

REVOLVE

QUARTERLY INSIGHTS INTO A CHANGING WORLD

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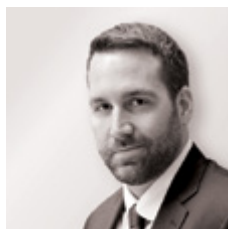
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ALL ABOARD!

2021 Is the European Year of Rail

ADINA VĂLEAN

EUROPEAN COMMISSIONER FOR TRANSPORT

Let's go behind the scenes of the European Year of Rail and see what's been going on

March 2020 will be remembered for many reasons in Europe, but it was also the date that I tabled a proposal to make 2021 the European Year of Rail. A lot has changed since then, and as I write, we are in month nine of the initiative. This seems a good time to take stock!

Let's start at the beginning: by putting the spotlight on rail, we wanted to highlight the crucial role it plays for us all, and its many benefits. Rail is one of the most sustainable and safest transport modes, and it has a strong European dimension - connecting people and businesses.

We need to raise awareness of these advantages to see more people travelling by train, more businesses shipping their goods via rail, and more people considering a career in the rail industry. Rail is also an ally in European efforts to reduce transport emissions. Today, trains carry 8% of all passengers and 18% of our goods transported by land, but is only responsible for 0.4% of all transport greenhouse gas emissions.

There are many positives to using rail, but we must also draw attention to the barriers holding rail back from realizing its full potential. For example, we need to improve long-distance and cross-border connections. We will use this year to create momentum for this, and for high quality infrastructure capacity. It is however important that this momentum lasts beyond 2021, so we need the entire rail community, policy-makers and public authorities to match words with deeds.

Rail and other more sustainable modes also need to become more affordable. We remain committed to the 'polluter pays' and 'user pays' principles, aligning the cost of using transport with its societal costs, including emissions and noise pollution.

Looking forward, it is a good sign that many new train connections and services have been launched or announced this year, promising more choice and travel options for passengers. The new night train linking Stockholm, Copenhagen and Berlin is just one example.



Alongside policy proposals, we continue to invest in innovation, for which I have huge respect.

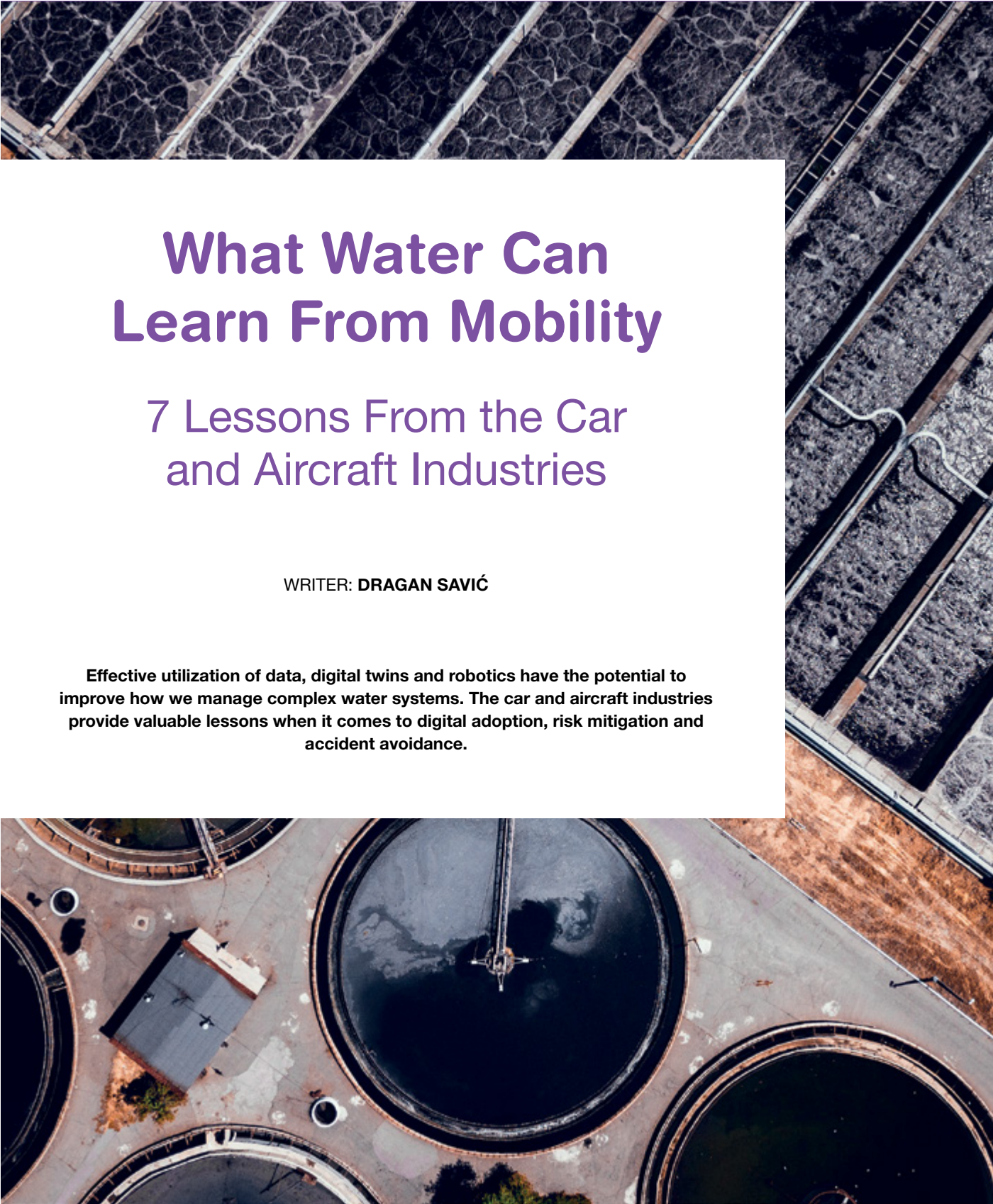
Innovation has already increased speed, safety, efficiency and comfort while making it easier to plan journeys. This year will see the launch of Europe's Rail, a research partnership continuing the important work begun by the Shift2Rail Joint Undertaking, pooling and coordinating research and innovation at EU level to help us solve our known challenges, and probably others that we didn't even realise we had!

By the time you read this, the Connecting Europe Express, one of the year's highlights, will have begun its 26-country tour of Europe. This unique train has certainly opened my eyes to the challenges linked to pan-European rail: having a train travel through so many countries is a complex undertaking that requires cooperation between numerous actors and technical problem-solving. This project is a clear reminder that we still have work to do on our way to a true **Single European Railway Area** and why it is truly worth the effort.

I am often asked why we chose 2021 to showcase rail. Actually it was a natural choice following the launch of our Sustainable and Smart Mobility Strategy in December 2020, which itself built on the European Green Deal. The Strategy presents tangible plans to overcome the challenges I referred to, with concrete milestones, such as tripling high-speed rail traffic and doubling rail freight traffic across Europe by 2050.

It has not been the easiest of years to bring people together, but I am pleased with what we have achieved to date. In fact, one of my early conclusions is that rail is very resilient. We saw this during the early days of the pandemic, and we are still seeing this today – trains continue to keep us moving, and they continue to transport the goods on which we rely.

The timing also allows us to restore trust in public transport in the wake of the pandemic. Please join us by becoming ambassadors for rail! Do this within professional networks, and with friends and family. Let's all choose train travel and encourage others to do the same. ●



What Water Can Learn From Mobility

7 Lessons From the Car and Aircraft Industries

WRITER: DRAGAN SAVIĆ

Effective utilization of data, digital twins and robotics have the potential to improve how we manage complex water systems. The car and aircraft industries provide valuable lessons when it comes to digital adoption, risk mitigation and accident avoidance.



Over the last two decades, modern digital technology has transformed our society by improving the planning and management of complex systems. Banking, transportation, marketing, entertainment and tourism industries have all witnessed huge disruption.

The water sector, too, has seen increased applications of wireless sensor networks, autonomous robots and sophisticated artificial intelligence tool applications. Given the multifaceted challenges surrounding water, this acceleration of digitalization appears inevitable to improve how we manage this precious resource.

However, there will inevitably be additional risks associated with those developments. One benefit of being behind the digital curve is that the sector has the opportunity to learn from others that are more advanced in terms of automation and digital transformation.

For example - the aviation and automotive sectors have made significant strides towards full automation. The introduction of digital technological advances, coupled with the drive for increased automation have also contributed to several high-profile failures in sectors where safety is of paramount importance.

One benefit of being behind the digital curve is that the [water] sector has the opportunity to learn from others that are more advanced in terms of automation and digital transformation.

1. The water sector must learn from sectors further along in their digital transformation.
Photo: Ivan Bandura

Limits to driver-assistance systems (DAS)

Since the first challenge by the Defense Advanced Research Projects Agency (DARPA) in 2004, there has been a huge interest in research and industry in autonomous or “self-driving” cars. Nowadays, it is more accurate to call them driver-assistance systems (DAS) as they help drivers by acting autonomously or alerting them to potential problems and avoid collisions, but cannot be considered fully automated.

Tesla is the leading producer of plug-in electric cars. The organization's Autopilot software can match speed with traffic conditions, keep within a lane, change lanes, transition from one road to another, exit the road when the destination is near, self-park when near a parking spot, and be summoned to and from the user's garage.

However, the rapid development of self-driving cars has also resulted in a few high-profile collisions of Tesla, Google and Uber cars, which are the most prominent companies trialling DAS. Some of those collisions ended

up with fatal outcomes. A number of these occurred due to the DAS not being able to recognize a stationary obstacle on the road, like when a Tesla car collided with a parked fire truck, or to understand and give a right of way to other vehicles or to detect and avoid pedestrians.

Airplane autopilot system

Another case is the Boeing 737 Max and its Manoeuvring Characteristics Augmentation System (MCAS) software that is suspected to have played a role in two aircraft crashes with significant loss of life.

With more than 50 years of service and over 15,000 planes sold, the Boeing 737 is the best-selling aircraft in the world. However, two fatal crashes of the 737 Max in 2018 and 2019 within five months of each other, which killed a combined 346 passengers, have led to questions about its safety and subsequently to the worldwide grounding of the aircraft in March of 2019.

The two accidents happened shortly after take-off and while the aircraft was gaining altitude, while the on-board software (MCAS) repeatedly engaged and forced the aircraft to nose-dive. This pointed to a potential flaw with MCAS, which was designed to automatically activate and stabilize the aircraft by nudging its nose back down.

By identifying what went wrong with the new technology in the cases listed above, it should be possible to learn from them and prevent future failures in water. Here are seven cases we can apply to water.



7 Lessons from Mobility for Water

1. Always keep humans in the loop

The impact of digitalization and automation in the water sector can mainly be felt by utility personnel. Increasingly capable digital and automation systems can bring fundamental change to how complex natural and engineered systems are protected, controlled and operated.

However, despite huge investments in innovation and implementation of automation in the fields such as automotive and aircraft industries, operating systems that require the highest possible level of safety still rely on trained airline pilots and vehicle drivers. For the water sector this means that despite smart software, including AI and machine learning (ML) solutions, these

automation systems will still require a highly skilled workforce to ensure safe future operation of water systems.

2. Ensure awareness and training on technology

People involved in managing water systems must not only understand their complex nature to be able to manage them more effectively, but also be trained in how to use digital technology systems aimed at improving their performance and to understand their limitations.

For example, the fact that the 737 Max pilots involved in the two crashes were not fully aware, or may not have been told about MCAS, makes these

automation systems vulnerable and at risk of causing serious failures. The overconfidence of drivers in the capabilities of the car automation software, such as the Tesla Autopilot, might have contributed to serious vehicle crashes due to drivers mistakenly believing the cars can operate independently.

Even a simple renaming of the Autopilot into a driver-assist system may help to clarify the fact that drivers always need to be alert when in control of a vehicle. For the water utility personnel, the level of training and documentation required has to be such that they are fully aware of the capabilities and limitations of automation systems to take full advantage of their capabilities.

Digital twin

A digital twin is a digital representation of a real-world entity or system. The implementation of a digital twin is a software object or model that mirrors a unique physical object, process, organization, person or other abstraction.

Machine Learning

The use and development of computer systems that are able to learn and adapt without following explicit instructions, by using algorithms and statistical models to analyze and draw inferences from patterns in data.



2. Tesla is one of the most prominent organizations trialling automated vehicles. Photo: Austin Ramsey

3. The Boeing 737 Max's Manoeuvring Characteristics Augmentation System (MCAS) is suspected to have played a role in two aircraft crashes. Photo: Aka The Beav

4. Users of digital technology systems ought to be trained to understand the technology and their limitations. Photo: Rayyu Maldives



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3. Include manual, fail-safe intervention systems

Autonomous safety systems, such as those on aircraft and in cars, can introduce added risk by initiating actions without any human involvement. For example, it seems that the erroneous reading of the angle-of-attack sensor has caused the MCAS software to pitch the nose of the 737 Max aircraft down and cause it to stall and eventually led to the two crashes.

While the first 737 Max crash in Indonesia occurred before Boeing issued clear instructions as to what pilots can do to remedy the situation, the second crash in Ethiopia happened after the pilots flying the Max received training following on from the Indonesia crash.

The key problem seems to be with the MCAS system that was automatically activated multiple times. Although most digital solutions in the water sector are not fully automated, any future developments that involve automation should include fail-safe mechanisms. This will enable users to be alerted when they are

initiating actions or the ability to initiate a manual intervention of the operator to remedy the situation.

4. Sensor redundancy is a good thing in safety-critical systems

Both the aircraft and car industries have embraced the power of sensor redundancy to protect human life. For example, safety of mass-produced vehicles is paramount and Tesla cars (and other 'self-driving' cars) have a number of sensors that provide a high level of redundancy.

