TRANSNATIONAL STRATEGY ON GREENING NODES

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Index

1. Introduction

"The European Union is undertaking an unprecedented effort: a green and digital transformation. The European Green Deal and the NextGenerationEU recovery and resilience facility will shape the social, economic, and ecological architecture of the continent for decades to come," European Commission president Ursula von der Leyen writes about the two main instruments that try to create climate sustainability on EU level (2020: i). Especially the Green Deal has become the symbol and cornerstone of the EU that is "[s]triving to be the first climate-neutral continent" with net zero greenhouse gas emissions, economic growth decoupled from resource use, while also achieving social and geographical inclusion (EU Com 2021a).

Setting targets for the continent or society as a whole is ambitious, but also takes a bird's eye approach that hides a lot of detail. If we zoom in, what does climate sustainability, climate-neutral or "going green" actually mean for a single sector like freight transport? In short, they all point towards the need for a rapid decarbonisation, i. e. the reduction and ideally elimination of greenhouse gas emission in all daily operations. It refers to the use of clean fuels, the integration of transport into renewable energy production, as well as a change in the modal shift towards modes that are most efficiently fuelled with sustainable energy.

This marks a significant shift away from the developments in transport over the last decades: In 2010, the sector was responsible for approximately 23% of total energy related CO_2 emissions, and which has grown in spite of technology-related efficiency gains and policy initiatives towards decarbonisation (IPCC 2014: 603). This even led the IPCC working group on the mitigation of climate change to the pessimistic outlook that "[r]educing global transport greenhouse gas (GHG) emissions will be challenging since the continuing growth in passenger and freight activity could outweigh all mitigation measures unless transport emissions can be strongly decoupled from GDP growth" (IPCC 2014: 603). This is not different on the European scale: "According to the Sustainable and Smart Mobility Strategy, transport emissions need to fall by 90% by 2050 for the EU to stand a chance of hitting the mid-century goal. But latest figures show that emissions are actually growing" (Morgan 2020).

The broader picture gets even more complex if we recall the various connections within society that will happen in parallel to the decarbonisation of transport if it really is a part of decarbonising society. We see old and new societal macro trends like longer life expectancy and low birth rates. Disruptive technologies emerge under buzzwords like "big data" with significant potentials and dangers for everyday life. Necessary change throughout current key industries will likely disrupt economic activity while also opening up new potentials of clustering and cross-sector solutions. Urbanisation is likely going to continue, and small-scale political activism along with it. This short look around society named nothing that is immediately connected to freight transport, yet to assume no impact would be incredibly naïve. A highly complex topic like the decarbonisation of society cannot be solved in an isolated way, so thinking that the decarbonisation of single sectors is not a realistic option.

The aim of this document is to provide European, national and regional actors with a better understanding of the task to decarbonise freight transport, especially under consideration of societal connections and the status quo. This strategy sets out to address the need to decarbonise transport on a transnational scale on the basis of understanding freight transport as part of society. Therefore, Chapter 2 elaborates on the current status quo of freight transport and what societal systems are contributing to the current dependency on road transport as dominant mode. This will be done by transferring important aspects of car dependency to the freight sector. Chapter 3 picks up from there and identifies four challenges that freight transport is facing to move towards decarbonisation. Following this, Chapter 4 is the central part of the strategy and maps out actions that can tackle these challenges. These are all considered on a societal level, so that they have a good fit to be transferred and applied throughout the whole of Europe. To underline this strategic approach, several spotlights will show how this is already done in certain urban nodes and regions, creating positive examples and points of orientation. The final Chapter 5 concludes the strategy and looks back at

the relationship between society, its sectors, and the political levels below to draw an overarching picture. It posits the main insight from the strategy that on all level of governance, efforts must be taken to work on the complex problem of decarbonising transport.

2. The political economy of freight transport

To underline the suggested actions that are developed in the transnational strategy further on, it is crucial to understand that an entire sector like freight transport is not an isolated entity, but rather embedded in the complex structures of society. On this macro-level, a striking feature and also significant challenge to decarbonisation is the heavy reliance on road transport. Between 2013 and 2018, the EU-wide share of road transport in the freight modal split has increase from 73,9% to 75,3%. In 24 of 27 EU countries, it is the dominant mode of freight transport (Eurostat 2020a).

This significant dominance of road transport in freight is paralleled by the role of the private passenger car in passenger transport (Eurostat 2020b: 69). The common denominator here is a status quo that heavily relies on one mode of transportation which is structurally the most difficult to become decarbonised (cf. de Blas et al. 2020). However, this also means that we can get a better understanding of freight transport through a look into the obstacles that prevent a decarbonisation of passenger transport on the societal level. This is the aim of this chapter, which will rely heavily on the idea of the "political economy of car dependence" (Mattioli et al. 2020).

