VESTLANDSBANEN FEASIBILITY STUDY - DELIVERY 1

Deliverable 2.2:
Current Demand for Freight Transport

Rev 08

NOVEMBER 2024

CHANGES RECORD				
Rev	Date	Author	Affected section	Changes
REV02	01/14/2024	D.C.G	All	First Issue
REV03	06/03/2024	D.C.G	All	Counting Points and Adjustment Process
REV03	16/04/2024	D.C.G	All	Comparisons of Traffic Counts, SSB and NGM.
REV04	07/05/2024	D.C.G	All	Comments discussed with Norks Bane
REV05	18/07/2024	D.C.G	All	Comments sent day 01/07/2024
REV06	23/09/2024	D.C.G	All	Comments received from Norsk Bane
REV07	18/11/2024	D.C.G	All	New version
REV08	22/11/2024	D.C.G	All	Comments received from Norsk Bane on new version

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1 INTRODUCTION

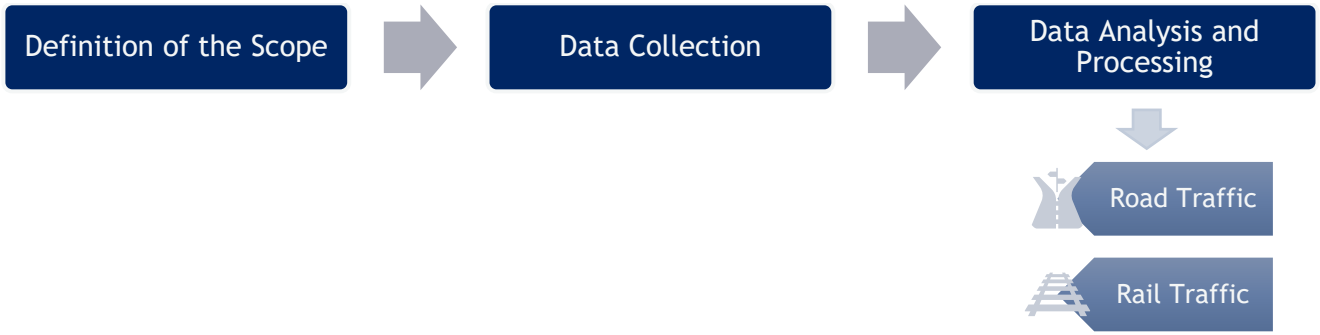
In an increasingly interconnected global economy, understanding and effectively managing freight demands is key for sustainable development and efficient transport systems. This Current Freight Demand study aims to comprehend the trends and patterns of the Norwegian transport market of freights and provide a solid base for a forecast of the future scenarios. Also, the purpose of the study is to understand how the new Vestlandsbanen corridor will impact to the freight transport market in Norway.

In freight transport, unlike passenger transport, decisions are made by very few actors. When analysing passenger movements patterns, it is possible to predict, depending on the time, costs, frequency or comfort what mode of transport is more attractive, due to the large number of actors deciding. However, freight actors are only a few (operators and logistics companies) and their decision can change or contradict any pattern.

Therefore, it is crucial to engage with these key stakeholders to comprehend their business operations, perspectives on the project, and readiness for change. SENER has reached out to major Norwegian freight transport companies; however, only Grenland Rail and ASKO have responded.

Also, challenging the current available data against other sources and studies is determinant for ensuring the best possible accuracy.

The methodology SENER used to estimate the current Freight Transport demand in Norway is described in the following steps:



2 DEFINITION OF THE SCOPE

The scope of the study includes the following:

1. **Area:** The analysis comprises freight transport from and to the whole country, Sweden and other European countries.
2. **Zoning:** This zoning system is named **Micro-regions** and represents a pragmatic balance between the aspiration for detailed data resolution and the challenge posed by the scarcity of such high-resolution data, which in turn leads to constraints in delivery. This is a practical approach used to achieve a better disaggregation of the corridors. The zones comprise 55 Zones in Norway, 21 zones in Sweden and one zone for each other European country.

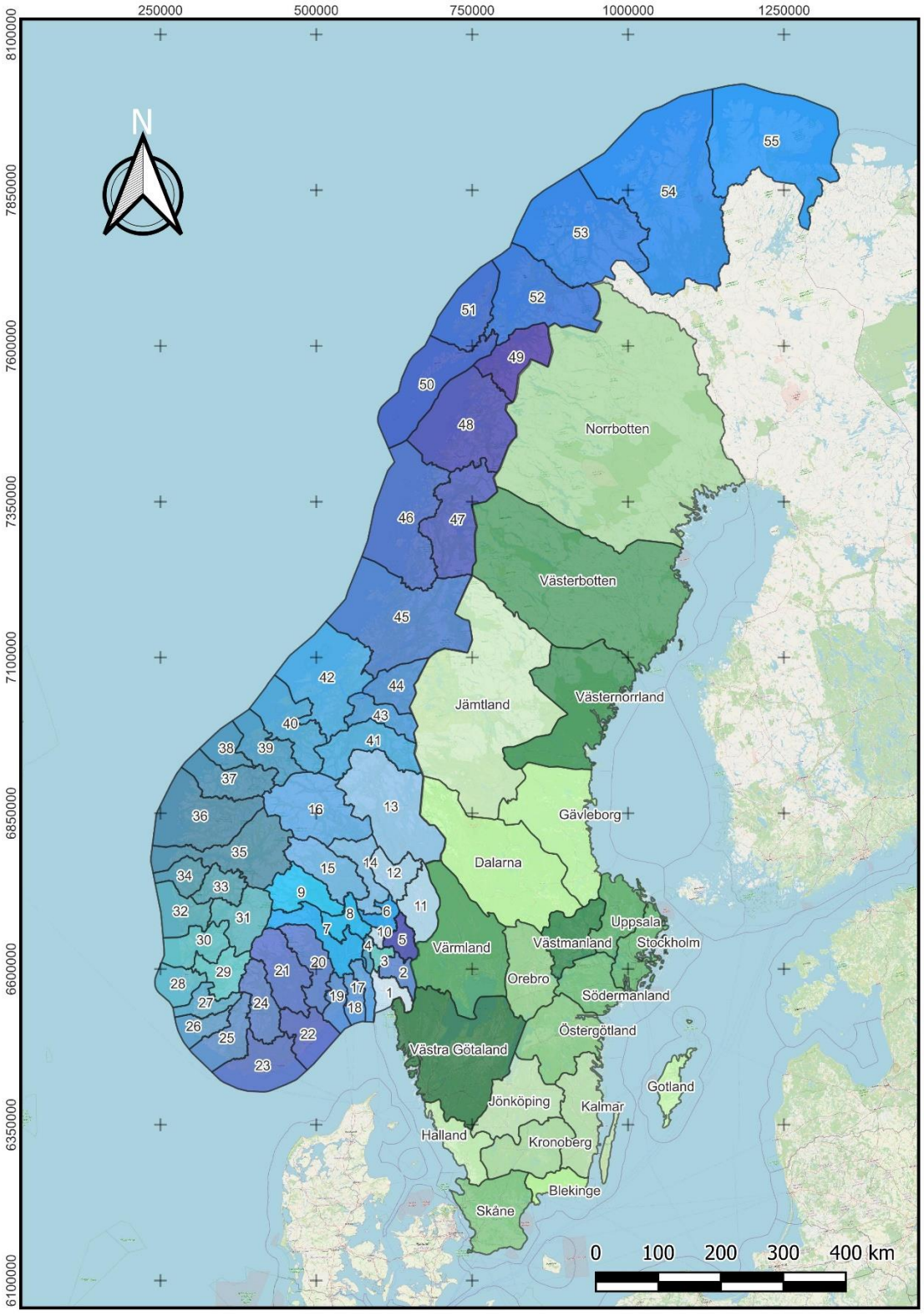


Figure 1: Zoning - Norway and Sweden. Source: Own

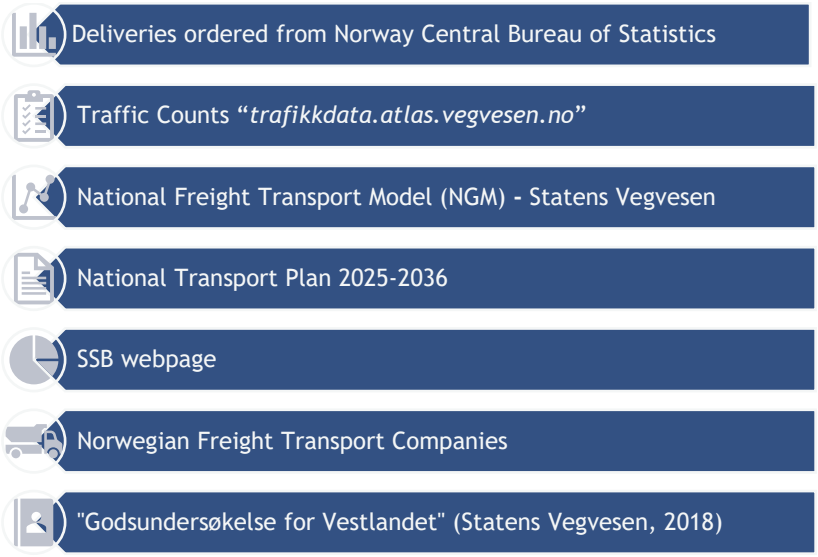
The following list shows the names of the zones of the map above:

Zone 1 - Østfold ytre
Zone 2 - Østfold indre
Zone 3 - Akershus sør
Zone 4 - Akershus vest
Zone 5 - Akershus aust
Zone 6 - Akershus nord
Zone 7 - Buskerud vest
Zone 8 - Buskerud aust
Zone 9 - Buskerud nord
Zone 10 - Oslo
Zone 11 - Hedmark sør
Zone 12 - Hedmark midt
Zone 13 - Hedmark nord
Zone 14 - Oppland sør
Zone 15 - Oppland vest
Zone 16 - Oppland nord
Zone 17 - Vestfold nord
Zone 18 - Vestfold sør
Zone 19 - Telemark sør
Zone 20 - Telemark aust
Zone 21 - Telemark vest
Zone 22 - Agder aust
Zone 23 - Agder sør
Zone 24 - Agder nord
Zone 25 - Dalane Agder
Zone 26 - Jæren sør
Zone 27 - Jæren nord
Zone 28 - Haugalandet

Zone 29 - Ryfylke
Zone 30 - Sunnhordland
Zone 31 - Hardanger
Zone 32 - Bergensområdet
Zone 33 - Hordaland aust
Zone 34 - Nordhordland
Zone 35 - Sogn
Zone 36 - Sunnfjord og Nordfjord
Zone 37 - Søre Sunnmøre
Zone 38 - Ålesundsområdet
Zone 39 - Romsdal
Zone 40 - Nordmøre
Zone 41 - Trøndelag sør
Zone 42 - Trøndelag vest
Zone 43 - Trondheimsområdet
Zone 44 - Inntrøndelag
Zone 45 - Trøndelag nord
Zone 46 - Helgeland ytre
Zone 47 - Helgeland indre
Zone 48 - Salten
Zone 49 - Ofoten
Zone 50 - Lofoten
Zone 51 - Vesterålen
Zone 52 - Troms sør
Zone 53 - Troms nord
Zone 54 - Finnmark vest
Zone 55 - Finnmark aust

3 DATA COLLECTION

The data used for estimating the Freight transport demand of Norway has been collected from different sources:



1. On the 22nd of September 2023, the Central Bureau of Statistics kindly provided the **transport demand by lorries** for the years 2020, 2021 and 2022 together. The data is collected by surveys; therefore, it may have a margin error.

