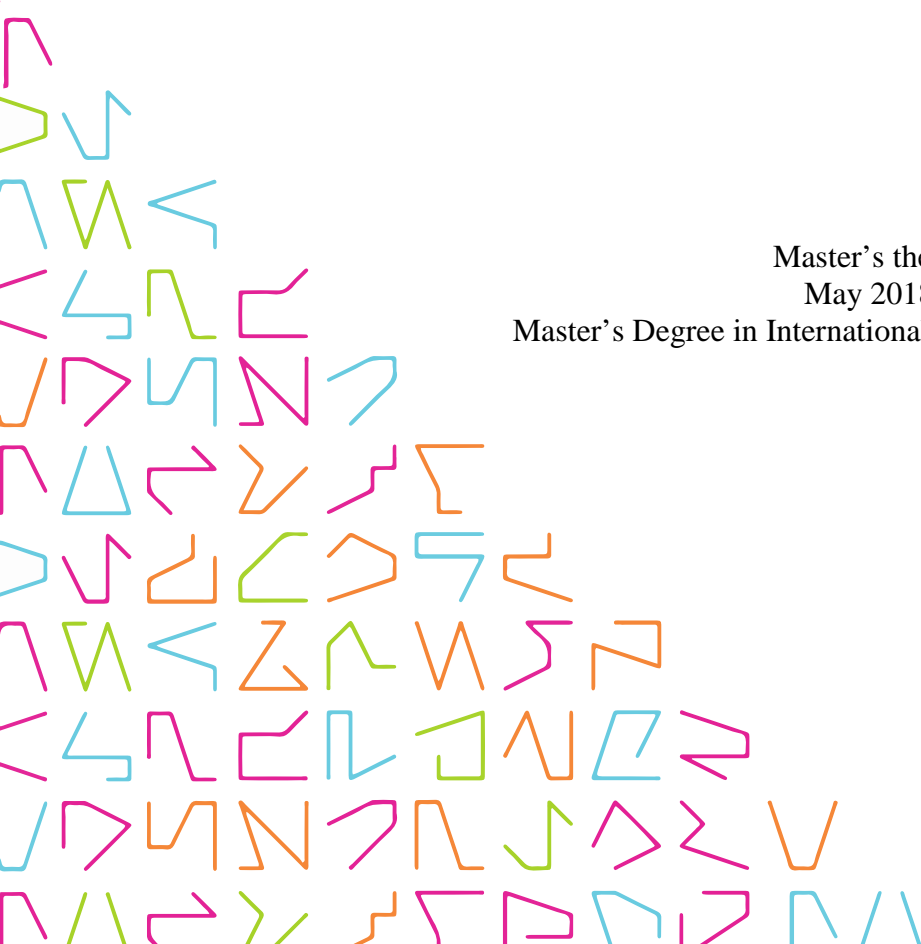


INNOVATIVE APPROACHES TO ENVIRONMENTAL FINANCING: NORDIC INVESTMENT BANK

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Master's thesis
May 2018
Master's Degree in International Business Management



ABSTRACT

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Innovative Approaches to Environmental Financing: Nordic Investment Bank

Master's thesis 55 pages, appendices 0 pages
May 2018

The purpose of this thesis was to propose to the international financial institution Nordic Investment Bank (NIB) a set of innovative financial tools and methods they may consider for future engagement in environmental investments.

A case study research method was used to research NIB and an interactive model to research the financial industry; these two methods were used to produce an overlapping set of findings which could then be used to develop a set of proposals. The case study found NIB to be a dual mandated bank operating mainly using loan instruments but also with the capability to provide different types of financing (via trust funds and guarantees); however these options were either no longer in use nor part of NIB's main business activities.

The financial industry was researched from two perspectives: that of traditional financial institution's that engage in impact investing and blended finance; and the solutions being developed and deployed in the alternative finance sector, namely blockchain and crowdfunding. These types of financing were defined and put into context within the financial industry; examples of each were also provided. The findings showed that NIB already had a number of financial instruments that are used for impact investing and blended finance, but had nothing suitable in place for the alternative finance solutions. However the low barriers to entry with the FinTech solutions would provide an easy testing ground for NIB to engage in new areas of environmental financing with the potential to de-risk some investments.

The first proposal is a revolving fund for long term environmental finance. Donors pay contributions into the fund which is then used for long term loans; repayments and interest are then re-used within the fund for new projects. The second proposal is establish a small portfolio of blockchain based token investments in the clean energy sector; this would make use of NIB's lending expertise in the energy sector and its capable Treasury department set up.

Key words: environmental finance, international financial institution, impact investing, blended finance, FinTech, blockchain, crowdfunding.

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ABBREVIATIONS AND TERMS

FinTech	Finance and information technology
GICS	Global Industry Classification Standard
GIIN	Global Impact Investor Network
ICO	Independent coin offering
IFI	International financial institution
NACE	Statistical classification of economic activities in the European Community
NIB	Nordic Investment Bank
OECD	Organisation for Economic Co-operation and Development
R&D	Research and development

1 INTRODUCTION

“The important thing for Government is not to do things which individuals are doing already, and to do them a little better or a little worse; but to do those things which at present are not done at all.” (Keynes 1926, 46)

Innovative actions backed by government policy and investments are in evidence dating back hundreds of years. At times this has required innovation in the type of financing required, such as the formation of the joint stock company acting as an early vehicle of public-private financing; the first instances it was used was during the period of global exploration to fund voyages of discovery around the world and the subsequent establishment of trade routes (Ferguson 2008, 126-138). Further stages of development followed in canal and later railroad building greatly enhancing the infrastructure to further enable the industrial revolution (Baskin & Miranti 1999, 132).

The signing of the Paris Climate Accord in 2015 marked a moment in which global governments realised the risks and dangers posed by effects of climate change, and agreed to take action; one of the key aims of the accord is “making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.” (UNFCCC, 2018). To successfully tackle climate change requires scaling up public and private sector investments to finance the shift to low carbon economies and climate resilient infrastructure (OECDa, 2014). This challenge requires innovation from many areas, including the financial sector. How private sector financing from a technological perspective and how public organisations are rising to this challenge is a central theme of this thesis.

1.1 Background

Nordic Investment Bank was founded in 1976 following oil crises, with the original mandate to increase competitiveness and co-operation in the region. Over time its role was enhanced to include an environmental mandate in response to concerns about climate change. It is NIB’s role today that is a (one of the) key theme of this thesis. There has been discussion amongst NIB’s owners and, some articles in the media (Wihtol 2014) about NIB developing and expanding its operations to match those of a so called ‘green investment bank’. Furthermore, academics have been doing extensive research

into the role of Governments/State into how they are and can be drivers of innovation - especially in environmental investments. Mariana Mazzucato (2014, 2015) has a number of works published on this subject. This thesis is written in the context of what possible new approaches or methods an institution of NIB's size and scope could take in order to increase its level of investments in environmental financing. It will investigate and report how NIB may advance its activities in investing in environmental projects using new financial approaches.

The definition/meaning of environmental finance in this thesis is in line with NIB's mandate (see section 2.3), and what it considers a project that enhances the environment, which is financing that: improves resource efficiency, develops a competitive low-carbon economy, protects the environment and its ecosystems, and development of clean technology.

1.2 Aim and objectives

The aim of this thesis is to develop a suitable set of proposals for NIB of innovative financial tools and methods they may consider for future engagement in environmental investments.

In order to achieve this, the thesis:

1. Researches and analyses NIB - the type of institution it is, its purpose, customers and financial activities
2. Researches and analyses innovative trends/actions in the financial industry - both by investors and investees.

1.3 Research questions

The below question and sub questions guided the research for this thesis:

- How can NIB increase its investments in environmental projects using innovative financing instruments?

Sub questions:

- How are financial institutions developing their environmental financing methods?
- How are the technological advancements in the financial technology industry (FinTech) altering the methods and means of financing environmental projects?

1.4 Methodology

“The activities of collecting and analysing data, developing and modifying theory, elaborating or refocusing research questions, and identifying and eliminating validity threats are usually all going on more or less simultaneously, each influencing all of the others.” (Maxwell 1996, 2)

1.4.1 Type of research

This thesis is applied research, which is conducted for an organisation. A central topic of this thesis is Nordic Investment Bank which is the authors place of work.

The purpose of this thesis was to understand the context and environment in which NIB is operating and how this may develop alongside innovations in environmental financing. There is a lot of available data on the financial industry enables this research to be descriptive.

Qualitative data is the main source of information for this thesis due to its focus on interpretation and understanding, allowing for a more holistic comprehension of a topic (Erikson & Kovalainen 2011, 5). Researching an organisation like NIB for this thesis topic would not have been sufficiently serviced by quantitative data; the political and environmental aspects alone require broader interpretation that quantitative research could not have provided. A strength of qualitative research is that it focuses on specific situations and carries an emphasis on words instead of numbers (Maxwell 1996, 17). However where applicable, qualitative research was used. A qualitative research approach allowed me to make use of the good working relationships I already have at NIB, and also the other Nordic financial institutions as well as a variety of other different approaches.

Joseph A. Maxwell (1996, 21) states that of three practical purposes of qualitative research, one is that it generates and credible results and theories that are understandable to both those being studied and to others. This is thesis is business research for a small organisation with a multitude of experts in different fields, a qualitative approach makes the results accessible to most.

1.4.2 Research design

The research required for this thesis is grouped in two areas, the first being NIB as an IFI and its current scope of operations and second, the research in the broader financial industry. As such the research design for this thesis is using two approaches: case study, and an interactive model (Maxwell 1996).

A case study strategy was adopted to research NIB. Erikson & Kovalainen (2011) detail two different types of case study: intensive (single case) and extensive (multiple case). An intensive or 'classic' case study focuses on an individual case that is being studied due to it being exceptional or unique and the need/desire to learn more about it. An intensive study may explore the case in its economical, social, cultural, technological, historical and physical setting. Extensive case study research does not have a single focus but instead encompasses multiple cases because there is little or no theory that needs to be developed or elaborated (Erikson & Kovalainen 2011, 118-119).

An intensive case study was used with NIB as the focus. NIB may not be unique in the type of organisation it is, but for its size, location and scope of operations it is one of a kind. Yin (2014) provides four formal case study designs also based on using single or multiple cases, with more detail than Erikson & Kovalainen (2011) on the structure. For the case of NIB I used a single case design; the rationale for this being that it is a fairly unusual case and its activities were studied from longitudinal perspective using data from the previous five years.

Maxwell's (1996) interactive model of research design (see figure 1) was used for the questions concerning the financial sector as a whole due to it being an interconnected and flexible structure (Maxwell 1996, 3). These questions are intended to examine different aspects of innovative environmental financing but remain connected to NIB and the overall aim of this thesis. As such the findings of any piece of this research (which

is forward looking in nature) had the potential to set off a different line of enquiry, such as the size and current reach of the financial sector. The interactive model recognises the importance of interconnections and allows the researcher to move between the design components when required (Maxwell 1996, 5).

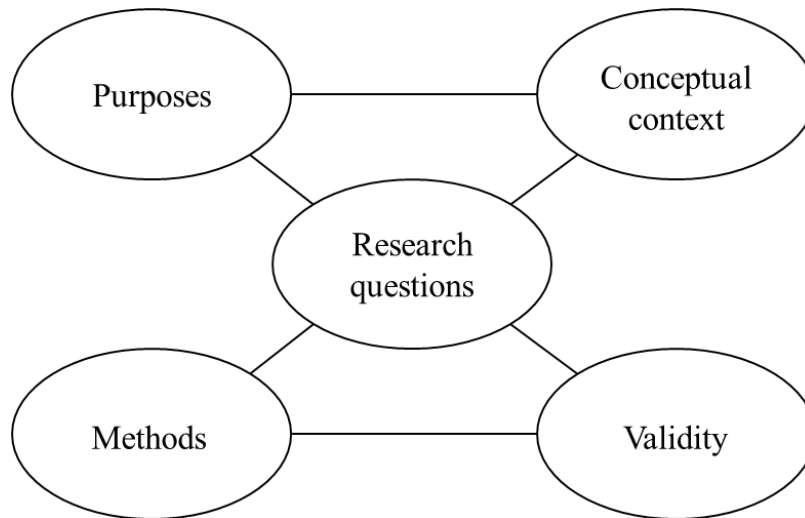


Figure 1. An interactive model of research design (Maxwell 1996, 5)

The financial industry research is two pronged, one aspect is on the institutional (top down) approaches to innovation in finance and the other how potential investees (bottom up) in the financial technology sectors are innovating. This enables recommendations to be both strategic suggestions and more exploratory in nature.

