Ministry of Transport

Government Offices of Sweden
Ministry of Rural Affairs and Infrastructure

Danish-Swedish Technical Analysis on long and heavy road transport

May 2025

DANISH-SWEDISH TECHNICAL ANALYSIS ON LONG AND HEAVY ROAD TRANSPORT

DATE
May 2025

ISBN (digital version)
978-87-7595-165-9

Summary

To promote cross-border transport with heavy road vehicle combinations longer than 25.25 meters (referred to as EMS2 [1]) the Swedish Minister for Infrastructure and Housing and the Danish Minister for Transport has initiated an assessment of the issue.

In Denmark, only the A-double EMS2 vehicle combination is allowed. The maximum length allowed is 32 meters. If the semitruck is equipped with an aerodynamic (and elongated) cab and/or is zero emission, the EMS2 vehicle is allowed to have a maximum length of 34 meters. In Sweden, five different EMS2-combinations are allowed. The A-double and the AB-double combinations have been allowed on the appointed road network since 1 December 2023 and three additional combinations with a length of approximately 27-28 meters were allowed as of 15 April 2025. The maximum length of the combinations in Sweden is 34.5 meters, which is the same as in Finland. Even though the maximum allowed length is 34.5 meter, the A-double combination in Sweden is normally around 32.5 meters.

To harmonize the maximum allowed length of the A-double, the maximum allowed length in Denmark could be increased to 32.5 meters. As the road network allowed for EMS2 is capable of handling climate-friendly A-doubles with a maximum length of 34 meters, it would not require investments to be made in the road network.

If the AB-double is allowed in Denmark in the future, there could be a need to harmonize the maximum length allowed for these combinations to 34.5 meters, enabling Swedish AB-doubles to cross the Danish-Swedish border. If the Swedish requirements for the AB-double are introduced in Denmark, it will have only minor effects on the road design, e.g. the length of turning lanes.

There are different technical requirements for A-double combinations in Sweden and in Denmark. For example, in Sweden the last axle in the first semitrailer must be steerable up to 30 km/h to reduce the area demand when turning. Additionally, the first axle on the first semitrailer must be liftable to enable better traction. In Denmark, there are no such requirements on the semitrailers. Instead, the road network allowed for the EMS2-combinations is adjusted for the extra swept area needed.

Given that the Danish A-double combinations do not have a steerable last axle in the first semitrailer they can only manage large roads, such as motorways, but not the arterial road network, which have much narrower roads and crossings. Also, given that the A-double does not have to meet the same demands for traction as in Sweden, any steep incline, 4.4 per cent or above, is troublesome for the Danish A-double combinations, especially during slippery roads conditions.

The Swedish requirement concerning front placement of signs on EMS2-combinations has been removed as of 15 April 2025. However, there are still differences in the required illustrations and text on the rear end signs. It is proposed to work on harmonizing these requirements for the Nordic countries.

In conclusion, the most feasible way to promote cross-border traffic with EMS2 between Denmark and Sweden would be to:

[1] EMS2 is an abbreviation for European Modular System with a total length of more than 25.25 meters.

- Increase the maximum allowed length to 32.5 meters for the A-double combination in Denmark.
- Allow the AB-double in Denmark with technical requirements that facilitates high maneuverability, such as placement of couplings and steerable axles.
- Further harmonize and simplify rules of the signs and to mutually recognize the signs in the two countries.
- Continued dialogue between the national transport authorities when allowing new vehicle combinations.
- Increase the road network for EMS2 in both countries.

Introduction

In February 2024, the Swedish Minister for Infrastructure and Housing and the Danish Minister for Transport initiated a working group to assess the possibilities of cross-border transport using heavy road vehicle combinations longer than 25.25 meters (referred to as EMS2) between Denmark and Sweden. The aim of the initiative was to promote high capacity cross-border freight transport.

In May 2024, the outline of the tasks of the working group was decided upon. The working group was tasked with the following:

1. *Assessment of length requirements*
   Assess whether the maximum length requirements for EMS2 can be harmonized towards the maximum permitted length in Sweden.
2. *Assessment of road infrastructure and technical requirements*
   Assess the possibility and consequences of a differentiated EMS2 road network with different technical requirements and a differentiated road network at different times of the year.
3. *Assessment of technical substitutions*
   Assess whether in the existing technical requirements in Denmark and Sweden, respectively, there are possible technical substitutions, e.g. if certain stability requirements in Denmark could substitute other stability requirements in Sweden and vice versa.