   This information includes the following specification:

   a. Volume, Transport Work, Vehicle-kilometres and number of registrations in the surveys, regarding both national and international transport and for Norwegian and Foreign owned trucks.
   b. Area of study: the information provided was delivered according to the Zoning I which is described above as Micro-regions. However, the data on transport with foreign owned trucks is not specified for the different zones in Norway, just for the whole country.
   c. Type of Freights, disaggregated in 5 commodity groups:
      i. Agricultural, forestry and fishing products
      ii. Food and beverages not included in (i)
      iii. Coal, coke, oil, and chemical products (including fertilizers)
      iv. Ores, stone, gravel, sand, clay, salt, cement, lime, and other mineral building materials
      v. Other processed goods and general cargo.

2. On the 27th of November 2023, the Bureau of Statistics kindly supplied the **Second Delivery** of Origin-Destination (OD) data for the **road transport demand**. This delivery was necessary and helped to solve some limitations of the First Delivery when referring to data with a low number of registrations in the surveys. This information included the following specifications:

   a. Area: 55 zones in Norway, the whole of Sweden as one zone and all other of European countries as one zone.
   b. The Origin-Destinations pairs consist of:
      i. From 55 Zones in Norway to the whole country
      ii. From the whole of Norway to 55 Zones in Norway
      iii. From the 55 Zones in Norway to the whole of Sweden
      iv. From the whole of Sweden to 55 Zones in Norway

v. From 55 Zones in Norway to the Rest of Europe
vi. From the Rest of Europe to 55 Zones in Norway

c. The data is not disaggregated into commodity groups

3. **Traffic Count data:** The available source of Traffic Counts is "*trafikkdata.atlas.vegvesen.no*". In chapter 4.1.1 these traffic counts will be compared with data from other sources. The comparison is limited to transports between Western and Eastern Norway, since these transports are mainly long-distance transports and most important for the purpose of this study.
    a. Traffic Count points: There are six roads that the traffic between Western and Eastern Norway is most likely to use. The selected count points on these roads are:
        i. E39 Teistedalstunnelen
        ii. E134 Vågslidtunnelen
        iii. Rv7 Lappestein
        iv. Fv50 Geiteryggtunnelen
        v. Rv52 Bjøberg
        vi. E16 Filefjelltunnelen
    b. Data selected: For the purpose of comparing with the First and Second Delivery, counts for Årsdøgntrafikk 2022 were downloaded.
    c. Lorry categories: Lorries from 12,5 m to 24 m and more, were taken into account for the analysis.
    d. Area of influence: The following image displays the Norwegian zones of Origins and Destinations that have been used for a comparison with data from other sources.
    e. Limitations: The counts for the E134 Vågslidtunnelen were not available for the year 2022. Therefore, the average of 2021 and 2023 has been used.

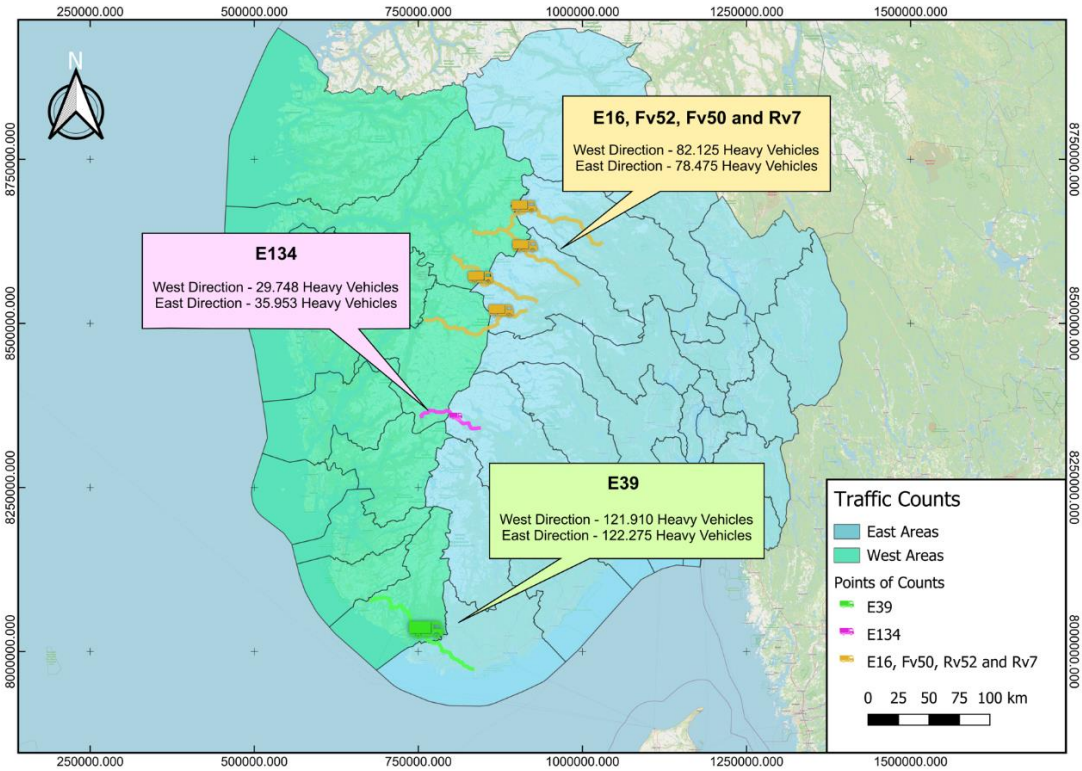


Figure 2: Annual number of heavy vehicles at some selected traffic count points. Source: Own.

4. **National Freight Transport Model (NGM):** The matrices from the Freight Transport Model have been kindly provided by Statens Vegvesen. the Norwegian Public Road Administration, responsible for national and county public roads in Norway. The data is valid for 2019 and includes the following specification:
    a. Volume, Transport work, and distance, regarding both national and international transports by Norwegian and Foreign owned trucks, railways and airplanes.
    b. Area of study: the matrices are based on a very detailed zoning, comprising several thousands of zones in the whole area of Norway, Sweden, and the rest of Europe.
    c. Type of Freights, disaggregated in 7 commodity groups:
        i. Dry Bulk
        ii. Liquid Bulk
        iii. Other Refrigerated or frozen goods
        iv. Industrial goods
        v. Piece goods
        vi. Fish
        vii. Timber
    d. Type of Transport Mode:
        i. Ferry and Ship (maritime transport)
        ii. Light Vehicles
        iii. Heavy Vehicles
        iv. Special long and heavy truck: 25,25m long and 60 tonnes.
        v. Diesel Train
        vi. Electric Train
        vii. Air transport
5. **National Transport Plan 2025-2036** “Challenges in Transport Corridors and Urban Areas”.[1] The document helped to compare and verify rail traffic data.
6. Information was also retrieved from the SSB webpage; more specifically, the Table 06988: goods loaded and unloaded in Norway,[2] Table 13299: Goods transport by rail, by region for loading and unloading (tonnes) 2020 – 2022[3], and several others, such as Table 06549, Table 08478, Table 08548, Table 11685, Table 11686 and Table 13321.
7. **Interviews** with Grenland Rail and ASKO. Contact with Grenland Rail was made at first, however, no further responses to specific data of interest were provided. A meeting with ASKO was arranged, and limited details about operability and market figures were provided. This information has been taken into account in the development of the Freight Transport Model.
8. **"Godsundersøkelse for Vestlandet"** (Statens Vegvesen, 2018).[4]

[1] https://www.regjeringen.no/contentassets/2426a22cfef14e16b1d3028442fc78df/utredningsoppdraget-leveranse-januar-2023/utfordringer-i-transportkorridorer-l2254364.pdf
[2] Table 06988: goods loaded and unloaded in Norway 2010 - 2022. SSB Norway. https://www.ssb.no/statbank/table/06988
[3] Table 13299: Goods transport by rail, by region for loading and unloading (tonnes) 2020 – 2022. SSB Norway. https://www.ssb.no/statbank/table/13299
[4] https://haugalandvekst.no/app/uploads/2020/07/Godstransport-på-Vestlandet-Rapport.pdf

4 DATA ANALYSIS AND PROCESSING

4.1 Road freight traffic in, to and from Norway

4.1.1 Main figures

The volume of lorry traffic in, from and to Norway is considerable, especially on longer distances, where the potential for shifting freight transport from road to modern railways is greater than on shorter distances. As the table below shows, in 2023, the share of truck transport on at least 300 km long distances was no less than 11.3 billion tonne-km (tkm) or 46% of the total truck transport work of 24.4 billion tkm in, to and from Norway. If transport on distances of 150-299 kilometres are also included, the proportion increases to 67%. These figures only apply to transport by Norwegian owned lorries.

