

# The Role of the Hydropower in our Sustainable Future

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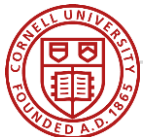


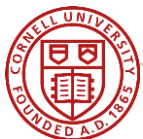
Pete Loucks

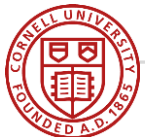




## The Grand Inga: World's Biggest Hydro Power Project

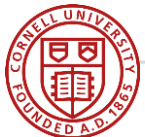


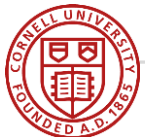




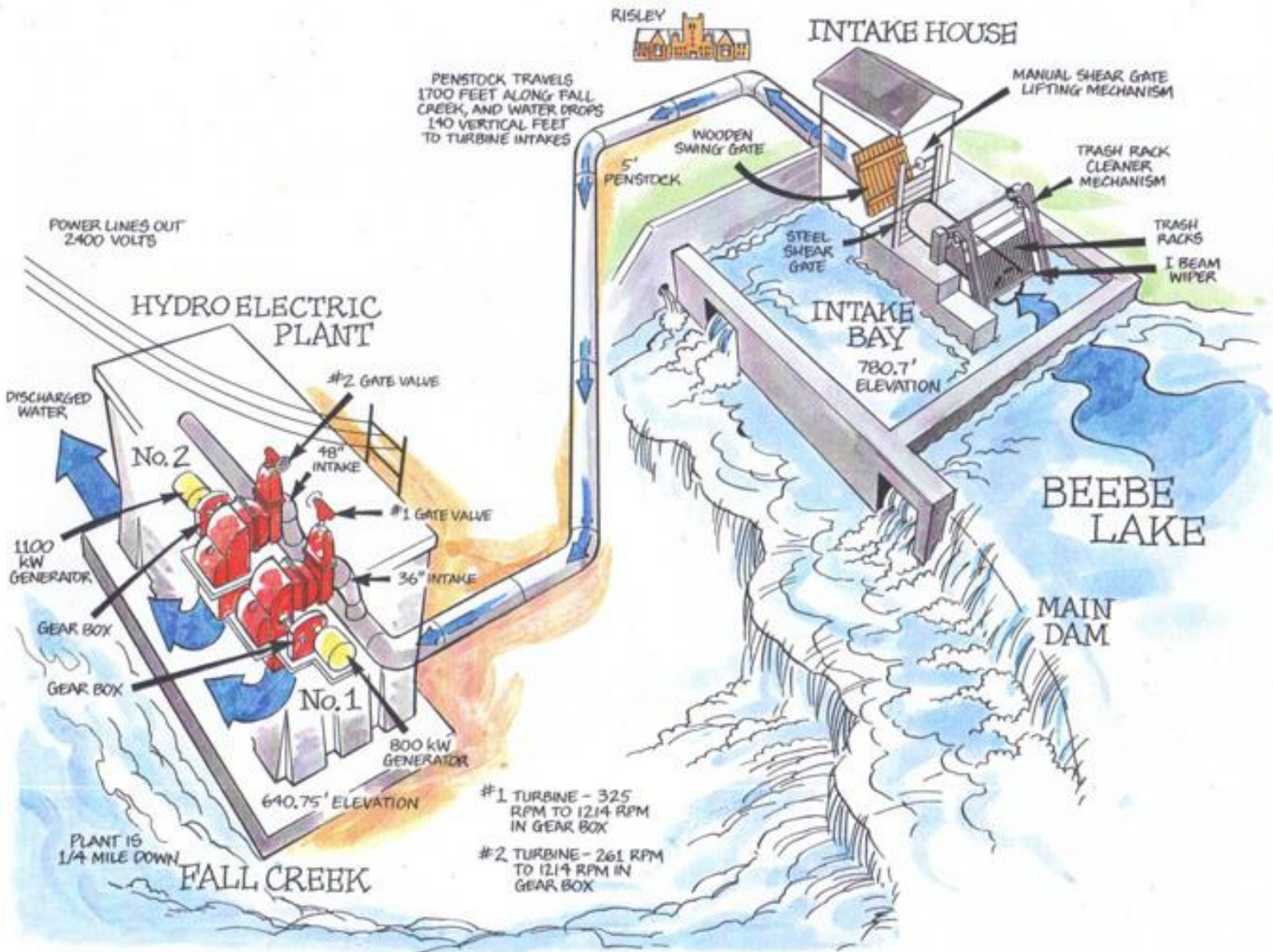


# Cornell University







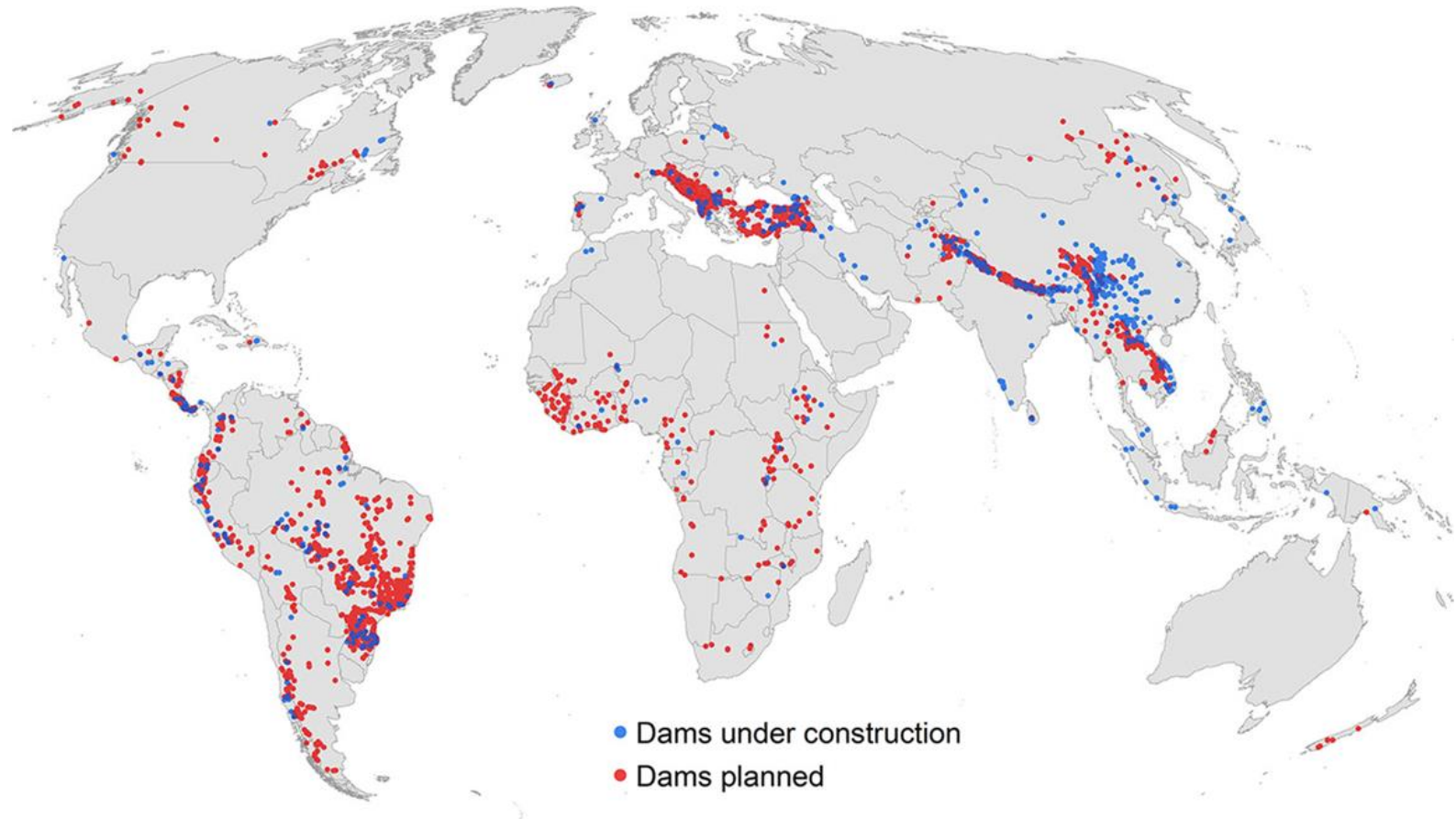