The research design of the thesis whilst using two different approaches overlaps; and remains focused on the research questions and overall aims and objectives (see figure 2).

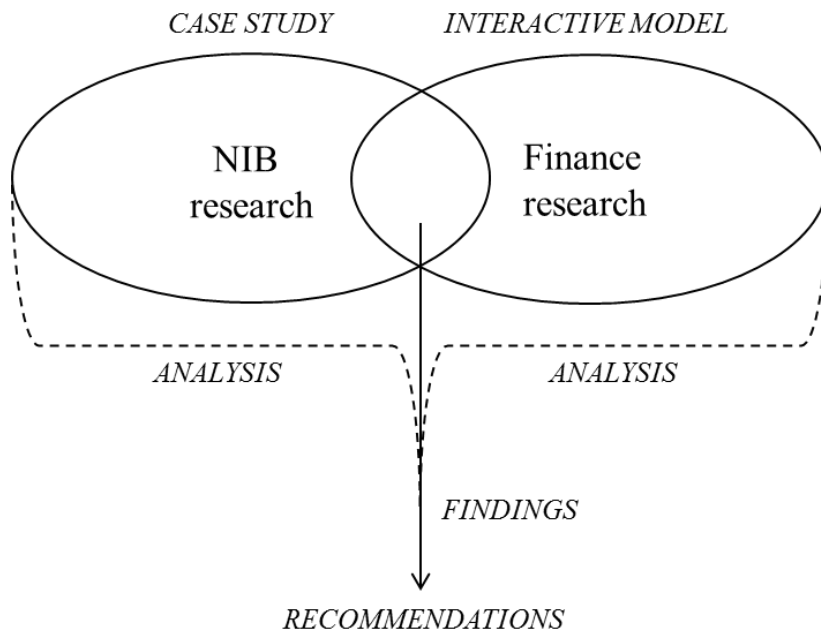


Figure 2. Research design

An extensive case study design with multiple cases was considered also to encompass the financial industry research but was deemed to be too restrictive to focus on only specifically chosen organisations as cases; especially considering when researching innovation. Concerns about the objectivity of selecting comparison organisation, and time and resource restrictions also were taken into consideration when deciding not to use an extensive case approach.

1.4.3 Data collection and analysis

Data for this thesis was collected using a variety of different sources and methods. Erikson & Kovalainen (2011, 126) divide empirical data used in case studies into two areas: existing empirical data and data produced for the project in question. The type of existing data about NIB used was documents (annual reports, progress reports etc.), archival records (organisational), media texts (journals and newspaper articles) and digital materials.

Yin's (2013, 118-129) four principles of data collection will be adhered to when gathering data for the case study:

1. Use multiple sources of data
2. Create a case study database
3. Maintain a chain of evidence

4. Exercise care when using data from electronic sources

To collect data on the financial sector as a whole the sources and methods mentioned above were used; purposeful sampling as part of the interactive model will be used as a principle for data collection (Maxwell 1996, 70). To research emerging financial technology, the start-up event Slush 2017 Helsinki was attended by the author. Key themes at the 2017 event were (amongst others) proposals to solve problems related to sustainability and climate change.

In order not to restrict the analyses an inductive orientated analyses strategy (Erikson & Kovalainen 2011, 129) was used with all data collected for this thesis, also described by Yin (2014, 139) as developing a case description. With this approach there was no pre-set or formal coding; this allowed for a more direct interpretation of the research. The research questions always remained as a guide to the analyses, but as described above they were refined as the research and analyses of the thesis progressed. Real life examples were used to demonstrate the solutions where appropriate.

1.5 Limitation & structure

NIB is a well-established provider of long term loans, these loans and lending programmes take various formats. These products will not be analysed in detail as the focus of this thesis is investigating alternative methods of investing that may be appropriate to NIB.

This thesis is structured in five further sections. Sections two and three are research based; first of which is the case study about NIB which describes its history, the type of organisation it is, its mandate, lending and customers, and the financial instruments it has at its disposal. Section three is split into two areas of financial research; firstly how financial institutions are developing new approaches to finance in the form of impact investing and blended finance; and secondly technological innovations that are emerging from the finance and information technology (FinTech) sector namely blockchain and crowdfunding.

The findings in section four brings together the research from sections two and three and compares and identifies similarities in the financial instruments used, the types of financial operations, the alternative finance operations as well as the convergence in the approaches.

Section five contains two proposals to NIB to consider, the first establishing a revolving fund using crowdfunding technology; the second setting up a portfolio for investment in blockchain based tokens.

Section six concludes the thesis by providing a general overview and final remarks.

2 THE CASE ORGANISATION - NORDIC INVESTMENT BANK

‘All multilateral institutions are originally established to solve problems’ (Bøås & McNeill 2003, 6).

2.1 History in brief

At the beginning of the 1970’s the Nordic economies were enduring the severe effects of the ongoing oil crises. Due to tight regulation of capital markets, and requirements for approval of all cross-border transactions they were suffering individually in relative economic isolation (need a reference); however a solution to this crises was envisioned in a spirit of closer cooperation. The idea to establish a credit worthy institution to support cross border activities and promote the integration of the Nordic economies, with better access to international capital markets was taken upon. The Nordic governments set about creating an investment bank to finance long term infrastructure projects in the region (NIB 2016).

In 1975 the Nordic Investment Bank was established by Denmark, Finland, Iceland, Norway and Sweden with the headquarters in Helsinki (NIB statutes). The authorised capital stock of the bank was split between each country with Sweden having the largest share (see figure 3).

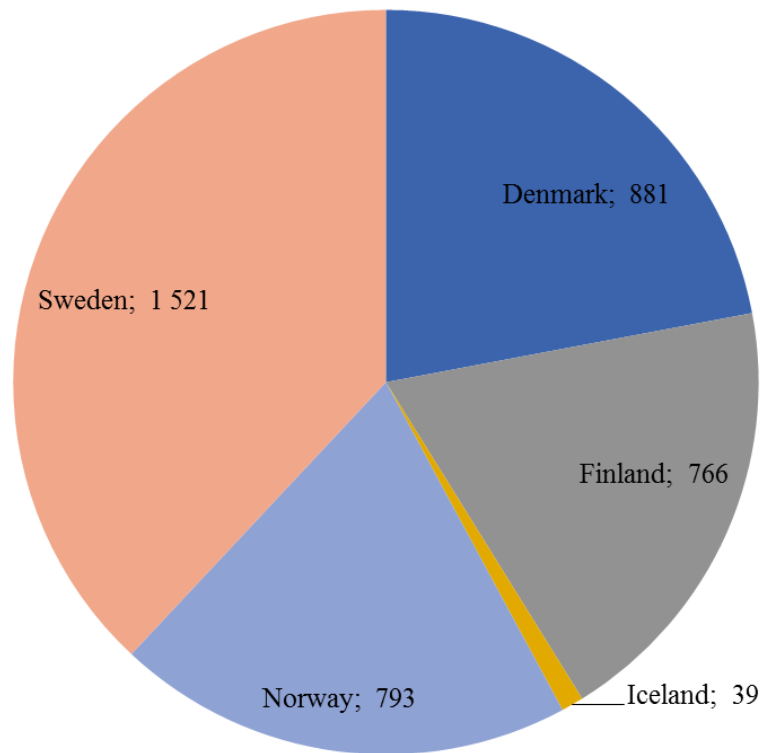


Figure 3. NIB pre Baltic expansion authorised capital 2004, EUR million (NIB 2017c).

Soon after the opening of the first office premises operations began in earnest in 1977 with the first loan agreement being signed and the first transaction taking place on the international capital market. Five years later NIB received the highest credit rating; following up this success the following year with its very first loan outside the member countries. During the 1990's NIB steadily increased its activities in the Baltic countries and its levels of environmental investments (NIB 2017).

In 2005 Estonia, Latvia and Lithuania became members of NIB, and the share capital was revised as shown in figure 4.

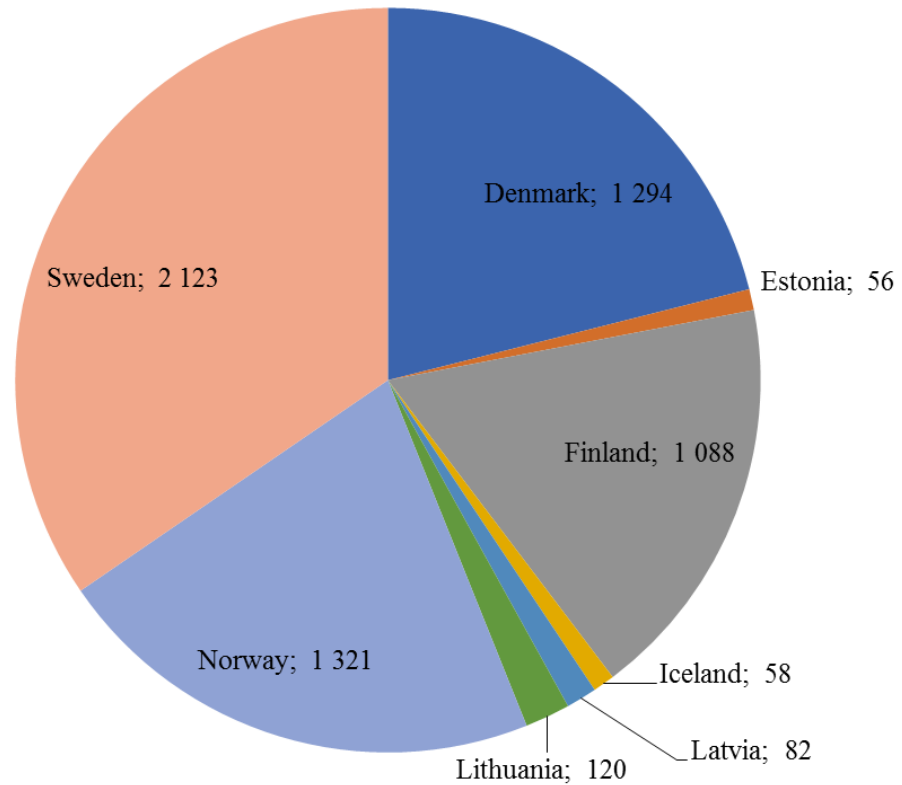


Figure 4. NIB 2017 authorised capital, EUR million (NIB 2017b).

The authorised capital was last increased in 2011 in response to the financial crises. At the end of 2017 NIB had 193 employees in permanent positions.

2.2 An international financial institution

NIB identifies itself as an international financial institution, comparable with the European Investment Bank and the European Bank for Reconstruction and Development (NIB 2017a). These types of institutions are also referred to as ‘multilateral financial institutions’, ‘regional financial institution’, ‘multilateral investment bank’ and ‘public investment bank’ amongst others (Skidelsky et. al. 2012, 12).

It was during the Bretton Woods conference in 1944 it was agreed that the first global international financial institutions be created: the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD) (Cissé et. al. 2012, 10).

These kind of institutions are typically owned and mandated by more than one national government and are not bound by the laws and legal institutions of the host country. The purpose of establishing multilateral institutions is to solve a common problem (Bøås & McNeill 2003, 6) and as such their governance, functions, and membership are shaped by the geopolitical realities at the time of their creation (Cissé et. al. 2012, 10). The inter-governmental nature of these organisations often provides them with great resources and reach, but also finds them at risk if being encumbered by political groups, whose individual interests are bonded to their own national manifestoes, which may not be consistent with the other owners/members of the institution (Bøås & McNeill 2003, 7).

Multilateral organisations have a similar governance structure/or blueprint for multilateral governmental cooperation consisting of:

- Board of Governors - high level decision making, meet occasionally
- Board of Directors - representatives for owner/contributing/member country Governments, regularly meet - in larger organisations these can be a ‘full time’ board who are permanently based at the organisation performing their duties
- ‘Head’ or CEO of the organisation and management team
- The administration, general staff

The three main functions of multilateral institutions are project assistance, programme lending and policy advice (Bøås & McNeill 2003, 12). NIB differs from this description as it is more of a collaborative institution and not a source of policy advice. Instruments of operation are detailed in section 2.4.

