

A panoramic view of a city, likely Munich, featuring a large cathedral with two prominent green domes and a tall spire. In the background, a range of snow-capped mountains is visible under a clear blue sky. The foreground shows a mix of urban buildings and greenery.

Influencing factors on cost and potential of global hydrogen production

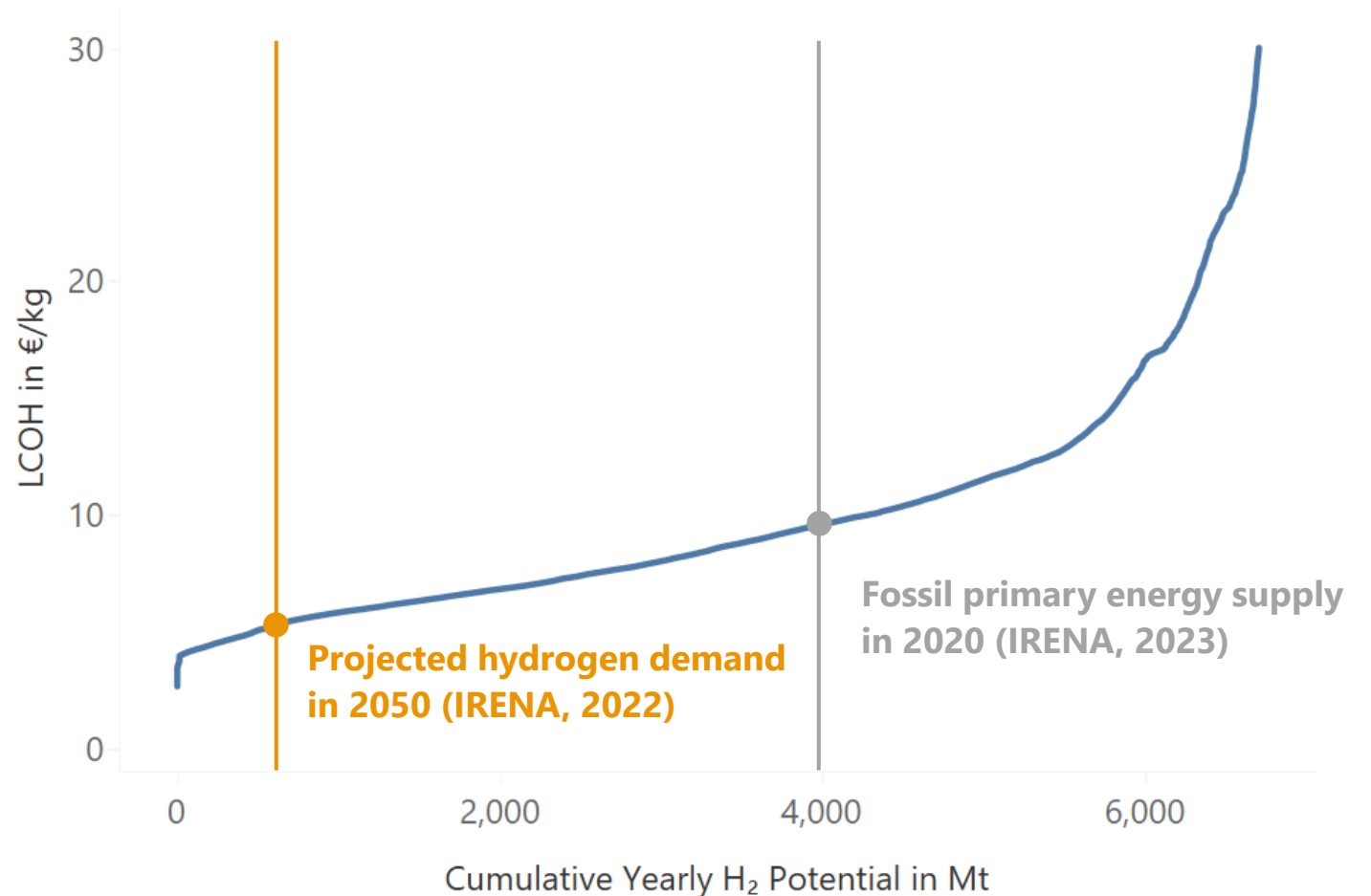
Tapio Schmidt-Achert

Strommarkttreffen Wasserstoff

Global hydrogen cost potential curve

How to get there and what is affecting its shape

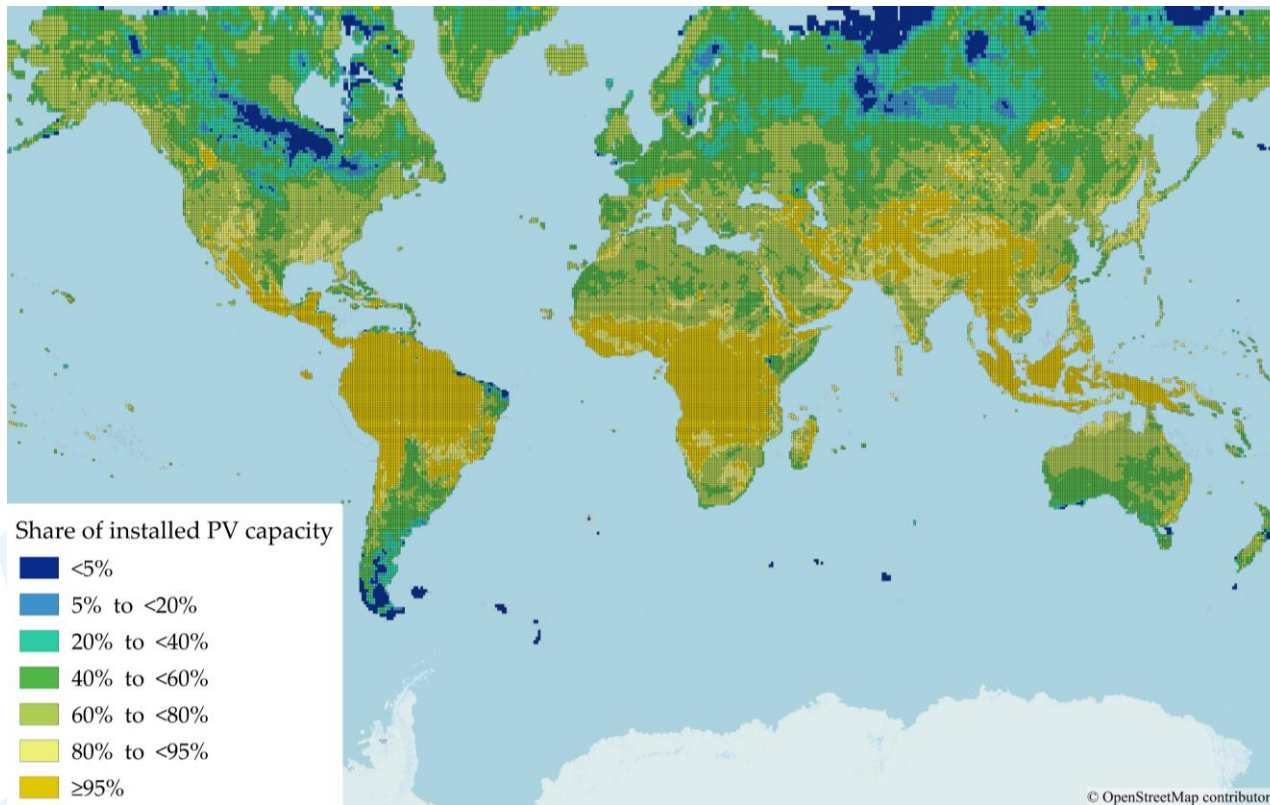
Levelized Cost of Hydrogen (LCOH) + Land eligibility analysis =



