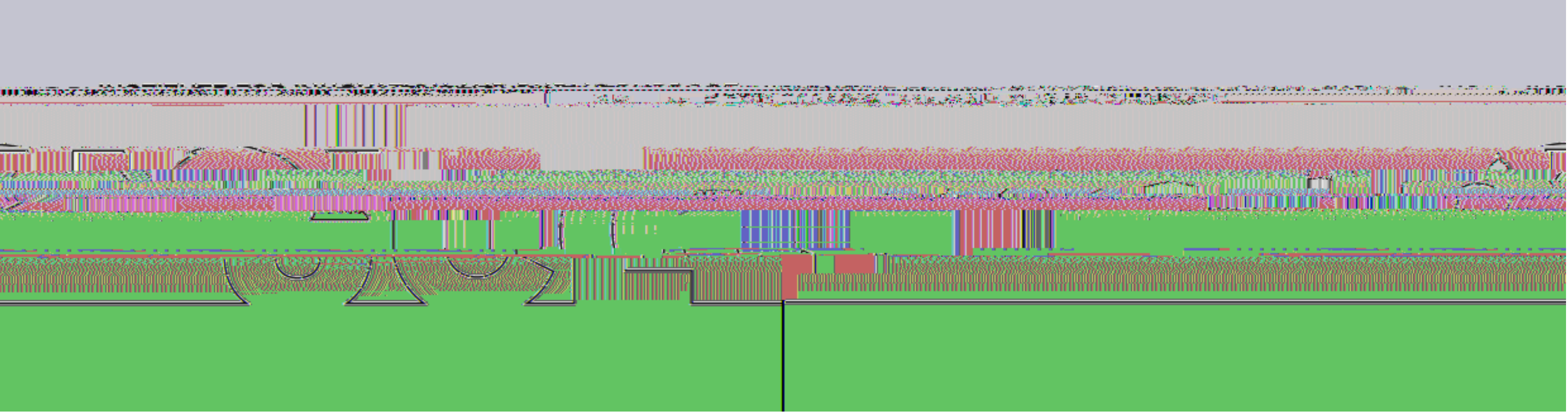

Rainer Kattel, Mariana Mazzucato, Jonas Algers and Olga Mikheeva

Report commissioned by Manifest Centre for Societal Analysis

Savings from the point of view of an individual and from the point of view of society as a whole are two entirely different concepts. They ought to be distinguished by using two different labels, not the same as now. This just causes confusion. Society as a whole can only save through productive investments.

Ragnar Frisch, *Noen Trekk av Konjunkturlæren*, 1947.

The value of petroleum-related assets, technologies and capabilities will diminish in the years to come, threatening jobs, export revenues and industrial innovation. With an advanced industrial base in sectors such as energy, maritime industries, offshore engineering and process industries fueled by green hydropower, the Norwegian economy might seem ready for a green industrial transition. But Norway faces a wicked policy paradox. On the one hand, reduced demand for petroleum, as a result of global climate policies, will mean that the country's main engine of growth must be replaced. On the other hand, several of Norway's foremost technological advantages are developed by the petroleum industry.

The carbon lock-in of the economy is exacerbated by path-

tt t t c

The mission of the UCL Institute for Innovation and Public Purpose (IIPP) is to change how public value is imagined, practised and evaluated to tackle societal challenges — delivering economic growth that is innovation-led, sustainable and inclusive.

Growth has not only a rate but also a direction: IIPP confronts this directionality head on. Finding solutions to global challenges requires purposeful organisations to collaborate in fundamentally new ways — across the state, businesses and civil society. Together, they can help reshape markets to produce growth that delivers public value. Building symbiotic eco-systems requires new tools and new forms of collaboration.

IIPP rethinks the role of the state in these collaborations. Rather than just a market-fixer, it can be an active co-creator of value. A mission-oriented approach can be used to set inspirational goals, with dynamic tools — from procurement to prize schemes — to nurture bottom-up experimentation and exploration across different sectors. IIPP's research and teaching help create new economic thinking and practical tools to make this a reality.