Norwegian lorry transport in, to and from Norway in 2023	Volumes (mill. t)	Average distance	Transport work (mill. tkm)	Share of tkm
Transport distance 0-149 km	219.5	37 km	8,020	33 %
Transport distance 150-299 km	25.1	202 km	5,076	21 %
Transport distance 300 km or more	21.8	520 km	11,332	46 %
All transport distances	**266.4**	**92 km**	**24,429**	**100 %**

Table 1: Lorry transport in, to and from Norway in 2023, Norwegian owned lorries.
Source: SSB Table 13321.[5]

However, there is also substantial traffic with foreign owned lorries. Data on transport work in various distance classes is not available, but the average transport distances in the table below suggest that transport by foreign owned lorries is almost exclusively transport over distances of at least 300 km. This results in a transport work of 19.3 billion tonne-kilometres in this distance class (300 km or more, Norwegian and foreign owned lorries together) and a share of 60 % of total lorry transport in, to and from Norway (at 32,3 billion tkm incl. foreign owned lorries). Sales in this long-distance market segment can be roughly estimated at 30 billion NOK annually.

Foreign lorry transport in, to and from Norway in 2023	Volumes (mill. t)	Average distance	Transport work (mill. tkm)
Domestic transport (cabotage)	1.2	437 km	527
Cross-border transport	8.9	828 km	7,393
All transport by foreign owned trucks	**10.1**	**781 km**	**7,920**

Table 2: Truck transport in, to and from Norway in 2023, foreign owned lorries.
Source: SSB Table 06803.[6]

4.1.2 SSB-data on Norwegian owned lorries

The First Delivery of SSB-data comprises figures for transport between 55 Norwegian Micro-regions, 21 Swedish counties and 15 other European countries. For the total transport volumes in 2020, 2021 and 2022 together, 776 million tonnes are given, and for the total transport work 68.4 billion tkm. Of this, domestic transport accounts for 762 million tonnes and 61.9 billion tkm in these three years together. These figures are consistent with data from other sources.

However, the SSB-delivery has some limitations because data is hidden when the number of registrations in the survey is less than 3 (Norwegian owned trucks) or 10 (foreign owned trucks).

This is represented by an ":" symbol in the database, and consequently the total amount of tonnes and tonne-km (including the hidden data) does not equal the sum of all OD pairs (which do not include the hidden data) of tonnes

[5] Table 13321: Road goods transport by Norwegian lorries, by distance class and commodity 2008 – 2023, SSB Norway. https://www.ssb.no/statbank/table/13321.
[6] Table 06803: Road goods transport by foreign lorries in Norway, by nationality of lorry and type of transport 2000 – 2023, SSB Norway, https://www.ssb.no/statbank/table/06803.

and tonne-km. The difference between these two sums represents the hidden data, 18.8 million tonnes and 8.46 billion tonne-km (when transport between foreign countries is not taken into account), corresponding to an average transport distance of 450 kilometres for domestic transport and transport to/from Sweden and other European countries together. This is important since these figures confirm the expectation that a high percentage of hidden data relates to longer distances (average 450 kilometres) and the potential capture for the Vestlandsbanen railway corridor.

The First Delivery of SSB-data is based on a survey with almost 79,000 registrations. This number does not include truck movements without load and transport with foreign owned trucks. However, the high number of registrations should not obscure the fact that there is either no data for many OD-pairs or that this data is rather random and therefore has limited representativity.

The following table shows some key figures for the data provided. The first row displays the number of possible combinations of origin Micro-region, destination Micro-region and the five cargo type groups for both the entire data set (but without transport between foreign countries) and for domestic transport only. The latter results, for example, in 55 x 55 x 5 = 15,125 combinations.

It is clear that the data provided only covers a small proportion of these possible combinations, 10% or 21% respectively, despite the high number of registrations in the survey. The table also shows that the hidden data makes up a considerable part of the data set.

Combinations of OD-pairs and cargo groups	All transport	%	Domestic transp.	%
All possible combinations of OD-pairs and cargo groups	34,925	100%	15,125	100%
Combinations where no data was recorded	28,389	81%	9,527	63%
Combinations where data is hidden	3,147	9%	2,446	16%
Combinations where data is provided	3,389	10%	3,152	21%

Table 3: Combinations of OD-pairs and cargo groups. Source: SSB First Delivery.

The Second Delivery, as mentioned above, comprehends less detail in terms of OD-pairs. However, it contains for instance the number of tonnes and tonne-km specified for all transport between Sweden and each Micro-region in Norway, including hidden data.

These figures show, for example, that 70% of all transport volumes between Sweden and Norway have their origin or destination in Eastern Norway, while the transport volumes from and to Rogaland and Vestland counties only account for 12%. Looking at the transport work, the shares are 54% and 17% respectively.

However, it should be noted that this only applies to transport with Norwegian owned lorries. If transport with foreign owned lorries is also taken into account, the shares change significantly, see chapter 4.1.3.

The size of hidden data

Compared to the First Delivery, the Second Delivery provides a relatively large amount of data that applies to transport volumes and transport work including hidden data. This raises the question of whether this additional information could be used to estimate the size of the hidden data. It would be conceivable, for example, that there could be a certain correlation between the size of a standard lorry load and the transport volumes per registration, and that this correlation could be used to estimate the size of the hidden transport volumes by multiplying the number of registrations for hidden data by an average value of provided transport volumes per registration.

SENER has analysed this and found that this is unfortunately not possible. The transport volumes per registration vary greatly. The relationship between the lowest and the highest value is often more than 1:10, and sometimes even more than 1:100, Therefore, it makes little sense to calculate average values. The following factors in particular contribute to this:

1. There are many, randomly distributed registrations of partial lorry loads, i.e. where only a few tonnes of cargo are recorded as one registration and the transport volume per registration therefore only makes up a fraction of the transport volume per registration for a fully loaded lorry. This could possibly be compensated for by

taking the cargo weight into account, but would still represent an element of uncertainty, because the cargo weight of a fully loaded lorry depends on the (only roughly specified) type of cargo.

2. For transport on shorter distances and especially on highly frequented routes, there are many randomly distributed registrations where numerous trips with the same load on the same route are only recorded as a single registration. This contributes to quite high average transport volumes per registration. However, there is no such registration for long-distance transport, as all transport is recorded daily and long distances cannot be driven several times a day. This leads to quite high average transport volumes for shorter routes, but not for longer ones.

3. As table 3 on the previous page indicates, there is no available data for many OD-pairs, even if they were aggregated to larger areas. It is therefore often not possible to derive a relevant average value from the data provided. As can be seen from Tables 5 and 8 below, the list of OD-pairs for which there is no, or only hidden data includes even such presumably not insignificant transport as all OD-pairs between Stavanger area (zone 27 Jæren nord) and Swedish counties and all OD-pairs between Bergen area (zone 32 Bergensområdet) and other European countries. Consequently, the hidden transport volumes on many of the longest transport routes would have to be set to zero – and underestimated accordingly.

These factors contribute to the fact that an estimation of the hidden data would lead to very uncertain and distorted results. The values would be too high for transport volumes on shorter distances and too low for transport volumes on longer distances.

However, despite the limitations mentioned, it is possible to give some idea of the extent of the hidden data. The following four tables apply to transport between some selected Micro-regions in Norway and European countries other than Norway and Sweden, hereafter referred to as 'Rest of Europe'. These tables show the size of the provided transport volumes and transport works compared to the hidden values. The latter can be calculated from the differences between the First and the Second Delivery if either the origin or the destination is aggregated to larger areas such as Norway, Sweden or Rest of Europe.

This is followed by four further tables with the same structure, which apply to transport volumes and transport work between the same selected Micro-regions and Sweden.

Zone 27 Jæren nord to and from Rest of Europe	1,000 t to Europe	Million tkm to Europe	1,000 t from Europe	Million tkm from Europe
Data provided from First Delivery	56.46	51.74	29.70	26.77
Calculated hidden data	55.00	47.31	64.18	51.45
Hidden data as percentage of data provided	97.4 %	91.4 %	216.1 %	192.2 %

Table 4: Provided and hidden data on transport between Jæren nord and Rest of Europe. 2020-2022. Source: SSB First and Second Delivery.

Zone 32 Bergensområdet to and from Rest of Europe	1,000 t to Europe	Million tkm to Europe	1,000 t from Europe	Million tkm from Europe
Data provided from First Delivery	0.00	0.00	30.74	21.98
Calculated hidden data	20.67	26.44	63.14	56.24
Hidden data as percentage of data provided	(infinite)	(infinite)	205.4 %	255.9 %

Table 5: Provided and hidden data on transport between Bergensområdet and Rest of Europe. 2020-2022. Source: SSB First and Second Delivery.

Zone 19 Telemark sør to and from Rest of Europe	1,000 t to Europe	Million tkm to Europe	1,000 t from Europe	Million tkm from Europe
Data provided from First Delivery	47.93	70.35	32.00	47.67
Calculated hidden data	44.99	16.73	15.05	5.81
Hidden data as percentage of data provided	93.9 %	23.8 %	47.0 %	12.2 %

Table 6: Provided and hidden data on transport between Telemark sør and Rest of Europe. 2020-2022. Source: SSB First and Second Delivery.

Zone 10 Oslo to and from Rest of Europe	1,000 t to Europe	Million tkm to Europe	1,000 t from Europe	Million tkm from Europe
Data provided from First Delivery	25.65	17.89	50.26	32.32
Calculated hidden data	16.44	18.87	37.70	35.96
Hidden data as percentage of data provided	64.1 %	105.5 %	75.0 %	111.3 %

Table 7: Provided and hidden data on transport between Oslo and Rest of Europe. 2020-2022. Source: SSB First and Second Delivery.

Zone 27 Jæren nord to and from Sweden	1,000 t to Sweden	Million tkm to Sweden	1,000 t from Sweden	Million tkm from Sweden
Data provided from First Delivery	0.00	0.00	23.24	15.45
Calculated hidden data	82.30	46.11	259.39	115.70
Hidden data as percentage of data provided	(infinite)	(infinite)	1,116 %	749 %

Table 8: Provided and hidden data on transport between Jæren nord and Sweden. 2020-2022. Source: SSB First and Second Delivery.