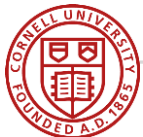
# Daming Rivers – Worldwide

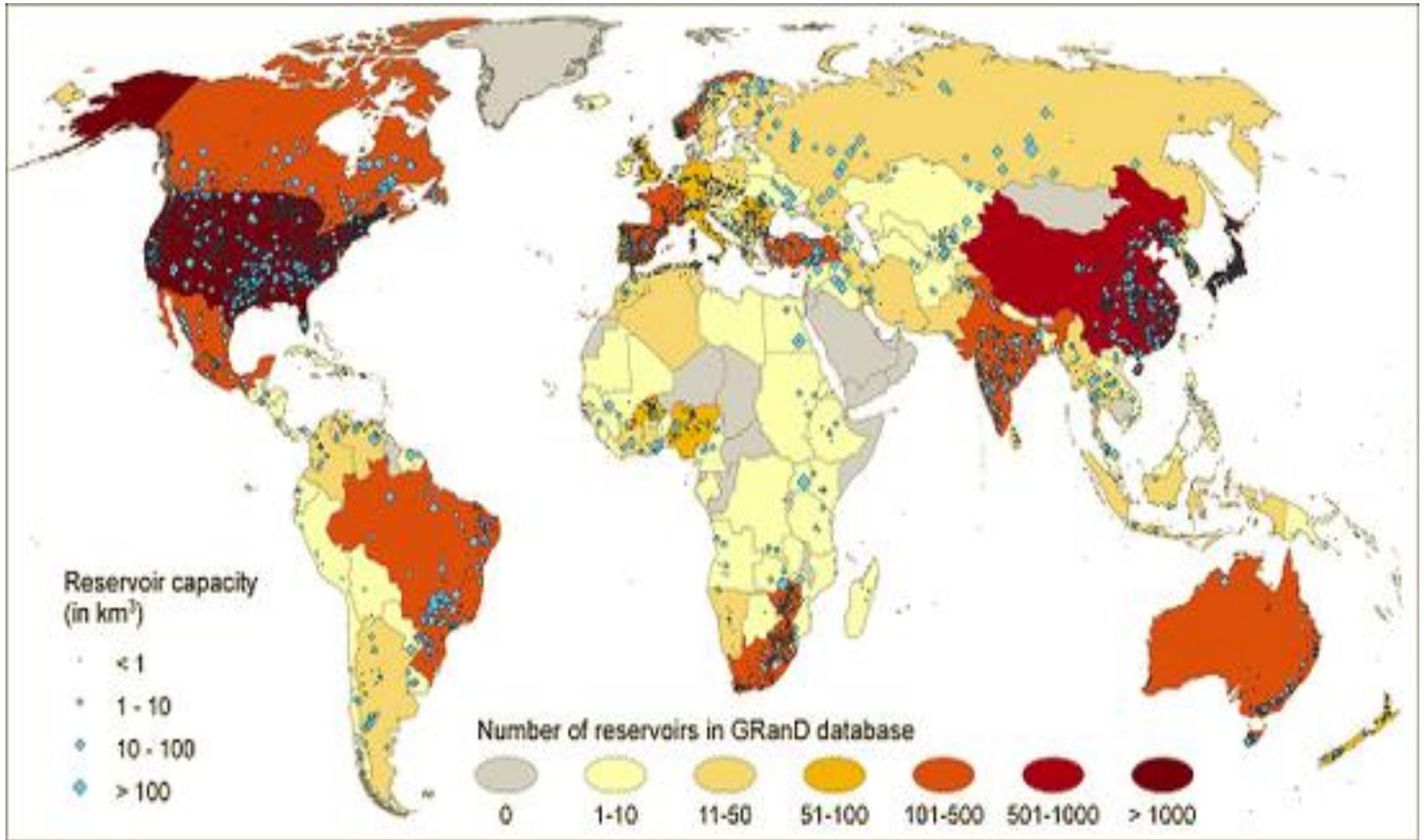
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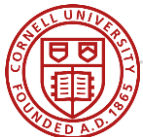
**> 57,000 existing large (15m+) dams worldwide.  
3,700 dams (1,700 GW) planned or under construction**

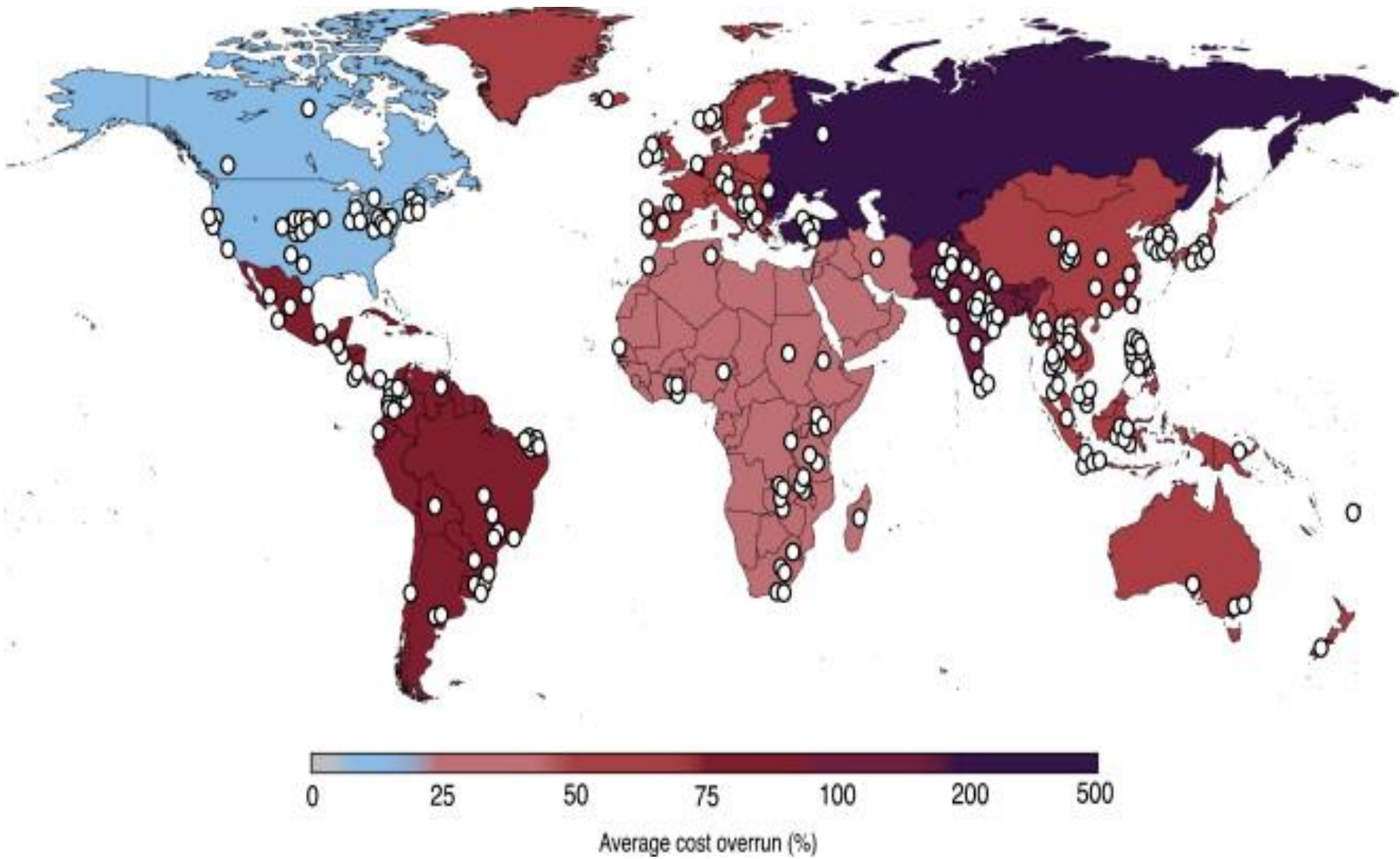
Source: Zarfl et al. (2015),  
*Aquat. Sci.*

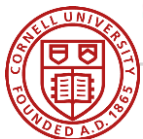
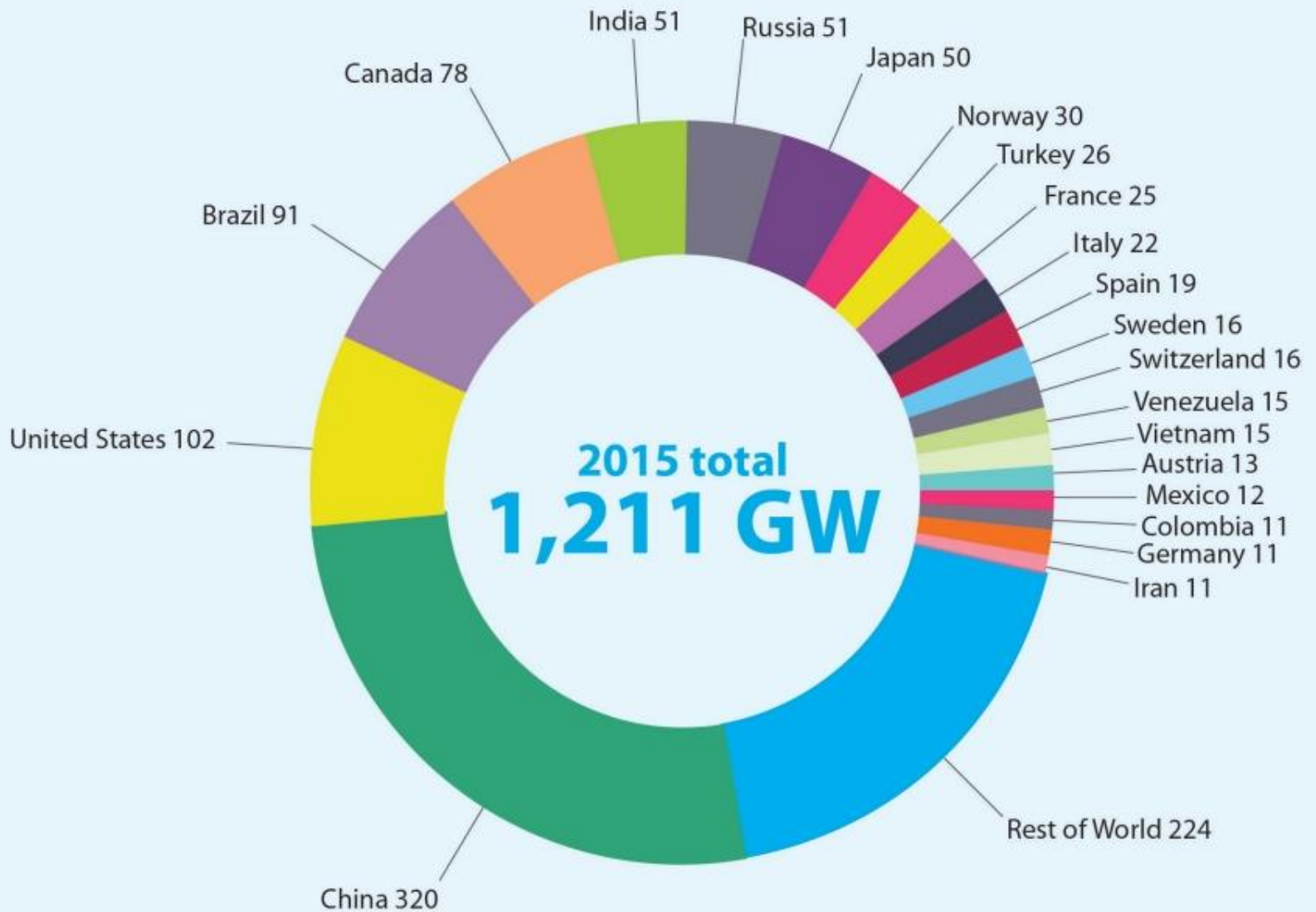


