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Managing the Decline of Fossil Fuels in a Fossil Fuel Intensive Economy: The Case of The Netherlands

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1 Introduction

The use and combustion of fossil fuels has been the main contributor to anthropogenic greenhouse gas (GHG) emissions over the last decades, making up around 78% of total GHG emissions globally (IPCC, 2014). To stay within the 2 degree, and preferably 1.5 degree average global temperature increase compared to pre-industrial levels set as the goal under the Paris Climate Agreement (Paris Agreement, 2015), a large part of current fossil fuel reserves—around a third of oil reserves, half of all natural gas (gas) reserves, and around 80% of global coal reserves—will need to remain unused (Jakob and Hilaire, 2015; McGlade and Ekins, 2015). Current climate policies put us on a pathway towards at least 3 degrees of global warming by 2100 (Climate Action Tracker, 2017; van Vuuren et al., 2017). Thus, to prevent dangerous climate change a rapid shift towards an energy system based on renewable and low-carbon sources is necessary. Lacking large-scale carbon capture and storage (CCS), fossil fuel use will need to be brought down drastically. Given the pervasiveness of fossil fuels in the (global) economy and its embeddedness in our daily lives this will involve enormous societal change, and radically alter the nature of our economy and change the way in which we produce, consume, and live.

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The Netherlands has been a slow adopter of renewable energy (RE), currently ranking 2nd last in the European Union when it comes to share of RE in the energy mix, with 6% RE (Eurostat, 2017). Historically, fossil fuels are important for the Netherlands, being a large producer of natural gas, functioning as a trade hub for oil, coal, and gas, and as a refining centre for (North) West Europe. Compared to other countries in the Organisation for Economic Co-operation and Development (OECD) the Dutch economy is fossil fuel and GHG intensive (IEA, 2014, p. 10), with over 90% of the total primary energy supply coming from fossil fuels, and with energy intensive industries contributing around 12.5% of GDP (Weterings et al., 2013). Moreover, the countries GHG emissions have been rising since 2015, mainly due to greater use of coal and gas fired power plants (Schoots et al., 2017). Although current developments around wind energy, with the first 'subsidy-free' offshore wind park announced for 2022 (Rijksoverheid, 2018a), current natural gas production caps, and a planned production stop in 2030 for country's largest 'Groningen' gas field due to earthquakes and the resulting societal impacts (Rijksoverheid, 2018b), do have the potential to accelerate the energy transition in the Netherlands, the country will likely not meet its set goal of 14% RE in 2020 (Schoots et al., 2017).

This position as a fossil fuel intensive country and trading hub with rising GHG-emissions is especially interesting given the Netherlands long history of policymaking aimed at GHG-reduction and the expansion of renewable energy. Verbong and Geels (2007) argue that, for a multiplicity of reasons, the Dutch government initiated the energy transition in the Netherlands in the 1970s. Moreover, in the early 2000s, with the fourth National Environmental Policy Plan, the government officially adopted a strategy of 'transition management' (TM) in order to transform the dominant fossil fuel based energy system and accelerate the uptake of renewable energy (Van der Loo and Loorbach, 2012: 221–222).

In sustainability transitions literature, on which this chapter builds, it has been hypothesised that the influence of fossil fuel incumbents in the energy system and strong government-industry ties have contributed to this slow development of renewable energy in the Netherlands compared to other European countries. The energy regime—the current culture, structure, and practices involved in providing the function energy—has shown a strong degree of 'lock-in'. Based on a long history of natural gas production and the build-up of related institutions (Correljé and Verbong, 2004), with the government having played an active role in shaping the energy system by introducing gas and nuclear (Van der Loo and Loorbach, 2012), and incumbent actors partially capturing earlier transition policy attempts (Kern and Smith, 2008; Smink, 2015), evidence suggests that the government, or parts of it, has itself exhibited 'incumbent behaviour', thus strengthening the current regime (Bosman et al., 2014; Van der Loo and Loorbach, 2012). Yet, transitions literature also sees an important role for governments in sustainability transitions, especially in the early stages of a transition (Geels, 2011; Meadowcroft, 2009; Rotmans et al., 2001; van den Bergh, 2013; Verbong and Loorbach, 2012). As such, strong ties between governments and fossil fuel industries could be problematic (Oxenaar, 2017). In a first step towards testing this hypothesis this chapter reports on a study into the question: what financial interdependencies exist between the Dutch government and the fossil fuel industry?[1]

This chapter provides a summary of the findings of this study (Oxenaar, 2017) and explores their relevance to the discussion around a managed decline of fossil fuels. To do this it first provides some relevant insights from transitions theory, such as multi-actor dynamics, then moving on to a description of the methodology used in the mapping exercise, a summary of the found relationships, and a reflection and discussion of the results and their relevance for a managed decline.

2 Sustainability Transitions and Managed Decline

Sustainability transitions are large-scale fundamental societal changes towards sustainability, such as developing a low-carbon energy system. They involve a change in 'regimes', from one set of dominant structures, institutions, practices, paradigms, and economics, to another (Verbong and Loorbach, 2012: 9; Van Raak, 2015). For the energy system, the regime consists of a network of actors and social groups, such as the government, the incumbent fossil based energy suppliers, and users of energy, combined with established practices and rules that guide the activities of these actors, e.g. laws, regulations, and societal norms, and the material and technical elements such as the electricity grid or power plants (Verbong and Geels, 2007). Regimes have a large historical aspect, develop path dependency, and are characterised by a high degree of lock-in. An important factor is that incumbent actors have vested interests in the status quo and social capital has been built up around it leading to a fixed idea about their 'role' in society. Adding to this, the existing

[1] The case study in this chapter is a summarised and adapted version of the following study: Oxenaar, S. 2017. Mapping the Financial and Organizational Interdependencies between the Dutch State and the fossil fuel industry. Master Thesis, Humboldt University Berlin and DRIFT, Erasmus University Rotterdam.

