

The Illusion of Green Hydrogen

Sustainability of green hydrogen production and supply chain

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Grafting Cities

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Background and questions



Since the publication of the EU Hydrogen Strategy in 2020, research institutes and activists helped to develop a more critical view about hydrogen, exposing corporate interests and opening questions about the impacts and implications of a transition to a hydrogen economy

A larger constituency of environmental and climate groups, researchers and experts are aware that only green hydrogen might be sustainable, if produced in hydrogen valleys for a limited, local use in hard to abate sectors.

Other uses of hydrogen, mostly pushed by the lobby of the fossil fuel industry, have been proved inefficient and most expensive if compared with other existing solutions based on renewable energy.

According to researchers and experts, led by Cambridge University professor David Cebon, “hydrogen use in buildings and for road transport is not efficient and does not make economic sense”
<https://www.rechargenews.com/energy-transition/hydrogen-for-heating-and-road-transport-is-not-efficient-and-does-not-make-economic-sense/2-1-1069478>

Repower EU and in particular the external energy strategy relaunched green hydrogen production outside of the EU, explicitly mentioning supply countries of green hydrogen and raw materials needed to decarbonize the EU



The illusion of green hydrogen

How to undermine a sustainable and just energy transition

Written by **Elena Gerebizza** and **Filippo Taglieri**

From the European Green Deal on, hydrogen stepped on the stage of the "solutions" to solve the climate crisis. Be it clean, low emission, grey, blue, purple, pink, green, you name it. "It's the most abundant element on the Planet", "it is generated by water", "it's zero emission". These are some of the most heard statements of the last few years. They're all true. Misleading though, when out of context.



In terms of production, for instance, only green hydrogen could be produced with (near) zero emissions. Would it have no impact whatsoever on the environment, then? Unfortunately, that's not the case. If we look at its long haul transport - the forbidden dream of fossil fuel corporations such as Snam - all colours of hydrogen have an impact and not simply in terms of emissions. Then, we get to storage and distribution and even here not much is being said, at least on the related risks. If we look at the energetic and productive model, then, does hydrogen really

represent a turning point for the achievement of a paradigm that would be both low emission and more sustainable, democratic and fair?

In short, quite a few questions need to be asked. One first step to disentangle the skein could be made by stepping into the complexity of the topic and trying to set a few anchors. In order to do that, we started from the supply chain of the "cleanest" - green - hydrogen, to try and understand whether it is really sustainable. Or else, if "green" hydrogen is a

"trigger" that is ably used by big corporations to ask for public funding - as in the retrofitting of the network of gas transport and distribution - in order to lay the ground for a new era of energy colonialism in the so-called "supplier countries" of a new commodity. Hydrogen, that is, artfully fit for the greenwashing of a sector - energy - which strenuously opposes the exit from the fossil fuel model. In that case, who would be profiting from the investments proposed in the name of a token sustainability?

We asked to Leonardo Setti (University of Bologna) and Sofia Sandri (Centro per le comunità solari /Center for solar energy communities) to look into the hydrogen strategy guidelines developed by the Italian government and EU hydrogen strategy objectives, and explore the question:

Would a green hydrogen production and supply chain, organised to achieve these objectives, be sustainable?

<https://www.recommon.org/en/the-illusion-of-green-hydrogen/>

**"Is green hydrogen
sustainable?"**



From the EU Green Deal to Next Generation EU, hydrogen is the silver bullet for the decarbonization of EU economy

Next Generation EU => prioritize green hydrogen, with funding dedicated to on-site production through the development of hydrogen valleys, and the development of innovative technologies to produce it

EU target:

1 million tons of green hydrogen per year by 2024
through 6GW of electrolysis capacity

10 million tons of green hydrogen per year by 2030

=> 40GW of electrolysis capacity in EU (+ 40 outside) by 2050

Italian target (preliminary guidelines):

700,000 tons of green hydrogen per year by 2030,
through 5GW of electrolysis capacity

Criticalities

Long distance transport is extremely energy intensive and energy inefficient

Even if we leave aside open questions about feasibility and cost of a 100% hydrogen pipeline:

- a hydrogen backbone for the transport of hydrogen for thousands of KM would be totally inefficient (3 times the energy needed for the transport of gas)

Storage is also energy intensive

- storage of liquefied hydrogen => 30% of the hydrogen's lower calorific power (PCI) is consumed

