Building blocks for climate justice

Hydrogen and Climate Justice

Transformative.
Solidary.
Feasible.

Hydrogen is no magic bullet against the climate crisis.

"Green" hydrogen may be usefully applied in various sectors. But European industry plans to secure supplies through massive imports from the global South threaten to follow centuries-old patterns of global injustice. Until such time as these imports might be realized, large amounts of climate-damaging fossil hydrogen are supposed to be burned.

konzeptwerk
neue ökonomie

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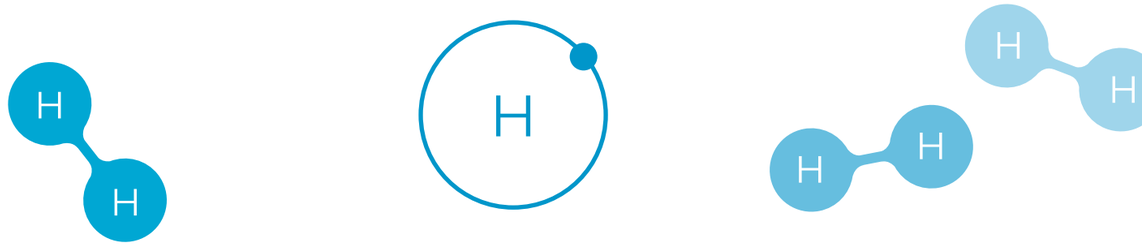
At a glance

- “Green” hydrogen made from 100% renewable energy may contribute to a climate-friendly and equitable economy if its application is limited and clear political priorities are set for specific uses.
- Hydrogen will not obviate the need for industrial degrowth in a truly social-ecological economy. The massive hydrogen buildup planned by industry, the EU and the German government may end up harming the climate since not all anticipated demand can be met through “green” hydrogen in the foreseeable future.
- New fossil gas grids are currently advertised as “H_2-ready”, but this is a stark exaggeration and might lead to another fossil lock-in for decades to come.
- Planned mega-projects for hydrogen exports in the global South threaten to extend colonial injustices. Resources including money, land, freshwater and raw materials are being appropriated for further European industrial growth rather than serving to support a local, democratic energy transition. Such developments must be prevented through strong legal protections.



What is hydrogen?

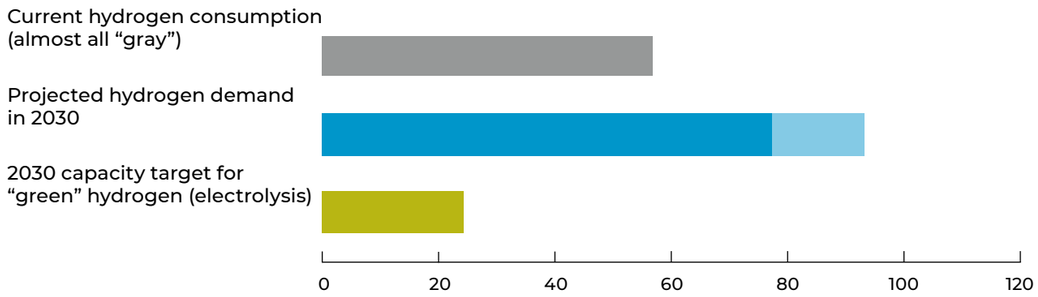
Hydrogen (H) is the most common chemical element in the universe. On Earth, it mostly occurs in molecular form: as H_2, a colourless and odourless gas which only liquefies at extremely low temperatures (below -250 °C). Research in many economic sectors has focused on opportunities to use hydrogen as a potentially climate-friendly energy carrier. Some industries have long been using hydrogen – but almost exclusively H_2 made from fossil gas.

To be rendered usable as an energy carrier, pure hydrogen must be produced from water. In the process, energy from sources such as fossil gas (“gray” hydrogen, made through steam reforming) or renewable power (“green” hydrogen, made through electrolysis) is converted and thus made transportable, storable and applicable. So no new source of energy is developed. On the contrary, energy losses occur in conversion processes.

