FINANCING THE GREEN TRANSITION

How investments enable a sustainable future

INSIDE THIS WHITE PAPER

- Green investments - from alternative to mainstream
- Private finance - it is green and it is good business
- Alternative investment models for high-risk markets
- Citizen involvement - creating large impacts with small investments
- Financing the green revolution
Green investments to curb climate change
Mobilisation of both public and private investments will be central to the green transition in both developed and developing countries. Fortunately, investors are increasingly looking towards sustainable green investments and financial products. With decreasing costs of green solutions, sustainable investments are no longer only a matter of doing the right thing from an environmental perspective – they also make good financial sense. In recent years, for example, Danish pension funds have invested heavily in offshore wind farms in both Denmark and abroad.

Going towards 2030, Denmark has set an ambitious target of reducing greenhouse gas emissions by 70 per cent compared to 1990. Private investors are expected to play a key part of this journey. This includes, for example, public-private collaboration around the development of the world’s first energy islands with a total capacity of 5 GW renewable energy to be completed by 2030.

Momentum is there
At the UN Climate Action Summit in September 2019, Danish pension funds announced plans to invest EUR 46 billion in clean energy and climate between 2020 and 2030 – a strong signal that Danish pension funds are ready to increase their green investments, provided the right policy frameworks are in place.

To unlock the financial potential, it is important to ensure that our public and private sectors are aligned. Governments need to set ambitious targets and put in place regulation that mitigates investor risk. At the same time, private investors must continue to explore new avenues to direct financial flows towards green investments.

This white paper provides insights on Denmark’s experiences with financing the green transition.

I hope you enjoy reading the white paper.
INDEX

Foreword .................................................................................................................................................. 3

Green investments - from alternative to mainstream ........................................................................... 6
  Net-Zero Asset Owner Alliance ........................................................................................................... 8
  Active ownership and responsibility .................................................................................................... 8
  PFA Climate Plus - Climate neutral pension savings ......................................................................... 9
  Matter and NASDAQ team up to disclose sustainability ................................................................... 9

Private finance - it is green and it is good business ........................................................................... 10
  Green electricity to power 450,000 Taiwanese homes ................................................................... 12
  Proterra - electric buses of the future ................................................................................................. 12
  Excess heat utilisation - a bankable solution ...................................................................................... 13
  New cost-competitive source of financing for solar energy .............................................................. 13

Alternative investment models for high-risk markets ...................................................................... 14
  The Partnership for Blended Finance on Water .................................................................................. 16
  Danish finance scales up wastewater solutions in India ................................................................. 16
  Powering Egypt - Benban Solar Power ............................................................................................... 17
  Lake Turkana - Africa's largest wind farm ......................................................................................... 17

Citizen involvement - creating large impacts with small investments .......................................... 18
  Wind turbine cooperatives - citizens as co-owners ......................................................................... 20
  Agrain - from waste to food ............................................................................................................... 21

Financing the green revolution ........................................................................................................... 22
  E-ferry Ellen ....................................................................................................................................... 24
  Power-to-X: the HyBalance project .................................................................................................... 25
  Optimised sorting - a solution to the plastic challenge ................................................................... 25
  DRIP - Partnership developing innovative efficient technologies in the food industry ............... 26
  Vertical farms will revolutionise our food industry ........................................................................... 26
  Where global wind giants come to test ............................................................................................. 27
GREEN INVESTMENTS – FROM ALTERNATIVE TO MAINSTREAM

The global focus on the need for a green transition has seen a spike in the past 20 years. Green investments have gone from being viewed as high-risk to part of the average investment portfolio. Moreover, the trends are showing us that the green focus is here to stay: the share of green investments from institutional investors keeps growing.

A green pledge
During the 2019 UN Climate Action Summit in New York, the Danish pension industry in collaboration with the Danish government announced plans for the pension industry to invest more than EUR 46 billion in green transition towards 2030. The number corresponds to 12 per cent of the total Danish gross domestic product and more than half of the total public consumption in Denmark for a whole year.

Following the pledge from the Danish pension industry, the Climate Investment Coalition was established as a partnership between the Government of Denmark, Insurance & Pension Denmark, the Institutional Investor Group on Climate Change (IIGCC) and World Climate Foundation. The aim is to unlock private capital to invest in global green investments in both developed and emerging markets.

Push from the bottom
Until recently, green investments were considered both alternative and high-risk. However, between 2010 and 2019, more than EUR 2.28 trillion went into building new renewable capacity globally, primarily solar and wind energy.

In Denmark, the pension funds have experienced a growing demand from the pension savers to invest in green stocks and bonds. According to a 2019 survey by Deloitte, it is vital for 49 per cent of the Danes that their pension savings create a positive impact on the environment or the climate and 37 per cent are willing to accept a lower return on investment for a higher impact.

Since 2015, the global market for sustainable investments has seen a 300 per cent increase and between 2014 and 2018, the Danish pension funds’ renewable energy investments more than doubled indicating that the trend has been underway for quite some time.

Defining green investments
The definition of green investments is rather broad and for investors, the ESG (environmental, social and governance) term is in many cases the preferred approach to making sure an investment is indeed sustainable. Currently, it is mainly used for negative screenings, i.e. sorting out unwanted investments, but the ESGs can as well be used in establishing a positive screening.

In March 2020, the European Commission put forward a 700-page long report outlining the EU taxonomy on sustainable finance or in other words: what constitutes a green investment and what does not. The aim of the report is to help standardise what is understood as sustainable investments and the findings are meant as a guide to act by for investors.

Institutional investors have different approaches to green investments. While some aim to abandon all investments in fossil fuels, others choose to maintain ownership of these assets with an intent to push for a greener agenda through active ownership. In any case, green investments are now to be considered.