Tesla Model 3 includes a vision system that consists of eight cameras, which provide full visibility around the car within a radius of 250 metres, 12 ultrasonic sensors and a forward-facing radar system. However, they do not have LIDAR, while almost every other company working on self-driving cars uses the technology.

On the other hand, Boeing on 737 Max used only one sensor to feed data about the angle-of-attack to its automated

MCAS safety system although the aircraft has two such sensors. As any sensor is prone to failure, providing redundancy and using both sensor signals would improve safety by indicating that one of them is sending erroneous data.

While the water industry still lags behind the automotive and aircraft industries in terms of the number and density of sensors in respect to the size of their systems, the increased level of redundancy will improve data quality and reduce the uncertainty associated with sensing data.

5. Don't underestimate cybersecurity risks

Although cybersecurity breaches were not involved in any of the analyzed transportation accidents, anecdotal evidence of white-hat hackers remotely taking control of a car and disabling its transmission as part of their research initiative is a cause for concern. The recent review of the incidents in the water sector indicates that safeguarding against cybersecurity threats is



considered a high priority of utilities and governments.

The review identified 14 reported and documented incidents, ranging from a disgruntled former employee taking control of the automation systems and deliberately causing the release of millions of litres of raw sewage into the environment, to a utility that had fallen victim to a ransomware cyberattack where hackers demanded payment to restore access to its computer systems.

6. Consideration of ethics

The prospect of increased availability of self-driving cars brings another challenge for car designers and AI practitioners of dealing with situations where the AI software will have to take life and death decisions. Ethics-based decisions related to unavoidable fatal accidents, i.e., those situations where for the reaction time available no solutions can be found to avoid an accident, are of particular concern.

For example, a tragic hypothetical dilemma in which a self-driving car has to decide whether to run over a group of pedestrians or plunge off a cliff, killing its own occupants, demonstrates one of the potential ethics issues with AI.

The use of AI in the water sector often involves optimal allocation of scarce water resources. However, if automation is taken to its extreme, e.g., in times of severe droughts, where AI decides how to allocate resources to various users (e.g., crop irrigation vs. urban supply), the decision can lead to ethical questions about responsible AI.

7. Framing and the digital vocabulary

Despite the referenced accidents above, organizations such as Tesla have continued to disrupt the traditional car industry, amassing a loyal following. Part of the reason for leading this movement is not only creating a desirable product, but the way the organization has framed electric vehicles as an experience. Owning a Tesla has become a way of life for many, with buyers becoming

natural ambassadors taking to social media to praise the brand. Imagine if we could create a similar movement for tap water!

As water's digital transformation progresses, it's important to communicate the benefits to consumers by using the right vocabulary. We need to make sure we bring ratepayers along the digital journey, using additional data to drive consumer engagement, as well as operational improvements.

5. The Waymo One vehicle uses lidar to paint a 3D picture of the vehicle's surroundings. Photo: Waymo

Despite digital solutions, automation systems will still require a highly-skilled workforce to ensure the safe operation of water systems.

Safeguarding water's digital transformation

Given the level of complexity involved with managing water systems, their critical nature (e.g. linking to health and food provision), the necessary safety culture in the industry and the state of digitalization so far, the water sector has the opportunity to learn from other sectors that are more advanced in terms of automation and digital transformation.

The incidents analyzed here occurred in the sectors with strong regulatory mechanisms and safety culture, thus indicating that similar concerns should be researched to safeguard the developing area of digital transformation in the water sector.

The lessons learned from the incidents in the transportation sector, which could at least partially be attributed to digitalization and automation, are useful for establishing academic and industry based research agendas in the digital transformation and automation of the water sector. ●



6. Water Management Systems are critical seeing they are linked to health and food provision.
Photo: Macau Photo Agency

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Energy

Cleaner Seas: Stockholm Is Shifting to Green Ferries

WRITER: JOSHUA FRANKLIN-MANN

Ferries carry just 5% of commuters in Stockholm yet represent 50% of its emissions. There is a similar story being told across the world as waterborne mobility has long been neglected in technological and policy developments to promote greener, more sustainable travel options.

But now, plans are underway in Stockholm that will provide cleaner, safer, and healthier alternatives to maritime commuting.



Approximately 2.1 billion people use ferries every year, putting the industry on a par with commercial airlines in terms of annual users worldwide. To many cities and their citizens, travelling the waterways lies at the heart of everyday life.

Yet these coastal and riverside towns are too often defined by the pollution of both the surrounding waterways, and the air inside their cities, tarnished by ferry traffic powered by highly polluting marine diesel.

While some cities have mandated the switch to 'fossil-free' biodiesel, these vessels are still omitting harmful particles that cause numerous health issues for people, and those billions of people who are using ferries each year deserve better.

Change has been slow

Despite a widespread push to reduce emissions, ferries have long been neglected in the drive to create cleaner, greener public transport in cities. A common focus for many cities has been placed on transforming bus networks with the consistent development of new technologies – better batteries, more charging points, and producing new buses at more affordable prices. In 2020 alone, the electric bus market grew by 22%, with the European Commission (EC) again setting new ambitious targets to encourage cities to convert their bus fleets to more sustainable alternatives.

Electric cars have also become a symbol of the drive for more sustainable travel options. At the heart of the EC's 'Fit for 55' strategy is, that by 2035, 100% of all new cars produced in the EU will be 'zero emission', with all the necessary infrastructure in place to support them.

Of course, these developments to more sustainable transport solutions are to

be welcomed, regardless of whether a 2035 target date is too conservative. But real action on climate change requires reform across all transport sectors for it to be truly effective.

No low-emission cities without cleaner ferries

In 2019, the city of London introduced an 'Ultra-Low Emission Zone' to curb emissions, but also to improve the quality of life of its residents. Yet this zone did not include maritime transport, which is instead managed by the London Port Authority.

In 2018, Ralph Hardwick was campaigning against a new cruise port slated to be built on the Thames in Greenwich. "Nothing on the Thames has really got emission controls, so when the mayor is trying to have ultra-low emissions, it's just not going to touch the river," he stated.

Plans for a cruise port in Greenwich were eventually shelved after prolonged, vociferous protests, but emissions

targets for the Thames' maritime traffic continue to 'kick the can down the road' with targets stretching into 2051.

This highlights how the disconnect between ferries and public transport is resulting in a disjointed effort to tackle emissions. Furthermore, what is lost in the international and global emission targets is what this means for citizens in the short term, as air pollution continues to kill 400,000 people annually in the EU.

Plans for cleaner waters

However, there are plans being developed across Europe that would give higher priority to marine transport. One ambitious initiative – the 'Boatplan Stockholm 2025' – has set out clear goals to improve the environmental impact of the archipelago's public transport fleet.

1. New Beluga24 ferry in Stockholm. Photo: GCF

2. Ferries at London Eye Pier, London, United Kingdom. Photo: Chan Lee

2



MARITIME TRANSPORT

Under the plan, all maritime traffic in the entire Stockholm archipelago would become 100% emission-free, with boats using either electricity or hydrogen as fuel.

These changes build upon guidelines set out by local politicians in the region, committed to reforming public transport between Stockholm's many islands. This would be a significant step towards reducing climate and environmental impacts, while also delivering a more attractive service for its residents.

This is by no means a simple task. Of the 62 vessels currently in use on Stockholm's archipelago, the majority are over 40 years old. Older vessels mean a decrease in energy efficiency and make many boats unsuitable to be converted to be emission free.

A four-part plan for the new fleet would consist of: new, efficient emission-free vessels; the selection of new existing vessels for hydrogen conversion; plus new or old vessels being converted to battery power – with select historic vessels remaining for assisting in peak times.

Most of the fleet would fall under the new emission-free category. These boats would be made by the Swedish-based company Green City Ferries, who unveiled their new ferry – the Beluga24 – as the world's first electric and hydrogen high-speed catamaran ferry. With two emission-free options – electric for short journeys and hydrogen for long – the Beluga24 has been designed as a multi-purpose solution for public transportation with space for 150 passengers and 28 bikes. The sexy design and futuristic feel of the Beluga24 will give commuters the feeling of really being part of the energy transition that is spreading across Europe. The introduction of high-speed ferries (30 knots) with low wake signature constitutes not only an attractive way to commute but also a convenient timetable that can compete with land-based alternatives for commuting.





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Green City Ferries has a collaboration with Teknikraft – a company from New Zealand with over 25 years' experience in the design of hydrofoil supported catamarans – who were able to create a design specific to commercial passenger vessels. In collaboration with renowned Italian yacht designer – Studio Sculli – who created the futuristic interior & exterior design, they claim to have created a vessel that is an attractive option for city governments and port authorities looking to reduce emissions, but more importantly as an improved means of transport for urban commuters and tourists.

What is the cost?

While there has been a shift towards prioritizing the environmental impact of sustainable mobility projects, there is still a bottom line for municipalities, cities and national governments that shapes the uptake of such schemes.

For the Boatplan 2025 for Stockholm, Green City Ferries say that the costs are not only manageable, but could in fact be lower than continuing to use the existing fleet and running them on biodiesel.

Given the speed at which technology is developing in the field of electric- and hydrogen-powered vehicles, in combination with increased pressure on policy-makers to shift away from marine diesel and biodiesel, it is essential that new vessels can be updated and retrofitted in the future. The Beluga24 can be fitted with a rechargeable battery or a hydrogen-fuel option, making it versatile and allows for future changes should the technology allow it in the future.

In addition to its versatility, the ferries are also more efficient than the existing models. By incorporating foil-supported hulls and a raised bow to reduce drag, they reduce the energy demand by 60-80% which in turn reduces operational costs.

With the potential combination of private and public investment, a decrease in fuel demand, and both lease and purchase options for the vessels – sustainable, emission-free ferries can be a cost-effective option for cities.

3. Map of Stockholm Archipelago.
Source: Cartographer Edvard Cohrs (1858-1934)

4. Huvudskär Island, Stockholm, Sweden.
Photo: Haken Tas

5. Older Ferry boat, Stockholm.
Photo: Laurent Gence

The Beluga24 High-Speed Catamaran Ferry

Key design challenge

The biggest challenge with electric vessels is the weight of the components that provide the electric power. This is the case in both battery-electric and hydrogen fuel-cell electric systems. The weight typically far exceeds the weight of a conventional diesel engine vessel.

The solution

The main feature of the vessel is the hydrofoil system. The lifting force created by the hydrofoil when the vessel is operating at cruise speed effectively reduces the displacement of the vessel, lifts the hull partly out of the water, and thereby reduces the resistance, alleviating the impact of the additional weight of the electrical propulsion system.

With the potential combination of private and public investment, a decrease in fuel demand, and both lease and purchase options for the vessels – sustainable, emission-free ferries can be a cost-effective option for cities.

Why hydrogen?

One of the unique features of Green City Ferries' Beluga24 is that it has both electric and hydrogen options for the platform of the vessel – but how does hydrogen really work and why is it a cleaner alternative to biodiesel?

Hydrogen fuel cells work similarly to batteries, but do not need recharging. Within each cell, a catalyst separates hydrogen molecules into protons and electrons, with the electrons going through an external circuit and creating a flow of electricity. All they require is hydrogen.

There has been significant debate on the use of hydrogen as a fuel, in particular between 'blue' and 'green' hydrogen. Green hydrogen is 'cleaner', produced by using only sustainably sourced electricity – whereas blue hydrogen is created using natural gas and thus considered a less clean option.

According to a December 2020 report by the International Renewable Energy Agency, green hydrogen is currently two to three times more expensive than blue hydrogen. Yet green hydrogen is expected to become cheaper over the next few years, with some estimates suggesting it will reach \$2/kg by 2025 – widely considered to be the competitive baseline for more global uptake.

Green Hydrogen

Green hydrogen is produced by splitting water using electricity generated from low-carbon sources. It is generally more expensive than blue hydrogen, though prices are becoming more competitive.

Blue Hydrogen

Blue hydrogen is derived from natural gas. The process mixes natural gas with very hot steam, in the presence of a catalyst, where a chemical reaction creates hydrogen and carbon monoxide.

It is roughly between two to three times cheaper than green hydrogen.

are providing is actually a solution to use this new green hydrogen that is being produced.”

Green City Ferries' commercial vessel starts in 2023, in Österåker, Sweden, with a high-speed hydrogen ferry taking on longer routes within the archipelago. This is confirmed by Michaela Fletcher, Executive Mayor of Österåker: “We are interested in trying to develop an archipelago traffic that takes care of us and our future generations.” And with other cities already showing interest in the technology, it might not be long before electric and hydrogen ferries are taking mobility into cleaner waters further afield as well.

Setting a precedent for bigger industries

As countries and cities turn their attention to making sustainable water mobility a reality, the wider shipping industry remains the ‘elephant in the room’.

Boats for the future

Fredrik Thornell, CEO of Green City Ferries, emphasizes this point. “If you look at the European plans for the hydrogen economy and all the policy papers and the European Investment Fund, you can find many large-scale green hydrogen projects. We see that the availability will be there. What we

6. The introduction of high-speed ferries (30 knots) constitutes an attractive alternative for commuting. Photo: GCF



“Stockholm has ambitious targets to become fossil free and climate neutral by 2040, and transforming our waterborne mobility with innovative solutions using electric and hydrogen ferries is a key component.”

Daniel Helldén, Vice-Mayor of Stockholm, responsible for Mobility

Global shipping is expected to increase considerably over the next 30 years, and while the industry makes up just 3% of CO₂ emissions, it is predicted that shipping could account for 10% of greenhouse gas emissions by 2050. In addition, ships in seaports emit particulates that are directly linked to health issues in port cities.