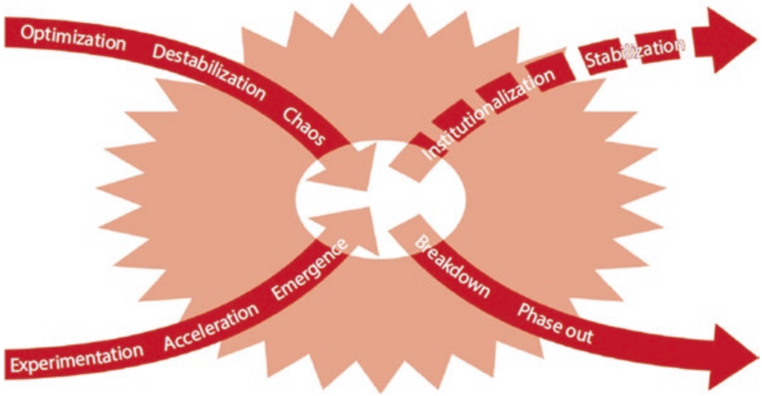

Fig. 6.1 Transition dynamics—X curve. (Source: Loorbach et al., 2017)

'rules of the game' have a stabilising effect on the system and habitual behaviour and shared mindsets and beliefs can contribute to 'cognitive inertia' which might impede actor's sensitivity to other ways of doing. Moreover, existing investments in technology, connected sunk costs, and the complementary nature of the technologies in use, further stabilises existing energy infrastructure (Turnheim and Geels, 2013; Verbong and Geels, 2007).

The shift in regimes is driven by persistent problems in the energy system, such as high GHG-emissions and ambient air pollution, and takes place over a period of decades (Loorbach et al., 2017: 2). Over 25–50 years, transitions generally follow a pattern of build-up and breakdown. 'New' practices emerge and are eventually institutionalised, and 'old' practices are disrupted and phased-out over time (Fig. 6.1). Traditionally, most attention in (sustainability) transition studies has been given to niche-regime interactions and pathways of build-up. However, with the energy transition advancing dynamics of 'destabilisation', 'breakdown', and 'chaos' are becoming more relevant and increasingly studied.[2]

Given the large-scale changes implied in transitions, they are by definition multi-actor processes, involving a multitude of actors from different institutional backgrounds—such as state, market, civil society and science. Changes in role constellations and power relations between these different actors are an important dynamic of a system in transition (Avelino and Wittmayer, 2016; Loorbach et al., 2017: 16). Part of the regime lock-in is thus due to existing power relations, further strengthening the path dependency. In the political economy literature, and now taken up by transitions literature, this has been conceptualised as an unconscious 'alliance' between policymakers and incumbent firms directed at maintaining the status quo in the system (Geels, 2014;

[2] See for example: (Bosman et al., 2014; Karltorp and Sandén, 2012; Turnheim and Geels, 2012, 2013).

Levy and Newell, 2002; Unruh, 2000). It is 'unconscious' in the sense that there is no 'official' or explicit agreement existing between government and incumbent parties that outlines the alliance. Rather, it arises from, on the one hand, society being reliant on growth, and large businesses being able to provide the capital necessary for this, providing an incentive for governments to accommodate them, and, on the other hand, these capital providers being dependent on governments that shape the market and playing field through rules and regulations (Geels, 2014). For the energy system this could take the form of a 'fossil fuel historical bloc' an implicit cooperation between governments, fossil fuel companies, and trade bodies based on existing, underlying, interdependencies. For example, governments need fossil fuel producers to extract their resources while producers need governments to gain access to these resources (Phelan et al., 2013). The existence of such a bloc would exert a strong stabilising force on the energy system, dampening the potential for change and non-fossil fuel-based innovation.

It is because of these multi-actor dynamics, as experience from 'transition management' shows, that transitions cannot be directly controlled and steered but only influenced in their speed and direction (Loorbach, 2009). Governance in such systems is a multi-actor process in which experimenting and learning shapes solutions, innovations, and institutions. Although a government is seen by some as a necessary catalyst in the initial stages of sustainability transitions, its agency in governing transitions might also be limited by the multi-actor dynamics and, for the energy system, the possibility of a 'fossil fuel bloc'. This has ramifications for the possibility of a managed 'decline' or 'phase-out' of fossil fuels. Firstly, when speaking of a 'managed' decline, who is supposed to do the 'managing'? If management is 'distributed' across a multitude of societal actors, as transition management implies, to what extent can governments manage a decline of fossil fuels? What would this management entail? The lessons from TM show that this could mainly focus on providing directional guidance, for example by setting an end date for fossil fuel production or accelerating/decelerating existing dynamics in the phase-out and breakdown 'pathway' of transitions.

3 Methodology

To structurally map the financial and ownership relationships between government and the fossil fuel industry an operational framework has been developed based on the fossil fuel value chain and inspired by studies on sectoral analysis.[3] This resulted in a framework with seven stages: In the initial scoping

[3] See, for example: (Moncrieffe and Luttrell, 2005).

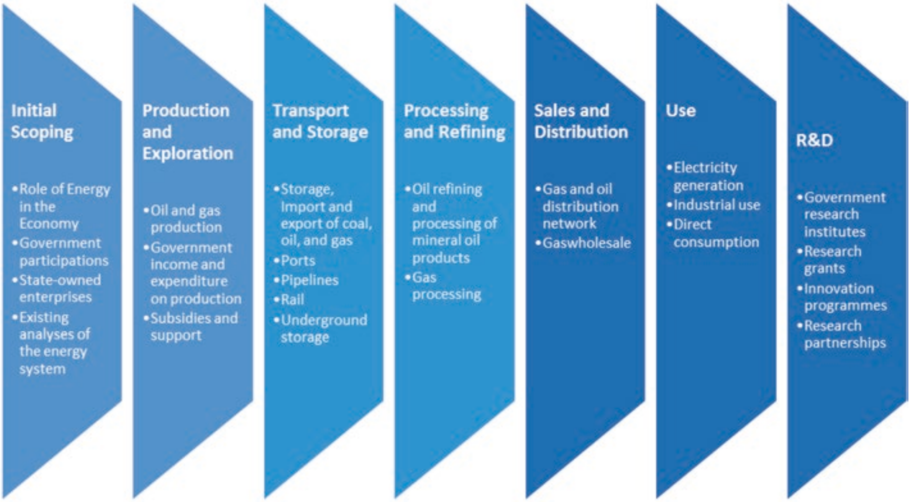

Fig. 6.2 Seven stage framework for the analysis of government-fossil fuel industry relationships. (Source: Oxenaar, 2017)

stage the role of fossil fuels in the economy was analysed by looking at existing studies to identify areas where financial linkages would be likely (Fig. 6.2). Stages one to six—production and exploration, transport and storage, processing and refining, sale and distribution, use, and research & development (R&D)—looked at specific segments of the value chain and R&D. For each stage a set of 'core' topics and questions were developed in an iterative manner by going back and forth between the data and the framework during the process (Oxenaar, 2017).