IIPP is a department within University College London (UCL) — founded in 1826 to solve grand challenges — and part of The Bartlett faculty, known internationally for its radical thinking about space, design and sustainability.

c g t

We would like to thank Björn Asheim, Jan Fagerberg, Jan Kregel and Erik S. Reinert for their comments on an earlier version of this report.

This report can be referenced as follows:

Kattel, R., Mazzucato, M., Algers, J. and Mikheeva, O. (2021). *The Green Giant: New Industrial Strategy for Norway.* UCL Institute for Innovation and Public Purpose, IIPP policy report (PR 21/01). Available at: https://www.ucl.ac.uk/bartlett/public-purpose/pr21-01

ISBN 978-1-917384-20-9

PART I:

INTRODUCTION AND MAIN RECOMMENDATIONS

1.

Figure 1. Investment in petroleum in 2017 NOK (million)[6]

The dramatic scenario illustrated in this chart is double-edged. On the one hand, many jobs and prospects for industrial innovation may be lost. On the other hand, the engineers and workers involved in constructing offshore platforms for petroleum today could be constructing offshore wind power plants tomorrow. The same chart therefore implies that the capacity to absorb tens of billions of NOK in annual investments in green industrial development will be freed up in the real economy, at a time when international markets for green industrial technology are set to grow at record pace.

As Semieniuk and Mazzucato have shown, various predictions 'emphasise the need for investments to double or even triple over the next 15 to 25 years' in order to enable green transformation of the global economy.[7] The increase implies compound annual growth rates that are several percentage points higher than recent historical rates. In order to produce 100% of electricity from renewables, the global economy needs investments in the amount of USD 5.5 trillion; low income and lower middle-income countries alone need investments in the range of USD 784 billion. Simply put, current green investment trends are insufficient. At the same time the global demand for green technologies offers opportunities for industrial development. Combining increased investment in the green shift with domestic industrial development provides a chance for a new path for the Norwegian economy.

Norway has significant capabilities at its disposal for action on this double challenge to the economy -3.9 (3 (o) -2.7) -6.3 (s)9 shown that 12 of the most devastating fossil fuel projects that are currently being planned or under development would use up three-quarters of the total remaining carbon budget if we are to have a 66% probability of limiting global warming to 1.5° Celsius. One of the most important funders of these projects is the Government Pension Fund Global.[8] The fund can serve as an insurance for the current and future wellbeing of Norwegians only if it's invested into funding the productive assets of the future, not of the past.

The lessons of Norway's historic approach to industrial development may prove valuable. Norway has shown before its ability to adapt to a changing context. At defining points in history, the Norwegian state has taken on global level, and contribute to the success of Norwegian exporters who foster sustainable, green industrial jobs at the local and national level. Conditionalities will be important to ensure that economic development and international cooperation considers labour and environmental conditions, and the distribution of risks and

PART II:

ECONOMIC CONTEXT AND POLICY FRAMEWORK

2. The Norwegian context

As the economist Carlota Perez has shown, capitalism evolves through periodic technological revolutions that reshape the economy.[10] Finance and technology are key ingredients in this process, co-shaped by public policy: "While each revolution brings a paradigm shift in the direction of innovation and the general criteria for

While the Oil Fund and the fiscal rule have enjoyed broad political support in Norway, concerns have been raised that the system has allowed a petroleum bubble to go unnoticed.[17] Another concern is that elements of the fiscal rule may be outdated. This rule was made to safeguard stability, whereas what the Norwegian economy needs now is patient long-term finance for large-scale dynamic change to increase the economic diversity. The fiscal rule enables large public gross investments in the petroleum industry to be kept outside the normal government budget. This system fuels the current petroleum-determined path dependence. As a petroleum-dominated Norwegian economy stands on the brink of the green transition, it may be wise to rethink rules and regulations that were put in place to preserve the status quo. As the context changes, so should policy.