MAN-SØN 00-24
STANDSNING OG PARKERING FORBUDT
#6256
Standsning og parkering forbudt i omkoblingsbanen
Tilladt for EMS2 vogntog at foretage omkobling i omkoblingsbanen
Parkering af EMS2 trailere henvises til skråparkering eller betalings p-pladser
EMS2

General framework

There are several types of combinations of EMS2, but the main assessment in this work is regarding the A-double combination. Also, the AB-double combination is mentioned as a future possible combination in Denmark and as a comparison against the A-double combination, cf. Figure 1.

Current trial regulation in Denmark

In Denmark, a five-year trial of an EMS2-combination on a designated approximately 400 km road network started on 1 January 2024, see Annex 1, Figure A. The trial will end on 31 December 2028. Before the end of the trial an evaluation will be made to prepare a decision on continuing the trial or issuing a permanent permission. During this trial the A-double combination with standard semitrailers, without any requirements of e.g. steerable axles, is allowed.

Current regulation in Sweden

In Sweden, the A-double and the AB-double as well as, since April 2025, three other EMS2-combinations are allowed.

The A-double combination in Sweden, as opposed to Denmark, needs to comply with some technical requirements. For instance, requirements of steerable and liftable axles on the first semitrailer. Thus, the Swedish EMS2-combinations can use the appointed road network, which constitutes about 6,000 kilometers, see Annex 1, Figure B, without any extensions or widenings to the roads or intersections, although the road authority must allow the use of EMS2 on its roads. The technical requirements are described in more detail below.

Swedish configuration AB-double. Copyright: Volvo Trucks AB.

	Type	Denmark	Sweden
	**A-double**		
	Permission	2024-2028 (5-year trial)	From 1. December 2023
	Length		
	Proportions	33.43 m	32.5 m
	Allowance	32-34 m	34.5 m
	**AB-double**		
	Permission	No	From 1. December 2023
	Length		
	Proportions	34.5 m	34.11 m
	Allowance	-	34.5 m

Figure 1. Specifications for the A-double and the AB-double.

Assessment

Task no. 1 – Length requirements

During the preparation of the five-year trial in Denmark, it was found that, based upon standard vehicle modules used in EMS1 (up to 25.25 meters), the A-double has a length of approximately 31.5 meters, and the AB-double has a length of approximately 33.7 meters. Based on this, in Denmark the maximum length allowed for the EMS2 A-double is 32 meters. However, to incentive a green transition of transport, the A-double is allowed to have a maximum length of 34 meters if the tractor is equipped with an aerodynamic (and elongated) cab and/or is zero emission to carry e.g. large batteries on the chassis.

The dimensioning of the roads in Denmark allowing EMS2 is based upon a vehicle with a total length of 33.43 meters. To ensure that the roads are wide enough, especially when turning, to allow for EMS2, there are some extra requirements for the road design including extra space between the vehicles driving path and road-markings.

In Sweden, the A-double is assumed to have a length of approximately 32.5 meters, and the AB-double has a length of approximately 34.1 meters. However, Sweden has a large number of heavy vehicles crossing the Swedish-Finnish border and in order to aim for a harmonization regarding vehicle combination length the maximum length in Sweden was set to 34.5 meters, which is equal to the maximum length in Finland. This also allows for trucks equipped with an aerodynamic (and elongated) cab and there is space for batteries on the truck's chassis.

To promote cross-border traffic with A-double combinations the maximum allowed length in Denmark should be increased to 32.5 meters. For trucks equipped with an aerodynamic (and elongated) cab and/or is zero emission the maximum allowed length is kept at 34 meters. As the road network allowed for EMS2 is capable of handling climate-friendly A-doubles with a length of 34 meters, it would not result in investments to be made in the Danish road network. This would remove a barrier for Swedish A-doubles crossing the Danish-Swedish border.

The AB-double is currently not allowed in Denmark. If the AB-double will be allowed in Denmark in the future, there would be a need to harmonize the maximum length allowed for this combination as well as to enable cross-border traffic with AB-double combinations. Currently the Danish road network allows for EMS2 (A-double) with a maximum length of 34 meters while the Swedish AB-double is 34.1 meters. An increase of the maximum length to 34.5 meters will affect the road dimensions in Denmark.

Different scenarios for harmonizing the lengths of A-double and AB-double combinations in Denmark and Sweden are listed in Table 1.

