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4 | Bane NOR | Norway on rails



"I am proud to lead 4,400 dedicated employees into the future.

## Norway on rails

Bane NOR's job is to ensure that the national railway infrastructure is available for rail services. We have to supply efficient, user-friendly services, including the development of hubs and freight terminals.

At Bane NOR, we have to do everything in our power to meet the social aims defined for the railway sector, and we accept these major tasks with utmost respect.

We provide a railway that is already one of the safest, most punctual in Europe, and our aim is to be the best. The organisation focuses on providing as much railway for the money as possible. Our ambition is to put Norway on rails, and openness, commitment and professionalism are the guiding principles for our work.

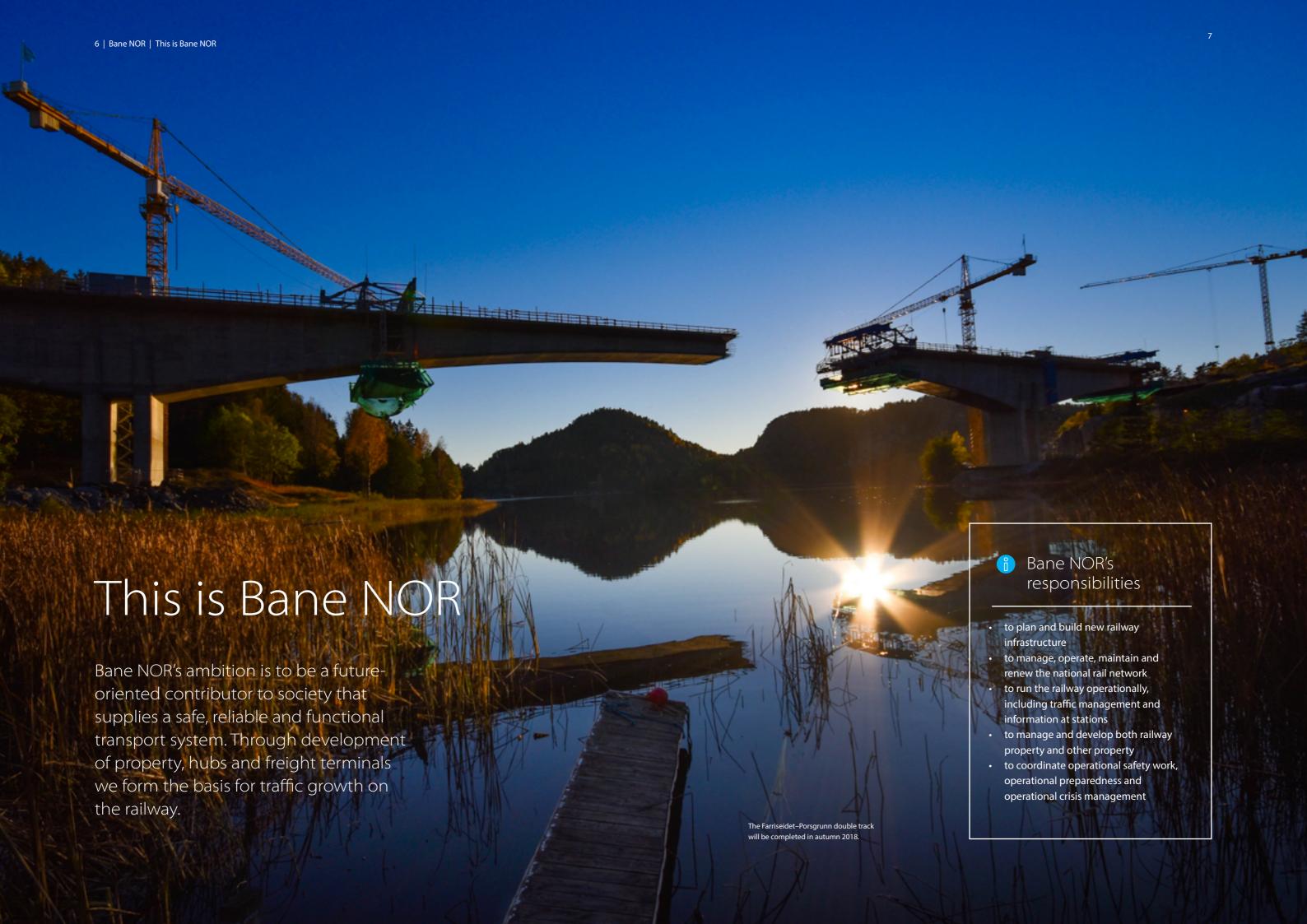
Bane NOR is responsible for a number of the country's biggest public transport projects, such as the development of InterCity, the Follo Line and the joint Ringerike Line and E16 project. We own and manage areas five times larger than Drammen, making us one of the country's largest property managers and developers.