Multilateral institutions use their strong capital base to regularly raise funding on international capital markets typically through bond issuance. This places a high level of significance on the credit rating attributed to them by the major rating agencies (Standard & Poors, Fitch) as this has a direct impact on the cost of their borrowing. NIB is no different in this respect; they have the highest AAA rating and during 2017 raised EUR 5.9 billion in new funding (NIB 2018b). Figure 5 below is a high level diagram showing NIB’s operations from borrowing money on the capital market, using the funds to lend to customers for mandate suitable projects.

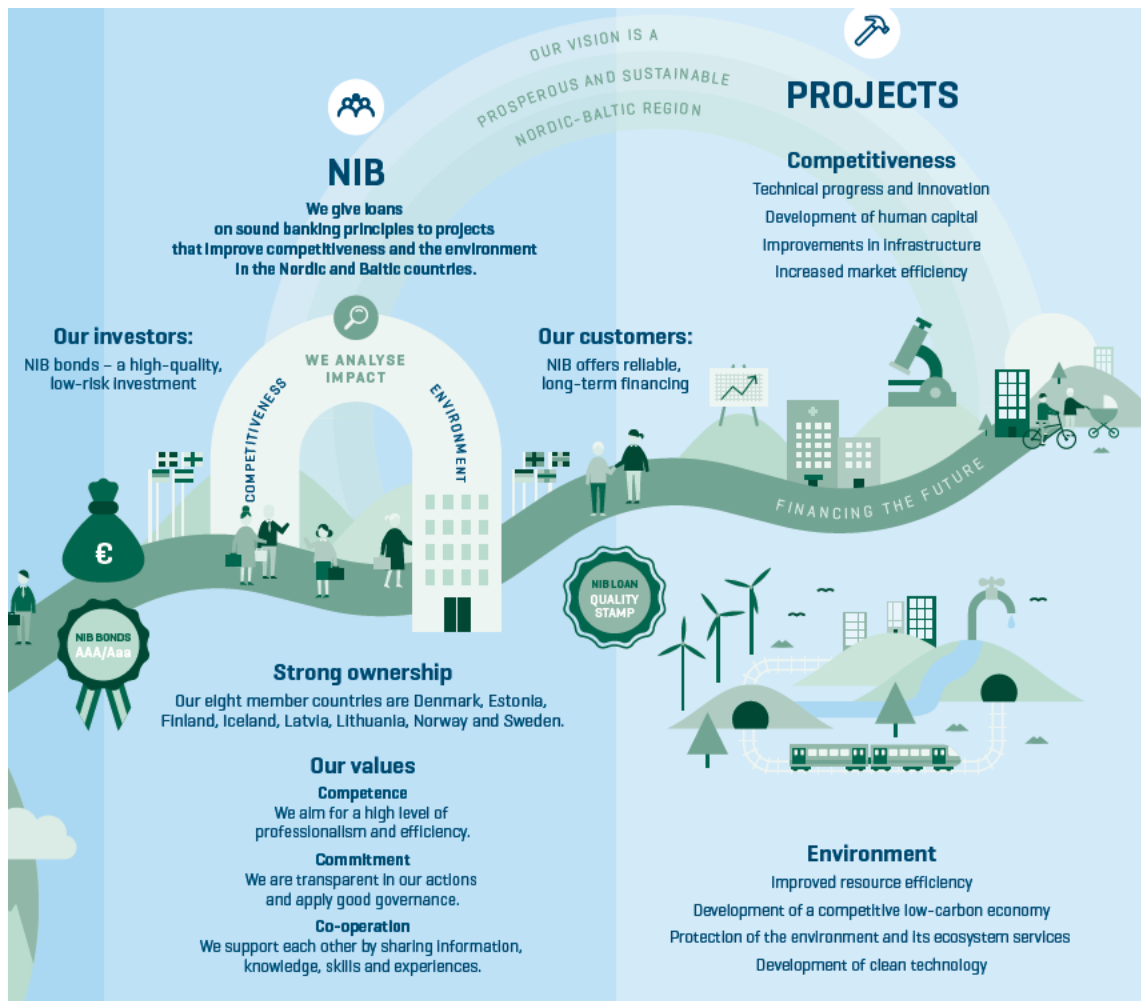


Figure 5. NIB high level operating model (NIB, 2018d)

2.3 NIB dual mandate

“NIB's vision is a prosperous and sustainable Nordic-Baltic region. We work towards that goal by financing projects that improve competitiveness and the environment of our member countries.” (NIB 2018d)

NIB has a two-pronged mandate, to strengthen competitiveness (productivity) and to enhance the environment. This dual mandate approach regards a perfect investment for NIB to be a project that fulfils both aspects of the mandate to a high degree, thereby linking long term economic growth with environmental sustainability. NIB targets lending projects that support competitiveness in terms of:

- Technical progress and innovation
- Development of skills and human capital
- Improved infrastructure

- Improved market efficacy and business environment

The lending projects in terms of the environmental mandate target:

- Improved resource efficiency
- Development of a competitive low-carbon economy
- Protection of the environment and its ecosystems
- Development of clean technology

NIB uses a mandate rating framework to assess all projects evaluating to what degree they are improving competitiveness or enhancing the environment. Broadly, competitiveness is defined as a higher level of gross domestic product (GDP). An enhancement to the environment is considered as activities that have a direct or indirect net positive environmental impact, including renewable energy projects, research and development projects focusing on benefits for the environment. The mandate rating framework breaks down both aspects into how a project fulfils the mandate, implementation risk of the project, and an impact assessment.

2.3.1 Examples of high mandate fulfilment

In 2012 NIB signed a loan agreement with Haldor Topsøe A/S for financing the company's investment in research and development. Haldor Topsøe A/S is a Danish technology company specialising in catalyst production - catalysts are an important component in reducing pollution. The R&D project activities included development of new or improved catalysts for the refining industry; the development of environmental solutions for removing pollutants and development of emerging breakthrough technologies converting biomass into valuable chemicals (NIB 2018e). This project was an excellent example of fulfilling both aspects of NIB's dual mandate. The investment would enhance the companies competitiveness because the potential innovations could expand the its product lines and improve the quality of existing ones. Due to the research focused nature of the activity the company had a wide research network (other European countries, Far East, Russia, America's) with collaboration with academia and other research partners which would have had considerable spill over effects for the industry (NIB 2012). This loan also fulfilled the environmental mandate very well because Haldor Topsøe A/S R&D programme focused on developing more environmentally efficient solutions for industry; and was also considered to indirectly result in the decrease

of greenhouse gases. Investing in R&D is typically long term; therefore securing long term financing is very important so this project was an excellent overall fit for NIB for both the bank and customer.

In 2015 NIB signed a loan agreement with Lyse AS for the construction of a new hydroelectric power plant. Lyse AS is a Norwegian power company operating 11 power plants, of which ten are hydroelectric (NIB 2018f). The new plant (Lyseboten 2) was constructed to replace an existing plant on the same site and would increase production due to drilling a new tunnel and water fall, and the improved hydraulic capacity would also have a stabilising effect on fluctuating regional energy prices thanks to the large scale energy storage capacity of hydroelectric power (NIB 2015); these aspects scoring high on NIB's competitiveness mandate. The environmental mandate was well fulfilled, contributed to significantly by the fact that all construction was taking place inside a mountain and the watercourses were already in use with no new ones required. The long expected life of this investment allowed NIB to provide its additionality with long term funding; another very good fit.

2.4 NIB lending activity & customers

During the previous 5 years (1.1.2013 - 31.12.2017) NIB has agreed over 250 loans with 200 customers totalling EUR 15 billion. Figure 6 below shows the location of NIB's customers, the vast majority of which are in the original member countries (expected as NIB is a regional multilateral).

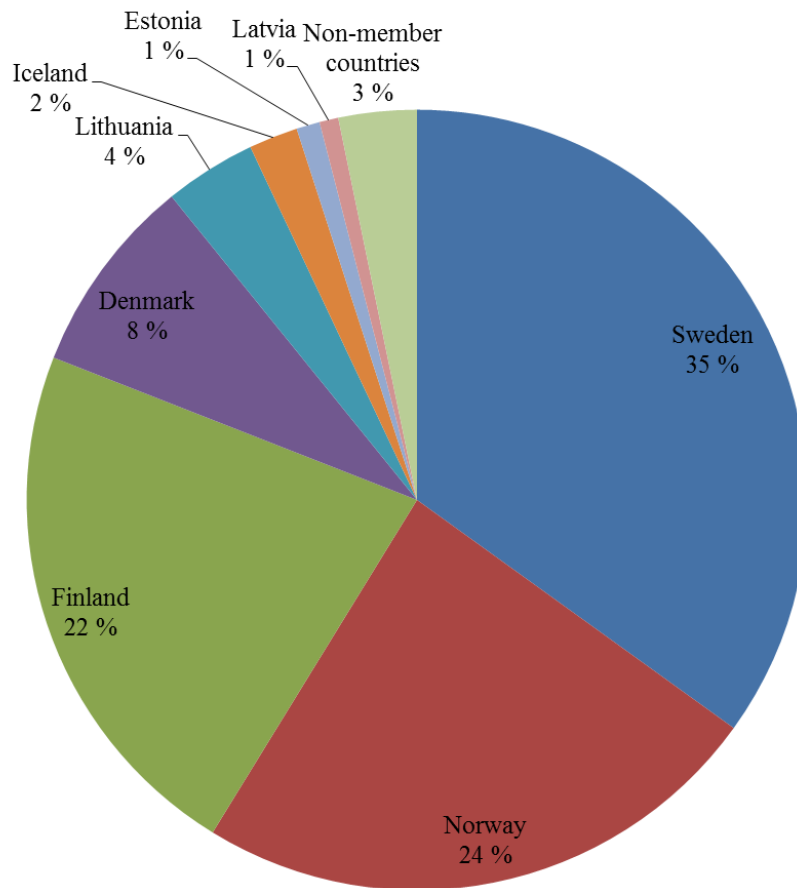


Figure 6. NIB country of customers, % of agreed loans 2013-2017

Using the Global Industry Classification Standard (GICS) methodology (MSCI, 2018) these customers can be grouped into industry sectors. There are four dominant sectors the customers fall into: public sector, financials, industrials and utilities as per figure six. These sectors have each had over EUR 2 billion worth of loans agreed in the last five years.

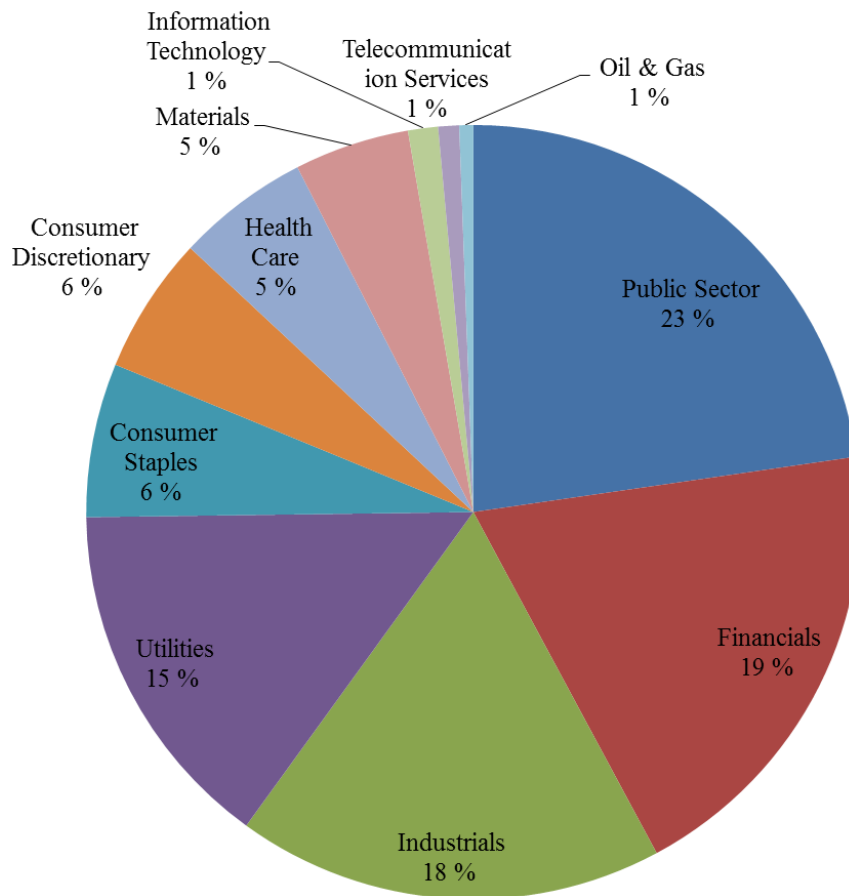


Figure 7. GICS industry sectors of NIB customers, % of agreed loans 2013-2017

Separating the four dominant industry sectors from figure 7, and then filtering by the most detailed GICS classification of sub-industry, then ranking the top three by total agreed amount, figure 8 below shows the specific industries NIB's core customers are in. The industrials sector is quite evenly distributed between railroads, airport services (transportation) and industrial machinery; whereas the other sectors have clearer concentrations. 'Local and regional Government' and 'Electric Utilities' are up to and over 80% of their respective sectors with 'Regional Banks' featuring largely in Financials.