In their study, Mattioli et al. look at the role of cars in the society through a systems of provisions approach (2020: 3). Their study addresses car use through the lens of the whole society, also including broader aspects such as car production, historical path-dependencies in infrastructure and overlapping effects between industry, politics and society. In doing so, Mattioli et al. identify five thematic areas for car dependency: the automotive industry, the provision of car infrastructure, car-dependent land-use patterns, the way public transport is provided, and the cultural aspects around cars. The first three topics bear a high relevance for freight transport as well. The following subchapters describe these three thematic areas and discuss the implications that arise from them for transport.

2.1. Industry influence

Mattioli et al. argue that the automotive industry creates three implications that influence car dependence: (1) As economically significant sector, the industry exerts high political influence. (2) Its low profit margins and high production capacities lead to a demand to find new customers for cars. (3) The dominant, mostly standardised platform design and the strong devaluation of cars lock consumers to functionally very similar cars, while the strong devaluation of new cars makes consumers stick to them for long times (2020: 4-5).

Whilst a direct application of these points regarding transport is complicated, parallel developments can be assumed. The manufacturing of commercial vehicles is regularly an branch within car industry corporations, so high political influence can be used interchangeably for both segments. Additionally, the interest groups and associations of road-based logistics companies add to the weight of the "road lobby", e.g. against tougher emission cuts (cf. Knowler 2019). However, it is not easy to judge whether standard sizes and weights of commercial vehicles, containers etc. work in a similar way as the multi-purpose 5-seater car does to reduce market variety on transport solutions, or whether it actually represents an efficiency gain for the whole system.

2.2. Infrastructure provision

Mattioli et al. look at the provision of infrastructure in a wider sense, not only focussing on the physical aspect, but also referring to the social sphere such as the enforcement of traffic rules (2020: 5). Not only are the costs to provide these infrastructures largely socialised, but also car use profits from so-called hidden subsidies such as the allocation and appropriation of urban spaces for parking (Mattioli et al. 2020: 5-6). This increases the scarcity of space, which will be an additional burden for sectors such as housing. These burdens are unlikely to be reflected in the actual prices charged for parking. "Thus, there is a normalized set of political and policy institutions that spread the costs of driving either among the public

at large or among the motoring public (meaning that low users subsidize high users)" (Mattioli et al. 2020: 6).

The use of road space is named as another example. Roads were used by multiple means of transport before, and when cars became popular, collisions and casualties rose. However, the problem did not lead to a stricter regulation of motorists, instead roads were reorganised to grant motor vehicles their own, exclusive spaces (Mattioli et al. 2020: 6). "Effectively, the twin processes of social and physical reconstruction transform roads from a commons, accessible to everyone, to a space reserved to car users, making a car a critically important need satisfier while also limiting the ability of other transport modes to satisfy people's needs" (Mattioli et al 2020: 6). This is accompanied by the allocation of additional space through road building, which is legitimised with often contradictory or thinly evidenced claims of merit and is influenced through additional road lobby actors like building companies. Road building also requires high public investments, which is problematic as it competes with other public spending (Mattioli et al 2020: 6-7).

These aspects can be transformed one to one towards the realm of transport. The provision of roads is generally open to all kinds of motor vehicles, not just passenger cars, but also light and heavy-duty commercial vehicles. The exclusion of certain types, i. e. commercial or high pollution vehicles is only applied very rarely. It is oftentimes accompanied by compensations, too, for example the construction of a bypass outside of town if the city centre is supposed to be low traffic or low emissions.

Spatial planning follows this logic: It is almost impossible to think about a newly constructed commercial or industrial area that is not also immediately connected to the road network. Even more so, a good connection towards existing road infrastructure is seen as a prerequisite for such location. The connection with other transport modes like rail is not given the same consideration.

2.3. Car-dependent land-use patterns

In respect to land-use patterns, Mattioli et al. point out that the emergence of cars has been taken into account by planning decisions, which then leads to a higher car use: "Historically, increases in motorization in the 20th century have gone hand-in-hand with significant changes in land-use patterns, creating car-dependent low-density settlement patterns, referred to as 'urban sprawl', which in turn have resulted in greater need for vehicle ownership and use" (2020: 8). They also widen the context of this development: The economic activity of growing suburbanisation is actively supported by policy initiatives since the New Deal Era. This follows the idea that the sectors heavily involved – construction, consumer goods, automobile – are also key industries, therefore the creation of demand was seen as economically beneficial (Mattioli et al 2020: 8).

As already shortly discussed concerning the previous point on infrastructure provision, the land-use pattern for wider transport can be described as locked in on road transport as guiding compass. Locating a transport-heavy industrial or commercial area in the middle of a city is unthinkable, as this would not only create further congestion, but also lack acceptance by urban citizens. However, this does not lead to a focus on sustainable transport, but instead creates greenfield development along existing, planned or easily built car infrastructure. When they are planned that way, remote central logistics hub alongside highways and beltways outside the city are dependent on commercial vehicles, as they do not connect to rail or waterway networks and are too far away for sustainable short-distance city logistics.

