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Coal Transition in the NETHERLANDS

An historical case study for the project "Coal Transitions: Research and Dialogue on the Future of Coal"

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This is one of the 6 country case-studies commissioned to collect experience on past coal transitions. The 6 countries are: Czech Republic, the Netherlands, Poland, Spain, UK, USA. Their role in the Coal Transitions project was to provide background information for a Synthesis Report for decision makers, and provide general lessons for national project teams to take into account in developing their coal transitions pathways for the future.

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Introduction

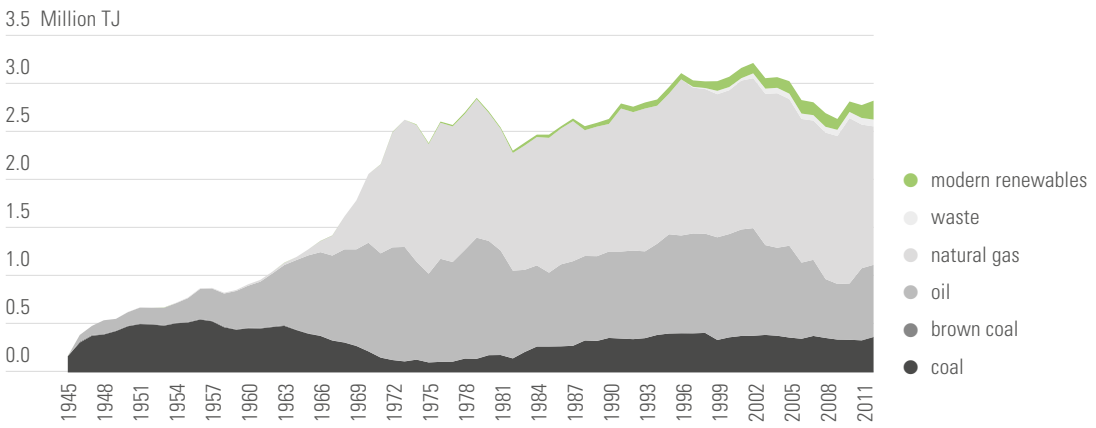
This document provides on overview of coal transitions in the Netherlands in the post-war period. The main focus is an in depth case study of the reconversion of the Limburg region in the South-east of the country which took place from 1965 to 1990. This is discussed in the first part of the document. The later part of the document discusses the re-emergence of coal as an energy source in the Netherlands and present challenges to phasing out coal use.

Historical context

Coal accounted for 85% of the total consumption of energy in the Netherlands prior to the Second World War (Gales & Hölsgens, 2016). Since then, its relative importance has steadily declined, even if its role remained important. For instance, after 1945, the shares of oil and natural gas increased quickly. The introduction of cheap Middle East oil did not so much replace coal, but was added on top of coal consumption (**Figure 1**). In May 1960, debating the supply of gas, parliamentarians expressed worries about the increasing dependence on foreign energy. The energy produced by Dutch coal mines was considered crucial.

However, in October 1960 it became public that NAM (a joint-venture of Standard Oil and Shell) had discovered Europe's largest natural gas field in 1959. From 1963 onwards, gas was bought up at Slochteren. Natural gas quickly began to displace coal in the market. Coal consumption dropped to its lowest level in 1975: 4.3% of all energy used. This was the first coal transition in the Netherlands, but it was soon followed by a second: the return of coal. The second phasing out of coal remains an ambition that to this day remains unfulfilled. In this case study we discuss the two transitions that have taken place, and also the one that has not. What was the role of policy in bringing about change and how was this change managed?

Figure 1. Consumption of fossils and modern renewables in the Netherlands 1945-2012



Source: Gales & Hölsgens (2016).

The disappearance of coal

On 17 December 1965, the Minister of Economic Affairs, Den Uyl, presented his master plan for the closure of the domestic collieries in the centre of the mining region of Limburg, in the south of the Netherlands.