Our employees manage, operate and maintain 4,200 km of railway. We are responsible for the introduction of ERTMS, Norway's biggest digitisation project. Along the railway, a 5,000 km-long fibre network is now being constructed that will form the backbone of the digital railway. Our staff handle all traffic management and distribution of capacity to train operators and information to rail passengers.

I am proud to lead 4,400 dedicated employees into the future. We must work together to ensure that Bane NOR is able to handle the corporate social responsibility assigned to us by the government and The Norwegian Parliament. We will create a predictable railway where all passengers and freight arrive by the agreed time.

Gorm Frimannslund CEO





## The Railway Reform in brief

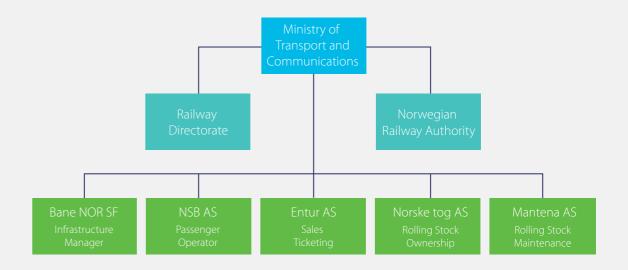
The purpose of the Railway Reform is to facilitate everyday transport for individuals and businesses. The ambition is to create greater predictability and clearer distribution of responsibilities in the railway sector, as well as adapting for the competitive tendering of passenger services.

When The Norwegian Parliament resolved to support the reform proposed by the government, a new state-owned company was founded in February 2016 as the successor to Jernbaneverket (the Norwegian National Rail administration). This company was named Bane NOR SF and was fully operational from January 1. 2017. A new Railway Directorate responsible to the Ministry of Transport and Communications was established at the same time. The Directorate is responsible for state purchases of passenger transport and the planning and development of train services and new railway lines in Norway. The Directorate concludes agreements with railway sector stakeholders on the supply of spesific services.

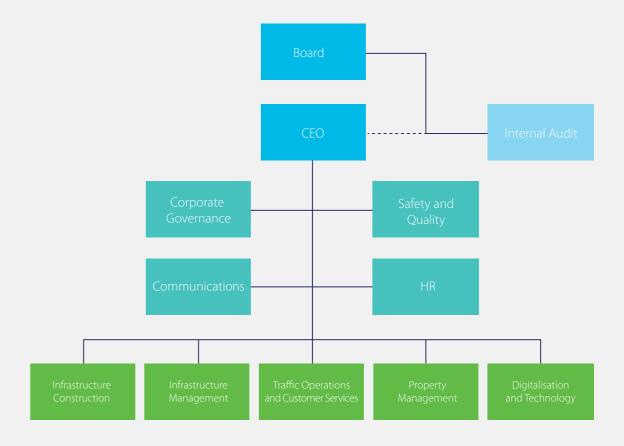
'Bane NOR SF, transport company NSB AS, Entur AS (national sales outlet for rail tickets), Norske tog AS (company that guarantee access to rolling stock for passenger operators) and Mantena AS (company that offers maintenance and workshop services for rolling stock) are all wholly owned by the Ministry of Transport and Communications.

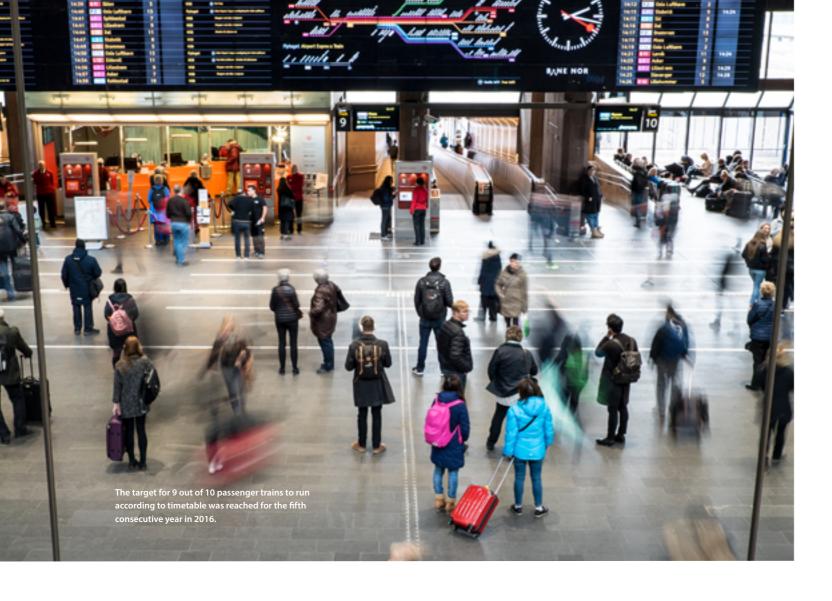
<sup>2</sup>Bane NOR SF is made up of five divisions and four staff teams. The Board is headed by Siri Hatlen, and Gorm Frimannslund is the CEO. The Internal Audit unit is the Board's way of carrying out checks on how the business is being managed. This is in line with guidelines for good corporate governance.