Based on the assessment of Danish requirements, an AB-double with no additional technical requirements, needs more space when turning compared to a standard A-double. To facilitate the use of AB-double combinations in Denmark there is a need of either redesigning parts of the road network or setting up technical requirements for the AB-double combination. The latter would also enable cross-border traffic with AB-doubles between Sweden and Denmark.

Conclusion

The working group finds that alternative no. 2 in Table 1 is the best and simplest solution and should be followed by no. 3 to allow for AB-doubles. Alternative 2 will allow the Swedish A-double to go to Denmark and will not impact the design of the designated road network.

	A-double DK*	A-double S	AB-double DK	AB-double S	Consequences
					The current conditions
1	32.0 (31.5)	34.5 (32.5)	- (33.7)	34.5 (34.1)	A regular Swedish A-double is not allowed in Denmark. AB-double is not allowed in Denmark.
2	32.5 (31.5)	34.5 (32.5)	- (33.7)	34.5 (34.1)	A regular Swedish A-double is allowed in Denmark. It requires a change in the Danish regulation. AB-double is not allowed in Denmark. Does not affect road design in Denmark.
3	32.5 (31.5)	34.5 (32.5)	34.5 (33.7)	34.5 (34.1)	A regular Swedish A-double is allowed in Denmark. It requires a change in the Danish regulation. The AB-double is allowed in Denmark. It requires a change in the Danish regulation. If the Swedish requirements for AB-double are introduced in Denmark, only minor effects on road design, e.g. length of turning lanes.
4	34.5 (31.5)	34.5 (32.5)	34.5 (33.7)	34.5 (34.1)	Swedish and Finnish A-double vehicles are allowed in Denmark. It requires a change in the Danish regulation to allow a longer A-double and the AB-double. Road design affected, including larger area requirements.

Table 1. Different scenarios for harmonization of maximum lengths allowed, in meters. In brackets are the maximum standard length.

*) The maximum length allowed in Denmark for an A-double using an aerodynamic cab and/or a zero-emission truck is 34 meters.

Task no. 2 – Road infrastructure and technical requirements

There are different technical requirements for A-double combinations in Sweden and in Denmark.

Maneuverability
In Sweden, the maneuverability requirement states that the last axle in the first semitrailer in the combination must be steerable up to 30 km/h. This allows the combination to be able to make a 180-degree turn between an outer circle with 12.5 meter diameter and an inner circle with 2.0 meter diameter, which corresponds to the Swedish turning circle requirement for 25.25 meter combinations (EMS1).

In Denmark, the A-double combination is exempted from Danish national rules on weight and dimensions and therefore does not have to fulfil the requirement that the combination must be able to turn within a defined turning circle. Instead, the required area demand on the designated EMS2 road network is based on an A-double combination with standard dimensions with a total length of 33.43 meters.

It has been assessed whether it is possible for a Danish A-double to operate parts of the appointed EMS2 road network in Sweden with regards to the maneuverability of the combination.

The Swedish rules assure that the vehicle combination will be able to handle the designated road network concerning maneuverability requirements. This is not the case for the Danish A-double combination and consequently it cannot use the Swedish EMS2 road network.

The differences in area demand between the Swedish and Danish A-double combinations for 180 degrees turning when driving at 15 km/h in a circle with an outer radius of 12.5 meters is shown in Table 2.

Feasibility
To assess the feasibility on differentiating the Swedish EMS2 road network regarding turning requirements, a specific route has been selected: From the Öresund fixed link to Gothenburg. According to the analysis carried out, the motorways between Malmö and Gothenburg and between Helsingborg and Stockholm can generally manage the Danish EMS2 turning radius but the road network connecting the motorways to the final destinations cannot.

	Length	Build	Outer radius	Inner radius	Overhang
Danish	33.43 m	Reference vehicle	12.5 m	0.498 m	0.714 m
Swedish	32.5 m	Standard combination	12.5 m	2.519 m	0.656 m

Table 2. Area required for 180 degrees turning for an A-double.

For the Danish EMS2 to reach e.g. industrial areas, approximately eight transhipment locations would be needed. The estimated number is based on how many transhipment locations there has been scheduled in Denmark, and with considerations to which locations are interesting for business to reach with the goods.

The cost of establishing eight transhipment locations has been roughly estimated to at least SEK 500 million, equivalent to DKK 333 million, including the specific locations and adjustments of roundabouts/crossings leading to and from the locations.

Plans and costs for these transhipment locations are not included in the current Swedish infrastructure plan. If prioritized, the establishment of these would take several years.

