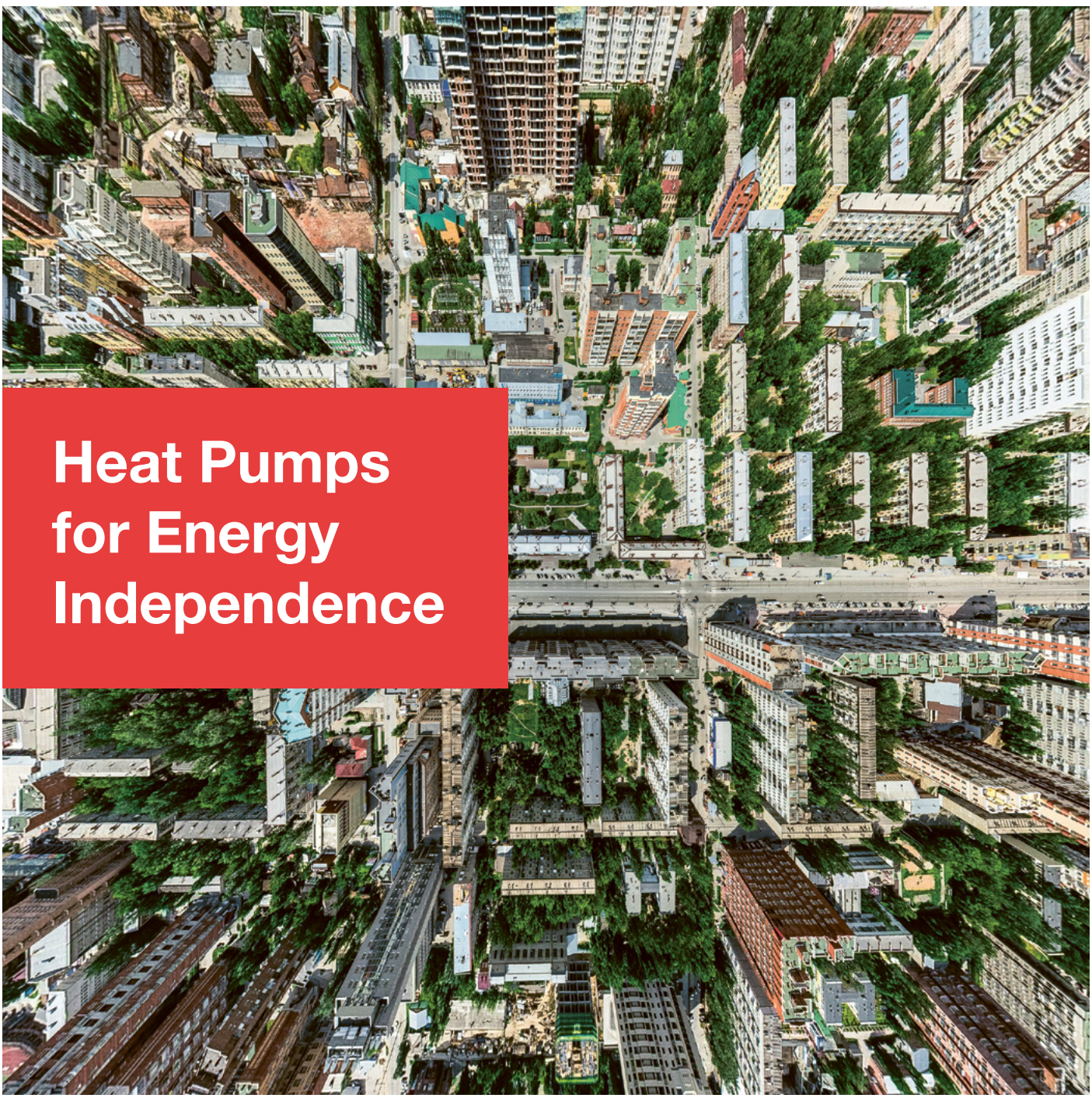
REVOLVE

QUARTERLY INSIGHTS INTO A CHANGING WORLD

N°48 | Summer 2023



Heat Pumps for Energy Independence

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A Just and Healthy Energy Transition

Summer is here and against all odds Europe survived the dire predictions of winter without Russian gas – at a very high price for its citizens and residents. The good news is that the production of electricity using renewable energy hit record highs and Europeans are now convinced that reliance on coal and gas must belong to the past.

In this issue, we focus on heat pumps and passive cooling as alternatives to fossil fuels. To achieve our climate goals, Europe's buildings require a 60% drop in greenhouse gas emissions by 2030, and they can do so by substituting oil and gas boilers with air or water heat pumps, and by applying passive cooling natured-based solutions instead of installing new air conditioning systems. These choices will help fight climate change and make the energy transition most just and to the benefit of everyone's health and comfort.

Reducing emissions and stopping the bloated system of global consumption will also help heal wounded forests. Our VIEWS takes us to the primary tropical forests of the Amazon, the Congo River Basin and the South-East Asia and introduces us to the indigenous communities fighting against deforestation. Conventional farming degrades and wounds the soil too. We explore how carbon-intensive practices can get phased out by regenerative agriculture that restores life to the earth.

The energy transition includes aviation, leading us to explore contrails and their contribution to global emissions. In addition, water management expert Annelies Broekman brings us solutions to the severe droughts in Catalonia, and we turn to the Orchid City project for sustainable, adaptive, and integrated solutions to urban living. ●

Send us your stories, ideas for features, and other comments at: **editors@revolve.media**

Thanks for revolving with us!



Covering today's challenges for **circularity, ecosystems, energy, mobility** and **water, REVOLVE country** reports take you on **journeys into sustainability.**

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Director, Except Integrated Sustainability

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REVOLVE is committed to climate-conscious reforestation and tree-planting initiatives as part of our company's sustainability policy to mitigate the impact from our business and project travel activities.

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To date, REVOLVE has planted 261 trees in reforestation projects in Roupage (BE) in 2020, Stoumont (BE) in 2021, and Martouzin (BE) and Zaragoza (ES) in 2022.

Cover image:

"The total number of connected heating heat pumps (both air to air and 'hydronic' or water-based) and hot water heat pumps in Europe is now around 20 million. They are providing heating to about 16% of Europe's residential and commercial buildings." (EHPA Association Press Release, 20 Feb. 2023) **Source:** AirCam.PRO / Shutterstock

(Image p.3) Greener cities. **Source:** Nerea Martí Sesarino / Unsplash

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Illustration by Dariana Guevara / REVOLVE

The Skills for the Green Energy Transition

WRITER: **KADRI SIMSON**
EU COMMISSIONER FOR ENERGY

The ambitious new targets for renewables and energy efficiency will require a growing and skilled green transition workforce.

During the energy crisis, many enterprises rapidly shifted towards installing solar PV panels and solar boilers, heat pumps and home insulation to save households from high heating bills and helped all of us to secure energy supply and reducing our dependency from imported fossil fuels.

With 2023 as the European Year for Skills, I would like to highlight the importance of the European workforce and its skills asset to achieve the European Green Deal ambitions.

The European Commission proposed increased ambition for EU's renewable energy and energy efficiency, which the Member States and the European Parliament provisionally agreed on earlier this year. This means a doubling of the annual deployment of renewables compared to 2021, more companies to carry out energy audits, and more people to provide technical and financial assistance to consumers to invest in renewables and energy efficiency. We have also proposed to double the annual energy renovation rate of buildings by 2030.

A green transition workforce will be indispensable to meet these targets, be it in the private or public sector to speed up permitting procedures for renewable projects. And if not properly addressed, it may lead to delays in the roll-out of clean energy technologies across all sectors.

The International Energy Agency estimates that already half of the 60 million energy-related jobs are in the clean energy sector. Globally, clean energy sector jobs are expected to grow from 33 million to more than 70 million by 2030.

In the EU alone, the number of people employed in the renewable energy sector will have to grow massively to keep our industry going. It is estimated that by 2030 we will need to create 3.5 million new jobs, which means more than doubling the existing workforce of an estimated 1.5 million workers.

This is why we focus this year's EU Sustainable Energy Week on the topic of skills. Lack of skills and an insufficient number of workers in the various segments of clean energy technologies' value chains is already perceived as a barrier to investments and is becoming one of the most serious concerns by the industry.

The increased deployment targets will trigger the need for reskilling of the workforce downstream. Where plumbers once installed gas boilers, we will need installers of heat pumps and solar thermal systems. Electricians will have to install solar PV systems and new energy management systems to connect renewables, home appliances and electric charging of vehicles to maximize their benefits.

New skills will also be needed in our infrastructure sectors. Skills on smart grids management, direct current electricity networks, and the operation of electricity grids with high shares of variable renewables will need to become the norm. Gas system operators will need the skills to transition from the management of natural gas pipelines and storage sites to hydrogen and CO2 pipelines.

The Net Zero Industry Act (16 March 2023) will also boost the European manufacturing sector, where new skills will be needed to produce clean tech technologies, such as batteries, electrolysers, and energy management systems. Expanding our manufacturing capacity of solar, wind, geothermal and biomethane technologies will also create new jobs across the EU. Industrial engineers will be needed to electrify our industrial production processes. This is why the Net-Zero Industry Act establishes European Net Zero Industry Academies.

And we do not stop there. Our Critical Raw Materials Act (CRM Act) aims to expand the extracting, processing and recycling of the raw materials needed to produce clean technologies. These are new industries that will require a new skill sets, including for the administrators, regulators and public servants that will be required to govern these new industries.

At the EU Sustainable Energy Week, we will present the newly formed Partnership for Skills in the Renewable Energy Sector. This initiative brings together partners from across the full value chain to identify skills gaps, support education, promote quality careers and diversity, and support public authorities. The partners are inviting additional stakeholders to join this initiative, because a skilled workforce will be beneficial for the whole value chain.

The aim of the European Green Deal is to create a climate neutral economy. This will not only ensure the livelihood for future generations, but it will also provide them with new career opportunities.

Heat Pumps: A Technology for Energy Independence

WRITER: **JOZEFIEN VANBECELAERE**

The rise of heat pumps and how they can help Europe hit its climate goals while weaning itself off Russian gas.

1

A crucial part of the fight against climate change boils down to how we heat and cool our homes but when it comes to slashing greenhouse gas emissions, Europe's buildings are way off track. Achieving the European Union's target of 'climate neutrality' by 2050 will require a 60% drop in greenhouse gas emissions from buildings by 2030 compared to 2022. However, with the policies in place, household emissions are projected to decrease by just 11% by 2030. This is mainly due to the over 90 million fossil fuel boilers installed in homes across the EU.

Cleaner heat, cleaner health

A clean alternative to Europe's vast stock of gas and oil boilers is the heat pump, which takes a renewable source of energy outdoors – from air or water – and efficiently turns it into heat with only a small amount of additional electricity. Heat pumps can also use waste heat from industrial processes or cooling and turn it into warmth for buildings. Heat pump sales in Europe climbed steadily between 2013-20 and spiked in 2021 and again in 2022.

The record-breaking 38% hike in annual heat pumps sales in 2022, which equates to an estimated 3 million devices according to market data gathered by the European Heat Pump Association (EHPA), came amidst Russia's invasion of Ukraine and the widespread disruption it sowed on Europe's energy markets.

In response to the energy crisis, the European Commission presented its REPowerEU plan on 18 May 2022, which set out a roadmap on how the bloc would end its reliance on Russian fossils fuels by 2030. Written into the proposal was a bid to add 60 million more heat pumps to the 20 million already installed in the EU by 2030.

Knock-on effects

The European Commission's heat pump targets would lead to a drop in gas demand from buildings of 40% between 2022 and 2030 and cut CO2 emissions by 46%, an April 2023 study by Cambridge Econometrics calculated.

The lower gas demand would shrink Europe's energy import bills by €60 billion, and household heating bills by 20% by 2030. This would increase a household's disposable income by an average of 2% or more.



2

A new heat pump is installed about every ten seconds in Europe, but a new fossil boiler is installed every eight seconds.

According to the Cambridge Econometrics study, this would also lead to a 2.5% growth in annual Gross Domestic Product (GDP) and create 3 million net additional jobs. Alongside these direct economic benefits of investing in heat pumps are the indirect health benefits they provide, given that they do not produce harmful emissions like burning fossil fuels and biomass. If the REPowerEU ambitions are met, nitrous oxide (NOx) emissions from household heating would also fall by almost 40% by 2030 compared to 2022.

With their many benefits evident, it is no wonder that heat pumps sales are breaking records, but the rollout is simply not fast enough to pull ahead of fossil fuel boilers. A new heat pump is installed about every ten seconds in Europe, but a new fossil boiler is installed every eight seconds.

Unless there is a major shift in direction, Europe will miss its targets and remain trapped in the fossil fuel boiler era for some time to come, with all the negative consequences for health, climate, energy bills and imports that this entails.