Cessation was planned as a collective process managed by the state, which also promised to look after the reconversion of the mining region (Den Uyl & Bakker, 1965). At the time, there were 11 producing units. Instead of doing nothing or opting for the technically possible goal of abandoning all mining by 1970, the government decided on the approach of gradually retiring mines with an unspecified end date. The minister verbally hinted that there was a 'reasonable certainty' of coal mining continuing for ten to fifteen years. Initially, policy focussed on the first five years. The largest and youngest state coal mine (1921) was set for closure between 1966 and 1969 (it actually closed in 1967), while another mine was closed before 1970. Extraction from the oldest Dutch mine (1742/1829) ended in 1970. The process then moved from the 'new' mining region, which had a diversified industrial base with the chemical plants of the state mines, to the 'old' mining region that was specialised in coal. A third closure was planned for 1970-1971, and duly occurred in 1970. Although the end point had initially been left unspecified, it proved to be close at hand. The last wagon load of coal was hoisted above ground in December 1974. This colliery, which opened in 1899 and represented the 'modern' breakthrough of the industry, was the last to disappear.

Over time, the disappearance of coal mining led to an oversimplification of the causes of the transition. For instance, the claim that pit closures were economically inevitable. To be sure, the 'structural' crisis of ocersupply of steel and coa, falling world prices in 1958 and 1959, together with increasing depths of extraction at Ducthc mines by the 1950s did make mining less competitive and unprofitable in the new European market (WRR, 2013, 66). Moreover, the discovery of abundant and cheaper to exploit natural gas in 1959 was another cause.

However, despite these economic realities, it cannot be overemphasised that policy also anticipated market outcomes to a large extent and was formulated accordingly, despite continuing economic uncertainties. This anticipatory approach was made possible because the dominant economic and political players also saw a credible alternative to coal. We, therefore, first describe the conditions that were encountered by three interested parties in the early 1960s.

The Dutch State Mines company became involved in natural gas, but not because the company was in a deep crisis or because the management expected revolutionary changes in the energy system (Kaijser, 1996). It was a raison d'état. The gas revolution was believed to have only a minor effect on coal use. In 1961, during the debate about how the gas regime would look institutionally, Dutch State Mines made projections without the 'new' gas, looking ahead to 1975. Energy consumption would increase by a factor of 1.5, but the share of new gas would be no more than 10%; oil would be the dominant fuel. The share of coal would almost halve, but in absolute terms the volume would merely diminish from 15.4 million tonnes of coal equivalent to 13.5. This perspective would change later. In the discussion which would directly lead to the decision to end coal production, one had given up to be very specific. By the end of 1964, natural gas was simply presented as a superior alternative. Still, the penetration rate projected for 1975 was only 25 percent. There was therefore still a plausible basis to consider the transition away from coal mining as a long term rather than immediate phenomenon.

Coal extraction did generate sudden losses in 1962, but only for the State Mines. It would have been remarkable if existential doubts arose after just one or two years of red figures.[1] The fundamental discussion within Dutch State Mines took place in autumn 1964.[2] The crucial position paper discussed two scenarios for 1975 in which it was assumed that nothing fundamentally different would be done in terms of activity levels. The group of

1 That is also the case with the four private mining companies. Two became loss making in 1965. This stimulated action by the government, but as a complication of a route already agreed upon: that closure should be collective. The state had to prevent unilateral action of a private party, which would make the process of closing unmanageable.

2 The paper is summarised by Messing, 1988, 239-246. We used the original document.

mining engineers projected small losses while the others, chemists and economists, suggested big losses. A third scenario was also discussed, and was centred around abandoning 'the aim of continuity'. That option was not quantified, but was in fact the focus of the discussions. Utlimately, after weighing the evidence and likelihoods of the different scenarios, abandonment did become the advice given to the owner, i.e. the state.