#### Ownership and management of the railway sector<sup>1</sup>



#### Bane NOR SF<sup>2</sup>





# More people choosing the train

Choosing the train over other forms of transport must be attractive for both passengers and freight. This is why Bane NOR focuses on its customers when developing the railway and the services for which we are responsible.



Did you know, our rail services are spread over 1,900 daily train routes?



... and that 200,000 people travel by train every day?

We want both passengers and freight to use trains, and to achieve this we have to plan and collaborate well. Did you know, for example, that planning the departure time for your train began many years ago?

Norwegian railway lines are popular and their capacity has to be planned so that we can utilise every single second and every single metre. A number of people work with this, and planning begins several years ahead. The Railway Directorate examines requirements and devises the long-term strategies for rail services more than a decade in advance, and when Bane NOR takes over the plans we launch a process which we call capacity distribution. Access to tracks has to be divided between passenger trains and freight trains. Time also has to be earmarked for necessary maintenance and renewals.

Planning track access requires much cooperation. This work involves both train operators and our own project managers. We have developed a number of digital tools to help with this work.

Routes are ordered in one tool (BEST), planned in another (TPS) and distributed to drivers and other people working on the railway in a third (FIDO).

#### Traffic management

Just as airports have control towers, railways have traffic management centres. All trains are driven by train drivers, but the journeys of each and every train are planned, approved, monitored and managed by Bane NOR traffic controllers. Our traffic controllers work shifts around the clock at the Traffic Control Centres.

Power system dispatchers and train information officers also work at the Traffic Control Centres. The power system dispatchers monitor and remotely control the power supply systems that supply power to trains via the catenaries.

Train information officers are responsible for providing rail service information to passengers. This information is provided via loudspeakers and screens at stations and is sent to websites and apps as well.

Some sections of the railway have not been upgraded to centralized traffic control as of yet. On these sections, train dispatchers control the traffic, allow trains to proceed and issue them with running permits. These dispatchers, also known as txp, remain at the station buildings along lines without centralized traffic control.

## Transporting freight by rail relieves pressure on the roads

Besides passengers, 31.6 million tonnes of freight were transported by rail in Norway in 2015, and the proportion of freight transported by rail is expected to increase over the next few years. The ambition is to achieve a level of 40 million tonnes in 2030. The freight transported includes containers of consumables transported throughout Norway (combi-transport), ore transported between Kiruna in Sweden and Narvik in Norway, and timber from the inland part of eastern Norway to Sweden.

Efforts are being made to make cross-border freight transport simpler, and a direct route was established recently between Italy and Norway.

#### **Good punctuality**

Punctuality is the most important factor for people who travel by train and companies that transport their goods by rail. "Is my train on time?" Bane NOR has a systematic, targeted approach when it comes to identifying ways of improving Norwegian rail punctuality still further. This is achieved by measures such as monitoring vital track components so that they can be replaced before they cause faults and delays. Our punctuality is currently among the best in Europe.

#### Modern railway stations

We currently have 336 operational railway stations in Norway. Many of these are equipped with modern information screens and speakers, waiting rooms and car parks. More and more stations are being upgraded in order to improve accessibility for passengers. Since Værnes, Skotbu, Moelv and Stange were upgraded in early 2017, 27 of our stations have been granted universal design status, which means they are accessible to all.

Some central stations have also been equipped with "cycle hotels" for safe storage of bicycles. Bane NOR also provides almost 19,000 parking spaces for rail passengers and has designated areas for commuters at 36 stations.

#### Assistance service

Bane NOR offers a free assistance service at some of the busiest railway stations in Norway. This involves helping passengers with reduced mobility to get to and from the platforms and in and out of the station.