EU targets, falling short?

The Commission is aware of the urgency of the situation and has taken several steps to help the sector. Proposed on 16 March 2023, the Commission identified heat pumps as a key net zero European industry in its Net-Zero Industry Act. However, the plan contains little detail in terms of subsector targets or intermediary goals. The Act outlined ambitions to increase the manufacturing capacity of heat pumps to 31 gigawatts (GW) by 2030. This target is far lower than the EHPA foresees.

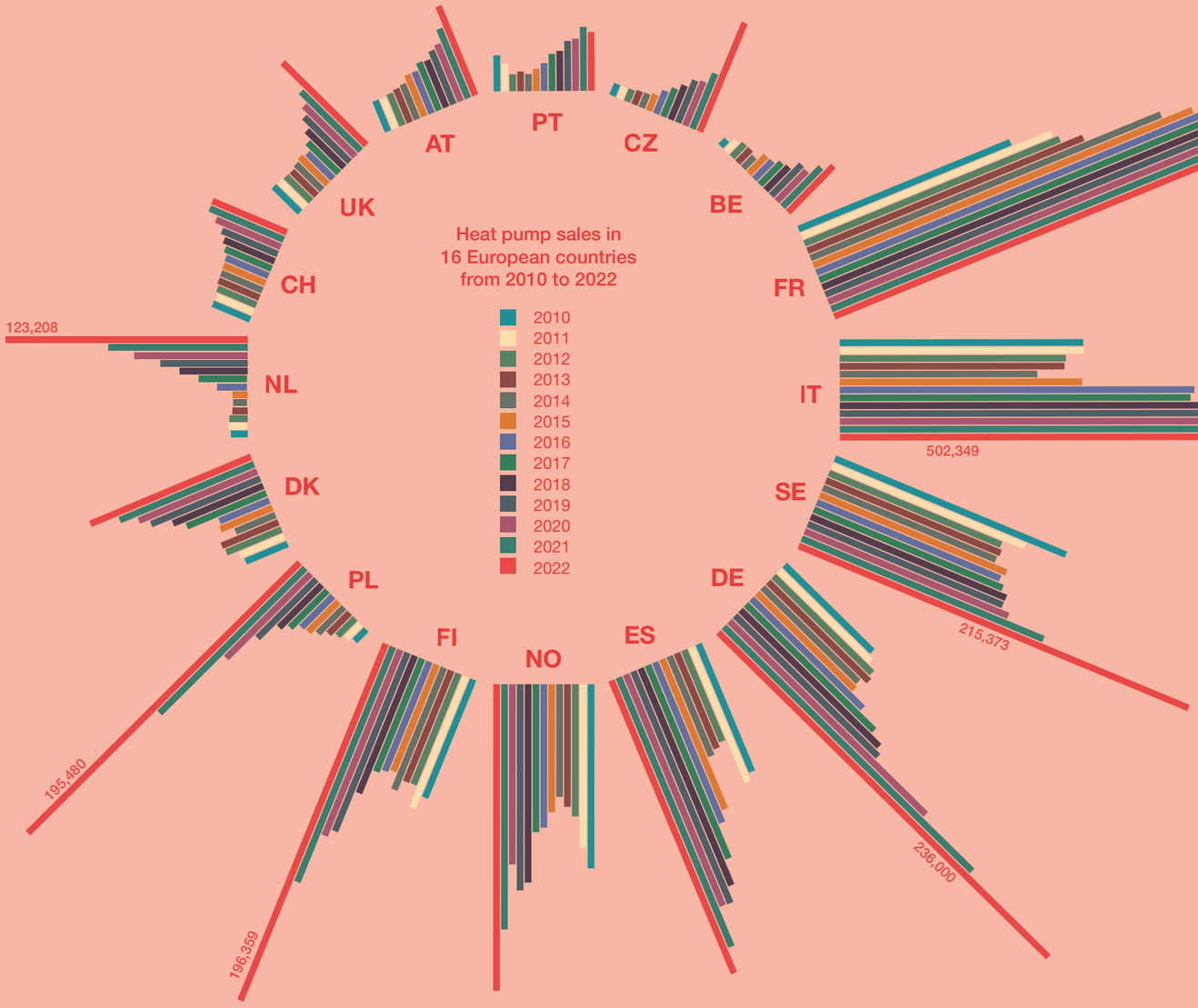
Even a conservative growth scenario would lead to 47 GW by 2030 – more than 50% higher than the Commission's targets. This is starting from the estimated 21.95 GW of European-made heat pumps installed in Europe in 2022. The Act also sets a goal for the EU to produce domestically at least 40% of the technology it needs to achieve its climate and energy targets by 2030.

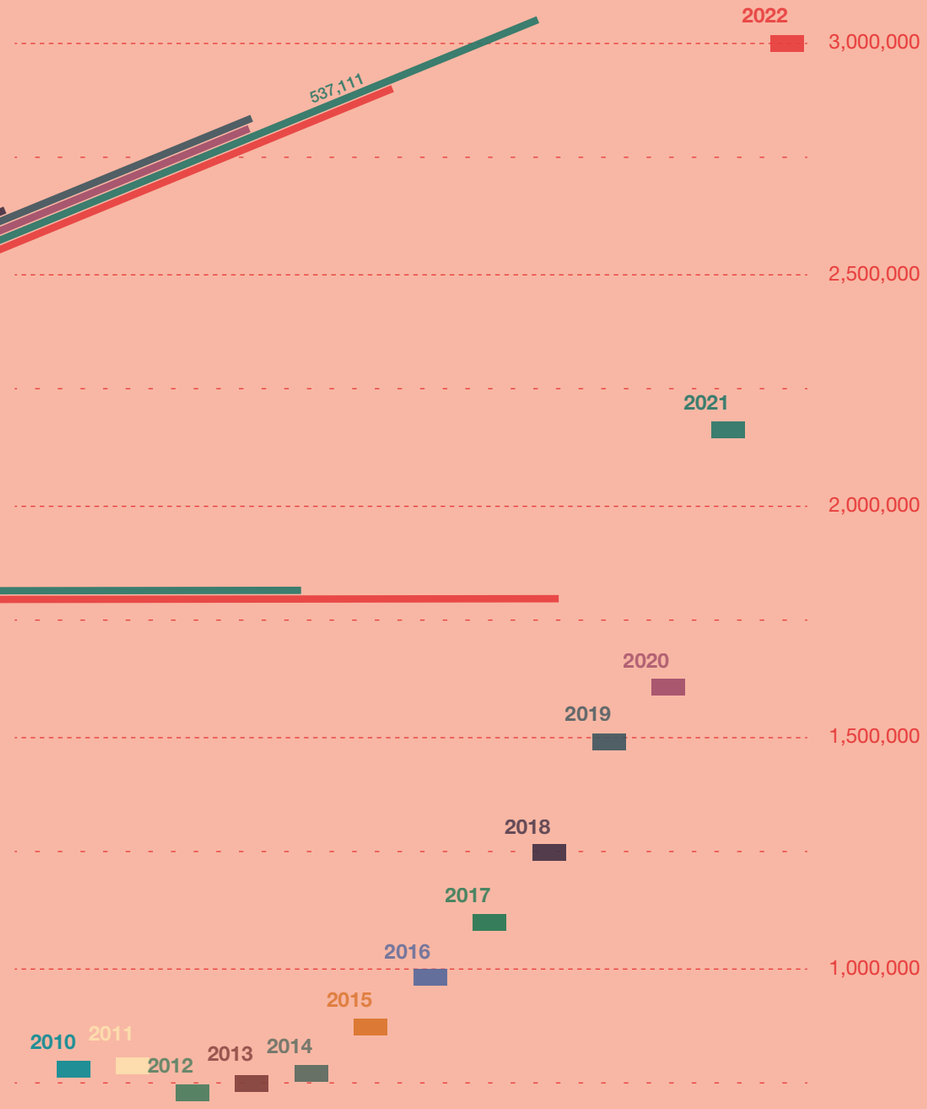
Accelerating the heat pump rollout

Following months of advocacy from the EHPA and its members, the Commission announced it would publish a heat pump

Heat Pump Sales

The European heat pump market broke a new record in 2022, with around 3 million units sold.





Radial bar graph based on data from: Austria, Belgium, Czechia, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Switzerland, UK.
NOTE: The overall figure of 3 million combines 2.7 million heating heat pumps and about 320,000 hot water heat pumps. For Estonia, Hungary, Ireland, Lithuania and Slovakia we added their 2021 sales numbers to make the overall total.

Infographic by REVOLVE. **Source:** EHPA



3



4

action plan before the end of 2023. The plan will include communication outreach to citizens, business and small industries, EU laws to help bring an end to gas boilers – such as the proposal to stop them being put on the market from 2029 – and actions to make financing more accessible.

Part of the action plan is to be an 'accelerator' or partnership between the Commission, Member States and the heat pump sector. The EHPA has already been working on this with the European Climate Foundation and a range of EU officials, NGOs, thinktanks and heat pump manufacturers to identify barriers and how to address them. The 'accelerator' document will be presented to the Commission in early June 2023. Challenges and actions have been clearly identified by participants.

One of the main hurdles to overcome is cost. Even though a heat pump is around 30% cheaper than a fossil fuel boiler over its lifetime, the upfront costs are much higher in most markets. The affordability of heat pumps could be improved by reducing taxes and levies on heat pumps, device installation and electricity.

Information on heat pumps needs to be better and clearer. Comparing heat pump options, choosing an installer, obtaining approvals and qualifying for relevant subsidies can be complex and time-consuming for customers.

There are pools of skilled workers, especially heat pump installers, and demand for such labor will only increase as heat pump sales continue to grow. The EHPA has calculated that REPowerEU's heat pump rollout targets mean we need a minimum of 500,000 skilled full time equivalent employees by 2030 in Europe, up from around 120,000 today. Countries should be encouraged to introduce financial incentives targeted towards installers.

Another major issue arises in the supply chain, where bottlenecks are adding to manufacturing costs and threatening capacity growth plans worth billions of euros. European production capacity could be increased by developing an EU industrial strategy for heat pumps and heat pump components.

The sector would also benefit from investment in power, power distribution and smart grids given that heat pumps can offer flexibility by using electricity when it is in greater supply and cheaper.

A crucial way of ensuring a smoother path for heat pump growth is through legislation that clearly sets a direction of travel and fosters confidence among investors and manufacturers. In this regard, ending the sale of fossil fuel boilers from 2029 would send a clear message on the way the wind is blowing.

Hurdles ahead

The Commission's proposal and vote by the European Parliament to speed up the end of fluorinated gases – an essential component for heat pumps – could jeopardize the goals the EU seeks to reach. The heat pump sector has been gradually moving away from F-gases, due to their impact on global warming, and has been replacing them with refrigerants with low global warming potential and non-fluorinated alternatives.

Yet ramping up the timeline for phasing out these gases at the same time as setting ambitious targets for heat pumps under REPowerEU is incompatible. Instead, the EU needs to allow manufacturers and the whole sector time to adapt rather than slow down heat pump growth and force consumers back to fossil fuels.

Overall, the future is bright for the European heat pump sector.

The sector is in a prime position to help citizens move to secure, clean heating which is not impacted by fluctuating and unpredictable energy prices.

But it needs the barriers and risks to growth to be addressed so that we can achieve clean, affordable heating for all, helping to fight climate change and benefitting all European citizens, our health, comfort, and the homes we live in.

1. Protective white cover on heat thermal pump. **Photo:** Nenad Stojkovic / Flickr.
2. Professional heat pumps technician installing new device. **Photo:** Welcomia / Canva.
3. MEP's voting in the European Parliament. **Photo:** European Parliament / Flickr.
4. Gas stove fire. **Photo:** Ilse Driessen / Unsplash.

BEYOND OIL & GAS

Freeing Europe from Fossil Fuels

WRITER: **CYRILLE CORMIER**

Reducing gas and coal by a third is possible by 2025 and gaining independence from both can happen by 2035.



1

Since the start of the 2020's, Europeans have experienced crisis after crisis after crisis. We've been made vulnerable by unaffordable jumps in the cost of living, poorer through energy instability, and we're more at risk than ever from extreme weather conditions driven by severe climate change.

These compounding crises are all rooted in reliance on fossil fuels, and while there is broad agreement that renewable power and energy efficiency are our best tools to address them, this necessary, transformative shift in our power systems is still not being treated with the urgency and resoluteness required considering it addresses all these crises at once.

Prior to the Russian war on Ukraine, countries across Europe (in this case the European continent excluding Russia and Belarus) had made big strides to end dependence on coal, with 23 nations announcing coal phase-outs; of these, 17 have either already gone coal-free or have committed to do so by 2030. Not one rolled back its commitment during the 2021 energy crisis, and the last four months of 2022 even saw a decline in coal-fired power generation. Many have in fact considerably stepped up their renewable energy ambitions in response to what is clearly yet another crisis tied intimately to fossil fuel use.