Hydrogen colour theory (selection)

green	Electricity from renewables
gray	Fossil gas
blue	Fossil gas (or similar) + CCS (Carbon capture and storage)
turquoise	Fossil gas + methane pyrolysis
pink red	Nuclear energy

More Gray than Green?
German hydrogen plans for 2030 (Twh)



Whence the hype, now?

Hydrogen is currently a more salient topic than ever, owing both to the reinforced search for industrial climate solutions and to the energy policy ramifications of Russia's attack on Ukraine. The German government pushes for new **LNG terminals** to import liquefied fossil gas by sea in order to reduce its dependence on Russian gas. These new infrastructures are justified by reference to a potential future switch to "green" hydrogen ("**H_2-ready**" – but these claims are **very questionable**, see "*So much for H_2-ready*"). This strategy was recently reaffirmed on the international stage at the **G7 summit.**[1]

In its coalition treaty, the new German government committed to **doubling its "green" hydrogen capacity target** for 2030 (by electrolysis). Despite claims that local production of hydrogen from renewables was the "first priority," the government's plan only aims to obtain about one-quarter of projected German hydrogen demand from such sources by 2030.[2] Thus, the largest share would have to be imported or made, as is currently the case, from fossil fuels. The **EU** has similarly reinforced its hydrogen targets since the onset of the war, particularly with regard to imports, and is currently negotiating a range of regulatory issues.[3] Various market forecasts predict annual growth rates of above 50% for the global "green" hydrogen market over the next few years.[4]

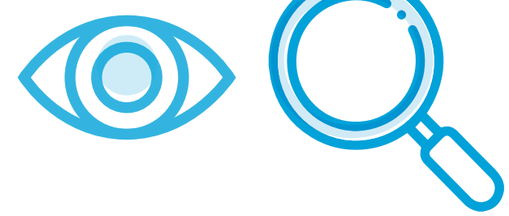
What makes hydrogen attractive – and for whom?

Hydrogen can **bridge gaps in the energy transition:** Hydrogen-based solutions are currently being developed in various sectors which are difficult or impossible to electrify directly. These solutions could be made to work on the basis of renewables, for example in the steel industry.

Hydrogen and its derivatives can replace fossil fuels in many applications and thus could **extend the lifespan of fossil infrastructure systems** such as the internal combustion engine or the fossil gas grid. Thus, old business models could be preserved. But what's reasonable from the viewpoint of particular firms or industries is not always reasonable at the systems level. "Green" hydrogen will be too scarce to be used in all of these sectors (see "*A sober look*"). Moreover, such hopes are frequently exaggerated at the purely technical level as in many cases, retrofitting infrastructures for hydrogen use would be quite costly.[5]

Across Europe, the most active lobbying force behind hydrogen has been the fossil gas industry, including gas producers as well as companies building and running gas grids. An extensive study by European NGOs shows how strongly the public-private lobbying body *Hydrogen Europe*, dominated by the gas industry, and associated organisations shape the EU's hydrogen policy.[6] The German car industry now focuses most of its efforts on more efficient and cheaper battery-electric vehicles rather than on hydrogen engines. Nevertheless, politicians (e.g. from the liberal party, FDP) continue to lobby for "e-fuels,"[7] synthetic fuels for combustion engines made from electricity, which could be produced from hydrogen and used e.g. for sports cars.

A sober look



For years, environmental organizations and scientists have countered the hydrogen hype with a more sober response.[8] Major points of their argument:

1. **Colour theory:** In addition to "green" hydrogen, made from renewable energy by way of electrolysis, "blue" and "turquoise" hydrogen are frequently framed as climate-friendly solutions. Here, the idea is to capture the CO_2 emitted when burning fossil gas in the hydrogen production process, and to store it underground (CCS, carbon capture and storage) or reuse it in solid form. But this will not be economically viable at scale, and CCS still involves various safety risks. What's more, highly climate-damaging methane already leaks at the fossil gas production and transportation stages. "Pink" hydrogen from nuclear energy isn't "clean," either. Only "green" hydrogen made from 100% renewables can ever be clean.
2. **"Champagne of the energy revolution":** "Green" hydrogen will only be available in limited amounts – and expensive. It thus needs to be applied very selectively, in processes that are both impossible to electrify directly and absolutely necessary to maintain.
3. **100% renewables first:** Not until all electricity demand can be met with renewables will the broad application of "green" hydrogen become justifiable in terms of climate and energy policy (see *"Climate trap H_2?"*).
4. **Prioritization of applications:** In the future, hydrogen could be used as a storage medium to stabilize the renewable energy and heat grids. In addition, high-temperature applications in various industries could run on hydrogen, and various base materials could be produced with H_2 (e.g. in the steel, glass and chemical industries). But even here, in many cases potential alternatives are available, and recycling rates could be improved. As for transportation, hydrogen could be used in long-distance freight traffic and shipping and is being discussed as an alternative in the aviation sector (but more on this in the sections "*Climate justice*" and "*Climate trap H_2?*"). Hydrogen is **not recommended** for decentralized heating systems or individual road traffic, where electric solutions are much more energy efficient.

So much for H_2-ready

New fossil gas infrastructures, including pipelines and LNG terminals for seaborne liquefied gas imports, are currently legitimized vis-à-vis the public by reference to their "H_2-readiness," referring to the possibility of a later conversion to ("green") hydrogen.

But this is **exaggerated in technical terms** – in most cases, retrofitting costs could exceed the costs of building new hydrogen terminals. Frequently, "H_2-ready" only means that some hydrogen could be blended into fossil gas – which would only delay the necessary phase-out of fossil gas. The German LNG acceleration law in fact includes no criteria for "H_2-readiness."

In infrastructural terms, a conversion would not make sense either given that the distribution of future hydrogen demand will not follow today's patterns of fossil gas demand (e.g. for heating systems and power generation). The shipping of hydrogen to LNG terminals, subject to high energy losses through multiple conversions, is expected to remain uneconomical; even government officials mostly expect future hydrogen imports via pipelines. Hydrogen derivatives such as ammonia are easier to ship and retrofitting of terminals is less expensive, making this a more realistic option if these derivatives are then used directly. Once again, reconversion into hydrogen would entail added costs and energy losses.[9]

Climate justice

Some aspects of climate justice tend to be neglected in technical debates around hydrogen. Who says that all industrial production in Germany needs to continue? Wouldn't it be more sensible to **build back** some fossil infrastructures if locally produced "green" hydrogen cannot remotely satisfy all demand? Which other sustainability problems (e.g. concerning raw materials) are ignored in one-to-one substitution plans? Which human needs are actually met by the respective end products?

What's more, the question of who will get to use scarce "green" hydrogen in the future, and for what purposes, is not merely a technical consideration. It involves a **question of social justice:** Who will get to consume the goods thus produced? From this point of view, it would not be justified to use a large share of available hydrogen for aviation, where it mainly benefits frequent flyers who constitute a small, privileged minority even within Europe – and even more so at the global scale. Priorities will either be set politically – or market purchasing power decides.

Likewise, hydrogen import plans deserve critical attention from a climate justice perspective (see *"Imports: Neocolonial practices?"*).

Climate trap H_2?

Hydrogen is frequently discussed as a key technology within a future climate-neutral economy. But in several ways, plans for a large-scale hydrogen run-up could threaten climate targets:

1. **It all depends on scale:** The more hydrogen infrastructures are built across sectors, the greater the risk that much of this demand – particularly in the short term, but also in the longer term – cannot be met through "green" hydrogen alone, not even through imports, which are only likely to become available at scale after 2030. This is where "blue," "turquoise" and even "gray" hydrogen come into play. Industry has been demanding "technology neutrality" in hydrogen development for this reason, in blatant contradiction of its own promises of a climate-friendly hydrogen strategy. Depending on the application, the carbon balance of fossil hydrogen can be even worse than for the "traditional" burning of fossil fuels due to high conversion losses.

2. **"Clean" hydrogen?** Particularly at the EU level, industry representatives have been slyly attempting to bring the concept of "clean hydrogen" into play.[10] Besides "green" hydrogen from renewables, this is understood to include "blue" or "turquoise" hydrogen from fossil gas or "pink" hydrogen from nuclear energy. These are neither climate-neutral nor "clean" (see *"A sober look"*).