Zone 32 Bergensområdet to and from Sweden	1,000 t to Sweden	Million tkm to Sweden	1,000 t from Sweden	Million tkm from Sweden
Data provided from First Delivery	85.15	88.55	89.03	73.15
Calculated hidden data	34.15	32.28	42.91	31.59
Hidden data as percentage of data provided	40.1 %	36.5 %	48.2 %	43.2 %

Table 9: Provided and hidden data on transport between Bergensområdet and Sweden. 2020-2022. Source: SSB First and Second Delivery.

Zone 19 Telemark sør to and from Sweden	1,000 t to Sweden	Million tkm to Sweden	1,000 t from Sweden	Million tkm from Sweden
Data provided from First Delivery	95.01	41.56	50.26	15.05
Calculated hidden data	115.13	49.23	12.36	5.57
Hidden data as percentage of data provided	121.2 %	118.5 %	24.6 %	37.0 %

Table 10: Provided and hidden data on transport between Telemark sør and Sweden. 2020-2022. Source: SSB First and Second Delivery.

Zone 10 Oslo to and from Sweden	1,000 t to Sweden	Million tkm to Sweden	1,000 t from Sweden	Million tkm from Sweden
Data provided from First Delivery	405.10	125.11	168.67	48.31
Calculated hidden data	139.37	49.84	53.72	25.75
Hidden data as percentage of data provided	34.4 %	39.8 %	31.8 %	53.3 %

Table 11: Provided and hidden data on transport between Oslo and Sweden. 2020-2022. Source: SSB First and Second Delivery.

These tables show that the hidden data is of considerable size, especially when longer distances are analysed, such as to and from zones on the coast of Vestlandet. It even happens that the hidden data are much larger than the data provided.

Unfortunately, it is not possible to provide corresponding comparisons for domestic transport. This can be explained by the fact that both the provided and the hidden data include transport on shorter distances, but to a far greater extent in the data provided than in the hidden data. A comparison would therefore be misleading. It should be noted that the average transport distance in the hidden data is 403 km when all domestic transport (with Norwegian owned lorries) is considered as a whole. In contrast, the average transport distance for the data provided is only 75 km.

However, it is possible to specify the size of the hidden data (without comparison with the data provided) for many examples of domestic transport. As can be seen from Tables 12 to 14 below, the hidden data represent quite large values, as a comparison with the traffic counts on selected roads in Chapter 4.1.4 will show. However, it should be noted that the data in this chapter apply to the First and Second Delivery from SSB (which cover three years), whereas the road counts are annual traffic numbers. Also, the transport volumes and transport work to and from different Micro-regions include domestic transport in all directions, not only along the selected roads.

Hidden data from and to some zones in Rogaland	1,000 t to Norway	Million tkm to Norway	1,000 t from Norway	Million tkm from Norway
Zone 27 Jæren nord	360.44	154.44	346.62	141.21
Zone 26 Jæren sør	303.87	130.26	290.21	162.55
Zone 28 Haugalandet	153.81	61.05	208.76	76.46
Zone 29 Ryfylke	367.22	104.35	250.95	76.49

Table 12: Size of hidden data on domestic transport between some selected zones in Rogaland and all other parts of Norway, 2020-2022. Source: SSB First and Second Delivery

Hidden data from and to some zones in Vestland	1,000 t to Norway	Million tkm to Norway	1,000 t from Norway	Million tkm from Norway
Zone 32 Bergensområdet	255.60	110.78	389.16	169.66
Zone 31 Hardanger	168.96	54.28	120.96	41.95
Zone 30 Sunnhordland	139.32	55.06	388.23	134.55
Zone 33 Hordaland aust	379.39	131.29	283.67	88.77

Table 13: Size of hidden data on domestic transport between some selected zones in Vestland and all other parts of Norway, 2020-2022. Source: SSB First and Second Delivery

Hidden data from and to some zones in Eastern Norway	1,000 t to Norway	Million tkm to Norway	1,000 t from Norway	Million tkm from Norway
Zone 19 Telemark sør	581.77	202.10	281.01	98.95
Zone 20 Telemark aust	264.59	74.92	296.13	74.59
Zone 18 Vestfold sør	493.03	128.84	297.09	89.15
Zone 7 Buskerud vest	244.85	97.43	352.97	132.06

Table 14: Size of hidden data on domestic transport between some selected zones in Eastern Norway and all other parts of Norway, 2020-2022. Source: SSB First and Second Delivery

4.1.3 SSB-data on foreign owned lorries

The First Delivery from SSB contains data on transport with foreign lorries to and from Norway. It specifies the country from or to which the freight was sent, the cargo type group and the transport volumes and transport work. However, there is no data on the transport origin or destination region in Norway. This limits the usability of the data.

On the other hand, certain estimates can be made with the help of other sources. For example, the average transport distances in cross-border traffic with foreign owned trucks are several hundred kilometres longer than the transport distances in cross-border traffic with Norwegian owned lorries.[7] This could have several possible explanations, but it is not unlikely that many foreign owned lorries carry goods over relatively long distances within Norway.

[7] Table 06549: International transports, to and from Norway. Tonnage carried and transport performance 2006K1 - 2024K2, SSB Norway, https://www.ssb.no/statbank/table/06549.

Furthermore, a survey on two days in April 2018, where all lorries passing certain points on the road network were stopped, showed that 21 – 28% of the trucks on the roads between Vestlandet and eastern Norway were owned abroad.[8] These results are of course subject to considerable uncertainty, but nevertheless suggest significantly higher transport volumes on these routes than can be deduced from the data for transport by Norwegian lorries.

4.1.4 Comparing SSB-data with road traffic counts

The objective of this chapter is to challenge the SSB data and compare them with traffic counts. This will be followed by a comparison of traffic counts with other possible sources, such as the matrices from the National Freight Model NGM.

Data selection

For transport with foreign owned lorries, the SSB data do not contain any information on the origin and destination areas within Norway. Therefore, a comparison with road traffic counts must be limited to transport by Norwegian lorries. It makes sense to make this comparison for the year 2022, as lorry transport had recovered this year after Covid-19, as shown in the table 16 about transport volumes and transport work in, to and from Norway in recent years. In addition, 2022 was a year in which the share of foreign owned lorries in total transport in, from and to Norway was slightly lower than in 2020 and 2021. This is also reflected in slightly longer average transport distances for transport with Norwegian owned lorries.

Year	Tonnage carried (mill. tonnes)	Transport work (million tonne-km)
2010	266.8	19,746
2011	256.3	19,185
2012	251.5	20,166
2013	271.3	21,303
2014	293.6	21,535
2015	270.5	21,235
2016	268.9	20,951
2017	255.7	21,386
2018	255.1	21,347
2019	244.4	21,466
2020	243.6	21,407
2021	266.4	22,557
2022	266.8	24,429

Table 15: Tonnes and Tonne-km carried in, to and from Norway by Norwegian owned lorries in recent years. Source: SSB Table 08478.

As shown in the table 16 below, the share of the transport volumes and transport work in 2022 was about 35 % of the figures for the years 2020, 2021 and 2022 together. This share has been used for the comparison with the road traffic counts. However, looking at the transport volumes alone, the share is slightly lower than 35 % (34,3%), while the opposite applies to the transport work (35,7%). This reflects a higher share of transport on longer distances in 2022 than in 2020 and 2021 but cannot be taken into account in the comparison because the origin-destination pairs are not known.

[8] https://haugalandvekst.no/app/uploads/2020/07/Godstransport-på-Vestlandet-Rapport.pdf, page 39.

Year	Volume (million tonnes)	% of 2020-2022 volumes	Transport Work (million tonne-km)	% of 2020-2022 transport work
2020	243.6	31.4%	21,407	31.3%
2021	266.4	34.3%	22,557	33.0%
2022	266.8	34.3%	24,429	35.7%
Total	**776,8**	**100%**	**68,393**	**100%**

Table 16: Distribution of volumes and transport work for the year 2020, 2021 and 2022, Norwegian owned lorries. Source: SSB Table 08478.

Road Traffic Counts

The location of the selected traffic count points between Vestlandet and Eastern Norway and the procedure of collecting data are described in chapter 3. The following table 17 shows which freight flow origin-destination pairs were allocated to the various traffic count points for the comparison with the SSB data. In this table, the zone codes refer to the Micro-region codes defined in chapter 2. In addition, Sweden is defined at zone 57 and Rest of Europe as zone 58.

Roads	Allocation of freight flow origin-destination pairs to various traffic count points
E39 Teistedals-tunnelen	Southern Rogaland (25-27) – Eastern Norway (1-21)
	Southern Rogaland (25-27) - Agder (22-24)
	Southern Rogaland (25-27) - Sweden and Rest of Europe (57,58)
	Northern Rogaland and coastal southern Vestland (28-30,32,34) – Agder (22-24)
E134 Vågslid-tunnelen	Northern Rogaland and southern Vestland (28-31) – Eastern Norway (1-21)
	Northern Rogaland and southern Vestland (28-31) – Sweden, Rest of Europe (57,58)
	Inner southern Vestland (31,33) – Agder (22-24)
	Greater Bergen area (32-34) – Telemark and Vestfold south (18-21)
E16, Rv52, Fv50, Rv7 Filefjell - Hard.vidda	Greater Bergen area (32-34) – Eastern Norway, not Telemark, Vestfold sør (1-17)
	Northern Vestland (35,36) – Eastern Norway, not northern parts (1-20, not 13,16)
	Greater Bergen area and northern Vestl. (32-36) – Sweden, Rest of Europe (57,58)
	Northern Vestland (35,36) – Agder (22-24)

Table 17: Allocation of freight flow origin-destination pairs to various traffic count points. Source: own.

This allocation of traffic flows is of course subject to a certain degree of uncertainty. For example, there are lorries that drive from the Bergen area to the Oslo area on E134 via Haukeli, just as there are lorries that drive from Hardanger to the Oslo area on Rv7 via Hardangervidda. This depends, among other things, on possible road works, weather conditions and cargo weights. A lorry with a heavy load heading for eastern Norway, for example, more often chooses Rv52 or E134 than Rv7, where a very long stretch with a steep gradient has to be overcome.

