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Green Financing – The Nordic Way

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Green Financing – The Norcic Way

The rationale behind this work is the idea that Nordic experiences and practices of green financing could be relevant in a global context – to both G20 and non-G20 countries. Nordic solutions – including technology, market expertise, policy measures and financing models – that have proven successful in a domestic and/or a regional context are explored and assessed in terms of their applicability to international markets. The objective is to identify solutions that can be scaled up in the short and medium term to accelerate the transformation towards a green(er) financial system.

The report has been prepared by Nordic Council of Ministers, based on research undertaken by Sven Hegelund (independent consultant) and Ash Sharma, Special Adviser for Climate Change to NEFCO. The research is based on consultations with financial institutions and other relevant stakeholders in the Nordic region.

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Foreword

This report presents some of the Nordic experiences and practices in green transformation and green finance. It demonstrates that progress in addressing urgent environmental challenges is possible. I believe some of the ideas in the report can also be relevant for other countries and regions. The Nordic countries stand ready to contribute with some open-minded and proactive thinking going forward. At the same time, we recognise that challenges remain in the Nordic region, for instance cleansing of the Baltic Sea, which is one of the most polluted waters in the world and decarbonisation of the transport sector in a region which is heavily relying on both goods and person transport.

The report also shows that there is no single “magic bullet” for driving the needed changes towards a green and climate-neutral society. Instead, we need a “policy mix” and a systemic approach to tackle the challenges ahead of us. Thus, the examples presented are diverse and cover different aspects of green transformation and green finance in the Nordic countries.

The evolving green transformation will require that the financial sector and the business sector work in tandem. We need financing and business plans - supported by government policies – that are long-term, credible and at the same time put the necessary emphasis on environmental, economic and social sustainability. In other words, there is a strong case for joint and integrated efforts to accelerate and broaden the green transformation.

The green transformation is not only morally right, and socially desirable, it is also economically smart. Our ambition is to send clear policy signals to the financial sector. We want to make a real paradigm shift towards a sustainable future. To achieve this we need to support the green transformation of the financial markets to become drivers for low-carbon and resource efficient investments.

The Nordic experience also shows that open public debate concerning environmental challenges has strengthened public knowledge, insight and support for a green transformation. Broad public support and committed political backing have been important for mobilizing private capital and creating an enabling market environment with predictability and stability.

Dagfinn Høybråten
Secretary General
Nordic Council of Ministers

Executive summary

The rationale behind this work is the idea that Nordic experiences and practices of green transformation and financing could be relevant in a global context – to both G20 and non-G20 countries. Nordic solutions – including technology, market expertise and policy measures – that have been proven to function domestically and regionally are explored and assessed in terms of their relevance and applicability to a broader international context. The objective is to identify solutions that can be scaled up in the short to medium term and support the long-term ambition to accelerate the transformation towards a green economy supported by a green financial system on a global scale.

The interest in Nordic experiences emerges from its success in dealing with the environmental problems in this region while at the same time becoming one of the most competitive regions in the world. It is important to review, broadly, the development of the environmental situation with an emphasis on the policy measures put in place and how they were financed over the last 40 years, that is the period when systematic environmental policies have been in place in the Nordic region.

How has this positive development been achieved?

There is no panacea for a green transformation; but the most important success factor were probably advanced and progressive research, a widely shared awareness among the public and, consequently, the sense of urgency for action by the governments. This is the most fundamental precondition for a common acceptance of the necessary regulations and costs to address these challenges. This awareness bridged the traditional political divisions and endured, thus creating the stable and conducive framework conditions for planning and implementing long-term environmental and energy policies. Direct and broad engagement of the public through market-based measures was also important. The Nordic Swan Ecolabel (Svanen) is one of the most successful examples of combining regulatory measures, new research and innovation, and consumer action for a proactive and efficient green transformation.

Another important success factor has been the tradition of regional cooperation between the Nordic countries. Water pollution problems in particular would not have been possible to tackle without this cooperation, which was crucially also extended to the other countries around the Baltic Sea. Regional and international cooperation have also had a role to play when it comes to the reduction of GHG emissions. Collaboration, exchanges of views and experiences have been important for regional initiatives such as the integration of the Nordic electricity markets and the role played by common public financing institutions such as the Nordic Investment Bank (NIB) and the Nordic Environment Finance Corporation (NEFCO).

What concrete and effective measures have been undertaken – Regulatory and economic policy measures and the Nordic regional market integration?

Regulatory responses came first. A number of restrictions and regulations on emission permissions and standards for air and water were put in place in the beginning of the 1970s. Such regulations often went hand in hand with dialogues with relevant stakeholders, such as the public, the industries and the scientific community, to determine what was possible to achieve and what relevant research would be needed.

The Nordic countries were pioneering in implementing the "polluter pays" principle around 1990. Regulatory measures were supported by economic incentives in the form of fees and taxes on, for instance, CO_2 emissions, as well as subsidies to promote, for instance, the introduction of renewable energy. A reduction of perverse subsidies (including tax rebates) to heavy fossil fuel-using industries has taken place, but some subsidies remain in the form of lower energy and CO_2 taxes.

More sophisticated economic measures were also introduced. The integration of the Nordic electricity grid had already started before environmental awareness arose, allowing more efficient use of seven electricity resources in the Nordic region. This was followed by the creation of Nord Pool, the integrated Nordic electricity market, with common prices and effective optimisation rules for the grid. High cost and polluting fossil fuel-based power units need to be used less, with benefits in terms of both cost-effectiveness and environmental protection.

Nord Pool has also facilitated the introduction of renewable energy production, primarily wind power. The huge hydropower resources available to the grid can be used to balance the variations in wind power generation and conserve water resources in the reservoirs. The introduction of feed-in tariffs or green certificates has stimulated the introduction of renewables into this market.

Another sophisticated economic tool is the EU emissions trading scheme (ETS) in which all the Nordic countries participate. The system as a whole, however, has become less effective due to over-allocation of emission allowances and the recession. Actions are under way to reform the EU ETS, including eliminating some of the over-allocation of free emission allowances.

What concrete and effective measures have been undertaken – the role of green finance?
The investments necessary to meet the regulations were initially financed mainly through "conventional sources", i.e. resources from companies and local governments, although the central government funds and directed subsidies also played a role. Driven by the regulatory environment and public policies, financial flows/resources were redirected towards environmental measures and complemented by bank loans or through bond issues. Eventually, some public banks were given special mandates to finance environmentally friendly projects and provide long-term financing for long-term projects. These institutions usually also had other functions, but a number of these public banks assumed

the role of, at least partly, green banks and have been financing green projects, raising funds through normal bond issues. The role of politics has largely been to create a demand for environmental investments, which have then been financed, to the necessary extent, by the general financial market, directly or through intermediaries like the green banks.

The awareness that payback can be achieved through a lower cost for energy or environmental remediation and that green products sell better, has been a driver for investments. There has generally been a move away from directed subsidies and a commitment towards decentralised and innovative market-based solutions.

Recently, some institutions investing in green projects have started to issue green bonds, i.e. normal bonds with additional conditions that the proceeds of the bonds can only be used for financing green projects. Specialised institutions have emerged that certify the environmental qualities of green bonds. These green bonds have become attractive in the market for pension funds or green saving funds. This market has grown quickly and will reach USD 133–158 billion in 2016 according to an estimate by HSBC. Compared with a global bond market of USD 1 trillion, this is nevertheless still very small. So far there has been no green premium on these bonds and therefore no additional benefits over normal bonds for investors in green projects. The green bond market is still in its infancy. Its development should be welcomed as it broadens the investor base for financing green projects. However, it is still an open question whether it will make a substantial contribution to facilitating the financing of green projects at a lower cost than other funds in the future. It depends on the balance between demand and supply of green bonds and whether savers are prepared to pay a premium/accept a lower return on green bonds than on conventional bonds.