Despite the growing concerns on shipping emissions, unlike passenger ferries it is widely considered that long-haul shipping is not ready for a complete emission-free transformation, yet it does need to have increased scrutiny from the international community.

Shipping was initially left out of the EUs 2030 climate targets, but recent amendments to the EU climate strategy includes the need to act on shipping emissions. This still only goes so far as to state that data on emissions needs to be collected, and the International Maritime Organisation supported in its initial strategy to reduce emissions by 50% by 2050 – another example of long-term targets for a problem that needs action now.

But the technology and investments are coming. As Thornell explains, “the speed at which technology is advancing,

anything is possible. It was not long ago when the idea of battery-powered ferries was inconceivable – but now it is a reality. Our Beluga24 can be an inspiration for the wider shipping industry by showing what is possible already today in waterborne transportation” With increased investment in research and the will to change, emission-free shipping might not need to be just a dream set in the distant future.

The investments underway in Stockholm represent the beginning for cleaner waters and better, safer transport options for citizens. Moving forward past the launch of the pilot in Sweden, Green City Ferries has been contacted by many cities worldwide interested in hydrogen-electric technologies. Starting up GCF Americas on west and east coast, the company is poised to step up the push towards more sustainable travel on the world’s waterways. Green City Ferries is setting a very precedent for what is feasible today to transform waterborne public transport systems with emission-free alternatives that are cost efficient, convenient, and attractive. By investing in zero-emission public transport across all mobility modes, Europe is positioning itself as a global leader in the transition towards fossil-free cities. ●

Fit for 55 – cutting 55% of emissions by 2030

- Strengthen EU Emission Trading Scheme (ETS)
- Extend ETS to maritime sector, reduce airline allowances
- New ETS for road transport and buildings by 2025
- ReFuelEU Aviation initiative to oblige sustainable aviation fuel blends
- FuelEU Maritime initiative to stimulate sustainable maritime fuels and zero emission technologies

More information on Green City Ferries:
www.greencityferries.com

7. New Beluga24 ferry in Stockholm. Photo: GCF





Hop on the Train: A Rail Renaissance for Europe

WRITER: LAIA SEGURA CUETO

How the 2021 European Year of Rail supports the European Green Deal
for a more sustainable recovery.



1. Inter-regional train from Porto to Pocinho.
Photo: Nelso Silva

The EU has set itself the target to become climate neutral by 2050 and making mobility more sustainable is necessary for reaching this target. Rail could therefore play a key role in the future transport system because it is clean, safe and reliable, and it could also become a symbol for the European Green Deal. Europe needs to become more climate friendly, and Europe needs to grow closer together. A strengthened European rail system has the potential to (1) reduce transport emissions by creating alternative options to road transport and aviation, (2) better connect people and businesses in Europe, and (3) give a green boost to the European economy post COVID-19.

Rail can help the EU to achieve its climate targets

Rail is the cleanest mode of transport. A flight from Paris to Berlin causes at least six times the CO₂ emissions of a train journey. Counting the non-CO₂ impacts of aviation, the flight is responsible for 18 times the climate impact of a rail trip. With further electrification and decarbonization of power generation, the carbon emissions of rail could be reduced to close to zero. Intra-European flights on distances less than 1,000 km are estimated to cause 28 MtCO₂ every year, without counting the non-CO₂ impacts.

Seventeen of the 20 most frequented air routes in Europe are for distances less than 700 km. In theory, almost all of these journeys could be shifted to rail. The better European cities are connected by rail, the easier it is to move transport away from high-polluting transport modes such as aviation and cars. The more attractive and easy-to-use rail services are, the more likely it is that people will want to switch.



Rail connects people, cities and countries

In contrast to aviation, rail not only services highly frequented core routes but also has a network that reaches remote regions. This network was much denser 50 years ago, both within countries and in border regions. While many connections are not in use anymore because of massive divestment from rail, many could easily be reinstalled. A network of fast long-distance connections combined with dense regional services could make Europeans feel more connected to and part of the EU.

Rail can be a driver for European recovery post-COVID-19

The rail sector employs more than 2.3 million people (directly and indirectly) and creates a gross value added of €143 billion, of which €66 billion is created directly by the sector. This is larger than the gross value added of air transport. The EU rail supply industry accounts for around 20% of the global market. Rail infrastructure investments usually need more time but add to mid-term stability and growth expectations in the construction sector. Some rail infrastructure modernization projects could be realized rapidly, -for example track switches, bypasses, and European Rail Traffic Management System (ERTMS). The investments needed for the realization of the Trans-European Transport (TEN-T) core network, for example, is estimated to create €4.5 trillion cumulated GDP and 13 million job-years EU-wide.

2. Railcars that cover the route from Badajoz (Spain) to Entroncamento (Portugal). Photo: Nelso Silva

3. Royal Border Bridge spans the River Tweed, England. Despite its name, the bridge does not in fact span the border between England and Scotland, which is approximately three miles further north. Photo: Dave43251

European Year of Rail, an opportunity to boost European rail services

While many actors are praising railways, the European rail system is currently not in the best shape to take a central role in transport systems. In almost all EU member states, the importance of rail has declined over the last decades due to a heavy focus on road and aviation.

Rail accounts for only 8% of passenger transport, and international rail services in particular are not sufficiently developed. Of the 365 cross-border rail links that once existed, 149 were non-operational in 2018, and today not even all European capital cities are linked by direct rail services. The rail system in the EU is currently not more than a patchwork of national systems, with no comprehensive European strategy. In the European Year of Rail

2021, the EU and national governments need to seize the opportunity to boost European rail services. This is an excellent moment for initiating a rail renaissance because: (1) COVID-19 has reshuffled transport systems and travelling habits; (2) with the European Green Deal, the EU economy is on the brink of a new era; and (3) there is strong political support for rail from actors across the board.

The options for improving international rail are right in front of us. EU institutions and players tend to focus on infrastructure development, but this is expensive and time consuming. Also, rail infrastructure projects are often not matched with measures to simultaneously improve service quality to make efficient use of the new infrastructure. There are low-hanging fruits available to the EU which could boost international rail services immediately, without the need for large scale investments.



3 priorities for a Rail Renaissance in Europe

Priority 1: Launch new direct international services, day and night, on existing infrastructure

International rail services between major European cities offer a large untapped potential. Most rail services stop at a border or end just on the other side. Travelers often need to change trains several times to get from one capital to the other which means additional stress and waiting time for the traveler. The few direct services often stop too many times along the way and wait too often at major traffic nodes for track capacity. **Direct trains between all European major cities of neighboring countries should be an absolute minimum**, also other metropolitan areas should be connected with direct and frequent services.

Furthermore, long-distance trains should connect well with regional rail services, to establish a dense and attractive network. Connecting long-distance trains to regional rail services does not always require new high-speed infrastructure.

Much of the infrastructure is already there, especially in western Europe, but is not utilized to its full potential. A European Commission report found that of 202 operational cross-border rail links, only 57 were fully exploited in 2017. In many cases more efficient use of existing high-speed or even conventional infrastructure and better coordination of timetables would be sufficient. A well-coordinated timetable could also integrate regional and long-distance trains and improve connectivity in Europe.

How can the EU launch new international rail services in the short term?

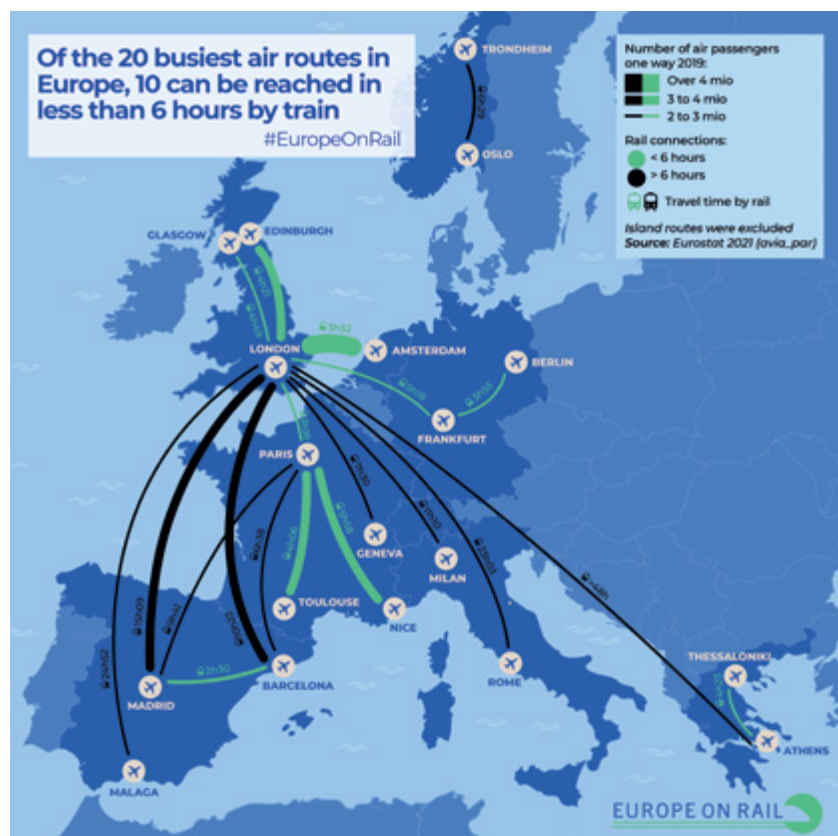
- **Get started:** Agree on one or two corridors to start with (e.g. Warsaw-Berlin-Brussels-Paris or Amsterdam-Paris-Barcelona).
- **Corridor coordination:** Task the European Railway Agency (ERA) with coordinating rail services on these corridors to create a one-stop shop for train operators. The agency could provide information on which rolling stock is required, and the frequency and speed of the services. It could facilitate coordination between infrastructure managers to ensure that services get the required track slots for fast and smooth journeys.
- **Start-up support:** Determine those sections of the corridor that the service can run on a commercial basis and those where it needs subsidies (at least to get started); start-up support should be tied to the condition that low-price tickets are available to make the service accessible to price-sensitive passengers.
- **Vision:** Agree on a comprehensive network of European day and night trains, with trains crossing external EU borders into the neighborhood (especially to the UK, Western Balkans, Turkey, Ukraine, Belarus and Russia)



Priority 2: Make booking of international services attractive and convenient

Booking international flights is very easy but buying international rail tickets is the opposite. Passengers cannot easily find and compare all available connections and prices and bear the risk of delays on the way. That needs to change: **travelling by rail needs to become at least as easy as travelling by plane**. Consumers should be able to book rail tickets for any connection in the EU via one-stop shops. Technical solutions for integrating information from different train providers are available. Independent online ticket vendors like Trainline, Omio, etc. try to assemble tickets from different operators, but their websites do not yet show all available rail connections and ticket offers. This is because rail operators are reluctant to share all the necessary data with other operators or with independent ticket vendors.

To make booking of international services more attractive and convenient **the EU needs to require rail operators to share all necessary data for easy booking of international rail trips**. Data such as platform numbers and changes, real-time delays and cancellations or predicted arrival time is critical for a seamless journey and for passengers to be able to find alternative connections in case of disruptions. Moreover, the EU needs to establish a comprehensive multimodal legal framework for booking, ticketing and payment services, making access to static and dynamic data mandatory, require rail operators to share data via an open Application Programming Interface (API), and allow ticket vendors to assemble their own discount and promotion packages to compete in an open ticketing market. And finally, the EU needs to establish rules to guarantee that international rail passengers arrive at their final destination and can hop on the next train in



5

case of missed train connections. Rail passengers often need to buy individual tickets from different rail operators for a multi-leg journey-and under current rules passengers bear the risk if a connection is missed. Rail operators are currently not obliged to sell so-called 'through tickets', that is, one ticket contract for multi-leg journey with a guarantee to arrive at the final destination.

Priority 3: Invest in cross-border infrastructure connections and key corridors

EU funding (cohesion funding, Connecting Europe Facility, and the Recovery and Resilience Facility) makes up an important share of overall transport infrastructure funding, especially in the new member states. Yet, in the past, EU

transport funding has not always been used wisely. Too much funding went into road and airports, and too little into rail. **Too much money also goes into mega-projects with exploding costs and long delays**. The European Court of Auditors cautioned, in 2018, that projects were often chosen based on political decisions and not on thorough cost-benefit analyses. The evaluated high-speed projects took 16 years on average, cost on average €25 million per track km, but often do not deliver on expectations: average speeds rarely reach 200 km/h, and only few lines transported more than nine million passengers per year (the benchmark for a successful high-speed line).

4. Map picturing the missing connections between neighbouring European capitals. Source: Europe on Rail

5. The 20 busiest European air routes and the availability of train routes. Source: Europe on Rail



6

In contrast, small-scale interventions with greater European potential are often not implemented. This can be electrification, constructing a second track or bypasses to increase capacity and speed, or closing smaller missing links on the border. The European Court of Auditors also noted a **lack of coordination of cross-border infrastructure projects**. Member states take a national perspective and do not prioritize closing cross-border gaps.

The EU should ensure that EU funding:

(1) Supports modal shift towards rail:

In the negotiations of the Operational Programmes for Cohesion funding, the European Commission should ensure that more budget goes to rail than to road, and no new roads are financed in the old member states, as they already have a sufficiently dense road network.

(2) Prioritizes rail projects essential for intra-European rail services:

Connecting Europe Facility (CEF) funding should only go into projects that are key to cross-border connectivity (e.g. for key corridors), and should focus more on low-hanging fruits than on new mega-projects. Such interventions should be based on sound cost-benefit analysis. **(3) Promotes infrastructure interventions which are accompanied by transformative measures:** When accessing EU rail infrastructure funding, member states should be required to present accompanying policy measures which ensure that the infrastructure is used efficiently.