For the initial scoping, data from statistics agencies and existing analyses of the Dutch energy system were used. The other stages relied mainly on data from: government documents and websites, annual-reports, -accounts, and -budgets of municipalities, provinces, and the national government; annual-reports of websites and studies of and by state owned enterprises (SOEs); data from trade associations; tax data; and reports and accounts of government agencies. The study looked at the period 2001 to 2015 (Oxenaar, 2017).

4 Government—Fossil Fuel Industry Interdependencies

This section provides a summary of the most important findings of the government-industry relations study, looking at government income and expenditure and the relationships found in each segment of the fossil fuel value chain (Oxenaar, 2017). The Dutch government was found to be related to the fossil fuel industry through revenue and expenditure and asset ownership, but also plays an important role in the industry itself. Through SOEs and participations, it is directly involved in the exploration, production, transport and storage, processing, sale, and distribution of oil and gas. Examples of these are the SOE *EBN* through which the State has a stake of at least 40% in all oil and gas production in the country, the publicly owned Dutch ports which facilitates fossil fuel trading and related activities, or the SOE *Gasunie* and regional transmission networks through which the state is involved in gas transport and distribution.

4.1 Government Fossil Fuel Related Income and Expenditure

Historically the Dutch government is very reliant on income from fossil fuels and related activities coming in through a host of different taxes, dividends, royalties, levies, and fees. On average, between 2001 and 2015, this brought in at least €21.5 billion a year.[4] This makes up about 14% of the governments freely spendable income (total government revenue minus social insurance premiums) on average over those years. In 2015, €5.26 billion came from the production and exploration segment, €437 million from transport and storage, €13.6 million from sales and distribution, and €14.35 billion from the use of fossil fuels (Fig. 6.3).

Figure 6.3 shows that until 2013 income from fossil fuel related activities was growing steadily, 7% average year on year growth, both in absolute terms and as share of spendable income. Also noticeable is that, due to the sharp fall in income from oil and gas production, income from the use of fossil fuels is becoming increasingly important as a revenue source. The data series analysed in this study only ran up to 2015, but government income from oil and gas production has continued to decline in 2016 to €2.85 billion, and decreased slightly to €2.82 billion in 2017 (CBS, 2018a).

On the other hand, the government also has expenditure on fossil fuel related activities (Fig. 6.4). For example, through tax exemptions and returns, compensation subsidies, R&D subsidies, and support measures for gas pro-

[4] This is a low estimate since several revenue sources such as income and corporate tax from fossil fuel related activities and VAT on electricity (88% fossil) could not be quantified. The same is the case for support measures and subsidies. For example, the VAT exemption for aviation and the gas production support policy are not included because no monetary estimate is available. And possible support for fossil fuel related activities as part of tax exemption programs for 'innovation' is excluded because it was found to be impossible to distinguish between different industries using the data available.

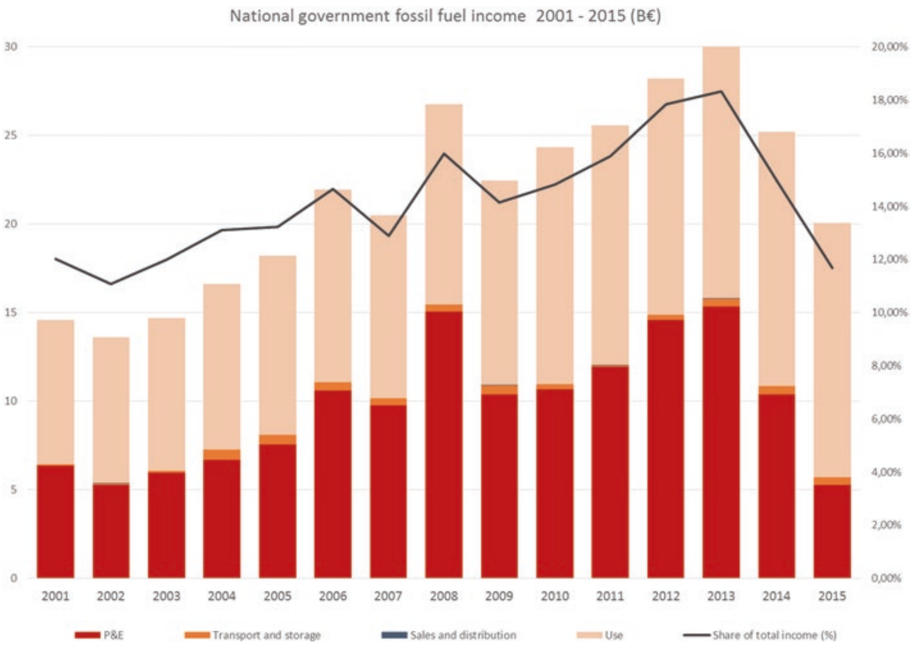

Fig. 6.3 Dutch government income from fossil fuels and related activities (2001–2015). (Source: Oxenaar, 2017)

Fig. 6.4 Government fossil fuel related expenditures (2001–2015). (Source: Oxenaar, 2017)

duction.[5] In 2015 this amounted to €4.36 billion, and between 2001 and 2015 on average €2.06 billion a year.[6] The lion's share of these subsidies went to excise tax exemptions for international marine shipping (€1.6 billion) and

[5] See the 'small field's policy' in later sections. No quantification of this measure is available.

[6] Another 2017 publication looking at support and subsidies from the Dutch government for fossil fuel related activities both within the Netherlands and abroad arrived at the even higher number of €7.6 billion annually (Van der Burg and Runkel, 2017).

aviation (€2.1 billion). The remainder went to income tax deductions for the marine sector (€237 million), energy tax restitutions (€133 million), a compensation subsidy for industries falling under the European Union, investment related tax deductions (€2.2 million), R&D subsidies (€17 million), and €106 million for oil storage (Oxenaar, 2017).

4.2 Exploration and Production

Since the first discovery of natural gas in 1959 the Netherlands has been a large producer with 3,582 billion cubic meters (bcm) having been extracted, and another 891 bcm in estimated proven reserves left.[7] The majority of which (665 bcm) is in the 'Groningen' field,[8] and the remainder in onshore (109 bcm) and offshore (117 bcm) 'small-fields' (TNO, 2016a). This position as a significant natural gas producer is currently shifting with production declining from 85.5 bcm in 2013 to 43.9 bcm in 2017 due to continually lowered production caps put in place on the Groningen field due to earthquakes (CBS, 2018b). Moreover, fields are maturing, with over 80% of the Netherlands' total reserves extracted (CBS, 2016a). This is also affecting gas exports, which declined by 40% over the same period (CBS, 2017) Production from the Groningen field is likely to be lowered further in an attempt to reduce seismic activity and related damages and deal with the social fallout related to these events.