Another green market feature is decarbonisation of financial portfolios, i.e. eliminating assets with a large carbon footprint from the investment universe. By doing so, the chosen portfolio will become greener than the original. Apart from avoiding financing of unwanted companies, the rationale for this kind of screening is that it enables the investors to avoid risks of investing in assets that may become “stranded”, i.e. lose value as a result of environmental risks.

Conclusions

The most important conclusions from the Nordic experiences for a broader global context can be drawn as follows:

- There are important lessons to be learned from the successful combination of regulatory measures and economic incentive systems in the Nordic region that could be interesting to investigate in detail and applied to other national and regional contexts.

- Nord Pool could be replicated in other environments with positive effects on

energy efficiency and facilitate the introduction of renewables such as wind, solar power, biofuels, etc. by balancing intermittent energy sources against hydropower generation where energy can be stored. Such a replication is currently being undertaken with some success in Southern Africa.

- The functioning of the Nordic green financing institutions, i.e. NIB, NEFCO and the municipal banks, could provide some interesting experiences. Their main success factors are their ability to fund themselves favourably due to high creditworthiness and to finance a pool of many smaller projects from weaker rated entities that could not get financing on the same terms.

- The role of local governments in developing and funding environmental projects in the Nordic region should be highlighted. They have carried out much of the practical work, including financing many of the necessary investments. Important preconditions for this have been their relative economic independence that allows them to raise their own funds from tariffs, taxation and borrowing.

- So far, rather conventional sources (own resources of companies and municipalities, directed government grants and borrowing from banks or through bonds) have financed practically all environmental projects in the Nordic region.

- The new market for green bonds is expanding not only in the Nordic region but also globally. The Nordic countries were forerunners in this market, and the Nordic role in this market is much greater than the Nordic weight in the world economy. This market is still in its infancy, however, and so far there have been no effects on the financing costs of environmental projects. One important Nordic experience in this field is the emergence of green ratings to create confidence in the market that green bonds really are green.

- Screening of financial portfolios to exclude environmentally damaging companies is also growing very fast in the global market, again with considerable Nordic participation. It can be seen as a way of avoiding risks in the future, such as from fossil fuel assets becoming "stranded" as a result of future regulations and/or market developments. It also has considerable marketing value for the participating companies.

- Looking ahead, the long-term objective of the green transformation of the financial system is to gradually remove subsidies and public financial support while market-oriented solutions and private sector engagement need to be the driving forces. This is the key to a green transformation – with speed and scale, for both the Nordic countries and globally.

The environmental situation in the Nordic-Baltic region has improved

The Nordic region has a good story to tell of its environmental development over the last 40 years. The situation back in the mid-1970s was rather worrying. Air and water pollution had then been increasing over a long period. In common with other industrialised countries, emissions of Greenhouse Gases (GHGs), such as CO_2, increased with GDP growth, largely due to the growth of fossil-fuelled industry, transport, heating, and energy generation. Though energy production emitted less CO_2 in the Nordic region than elsewhere, given the large hydropower resources and later also nuclear power, in this region. Emissions and pollution to water, without sufficient treatment and from increasingly fertilised agriculture, resulted in deteriorating water quality, ultimately affecting the large landlocked brackish-water sea in the region, the Baltic, leading to increased eutrophication, dead seabeds and depleting fish stocks. The risk of further biological damage to the sea with enormous social and economic consequences for the whole of Northern Europe was real.

However, there had been increasing public awareness of environmental problems and a sense of urgency among policymakers. This resulted in actions starting to be taken around 1970. Forty years on, we can look back on a positive development. At the same time, despite the largely successful story of Northern environmental policies and developments, there are still important steps that need to be taken by the Nordic countries.

CO_2 emissions

For the region as a whole, the increasing trend of CO_2 emissions has been broken and reversed into a decreasing trend. Today, the level of emissions is one-fifth lower than it was back in 1975.

First, the link between economic growth and CO_2 emissions in the Nordic region was decoupled. Between 1995 and 2013, emissions decreased by 20 per cent while the economy grew by 129 per cent. This is a result of both the effects of structural changes in the economies and large-scale substitution away from fossil fuels. Since 1975, CO_2 emissions have decreased substantially in Sweden (-50 per cent) and Denmark (-26 per cent). In Finland, CO_2 emissions have decreased since 1990 (-8 per cent). In Norway, CO_2 emissions have increased as an effect of growing oil- and gas-based industries, which have offset the effects of the decrease in CO_2 emissions elsewhere. Iceland, due to its small size and traditional reliance on geothermal and hydropower for heating and electricity generation, only accounts for 1 per cent of the total Nordic emissions. Iceland has recently increased its energy production substantially and established a number of energy-intensive production units, such as aluminium smelters, which have led to increased CO_2 emissions. It is also important to keep in mind that some of the structural reductions of CO_2 emissions in the Nordic region have been achieved through reallocation of heavy industries to other parts of the world where emissions continue, and the production may even be less emission efficient. Furthermore,

the transport sector, despite some progress, is still a large emitter of CO2 and a major challenge for the transformation towards a low carbon and resource-efficient society in the Nordic region.

Second, the emissions of the two main pollutants to water, nitrogen and phosphorus have been reduced significantly since their peak in 1981. These reductions need to be accelerated further, beyond the downward trend. Despite these improvements, the state of the Baltic Sea is still vulnerable, as most of the seabed is affected by eutrophication. Due to the limited interchange of water between the Baltic Sea and the oceans, it will take a long time for the sea to recover, even with continued positive developments. Signs of recovery are emerging however.
Third, the emissions to air have been reduced by pioneering initiatives to introduce catalytic converters and other domestic measures and by actions taken collectively with other countries, such as the creation of the Convention on Long-Range Transboundary Air Pollution (CLRTAP)[1] and actions within the EU and together with Eastern European countries.

Fourth, the Nordic countries have taken the lead to reduce chemicals in consumer goods and introduced one of the most effective eco-labels, the Nordic Swan Ecolabel, in the world twenty-five years ago. This eco-label has contributed significantly to channelling consumer actions towards more environmentally friendly products and played a role when, for instance, chlorinated paper was phased out. More recently, a new initiative has been taken to investigate the possibility of developing the criteria of the Swan Ecolabel for financial products such as equity funds.

Outside the Nordic region, the same pattern can be observed for the US, EU member states such as Germany, France, the UK, Austria, Belgium, the Netherlands, the Czech Republic and Hungary, and a number of others including some developing countries. This is a very positive sign as it shows that it is possible to grow the economy without a negative impact on the environment.

Nevertheless, the global development as a whole is less promising, with CO2 emissions still increasing by about 2 per cent annually. This development is illustrated in Figure 1.

CO2 emissions are closely related to the use of energy, since most of the emissions stem from combustion of fossil fuels for producing energy, either for generating electricity or heat. This relationship will be explored later in this paper.

Despite a relatively less carbon-intensive electricity supply and downward trend of CO2 emissions, the Nordic region has slightly higher per capita Greenhouse Gas (GHG)

1. The 1979 Geneva Convention on Long-Range Transboundary Air Pollution.

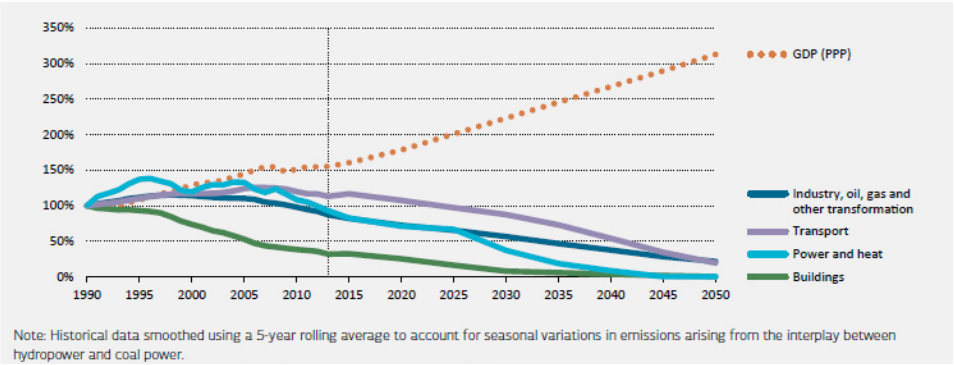


Figure 1: Correlation between GDP and CO2e development in the Nordic region.
Source: International Energy Agency.