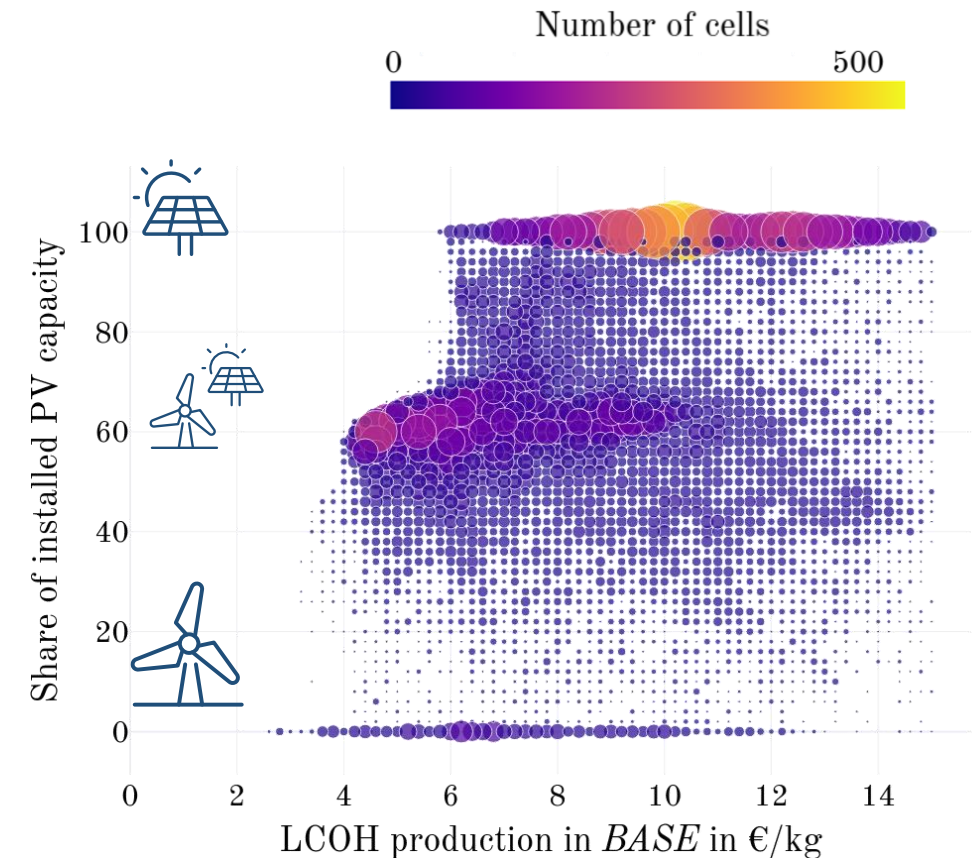
Cost effect of different types of electricity supply