Small amounts of oil, around 1,500 million kilo gram (kg) annually with a total reserve of 32 standard cubic meters (Sm3) (CBS, 2016b), and no coal is produced in the Netherlands. In 2015 the oil and gas reserves were valued at €103 billion, constituting around 14% of the government's total assets. On average between 2001 and 2015 the value was around €140 billion. Although naturally fluctuating based on the gas price the value of the reserves is now declining rapidly due to the lowered production rate, dropping to €42 billion in 2016, severely decreasing the government's wealth (Oxenaar, 2017).

Oil, gas, and mineral reserves are government property, but *de facto* ownership rights are transferred to license holders. In 2015, there were around 11 different gas field owners, 8 oil field owners, 13 operating permit holders, and 6 exploration permit holders. Of these the company *NAM*, a joint-venture between *Royal Dutch Shell (Shell)* and *Exxon Mobil*, is by far the largest permit and concession holder, with around 50% of all fields including the Groningen field. On behalf of the government, the SOE *EBN* takes a 40% financial stake

[7] For a complete production history of natural gas in the Netherlands see the graph on page 7 of TNO (2017).

[8] For a geographical overview of Dutch oil and gas production see the website: NLOG.NL.

in all developed fields except the Groningen field. *EBN* does not hold any production licenses but shares in the investments and revenue for each field and provides technical support. Although *EBN* is not directly involved in the Groningen field it does receive some of its profits through its holding in the gas wholesaler *GasTerra*. *EBN* also supports the exploration of oil and gas through its research efforts and knowledge sharing and is actively involved in finding end-of-life solutions and decommissioning of infrastructure. It thus actively supports oil and gas production from small-fields. Based on *EBN*s revenue of 4.76 billion in 2015 and its 40% share, a rough estimate of total revenue in the Dutch oil and gas production sector would amount to €10–12 billion for 2015 (Oxenaar, 2017).

In addition to the support provided through *EBN*, the government supports oil and gas production through its 'small-fields' policy and the related 'marginal fields and prospective incentive'. The small-fields policy was started in 1974 to maximise production from these fields and reduce withdrawals from the more flexible Groningen field. The policy entails an obligation for *GasTerra* to buy the gas, *Gasunie* to transport it, and *EBN* to take a 40% share. By taking away investment, transportation, and demand related risks it supports production. There is thus a clear dependency of producers on the involvement of these government parties. On the other hand, the government needs to create these conditions to extract its resources and realise the value of its reserves (Oxenaar, 2017). In-order to further incentivise offshore production producers can deduct 25% of their investment costs from their taxable profit and fallow areas can be 'de-licensed' reducing certain legal obligations for operators regarding liability. No monetary estimates of the magnitude of these support measures exist.

As a co-investor *EBN* is also involved in developing end-of-life solutions and decommissioning of oil and gas infrastructure. Given the low gas prices and maturing small (offshore) fields t is expected that decommissioning of infrastructure will become increasingly relevant. As such it is actively engaged in exploring possibilities to extend infrastructure lifetime, for example, through using 'green gas', carbon capture and storage (CCS), or wind-to-gas technologies to replace natural gas flows. Currently, *EBN* estimates that the government will contribute around 70% of decommissioning costs, amounting to €6.7 billion. Given that in 2014 alone total decommissioning costs amounted to €4.3 billion, *EBN* expects the total bill for the government could end up being considerably higher.

Since 2012 seismic activity around the Groningen field has become increasingly strong and has led to increased damage to buildings in the area. This leads to costs related to research on seismic activity, safety inspections, and payments for building retrofitting, reparations on damaged buildings, extra safety measures in new construction projects, and compensation payments. Although the operator of the Groningen field, *NAM*, is legally responsible for the safe operating of the field and thus liable for the damages caused by production the state plays an important role. It has taken up a role in implementing the above measures and pays for around 60% of the total costs, through both direct payments and reduced income from the Groningen field (Oxenaar, 2017).[9,10]

4.3 Transport and Storage

The Netherlands is a large importer of oil, coal, and gas, with coal and oil entering and leaving the country mainly through (sea) ports and gas through pipeline-interconnectors with Belgium, Germany, the United Kingdom, and Norway, and an LNG import terminal. The (sea) ports through which the fossil fuels enter the country are publicly owned and SOE *Gasunie* owns and operates the high-pressure gas network and co-owns the LNG import terminal. Coal transport and storage takes place in the publicly owned ports, but no government related entities are directly involved (Oxenaar, 2017).

4.4 Ports

The Netherlands has 17 publicly owned seaports of which the biggest are the Port of Rotterdam and the Port of Amsterdam. Both ports are 'fossil hubs' with over 50% of throughput, in tonnage, coming from oil, oil products, coal, and liquefied natural gas (LNG). They are also important for the Dutch economy: the port of Rotterdam's activities provides (indirectly) 3.3% of GDP.

The port of Rotterdam houses oil refineries, oil, coal, and LNG storage facilities, a coal fired power plant, and industry that uses oil and gas as an input. Together with the docking fees for ships bearing fossil loads, these activities provide a significant part of the ports revenues (Oxenaar, 2017).[11] Additionally, the intermediate products of the refineries are important inputs

[9] See Follow The Money (n.d.).

[10] The agreements governing the extraction of the Groningen field are secret, this makes it impossible to determine what the exact distribution of responsibilities and costs between the involved parties *NAM, Shell, Exxon Mobil*, and EBN are.

[11] Unfortunately, the Port of Rotterdam does not breakdown its revenue in enough detail to determine the exact fossil share but given that over 50% of all throughput is fossil fuels, and many leaseholders are involved in fossil fuel related activities, they will provide an important share.

for the chemical industries and transport companies located in the surrounding areas (TNO, 2016b). Fossil fuels are thus not only important for the port itself but also for the region at large. For example, around 10,000 jobs, or 10% of port related employment, and €12.5 billion in added value are directly related to the oil refineries, chemical industry, and the coal fired power plant in the port.

