The impact of High Capacity Transport (Super EcoCombi/EMS2) on climate policy in the Netherlands

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Abstract

The Netherlands has been a pioneer in maximising road freight productivity as an early adopter of Larger Heavier Vehicles in Western Europe. With that concept now well established in the logistics sector, and with ever more stringent climate targets, the country is looking at the next step in this area as a means to reach those goals.
This paper will provide insights on the potential contribution of the Super Eco Combi (SEC, Dutch name for the European EMS2 combination), a 32m long, 72t heavy duty vehicle combination, to the Dutch climate targets for multimodal goods transport, by estimating its market potential and reductions in carbon emissions associated with that potential. Other impacts, e.g. modal shift, electrification, congestion and driver shortage, are also considered. The calculated contribution is compared to that of other measures included in the Dutch plans to meet its emission targets, with a primary horizon of 2030. We conclude the paper with considerations on how recent trends affect the strategic priorities for road transport policy.

Keywords: High Capacity Transport, Climate Policy, Decarbonisation, Netherlands

1. Introduction

For more than 2 decades, The Netherlands have been a pioneer in maximising road freight productivity as an early adopter of Larger Heavier Vehicles in Western Europe. Since starting trials with 25.25m, 60 tonne Longer Heavier Vehicles in 2002, the concept has become an important part of the freight transport mix, with over 3 000 such vehicles current circulating on Dutch roads.

With increasing transport demand, the sector has never lost track of innovations that will improve productivity while addressing the ever-growing pressure on the capacity of the infrastructure.

The Super Eco Combi (SEC or sometimes EMS2), essentially an A double with two 13.6m standard semi-trailers, for a total of 32m, has been part of trials or even full operation in Finland, Sweden, Denmark and Spain. The Dutch government started its own investigation of the concept in 2019 (at a maximum weight of 72 tonnes) and is now at the stage of a gap analysis, where it attempts to collect all necessary (theoretical) knowledge on the impact of the vehicle in different fields. As part of this gap analysis, the study that forms the basis of this paper was commissioned to investigate the impact the SEC could have on carbon emissions of the freight sector, and to make a comparison with other climate measures in the mobility and (freight) transport sector.

To deliver these results, three topics were assessed:

1. What are current climate measures implemented or planned in the Netherlands in the mobility sector?
2. How would the SEC fit in the current and future logistic network of the Netherlands and which size of market share could it realistically obtain?
3. What is the CO_2 reduction potential of the implementation of the SEC in the Netherlands and how does this compare to the potential of other climate measures?

2. Dutch climate policy in the mobility sector

Current Dutch climate policy is mostly shaped by the Paris agreement of 2015, the European Green Deal of 2019 and the “Fit For 55” package of 2023, and in part still refers to the Kyoto protocol of 1995, which set 1990 as the reference year for emission levels. The “Fit for 55” set of measures aims to reduce total EU carbon emissions by 55% by 2030, en route to full carbon neutrality by 2050.

In addition to measures at the EU level, each EU Member State has its own climate plans to meet individual targets. These individual measures per sector should combine to meet the EU targets per sector and in total.

2.1 General mobility measures

Current climate policy in The Netherlands is mostly driven by the Climate Agreement (Klimaatkkoord, 2019). This plan took stock of the current status of emission levels, and included further reduction targets for all sectors (mobility, industry, agriculture, power generation, housing, …). For some sectors, plans were much more developed than for others. The mobility sector was given a target for the medium (2030) and long term (2050), but unlike for sectors like industry and power generation, measures were relatively vague and would require further detailed development "en cours de route". To reach the national targets, the mobility sector would need to reduce its GHG emissions from 35.2 Mton CO_{2eq} to around 21 Mton in 2030 - a reduction of 14.2 Mton.

The measures for the mobility sector broadly cover these aspects:

- Low carbon energy carriers
- Promoting electric mobility
- Sustainable logistics
- Smart reduction of transport demand

In the original calculations for the Climate agreement, a total reduction of maximum 8 Mtons could be achieved, about 90% of which was to come from renewable energy carriers, e-mobility, or EU level CO_2 targets for vehicle emissions. Similar projections are made in Germany (Umweltsbundesamt, 2024) and Belgium. Efficiency improving measures in the logistics sector only included a road infrastructure charge for heavy vehicles, which is expected to deliver a reduction in the range of 0.1-0.3 Mton per year. Clearly, existing measures would need to be developed further, and additional measures would be needed to meet the targets set for the sector.