Global trends in renewable energy investment 2020 (billion EUR)
Average exchange rate 1 USD / 0.85 EUR

Source: Frankfurt School UNEP Collaborating Centre for Climate & Sustainable Energy Finance
PensionDanmark: Sustainability through active ownership

PensionDanmark is a Danish non-profit labour market pension fund. The fund manages pensions under collective and corporate agreements and health care products on behalf of 23,000 businesses. PensionDanmark is one of the 50 largest pension funds in Europe and currently has EUR 36 billion under management.

PensionDanmark was an early instigator among peers in the Danish pension industry when considering investing in renewable energy and the labour market pension fund has already made green investments worth EUR 3.4 billion, contributing to a reduction in CO₂ emissions of 3.4 million tonnes a year. In 2019, PensionDanmark’s renewable energy assets (wind, solar, biomass) produced 3.665 GWh of green electricity. This equals the annual electricity consumption of some 1 million Danish households – exceeding PensionDanmark’s 680,000 members and their families.

Learn more at www.pensiondanmark.com

PFA is investing to make the present sustainable

As the pension company of 1.3 million Danes, long-term sustainable investments are an integral part of PFA’s business model. This is reflected in PFA’s corporate purpose: to create “a sustainable present for the good life in the future”. PFA ensures that the more than EUR 75 billion it invests on behalf of its customers is on the right side of the green transition of the economy.

PFA is a large-scale investor in the green transition. The company has invested a total of approx. EUR 650 million in the world’s currently largest offshore wind farm (Walney Extension) and in the wind farm, which will become the largest (Hornsea 1). Furthermore, PFA is part of a consortium ready to invest EUR 54 million in the planning of one of two so-called ‘energy islands’ proposed by the Danish government as a means to bring offshore wind energy to the next level.

PFA has committed itself to clear targets for its climate impact: its investment portfolio must be CO₂ neutral by 2050 at the latest, and for the newly developed product PFA Climate Plus, PFA strives to achieve CO₂ neutrality already by 2025.

Learn more at www.english.pfa.dk

Sustainability in investments should be transparent and intuitive

Founded in 2017, Matter is a Danish fintech company based on a mission to make capital work for people and planet by making investments transparent and intuitive.

Matter has launched Denmark’s two first sustainable pension plans in collaboration with Skandia and AP Pension, and it helps a range of clients with sustainability analysis and reporting of their investment portfolios.

Drawing upon a team of sustainability experts, economists and tech developers, Matter has developed a tool that helps institutional investors understand the sustainability profile of their investment portfolios, as well as deliver intuitive and transparent reporting for clients. Matter’s tool is built upon the knowledge of dozens of expert sources ranging from NGOs to civil society and academia, and the founding principle that sustainability is complex and must be addressed as such.

Learn more at www.matterpension.dk
Net-Zero Asset Owner Alliance
Climate change rose to the very top of the national and international agendas in 2019. Solving the challenges of climate change will require massive contributions from both public and private players. In September 2019, PensionDanmark and a group of leading international investors announced the formation of the Net-Zero Asset Owner Alliance – an alliance of some of the world’s largest investors stepping up to safeguard the planet. The goal of the alliance is to support and actively work towards achieving the goals of the Paris Agreement by accelerating the decarbonisation of the global economy.

Alliance members commit to ensure that their investment portfolios are carbon neutral by 2050 and thereby contributing to limit the global temperature increase by 2100 to no more than 1.5°C. In focusing on impacting the real economy, the alliance will work to strengthen mandatory reporting methods, exercise active ownership and inspire each other to invest in the green transition. Since the launch of the alliance, an additional three Danish pension funds has joined. Currently, the Alliance consists of 26 institutional investors representing nearly EUR 4.2 trillion assets under management.

Active ownership and responsibility
PensionDanmark fulfils its investment responsibilities by means of active ownership. This means that the pension fund believes that attempting to steer a company in a sustainable direction rather than divesting if the company makes a mistake or fails to comply with international standards is the responsible approach. PensionDanmark exercises active ownership through dialogue with authorities and other stakeholders concerning societal challenges. The approach extends investment opportunities, while at the same time helps solve societal tasks such as the UN’s global goals.

An example of how active ownership has led to action is the dialogue with Royal Dutch Shell, one of the world’s largest oil and gas companies. Since 2003, PensionDanmark and other investors, has sought to influence Shell in a sustainable direction. At the 2019 general meeting, a large majority of shareholders decided that Shell should meet the objectives of the Paris Agreement. Shell now recognises the need for efficient products associated with lower or no GHG emissions, and it has announced a 50 per cent reduction in emissions by 2050. PensionDanmark welcomes Shell’s efforts to limit the temperature rise. However, dialogue will continue as PensionDanmark seeks to promote further improvements on a number of topics, including issues related to occupational health and safety.

PensionDanmark & the Net-Zero Owner Asset Alliance
In 2019, PensionDanmark had 488 dialogues with 279 companies and made progress on 253 milestones.

PensionDanmark
PFA Climate Plus - Climate neutral pension savings
In 2020, PFA launched an innovative product for its pension fund customers, PFA Climate Plus, which allows the customers to choose to place their pension savings in extra climate-friendly investments. From the outset, the shares in the PFA Climate Plus product will emit 60 per cent less CO₂ than the global equity index. The product design enables customers to invest in fewer and greener assets whilst having the same expected risk and return as a more broad-based investment portfolio.

The goal is for PFA Climate Plus to become CO₂ neutral by 2025 and become CO₂ negative by removing more CO₂ from the atmosphere than it emits by 2030. With more than 1.3 million PFA customers of a population in Denmark of 5.8 million, there is a significant potential for PFA Climate Plus to make a notable difference to the carbon footprint of Danish pension savers. Through this green product option, PFA aims to prove that it is possible to combine climate ambitious investments with prudent long-term risk management.

