Minimizing biodiversity trade-offs of future global hydropower reservoirs by strategic site selection

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SUSTAINABLE DEVELOPMENT GOALS

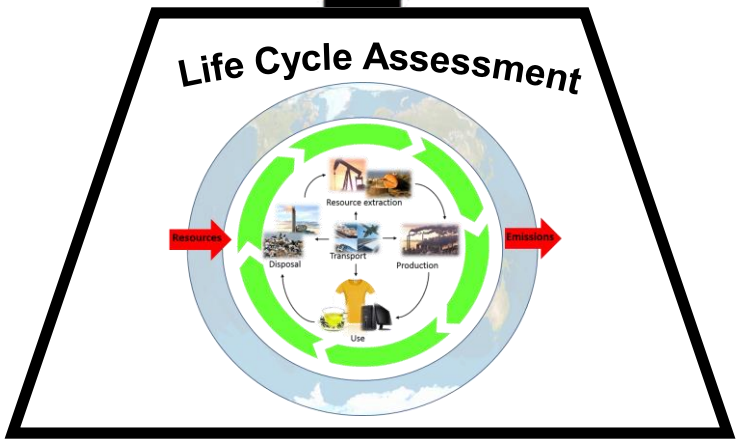
7 AFFORDABLE AND CLEAN ENERGY

13 CLIMATE ACTION

6 CLEAN WATER AND SANITATION

15 LIFE ON LAND

Increase in hydropower production

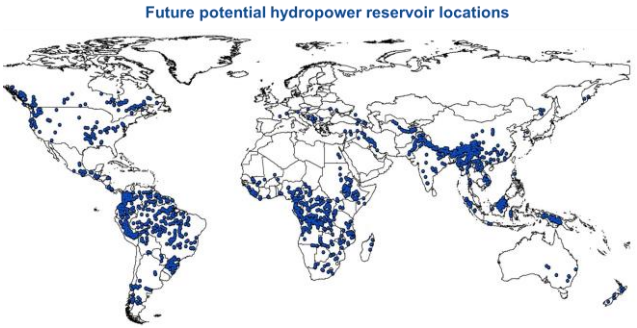


Potential biodiversity impact?

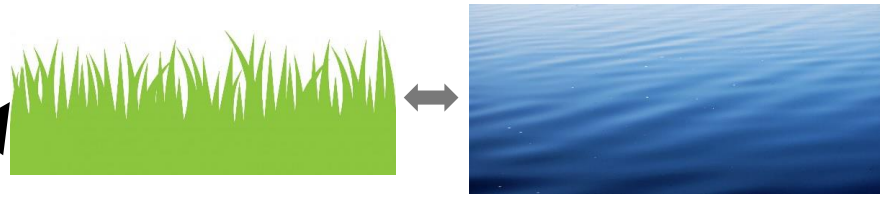
→ Where can we build new hydropower plants with least biodiversity impact?

Dam image from : https://www.utilities-me.com/public/styles/full_img/public/images/2018/03/13/hydro-power_1.jpg?itok=R342giyq

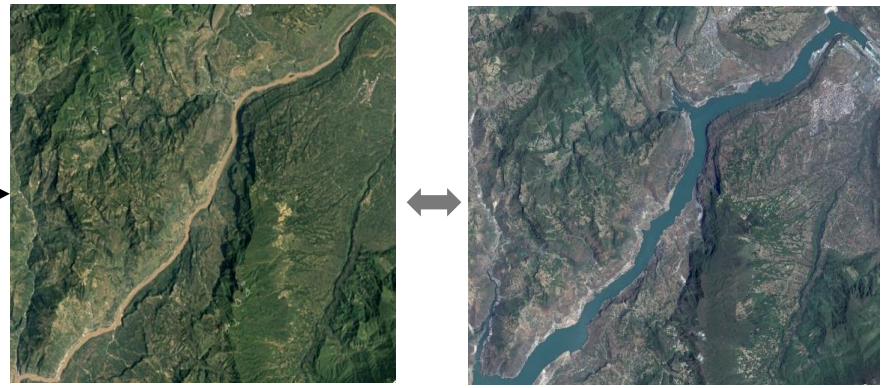
Hydropower Impacts and LCIA



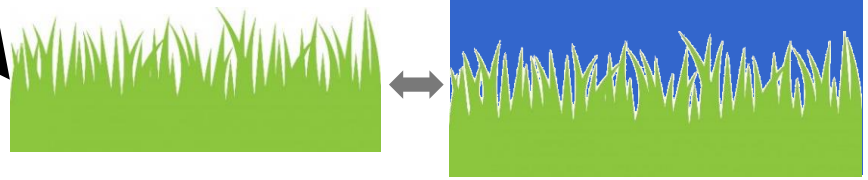
Water Consumption $\left[\frac{m^3}{kWh}\right]$



Land Occupation $\left[\frac{m^2}{kWh}\right]$



GHG Emissions $\left[\frac{kg\ CO2\ eq}{kWh}\right]$



Reservoir

$\frac{\text{Biodiversity Impact}}{kWh}$

Discharge

Habitat

Temperature

Biodiversity Impact

Characterization Factor

$\left[\frac{\text{Potentially Disappeared Fraction of Species}}{\text{Unit Change}}\right]$