Relation between freight volumes and traffic counts

Only the number of vehicles is measured in the traffic counts, so an assumption must be made about the average load per vehicle. Unfortunately, the First Delivery of SSB cannot be used for this purpose. The data on transport with Norwegian owned lorries have a high proportion of hidden data, especially for long-distance transport that is mostly relevant for the selected traffic count points, cf. tables 4 - 14 in chapter 4.1.2. There are also large gaps in the data for transport with foreign owned lorries, especially for transport on the longest transport distances – which often has the highest average load weights.

SSB's Second Delivery cannot be used to determine average loadings either, as it does not contain the data required for such calculations. There are similar problems with other SSB data. Table 13321 shows average loads of 16 – 19 tonnes for all lorry trips in, to and from Norway in the longest transport distance classes (more than 300 km). However, these figures only apply to Norwegian lorries and only for lorry trips with a load, i.e. not including empty runs. Table 08478, on the other hand, also contains data including empty runs, but is not specified for different transport distances. This limits the usability of such data.

In contrast, the 'Godsundersøkelse for Vestlandet' report contains usable data.[9] Although these originate from a roadside survey conducted over only two days in 2018 and have a corresponding margin of error, they are not only national averages but are specified for traffic count points that are close to those listed in Table 17. On this basis, average vehicle loads of 14 tonnes can be assumed for lorries through the E39 Teistedalstunnelen, 17 tonnes for lorries through E134 Vågslidtunnelen and 14 tonnes for lorries via the four northern traffic count points.

However, these loads have been calculated as an average value for all lorries over 7.5 metres long, whereas the traffic counts at the count points selected here apply to lorries over 12.5 metres long. This is because many vehicles with a length of 7.6 to 12.5 metres are less relevant vehicles such as buses, large motorhomes or passenger cars with trailers.

However, lorries without trailers are also included in this length category. In the roadside survey in April 2018, such lorries without trailers accounted for 6 – 16 % of all lorries surveyed[10] and thus contributed to a lower average load due to their load weight of about half of the load weight of semi-trailers and lorries with trailer. This means that the average load of lorries longer than 12.5 metres was most likely slightly higher than is used in Table 18 below.

Road	Direction	Tonnes per vehicle	Transport volumes traffic counts (tonnes)	Transport volumes SSB basis (tonnes)	Traffic counts in per cent of SSB
E39 Teistedals-tunnelen	East	14	1,711,850	1,255,212	136.4%
	West	14	1,706,740	1,385,748	123.2%
E134 Vågslid-tunnelen	East	17	611,192	537,310	113.8%
	West	17	505,708	457,283	110.6%
E16, Rv52, Rv50, Rv7	East	14	1,098,650	853,328	128.7%
	West	14	1,149,750	1,087,590	105.7%
Totals	East	14.5	3,421,692	2,645,851	129.3%
	West	14.4	3,362,198	2,930,621	114.7%

Table 18: Comparison between traffic counts and SSB data on transport volumes via selected traffic count points. Source: Statens Vegvesen and SSB First Delivery.

The comparison between the SSB-data and the road traffic counts shows lower transport volumes in the SSB-data. However, the differences to the traffic counts are in several cases smaller than the extent of the hidden data (cf. chapter 4.1.2) and the lack of data on transport by foreign owned lorries (cf. chapter 4.1.3) would suggest.

This gives rise to assumptions that the SSB-data could be too large, or the values obtained from the traffic counts too small. For example, in the SSB data, transport trips from Zone 28 - Haugalandet and Zone 29 - Ryfylke to Värmland county in Sweden account for 83 % of all transport volumes from Rogaland and Vestland counties to the whole of Sweden, and at the same time 30 % of all eastbound transport volumes on E134. This is most likely based on rather random registrations (cf. chapter 4.1.2) and contributes to a distortion of the transport volumes stated.

On the other hand, too low loads per vehicle and the lack of freight volumes carried by lorries between 7.6 and 12.5 metres in length probably contribute to too low transport volumes recorded for the traffic count points. These moments may explain the partly too small differences between SSB-data and road traffic counts.

[9] https://haugalandvekst.no/app/uploads/2020/07/Godstransport-på-Vestlandet-Rapport.pdf, page 45.
[10] https://haugalandvekst.no/app/uploads/2020/07/Godstransport-på-Vestlandet-Rapport.pdf, page 40.

4.1.5 Comparing NGM-data with road traffic counts

In contrast to the SSB-data, the matrices of the National Freight Transport Model NGM do not contain any hidden data. They also include transport with both Norwegian and foreign owned lorries in domestic and international traffic and are specified for smaller and many more origin and destination zones than the SSB-data.

For the purpose of challenging the NGM-data the vehicle-types “Tunge Biler” and “Modulvogntog” have been taken into account. These figures have been compared with road traffic counts in 2019, because the last update of the NGM-data was made this year. This explains the slightly different transport volumes in the column for traffic counts in Table 19 compared to 2022 figures in Table 18.

Road	Direction	Tonnes per vehicle	Transport volumes traffic counts (tonnes)	Transport volumes NGM basis (tonnes)	Traffic counts in per cent of NGM
E39 Teistedals-tunnelen	East	14	1,553,440	1,634,666	95.0%
	West	14	1,573,880	2,446,658	64.3%
E134 Vågslid-tunnelen	East	17	589,475	497,209	118.6%
	West	17	483,990	659,764	73.4%
E16, Rv52, Rv50, Rv7	East	14	1,129,310	1,444,116	78.2%
	West	14	1,200,850	1,405,708	85.4%
Totals	East	14.5	3,272,225	3,575,991	91.5%
	West	14.4	3,258,720	4,512,130	72.2%

Table 19 Comparison between traffic counts and NGM data on transport volumes via selected traffic count points. Source: Statens Vegvesen and NGM.

In almost all cases, the comparison shows larger transport volumes in the NGM-data than in the traffic counts. The eastbound transport volumes on E134 are an exception. However, the NGM-data and the traffic counts show very similar values when the eastbound and westbound transport volumes are added together.

This suggests that the loads per vehicle are not the same in both directions but are considerably greater in the westbound direction than in the eastbound direction. This assumption is also supported by the roadside survey in April 2018, in which an average west-east directional balance of 56:44 was determined. If, for example, instead of 17 tonnes load in both directions, 20 tonnes load in the westbound direction and 14 tonnes load in the eastbound direction are assumed for lorry transport on E134, there are fairly small differences between the NGM-data and the traffic counts.

However, this does not apply to lorry transport on E39. Even though the transport volumes obtained from the traffic counts are most likely too low, see the comments to Table 18, the high NGM-data for westbound transport volumes can only partly be explained by different loads depending on the direction. Another possible explanation is the verbal information from Statens Vegvesen that the NGM-data is partly based on traffic counts from 2018, which were extrapolated to 2019 using the average national traffic growth. However, at the selected Teistedalstunnelen count point, the actual lorry traffic in 2019 was not higher, but lower than in 2018. This may also contribute to the differences between the NGM-data and the traffic count values.

For lorry traffic on the four northern roads, the average difference between the NGM-data and the transport volumes obtained from traffic counts is around 20%. This can be explained in part by too low average loads per vehicle and the lack of transport volumes with lorries without trailers. However, the remaining deviations are not so large that significant errors in the NGM-data must be assumed.

4.1.6 Data usage - conclusions

The analysis conducted shows:

- The large amount of hidden data, especially for long-distance transport, the lack of geographically specified data for transport with foreign owned lorries and many rather random registrations make it very difficult to use the SSB data as a basis for traffic forecasts for Vestlandsbanen. However, the SSB data helped to estimate average vehicle loads.
- A comparison of NGM-data with transport volumes obtained from traffic counts shows good correspondence in most cases. For westbound transport volumes on E39, the NGM-data appear somewhat high, but the deviations are within the range of inaccuracies to be expected in a model calculation.
- As no other data with a sufficient geographical resolution is available, **SENER has decided to use the NGM data for further analyses.**

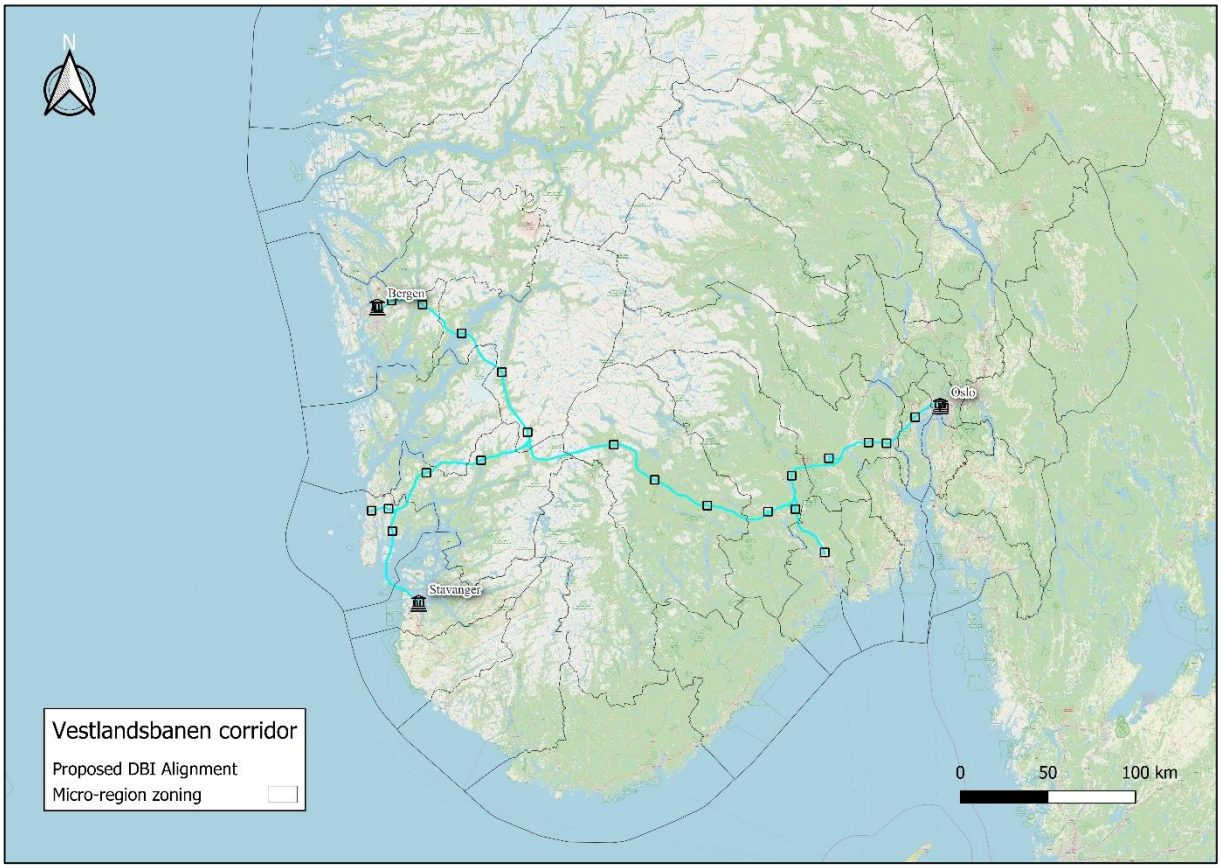
4.2 Road freight traffic in Vestlandsbanen corridor