2.4. Summary

The aim of this chapter was to provide a look into the deeper societal connections of freight transport that have created and are maintaining the current status quo, which is heavily reliant on road transport. This was done through the lens of a political economy approach. The starting point was the dependency on passenger cars, as elaborated in the study by Mattioli et al. (2020). Three thematic factors of car dependency were transferred from passenger to freight transport: the role of the industry, the societal provision of infrastructure, and the way of land use.

The structure of the industry, together with the existing road lobby, ensures that a high amount of political influence is used to hold onto the status quo. This harms the development of innovative approaches and prohibits changes in spending patterns. Generally, the provision of road infrastructure is a dominant factor as road provision does not distinguish between private and commercial or passenger and freight transport uses. Whilst some fees can target road transport specifically, the hidden subsidies for road infrastructure oftentimes create artificially high competitiveness, especially when other modes of transport are forced to bear all the costs of provision. Lastly, land use tends to acknowledge and encourage this development when the quality of road connections becomes one of the most important characteristic for industrial and commercial spatial planning.

3. Challenges

The starting point for this strategy was the overarching need to decarbonise freight transport, which at the moment heavily relies on road transport. It is clear from the analysis of the previous chapter that this status quo is embedded deeply not just in transport, but also in society as a whole. This chapter follows this point and works out two thematic areas where this is most prominent on the interaction between European, national and regional level. The basis for this is drawn from the project deliverables D.T2.1.1 and D.T2.1.3 as well as the various experiences within the project itself. The first thematic area is challenges on the spatial planning regimes, the second on the macro-society trends in urban areas as geographical entities.

3.1. Spatial planning regimes

A key point in understanding spatial planning regimes is the significant disparity. Coming from historical, legal or economic differences, states regularly differ on core aspects such as democratic oversight, planning levels, and financing procedures. The differences in each will likely influence processes, outcomes and public acceptance, which again flows back to the chances of decarbonising transport.

To empathize this, some key configurations can be contrasted. Strong decentralised **oversight** might focus stronger on negative or conflicting side effects (e.g. sound/light/emission pollution) of spatial use and the influence on neighbouring spaces. It is also a potential open ear for civil society protest against change (Kinder 2021). Centralised oversight runs the risk of being too far away to approve local, small-scale solutions that can greatly improve neighbourhoods. Generalised and abstract **planning levels** might treat regions only as part of the whole and/or ignore local characteristics, while small-scale localised planning might miss integrated approaches between planning entities. A strong reliance on decentral **financing** can lead to further inequality if infrastructure change is only financed in wealthy regions, while a strong focus on central financing leaves a higher risk of misdirected financing towards costly prestige projects instead of diversification and broad local investment.

This short overview also emphasizes that there is no correct way to organize any of these central aspects or the planning process in general. Most often, differences between states depend on historical developments, path dependency choices and political institutions in the broader sense. However, this also points towards the challenges that exist within spatial planning. For one, the need to coordinate different levels of decision-making arises, not only within a state, but also between states and on a European level. Second, looking from a European perspective, the effectiveness and applicability of solutions cannot be taken for granted, because there is a diversity of planning regimes and tools where it would be applied. These challenges directly derive from the nationally fragmented character of spatial development and cannot be expected to change, so it is necessary to find ways to work within these structures.

3.2. Urban areas

Almost three thirds of the European population live in cities and urban areas already, while the growth of that share is expected to continue throughout the next decades (EIB 2018). This clearly underlines the significant impact that urban areas have on decarbonisation, but also European societies as a whole. We can at least identify two macro-trends that affect urban areas in particular and related to the decarbonisation of transport.

As the demographic shift continues, the efforts to satisfy the needs of (sub-)urban populations will grow even further. This affects a whole range of aspects like housing, employment, social and recreational welfare structures, and infrastructure in the widest sense. All of these have in common that they will likely contribute to a higher demand for (affordable) spaces that can be used or converted to satisfy such needs. This is a problem for spatial planning per se, but also all these uses will compete with transportation for usage within these urban areas. This also has to take into account that spatial planning is highly path-dependent: cities grew outwards from their centre, often enclosing areas that were formerly outside the

city limits (or, historically, the city walls). This could often mean that it is hard to just expand existing areas, even if this would create significant synergies, or that a free spatial use is limited by the already existing uses around. Similarly, growth away from a centre will require more infrastructure, and such uses of space, to create connections.