PFA

Matter and NASDAQ team up to disclose sustainability
On a global level, professional and retail investors alike are calling out for sustainable solutions in response to global challenges. In a groundbreaking collaboration for increased transparency and footprint analysis, Matter has teamed up with NASDAQ to make the environmental footprint of sustainable investments transparent and easy to grasp.

The demand for sustainable investment products is on a steep rise. However, sustainability is a complex topic and is not always intuitive in investments. As a result, Matter has teamed up with NASDAQ to create a digital tool for increased transparency and thereby enable customers to understand what sustainability in investments means - ranging from the environmental footprint to exposure to controversial companies, as well as standout performers on issues such as renewable energy, diversity and inclusion.

In May 2020, the Scandinavian bank of Nordea became the first bank to utilise the new tool. The bank uses its calculated footprint to communicate sustainability to clients online and in advisory meetings.

Matter, NASDAQ & Nordea
PRIVATE FINANCE – IT IS GREEN AND IT IS GOOD BUSINESS

A large amount of private capital is required in the green transition and solid financing models are vital if the green political goals for the future are to be reached. Good framework conditions, new finance models and risk management can help pave the way in unlocking private finance for sustainable projects.

Large capital needs
Transforming an energy system and developing new green technologies requires equity. In a recent report from Copenhagen Economics, it has been estimated that investments of more than EUR 85 billion are needed for Denmark to reach its goal of a 70 per cent reduction of greenhouse gas emissions by 2030 (compared to 1990).

Similarly, the European Commission anticipates a financing need of EUR 1 trillion by 2030 in order to achieve the European Green Deal. While it may seem unachievable to gather this level of funding, there is, according to the Danish financial sector, no lack of capital for projects based on a sound business model. Instead, the challenge will be to ensure framework conditions globally that can make necessary investments bankable.

Unlocking private finance for green investments
A big source of capital is in the hands of institutional investors such as pension funds but other types of private capital can as well be part of the solution in financing a greener future. This capital can take many forms such as for instance bank loans, mortgage loans and venture capital.

Mortgage loans are provided by mortgage credit companies and in essence, mortgages are money being lend to someone to acquire something valuable against which the loan can be secured. The money is then repaid over a set timeframe with interest. Traditionally, mortgage loans have been provided for acquiring for instance a house; however, these loan types can also be used as private equity for green solutions.

Venture capital is another form of private capital, which can play a role in financing the green transition. Venture capital often comes from foundations owned by large companies or private investors and venture capitalists earn profits from injecting money into start-ups and scale-ups. Traditionally, the funding comes with a part-ownership in the company and if it makes money, the venture capital gains a surplus. The investments usually carry a large risk but also a large profit potential.

Risk-managing green investments
Some private equity actors may refrain from investments in green technologies as they in some cases are considered to have an unattractive risk-return profile.

The business and finance model known as ESCO (Energy Saving Company) can function as a solution to the risk dilemma. The idea is that a private company or consortium offers to plan and execute an energy renovation or energy optimisation project of for instance an office building, financed through energy savings. The unique part of the model is that the private company behind the ESCO guarantees the energy saving for the owner of the office building and thus handle the risk.

In case the project creates a larger saving than anticipated, the private company will profit.

A government can as well support a growing number of investments in the green transition through credit agencies. This can be in the form of for instance bank guarantees for loans, insurances or different types of guarantees such as export credit guarantees.

Global growth in sustainable investments between 2012 and 2018 (trillion EUR)
Total assets in sustainable investment has more than doubled between 2012 and 2018 and Europe is leading the trend. Average exchange rate 1 USD / 0.85 EUR.

Source: Global Sustainable Investment Alliance, March 2019 / visualcapitalist.com
EKF - Denmark’s Export Credit Agency

EKF does not only support Danish exporters’ growth and entries into new markets, but is also dedicated to reducing CO2 emissions and promoting the green transition – in domestic industries as well as worldwide.

Green projects are a pillar of EKF due to many years of experience with international wind projects. However, EKF’s work with green transition also include other industries such as water technology and biogas, i.e. sectors with a positive carbon footprint. As part of the budget for 2020, the Danish government allocated EUR 1.8 billion to EKF to promote Danish climate technology to the rest of the world, all this being part of the newly established “Denmark’s Green Future Fund”.

EKF is owned and guaranteed by the Danish state. The agency promotes Danish export and the internationalisation of Danish companies through globally competitive financing and risk coverage.

Learn more at www.ekf.dk

THE VELUX FOUNDATIONS - impact investments for a greener future

THE VELUX FOUNDATIONS are two philanthropic foundations distributing grants within scientific, environmental, social and cultural purposes. In 2019, the foundations gave joint grants of approx. EUR 178 million. Since 2013, the foundations have invested an increasing proportion of their assets in green impact investments, which on the one hand are intended to counter climate change and increase resource efficiency, and on the other hand generate attractive returns.

A significant proportion of the impact investments are placed in mature green technologies such as wind turbines, solar panels and sustainably managed forests around the world, but the impact investments also include investments in tomorrow’s green technologies across industry, transportation, agriculture etc. The aim is to achieve profitability and gain access to markets across the globe, thereby maximising the positive impact on the climate through sales of a firm’s products and services. The foundations have recently raised their target for impact investments from 10 per cent of the long-term invested assets to 15 per cent by the end of 2022 based on positive experiences with impact investments from the early years of the program.

Learn more at www.veluxfoundations.dk
Green electricity to power 450,000 Taiwanese homes
Around eight kilometres off the coast of the Yunlin region in the west of Taiwan, 80 wind turbines from Siemens Gamesa will make up the Yunlin Offshore Windfarm. With its 640 MW capacity, this will be Taiwan’s largest offshore windfarm, which from 2021 will be powering more than 450,000 Taiwanese homes with green electricity. EKF is helping finance the project with a guarantee of EUR 422 million, representing 25 per cent of the senior debt. Taiwan has long been forecasted as the next major market for offshore wind, and the consensus is that Taiwan is poised to be a crucial regional wind energy hub in the coming years.

