



# Valuing Rivers

Stuart Orr, WWF International









Freshwater ecosystems occupy less than 1% of the earth's surface...

... Yet, they are home to 10% of the world's wildlife (126,000 species)



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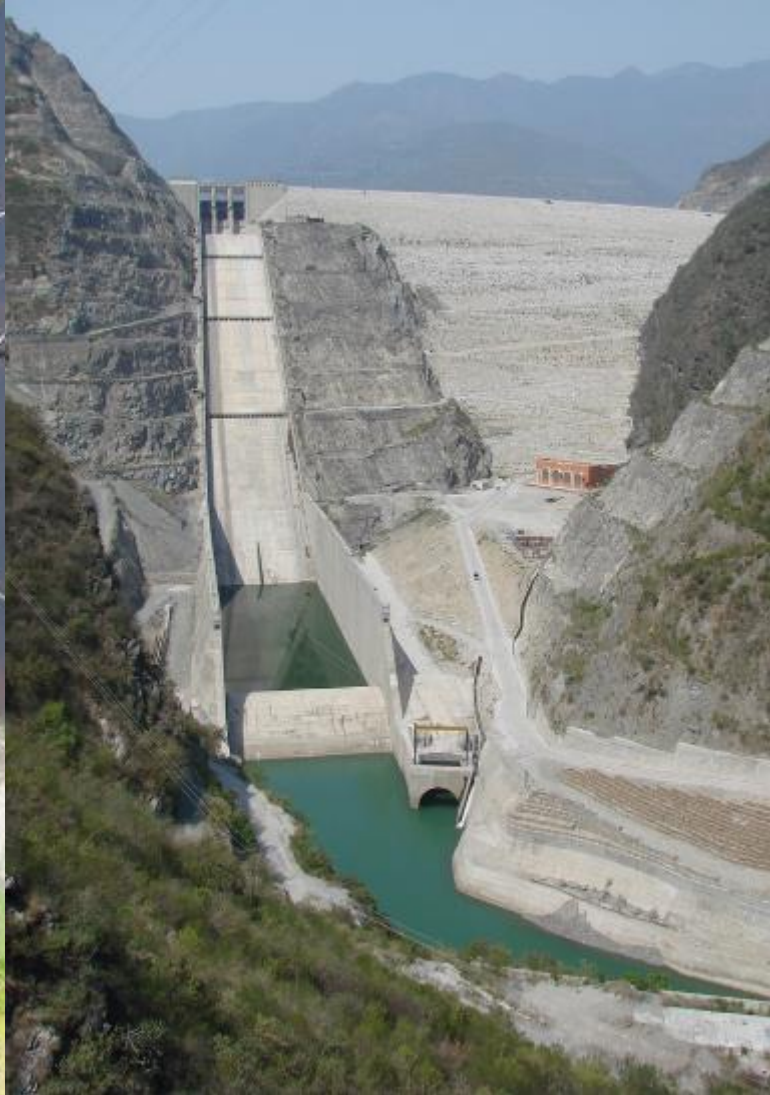
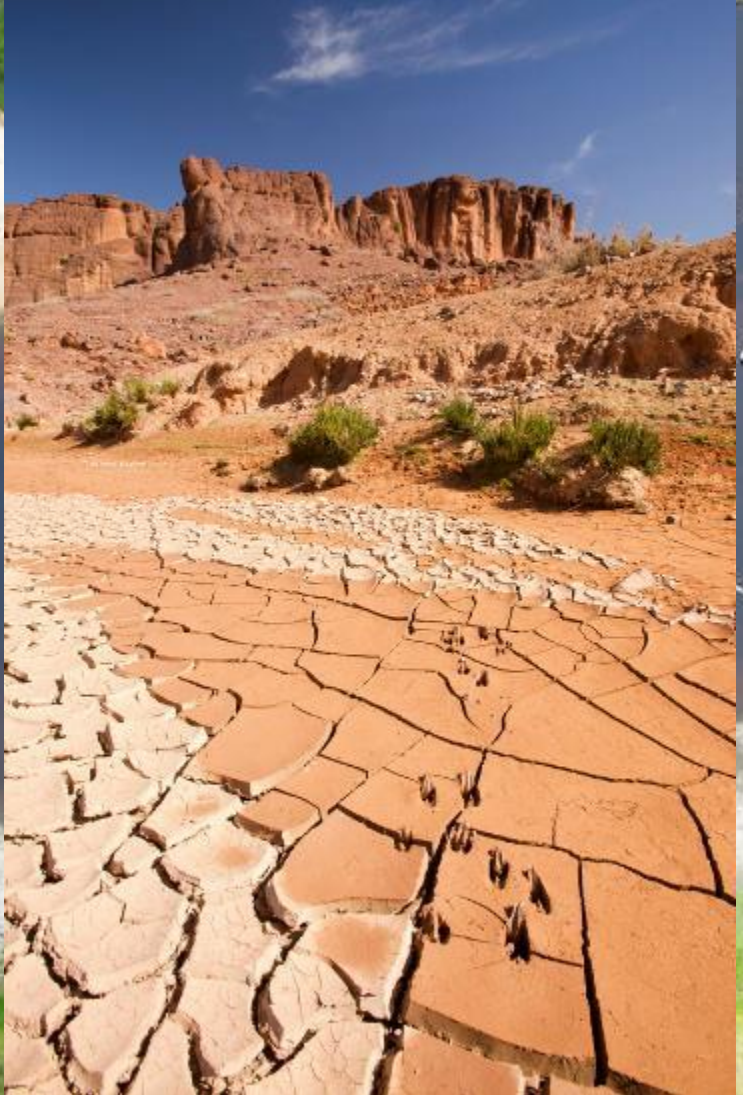


- High levels of endemism due to habitat isolation and niche specialisation.
- Many unidentified species, many poorly known species
- Shifting baseline: we are losing wildlife before it is identified