The increasing polarisation of spatial planning discourses is another aspect that becomes relevant in decarbonisation efforts. On the one hand urban stakeholders increasingly get involved in agendas of change for their own cities, districts or neighbourhoods. Oftentimes, they are even faster to demand sustainable transport solution, e.g. the creation of bike lanes at the expense of car lanes on streets. On the other hand, this appears to be met with increasing opposition from opponents of such policies within urban areas, who rely or even might currently depend on the status quo. They will reframe their right to mobility as a right to park and drive their car as they have always been able to, as the authorities up until now provided it. Similarly, there will be disagreements between citizens who live in the most metropolitan areas and those urban and (sub-)urban areas surrounding such. It is clear that no spatial planning regime can allow itself to ignore either the growing politicisation within the population or a trend towards such urban-rural divide (JRC 2021). This creates the need to generate acceptance at stakeholder level to safeguard long-lasting support for any planning or development decisions taken that help the decarbonisation of transport.

3.3. Summary

This chapter has focussed on spatial planning regimes and societal macro-trends in urban areas to define challenges to the decarbonisation of transport on the intersection of European, national and regional level. In total, four challenges have been identified:

- Challenge A: The different levels of decision-making in spatial planning regimes cannot be coordinated from a single point of view.
- Challenge B: It is impossible to assume certain tools, knowledge or equipment between several planning regimes, as there is a high level of diversity.
- Challenge C: Urban areas are seeing an increasing competition for scarce spaces.
- Challenge D: The creation of acceptance at stakeholder level to safeguard long-lasting support for changes is becoming increasingly harder to achieve and maintain.

The four challenges need to be addressed if a greener development for transport is supposed to be happening, yet they lack a common starting point, because they come from very different factors such as political institutions or societal trends. They also do not represent an exhaustive list, as more challenges could be added especially from topics other than spatial planning and urban areas. However, within the project approach of InterGreen-Nodes, it is already becoming visible that solutions to these challenges can be found: Not just from the deployment of technical pilots, but from the shared knowledge and experience of the participants and their experiences with decarbonisation efforts, there is good grounds to suggest some actions for the four challenges presented here. These actions will be presented in the next chapter.

4. Joint Actions towards decarbonisation

The previous chapters have demonstrated the various interconnections between transport and society to then identify four challenges for decarbonisation with regards to spatial planning and urban areas. This chapter is going to present five actions that can be deployed on a transnational level for the move towards decarbonisation. Importantly, this does not claim that only these actions can help tackle the challenges outlined before, as other actions could be effective, too. More so, these challenges reflect the joint project experiences and expertise from all partners.

The chapter is structured so that for each challenge, one or two actions are presented. Additionally, they will be emphasised by the presentation of a positive example how this action is already implemented successfully in a small scale, a so-called spotlight.

4.1. Acting on Challenge A: Creating leverage through EU decision-making

As pointed out regarding Challenge A, spatial planning regimes are fragmented and institutionalised differently between European states as well as within their national polities. This is problematic because an increased, collective effort of all political levels is required to reach decarbonisation goals.

As action, we propose that EU-level policies should explicitly try to leverage green development and decarbonisation throughout the different levels of decision-making. This is because a policy or planning decision on EU-level is likely going to be a good argument for a discussion in national, regional or local contexts.

This should also be explored further in the conditionality of EU funding: funds should be available if projects are in line with broader infrastructure or spatial development plans and add green development at the same time. Especially the connection between both is important, and it should not be enough to just tick in one of the two requirements. This should include a shift away from static, narrow criteria what counts as EU-relevant infrastructure i.e. within TEN-T, too, and take local relevance and opportunities for change into account. This is an aspect that has been explored in the context of the project when the Joint Spatial Planning Department developed a Regional Action Plan (D.T2.1.4) on inland waterways in the capital region Berlin-Brandenburg.

Spotlight: Understanding the crucial role of small-scale transport infrastructure

Within the InterGreen-Nodes project, the Joint Spatial Planning Department is developing a Regional Action Plan (RAP) for inland waterways transport in the capital region Berlin-Brandenburg with several partners from the waterway transport sector. One prominent finding during the development process was that there is a significant gap between infrastructure that is part of the TEN-T network and other, significant infrastructures that are not included in that network. This actually limits the abilities of these smaller scale infrastructures to move towards decarbonisation, although they are highly relevant for transport in regional and local contexts.

At the moment, incorporation into the comprehensive network of TEN-T requires a “inland ports shall have an annual freight transhipment volume exceeding 500 000 tonnes“ based on a three-year average (TEN-T Regulation, Art. 14 (2)). Smaller ports in the capital region have criticised this narrow definition that does not take into account total waterway freight flows and capacities itself. As part of the RAP, the Joint Spatial Planning Department has brought this point up for consideration within the TEN-T revision process. This way, also smaller ports had an advocate for their contribution to decarbonisation on the EU-level.

