
Action Plan for a Research Program for Road Freight Transport

This paper proposes an action plan for future research activities with the aim of reducing CO₂ emissions from road freight transport. The work is based on a mapping of ongoing research in this field in the Nordic Countries.

The main recommendation is to focus more on a pathway to support concrete implementation steps and not only in developing new low-carbon initiatives. Several initiatives will best be handled at Nordic level, both to use the funding in an optimal way, but also due to the cross-border nature of road freight transport. This call for a better coordination of both research, test and pilots as well as of implementation and the policy measures to do so.

Swedish platform initiatives – specifically TripleF could provide a basis for joint Nordic activities in the field of road transport.

Report

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Table of contents

1. Introduction	3
2. The need for decarbonizing road freight transport	3
3. Mapping of research activities	4
4. Results from the mapping.....	5
5. Types of research activities.....	8
6. Border crossing initiatives	9
7. State of the art on low-emission solutions.....	10
8. More focus on implementation.....	11
9. Ecosystems.....	13
10. Future demands for road freight	14
11. Action Plan.....	15
12. References	19
13. Annex Description of the Swedish Platform initiatives.....	20
<i>Triple F: Fossil Free Freight (triplef.lindholmen.se)</i>	<i>20</i>
<i>Drive Sweden (drivesweden.net)</i>	<i>21</i>
<i>f3 (f3centre.se)</i>	<i>22</i>
<i>2030-sekretariatet (2030-sekretariatet.se).....</i>	<i>23</i>

1. Introduction

Concito has developed this action plan for future research activities in Road Freight transport on request by Nordic Energy Research. As a background to the proposed action plan, Concito developed a report on decarbonisation of road freight, which provides a comprehensive overview of the potential technologies which can be brought to the market (ref 5). Furthermore, Concito has compiled the recently finished and ongoing research in the Nordic countries and mapped these initiatives. Finally, Concito has been looking at ecosystems for the implementation of 0-emission road freight transport. On this background the recommendations for an action plan has been developed.

The worsening climate challenge as spelled out in for instance the latest IPCC and UNEP GAP reports (ref 1 and 2) underscores the need for rapid and scaled up implementation of low-carbon and 0-emission solutions. Therefore, this action plan covers the full process from research in 0-emission technologies and fuels, to the support for implementation at the political level.

This study, financed by Nordic Energy Research, was carried out between October 2019 and January 2020.

2. The need for decarbonizing road freight transport

It should not be necessary to describe why a fast decarbonation of road freight is needed, but we want briefly to remind the reader of the burning platform. Recent reports from UNEP, (ref1), and IPCC (ref2) provide convincing indications showing , that the climate system may be close to a collapse, and that there is therefore a need for urgent emission reduction actions in all sectors.

In the road freight sector, only limited focus has so far been given to CO₂ emission reductions. All Nordic countries have set a goal to be carbon neutral by 2030 (Norway), 2035 (Finland), 2045 (Sweden) or 2050 (Denmark) respectively. Sweden has furthermore set a specific reduction target for the transport sector, amounting to a 70% CO₂ emission reduction by 2030 compared to 2010. Finland has assumed a similar target of 50% CO₂ emission reduction from transport by 50% in 2030 compared to 2005.

Sweden is the only Nordic country where a CO₂-reduction from road freight has been realized, due to the use of HVO (Hydrotreated Vegetable Oil). However, this is not considered a long-term sustainable solution. (ref 3)

The road freight sector is still in a phase of research in a lot of different low-emitting fuels and other reduction pathways, but it is important to look at how the research results can be transformed to action, so the Nordic region within a short timespan can translate research findings into real reductions of CO₂-emissions from the sector. The mounting climate challenge does not allow for a long research phase and an even longer discussion amongst stakeholders, of which many bring clear economic interest in the various technical solutions.

The transport sector in general is a heavy regulated sector, so the challenge for research initiatives in the sector is not only to identify technical solutions themselves,

and a business case for their application: If the policy regulation of the sector does not support the shift of technology itself, very little will happen.

Another important characteristic of road freight transport is the international dimension. This implies that regulation, infrastructure - and to some extent also availability of fuels - need to be decided in coordination between neighbouring countries. This requirement calls for EU initiatives and regulation to drive changes in the sector. EU regulation is often based on some first experiences from one or several EU member countries. A Nordic region with joint action to fast decarbonize road freight transport could therefore have a considerable impact on EU regulation.

So, there is a clear need for a future Nordic research program in this field.

3. Mapping of research activities

The mapping of research activities has applied a type of snowball methodology. However, according to the snowball methodology one should continue until all the already found initiatives come up again. We did not continue so long, and therefore the mapping might miss relevant research initiatives as well as relevant organisations. The mapping is not validated against other similar initiatives. The picture described by the mapping is however quite clear, and we find that it can form a solid background for the further analysis, despite the shortcomings of the methodology. In several cases, it has been necessary to assess the research activity quite fast, including which category the specific activity should be placed in, and how relevant the specific research activity is. Consequently, this is to some extent a subjective assessment. Therefore, this mapping should only be considered a basis for further analysis, and not as a result of a research process itself.

We started out by assessing the research initiatives, which we knew from a comprehensive study previously carried out in Concito and supplemented by related research - and funding organisations. The research initiatives, that came up in this way lead us to other institutions and research initiatives. After having identified a large number of such initiatives they were put into different categories.

A spreadsheet was developed to cover all the initiatives that we found. Later in the process, some research initiatives were identified as less relevant, if for instance they primarily focused on passenger transport or were assessed to have limited impact on decarbonisation. The mapping covers initiatives based in any Nordic country, but it is mentioned when initiatives also include a neighbouring country (Germany). There are basically four types of research entries into the spread sheet:

Projects: covering all research initiatives with a well-defined target and timeframe, and which leads to a concrete result i.e. a report, a demonstration or a calculation tool.

Programs: are a number of projects joined together. Programs focuses on research activities.

Platforms: initiatives with several and different types of actors, including research institutes, company researchers, transport industry associations and authorities, aiming to bridge the gap between research and implementation

Organisations: Universities and other research institutions. These entries covers other organisations involved in the research process – as well as research funding institutions.

The mapping of research activities covers ongoing and recently finished research activities. We have thereby narrowed the scope as we anticipate previous research to be included in more recent projects. The mapping exercise comprises 76 funding and research institutions. It covers 119 projects, programs or platforms of which 89 are found to constitute some relevance for the study of road freight transport and climate change. For each entry, the sheet covers the following information:

- name/acronym,
- country – countries outside of the Nordic region are included, when at least one Nordic country participates
- type of organization which carry out the research,
- pathway (which is explain below)
- relevance for the freight sector and CO₂ reduction,
- theme and sub-theme (to be able to give keywords of the content)
- finally, a brief description of the initiative from the project website.

The pathway is taken from Mckinnon (ref 4) and also used by the Nordic report on freight transport (ref). This enabled us to divide the research activities into the following overall thematic categories of goals:

- 1) To reduce the need for transport
- 2) To improve efficiency by improved logistics
- 3) To encourage mode shift to less emitting modes
- 4) To increase vehicle efficiency
- 5) To introduce less emitting fuels

4. Results from the mapping

In the following, we will highlight some of the findings from the mapping of Nordic research initiatives. The full mapping is available from Concito at request.