The rail necessity

An enhanced European rail system would significantly contribute to the EU's target to become climate neutral by 2050 – at the latest. Europe needs a more attractive and connected rail system to offer an alternative to flights, reduce transport emissions and give a green boost to the economy. ●

Disclaimer: This article summarizes the key ideas of the report "Hop on the Train: A Rail Renaissance for Europe. How the 2021 European Year of Rail can support the European Green Deal and a sustainable recovery." The report was elaborated under the **Europe on Rail initiative**, which aims to build support for a 'Rail Renaissance' in Europe, with a focus on cross-border passenger rail transport.

6. Passengers in the platform at Amsterdam Central Station. Photo: Stas Rozhkov



ZERO BRINE **FINAL FORUM**

IN COOPERATION WITH AMSTERDAM INTERNATIONAL WATER WEEK

 **AMSTERDAM
INTERNATIONAL
WATER WEEK**

RECOVERING RESOURCES FROM INDUSTRIAL WASTEWATER

2 November, 14:00-15:00
Expert Panel at AIWW (Digital)

Will 'mining' resources from industrial brine be key to bring greater European economic competitiveness?

Gain new perspectives into opportunities for brine to be a contender for building climate resilience more globally.

CIRCULAR ECONOMY SOLUTIONS FOR INDUSTRIAL WASTEWATER: ZERO BRINE FINAL FORUM

4 November, 10:00-16:30
De Oude Bibliotheek, Delft (Digital/Live)

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Making Gothenburg Greener

INTERVIEW WITH AXEL JOSEFSON, EXECUTIVE MAYOR

**Gothenburg's mayor gives insights into the Green City Accord
and how the city is becoming more sustainable.**



How important are mobility interventions in achieving environmental goals such as improving air quality and reducing noise pollution?

Road transport is one of the largest sources of greenhouse gas emissions in our city. NO₂ emissions from road transport pose a challenge for us, as it does for many European cities. We have made great progress in reducing our emissions from road transport by optimizing our traffic routes and we are on our way to making our entire transport fleet fossil free by 2023. Today, many of our bus lines are solely run by electric buses, which greatly reduces air and noise pollution. This underlines the importance of mobility interventions

to meet our environmental targets. We cannot rely solely on technology in our transition to sustainable urban mobility. Therefore, we are also working to make it easier and safer for pedestrians and cyclists to use our roads.



1

How has the situation been in terms of air quality in Gothenburg since the pandemic? How will you ensure that improvements are maintained?

We have seen a decrease in traffic flows by about 10-15% and an increase in bike usage. This has had a positive effect on air quality and noise levels, but we have yet to evaluate its impact properly. We have also seen a decrease in public transport and car usage; however, the former was larger than the latter. It is still too early to comment on the long-term effects of the pandemic, but Gothenburg has made a lot of progress in implementing our Sustainable Urban Mobility Plan (SUMP). For instance,

we have expanded our infrastructure for cyclists, pedestrians, and public transportation. We hope that our active engagement will safeguard some of the positive effects from the pandemic, such as increased cycling.

Gothenburg is known for traditionally being an industrial city with strong shipping and automotive industries. How is the city promoting sustainability in light of this heritage, for example moving towards becoming a city where people choose greener forms of transportation?

This heritage has given us the entire value-chain in vehicle production, broad competence and world-leading research and development on sustainable and connected mobility. The city is working in close cooperation with external parties within the automotive industry, academia, and civil society in electrifying transportation as well as finding other innovative solutions for this challenge.

Gothenburg has been one of the pioneers in the electrifying of harbors. The location of the port in relation to the road network still means that many international trucks pass through our city. We have made a lot of progress in developing and testing multimodal mobility solutions, for example within the Gothenburg Green City Zone and through our newly EU-funded Horizon 2020 project MOVE21. We also invite others to use our city as a test arena.

What benefits do you think signing Gothenburg up to the Green City Accord will have in terms of improving air quality and noise pollution?

Signing the Green City Accord clearly shows our ambition in approaching the World Health Organisation's recommended guidelines and pollution levels. These are more ambitious than those in the EU Air Quality Directives and in Sweden's national guidelines that we currently use for benchmarking in our urban planning. The Green City Accord clearly stresses the need for mainstreaming improved air quality and noise pollution targets into our energy,

climate and transport strategies, action plans and programs. This is very much in line with Gothenburg's ambition to tackle these issues in a holistic manner. We see that the Green City Accord will provide a forum for knowledge exchange with other European cities, so that we can learn how best to approach these issues together.

What message would you like to send to other cities in Sweden and Europe by committing to higher targets on air and noise pollution?

Like Gothenburg, European cities are growing rapidly. Without tackling the health issues that air and noise pollution pose we cannot grow in a sustainable way. Ensuring that we meet our goals of becoming a sustainable city is as important for our citizens as it is for the environment. ●

More information on EU Green City Accord: www.greencityaccord.eu

1. Axel Josefson, Executive Mayor, City of Gothenburg
2. The Göta älv River running through Gothenburg towards the Kattegat. Photo: Per Petersson
3. City cycling in Gothenburg. Photo: Martin Magnemyr



2



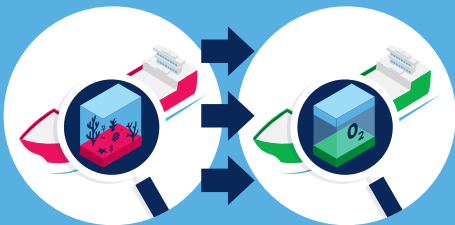
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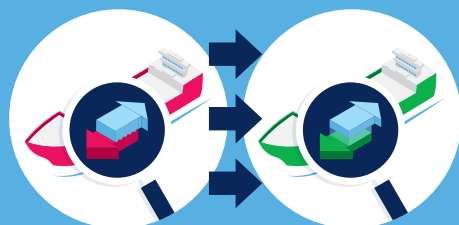
AIRCOAT

FLYING ON WATER

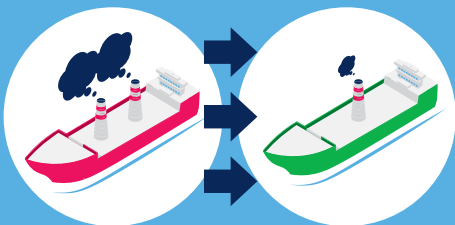
The AIRCOAT project promotes a ground-breaking passive air lubrication technology with a high potential to revolutionise the ship-coating sector by reducing energy consumption and ship emissions.



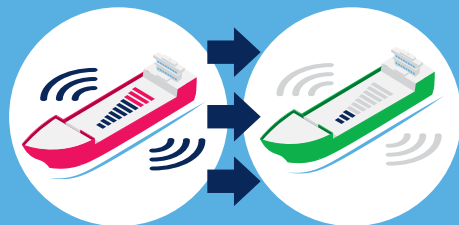
REDUCING BIOFOULING



REDUCING FRICTIONAL RESISTANCE



REDUCING EMISSIONS



REDUCING NOISE POLLUTION



The AIRCOAT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 764553.

✉ info@aircoat.eu



VIEWS

The Interrail Pass

The Interrail Pass remains as relevant and popular today as it did from the start in 1972. With just one pass, travelers of all ages are able to visit up to 33 different European countries.

For almost 50 years, the Interrail Pass has been providing unique travel experiences filled with adventure, freedom, and flexibility while offering a gateway to the geographical, historical, and cultural richness of Europe.

Rail is one of the most environmentally friendly and energy efficient ways of travelling. 2021 has been named by the European Commission as the European Year of Rail – with the aim of highlighting the benefits of rail as a smart, sustainable, and safe means of transport.

A variety of activities this year is putting rail in the spotlight across the continent, to encourage the use of rail by both citizens and businesses and to contribute to the EU Green Deal goal of becoming climate-neutral by 2050.

With an Interrail Pass, travelers are able to make travel decisions that leave a positive impact on the world.

↑ Munich, Germany

Eurail provides sustainable, unique travel experiences as a gateway to the cultural richness of Europe.

Photo: Julian Love



The history of the Eurail and Interrail schemes is interwoven with the history of Europe. With just one rail pass, travelers of all ages have the ability to visit up to 33 different European countries. Eurail, the company behind the Eurail and Interrail Passes, is owned by over 35 European railway and ferry companies, and is based in Utrecht, the Netherlands.

Interrail Map - 2021







↑ Berlin, Germany

In 1972, the Interrail Pass was introduced by the European railways to enable young Europeans up to the age of 21 years to discover their continent by connecting 21 countries with one pass. Photo: Snälltåget

Thanks to rail travel, millions of people from around the world have brought home memories as diverse as the countries they've crossed. Photo: Snälltåget

↓ Malmö, Sweden





↑ Jämtland County, Sweden

Travelling opens minds, brings cultures closer together, and deepens the understanding and empathy for one another. Photo: Snälltåget

Rail travel empowers travelers to go one stop further from what they already know and spark their curiosity that encourages people to experience the unfamiliar. Photo: Snälltåget

↓ Åre Municipality, Sweden



Inter-Rail 1975

685 kr



↑
Eurail has been a pioneer in unifying neighboring countries by removing the perception of national borders and promoting train as an efficient and eco-friendly way to travel across Europe.

Photo: Eurail

INTER-RAIL

**Jonger dan 26? Dan een hele maand
door 21 landen treinen voor f 420,-.**



Eurail actively encourages travelers to explore new locations, step out of their routines and transform their trip from something good into something unforgettable.

Photo: Eurail



↓ Flamsbana, Norway

Regardless of the length of the trip – be it 3 days or 3 months – trains are not only a viable alternative to planes, but essential in the fight against climate change.

Photo: Michael Meusburger

↓ Flåm Railway, Norway

Travelers are invited to dive deeper into any stop they come across and absorb the diversity Europe has to offer.

Photo: Eurail



↓ Norway

From London to Athens, travelers are free to discover Europe's most beautiful, interesting and exciting destinations.

Photo: Eurail





↑ Germany

In 2020, Eurail launched the mobile version of its Eurail and Interrail Passes, a paper-free, all-in-one digital pass that gives travelers even more freedom and flexibility to discover new landscapes, cities and cultures by train. Photo: Eurail

More than 680,000 travelers of all ages and from around the world choose to travel with an Interrail or Eurail Pass every year. Photo: Eurail

↓ Stockholm, Sweden





↑ Austria

2021 is the European Year of Rail, highlighting the benefits of rail as a smart, sustainable, and safe means of transport. Photo: Nightjet - ÖBB/Harald Eisenberger

European initiatives like DiscoverEU or the European Year of Rail are making use of rail travel to support the key goal of reducing the harmful impact of CO₂ emissions of the transport sector on our environment and societies. Photo: Nightjet - ÖBB/Harald Eisenberger

↓ Austria



07:29

BYDGOSZCZ GŁÓWNA





↑ Bydgoszcz Train Station, Poland

Initially designed to encourage youth mobility in 1972, the Interrail Pass has since broadened its horizons for European travelers of all ages to discover every corner of their continent by rail.

Photo: Eurail

↓ Flamsbana, Norway

Eurail brings together more than 43 European transportation carriers to enable borderless travel.

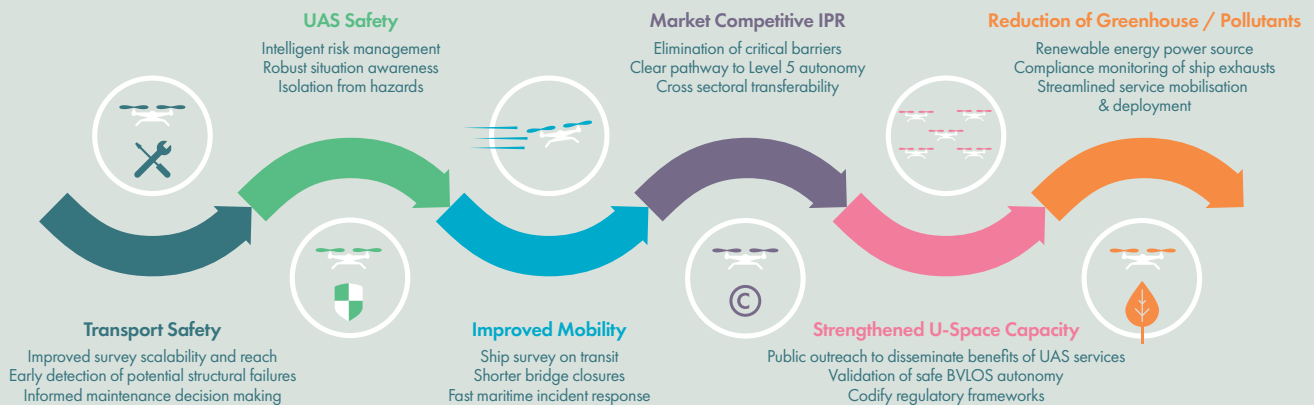
Photo: Michael Meusbürger





Risk-aware Automated Port Inspection Drones

RAPID will save lives by delivering an early warning system that will detect critical deterioration in transport system infrastructure, while also minimising system disruption and delays to critical supply chains.



The RAPID project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°861211

rapid2020.eu

The 15-Minute City

INTERVIEW WITH CARLOS MORENO

Carlos Moreno developed the concept of the 15-minutes city in 2015 as a plan to reduce cities' greenhouse gas emissions but keeping a social perspective. However, it was not until the COVID-19 pandemic was declared that the concept didn't become a reality. Moreno explained to REVOLVE which are the ideas behind this concept and how it aims to rebalance urban inequalities.



1

Where does your interest in city development come from?