- storage of compressed hydrogen => 4-7% of the PCI is consumed

Water consumption is an issue

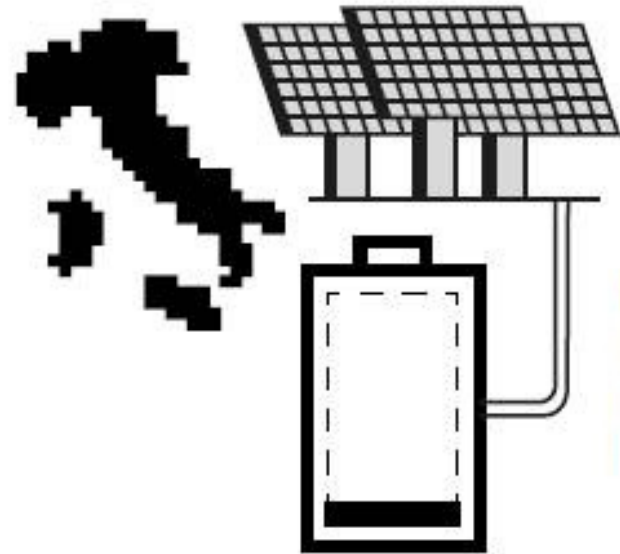
9 liters of water for 1 kg of hydrogen

6.3 million cubic metres of water per year

to produce 700,000 tons per year by 2024 (Italian target)

If we transported it by pipeline

It would take 3 times the power of compression required for the transport of fossil gas, or 20 TWh per year



which are equal to 20 GW, almost all the derived power from photovoltaics in Italy

100% of the power derived from photovoltaic in Italy

20 TWh per year for hydrogen → 20 GW

If we were to store it for a long time

The storage of liquid hydrogen would take place inside cryogenic storages, which require constant consumption of energy and does not eliminate the natural dispersion