Together with Danish sponsors and exporters, EKF helped open up the market in Taiwan. The Taiwan Strait – the body of water between the Taiwanese west coast and the Chinese mainland – is with its viable water depths ideal for wind turbines. Political willingness and great ambitions mean that the framework conditions for attracting investors are more favourably advanced than in other potential markets. EKF has so far been involved in the financing of all of Taiwan’s offshore wind farms.

EKF & Siemens Gamesa

Proterra – electric buses of the future
Proterra is a leading designer and manufacturer of electric buses and the company is known as ‘the Tesla of buses’. Electric buses do not emit CO₂, NOₓ or harmful particles when operated, and they make far less noise than traditional diesel-based buses.

Proterra estimates that CO₂ emissions are reduced by more than 100 tonnes annually for each diesel bus replaced by an electric bus. To encourage uptake of its technology and get more electric vehicles on the roads, Proterra partners with a number of established vehicle manufacturers since the technology can also be incorporated into other heavy duty electric vehicles such as lorries and refuse collection vehicles.

THE VELUX FOUNDATIONS have invested in Proterra via a growth equity fund investment managed by a leading London based impact manager. Since investing, the company has grown significantly and revenues have increased sevenfold.

Proterra & THE VELUX FOUNDATIONS
New cost-competitive source of financing for solar energy
The renewable energy company, Better Energy and the Danish bank and mortgage credit company, Nykredit, has entered into a partnership to accelerate the construction of solar plants financed by mortgage loans. The model and partnership ensures cost-competitive and long-term financing of the solar infrastructure projects, which is an important step when upscaling green solutions and reducing greenhouse gas emissions.

The first three Better Energy solar plants financed by mortgage loans from Nykredit supply the global bioscience company Chr. Hansen and the Danish capital Copenhagen with green energy. Better Energy will maintain ownership of two of the plants, whereas the third solar plant has been divested to the local Copenhagen utility company, HOFOR. The three solar plants combined have a capacity of 75 MWp and are expected to produce electricity equal to the annual electricity consumption of 19,000 Danish households.

Better Energy Management, Nykredit, Chr. Hansen & HOFOR

Excess heat utilisation - a bankable solution
A few years ago, the city of Benxi vanished in smog. Now, the old steel capital of China can breathe again. Implementing an advanced district heating system in corporation with Danfoss has reduced annual coal use by 26,500 tons. This has reduced emissions of 69,000 tonnes of CO₂ plus massive amounts of NOₓ and SOₓ and Benxi has become a model city for excess heat utilisation.

In addition, the advanced Danfoss control equipment has led to increased heat supply stability, which means higher comfort for end users. The surplus heat system includes 40 Danfoss heat exchange substations and is planned to cover 7 million m² this autumn.

To finance the project, a framework agreement was made between Liaoning Environmental Protection Department, Benxi City Government, Bengang Group and Danfoss in 2014. Liaoning Environmental Protection Department provided the start-up funding of EUR 1.2 million for the project. Turning an annual loss of EUR 2.4 million into a revenue of EUR 206,000 and EUR 607,000 within the first two years respectively, the project has proved fully bankable and commercially viable.

Danfoss, Bengang Group Corporation & Bengang Group Heating Development Co., Ltd.
ALTERNATIVE INVESTMENT MODELS FOR HIGH-RISK MARKETS

The developing countries around the globe are in dire need of infrastructure investments within energy, waste, transport, water, and agricultural improvements. However, the markets’ high-risk profiles often mean that investors refrain from engaging. Alternative financing models are part of the solution.

Developing countries around the world are experiencing a gap between the investments required to meet the commitments of the Paris Agreement, the Sustainable Development Goals and the financial investment opportunities available. The UN estimates the gap to be EUR 2.2 trillion every year. Meanwhile, more than 10 per cent of the world’s population lacks access to electricity and one in three people around the globe lacks access to safe drinking water.

The need for investments is urgent. However, a central problem is that developing countries in financial terms tend to be classified as high-risk markets and this provides a large barrier when the investments required are in the category of millions or billions of euros.

**Blended finance – an attractive model**

 Financing for high-risk markets can take many shapes: share capital, mezzanine loans, subsidised loans, export credit guarantees, and loans from development banks, regional banks or commercial banks. Overall, many investors favour blended finance as an attractive method to invest in high-risk markets. The model involves mixing different forms of capital such as public and private to finance large infrastructure projects.

According to the OECD, making use of blended finance can bridge the EUR 2.2 trillion investment gap. The initial investment is the hardest to achieve and it furthermore involves the highest risk for investors. As a result, the initial financing is the target of blended finance.

The overall idea is to utilise public finance as a catalyst to attract private investors. This can create an impact that drives both social, environmental and economic progress, while at the same time securing financial returns for investors in line with the market rate. The method is one of several methods of finance all aiming at taking the initial risk off investments.

**Bankable projects are key to a green transition**

Blended finance, in other words, can make risky investments bankable. It can channel private investments to sectors of high-development impact while at the same time delivering attractive risk-adjusted returns. Financing the green transition in developing countries is key to enabling a global green transition and it is pivotal that public and private capital can work together to address the global challenges.

Ensuring proper financing for high-risk markets can help alleviate the issues of lacking access to basic infrastructure for millions of people. An added benefit to the early, bankable investments is the creation of more robust and resilient markets that might in the near future prove ready for market-based solutions.
P4G – Partnering for Green Growth

Ensuring sustainable partnerships which can start up and scale up their solutions is a core task for P4G – Partnering for Green Growth and the Global Goals 2030. The international initiative supports partnerships through funding of up to EUR 850,000. Several partnerships with Danish participation have been supported by P4G focusing on flood warning systems in Vietnam, solar-powered cooling technology for fishermen in Kenya, improving water supply in Ugandan refugee camps, etc. The partnerships all include NGOs, public authorities and private companies.