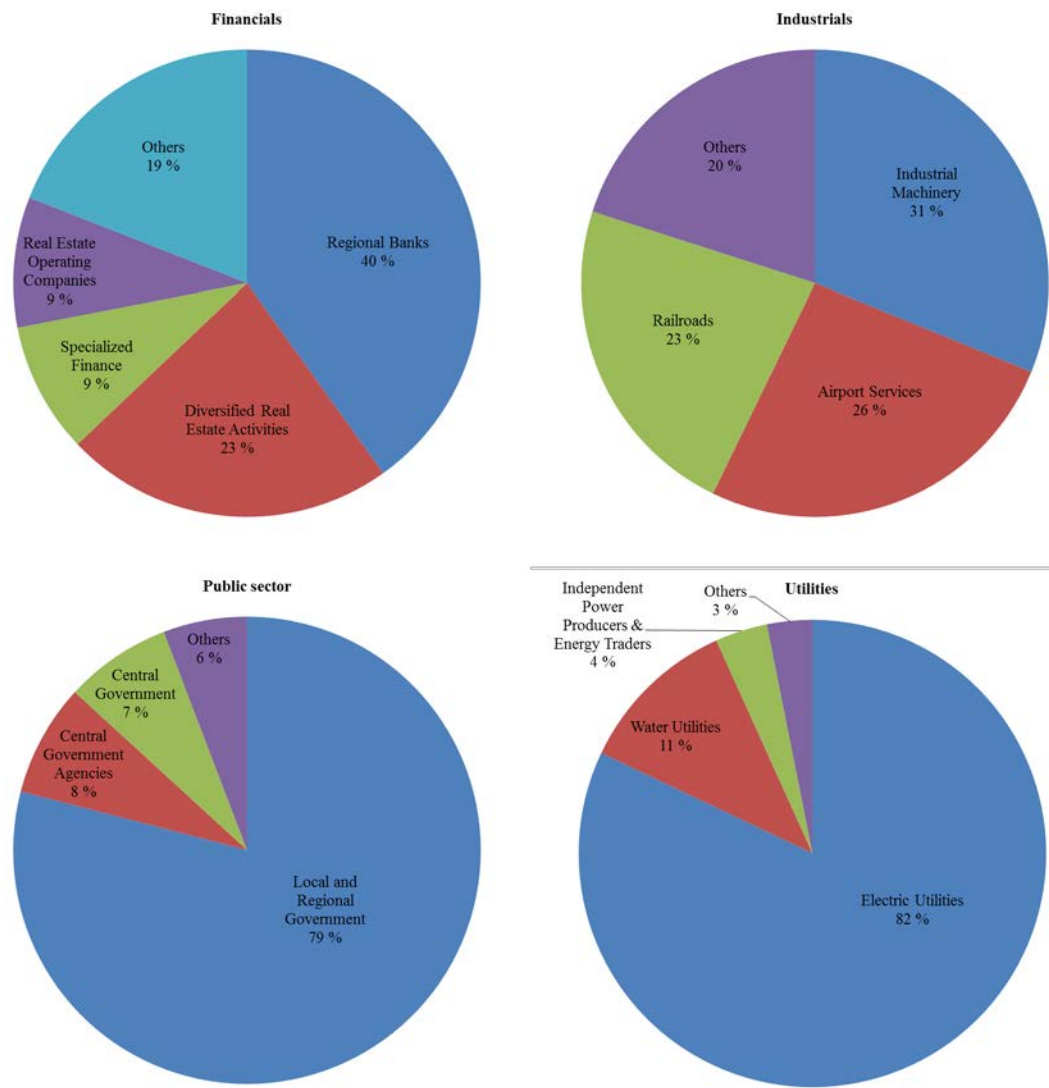


Figure 8. Ranked GICS sub-industry sectors of NIB customers, % of agreed loans 2013-2017

The intended use of the agreed loan proceeds of the investment projects of NIB's customers can be analysed using the NACE statistical classification of economic activities (Eurostat 2018). Table 1 below shows the four largest customer sub-industries with the activity of the investment project. The sub-industry 'Local and Regional Government' has the most diverse activities.

Table 1. Economic activity in selected sub-industries as result of NIB agreed loans 2013-2017.

NACE activity code:	GICS sub-industry:			
	Electric Utilities	Industrial Machinery	Local and Regional Government	Regional Banks
Construction			20	
Education			9	
Electricity, gas, steam and hot water supply	37		2	
Financial intermediation, except insurance and pension				27
Manufacture of machinery and equipment n.e.c.		7		
Sewage and refuse disposal, sanitation and similar act			10	

2.5 Instruments of operation

NIB's focuses on being a provider of long term financing making lending decisions based on its mandate, but also on sound banking principles. NIB's main product is a long term loan; this can take many shapes and form, but essentially the same outcome is required that the borrower repays the loan. However, NIB also has the possibility of channelling concessional finance from donors in the form of grants and technical assistance, and may provide guarantees.

2.5.1 Long term lending

A standard feature of loans provided by IFI's is conditionality. This is typically related to e.g. procurement, financial accounting, environmental issues and organisational reform and the actions a borrower must take in these areas to receive a loan. Failing to comply with a condition could result in recall, cancellation or suspension of a loan. The intention of conditionality is to support an IFI's objectives (Bhargava 2006, 405-406).

Whilst there are aspects of NIB's lending which has conditionality attached, NIB is more of a complimentary lender than conditional. A global IFI/multilateral organisation may use a large conditional lending program to steer policy direction of a national gov-

ernment; whereas NIB's lending activities are intended to compliment investment activity that are in compliance with NIB's mandate.

NIB offers the following debt/loan products:

- Corporate loans
- Loan programmes
- Project and structured finance
- Sovereign loans
- Loans to municipalities
- Environmental loans
- Guarantees
- Corporate & green bond purchase
- AB loan
- Mezzanine
- Uncommitted credit facilities

NIB loans are typically for larger projects. However as part of NIB's strategy they do provide lending to small and medium sized enterprises through financial intermediaries, typically in the form of a lending programme through a commercial bank to financing which complies with NIB's mandate.

2.5.2 Concessional finance - trust funds

Member countries (and others) of multilateral institutions may be asked/or offer to provide donations to be used for grant financing, these donations are entrusted to the institution who manage the funds. A donors reasons to grant trust fund money is to ensure that viable projects are developed and successfully implemented in general, but maybe even more importantly that projects in sectors responding to political priorities of the donor country are getting support e.g. environment, gender issues, urban planning etc. (Reinsburg et. al. 2017, 768).

The establishment of trust funds in IFI's by individual donors has been common since their inception. The purpose on one hand is the need to assure the viability and bankability of projects through the involvement of expert consultants in situations where the

project owners are not able to provide or procure such expertise - commonly referred to as 'technical assistance'; and on the other hand to ensure capacity and competence to carry out supervision of the implementation of projects or 'technical cooperation'. When an IFI does not have internal funds to cover the cost of "technical assistance" or "technical cooperation" a trust fund may be established. Trust funds are also used for grant financing of specific project components known as "capital grants", to supply goods rather than services. These types of funds are established to lessen the burden on borrowers that would otherwise find the financial cost too high to carry. Some donors occasionally prefer to provide grant financing directly to recipients without involving the services of IFIs. Trust funds may be established in most multilateral organisations without its governing bodies approval (Reinsburg et. al. 2017, 770).

The trust funds that were established by IFI's were originally tied to procurement of goods and services from the donor country ('tied aid'). They were viewed as a competitive edge for the industries of the donor countries in both the project preparation phase and in the procurement of goods. With the increased requirements of open and transparent procurement throughout the entire project cycle most trust funds that are established today are un-tied or at least having much fewer procurement restrictions (Reinsburg et. al. 2017, 770).

Trust funds can be used to facilitate the lending of an IFI, especially to cover costs related to assessing the feasibility of especially complex project financing. They also allow an IFI to directly respond to political priorities of its members with a donation. By participating in policy related programs through the administration of a fund, gives an IFI a higher level of visibility it may not achieve through usual lending channels, reinforcing its image of doing good. It can also create additional co-operation platforms with other multilateral institutions, Governments and other stakeholders. However, the administration of trust funds does place a heavy burden on an organisations human resources; the processing and monitoring of projects benefitting from support of trust funds are typically more time-consuming and resource demanding because of the very reason that trust fund money is needed, namely the weak implementation capacity of project owners.

NIB administers trust funds for the purpose of financing consultancy services during preparatory phases of projects which may be eligible for NIB funding (technical assis-

tance funds); for supervision and monitoring of project implementation (technical cooperation trust funds), or for partly covering project expenses (both goods and services) during the implementation of a project which NIB is financing or potentially could finance with a loan (special purpose trust funds) (NIB 2018g).

NIB established its first trust fund in 1992; up to year end 2017 NIB has managed twenty three funds which have provided financing in total of EUR 87 million. Finland, Norway, and Sweden (in the form of Swedish International Development Cooperation Agency - Sida) were the main donors of the first funds, with contributions more recently coming from Germany, the European Union and Northern Dimension Environmental Partnership Fund. The purpose of the majority of the trust funds is to support environmental projects in NIB's member countries or their neighbours. Two funds are related to supporting projects within the scope of the Nordic Dimension Partnership on Transport and Logistics. Two funds were established to support projects in new EU countries (2004 enlargement) and one was established to support and provide technical assistance for small and medium sized enterprises (SME's) involving female entrepreneurs in Lithuania.

Only a small fraction of NIB's lending is related to projects where technical assistance or capital grants from the trust funds are present. The overwhelming majority of the NIB's lending is directed towards member country corporates or local and regional governments, which are fully capable of carrying out adequate project preparation and implementation procedures themselves. Non-member country lending is (currently) targeting counterparties that are not in need of assistance. As such, the group of borrowers for which technical assistance and/or capital grants are required is limited to some public sector project owners, which carry out investment projects of importance to NIB's member countries.

An important part of the trust fund activity at NIB has been projects in the neighbourhood of the member countries in which cross-border effects are significant, such as water treatment and other environmental projects. These have to a large extent been in cooperation with other IFI's under policy related programs (NDEP) (NIB 2018g).

2.5.3 Green bonds

The term ‘green bond’ is a self-determining label applied by an issuer to bond that in general have the intended purpose to use the proceeds for ‘green projects’ that generate climate or other environmental benefits (OECD Green Bond paper). This use of bonds has been considered as a recent innovation in financial markets.

NIB is both an issuer of green bonds, as well as a purchaser. Since 2011 it has issued its own environmental bonds to fund loans to customers with a suitably high environmental mandate score; and starting in 2016 it has been purchasing green bonds (with the intention of holding to maturity) from the capital markets from issuers who are using the proceeds in the same manner.