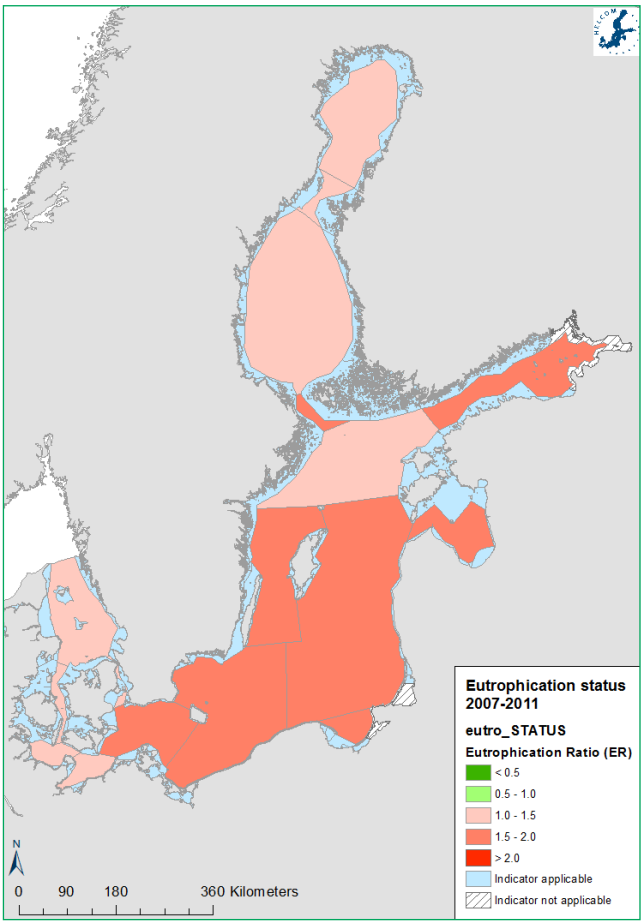
emissions than other industrialised countries in Europe. This is partly due to the cold climate and the prevalence of energy-intensive industries in the region.

Water pollution – Challenges remain in the Baltic Sea

Water pollution was recognised as a big problem in the 1960s when awareness of the unsustainable environmental trend started to rise. The problem was aggravated by the marine surroundings of the Nordic countries. The large, brackish water of the Baltic Sea is especially vulnerable to pollution because it is enclosed by land and only connects to the North Sea through the narrow and shallow straits, allowing only limited interchanges of water.

The water quality had started to deteriorate already in the 1920s. The deterioration was slow until the 1950s but accelerated in the 60s and 70s. The situation was worsened by eutrophication, which resulted in an increase in oxygen-free and dead bottom areas of the sea and large-scale changes to marine life, including a substantially reduced presence of fish (see figure 2). The figure shows that despite measures to reduce the external inputs of nitrogen and phosphorus to the sea, much of the Baltic Sea area is still affected by eutrophication.

The large increases in the 1950s and 60s were linked to the wider application of mineral fertilisers in agriculture and the growth of agricultural production as well as urbanisation. The reduction in the 1980s and 90s was associated with the introduction of more advanced municipal waste water treatment. In recent years the emissions of nitrogen seem to have stabilised, albeit at elevated



levels well above the target levels agreed by all the member states of the Marine Environment Protection Commission (HELCOM).

As a result of growing awareness of the problem, policies started to change on the western and southern sides of the Baltic Sea in the 1970s, and water management has since continued to improve in the Baltic catchment area, resulting in a considerable decrease in emissions. Poland, the Baltic States and Russia implemented advanced waste water treatment later, with effects on emissions from around 1997–2003. Even with sharply reduced emissions it will take a long time for the Baltic Sea to recover, and there is still

a need for further substantial reductions of emissions, mainly from agriculture but also from municipal waste water and industries. There have been signs of improvement of the water quality from around 2013, but a large part of the Baltic Sea is still affected by eutrophication (Figure 2) and the resulting large-scale algal bloom.

The policy context – A brief historic overview

In the 1960s, awareness of the environmental situation and the need to address it grew in all the Nordic countries. During the 1970s, the political systems started to address the matter seriously, and a number of institutions to monitor the conditions were set up. Policies, laws and environmental regulations were put forward, including integrated permits, more stringent standards and producer responsibilities.

Early actions adopted included regulations to reduce emissions of poisonous substances such as mercury, cadmium and lead as well as sulphur in fuels and pesticides. An important driving force was the intensive research on the effects of different substances on the environment. There was a collaborative effort between the industrial sectors using these substances and the scientific community, with a view to jointly identify solutions with minimal negative impact on the economy. Governments financed or co-financed research to enable reductions. Important steps taken included the introduction of compulsory unleaded petrol in the early 1990s and the complete ban on the use of mercury in Sweden in 2009 following some successful measures to curb the heavy metals emissions.

Regulations in the 1970s also started to limit emissions to air and the degree to which water must be treated before being emitted into lakes, rivers and seas, successively going from no or rudimentary mechanical treatment to also include chemical and biological treatment steps in the 1970s and 80s. This has since been complemented by further membrane treatment to remove plastic remnants in the waste water.

From the end of the 1980s, further economic incentives were also introduced in the form of taxes on pollution and larger scale subsidies for the introduction of new technologies such as renewables. Taxation on CO_2 and other greenhouse gas emissions as well as subsidies to support the development and deployment of renewable energy were also introduced. A shift was made from subsidising the energy use of heavy industry to subsidising the introduction of renewables. Other economic measures followed, including the Nordic countries becoming part of the EU's emission trading system and the creation of the integrated Nordic electricity market (Nord Pool).

The early steps were straightforward regulation by setting limits and enforcing them. Public financing occurred in the form of redirecting municipal funds towards financing waste water treatment and subsidies for research and development to find alternative

solutions to replace polluting processes. The main financing came from conventional funding sources, i.e. own resources of companies and municipalities (including tariffs) and, when loans were necessary, from commercial banks or other financing (bonds).

Regulations have been further developed in parallel with economic measures and incentives. Regional cooperation has played a role not only within the region but also beyond the regional borders, including measures to protect the seas within the framework of the Marine Environment Protection Commission (HELCOM).

Financing energy transition and climate change mitigation

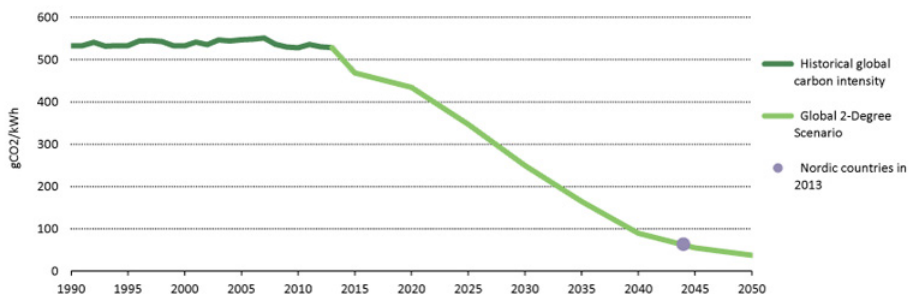
Introduction – the Nordic region as a forerunner

The global energy demand is currently in a period of unprecedented growth. Almost all of it is occurring in non-OECD countries. This growth will require huge investments in energy infrastructure, estimated at about USD 45 trillion in the period 2015–2030.[2] The choice is therefore whether countries will lock in a high carbon future in contrast to the Paris Agreement, which would expose them to market volatility, prospects for huge stranded assets and air pollution with its attendant public health and environmental impacts, or move towards a low carbon trajectory.