However, to truly restore energy security, to cut bills, and to stay within the +1.5 degree Celsius limit agreed under the 2015 Paris Climate Agreement, we need to go much faster and much further – phasing out fossil gas and coal to achieve a fully renewable-based powered Europe by 2035.

Beyond Fossil Fuels' first report, "Freedom from Fossil Fuels" (2023), shows what European countries need to be doing to get on track, namely: removing 1/3 of the coal and gas used for heat and power from Europe's energy demand in the next couple years through a mix of measures covering a big scale up of renewables in the power sector, efficiency in buildings and industry, and smart consumption.

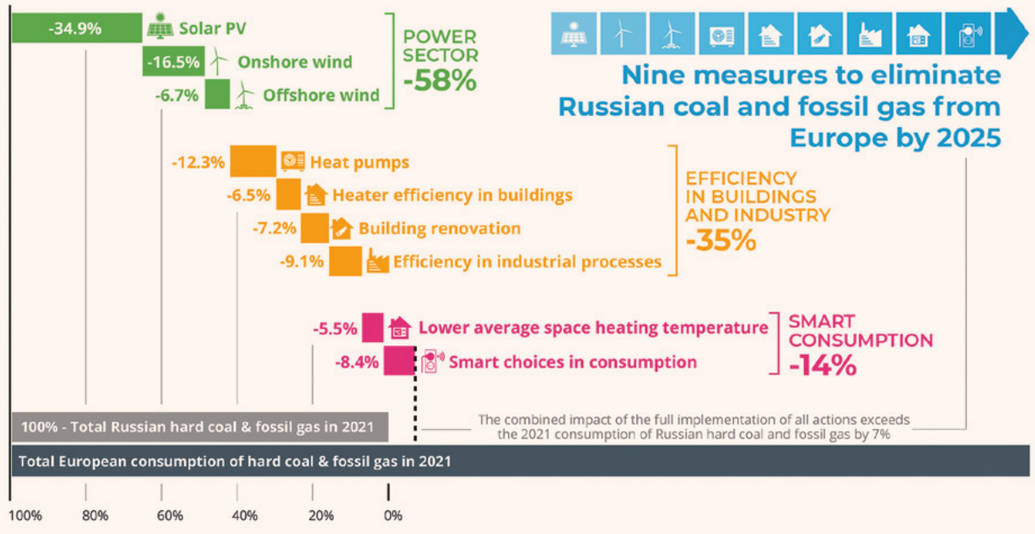
Roadmap for a renewable revolution

Reducing fossil gas and coal demand by at least a 1/3 by 2025 is both achievable and necessary to address bills, energy security, and climate change. A total of nine measures which, if implemented in the coming few years, will remove 44% of coal (75 Mt in 2021) and 35% of fossil gas demand (199 bcm in 2021) within Europe's electricity and heating sectors.

The European solar, wind and heat pump industries have identified that a significant amount of new capacity could be deployed across the continent in four years. Power sector measures outlined above are only a moderate increase of the industries' current forecasts.

Considering this is equivalent to the coal and gas that Europe was importing from Russia before its war on Ukraine, cutting this level of fossil fuels out with a massive expansion of solar and wind, heat pumps, efficiency measures in the industry, building renovations, and smart choices in terms of energy consumption is not just a win for household bills and climate change, it's also a huge step towards energy security and peace.

Together with targeted, temporary measures to reduce electricity and heat demand and balance supply to manage the next two winters, these measures will reduce Europe's gas demand to a level that negates the need for more gas import infrastructure like gas pipelines and LNG terminals and end all Russian coal and gas imports for good.



Source: Beyond Fossil Fuels, 2023.

Doing the heavy lifting

The encouraging news is that accelerating the deployment of solar, wind and heat pumps alone would substitute a large share of Europe's pre-war fossil gas and coal imports from Russia, avoiding an expensive "dash-for-gas" globally, and locking higher energy prices for more vulnerable strata of society and more unsustainable fossil fuel infrastructure in Europe and abroad.



2

"Reducing fossil gas and coal demand by at least a 1/3 by 2025 is both achievable and necessary to address bills, energy security, and climate change."



3

As illustrated in the "Freedom from Fossil Fuels" (2023) report, European countries and businesses would need to add 481 gigawatts (GW) of solar, 102 GW of new wind capacities and nearly 29 million heat pumps from 2022 until the end of 2025. As a daily average, this translates to the solarization of 20,000 homes and 30 parking lots; building seven solar farms and 14 wind turbines; and installing 19,500 heat pumps across the continent. Building 14 wind turbines a day is next to nothing when 45,000 new cars are manufactured in Europe every day and more than 12,000 gas boilers are installed in homes.

The skyrocketing growth of the solar and heat pump sector growth in 2022 speaks to the achievability of this ambitious plan. Although a coal comeback was widely expected over winter 2022, it was renewables that rose to meet demand. Where other energy sources like nuclear and hydropower failed, solar and wind picked up the pieces. In 2022, heat pump sales saw record-breaking growth nearing 40% in Europe while solar celebrated its best year yet, growing 47%.

That's not to say there is not a lot of work to be done. While initially, wind scaled quickly, national start-stop policies stifled its potential. European governments, municipalities, financial institutions, utilities, and businesses must work together to fix existing barriers and provide the financial assistance needed to support the speed and magnitude of the transition. This requires a scaled-up industrial plan that addresses supply chains, the workforce and embraces social, environmental, and public participation standards.

We have seen impressive renewable energy developments in Greece, Poland, and many countries across Europe, but making the progress we need now hinges on decision-makers stepping up and investing in a fair and just transition for all.

1. Solar panels cover former coal mining land in Kozani, Greece. **Photo:** Greg McNevin / Beyond Fossil Fuels
2. Solar farm, Hamal village of Sivas. Turkey, 2021. **Photo:** Barbaros Kayan / Europe Beyond Coal
3. Windmills dot purple fields in coal country, outside Cologne, Germany. **Photo:** Greg McNevin / Beyond Fossil Fuels
4. Anargyroi, Greece. **Photo:** Greg McNevin / Beyond Fossil Fuels
5. Kozani, Greece. **Photo:** Greg McNevin / Beyond Fossil Fuels



4

Making smart decisions

The acceleration of the fossil fuel phase-out in Europe will only hit the level necessary to address the challenges ahead if governments, financial institutions, utilities and business leaders, as well as local governments, recognize that there is no security, no prosperity, and no real respite from crises to be had by switching fossil fuel imports from one country to another. Only rapidly cutting coal and gas demand will.

Several EU Member States still cling to unnecessary gas infrastructure plans, which will inevitably reach obsolescence in the coming years as the Continent continues to decarbonize. This will cost companies billions in stranded assets - with much of the cost burden ending up on tax-payers and consumers. Just as the closures of all existing coal plants and mines will happen before 2030, we must seal the same fate for all gas plants before 2035.

Investment in solar, wind, and heat pumps would already get us a long way to break our dependence on fossil fuels but more will be needed across all sectors to cut energy and fossil fuel use, and to help vulnerable households, communities and local businesses with the transition. While the investment feels big, it would buy an end to the destructive, exploitative status quo, stable, affordable electricity bills, far more secure energy supplies, and real action on climate change all at once.

As think tank Ember announced in April 2023, "the end of fossil age has begun". That became evident when the energy crisis did not even attempt to bring coal back. Instead, the crisis has blown wind into the sails of the energy transition and proved just how necessary and ultimately unavoidable a fossil-free, renewables-powered Europe is.

There is also a strong consensus among Europeans on the need for renewable energy with 87% agreeing "the EU should invest massively in renewable energies". Many took matters into their own hands during the energy crisis, running to install solar panels and more efficient heat pumps to bring down their energy bills. This had a ripple effect on governments and businesses that witnessed an unprecedented enthusiasm for clean, renewable solutions.



Exponential growth trends in solar and heat pump deployment, swift decision making by governments, and the energy saving potential demonstrated by industry showed just what Europe is capable of… and laid the foundations of the needed scale-up. In just a few years, Europe can replace every joule of Russian fossil gas and coal it was relying on by committing to accelerated deployment of solar and wind, by determinedly looking for real energy savings in industry and building modernization, and by encouraging smarter use of energy across the board.

Now is the time to look beyond short-term fixes, and implement robust, permanent transition plans across Europe to insulate, to electrify, and to repower our societies with truly clean and renewable solutions. Every politician, business, financial institution, and energy company has a responsibility to put smart and popular plans in place to rapidly end fossil fuel use, and build a fair, more electrified, energy efficient, circular, sustainable, renewables-based European economy.

Europeans overwhelmingly want this renewable transition, and given it addresses our critical challenges of cost of living, peace, energy security, and necessary climate action, we have every reason to vigorously pursue it. ●

"There is no security, no prosperity, and no real respite from crises to be had by switching fossil fuel imports from one country to another."

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Summer Energy Poverty Hits Back

WRITER: **BELÉN G. CARMONA**

Escaping the heat is already a serious issue across Europe.

1

When we hear ‘energy poverty’, we automatically picture someone that is not able to turn on the heating during a cool winter day. But the inability to cool homes during the summer is becoming an increasing, and often overlooked, part of the equation.

According to the data collected by the Right to Energy Coalition in 2019, 1 in 10 Europeans cannot properly warm their homes in the winter, and 1 in 5 cannot properly cool their home in the summer. The proportion of people suffering from summer energy poverty would be five times higher than the proportion of people suffering winter energy poverty.

There is a worrying lack of data and research on the specific topic of summer energy poverty and its consequences, which makes it very difficult to address and tackle the right problems. In 2021, 6.9% of the EU population — almost 31 million Europeans — were not able to keep their homes adequately warm.

However, the Eurostat Survey on Income and Living Conditions (SILC), one of the most referred databases when it comes to energy poverty, includes the indicator ‘inability to keep home adequately warm’, but does not include the indicator ‘inability to keep home adequately cool’. This data is only collected in ad-hoc modules, the last one was published in 2012, when the EU share amounted to 19.2%.

Since then, global warming has accelerated and worsened this phenomenon. Summer 2022 was the hottest on record across all Europe, with long and extreme heatwaves becoming the norm. The World Meteorological Organization has also warned of Europe’s particular vulnerability compared to the rest of the other continents, as, compared to the global average, temperatures have increased at more than twice over the past 30 years.

Therefore, the cooling degree days (CDD) and cooling demand have only increased. In the EU, the need to cool a given building in 2022 was almost four times higher than in 1979, while heating degree days (HDD) have significantly decreased.

Russia’s invasion of Ukraine and its economic consequences have worsened the situation. Since September 2021, inflation has increased energy poverty by 5%, according to a Joint Research Centre (JCR) study on ‘The effect of rising energy and consumer prices on household finances, poverty and social exclusion in the EU’ from December 2022.

Vulnerable consumers

At national level, some countries provide indicators regarding cooling actions and others do not: there is no unified approach. Summer energy poverty is a problem in South-East Europe and Mediterranean areas, but also increasingly now in Northern and Central European countries that are traditionally less prepared for extremely high temperatures. In the 2012 SILC dataset, Bulgaria (49.5%) and Portugal (35.7%) lead the share of population living in a dwelling that is not comfortably cooled during the summer, but countries like Latvia (29.9%), Hungary (26.3%) and Finland (25.2%) also appear high in the ranking.

This fact might be due to multiple factors apart from country-specific climate conditions and global warming. Differences can be found from the energy efficiency and insulation level in buildings to the type and age of constructions and the cities’ urbanization level, among others. What remains clear is that both summer and winter energy poverty particularly concern the usual suspects: vulnerable and low- and middle-income population groups.

Defining Energy Poverty

“‘energy poverty’ means a household’s lack of access to essential energy services that underpin a decent standard of living and health, including adequate warmth, cooling, lighting, and energy to power appliances, in the relevant national context, existing social policy and other relevant policies.”

Source: EC’s proposal for the recast of the EU Energy Efficiency Directive (EED), Article 2 Definitions (49).