The internal exchange had more to do with defining what was a desirable future to aim for at the company, rather than being reactive to unfolding events on a more short term basis but without accepting the need for a more fundamental change of thinking . Ending coal extraction was thus a pre-emptive action. It was taken in part also to avoid the risk of much worse scenarios . For instance, one outcome to be prevented was that the State Mines had to take over private mines becoming unprofitable around 1975 and was left in an impossible economic situation that would then be out of its control.

The State Mines pre-emptive decision was made easier because it also had some alternative business options at that time: a promising chemical business, besides acting as the state's trustee in natural gas. In 1965, it wanted furthermore to merge with two other major chemical companies, which would soon become Akzo. In the end, the minister would not agree with an amalgamation. Still, a strategy of making the most of existing opportunities for a constructive and voluntary exit from the coal mines determined actions then and later. Ultimately this strategy proved reasonable successful for the company as it succeeded in living on as the chemical major DSM (Jeannet & Schreuder, 2015). The ability to proactively accept and move forward with the transition also enabled better outcomes on its coal activities during the phase down period. For instance, thanks to a shift from industrial to household coal (together with restructuring), company losses on coal was virtually over by 1966. For some time thereafter, the State Mines had even profits on its coal activites during the phase down.

The break in government policy testifies to the importance of uncertainty and, in particular, the speed with which circumstances in an industry can change. For example, the elite of the industry and region had in January 1964, when the then minister of Economic Affairs had announced temporary subsidies to pay for a limited number of redundancy packages. The message was that the mines were, in principle, profitable and needed beyond 1975. This subsequently changed with the arrival of a new Minister and with the evolution of internal thinking within the company.

The minister did not change his view because the State Mines thought differently about the future. Different economic paradigms also had an important impact. The first, catholic minister had believed in a more laissez faire approach, based on 'juggling with macro-economic quantities in an economy without creating distortions' (Messing, 1988, 225, 234). In contrast, his social-democratic successor, den Uyl, in office since March 1965, believed in "structural" policies, identifying differing needs of industries taking off versus mature industries versus regions in decline and having a willingness to intervene as he saw appropriate. Closing the coal mines was only the first example of a sector policy which would spread to textiles and other 'mature' industries (Den Uyl & Bakker, 1966).. The chosen style of policy had also to do with deeper drivers. Den Uyl was convinced that mining was inhumane. He was partial to the view of a kindred economist who argued that the disutility of work escaped calculation and that, in the end, basic ideas solved great social problems.[3]

The government thus first blocked action and then suddenly made coal closures possible. The contribution to this process by the government was, firstly, setting a standard for action: ending old employment would be linked to the creation of new jobs. Later, Den Uyl qualified the norm with the adverb 'reasonable' and the operationalisation of the promise became contentious (Elmpt, 2011, 95). Still the standard shaped the process. Coordination making the transition a collective process was the second major contribution.

Management was also helped to a significant degree by the fact organized labour did not strongly fight the closures. Indeed, at one point the boss of the dominant labour union told a journalist late 1964: 'I will hoist all flags when the last miner goes underground'.[4] To be sure, there were points of conflict between management and the two dominant labour unions. For instance, immediately after the speech of Minister Den Uyl, the

3 See the review by J. Pen of Cooper and Hopper's Debating Coal Closures. Economic Calculation in the Coal Dispute 1984-5 published in *De Economist* 137 (1989), 525-526.

4 *De Nieuwe Linie* 26 Oktober 1963.

union and the top of the State Mines started a public fight who had contributed most to the decision to close the mines. However, extraordinarily, after 1959, the ultimate decision to transition away from coal was not the subject of mass industrial action. Why was this the case? Part of the story appears to have been that the inevitability of some scaling back of activity had become evident to intelligent observers by the early 1960s, especially in the wake of simila restructuring exercises in neighbouring Belgium. Thus, in 1961, both the catholic blue and white collar unions had been able to agree with management of the Dutch State Mines to act in public as messengers of the fact that the future of the mines was limited and a new strategy was needed (Messing, 1988, 258). While the unions did not actively propagate the idea of fully and unequivocally ending extraction, the necessity of a change of approach appears to have been acknowledged and accepted. The question for the union leadership appears to have been: how to make the most of the situation as is stood.