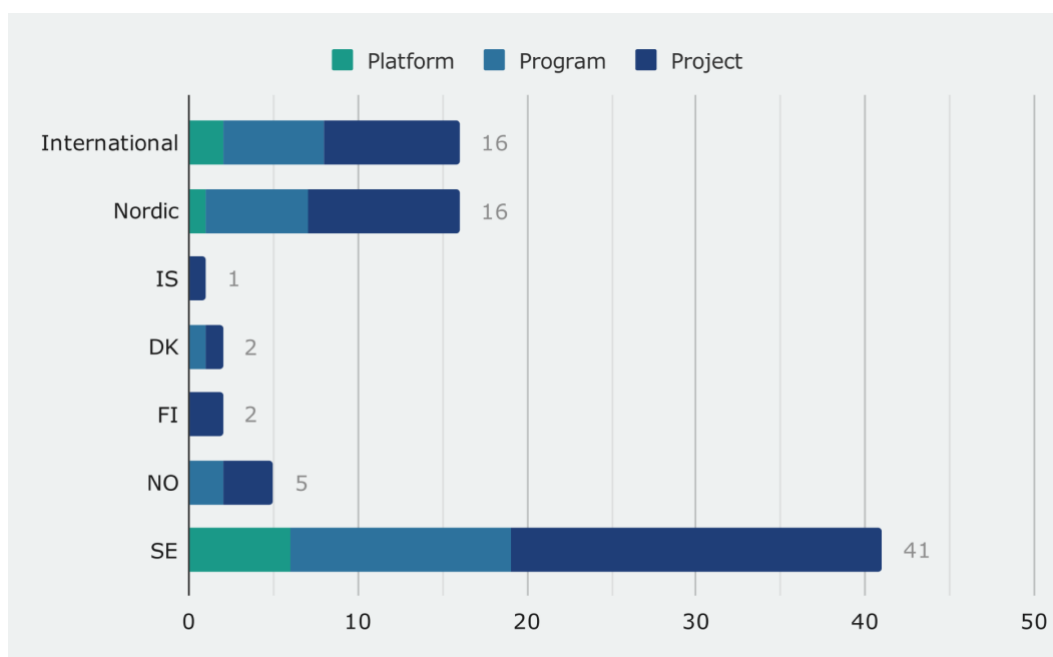


Figure 1 Numbers of initiatives per country entered in Nordic mapping divided into three different categories. Initiatives mainly concerning actors in one country are listed with the two-letter country code for that country. Nordic implies international collaboration between actors of two, or more, Nordic countries including Germany. International initiatives consist of multiple international actors of which at least one is from a Nordic country, and has an area of concern, which is at least partly applicable in Nordic countries.

- Platforms: Large, long-term, multi-actor initiatives can have stated missions but often no specified objectives

- Programs: Multi-actor initiatives, spanning several years and with multiple goals or targets, however, the specificity of the goals might vary

- Projects: Single or multi-actor initiatives, with limited duration and specific goal(s)

Sweden is by far engaged in most relevant research activities. Both projects and programs are numerous in Sweden, and interesting enough, platform initiatives are ongoing in Sweden, in joint Scandinavian projects and in EU projects, whereas research-based platform initiatives do not seem to exist in the other Nordic countries.

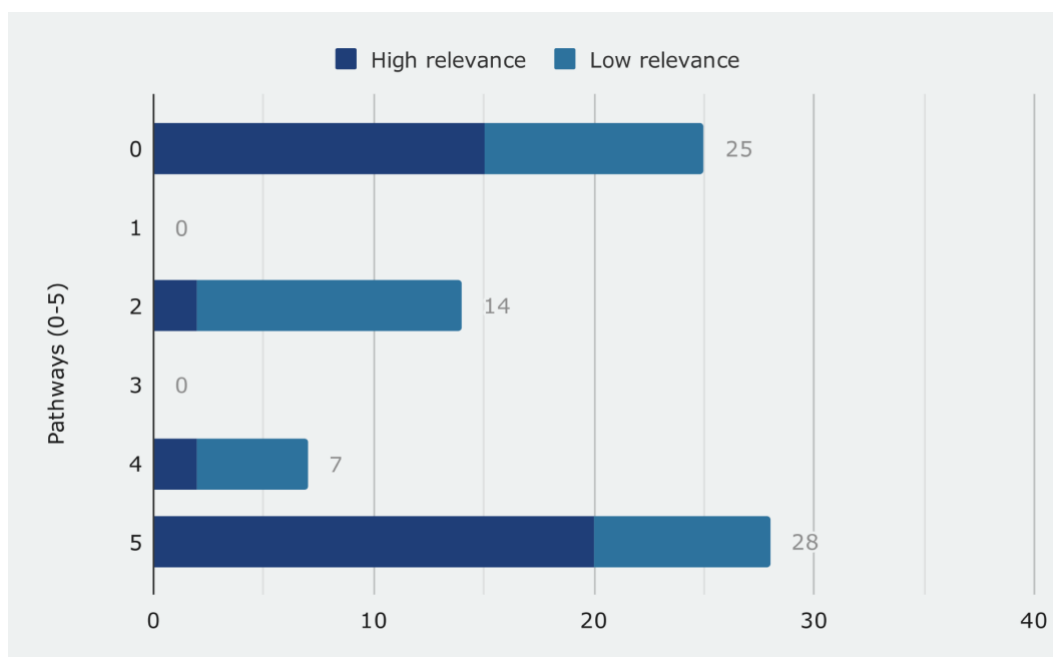


Figure 2 Number of programs and projects (single- or multi-actor initiatives, both national and international, with declared objectives to varying degrees) per decarbonisation pathway in Nordic mapping. Pathway 0 denotes initiatives that do not fit any one particular pathway (e.g. assessment of the impact from other initiatives). Pathway 1 - 5 are (1) reduce transport need, (2) improve logistics, (3) shift transport modes, which has not been assessed in the mapping, (4) increase vehicle efficiency and (5) introduce less emitting fuels

When we categorize the research initiatives according to pathways, defined by Mckinnon, we see again a clear picture. The category called "0" are initiatives that cover several areas. Typically, these are projects with the aim of providing an overview of existing technologies. In this category also transport corridor studies are included. These studies include a decarbonisation input, but are also lobbying for new road infrastructure.

Interesting enough, there are no research initiatives identified in the mapping, which have the specific aim to reduce the demand for transport. With the overall perspective of decarbonizing the transport sector, it should be obvious to start by reducing the demand for transport. It is well-known that a lot of products are transported several times around the globe during the production process, and a reduction of this transport could be an important source to reduce the emissions from transport. Furthermore,

incentives to consume products from the same region would have a potential for reducing freight transport emissions.

The demand for freight transport will be a trade-off between the cost of transport and the cost of production in different regions of the world. Increased cost of transport can therefore lead to important shift in the world trade and should consequently be of interest in thriving for the o-emission society. A reduction in transport demand will of course challenge globalization and economic growth emerging from intensified global trade, and that is probably explaining the lack of research in this field. Furthermore, this type of research might not be found in transport research, and therefore not included in the mapping exercise. When the o-emission society is implemented by the middle of this century, these types of reductions will however be relevant.

In the following figure, some more details in the pathway are presented. The research initiatives have been evaluated according to relevance, so that initiatives with marginal impact on CO₂ emissions or with limited focus on road freight transport get the score 2 in relevance.

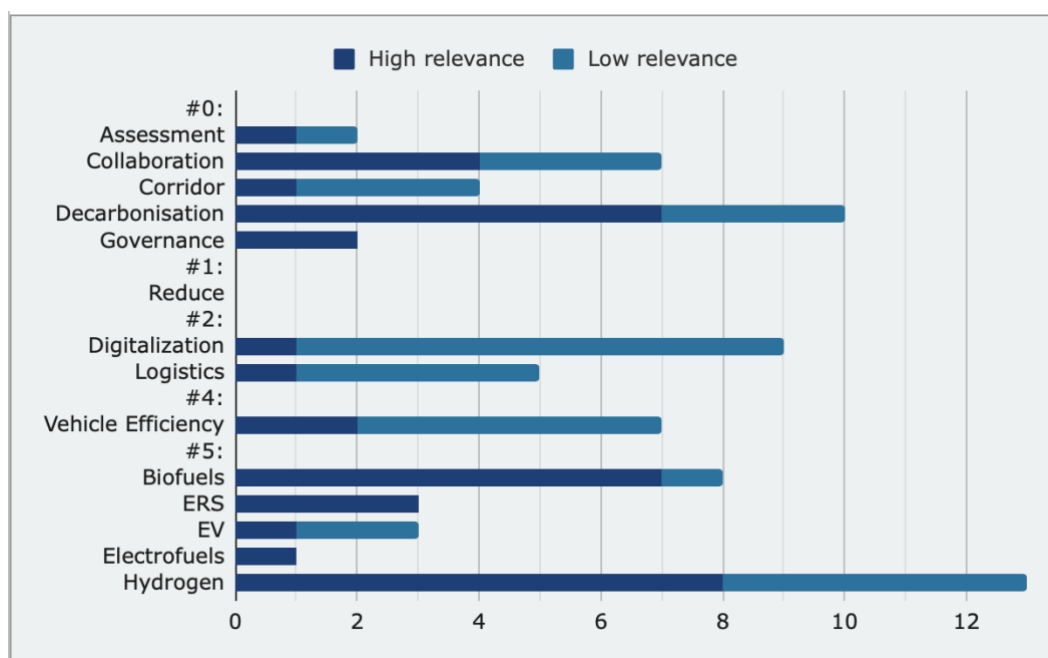


Figure 3 Number of programs and projects per decarbonisation pathway, initiative theme and relevance. Pathway 3, shift transport mode, is omitted from the scope. Each theme is based on the assessed primary concern of the initiative.