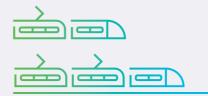
### Constant improvement in customers' satisfaction with railways

We are keen to know what the people who use our railway think of us. This is why we carry out regular surveys to find out how satisfied our customers are with our station areas and the effectiveness of the information flow at stations. In 2016, passengers gave these areas a score of 74 out of 100. This is a good result, but we want to go on improving. We are working in particular to improve the information we provide in the event of disruptions to rail traffic.

#### **Customer information**

Bane NOR is responsible for providing passengers with good information via speakers and screens at stations, on websites and in service apps. We provide information on train structures, where trains are going and where they will be stopping.

This information is also available to blind and visually impaired people. Inside Norway call 02009 for information about all timetables and stations.



#### Trains on time

Punctuality is defined as the number of trains on time at the terminal station (as a percentage). "On time" is defined as arrival at the terminal station within a margin of three minutes and 59 seconds. For long-distance trains and freight trains, this margin is five minutes and 59 seconds. The target for passenger trains is for 90 per cent of trains to reach their final station on time, while the target for Flytoget (the Airport Express Train) is 95 per cent.



#### Annual train timetable launch

Did you know that the train timetables for the coming year are always launched at 03.00 on the second Sunday in December? This is the same in all European countries as good coordination is vital for cross-border transport.



#### More people choosing the train

The train is becoming more popular as a mode of transport. In 2016 the increase in train journeys was significant. 74.2 million train journeys were recorded. The same figure for 2011 was 59.4 million.

Rail traffic in the central part of eastern Norway was rescheduled in 2012, and the service was improved significantly. There was a 20 per cent increase in the number of trains. New train sets were purchased, and there were more departures which were more predictable, offering more stops and reduced travelling time. Since then the popularity of trains as a mode of transport has increased significantly, and people are flocking to the railways.



#### "Cycle hotel"

At some stations you can check your bicycle into a "hotel" while you travel by train.





#### Remote control – the future

All railway lines in Norway will be controlled remotely by 2030 when the ERTMS – the biggest digitisation project in Norway – is completed.



#### Talk to us

Did you know that Bane NOR has its own customer centre? You can give us a call, chat online, send us a text message or write us an email. We need your feedback if we are to improve. banenor.no/kundesenter

#### The national rail network in figures

泄

4,200

336

Railway stations and stops for passenger services



700

Kilometres of railway track

Tunnels



3,500 Level crossings



2,500

Bridges



12

Freight terminals

Number of trains calling at our biggest towns and cities over a 24-hour period



1,000<sup>+</sup>



157

Stavanger



96

Bergen



105

Trondheim



74

Number of train journeys recorded in Norway in 2016



31.6

Number of tonnes of ore, timber and freight containers on Norwegian railways in 2015

# Technology – the future for railways

The railways of the future will be characterised by modern computer technology. The introduction of a series of computerised systems will change the ways in which Bane NOR operates, maintains and develops its railway lines.

The purpose of this major *digital* initiative is to ensure that the railway infrastructure is always accessible and in good condition.

For passengers and freight industry, this means more trains with increased punctuallity. It also means improved and customised traffic information and enhancement of rail travel.

The introduction of the computerised ERTMS signalling system is the biggest digitalisation project in Norway. ERTMS will modernise the way in which rail traffic is managed. More extensive automation, monitoring of all trains via mobile networks and intelligent systems for dealing with discrepancies are just some of the advantages of ERTMS. The signalling infrastructure will also be easier to maintain and develop. ERTMS has been in use on the Østfold Line between Ski and Sarpsborg since August 2015.



#### **f** Facts

ERTMS stands for European Rail Traffic Management System, a joint signalling system for railways in Europe. Every EU country has a binding plan for the roll-out of ERTMS which is supported by the authorities.

Bane NOR's objective is to renew its signalling systems on all railway lines by 2030.



The new ERTMS signalling system will modernise the planning and management of rail traffic. There will be more trains with increased puncuality, and rail travel will be enhanced.



With ERTMS, signal lights will be replaced with computers aboard trains. Trains will communicate via the railway's own GSM-R network.



The railways are already using many computerised solutions. Many tasks relating to route allocation, maintenance and customer information are currently executed using PCs or tablets.





Sensors along the train routes issue alerts when the railway infrastructure requires inspection.

Bane NOR can continuously monitor the condition of its railways by using sensors and monitoring the power consumption of track components. This allows us to rectify technical faults before they affect rail services. Such systems are already used on several railway lines; between Oslo and Drammen, for instance. This will become the standard for the entire rail network in Norway in a few years' time. We call this "smart maintenance", because staying one step ahead is generally a pretty smart thing to do.