The Nordic region is better placed than many countries in the world to make the transition from fossil fuels to low carbon energy sources. It is also well advanced in moving in this direction. The IEA[3] has noted that the Nordic countries are "frontrunners in decisive policy actions towards clear, long term energy targets – including the establishment of interconnected grids and a common, liberalised power market."

Figure 3 shows that the Nordic electricity supply is already where the world needs it to be in 2045 for the 2° C temperature increase scenario to be realised.

Figure 3: Carbon intensity of electricity supply.
Source: Nordic Energy Technology Perspectives, 2016.



2. Better growth, better climate : The New Climate Economy, Global Commission on the Economy and Climate, World Resources Institute et al, 2015.

3. Ibid, IEA/OECD 2013.

Energy intensity and substitution

Energy efficiency improvements offer the greatest potential for near-term energy savings and emission reductions. Energy use per capita has remained almost unchanged since 1975 in Sweden, Norway and Finland, as in the Nordic region as a whole, whilst the economy grew by 129 per cent. Increased energy efficiency combined with structural changes has thus offset the effects of economic growth during this period. Table 1 illustrates the energy use relative to GDP growth and shows a significantly lower use of energy per unit of GDP over time in all the Nordic countries except Iceland

Table 1. Energy Intensity. Use of primary energy per unit of GDP in the Nordic countries (changes in per cent).
Source: IEA Database, 2016.

	1975-1990	1990-2013	1975-2013
Sweden	-10.5	-35.3	-42.1
Norway	-8.3	-9.1	-16.7
Denmark	-30.8	-22.2	-46.2
Finland	-9.1	-20.0	-27.3
Iceland	10.5	47.6	6.2

Much of this change is structural and mirrored elsewhere in Europe. The Swedish economy, for instance, has changed radically from the one based on heavy industries (forest, mining, steel, chemicals, shipbuilding, etc.) in 1975 to a largely service-based economy in 2013 (even the industry sector is now largely based on low-emission service inputs). This explains a large part of the reduced energy intensity shown in Table 1. Nonetheless, some industries are large emitters in the Nordic countries, especially steel,aluminium and mining.[4]

In addition, there has been large-scale substitution from fossil-based towards low-carbon energy sources. In 2013, only 17 per cent of the energy supply to the Swedish industry came in the form of oil, coal or natural gas. Electricity contributed 41 per cent, biofuels and waste 38 per cent and heat the remaining 4 per cent. These figures, compared with those for 1975 and 1990, show a radical reduction in the use of fossil fuels and a corresponding increase in the use of electricity (generated by nuclear energy, 58 per cent; hydropower and biofuel, 18 per cent each; and fossil fuels only 2.5 per cent) and biofuels over the period. An even stronger development in the same direction can be observed in “other” sectors (mainly housing,

4. The argument is sometimes brought forward that the reduction of GHG emissions in developed economies such as the Nordics is largely an effect of moving heavy industry to emerging economies. While there is admittedly an effect in this direction, it certainly does not explain the whole reduction of emissions since, at the same time, a huge substitution of fossil fuels for renewables has taken place, as explained in this report.

commercial and public buildings) where electricity, heat and biofuels contribute about 95 per cent of the total energy input. Only in the transport sector does oil still dominate (86 per cent), although in 2013 about 10 per cent of this sector was powered by biofuels and a small proportion by electricity.

The same factors play a role in the other Nordic countries, though different factors also contribute. Denmark has a similar trend to Sweden, with the energy intensity reduction being somewhat larger but the effects on CO_2 emissions still being smaller, due to less far-reaching substitution: fossil fuels still play a significant role in electricity generation (55 per cent), industry (53 per cent) and housing (25 per cent).

Norway has been the fastest growing of the larger Nordic economies during this period, mainly due to the expansion of the North Sea oil and gas sector, as well as industries based on these commodities. The build-up of these sectors has meant that the overall energy intensity has decreased much more slowly than in Sweden and Denmark. This has contributed to the increase of CO_2 emissions in Norway, even though most of the oil and gas are exported. Much of the increase in CO_2 emissions apparently stems from gas-fired power generation on the platforms in the North Sea. In addition, 28 per cent of the energy use in Norwegian industry comes from fossil fuels. Beside oil, coal and natural gas play a significant role. In the housing sector, 14 per cent of the energy used comes from fossil fuels. However, electricity is produced almost entirely (97 per cent) from renewables, mainly hydropower.

In Finland, energy intensity has been decreasing since 1975, at a pace somewhere between that of Norway and Sweden. CO_2 emissions, however, increased between 1975 and 1990 but decreased again between 1990 and 2013. After a period of decreasing use of fossil fuels, there was a rebound during the late 1980s. After 1990, the substitution of fossil fuels regained pace in favour of electricity (of which 33 per cent still comes from fossil fuels), biofuel and heat (some of which comes from CO_2-emitting peat).

Due to its small size, Iceland only contributes about one per cent of the total CO_2 emissions in the Nordic region, despite the large expansion of energy production during this period. Since the energy sector expansion is close to 100 per cent geothermal energy and hydroelectric generation, the energy expansion by itself does not contribute to the growth of emissions, though it does indirectly, since technology does not allow direct electricity exports across the deep water of the North Atlantic at competitive prices. Iceland has used a large part of the increased energy production to build up of energy-intensive industries such as aluminium smelters, which contribute significantly to GHG emissions.

Across the Nordic countries, there have been advances in the substitution of fossil fuels in the district heating sector – important in the

regional context due to the source of heating and the cold climate – notably by biofuels and heat pumps.

Growth of renewables

According to IEA, the total amount of renewable energy produced in the Nordic countries amounted to 47.6 Mtoe[5] in 2013. This was an increase of 55 per cent since 1990 and 135 per cent since 1975. Renewable energy sources include hydropower, biomass, geothermal power, and wind and solar energy but exclude nuclear energy despite it being non-GHG emitting.

With their production of hydropower as well as heat and power from biomass, Sweden, Norway and Finland had substantial production of renewables already in 1975, which for the three countries together has about doubled since then. Even more significant in relative terms is the substantial increase in Denmark, which started from a low level of renewable energy deployment in 1975. In Iceland, where renewables have always played an important part, energy production has increased very substantially as has the relative role of renewables. Both Denmark and Iceland have increased their production of renewable energy by a factor of about ten since then. In Iceland, the main sources are geothermal power and hydropower, and in Denmark the most significant part of the increase has been wind power.

The share of renewable energy in the primary energy supply of the larger economies varies from 25 per cent in Denmark to 37–38 per cent in Norway and Sweden. In Iceland, about 90 per cent of the primary energy supply is renewable. In Norway and Iceland, close to 100 per cent of the electricity production is generated from renewable sources. The corresponding figure for Sweden is 54 per cent, for Denmark 46 per cent and for Finland 36 per cent. In Sweden and Finland, a large part of the energy system is built on nuclear power. This is expected to decrease in Sweden, while Finland is expanding its nuclear scheme.

Power sector integration

Nord Pool

The integration of the Nordic electricity grid had already started before environmental awareness arose, allowing for more efficient use of electricity resources in the Nordic region.

In 1991, the Parliament of Norway decided to deregulate the market for electricity trading. In 1993, the transmission system operator Statnett Marked AS was established as an independent company. The wider Nord Pool market was created in 1996 as a result of the establishment of a common electricity market of Norway and Sweden, initially owned equally by the two national grid companies.

5. Million tons of oil equivalent.

Later, Denmark and Finland, and eventually the Baltic countries, joined the system, and they now share the ownership. Electricity market reforms have taken place in all the Nordic countries based on third-party access, competition in the wholesale and retail sectors and regulation of monopolies.

Crucial factors for the functioning of Nord Pool were extending the physical interconnections between the national grids, as shown in Figure 4, and introducing coordinated management of the grid based on market principles and rules for optimising the use of the grid (for instance, guaranteeing access for deliveries of wind power, continuous use of "must run" production such as nuclear power plants and using hydropower as a reserve).