The research in logistics and improved organisation to increase efficiency in freight flows is a broad sector, which has tended to mostly focus on the efficiency in the single company. The major part of the projects develop IT tools for more efficient freight solutions. This is important and has a potential for decarbonisation but will never be the most important way to reduce emissions. Here again the transport cost could be expected to be more in focus. Higher transport cost should be likely to increase efficiency in the sector. There is however not any or very limited focus on research in this field. Even an evaluation of the German MAUT (the km-based tax on trucks) do not seem to have been carried out.

The third category is on modal shift, which is constantly being assessed. Modal shift clearly holds a potential for decarbonization especially over long distances. The barriers also prove to be large, so in most cases the potential for decarbonization turns out to be limited. This category will not be discussed further, as the tender from NER is limited to road freight transport.

The fourth category covers increased vehicle efficiency. Most of these research initiatives focus on the impact of larger vehicles. It is obvious that if a certain shipment can be taken by one lorry instead of two, emissions will be reduced. This will be relevant for large shipments i.e. in the forest industry and similar sectors. There is a great interest in using larger lorries amongst the transport companies, for obvious reasons. The larger vehicle gives higher flexibility for the transport company and potentially reduces both costs and emissions. However, the real-life situation will seldom follow the simplistic example above. An assessment of introducing High Capacity Vehicles (HCV) in Denmark shows a reduction in CO₂ emissions of less than 2% (ref 5). The introduction of larger vehicles has however had a large impact on the vehicle fleet in Denmark, so the major part of emissions from lorries now come from lorries with a total weight of more than 40 tonne.

The fifth category is low-emitting fuels, and this is where the largest number of research initiatives are and with the highest potential for emission reduction. We have looked into which fuels the projects cover.

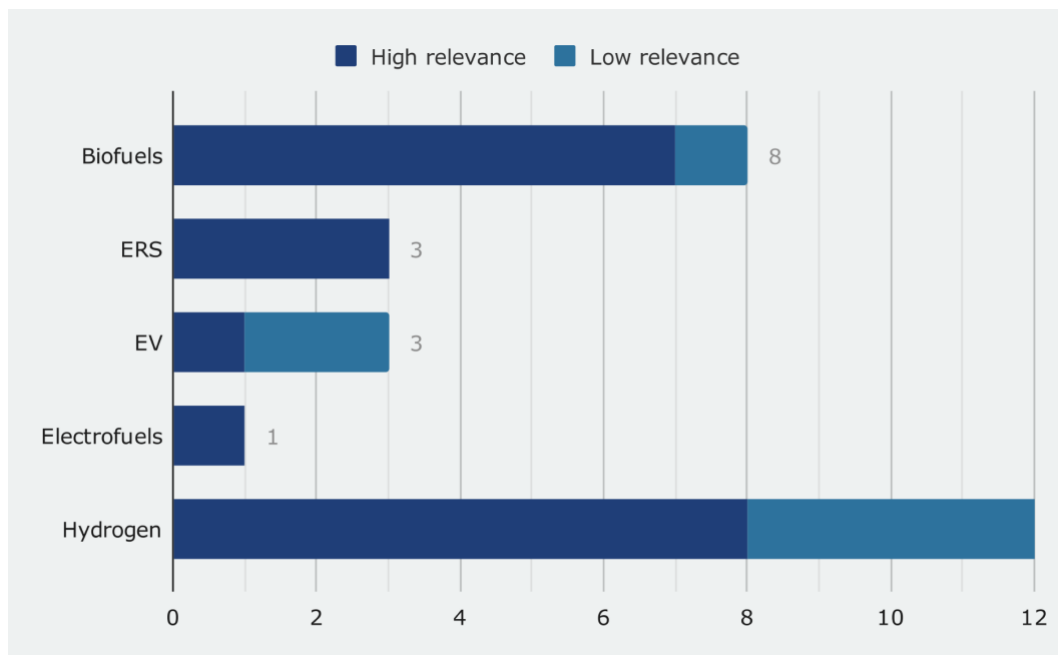


Figure 4 Number of programs and platforms in pathway 5 (introduce less emitting fuels) per energy type after relevance.

If we summarise the electricity-based systems (Electric Roads Systems (ERS), Battery vehicles (EV) and electrofuels) we see that biofuels, hydrogen and electricity based systems are at the same level of research activities.

5. Types of research activities

From the mapping, we can see that most of the research activities are projects carried out in one country with one or two research institutions involved and financed by the funding institution from the same country. The results from these research activities are indeed put forward to policymakers, industry and other researchers, but only a limited effort is generally made to facilitate the use and implementation of the research findings themselves.

In Sweden, there are however a number of so-called platform initiatives, which involve several types of organizations and have the overall target to nurture alignment and to bring research findings closer to policy initiatives and implementation. These platforms (or arenas) form common knowledge centres for all the participating organisations: researchers, industry, authorities and organisations with specific interests. The funding for these initiatives is mainly sourced from public sources, but private funding is also sourced for these research initiatives.

TripleF, Closer, DenCity, F3 and KNEG are in a broad sense all examples of platform initiatives within the area of road freight and decarbonization. Looking closer into some of these initiatives, most of them focus mainly on technical solutions, whereas TripleF also focus on policy measures and logistics. A description of 3 platform initiatives is contained in an annex (in Danish)

TripleF is a rather new platform, started in 2018, with the aim of decarbonizing the Swedish road freight sector, in accordance with the set national target. TripleF has a long-time perspective which is of great importance, considering the platforms role in supporting implementation. Furthermore, Triple F has an important role in monitoring the decarbonization of the freight sector. This includes setting up indicators and tracking these in order to be able to explain how and why the decarbonation is realized.

Within the first years, Triple F has however not yet focused on how to define a clear pathway for implementation and still lack a number of tools for this. The platform initiatives seem a very useful way to consolidate the research and facilitate the dialogue between all the stakeholders in the road freight sector.

Sweden hosts several platforms, but at least one of them could develop into a Nordic initiative.

A recommendation from Concito is to further develop the TripleF initiative to become a Nordic initiative. This will of course need funding from the other Nordic countries, and a suitable way for a Nordic organization of the initiative should be developed accordingly. We are aware that some initiatives are already being taken amongst some researchers, but it is important to involve research funding organizations and the authorities from all Nordic countries.

6. Border crossing initiatives

There are of course research initiatives across borders in the Nordic region and within the EU. One important example is COLLERS which is a cooperation between Sweden and Germany on Electric Road Systems (ERS). There are funding initiatives in the Nordic region such as Nordic Council of Ministers, Nordic Energy Research and Interreg and they serve to establish a common understanding and to enable knowledge sharing between the researcher in the Nordic countries.

Among other border crossing initiatives, we will also mention the corridor projects, STRING which lead to GREAT, which looks at infrastructure from Germany to Oslo, but also include low-emission fuels along the network. Another project is SWIFTLY Green which develop corridor from Italy to Sweden, and also include low-emitting solutions. This is however an example of a large EU research project, which developed a database of low-emission solutions, but apart from one attempt to update the database, it is now outdated. It is a pity that several good and large projects develop tools and databases, but there is no funding for the cost of operations and ongoing update, so this kind of outputs get quickly outdated.