Startability and hill climbing

In Sweden, there are the following requirements concerning startability and gradeability (i.e. ability to start and drive up a steep incline). As it is not always possible for the driver to load any vehicle combinations perfectly to maximize the drive axle loads, technical requirements are set for the truck as well as for the first semitrailer in the A-double combination. For the truck, the requirement is at least 3 axles, and if the gross weight of the combination is more than 64 tonnes, the truck needs to have two drive axles.

For the first semitrailer, the distance between the kingpin coupling and the first axle must be at least 7.0 meters for a three-axle trailer, and 7.7 meters for a two-axle semitrailer. This axle placement requirement increases the combination's ability to handle steep uphill roads, especially during winter conditions. Even in the cases where the driver has no or low possibility to shift the loads on the semitrailers.

In Denmark, in general, it must be possible to bring 20 per cent of the A-double combination's weight to rest on the driving wheels during start-up. However, the A-double combinations do not have to fulfil the requirement that 20 per cent of the weight of a combination must rest on the driving wheels during normal driving.

Feasibility

The Swedish transport authorities have deemed the maximum possible incline to be 4.4 per cent for the Danish A-double combination during bad road conditions, such as heavy rain, snow and slippery roads. A Danish A-double combination from the Öresund fixed link will be able to reach Görarp, south of the city of Helsingborg, before the incline gets too steep, cf. Figure 2. Traffic to Gothenburg, Jönköping and Stockholm goes via Helsingborg.

Any infrastructure incline of more than 4.4 per cent requires the road to be rebuilt or EMS2-combinations (if possible) to be redirected to facilitate a Danish A-double. As a reference, Hallandsåsen (E6 north of Ängelholm) has an incline of 6 per cent. This would require rebuilding the road at a cost roughly estimated to at least SEK 500 million, equivalent to DKK 333 million. The cost for mitigating environmental impact might increase the total costs of the rebuilding further.

Other Implications
The Swedish Transport Administration (Trafikverket) has appointed state roads for vehicle combinations up to 34.5 meters since these could manage intersections as vehicles up to 25.25 meters. This message has also been communicated widely, including to the municipalities that also have appointed municipal roads for vehicles up to 34.5 meters.

The Swedish Transport Administration sees a risk in appointing a differentiated road network for vehicles up to 34.5 meters that do not meet the current technical vehicle requirements, since it could lead to vehicles deliberately or accidentally to use roads and crossings that are not passable. This could cause the municipalities to become more reluctant about appointing municipal roads for vehicles up to 34.5 meters, which could lead to a decrease in the efficiency of heavy goods transport overall.

Conclusion

The working group finds the conditions for allowing current Danish A-double on certain Swedish main roads to be poor. On the stretch between Malmö and Gothenburg, investments in transhipment locations would be needed at an estimated cost of at least SEK 500 million, equivalent to DKK 333 million, in order to make sure that the vehicles could reach their final destinations along the route.

Furthermore, the Danish EMS2-vehicles can handle a maximum incline of 4.4 per cent regardless of the time of the year (during bad road conditions, such as heavy rain, snow and slippery roads).

There are inclines of more than 4.4 per cent on all assessed stretches done within this work; between Malmö and Helsingborg, between Helsingborg and Gothenburg, and between Helsingborg and Stockholm.

Figure 2. Motorway from Malmö to Görarp.

Task no. 3 – Technical substitutions

The regulation of the A-double combinations in Sweden is specified in the Swedish Transport Agency's (Transportstyrelsen) regulations on technical requirements for road trains with a length of more than 25.25 meters, TSFS 2025:17. The regulation of EMS2-vehicles in Denmark is specified in the Danish Road Traffic Authority's (Færdselsstyrelsen) executive order no. 1605, dated 12 December 2023, regarding technical requirements for EMS2 road trains. It has been assessed whether there are any technical solutions that can substitute the current technical demands described in the two national requirements on A-double combinations.

Background

The technical rules and demands are, as previously discussed, not the same in the two national regulations.

The Swedish regulation is based upon the existing road network with requirements to fulfill rules for maximum (12.5 meters) and minimum (2 meters) turning radius, whereas the Danish regulation is based upon using existing vehicles and defining a road network allowing an A-double combination up to 32 meters and 34 meters for zero emission vehicles.

Technical demands in general

Table 3 shows a selection of the main technical differences between the two sets of regulations. The main difference is that the Swedish rules include that the first axle on the first semitrailer must be liftable and be positioned at least 7.0 meters from the king-pin. In addition, the last axle on the first semitrailer must be steerable.