- 70 mammal species
- 566 bird species
- 263 turtle species
- 24 crocodiles, alligators, caiman & gharial species
- 15,000 fish species
- 4,117 amphibian species
- 5,700 dragonflies & damselflies species
- 640 crayfish species
- 1,300 crab species

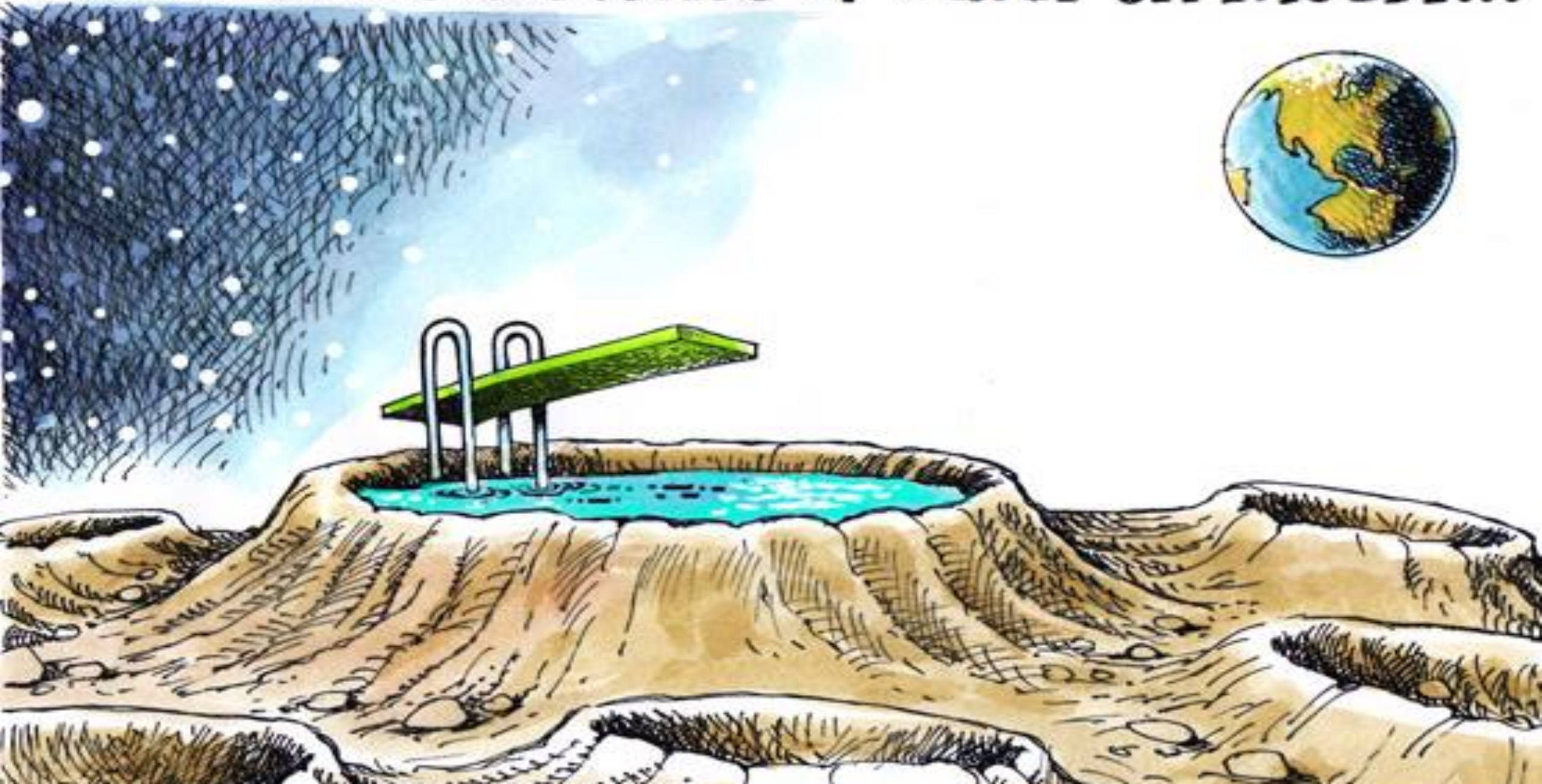


# Freshwater ecosystems under increasing threats





# NASA finds evidence of water on Moon...



# HIDDEN VALUES OF RIVERS AND WETLANDS

FOOD  
PRODUCTION



LIVELIHOODS



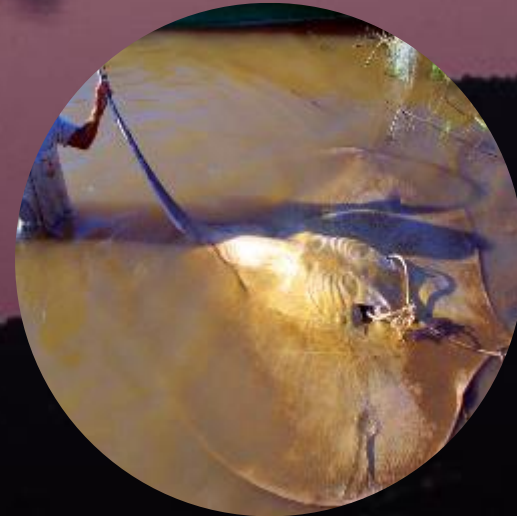
FLOOD  
MITIGATION

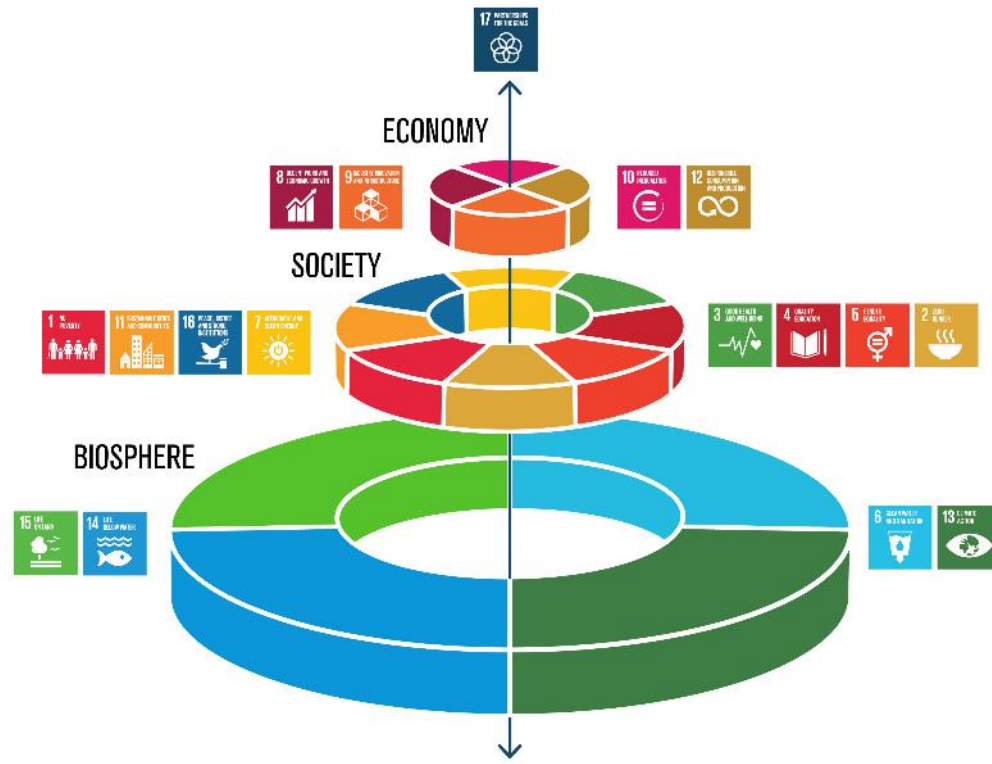


FRESHWATER  
FISHERIES



BIODIVERSITY







# Valuing Water: Moving from theory to action



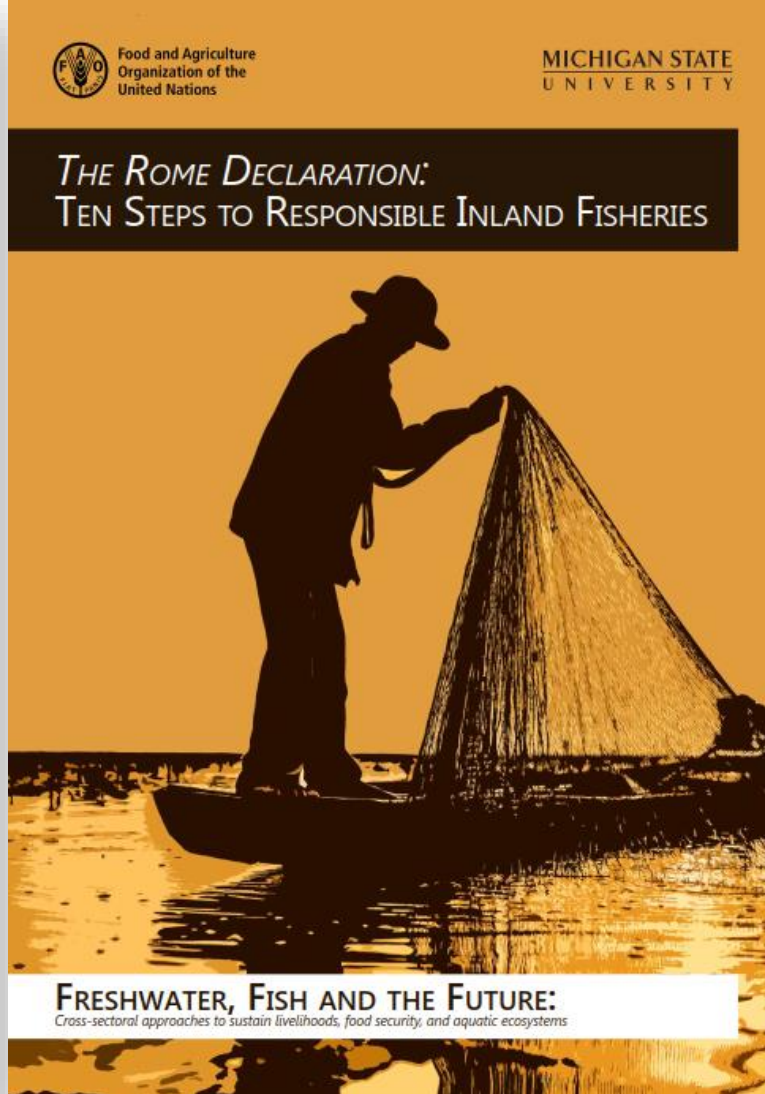
# Inland Fisheries – a blind spot gaining attention



© Michael Pappas



**SHOAL**  
Working together to conserve  
freshwater species




Food and Agriculture  
Organization of the  
United Nations

MICHIGAN STATE  
UNIVERSITY

*THE ROME DECLARATION:*  
TEN STEPS TO RESPONSIBLE INLAND FISHERIES

**FRESHWATER, FISH AND THE FUTURE:**  
*Cross-sectoral approaches to sustain livelihoods, food security, and aquatic ecosystems*



Food and Agriculture  
Organization of the  
United Nations

**2018**

**IN BRIEF**  
**THE STATE OF**  
**WORLD FISHERIES**  
**AND AQUACULTURE**

**MEETING THE SUSTAINABLE  
DEVELOPMENT GOALS**

# Sand Mining & Rivers

- Up to 50 billion tonnes of sand & gravel extracted each year – largest extractive industry in the world
- 2/3rds used for construction
- 30,000 tonnes of sand for 1km of road
- Extraction increasing & rivers are preferred source
- China consumed more sand 2011-2013 than US in entire 20<sup>th</sup> century