Additionally, the platform provided by the RAP helps all ports within the capital region to underline their importance for transport when in contact with planning authorities, transport administrations and municipalities. They agreed to present themselves as “capital region ports” and will participate in planning and land use debates with a joint voice. This is also possible because the inland waterway structure between

the capital region and seaports in North Sea and Baltic Sea like Hamburg and Szczecin is part of the TEN-T network, which underlines the transnational importance within the regional and local planning decisions.

Picture 1 TEN-T core and comprehensive inland waterway network around the capital region Berlin-Brandenburg reaching to seaports in the North Sea and the Baltic Sea.

4.2. Acting on Challenge B: Encourage policy learning and tool sharing

Challenge B focussed on the impossibility to assume similar tools, knowledge or instruments across the several European planning regimes. In this environment of diversity, there is little use in centrally developed tools and top-down solutions that have a poor fit to existing setups.

As an alternative to such top-down approach, we want to encourage bottom-up development and policy learning between relevant actors on all levels. To improve planning at regional and national level, the European Union should support financially – through project funding - the planning authorities to develop their tools with the purpose of moving towards green transport solutions resulting in more efficient, sustainable and environmentally-friendly European transport both on land and waterways.

Spotlight: Ports as knowledge and service provider in green infrastructure

The Freeport of Budapest Logistics Ltd. (FBL), the intermodal logistics centre and industrial park with its gigantic development area is one of the largest ports and distribution centres in Europe. Characterised by modern, advanced, maintained and quality infrastructure solutions and services. FBL, as a water, rail and road freight node is a key green infrastructure service provider making great efforts to decarbonise transport by introducing sustainable, green measures.

The following, best practices and plans to be implemented of FBL are listed, which serve the decarbonisation of transport and green transition.

One of the FBL's green solutions contributing to CO_2 reduction is the installation of sun collectors on the top of warehouses, with the aim of producing hot water locally. Solar collectors are part of the mechanical system, thus they also play an important role in the green-roofed warehouse newly built in the port area.

In the port area, the new reinforced concrete warehouse is an extremely impressive facility. Renewable energy in the establishment will be provided by solar panels covering about 10% of the roof. Additional

surface of the roof (approx. 60%) will be covered by extreme weather tolerant plant varieties and an own irrigation system. It is important to highlight that establishment of new warehouses or office buildings in Hungary require compliance with the principle of zero carbon emissions.

The vegetative, eco-friendly roof solution was chosen due to spatial regulations covering areas alongside the Danube River. According to the regulations, new buildings should be covered by green roofs. In the area of FPB, 6000 sqms of area will be covered by green roofs of which one roof is completed and two more are under planning.

Picture 2: 10% sun panels and 60% green roof (the red parts) will cover the new "D3" building in the Freeport of Budapest (photo was taken on the 7/6/2021)

Regarding solar panels, three set of panels are also going to be installed on the roof of three warehouses within the port area, of which one has been completed and the remaining two are currently under construction. Each panel will have a capacity of max 50 kWs. Panels with larger capacity require special permits from the relevant authorities.

About e-mobility and e-transport, many plans are elaborated for the port area, but little implementation has been realised yet. The possibility of installing electric charging stations already exists, however the tenants have not taken the opportunity yet.

FPB will operate shuttle buses inside the port area as well, in order to connect the public transport stations and the inner locations. Taking into action sustainable port development, operating electric vehicles would be the most viable solution.

All the measures and developments listed above contribute to greener transport and to fulfil the expectations of CO_2 reduction by 2050 both at national and EU levels, however regulations and permits may hinder developments or the progress of green transition. Further challenge could be the lack of willingness of becoming „greener", as it is seen there is the potential for green solutions, yet people are not taking all the opportunities.

4.3. Acting on Challenge C: Improving transport spaces

Especially in urban areas it is expected that the competition for spatial uses will increase even further, as stated in Challenge C. This means that the transformation towards decarbonisation in transport cannot assume the additional use of new spaces, as those are scarce and contested for different uses like housing or recreation.

For this, we propose two actions: First, existing areas that are already predominantly used for transport need to be converted towards a higher efficiency and multimodal uses to work under the premise of a decarbonised transport. Second, transport has to be open to deploying modern technology to unlock new potentials for green transport.