Area of regulation	Denmark	Sweden
General requirements		
Length	32.0 m 34.0 m (zero emission and/or aerodynamic cab)	34.5 m
Weight	60 t (minimum 19 m from first to last axle) 72 t (minimum 27 m from first to last axle)	64 t (on BK 1 roads) 74 t (on BK 4 roads)
Height	4.1 m	4.5 m (free height)
No. of axles on combination	Minimum 9 axles	Minimum 9 axles (in practice)
No. of axles on vehicles	Truck: Minimum 3 axles Dolly/semitrailers: Minimum 2 axles	Truck: Minimum 3 axles Dolly/semitrailers: Minimum 2 axles
Braking systems	ABS and EBS (electronic braking system), ECE-R13	ABS and EBS (electronic braking system), ECE-R13
Control systems	ESC (Electronic stability control systems), ECE-R13	ESC (Electronic stability control systems), ECE-R13
Signs (decribed in details below)	Min 90 x 45 cm (w x h). Placed on the left side on the rear of the last semitrailer 	Min 90 x 45 cm (w x h). Placed on the left side on the rear of the last semi-trailer (proposed adjustment to enter into force in 2025) 
Requirements on tractor		
No. of driving axles	-	Two drive axles (more than 64 t gross weight)
Weight distribution	20 per cent of the combination's gross weight on the drive axles during start up	-
Engine power	5.2 kW/t gross weight	Minimum 310 kW (over 64 t gross weight)
First semitrailer		
Steerable axles	-	Last axle must be steerable up to 30 km/h, but not over 40 km/h
Liftable axles	-	First axle must be liftable if it has at least 3 axles
Distance from kingpin to first axle	-	Min. 7.0 m, 3-axle semitrailer Min. 7.7 m, 2-axle semitrailer
Coupling distance	-	Max. 1.4 m from last axle to rear coupling
Second semitrailer		
Distance from kingpin to first axle	-	Min. 6.2 m

Table 3. Selection of technical differences in regulations on the A-double in Denmark and Sweden.
Note: In Denmark a dolly coupled between the first semitrailer and the last semitrailer is allowed to have steerable axles, but if fitted, the axles must be locked in speeds over 40 km/h.

Is it possible to align the signs for EMS2?
The requirements concerning signs on EMS2 are different in Denmark and Sweden. In Denmark, it is a requirement that a sign is placed at the back of the rear vehicle. No signs are required at the front or on the side of the vehicle.

In Sweden, previously, a sign has been required at the front and at the back of the vehicle. However, as a result of the working group's effort to increase harmonization, as of 15 April 2025 Sweden no longer requires a sign at the front of the vehicle.

Further possible harmonizations and simplifications of the rules of the sign could be beneficial and should be elaborated together with the Nordic countries and the rest of the EU.

Is it possible to combine/accept both sets of rules assuring accessibility at bad weather conditions and starting uphill?
The Swedish rules demanding the possibility to lift the first axle on the first semitrailer is intended to ensure sufficient weight on the drive axles of the truck during normal driving. The road tire friction is one of the main factors to be able to handle steep inclines, especially during bad weather. The placement of the first axle on the first semitrailer, as well as the ability to lift the axle, automatically shifts some of the load from the semitrailer upon the truck's drive axle(s), compared to a standard semitrailer. This increases the traction of the truck.

The Danish requirement of 20 per cent of the total weight on the drive axle is not deemed to be a

Swedish configuration A-double. Copyright: Volvo Trucks AB.

sufficient substitution to the Swedish requirements since it is limited to start-up and does not apply during normal driving. Furthermore, it should be taken into consideration that it is difficult to load a standard semitrailer so that you get 20 per cent weight on the drive axle. An even loaded Danish A-double with 50 tonnes gross weight will have about 17.5 per cent of the gross weight on the drive axle, which decreases with more load. In comparison, the Swedish A-double has about 21 per cent of the gross weight on the drive axles, which remains even if the A-double is fully loaded up to 74 tonnes or if it is empty.

Is it possible to use vehicle combinations with increased height in Denmark?

In Sweden the vehicle height is unregulated, however the infrastructure may have limitations on maximum feasible height. A common height for Swedish vehicles is about 4.5 meters. In Denmark, 4.1 meters in height is allowed for all vehicle combinations. Several bridges and tunnels on the TEN-T road network in Denmark have a limitation for the maximum height of vehicles at around 4.20-4.30 meters. Therefore, it is not deemed feasible to increase the Danish height limitations.