In 2015, the port had a revenue of €657.3 million of which, based on fossil throughput, at least half of this could be related to fossil fuels. However, given the prominence of fossil fuel related activities in the port, and the revenue this generates through land leases, the fossil share of revenues probably lies above this 50%. The port authority pays annual dividends to its shareholders, the municipality of Rotterdam (70.8%) and the Dutch government (29.2%). Between 2004 and 2015 this amounted to, on average, €72 million annually. In 2015 this was €91 million of which €64.5 million for the municipality of Rotterdam, or 1.5% of the cities total budget. In addition, the share value of the port represents around 8% of the city's total assets and, in the past, the city has financially supported the port by providing a total of €1.16 billion in loans since 2004 (on which it received €383.4 million in interest). This totaled at least €50 million in operational subsidies and contributions from both the city and the national government, and €936 million in government contributions to investment, mainly for port expansions, between 2004 and 2015 (Oxenaar, 2017).

The city and national government are thus closely related to the port, both through ownership and financial flows, and there is a clear dependency of the port on government contributions to port expansions. Moreover, the port represents an unneglectable share of the city's assets (7.7%) and through dividend and interest payments contributes, in absolute terms, a significant amount to the budget (Oxenaar, 2017).

The second main seaport, the port of Amsterdam, has a strong focus on oil and oil products—it is the biggest gasoline port in the world—and the second largest coal port in Europe (after Rotterdam). In 2015, around 70% of its throughput was fossil fuels. On average, the port has paid around €41.5 million in annual dividends between 2005 and 2015 to its shareholder, the city of Amsterdam. This represents, on average over the same period, less than 1% of the cities total budget and around 1.8% of the cities freely spendable income. The capital value of the port represents 2.4% of the city's assets. In addition, the city has lent the port €147 million in 2013, on which it has received €18.6 million in interest since. Moreover, since 2013, a total of €3.3 million in subsidies given since could be identified, and €757 million in government (national, provincial, and municipal) contributions to port infrastructure investments. The relationship between the port and the city are thus strong, although, financially, the dependency is lower than in the Rotterdam case (Oxenaar, 2017).

Three other port entities, *Zeeland Seaports* ('ZSP'; 40% fossil), *Groningen Seaports* ('GSP'; estimated at least 26% fossil), and the *Port of Moerdijk* (5.6% fossil) were also analysed. These ports are less financially healthy, pay no or very limited dividends to their public owners, require guarantees or loans from their shareholders to continue operations, and their asset value presents a considerable share of their owner's total assets. It was found that all the analysed ports are dependent on their public owners in some respect, whether for infrastructure investments or loans and guarantees, and the public shareholders have a financial interest, based on dividend payments and/or asset value, in the ports (Oxenaar, 2017).

4.5 Gas Transport and Storage

The Netherlands has a large transport and distribution network for natural gas. The SOE *Gasunie* runs the high-pressure network while municipally owned regional distribution companies handle the low-pressure network. In 2015, *Gasunie* managed around 15,500 kilometre (km) of pipelines in the Netherlands and Germany and transported 1.179 Terawatt hours (Twh) of gas. Since 2007 the government, through *Gasunie*, has invested around €8.4 billion as part of its 'gas roundabout' policy in new international pipeline interconnectors, facilities for gas processing and storage, LNG import and breakbulk terminals, and a new trade platform for natural gas. *Gasunie* is also investing abroad, for example, it participated in the building of *Northstream one*,[12] in 2007 it bought part of the German transmission network for €2.1 billion, and it was looking to partake in *Northstream 2*. In addition, *Gasunie* expects to invest around €300–500 million annually to maintain the transmission network. In 2015, *Gasunie* paid €330 million in revenue to its sole shareholder, the Dutch government. Between 2002 and 2015 it contributed on average €313 million in dividends annually. Through *Gasunie* the government owns and manages practically all long-distance natural gas infrastructure in the country. *EBN*, the other SOE involved in oil and gas, also holds stakes (40%) in two large underground gas storage facilities and participates in several offshore trunk lines connecting some of its fields (Oxenaar, 2017).

[12] A natural gas pipeline running through the Baltic sea between Russia and Germany.

4.6 Oil Transport and Storage

Around 35% of all oil, oil products, and chemical products in the Netherlands are transported by pipeline. Currently seven different pipelines or pipeline networks are in operation in the country. The biggest of which is the NATO owned Central European Pipeline system (CEPS) that runs partly through the Netherlands. In the Netherlands it is operated by the *DPO*, falling under the ministry of defence. Through this system, the Dutch military provides at least around 50% (1.8 million cubic metres (mcm) minimum obliged purchase requirement) of the fuel needs for Amsterdam Schiphol airport, the main international airport of the Netherlands. DPO also provides commercial storage services. In this way the state is able to recuperate part of the maintenance costs for the CEPS network. Indirectly, through the government's 5.9% stake in the *KLM* airline, the government also partakes in the pipeline that supplies the other 50% of the fuel needs. All other oil pipelines in the Netherlands are privately owned.

The Netherlands has 30 mcm capacity of oil storage (2014), situated mainly in and around the ports and privately owned and operated. The government is involved in the storage of oil through its obligatory, as an EU and IEA member, strategic stockpiling of oil. The Netherlands Stockpiling Agency (COVA) maintains 80% of the stock (90 days of net import) stored in commercial storage terminals. This is financed through a stock levy on petroleum products, which totals to around €100 million a year in the past few years. Although *COVA* is a not-for-profit organisation it made around €19 million in profit in 2015. In addition to the tax revenue it receives, *COVA* has €953 million in loans guaranteed by the government. The government is thus directly involved in both the transport and storage of oil and natural gas (Oxenaar, 2017).

4.7 Processing and Refining

The Netherlands is a major producer of oil products with six refineries, five located in the port of Rotterdam and one in Flushing (Zeeland Seaports), supplying the North-West European market. In 2015 refinery output amounted to 60 Megaton (MT), almost 10% of OECD Europe, and 1.5% of global production. Although all refineries are privately owned, most by international oil companies (IOCs), they are all located in publicly owned ports, contributing to port income. It was however, impossible to determine the amount of revenue related to these leases. The refineries do benefit from an excise tax exemption on fuel used in the process, amounting to a loss of revenue for the government of around €40 million annually, last reported on in 2011. Some coal processing might take place in the storage facilities located in the ports. However, these are also privately owned and their share in port revenues unknown. For this reason, this was not further pursued in the analysis (Oxenaar, 2017).