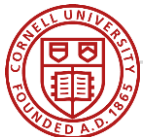
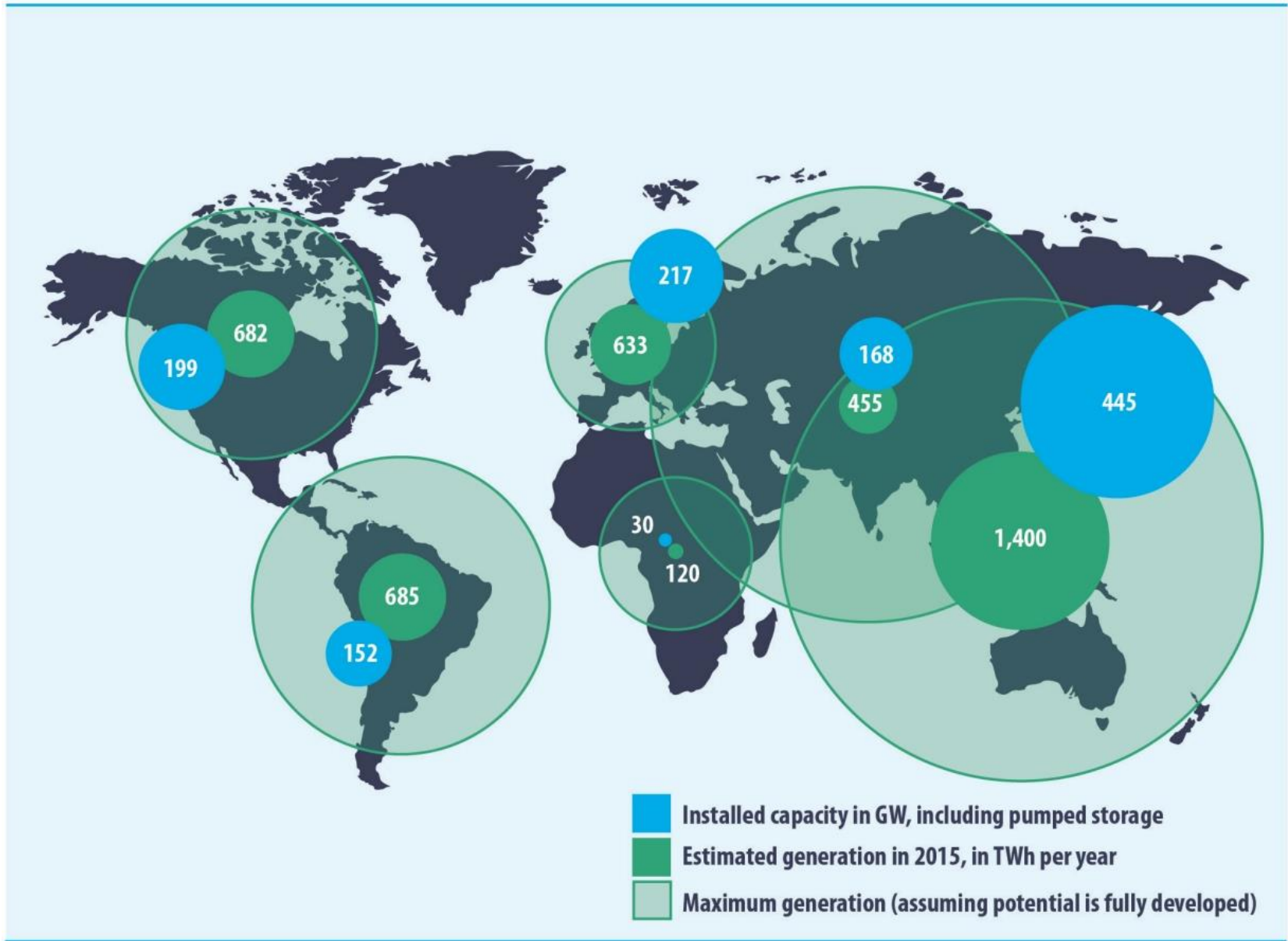


**Cumulative storage capacity of 6,197 km<sup>3</sup>**





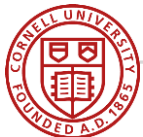




# Hydropower (Global)

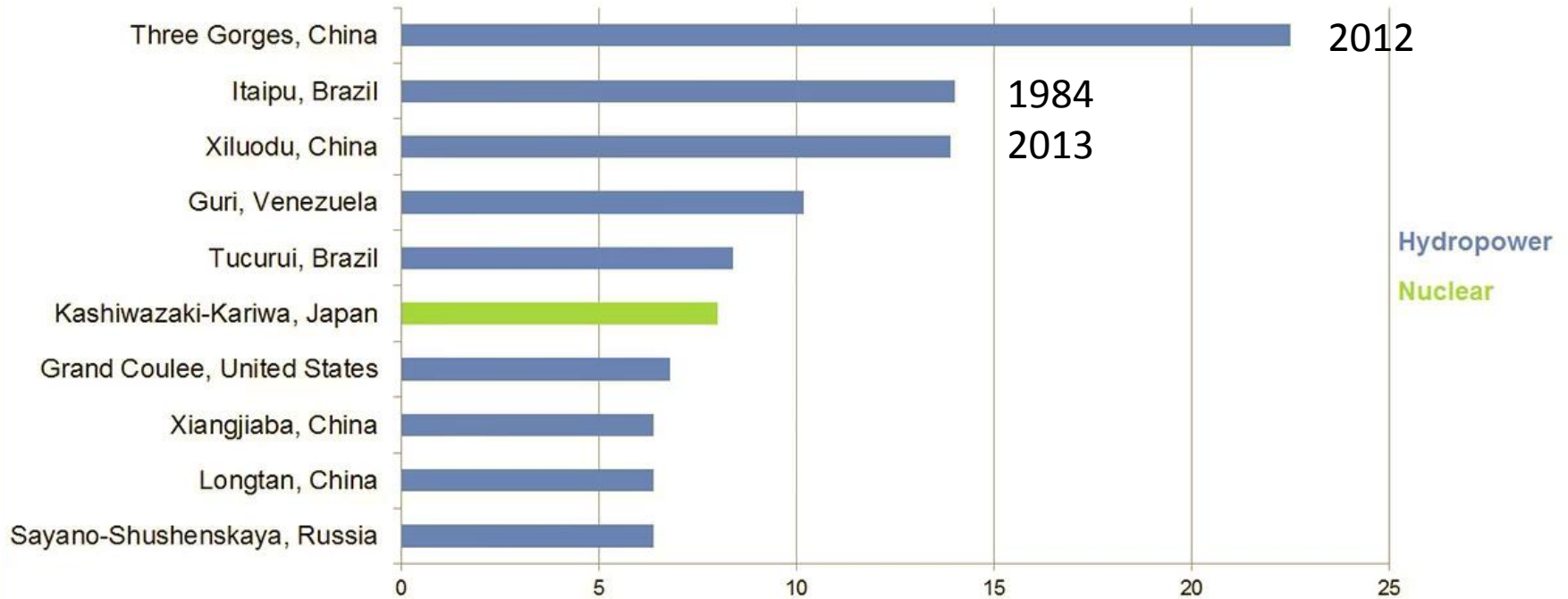
- leading renewable source for electricity generation
- 16.4% of the world's electricity from all sources
- 71% of all renewable electricity.
- 1,064 GW of installed capacity in 2016
- 1,212 GW global hydropower capacity (including pumped storage)
- Growth particularly strong in Asia, Africa, Latin America (PP-funding, cooperation among countries)

(World energy council-2016)



# Top 10 Largest Power Plants in the World

By capacity (gigawatts)



Source: US Energy Information Administration, based on International Commission on Large Dams and IAEA Power Reactor Information System

Note: Japan's Kashiwazaki-Kariwa nuclear facility has not operated since being shut down in 2011 and has not submitted a restart application