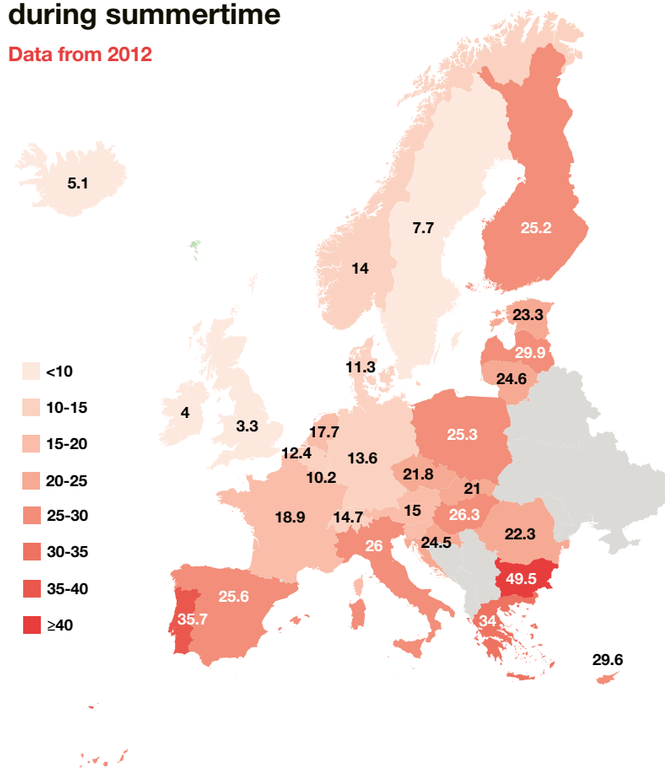
There is no common definition of energy poor or energy poverty in Europe. In March 2023, the European Parliament (EP) and the Council of the EU reached a provisional agreement on the recast of the EU Energy Efficiency Directive (EED). The proposal (2021) from the European Commission (EC) included for the first time a definition of energy poverty at EU level, prioritized energy efficiency measures among vulnerable and energy poor consumers and encouraged Member States to provide them with financing support schemes.

Energy poverty has long been known to be a problem, but so far it has not been collectively addressed. Once the new legislation is formally adopted, we will be able to talk about energy poverty at EU level as “a household’s lack of access to essential energy services that underpin a decent standard of living and health, including adequate warmth, cooling, lighting, and energy to power appliances.” The fact that this legal framework establishes cooling as a basic energy service is essential to design and implement summer energy poverty solutions.

The EC is also reinforcing this position through the recast of the Energy Performance of Buildings Directive (EPBD), as buildings account for 36% of Europe’s greenhouse gas emissions and 40% of its energy consumption. This piece of legislation, now being negotiated between the EP and the Council, provides that building renovations should target most vulnerable people first, including “households with

Share of population living in a dwelling not comfortably cool during summertime

Data from 2012



Bulgaria	49.5
Portugal	35.7
Greece	34
Latvia	29.9
Cyprus	29.6
Hungary	26.3
Italy	26
Spain	25.6
Poland	25.3
Finland	25.2
Lithuania	24.6
Croatia	24.5
Estonia	23.3
Romania	22.3
Czech Republic	21.8
Slovakia	21
EU	19.2
France	18.9
Netherlands	17.7
Austria	15
Switzerland	14.7
Norway	14
Germany	13.6
Belgium	12.4
Denmark	11.3
Luxembourg	10.2
Sweden	7.7
Iceland	5.1
Ireland	4
Great Britain	3.3

Source: Eurostat

In the EU, the need to cool a given building in 2022 was almost four times higher than in 1979.

Source: Eurostat



2

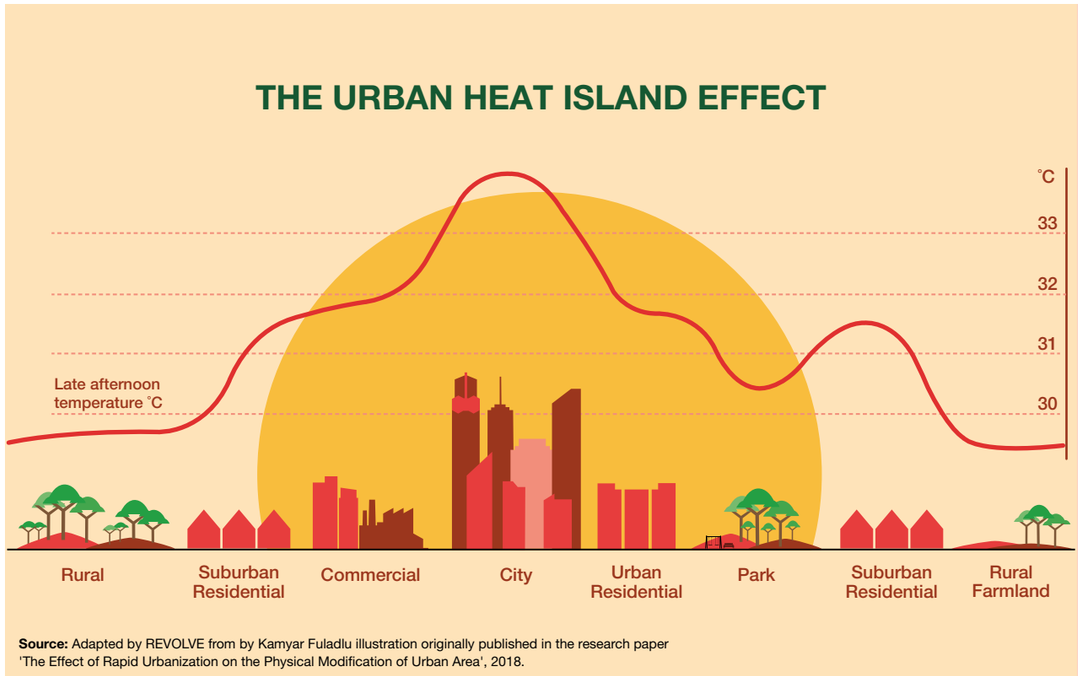
lower middle-income that are particularly exposed to high energy costs and lack the means to renovate the building they occupy."

Consumer protection becomes vital when it comes to health-related issues. Research from the EU Energy Poverty Observatory has shown that energy poverty is associated with respiratory and cardiovascular diseases, mental health problems such as anxiety and depression, as well as musculoskeletal problems and malnutrition. Moreover, "the combination of excess heat and inadequate cooling systems can also result in hypertension, heart attacks, dehydration, renal failure, and increased insomnia and sleep disturbance."

Also in relation to lack of adequate cooling, extreme heat events are estimated to kill some 12,000 people per year. The World Health Organization (WHO) reports that between 1998 and 2017, more than 166,000 people died due to heatwaves. In 2003, heatwaves killed 70,000 people in Europe during the summer. Forecasts are that by 2050, deaths caused from extreme heatwaves could raise to 255,000 per year.

More complex indicators that consider summer energy poverty specificities and regularly updated information are needed to close the data gap and act accordingly. Cooling access must be considered in the fight against energy poverty and as an urgent climate change mitigation action. But what can be done?

Cooling access must be considered in the fight against energy poverty and as an urgent climate change mitigation action.



Source: Adapted by REVOLVE from by Kamyar Fuladlu illustration originally published in the research paper 'The Effect of Rapid Urbanization on the Physical Modification of Urban Area', 2018.

Sustainable solutions

Active cooling systems like air conditioning are insufficient to address summer energy poverty. They are energy inefficient and raise energy bills, so both the environmental and the social dimensions of the problem are left aside. Air conditioning also contributes to the urban heat island effect, which, according to the World Meteorological Organization (WMO), can raise temperatures by 5-10°C in cities, compared to the surrounding rural areas.

1. A parking lot garden. **Photo:** Danist Soh / Unsplash
2. Greener cities. **Photo:** PCHUTTERSNAP / Unsplash
3. The fountain in the main square of Genoa, Italy. **Photo:** Belinda Fewings / Unsplash

There is a wide range of passive cooling alternatives such as heat pumps, radiative and evaporative cooling or thermal insulation. These solutions also include windows location, type of glazing, use of cool and thermochromic construction materials with reflective properties and permeable paving materials that allow evapotranspiration, and orientation of the building from design and planning phases.

Research from Energy Report shows that passive cooling solutions can cut energy consumption in buildings "by 8%–70% (using external shading), 37% (utilizing cool colored paints roof), 25% (creating green space), 7.88% (construction of the prismatic building), 32%–100% (using vegetation-based wall), 50% (using PCM-base wall), 33% (incorporation of insulation into the wall), 10%–20% (building equipped with solar chimney), 25% (using radiative cooling system)." Furthermore, life-cycle cost (considering initial investment, maintenance, and operation cost) saving reached 52%, compared to not affordable active cooling systems.

Finding inspiration from nature and its processes, so often interrupted by humans, is particularly relevant. "Natured-based solutions offer several benefits for cooling buildings. By providing shade and reducing or absorbing heat, green walls, green roofs, urban parks, or city vegetation can reduce the amount of solar radiation that enters the building and, therefore, the need for cooling. They also help to mitigate the heat island effect," underlines Laura Hurtado, environmental engineer at ABUD, a consultancy specializing in sustainability in buildings and urban areas.

She recognizes that these solutions should be part of an integrated approach, a first step in addressing

summer energy poverty. They reduce energy demand for cooling, which "has the highest annual growth rate of all building end uses," she states.

It is essential to raise awareness on energy use reduction and households' thermal comfort. Mainly among consumers, but also among the building sector, comprising the construction and renovation industries, and policy-makers regulating them.

"The CoolLIFE project is developing awareness campaigns on alternatives for occupants when they need to face thermal discomfort. This is not only in their households but also in their workplaces and in urban areas overall, in cities, the places where we unfold our lives," emphasizes Hurtado. This EU-funded project promotes sustainable space cooling solutions and provides recommendations on building inhabitants' lifestyles and behavior to optimize their energy use in the summer months. To achieve this goal, CoolLIFE Project Coordinator, Simon Pezzutto asserts that: "The CoolLIFE analysis tool will be mainly a planning tool, and the knowledge hub will be a repository for data and information."



4

A just transition

Energy communities can play an important role in fighting energy poverty and protecting vulnerable consumers, by redistributing the surplus of energy to the families in need. They reduce energy costs and allow smart building technologies in energy management services, while fostering citizen's participation and proximity of support within their own neighborhoods.

Energy citizenship faces important challenges such as the need for big initial investments, financing, and intensive technical support. Communities and authorities also struggle to facilitate the access of eligible energy poor households to help programs, so the energy and the profits are rightly distributed among them.

"The energy poor are very hard to reach. In The Netherlands there are all kind of subsidies for energy poor households, but they don't know the way to find these subsidies" — explains René Schellekens, Senior Consultant on Energy Transition and Energy Poverty at the Netherlands Enterprise Agency (RVO), who has been working on energy poverty for 14 years — "And if you look at energy communities, it's not the energy poor who are part of these communities, because they have other problems that they need to worry about, their entire capacity is set on survival."

From his experience, the energy poor need to connect with someone they relay to, like people who once were poor and came out of it. In some energy communities, they have what they call coaches or fixers that visit energy poor households in brigades to help them apply small energy efficiency measures like draught excluders.

They are also working on involving other investors in the fight against energy poverty trough buildings renovation. "Health is an issue among the energy poor, and that has to do partly with their housing conditions," stresses Schellekens. Once they demonstrate this correlation, the health sector, national and local authorities, and other stakeholders will see multiple benefits of investing in energy poor households' refurbishment.

There are other energy communities dealing with these difficulties as intermediaries. Enercoop's customers in France can choose to make a micro-donation of 1 or 2 cents per kWh of the energy they consume to support local energy poverty actions trough Énergie Solidaire. Energy producers can also donate their surplus energy, which is especially interesting with photovoltaic sources in the summer.

"It's harder to escape the heat than it is to escape the cold," concludes Schellekens when asked about summer energy poverty. Cooling access and sustainable and affordable space cooling solutions should be at the top of the energy poverty fighting policy agenda.

Cool LIFE

Driving a sustainable future in space cooling

The CoolLIFE project aims to address the need for **sustainable solutions** to the EU's rising demand for **space cooling** in buildings. The project will develop **open-source tools** which encourage the consideration of green space cooling solutions in public and private **decision-making**, **planning, design**, and **implementation** processes.

coollife.revolve.media

in CoolLIFE Project @CoolLIFE_EU



Co-funded by the European Union

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PRIMARY: Defenders of Wounded Forests

A **RUIDO** PHOTO PROJECT

Primary tropical forests are virgin forests that have not been altered by man. They are found in three areas of the world: the Amazon, the Congo River Basin and the South-East Asia. They represent 26% of the Earth's forest cover and contain 60% of biodiversity and store 68% of the Planet's carbon. Their existence is vital for the survival of humanity and its destruction is completely linked to the current climate crisis.

In this collective project, we have photographed the destruction by humans of the main tropical primary forests in the world. We have documented illegal logging in the Democratic Republic of Congo, the destruction caused by coal mines in Indonesia, the disappearance of primates in Thailand, and deforestation caused by invaders of indigenous reserves in Brazil.

Beyond the denunciation, the PRIMARY project aims to document and honor the defenders of these forests that, almost without resources, fight against the great machinery of global consumption. Men like Pak Benang who decided to confront the largest mining company in the world in Borneo or women like Maria Jucilea who defends her village from the incursions and death threats from the invaders of the Brazilian Amazon.