Bane NOR's digital initiative is facilitating better utilisation of existing resources and expertise in a number of specialist fields, providing more and better railway for the money invested. The digital railway is becoming increasingly apparent in three areas:

#### Signal renewal

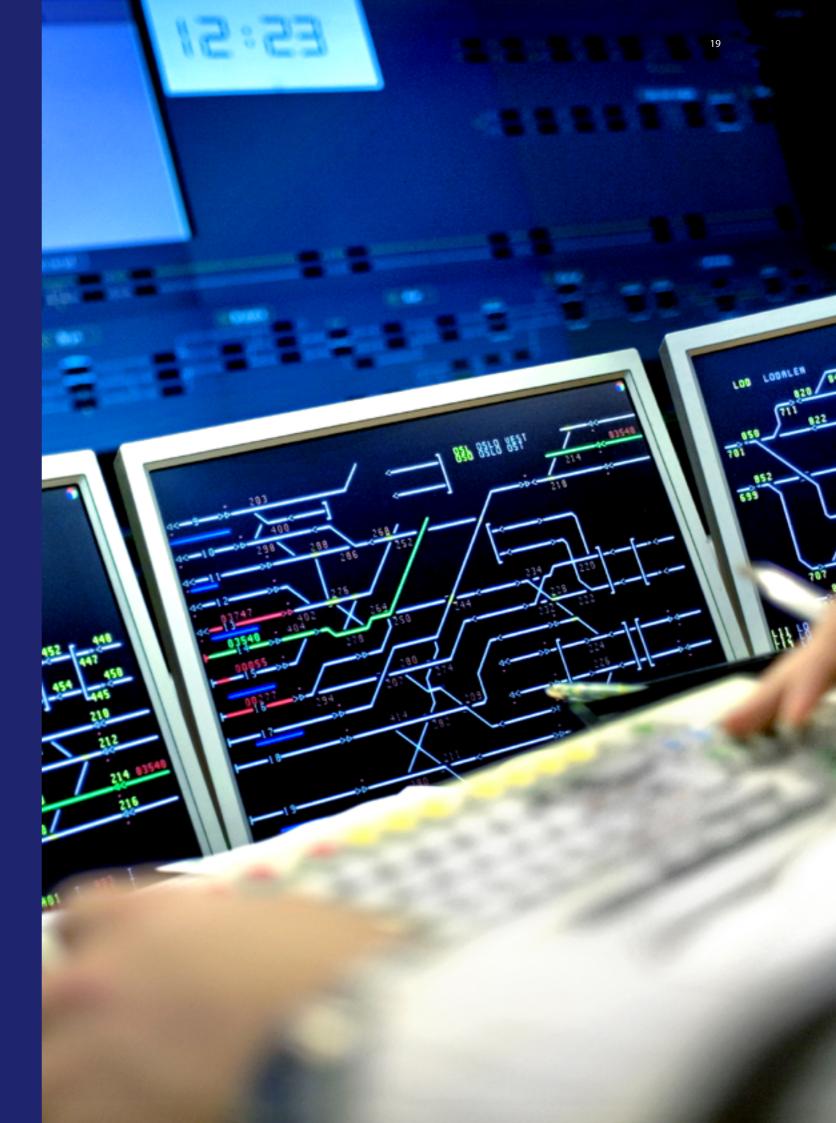
This renewal involves introducing both ERTMS and Thales systems (also computerised). Bane NOR's objective is to renew its signalling systems on all railway lines by 2030.

#### Condition monitoring

Monitoring the condition of the railway gives us the opportunity to remedy technical faults that may lead to delayed services. Power consumption and sensors provide alerts when the railway requires inspection.

#### **ICT** security

A digital railway is a vulnerable railway. Bane NOR is carefully monitoring potential threats in an increasingly computerised world. We have to protect the railway infrastructure from deliberate actions that may affect rail services, people or assets.



→
Rail services are monitored and controlled
from modern Traffic Control Centres.

## Operation, maintenance and renewals in 2017

Bane NOR employees are out on the tracks every day, all year round, for operation, maintenance and renewal of railway lines in Norway. In 2017, we will spend NOK 2.4 billion on renewal projects of various sizes all over the country. We will also spend NOK 6.3 billion on maintenance.

Ensuring safety is by far the most important reason as to why we maintain our rail systems. Good maintenance is also a prerequisite for punctual traffic. Faults and defects that are detected early on can be remedied before causing service stoppages. This is also the reason why Bane NOR is starting to use new digital solutions for monitoring important track components, such as point switches.