There is an emerging consensus that Norway needs to increase its efforts in the green industrial transition. Several evaluations and reports commissioned by the government as well as other institutions have found that Norway needs to world.[22] In 2017, Sintef estimated that Norwegian offshore wind (floating and bottom-fixed) has an export potential of NOK 50 billion and 24 000 jobs by 2030, and double that by 2050.[23]

The UK has set a goal of 30 GW offshore wind generation by 2030.[24] Denmark, already well ahead of Norway, has already approved a €37 billion package for development of an extra 12 GW.[25] A leaked draft EU strategy shows that the EU aims to develop 60 GW by 2030 and 300 GW by 2050.[26] At the time of writing, Norway has yet to set goals for offshore wind development. Nor has a financing scheme or necessary regulations for offshore wind been established.

While industrial companies and climate activists are impatient, the government has been slow to act. In 2019, Norwegian researchers pointed out that, "What has happened in the industry so far has been 'bottom-up'. There haven't been any publicly led initiatives."[27] Political authorities have not established a domestic market that could facilitate the demonstration and industrialisation of technologies developed by Norwegian

Several

and transport costs through greater deployment.[38] CCS development will require coordination and cooperation between a number of actors and investment support.

, t t

Shipping could be emission free. Batteries, hydrogen and ammonia have the potential to be energy carriers for different segments of seaborne transport. Norway is a significant player in the global shipping market, with a large number of ferries in domestic transport and Norwegian firms owning 7% of the world's vessels. McKinsey estimates that the Norwegian market for low-emission and emission-free maritime industry can reach €5 billion by 2030 and between €17 and 53 billion in 2050. Mostly, this will not be new jobs, but preserving the existing ship-building industry.[39]

Requirements for low emissions in ferry transport by 2023, as announced by the government, could be an

The growing market for batteries will create a number of relevant segments for Norwegian industries, from production to recycling. Panasonic is eying investments in a new plant in Norway, in collaboration with Equinor and Norsk Hydro,

3. New industrial policy framework: the mission-oriented approach

Moving to a greener low carbon economy means redirecting all sectors and all actors – public, private and civil society – towards economic growth in a sustainable and inclusive direction. However, such challenge-led growth requires a new toolkit; one that is more based on market shaping and market co-creating.[49]

Directing investment into green industrial development rather than petroleum will not be profitable from a static short-term perspective. Ground rent gives rise to a very high value-added per employee in the petroleum sector, making non-strategic sunset industries highly profitable in the short term. Therefore, green industrial development is not about maximising value-added in the short term. Instead, a green industrial strategy is about developing technology and innovation that can help solve the climate crisis while capturing shares in markets that will expand as the global green transition progresses. The plummeting costs of renewable energy have been driven by mission-oriented investment and innovation by countries such as China, Denmark and Germany.[50] By accelerating zero-emission technologies along their learning curves, Norway can utilise first-mover advantages within such key sectors and develop necessary technologies for the global green shift.

Markets will not find a green direction on their own. There is not yet a ready-made route that will make multi-directional, experimental, green innovation profitable. Business does not invest unless it sees an opportunity for growth, so turning mitigation into opportunities for investment and innovation is key. Governments cannot micromanage this process as that would stifle innovation, but they can set a clear direction, make the initial high-risk bold investments which crowd in private actors later on and reward those who are willing to invest and innovate. Through can be justified, in the main it is assumed that the private sector is the more efficient innovator, possessing greater entrepreneurial capacity and better able to take risks given the pressure created by competition. In contrast, the state is viewed as risk-averse and in danger of creating government failure if it becomes too involved in industrial policy by ‘picking winners’. The perception is its role is to level the playing field for commercial actors—mostly through supply-side inputs such as better skills or the removal of market frictions—and then get out of the way. This has led to rather diverse debates and the development of policy practices aimed at finding ever more precise *policy targets* through better measurement of failures and of the impact of policies trying to fix those failures. Such a targeted approach has led to an intense focus on the effectiveness of single policies, rather than evaluating the impact of policy mixes and public investment portfolios.[53] Indeed, as argued by Reinert, Rodrik and others, policy discussions, in particular, should focus on ‘heterodox’ policy approaches that recognise both market and government imperfections and failures—as well as the fact that it is impossible or even undesirable to attempt to remove all of them at once—and the need for policies that support scale economies, dynamic learning effects and cross-sectoral spill-overs.[54]

process is cumulative, collective and uncertain, the rewards from such innovation is increasingly distributed in fewer hands based on an ideology of maximising shareholder value. As the state contributes capital and workers contribute labour to the innovation process, such stakeholders should also participate in sharing the rewards.