Forests that can best withstand and resist deforestation around the world are those inhabited by indigenous populations. These local defenders of the forests are the untold heroes that are fighting on the frontline of the global battle against deforestation, often risking their lives for our collective future.

xxxxxxxxx





Side: Jupai Diahui, is 59-years old and is the chief of the Cuaiarí village, located in the indigenous Diahui land, in the state of Amazonas, Brazil. Loggers and deforestation are encircling their territory and threatening their form of sustenance. **Above:** Heavy trucks in the forest operations of the Congo River basin. The use of heavy machinery completely destroys the exploited areas and expels the native fauna. In the last 15 years, this basin has lost an area of tropical primary forest equivalent to Spain and Portugal combined. **Below:** Tosha Dibadi, a 54-year-old local logger, cuts down a tree more than 30 meters tall in the rainforest of the Congo River Basin. Concessions to Chinese logging companies have proliferated in this region, in addition to numerous other illegal exploitations.





Trees cut and ready for transport in a logging operation owned by a Chinese company in the Equator region of DRC. These trips are shipped down the Congo River to the Atlantic Ocean. Most companies that exploit these forests are European, Lebanese or Chinese.

Above: No Caption. **Below:** Joao plays with his godson in Sepotí village, one of the indigenous communities of the Brazilian Amazon. The lands of this community are being invaded by illegal loggers. The village leaders struggle to keep them at bay and report them to the authorities but never get a response. **Side:** Luna Tenharim is a young woman who has lived all her life in the indigenous Sapotí land in the Brazilian Amazon. Her life is continuously threatened by invaders who try to exploit the wood and open cattle pasture areas on forbidden lands. Her community has lived in the forest for generations in a sustainable way and is key to its protection.

A small, wooded island in the middle of the Amazon River around which is the largest tropical primary forest in the world. Several studies show that the forests where indigenous people live are historically those that suffer the least deforestation. However, between 2019 and 2021, the indigenous territories lost 1,255 square kilometers – an area equivalent to twelve times the city of Barcelona. Indigenous peoples are the last front against the ongoing encroachments on tropical forests.

Side: A forest ranger (who prefers not to give his name) patrols inside Khao Phra Thaeo, the only remaining primary tropical forest reserve on Phuket Island, Thailand. The tourist explosion during the second half of the twentieth century destroyed the primary forest of this island and eliminated many primates too. Now, forest patrols watch out for poachers hunting the primates that are being reintroduced. **Above:** A family from Dayak Basap bathes in the river near Sengatta, Borneo, Indonesia. This indigenous community has lived for centuries in these tropical forests. Now, many were expelled from their land where a gigantic coal mine owned by Kaltim Prima Coal (KPC) Company destroyed the forest and contaminated the waters. **Below:** A group of indigenous Satere-Mawé children bathe in the Amazon River at sunset. Hundreds of barges loaded with illegally felled trees have already passed through this same river, a common practice in the depths of the Brazilian jungle.

A tree falls in a deforested area near the Mura Indian reserve in the Brazilian Amazon. The Mura claim to be surrounded by the invaders and continuous death threats have forced several people to flee the region.

Above: Gelma Pessoa in the kitchen of her home in the community of Brejo das Meninas near Santa Filomena, Piauí, Brazil. The Pessoa family has maintained a sustainable farming model for more than 40 years, but the expansion of soy farms for export threatens their way of life and that of many other small farmers. **Below:** A convoy of trucks loaded with palm fruit drives through the East Kalimantan region of Borneo, Indonesia. From this fruit is extracted the palm oil used massively by the global food industry. African palm plantations are the main cause of deforestation in Indonesia. **Side:** Dirman is a young leader of the indigenous Dayak Basap community that has lived for centuries in the eastern tropical forests of Borneo Island. All the inhabitants of his village were expelled from their lands to build a gigantic coal mine. The government and the mining company relocated them to a nearby area with promises of progress and work that were never fulfilled.



Above: At the port of Mbandaka, a boat loaded with gigantic tree trunks leaves for the capital Kinshasa. The Congo River – the second largest in Africa – is the only transport route from the jungle to the Atlantic Ocean. The remoteness of the jungle facilitates hundreds of illegal logging operations in this region. **Below:** Coal mining by the Kaltim Prima Coal (KPC) mining company in an area that was completely covered with tropical primary forest and is now completely destroyed. This type of mining destroys forests and fertile land while also polluting groundwater and surface water. Several European countries, including Spain, have bought coal from Indonesia during the energy crisis.



LEAP4SME

JULY

Final Conference

European Parliament

ENERGY EFFICIENCY POLICIES: INCREASING SME SUSTAINABILITY



LEAP4SME is organising a high-level energy efficiency conference on **4 July at the European Parliament,** hosted by **MEP Patrizia Toia**, Vice-Chair of the Industry, Research, and Energy (ITRE) Committee.

The event will bring together policy-makers, national energy agencies, business associations and other key stakeholders in discussion about creating and implementing more effective energy efficiency policies for SMEs.

It will be an opportunity to gather information from EU policy makers on the latest developments of the EED Recast and to better understand the role of industry, businesses and SMEs in the updated Directive.

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REGISTER

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No 893924.

REGENERATIVE FARMING

Regenerative Agriculture: Rethinking Sustainable Farming

WRITER: **ATHENA FOSLER-BRAZIL**

Regenerative agriculture offers an alternative to carbon-intensive farming and can deliver more resilient food systems.



1

REGENERATIVE FARMING

Look out the window of a train traveling through the French countryside, and there's a good chance you'll be gazing out over fields of wheat. Drive through rural Missouri, and miles of soybeans and corn will flank the interstate. Most of us are accustomed to these views: homogeneous fields of one or two crops, perhaps broken up by patches of forest but generally uniform over countless acres.

Monoculture, the practice of repeatedly planting one crop in a large area, took over agriculture in the 1940s as farming technology advanced and farmers began producing for an increasingly globalized market. Monoculture allows farmers to specialize their production and maximize their yields. But it's well known that this practice comes with significant downsides: soil degradation, lower crop resiliency and increased dependency on pesticides, herbicides, and fertilizers, all of which have long-lasting environmental impacts.

Regenerative agriculture offers an alternative.

In the midst of an international push to implement sustainable solutions to carbon-intensive practices, the European Green Deal's Farm to Fork strategy has set ambitious goals to reduce pollution from the agricultural sector. Regenerative practices are more relevant than ever as farmers find ways to adjust.

What is regenerative agriculture?

In contrast to conventional modern agricultural practices, regenerative agriculture focuses on improving soil health through principles based in ecological processes. As the name implies, at its core regeneration is about replenishing degraded soil– restoring life to the earth instead of simply extracting it, and ultimately having a positive impact on the land.

The Noble Research Institute defines four interconnected ecological processes that inform regenerative agriculture: the water cycle, energy flow (sunlight), the nutrient cycle and community dynamics, which encompass changes in a plant, animal, or microbial community over time.

Regenerative farmers view their farms as ecosystems that are most resilient when they work in harmony with these processes. To do so, farmers will often employ a number of techniques like planting nitrogen-fixing ground cover, which acts as a "living mulch", applying compost, planting hedges as borders between fields, using a no or low-till approach and diversifying the crops cultivated on a piece of land, all of which aid in soil health.

Fertile topsoil is vital to a productive harvest, but it's also inextricably linked to efficient water management, biodiversity, and the overall health of the ecosystem.

Clara Behr is Head of Policy and Public Relations at the Biodynamic Federation Demeter International, one of the predominant organic certifiers and the largest biodynamic agriculture certifier. Biodynamics is a holistic agricultural approach that has regeneration as one of its core tenants.

"Good soil is the beginning for everything," Behr said. "It ensures good quality products and livelihoods of farmers, but also contributes to climate change mitigation and preserving our nature and our environment."

Soil that is rich in microorganisms has more potential to sequester carbon from the atmosphere. This is also the principle that underlies cover cropping. The more time soil spends growing diverse crops, the more carbon can be sequestered and nutrients returned to the soil. In turn, healthier soil can grow more crops, and the cycle reinforces itself.

Over time, organic regeneration can lead to lessened or no dependence on chemical fertilizers and pesticides, which are harmful to water quality and biodiversity. Organically farmed land has 30% more biodiversity than conventionally farmed land, and a central goal of the Farm to Fork strategy is a 50% reduction in the use and risk of pesticides by 2030.

The Biodynamic Federation has 47 partners in 36 countries, and Behr said interest in the organization grows every year, including in countries facing climatic and political stressors, like Egypt and Ukraine.

"Farmers [in Ukraine] don't have any access to chemical pesticides or fertilizers and they need to grow food to feed their population, despite the war," Behr said. Regeneration offers an agricultural model that doesn't rely on agrochemicals, ultimately leading to a more resilient food system. Less reliance on agrochemicals also translates to lower input costs in the long run.



2

1. Large fields of monoculture crop production in arizona. **Photo:** Iofoto
2. Mustard is an example of a cover crop to aid in soil health. **Photo:** Getty Images

At its core regeneration is about replenishing degraded soil– restoring life to the earth instead of simply extracting it.



3

Healthy soil and water management

On La Junquera Farm in southern Spain, Regeneration Academy employs regenerative techniques and holds educational workshops to teach both local youth and international students and visitors about regeneration. The 1,100-hectare farm is in a semi-arid, hilly environment that receives very little rain.

Yanniek Schoonhoven, a trainer and international project manager for Regeneration Academy, explained that the area faces challenges with rainwater infiltration, erosion, and poor soil health.

"We have a lot of erosion because of intensive tilling and past land management. That means we have very little topsoil, and that's what we're trying to improve," Schoonhoven said. "If your organic matter in the soil improves, the rain has a greater chance of being taken up by the soil because it acts as a sponge."

Developing healthy topsoil facilitates rainwater infiltration, which is important for both farming and underground aquifer replenishment. In arid climates, maximizing water retention in the soil is key.

La Junquera Farm also has ponds and swales– small canals between plots of land– that collect the little rainwater they receive and create small wetland environments, which aid in soil moisture. Amongst other things, the farm grows almond trees without any additional irrigation. In California, which produces 83% of the global almond supply, growing a single almond kernel uses 12 liters of water.

> "Grasslands and large herbivores coevolved, so to maintain diverse grasslands that are able to store carbon and cycle water, you have to have large herbivores."
>
> — Nikki Yoxall, Head of Research – Pasture For Life

Regeneration and animal husbandry

Regeneration isn't just relevant to farmers growing crops but can be applied to animal husbandry operations as well. Part of the Pasture-Fed Livestock Association, Pasture for Life is the leading certifier for 100% grass and pasture-fed ruminant meat and dairy in the UK. Regenerative practices are at the heart of Pasture for Life-certified farms.

Nikki Yoxall, Head of Research at Pasture for Life, explained that raising cattle on pasture or cover crops is not only better for animal welfare, but also for the environment, as grasslands help sequester carbon and grazing animals return nutrients to the soil.

3. The regeneration academy offers educational workshops for those people and organizations who want to co-create the future of farming and food. **Photo:** The Regeneration Academy.
4. Grazing animals on pasture brings positive impacts for biodiversity. **Photo:** The Regeneration Academy
5. Cows in a small-scale farm in devon, england. **Photo:** Getty Images.



4

REGENERATIVE FARMING

> “You took out fast money, but then that’s it, that land is useless. You basically desertified your land in ten years for fast money.”
>
> — Yanniek Schoonhoven, International Project Manager, Regeneration Academy



5

“Grasslands and large herbivores co-evolved, so to maintain diverse grasslands that are able to store carbon and cycle water, you have to have large herbivores,” Yoxall said. This holistic view of farms as ecosystems is central to regeneration.

Relying on pasture to feed ruminants also facilitates more efficient land management. Globally, 33% of croplands are used for livestock feed production. Yoxall explained that Pasture for Life thinks cropland should be used to feed monogastric animals that cannot subsist on grass.

“Let’s keep our ruminants eating what they were evolved to eat, which is grass, pasture, cover crops, rather than using productive land to produce what could be human food and then feeding it to animals that don’t need it,” she said.

There is also a significant economic incentive to transition toward pasture-raised meat, as lessening dependence on feed means lower input costs in the face of rising feed prices. Certified meat and dairy also attract a premium, which means farmers can earn more per kilo of meat.

Long-term investment for long-term change

Commonland is a not-for-profit organization that partners with groups across 20 countries to tackle large-scale, long-term landscape restoration projects. Commonland has aided in the restoration of 30,400 hectares of land, including agricultural areas.

Willelmijn de Iongh is a landscape developer with Commonland, and she emphasized that a more sustainable food system will require a rebalancing of local and international markets.