Contents lists available at [SciVerse ScienceDirect](#)

## Global Environmental Change

journal homepage: [www.elsevier.com/locate/gloenvcha](http://www.elsevier.com/locate/gloenvcha)



### Dams on the Mekong River: Lost fish protein and the implications for land and water resources

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<sup>d</sup> Fenner School of Environment & Society, Australian National University, Canberra ACT 0200, Australia

- 6 -17% increase in water consumption
- 7 -155% pasture land
- 6 - 59% crop land



# Economics for Water and Rivers

THE  
COLORADO  
RIVER  
\$1.4 TRILLION  
IN ECONOMIC BENEFIT



The river supports a diversity of industries including a \$26 billion recreation economy

WWF  
REPORT  
Living Himalayas  
2016

**BHUTAN - WATER AND OPPORTUNITIES FOR RESILIENT DEVELOPMENT**  
Volume 1 and 2

THE VALUE OF WATER  
A framework for understanding water value  
DISCUSSION DRAFT | August 2015

Authors: Albert J. Morgan and Stuart Orr

WWF  
REPORT  
NOVEMBER 2016

WORKING TOGETHER TO HELP PROTECT THE WORLD'S FRESHWATER RESOURCES

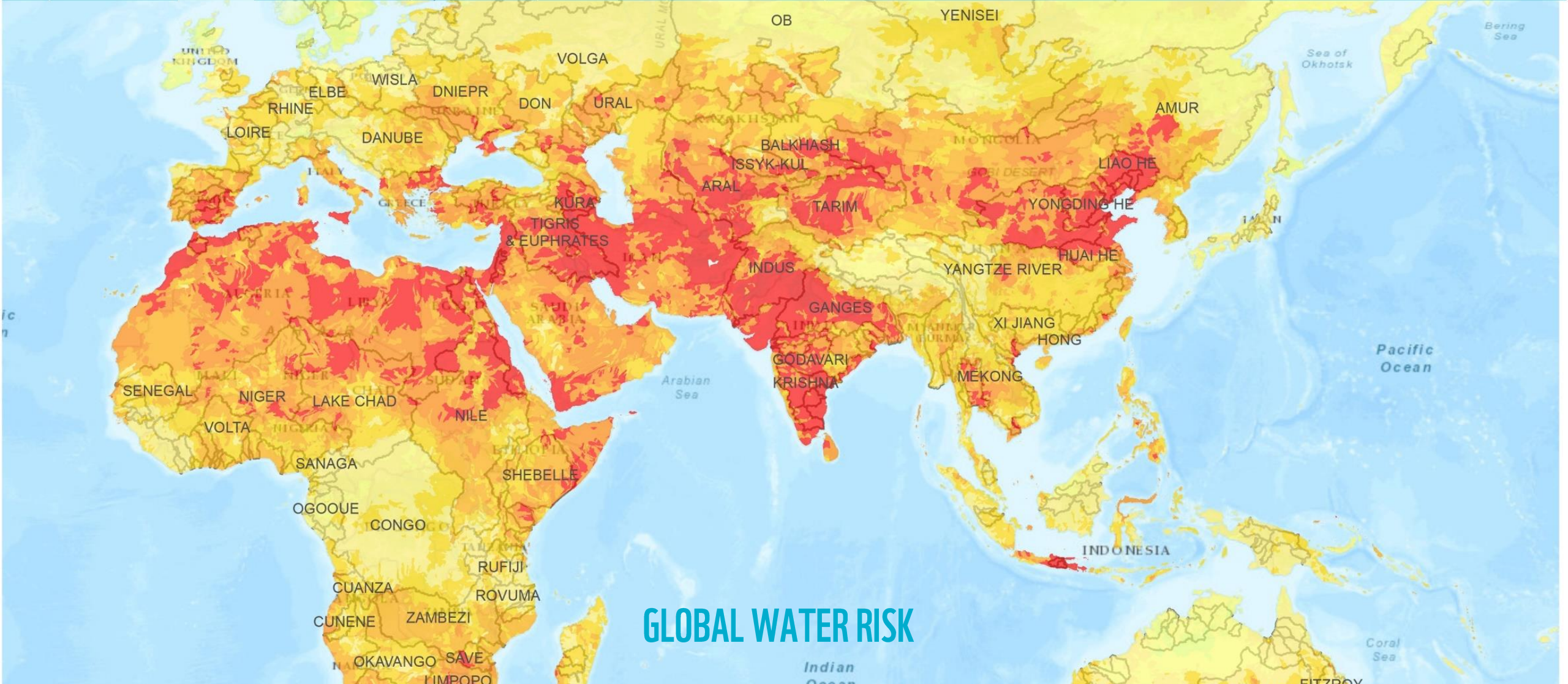
HSBC

**Meko In the Mekong**

WWF  
REVIEW  
2018

**IMPACTS OF SAND MINING ON ECOSYSTEM STRUCTURE, PROCESS & BIODIVERSITY IN RIVERS**  
REPORT BY LOIS KOEHNKEN

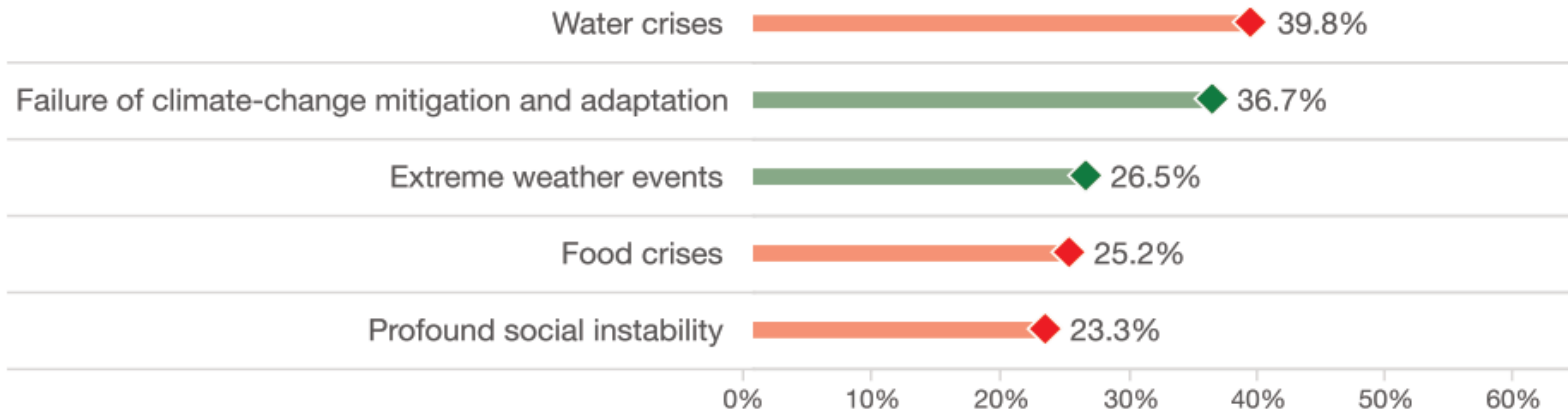
# Water Risk Filter





# Risky Business?

For the next 10 years



The World Economic Forum's annual risk report ranks water crises as **#1 global risk** in terms of impact.

# Risky Business?

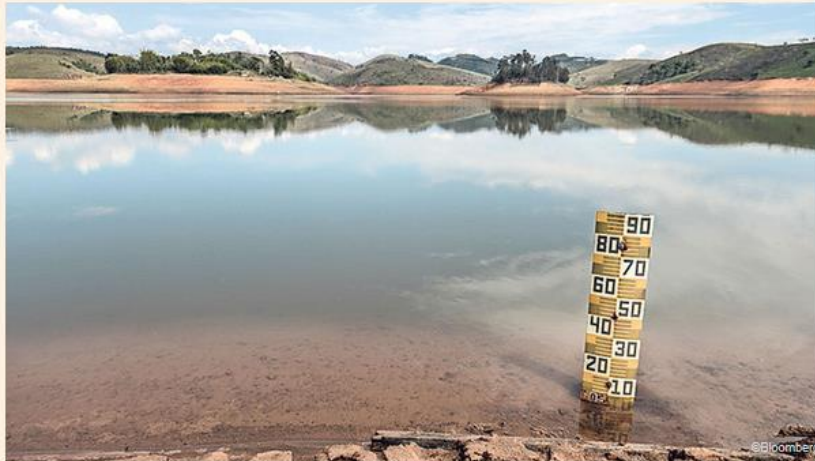


# Risky Business?

March 22, 2015 7:20 am

## Investment consultants told to 'man up' on stranded assets

Sophia Grene [Author alerts](#)



Drivers of asset stranding include water scarcity

Companies in the [mining](#), oil and gas sectors are ignoring a big risk to their valuations and predictions of future revenue.

### Major risk:

- 23% cited drought
- 55% cited flooding
- \$bn's projects on hold



# Finance and Economics

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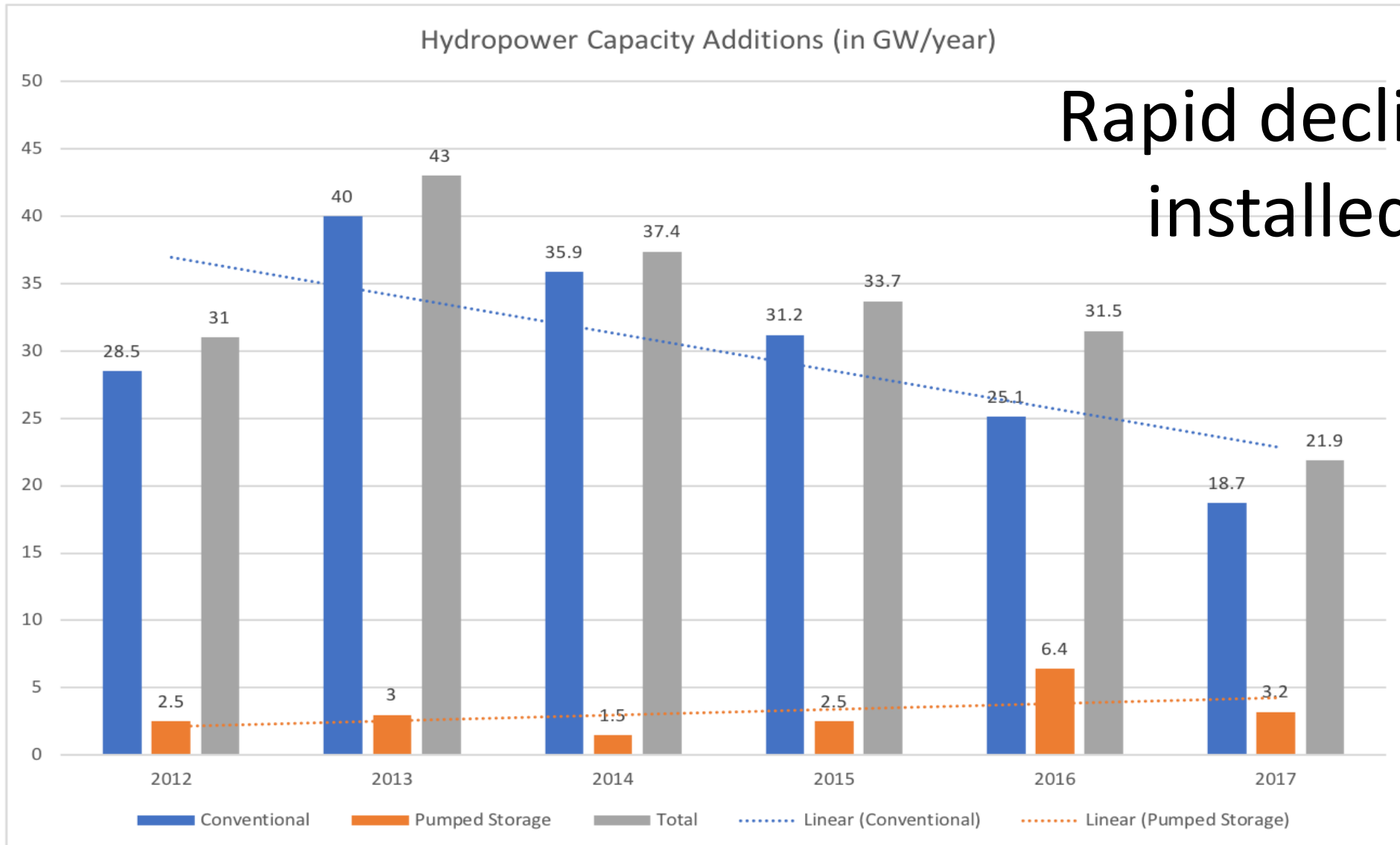