This year our jobs will include replacing old sleepers, rails and point switches and doing extensive work on drainage.

Good maintenance extends the service life of system elements, allowing us to benefit more from our investments; but sooner or later renewals are needed if we are to maintain the desired functionality. This year, most of our renewal work will be taking place on the Sørlandet Line, the Østfold Line, the Dovre Line and the Nordland Line.

We will be renewing the power supply system on the section between Egersund and Kristiansand on the Sørlandet Line. We will be installing a new catenary and a new autotransformer system. We will also be replacing old wooden pylons with steel pylons between Moi and Egersund. This will provide greater reliability and allow us to operate additional, longer trains. We will also be renewing rails, tunnels, bridges, terminals, public areas and telecommunications systems. All this work will help to improve the standard and punctuality of the Norwegian railway.

Bane NOR is also working on the necessary renewal of old signalling technology. When ERTMS is completed in around 2030, we will be able to offer passengers an even safer, more reliable railway with greater capacity.

Figures for 2017



6.3

#### Operation

We will be spending NOK 6.3 billion on operation and maintenance.



) bil

#### Renewal projects

Renewal projects worth just over NOK 2 billion will be carried out.



460 mil

#### **ERTMS**

NOK 460 million will be spent on the introduction of ERTMS.



500 pcs

#### Operation

Bane NOR's aim is to start digital monitoring of 500 point switches with 1,200 point motors.

## Building the railway of the future

There is broad agreement that the railway should be a central element in resolving the transport challenges of the future. As a construction client responsible for a number of major construction projects, Bane NOR is the key to achieving this aim.

#### **Hub development**

The railway links Norway together and helps to shape the country. When Bane NOR develops attractive hubs that work well in connection with railways, we influence where people choose to live and where they work.

Bane NOR owns, develops and manages all railway property in Norway. Our Property Management division is Norway's leading developer of hubs and an important stakeholder in community and urban development.

Bane NOR Property Management has more than 200 ongoing property development projects at hubs in Norwegian towns and urban districts and develops both commercial property and housing. The division also manages all the Norwegian railway stations, and work together with our tenants to develop stations, turning them into attractive destinations with pleasant eateries and shops. The Property Management division's ambition is to persuade more people to use the railways. The property business is an important source of income for Bane NOR.

When Bane NOR develops and improves rail services, we influence where people choose to live and where they work.

**CEO Gorm Frimannslund** 

#### InterCity development in eastern Norway<sup>1</sup>

Forecasts for Oslo and the central part of eastern Norway indicate strong population growth over the next few decades. Significant improvement of rail services on the InterCity network will play an important part in relieving the pressure on the capital city area and in the development of the areas where people live and work along the InterCity sections.

The InterCity initiative includes the planning and construction of 270 kilometres of new double track and 25 new stations.

This development paves the way for services that meet the demand for transport in line with population growth. This will result in shorter travel times, frequent departures and very regular services. InterCity will contribute towards sustainable development, encouraging more people to choose public transport, cycling and walking. Bane NOR will act as a driving force for the development of functional hubs and densification around the new stations, and invite partnership and discussion with other stakeholders in this regard.

#### Other major projects

The construction of a new double track on the very busy section between Arna and Bergen will

improve the situation for both freight and passenger services. A new tunnel through Ulriken, 7.8 km long, will cover most of the section. This project will be completed in 2022.

In Trøndelag, the Trondheim–Stjørdal–Steinkjer and Hell–Storlien sections will be electrified by 2023. This affects around 200 km of railway in total.

Other major projects involving planning and startup in the period to 2030 include a new double track between Arna and Stanghelle on the Bergen Line, linking together of the Vestfold Line and the Sørlandet Line (Grenland Line) and a new double track between Sandnes and Egersund. The National Transport Plan also paves the way for measures designed to encourage freight traffic, worth NOK 18 billion overall.

The Infrastructure Construction Division is responsible for implementation of the biggest projects, while renewals and smaller projects are managed by the Infrastructure Management Division.

The government proposal for a National Transport Plan for 2018–29 forms the basis for the references to the construction projects in this section.

#### The map shows the status as of May 2017

Completed section

Section under construction

Planned section

#### The InterCity initiative

#### Vestfold Line

According to the National Transport Plan for 2018-29, continuous double tracks must be completed to Tønsberg in 2024 and to Skien in 2032. A number of sections have already been completed; most recently Holm–Nykirke, which opened to traffic in November 2016 along with the new Holmestrand Station. 22.5 km of double track is being constructed from Farriseidet to Porsgrunn, with seven tunnels and ten bridges. This will be opening in autumn 2018. Construction is planned to begin in 2018/19 on two new sections, Drammen–Kobbervikdalen and Nykirke–Barkåker.