7. State of the art on low-emission solutions

The recent Concito report (ref 5) on decarbonization of road freight transport and the Nordic SHIFT project (ref 6) provide an excellent overview of some of the challenges in regard to decarbonisation of road freight. We will not summaries all the finding here, but only point to some of the major challenges in these two recent publications and which also points to recommendations for future research.

When looking at the different fuels and technologies, the following observations should be brought forward to the next level of research activities:

- Electrification by Electric Road Systems and battery solutions will by far form the most efficient use of the renewable power, that are available. The SHIFT project conclude that the use of power directly into the engine will increase the power consumption by 10% compared to the current consumption in Sweden, whereas the use of the renewable power to produce P2X will increase the power consumption by 60%. It is a particular challenge that all sectors want to use the renewable power, without a consolidated overview of the amounts available in the future
- In Sweden and Finland HVO has been used to reduce emission. HVO is produced from forest waste. However, also amounts of imported biomass for instance palm-oil is used. The use of biomass can be sustainable, but in several cases it is not. This point to the challenge that industries tend to use all the sustainable biomaterial available and often a lot more
- Several projects work with the use of hydrogen in the transport sector, but the conclusion from both SHIFT and Concito point to the fact that using power directly is much more efficient from a resource perspective. than transforming it to hydrogen and use this as a motor-fuel. Hydrogen from renewable electricity is valuable for producing P2X and should primarily be used in this process.
- Specially the SHIFT project point to the challenge of the need for strong policy measures in order to drive the decarbonization. Currently each country introduces measures from a narrow national perspective. One example is the huge economic support for production of biogas in Denmark and incentives for the use of biogas in Sweden. This leads to export of biogas from Denmark to Sweden, which provides double incentives. The SHIFT project highlights the

need for coordination of measures to increase decarbonization and with an international approach.

8. More focus on implementation

Projects like SHIFT and platform initiatives such as TripleF do focus on the consolidation of research result and implementation. However, there needs to be much more focus on fast ways to implement a regulatory regime, which in an efficient way will provide sufficient incentives for the necessary decarbonization of road freight.

The diagram below illustrates some of the necessary steps to take all the way from research to the implement the decarbonized transport system for road freight.

The first step is to build research-based knowledge on technologies and improved logistic systems. The next step is to get a research-based and independent assessment of the technologies from a number of criteria. In order to create political acceptance of the new technologies at process is needed, where all stakeholders are involved.

Furthermore, policy measures should be identified to make a successful introduction of the new technology. And these measures will also have to be accepted by policy makers and stakeholders before a long-term and sustainable political change can be realized.

The mapping of Nordic research initiatives shows that there are several projects which focus on technologies and fuels for emission reduction and also some that focuses on logistic improvements. There is an ongoing need and demand for further research in new technologies, but this is not sufficient to make the needed transition fast enough.

Current technology research should be supplemented with research in the next steps towards implementation of a new and green regulatory regime.

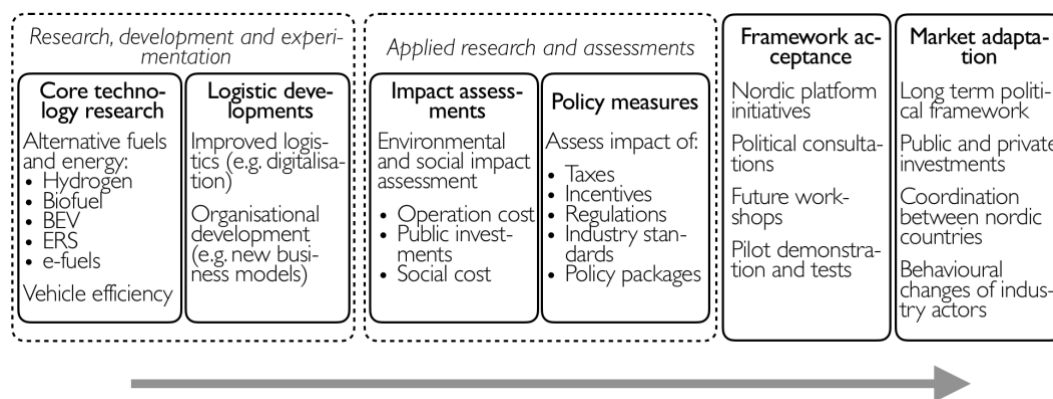


Figure 5 Action plan for implementation of decarbonisation pathways, from development of core technologies through acceptance and market adaptation

There is a need for an independent assessment of the new technologies and fuels. In the current situation, there are huge economic interests in the different technologies, and they are promoted by the interested stakeholder based on research results. It is extremely difficult for policymakers to assess the results against each other and look through the prerequisites of the different research projects.

It is just as relevant to develop tools for a process to create political acceptance of new technologies and measures to implement it. A process, which can set the scene for consultations, future workshops and meetings between researchers, politicians, organisations under informal Chatham House rules, and establish a transparent process for a general acceptance of a green framework for the road freight sector. A well-defined process – also with an end date – will be needed in order to reach a result at both the national and the Nordic level.

Another important task is to develop policy measures which are adequate for the regulation of the road freight sector. As mentioned above the incentives implemented so far has not been sufficiently comprehensive to establish the needed regulatory regime. The impact of taxes, incentives, standards and similar regulations should be assessed and especially how to connect them into comprehensive policy packages with both starting and end points for the regulation.

If the Nordic countries manage to agree on a coherent framework, the EU will probably take it as a point of departure for the relevant EU regulation.

One issue is especially difficult, and that is to coordinate a possible implementation of an Electric Road Systems. This system proves so far to be the most energy efficient system and will be worth testing in order to see the functionality and assess pro's and con's of the system. If this is to be implemented the investments in the system should be well coordinated in order to make the transport industry invest in the vehicles. The system should cover the main road network for the international freight transport. In order to obtain the limited cost of the infrastructure, which is found in literature, it is crucial that most trucks using this road network also use the infrastructure. So, several countries – if not the whole of EU – should back up the decision to invest in ERS and refrain from various other solutions along the corridor where ERS is established. This will be a difficult decision process. Outside of the network, other fuels need of course to be available for the regional road freight.

Concito recommends independent annual assessments of the different technologies, based on new research results. It is important that the assessment is carried out by researchers and organised by independent institutions. The assessment could be organised by the independent climate Think Tanks in the Nordic countries (Fores from Sweden, Zero, from Norway, Sitra from Finland and Concito from Denmark). Alternatively, the assessment can be organized in cooperation by the Nordic independent Climate Councils. The assessments should comprise the potential CO₂ reduction in relation to social cost and operational cost for transport companies as well as public investments in a future infrastructure.

Such an ongoing assessment could be an important element in the creation of political acceptance of a new green freight transport regime. The political process will however need also consultations with stakeholders and industry organisations, in order to jointly accept the best way to make the shift over a relevant, short time span.

Similar processes should be developed to create acceptance amongst all stakeholders and policy makers. This should also be organized by independent actors in order to avoid bias from involved economic interests.

9. Ecosystems

We have looked into the concept of Business Ecosystems. This is done because a shift in technology will not be implemented just because it is available. There is a complex background in several sectors, which should be in place to implement this shift. We look at the concept of business ecosystems and try to relate it to road freight transport.

As we can see from the previous experiences with single national measures to impact the technology used in the transport sector, the response from industry is not always the wanted one.