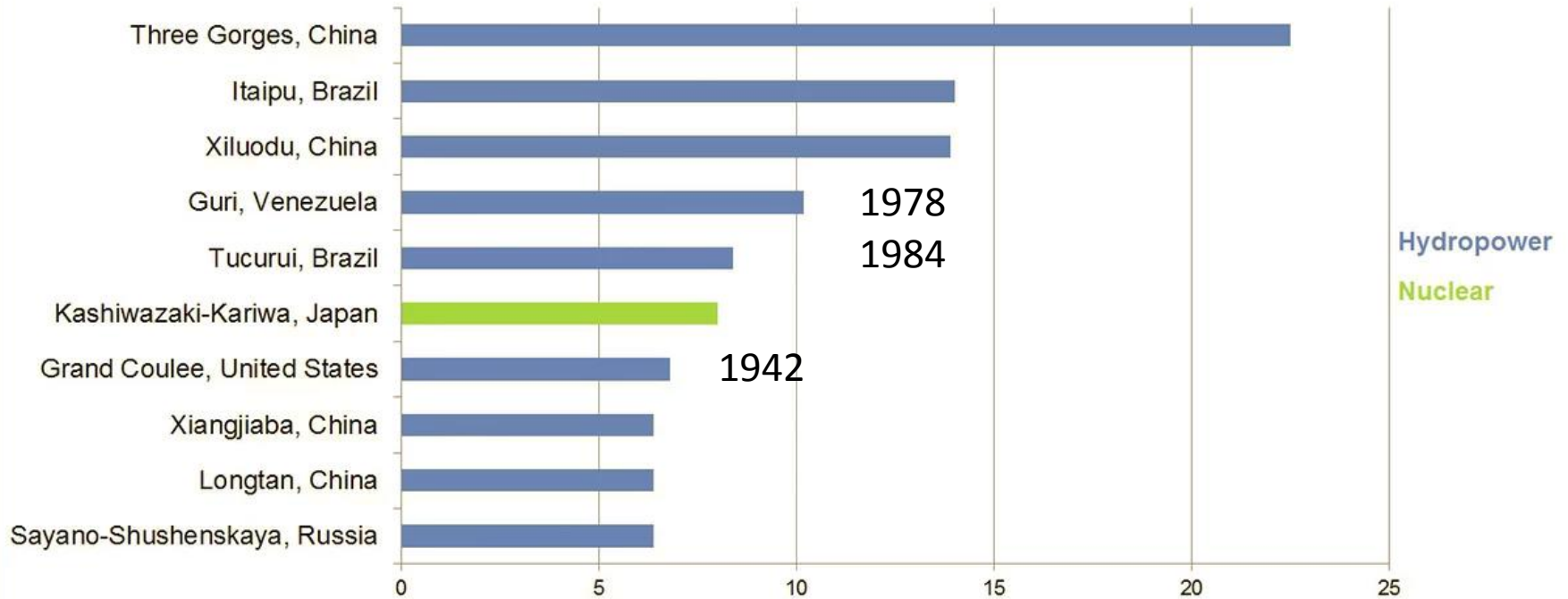
三峡水利枢纽鸟瞰图





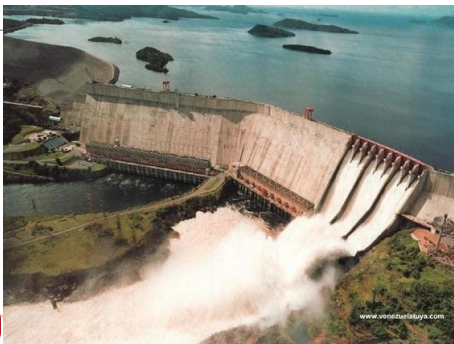
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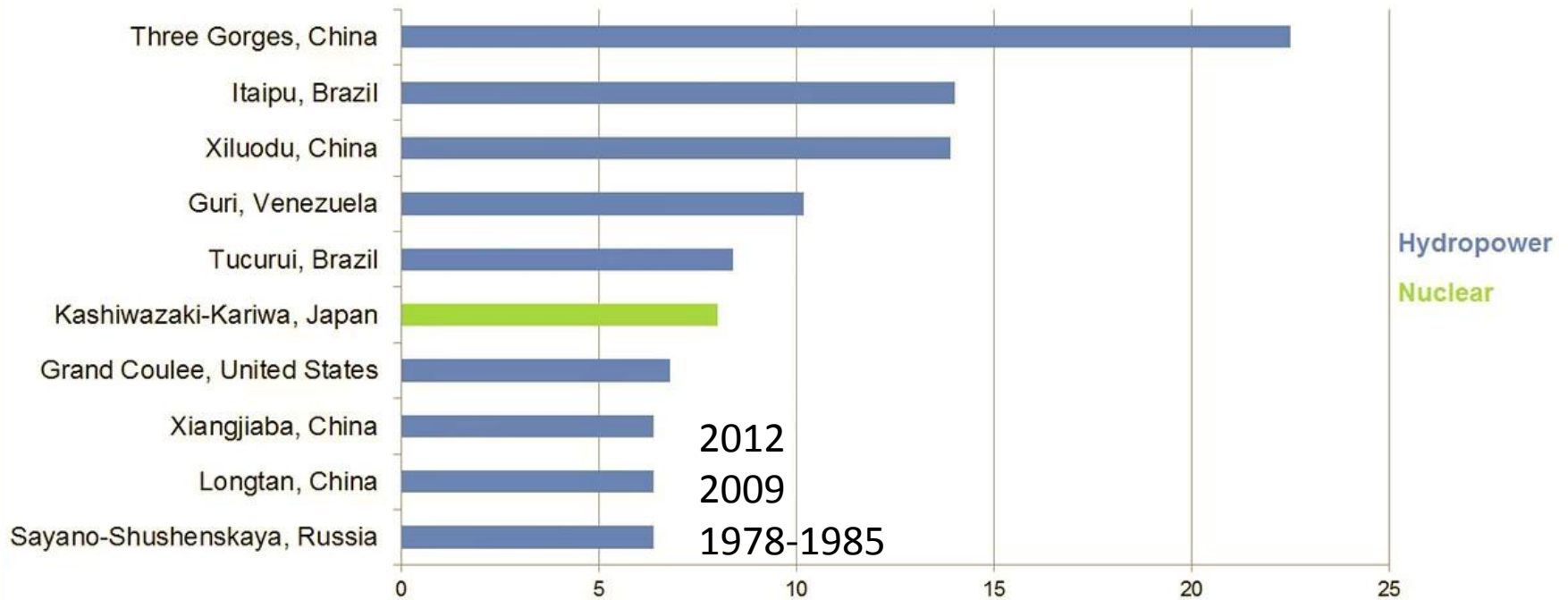
**Source:** US Energy Information Administration, based on International Commission on Large Dams and IAEA Power Reactor Information System

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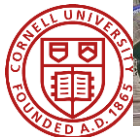
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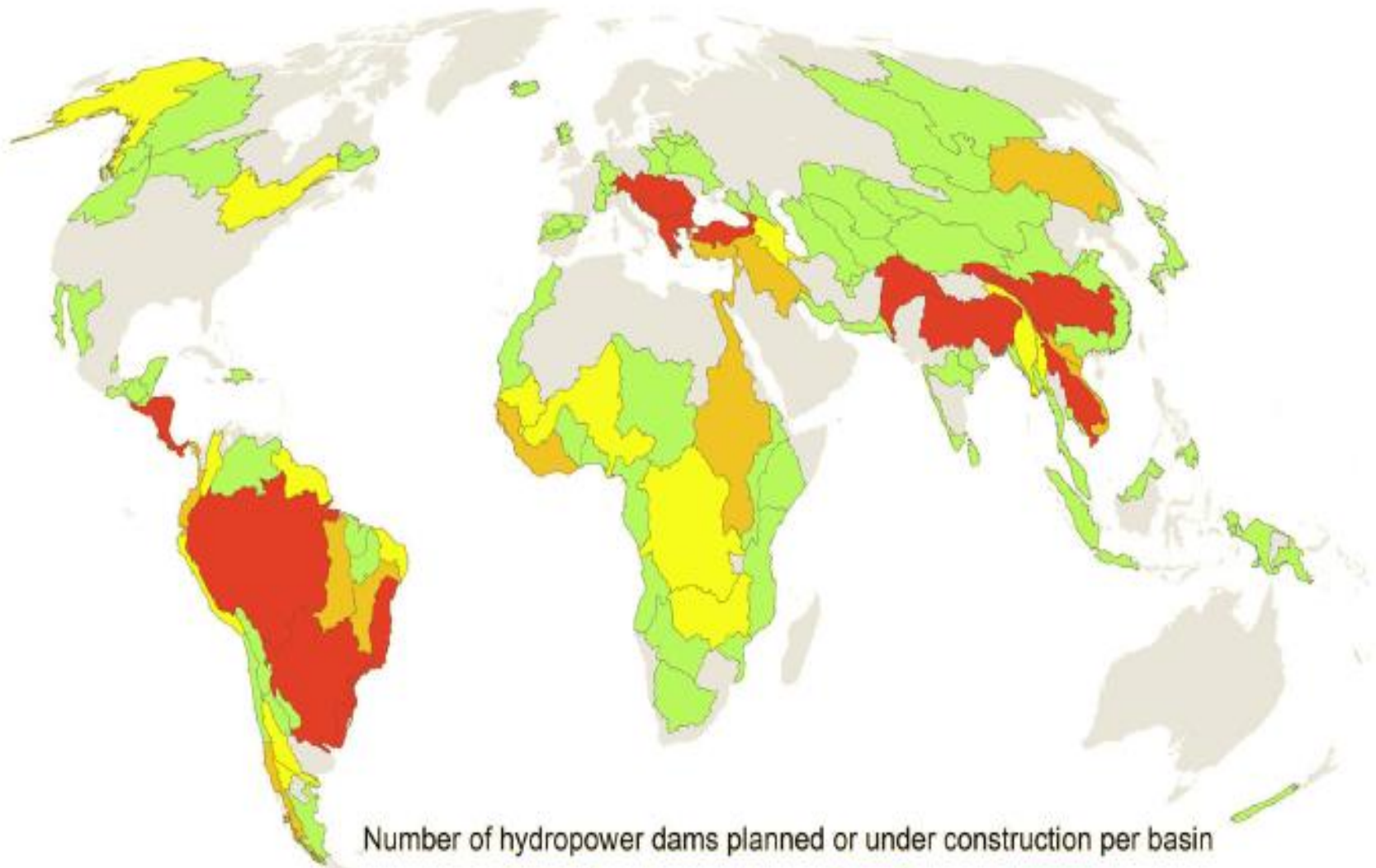
By capacity (gigawatts)