My interest in cities started a long time ago. I was born in Colombia, and I came to France in my twenties. I had the opportunity to travel around the world, which allowed me to understand that

the world had become mostly urban – when I left Colombia at the end of the 1970s, only 30% of the population was urban. Travelling I realized that cities play a major role in our societies, but our urban way of life poses an ecological and climate threat.

Professionally I specialized in computer science, and I was part of pioneering movements on cities such as Smart Cities. It was from the 'Smart City' movement that I became more interested in lifestyles than in the use of technology.

What made you shift and look more at the social side of cities?

Technology is a powerful tool, but it is only a tool. It cannot be an end in itself. When I participated in the 'Smart City' process, I understood that it was a dead end. No matter how much technology you put into traffic, the problem is not how to make traffic flow more smoothly. You have to understand why people travel so much by car and avoid those journeys, rather than making traffic flow more smoothly.

When did you develop the 15-minute city concept?

After trying to introduce the human component in the 'Smart City' with the 'human smart city' concept, I started to talk about the living city, taking up the idea developed by Jane Jacobs. It was from the living city that I saw the need to put proximities as a new priority. It was at that moment, coinciding with COP21 in 2015, that I proposed the idea of the 15-minute city – but everyone thought it was a utopia. At that time, I explained that to reduce CO₂ emissions we had to change our lifestyles.

Given that in cities mobility is the first source of emissions we had to understand why we move so much, so we can create new centralities and reduce the pendulum effects of mobility. The idea was to create a polycentric city, with a 'human proximity' – areas in the vicinity that provide living, working, shopping, physical and mental health care, access to culture and green spaces. Since 2015 no one has really shown interest in this concept. It was not until the COVID-19 pandemic that the 15-minute city became a reality.



2

How has COVID-19 impacted policy-makers' long-term visions to make urban living more sustainable and pleasant for residents?

Even though many politicians take short-term measures, now we are confronted globally almost for the first time with two threats: climate change and a global pandemic.

Politicians have found in the 15-minute city the right concept at the right time to answer those threats. If local governments implement the 15-minute city they say that they are working on proximity, viable economic consolidations, and models of social bonding.

The 15-minute city is a concept of humanist ecology that says 'yes, we can do things differently'. Human proximity becomes the central axis of urban policies requiring an important presence of local governments so that it does not give way to gentrification. We want the 15-minute city to become a polycentric city that serves everyone and not just a few privileged neighborhoods.

How does the concept of the 15-minute city challenge inequalities and create fairer cities?

We have to take as a starting point that we already live in cities that are fragmented, segmented and even segregate its citizens. In the 15-minute city, we are talking about a city of human proximity – always in plural.

We seek to break with the fragmented city and to rebalance the center with the periphery, integrating economy, ecology, and social issues at the heart of a new urban policy.

We speak of six essential urban social functions to be satisfied and rebalanced in all areas: living, working, shopping, physical and mental health care, access to culture and green spaces.

Can this concept be exported to any city in the world?

The 15-minute city started in Paris because the city's mayor Anne Hidalgo

proposed this concept as the backbone of her new candidacy.

However, the concept has had international impact since the C40 decided to give the 15-minute city a leading role in the post-pandemic recovery roadmap. We have seen that cities around the world – like Milan – have made this concept the centerpiece of their urban policy. All that is needed is a political decision to put in place a new urban policy that gives priority to the convergence between ecology, economy and society with this notion of happy proximities.

Could the 15-minute city threaten the mixture and movement of people that enriches social and cultural life in cities?

The vitality of a city is not getting up at 6am to commute for 1h30 to get to work. That's stress and anonymity in your neighborhood – a rhythm of life that does not correspond to urban humanism. We want to revitalize the city but with an urban humanism giving residents the notion of personal, social, and ecological wellbeing.

We want to move away from forced mobility towards chosen mobility. ●

Read the full interview at revolve.media

1. Pedestrian area close to Lubyanka Square, Moscow.
Photo: Marco Verch.

2. Allen & Pike Malls, New York.
Photo: Payton Chung.

The EU Cannot Decarbonize Global Aviation Alone

WRITER: DAVE KEATING

The EU's 'Fit for 55' proposal would phase out jet fuel subsidies and end free emissions trading allowances for airlines, but without global cooperation, the changes will not stop aviation emissions from growing.

“Not so fast,” said Washington when, in 2011, the EU was preparing to become the first major economy to make a serious attempt to tackle aviation emissions by forcing airlines to purchase permits to pollute in its Emissions Trading System (ETS).

A trade war loomed as the Obama administration, backed by bipartisan support in the US Congress, threatened to retaliate if the EU dared make US airlines pay for emissions for flights to and from Europe. It was a matter of sovereignty, the administration insisted. Eventually, the EU backed down, agreeing to exempt foreign airlines and only make flights within EU airspace subject to emissions trading. Connie Hedegaard, EU climate commissioner at the time, said Europe was, instead, giving the International Civil Aviation Organization (ICAO) time to agree a global deal. If no deal were reached by the end of 2013, foreign flights would be included in the ETS, she warned.

That deadline was breached, but the threat was never carried out. Today, there is still no effective global tool to lower aviation emissions, and non-EU flights are not included in emissions trading. The ICAO agreed a voluntary Carbon Offsetting and Reduction Scheme for International Aviation (Corsia), in 2016, but so far it has not been implemented by any country. Even if all countries were to adopt it by the 2027 deadline, which looks unlikely, it would have little effect on aviation emissions, say campaigners.

Last month, as part of its mammoth ‘Fit for 55’ package of climate proposals, the European Commission laid out the groundwork for the EU to become the first major economy to implement Corsia. The change will create a “future-proof system” that “creates a market for sustainable alternative fuels and low-carbon technologies”, said EU transport commissioner Adina Vălean. However, climate campaigners believe this is a lost opportunity to call out

international partners for dragging their feet on aviation emissions. They wanted the Commission to propose including non-EU flights in the EU ETS come hell or high water.

“We would prefer a full scope ETS to maximize a range of carbon pricing,” says Andrew Murphy, head of aviation at the NGO Transport & Environment (T&E). However, the EU’s desire to ‘champion multilateralism and international agreements’ makes such an approach challenging, he says. Nonetheless, Murphy welcomes the Commission’s pledge to extend the ETS to flights outside the EU if Corsia isn’t implemented by 2027.

Such pressure is needed, Murphy says, because the world’s other major economies aren’t moving. “We have seen no evidence the US is planning to implement Corsia in a legally robust manner,” he notes. “They have airlines voluntarily reporting their emissions. There is no evidence of legislation in Congress, and we don’t think the administration can do it by executive order.” It is still unknown if China or India will participate, Murphy says. Beijing and Delhi are objecting on “common but differentiated responsibilities” grounds – saying Corsia does not distinguish between newly industrialized countries and those that industrialized a century ago. Russia has also not yet signed up.

Today, there is still no effective global tool to lower aviation emissions, and non-EU flights are not included in emissions trading.

If China doesn’t implement Corsia, it is likely the US won’t either. That would leave the EU as the only major economy tackling aviation emissions, unless it can pressure others to move. The EU dropped the idea of including international aviation in its ETS to give global measures a chance to develop, says Murphy. “If the US is so unhappy about the prospect of being included, all they have to do is implement Corsia. If not, the EU is within its rights to extend the ETS.”

What is Corsia?

At first glance, the envisioned Corsia system seems to resemble the EU ETS. An airline would purchase carbon credits to offset any emissions above 2019 levels (a baseline originally meant to be 2020, but changed because of the distorting effects of the COVID-19 pandemic). Credits could be obtained by planting forests, for instance. The annual revenues from the system would be used for carbon-reducing activities or research into alternative fuels.

1. The EU needs cooperation from international partners to reduce air traffic emissions. Photo: CHUTTERS/NAP

However, Corsia doesn't require airlines to reduce emissions, only stop their growth. It also only applies to international flights – domestic flights account for about 60% of aviation emissions – and, because of the 2019 baseline, just 25% of that 60% of emissions would be covered by the time the system is meant to be fully in force by 2027.

However, airlines insist this is a work in progress. The rules will be reviewed every three years, with the next session expected in 2022 when the baseline year could be moved. It is also possible the criteria around offsets will be made more robust and put more burden on airlines to reduce emissions. In addition, Corsia is just one of three pillars

of ICAO's efforts to deal with aviation emissions, the others being fuel taxes and the development of alternative fuels.

To update the EU ETS to accommodate Corsia, the Commission has proposed phasing out free allowances for airlines by 2027 and reducing the number of allowances auctioned as of 2023. This decrease would be achieved by applying an increased linear reduction factor of 4.2% instead of today's 2.1%. While routes entering or leaving EU airspace would still not be subject to the ETS, the EU would apply Corsia obligations on those routes from 2027 at the latest. Europe would also apply sustainability safeguards to try to avoid some of the system's potential defects, such as

offsets being double-counted under the Paris Agreement and Corsia. Corsia only applies to airlines from countries that have implemented it, and so from 2027, flights to and from countries that haven't implemented the system would be subject to the EU ETS.

2. European airline's total emissions, 2019.
ENERGY MONITOR

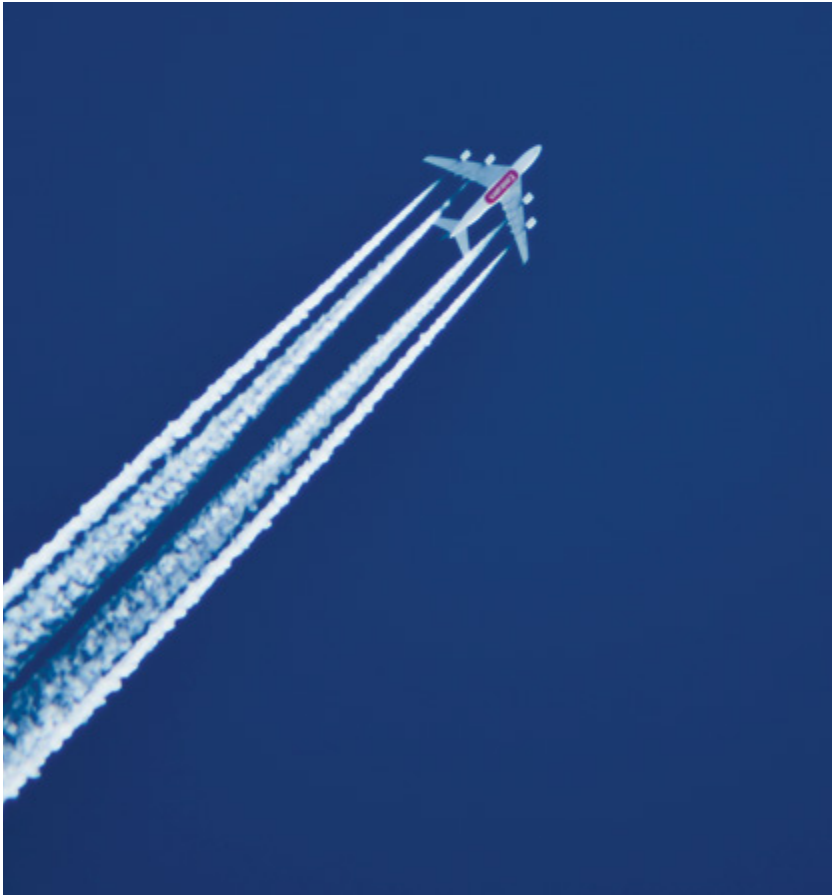
Some of the biggest recipients of airline bailouts were also the biggest European airline emitters

	COUNTRY	AIRLINE	TOTAL EMISSIONS, MTCO ₂	COVID BAILOUT RECEIVED, €M
1		Lufthansa	19.11	6,840
2		British Airways	18.38	2,553
3		Air France	14.39	7,000 (plus 3,000 under discussion)
4		Ryanair	12.28	670
5		KLM	10.03	3,400 (plus 1,000 under discussion)
6		Iberia	5.66	750
7		EasyJet UK	4.83	2,240
8		Virgin Atlantic	4.15	0
9		SAS	3.78	1,130
10		TAP	3.75	1,200
11		Alitalia	Unknown	200 (plus 3,000 under discussion)

**Europe is the
most developed
aviation market
in the world,
with among the
lowest prices
for consumers.**



3



4

These changes will have a “transformative impact” in Europe and globally if Corsia is implemented, says Thomas Reynaert, managing director of the industry association Airlines for Europe. However, the sector is concerned European flights could become more expensive, “shifting demand globally and reducing traffic locally, but not tackling the source of the emissions”, says Reynaert. He suggests European airlines could end up subject to EU and global obligations. “Unilateral and double pricing of CO₂ under several market-based measures would be economically counterproductive,” he says. “If airlines pay for their CO₂ under the ETS, they should not have to pay again elsewhere.”

Fuel taxes

However, there are plans being developed across Europe that would give higher priority to marine transport. One ambitious initiative – the ‘Boatplan Stockholm 2025’ – has set out clear goals to improve the environmental impact of the archipelago’s public transport fleet.

The next of the three aviation proposals within ‘Fit for 55’ is a change to the taxation regime for fuels. It would see airlines lose tax exemptions, in particular for kerosene. This decision, combined with the loss of free allowances in the ETS, would mean new costs for airlines, and the proposal will face fierce opposition from certain groups in the European Parliament and some national EU governments. Yet many also agree that the special tax privileges enjoyed by airlines in Europe, of which other lower-carbon modes of transport could only dream, make no sense in a world aiming for net zero.

Europe is the most developed aviation market in the world, with among the lowest prices for consumers. The proposed changes to the EU Energy

Taxation Directive are limited to intra-EU flights, which will see tax rates gradually rise to a minimum rate of €0.38 a liter (L) by 2033, with an exception for cargo flights. To incentivize the development of low-carbon aviation fuels, the minimum tax will not apply to advanced biofuels and e-fuels for the first ten years, and the methodology for determining tax will also be based on energy content rather than volume.