3. **Lacking additionality:** Even "green" hydrogen can only ever be climate-friendly if the renewable energy used for electrolysis is from additional production. At this point, Germany and most potential export countries are far from a 100% renewable energy mix. As long as this remains the case, even "green" hydrogen production consumes scarce renewable energy capacity – and might lead to more fossil power in the power grid. Additionality regulations are currently highly contested in the EU apparatus.

4. **Green aviation illusions:** The aviation industry justifies its massive growth plans by reference to hydrogen-based e-fuels, hydrogen fuel cells or hydrogen engines that burn H_2 directly. But firstly, these technologies will at best become market-ready in several decades, long after global CO_2 budgets have been exceeded. Secondly, it remains entirely unclear how the massive demand for renewable energy resulting from such growth could be met. Even today, it would take 2.5 times the global renewable energy capacity to replace all kerosine with e-fuels. And thirdly, about two-thirds of aviation's climate impact does not stem from CO_2 emissions but from vapour trails and nitrogen oxides. These can only be partially mitigated through hydrogen technologies.[11]

Imports: Neocolonial practices?

In several respects, German and European hydrogen import plans threaten to perpetuate colonial patterns:

1. **Unequal power relations:** When negotiating import agreements with Southern states, states like Germany largely dictate the terms and conditions. Germany seeks to ascend to world market leadership in hydrogen technologies while African countries offer the required land and natural resources. Accordingly, with respect to hydrogen imports, the German government's coalition agreement only promises to "secure fair competitive conditions for our economy."[12]

2. **Energy poverty and local energy transition:** Mega-projects for "green" hydrogen exports from the global South tend to occupy the most favourable locations for renewable energies. This jeopardizes local renewable energy supply, especially since in many of these areas, a large share of households do not as yet have access to electricity. In western Africa, this is true for almost half of all households, while the overall energy mix is still dominated by fossil fuels.[13] The local population's access to renewable energy should be warranted before beginning to export energy.

3. **Who benefits?** Export projects of the kind now envisioned by the hydrogen industry are usually planned by transnational corporations from the global North according to their interests.[14] Little of the value added remains in the area of origin; the most attractive jobs are commonly given to specialists flown in from Europe. Likewise, the entry requirements of state subsidy programmes such as *H2Global (Germany)* benefit European corporations. The hydrogen sector is soon to be added to the Energy Charter Treaty, meaning that corporate interests in this field will receive more comprehensive legal protection from state interventions.[15] After all, the large-scale infrastructure requirements of a hydrogen export economy (pipelines, electrolysers, tankers, terminals) are difficult to fulfil other than through mega-projects. This does not favour local self-determination of economic development.

4. **Local collateral damage:** An unequal ecological exchange between world regions is taking place, in which Germany and Europe conveniently outsource negative impacts. Hydrogen production requires much freshwater, which in arid regions is already scarce. Desalination plants have been suggested in response; but here, usually, residues are dumped back into the sea, causing ecological damage. Moreover, conflicts over land are to be expected if large areas are appropriated for energy exports.[15]

Mega-projects for hydrogen exports

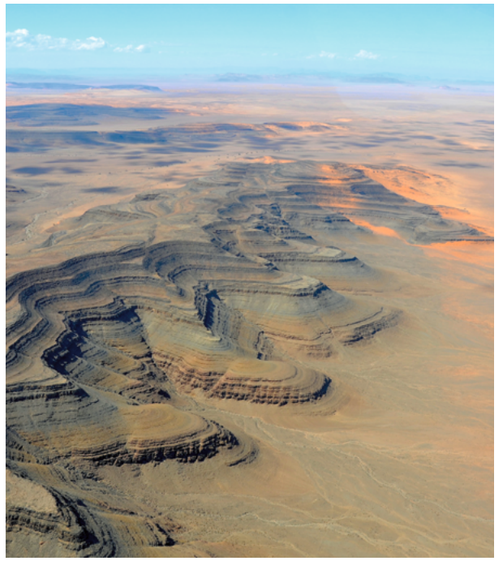
By Johanna Tunn and Tobias Kalt (H2Politics research group, University of Hamburg)