Both actions try to implement the same direction: Existing spatial uses have to be utilised better, which can be done conventionally through efficiency gains, but also through the early adaptation of e.g. disruptive

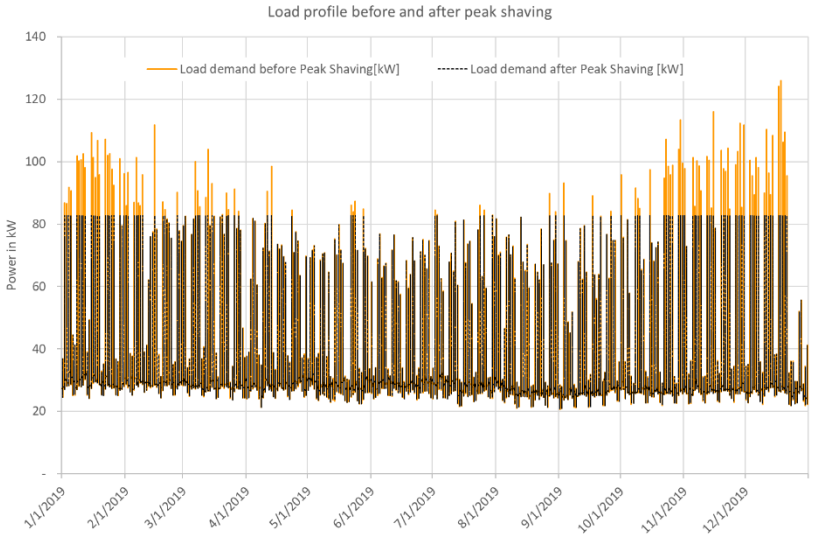
technologies. Technologies do not necessary have to be about transport itself, but could help the sector through synergies. Possibly candidates are for example big data solutions and make logistics planning more efficient or new fuel technologies that create more competitiveness for sustainable transport modes like rail or waterway. Another significant aspect will be the availability of multi-level spatial use for different sectors aside from transport, but on transport spaces: this will be most important for the sectors of energy and commerce, but potentially also for in the context of circular economy.

Spotlight: Ports as electricity providers and hydrogen suppliers

"It has been estimated that just one of these container ships, the length of around six football pitches, can produce the same amount of pollution as 50 million cars. The emissions from 15 of these mega-ships match those from all the cars in the world. And if the shipping industry were a country, it would be ranked between Germany and Japan as the sixth-largest contributor to CO_2 emissions" (Piesing 2018). Ports have to face this challenge in the change of mobility.

In the future, transport (ships, boats, trucks, cars, trains, cargo equipment) will become more and more electrified, which consequently also affects the energy supply structure in the ports. This is assumed because in logistical peak times with battery-electric equipment, vehicles have to be charged at the port at the same time. In particular, the last mile to the ports will be electrified and equipped with batteries. However, supplying electricity from land is not so easy. Besides the structural performance standards, requirements and power connections of the vehicles, enormous volumes of energy are needed. These are very cost-intensive when operating several vehicles at the same time.

To reduce costs (grid extension costs or grid charges during operation), containerised lithium-ion battery energy storage systems can be used in addition to conventional measures (on-site load/demand management; use of locally already existing "storage"). The application of peak shaving is being pursued so that ports can efficiently use their maximum grid connection capacity even during irregular load peaks. With little effort behind the meter battery storage systems can be integrated into the existing power supply system and can react to cap peaks within less than a second when large and punctual power amounts are requested from the grid. With battery storages that are precisely tailored to the load profile, consumers can save up to 90% of their network charges.

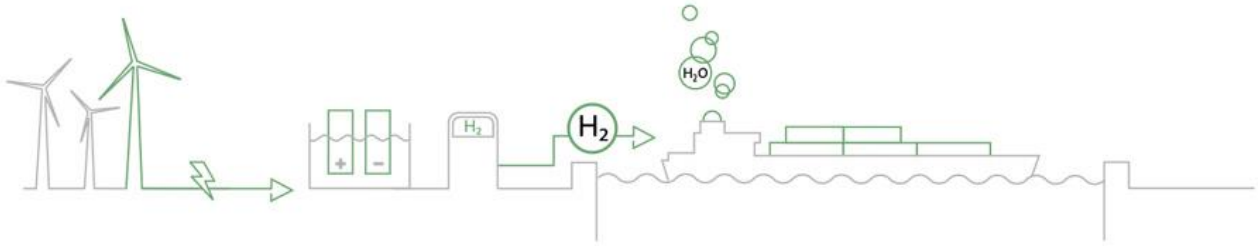


Picture 3: Example load profile of an exemplary office building demonstrating the analysis and the outcome for peak shaving

However, the electrification of transport does not only mean adding batteries to vehicles, but also consists of a completely different technology: the fuel cell. Ideally, the fuel cell is powered by hydrogen and many incentives are currently going in this direction: e.g. hydrogen fuel cell propulsion for ships, automotive industry, hydrogen refuelling stations etc. Many European countries have published their hydrogen strategies in 2020 to show more support for the technology and increase private investment.

Ports could benefit from this development by becoming not only electricity providers but also hydrogen suppliers by producing hydrogen in the port. This would be done by combining renewable energies (solar and/or wind) with an electrolyser. The electrolyser produces hydrogen

from the electricity overproduction of the renewable energies. In this way, any type of means of transport could be fuelled with locally produced hydrogen.