The SOE *Gasunie* converts LNG, imported gas, and some domestically produced natural gas.[13] For example, in 2015 *Gasunie* converted 16.9 bcm of high calorific gas to low calorific gas by adding nitrogen to make it suitable for the Dutch grid. Given the lower production from the Groningen field, and the obligatory switching of large gas users to non-Groningen sources entering into force in 2022, gas conversion will increase in the coming years (Ministerie van Economische zaken en Klimaat, 2018).

4.8 Sales and Distribution

4.8.1 Oil

The sale and distribution of oil occurs through wholesalers and retailers or directly by the producer. In 2015, 1,152 petajoule (PJ) in fuels for road, rail, water, and air transport was supplied, of which 538 PJ through marine bunkers and 160 PJ through aviation bunkers found in the public ports and airports and 450 PJ for road transport and 7 PJ for rail transport. As mentioned earlier, international marine and aviation bunkering benefits from a tax exemption amounting to around €3.8 billion in 2015. The tax expense[14] for the government has grown considerably over the years from around €100–200 million per year in the early 2000s, to between 3 and 4 billion euros per year since 2011.

The government is involved in supplying fuels for road transport through the petrol stations leasing government owned land. Between 2002 and 2016 this brought in around €340 million, or €26.5 million on average per year. When it comes to oil, government involvement in this part of the chain is thus mainly financial, through income and tax exemptions (Oxenaar, 2017).

[13] Appliances in industry and households are adapted to the Groningen gas which is a low calorific gas (high in nitrogen), while gas from abroad or small-fields is high calorific gas (low in nitrogen) and needs to be made suitable for the Dutch grid by adding nitrogen.

[14] The ministry of finance does however note that the actual loss in taxes is likely to be lower, due to displacement of demand if the tax exemption were to be lowered or stopped.

4.8.2 Gas

GasTerra, a public-private partnership,[15] is the Dutch wholesaler for natural gas. It handles the gas imports from Russia and Norway, the gas coming from the Groningen field, around 85% of the small-fields production, and all gas exports. The company also serves a policy goal, being a key player in executing the governments 'small-field policy'. Being legally required to buy all gas extracted from the small-fields and taking a production driven approach to supply,[16] it takes over some of the production risk from the producers. This makes it easier for the producers to invest in small-field production. In addition to natural gas, *GasTerra* is also involved in developing a supply of, and demand for, biogas. For example, in 2015 *GasTerra* installed a high-pressure digester and concluded contracts to deliver 54 mcm of biogas. Although *GasTerra* has a very high revenue, €14.7 billion in 2015, its profits and dividends are capped at €36 million. Most of the added value runs through the 'Maatschap Groningen', a partnership between *NAM* and *EBN*, which pays taxes, royalties, and dividends to the government.[17] Through its policy activities, its political engagement, and lobbying through trade associations, *GasTerra* is also actively promoting natural gas in the Netherlands and Europe, pushing for more investments in production and infrastructure (Oxenaar, 2017).

Trade of natural gas in the Netherlands is facilitated by the Title Transfer Facility (TTF), a virtual gas trading hub for North-West Europe, in which *Gasunie* holds a 20% share. Since its foundation in 2003 it has grown considerably, becoming the largest trading facility for natural gas in Europe in 2016, with 21.468 TWh hour traded virtually and 516 TWh physically delivered.

Gasunie, as discussed previously, handles the high-pressure transport, while regional distributors, owned by municipalities, deliver to households. The larger distributors generate significant profits. In 2015 the regional distributors dividend a total of €527 million in dividends over hundreds of Dutch municipalities. Depending on the distributor, between 15 and 30% comes from activities related to natural gas. However, given the large number of

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[15] *NAM* (50%; *NAM* is owned by *Shell* and *ExxonMobil*), *EBN* (40%), and the Dutch Ministry of Economic Affairs and Climate Change (10%) own *GasTerra*. Indirectly the government thus has 50% of the venture.

[16] *GasTerra* buys gas on the basis of availability instead of demand, provides flexible purchasing contracts but long-term buying guarantees. The goal of these measures was to increase producer profitability and maximise gas production from small fields.

[17] For an overview of the Dutch 'gas building', the complex structure of entities, ownership relations, and profit flows see figures 4 and 5 in van der Voort and Vanclay (2015).

shareholders, no municipality was found to have a large dependence on this revenue (Oxenaar, 2017).

4.8.3 Use

Final energy use in the Netherlands amounted to 2.586 PJ in 2015, with industry using 46%, transport 19%, households 17%, agriculture 5%, and other uses the remaining 13%. For industry around 625 PJ was used for energetic uses and 526 PJ for non-energetic uses, mainly as input for refining processes and the production of artificial fertilizer. The Dutch electricity mix is also largely fossil, with 42% coming from gas, 35% coal, and 4% 'other fossil fuels' and the remainder generated with nuclear, wind, solar, hydro, and biomass. The government is involved in the use of fossil fuels through its ownership of two utilities, through fiscal measures public airports, and its share in the airline *KLM*. Also, as discussed earlier, most refining activities take place in public ports (Oxenaar, 2017).

4.8.4 Electricity Production

Before the start of the liberalisation of the 'energy market', municipalities and provinces owned all utilities. *Eneco* and *PZEM* (formerly *DELTA*) are the final remnants of these and will likely be sold in the near future.[18] *PZEM*, with 22 shareholders of which the biggest is the province of Zeeland (50%), is currently in a bad financial position and most of its sellable activities have been sold. However, until 2015 it paid dividends to its shareholders, of which, on average between 2005 and 2015, around 57% coming from fossil fuel related activities. For the province of Zeeland this means it received €130 million in fossil dividends over that period. Prior to the start of *PZEM*'s financial issues in 2013, this made up between 10 and 15% of the provinces freely spendable income. The province has also stated explicitly that it remained a shareholder to protect regional employment, indicating that ownership also serves policy goals (Oxenaar, 2017).

[18] A majority of its public shareholders have started talks to sell the utility *Eneco*, since it split off its grid management unit into a separate entity (owned by the *Eneco* shareholders) in 2017 the municipalities no longer deem ownership of the utility in the interest of the public. *DELTA* has had to undergo the same transformation, and due to its bad financial position had to sell many of its activities. However, since *DELTA* also partially owns the only nuclear power plant in the Netherlands, which is loss-making, and cannot be sold to foreign companies, it has not yet been possible to find a buyer.