Wind and hybrid systems currently provide most competitive LCOH

Cost optimal electricity supply configurations



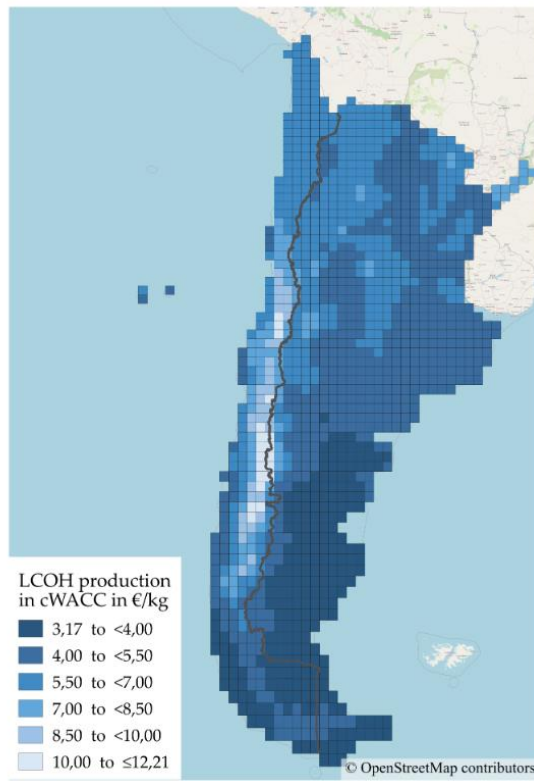
LCOH depending on configuration



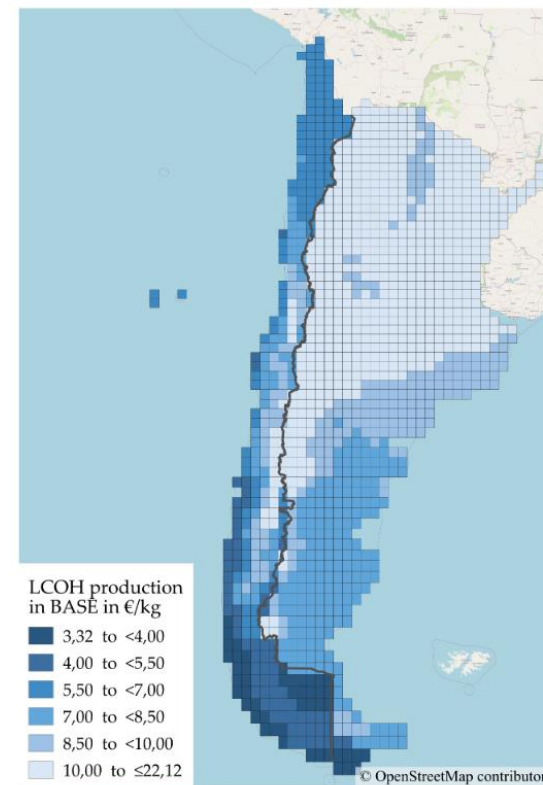
Country Risk Premium (CRP) effect

High full load hours alone are no guarantee for low LCOH

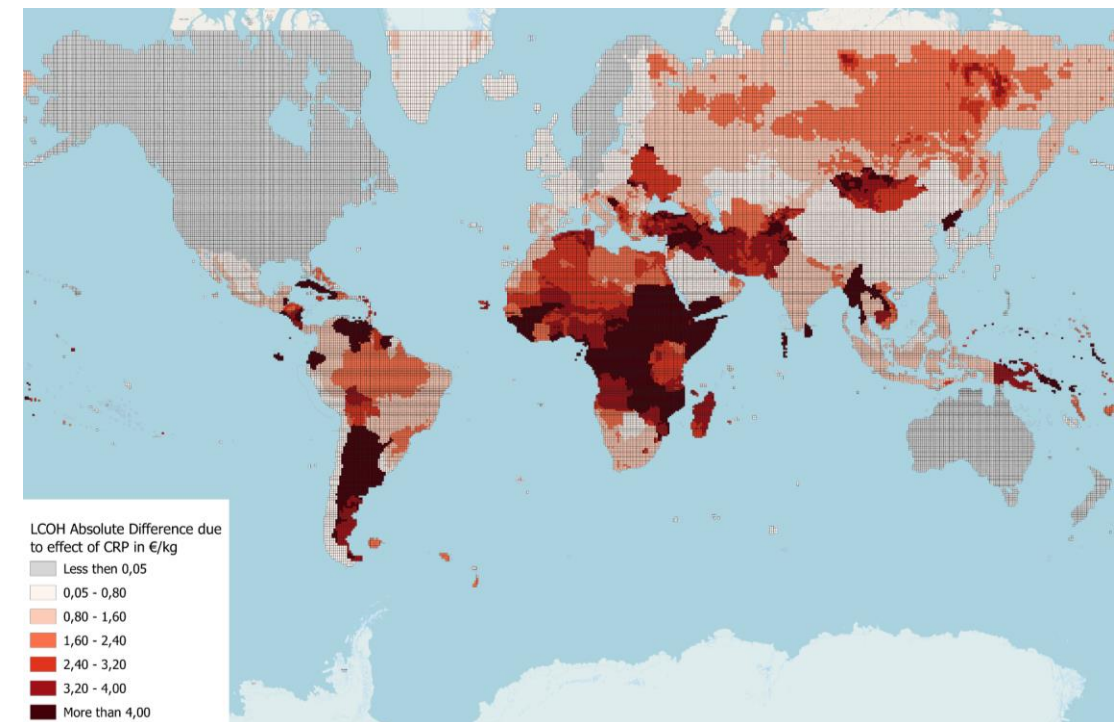
LCOH without CRP



LCOH with CRP



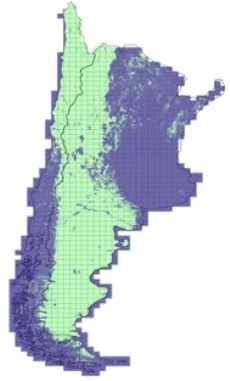
Cost difference caused by CRP



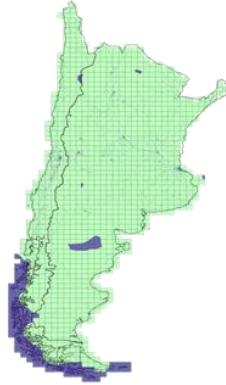
Land Eligibility Analysis

Which criteria have an impact on the available land?