# Finance & Economics – what the banks are saying?

JP Morgan	<i>'Watching water: A guide to e</i>
Citi	<i>'Water Worries: Climatic Cons</i>
Credit Suisse	<i>'Water: The Paramount Mega</i>
Goldman Sachs	<i>'Water could be a constraint o</i>
HSBC	<i>'GDP will be 'severely hamper</i>
Citi	<i>'The Growing Impact of Water</i>
Merrill Lynch	<i>'Water scarcity a bigger prob</i>
Morgan Stanley	<i>'Water: The Perfect Storm'</i>
Standard Chartered	<i>'Water – The Real Liquidity Cr</i>

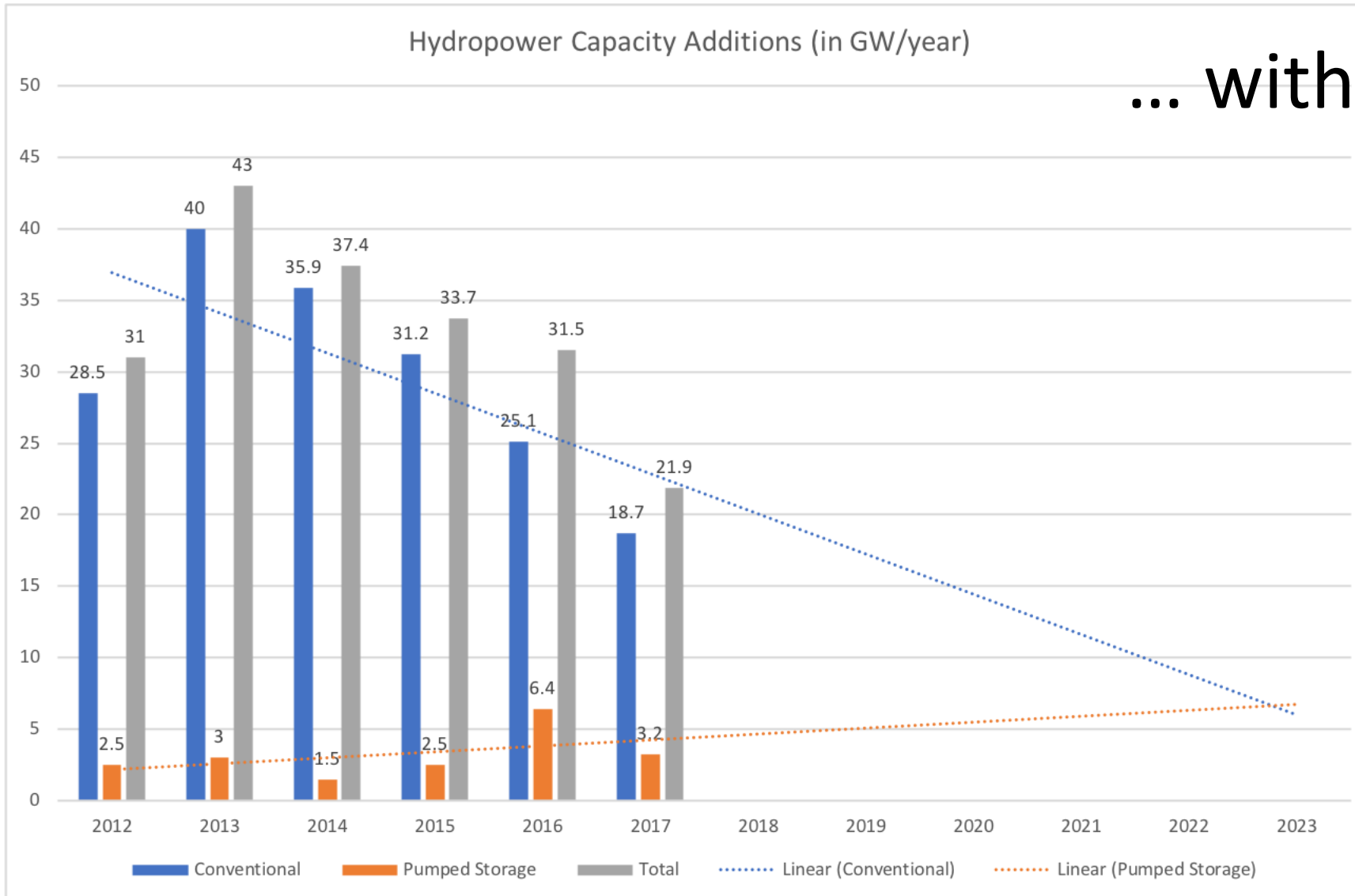


# What's coming? Energy disruption



Rapid decline in newly installed capacity ...