For the following investigations it is important to know the freight volumes that are moved in the Vestlandsbanen corridor. This is because a considerable part of these volumes may be susceptible of being transferred to the new railway line. However, it is not possible to precisely delineate the relevant freight traffic flows. For example, the following tables show road transport flows to and from Vestland county. A large proportion of these transport flows have a high potential for being transferred to Vestlandsbanen, but if the northernmost parts of Vestland county are considered, parts of the transport flows become less relevant.

These differences in relevance depend on different factors such as costs related to the loading and unloading of cargo, distances between rail freight terminals and cargo origin and destination, the lack or existence of appropriate railway lines connected to Vestlandsbanen, and the freight train operation characteristics. Also, the development of the current rail network connected to Vestlandsbanen is highly important for the future rail traffic from and to Agder, Møre og Romsdal, Trøndelag, northern Norway, Sweden and other European countries. These conditions and differences in relevance are taken into account in the Freight Demand Model but are not shown in the following tables.

The tables below are grouped as follows:

- Long-distance road transport between western Norway, and eastern Norway and foreign countries,
- Long-distance and regional road transport in western Norway and adjacent regions,
- Long-distance and regional road transport in eastern Norway, adjacent regions and foreign countries.



Long-distance road transport between western Norway, and eastern Norway and foreign countries

West direction

Origin/Destination West Direction (1,000 tonnes)	Rogaland	Vestland	Total
Oslo and Akershus	1,021	758	1,779
Østfold and Innlandet	232	433	665
Buskerud, Vestfold and Telemark	488	399	887
Sweden and Rest of Europe	187	128	315
Total	**1,928**	**1,718**	**3,646**

Table 20: Westbound road transport volumes between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination West Direction (million tonne-km)	Rogaland	Vestland	Total
Oslo and Akershus	543	342	885
Østfold and Innlandet	136	159	295
Buskerud, Vestfold and Telemark	187	165	352
Sweden and Rest of Europe	210	183	392
Total	**1,075**	**848**	**1,924**

Table 21: Transport work on westbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination West Direction Transport Distance (km)	Rogaland	Vestland	Total
Oslo and Akershus	531	451	497
Østfold and Innlandet	587	367	443
Buskerud, Vestfold and Telemark	383	413	397
Sweden and Rest of Europe	1,122	1,425	1,245
Total	558	494	528

Table 22: Transport distances on westbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Product Category	Volume (1,000 tonnes)	Transport Work (million tonne-km)
Tørrbulk - Dry bulk	382	166
Stykkgods - Piece goods	1,545	753
Fisk - Fish	54	27
Tømmer - Timber	0.3	0.1
Industrivarer - Industrial goods	1,085	539
Våtbulk - Liquid bulk	230	147
Termo - Refrigerated or frozen goods	350	290
Total	3,646	1,924

Table 23 Product categories on westbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Piece goods and industrial goods, followed by refrigerated or frozen gods and bulks, are the products that account for the largest share of the westbound road transport volumes between western Norway, and eastern Norway and foreign countries.

East direction

Origin/Destination East Direction (1,000 tonnes)	Oslo and Akerhus	Østfold and Innlandet	Buskerud, Telemark and Vestfold	Sweden and Rest of Europe	Total
Rogaland	476	96	457	77	1,106
Vestland	655	345	472	242	1,713
Total	1,131	441	929	319	2,819

Table 24: Eastbound road transport volumes between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination East Direction (million tonne-km)	Oslo and Akerhus	Østfold and Innlandet	Buskerud, Telemark and Vestfold	Sweden and Rest of Europe	Total
Rogaland	253	55	161	74	543
Vestland	306	142	205	317	970
Total	559	198	366	391	1,513

Table 25: Transport work on eastbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination East Direction Transport Distance (km)	Oslo and Akerhus	Østfold and Innlandet	Buskerud, Telemark and Vestfold	Sweden and Rest of Europe	Total
Rogaland	531	575	352	960	491
Vestland	467	413	434	1,311	566
Total	**494**	**448**	**394**	**1,226**	**537**

Table 26: Transport distances on eastbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Product Category	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Tørrbulk - Dry bulk	75	27
Stykkgods - Piece goods	1,034	471
Fisk - Fish	348	326
Tømmer - Timber	2	0,3
Industrivarer - Industrial goods	858	381
Våtbulk - Liquid bulk	205	154
Termo - Refrigerated or frozen goods	296	154
Total	**2,819**	**1,513**

Table 27: Product categories on eastbound road transport between western Norway, and eastern Norway and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

In the opposite direction piece goods and industrial goods, followed by fish, refrigerated or frozen gods and bulks, are the products that account for the largest share of the eastbound road transport volumes between western Norway, and eastern Norway and foreign countries.

Long-distance and regional road transport in western Norway and adjacent regions

The tables below contain some short-distance road freight flows, for example between the southern and northern parts of Rogaland. This is due to the height difference of two times almost 400 metres for lorry trips through the Rogfast tunnel and the considerable toll charges. Otherwise, only road transport flows are listed where the lorry transport time between the centres of different regions is at least two hours.

The regions selected comprise, among others, the greater Bergen area (Bergensområdet and neighbouring regions in the north and the east) and northern Vestland, the former county Sogn og Fjordane, combined with Møre og Romsdal county.

Origin/Destination (1,000 tonnes)	Agder	Southern Rogaland	Northern Rogaland	Sunnhordland	Hardanger	Greater Bergen area	Northern Vestland and MogR	Total
Agder			170	18	16	106	44	355
Southern Rogaland			683	92	13	313	113	1,213
Northern Rogaland	50	498			127	101	52	828
Sunnhordland	24	45					129	198
Hardanger	10	14	74			195	7	299
Greater Bergen area	103	492	84		378			1,057
N. Vestland and MogR	34	103	35	44	25			242
Total	**222**	**1,152**	**1,046**	**154**	**558**	**715**	**344**	**4,192**

Table 28: Long-distance and regional road transport volumes in western Norway and adjacent regions, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination (million tonne-km)	Agder	Southern Rogaland	Northern Rogaland	Sunnhordland	Hardanger	Greater Bergen area	Northern Vestland and MogR	Total
Agder			58	7	5	48	31	149
Southern Rogaland			75	14	3	65	73	230
Northern Rogaland	15	54			17	14	20	120
Sunnhordland	9	8					36	54
Hardanger	4	5	9			14	2	35
Greater Bergen area	44	96	12		31			184
N. Vestland and MogR	24	51	16	19	7			116
Total	**96**	**214**	**170**	**40**	**62**	**142**	**163**	**887**

Table 29: Transport work on long-distance and regional road transport in western Norway and adjacent regions, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination Transport Dist. (km)	Agder	Southern Rogaland	Northern Rogaland	Sunnhordland	Hardanger	Greater Bergen area	Northern Vestland and MogR	Total
Agder			339	354	322	451	713	418
Southern Rogaland			109	153	227	209	649	190
Northern Rogaland	299	108			135	140	391	145
Sunnhordland	385	178					281	270
Hardanger	398	373	128			73	361	118
Greater Bergen area	430	195	147		81			174
N. Vestland and MogR	689	493	447	437	260			479
Total	**434**	**186**	**162**	**258**	**112**	**198**	**475**	**212**

Table 30: Transport distances on long-distance and regional road transport in western Norway and adjacent regions, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Product Category	Volume (1,000 tonnes)	Transport Work (million tonne-km)
Tørrbulk - Dry bulk	548	61
Stykkgods - Piece goods	1,821	348
Fisk - Fish	113	50
Tømmer - Timber	22	1
Industrivarer - Industrial goods	1,043	304
Våtbulk - Liquid bulk	435	77
Termo - Refrigerated or frozen goods	210	46
Total	**4,192**	**887**

Table 31: Product categories on long-distance and regional road transport in western Norway and adjacent regions, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Piece goods and industrial goods, followed by dry bulk and liquid bulk, are the products that account for the largest share of road transport volumes in western Norway and adjacent regions.

Long-distance and regional road transport in eastern Norway, adjacent regions and foreign countries

The tables below do not include road freight flows where freight trains will only use Vestlandsbanen on the Oslo – Drammen section. The conditions for freight trains on this section will not differ so much from the conditions on the existing railway line that this alone could trigger significant shifts from road transport to rail. For this reason, road freight flows between Buskerud and Sweden, for example, have not been included in the tables.

Freight flows between Telemark and Agder and between Telemark and Buskerud, on the other hand, is included, as road freight transport to and from Telemark is concentrated in the southern part of the county and freight trains will therefore not only run very short distances on Vestlandsbanen. It should also be noted that there is currently no freight train service on Vestfoldbanen.