PART III:

STRATEGY AND POLICIES FOR THE GREEN GIANT

4. Mission-oriented market shaping

˛ c ç t˛ :

A Green Industrial Investment Bank

Norwegian Bank for Sustainable International Cooperation

An amended fiscal rule for the green industrial transition

Innovative procurement for green economic development

Figure 2. Global renewable energy investments in wind and marine energy R&D[62]

This type of public direct investment has been found to *mobilise* private investment in renewable energy. According to Deleidi, Mazzucato and Semieniuk,[63] public investment does not only have a positive effect on private investment, but also has the *largest* positive effect compared to other traditional policy tools. While public investments are often misunderstood to crowd out private investment, these results point to the crucial role of public investments in developing technologies, taking on risk and pushing down unit costs in renewable energy generation.

4 c t t g t t t

As we argue above, the investments in Norway's most important economic sector are set to dwindle rapidly over the next decade. Over the previous decade, average annual investments in the petroleum sector amounted to more than NOK 170 billion (about USD 17 billion).[64] This has directed labour, capital and innovation towards petroleum extraction.

The level of annual investments in petroleum are in a business-as-usual scenario estimated to fall by 60 billion NOK for the years 2025–2034, according to one recent report by Statistics Norway. In a scenario with a more restrictive extraction policy, the annual investment level in this sector is estimated to fall below NOK 40 billion in 2029 (see Figure 1 above). On the one hand, the scenarios depicted in Figure 1 show that the fossil-driven engine of the Norwegian economy will be weakened. On the other hand, the same chart implies that real economic resources, such as engineers, technicians and productive facilities, will be available for a new economic direction. This double-sided nature of the transition from petroleum dependence, where the old must be phased out while the new is rapidly phased in, is the vantage point for our proposed Green Giant Strategy.

Whereas the dominating role of oil and gas investments over previous decades drove Norway down a petroleum-dependent path of economic development, where skills and technology are linked to that industry,

Figure 3. Norwegian total public energy R&D budget[66]

Expectations of the green industrial shift are high and there has been a wave of private investment in the green transition in the last year. Since the end of 2019, ‘green’ firms have doubled their share of value on the Oslo Stock Exchange. The value of green shares has increased by 84% in the same period and several green firms have been, or soon expect to be, listed on the Stock Exchange.[67] Some commentators argue that Norway is experiencing a green bubble similar to the dotcom

telecommunications and banking sectors.[86] This institutional set-system, this makes SWFs a unique type of public investor as they have the direct capacity to intervene in private firms, on a par with

Strategic development banks tend to possess substantial analytical capacities in the form of technical competences and market intelligence that commercial banks or other types of financing agents do not have.[103] This allows public development banks to perform due diligence of projects, especially pre-appraisal (i.e. before

learning process within the banking sector was essential to the financing of industrial technologies in developed countries: economic development occurred when local industrial *firms* received financing for investments, not just projects.[112]

There are other already existing institutions that could be wholly or partially merged into the new Green Industrial Investment Bank. Norfund has been operating on behalf of the Norwegian government as a state investment company for private sector development in developing countries. Through equity and loans, Norfund invests in priority sectors, including green energy and infrastructure.[113] It has accumulated significant expertise in developing regions, including in Africa, which can be further strengthened before the fund is turned into the subsidiary of the bank fully dedicated to international investments in green sectors abroad.

Other existing agencies, such as Eksportkreditt, GIEK, NORWEP and Innovation Norway, all have overlapping mandates when it comes to ex

Establish a Ministry of Climate and Industry

To coordinate and implement the green industrial strategy, Norway could establish a new Ministry of Climate and Industry. It is important to coordinate the phasing out of petroleum and the phasing in of green industries, and to ensure that the burden of adjustment is not placed on Norwegian workers.