Conclusion

There were no findings of technical solutions on the Danish A-double that could substitute the current Swedish technical requirements in regard to placement of axles or the requirement of liftable and steerable axles. However, harmonization relating to the requirement of vehicle signage has been made and it is proposed that work be done towards Nordic harmonization of the signs. A first step being mutual acceptance of the signs used in Denmark and Sweden, with further elaboration on the matter of simplification to be continued.

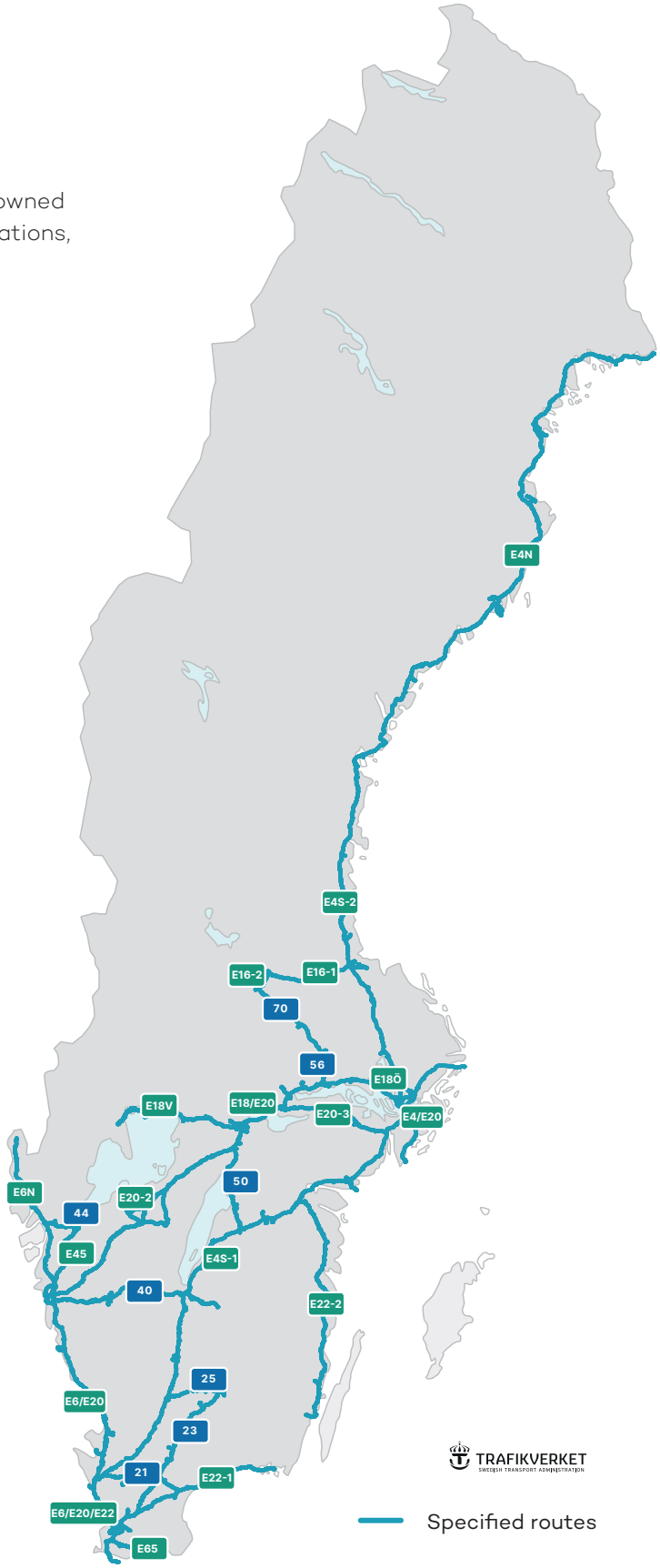
Annex 1

Figure A

Road net of the Danish trial, including two new decoupling areas expected to open in late 2025, marked with red. The existing decoupling areas are marked with an orange dot and rest areas are marked with a green dot.

Figure B

The permanent Swedish network of state-owned roads designated for EMS2 vehicle combinations, up to 34.5 meters.



Ministry of Transport
Frederiksholms Kanal 27 F
1220 Copenhagen K
Denmark

Government Offices of Sweden
Ministry of Rural Affairs and Infrastructure
Herkulesgatan 17
SE 103 33 Stockholm
Sweden