#### Follo Line

The Follo Line (22 km) is a pioneering project for Norwegian railway development and will be the innermost part of the InterCity development south-east of Oslo. A new double track between Oslo S and the Ski Station public transport hub will be completed by December 2021. This project includes a 20 km rail tunnel with two separate tunnel tubes, extensive work at Oslo S, a new railway station in Ski and the necessary conversion of tracks for the Østfold Line. This project will include 64 km of railway track.

#### **Dovre Line**

Here, continuous double tracks will be laid to Hamar by 2024 and to Lillehammer by 2034. New stations will be constructed in locations such as Tangen, Hamar and Brummunddal. 2015 saw the opening of 17 km of double track along the south end of Mjøsa (Langset–Kleverud), and in 2018/19 Bane NOR will be starting work on the sections south and north of this section (Venjar–Eidsvoll–Langset and Kleverud–Sørli).

#### New rail tunnel

A new rail tunnel through Oslo is necessary for further development of capacity and rail services in eastern Norway. The National Transport Plan indicates that a new tunnel could be completed around 2032.

### Brumunddal Stange Tangen Eidsvoll Oslo Lufthavn ( Hønefoss 🦲 Sundvollen Oslo S Sandvika Asker Drammer Ski Sande Holmestrand Rygge Horten Råde Sarpsborg Tønsberg Stokke Fredrikstad Skien ( ⊕ Torp Sandefjord Porsgrunn

Lillehamme

#### Ringerike Line

This is a new double track section approximately 40 km long between Sandvika and Hønefoss. The new double track section will reduce travelling times between Oslo and Hønefoss/Bergen by almost one hour. A new motorway will also be built alongside parts of the section, and this development work is a joint project also involving the Norwegian Public Roads Administration. Construction will probably begin in 2021/22.

#### Østfold Line

A continuous double track will be built to Seut in Fredrikstad in 2024 and on to Sarpsborg by 2026. This double track will be continued to Halden by 2034. The track will pass through all towns, and six new stations will be built. The Haug–Seut and Sandbukta–Moss–Såstad sections will entail major projects for Bane NOR up to 2024.



# Safety and the environment

Safety and the environment are important elements in Bane NOR's corporate social responsibility. Through our day-to-day operation and developement of the infrastructure we make a positive contribution to both of these important fields.

#### One of the safest in Europe

The Norwegian railways are among the safest in Europe. Systematic, risk-based safety work, in combination with close monitoring from the authorities, has an important part to play in this, and Bane NOR's aim is to continually improve.

Our aim is to make sure that no lives are lost on the railways. This is why safety takes top priority throughout the entire organisation, and our skilled employees help to maintain and further improve safety in many different ways.

## "Our aim is to make sure that no lives are lost.

**CEO Gorm Frimannslund** 

The following sections include examples of some of the many projects we are implementing with regard to safety and the environment.

#### Risk analyses

We use risk analyses to implement targeted measures in areas where the gains are deemed to be greatest.

#### Operation and maintenance

Good maintenance is important to both safety and the reliability of rail services, and so it is a high priority for us. Mapping areas that may be susceptible to flooding, landslides and avalanches and measures for reducing the risk of such incidents form part of this work.

When we keep platforms and other public areas clear of snow and ice in winter, we are helping to ensure that our customers can travel safely.

#### Level crossings and awareness campaigns

Bane NOR takes its corporate social responsibility very seriously. We use information and awareness campaigns to help make people of all ages more aware of the importance of taking care when crossing the railway line.

We are also working to eliminate level crossings. We reduced the number of level crossings by 60 in 2016, most of which were on the new InterCity section opened around Holmestrand.

We also implement both major and minor measures each year to improve safety on the 3,500 or so remaining level crossings. Around 170 such measures were implemented in 2016.

#### Health, safety and the environment

Bane NOR is helping to make the construction sector safer and greener and to run railways in safe, environmentally efficient ways.

As a professional, responsible developer, Bane NOR focuses on health, safety and the environment (HSE) at our building and construction sites and has signed a Charter for a zero-injury building and construction industry.

#### Rail service management and monitoring

Rail services are remotely controlled and monitored constantly from our Traffic Control Centres. You can find out more about this on page 11.

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#### New technology

The introduction of modern technology such as new signalling systems and monitoring of technical track components is helping to make the railway even safer. Find out more about the major digital initiative in progress on pages 16-18.