The main effects of Nord Pool have been to create an effective electricity market in the Nordic-Baltic region, thereby creating common price formation and effective allocation of energy produced from different sources. This means, for instance, that energy is produced (mainly) by the most efficient production units. Characteristics of the Nordic power system are availability of large amounts of hydropower in Norway, Sweden and Finland, a significant proportion of nuclear power in Sweden and Finland, and a mix of fossil power generation and wind power in Denmark.

In Sweden, Norway and Finland, fossil-fuelled power generation is also in place, some of which provides high cost and high pollution reserve power for use if there is a lack of water, production unit closures or bottlenecks in transmission. The integrated market has meant that these reserve power units are needed less and could be scaled back with increasing integration of the market, in both cases with cost-effective and environmental benefits.

An important benefit of Nord Pool is that it allows efficient use of intermittent renewables (currently mainly wind power) despite wind farms only producing when the wind is blowing. Connection of wind power units to the grid means that they can deliver what they are producing with no risk to consumers because of the vast hydropower resources available to the net that can be used as reserve power when there is no wind and where water can be conserved. Systems have been introduced for handling the necessary subsidies to wind power units, partly using market mechanisms to make the system effective.

The success story of Nord Pool could be strengthened further by continued investments in capacity increases of the links between the connected national grids and, in some cases, also by further increasing the transfer capacity within the national grids.

In addition to the effects mentioned above, Nord Pool has had a greening effect outside the region because of the export of GHG-free power through the linkages. This may have applications in other parts of the world where interconnections are possible, such as

the Southern Africa Power Pool.

Thus, the experience in South Africa shows that Nord Pool could be replicated in other environments with positive effects on energy efficiency and facilitate the introduction of renewables, such as wind, solar power, biofuels, etc. through the balancing of intermittent energy sources against hydropower generation where energy can be stored.

Figure 4: The Nordic and Baltic Sea region: a highly integrated electricity system.
Source: European Network of Transmission System Operators for Electricity.

Facts: Nord Pool replicated in Southern Africa

Nord Pool has been advising the Southern African Power Pool (SAPP) on developing the power market in 12 countries within the Southern African Development Community

(SADC) since 2004.[6,7] The SAPP is now operating a market consisting of three different segments: FPM (Forward Physical Market), DAM (Day-Ahead Market) and IDM (Intra-Day Market).

Research in advance of the establishment of the SAPP found that the investment costs for introducing more renewable technologies into the future power system would be higher than for fossil fuels or nuclear energy; however, the cost-saving effects (i.e. fuel saving and the reduction of transmission and distribution investments) would far exceed the additional investment costs. Adding more hydropower to the SAPP would significantly reduce the average electricity generation costs. Furthermore, the financial requirements for interconnector investment were minimal compared with the resulting benefits of the international power trade.

The members of the SAPP have now created a common power grid (see Figure 5) between their countries and are developing a common market for electricity. Current plans being progressed include investment projects, further interconnecting the grid, ensuring third-party access for independent power producers and the development of a competitive market.

The market was initially restricted to the national power utilities of the SADC but has since opened up to non-SAPP members such as independent power producers and transmission companies, as long as these interconnect to the SAPP. There are currently 16 members, four of which are private entities.

As opposed to the Nordic model, the SAPP national markets have not been fully deregulated – there are still national incumbent power companies acting as single buyers and sellers of electricity, creating problems of efficiency.

Figure 5: The electricity grid of the South African Power Pool (SAPP).
Source: ESKOM, from the Global Energy Network Institute.

6. The Norwegian and Swedish Agencies for the Development Cooperation NORAD and SIDA have been two of the main contributors to the establishment and operations of the South African Power Pool (SAPP), based on the experiences from Nord Pool.
7. See "The Nord Pool Market Model", Hans-Arild Bredesen, February 2016.

Feed-in tariffs and green electricity certificates

Economic incentives[8] in the energy sector, such as state-guaranteed feed-in tariffs, have long been successfully deployed to encourage renewable energy producers to invest in generation capacity for sources such as bioenergy or wind power, as demonstrated by Finland and Denmark, respectively. In contrast, Sweden and Norway[9] support renewable energy producers through a market-based green electricity certification scheme covering both countries. In both cases, producers of renewables have a guaranteed right of delivery to the grid.

These incentive structures have also been successfully used around the world. However, more and more countries seem to be moving away from guaranteed feed-in tariffs (where the government takes the risk of lower than expected prices on electricity) and embracing competitive market-based processes to allocate capacity to the more mature renewable technologies of wind and solar power.[10] As these renewables become increasingly cost-competitive, direct support schemes globally are giving way to competitive market-based solutions.

Carbon pricing in the energy sector and industries

The Nordic countries have a long history of using economic instruments as a key element of their environmental policies, including carbon taxation and emissions trading.[11] Their results show how such policies can change consumer and organisational behaviour and reduce emissions while also stimulating the economy. Well-targeted measures make it possible to combine environmental improvements with economic growth by creating opportunities for green growth in areas such as electric vehicles and renewable energy technologies.

These economic instruments are designed to correct market failures by adjusting the prices of goods and services so that they also reflect non-monetary costs such as environmental impacts, according to the "polluter pays" principle. The Nordic countries widely apply all the main kinds of economic instruments, including "carrots" such as subsidies and "sticks" like targeted taxes, as well as emissions trading (led by the EU) to lessen the cost of reducing emissions.

8. A detailed report on The Use of Economic Instruments in Nordic Environmental Policy 2010–2013, was published by the Nordic Council of Ministers in 2014.

9. However, Norway may be leaving the certificate system after 2021 since little capacity based on renewables has been added to the Norwegian grid as a result of the system.

10. New Energy Outlook 2016, Global Overview, Bloomberg New Energy Finance.

11. "Ibid, Nordic Council of Ministers, 2014"

Carbon taxation

The Nordic countries have been pioneers in the deployment of carbon taxes since the late 1980s, giving energy users incentives to improve efficiency and switch to low-carbon or renewable energy sources. Today, such taxes are applied in sectors not covered by the EU ETS. Taxation levels on energy and, especially, on fossil fuels are generally considerably higher in the Nordic countries than elsewhere in Europe. Norway, Sweden and Denmark also impose taxes and fees on emissions of sulphur dioxide and nitrogen oxides. Several of these countries have been well represented in international initiatives to place a price on carbon, such as the Carbon Pricing Leadership Coalition launched at COP21 in Paris and the World Bank's Programme for Market Readiness.

The hypothecation or recycling of revenues for green financing, as opposed to the general budget, is an important opportunity. This has been achieved in, for example, Swedish NOx emissions from stationary combustion facilities that are recycled back to the industries. Proceeds from the fees are paid back to the plants based on the amount of energy used. This means that plants with low emissions compared with energy production are net receivers of funds, while plants with high emissions in relation to energy production are net payers.

Norway taxes carbon dioxide emissions from offshore oil facilities, while Sweden is one of just two countries in the world where landing fees at state-owned airports are environmentally differentiated with regard to the nitrogen oxide emissions of different aircraft types.

Emissions trading

The EU emissions trading system (EU ETS) is a cornerstone of the EU's policy to combat climate change and its key tool for reducing industrial GHG emissions cost-effectively. The system operates in 31 European countries and all the Nordic countries, limiting emissions from more than 11,000 heavy energy-using installations (power stations and industrial plants) and airlines operating between these countries, covering about 45 per cent of the EU's greenhouse gas emissions. The results should not be overestimated. Over-allocation of permits and the economic recession have reduced the price on emission rights and thereby the impact of the system on emissions.

Incentivising low-carbon transport

IEA/OECD[12] research modelled on the Nordic countries shows that transport requires the most dramatic cuts in emissions to achieve a carbon-neutral scenario, from 80 million tCO2e in 2010 to 10 million tCO2e in 2050. This requires limiting the growth in transport demand, a reduction in technology costs, a supply of sustainable biofuels and electricity, and modal shifts.