Picture 4: Project examples from ABO Wind AG - Wind farm plus electrolyser at the shipyard as fuel for hydrogen-powered Rhine shipping (ABO Wind AG)

These changes can enable new business models. Depending on the technologies of the means of transport arriving at the port, containerised lithium-ion battery energy storage systems and/or renewable energies combined with containerised electrolysers producing the energy carrier hydrogen with renewable energies are available as different options to meet their needs.

Spotlight: Creating a full-electric terminal

Changing energy sources for vehicles and machinery in ports and transhipment terminals from fossil fuels to electric energy opens up the possibility of using environmentally friendly and long-term-sustainable energy sources. The “full electric Terminal pilot” in InterGreen-Nodes is meant to demonstrate the viability of electrifying numerous processes along the complete added value chain.

It consists of elements that are already electrified on a regular basis in numerous ports (such as using electric cranes for transhipment). But it also changes other elements of the added value change to electric drivetrains. The specific InterGreen-demonstrator-elements are situated in the Berlin Westhafen-port, operated by BEHALA. They consist of:

- Electric rail-shunting Vehicle
- Electric Crane
- Electric Terminal Tractor, that doubles as a 40 t road vehicle
- Electric general purpose cars
- Electric utility van (for use by maintenance personnel, equipped with maintenance tools)

The specific characteristics of electric drivetrains have a number of additional positive effects in an urban environment:

HIGH EFFICIENCY in urban areas: Electric motors provide their maximum torque across the complete performance spectrum, enabling quick accelerations at any speed, while conventional engines only provide maximum torque over a certain rate of rotation. In practice this means that an electric motor can accelerate with less energy-demand than a conventional motor. This leads to a lower energy-demand, especially in urban environments, where vehicles have to decelerate and accelerate often. This leads to a more efficient energy use from tank/battery to wheel. Conclusions about the total energy efficiency can only be drawn when the whole energy-supply chain is considered and will differ, depending on the method of electricity production.

REDUCED NOISE EMISSIONS could allow for new logistics concepts: e.g. night deliveries in urban areas for example to stores. It also allows for direct delivery into buildings, for example: transportation of trailers with production material, directly to production/assembly lines, without additional transhipment at a loading dock. Tough loading and unloading can still emit noise, this noise can be minimized by technical solutions (rubber wheels on transport carts, rubber buffers etc.). The relative quietness of electric vehicles

can make them a hazard, when other road users (mainly pedestrians and cyclists) are not able to hear the electric vehicle. Technical solutions, such as noise emitters, are currently being discussed.

RECHARGING AND RANGE: Range is an important issue in the operation of electric vehicles. A number of demonstration projects have tested recharging processes in between tours during one day. However, this has often proved to be impractical, as delays in deliveries often lead to a shortage of time for the recharging process. It seems generally more practical to recharge vehicles during longer non-operations-periods (e.g. during the night). Tests with battery-changing systems (i.e. the whole empty battery is being swapped for a recharged battery) have yet not been proven to be practical, as the very high costs of batteries lead to very high additional investment costs.

4.4. Acting on Challenge D: Intensifying the push for acceptance

Challenge D points towards the fact that stakeholders get more involved, and more critical, with planning decisions especially regarding transport. This is problematic as for long-term planning, similarly long-lasting support is needed to avoid the risks of blockades and unclear priorities within politics.

The key to broad and long-lasting acceptance within civil society lays in actions that promote working solutions and deliver a visibly positive impact for the population. In transport terms, this should start with small-scale solutions that replace a status quo with visible negative effects. This could be technological, i.e. when noise or air pollution are reduced with new technology, but also on social level, i.e. when congestions on roads are reduced by the shift from truck to cargo bike delivery.

Similarly, positive stakeholder behaviour should be encouraged more actively. Whilst negative framing of e.g. car ownership is likely to receive a lot of backlash, pointing out the positivity of not owning a car or decreasing it's use will be probably lead to less negative reactions while still encouraging sustainability. This can be coupled with actual incentive systems, too.

Lastly, stakeholder participation in planning processes should be seen valuable and helpful addition. This requires a shift in timing: They should not be reduced to the role of commentators on a planning proposal, as this is too late to talk about premises and alternative. Instead, affected stakeholders should be involved at the starting point and in open formats like workshops or forums.

Spotlight: The SULPiTER methodology for engaging stakeholders

One of the key-factors for implementing sustainable policies in the urban freight transport is the stakeholder cooperation. In the last decades, urban freight transport has been identified as a business problem that more or less is solving itself. However, this perspective has recently changed from a situation wherein logistics is a business problem handled by private parties to a "more public logistics", with stronger involvement by public organizations.