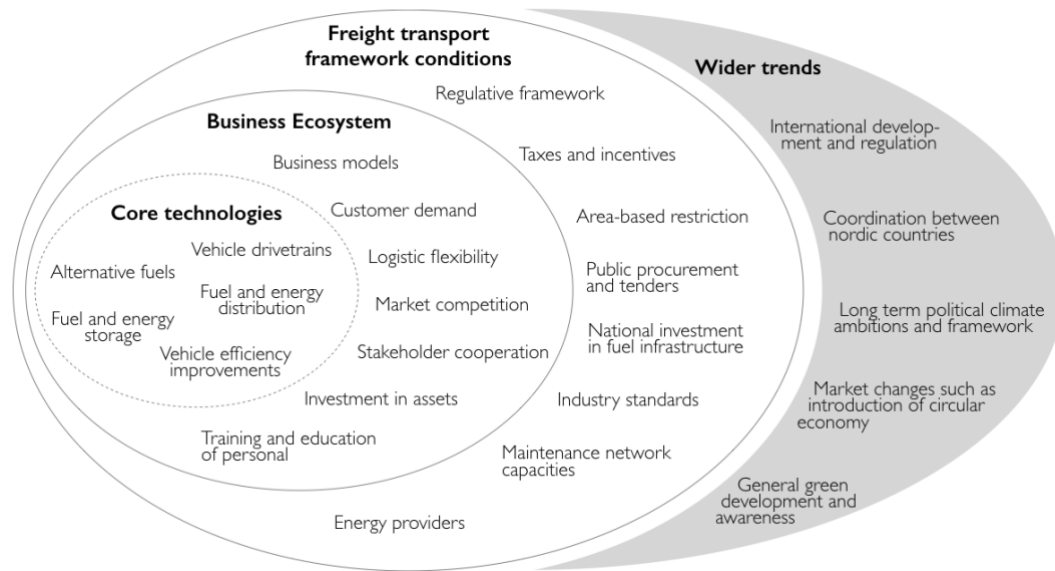


Figure 6 Illustration of the ecosystem of road freight transport where business in freight depends on certain core technologies and are imbedded in a larger set of framework conditions, which again is impacted by wider national and international trends

In order to achieve 0-emission road freight the core technology has to be available, with the elements described in the inner circle:

- 0-emission fuels,
- vehicles, which can use the fuels
- infrastructure to distribute the fuels,

Just to get the core technology available for the market requires a huge efforts from several partners, including industry.

It is however not enough to have the core technologies available, a business ecosystem is needed. For the transport company, it is a prerequisite that a business with the new technologies can be assured (return on investment). Otherwise the transformation will not take place. Therefore, the regulation in the form of incentives and taxes needs to be decided in a way, which lead to the shift in technology at a level playing field for the companies. Most importantly the regulation needs to be long term, so the business can invest in new vehicles and also trust that the regulatory regime will not shift overnight. In this connection it is important not only to introduce incentives and taxes, but also to decide, at which stage they should be cancelled again.

An important incentive for the transition is the demand from costumers. It will be an advantage to invest in cleaner vehicles, if there is a demand for o-emission transport, and here the public sector can provide a very cheap incentive for the transformation. A movement, which has already started in Oslo, and in several Swedish municipalities.

To make the business run for the transport companies it is necessary to have fuel available for the transport companies in all relevant areas and with a density, which facility a flexible transport company.

In order to establish a long-lasting ecosystem for o-emission road freight even a wider view is needed. Educations and vocational training of personal to take care of maintenance and repair of the new type of vehicles is for instance a prerequisite. Also, ongoing research activities in order to improve the new technologies and to provide research for the companies on improved use of these technologies.

The wider ecosystem comprises the framework conditions, which are important for the business, but difficult to influence. This is the future development both in technologies and in politics.

One should bear in mind, that with the implementation of new technologies the operational mode will hardly be constant. Some changes might be attractive, and the business system might change with new technologies.

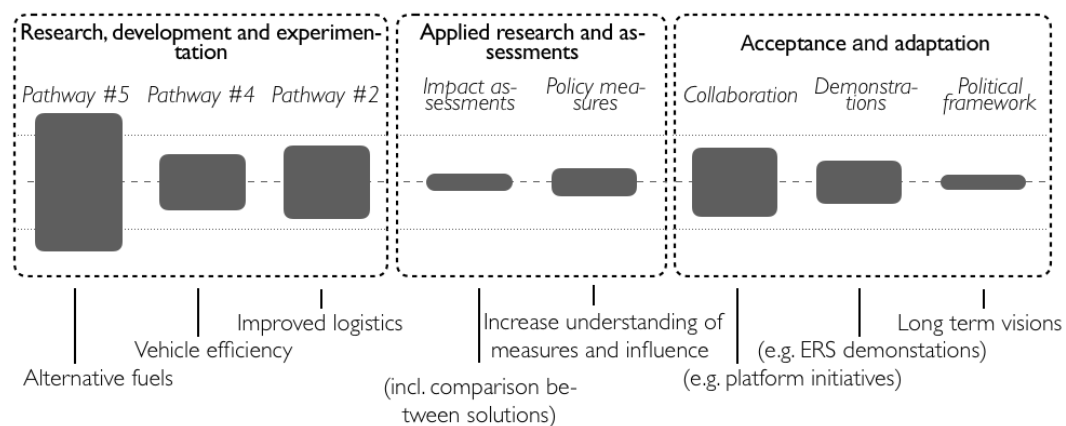


Figure 7 Indication of focus on each step in the action plan from actors in the Nordic countries based on inputs from the mapping of road freight initiative in the Nordic countries.

10. Future demands for road freight

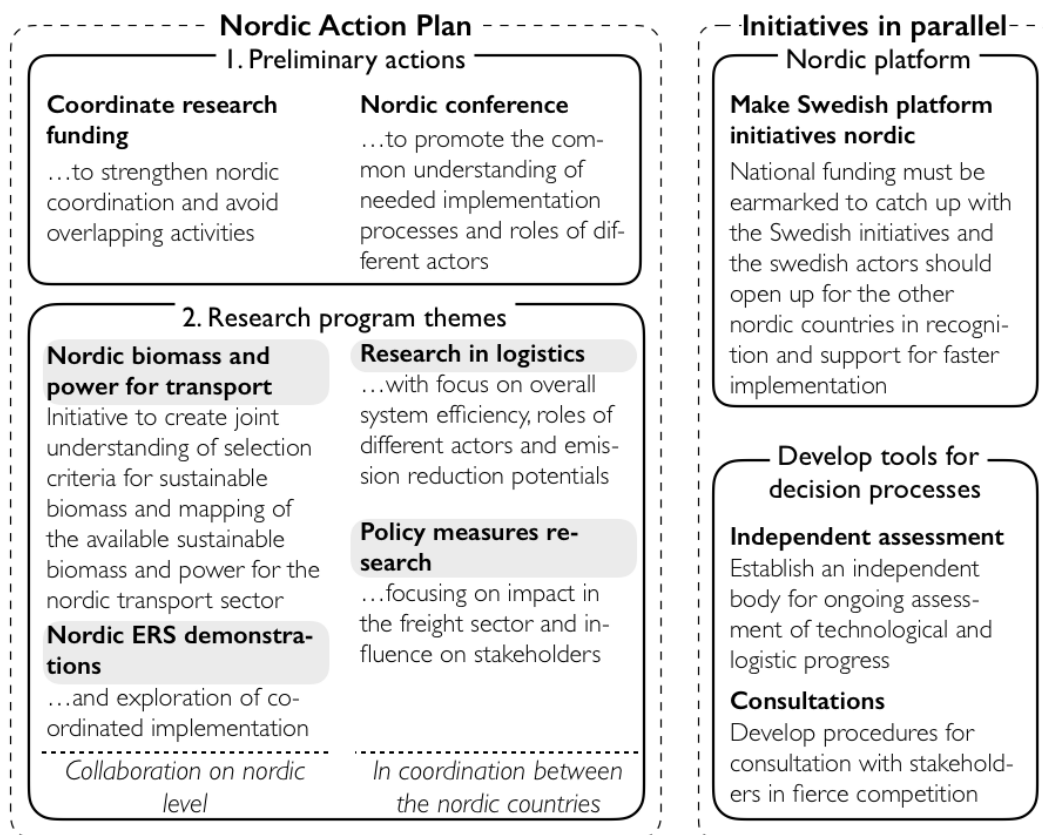
In the coming years the focus on circular economy will be developed further, and the impact on the transport industry is not easy to assess. On one hand there will be much more return freight, as one might imagine that several production companies will take their products back in order to either repair or reuse components and basic materials. This will probably lead to less freight, but definitely to a change in the market, so there will be less waste and more transport of used products. This kind of changes in the market should be included in the future research agendas. The green transition will

probably in several ways set a new demand for freight transport and research should refrain from keeping the same focus on resources and cost.