“There’s a huge opportunity for a new wave of agriculture to become a little bit more regionalized within a global food system,” de Iongh said. “Of course, you’re going to have global trading, but make it a bit more balanced.”

Moving toward regeneration means moving away from the agro-industrial complex that controls the food system along every step of the chain. Agrochemical companies, feed producers and corporate grocery stores all shape the market, and regeneration represents a radical deviation from the norm.

“There’s a fear from farmers that if they shift and change the system, they’re going to lose that control and they won’t be able to meet the market demand, which is actually not driven by consumers but is driven by monopolies and oligopolies and the commodified food system actors,” Yoxall said.

Farmers need financial assistance to support them in this change. De Iongh said this means increased transition finance and a change in expectations from large capital investors.

“You need a large amount of capital to also take that leap and be a little more flexible in how quick and how high the return on investment needs to be,” she said. Return on investment will not be as high as it would be from a conventional farm, but there is a limit to how much can continue to be grown from degraded soil.

Schoonhoven said this is the same dichotomy farmers face in water-scarce regions. More irrigation might mean a larger harvest, but there’s a limit to the resources, and farmers are already seeing their water supplies dry up.

“You took out fast money, but then that’s it, that land is useless,” Schoonhoven said. “You basically desertified your land in ten years for fast money.”

De Iongh emphasized that not-for-profits often depend on project finance that typically only lasts three to five years, which isn’t nearly enough time to see real change in an ecological system. Commonland operates under a 20-year timeframe, which is the timescale necessary to see real systems change.

Regenerative agriculture is not new, and it doesn’t necessarily require investment in any new technology. It’s a turn away from the agro-industrial processes that farmers have relied upon for the past half century and that have steadily degraded the land they rely on. The transition will undoubtedly take time and will look different for each farmer.

“It’s not going to be uniform, and that’s a good thing,” de Iongh said. “We should celebrate that.” ●

Contrails: The Forgotten Lines

WRITER: **STUART REIGELUTH**

PHOTOGRAPHY BY: **WILHELM WESTERGREN**

What are contrails and how much do they contribute to global emissions?.

1

Once you start seeing contrails, you will not stop seeing them. Look up at the sky and there they are: white lines pushing airplanes across the blue expanse above to some unknown destination. When these mega 'heavier-than-air' vehicles reach a certain altitude (anywhere between 8-12 kilometers above ground) the ambient atmospheric air is cold enough to condense the water vapor and soot particles into artificial cirrus-like clouds that literally tail out behind the planes, tracing their trajectory across the sky. Criss-crossing lines and cross-hatching marks overlap to form a patchwork of fading knots. The contrails gradually disappear, leaving that ephemeral sensation of not having been. And yet, the polluting particles remain suspended up there invisible to the naked eye, slowly but surely contributing to the warming effect of planet Earth.

Contributing to global warming

According to the BBC, contrails are estimated to occur behind 18% of flights. And while they are ubiquitous, contrails (short for condensation trails) are not as innocuous as one might assume. In an exclusive interview, Magnus Gislev, Environment and Aviation Team Leader at the Mobility and Transport Directorate-General of the European Commission, described the nuances as follows:

Contrails are formed when water vapor is emitted from the aircraft and condenses on soot particles to form ice crystals, and this happens in so-called 'ice super-saturated areas' of the atmosphere.

The way this contributes to climate change is quite complex because actually in the morning and in the evening you have a cooling effect, and that is when the sun is low on the horizon, but then during the day when the sun is high up in the sky and also during the night there is a warming effect and this is because contrails actually reflect part of the solar radiation during the day but during the night they instead trap the heat and the infrared radiation, and stop it from disappearing from the Earth's atmosphere.

The last scientific consideration which is important is that it's quite easy to predict the short-lived contrails but much harder to predict with accuracy the so-called 'persistent' contrails, which can last in the sky anything from a few minutes up to several hours.

The longevity of the fake cloud formations depends on the humidity and temperature of the air. The drier and hotter the air, the quicker contrails dissipate. If the air is humid and cold, the ice clouds linger for longer. Contrails therefore contribute to climate change by trapping heat in the atmosphere. Increased cloudiness traps heat, and more persistent contrails have a greater warming impact.

Contrails contribute to climate change by trapping heat in the atmosphere



2

1. Contrails.
   Photo: Wilhelm Westergren
2. Contrails.
   Photo: Wilhelm Westergren
3. Contrails.
   Photo: Wilhelm Westergren
4. Contrails.
   Photo: Wilhelm Westergren
5. Contrails.
   Photo: Wilhelm Westergren

Of the net warming effective radiative forcing of aviation, contrails have the largest impact, followed by carbon dioxide and nitrogen oxide emissions. According to CNN, about 80-90% of the warming effects of contrails come from just 10% of flights traveling through extremely humid areas. Modifying flight paths and rerouting flights that produce high amounts of condensation trails could be one way to mitigate their impact. Other solutions are also emerging for the trendy and rather contradictory 'sustainable' aviation fuels (SAF

Can aviation fuels be sustainable?

Contrails are of course inextricably linked to the ever-controversial climate change topic – how exactly should we move people and products around the world, if not by flying? Do you really need to fly for your business trip or for your vacation? Why not take the train and join the slow-travel movement? Wouldn't it be nicer to take your time getting from one point to the other.

Maybe next time I'll take the train, you might think, but this time I just need to get there, no time to waste today. And so aviation and shipping remain major contributors to climate change, but the quest is on for sustainable solutions and the subsequent race has started to find those magic fuels that will make both aviation and shipping more sustainable.

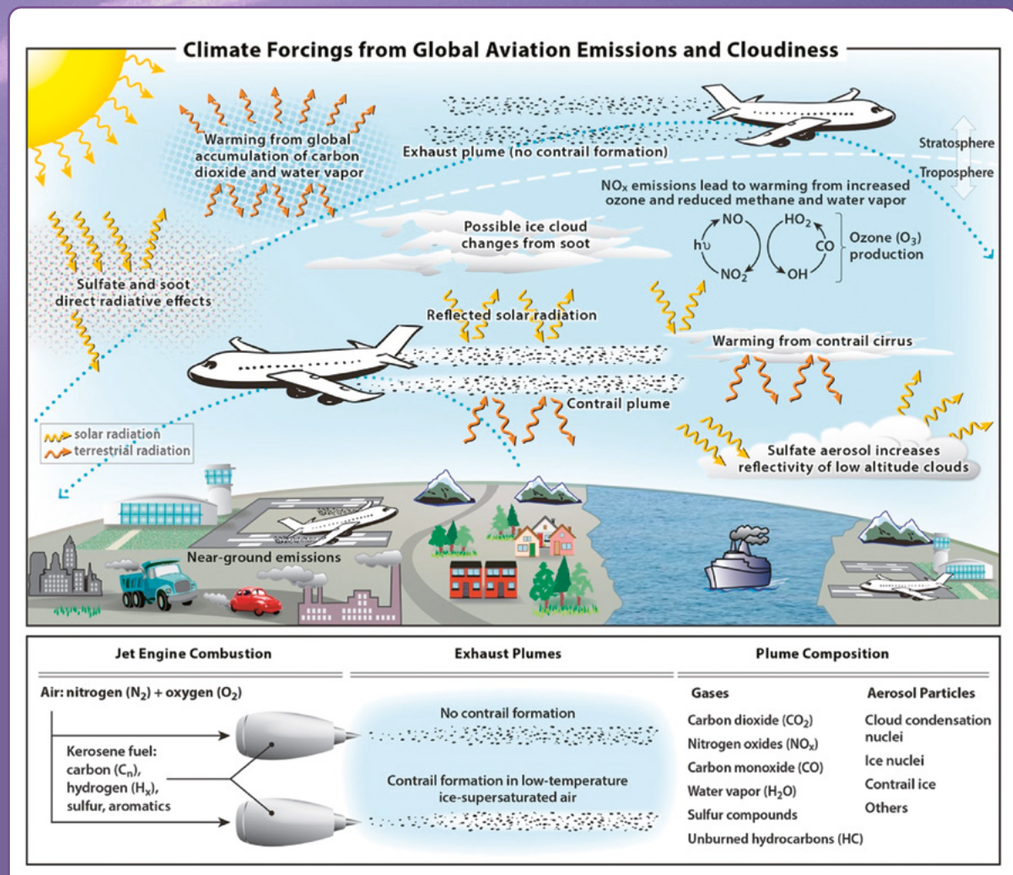
Sustainable aviation fuels (SAF) are biofuels used to power aircrafts. They can come from a variety of renewable or waste sources, including:

- Corn grain
- Oil seeds
- Municipal solid waste
- Algae
- Other fats, greases and oils
- Agriculture and forestry residues

Defining Contrails

"Contrail cirrus is an artificial cirrus-like cloud produced in the upper atmosphere (~ 8 to 12 km above ground) as a result of aircraft emissions of water vapor and soot particles into very cold atmospheres that are supersaturated with respect to ice. Conditions of the atmosphere (temperature and ice supersaturation) dictate whether linear contrails form behind the aircraft and persist to produce larger-scale spreading of the linear contrails into contrail cirrus."

Source: European Commission



Source: 'Atmospheric Environment', 2021. Elsevier.

- Wet waste
- Mill waste
- Dedicated energy crops

Depending on the feedstock and production methods, they can have a significantly lower carbon footprint than conventional fuels. Made through a variety of processes including physical, chemical and biological reactions to break down biomass and turn it into energy-dense hydrocarbons for example, SAF can be chemically similar to traditional jet fuels. According to British Petroleum (BP), SAF can contribute to a reduction of up to 80% in carbon emissions over the lifecycle of a fuel compared to traditional jet fuels.

Greenwashing, some will say. Incumbent advantage, others will say. Those who crack the code of finding more sustainable fuels will control both of the massive global industries of aviation and shipping. So it is no surprise that Big Oil and Big Aviation are collaborating and competing to find the most sustainable solutions in order to maintain market share.

Algae was also seen as a major solution for providing more sustainable biofuels. In a best-case scenario estimation in Science Direct, up to 68% of GHG savings could be achieved with algae biofuels. Algae is only a preferable feedstock if certain conditions in cultivation and production are met, such as processing optimization, nutrient recycling, and the use of renewable energy in processing. Scalability is one of the biggest barriers to algae-based biofuels in aviation – necessary scale is likely 10-20 years away.

United Airlines invested $5 million in a company producing biofuels from algae as algae SAFs were expected to have a reduced carbon footprint of close to 70% and companies could maintain their competitive advantage and claim to be more 'green' than the others. There were testing ponds in the Emirates and millions were sunk in research labs, but as of 2023, ExxonMobil has 'canned' algae as a solution. All of the others involved in the race, such as the Big Aviation duopoly Airbus and Boeing are also turning away from algae. The funding necessary to substantially research and scale up algae fuel production is too large. No company has been willing to make the necessary investment. Gas is highly subsidized, which decreases the financial incentive to invest in algae. Wild algae strains do not produce enough lipids and genetically modified strains are necessary but difficult to extract.

Etihad Airways has ambitious targets to become the first airline to reach net zero emissions by 2050 and reduce emissions by 50% by 2035. Etihad is already blending fuels with SAF and is positioning itself as an aviation market



2

leader in moving towards 100% SAF flights. According to Air Insight, Airbus is developing a hydrogen-powered aircraft and advancing its hydrogen strategy. Boeing is exploring more ideas too and has a well-developed strategy. Marc Allen, Boeing's chief strategy officer at NBAA-BACE 2002 says:

"We have shifted our language from zero emissions to zero impact. Hydrogen might have a role, but that might be being used on the ground to produce SAF or perhaps for direct propulsion. But how can we be sure it's truly green hydrogen and that the net result might not be worse in terms of emissions, not just CO2 but also contrails."

There is no holy grail for sustainable aviation fuels. Meanwhile the quest for reducing emissions continues and reveals complex layers of questions revolving around how we can continue to race around the world (more sustainably somehow) in these amazing gravity-defying vessels.

According to Magnus Gislev from the European Commission, for contrails and climate change the conclusion is that "if you reduce the number of soot particles and the amount of sulfur dioxide that you emit, you can also reduce the formation of contrails." Combining more renewables with planet-conscious choices is the first step. It may remove the ever-changing patchwork of clouds above us, but it can make our travel more sustainable. ●

Athena Fosler-Brazil contributed reporting to this feature and carried out the interview with Magnus Gislev from the European Commission on 20 April 2023 at the Cinquantenaire Park in Brussels, Belgium.

Aviation Emissions

Global aviation (passenger and freight) contributes to a few percentiles of global greenhouse gas (GHG) emissions, including CO2, and contribute 3.5% of effective 'radiative forcing' (overall warming). Flying accounts for around 2.5% of global CO2 emissions, but 3.5% when we take non-CO2 impacts on climate into account. Contrails account for the largest share of non-CO2 warming, about 2/3 in total.