Democratic Republic of the Congo (DRC)

In the DR Congo, green hydrogen is to be produced from hydropower for export to Europe. For this purpose, the construction of new megadams is planned at the Inga waterfalls of the river Congo. After the World Bank withdrew in 2016, it is now the Australian mining corporation *Fortescue* which moves the US$80 billion project ahead.[17] The largest buyer is the German energy corporation *E.ON*, which has committed to purchasing 5 million tons of green hydrogen from Fortescue by 2030.[18] Besides massive interferences with the river ecosystem, for the next project phase Inga-3 alone, 37,000 residents would have to be forcibly relocated.[19] In addition, there is a large unmet need for energy among the population, given that as yet less than 20 per cent of households have access to electricity.[20] But the electricity produced by the dam is instead intended for use by the mining industry as well as for direct electricity and green hydrogen exports. Appolinaire Nsoka of the *Initiative for Local Development* criticises the project: "This is the concept of the centre and the periphery. Everything that's produced here will be brought to the centre, to the West, where they are facing the challenge of the energy transition... But we don't think that we've already covered the electricity needs of our country."[21] Resistance against the mega-dams is led by *Femmes Solidaires (FESO)*, *Women against Mining (WoMin)* and *International Rivers*, among others.[21]

Namibia

In Namibia, *Hyphen Hydrogen Energy*, a joint venture between German producer of renewable energy *Enertrag* and investment trust *Nicholas Holdings*, plans to invest US$9.4 billion in a hydrogen project – this almost equals Namibia's annual gross domestic product.[23] *Hyphen* wants to install plants at the country's southwestern coast with the capacity to convert 5 GW of electricity from wind and solar farms into 300,000 tons of green hydrogen per year. The area includes 4,000 km² and covers one-fifth of the Namibian Tsau/Khaeb national park. The export-oriented production of green hydrogen is intended to enable Namibia to generate income from energy exports. However, there is a high risk that a hydrogen enclave emerges, in which hydrogen is produced for export by workers flown in from Europe with imported technology while the local economy and the Namibian population hardly benefit. While development finance institutions in particular have become interested in the project, the Namibian government also contributes a share of 24% while assuming the default risk in case the project fails.[24] Cases of land acquisition without prior consultation of residents as well as intransparent tendering procedures suggest that the project is being shaped outside forums of civic participation.[25] Thus, further conflicts around energy and water may arise.



Hyphen Hydrogen Energy plans to install its project in the Tsau/Khaeb national park, in one of the most biologically diverse areas in Namibia. Photo: Olga Ernst/HP Baumeler, CC BY-SA 4.0

Climate justice demands

In the following, we would like to propose a few starting points for a stance towards hydrogen policy that takes climate justice seriously.

1. Several key points are shared by many civil society organisations.[26] **Only "green" hydrogen** made from 100% additional renewable energy is justifiable at all. Applications should be prioritized politically, and hydrogen should be inserted into the energy system with a view to the entire system's functioning.

2. Another clear red line: **No more fossil infrastructures** may be built – not even if they are sold to the public, with flimsy arguments, as "H_2-ready."

3. **Degrowth first, hydrogen second**: There is hardly another branch in which it becomes so evident that an actually "green" production needs to be limited. The allocation of this scarce good has to be determined politically in order to address social justice concerns. The aviation industry, for example, needs to shrink – instead of appropriating all available hydrogen for a select few people's joy of flying.