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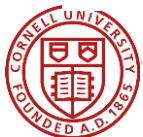
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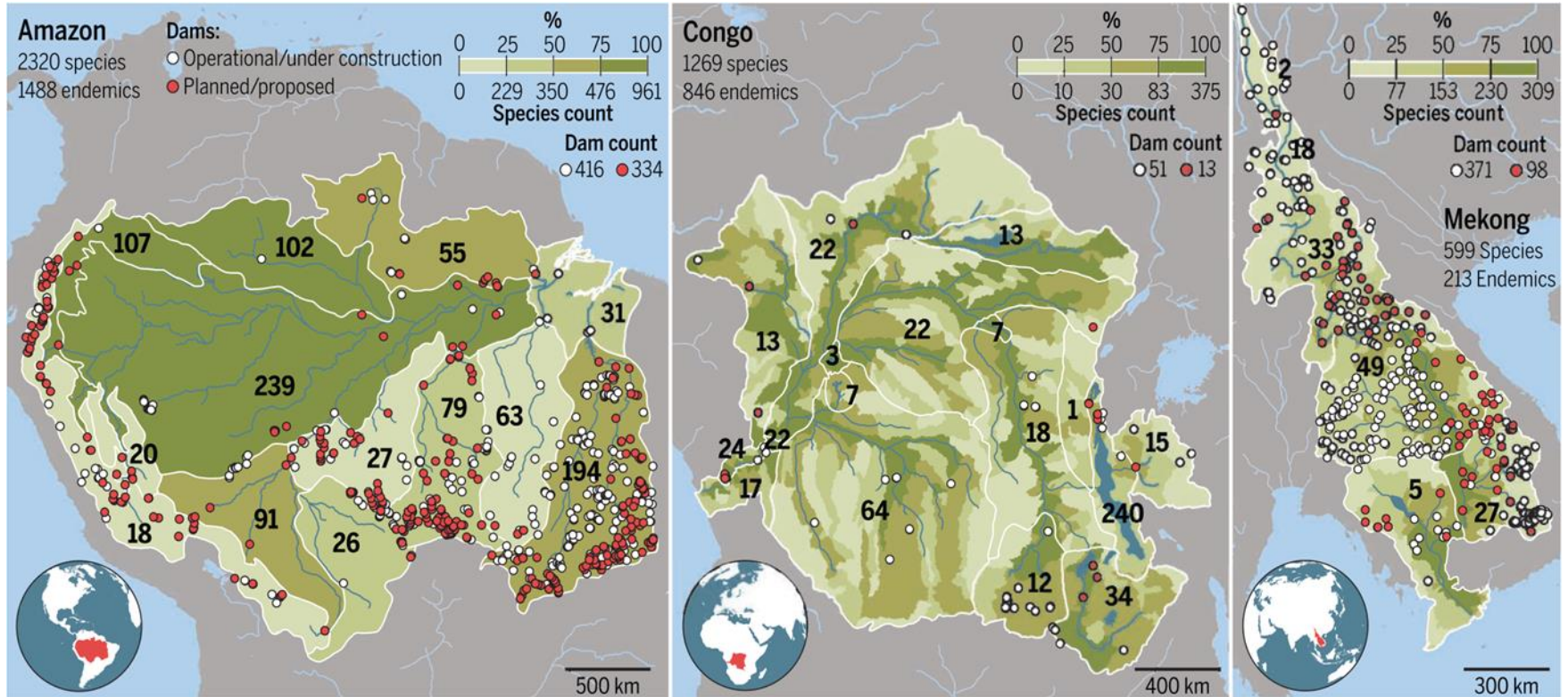


Number of hydropower dams planned or under construction per basin

n.d.a. ≤ 10 11 - 25 26 - 100 > 100



# Daming Rivers – Worldwide



## Amazon

## Congo

## Mekong

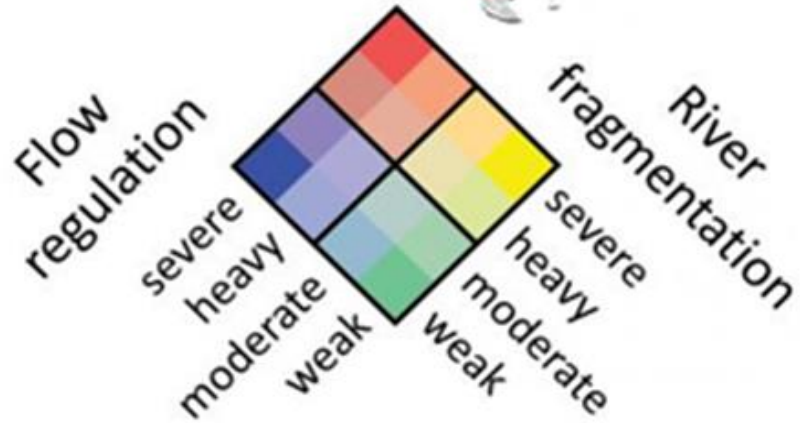
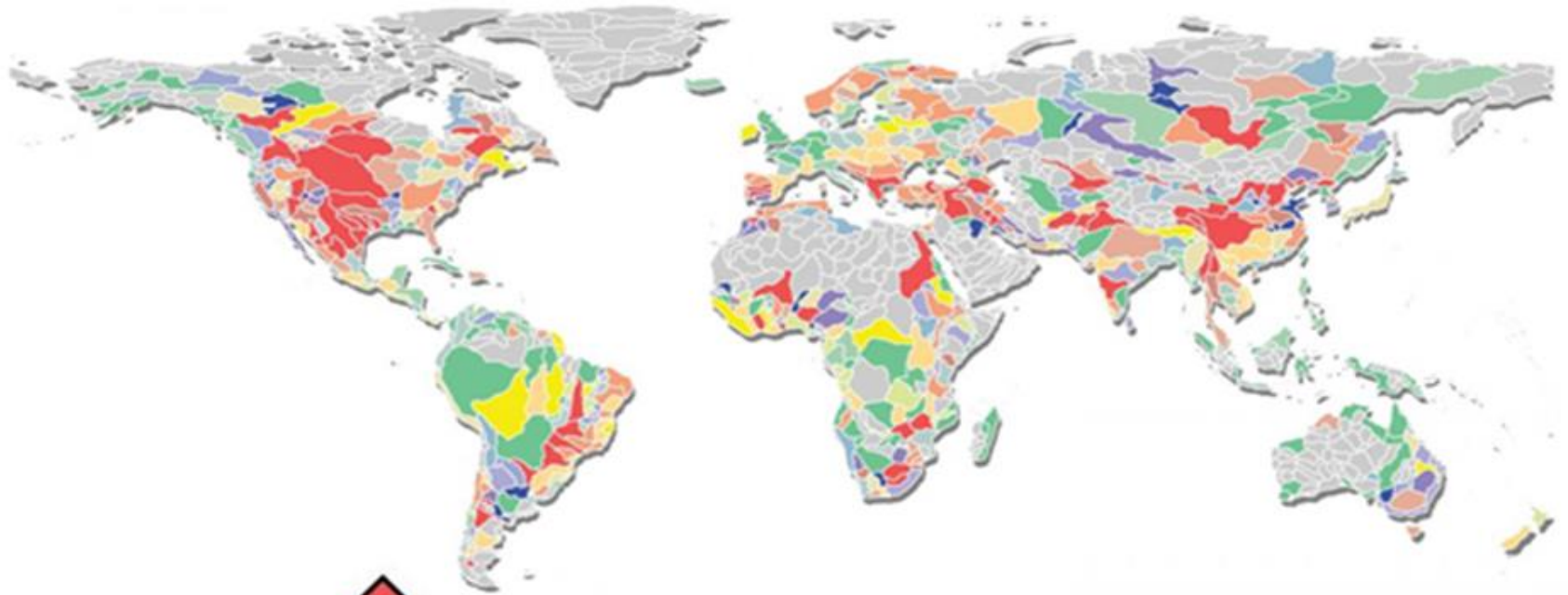
○ Existing/Under construction 416  
● Planned/Proposed 334