Sources: Our World in Data, Elsevier Science Direct



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Preparing Parched Catalonia for the New Normal

WRITERS: **MARTA CASTILLO SANCHEZ**
& **JAKE THREADGOULD**

Water governance is turning to new technologies and nature for management solutions.

1

The re-emergence of the medieval Sant Romà de Sau Church from the shrinking Sau reservoir in Catalonia has become a symbol of the Spanish region's water crisis. The bell tower of the Romanesque church has served as an indicator of water levels since the area was submerged in 1962.

When the reservoir is full, only the tip of the tower protrudes from the surface of the water. Periods of drought not only reveal the crumbling building in its entirety but also our need to adapt our water management systems in time for what will soon become – or perhaps what has already become – the "new normal."

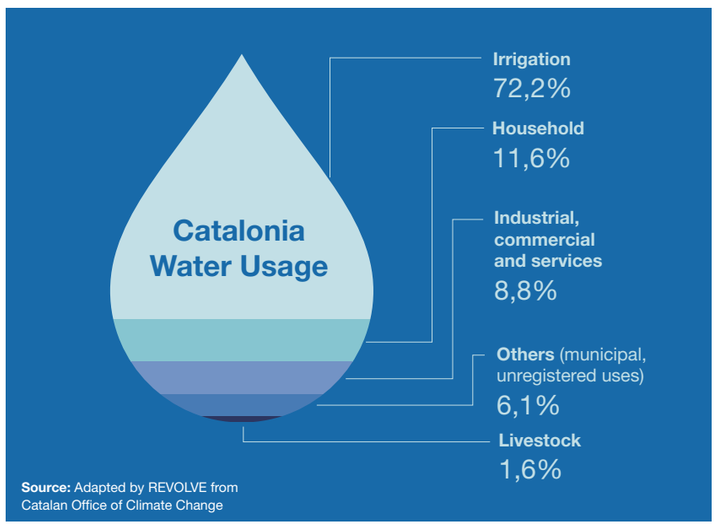
As of 2 June 2023, amid prolonged and severe drought conditions in Catalonia and the wider Iberian Peninsula, the Sau reservoir was at around 14% of its capacity – a decrease accelerated by local authorities emptying the water into a fuller reservoir further downstream on the Ter River. Average reservoir capacity levels in Catalonia hovered at 25% as of the same date, according to the Catalan Water Agency (ACA).

Periods of drought are commonplace in the Mediterranean, but science has shown that climate change will make them more frequent and severe. The region is warming 20% faster than the global average and its rainfall in spring and summer is expected to decrease by around 30% by 2080.

To prepare for this scenario, we must draw on all the scientific knowledge and evidence available, re-evaluate our relentless demand for water and further study how nature-based solutions (NBS) can help the region prepare for the evolving climate crisis, according to Annelies Broekman, water management expert and researcher at the Ecological and Forestry Applications Research Centre (CREAF).

Climate Resilient Decision-Making

Catalonia has good quality water planning for 'normal times' and periods of drought in line with the principles and concepts in the European Water Framework Directive. But when it comes to addressing the water crisis and adapting strategies to meet the pressures of climate change, there are several factors that threaten to hinder the timely application of necessary measures, Broekman tells REVOLVE in an exclusive interview.



These factors include overly rigid policy-making structures, a lack of harmony between decision-making bodies and conflicting interests between industries.

"If you have agricultural policy pushing for more irrigated crops and on the other hand you have a water management plan saying 'I don't know how I'm going to save this river' then you have a clash. And they leave citizens to fight it out. It should not be a struggle between the agricultural sector and environmentalists. It should be in a policy harmonization idea of how we manage this territory," Broekman says.



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A swift and holistic response to the water crisis in Catalonia becomes further complicated when decision-making is delegated and split across territories and municipalities that often lack the powers and coordination needed to address water management issues.

The overarching nature of the water crisis calls for adaptive, cross-sectoral approaches toward co-designed solutions that acknowledge all relevant actors and factors within a territory, from people and socio-economic considerations to the private sector.

From theory to practice

"Only by implementing theoretical frameworks can we see if it works or not," Broekman tells REVOLVE. That is what a CREAF team led by Broekman is doing in Maresme County, an area on the Catalan coast north of Barcelona that is facing climate crisis-linked events from droughts, floods, heatwaves and wildfires to coastal erosion and rising sea levels.

The CREAF team started working with the Consell Comarcal del Maresme – a supra-municipal governance body – because they decided to "take the climate emergency seriously," Broekman explains. The Consell Comarcal represents the 30 municipalities in the county and works to support those local entities and ensure that policies are coordinated beyond short-term electoral objectives. The municipalities agreed on the pressing need to work on climate change adaptation and unanimously approved a climate emergency statement in March 2021.

The Consell Comarcal obtained a strategy for climate change adaptation drawn up by experts in the field but hit hurdles when it came to translating it into effective policies, as tends to happen with smaller governance bodies. "It is a big document, very well done, but they don't know what to do with it because it says that they need to change everything," says Broekman.



2

This is where the CREAF team came in. The first step it took to support the Consell Comarcal del Maresme was to engage scientists with the creation of a Scientific Committee composed of 38 experts with knowledge and experience in the geographical area. “Too much of the complexity of climate change impacts is lost in decision-making because too often policies are based on intuitions,” Broekman adds. “We need knowledge, and we need to learn from each other."

The outcome of the committee’s first assessment was presented to the municipalities in a second phase that provided local policymakers space to contribute to the final plan. The final Strategy for the Energy Transition and Climate Adaptation of Maresme County by 2030 was presented in January 2023 and approved by the 30 municipalities in the county. The document integrates scientific knowledge and analysis with an on-the-ground understanding of the municipalities, matching it up with existing policies and integrating synergies with active plans and programs.

Water management holds a prominent position in the strategy, forming “the backbone of the adaptation of the county.” The strategy not only aims to foster a more comprehensive management of the entire water cycle and establish a participatory model, but it also highlights the need to view the water cycle as a hydro-social cycle.

It integrates a crucial point not often included in water management plans – the need to reduce total water consumption. “Economic development always overrides environmental constraints, until now, in policies. This needs to change because the basis of all the economic development policies is the stability of the environment. If we lose this stability, businesses will also fall down,” remarks Broekman.

Long-term planning

The Maresme municipalities are now in the position to start implementing this longer-term roadmap and to open governance spaces with other stakeholders like citizens and businesses. CREAF is also putting the initiative on the map by showcasing the experience in Maresme to others. “It would be really cool now to have other people doing the same things and teaching us how it went and how they took it over,” the CREAF researcher explains.

Climate change-related problems seem too big, complex, and far away for smaller municipalities, she adds. “What we are trying to do is to promote municipalities between them and show that problems are shared so they don’t feel alone,” she says.

By sharing the work done in the Maresme area in other forums, regions, and municipalities, or incorporating approved action points from the strategy into projects funded by the European Union (such as Interreg Euro-MED, Horizon Europe, or LIFE), local communities in Maresme and beyond can receive additional funding and technical support.

European financing is a key element for regions and municipalities that normally lack access to funding or technical resources. The European Commission has shifted its focus toward working directly with local authorities to improve climate change adaptation and resilience. For example, two out of the five EU Missions included in the Horizon Europe program focus specifically on regions, cities, and local communities.

The municipality of Blanes – bordering Maresme County to the north – joined one of the EU Missions by participating in the RESIST Project. Josep Lluís Pouy, Head of Civil Protection in the municipality of Blanes, tells REVOLVE in an interview: “Being part of RESIST gives us a technical vision at the research and university levels. In addition, it provides computing resources that are available to create tools and also a window to learn how the work is being done elsewhere. And it also gives us financial resources to have a technician dedicated to this work.”

Blanes is a coastal municipality in the Catalan province of Girona. It is suffering the effects of the severe drought in the region. Among other measures to reduce water consumption, following the Catalan government directives, the municipality decided not to install showers on its beaches. This measure could reduce overall water consumption in a region that receives a high influx of visitors in the summer season. However, as Pouy explains, the most effective tactic is to raise awareness among citizens, especially children.

Like its neighboring municipalities in the Maresme, Blanes suffers from other climate change-related events like heatwaves, wildfires, and floods. The municipality is one of the RESIST Project pilot areas in Catalonia – along with Terrassa – working to improve resilience to multi-hazard challenges linked to climate change. Both municipalities are already working to identify areas and communities at risk from climate change impacts. After this initial assessment, they will start integrating the Argos tool to manage weather-induced hazards.

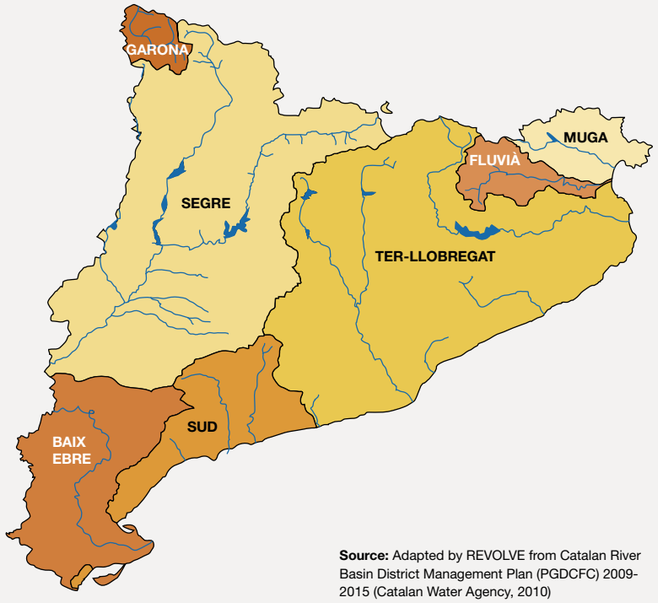
The tool analyzes data coming from sensors, weather forecasts, and historical records, and sends SMS risk alerts directly to emergency services and even private citizens. “Instead of saying tomorrow it will rain 20mm, we can say be careful because tomorrow it will rain and this industry or this area will be affected,” says Xavi Llort, R&D Manager at HYDS, providers of the Argos service.

Blanes will start testing the Argos tool for flashfloods, but the tool can also be used to identify drought or heatwave risks and alert the governance bodies to act. Nevertheless, “we need to change the paradigm of identifying a risk and finding a solution to mitigate that risk when it happens. We need to identify the risk and change the approach to be more resilient and avoid the emergency,” Pouy adds, in line with the approach being implemented in Maresme county.

Turning to nature

In the short term, the regional Catalan government’s Special Drought Plan for each drainage basin paves the way for a proactive approach to dealing with

Catalonia's Drainage System



Source: Adapted by REVOLVE from Catalan River Basin District Management Plan (PGDCFC) 2009-2015 (Catalan Water Agency, 2010)



4

the challenge the water shortage poses, with clear rules for everyone.

It envisages the use of technology to produce water. That means managing the scarcity of water by producing enough to meet demand through reuse and desalination, for example. While useful in the short term to cope with isolated droughts, such technology-based solutions are not workable in the long term because of their economic, energy, and environmental costs.

And what if the lack of water becomes chronic rather than transient?

The smartest and most immediate solution would be to rein in our insatiable thirst, to curb demand and realize that our socio-economic way of life is unsustainable. This requires a change in mentality that prioritizes the health of bodies of water and natural ecosystems over societal and industrial demands.

Such a change of mentality needs to start today, as does another vital undertaking, that of beginning to meaningfully implement measures to restore, maintain or improve our hydrological systems. This includes the protection of aquifers and the restoration of natural river courses and ecosystems. Such conservation involves restoring wetlands, rivers and streams, establishing adequate environmental flows, reviving riverside woodland, and making society aware of the fragility of the river environment.

"We have to recover very basic knowledge on biology and geology on how we maintain the rivers' functioning – rivers as a basin, I mean, all the water bodies interconnecting. This needs to keep functioning and many people don't understand why," CREAF researcher Broekman says.

"They say 'let's have a desalination plant, let's overexploit all the resources, well, the ecologists don't want the fish to die.' But what I say is if you don't have the fish the water in the river is poor and you need to treat it and it will be very costly."

"On top of this you have wildfires, the whole habitat collapses, you have plagues in your agriculture. You are the fish. You need to have the fish in order to have your business. One fish is very valuable if you look at it in this way." ●

What's the difference between drought and water scarcity?

A meteorological drought is a prolonged lack of precipitation, while scarcity (also known as hydrological drought) refers to there not being enough water available for all the different things we use it for.

Water scarcity can be gauged by means of the water exploitation index (WEI), an indicator that reflects the pressure on resources of fresh water and measures annual water consumption as a proportion of the total available.