Progress has already been made. National road vehicle taxes across the Nordic region are widely based on emission levels to favour low-carbon cars. Vehicle registration taxes are typically based on specific fuel use or car-

bon dioxide emissions. In Sweden, cars with low CO2 emissions are exempt from vehicle tax for the first 5 years and given favourable tax rates thereafter. Incentives such as these have been proven to help enhance fuel efficiency as well as the use of biofuels, hybrids and electric cars.

The IEA carbon-neutral scenario requires 90 per cent penetration of electric vehicles by sales in 2050. Norway already leads the world in promoting the use of electric cars, with more than 100,000 electric cars on the road in May 2016. Electric cars are fully exempted from the (high) import tax and VAT, as well having been allowed to use public transport lanes (the latter is now changing in Oslo and other urban areas).

Sweden has introduced inner city road congestion tolls by imposing charges on most vehicles entering central districts of Stockholm and Gothenburg.

Fossil Fuel Subsidy Reform (FFSR)

Pricing reforms should include the removal of perverse incentives such as fossil fuel subsidies. Studies have shown that significant opportunities exist in developing countries for redirecting harmful fossil fuel subsidies to more productive use.[13] FFSR has been supported by the Nordic countries.[14] Subsidies for the consumption of fossil fuels globally were estimated at USD 550 billion in 2013, according to the International Energy Agency. A report[15] by IISD and the Nordic Council of Ministers modelled the impact of removing fossil fuel subsidies in 20 countries between 2015 and 2020. The results show that this alone would reduce national emissions, against business as usual, by an average of 11 per cent. By taking 30 per cent of subsidy savings and investing in renewable energy and energy efficiency, it is modelled that national emissions can be reduced further to an average of 18 per cent by 2020.

The Nordic countries have reduced such subsidies significantly to large users of fossil fuels. At the same time, subsidies have increased to develop and promote the introduction of renewable sources of energy. Some subsidies for energy-intensive industry remain in the form of lower energy taxes and lower CO2 taxes, which should be removed. There are some promising ongoing research programmes which, if successful, will reduce the use of fossil fuels considerably.

12. Ibid IEA/OECD, 2013.

13. The leaders of the Group of Twenty (G-20) countries agreed in September 2009 to phase out inefficient fossil-fuel subsidies over the medium term.

14. Set up in June 2010, Friends of Fossil Fuel Subsidy Reform (the "Friends") is an informal group of non-G20 countries aiming to build political consensus on the importance of fossil fuel subsidy reform. Current members of the Friends group are Costa Rica, Denmark, Ethiopia, Finland, New Zealand, Norway, Sweden and Switzerland.

15. Tackling Fossil Fuel Subsidies and Climate Change: Levelling the energy playing field, Global Subsidies Initiative, November 2015 available at http://norden.diva-portal.org/smash/get/diva2:860647/FULLTEXT02.pdf.

New green financial instruments

Green bonds

Green bonds are simply normal bonds emitted by companies that aim to raise funds for environmental projects using proceeds limited to financing specified environmentally friendly projects.

The early issuers of green bonds were multilateral banks led by the World Bank. Nordic participation was there from the start, with the Swedish commercial bank SEB arranging the first green bond issue of the World Bank. SEB has remained one of the largest arrangers of green bonds in the world. This issue was then followed by others, notably the European Investment Bank, the European Bank for Reconstruction and Development, the African Development Bank and the Nordic Investment Bank, the municipal banks of Sweden, Norway and Finland and others, such as a number of property-owning companies in the Nordics and worldwide for financing green buildings. Some corporates have followed suit, such as Apple with a USD 1.5 billion green bond emission to finance energy-efficiency investments in their factories.

Initially, the typical Nordic investors in the green bond market were pension and other savings funds, such as the Swedish AP funds, the Norwegian insurance company/pension fund Storebrand, and the Nordic Investment Bank (both an issuer and investor/buyer). Internationally, a number of large pension and other savings funds have invested in this market.[16]

The total volume of the green bond market has increased rapidly and the availability of data on the market size is uncertain. An estimate that the market will reach USD 133–158 billion by the end of 2016 was made by HSBC in January this year and can be compared with a total market for bonds internationally of some USD 1 trillion. A record USD 41 billion of green bonds was raised in 2015 to finance projects that help to reduce carbon emissions, such as renewable energy and energy efficiency schemes, according to Bloomberg. About 10–15 per cent of the green bond market seems to involve Nordic issuers and/or investors, which is disproportionate to the weight of the Nordic region in the world economy.

Two issues are constantly emerging in the debate about the green bond market, namely how to determine that a bond really is green and what effects it has on the market, notably including how it affects the financing of green projects.

How to determine that the bond i green is highly relevant to investors who want the willingness of their clients to “invest green” to materialise in very environmentally friendly projects. The answer is that a few

16. Some pension funds such as Pension Danmark and ATP in Denmark make significant investments in green projects but prefer to make them directly rather than investing via green bonds.

institutions have emerged that specialise in "rating" green projects according to their degree of improving the environment. The best known in the Nordic context is the Norwegian CICERO research institute, linked to Oslo University, which has moved from giving "second opinions" on projects to issuing various "shades of green" (dark, middle and light) ratings according to how environmentally friendly a project is. Det Norske Veritas, some German and French institutions as well as Moody's investment services also provide similar services.

What effects green bonds have on the market is much harder to answer. From an environmental point of view, it is positive that some funds are earmarked for investing in environmental projects and that these can be verified by third parties. However, until very recently, all environmental projects were financed using funds from conventional sources such as own funds of companies and municipalities as well as bank loans and bonds without the specific green label on the use of proceeds. So, the natural question is of course whether the specific green label has changed the conditions of the funds for green projects or whether that is going to happen in the future, if and when the market for green bonds expands.

So far, it has to be recognised that the interest rate and price of green bonds do not deviate significantly from other bonds with the same conditions (except for greenness), and where small deviations have been observed they go in both directions. In general, many investors are happy to invest in a green bond if the return on the investment does not deviate negatively from an identical "brown" bond. For the project developer who wants to finance an environmentally friendly project, the green bond does not appear to improve the conditions significantly. Only if investors were willing to pay a green premium on the bonds would the costs of financing green projects be lowered. It is too early to tell if this situation will change. It may be argued, for instance, that if the ratings were to develop into clearer assessments for the investors of the improved environmental risks connected with the projects, then a willingness to pay for this additional risk information might develop.

Portfolio decarbonisation

Decarbonisation of portfolios means that an investment fund or institution reviews its possible investment universe and screens every possible asset (e.g. stocks) according to its carbon footprint. The worst emitters are then excluded from the investment portfolio, thereby ensuring that the remaining portfolio is greener than the screened universe.

A number of Nordic Institutions have been leaders in this development, such as the Norwegian SPU Pension Fund, which excludes companies with more than 30 per cent of their income from coal (from the investment universe) and the Swedish AP (pension) funds.

This decarbonisation methodology has increasingly been used over the last five or so

years. The rationale for the procedure can be seen from two angles. First, by excluding the heaviest polluters it is ensured that the funds available are invested in a preferred way, for example in line with public policy. Second, the excluded assets could be seen as carrying a risk for the investor by, for example, having assets on its balance sheet that might become "stranded", i.e. worth less because of future legal or other restrictions as to their use. A third argument has also been put forward, namely that the polluting companies tend to be less profitable than the portfolio as a whole.[17]

Similar to green bonds, the volume of portfolios being screened for their carbon footprint or in other ways for polluting companies' shares has increased very rapidly in the Nordic region as well as elsewhere. As with green bonds, at least for now, it is also difficult to see that this method has had effects on the conditions for financing, for instance, fossil fuel. On the other hand, the issue of "stranded" assets is real. A Nordic example is the lignite-based power generation assets in Germany of the Swedish energy company Vattenfall, purchased as part of a corporate expansion in the late 1990s and now suffering a highly uncertain valuation.

17. The Swedish 4th National Pension Fund (AP4) has used this methodology to screen its portfolio and has had a considerably better return on the screened portfolio than the reference portfolio for four consecutive years.