51  
13

371  
98



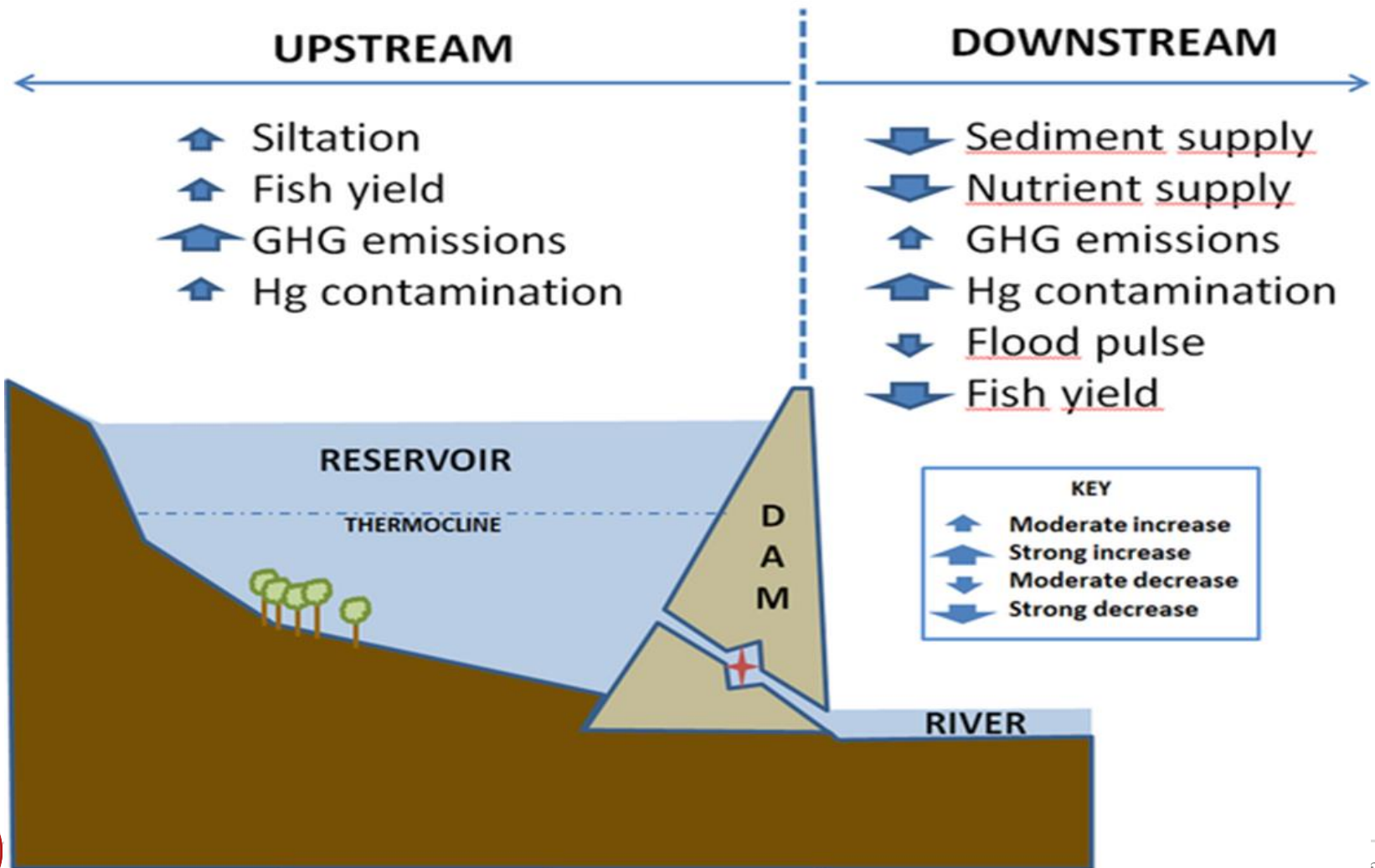
# Impacts:



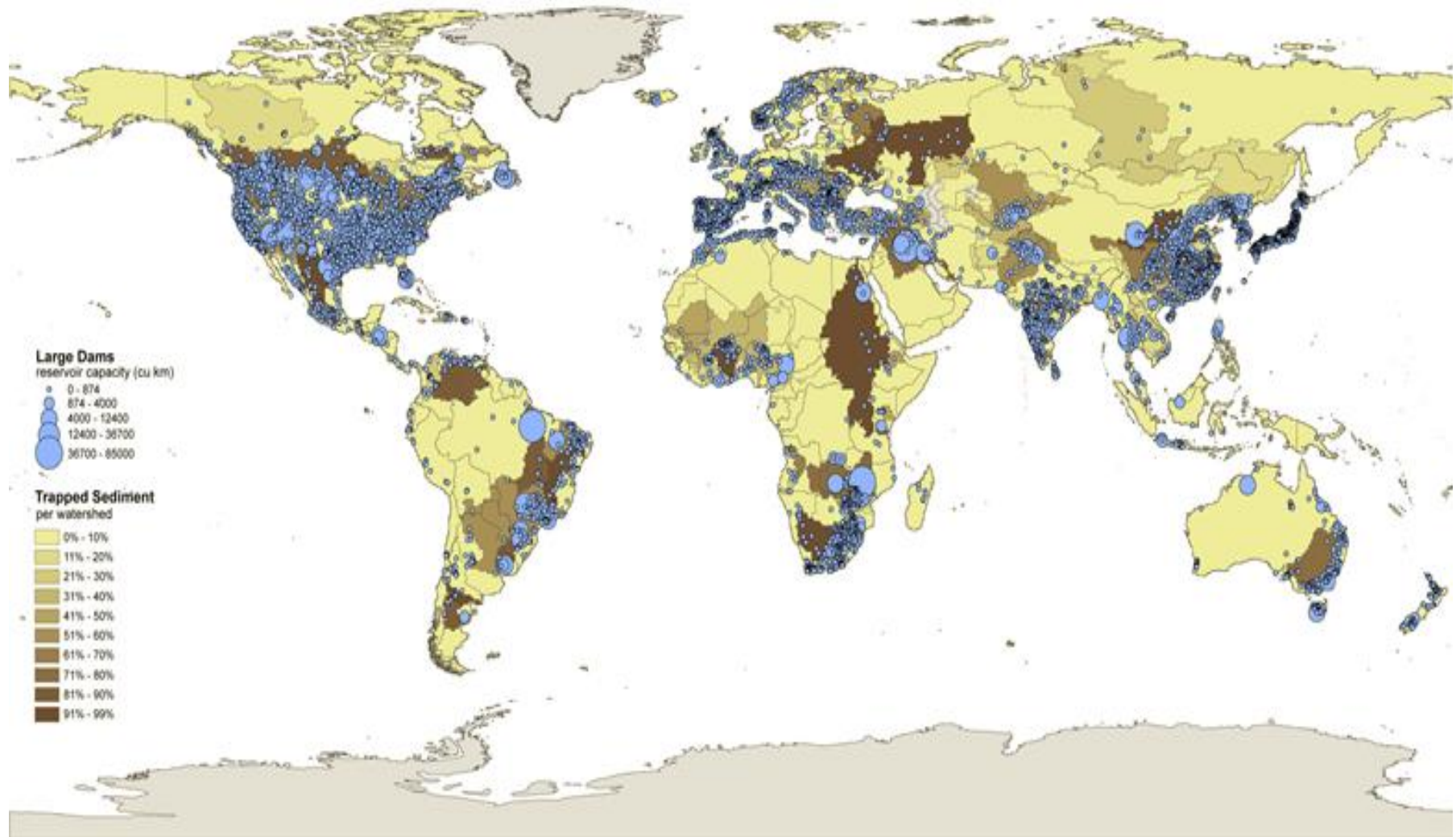
Not affected by large dams

# Impacts:

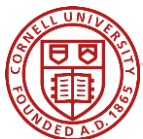
## EXPECTED ENVIRONMENTAL IMPACTS

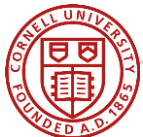
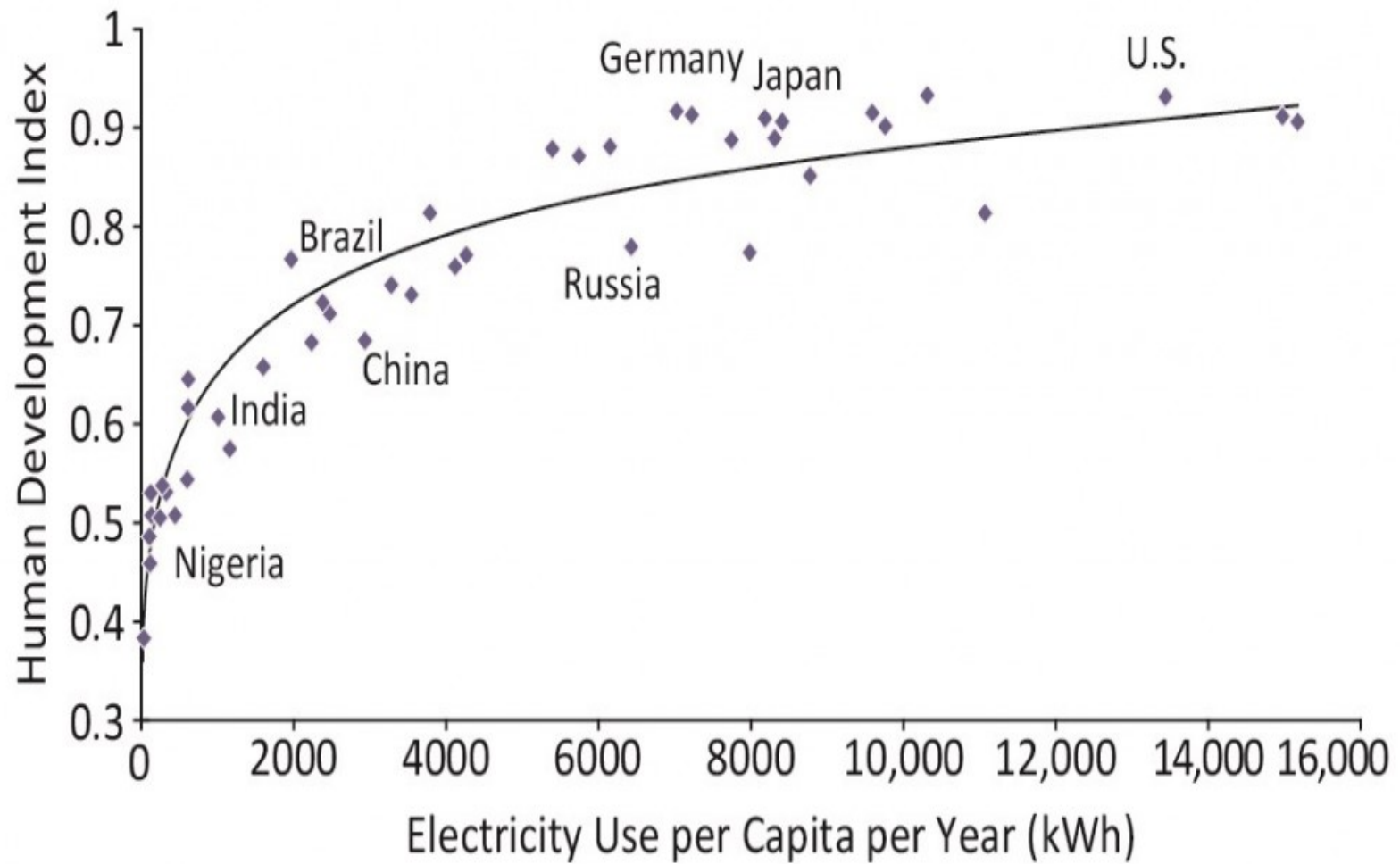


# Impacts:



**% Trapped Sediment per watershed**







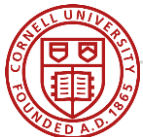


## Rural and Urban Electrification



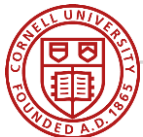
# But at what cost? Who cares?







**Which is worse?**





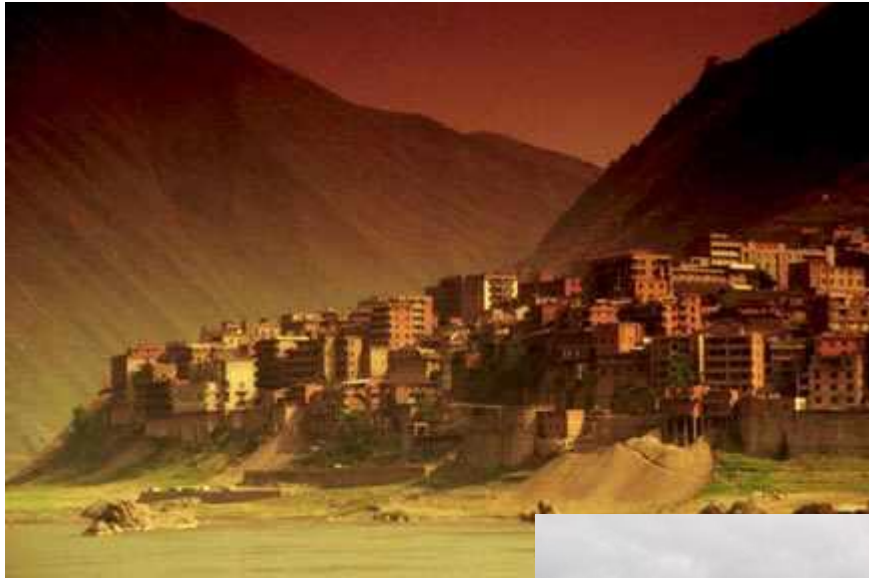


The politically weak and the most adversely impacted.









**People Displaced**

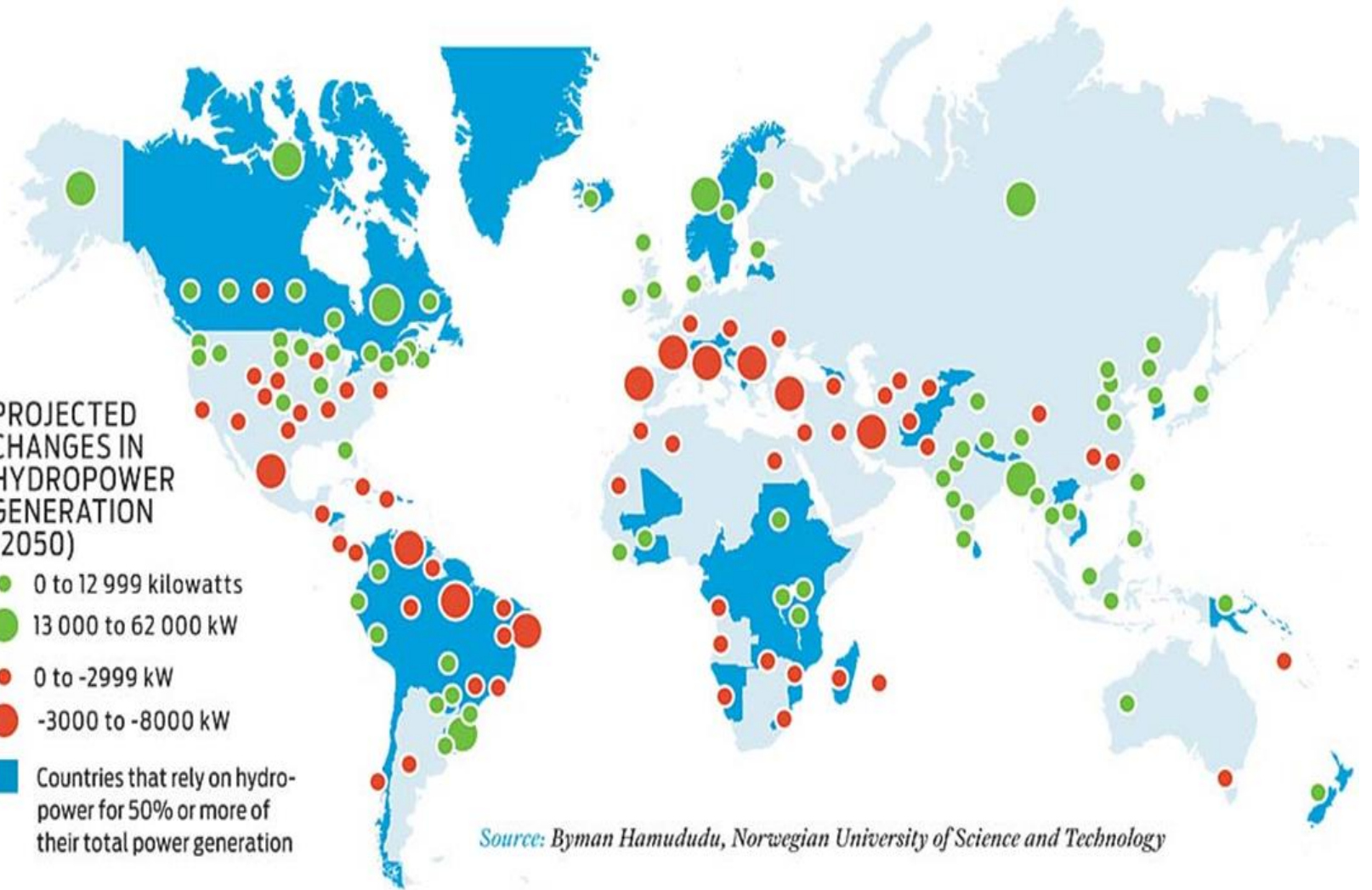
**Some Relocated**



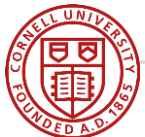
### PROJECTED CHANGES IN HYDROPOWER GENERATION (2050)