As part of the regulative framework, it is also a challenge to provide a clear ecosystem for the o-emission technologies.

11. Action Plan

Three types of actions are recommended in the action plan. Preliminary actions to carry out before the research program can be announced. There are recommendations to the content of the research program and finally there are recommendations for other initiatives to be carried out in parallel. The focus is on initiatives, which are relevant to look at in a Nordic perspective.



Preliminary actions:

– **Coordinate research funding**

Nordic Energy Research should gather national and Nordic research funding organizations in the field of decarbonization and transport for possible coordination of funding of research in the ecosystem of o-emission road freight transport. This could lead to a common pool of funding for a joint Nordic initiative or at least a division of labour between the research funding organizations, which will ensure that there are funding available not exclusively for technological research, but also for input to the policy related research and processes. As a minimum, a strengthened coordination will avoid overlapping activities, that do not cooperate throughout the research process.

– ***A Nordic conference on implementation of decarbonization policy***

Nordic Energy Research should host a Nordic conference on the process from research to political action to enable a focused discussion on the need for fast implementation of o-emission solutions in road freight. The outcome of the meeting amongst funding actors could be announced and set the stage for a dialogue between researchers, industry, policy makers and interest organizations on the need for procedures to ensure faster implementation. The outcome of the conference should be:

- a common understanding of the implementation process and the role of different actors
- a common understanding of what should be developed at a Nordic level and what at national level

The research program:

The research program should focus on the following research themes, some are important to carry out at Nordic level, others are of a general nature. The themes should of course be coordinated with other research funding institutions as mentioned above:

At the Nordic level, the following three themes are important:

– ***Availability of CO₂ neutral and sustainable biomass and power in the Nordic countries, which can be dedicated to the transport sector***

To avoid that several sectors plan to use the same renewable energy resources, the following assessment should be carried out at Nordic level. A joint understanding of which basic criteria should be used to select biomaterial, which can be taken out of the ecosystem in a sustainable manner. Furthermore, a mapping of how much sustainable biomaterial there are available in the Nordic region in the future.

A similar assessment of o-emission power production in the Nordic region should be undertaken.

It is also important to assess how much will be available for the transport sector and when it will be available.

As part of this initiative, an independent assessment should be carried out to eliminate bias. The assessment should be led by independent Nordic organizations and build on input from researchers in the field.

– ***Nordic Electric Road System demonstrations***

Some tests are already being carried out in Sweden and in Germany – and at least one in cooperation between Sweden and Germany. Further research and demonstration should be carried out in cooperation and coordination amongst all Nordic countries and Germany. Roadmaps for the possible implementation of an electric road system should be explored, in order to pave the way for a coordinated implementation, in case the system proves superior to other options in terms of economy and climate impact.

– ***Policy measures for freight***

Research in the impact of relevant policy measures in the road freight sector. Measures as pricing, incentives, area-based restriction and combination of these measures - in order to understand the impact on the freight sector. The research initiatives should

focus on the impact on freight flows and how policy packages would influence the business models of stakeholders in the road freight sector.

The research themes below are not Nordic by nature. They are important research areas, where we have identified knowledge gaps, but they are of a more generic nature

– ***Research in a future demand for freight transport***

The green transition will probably change the demand for freight transport. Circular economy and a higher price on transport - due to higher energy cost - will change patterns and might create a different approach to transport demand. It will be of great relevance to start research initiatives in this field.

It is however not important to coordinate these research activities at Nordic level. This area is of global interest.

– ***Logistics with focus on overall efficiency and reduced emissions***

Further research in logistics should focus on measures to optimize freight across value chains. This involves forwarders and their role in determination of the carbon footprint by selecting mode and set standards for the transport strategy.

A future logistic system should look at various measures and mechanisms to reduce energy consumption from the logistics system and should address ways to strengthen coordination of freight across companies.

Other initiatives to decarbonize road freight as fast as possible

– ***Make the Swedish TripleF platform initiatives Nordic***

Sweden has a number of ongoing platform initiatives, which can help the process of Nordic decarbonization. As road freight is a border crossing initiative, where similar standard and systems are crucial across a larger region, the Swedish platform initiative, TripleF should be developed into Nordic initiatives – or at least have a clear cooperation with all Nordic countries.

This should enhance the common understanding of the potential for decarbonization and pave the way for coordinated actions to implement o-emission road freight as fast as possible.

It is important to involve all relevant stakeholders engaged in the business ecosystem of o-emission road freight transport.

The national governments and funding organizations must earmark funding to catch up with the Swedish initiatives and engage in the actions in the platforms. The Swedish actors should open up for the other Nordic Countries and recognize the need for faster implementation.

– ***Develop tools for the decision processes***

In order to speed up the implementation we need tools for an accelerated process from research to decision making. Furthermore, the process should be institutionalized so it is well-defined which institutions should carry out the different steps and which stakeholders should be involved at which step. The following tools could be key initiatives:

Independent assessment:

Research is currently providing new technologies and fuels that can decarbonize the transport sector. The results are often communicated, but the limitation in each of the new developments are seldom expressed. This constant flow of positive news, often brought forward by stakeholders with economic interest in one specific technology, make it difficult for the policy makers to bring forward the regulative framework to decarbonize the sector.

In order to facilitate the decision process, an independent assessment should be established to assess the potential fuels and technologies against each other on clear parameters such as carbon reduction potential, cost of initiative for the industry, public sector investments as well as social cost of the initiatives.

The independent assessment could be led by the independent climate councils in the Nordic countries and /or in cooperation with Nordic think tanks (Fores, Zero, Concito, Sitra). The assessment should be carried out by researchers and followed by the stakeholders, in order to create an assessment in consensus amongst the stakeholders.

The initiative should be ongoing so new research results can be assessed within a limited period.

Consultations with stakeholders

Consultations can be a helpful tool as a way to ensure the legitimacy from the stakeholders to a new regulatory regime,. There are several well-developed procedures which have already been used to facilitate the many consultations in relation to urban planning, climate adaptation projects and several other initiatives. However, most of the tools and experiences relate to consultation with citizens, so an adaptation of the procedures to stakeholders in fierce competition, may need adjustments to the procedures.

The consultations should involve all stakeholders in the business ecosystems, in order to involve the full value chain for the road freight transport.

As some of the policy initiatives will involve several ministries, it will be important to involve them and conduct a process to align the Ministries and develop consensus amongst them.

12. References

- 1) Emission Gap Report 2019, UNEP 2019
- 2) Global Warming of 1,5 degree C, IPCC working group 1, 2018
- 3) Triple F: Systemövergripande uppföljning 2019 – Uppföljning av hur godstransporter närmar sig det svenska klimatmålet 2030, Johanna Takman, VTI
Lina Trosvik, VTI, Inge Vierth, VTI, Patrik Klintbom, RISE, Johannes Huffmeier, RISE
- 4) Decarbonizing Logistics – Distributing goods in a Low-carbon World, Allan Mckinnon
- 5) Decarbonisering af vejgodstransport, Henrik Gudmundsson, Concito 2020
- 6) Sustainable Horizons in Future Transport – with a Nordic Focus. Project Summary 2015 – 2019, Nordic Energy Research, 2019

13. Annex - Description of the Swedish Platform initiatives

Triple F: Fossil Free Freight (triplef.lindholmen.se)