2.5.4 Guarantees

NIB statutes provide it the capability to issue guarantees. A guarantee is a legally binding agreement which, in the event of non-payment by an obligor (or loss of value in case of investment), the guarantor has agreed to pay part or the whole amount due on a loan, equity or other instrument (Mirabile et. al. 2013, 4). A guarantee protects banks and investors from risk so may be considered as quasi insurance policy. From the perspective of an IFI/multilateral organisation, guarantees can be viewed as providing a service or role in assisting the private sector make investments that would normally be assessed as too risky. Guarantees typically encourage investments that promote growth and create jobs (Mirabile et. al. 2013).

The majority of NIB’s activity in this area was during the 1990’s; the last guarantee NIB furnished was agreed in 2001 and expired/matured in 2012. No further activity in this instrument has taken place since then.

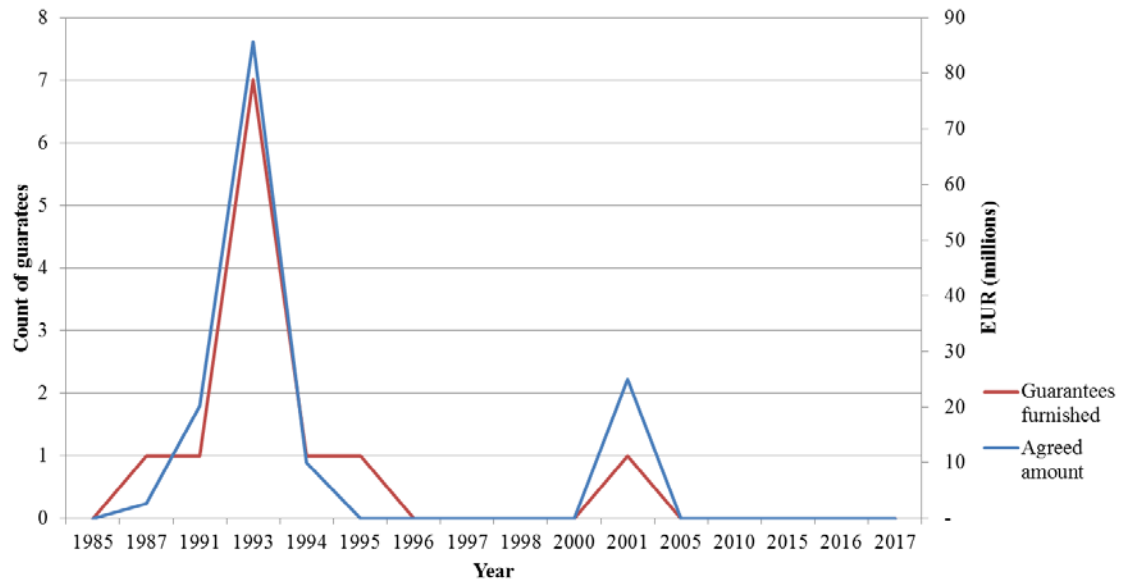


Figure 9. NIB guarantees 1985 - 2017

3 INSTITUTIONAL & TECHNOLOGICAL INNOVATION

The challenge of tackling climate change is one that NIB's owners decided the bank should address, which NIB has been doing as described in the section 2 above. Whereas NIB has focused on its programme of long term lending, other institutions including those in the private sector, have been developing new approaches sometimes in collaboration. Two such approaches are impact investing and blended finance.

Innovation in finance is not limited only to the large institutions; at a 'grassroots' level technology firms have been developing alternative finance solutions to global issues, including climate change. The start-up event Slush held annually in Helsinki had the theme 'calling for solvers' to global problems. Al Gore in his opening key-note speech extolled the 'sustainability revolution' driven by start-up technology companies. A technology prominent at the event which is rapidly establishing itself in finance is blockchain and a type of financing fast gaining prominence is online crowdfunding.

This section will define and describe these types of financing and technology, ascertain the scale of implementation and provide short real-life examples and applications/possibilities for use with environmental financing.

3.1 Innovation in institutional financing

3.1.1 Impact investing

Impact investing is a term devised by the Rockefeller Foundation in 2007. The term has been used to cover a broad range of financing; in their paper Höchstädter & Scheck (2015) found that the most common definition of impact investing focus on two main elements of having both a non-financial impact and financial return. In 2016 at least USD 113.7 billion worth of impact investment assets were under management (GIIN Survey, 2017).

The non-financial impact of these investments is usually social and/or environmental which must be intentional and shall in most significant cases, measurable. The most basic requirement of the financial return is the repayment of the investors' principal (no

loss occurs), how much (if any) profit is made can vary between investments (Höchstädter & Scheck, 2015). Impact investing is typically associated with developing and emerging markets but is also present where an underserved population exists in a developed country. Sectors which receive funding from impact investing include:

- Agriculture
- Clean tech/energy
- Education
- Healthcare
- Financial services (e.g. microfinance)
- Housing
- Water

The type of organisation that is a recipient of impact investment funds has limited data available and is also difficult to define; either the type of organisation is limited by the investment or that the organisational characteristics are disregarded and only the ultimate impact of the investment is focused on (Höchstädter & Scheck, 2015). However data from GIIN (2017) survey shows the stage of the businesses that were invested in; the majority of which were in start-up stage to growth stage as per figure 10 below.

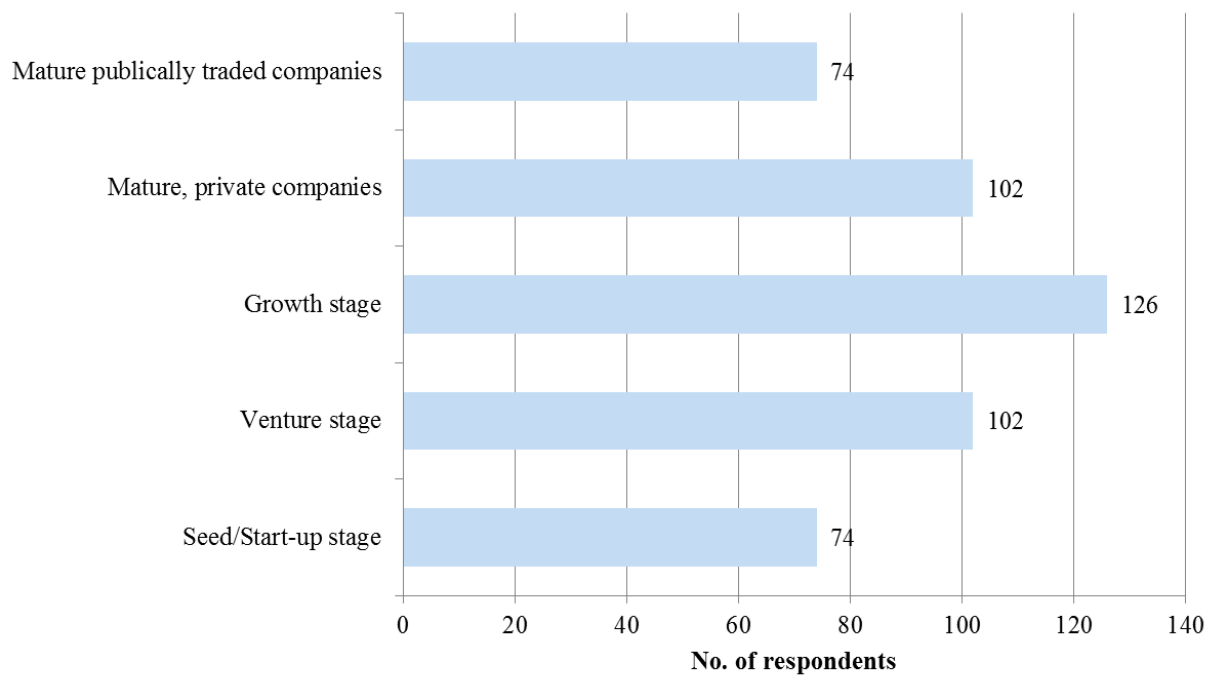


Figure 10. Respondents with allocation to a stage of business (GIIN, 2017)

The same GIIN survey found that over half the types of organisations making impact investments were ‘for profit’ fund managers (see figure 11 below) based in USA, Canada and Europe (GIIN, 2017).

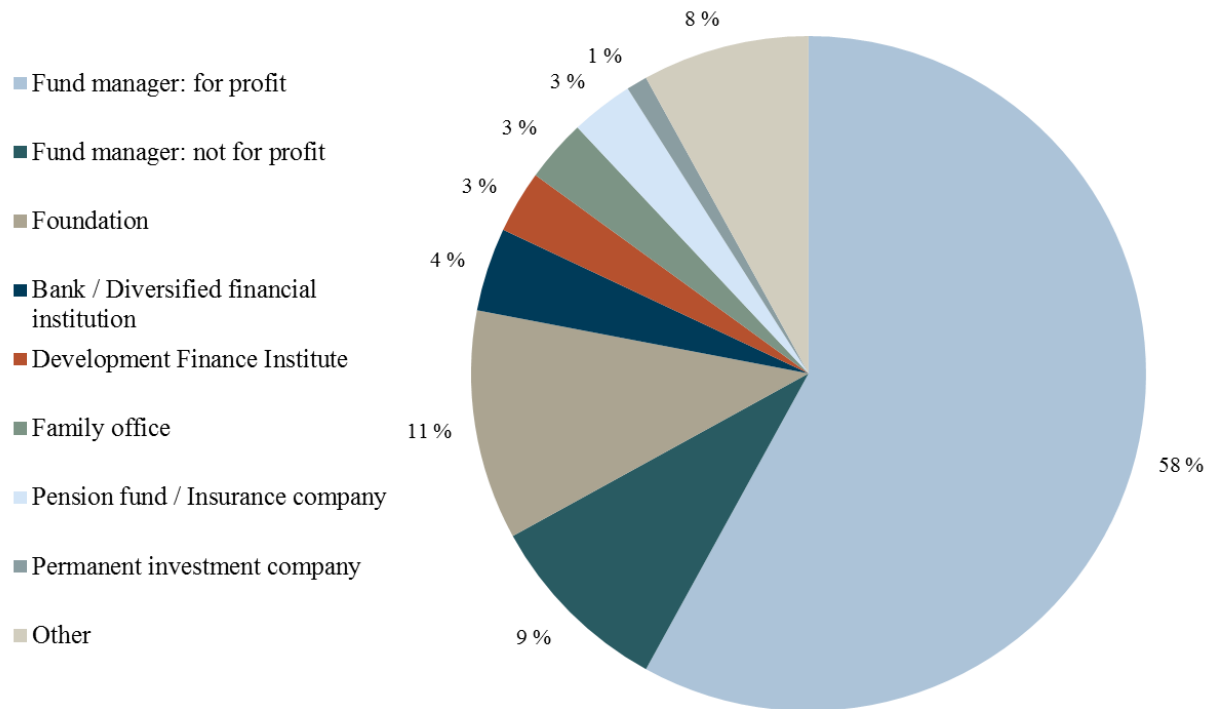


Figure 11. Impact investors organisation type (GIIN Survey 2017)

In their analysis Höchstädter & Scheck (2015) found that “...there appears to be no limitation regarding the asset classes and financial instruments available for impact investing”. However they do go on to identify some common examples:

- Debt
- Equity
- Guarantees
- Deposits
- Social impact bonds (SIB)

In GIIN’s 2017 survey the most common instrument used by respondents was private equity, followed by private debt - see figure 12 below.