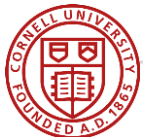
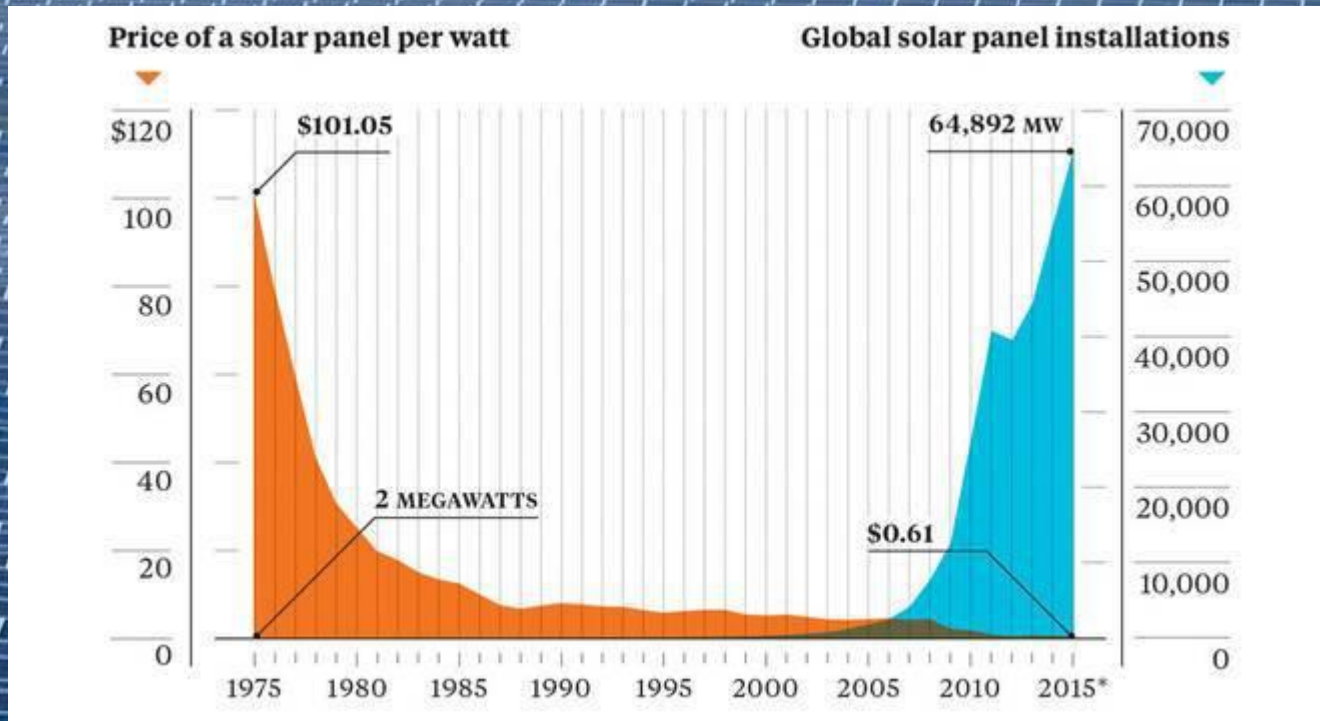
- 0 to 12 999 kilowatts
- 13 000 to 62 000 kW
- 0 to -2999 kW
- -3000 to -8000 kW

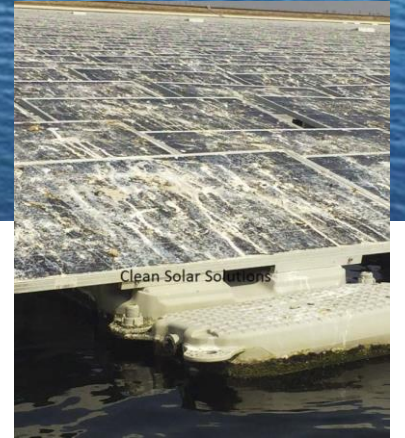
■ Countries that rely on hydro-  
power for 50% or more of  
their total power generation



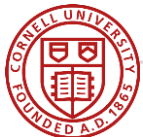
Source: Byman Hamududu, Norwegian University of Science and Technology



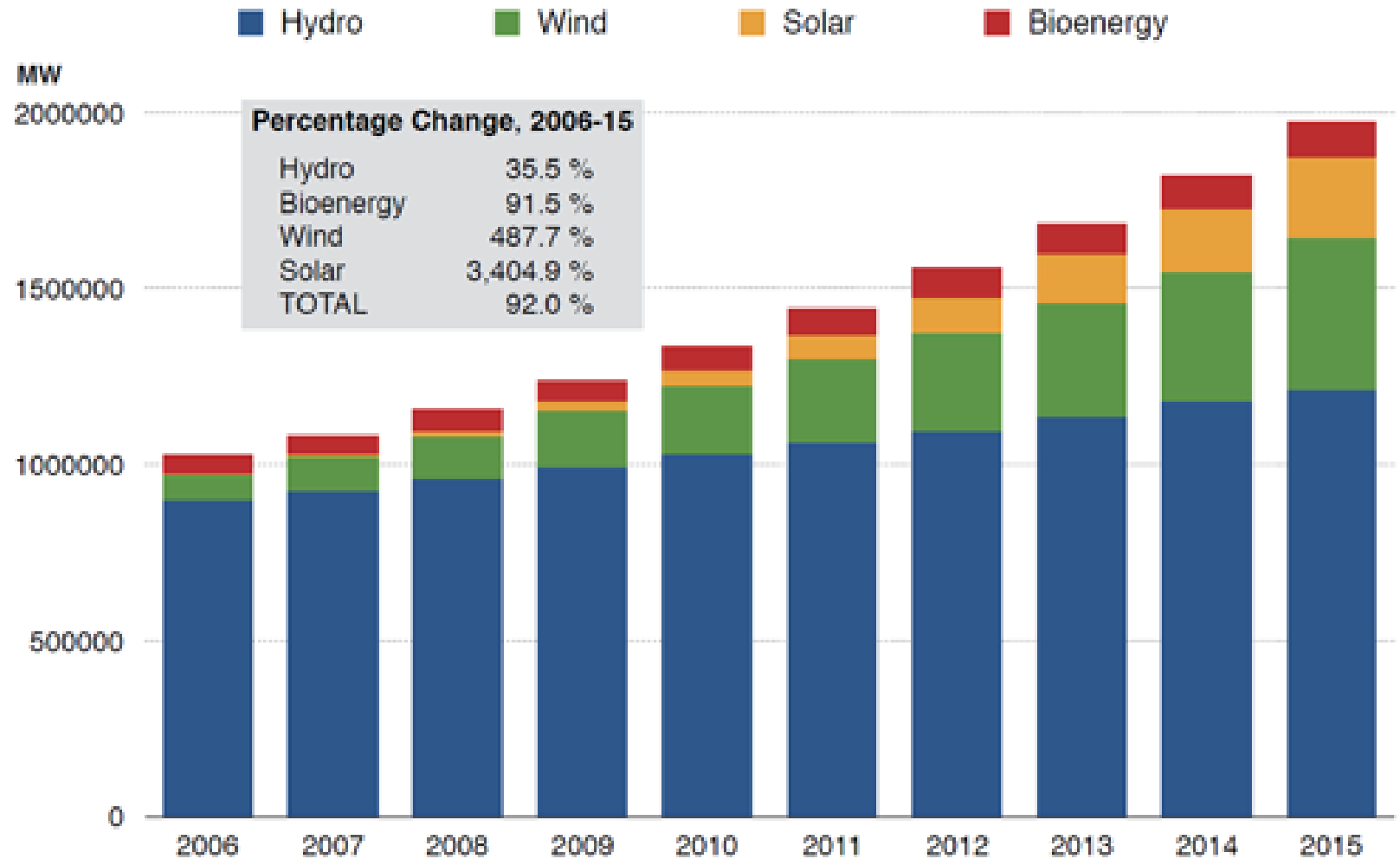




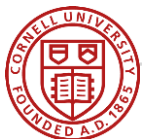
**Floating solar power plant (40MW)**



# Global Renewable Energy Installed Capacity by Technology (Megawatts, 2006-15)



Source: International Renewable Energy Agency, *Renewable Capacity Statistics*, 2016



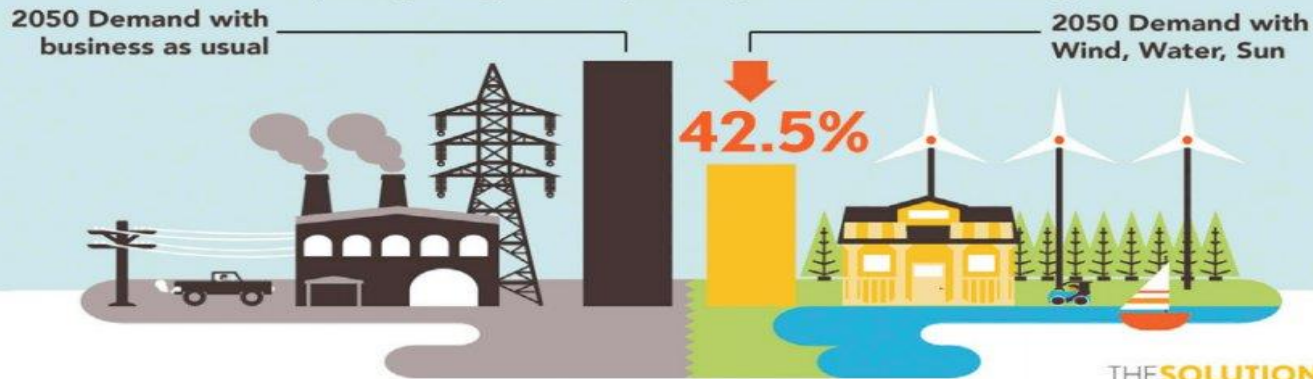
# 100% IN 139 COUNTRIES

Transition to 100% wind, water, and solar (WWS) for all purposes  
(electricity, transportation, heating/cooling, industry)



**JOBS CREATED 52 MILLION**  
**JOBS LOST 27.7 MILLION**

Using WWS electricity for everything, instead of burning fuel, and improving energy efficiency means you need much less energy.



THE **SOLUTIONS** PROJECT

9/26/2017

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