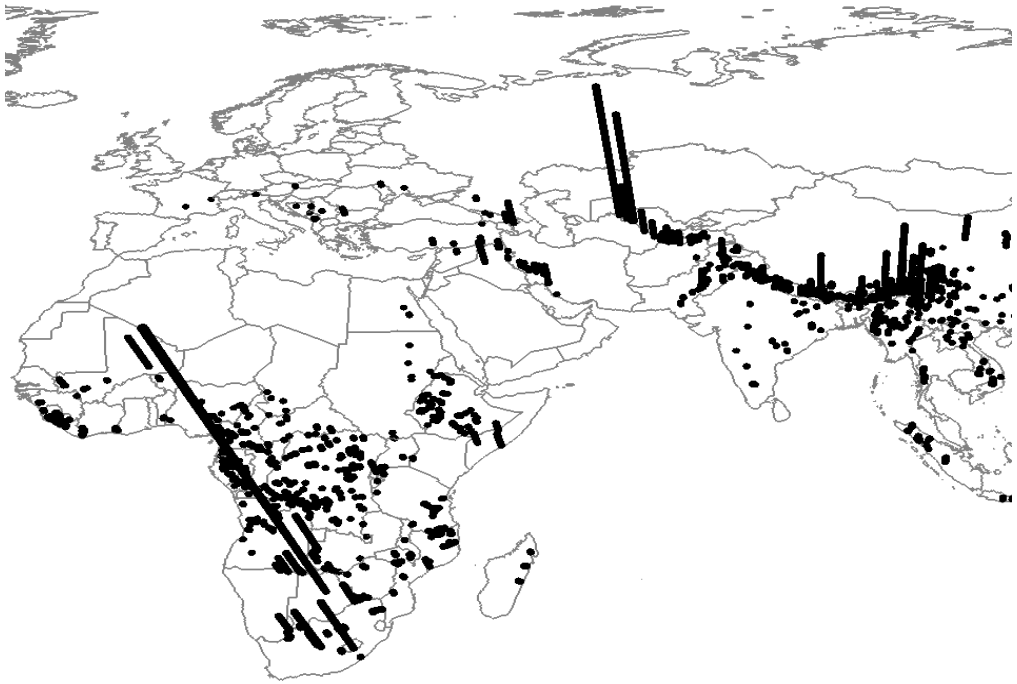
Gernaat, D. E. H. J., P. W. Bogaart, D. P. v. Vuuren, H. Biemans and R. Niessink (2017). "High-resolution assessment of global technical and economic hydropower potential." Nature Energy **2**(10): 821-828.

GoogleEarth

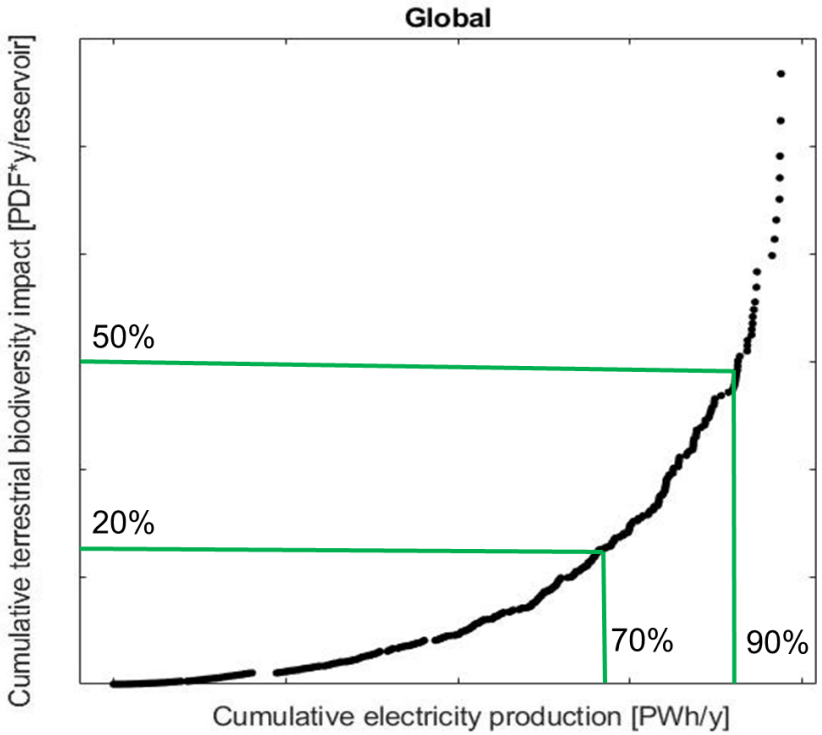
https://2.blogs.elcomercio.pe/expresiongenetica/wp-content/uploads/sites/252/2019/04/biodiversity.jpg

Results

Terrestrial biodiversity impact [PDF*y/kWh]



Terrestrial biodiversity impact [PDF*y/reservoir]



→ A relatively small number of possible future hydropower reservoirs contributes to a relatively big proportion of the total biodiversity impact

→ Careful selection of future hydropower reservoirs has a large potential to limit biodiversity impacts and can help to achieve a more sustainable renewable energy development