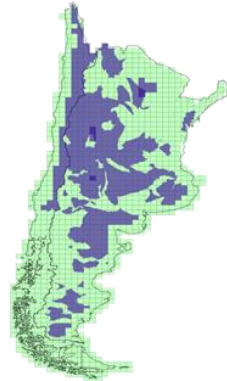
1 Land Use and Land Cover



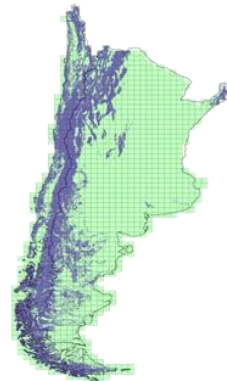
2 Road network



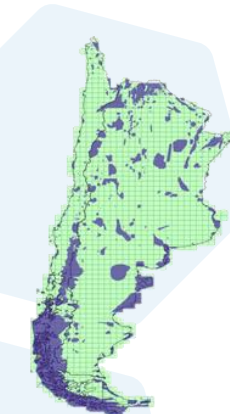
3 Water Availability



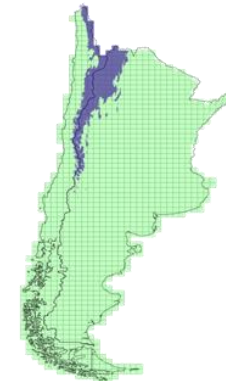
4 Slope of terrain



5 Protected Areas



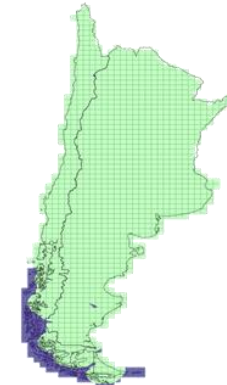
6 Elevation



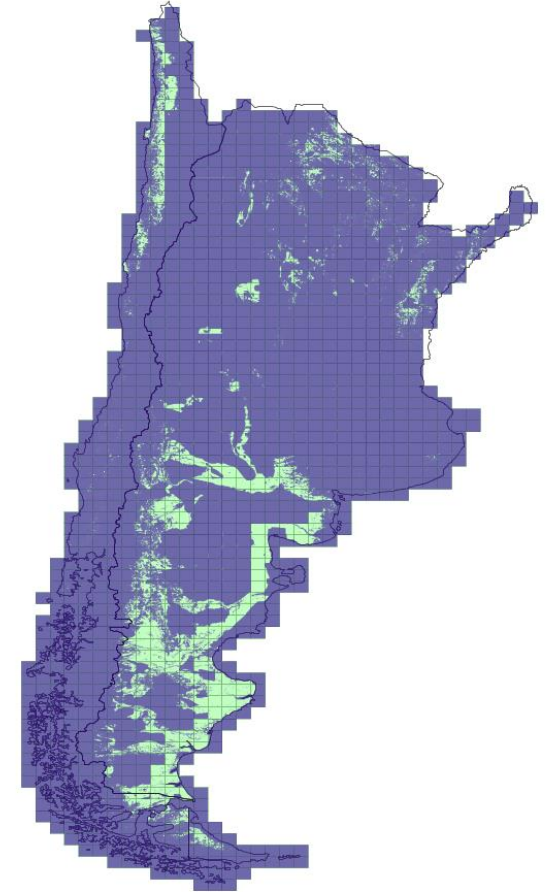
7 Population density



8 Access to Settlement Areas

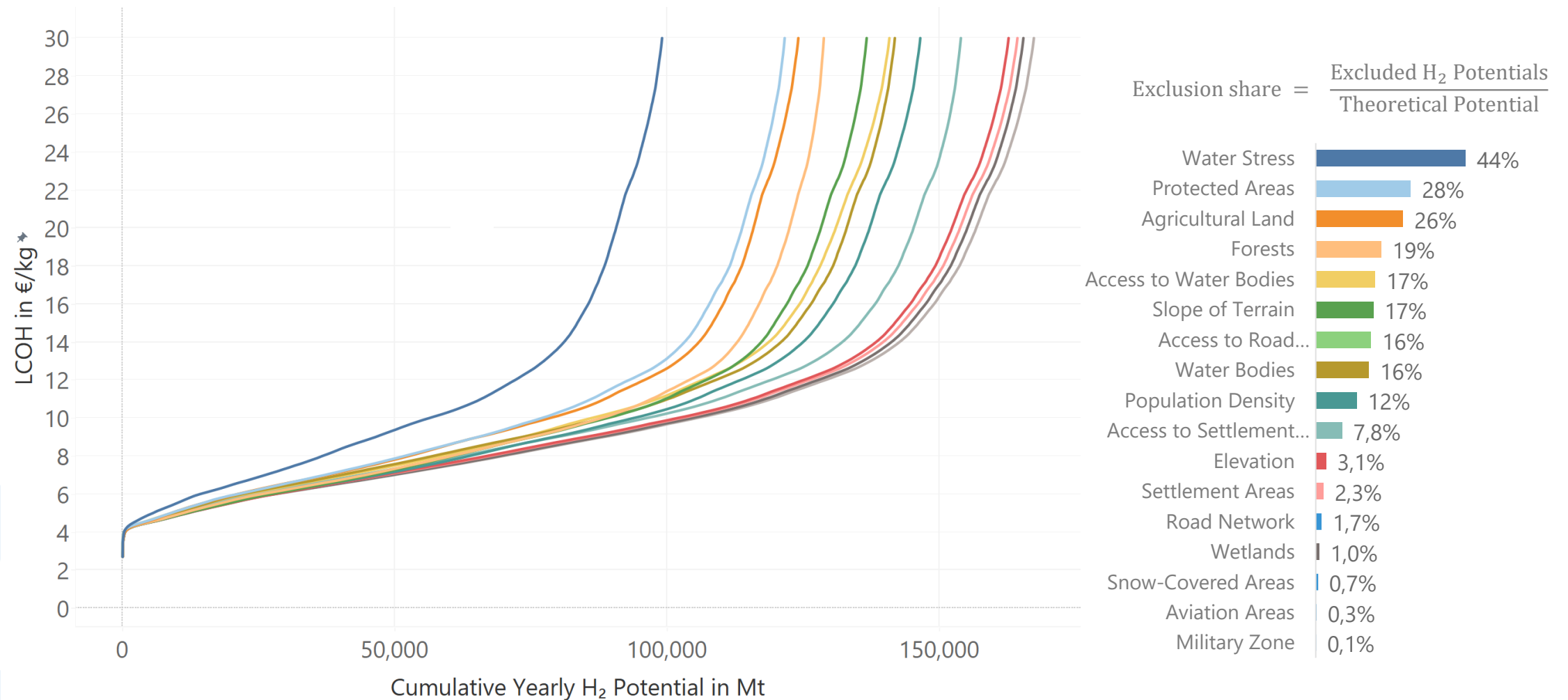


■ Eligible
■ Excluded



Single criteria effect on global hydrogen potential

Water stress and protected areas show strongest impact on hydrogen potential



Key factors affecting hydrogen cost and potential

Are there more?



1 Availability of attractive hybrid electricity supply



2 Low risk and financing conditions



3 Availability of water

arXiv

More details here:

<https://arxiv.org/abs/2312.07361>

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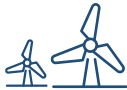