## High priority for environmental work at Bane NOR

This work involves following up statutory operation and maintenance requirements and specifying environmental requirements for railway planning and development.

#### Construction

Bane NOR is working constantly to check and reduce unwanted impact on natural diversity throughout all phases of its construction projects. We map natural diversity, monitor water quality in streams and rivers and restore adjacent terrain. We compensate as far as possible for encroachment on cultivated land by establishing new agricultural land on permanent landfill sites, for example.

#### Planned improvements

Environmental improvements are being implemented in accordance with specific action and maintenance plans in order to reduce greenhouse gas emissions by means of various energy streamlining measures, for instance.

Rail grinding is an effective way of preventing and reducing both wear and traffic noise. Vegetation clearance and removal of new growth along the

track, along with construction and maintenance of fences, are examples of measures implemented to reduce collisions with animals.

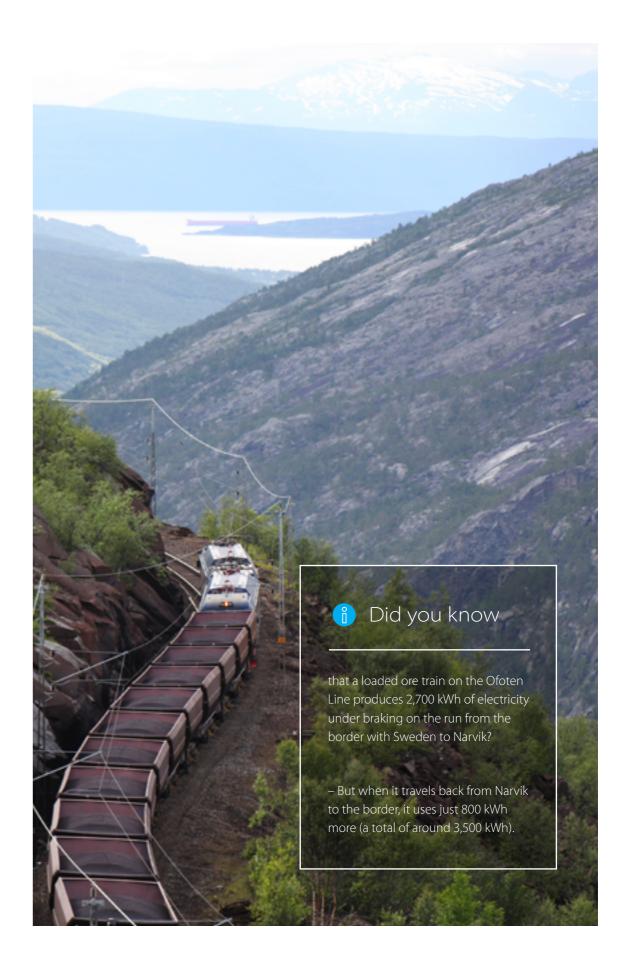
## Trains are eco-friendly and energy-efficient – a green solution!

In Norway, there is a political aim to move freight from the roads to the railways where appropriate. Trains can transport lots of passengers and freight at once, so they are an important contributor to the national eco-friendly transport initiative. If more passengers and freight in Norway were transported by rail, this would relieve the strain on our roads. This would mean less congestion, safer roads and efficient use of space.

#### Ofoten Line

Around 60 per cent of freight travelling by rail in Norway is transported on the Ofoten Line, even though this line constitutes merely one per cent of the rail network.

- Around 20 million tonnes of iron ore are transported between Kiruna and Narvik each year.
- At present, 16 freight trains a week operate each way between Oslo and Narvik.
- Heading south, around 200,000 tonnes of fish are transported each year, which is equivalent to around half of all the fish transported by rail in Norway.

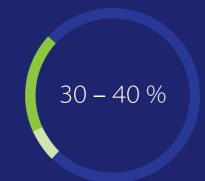


29

Did you know that Bane NOR is a state-owned company employing specialists in a wide range of fields?

30-40 per cent of Bane NOR's annual employment is within traditional core fields:

- Building and construction
- Power and energy
- Electrics, automation and cybernetics
- Communications technology and telecommunications





10-15 per cent of all new employees are recruited to manage infrastructure construction projects. Our need for skilled employees increases as our project activity expands.

Bane NOR focuses on safety, quality and process improvement and will be needing experts in fields such as climate change, community safety and information technology in years to come. As a new signalling system and new maintenance management systems are introduced, Bane NOR will need more people who are capable of innovation, development and operation of new technology.