At the international level, P4G is coordinated by a secretariat in Washington D.C., while national anchoring in the 12 partner countries is secured through national platforms. State of Green is the national Danish P4G platform. The national platform ensures a broad Danish involvement from strong actors with innovative sustainable solutions, including investors such as pension funds.

Learn more at www.p4gpartnerships.org

IFU – Financing green transition in developing countries

IFU, the Danish Investment Fund for Developing Countries, offers risk capital and advisory services to companies in Africa, Asia, Latin America and parts of Europe. Investments are on commercial terms in the form of share capital, loans and guarantees. The purpose is to promote economic and social progress as well as to support the UN Sustainable Development Goals. IFU is contributing to financing the green transition and has for example invested in more than 1,150 MW renewable energy in Kenya, Egypt and Mongolia.

IFU acts as fund manager for several investment funds based on public and private capital, including the Danish Climate Investment Fund and the Danish SDG Investment Fund, which are partly capitalised by large Danish pension funds. In total, IFU has been engaged in 1,300 investments covering more than 100 countries. Total capital under management is EUR 1.5 billion.

Learn more at www.ifu.dk
The Partnership for Blended Finance on Water

As in many countries, water leakage is a huge challenge in Vietnam. In 2018, the P4G initiative supported a start-up partnership analysing how financial models could be developed to start investments in modernising the drinking water infrastructure in Vietnamese water companies. The Partnership for Blended Finance on Water focused on investments in pressure management technologies with the aim to reduce non-revenue water from 22 per cent today to 15 per cent in 2025 while at the same time reducing energy consumption.

IFU developed the blended finance model. Encouragingly, the conclusions of the feasibility study found that for many water companies, investing in pressure management technology provides enough savings in energy costs and water leakage over a five-year period for the investment to be made through conventional financing. With investments, other companies can achieve water savings with a very short payback time.

Grundfos, IFU, P4G, VWSA & ASSIST

Danish finance scales up wastewater solutions in India

Wastewater is a huge challenge, not least in developing countries and emerging markets. Consequently, Indian authorities have tightened wastewater regulations and introduced guidelines for Zero Liquid Discharge (ZLD) for major water consuming industries. To assist companies in complying with regulations, Rochem Separation Systems (RSS) has developed a modern and energy-efficient wastewater recycling and ZLD solution that can recover 75 to 80 per cent of the water from wastewater. The plants are provided on an operating lease basis to individual companies, which are charged a fixed and variable fee.

The upfront cost of installing the turnkey plants is financed by Roserve, a joint venture set up by RSS and the Danish Climate Investment Fund managed by IFU. Total investment is EUR 22.8 million of which IFU has provided EUR 4 million in equity. Due to local financial institutions’ reluctance to finance innovative business models, Roserve is instrumental in scaling up sales and fast track the adoption of wastewater recycling in India. Roserve has so far established 30 plants in India and the solution has even greater potential.

IFU, Danish Climate Investment Fund & Roserve
Lake Turkana – Africa’s largest wind farm
Located in northern Kenya, the Lake Turkana Wind Power project consists of 365 Vestas turbines with a total capacity of 310 MW. A 428 kilometre double circuit transmission line ensures that the project can deliver 15-20 per cent of Kenya’s current installed electricity generating capacity. The project furthermore replaces fuel imports of approx. EUR 120 million annually.

It took more than eight years to finalise the project and it required a financial package of approx. EUR 600 million. Nordic Development Financing Institutions (Norfund, Finnfund and the Danish Climate Investment Fund) have provided a substantial part of the equity. Loan financing has been provided by a number of private banks and development banks such as African Development Bank. Denmark’s Export Credit Agency, EKF, also supported the project by providing a project-financing guarantee of EUR 120 million, which relieved the funding providers of risk.

Powering Egypt - Benban Solar Power
With a total capacity of 1.8 GW, Benban Solar Power is Africa’s largest solar park. The park covers 37 km² and it is anticipated that the project can help reduce the number of power cuts and overall support Egypt’s target of a 20 per cent renewable energy supply by 2022.

The park is divided into 41 plots and IFU has invested in three plots of 50 MW each in cooperation with IFC, Swicorp and Acciona. The total financing of the three plots amount to approx. EUR 160 million of which IFU has contributed EUR 10.6 million in equity and loan.

It is expected that the three plots will produce 300,000 MWh a year on average and the solar park has entered into a 20-year power purchase agreement, which means that the project can be implemented on market terms and therefore provide a return on the investment to its investors.
The citizens of Denmark have a long history of involving themselves in the green transition. In the 1970s, for instance, public opposition to nuclear energy meant that the technology was abandoned in Denmark. Since then, a number of initiatives have helped pave the way for the public to engage financially in the push for a greener future.

The Danes have a green mindset and they like getting involved in the green transition. A 2019 study among Danish citizens by Norstat for the Danish Ministry of Climate, Energy and Utilities indicated that 67 per cent of the surveyed think Denmark should be a pioneer country and lead the green transition, even at an increased cost. In another survey from April 2020, approx. 50 per cent of the surveyed even said that they feel the government should spend more money on the green transition.

Where to start when going green?
The Danes are presented with an ever-growing number of ways to financially impact the green transition. Aside from making a conscious choice regarding one’s pension saving as mentioned previously, it is as well possible to choose a bank with a green stance. One has implemented a green bond framework, another has developed mortgage loans for solar PV farms, and a third has gone so far as to only offer car loans to consumers who wish to buy an electric car.

