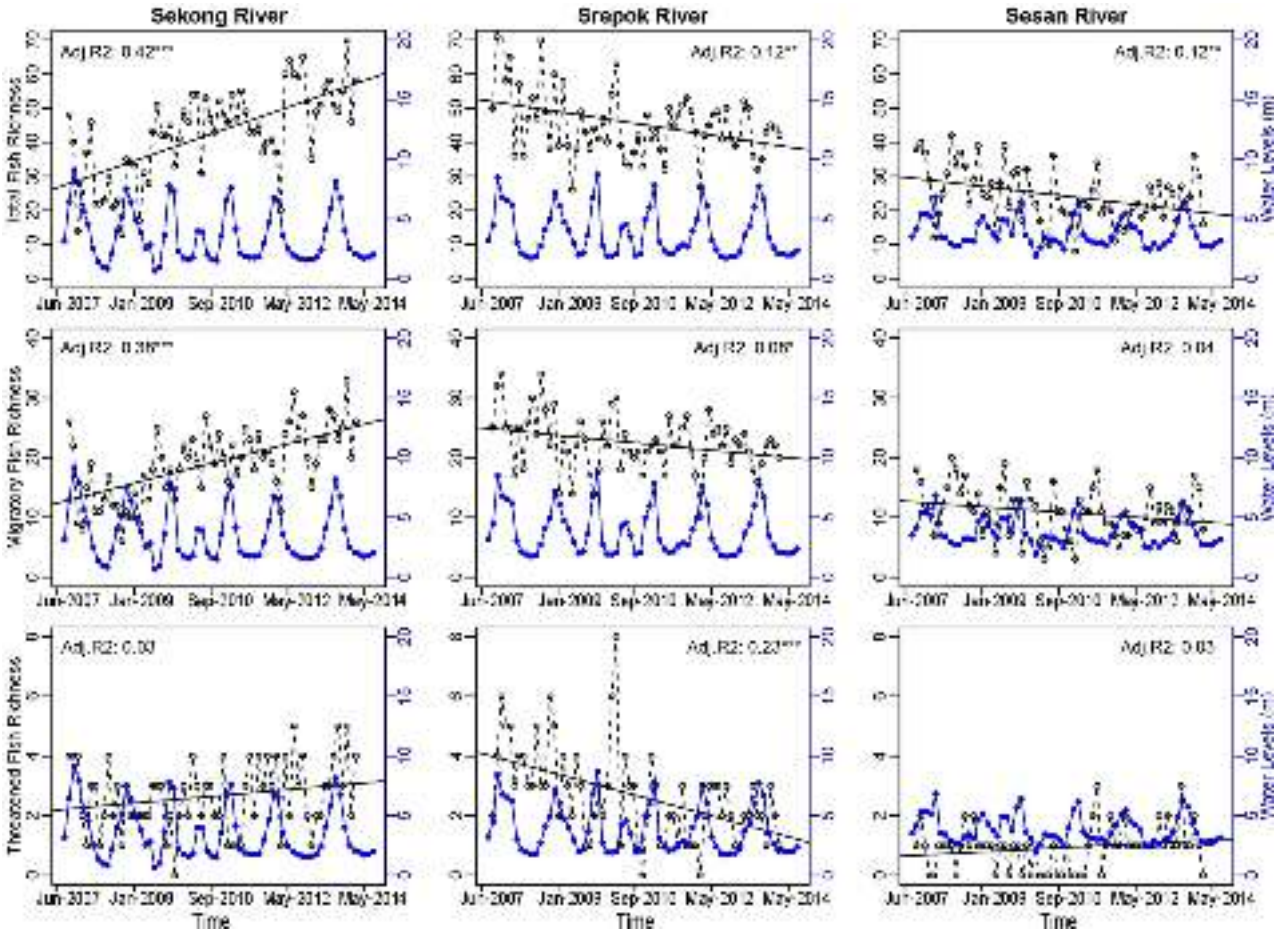