The increased costs could have a perverse effect, claims Reynaert, robbing airlines of money they need to invest in new fuels. “We need to invest in solutions that offer real reductions in CO₂ emissions per aircraft,” he says. “Increasing costs reduces our capacity to make these investments while CO₂ emissions are potentially shifted to other regions.” Airlines are particularly shaky given the hit they have taken from the downturn in travel during the pandemic.

However, as climate campaigners point out, the minimum tax for commercial flights will not be introduced for ten years, after applying to private jets in 2023. Those ten years amount to a €35B (\$41.16B) subsidy, says T&E. “Europe is quite unique,” adds Murphy, being one of the few jurisdictions not to charge any fuel tax for airlines. The EU’s zero tax rate compares with €0.14/L in Japan, €0.04/L in the US, and €0.02/L in Australia and Canada, shows data from research organization Fairose. As for the Covid impact, Europe’s airlines have received generous bailouts where, in theory at least, the money was supposed to be spent in a green way.

Because of international agreements, the EU doesn’t have the authority to set a minimum fuel tax for flights entering or leaving EU airspace. EU member states can tax jet fuel on these flights on a voluntary basis, but only by concluding new air service agreements with countries outside the EU.

Flight	Destination	Scheduled	Estimated	Gate
LH 2656	Barcelona	10:55		
LH 1642	Gdansk	10:55		K7
LH 2036	Berlin (TXL)	11:00		602
LX 1123	Geneva	11:00		604
LH 1686	Debrecen	11:05		646
LH 2460	Helsinki	11:05		61
LH 2528	Moscow (DME)	11:05		61
LH 2218	Toulouse	11:05		H3
LH 1612	Warsaw	11:05	11:30	K3
LH 2094	Hanover	11:10		61
EN 8290	Pisa	11:10		61
LH 1658	Timisoara	11:10		66
A3 803	Athens	11:10		H3
EN 8194	Florence	11:15		K1
LH 2068	Hamburg	11:15		66
LH 1622	Krakow	11:15		61
LH 1630	Wroclaw	11:20		K0

5

New fuels

The Commission is also proposing a so-called 'ReFuels' initiative, whereby jet fuel sold in Europe would include an increasing blend of sustainable advanced fuels, starting with 2% in 2025, 5% in 2030 and more in 2035 and beyond. This would apply to all fuel sold in the EU, including for flights leaving EU airspace. Only advanced biofuels, as defined by the sustainability criteria of the revised EU Renewable Energy Directive, can meet the target. The proposal includes a sub-target for e-kerosene of 0.7% from 2030. It has been welcomed by fuel suppliers and campaigners as a way to stimulate the development of lower-carbon jet fuels. T&E's Murphy says this element of 'Fit for 55' may have the biggest impact on aviation emissions.

Hydrogen, still at very early stages of development as a potential aviation fuel, could also benefit. The Commission recently launched a joint research project with Japan to work on hydrogen as an aviation fuel. The Canadian government is also considering a similar fuel content mandate, and the US may use tax

credits for the same end. “Unlike the ETS, where the EU remains something of a lonely figure, we think the EU is much more likely to be joined by other jurisdictions in developing alternative fuels for aviation,” says Murphy.

The EU cannot decarbonize global aviation alone, and its ability to implement effective policy, even at home, is hampered by legal and diplomatic constraints. Campaigners believe Europe should continue to plough ahead, however, insisting any damage to the sector will be less significant than the industry fears. ●

This article was first published on energymonitor.ai.

3. The Commission's 'ReFuels' initiative will promote the use of advanced biofuels in Europe. Photo: Jose Lebron

4. International agreements prevent the EU from implementing minimum fuel taxes for flights entering or leaving EU airspace. Photo: Ben Klewais

5. Internal and external flights are subject to different environmental regulations under existing plans. Photo: Daniel Schludi

India's Complicated Relationship with Palm Oil

WRITERS: PRIYANKA BHIDE & ANIMESH JAIN

India is one of the largest consumers of palm oil, responsible for using 20% of global supplies, primarily for cooking and food production. Much of the country's growing demand is met by Malaysia and Indonesia, where mass cultivation of the crop has been linked to deforestation, contributing to India's so-called 'imported deforestation' footprint. In August 2021, the Union Cabinet approved €1.2 billion to be spent through the National Mission on Edible Oils-Oil Palm (NMEO-OP) over the next five years to boost domestic production, raising major concerns about the risks to biodiversity in India.

Imported deforestation occurs with “the importation of goods whose production has contributed, directly or indirectly, to the deforestation or conversion of natural forest ecosystems”.

Source: IUCN (International Union for Conservation of Nature)

This article gives an overview of the complex nature of the linkages between palm oil production, sustainability, as well as implicated livelihoods and food security in India. The low price of palm oil makes it a more viable and attractive option for a country where 22% of the population lived below the poverty line pre-pandemic, and 75 million more people are with incomes of \$2 or less a day, due to the pandemic-related economic downturn, while the Indian middle class is also estimated to have shrunk by 32 million in 2020.

Palm oil is a lifeline not only for the farming population in Malaysia and Indonesia, but also linked closely to the food and livelihood security of consumers (both commercial and domestic) in India. Efforts to reduce Indian import expenditure by increasing domestic production have raised questions around sustainability as well as feasibility of producing the quantities required to meet demand. The way forward will not be easy, as it must involve a combination of more sustainable manufacturing of palm oil, with potential alternatives that do not increase costs for manufacturers and consumers to safeguard both biodiversity as well as livelihoods. Current solutions are limited, and this article advocates for better data as well as greater awareness on the issue amongst all stakeholders.

The Livelihoods & Food Security Nexus

India's population of 1.3 billion and growing, is a large consumer of edible oils, with an annual consumption demand of about 22 million tonnes as of 2020, of which almost 15 million tonnes (68%) was imported and palm oil accounted for 9 million tonnes (60%) of total imports. Palm oil is a preferred choice amongst edible oils because it is one of the cheapest sources of cooking oil, and palm is the highest oil-yielding plant in the world. Almost 90% of the palm oil consumption in India is for cooking and food production, which includes businesses in the informal and formal food sector (small businesses, sweet shops, and local street vendors) as well as households. It is also used as an ingredient in a wide range of consumer goods, like cosmetics, pharmaceuticals, detergents, and biofuels. As a result, the demand for palm oil in India is high, and there has been a 230% increase in consumption in the last two decades alone. Consumer awareness however, on both the imported nature as well as the link between palm oil production and deforestation in other countries, is low.

Malaysia and Indonesia, from where much of India's palm oil is imported,

account for 63% of global land use for palm plantation and 84% of palm oil production. Several arrangements in the past have ensured the trade continues to safeguard livelihoods on both sides of the supply chain. Indonesia for example, relaxed the quality requirements for their sugar imports in 2020 as part of a barter exchange to secure palm oil export access to India and to deal with dwindling local supply of sugar. As the palm oil sector has matured in Indonesia and Malaysia, they have taken steps towards reducing deforestation: Malaysia has a cap on its land-use at 6.5 million hectares and Indonesia has a moratorium in place on further development of the palm oil sector. To ensure the sustainable manufacturing of palm oil, Malaysia and Indonesia have created mandatory certification schemes - Malaysian Sustainable Palm Oil (MSPO) and Indonesian Sustainable Palm Oil (ISPO). Yet, direct deforestation caused directly by palm oil is at a staggering 60% in Malaysia and 16% in Indonesia.

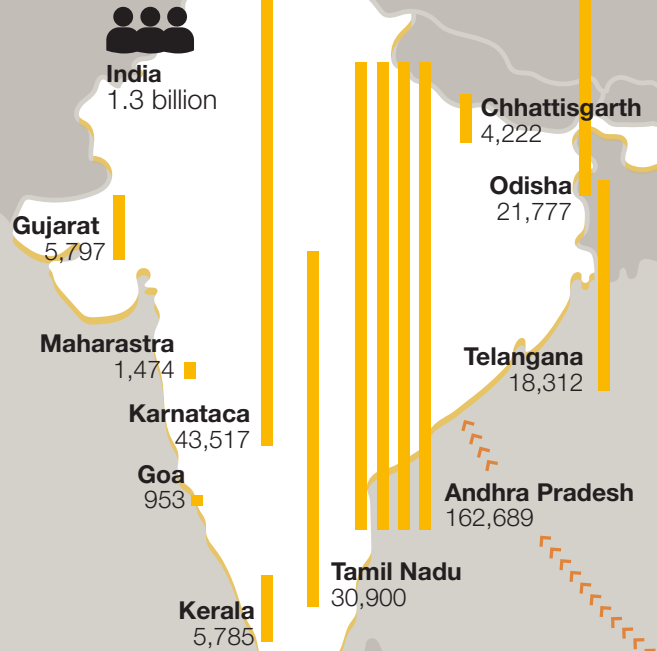
1. Palm Oil Trees, Negeri Sembilan, Malaysia.
Photo: Nazarizal Mohammad

India's palm oil production boom

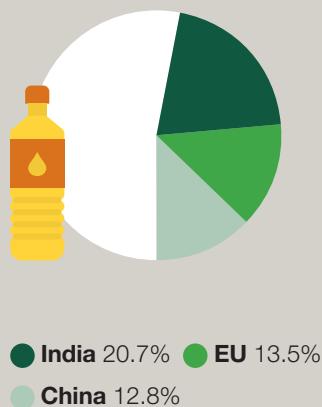
Largely dependent on Malaysia and Indonesia for palm oil, India is striving to become more self-reliant on local production.

Land use for palm cultivation has increased more than **3,500%** since the early 1990s, reaching 331,082 hectares in 2018.

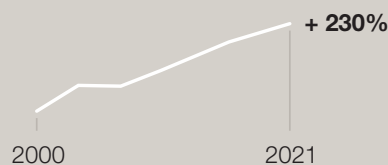
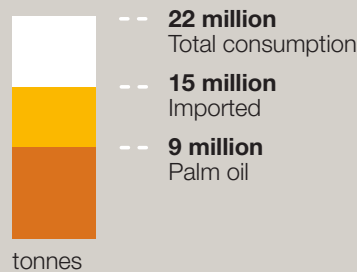
 = 5,000 hectares

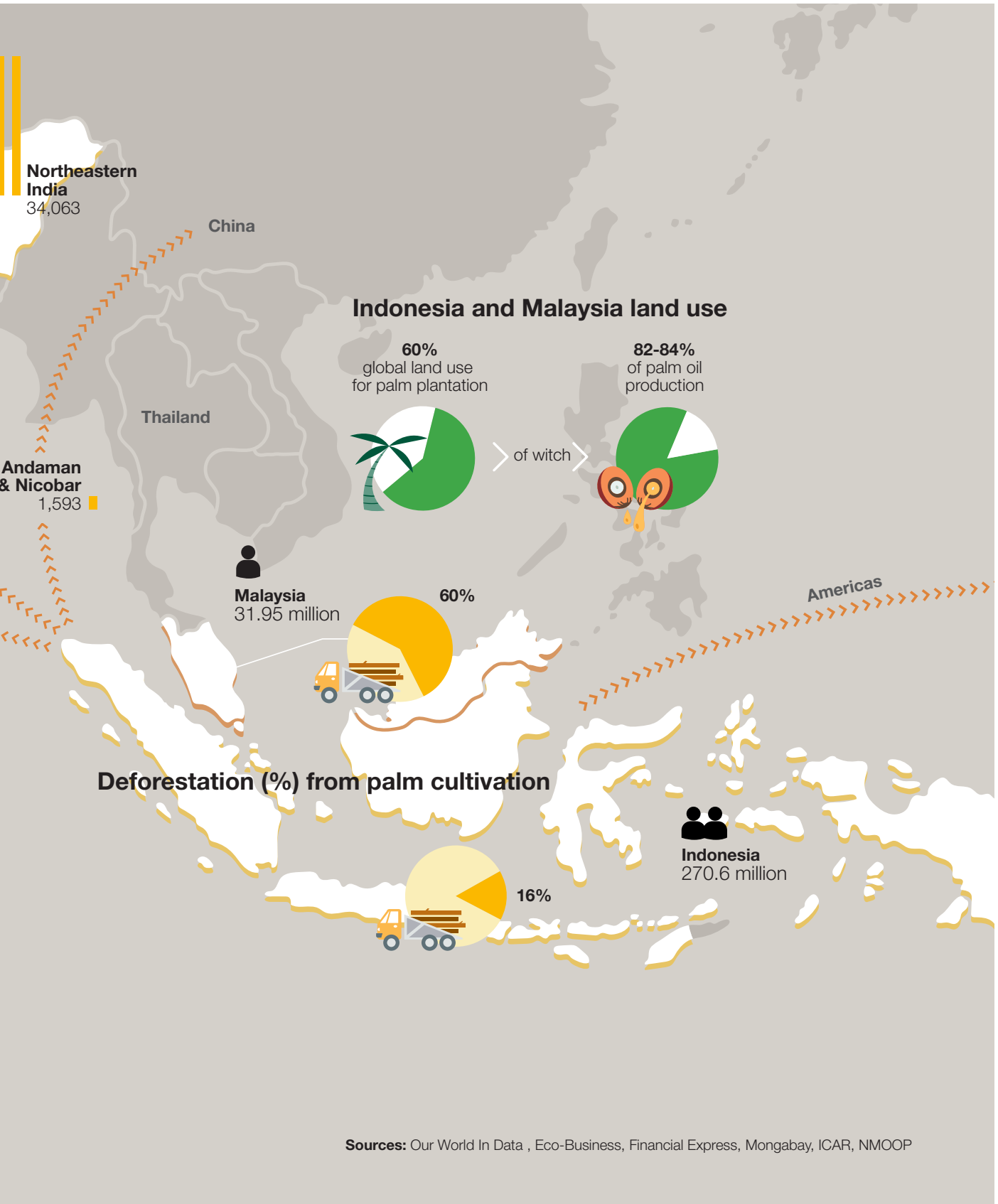


Annual consumption of edible oils



Demand in India for edible oils





Domestic Production of Palm Oil in India

In efforts to reduce its \$480 billion (2019) import expenses, India has tried ramping up domestic production through incentivizing farmers grow palm oil in place of existing crops. The uptake from farmers however has been slow, as growing the palm oil crop comes at a considerable cost. The gestation period is long: around 5-to-7 years for the first crop which can be unaffordable. The

cultivation of palm oil is water-intensive: requiring a minimum of 280-to-350 liters of water per plant per day, which can be difficult to come by as irrigation infrastructure is poor. Agriculture in India is largely rain-fed and monsoons can be erratic, which also adds limitations as to where the crop can be grown. Growing palm oil at a scale where it can be profitable also requires large areas of land, which is problematic in a country riddled with small-holder farms. Domestic cultivation has raised concerns by environmentalists and conservationists of the impact of such monoculture on biodiversity, and the risk of groundwater depletion due to the crops water intensive nature. Given the right conditions however, palm oil cultivation

can be very lucrative, and grown in a sustainable manner. Professor Ashok Vishandass at the Indian Institute of Public Administration (IIPA) claims that “4 million MT [metric tons] of traditional oils is being produced in the country by using 15.8 million hectares of land. This much quantity of palm oil could be produced from just 1 million hectares.” To encourage farmers in selected states identified for growing oil palm, the central government (as part of the National Food Security Mission) is working with state governments to provide financial incentives as well as technical and scientific support to increase efficiency yields. The Indian Institute of Oil Palm Research (IIOPR) serves as a center for conducting and coordinating research