# What's coming? Energy disruption



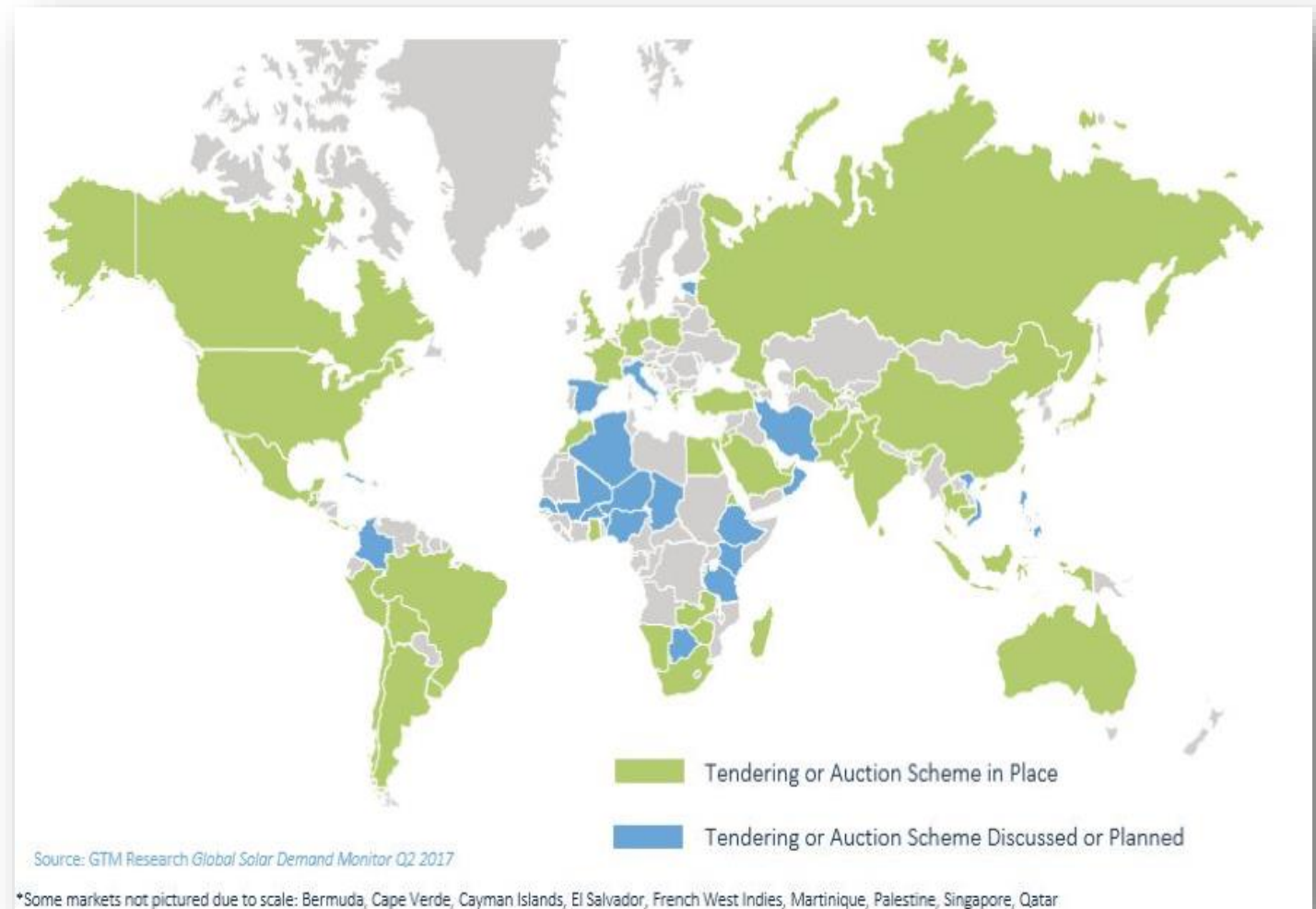
... with the exception  
of pumped  
storage plants

# Energy auctions

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## Results of 2017 auctions:

- Brazil: hydro 11.5 MW out of a total 674.5 MW
- Argentina: hydro 20.8 MW out of a total 1,408.7 MW
- México: no hydro out of a total 2.7 GW
- Chile: no hydro out of a total 2,200 GWh





# What's coming? Sediment and adaptation

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Deltas - home to 1 billion people and 10+ mega cities in Asia

- 40% of Chinese GDP is generated in **Yangtze Delta**
- Vietnam is leading rice exporter because of the **Mekong Delta**
- 40% of Myanmar's population lives in the **Irrawaddy Delta**
- 75% of people in the **Indus Delta** depend on the fishing industry
- The **Ganges-Brahmaputra** is the largest and most densely populated delta in the world