Renovating your private home can as well in many cases be a good investment. Aside from mounting solar PV on the roof, many homes can benefit financially from additional insulation, new windows, installation of a heat pump or replacement of the home’s source of heat away from fossil fuels. The Danish government currently operates with a tax deduction for energy saving initiatives in private homes and in any case, energy renovating your home will often have a short payback time of just a couple of years.

Investing in a greener future
Some citizens wish to extend their green action further and join forces to create a greater impact as a group. One option is to pool resources in a cooperative, which has historically been a popular solution in Denmark. The first cooperatives in Denmark included dairy producers and cold storage options for households but the idea persists in modern cooperatives for farming, in which consumers buy back land to ensure sustainable farming, and for wind turbines in which consumers buy shares in renewable energy.

Crowdfunding is another option for citizens wishing to make an impact in the green transition. Rather than taking out a loan, entrepreneurs and inventors can enter into a crowdfunding of which there are at least three different kinds. One is donation or reward crowdfunding in which people invest because they like the cause and expect no more than a small reward in return. Another is debt crowdfunding in which investors expect their money back with interest and finally, equity crowdfunding in which investors expect a share in the company or invention.

Investor interest in sustainable investment continues to grow

![Investor interest in sustainable investment](source: Morgan Stanley 2019 / visualcapitalist.com)
Andelsbevægelsen - the Danish cooperative movement

The cooperative movement has been part of the Danish story since the first consumer cooperative was created in 1866. The cooperative idea was well suited to Denmark at the time, as most people did not have the opportunity or the funds to start a business. Instead, the citizens of a village or smaller area would join forces in creating a purchasing cooperative or a production cooperative. Between 1880 and 1900, more than 3,000 such cooperatives were established around Denmark.

Historically, cooperatives focused on the agricultural sector through for instance cooperative dairy and slaughterhouses but also cooperative cold stores were common in Denmark in the 1950s. The general ideas behind a cooperative are that the members are the owners and that one membership equals one vote at the annual general assembly.

Coop Crowdfunding: connecting consumer and company

Coop Crowdfunding is a crowdfunding platform run by Coop - the large Danish supermarket chain and cooperation. Crowdfunding is a method of raising capital and getting exposure through the collective effort of friends, family, customers, and individual investors.

The Coop Crowdfunding platform was established in 2017. The idea was to bring the consumers closer to the food entrepreneurs with the ambition of thereby raising the overall quality of food being produced in Denmark. Furthermore, the platform was created to serve as a helping hand for food entrepreneurs in need of finances and/or exposure while allowing the consumer to be more involved in the Danish food industry.

With Coop Crowdfunding, food companies are encouraged to develop their business - through for instance expanding, becoming more sustainable or testing a new product - with the help of the Danish consumers. This way, the consumer has a say in which types of companies succeed and ultimately what kind of products end up on the supermarket shelves. Since the launch, approx. 400 projects have been funded with a total of more than EUR 2.6 million.

Learn more at www.crowdfunding.coop.dk
Wind turbine cooperatives - citizens as co-owners

Onshore wind turbines in Denmark have until recently been covered by an “option to purchase” regulation. This has meant that at least 20 per cent of the ownership of new turbines had to be offered as shares usually of approx. 1,000 kWh (annual production) to local citizens through a cooperative. The price of a share depends on the price of the project, but it equals for instance 1/4,500 of the cost of a turbine, if the project has been divided into 4,500 shares.

The practice of wind turbine cooperatives started in the 1980s and during the following 10-15 years, most turbines were erected by cooperatives. The idea behind cooperatives and the option to purchase is to create a correlation between the benefits and the inconvenience some people experience from living close to a wind turbine. An example of a cooperative is the one behind the iconic offshore windfarm Middelgrunden located outside the Copenhagen harbour. More than 8,500 local citizens bought 50 per cent of the project, equalling 40,500 shares in the project dated from 2001.
Agrain - from waste to food

Agrain is a small Danish company passionate about finding solutions to prevent food waste and starvation worldwide. Agrain has developed a method to upcycle the brewer’s spent grain – draff – from organic, Danish beer production into a variety of different products such as flour, beer, granola etc.

Every year more than 40 million tons of draff is wasted. Some is used for animal feed, some for biogas but most end up as a waste product. Draff is rich in nutrients and could potentially cover 10 per cent of the calorie shortage that the world is estimated to face within the next eight years. Agrain is now upcycling 12 tons of draff every week.

While developing delicious products for the Danish consumer, Agrain is furthermore working on developing long-term solutions to help change the global food systems, in order for the world’s poorest populations to benefit from the qualities of upcycled draff.

In March 2020, Agrain used Coop Crowdfunding to raise money for a machine that could help upscale the production. The company raised EUR 10,600 from 219 backers.

Agrain & Coop Crowdfunding

Image credit: Lars Andreas Kristiansen
When developing innovative technologies and solutions, gaining access to the necessary capital is often the hardest step. However, funding can come from a many sources and in Denmark, a number of governmental and intergovernmental funds can be applied for assistance.

The funds select the most promising ideas and support them with not only funding but often also expertise, knowledge and support in the search for a new export adventure. In many cases, the governmental funds are looking for more than a financial yield. They are as well looking for a societal return in the form and shape of for instance job creation, environmental improvements or overall corporate social responsibility.

**Public support for green ideas**

Public support programmes offer an efficient method for minimising risk related to research, development and testing of new technologies and contrary to financial support from private sources, public support is most often provided without share in the start-up as a quid pro quo.

Oftentimes, however, a good idea is not enough to secure financial support. Fortunately, public financial support usually includes both a strong network, help with developing a good business case and aid for a strategy for securing intellectual property rights. Public financial support can as well function as a seal of approval in the search for additional investments.