2. Palm oil fruit harvest, Malaysia.
Photo: Craig Morey



Given the right conditions, palm oil cultivation can be very lucrative, and grown in a sustainable manner.

IMPORTED DEFORESTATION

on all aspects of palm oil conservation, improvement, production, protection, post-harvest technology, and transfer of technology. In August 2021, under the National Mission on Oilseeds and Oil Palm (NMOOP), the Union Cabinet has approved €1.27 billion to be spent over the next five years to make India more self-reliant. As of July 2020, India had 330,000 hectares under palm oil cultivation in the states of Andhra Pradesh, Mizoram, Assam, Nagaland, Tripura and Arunachal Pradesh, and a potential of 1.93 million hectares has been identified for additional cultivation. Palm oil production in India increased by about

45% over the five-year period from 191,510 tons in 2014-2015 to 278,922 tons in 2018-2019. The potential hazards and future risks to biodiversity when domestic production is scaled-up further has not received extensive attention or adequate news coverage, as domestic production is nowhere close to meeting the steadily increasing demand for palm oil in India, while imports from Malaysia and Indonesia continue to be significant. Efforts to green the supply chain have also had limited uptake from industry: in 2017, the Solvent Extractor's Association (SEA) released the Indian Palm Oil Sustainability Framework; and

in 2004, the Roundtable on Sustainable Palm Oil (RSPO) was formed as a voluntary organization whose members are meant to comply with a set of social and environmental norms. However, only an estimated 3% of India's palm oil imports are RSPO certified.

3. Tamaco Palm Oil Mill 2 and surrounding plantation, Sabah, Malaysia. The foreground area is subject to replanting young oil palms after removing the old trees. Photo: Uwe Aranas



The Need for More Sustainable Solutions

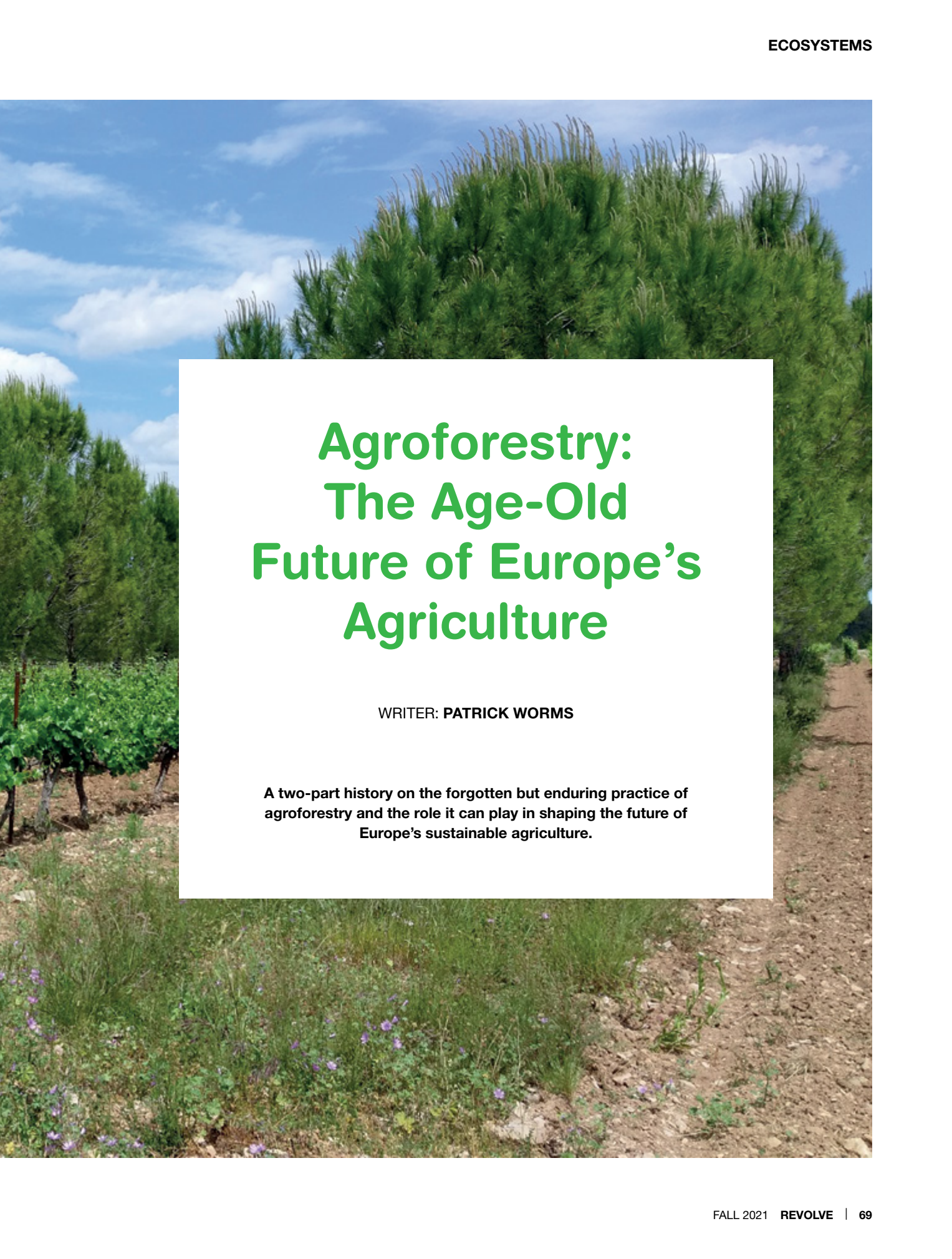
Given India's dependence on palm oil, the way forward to ensure more sustainable manufacture as well as use, is complicated. Without viable alternatives, restricting imports will only result in increased illegal channels being used for procurement. Ramping up domestic production to meet demand, be financially viable for farmers, cultivated in areas where water tables are unaffected, and in a way that protects biodiversity, will require greater

research and analysis, monitoring and data collection. An explicit mapping at the national level will be helpful in understanding the land-use patterns, including protected areas, primary and secondary forests, agricultural land with crops, fallow lands, and degraded areas. Potential areas favorable to grow palm oil must then be identified by also considering climatic conditions, rainfall, water balance, biodiversity and land profiles. Along with irrigations facilities, there must also be a mechanism to monitor and replenish water tables. Along with research on growing palm oil more sustainably, there is also a need

for greater research and data on viable alternatives; while the coconut tree, that uses less water and can be grown along with other crops could be a solution, evidence on growing it sustainably in large quantities to meet demands is limited. Finally, there is also a need to increase knowledge and awareness about changing consumption patterns and manufacturing behaviors – maybe we don't need so much palm oil. ●







Agroforestry: The Age-Old Future of Europe's Agriculture

WRITER: **PATRICK WORMS**

A two-part history on the forgotten but enduring practice of agroforestry and the role it can play in shaping the future of Europe's sustainable agriculture.

In 2019, just before the COVID-19 pandemic hit, the application of Big Data to archaeology revealed hitherto unsuspected insights into the extraordinarily long time we humans have been impacting our planet.

We all remember the story we were told at school: about seven or eight thousand years before the birth of Christ, Neolithic people started domesticating cereals and some animals, in what is today the Middle East, and this agricultural revolution then spread around the world. What ArcheoGLOBE, an online platform for assessing past human impacts, revealed, was something that some paleobotanists and paleoclimatologists

had begun to suspect: not only was the story far more complicated than that, but it was also far more inspiring.

Humans domesticated at least hundreds, perhaps thousands of plants, and started doing it millennia before they did so in the Levant. They did so everywhere on the planet, from eastern Sudan to Papua New Guinea; from Australia to the Amazon; from China to the Mississippi plains. And they soon applied their new technologies to transform the planet.

William Ruddiman was the first to point out that the Holocene's suspicious climate stability may be an artefact, suggesting that the increasing emissions of methane (from wet rice cultivation in South-East Asia) and CO₂ (from deforestation and grassland burning elsewhere) coincidentally counteracted the gentle cooling that celestial

mechanics had preordained for our world. Others found tantalizing clues of our deep history here and there – the discovery of ancient charcoal-amended *Terra Preta* fields in the Amazon, signs for the domestication of sorghum in Sudan 5,000 years ago.

Then came ArcheoGLOBE that brought together a series of disparate insights into a stupendous basket full of wonders. For example, the south-western Amazon was an artificial landscape of periodically flooded flatlands dotted with inhabited and cultivated hillocks of trees and fields 10,000 years ago. The transition of the Sahara from semi-arid to hyper-arid was in some places slowed down by centuries because of pastoral grazing practices. Large-scaling draining of wetlands for agriculture happened thousands of years ago in several regions, and areas like the uplands of New Guinea developed farming systems

1. Pines and vines at Restinclières, France.
Photo: AGFORWARD

2. Sheep grazing vineyards, south Portugal.
Photo: João Palma



Amongst all of
the technologies
that people
used to start
transforming
our planet,
the most
important was
agroforestry.

that allowed these communities to reach population densities similar to those of today's Netherlands many millennia ago. Most stunning of all, over 80% of the terrestrial biosphere was already significantly influenced by hunting practices like fire 10,000 years ago.

These insights are mostly the results of new technologies that only became available in the 21st century and allowed archaeologists to draw information from clues left in the soils of areas where civilizations had never built monumental structures – or perhaps did so from perishable materials. Until these became available, the archaeology of much of the world was scant, especially in the tropics.

3. Agroforestry at Restinclières, France.
Photo: AGFORWARD

The domestication of trees

What this new archaeology reveals is how important trees were to humanity's transformation of the world. Clues started coming in from the forests of Borneo and Amazonia. Population ecologists started noticing that the frequency and distribution of tree species in those forests was suspiciously skewed towards trees that are useful to humans. They found examples of soils that had been engineered by the large-scale application of biochar. In some tropical humid highlands, they found evidence that the complex multistory agroforestry systems European explorers discovered had been maintained for at least centuries, and probably millennia. And as our ability to extract knowledge from genetic information increased exponentially, we started noticing that some of the oldest proven

plant domesticates were tree species ideally suited to agroforestry systems. The honor of being the world's oldest domesticated plant goes to a species of fig common in the Middle East, domesticated around 11,400 years ago.

What all this suggests is that the Holocene, the epoch that agriculture and civilization developed in, is in fact a human artefact. If further evidence confirms this suspicion, we will have to conclude that the Anthropocene didn't start 50, 100 or 200 years ago, but at least 10,000 years ago. What this also suggests is that amongst all of the technologies that people used to start transforming our planet, the most important was agroforestry. It was the husbanding of silvopastoral savannahs that helped people postpone the arrival of the desert in the Sahara; what we would today call perennial permaculture that allowed them to densely populate



10,000 years ago, over 80% of the terrestrial biosphere was already significantly influenced by hunting practices like fire.

the Papuan highlands; and forest gardens that allowed them to transform the species compositions of the world's largest tropical rainforests. And to get back to our school-day story? It was probably the interaction of trees like figs with grasses, in practices that may have resembled what we now call farmer-managed natural regeneration with intercropping, that allowed the people of the Middle East to develop the suite of cereals that let them soon

take over Europe. Agroforestry as a word may only be a few decades old, but as a set of practices it transformed the planet on which we live long before the first urban civilizations.

As we become increasingly aware of the speed with which our unsustainable use of natural resources is pushing the planet away from its Holocene equilibrium, we can take succor from the most extraordinary fact about this

story. It is that the use of trees, this technology that completely transformed the world, did so in ways so subtle, so sustainable and so resilient that we had no inkling at all of this history until the most modern tools of investigation allowed us to start lifting the veils under which it was slumbering. Agroforestry, we now know, is a tool that has already transformed the world without overly damaging it and as such, offers great promise for our rapidly changing future.