Finansieret af: Trafikverket Koordineret af: Lindholmen Science Park Hovedpartnere: VTI, RISE Stakeholders. ~50 (akademisk, industri og offentlig)	Land: Sverige Periode: 2018-2030 Budgetteret: 290 Mio. SEK Forskning: bl.a. 21 PhD stillinger
MÅL Dekarbonisering af fragtttransporten: At tydeliggøre bestemte udviklingstrin til at skabe system-ændringer og at skabe en platform til at udbrede klimakompetencer mellem aktører i godstransportsektoren TEMAER Politiske instrumenter, teknologiens rolle og logistikløsninger	
KOMMENTAR Triple F er stadig ny, hvilket afspejles i antallet af afsluttede og igangværende projekter. De projekter som har kørt indtil videre har haft begrænset klimapotentiale, men en mere systemændrende tankegang ser ud til at vokse i takt med at platformen modnes	

OM Triple F's overordnede målsætning er en reduktion af klimagasudledningerne fra den svenske fragtttransport med 70% i 2030 og dernæst at forberede overgangen til en fossilfri godstransport i 2045 i overensstemmelse med regeringens mål. Platformen blev etableret i 2018 og vil fortsætte over en 12 års periode indtil 2030. I forhold til andre store platforme er Triple F søsat med et direkte fokus på reduktion af drivhusgasudledning og tager udgangspunkt i en grundig gennemgang af svenske godstransport i forhold til 2030-klimamål. Da platformens fokus er på godstransport er projekter omkring sø-, luft-, og togtrafik også medtaget, men på nuværende tidspunkt er fokus hovedsageligt på vejtrafik, omend få projekter drejer sig udelukkende om skibstrafik.

FOKUS Triple F har tre forskellige overordnede temaer som hvert projekt kan høre under i større eller mindre grad. Tankegangen tager afsæt i *triple helix* principper, hvor temaet *politiske instrumenter* ses i forhold til at skabe incitamenter til handling for aktører gennem hele systemet, *teknologiens rolle* ses i forhold til effekterne fra forskellige teknologiske innovationer frem for den teknologiske forskningen i sig selv og *logistikløsninger* bruges erfaring fra de to førnævnte temaer til udvikling og forståelsen for mekanismerne bag implementeringen af nye løsninger. Triple helix princippet bruges også i en række aktørgrupper (H3-grupper), hvor aktører med forskellige baggrunde samles omkring fælles interesser. I grupperne udføres både projektarbejde og Triple F får aktørdrevne referencer til de udfordringer og behov som stilles i forbindelse med dekarbonisering af transportsystemet.

PROJEKTER At platformen er forholdsvis ny afspejles i mængden af afsluttede og igangværende projekter. Ud af de 10 *afsluttede projekter* er der et par projekter som omhandler søveje, eller specifikke områder som affaldstransport og transport i stål- og byggeindustri. Mere relevante projekter for det større transportsystem har omhandlet biogas, tungere vogntog, cirkulære flows og e-handel, men der er altså tale om at de afsluttede projekter har fokuseret på områder med begrænset dekarboniseringspotentiale.

I de *igangværende projekter* ses både på transportkøberens rolle, speditørperspektiv, øget koordinering, men også evaluering af DME brændstof og byers strategiske arbejde med godstransport. Her er systemperspektivet altså mere fremtrædende, men til gengæld er det sparsomt med offentliggjort information.

Kommende projekter de næste par år vil fokusere på økosystemer til elektrificering af godstransport og særligt på kombinationer af en række forskellige dekarboniseringsløsninger med målet om fuld dekarbonisering for øje. Altså har Triple F valgt et fokusområde, og må derfor afvige fra at være teknologineutral. Dette valg skal ses i forhold til at de kommende projekter har større reduktionspotentiale, i forhold til de foregående projekter, og at den anden store svenske platform med udgangspunkt karbonreduktion inden for transporten har et meget stort fokus på brændstoffer men forsvindende lidt på elektrificering.

Drive Sweden (drivesweden.net)

Overordnet målsætning: At adressere fremtidens mobilitetssystemer

Finansieret af: Vinnova, FORMAS og Energimyndigheten Vært: Lindholmen Science Park Stakeholders: +100 (akademisk, industri og offentlig)	Land: Sverige Periode: 2015 (12 år) Andet: SIP (Strategic Innovation Program)
MÅL At udvikle bæredygtige løsninger på fremtidens transportudfordringer frem mod 2030 TEMAER Samfundsplanlægning, digital infrastruktur, forretningsmodeller, politikudvikling, offentligt engagement	
KOMMENTAR Fokus er på fremtidens tekniske og sociale muligheder og eventuelle klimapåvirkninger er en sidenote	

OM Drive Sweden er et svensk Strategic Innovation Program (SIP). Denne type af programmer arbejder med bæredygtige løsninger på komplekse samfundsområder. Her skal bæredygtig forstås i en bred forstand, således at løsningerne der fokuseres på kan være møntet på miljømæssig-, social- eller økonomisk bæredygtighed. Drive Sweden arbejder ud fra det synspunkt at vi er på kanten til et større regimeskifte inden for transport, hvor vi over den næste årrække vil bevæge os væk fra privatejet bilisme til mobilitet som en service. Dette skifte vil få implikationer på tværs af systemet blandt andet i form af nye forretningsmodeller og ændringer i transportmetoder og -behov.

Platformen har eksisteret i et par år, og har en større gruppe af stakeholders end det yngre Triple F initiativ. Om de flere samarbejdspartnere skyldes den længere levetid eller at Drive Sweden har større fokus på nye forretningsområder (og dermed indirekte på omsætning) end Triple F, eller af andre årsager, står uvidst hen.

FOKUS Platformens fokus er at arbejde på tværs af aktørgrupper inden for vejtransporten mod øget sikkerhed, effektivitet og miljøforbedringer samt forbedring af sekundære effekter, så som bedre brug af plads i byer. Drive Sweden har udviklet et interaktivt roadmap for transportudviklingen frem til 2030, for blandt andet at tydeliggøre at både integrering mellem systemforskning, teknologiudvikling og mobilitetsydelser er vigtige samt at vise at flere mellemetaper er nødvendige for at nå en transformation i transportsystemet i en ønsket retning. Fokus er samtidigt ikke på godstransporten men hovedsageligt på persontransport hvor transportmængde er størst.

PROJEKTER En del af Drive Sweden's projekter bliver udført som samarbejdsprojekter hvor platformen kun har en deltagende rolle, men andre projekter er koordineret af Drive Sweden under platformens forskellige temaer. En del vægt bliver lagt på projekter som omhandler mobilitetservice for passagerer og autonome køretøjer, og er derfor kun af mindre relevans for en omfattende dekarbonisering. Til gengæld kan disse temaer få betydning senere hen, hvis teknologierne modnes og får en rolle i større systemændringer for transporten.

Af andre projekter som er mere relevante er *Policy Lab*, hvor der ses nærmere på at overføre og sammenfatte erfaringer fra Drive Sweden's projekter til generelle anbefalinger og retningslinjer inden for innovation i lovgivning og politik. Et *Business Model Lab* vil tilsvarende sammenfatte erfaringer indenfor innovative forretningsområder i transportsektoren. Her er fokus på samarbejde og automatisering i transportsystemet. Der er dog meget lidt tilgængelig information på de to projekter. Herudover er der i projektet *The digitalization of the transport delivery chain on roads* fokus på selve digitaliseringen af transporten. Igen er der altså tale om at relevansen kan ses i form af teknologiernes mulige rolle i fremtidens transportsystem, mere end selve potentialet for dekarbonisering.

f3 (f3centre.se)

The Swedish Knowledge Centre for Renewable Transportation Fuels

Finansieret af: parterne, region Västra Götaland I tæt samarbejde med: Energimyndigheten (SE) Partnere: 16 (akademisk, industri)	Land: Sverige Startår: 2011
MÅL At understøtte transitionen til et transportsystem på fossilfrie brændstoffer gennem forskningsbaseret viden og samarbejde TEMAER Systemstudier og -sammenligninger, aktørstrategier, procesintegration og effektpotentiale, synteser af forskning	
KOMMENTAR Kun fokus på brændstoffer (f.eks. ingen sammenligning til BEV eller ERS i analyserne) og meget vægt lægges på biomasse	

OM f3 skriver at de er en upartisk svensk platform med fokus på fremme viden om et fremtidigt fossilfrit transportsystem. Platformen vil bruge viden fra ny forskning til at hjælpe samarbejder på vej mellem private og offentlige aktører for bedst muligt at udnytte åbninger for svensk produktion og brug af fornybar brændsel og samtidigt undgå faldgruber i processen.