**Multi-stakeholder approach**

Innovation and the development of new technologies thrive when a number of stakeholders collaborate and it can create a positive outcome, when existing measures are questioned and existing concepts and ideas are challenged. Academia, private businesses and the public sector can work closely together in what is known as triple-helix structures to develop innovative ideas that not only benefit society but also create solutions and technologies able to survive on market-based terms. In Denmark, the triple-helix approach has proved a driver for the innovation process and a key part of the explanation for the successful technology development in the green industry.

**Innovation is the cornerstone of a greener future**

Denmark has set the ambitious target to reduce its greenhouse gas emissions by 70 per cent by 2030 (in relation to 1990) and achieving the goal will require solutions we do not know today. As a result, innovation is the cornerstone of a greener future.

Danish companies annually invest more than EUR 9.3 billion in research and innovation and for 2020, the Danish parliament allocated approx. EUR 200 million to green research within energy, climate, agriculture, transportation, environment etc.

As a small country with very limited natural resources, it is important to focus on knowledge and innovation. With 412 patent applications per million inhabitants, Denmark is already considered among the most innovative countries in Europe and an increasing amount of these patents is within the field of renewable energy development.

**Horizon 2020**

With nearly EUR 80 billion available, Horizon 2020 is the biggest research and innovation programme in the world. Between 2014 and 2020, the programme offers funding for researchers, companies, entrepreneurs, organisations, regions etc. Horizon 2020 puts emphasis on excellent science, industrial leadership and projects tackling societal challenges. The goal is to ensure that Europe produces world-class science, translates excellent science into innovation and makes it easier for the public and private sectors to work together in delivering innovative solutions.

In order to respond to the urgency and ambition of the European Green Deal objectives, Horizon 2020 will soon launch a call worth close to EUR 1 billion. The call is expected launched in September 2020 with a deadline for applications in January 2021. The Green Deal call will mobilise research and innovation to foster a just and sustainable societal transition aiming at 'leaving nobody behind'. Projects are expected to deliver tangible and visible results relatively quickly and show how research and innovation can provide concrete solutions for the Green Deal’s main priorities.

Learn more at www.ufm.dk/forskning-og-innovation/tilskud-til-forskning-og-innovation/eu-og-internationale-programmer/horizon-2020
EUDP and MUDP – public grant schemes

The EUDP and MUDP are public grant schemes to support innovative technologies within energy and environment. The programs contribute funds to enterprises and knowledge institutions to develop green energy and environment technologies. The purpose is to support growth and job creation through grants to development, test and demonstration, and projects aiming to implement new technologies in full-scale.

The focus is on projects that require major economic resources and thus a high-risk tolerance. By contributing to the financing, the schemes ensure that more projects bridge the gap between “proof of concept” and “proof of businesses”.

EUDP (Energy Technology Development and Demonstration Program)

The aim of EUDP is to support energy technologies to reach Denmark’s climate targets. The EUDP supports a broad spectrum of energy technologies such as renewable energy technologies, energy efficiency technologies, alternative transportation fuels, integration of energy systems including storage and Power-to-X, efficient methods for recovery of oil and gas and storage of CO₂. The EUDP general pool for funding is EUR 33.5 million (2020). According to the recipients of EUDP financial support, 97 per cent of projects would not have been completed to the same extent without financial support from EUDP.

Learn more at www.ens.dk/en/our-responsibilities/research-development/eudp

MUDP (Environment Technology Development and Demonstration Program)

The aim of MUDP is to support environment technologies within prioritised environmental challenges. The scheme supports technologies within water, climate adaptation, air pollution, waste, sustainable building design and circular economy. The MUDP general pool for funding is EUR 18 million (2020). Experiences show that for every EUR 134,000 invested by MUDP, the company in question sees a turnover of EUR 389,000 on average.

Learn more at www.eng.ecoinnovation.dk

Innovation Fund Denmark – investing in sustainable solutions

Innovation Fund Denmark creates frameworks for entrepreneurs, researchers and businesses to help them develop innovative and viable solutions to society’s challenges. Innovation Fund Denmark was created to invest in projects with high risk and high potential. The fund’s results do not necessarily need to be reflected in the direct financial results but can also be evaluated on social welfare improvements, increased societal wealth, job creation, reduction of CO₂ emissions etc.

Innovation Fund Denmark consists of several programs including Grand Solutions for large research partnerships, Innobooster for innovations projects in startups and sme’s, Innofounder for knowledge-based entrepreneurs and a range of international programs. In 2020, Innovation Fund Denmark pool for funding is EUR 255 million of which EUR 107 million is dedicated to green projects. In 2020, the fund is as well administering an additional EUR 47 million aimed at knowledge-based and innovative entrepreneurs and small and medium-sized businesses that have been affected by the covid-19 health crisis.

Learn more at www.innovationsfonden.dk

Vaekstfonden and the Danish Green Investment Fund – Developing Green Businesses

Denmark needs to be on the forefront of innovation and a green transition. In order to do that we need to discover and develop the companies that Denmark cannot afford to miss out on. This is the role of Vaekstfonden.

As the Danish state’s investment fund, Vaekstfonden finances novel businesses with innovative ideas and the potential to make a real impact on society. It does so by aiding them in creating new jobs, supporting companies working towards CO₂-reduction and sustainable solutions.

Through partnerships with investors and companies, Vaekstfonden finances more than 800 companies each year. In 2019, these companies helped reduce CO₂-emissions by more than 677,000 tons. In the years to come, Vaekstfonden is looking into financing many more green and sustainable companies to help transition to a greener and more sustainable planet.

Learn more at www.vf.dk
E-ferry Ellen
The electrified car and passenger ferry, Ellen, has made its debut between two islands in Denmark. The e-ferry project received EUR 15 million in support from Horizon 2020. The project was coordinated by Aeroe municipality, who also contributed EUR 14 million to the project for a docking and charging station. The project included participants from Finland, Germany and Switzerland.