Backup

Levelized cost of hydrogen methodology

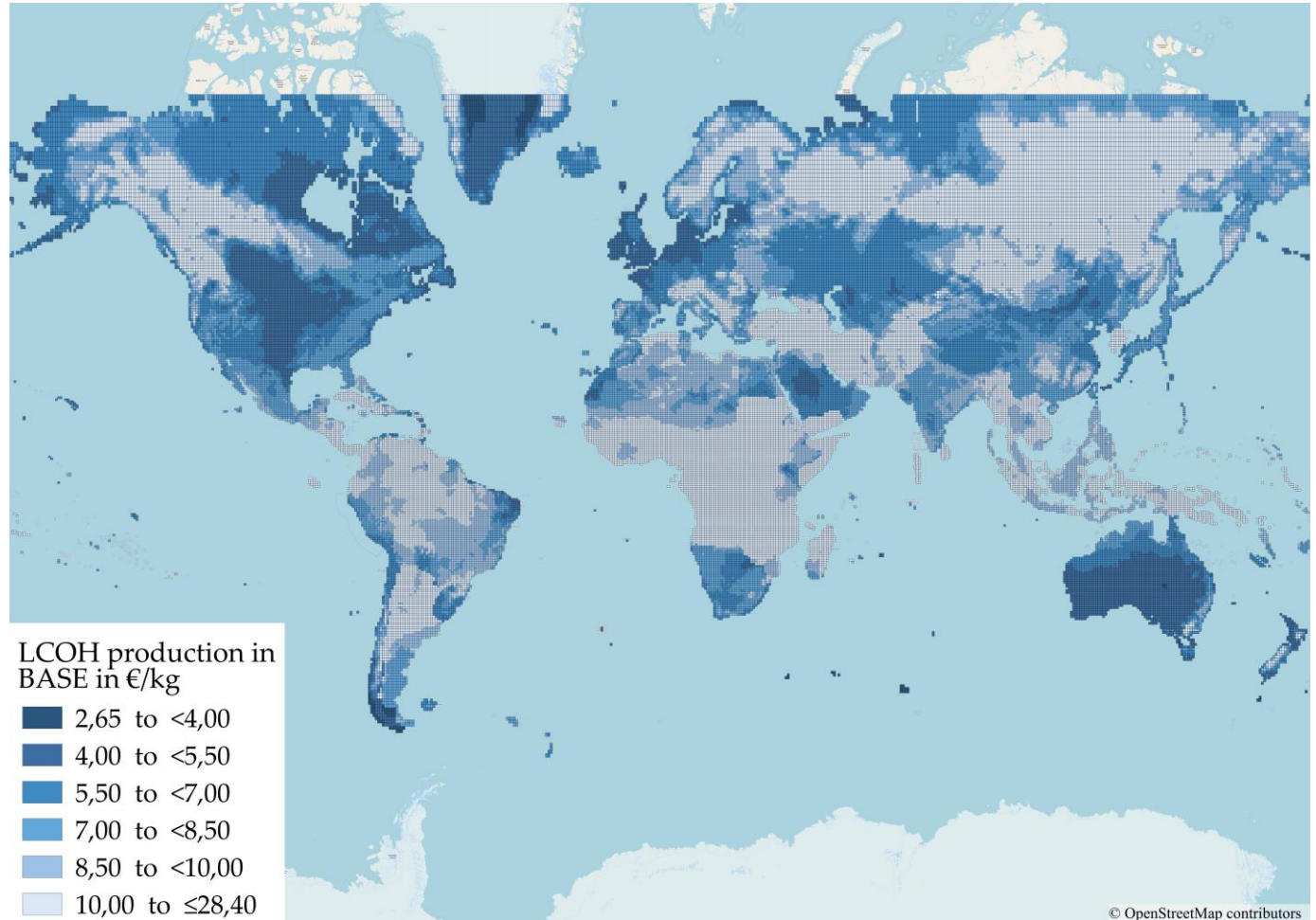
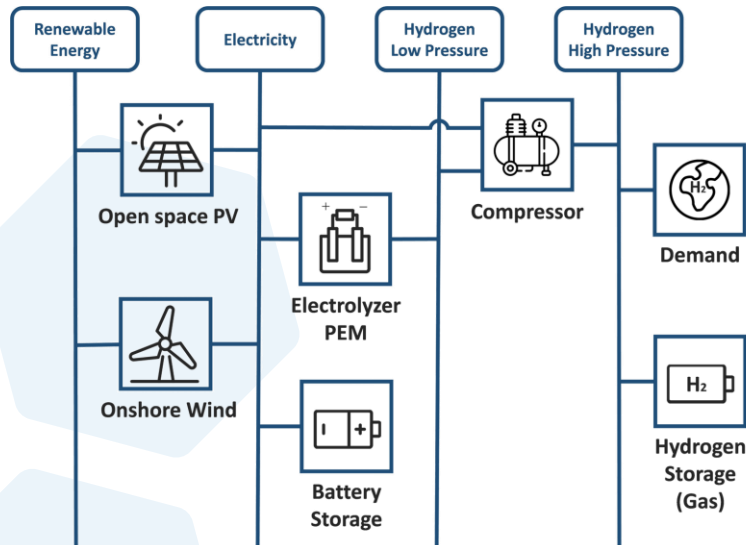