Origin/Destination (1,000 tonnes)	Agder	Telemark	Vestfold	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Agder		232	165	77	473	54	49	1,050
Telemark	328			390	966	42	130	1,856
Vestfold	138							138
Buskerud	137	162						299
Oslo, Akershus, Østfold and Innlandet	1,253	937						2,189
Trøndelag and northern Norway	7	31						38
Sweden and Rest of Europe	67	106						173
Total	**1,930**	**1,467**	**165**	**467**	**1,439**	**96**	**179**	**5,743**

Table 32: Long-distance and regional road transport volumes in eastern Norway, adjacent regions and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination (million tonne-km)	Agder	Telemark	Vestfold	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Agder		28	34	18	124	65	30	299
Telemark	38			46	139	21	40	284
Vestfold	20							20
Buskerud	21	17						38
Oslo, Akershus, Østfold and Innlandet	181	144						325
Trøndelag and northern Norway	2	3						5
Sweden and Rest of Europe	39	66						106
Total	**301**	**258**	**34**	**63**	**264**	**86**	**70**	**1,076**

Table 33: Transport work on long-distance and regional road transport in eastern Norway, adjacent regions and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Origin/Destination Transport Dist. (km)	Agder	Telemark	Vestfold	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Agder		120	209	228	262	1209	609	285
Telemark	115			117	144	497	310	153
Vestfold	144							144
Buskerud	157	103						128
Oslo, Akershus, Østfold and Innlandet	144	153						148
Trøndelag and northern Norway	283	99						134
Sweden and Rest of Europe	590	626						612
Total	**156**	**176**	**209**	**135**	**183**	**896**	**392**	**187**

Table 34: Transport distances on long-distance and regional road transport in eastern Norway, adjacent regions and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

Product Category	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Tørrbulk - Dry bulk	1,377	197
Stykkgods - Piece goods	1,997	313
Fisk - Fish	52	15
Tømmer - Timber	86	8
Industrivarer - Industrial goods	1,306	280
Våtbulk - Liquid bulk	853	254
Termo - Refrigerated or frozen goods	73	9
Total	**5,743**	**1,076**

Table 35: Product categories on long-distance and regional road transport in eastern Norway, adjacent regions and foreign countries, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

The following tables summarise the current road freight flows that are relevant for the Vestlandsbanen corridor:

- All road freight flows, both directions together:

Road freight flows	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Between western Norway, and eastern Norway and foreign countries	6,465	3,437
In western Norway and adjacent regions	4,192	887
In eastern Norway, adjacent regions and foreign countries	5,743	1,076
Total	**16,401**	**5,400**

Table 36: Summary of road transport volumes and transport work. Relevant figures for Vestlandsbanen corridor, 2019. Source: NGM.

- Domestic road freight flows only, both directions together:

Road freight flows	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Between western Norway and eastern Norway	5,831	2,653
In western Norway and adjacent regions	4,192	887
In eastern Norway and adjacent regions	5,392	901
Total	**15,415**	**4,441**

Table 37: Summary of domestic road transport volumes and transport work. Relevant figures for Vestlandsbanen corridor, 2019. Source: NGM.

- Road freight flows from and to Sweden:

Road freight flows	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Imports From Sweden	232	142
Exports To Sweden	322	172
Total	**554**	**314**

Table 38: Summary of road transport volumes and transport work to and from Sweden. Relevant figures for Vestlandsbanen corridor, 2019. Source: NGM.

- Road freight flows from and to Rest of Europe:

Road freight flows	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Imports From Rest of Europe	256	356
Exports To Rest of Europe	176	289
Total	**432**	**646**

Table 39: Summary of road transport volumes and transport work to and from Rest of Europe. Relevant figures for Vestlandsbanen corridor, 2019. Source: NGM.

4.3 Rail Traffic

4.3.1 Input data

A similar analysis has been carried out for the rail freight transportation. Different sources are used to estimate the current demand.

- SSB data: "Table 13299: Goods transport by rail, by region for loading and unloading (tonnes) for 2020"[11]. This data is presented in tonnes and divided by different geographical regions.
  - Oslo, Akershus, Buskerud and Østfold
  - Innlandet
  - Vestfold, Telemark and Agder
  - Rogaland, Vestland and Møre og Romsdal
  - Trøndelag

[11] Table 13299: Goods transport by rail, by region for loading and unloading (tons) 2022. SSB Norway, https://www.ssb.no/statbank/table/13299

    - Northern Norway (Nordland, Troms and Finnmark)
- National Transport Plan 2025 – 2036: «Utfordringer i transportkorridorer og byområder»[12]
- «Vekst i godstrafikken» Banenor Report[13]
- Data from National Freight transport Model (NGM), kindly provided by Statens Vegvesen

4.3.2 Transport Demand in the corridor.

As in the analysis of road freight flows, it is important to understand the rail freight volumes that are carried in the Vestlandsbanen corridor, because it is expectable that all or major parts of the current transport volumes will be transferred to the new and shorter double track railway with low gradients. The current rail freight that will potentially be captured are the transport volumes between Oslo and Bergen, Oslo and Stavanger, Oslo and Kristiansand via Oslo – Bø, and other rail freight flows that could be transferred to shorter sections of Vestlandsbanen, such as Trondheim – Oslo – Notodden.

SSB-data on Rail Transport Volumes

The table below shows domestic rail freight flows as far as they have been recorded by SSB for 2020. In the original SSB-file, there was no individual data for the transport volumes to and from Rogaland, Vestland and Møre og Romsdal, only data for the total of all these transport volumes. In 2020, however, the freight rail service on Raumabanen railway line to Møre og Romsdal was suspended. The SSB-data therefore only relates to the sum of transport volumes to and from Rogaland and Vestland.

It should be noted here that missing values in the table below applies to freight flows that are either not considered relevant or where no freight transport is listed by SSB. An example of the former are the transport volumes within Vestfold, Telemark and Agder, even if parts of these volumes (between Telemark and Agder) may be relevant. However, there is no information about their size.

An example for the latter is transport from western Norway to Sweden. No through freight trains are offered for such transport. Instead, the cargo is reloaded onto another train in Oslo and thus registered by SSB as transport from western Norway to Oslo and as another transport from Oslo to Sweden. This explains why the table does not show any rail freight flow between Norwegian counties and Sweden or other countries.

Origin/Destination (1,000 tonnes)	To Oslo, Akershus, Buskerud and Østfold	To Innlandet	To Vestfold, Telemark and Agder	To Rogaland and Vestland	To Trøndelag and northern Norway	Total
From Oslo, Akershus, Buskerud and Østfold	-	-	0	710	-	710
From Innlandet	-	-	19	1	-	19
From Vestfold, Telemark and Agder	293	133	-	126	21	572
From Rogaland and Vestland	650	-	18	-	7	675
From Trøndelag and northern Norway	-	-	56	12	-	69
Total	943	133	92	849	28	2,046

Table 40: Rail freight volumes between Norwegian regions, 2020. Source: SSB. Relevant figures for Vestlandsbanen corridor.

[12] https://www.regjeringen.no/contentassets/2426a22cfef14e16b1d3028442fc78df/utredningsoppdraget-leveranse-januar-2023/utfordringer-i-transportkorridorer-l2254364.pdf

[13] https://www.banenor.no/nyheter-og-aktuelt/nyheter/2023/vekst-i-godstrafikken-i-2022/

National Transport Plan 2025-2036

In the document "Utfordringer i transportkorridorer og byområder", used as one of the fundamentals for the National Transport Plan (NTP) 2025-2036, there is information about the rail transport volumes and transport work in 2020 on both Bergensbanen and Sørlandsbanen (included minor adjacent railway lines):[14]

- Bergensbanen: 1,420,000 tonnes moved, 527 mill. tonne-km, 371 km average transport distance.
- Sørlandsbanen: 1,477,000 tonnes moved, 596 mill. tonne-km, 404 km average transport distance.

At first glance, the SSB-data appear to be considerably lower than the data from the NTP-document. According to SSB, for example, 1.524 million tonnes were transported by rail between Rogaland and Vestland on the one side and Eastern Norway, Trøndelag and Northern Norway on the other in 2020. In addition, there were 521,000 tonnes moved between Telemark, Vestfold and Agder on the one side and all other parts of Eastern Norway, Trøndelag and Northern Norway on the other. Transport to and from Agder probably accounts for the largest share of this.

It is worth to mention that the information in the NTP-document also includes transport volumes within different counties or between counties that are grouped into a region in the SSB-data, for example on Brevikbanen in southern Telemark or between Buskerud and Oslo or Akershus. This may explain large parts of the differences between the SSB-data and the data in the NTP-document, but perhaps not all.

National Freight Transport Model

Further data can be retrieved from the National Freight Transport Model NGM. The following tables show the transport volumes, transport work and average transport distance according to the NGM for 2019. It is worth noting here that the data on transport work covers the entire transport distance, i.e. also on Swedish railway lines, for example, while the data in the NTP-document is limited to Bergensbanen and Sørlandsbanen (including minor adjacent railway lines).

Origin/Destination (1,000 tonnes)	Roga-land	Vest-land	Agder	Tele-mark	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Rogaland					20	79	77	13	189
Vestland					21	448	12	18	499
Agder					3	27	85	141	256
Telemark					1	62	0	171	234
Buskerud	65	89	0	0					154
Oslo, Akershus, Østfold and Innlandet	320	431	72	0					822
Trøndelag and northern Norway	46	4	29	0					79
Sweden and Rest of Europe	19	29	2	30					80
Total	**450**	**553**	**103**	**30**	**44**	**617**	**174**	**344**	**2,314**

Table 41: Current rail transport volumes, relevant for Vestlandsbanen corridor, 2019. Source: NGM.

[14] https://www.regjeringen.no/contentassets/2426a22cfef14e16b1d3028442fc78df/utredningsoppdraget-leveranse-januar-2023/utfordringer-i-transportkorridorer-l2254364.pdf, page 70/71 and 87/88.

Origin/Destination (million tonne-km)	Roga-land	Vest-land	Agder	Tele-mark	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Rogaland					10	45	87	43	186
Vestland					10	206	17	48	282
Agder					1	14	89	119	224
Telemark					0	15	0	64	79
Buskerud	34	45	0	0					79
Oslo, Akershus, Østfold and Innlandet	189	199	36	0					424
Trøndelag and northern Norway	53	4	26	0					83
Sweden and Rest of Europe	56	66	1	12					135
Total	**332**	**314**	**63**	**12**	**22**	**280**	**194**	**274**	**1,491**

Table 42: Current rail transport work, relevant for Vestlandsbanen corridor, 2019.
Source: NGM.