One perspective is that the thead of the unions wanted to maximize wages and not employment and, in a region with below national average mining wages and a company with negative profit margins, delivering on this could be helped by some restructuring However, the union's strategy appears to have been broader. For instance, one pushed for national intervention, European cooperation and accepted the prospect of closure on the condition of assurances of alternative employment. Indeed, the theme of no restructuring without alternative employment seems to have been a common position from as early as 1959, when protest marches by organised labour in neghbouring Belgium made the same demand (Delaet, 1988, 162, 166).

The union leaders also considered the timing strategically. Coal owners might have an incentive to continue extraction till marginal cost equalled revenue, but labour had to gain from an earlier, subsidised exit; before profits would evaporate (Dohmen, 1986, 78-80).

Finally, it appears that the company management and the unions had a history of constructive engagement on some issues and thus there was sufficient good faith for management and the unions to develop some degree of common understanding of the situation relatively early on. For instance, management and unions had in some cases teamed up against government on specific issues. The early engagement of organised labour with management and the time that was allowed for the necessity of change to sink in helped paved the way for the decisions of 1965, while policy accommodated labour. The change in the positon of the government minister, who now pushed for agreement between labour and management and which took on board the union's rallying cry as its own – i.e. no closure without new employment – also helped to align unions and management. . Management and unions together made institutional disappearance easier. Both in the transition out of coal, and during the diffusion of natural gas, survival and extinction did not become a matter of conflict. Internationally, that was a remarkable feature of the Dutch transition (Kaijser, 1996, 344, 349-350).

Was the end of coal mining unavoidable simply because there was a lack of willing miners to work in the region? Contemporaries raised the question frequently: How to secure a permanent population of miners had been a major pre-occupation of the continental coal-industry. Perpetuity was undermined by 'the desertion of the sons', the label fashionable in the European Coal and Steel Union (Vinck, 1959, 65). The worry reached the Netherlands in the early 1960s. A 'negative sentiment' of labour framed decision making.[5] Wage levels largely explained insufficient supply. The gap with other wages decreased steadily since the early 1950s. With full-employment, frictions caused by the national policy of controlling wages became ever more acute. Miners were paid less than their colleagues in the struggling pits of Wallonia. It is therefore a myth that the region was wealthy till 1966 and suddenly poor after. Individually miners experienced a transition to lower wages, but after tax income and wealth was always below the national average. Whether wages could be raised and costs handled in the future was another issue. However, the proponents of closure within the State Mines did not think in 1964 that future labour supply would be a major hurdle. Sentiment had improved; applications for work increased once subsidies were announced. The possible influx of foreign labour was a worry, a small one though. Labour and its supply influenced decisions, but did not force them.

5 It is remarkable how often policy documents refer to rumours and how adequate rumours did reflect internal policy making.

Table 1. Destination of former miners

	1965-1969	1970-1974
	percent	percent
Pension, old age or invalidity	17	18
Bridged to pension	13	22
Repatriation abroad	12	3
Social workshops	6	6
External employment	41	35
Internal employment (chemical works dsm)	10	7
Internal employment (other)	0	8
Total exit (number)	31585	18770

Source Messing, 1988, 413; Rottier (1976), 230; see also Kasper (2013a), 45.