Eneco, with 53 municipal shareholders including Rotterdam (31.7%) and The Hague (16.55%), is in a much better financial position and paid €103 million in dividends in 2015 of which around €77 million came from fossil fuel related activities. The municipality of Rotterdam received €25.5 million (1.5% of freely spendable income) and The Hague €12.8 million (1.6% of freely spendable income). As a share of the budget these 'fossil' dividends are thus only a minor part of these city's budgets. However, in absolute numbers it is still a significant financial contribution to the budget. Between 2005 and 2015 Rotterdam received in total €425.4 million and The Hague €222 million (Oxenaar, 2017).

The government also supports (renewable) electricity production through subsidies. Until 2006 subsidies were still given to gas fired power plants (combined heat and power: €320 million in total). Since then no direct subsidies have been given to fossil fuel powered plants. However, between 2003 and 2016, €3.42 billion in subsidies for biomass co-firing in coal plants has been given. In 2016 and 2017 possibilities to apply for further biomass co-firing subsidies were still open. Although this officially is a subsidy on renewable energy it has been argued that the subsidies have led to a postponement of old coal fired power plant decommissioning and could increase the profitability of currently uneconomic power plants (Oxenaar, 2017).

4.8.5 Government Participations in Fossil Fuel Use Related Companies

In addition to ports, almost all airports in the Netherlands are publicly owned. Although they do not use fossil fuels themselves, they facilitate the fossil fuel intensive aviation industry. Only the financial relations with the largest airport entity, *Schiphol Group*, owned by the national government (69.7%), Amsterdam (20.2%), and Rotterdam (2.2%) were analysed. In 2016 it transported around 70 million passengers and had a revenue of €1.4 billion, of which 70% related to aviation, resulting in a profit of €306 million. However, only around 18% of profit comes from activities directly related to aviation. Saying that, it can be argued that all other activities, such as retail and real estate, can only generate profit because of the aviation activities this makes it less clear what the share of fossil revenue is. Between 2001 and 2016 *Schiphol* paid out a total of €1.86 billion in dividends, of which €148 million was in 2016.

The national government is also a shareholder of the, formerly Dutch, airline *KLM* (5.9%) and the tiny *Winair* (8%). In both cases, the government keeps its share in the airlines to protect 'public interest' stating that *KLM* is crucial to the Dutch economy and *Winair* an essential transport provider. *KLM* pays only a very limited dividend, €1 million in total in 2015, and *Winair* is dependent on its public owners to stay afloat (Oxenaar, 2017).

4.8.6 Research and Development

The government supports R&D in different ways. On average, it funds 40% of all R&D in the Netherlands. In total, through a variety of direct subsidy measures and innovation support programs, €17 million in support for R&D related to fossil fuels was identified for 2015. This mainly went to projects on CCS, LNG, and 'tough gas' (i.e. offshore small field production). Between 2005 and 2015 at least €200 million in subsidies for fossil fuel related R&D was given. For all indirect subsidies, such as tax deductions for innovation, which amounted to €2.2 billion in 2015, it was impossible to determine the share going to fossil.

The government also funds R&D organisations and universities. For universities it was estimated that between €50 to a €100 million is spent on energy R&D annually. For the years 2009 and 2010 it was found that, respectively, €12.7 and €16 million was spent on fossil fuel related R&D. No recent data was found. For research organisations it is notable that one main government funded research organisation, TNO, focused its energy program entirely on natural gas and oil prior to 2008. However, it could not be determined how much was allocated on the projects in this program. Although a complete study of their R&D projects was not undertaken their natural gas related R&D was mainly on offshore gas production and exploration and LNG. This is relevant because it further underlines the governments support for offshore natural gas production (Oxenaar, 2017). It was also found that different, government related parties, such as universities, grid managers, and SOEs, form research consortia with research organisations and industry players. For example, in the Energy Delta Gas Research program, running between 2009 and 2015, which looks at the future of the energy system and the role of natural gas (Oxenaar, 2017).

5 Conclusion and Discussion

This chapter presented an overview of the main financial and ownership relations found between the Dutch government and the fossil fuel industry. On the one hand, it showed that fossil fuel related activities form an important source of revenue for the Dutch national government, amounting to, on average €21.5 billion a year, or 14% of freely spendable government income for the period 2001–2015. On the other hand, the government supports fossil fuel related activities with, on average between 2001 and 2015, €2.06 billion annually. The government was found to be tightly interwoven with the fossil fuel system, with ownership and financial relations found in all segments of the fossil fuel value chain, from production and exploration to use and R&D, and at the local, regional, as well as national levels of government. Moreover, through SOEs, it could be said the government itself is to some extent the fossil fuel industry, especially when it comes to the production, transport, storage, and distribution of natural gas. Finally, for the production of natural gas, the picture arises of a strong interdependency between government and industry, with the government providing a favourable framework for production, through subsidies, risk sharing, and (technical) support measures, and the industry generating revenue in the form of tax and royalties.

These findings support the hypothesis of a 'fossil fuel historical bloc'—an implicit 'alliance' between government and industry based on mutual dependencies—existing in the Netherlands. Moreover, the results seem to support the hypothesis that the existence of this bloc has contributed to the slow take-up of renewable energy despite decades of (apparent) policy support. As such it has contributed to the limited success of GHG-emission reduction policy in the Netherlands and provides some explanation of the pervasiveness of fossil fuels in the energy system. Given the need to steer away from fossil fuels to prevent dangerous climate change and preferably stay within a 1.5 degree pathway this supports the need for, and underlines the urgency of, a directed or managed decline of fossil fuels.

First, because the strength of the lock-in has, so far, prevented or drastically slowed a 'natural' decline or phase-out of fossil fuels. But also, because the active involvement of the government in the fossil fuel value chain, and related revenue streams, means that a decline in fossil fuels will have an impact on government assets and revenue. A managed decline would thus be necessary to speed up the required transition towards using mainly renewable energy sources and to prevent shocks to public finances.

Yet, in the frame of thinking about a 'managed decline' of fossil fuels this raises the question, who is supposed to 'manage' this decline? If it is the government, is it possible for a government to manage the 'decline' of an industry it itself is heavily involved in, and partly dependent upon? And, if so, what is needed for a government to start doing this?