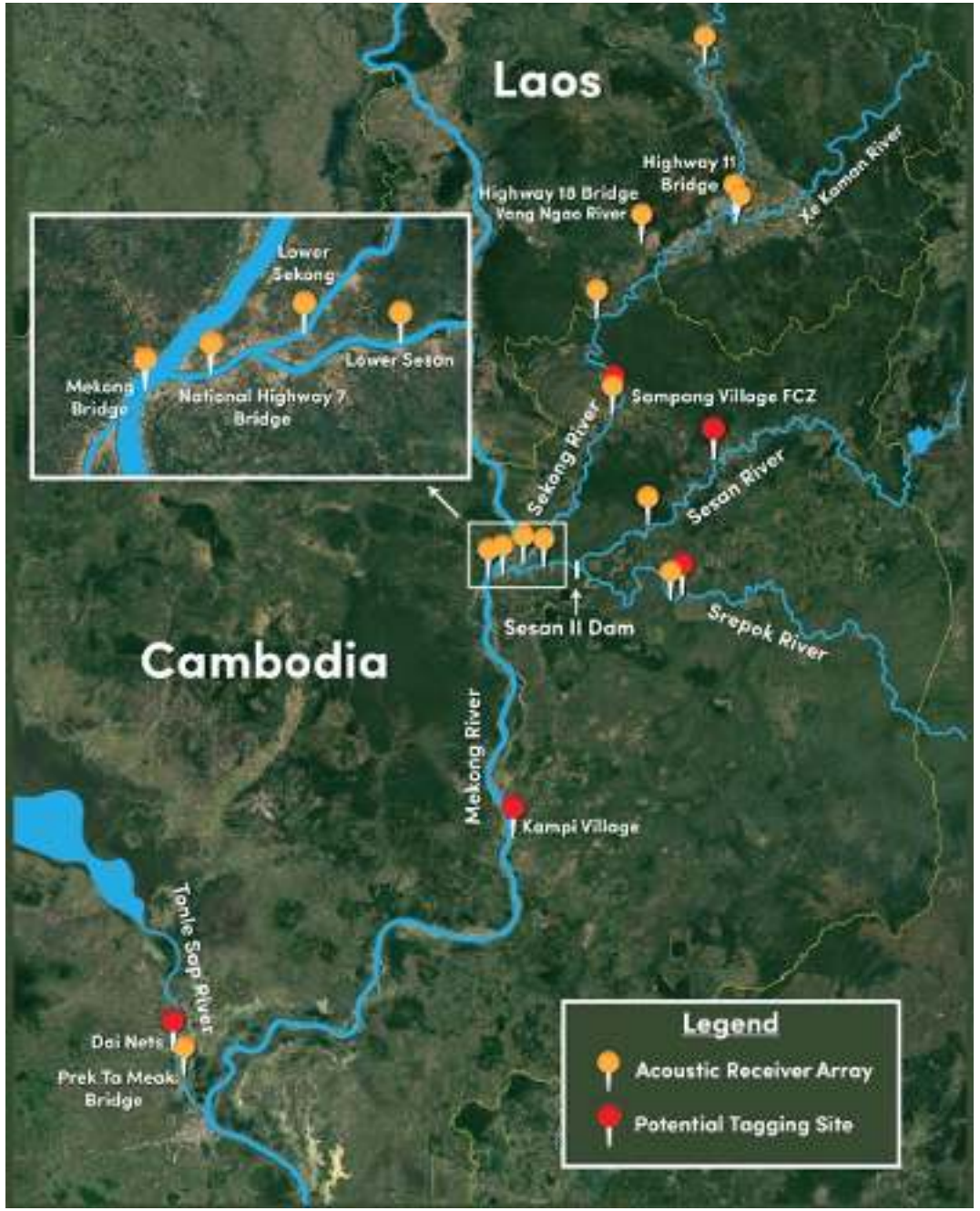