Logistics activities depend on the interaction between many stakeholders, often with unique characteristics, strategies, business models, objectives or roles. Local authorities attempt to mitigate the external challenges presented by urban freight logistics such as emissions, congestion or accidents, while working to create conditions that will promote the efficiency of operations and processes. The scope of intervention of (local) authorities is, however, limited. Logistics activities are essentially of a private nature and EU regulation sets clear limits to the lawful level of influence of public authorities. Secondly, when urban freight logistics is the end part, or last mile, of either longer supply chains or larger distribution networks, stakeholders must measure the impact of the (local) policy measures on their chains and networks. The actual impact of the measures may be lower than initially expected.

The most common tool for Public Authorities for including stakeholders in the decision-making process is the Freight Quality Partnership (FQP): partnerships between local authorities, local community, freight industry, private sector, environmental groups and other stakeholders. Their goal is to develop an agreement related to freight transport issues. Different types of FQPs are possible, depending on forms,

objectives, territorial extension, type and number of stakeholders involved, modes of transport considered, amount of funding and other specific issues.

With the purpose of sharing knowledge and decisions among different stakeholders involved in urban transport policies, SULPiTER - an EU project funded by the Interreg Central Europe program - has dealt with all the related issues with the ultimate goal of providing clear and easy to use tools for the implementation of so-called Sustainable Urban Logistic Plans (SULP). Among the various activities, a specific part of the work focused on the FQP tool.

In the framework of the project, a detailed analysis of available information has been carried out. It has considered the large spectrum of data sources, both institutional-academic and empirical, arising from real experiences in the field. This extensive review allowed to identify a few effective steps for fruitful implementation of a SULPiTER FQP tool. Besides the natural need to tailor each experience to the specific context, it has been possible to identify some common features and implementation stages. These have been outlined in 6 steps that could be used as a checklist for typical implementations.

- Step 1: Strategy Design
- Step 2: Setting up the FQP's objectives & requirements
- Step 3: Mapping
- Step 4: Prioritizing
- Step 5: Engaging
- Step 6: Establishment of the FQP

The full methodology can be found on the project website:
https://www.interreg-central.eu/Content.Node/SULPiTER.html

5. Conclusion

Today, modern policies like the European Green Deal acknowledge the need for a rapid decarbonisation of transport. Similarly, planning regimes now reflect the negative impact of freight road transport on spatial planning, emissions and citizen safety within cities. However, this has not (yet) translated into a significant change in the modal split. This puts the top-level policies of change at odds with the continuity of the everyday life, the Status Quo in transport. The aim of this strategy was to point this paradox out and to describe it as consequence of the interconnections between freight transport and society. This was done in chapter 2. The influence of industry and road lobby, the subsidised provision of road infrastructure and the road-focussed land-use patterns were identified as important factors that maintain the status quo.

However, these aspects are integrated deeply into society and as aggregated aspects, they are very hard to tackle. Because of this, chapter 3 had set out to describe the influence of these factors on the specific aspect of spatial planning regimes and urban areas. There, four challenges were identified that form obstacles to the decarbonisation of transport:

- Challenge A: The different levels of decision-making in spatial planning regimes cannot be coordinated from a single point of view.
- Challenge B: It is impossible to assume certain tools, knowledge or equipment between several planning regimes, as there is a high level of diversity.
- Challenge C: Urban areas are seeing an increasing competition for scarce spaces.
- Challenge D: The creation of acceptance at stakeholder level to safeguard long-lasting support for changes is becoming increasingly harder to achieve and maintain.

These challenges reflect aspects that can be addressed and influenced more easily, but are still reflections of the description of the status quo in freight transport on a societal scale. This allows to find reasonable and realistic actions that can be taken up by actors on all levels to create lasting change. In chapter 4, a total of five actions was presented and recommended that would do that:

- Creating leverage through EU decision-making
- Encouraging policy learning and tool sharing
- Increasing the functionality of transport spaces
- Embracing innovative technologies and solutions
- Promoting positive impacts that are created

Neither the actions nor the challenges themselves are exclusive: it is possible and plausible to describe them with different orders, structures and focusses, or to add more to the list. However, two aspects seem to be rather universal: The underlying dynamic of needed change against a very prominently advocated status quo and the overarching interconnectedness of the topic. While the challenges and actions might not include all relevant aspects, one can conclude confidently that the decarbonisation of transport is highly complex.

This complexity should also be considered in the design of the next steps. While it is good to have a strategic idea what to do, the gap between that and actual action happening has to be bridged. This task mostly lays at the EU and national levels, who have to provide funding and guiding decisions that can provide orientation, especially for the segment between successful pilots or innovations and the massive, commercial and market-size rollout of such. Meanwhile, regions and local authorities will have to work on their readiness to implement such solutions together with their citizens and with all available tools. Complexity will be very important here because on this level many small-scale decisions have to be taken and coordinated.

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