Recent developments around natural gas production in the Netherlands provides an interesting case from which some lessons for the conditions under which a (government initiated) managed decline could occur. Increasing social unrest and related protests and civil society action in reaction to increasingly strong and prevalent earthquakes induced by natural gas production from the Groningen field[19] has led the Dutch government to adopt increasingly lower production caps for this field—42 bcm in 2014, 27 bcm for 2015, 24 bcm for 2016–2021, and 12 bcm for 2022, and 5–7.5 bcm for 2022 and beyond,—and in early 2018, the Minister of Economic Affairs outlined a plan to phase-out Groningen production by 2030 (Ministerie van Economische Zaken en Klimaat, 2017). This plan involves a large scale switch to alternative fuel/heating sources in industry, agriculture, and the built environment and would leave between 494 and 545 bcm of economically recoverable gas in the ground.[20] This is a radical break with previous policy, which was aimed at expanding or at least maintaining the role of natural gas in the Dutch energy system[21] and persisted despite the regular occurrence of earthquakes over the past decade, and impacts some of the relations and interdependencies described in this chapter. As a consequence of this decision production of natural gas in the Netherlands has decreased much more rapidly than it would have naturally (on the basis of fields maturing), dropping from 82 bcm in 2013 to 51 bcm in 2016, 43 bcm in 2017, and 27 bcm in the first nine months of 2018 (CBS, 2018b). Although production of both the many small fields and the large Groningen field was set to decline towards 2030 anyway due to declining production capacity and maturing small fields, a 2013 study by the producer *NAM* expected the Groningen field to be in production until 2080 (NAM, 2013: 17). Subsequently, government income from production has dropped from €15.4 billion in 2013 to €2.8 billion in 2016 and 2017[22] and the public and political discourse around natural gas has started to shift towards "getting rid of natural gas".[23] Although the phase-out plan has not yet been officially adopted, needs to be further developed, and might be vulnerable to damage claims from the Groningen concession holders (*ExxonMobil* and *Shell*),[24] this provides a clear example of how external pressure helped

[19] For an overview see: van Thienen-Visser and Breunesse. 2015. Induced seismicity of the Groningen gas field: history and recent developments.

[20] Own calculation based on current status of Groningen field and the phase-out pathways as currently set out by the national government (see: https://www.rijksoverheid.nl/actueel/nieuws/2018/03/29/kabinet-einde-aan-gaswinning-in-groningen).

[21] See for example the 'gas roundabout' policy and *EBN*'s involvement in preventing 'early' decommissioning of gas infrastructure as described in the study that underlies this chapter.

[22] A rise in the Dutch gas wholesale price compensated for the lower production.

[23] 'Van Gas Los' in Dutch.

[24] For now, both Shell and Exxon have made a deal with the Dutch government, relinquishing any future damage claims in exchange for a higher percentage of current profits from the Groningen field (27% versus 10% previously).

'opening' up the regime and the 'fossil fuel historical bloc' and pushed the government towards beginning a 'managed decline' in natural gas production.

This recent development shows that, despite extensive government-fossil fuel industry ties, strong and lasting external pressure can move the system towards initiating a decline of fossil fuels.[25] It does however raise questions regarding whether this 'crisis' response in the face of earthquakes can be seen as a 'managed' decline and thus prevent impacts on public finances and jobs. See, for example, the rapid and unplanned-for reduction in government revenues from natural gas. And, thus, if external pressure is an influential factor in pushing the regime towards the breakdown and phase-out phases of transition, to what extent is a 'managed'- meaning guided and directed—decline possible?

From these conclusions we can draw several insights for the discussion on a managed decline of fossil fuels. First of all, that strong government-fossil fuel industry interdependencies can hamper and/or slow the phase-out of fossil fuels and thus the transition towards a low-carbon energy system. This indicates that the government should start breaking down such relations throughout the fossil fuel value chain and at all government levels. However, at the same time, it should see if it can use some of the existing ties as 'levers' in accelerating the shift away from fossil fuels. What if, for example, the Dutch government started using its SOEs to invest in renewable energy? *EBN* has state-of-the-art knowledge of the Dutch subsoil based on decades of oil and gas exploration and well-drilling. This is knowledge that is also highly relevant in further developing geothermal energy. Moreover, its involvement, for example, by co-investing in production as it does in oil and gas, could reduce (financial) risks. The government could start taking a more pro-active role as a shareholder and start using its SOEs as a policy lever in the energy transition. This would however require a shift in the government's view on dealing with SOEs. Although the government holds shares in these companies to secure the public good and officially strives towards being an 'active shareholder' (Rekenkamer, 2015), the current attitude towards SOEs seems to be to see them as independent entities that the government should not or cannot control directly. Yet, *GasTerra*, and *Gasunie* are also used to enact the 'small-fields policy' to maximise gas production from small-fields and *EBN* to support offshore production.

[25] The discussion around production has also led to measures aimed at reducing gas use. For example, new houses in the Netherlands are no longer obliged to be connected to the gas grid, enforcement of existing energy efficiency laws for companies has been increased, and large users of natural gas have been requested to start switching to alternative sources of gas/energy.

Secondly, when thinking about managing the decline of fossil fuels, government fossil fuel related income and spending should be taken into account. On the one hand, because their existence can hinder or slow a decline, on the other hand, because a decline could have an impact on public finances and economic stability. If strong financial relations and/or dependencies exist it might be prudential to plan-ahead instead of waiting for a shock, such as the earthquake related fallout in the Netherlands, to occur. This also means looking at how to ensure future public revenue from the energy system. For example, in addition to using SOEs to accelerate the transition towards a renewable energy-based system, they could at the same time also serve to ensure future public revenue. If oil and gas were seen as resources that should provide benefits to society as a whole, in the form of royalties and taxes, why should the same not be the case for renewable sources of energy? Especially at a time when gas production and related revenues are decreasing rapidly, damage payments will need to be made, and (offshore) wind is becoming cost competitive: this could be fruitful in the Netherlands.[26]

Finally, from a transitions perspective, a managed decline involves a multitude of actors, especially citizen initiatives and NGOs, and requires strong external pressure by these actors on the system. The multi-actor aspect of transitions and the possibility of a 'fossil fuel historical bloc' means that it is not enough to just look at the government when thinking about managing the decline of fossil fuels. Other regime parties, such as SEOs involved in the energy system, and external pressure in the form of crises have the potential to accelerate the decline of fossil fuels. Especially, there is a role for collective action, citizen initiatives and pressure groups, and NGOs such as, for example, the global divestment movement, activist shareholders demanding more insight in climate related risks, and citizens demanding change in leveraging crises and building external pressure should not be underestimated. In the Dutch case these have shown to be crucial in 'opening' up the regime and providing space within and for the government to start steering towards a decline of fossil fuels.

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[26] The first 'subsidy free' offshore wind park will, if all goes well, be built in the Netherlands in 2022.

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