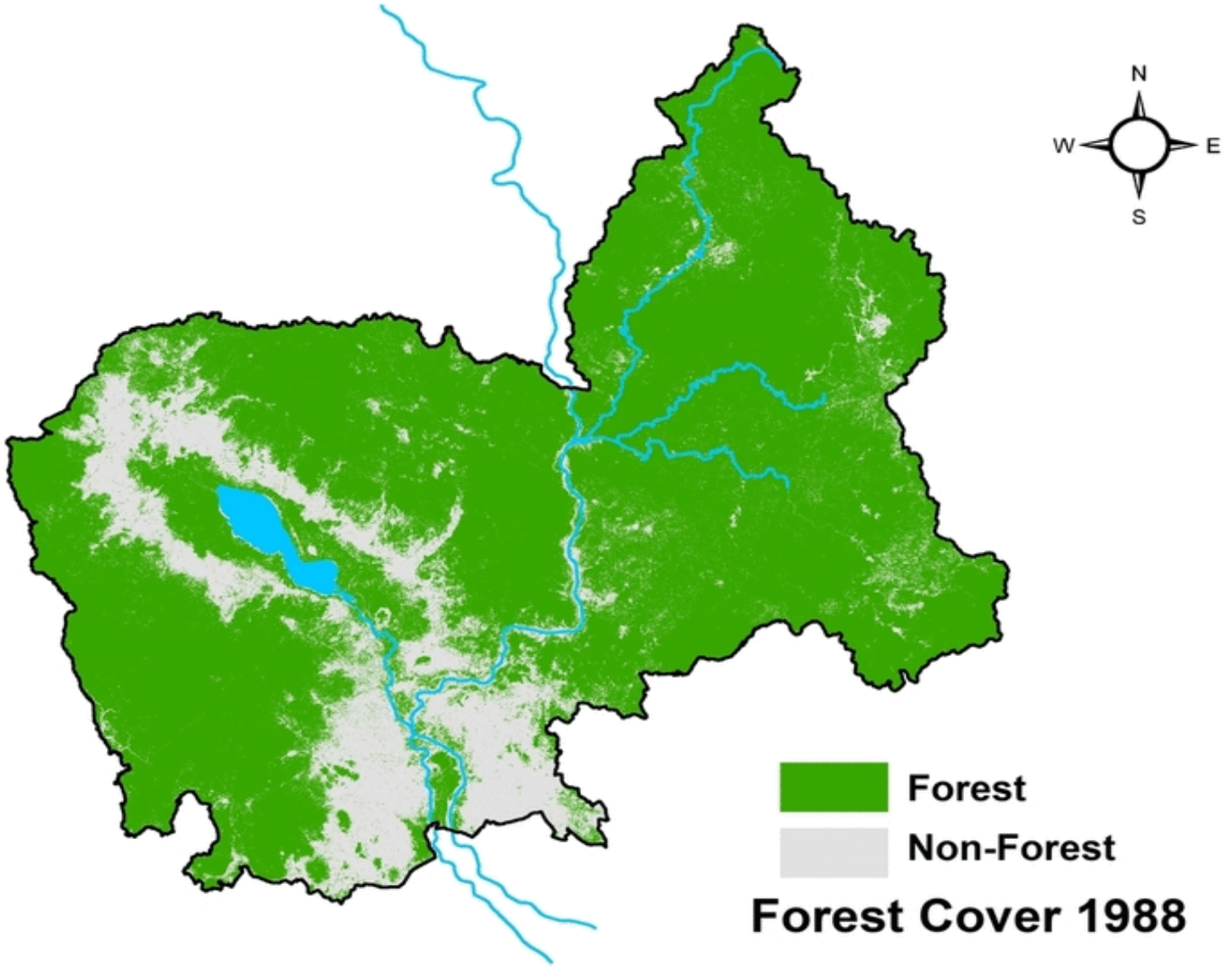
Figure 4. Monthly water levels from 2007 to 2014 (blue lines) and monthly fish biodiversity richness (number of species/sample, black dashed lines) in the Sekong, Srepok, and Sesan Basins. Asterisks $^{*}P<0.05$, $^{**}P<0.01$, $^{***}P<0.001$. Figure was created using R statistical programing language version 4.0.1.