In the name of efficiency

The knowledge of the efficiency of agricultural systems that mimic the processes of natural ecosystems by including trees with livestock and crops had almost been erased by the 20th century. Europeans were seduced by the extraordinary developments that brought us inorganic fertilizers, chemical phytosanitation, and most importantly the internal combustion engine – a tool that allowed us to automate the hard graft of tilling and to access new groundwater resources in seemingly limitless quantities. Agricultural productivity exploded, the dream of efficiency took over, millions of kilometers of hedges and billions of trees were uprooted, and soon all memory of the natural tool that allowed us to transform our world had been forgotten – at least in the rich world.

In poorer parts of the planet, of course, agroforestry never disappeared. There, farmers without the financial resources to replace ecosystem services with chemistry and machinery still used the practices their communities had evolved since time immemorial and continued to produce most of the food the world was eating by husbanding the manifold services of trees in their production systems.

But that hive of agricultural activity and innovation was almost invisible in the universities and conference rooms of the global North. In Europe, the 20th century's all-powerful agricultural and bureaucratic technologies were deployed to transform the continent's landscapes radically, at speeds and scales exceeding anything that came before. In the capitalist west, landholdings were rationalized, plots were fused to make huge fields, trees and hedges were removed, and the entire food system was hurried into directions of ever greater efficiency by the judicious



4

application of rules, regulations and subsidies codified by the Common Agricultural Policy.

In the Communist East, similar dreams of efficiency led to similar results through different routes. In many countries, farmers were expropriated and their landholdings brought together into giant state-owned agricultural organizations, run according to the latest in productivist principles. Poland and Romania were exceptional in that much of their peasantry survived this phase. There, until late in the 20th century, complex and highly efficient polycropping systems of crops, trees and livestock survived on small farms. But what communism could not destroy, the flood of European subsidies washing across the landscape after the collapse of Communism soon did. Today, it is often only the old who maintain these amazing farms. When they die, their beautiful wooden houses collapse, soon replaced by the ubiquitous concrete boxes of globalization.

Their trees follow, the fields coalesced into yet another large “efficient” plot devoted to a single crop.

The process is not yet complete, but the differences between the eastern European and western European farming systems are becoming ever narrower. Everywhere, landscapes have been simplified, farmers are getting older, farms are becoming consolidated, the need for rural labor has dropped so much that villages and market towns are dying, the use of inputs and diesel has risen, biodiversity is in increasingly dire straits and soils are eroding at an accelerating rate. ●

This article is Part 1 of 2 providing a brief history of agroforestry. The next issue (#42) of REVOLVE will feature Part 2.

4. Harvesting wheat in mixed timber system, Wakelyns Agroforestry, Suffolk, UK. Photo: ORC

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Technology, Economy, Society: What Do We Need to Achieve Circularity?

Transitioning to a more circular economy increasingly seems a necessity, but what do we need to achieve this transformation? REVOLVE Circular explores the barriers to the circular economy in its latest interview with the Norwegian recycling company TOMRA, while also breaking down the latest position paper from the Hans Sauer Foundation in Germany, on paths towards a circular society.

INTERVIEW WITH **MITHU MOHREN**

‘Why technology is not enough to achieve a circular economy’ is the title of a recent announcement by TOMRA, a company describing itself as a “global leader in sensor-based technologies with approximately 50 years’ experience in diverse sectors such as the Food, Recycling and Mining industries”.

REVOLVE Circular caught up with Mithu Mohren, Senior Vice-President Communications, Circular Economy, at TOMRA, to find out more.

1. Automatic waste sorting at TOMRA. Photo: TOMRA

Why is technology not enough to achieve a circular economy? What is it that technology cannot do in the shift from a linear to a circular economy?

Allow me to explain some technological solutions first, after which I will address what technology cannot do:

Through its sensor-based technology, TOMRA enables recovery of valuable resources that might otherwise be lost, allowing more material to be available for recycling and keeping these in the loop as long as possible. Whether it's reverse vending machines to take back used beverage containers or sorting machines that separate different types of material - such as High-Density Polyethylene (HDPE) from household waste - the goal is to collect as much material as possible. Of course, these materials must be designed for recycling.

When it comes to waste management's role in positively impacting climate

change, there are two aspects that should be considered: first, increasing the amount of material collected for recycling and second, increasing the amount of material that is recycled in a closed loop. Our recently launched Holistic Resource System focuses on the first aspect with existing waste management structures such as: deposit return schemes; separate collection of selected waste streams; and mixed waste sorting. If these three are combined in an optimized way globally, we could reduce CO₂ emissions by 2.76 billion tons each year. As the technology to support this system already exists, this can be done – now.

Finally, new and developing recycling technologies ensure that recyclable material can be processed to high-quality recyclates leading to a more sustainable future.

So what can technology not do? First of all, it's important to emphasize that we believe very strongly in the waste hierarchy, in which 'reduce' and 'reuse' play primary roles. That means reducing our waste and reusing the resources that are already in circulation. However,

these initiatives will take time to get to scale to be effective. We must act now – and that is where recycling comes in.

Although TOMRA has 50 years of experience in circular waste management, we know we cannot accelerate the transformation to a circular economy alone. All of us in the value chain must work together to develop sustainable solutions to manage our waste. Until recently, that wasn't happening, but now that's changed. In fact, TOMRA is considered to be a go-to collaborator and strategic partner for business, authorities and NGOs when it comes to developing these solutions. Working together – talking to one another – does not require technology.

As part of the value chain, consumers can and should use their power of purchase to convince brand owners that they are shifting their buying habits towards a sustainable future. Of course, demand from brand owners can only be met by adequate supply, and at attractive prices.

Policy plays a key role in supporting the establishment of such a marketplace. Legislation has already begun to set higher standards towards a Green Recovery: the Single Use Plastic Directive ; increased recycled content amounts in packaging; higher recycling quotas; the establishment of a common measuring system in the EU (where countries can currently decide on their own how to measure what they report); carbon taxes; plastic taxes; and the EU's taxonomy are just some of the initiatives that are either already in place or being prepared to go into law shortly.

Encouraging demand of high-quality recyclates through such policies means that supply must be also adequate.



2. Garbage collection, Barcelona, Spain. Photo: Zibik

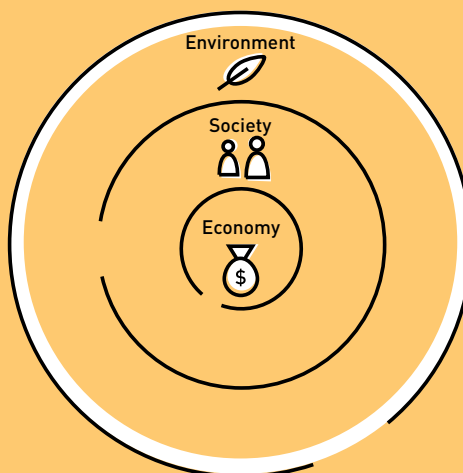
Is a Circular Economy Not Enough?

WRITER: SOREN BAUER, PRESIDENT OF REVOLVE CIRCULAR

In its thematic focus on a 'Circular Society', the German Hans Sauer Foundation and its social design lab address the prevailing structures and practices of linearity. They go well beyond purely economic concerns and activities such as those of product design, manufacturing, waste management or the 'circular economy action imperatives' including reducing, repurposing, recycling and much more. Its position paper 'Paths towards a circular society' also looks at societal concerns and places special attention on how we can establish social practices that enable circularity, but also change the way that we think and act as a society.

The paper's starting point is 'the Linear System in Crisis' and it states that "linear(...) ways of thinking and acting have significantly contributed to current social and ecological crises". Its first chapter, "The Circular Economy: A Promising but Insufficient Sustainability Strategy" analyses the potential as well as the shortcomings of the emerging concept, and explains why a focus on economic value creation and technological innovation largely neglects the social dimension: "A shift toward more circularity requires much more than ecological modernization; it also requires a redesign of social practices, societal structures, and cultural patterns."

For the foundation, a circular economy is therefore not enough; it finds that "the societally broader approach of a circular society" is the better concept for a transition towards more circularity. The paper's chapter "No Economy Without Society: The Idea of a Circular Society"



explains the need for a systemic perspective that "views social, ecological, and economic processes not as discrete but in context." Subsequent chapters explain the importance of and need for "new knowledge". This includes system knowledge, target knowledge, and transformation knowledge – and using participatory approaches and educating more people on alternative socio-economic models to increase 'circular literacy'.

Towards a circular society?

The Foundation's 'social design' lab identifies, initiates and tests social innovation processes towards circularity. Two examples: In the Bavarian town of Markt Schwaben, with active participation of citizens and actors from public utility, local politics and social economy, the social design lab initiated a redesign of the local recycling center as a place of sustainability, learning and communal actions. On a conceptual but soon practice level, the Foundation explores the potential and barriers for circular practices in cities and neighborhoods.

The most recent Hans Sauer Awards - an accelerator for socio-ecological innovation - have recognized circular pioneers in the built environment, urban communities and more generally in organizations and (social) businesses. A March 2021 Forum on the Circular Society resulted in a loose network of more than 600 people collaborating at circularsociety.de. More still needs to be done. As the Foundation writes, "it is essential to pursue local, experimental, and novel approaches, to connect actors across sectors and to transfer new practices and models and the knowledge they generate to other places". ●

Let's talk about recycling, your core business: its critiques say that recycling only addresses the "end of life" stage of products and is a linear economic activity which does not close any loops - what is TOMRA's answer to such criticism?

While this might be the case until now, we see that the tide is changing. There has been a clear and strong shift in the mindset across the value chain so that, although better than nothing, downcycling cannot be the goal of recycling. As mentioned before, you see this shift in policy changes, new technology developments and a true

and concerted effort to make REAL advancements in recycling. We believe in the waste hierarchy – that's a fact. However, we are not specialists in reduce. In fact, TOMRA's history lies in reuse (through the Reverse Vending machines) and strong and impactful support of recycling. More recently, we've been working with brand owners and converters to improve the recyclability of their packaging, so-called Design for Recycling. This includes moving towards mono-material packaging, supporting development of new digital tracing and marking technology and continuing to advance our own artificial intelligence efforts, to name a few. In the end, the better the material can be sorted with high-purity yields, the higher the opportunity for high-quality recycling and truly closing the loop. That's the goal!

TOMRA has recently created 'ReSociety'. Can you tell us what this initiative is and what you are trying to achieve with it?

ReSociety is an initiative that was launched in 2020, with the goal of becoming a circular economy hub for information and collaboration. Currently, the initiative is a platform to provide information about all things circular.

On the business-to-consumer side, while consumers are becoming increasingly interested in the environment and circular economy, they are unaware of what their role in it is. ReSociety aims to provide education that all of us can use as we make everyday decisions like – do I really need another pair of



jeans? What should I consider when thinking about purchasing a vehicle? How do I consume sustainably?

On the businesses-to-business side, the platform is used to talk about systemic change and what the value chain can do to move towards a circular economy quickly. To date, there have been posts on chemical recycling, deposit return schemes and the Holistic Resource System. The motivation is one of collaboration, encouraging all of us to work together to come to sustainable solutions.

The platform will be relaunched in September 2021 and will allow for much more interaction. Our hope is that a true ReSociety – a movement – will come together here to communicate, initiate projects, and get informed in order to make impact.

How will you avoid ReSociety becoming a vehicle for greenwashing (or circularity-washing) TOMRA's activities as a for-profit company?

This is a very good question and one that we are fully cognizant of. Before, I explained what ReSociety is and hopes to become. What ReSociety is NOT is a platform to sell our technology. While TOMRA initiated the platform, we welcome guest posts that have nothing to do with our business. We are aiming for true collaboration towards a circular economy – whether it has to do with recycling or not.

Let's talk about one of the key issues of the linear economy, the limited responsibility of producers for the enormous waste their products generate. As a technology and recycling firm, what does TOMRA think about extending the responsibility of producers beyond the point of sale – so-called Extended Producer Responsibility (EPR) schemes - and what is your role in it?

We strongly believe that EPR is a necessary tool to accelerate the transformation to a circular economy. Recycling must become an attractive business model, which is currently not the case. EPR is part of making that model appealing.

As mentioned before, one of the keys to ensuring sustainability is to collect as much recyclable material as possible. This collection must be financed, or at least co-financed, for which EPR should be used. While there are different types of EPR, one interesting format is Eco-modulation, the concept of penalizing the use of materials that are less environmentally friendly. If implemented properly, this would also work to incentivize more recycled content in packaging material, while penalizing those who choose to continue using proportionately more virgin material.

Deposit return schemes (DRS) can also be a very good example of a successful EPR scheme. These work by adding a small extra deposit on the price of drinks sold in plastic and glass bottles and

cans, which the consumer gets back once they've returned the container for recycling. TOMRA supports policy that works towards establishing such effective EPR schemes.

What solutions – or good examples – that are not technology-driven are out there in which consumers, policy-makers, and collaborators across the value chain are already making a difference?

Again here, collaboration is key. The focus on a Green Recovery – on both sides of the Atlantic – is strong evidence that the severity of the situation is being addressed. We also see no-packaging grocery outlets, more opportunities to reuse and non-traditional industries – such as fast-fashion – demonstrating their commitment to making adjustments to their business models towards greater sustainability.

Green start-ups are booming, and we feature some of them on ReSociety. It is no longer only 'cool' to be environmentally aware, it is a necessity, and the recent environmental catastrophes have cast well-deserved attention on the issue. We truly believe that together, we can make a difference. ●

3. There is a strong focus on waste management and recycling in the circular economy debate; what is much less talked and written about is the need to reduce our consumption in the first place, and how we can 'design out waste' by different product design.

Photo: Hello I'm Nik

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