Origin/Destination Transport Dist. (km)	Roga-land	Vest-land	Agder	Tele-mark	Buskerud	Oslo, Akershus, Østfold and Innlandet	Trøndelag and northern Norway	Sweden and Rest of Europe	Total
Rogaland					522	575	1,138	3,219	985
Vestland					506	459	1,411	2,605	564
Agder					326	528	1,049	847	874
Telemark					112	236		373	336
Buskerud	522	506		357					506
Oslo, Akershus, Østfold and Innlandet	591	462	507						516
Trøndelag and northern Norway	1,153	1,123	885						1,053
Sweden and Rest of Europe	2,927	2,233	592	412					797
Total	**737**	**567**	**613**	**412**	**495**	**455**	**1,114**	**1,681**	**644**

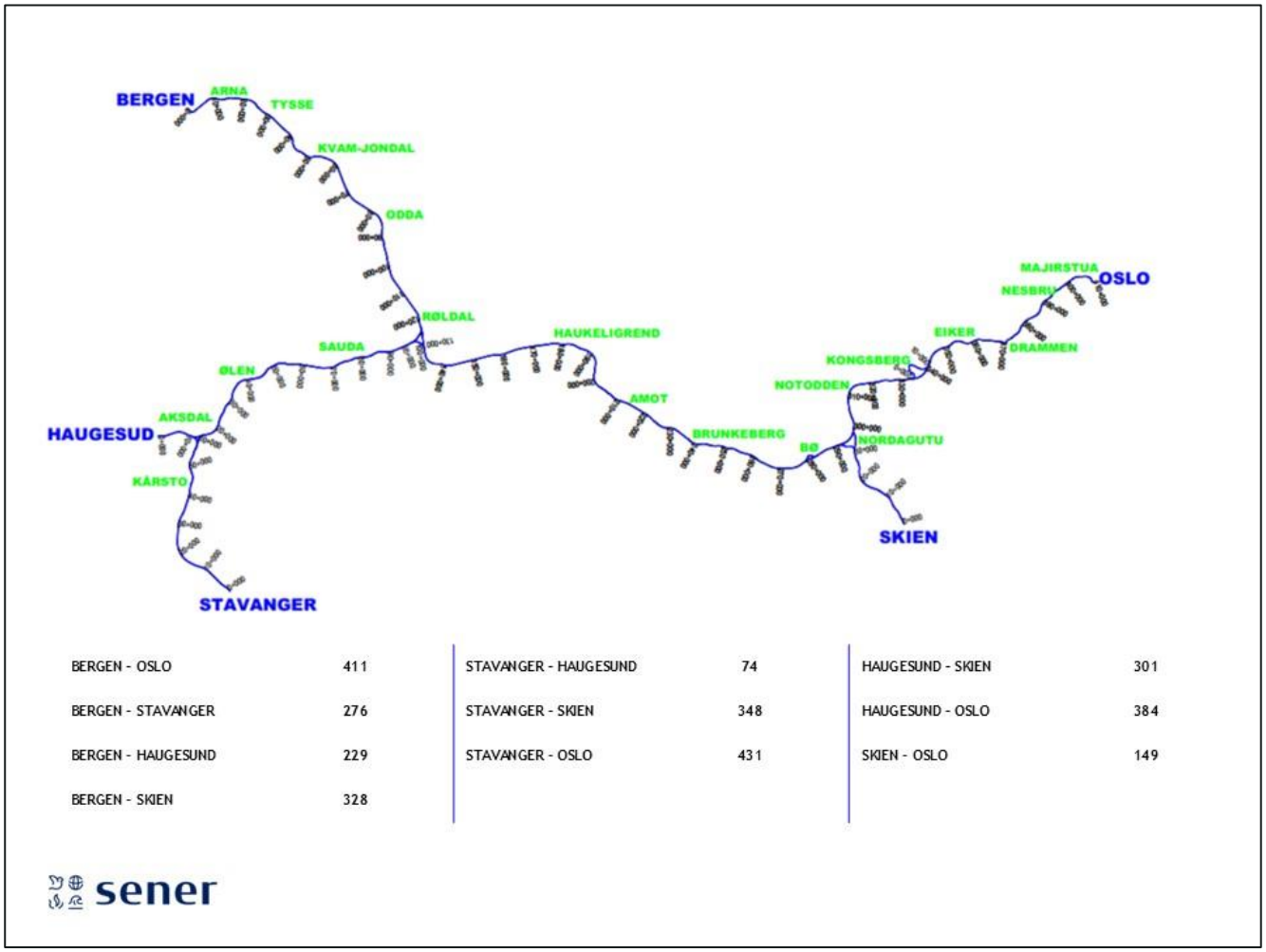
Table 43: Current rail transport distances, relevant for Vestlandsbanen corridor, 2019.
Source: NGM.

The NGM-data show on average 13 % higher transport volumes than the SSB-data, 2.314 million tonnes (NGM) compared to 2.046 million tonnes (SSB). This may be related to the different years of data collection, 2020 (SSB) and 2019 (NGM). It is not possible to say exactly, as no corresponding SSB-data is available for 2019. There may also be errors in the SSB data. For example, it seems unlikely that the rail transport volumes in 2020 from Oslo, Akershus, Buskerud and Østfold to Telemark and Agder should have been almost zero.

Conclusion

SENER has decided to use the NGM-data for further analyses. It is the only data available that has a high geographical resolution and also includes information on traffic to and from other countries. In addition, the differences to data from other sources are not so great that significant errors need to be suspected.

In this context, it should be noted that the transfer of freight from existing railway lines to Vestlandsbanen not only will result in a significant increase in transport speed, operational reliability and transport capacity, but also in a considerable reduction in transport distances, which, in combination with low gradients and much larger curve radii, will lead to corresponding savings in freight train operating costs. The following chart gives an impression of the extent of these savings. In comparison, the distance Oslo – Bergen on the existing route is 485 km (via Drammen), while Oslo – Stavanger is 588 km.



4.3.3 Other railways lines.

Vestlandsbanen will be connected to existing railway lines and future parts of the Norwegian rail network at several points and thus both influence them and be influenced by them. In this context, Østfoldbanen is very important, since major parts of the rail transport between freight terminals on Vestlandsbanen and foreign countries will use this line. Østfoldbanen designates the part of the Oslo – Gothenborg link that lies on Norwegian territory. The line is almost 350 km long, has three freight terminals[15] in Norway and is connected to Gothenborg harbour, which has great significance for imports to Norway.

Østfoldbanen has considerable train traffic, but also still has available capacity for freight trains, especially at night and during off-peak times of the day. An increase in freight train numbers as a result of the commissioning of Vestlandsbanen will therefore not be hindered by insufficient line capacity.

On the other hand, there are limits on the length and weight of freight trains. For example, the Tistedalsbakken, a 3 km long section with a steep gradient east of Halden, allows a maximum wagon weight of only 700 tonnes if no auxiliary locomotive is to be used.[16] This is less than half the wagon weight possible on Vestlandsbanen. Østfoldbanen and the subsequent stretch on the Swedish side of the border to Gothenburg is also around 55 km longer than the parallel E6 motorway. This contributes to the limited attractiveness and a low market share of rail

[15] https://www.banenor.no/for-deg-i-bransjen/godstransport/terminaler/
[16] https://trafikverket.diva-portal.org/smash/get/diva2:1561469/FULLTEXT01.pdf

freight transport. For example, Østfoldbanen accounted only for an 11% share of freight transportation between the Oslo area and the Swedish west coast.[17]

Nevertheless, this also means that Østfoldbanen has significant potential for an increase in freight traffic if appropriate investments are made. When making such investments, emphasis should be placed on avoiding drops in the permitted speed and on straight-line bypasses of residential areas. Also, alignments without major detours and steep inclines should be realised, while at the same time a connection between the Drammen area and Østfoldbanen should be prepared, which can shorten the rail freight distances and enable a bypass of the capital area.

These investments will be worthwhile, and Vestlandsbanen and the additional freight volumes to and from Western Norway, Agder and Telemark will further increase their profitability. At the same time, investments in a modern Østfoldbane will increase the profitability of Vestlandsbanen.

5 CONCLUSIONS

This deliverable aimed to analyse the current freight demand along the Vestlandsbanen Corridor, using multiple data sources, including NGM data, SSB data, and the NTP. These insights provide a well-rounded understanding and estimation of the corridor's freight demand. Nevertheless, several challenges emerged during the research.

Regarding the **road freight demand**, the following items are remarkable:

- A significant amount of inaccessible data, particularly for long-distance transport, along with limited geographically specific data for foreign-owned lorries, and several irregular registrations make SSB data challenging to rely on for traffic forecasts specific to Vestlandsbanen. However, SSB data did support an estimation of average vehicle loads.
- Comparison of NGM data with traffic count-based transport volumes generally shows strong alignment. While westbound transport volumes on E39 are slightly higher in the NGM data, the discrepancies fall within an acceptable margin of error for model calculations.
- Due to a lack of alternative data with adequate geographical detail, SENER has chosen to rely on 2019 NGM data for further analysis.

As per the **rail freight demand** SENER has also opted to use the 2019 NGM data for rail freight analysis. It offers higher geographical resolution than the SSB data and also includes cross-border traffic information. The differences between NGM data and other sources are minimal, suggesting a low risk of substantial errors.

As final conclusions and despite the data limitations and problems encountered, this research has provided valuable insights. The following table summarizes the total current road and rail freight demand in that are relevant for the Vestlandsbanen corridor. It shows that road freight transport, despite the current considerable market share of rail transport, especially between the Bergen area and the Oslo area, represents by far the largest share of the freight potential for Vestlandsbanen.

Freight Market	Volumes (1,000 tonnes)	Transport Work (million tonne-km)
Road Freight Demand	16,401	5,400
Rail Freight Demand	2,314	1,491
Total	**18,715**	**6,891**

Table 44: Current road and rail freight volumes and transport work for year 2019. Source: NGM.

[17] https://www.rail-pass.com/ostfold-line-ostfoldbanen-a