Evaluating transboundary migration of species

- Examine fish migration patterns in the Mekong River and important tributaries in the 3S Basin
- Formed a Telemetry Working Group to facilitate transboundary collaboration and data sharing across Cambodia and Laos PDR
- Tag fish with acoustic transmitters and detected at acoustic receiver arrays located throughout the study area
- Capacity building and training components to promote future use of telemetry infrastructure



41% loss of forests since 1998 in the lower Mekong river basin with a major loss of flood forest and conversion to crops in the Tonle Sap Lake Basin



2020 Water

Wonders of the Mekong

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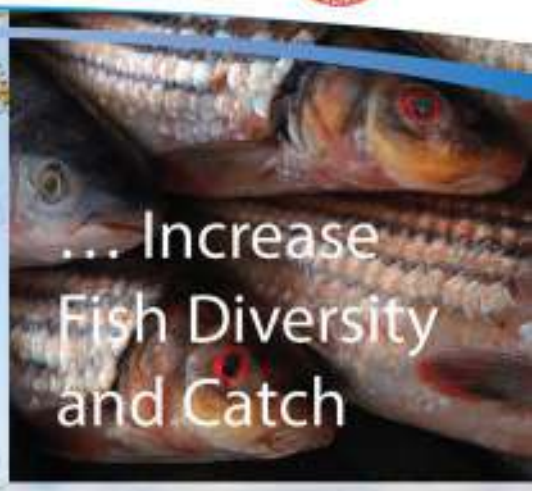

Larger Flood Pulse = More Fish

Free-flowing Rivers Sustain Threatened Biodiversity

- The life cycles of the endangered species like the Mekong giant catfish and river catfish are adapted to the flood pulse
- Young are born at the beginning of rainy season and carried downstream to flood plain habitats
- Juveniles mature in flood plain habitat adults migrate back the main river to spawn