LCOH (€/kg_{H₂}) on MERRA2 cell level



Optimized component sizes and time series

Off-grid energy system

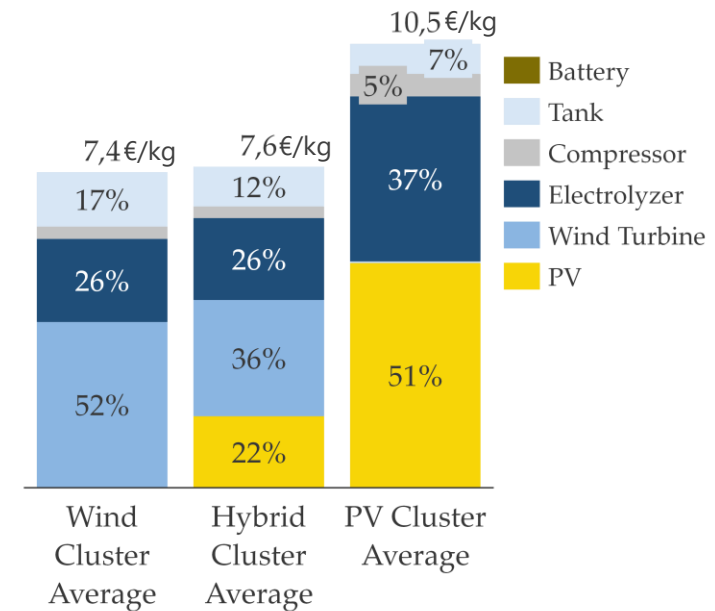
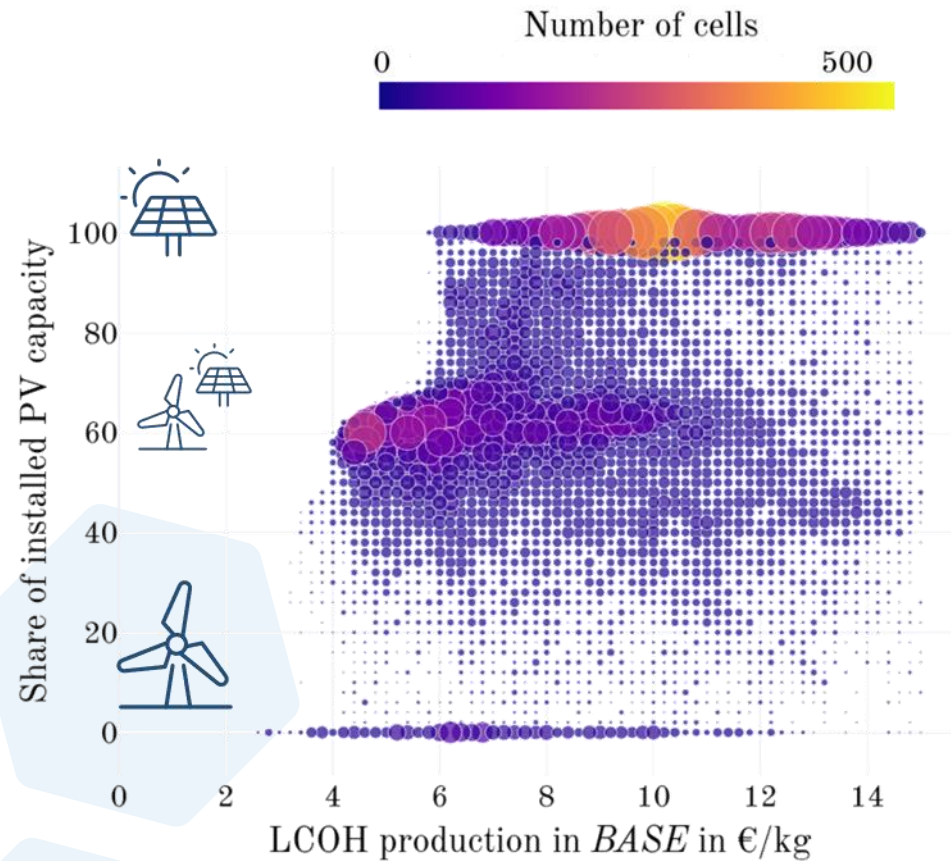


Technoeconomic parameters

Technology	Economic Parameters			Technical Parameters	
	CAPEX ₁ (<i>e/MW</i>)	CAPEX ₂ (<i>e/MWh</i>)	OPEX (% of CAPEX ₁)	Lifetime (<i>a</i>)	Efficiency (%)
PV	685 456	-	2.5%	25	-
Weak Wind Turbine	2 034 400	-	1.4%	25	-
Strong Wind Turbine	740 000	-	3.9%	25	-
H ₂ Storage	1 518	15 179	2.0%	30	97.5%
H ₂ Compressor	4 700 717	-	4.0%	30	97.5%
Battery Storage	530 410	138 229	5.8%	10	95.0%
PEM Electrolyzer	1 495 067	-	2.0%	20	58.0%

Cost effect of electricity supply and cost components

Electricity supply has a cost share around 50%



Water Stress Indicator

Overall Water Risk