This started taking shape in following years, as presented in annual Climate notes "Klimaatnota") that included more detailed calculations of expected impacts. As EU vehicle emission targets became more stringent, projected availability of renewable fuels improved, and measures such as a general road pricing system were put on the table, the target came within reach. However, the new government has retracted some of these plans. In the latest iteration of the Climate notes (Ministerie van Klimaat en Groene Groei, 2024), it is stated that it is now "highly unlikely" that reduction targets will be met in 2030, which could lead to fines imposed by the European Commission. As it stands, the mobility sector has reduced its emissions by just 11% compared to 1990 levels.

2.2 Measures in logistics and freight transport

A specific planning document dealing with freight transport policy ("Goederenvervoeragenda") was compiled by the Ministry of Infrastructure and Water

Management in 2019. The four focus areas for a robust, efficient and sustainable transport system are:

- Digital transport
- Sustainable freight and logistics
- Sustainable and efficient urban logistics
- Integrated freight corridors

While not explicitly targeting carbon reduction, improving the efficiency and sustainability of the freight sector should contribute to meeting climate targets. Examples cited in the report include more efficient vehicle use (0.9 Mton reduction) and sustainable inland shipping (0.4 Mton). The SEC is not mentioned.
However, a revised (officially “recalibrated”) version of this planning document is currently being prepared. A preliminary draft of the recalibrated planning still does not explicitly mention the SEC, but it does give indications of a shift in the strategic priorities of freight transport policy, citing following priorities:

- Optimizing capacity to accommodate freight transport growth
- Robustness to disruptive events (e.g. the Ukraine war, COVID, climate change)
- Proactively accounting for global context (energy, circular economy, strategic autonomy)

This shows how the driving force to improve transport efficiency has moved from primarily economic objectives (cost reduction) to a practical necessity (capacity and robustness), indicating a crucial shift in the paradigm for the organisation of logistics.

3. The Super Eco Combi

3.1 Position in Dutch logistics

Logistics is a crucial sector for the Dutch economy, which is home to two of Europe’s four largest seaports (Rotterdam and Amsterdam), very dense road and inland waterway networks, and crucial rail connections to the European hinterland. Innovation in every aspect of the sector is actively promoted by the government and many cooperative programs are set up jointly with the industry. A prime example of such a program was the introduction of the EcoCombi (the 25.25m, 60t version) as the pioneer in Western Europe, where a trial led to full adoption of the concept in 2013. The lessons learned from this trajectory should help with an expedited introduction of the SEC, though all steps still need to be made, including an assessment of the market potential, which serves as the basis for the estimation of other economic, environmental and social effects.

The strongest similarity between the Super EcoCombi and the shorter regular EcoCombi is undoubtedly its suitability for fixed transport routes with sufficiently large volumes, e.g. between large hubs or from these hubs to large distribution points. Examples of suitable sectors include construction, retail, and containers.
Still there are a few practical differences that should be accounted for:

- With its larger size, the SEC is more difficult to manoeuvre than the regular version, and infrastructure adaptations may be needed to logistic sites or parking areas;
- The modular composition of a towing vehicle with two standard semi trailers makes it easier to use equipment that is already in use, whereas the regular EcoCombi relies on less common shorter trucks and trailers.
- This provides the opportunity to more flexibly organise coupling and decoupling in specific sites, allowing for a larger base of users that could reap benefits from the concept;
- Warehouses may need to be adapted to receive 2 FTL of goods (as compared to 1.5 for the regular EcoCombi right now), and logistic planning processes and software would need to be updated as well. However, it is likely less complex to work with full standard units instead of a fraction.

All aspects considered, it is probably less complicated to implement the Super EcoCombi than it was to implement the regular EcoCombi.

3.2 Market potential

Estimating the market potential of the Super Eco Combi was done based on information from three sources:

- A review of earlier publications on the SEC's market position;
- Interviews with sector representatives;
- Model data from the Dutch freight model BasGoed (https://www.basgoed.nl/)

(Buck Consultations, CE Delft, 2020) identified seven market segments for which the SEC would be a solution, which would require between 2 000 and 6 000 trips per day in 2030. For profitable operation, a threshold of 130 km per single trip was found. Assuming round trips need to be made and vehicles should be driven for a maximum of 9 hours per day at an average speed of 70 km/h, each vehicle could make 4 (single) trips per day, which can be done by 500 to 1 500 vehicle combinations.