Wonders of the Mekong

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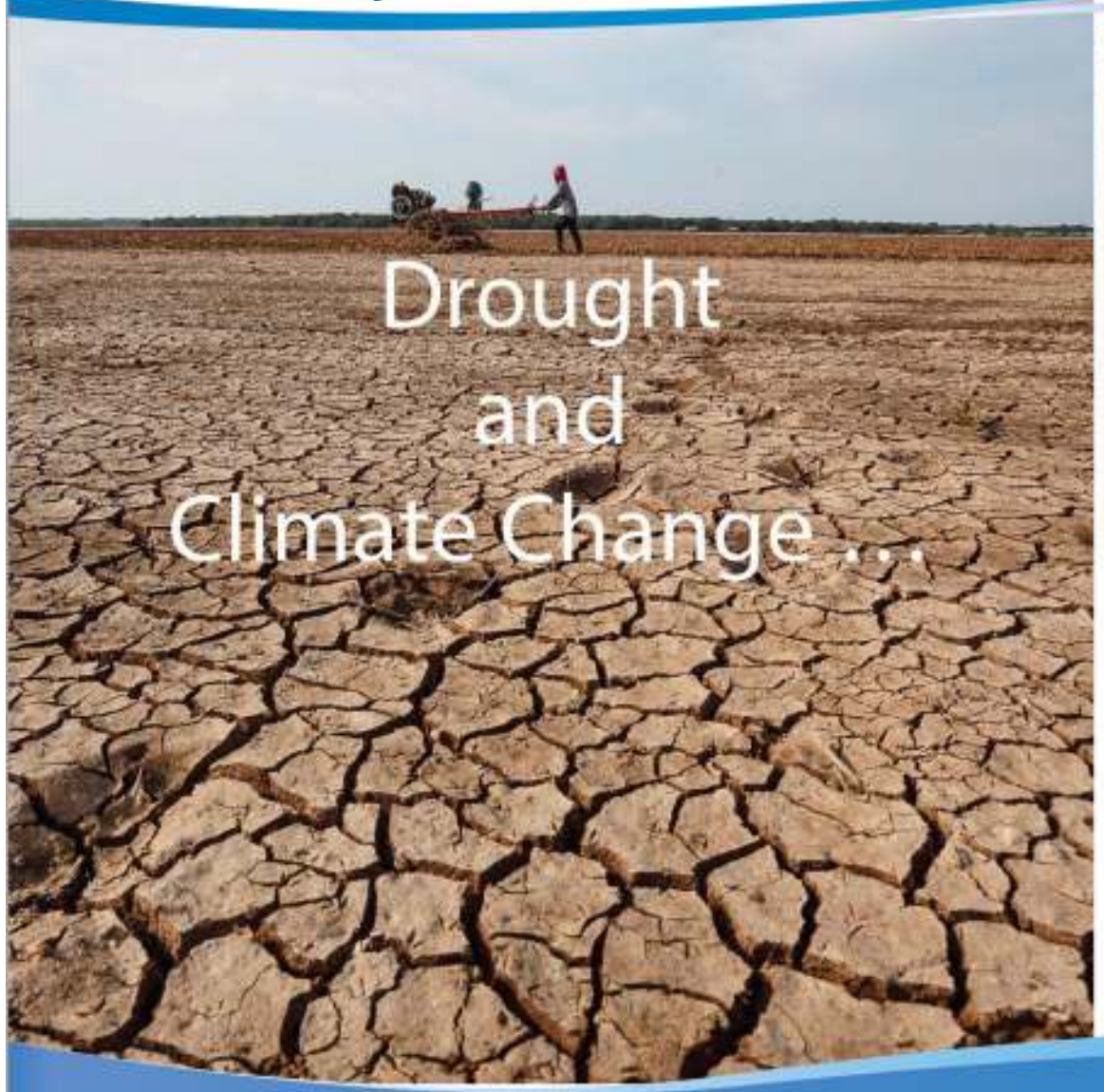

Drought and Climate Change …

… Lead to increases in forest fires, increases in land conversion, and decreases in fish harvest and diversity

- Loss of habitat for fish and biodiversity
- Decreases in abundance of traditional food sources and livelihoods
- Less resiliency to future environmental shocks

Wonders of the Mekong

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Capacity Building

Building one of the largest groups of Mekong experts in the world and the largest cohort of female scientists studying aquatic resource management in the region

Students have participated in grant programs, received international fellowships, served as invited experts at international meetings and workshops, and now serve in leadership positions within government and civil society

Future envionmental leaders of Cambodia and other Mekong countries

Capacity Building:
Training for over 5000 students, NGO staff, community-members, and government staff

"training, tools, and technology to support science-based natural resource management"

University Partnerships and the Center Center of Excellence on Fisheries and Aquatic Science for Sustainability (CEFASS)

Mekong conservation heroes recognised

NATIONAL

Publication date
02 November 2022 | 20:21 ICT

Reporter : **Ry Sochan**

More Topic

Six Cambodian environmentalists recognised as Mekong Conservation Heroes. MEKONG FISH NETWORK

Six Cambodian conservationists have been recognized as "Mekong Conservation Heroes" by the Wonders of the Mekong project for their environmental activities. Their actions include work on endangered species such as the Irrawaddy dolphin, Mekong giant catfish, and giant softshell turtle, as well as outreach and community-based efforts to protect Cambodia's globally significant forests and fisheries.

An award ceremony to honor the heroes will be held on November 3 at the Himawari Hotel in Phnom Penh. It will recognise each hero, by screening a short video about each of their work.

The heroes programme was developed by the USAID-funded Wonders of the Mekong project to shine a light on inspiring individuals who are working in the lower Mekong basin to study, protect, or raise awareness about the its unique ecosystem, biodiversity, habitats, and cultural heritage.