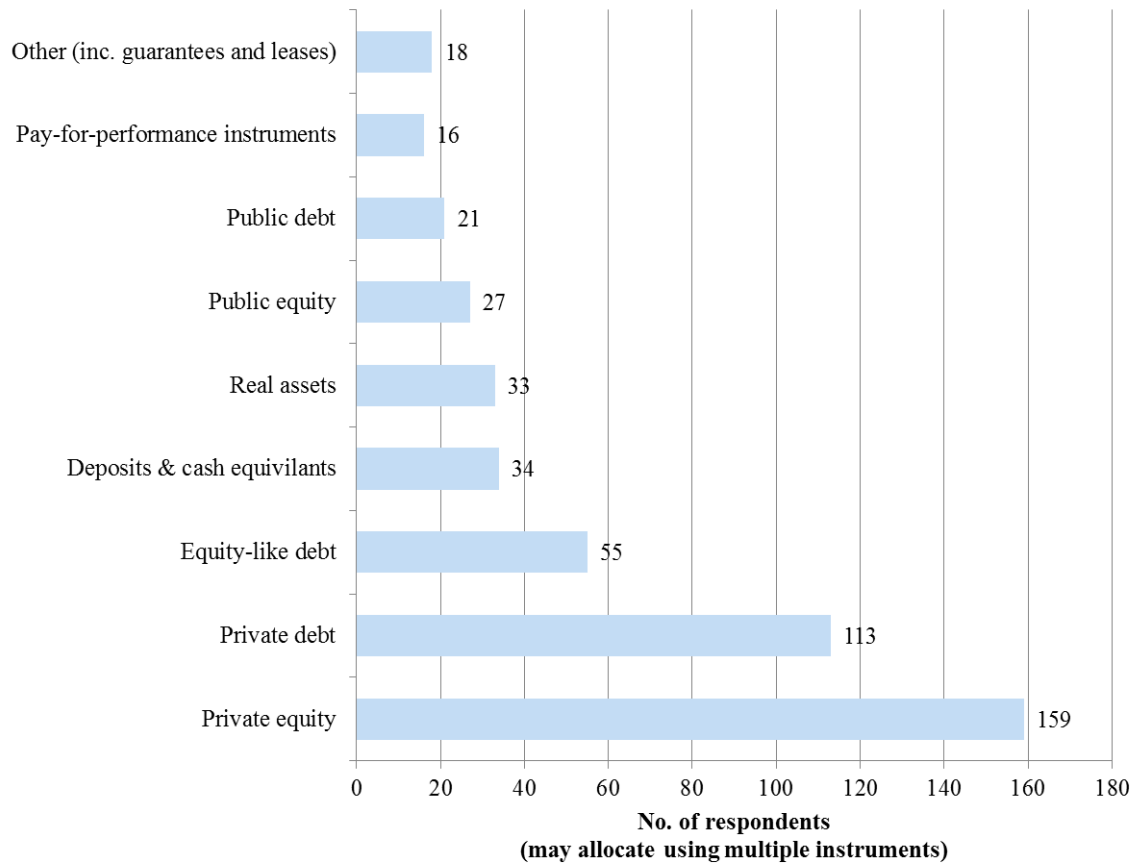


Figure 12. Type of instruments used in for impact investments (GIIN Survey 2017)

Started in 2009 the Global Climate Partnership Fund (GCPF) is a public-private partnership energy investment impact fund that uses public funding to leverage private capital. They aim to reduce the emission of greenhouse gases by providing funding for energy efficiency and renewable energy projects in developing and emerging markets (GCPF, 2018). The fund is managed by a private asset manager with current assets totalling USD 525 million as of December 2017. The target intermediaries for their investments are financial institutions which take the form of on-lending and debt financing. Investors in the fund can purchase three different levels of shares: senior, mezzanine or first loss, at a minimum investment of EUR 200,000.00. The fund also has a facility to provide technical assistance to projects; this receives public funding and also shares of GCPF's profit (GCPF, 2018).

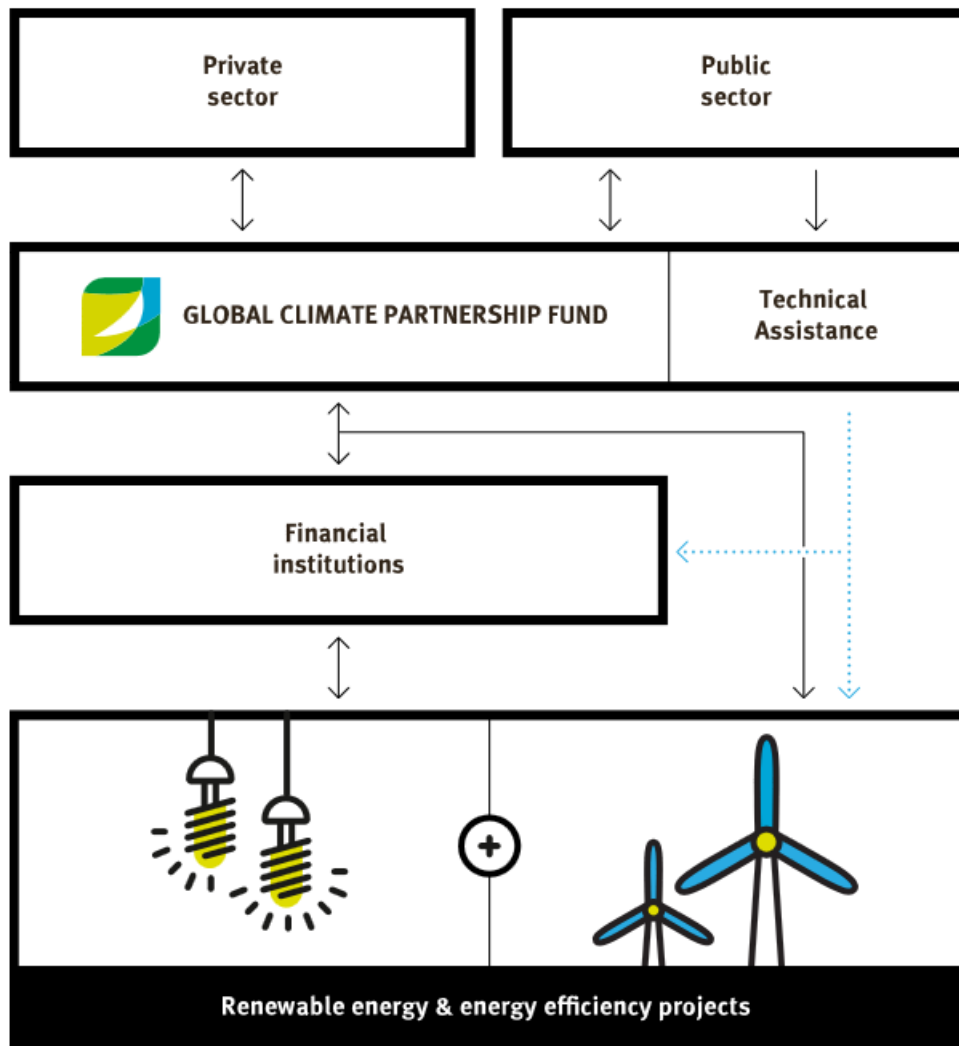


Figure 13. GCPF impact financing structure (GCPF, 2018).

3.1.2 Blended finance

The OECD (2018) definition of blended finance is “the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries”; Romero’s 2016 article more specifically describes a blended finance mechanism as “mechanisms that link a grant element provided by ODA [Official Development Assistance], with loans from publically-owned institutions or commercial lenders”. This type of financing is not new, however the impetus to scale mechanisms like this to target private sector companies and leverage private sources of finance, represents a change in the use of development finance.



Figure 14. OECD blended finance.

As the name entails, blended finance constitutes of a mix of various traditional financial instruments which have been structured in a transaction with the aim of ‘de-risking’ an investment project making it more attractive to commercial investors. The types of instruments in use are (OECD, 2018):

- Debt (including bonds)
- Equity
- Mezzanine
- Hedging
- Guarantees and insurance
- Grants and technical assistance

These can be structured as a fund, syndication, securitisation or a public private partnership (PPP). Blended finance can raise investment for companies and financial institutions, projects and Governments. The focus of blended finance has been in energy, transport and water and sanitation projects; however the scaling up of this approach is now aiming at other areas such as agriculture and social sectors (Romero, 2016). The OECD (2018) finds that blended finance funds and facilitates target the UN Sustainable Development Goals at a general level, with Climate emerging as a key area.

The OECD (2018) calculates that of the 167 facilities launched between 2000 and 2016 the combined size (by commitments) of blended finance facilities was USD 31 billion. They also found that the managers of the facilities were mainly MDB's and DFI's, but private asset managers were beginning to play a more significant role. The leveraging effect of blended finance mechanisms can vary, according to a World Economic Forum (2016) survey for every \$1 of public money invested, \$1-20 of private investment was attracted.

The International Finance Corporation (IFC), part of the World Bank group, has a Blended Climate Finance team that manages donor funds to be deployed for investment projects addressing climate change that require concessional finance to catalyse private sector investment. They manage approximately \$700 million in funds which are used in a variety of debt and equity instruments (IFC, 2018).

Incorporated in 2005 GuarantCo provides credit guarantees for long-term local currency debt for infrastructure projects in developing countries. Their aim is to address constraints in the supply of local financing in turn also helping to develop local financial markets (GuarantCo, 2018). Their guarantees are typically 10-15 years and can various forms: non-payment, on-demand, principal and interest coverage, and other structures to suit the project. GuarantCo is part of the Private Infrastructure Development group through which it receives sponsorship from a number of national governments and coordinates with other finance companies to engineer blended solutions. They have guarantees in 41 projects in 17 different countries which have enabled USD 4,665 million in investments (GuarantCo, 2018).

3.2 Finance and Information Technology (FinTech) solutions

3.2.1 Blockchain

Global IT consultants Gartner define blockchain as “a type of distributed ledger in which value exchange transactions (in bitcoin or other token) are sequentially grouped into blocks. Each block is chained to the previous block and immutably recorded across a peer-to-peer network, using cryptographic trust and assurance mechanisms” (Gartner 2018).

The technology is well deployed in various forms of tokenisation mainly in cryptocurrencies, the best known of which is Bitcoin. The cryptocurrency market has evolved considerably in recent years and during December 2017 the market capitalisation crossed USD 600 billion (Higgins, 2017) peaking at over USD 800 billion, but has since returned to lower levels as per figure 15 below.

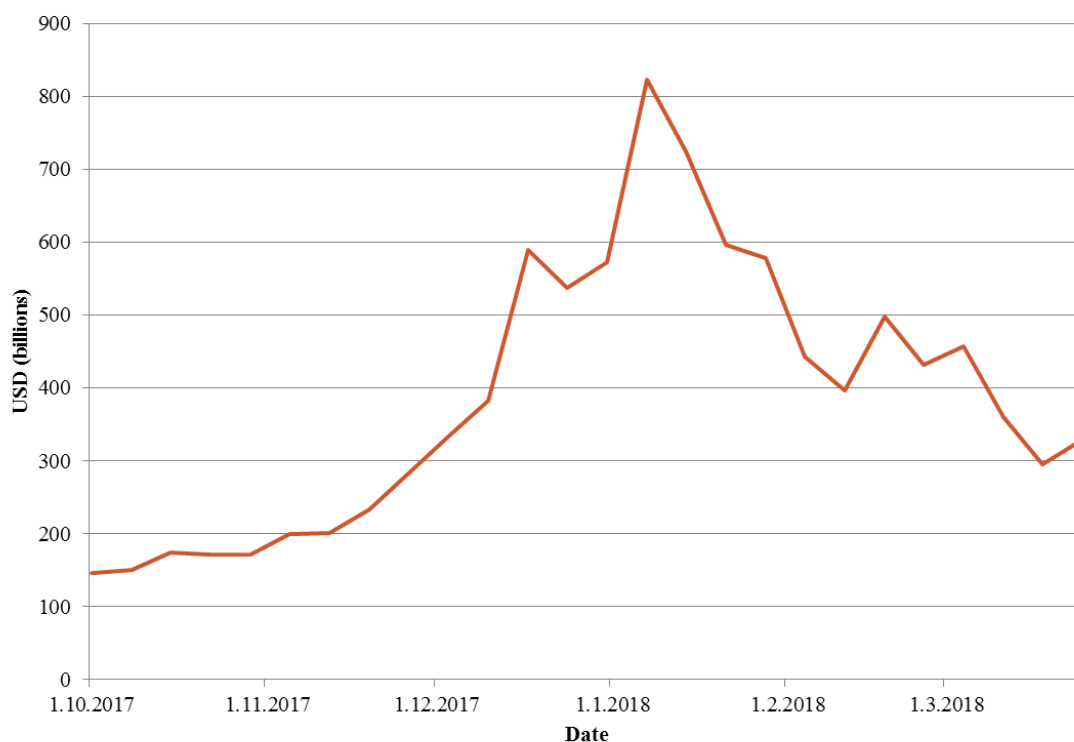


Figure 15. Cryptocurrency total market capitalisation (CoinMarketCap, 2018)

Each type of cryptocurrency has its own coin, and purposes of the coins can vary from a basic decentralised currency to be used as a store of currency (Bitcoin, Monero, Dash); or a token can be used to create an exchange for different kinds of goods and services which also use Blockchain technology (Sherif 2016, 384) e.g. Factom - decentralised notary; Golem - purchase supercomputer processing time; Civic - universal digital identity. These types of blockchain tokens can be categorised in three groups: asset backed; rights backed and utility (Ruusalepp, 2017).