Green banking

Green banking refers to banks with an explicit or implicit environmental mandate. In the Nordic-Baltic region, the Nordic Investment Bank, NEFCO and the municipal banks could be said to at least partly fulfil this criteria. These institutions all invest considerable funds into projects like waste water treatment, public transport, buildings with high environmental and energy-efficiency standards, wind farms, the introduction of smart meters into the power grid and power transmission links, both cross border and within the Nordic-Baltic countries. These latter investments will, for example, increase the efficiency of Nord Pool.

The importance of the green banks lies their ability, in various ways, to reduce the risks of financing environmentally important projects and thereby reduce the costs of financing. This is done through providing expertise, assisting project operators in developing "bankable projects" and by aggregating smaller projects into a larger pool that can attract funds on favourable terms, since the financiers can take the risk on the highly rated green bank rather than on each project or project owner. The green banks are set up to offer long-term financing of long-term projects, something that the commercial banks would not normally do.

The publicly owned green banks' ratings allow them to raise funds on favourable conditions, which in turn allows them to offer loans to their clients on favourable terms and strengthens the risk-bearing capacity of the institutions.

NIB and NEFCO

NIB

The Nordic Investment Bank was established in 1986 as a bank to promote integration in the region and facilitate financing of larger infrastructure and industrial projects in the member states. Whilst not part of its initial mandate, environmental aspects were singled out as part of the mandate, starting in the 1990s. In 2005, the Baltic States joined NIB as members and the 'home market' of the Bank was extended accordingly. The bank enjoys the highest credit ratings, including the AAA rating from S&P and Aaa from Moody's.[18] The Bank currently has an outstanding loan portfolio of about EUR 16 billion. The annual business volume is about EUR 2.5 billion.

NIB finances projects not only in the Nordic Baltic region but also beyond. A special Environmental Loan Facility (MIL) was set up in the 1990s. NIB, based on this facility, has played an important role together with other multinational finance organisations for financing waste water treatment plants and other environmental projects in north-west Russia, including St Petersburg and Belarus.

18. http://www.nib.int/about_nib/rating

Contributions of grants from the EU and the Nordic countries played an important role in enabling funding of these projects.

As a result of its clear environmental mandate and its active work in identifying, developing and financing such projects, NIB has always had the partial character of a green bank. However, NIB's lending, including its environmental projects, has, until recently, been through its normal financing, mainly normal bond issues based on NIB's favourable ratings. Starting in 2011, NIB has also raised funds through issuing green bonds, totalling close to EUR 2 billion for the period up to now.

NIB's green bonds are basically normal NIB bonds reserved for financing NIB's green investments. The selection criterion is projects with an environmental mandate rating of good or excellent, according to NIB's well-established and quite conservative internal mandate rating system. The green bonds are kept in a special "window" in the Treasury and are not used for any other purposes than financing green projects. Like other NIB bonds, the green bonds carry the risk of the bank as a whole, not that of individual projects or the green portfolio. NIB's framework for financing green projects by green bonds has been reviewed and given a "second opinion" by the Norwegian research institute CICERO. Through its financing of green projects, NIB is contributing to establishing a green finance market where green funds can find certified green projects. The rapidly rising availability of green funds on the market is also seen as an opportunity to tap into a new funding source for the green projects, thereby broadening the overall funding base of NIB. So far, NIB's green bonds have financed 36 projects by EUR 1.6 billion, and up to now, the funding costs have been the same for green as for normal bonds. The reduction of CO_2 emissions from these projects is estimated at more than 330,000 tCO_2.

NEFCO

The Nordic Environment Finance Corporation (NEFCO) is a small-scale International financial institution established by the Nordic Governments in 1990 to provide financing to projects from Central and Eastern Europe that reduce emissions affecting these countries as well as the Baltic Sea and polluting the air in the Nordic region. It does not, however, lend inside the Nordic region itself. Over the years, NEFCO has also administered many trust funds from countries and companies with a more general environmental aim.

NEFCO's main investment activities are funded from its Investment Fund, which is provided by the Nordic Governments. The annual business volume including all its funds is about 150 projects at a value of about EUR 100 million.

NEFCO's green financing is targeted at small and medium-sized projects (SMPs). NEFCO has participated in developing innovative financing instruments designed to improve the environment and combat climate change in its area of operations. Interventions are mainly related to renewable energy, energy

efficiency and the reduction of short-lived climate pollutants.

NEFCO has developed an ability to assist borrowers efficiently in the identification, development, implementation and administration of environmental projects and to make them attractive also to other financiers as well as enable scaling up. Through its ability to work with small-scale projects in a cost-effective manner, it has often found an appreciated place complementing larger multilateral financial institutions.

NEFCO is a small-scale but very successful specialised green bank. It is currently limited to lending in Eastern and Central Europe but has a global reach through its administration of trust funds. Through its fund assignments, it is active in more than 50 countries globally though the focus is on Eastern Europe.

NEFCO's mandate was recently extended to focussing on four areas: the Baltic Sea, the Arctic and Barents regions, climate change and green growth.

There is no identified need for new green financing institutions in the Nordic region. Public banks such NIB and NEFCO with their existing environmental mandates (having become stronger over the last years) can be expanded at much lower cost, as can the role of the four municipal banks.

Municipal banks

The municipalities have carried out much of the practical work, including financing many of the necessary investments. Important preconditions for this have been their relative economic and fiscal independence, allowing them to raise their own funds from tariffs, taxation and borrowing.

In Denmark, Finland, Norway and Sweden, specialised banks have been established to finance municipal projects. The main characteristics of these banks are their ability to borrow on favourable terms on the basis of being public institutions with the highest ratings and to lend long term for long-term projects. These banks were not explicitly started as green institutions and they also finance other than green projects.

Over time, however, they have all played an important role in green financing and have developed considerable expertise in doing so. They play an important role in pooling smaller green projects from less creditworthy project owners to be financed by the wider financial market against the risk of the municipal banks, thereby lowering the financing costs of the projects.

Kommunekredit (Denmark)

Kommunekredit (KK) was established to finance loans to all Danish municipalities and it is regulated by the government. A crucial feature of the institution is a joint and several guarantee by all members for all funding of KK (similar to that of the Swedish Kommuninvest). Kommunekredit lends to non-profit activities of Danish local governments, including for social, educational, housing and energy-efficiency purposes. Thus, it partially

fulfils a green bank function by financing important environmental projects. KK enjoys an AAA rating from S&P and an Aaa rating from Moody's. The annual lending in 2015 was EUR 3.8 billion, and the outstanding loan portfolio EUR 21 billion. KK funds itself by issuing bonds but so far does not seem to have issued any specific green bonds.

KK is part of the EU's ELENA (European Local ENergy Assistance) programme for mitigating climate change. Under this programme, the EU provides technical assistance loans and grants for local government investments into energy efficiency projects such as energy savings in buildings, public transport and infrastructure of up to 5 per cent of the investment costs.

Munifin (Finland)
Municipal Finance Plc is owned by the municipalities, the local public sector pension fund and the state. Its funding is guaranteed by the Municipal Guarantee Board, rated Aa1 by Moody's and AA+ by Standard and Poor's. The annual lending volume is EUR 2.5–3 billion and the loan book about EUR 20 billion.

Munifin finances projects relating to infrastructure, health care, education and the environment. Munifin has a long history of financing environmentally friendly projects. Green financing is offered to selected projects that promote the transition to low-carbon and climate-resilient growth, seek to mitigate or adapt to climate change. Munifin, like the Norwegian Kommunalbanken, offers a margin discount for all green projects. The amount of discount is based on the project categorisation provided by Cicero. In essence, the greener the project, the bigger the discount. The majority of the eligible projects are long-term projects with maturities varying from 5 to about 40 years.

Munifin's inaugural green bond is planned to be launched later in 2016. Munifin aims to issue one benchmark-sized green bond per year. This represents approximately 15 per cent of the annual gross lending volume. The aim is to finance green investments by its green bond issues.