A healthy Mekong is necessary to support communities, wildlife, and economic activity across Cambodia, US Ambassador W. Patrick Murphy said.

Ms. Chea Seila
2018 Mekong Conservation Hero

- NexGen Fellow
- International Visitor Leadership Program Participant
- PhD Candidate
- Expert on Mekong issues
- Leader of Endangered Fish Program
- Community Outreach
- IVLP Impact Award Recipient

Wonders of the Mekong Communications Products

Goal: Increase the public and government's awareness of the Mekong River, its ecosystems, and biodiversity

Wonders of the Mekong

NATIONAL GEOGRAPHIC

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National Geographic Partnership

LOCAL VOICES, GLOBAL REACH

WONDERS OF THE MEKONG

Can the Amazon of Southeast Asia Be Saved?

WATCH

ENVIRONMENT

Southeast Asia May Be Building Too Many Dams Too Fast

READ

WONDERS OF THE MEKONG

Enormous Fish Make One of the World's Largest Migrations

WATCH

WONDERS OF THE MEKONG

Angkor Wat's Collapse From Climate Change Has Lessons for Today

WATCH

ENVIRONMENT / WONDERS OF THE MEKONG

River sanctuaries help giant fish recover in Southeast Asia

READ

ANIMALS

WONDERS OF THE MEKONG

Cambodia's river dolphins at highest population in 20 years

WATCH

ANIMALS · WILDLIFE WATCH

How the world's largest snake hunt hurts Southeast Asia's bigge...

WATCH

ENVIRONMENT

WONDERS OF THE MEKONG

Baby Giant Mekong Catfish are Hard to Find

READ

ANIMALS

WONDERS OF THE MEKONG

In Cambodia, giant turtles come back from the brink

WATCH

Wonders of the Mekong

Wonders of the Mekong

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Stingray Case Study

Combining research, capacity building, and communications for local, regional, and global impact

Species **conservation action plan** developed for **giant** freshwater **stingray**

Science

Office of Cambodian PM

@PoscadPalaceKH

World's Largest Freshwater Fish Found in Cambodia akp.gov.kh/post/detail/25...

Wonders of the Mekong

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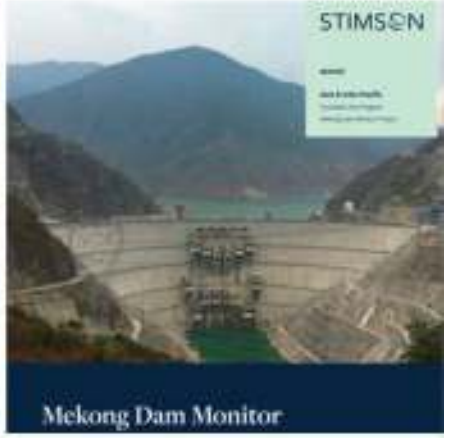
"Forge innovative partnerships to leverage resources and skills that can magnify results"