In 2019, according to the WEI, Cyprus, Malta, Greece, Portugal, Italy and Spain experienced the worst seasonal water scarcity conditions in the European Union, which goes to show that we consume too much water for our system to handle even in 'normal' times.

Source: CREAF

1. Sant Romà de Sau, Nov. 2022. **Photo:** Carles Paraire / Flickr
2. Watering tank in Horts de les Cinc Sènies de Mataró, Maresme, Spain. **Photo:** Olivier Deroche / Flickr
3. Pont de Querós (in Sant Hilari Sacalm), a medieval bridge that is usually underwater in Susqueda Reservoir. **Photo:** Jordiavus / Wikimedia Commons
4. Parc Natural del Delta de l'Ebre, Spain. **Photo:** Angela Llop / Flickr

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Searching for Utopia

WRITER: **TOM BOSSCHAERT** & **SAUL BOYLE**

Learning from past mistakes to make future cities more resilient, more liveable, and more sustainable.

1

There have been numerous attempts throughout history to create utopian-like societies, cities built around the latest innovative approaches with the aim of creating a perfectly functioning society. Across the globe, these attempts have encountered various challenges and often failed to realize their visions for myriad reasons. As climate change, increasing demand for resources, and rapid population growth and urban development pose our world with new challenges, we can look to the past for valuable lessons on building utopia.

Utopia must work with, not against, nature.

Amid the Industrial Revolution, English urban planner Ebenezer Howard came up with Garden Cities, an idealistic but flawed city plan which he saw as combining rural and urban living. He conceived of his idea in a time when cities like London and Manchester were becoming dangerous, unhealthy, congested, and choked by coal smoke from factories.

Howard based his designs around form rather than function, imagining a Garden City that would house 32,000 people on a site of about 9,000 acres. He originally conceived concentric patterns with open spaces, public parks, and six massive boulevards extending out from the centers. He envisioned a cluster of Garden Cities surrounding a central city, each linked by road and rail. At his heart, however, it was clear that Howard hated urban living, and his paternalistic ideas weren't a practical response to the issues of overcrowding. What looked good on paper did not necessarily translate into a successful reality, but the plans influenced communities across the world, including in the UK, the US, Canada, Brazil, Australia, Belgium, and more.

The primary flaw with Garden Cities was that Howard failed to recognize that nature is not just an area on a map you color with a green pencil. The cities' creation mandated the destruction of large swaths of nature. The rigid geometrical framework of the garden cities stands in contrast to the diversity, flexibility and irregularity of nature itself. The mandated isolation and separation of the program meant that they didn't have a net positive economic impact and faced many issues of suburbanization. This segregation of function, which is quite absent in nature, was a real killer. In 1998, the architect of an Australian social housing project based on Garden City's design described the community as filled with crime and violence. The failure to recognize that cities must work with, not against, nature, and not just the presence of grass and trees, but the fundamental properties of nature's organic planning, is one that is replicated in the contemporary example of NEOM in Saudi Arabia.

NEOM, an area the size of a small country in the northwestern Arabian Peninsula, contains several projects including the beginnings of a futuristic city called The Line. The project has already been critiqued by many, but there are a few things worth predicting about this city of the future. The issues begin with the CGI rendering of The Line, which illustrates a 170-kilometer-long, 500-meter-tall, and 200-meter-wide city cutting through the Arabian desert and encased in mirrored glass. This is about the distance from Brussels to Amsterdam.

To bring this construction to life, many indigenous communities have been displaced and several sentenced to death for resisting displacement. In The Line, life and technology will be entirely enmeshed, negating all rules of nature and ecological integration. Resources will have to be spread along the entire length of the city, which will supposedly be powered by renewable energy. Power will need to be supplied not just to the city's 9 million residents, but to the cooling requirements, human and resource transport, and city infrastructure that must run constantly without fail.

Like the Garden Cities, NEOM is facing challenges of alienation from nature but on a much greater scale. The city is designed to be fundamentally separate from and above the forces of its surrounding environment.

Cities cannot be designed to fit an aesthetic plan.

Just as successful cities cannot be designed in opposition to nature, they also cannot be designed to fit into a set aesthetic plan. The Brazilian capital of Brasilia is a prime example of this. The city was designed to utilize the 'best' ideas in urban planning at the time, but from the 1970s until relatively recently, the city has been a punching bag for those who wish to criticize contemporary urban planning.



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Brasilia contains some visually stunning architecture, but proved to be an appalling city to live in. The chief issue with the capital was that it was designed to look like a giant bird from above. All the zoning, logistics, infrastructure, and street layout were subservient to the idea that the city had to look like a bird. This resulted in a seemingly inane mistake but one that must be restated: a city plan is not an aesthetic design. This very mistake is being repeated in Japan by Toyota's 'smart,' 'woven city,' which was designed to look like the project's logo.

Brasilia, on top of being designed to look like a bird, was built around and for cars. As suburban America has demonstrated overwhelmingly, car-centric neighborhoods destroy social and economic fabrics of a city, leaving only isolated islands left to their own devices. For its critics, Brasilia failed because its living blocks were cold and antiseptic, and its programmatic separation into vast living versus working areas made it depend upon broad, long highways that destroy human scale and cause traffic issues. All residents, from office workers to the highest government official, were forced to work around design elements set in concrete, leaving little room for the imagination or for individual choice.

The lesson of Brasilia, Toyota's woven city, and all urban design based around an aesthetic vision is that any attempts at building utopia must have human experience at its heart, including both rich and poor, young and old.

You can't treat the design of a city like the design of a machine.

A true utopia cannot be designed to look like a bird, and it also can't be designed to function like a machine. Almere, the newest city in the Netherlands and a feeder city for Amsterdam, saw its first residents move in during the late 1970s. The city was designed to mimic a 'green' way of living, avoiding urban densities, around a set of smaller nuclei. City planners wanted to build a nice place for people to live, with lots of green, space for kids to play, and lots of affordable housing.

The complaints began soon after families began moving in. Residential streets went on endlessly, hundreds of identical homes in endless rows. In a country famous for its use of bicycles, residents of Almere had to take up daily use of a car. The lack of a city center created a lack of density for services. Shops closed, and there were few spaces where the community could connect.

Today, a center-like area has been created to try to offset some fundamental flaws of the urban plan, though



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1. Artist impression of Orchid City. **Photo:** Orchid City / Except
2. Neom mountains. **Photo:** Adel Al-Omrani / Flickr
3. A 3D rendering of the futuristic city 'The Line Neom' project in Saudi Arabia desert. **Photo:** Corona Borealis Studio / Shutterstock
4. View from the TV tower in Brasilia, Brazil. **Photo:** Weigler Godoy / Unsplash
5. Artist impression of Orchid City. **Photo:** Orchid City / Except
6. Artist impression of Orchid City. **Photo:** Orchid City / Except

it remains sparse of people and devoid of community influence, lined with chain stores and hard covered surfaces. The city continues to struggle with mobility, monotony, and deserted streets. Almere is an example of how treating a city like a design for a building or a machine, and not like an organism which will develop and grow, is a recipe for failure. This is reflected, again, in The Line at NEOM.

The Line may be the ultimate example of the risks of treating a city like a machine, as the entire plan relies upon complex and precise technology to keep the place functioning at all. The plan includes 170 km of high-speed rail, a metro system, and freight line, all built into the basement level of the city and able to transport people from one end to the other in 20 minutes. If one element fails, millions are now late or stranded. If maintenance is required, whole sections of the city will be unable to travel and resource transport will be stopped. Residents will also be made to live on top of one another, and at least 15,000 elevators would be required to move people vertically through the city.

The Line would also only be able to function with a population between 4 and 9 million, leaving no room for organic growth. The technologies required to keep a city with such rigid and inorganic design functioning render The Line incredibly vulnerable to infrastructural failure. This is an even more extreme example than Almere of why a city is not and cannot be treated like a machine.

Technology is a tool, not the full solution.

A city is not a machine, nor can it rely too heavily on machines and technology to solve its core problems. This is where the idea of 'smart cities' fails. For nearly 15 years, architects, technology experts, engineers, and urban planners in Songdo, South Korea have worked hard to create a new business district for the sprawling city of Incheon, near Seoul. Songdo was presented as the flagship for how we would live in the cities of the future, where technology, big data, sustainability, and smart urban planning would create a modern utopia.

To accomplish these lofty goals, some of the world's most advanced urban

technologies were utilized. Streets connecting the district are lined with sensors measuring energy use and traffic flows, a seaside park is outfitted with a self-sustaining irrigation system, residential waste is transported via trash tube to a central waste-sorting plant, and homes are operated by cellphone apps that control everything from heating and cooling to light levels. The city does boast 76% waste recycling and energy use per person is 40% less than other cities, all of which is to the designer's credit.

Many residents, however, have called Songdo cold and deserted. The city is packed with censors tracking data, but lacks the feeling of community, instead creating a sterile environment that puts the needs of humans second to the functions of technology. A similar situation arose in Masdar, another high-tech smart city on the outskirts of Abu Dhabi, in the United Arab Emirates. Masdar was heralded as the world's first zero-carbon city, with 50,000 residents and dreams of high-tech water recycling systems, argon-insulated buildings, electric driverless cars, and a massive wind tower that would suck cool air from above to cool the streets below.

Several of these design elements are in place, but still, no one wants to live there. Designers have also admitted that they cannot deliver a totally carbon-free city, their high-tech plans failing against the sandstorms and heat. Today, less than 10% of the city is completed and office buildings stand mostly empty. Masdar's fundamental reliance on technology to deliver basic human living needs contributed to what is now a shell of a city, devoid of community. Both Songdo and Masdar exemplify the flaws of relying on technology to be the beating heart of a city, failing to put human needs first and instead prioritizing high-tech solutions that miss one critical detail: cities die without community.

Building the 'future' city.

The Orchid City project was started with the mission of building new future-proof cities. In Orchid City, 25 organizations around the world work to learn from the past and craft a new framework for self-sustaining, resilient, and climate-adaptive urban places that are also affordable and realistic. It combines human-centered design, regenerative principles, and adaptive systems, and weaves new approaches to design with eco-engineering and real estate investment strategies. The project's approach is founded on five elements: design which facilitates social connectivity, builds upon nature and ecosystem processes, adapts to changing circumstances, integrates living and working environments, and prioritizes inclusivity and diversity.

Orchid City emphasizes human-scale design, walkability, and layered social integration. Pedestrian-friendly spaces are prioritized, encouraging meaningful connections. Orchid City will foster cross-generational and inclusive roles within the neighborhoods, such as students caring for the elderly, which allows for a broad social-economic foundation. This focus on human connection creates dynamic, inviting neighborhoods and facilitates community development.

Unlike many high-tech based sustainable cities, Orchid City is founded on ecological and regenerative principles. Regenerative design not only protects but restores ecosystems and biodiversity and ensures sustainable management of energy and material flows while providing essential food, water, and energy resources for the city. It prioritizes urban design that works in hand with ecosystem services over aesthetic forms, optimizing daily functioning and reducing development cost. In this way, Orchid City reduces the carbon footprint of each inhabitant by 140%.

Unlike designs such as NEOM or Masdar City, Orchid Cities are designed as adaptive systems, rather than fixed master plans. This flexibility allows for climate adaptation, addressing issues such as future flooding and changes in weather patterns, as well as demographic, lifestyle, educational, and work-related changes. By anticipating and adapting to these evolving needs, Orchid City remains a thriving, resilient community over time, and a better long-term investment.

Implementing lessons learned from over-segregation in many other eco-cities, Orchid City offers an integrated living environment that blends housing, work, education, production, and leisure. Providing as many jobs as residents need, Orchid City reduces job-related mobility by more than 40%, enhances the quality of life, and fosters educational opportunities. This approach also facilitates effective resource-use with circular supply flow design and enables solutions like packaging-free shopping.

Acknowledging the importance of accommodating a diverse range of residents, Orchid City promotes mixed-use neighborhoods that combine housing, light industry, and commerce, creating an inclusive environment for a diverse range of residents and fostering a dynamic urban fabric.

By incorporating lessons learned from past attempts at building utopian-like cities, Orchid City sets a new standard for urban development, offering a sustainable, adaptive, and integrated solution to urban living. As we face the challenges of the 21st century, urban planners, investors, developers, and policymakers must collaborate to achieve truly self-sufficient cities that fulfil the daily needs of people from walks of life. Demonstrating this as possible and feasible, Orchid City serves as a beacon of hope for a greener, more vibrant future.

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20-22 JUNE 2023

EUROPEAN SUSTAINABLE ENERGY WEEK

Accelerating the clean energy transition - towards lower bills and greater skills

TAKE PART IN EUSEW

Let's shape Europe's energy future together!
This year's hybrid, interactive event is great for getting together, sharing ideas and know-how, and building alliances to drive forward the energy transition.
Registrations will open in April 2023.



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