4. Several organisations in Germany have proposed criteria for a sustainable, socially j**ust hydrogen policy:**

   → The Rosa Luxemburg Foundation proposes an "Additionality 2.0" which not only guarantees that hydrogen is made from additional renewable energy capacity and avoids negative impacts in the exporting country (land use conflicts, water availability), but also warrants additional benefits for the local population (e.g., access to renewable energy, local added value).[27]

   → The German Advisory Council on the Environment (SRU) demands "dark green" hydrogen with particularly strict social-ecological criteria.[28] Likewise, the government's National Hydrogen Council recommends a relatively comprehensive set of criteria[29], which largely overlaps with the position paper published by Klima-Allianz, a broad coalition of civil society organisations.[30]

   → The fact that the industry-heavy Hydrogen Council proposes almost the same criteria as civil society organisations should give us pause. It becomes all the more important to **put these sets of criteria into perspective, with a view to power relations**. Mega-projects for hydrogen exports are born from very unequal power relations within which the realisation of any social-ecological wishlist is unrealistic. The targeted export countries are economically attractive precisely because they offer opportunities for cheap production, and because the local populations have a hard time asserting their rights. A strongly decentralized and locally, democratically controlled hydrogen export economy in the global South would be expensive for importing countries and difficult to realise in infrastructural terms.

   → Minimal requirement: In order to be effective, **import criteria must be legally fixed, verifiable and enforceable**. Voluntary industry certifications for sustainable "premium hydrogen" would have little effect across the sector. An intermediate step would be to turn the fulfilment of criteria into a prerequisite for public subsidies, as suggested by the Hydrogen Council – this would be more binding than voluntary schemes, but still weaker than general legal provisions.

5. After all, the **dominant idea of a hydrogen economy reflects a "business as usual" stance at the structural level.** What is needed is the exact o**pposite: a social-ecological transformation**, in the course of which power relations are significantly transformed – within Europe as well as between the global North and South. In such a constellation, "green" hydrogen could play a limited role.

Resistance and leverage points

There has been a range of critical civil society engagement with the official hydrogen strategy and the projects thus legitimized. We would like to introduce some of these efforts here – and offer some suggestions for further potential leverage points.

Photo: Roger Marks (CC BY-NC-ND)

→ With the expansion of only allegedly "hydrogen-ready" **LNG terminals**, which imply a fossil lock-in for decades to come, the German government has been rapidly creating facts on the ground in 2022. Groups like Ende Gelände and the Gastivists network, NGOs such as the Deutsche Umwelthilfe and local citizens' initiatives such as the "BI gegen CO_2-Endlager in Schleswig-Holstein" have been working against these developments.[31]

→ In **Wilhelmshaven**, plans even include an "**Energy Hub Port**," which is supposed to import hydrogen derivatives in addition to LNG, produce hydrogen on site and export captured CO_2 from all over Germany[32]: quite a lot of fossil fuels for a putative energy transition showcase project.

→ Organisations such as Corporate Europe Observatory and Stay Grounded work to **debunk industries' greenwashing myths in relation to hydrogen**. The research project H2Politics at the University of Hamburg likewise engages critically with the global hydrogen trade and develops comprehensive criteria for "hydrogen justice."

→ Most envisaged hydrogen mega-projects in the global South are still at a relatively early planning stage. Thus, conflicts on the ground may be expected to intensify over the next years. It will then be all the more important for the European climate movement to **support local resistance groups and civil society organisations in exporting countries**, to listen and to help make their voices heard in importing countries (for specific references, see *"Mega-projects for hydrogen exports"*).

→ At the moment, **disputes are taking place in EU institutions** around additionality regulations for the renewable energy used to produce "green" hydrogen. Even "blue" hydrogen has received renewed attention, and the use of hydrogen for less sensible applications has been proposed.[33]

→ The German government wants to **revise the National Hydrogen Strategy**, adopted in 2020, in the course of 2022. Imports will play a crucial role. In its coalition agreement, the government refuses any political prioritization of applications: "We do not seek to restrict the use of hydrogen to particular areas of application."[34] The most important governing body is the government-appointed National Hydrogen Council, which, however, is dominated by industry representatives.

→ The more "blue" hydrogen is produced, the more risks will emerge from **carbon storage** (via CCS). In the face of massive domestic resistance against CCS, **Germany intends to export these risks**. Here, cooperation with civil society organisations in the importing countries will be essential.

→ Any **engagement for a true transformation** of the economy towards sustainability, social justice and independence from growth could reduce future hydrogen demand!

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