When a blockchain network is started for a cryptocurrency or token the creators can impose a limit on the number made. These coins or tokens can be obtained by using computing power to solve complex mathematical problems and then freely traded (min-

ing) or the creators can sell them via an ‘initial coin offering (ICO)’. New companies have been using ICO’s as an alternative to venture capital funding (Shrier 2017).

In 2017 USD 3,2 billion in funding was raised using ICO’s of which USD 2,2 billion was for start-up companies (Ruusalepp, 2017). Figure 16 below shows that the ICO funding is a small proportion of funding available to start-ups, but does have a higher concentration in Europe compared to North America or Asia.

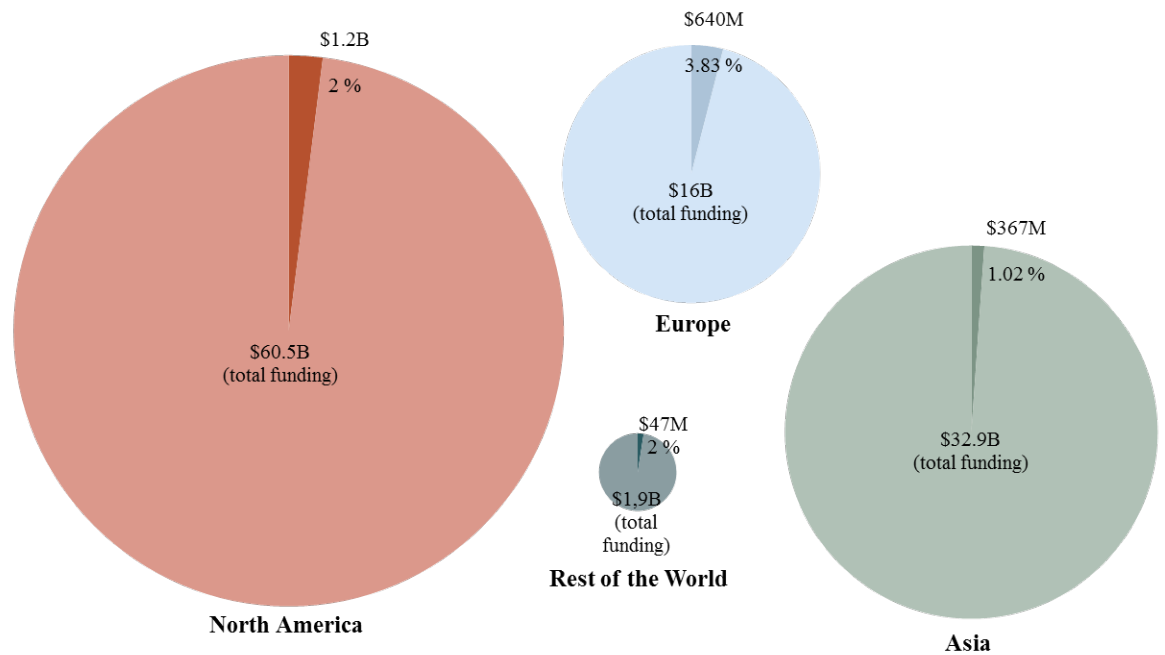


Figure 16. 2017 start-up funding by region compared to ICO funding (Ruusalepp, 2017)

Cryptocurrencies and tokens have been developed that include smart contract features. Eha (2016) describes a smart contract as “...a piece of software that executes its terms automatically and encodes rules agreed upon by all parties (...) they can be used to transfer value, and that transfer is triggered in response to certain events, without the need for someone to supply additional input”. When a smart contract is developed on a blockchain it is by design decentralised and accessible by all parties to that contract. The mathematical components of a financial contract in particular are considered to be suitable for smart contract adoption, however the legal text written out in ‘natural language’ is more challenging for computer software (Brammertz & Mendelowitz, 2018).

A number of companies have taken these technologies and created new products that ‘blend’ these blockchain technological capabilities. Notable sectors of interest for NIB are in renewable energy and SME financing (for environmental projects/purposes).

Launched in Estonia in 2013, Funderbeam has been fully live since 2016 and is a platform for researching private companies, funding and trading. The platform is designed to act as a 'stock exchange' for start-ups which uses blockchain technology to sell and trade equity; principally by tokenising start-up equity (Ruusalepp, 2017). The company employs staff to collect and analyse data on companies and uses blockchain for the funding and trading (Lapakko, 2017). Equity that is bought from a start-up is traditionally considered a very illiquid asset; Funderbeam's platform is providing a possible solution to this liquidity issue by having a platform which enables the possibility of trading the early stage equity (O'Hear 2016). Using an online platform for investment provides the opportunity for both small and large investors, potentially widening the investor base (users can start with as little as €1). The use of blockchain technology for the equity and trading can also be considered as shifting the requirement of trust to the technology, not the institution providing the brokerage (O'Hear 2016).

The type of companies that have used Funderbeam include a number of software providers but also a brewery and an electronic smart bike start up; a bond has also been issued and redeemed through their platform. Funderbeam is now at a stage in which it is trying to scale its business, it had a number of seed funding rounds during 2013 - 2016 and last year began to take on convertible debt; today they employ 33 people and in March 2016 and has a revenue of X (Funderbeam, 2018).

In the energy sector Lithuanian company WePower has produced a business case for using blockchain technology to tokenise units of green energy, and have received official support from the Lithuanian Government (Caldwell, 2017). In January 2017 they established their energy financing and trading platform which has the aim of enabling renewable energy producers to raise capital by issuing tokens. Each energy token holds a value of 1kWh of future energy production; the token itself behaves as a mini smart contract which is stamped with the type of energy being bought, the time when the energy will be produced and delivered and the price. The first energy tokens are sold at 'energy auctions' by the producers on the platform (WePower, 2018).

By enabling green energy consumers to directly purchase the token they are supporting the development of a sustainable energy project. When the energy is produced the consumer can redeem the token for energy, trade it, or sell it back to the grid. In this way

the WePower platform, acting as an independent energy supplier, could influence how energy is developed and distributed (Caldwell, 2017).

The team of 22 people at WePower have recently used an ICO to raise USD 40 million and have set up a partnership with an Estonian electricity and gas operator (and NIB customer) Elering AS to test their smart meters with WePower's blockchain technology (Renewables Now, 2018). Simulations of the system in Spain are planned during 2018 to work with various solar projects in the region.

3.2.2 Crowdfunding

Online crowdfunding platforms are a means of raising financing for individuals, groups, businesses or organisations by asking a large amount of people to provide small amounts of money to their project or venture (Nehme, 2017). During 2015 it is estimated that the total volume of funds raised in this way was USD 34 billion; the year to year volumes have been more than doubling since 2012 as shown in figure 17 below (CrowdExpert, 2018).

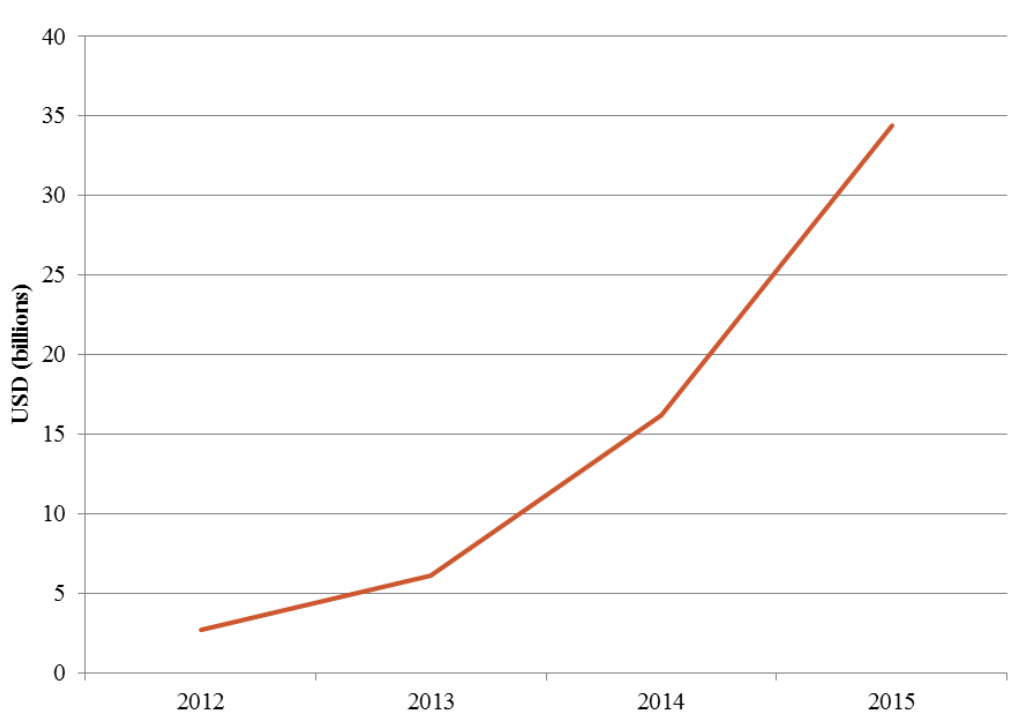


Figure 17. Crowdfunding total volume 2012-2015 (CrowdExpert, 2018)

Crowdfunding can be divided into four main areas:

- Donation
- Reward
- Peer to peer lending
- Crowd equity

Donation based crowdfunding provides no financial benefit for the donator or investor, it is a contribution only and these are normally for social, or community based projects.

When investing in a reward based crowdfunded project the contributors receive a sort of product, service or name recognition as a 'reward' for their participation raising of funds; recipients of this type of funding can be independent music and film producers or new companies trying to propose an new product or service idea to the public.

Peer to peer crowdfunding links small lenders to a borrower and its project, by grouping a large amount of small lenders the borrower can receive a suitable sized unsecured loan. The peer to peer lender will receive interest payments and their original investment paid back according to the terms of the loan. Users of peer to peer loans are borrowers who are unable to raise funds using traditional financial markets, or wish to diversify their lending activity.

The last form of crowdfunding is equity based in which by accepting a contribution a business will take the capital for a share of its equity; these are typically early stage start-up companies looking for alternative types of financing compared to angel investors or banks (Nehme, 2017).

Figure 18 below shows that in 2015 peer to peer lending was the largest recipient of crowdfunding and the other three main types are relatively evenly distributed.