0,4% of hydrogen evaporates everyday

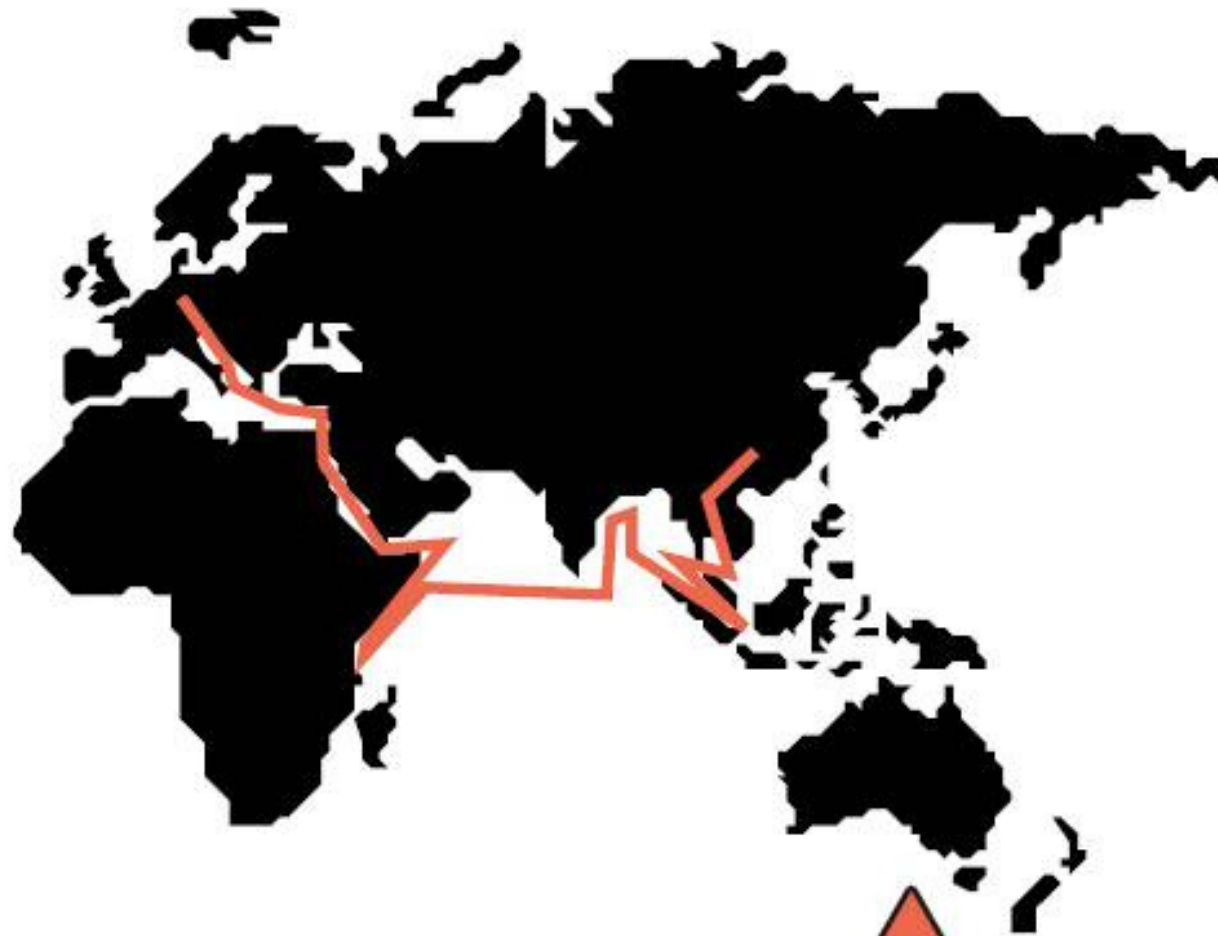


il 50% of hydrogen evaporates after 4 months

50% of stored hydrogen disperse after 4 months

If we carried it via ship in liquid form

Considering a Europe-China return trip



A ship adapted to transport hydrogen of 15,000 tons by weight, would consume approx 2000 tons of hydrogen as fuel: 100 GWh of electricity

1/7 of the transported hydrogen would be needed to power the ship



Soil consumption is also an issue

Italian National Strategy aims at 5GW installed electrolysis capacity by 2024

=> may not be enough to produce 700,000 tons

=> constant and dedicated power all year long may not come from solar and wind

So, where will the energy come from?

WEC-Europe scenario of hydrogen production by 2030

=> 40 GW hydrolysis capacity could produce 2.6 million tons of hydrogen (not 10 million tons)

and only 0.8 million tons would come from renewable energy

most hydrogen produced using "additional generation from existing nuclear power plants"

1 electrolyzer of 100 MW

=> 375 megawatts of
wind power (11,000 hectares!)

=> or 625 megawatts of
photovoltaic power (862 hectares!)

50 electrolyzers of 100 MW each
(5GW)

=> 550,000 hectares of wind farms /
5,500 km²

= Modena and Reggio Emilia districts
combined!

=> or 43,100 hectares of solar farms
/431 km²

=> HYRDOGEN (OR ELECTRICITY) TO BE IMPORTED FOR LONG
DISTANCE / THOUSANDS OF KM FROM OUTSIDE THE EU

RePower EU and hydrogen



With RePower EU, "non-fossil", "low carbon hydrogen" are back. The external energy policy contains elements that reinforce criticalities emerged from our research:

= > Concerns that the review of RRF national plans may include pipeline retrofitting/hydrogen ready, CCS projects for blue hydrogen, etc and incentive for H2 produced thorough electricity generated by nuclear power plants

= > Concerns for external dimension: RePOwer EU set a target of 10 million tonnes of domestic renewable hydrogen production and 10 million tonnes of imports by 2030
This could lead to energy colonialisms and resource and energy grab in North Africa (Egypt, Tunisia, Algeria), Ukraine, SubSaharan Africa and Latin America.