FOKUS Platformen tager udgangspunkt i *samarbejde* mellem aktører på tværs af traditionelle skel ved at samle teknologiforskning, systemanalyse og samfundsforhold på nationalt og internationalt plan. Platformen fokuserer også på deres *eksterne kommunikation*, hvor de tilstræber at gøre deres forskellige resultater let tilgængelig for diverse beslutningstagere. Platformen deltager i og finansierer *systemorienterede projekter* både selvstændigt og i samarbejde med andre aktører.

PROJEKTER På *EU-niveau* har f3 fungeret som en såkaldt "konsekvensplatform" for Sverige under *Horizon 2020* med finansiering fra *Vinnova*. Selvom *Horizon 2020* nu er afsluttet vil f3 fortsætte dette arbejde, men på nedsat niveau da de ikke længere modtager særskilt finansiering fra *Vinnova* hertil. I arbejdet vil fokus være på de oprindelige temaer som er samarbejdet med den europæiske udviklingsplatform for bioenergi, *ETIP Bioenergy*, vidensdeling om vedvarende brændstoffer på EU-niveau samt udvikling af samarbejdet på nordisk niveau på samme område. f3 lægger også vægt på deres bidrag til EU Strategic Energy Technology Plan om bio- og alternative drivmidler. På *nordisk plan* har platformen samarbejdet med norske *Bio4Fuels* siden 2018. Ovenstående informationer er fra f3's seneste årsrapport (2018), og peger på at platformens teknologisk præference domineres af brændstof, men at fokus særligt har været på biobrændsel. Dette går også igen i f3's egne beskrivelser som overordnet at arbejdet er rettet mod "a fossil independent transport sector", men andre steder er specificeret til "sustainable renewable transportation fuels".

Mellem 2018 og 2021 samarbejder f3 og Energimyndigheten gennem programmet '*Förnybara drivmedel och system*', med *Chalmers Industriteknik* som værtsorganisation, om at øge systemforståelsen ved et regimeskifte til alternative brændstoffer for beslutningstagere og andre aktører på transportområdet i både politik og industri. En stor del af alle platformens projekter omhandler forskellige aspekter af biobrændstoffer, men der findes også projekter som sammenligner forskellige typer af andre brændstoffer (dog ses *ingen* sammenligninger med alternative systemer som BEV eller ERS). Et mindre antal projekter går på teknologier som elektrofuels og systemfunktioner såsom bidraget til teknologiændringer ved offentlige indkøb. I mange af projekterne er fokus ikke på transportformen men på drivmidlet. Få projekter henvender sig specifikt til sø- eller lufttransport, så en stor del kan af platformens arbejde kan relateres til vejtransport.

Som en del af tydelig ekstern kommunikation udgiver f3 faktablade over emner indenfor alternative drivmidler (pt.: Biodisel, FAME, DME, Methanol, HVO, Biogas, Bioethanol), og afledte effekter (arealanvendelse, bæredygtighedskriterier for biomasse og fremskafning af biomateriale).

2030-sekretariatet (2030-sekretariatet.se)

www.2030-sekretariatet.se og www.2030.miljobarometern.se

Koordineret af FORES Finansieringen er umiddelbart ikke offentliggjort Partnere: 80 (akademisk, industri, offentlig, NGO og brancheforeninger)	Land: Sverige Periode: 2015-2030
MÅL At understøtte udviklingen mod et fossilfrit svensk transportsystem i 2030 TEMAER Køretøjsudvikling, brændstofudvikling og adfærdændringer	
KOMMENTAR Et stærkt initiativ til at holde pres under transportsektoren mod Sveriges klimamål, men der mangler solid data for lastbiler	

OM 2030-sekretariatet blev oprettet af tænketanken FORES i forlængelse af den svenske regerings målsætning om 70% reduktion af klimapåvirkningerne fra transportsektoren i 2030 med det formål at sikre at målene bliver nået. FORES ser Sverige som at have gode betingelse for at blive en en 'global pioner' inden for fossilfri transport på grundet af at landet har en stærk bilindustri (særligt for tunge køretøjer), en brændstofindustri med bred adgang til alternative brændstoffer (marker, skove og hav), og en omfattende fossilfri elproduktion. På denne baggrund har sekretariatet samlet en række af offentlige og private aktører indenfor transportsektoren.

FOKUS Initiativet har fokus på de tre 'ben': bilen, brændstof og adfærd (på svensk Bilen, Bränsle og Beteende). De tre ben vil kontinuerligt blive analyseret frem til 2030 for at give indikationer på henholdsvis hvor langt Sverige er fra at nå målet, på hvilke områder af transporten der er behov for at øge fokus og til at samle erfaringen fra vellykkede eksempler på forbedringer i vejtransporten. Sekretariatet forsøger at holde fokus på at overfører de langsigtede forpligtelser til kortsigtet handlinger, at rykke udfordringerne til at blive set som værende opdelt elementer til at være systemorienterede og fra en bilbaseret tænkning til mobilitetsaktiverende. Med andre ord arbejdes der ud fra en tankegang om systemændring.

Derudover bestræber sekretariatets sig på at på at være fortalere for politisk klimahandling, både i Sverige, på EU plan og i samarbejde med andre nordiske tænketanke. Derfor er opgaven med samfundsoplysning vigtig for sekretariatet, som arbejder på at have høj relevans i den Svenske klimadebat. Blandt andet nedsættes arbejdsgrupper til at øge påvirkningen af transportsektoren og samtidigt at opstille delmålsætninger og indikatorer for fremskridt som er mest mulig relevante for alle aktører (2030-sekretariatet nævner selv grupperne Behavioral Change, Biofuel Taxation, Vehicle Taxes and EV infrastructure).

PROJEKTER Rækken af indikatorer til at følge processen mod en 70 % klimareduktion for transporten er blevet samlet for nationale og kommunale tal på hjemmesiden 2030.miljobarometern.se. De overordnede kategorier er *persontrafik*, *lastbiltrafik* og *kollektiv trafik* samt *hele vejtrafikken* og *hele transportsektoren*. *Lastbiltrafikken* er kun opgjort på nationalt plan, og man kan derfor ikke finde information om udledninger fra tunge køretøjer på kommunalt plan. Der er dog usikkerhed om beregningerne for lastbiler og metoden bag indikatoren kan i sig selv forekomme en smule arbitrær. Målet for lastbiler er opstillet som *at reducerer den fossile energi per indbygger som tunge lastbiler i Sverige ville bruge, hvis de alle var ny med 80 % i forhold til 2010*. Dette mål fås ved afveje tre forskellige faktorer som svarer til de tre forskellige ben; *bilen* (gennemsnitlig energieffektivitet for nye tunge lastbiler), *brændstof* (procentdel af vedvarende brændstoffer i vejtrafik) og *adfærd* (gennemsnitlig trafikarbejde for tunge lastbiler per indbygger). De tre faktorer vægtes ligeligt, og resultatet indikerer hvor langt der er til klimamålet for lastbiler.

Miljøbarometeret oplyser at opgørelserne for lastbiltrafikken er usikker, da der ikke findes officielle forbrugstal for tunge lastbiler (derfor sættes det gennemsnitlige energiforbrug til at være det samme hvert år). Personbiler opgøres efter samme metode, men her ligger der data til grund for alle tre faktorer. Initiativet står som det fremmeste i norden på indikatorer på

vejtransportområdet, men det på trods, mangler der stadig ordentlig datagrundlag for en tilstrækkelig formidling.



CONCITO er en uafhængig tænketank, der formidler klimaviden og -løsninger til politikere, erhvervsliv og borgere.

Vores formål er at medvirke til en lavere udledning af drivhusgasser og en begrænsning af skadevirkningerne af den globale opvarmning.