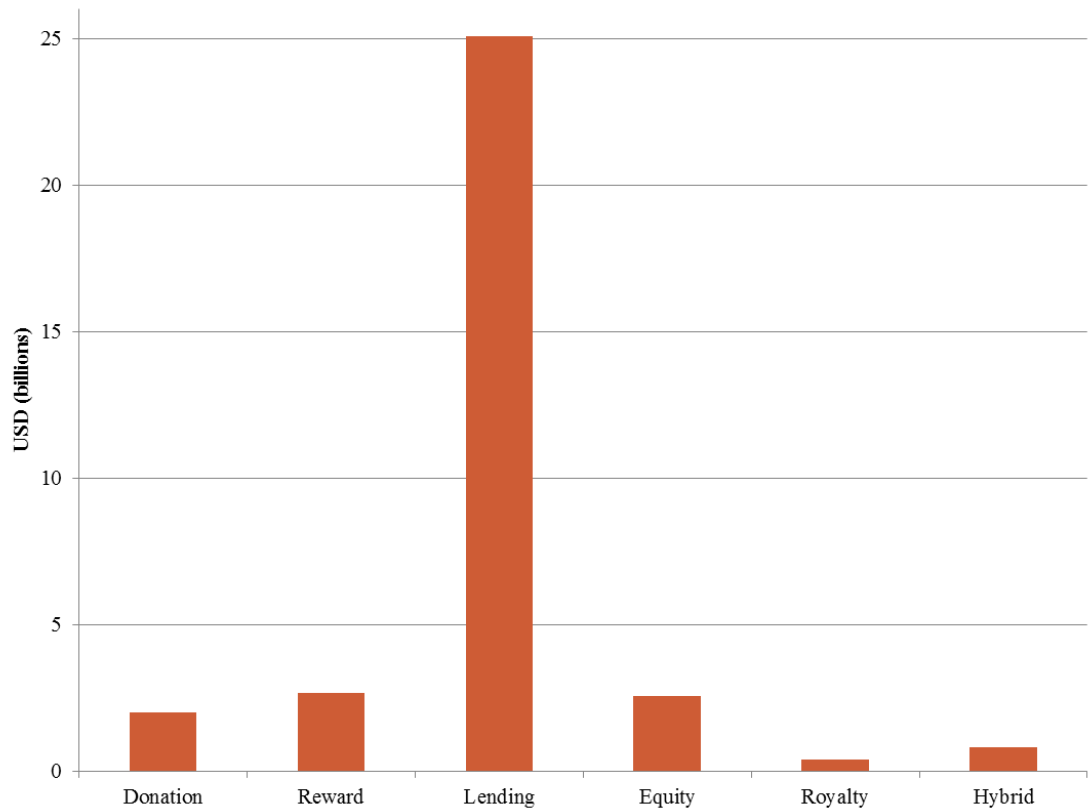


Figure 18. Estimated crowdfunding volume by area 2015 (CrowdExpert, 2018)

Founded in 2011, San Francisco based RE-volv is a donation based crowdfunding platform which provides financing to non-profit community organisations for solar energy projects. Users of the platform donate money to a project; RE-volv uses the accumulated contributions to install solar panels which are then leased (long term) by the non-profit organisation. The re-payments received by RE-volv are then re-used for new projects, hence a ‘revolving’ fund, see figure 13 below.



Figure 19. RE-volv's financing model (RE-volv 2018)

Re-Volv has a team of three full time staff; the crowdfunded projects range from USD 10,000 - 60,000 and to date they have completed 12 projects raising over USD 350,000 (RE-volv 2018).

Based in the Netherlands Oneplanetcrowd was launched in 2012 as a 'sustainable crowdfunding platform' to provide seed or growth capital to entrepreneurs for both project and business funding for sustainable or social enterprises. Their platform services all four types of crowdfunding: donation, reward, loans and equity. Their loans are offered with various repayment options (linear, bullet etc.), typically for a duration of 1-5 years and can be subordinated. The equity crowdfunding is offered via a convertible loan, these are normally of the duration of five years at the end of which the crowdfunder has the option of converting the loan (and interest) into shares - this may occur if a substantial new investor acquires equity in the enterprise (Oneplanetcrowd, 2018).

Oneplanetcrowd collaborates with two commercial banks (ABN Amro and ASN Bank), a venture capital fund, and knowledge foundations to leverage expertise and network effects. So far Oneplanetcrowd has raised over €25 million in funding from 25,000 ac-

tive investors which have been used for over 175 projects, mainly in the Netherlands and employs 10 people (Oneplanetcrowd, 2018).

4 FINDINGS

4.1 Financial instruments

The research into NIB, institutional financing and the FinTech solutions has revealed that a number of different financial instruments that are being used. Table 2 below combines the data. NIB's financial instruments are well represented in impact investing and blended finance, although mezzanine, grants and guarantees are far from core products offered by the bank. The FinTech instruments are missing entirely, however the barrier to entry for these tools is quite low in value and technical expertise due to them being available online and in the case of blockchain, decentralised. In comparison the institutional financing has a higher threshold to entry but is familiar territory for NIB.

Table 2. Comparison of financial instruments

<i>Instrument:</i>	NIB	Impact Investing	Blended Finance	Blockchain	Crowdfunding
Loans (debt)					
Mezzanine					
Bond purchase					
Grants					
Guarantees					
Equity					
Deposits					
SIB's					
Hedging					
Insurance					
Utility token					
Asset backed token					
Donation CF					
Reward CF					
P2P CF					
Equity CF					

On the evidence of financial instruments alone, NIB could par-take in some aspects of impact investing or blended finance. At most the instruments available at the bank would allow NIB to establish their own impact fund or blended finance transaction. Some of the trust funds NIB administers would be considered blended finance if there were private investors involved in the projects.

4.2 NIB's financing

The type of organisation NIB's is as an IFI and its level of operations put a heavy emphasis retaining its top AAA credit rating. The type of organisations, the projects they lend money to have a considerable impact on this rating; so if NIB were to engage in riskier lending activities their credit rating may fall, resulting in a higher cost of borrowing in the capital markets. The types of finance investigated in section 3 can be associated with higher levels of risk, however its particularly notable that there are many different levels of financing available in blended finance with the intention to reduce the risk for investors (Romero, 2016).

The example of Funderbeam using blockchain technology to tokenise and trade start-up company equity, is a technological innovation that takes some risk of investing in new companies away by making this type of asset much more liquid if an exit is required (Funderbeam, 2018). However at this point in time NIB is not able to use equity as an instrument of investment according to its statutes.

Section 2 showed that one of its most specific project sectors was in utilities - electricals (see figures 6-7), indicating a high level of expertise within the organisation in this area. The trust fund activity at NIB, whilst considered a common feature of IFI's is not so prevalent, the level of resources required for this type of activity is considerable considering NIB's total staff is under 200 people.

4.3 Alternative financing technologies

Notable with the FinTech solutions is the low barriers to entry for new participants/users (Ruusalepp, 2017). This could be a very direct method to attract private capital to a project or on the other hand, using donation crowdfunding as highly un-bureaucratic approach to collecting contributions towards a project from both public sector and private donors. Re-Volv, although still very small in its level of operations, has focused on its sector and created its own approach to finance projects that provided sustainable power to organisations who must themselves be sustainable in their operations to pay back the investment; thus blending donation crowdfunding with an 'impact investment' - a revolving impact fund.

The professional set up of Oneplanetcrowd and its collaborations with commercial banks is a compelling example of how traditional finance can work alongside and compliment an alternative financial organisation. Some similarities to NIB are notable, such as they work with a very clear (self-appointed) mandate and in most projects focus on the financial return aspect collaborating and co-operating with private businesses. The taglines for the organisations also contain similarities:

- Nordic Investment Bank - ‘Financing the future’
- Oneplanetcrowd - ‘Together we fund the future’

The similarities end when considering the level of financing available, however the focus of Oneplanetcrowd is on small business and start-ups and NIB’s on much larger companies and projects.

The technology of utility tokenisation is beginning to gain momentum, whether it be for trading or purchasing a private supply for use this approach at this stage appears to have a good for the utility industries. WePower is at a very early stage but is showing promise with its approach to funding sustainable energy production, particularly as they wish to partner directly with the electric utilities, not just trade their energy.

All of the example companies noted in section three were very small in size, ranging from staffing of 3-33 people and levels of investment starting as low as €1. However, the technology and strategies underpinning their organisations affords them a significant ‘multiplier effect’ on how much finance can be raised and the resulting investment impacts.

4.4 Convergence

Despite being able to define each of the institutional and technological financial approaches separately, the overlapping and convergence of these approaches is not difficult to neither observe occurring, nor predict will hasten as they develop further. Some aspects of impact investing and blended finance are very similar, the financial instruments used, the focus on an ‘impact’ as well as the financing (Höchstädter & Scheck, 2015). The main differences is the use of development assistance in blended finance which implies a larger portion of grant funding is required and the finance is for developing countries; in comparison to impact investing in which smaller amounts of conces-

sional finance may be utilised and can be deployed in any region. Overall impact investing may be considered to be a more commercial finance approach, compared to blended which is more development focused.

NIB can make a strong case that it is already a well-established impact investor - its mandate demands that there is a non-financial impact as well as the financial return. However the areas it has been providing financing for in the last five years are typically not in developing and emerging markets and those they do finance may be difficult to term as 'underserved'. The focus of NIB's purpose is the long term financing they provide, as this is not a typical product in commercial banks.

The FinTech solutions are operating in an industry which is constantly evolving. Online crowdfunding preceded the emergence of blockchain; blockchain solutions are very suitable for deployment in a crowdfunding type platform especially in which smart contracts are considered. Whether this merging of technologies will produce the same outcome or one that is more secure and efficient is yet to be seen.

Convergence of the institutional financing and FinTech solutions and platforms is not yet prevalent in environmental financing, however the example of Oneplanetcrowd and its collaboration with commercial banks notable. Some of the FinTech solutions receive institutional financial (or other) backing for their organisations but this is not the same as adopting the technology on offer.

5 PROPOSALS

NIB's AAA rating, the size and expertise of NIB's staff, are both of key importance when considering undertaking new environmental finance activities, especially the more early stage investments. To maintain the highest credit rating new activities may have to be de-risked, and the activities themselves be in a sector of environmental financing that NIB staff already have considerable expertise and enthusiasm to help to grow and develop - for example clean energy technology.

5.1 A revolving fund for long term environmental finance

Taking inspiration from Re-Volv, an option for to mitigate risk would be to establish a fund that would receive contributions, which could then be used to make long term loans to organisations that would be unable to access NIB's normal lending due to size, level of risk, and amount required. The repaid loan amounts and interest earned would then be re-used for new projects. As the loans would be funded through donor contributions there would be a clear separation of resources from NIB, these would not be considered as normal business which would impact NIB's financial operations, administrative costs aside.

NIB's past and recent trust fund administration activities shows has some expertise in this area, and would add a level of financing available to NIB's customers and staff to utilise. Donor contributions could be solicited from NIB's member countries, NIB itself and private investors. To reduce administrative burden and bureaucracy, provide transparency and make available the possibility of private donations, using an already established crowdfunding platform could be considered.

Projects that prove successful and grow over time could then be considered to normal NIB lending products to either assist with scaling up the company or the project that was begun with the revolving fund.

5.2 Token investment

Cryptocurrencies and tokenisation is still a very early stage of development and subject to large swings in value - however there appear to be some very strong cases for the deployment of the technology in environmental financing. Currently NIB does not have a portfolio or instrument which would allow for this kind of investment, however considering the current set up of the cryptocurrency markets indicates executing this type of investment may be suited best to NIB's Treasury department - at an initial phase. A proposal for a small portfolio amount to invest in utility tokens to (using the example of WePower) to be held up until the point in when they could be sold back to the grid.

This would support sustainable energy production, provide experience to those investing in a new type of instrument and provide a return on the investment. The fact that this is being currently developed and deployed in NIB member countries, and has some government backing, fits well into various aspects of NIB's mandate.

Such a portfolio could be expanded to include other types of investments. NIB currently does not do equity investments, however the blockchain technology underpinning companies like Funderbeam could allow NIB to take its first steps in this young type of market. This type of portfolio would not have to be large in value thanks to the low barriers to entry, nor have any new systems on boarded as most of the technology is decentralised and web based.

6 CONCLUSION

This thesis set out to develop a suitable set of proposals for NIB of innovative financial tools and methods they may consider for future engagement in environmental investments.

The case study about NIB put the organisation in its context as an IFI how it operates, its customers and activities. The direction then moved to how innovative environmental finance is being conducted from two different perspectives, institutional and FinTech alternatives; which in turn provides different levels of financing required to take part. The findings showed some cross over in approaches and indications of possible convergence but also a level of risk that may be unsuitable to NIB.

Two proposals were presented in the form of NIB establishing up a 'revolving fund' which would be separated from NIB's own resources and not impact its credit rating. This could then be used to lend to projects deemed unsuitable for NIB's normal lending. The second proposal is setting up a small portfolio at NIB operated by the treasury department to use for small investments in types of tokens set up for environmental finance.

Overall, from an institutional perspective NIB has most of the tools and instruments, but not the risk appetite. The two institutional approaches researched were to some extents designed to de-risk investment transactions, NIB could either or both take part in this or advantage of it depending on the investment. The low barriers to investing in the FinTech solutions potentially provides a simple testing ground for NIB to engage in a new different type of financing.

An encouraging observation from this thesis is the examples of the small technology companies aiming to make a big impact on improving the environment, and the proof that they are indeed doing so. For an organisation of NIB's small size, in comparison to some of its larger peer organisations, this provides a potentially promising vision of technological innovation in environmental finance which should be embraced.

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