As a prototype and full-scale demonstration ferry, the project addressed the urgent need for reducing European CO₂ emissions and air pollution from waterborne transportation by demonstrating the feasibility of a 100 per cent electrically powered, emission free, medium sized ferry for passengers and cars, trucks and cargo relevant to island communities, coastal zones and inland waterways. The project partners hope that the concept will be applied on a larger scale among relevant industry and ferry operators.

Aeroe Municipality & Horizon 2020
Power-to-X: the HyBalance project

Power-to-X technologies are considered important in order to decarbonize the energy sector, especially where direct electrification is difficult with current technologies. HyBalance is a project that demonstrates Power-to-X in real scale. Hydrogen is produced from water electrolysis, which enables storage of renewable electricity from for instance wind turbines. The technology can thus help balance the electricity grid and the hydrogen can be used for clean transportation and industrial purposes.

The hydrogen produced in the HyBalance project can supply a fleet of more than 800 fuel cell electric vehicles (FCEV) and could contribute up to 0.5 per cent of the GHG reduction targets of the Danish transport sector.

The project facility is placed in Hobro in northern Denmark close to relevant hydrogen end-users in high value markets, such as industry, hydrogen-refuelling stations for fuel cell cars and -buses and salt caverns for hydrogen storage. The HyBalance project has received EUR 2.6 million in funding from EUDP and EUR 8 million from the EU.

EUDP, Hydrogen Valley, Copenhagen Hydrogen Network, Air Liquide, Hydrogenics, Centrica & Ludwig-Bölkow-Systemtechnik

Optimised sorting – a solution to the plastic challenge

Plastic pollution and climate change are some of the fastest growing environmental challenges we are facing today. Since 2009, the MUDP scheme has supported 45 projects that aim to develop new environmental technologies to help combat these global challenges. One example is a technology that follows the thinking of the circular resource economy, where plastic from households are sorted, cleaned and reprocessed to produce a regenerate of such quality that makes it possible to be directly included as a global commodity. A number of Danish companies representing the entire value chain from sorting plants to plastic-producing companies and technology suppliers have been key actors in developing and implementing this project.

In 2020, the project was completed and two types of plastic (PP and PE) were reprocessed into a high-quality product that now has value in the European market. Increased recycling of plastic results in various environmental benefits e.g. reduced CO₂ emissions from plastic incineration and the global use of fossil fuels.

MUDP, Aage Vestergaard Larsen, Reno-Nord, Nomi4s, ARC, Sky-light, AL2-Teknik & Danish Technological Institute
Vertical farms will revolutionise our food industry

Locally produced crops grown around the corner from your block? That will become the reality in the future. One of the biggest vertical farms in Europe, Nordic Harvest, is currently under construction just outside Copenhagen.

To support Nordic Harvest in achieving its green vision, Vækstfonden has invested in the company and the Danish Green Investment Fund has provided a loan. The capital will support Nordic Harvest in building the facility and reach its scalability ambitions. The company has received EUR 8.3 million in investments and loans and it is expected to produce 1,000 tons of food annually when fully operational.

Vertical farming has a great potential for making a green impact on the food industry. To create the necessary transformation, it is vital to invest in innovative solutions. With Nordic Harvest, it is possible to bring crops closer to the consumer, which will significantly reduce the use of fossil fuels from transportation. Furthermore, it uses 90 per cent less water resources compared to ordinary farming.

Nordic Harvest, Vækstfonden & the Danish Green Investment Fund

DRIP - Partnership developing innovative efficient technologies in the food industry

DRIP is a public-private partnership focused on water efficiency in the food industry, one of the largest water-consuming industries in Denmark and globally. The partnership gathers a number of food sector companies, technology providers, universities and research and technology organisations (RTOs) to produce more food with less water without compromising product quality and food safety.

The project is supported by Innovation Fund Denmark as a triple helix partnership. Based on societal and business challenges, opportunities and innovation needs, Innovation Fund Denmark wants to enable cross-disciplinary investments in knowledge institutions and companies – private as well as public. The projects that receive funding usually have a high-risk profile and high value creation. The DRIP partnerships have gained a EUR 6.7 million investment from the Innovation Fund and EUR 6.4 million from the participating partners over a 5-year period.

Innovation Fund Denmark, DRIP Partnership & Danish Agriculture & Food Council

Image credit: Danish Agriculture & Food Council / Prikken Design
Where global wind giants come to test

Rising more than 230 meters into the air, the next generation of wind turbines rotates in the strong winds at Test Centre Østerild in the northwest part of Jutland. The public-private partnership at the heart of the Danish wind energy success story is also demonstrated in full force at Test Centre Østerild.

Østerild is financed jointly by the wind industry and Technical University of Denmark (DTU). The joint ownership and operation provides globally unique opportunities for both the industry and researchers. DTU Wind Energy operates five of the nine pads at Østerild, while the other four are operated by Vestas and Siemens-Gamesa.

According to the laws regulating Østerild, the industry must cover all expenses related to its establishment and operation. DTU operates the test centre, and its five test pads are open for international companies through open tenders. The next giant to be tested at Østerild will be the Siemens-Gamesa 14 MW turbine, planned for installation in 2021.

DTU, DTU Wind Energy, Thisted Municipality, Vestas Wind Systems & Siemens-Gamesa Renewable Energy
Learn more about how to finance the green transition, find more cases from Denmark and around the world and connect with Danish expertise at www.stateofgreen.com

State of Green facilitates relations between Danish and international stakeholders seeking to drive the global transition to a sustainable, low-carbon, resource-efficient society. We are a not-for-profit, public-private partnership founded by:

- Confederation of Danish Industry
- Danish Energy Council
- Danish Agriculture & Food Council
- Ministry of Industry, Business and Financial Affairs
- Danish Ministry of Climate, Energy and Utilities
- Ministry of Environment and Food of Denmark
- Ministry of Foreign Affairs of Denmark