Kommunalbanken (Norway)
Kommunalbanken (KBN) is a 100 per cent state-owned agency for financing the local government sector in Norway. It is the third largest financial institution in Norway with a loan book of some NOK 260 billion. The bank enjoys an implicit-explicit state guarantee by a support letter from the government and is rated AAA/Aaa.

KBN finances about half the investments of the local government sector in Norway. Local governments in Norway are important to the application of emission and energy reduction measures: an estimated 20 to 40 per cent of the emission cuts pledged by the Norwegian state are subject to municipal and regional policies. In 2009, Norwegian municipalities were required to make climate and energy plans, and targets for CO_2 emissions were introduced.

KBN introduced its green lending programme in 2010 funded by the bank's first green issuances in the market the same year. CICERO has assessed KBN's Green Bond Framework: the latest version (2016) was given the Dark Green grading.

A unique feature of KBN's green lending programme is that it offers a special green rebate of 10 basis points on interest rates for green projects. For a project to be granted the green rate, it has to meet KBN's category-specific eligibility criteria.

Kommuninvest (Sweden)

Kommuninvest was created in the mid-1980s by a number of municipalities and county councils in mid-Sweden aiming to pool their borrowing needs and bypassing a banking cartel by borrowing jointly on the international market. A key feature of Kommuninvest's structure is a joint and several guarantee agreement between the members for all current and future borrowing by Kommuninvest. The institution enjoys ratings of AAA from S&P and Aaa from Moody's. The annual lending is about SEK 120 billion and the outstanding loan book SEK 250 billion. Kommuninvest's share of the total borrowing of the municipal sector in Sweden was 47 per cent in 2015.

Kommuninvest also has the function of aggregating smaller municipalities' loans into a sufficiently large pool to be financed. For investors, they add the benefit that they are not taking the risk on any individual projects or even municipalities but on a large part of the local and regional government sector joint and severally.

Kommuninvest has been financing green investment projects by its members for many years without raising specific green funds. The first dedicated green fund was raised this year, with the issuance of a green bond. Kommuninvest expects its Green Loan portfolio to grow to 15–20 per cent of all lending in the near future and to issue green bonds regularly. Kommuninvest's Green Loan portfolio is presently worth USD 1.1 billion. Like other green banks, Kommuninvest has a screening committee in place to verify that projects are sufficiently green.

Engaging the private sector

In the Nordic countries, environmental regulations and economic incentives have created a demand for green investments financed through primarily private funds. This development has been gradual. Giving the the anticipated high risks and market uncertainties during the early stages, public funds – both subsidies and lending – have been required, at least initially, to catalyse conventional private funding.

The long-term objective has been to gradually remove subsidies and public financial support and encourage market-oriented solutions.

Another example can be seen in Nord Pool. The creation of a transparent, deregulated and easily accessible electricity market has enabled more efficient use of existing energy assets and resources. No public funds are used for investment in the market. The creation of a larger and more efficient electricity market has also facilitated the introduction of renewable energy as a viable alternative to fossil-based power generation.

In this context, it could also be noted that, over time, open public debate concerning environmental challenges has strengthened public knowledge, insight and support for remedial action. Enhanced political backing of environmental improvements in general has subsequently, in turn, facilitated the establishment of predictable and stable regulatory development. Broad public support and committed political backing have both been important for mobilising private capital and creating an enabling market environment with predictability and stability.

Increased public awareness of environmental and climate challenges has further strengthened the demand for green financial products (see page 26f). The financial sector is beginning to respond to this demand by engaging in green bonds and decarbonisation of financial assets portfolios. It is still too early to draw firm conclusions of this development. , but the moving away from investments and companies with an insufficiently green profile could be expected to push investment managers to improve the environmental sustainability of projects going forward.

There is also a Nordic interest in buying green bonds globally. However, standardisation and project development (including identification) need to improve. Green standards should be harmonised, e.g. through harmonised second-opinion practices and/or eco-labelling, such as the Swan.

Conclusions and recommendations

A key contributing factor behind the success story of the Nordic region has been to get the right policy mix, i.e. regulations and financial incentives (taxes and subsidies). At the same time, it has been important to ensure that financial resources are available for green investments, not least to the important municipal sector. The importance of policies (i.e. well-directed regulations), such as setting emission caps to water and air, energy use in buildings, etc., and enforcing them, in combination with public financing for innovation and technology development, should not be underestimated.

Getting the incentives right also means ensuring that subsidies go to improving energy efficiency and the environment and that taxation on, for instance CO_2 emissions, is used to reduce emissions. It also involves the elimination of perverse incentives such as giving tax rebates to heavy users of fossil fuels.

However, the pattern of regulations, economic incentives and disincentives in the Nordic region is a complex policy measure mix that has taken a substantial period of time to be developed.

The experience of integrating the power grids in the Nordic-Baltic area has been very important for increasing the efficiency of the power system as well as for reducing the use of polluting power production and for the smooth introduction of power generated from renewables. In many parts of the world, solar power could play the same role as wind power does in the Nordic-Baltic region. They have many characteristics in common, notably their intermittent availability, which in an integrated grid can be balanced against, for instance, hydropower. Rapid technical development has been achieved and is ongoing in the field of solar-generated electricity, as has been the case for wind power.

It has also been shown that Nord Pool could be replicated and adapted to circumstances elsewhere with positive effects on energy efficiency and facilitate the introduction of renewables such as wind, solar power, biofuels etc. through the balancing of intermittent energy sources against hydropower generation were energy can be stored.

So far, rather conventional sources (own resources of companies and municipalities, directed government grants and borrowing from banks or through bonds) have financed practically all environmental projects in the Nordic region. The role of policies has largely been to create a demand for environmental investments, which have then been financed, to the extent necessary, by the general financial market, directly or through intermediaries like the green banks.

An important factor behind the Nordic development is the financial properties of local government. Municipalities in the five Nordic countries enjoy a significant degree of economic independence based on the constitutional rights of local government to raise its own taxes and loans. In addition, local governments are subject to a stable set

of laws, regulations and (rather limited) state financing. Amongst the important requirements imposed by the central governments is a requirement on municipalities to balance their budgets. This set-up makes Nordic municipalities creditworthy, and many of them have ratings close to those of the sovereigns. Green banking has been important in the Nordic-Baltic context, raising low-cost funds through the high creditworthiness of the green banks and their provision of long term financing and expertise for developing bankable green projects. This function is mainly provided by International Financial Institutions (IFIs) in emerging markets. The green capacity of the IFIs could be strengthened. The establishment of the new Asian Infrastructure Investment Bank (AIIB) provides an opportunity for adding green bank capacity to the Asian financial system. Here the experiences of NIB have been of interest. The creation of specialised green banks, which has been done in the Nordic region, could also be contemplated, in which case the Nordic experiences could be useful.

The long-term importance of green bonds and carbon screening of portfolios is still difficult to assess, though the momentum of both are impressive. The rapid development of these instruments should be welcomed as a means of broadening the financial base for environmental investments (green bonds) and reducing the risks connected with fossil fuel-based assets to the financial markets (decarbonisation).

Whether the expansion of the demand for green bonds will eventually lead to a price premium on green versus conventional bonds will depend on the balance between demand and supply of green bonds as well as the allocation policies of pension funds and other savings institutions. If this were to happen, green bonds would have the potential to lower the financing costs of environmental projects. However, this has not yet been the case. Green bonds are attractive as an alternative to conventional bonds but, so far, only if they can be held at the same price, ceteris paribus.

Looking ahead, the long-term objective of the green transformation of the financial system is to gradually remove subsidies and public financial support while market-oriented solutions and private sector engagement need to be the driving forces. This is the key to a green transformation – with speed and scale, for both the Nordic countries and globally.

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The rationale behind this work is the idea that Nordic experiences and practices of green financing could be relevant in a global context – to both G20 and non-G20 countries. Nordic solutions – including technology, market expertise, policy measures and financing models – that have proven successful in a domestic and/or a regional context are explored and assessed in terms of their applicability to international markets. The objective is to identify solutions that can be scaled up in the short and medium term to accelerate the transformation towards a green(er) financial system.

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