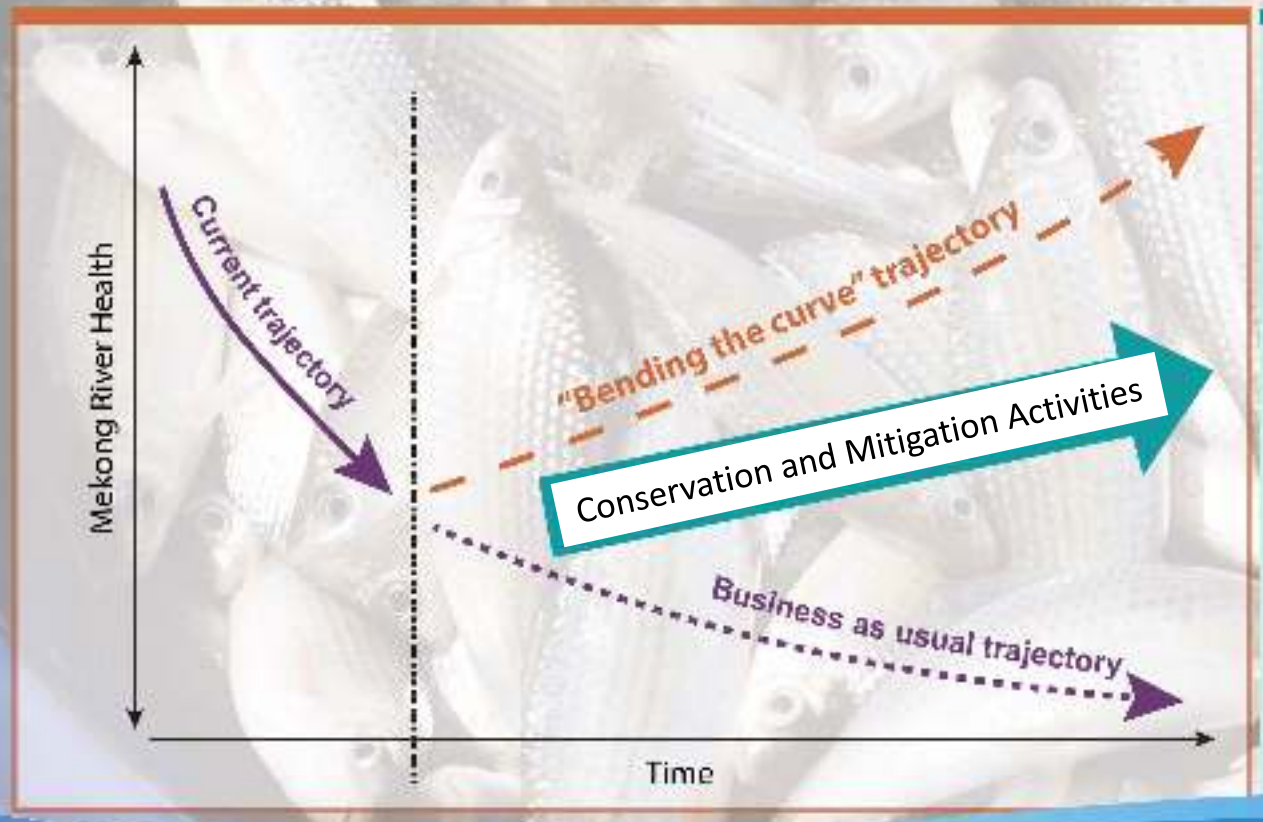


Wonders of the Mekong: Conservation and Policy Impacts

- Increased enforcement of fishing regulations, actions against land grabbing, reiteration of commitment not to build mainstream dams on the Mekong.
- Development of a program to recognize fishermen who release endangered fish, increased community participation in science and conservation.
- Statement to communities Stung Treng section of the Mekong would not be developed for hydropower.
- The PM and other government minsters shared posts and commented on Wonders of the Mekong social media multiple times.
- Through social media, local communities now raise concerns about enforcement issues and the government has been responsive, holding press conferences and meeting with communities to resolve issues.
- The Cambodian and Cambodian media regularly use Wonders of the Mekong as a source of scientific information and unbiased environmental stories.

Wonders of the Mekong

Bending the Curve for Conservation



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Wonders of the Mekong: Science and Conservation Surprises

2022 - World's Largest Freshwater Fish

2022 - Rediscovery of presumed extinct fish

2022 - New Species

2023 - Most reports of Mekong giant catfish ever

Increasing fish catches 2020-2023

Growing awareness and pride about Mekong River

For more information:

- Wonders of the Mekong Facebook page (https://www.facebook.com/MekongWonders)
- National Geographic website
- Open-access research – special issue of the Journal Water
- Fishbio's Mekong Fish Network
- Contact me: zhogan@unr.edu or zebhogan@gmail.com

THANK YOU!