Based on estimates made by the Dutch government, (Panteia, 2024) came to a similar number: 3 000 SEC on the roads by 2033.

When sector representatives were asked about the market potential for the SEC, they were hesitant to provide a number, given the amount of uncertainty regarding the implementation conditions. However, they did provide useful input in other areas. For example, operators estimate that the SEC would be able to replace around half of current regular EcoCombi vehicles. For profitable operations, operators gave a range from 50 km to 120 km per trip; the latter number is close to Buck's estimate.

These estimates served as input for the selection of filters of the BasGoed database (which is based on estimates per week).

Table 1: BasGoed model parameters

Model years	2018, 2040H (high) – projection year for the study was 2030; linear interpolation was performed to estimate this number
SEC market segments	Filtered from BasGoed good types: Plastics/rubber; Products of agriculture, forestry and fishery; Machines, electronics and transport means; Foodstuffs, Mineral products, Other goods
Vehicle types	Truck- semitrailer, EcoCombi
Type of transport	Domestic only
Shipments	Only return trips (2 trips for 1 full cycle)
Distance per trip	Minimal average trip distance: 50, 90 and 130 km.
Minimum weight transported per Origin/Destination pair	Assuming mostly light goods but full trips, minimum weekly weight was set at 50 tonnes

Applying these parameters to BasGoed figures resulted in these estimated activity levels for the SEC:

Table 2: BasGoed model output: SEC potential per week

Year, minimum trip length threshold	Weight transported (ton)	TonKm	Number of trips
2040H, 50km	393.133,58	40.853.246,56	40.220,00
2040H, 90km	210.050,56	28.515.393,75	21.156,00
2040H, 130km	98.466,13	16.731.345,27	9.780,00
2018 Base year BasGoed 50km	24.2547,80	25.617.759	24.877
2018 Base year BasGoed 90km	1.34.892,70	18.433.129,22	13.951
2018 Base year BasGoed 130km	62.275,21	10.765.154,77	6.472

3.3 Impact on CO_2 emissions

Truck emission factors were taken from (ICCT, 2023). Typical current tractor-semitrailer combinations (class 5 long haul) have emissions of 55.9g CO_2/tkm (equivalent to a fuel consumption of 28.3 l diesel/100 vkm). As for the reduction per tkm that SECs can provide, we follow (TNO, 2021) and set this at -27%.

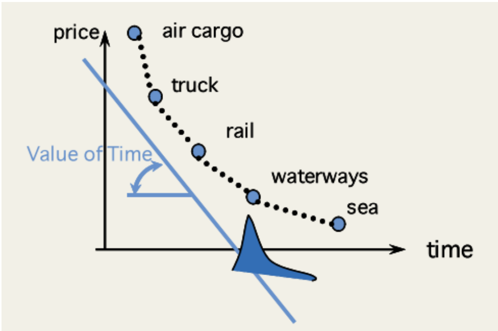
Based on the estimated market potential shown in Table 2, we calculate the CO_2 reduction potential as follows:

Minimum trip distance	SEC tkm potential 2030 (mio tkm)	SEC CO_2 reduction potential 2030 (ton)
50	1.764,3	26.627,9
90	1.311,4	19.793,6
130	729,0	11.003,0

This bottom up calculation gives us a number that can be compared to that of other measures, e.g. the reduction potential of the road infrastructure charge for heavy vehicles mentioned in Section 2.1, which is around 0.2 Mton; the SEC's reduction potential of 0.02 Mton is around 10% of that.

3.4 Other impacts of the SEC

- In addition to the reduction of CO_2, the SEC can provide similar reductions of 25-30% in the emissions of other pollutants (NOx, PM).
- When the fleet is fully electrified, the SEC still provides a benefit in the amount of energy consumed per tkm.
- Carrying more cargo in a single vehicle means fewer drivers are needed.
- Replacing two normal trucks by 1 SEC reduces the amount of space occupied on the road, thereby leaving more capacity for other vehicles and reducing congestion.
- The SEC is not expected to have a major impact on modal shift. Goods transported by road generally have different customer requirements than goods transported by rail or ship; to a large degree, they are separate markets, as illustrated by e.g. (Tavasszy & Van Meijeren, 2011):



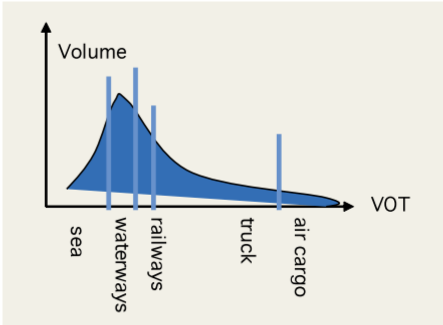


Figure 1: market segmentation based on volume, price and time value

Literature review of 6 studies by (McKinnon & Piecyk, 2020) finds that for countries that have implemented larger and/or heavier vehicles (Netherlands, Sweden, Germany, UK) have not experienced modal shift in practice.