The development of the petroleum industry was a large transition for the Norwegian economy, which required

5. State-owned enterprises in the green industrial transformation

̧ c ç t̸ :

G

their electricity capacity portfolios from 9% to 23%.[121] At the same time, some of the SOEs operating in the carbon-intensive sectors – coal, gas and fuel – are powerful multinational corporations (such as Petrobras, explicitly to protect the state's and Norwegian interests.[131] And more recently, when SOEs have become partially privatised, state majority control is considered important in order to block any outsourcing abroad.[132]

The large share of state ownership in Norway implies that an innovation-while production continued in Singapore and the USA.[142] In 2011 Elkem Solar, another Norwegian company, was taken over by China National BlueStar and new production facilities were built in Iceland instead of Norway. China National BlueStar is owned by ChemChina, a Chinese SOE. With a greater willingness to use state ownership in strategic sectors, the Norwegian solar sector may have fared better.

Governments tend to utilise SOEs to achieve policy goals beyond profit maximisation. There is evidence that suggests that the turn to renewables, a policy goal, has therefore been driven by SOEs. OECD found that the capacity share of SOE ownership in the electricity sector has a positive effect on renewable energy investment across OECD and G20 countries.[143] This is driven by two factors: that SOEs tend to be directly used by states to increase investment in renewables; and that it is easier for SOEs to finance investment in renewable energy projects. Therefore, it concludes that governments cannot be passive shareholders:

> These results point to an opportunity for governments with SOE holdings to make use of their shareholder influence to accelerate the low-carbon transition while retaining public service obligations (such as universal electricity provision) and financial return requirements.[144]

ç t̡

Utilise SOEs for the green industrial transition

The Norwegian state has historically used state ownership to promote industrial policy and innovation, a responsibility the state often had to shoulder due to the lack of private investors. To enable the green transition, the state could either establish new renewable energy companies as it did with Statoil in the petroleum industry, or direc

6. Mitigating climate risks through financial regulation

Encourage ‘green’ and penalise ‘brown’ in financial regulation

A green mandate for the Financial Supervisory Authority of Norway

A green mandate for Norges Bank

The then Bank of England governor Mark Carney made the case that the common mainstream conceptualisation of environmental regulation as a “tragedy of the commons” is less suitable for climate change than as a “tragedy of the horizon”.[145] Where the horizon for monetary policy is over two to three years and financial stability regulation is for about a decade, the horizon for climate change is much longer: “In other words, once climate change becomes a defining issue for financial stability, it may already be too late.”[146] A ‘brown’: there should be a mix of strictly defined taxonomy of green lending and clearly spelled out degrees of brown lending.[151]

Other macro prudential tools include liquidity ratios, reserve ratios, ceilings on credit growth, and restrictions on profit distribution, as well as capital adequacy ratios and incorporation of environmental, social and gov

The collateral framework defined by financial regulators affects the types of assets private banks hold and therefore includes low-carbon projects in the list of eligible assets.[161] Recently, the European Central bank announced that green bonds will be accepted as collateral from January 2021.[162]

Climate-aligned financial regulation and green monetary policies put additional pressures on central banks to act as responsible portfolio managers. The principles of sustainable and responsible investments (SRI) suggested by the NGFS touch upon a broad range of sustainable investment strategies, including environmental, social and governance (ESG) criteria.[163]

Norges Bank has two key missions: to promote economic stability by conducting monetary policy and monitoring the financial system; and to manage Norway's Oil Fund based on a separate mandate issued by the Ministry of Finance. In both areas of responsibility, the issue of understanding the risks and ensuring effective risk management is key.

Norges Bank carries out work on climate risk management within its mandate related to the management of the Oil Fund. The Oil Fund is focused on long-term financial returns and therefore Norges Bank, when assessing the companies in which it invests, takes into consideration sustainability risks from a long-term perspective. In 2019, the Bank divested from 42 companies (282 companies since 2012) based on assessments of ESG risks.[164]

The mandate of Norges Bank g(B) 0.8 (y) 8f [(t) 6.3 (e) -J E-2.8 0 0.24 14 622.e W n /Cs1 cs 0 0 0 sc q 0.24 0 0 0.8 (at) 6

8. Appendix 1.

ucl.ac.uk/iipp

@