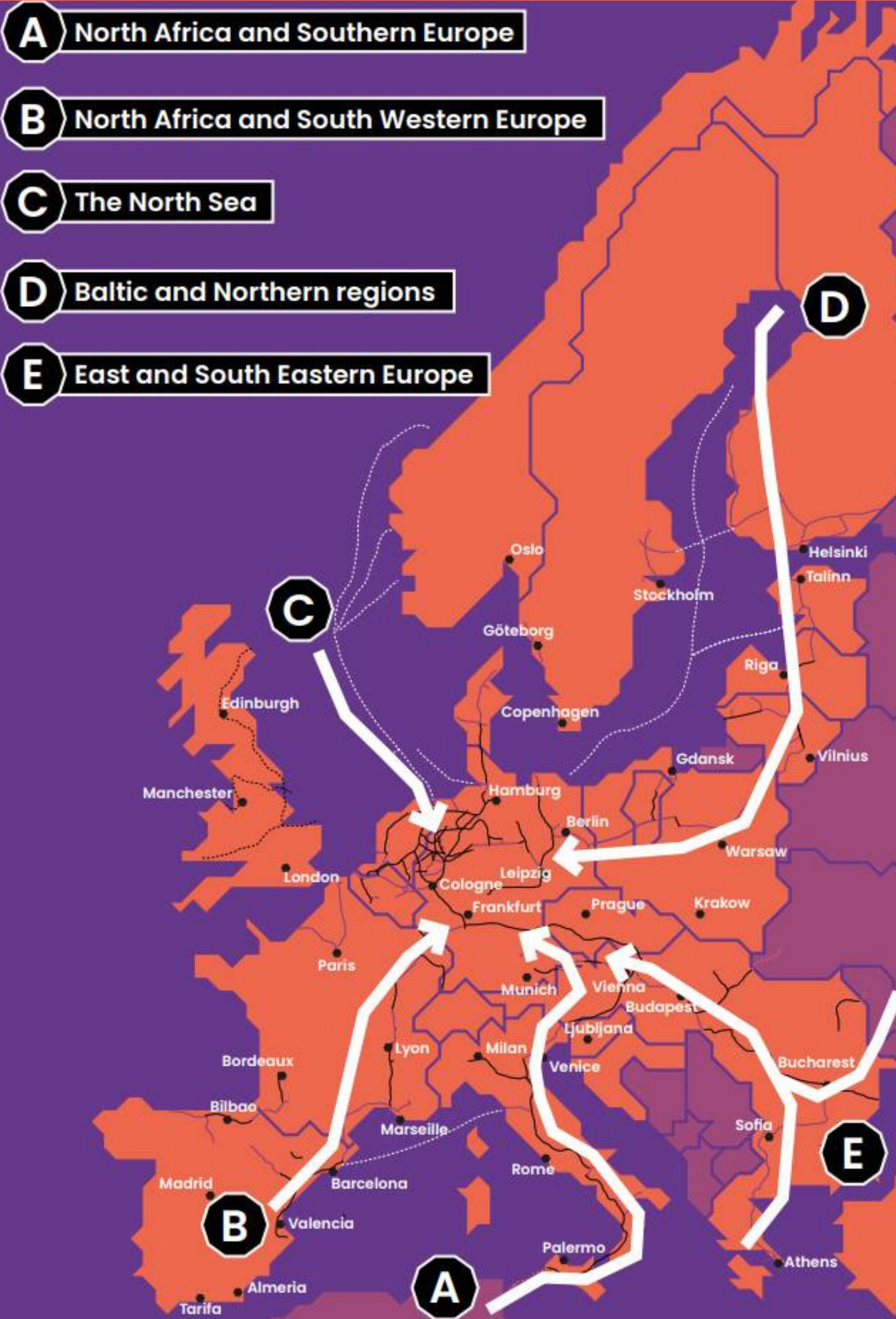
A North Africa and Southern Europe

B North Africa and South Western Europe

C The North Sea

D Baltic and Northern regions

E East and South Eastern Europe

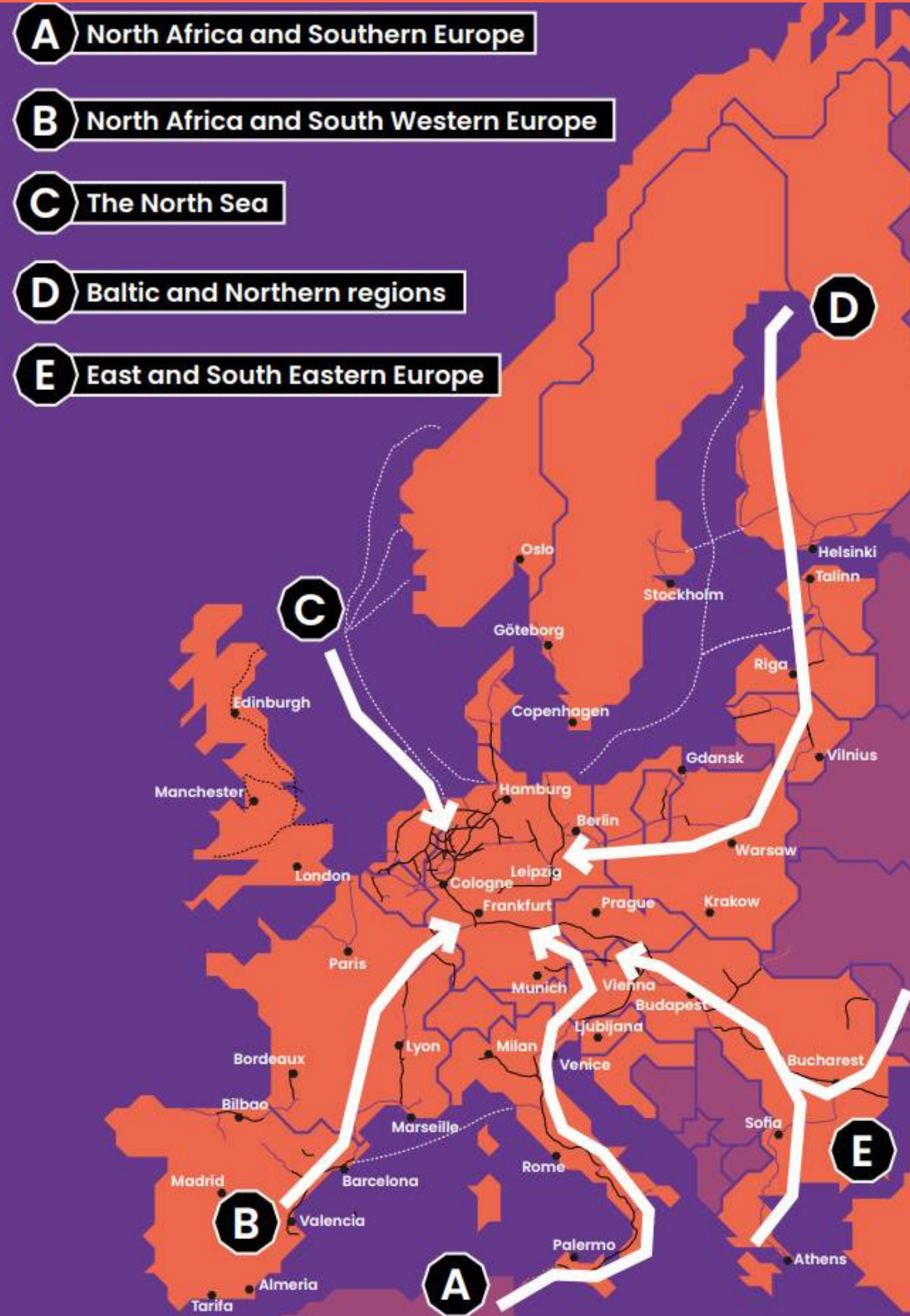


A few days after RePower EU was published, 31 gas transport corporations united in the European Hydrogen Backbone Initiative presented their necessary-investment plan to implement a "shared vision" –that is their vision – for a "climate-neutral Europe, enabled by a thriving renewable and low-carbon hydrogen market"

80- 130 billion investment plan structured on 5 import corridors

Italian TSO Snam is on a leading position, controlling the TransMed gas pipeline, Trans Austria Gas pipeline (TAG), the interconnection Italy-Slovenia-Hungary and the Trans Adriatic Pipeline (TAP)





The next stage of the corporate plan would imply going from 28,000 km of gas pipelines to approximately 53,000 km by 2040. 60% of those would consist of readapted gas pipelines –including underwater – fit from the start to transport also hydrogen.

https://www.ehb.eu/files/downloads/1654775681_EHB-CEO-pledge-signed.pdf



**"Is green hydrogen a
trigger?"**



Many criticalities in the current plans imply that most of the green hydrogen will be produced outside the EU and transported on long distances, making it unsustainable and a block to full electrification and to a just and sustainable transformation of EU economy.

Green hydrogen may be a trigger for public investments into retrofitting of the gas transport and distribution system (to avoid pipelines and infrastructure becoming stranded assets) for the construction of a market (not niche, local production) where hydrogen produced by nuclear or gas may also circulate.

It may serve the purpose of laying the ground for a new era of energy colonialism in the so-called "supplier countries" of a new commodity. As a minimum, this is leading to more investments into the gas infrastructure, ensuring their value beyond 2050.

It leads to expansion of the gas transport: "hydrogen readiness" used to justify building new gas pipelines

= > gas lock in for EU economy



Contro
le ingiustizie
per natura



Thank you!

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