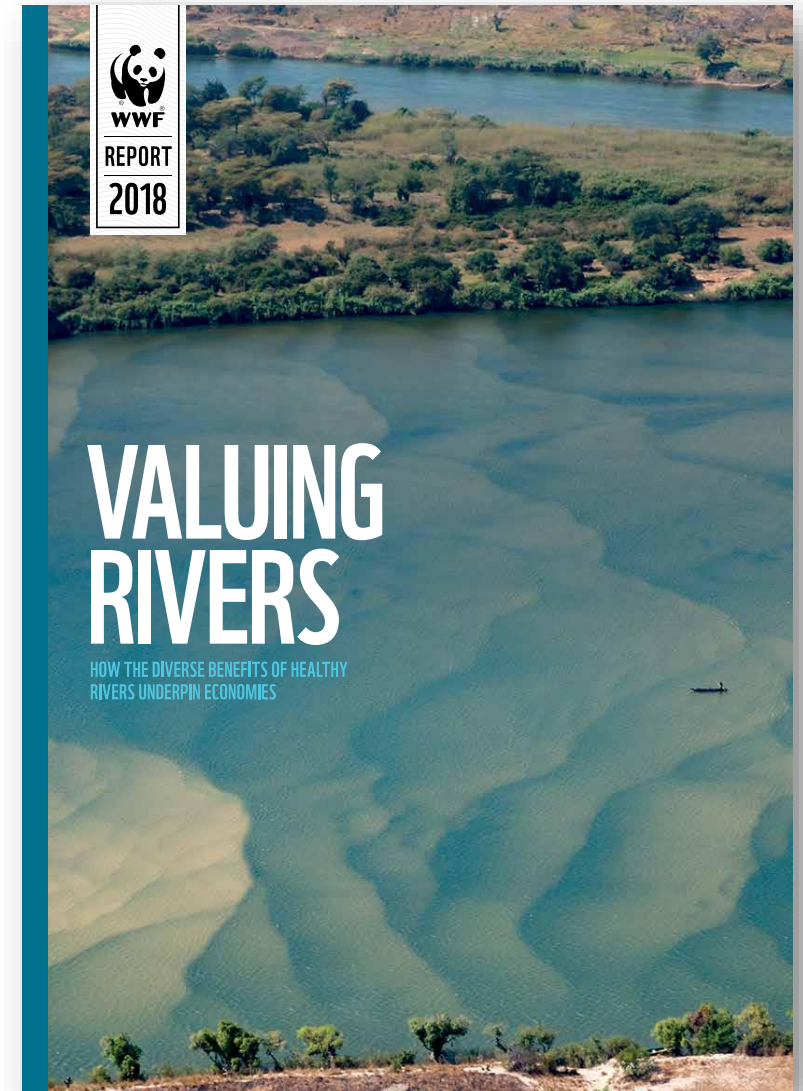
# What's coming? – 4IR

- Water data – more publicly available
  - Info from satellites and drones
  - NASA layers and entrepreneurs
- Cloud based computing
  - Sharing of data
  - Wifi linkage
- Smartphone sensors
  - Citizen science, eDNA
- Corporate transparency
  - Greater focus on risk and opportunity
- Blockchain verification



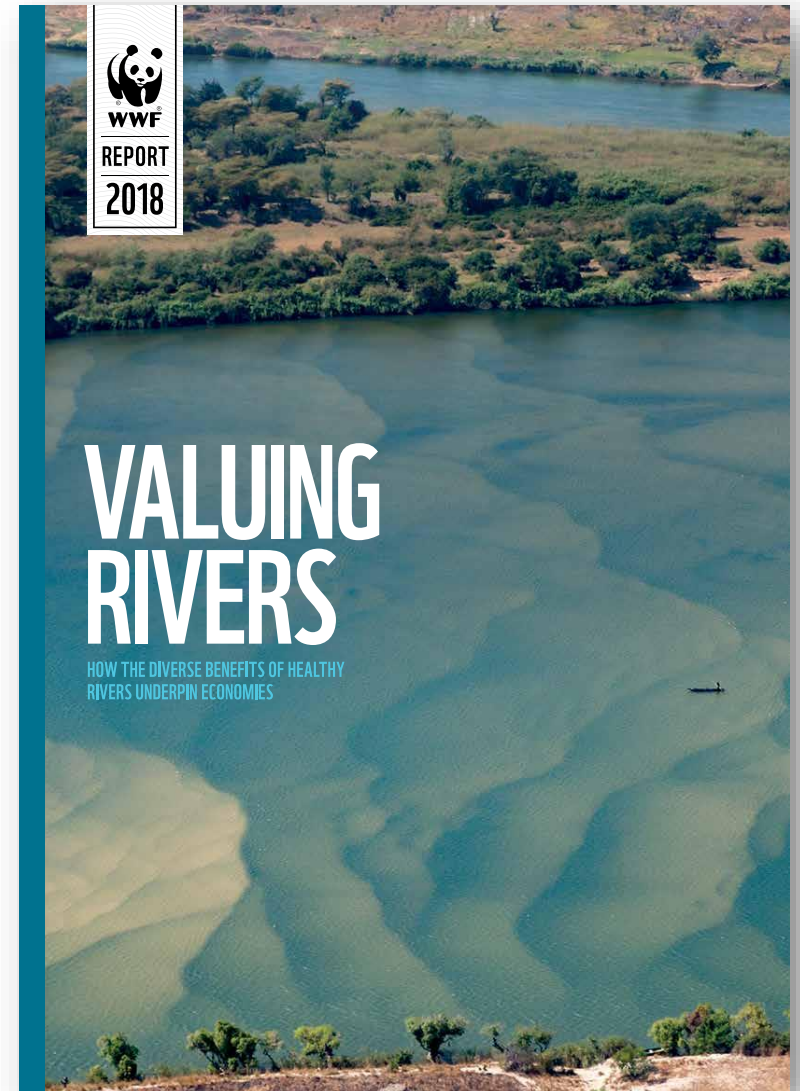
# What's coming? - Valuing Rivers

- 2 billion people rely directly on rivers for their drinking water
- 500 million people live on deltas that can only be sustained by sediment from rivers
- 25 per cent of the world's food production depends on irrigation from rivers
- At least 12 million tonnes of freshwater fish are caught each year, providing food and livelihoods for tens of millions of people.



# What's coming? - Valuing Rivers

1. Measure
  - Emergence of new tools and trends
2. Value
  - Get out of the 'water bubble'
3. Understand Trade-offs
  - Employ different models
4. Influence Governance
  - Not just government – corporations, finance, civil society



# Species in Decline



The Guardian website header includes the logo, a 'Subscribe' button, and navigation links for 'Search jobs', 'Sign in', 'Search', and 'International edition'. Below the header are category tabs: 'Opinion', 'Sport', 'Culture', 'Lifestyle', and 'More'. A secondary navigation bar lists 'Climate change', 'Wildlife', 'Energy', and 'Pollution'. The main article title is 'Scientists call for a Paris-style agreement to save life on Earth'. Below the title is a photograph of several golden snub-nosed monkeys in a forest. To the left of the photo, there are social media sharing icons and a comment count of 649. The article's word count is 21,855.

Terrestrial  
Species

36%

Marine Species





**together possible.**