4. Overview of CO_2 reduction measures in the transport sector and their potential

The main instrument to mitigate carbon emissions from road freight transport exists: electrified transport. Whether through battery electric vehicles, green hydrogen or electric road systems, the transition to zero emission trucks is on the way. However, this transition will be slow and significant carbon reductions will not be realized until 2035-2040. In the meantime, it still makes sense to consider other measures that will improve the efficiency of road transport: they reduce emissions now, and lower energy needs for an electrified fleet.

It was already mentioned that the road infrastructure charge for heavy vehicles could deliver a reduction of around 0.2 Mton annually, by incentivizing more efficient loading. The aforementioned study by (Panteia, 2024) not only considered the SEC, but other measures to improve efficiency in the logistics sector, such as promoting collaboration in the logistics chain, or better measurement of CO_2 performance. The reduction potential of these measures is of the same order of magnitude as the SEC: between 0.01 and 0.05 Mton per year.

It is worth noting that vehicle efficiency and electrification are mostly the result of policy at the European level; the Dutch government can implement acceleration measures but is not in the driver seat. For measures promoting logistics efficiency, national policy is the main driving force, and results not just in reduced emissions, but also in reduced costs and a more competitive economy.

It is clear that meeting the 2030 CO_2 reduction targets will be challenging. Transport is one of sectors that is proving the hardest to decarbonize, and the Dutch government should consider all measures that can contribute.

5. Further discussion

This paper touches on two important strategic considerations in the field of freight transport policy.

The first aspect is the balance between transport modes in light of decarbonization efforts. Modal shift from road to rail and ship has been one of the primary objectives of European transport policy since the earlier 2000's, to reduce emissions of the transport system in light of ever-growing demand, while maximizing the potential of the infrastructure that is available. However, a recent report by the (European Court of Auditors, 2023) suggests that European modal shift policy has been largely ineffective, mainly due to the poor design of support measures that do not target the correct objectives. Many countries have implemented measures that provide financial support to operators to move goods by train or ship instead of road. However, these measures are based on the assumption that price is the main driver of modal decisions, whereas many other factors are into play (as also mentioned in section 3.4), and sustainable modal shift through pricing policy can only be realized when a level playing field between transport modes is achieved – by addressing infrastructure needs, information flows, and discrepancies in the legal framework.
Furthermore, the transition to electrified transport is shifting the balance between modes. With environmental and climate concerns de facto removed from the equation, the external costs of different transport modes are much closer together than with fossil fuel powered trucks. Rail and inland waterways still come out favourably from a comparison of external costs (even while the transition to sustainable propulsion methods is going much slower in water transport than in road transport), mainly due to the greater congestion on roads, though rail infrastructure is also approaching its maximum capacity in some regions, and inland waterways are suffering from water level variations that periodically restrict navigation, due to climate change. Maximising efficiency in every transport mode is a way to optimize the capacity of the infrastructure, and from that perspective, measures like the SEC can bring benefits at the strategic level, beyond business economics.

The second consideration was already mentioned in section 2.2: the past half decade has shown that many aspects of society that were considered self-evident for a long time, are very much in question.
Climate change is bringing changes in seasonal weather patterns that lead to extended periods of reduced transport availability, impacting the lives of people in the affected areas and

beyond. Droughts, extensive rainfall, or heat waves lead to blocked roads, faster infrastructure degradation, inaccessible waterways, forest fires, or worse.
The COVID19 crisis demonstrated the critical importance of efficient transport and showed the vulnerability of economies relying on goods transported over long distances.
Finally, the Russian war of aggression against Ukraine revealed the consequences of Europe's energy dependence on volatile foreign regimes.
For the transport sector, the main conclusion needs to be that more emphasis should be put on robustness, redundancy and independence. This will inevitably lead to higher system costs, which can only be alleviated by an even greater push for more efficiency in the entire logistics chain, and in society as a whole by extension.

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