A key factor in the arrival at consensus between labour, government and management was that, in the end, natural gas was simply the better alternative, both for the company and the nation. It even would be in case of an oil-boycott which was briefly considered.[6] Closure now, despite all uncertainty around economic indicators, came with the advantage that the company was still – for the time being - in a good shape. It couldtherefore guarantee its personnel a calm and financially favourable transition. The State Mines and leading labour unions – and then government - simply gave up on coal. It was just one example of the general pattern of the 1960s: authorities, enlightened oligarchs, gave up upon the status quo in the name of progress (Kennedy, 1995, 148-150). The paradoxical result was a policy that was reactive but also somewhat ahead of the 'facts', ahead of market signals.

The decision to end domestic mining of coal was followed by grand effort at social engineering, which, in part because of its ambition, was bound to be frustrated. Earlier European thinking about reconstruction had underlined that changing mining districts would be a shock, requiring policy to master unprecedented strains. Still, policy was committed to a certain approach and was in essence the redemption of a pledge. We will discuss characteristics and evolution over time, then finance and lastly outcomes.

It is interesting to understand the philosophy of the company in approaching the transition. For one thing, it saw the challenge as more than simply eliminating 'structurally unhealthy employment'. The main reason for doing so, from the company's perspective, was that would undermine, in the eyes of management, the reputation of the State Mines. The social aspects therefore were defined as the most important ones of closure. Thus, for instance, already in 1964, the elderly with many years of employment were identified as special. Besides the financial loss to be compensated, one expected unemployment or early retirement to come with serious social and psychological disadvantages: feelings of rejection and a lack of appreciation. Management thought that white collar workers might feel so most intensely. The conclusion was both that a generous program was required, but one that also respected psychological aspects of the transition.

The transformation was managed intensively. Dutch State Mines became an active player in the transition, alongside government. It created a re-industrialisation department. This in turn became a service institute for outside investors. One found out that bundling projects eased finance. In contacts with prospective employers, workers were bundled in packets of young and old, suitable and less suitable (Bloemendal, 1971, 278; Jochems, 1971, 159). As already suggested in 1964, age-discrimination became an important characteristic of the reallocation of labour. Workers at different ages and skill levels required different approaches. While older workers were deemed as more sensitive to redundancy, efforts also concentrated upon the 'threatened' age-cohort between 35 and 45 (Hellemans, 1971).

Formally, there were no redundancies: the miners found another occupation or exited the work force. Individual miners had to cooperate and could not reject fitting work at will. **Table 1** gives an overview. Over the 10 years to 1975, approximately 50 000 miners were moved out of mining activities. Between 1965 and 1969, half of the total found another job either within the company's chemical activities or, more commonly, in a role external to the company. 12%, as foreign workers, were repatriated abroad. 30% left the workforce, with 17% moved directly to pension, old age or disability benefits. A further 13% were bridged to a pension. The remaining 6% were given work in so-called social workshops. 21% of the total were retrained.

Compensation income was given to half of the group,according to the criteria of the European Coal and Steel Union. Twenty percent got a job or pension without loss of income and did not qualify for support. Around 25% left the industry on their own accord and therefore without a financial support package, including foreign workers opting for repatriation(Jochems, 1971, 156; Rottier, 1976, 230).

6 Natural gas overawed the future, not because of its expected penetration, but because of its (potential) cheapness and user friendliness.

The masterplan of Den Uyl focused upon reducing production in tandem with employment, but it did not ignore coal use. The government announced long-term deals with both the domestic electricity industry and the national iron and steel plant. Increasing sales to the utilities was already an objective of policy from before the masterplan. The higher price constituted 26% of the so called "pat on the industry's back", given by the government in 1964 (Den Uyl & Bakker, 1965, 8, 20-21). Policy induced remarkable changes, but of a short-term nature. The share of coal of a major electricity producer went down from 90% in 1963 to below 45% two years later, increased to almost 85% in 1967, to be followed by a reduction to 20% in 1969 and was 0% in 1971 (Vlijm, 2002, 187). The ups and downs were stimulated by skepticism in house about expensive plans. The 'industry pope', a senior civil servant at the ministry of Economic Affairs, argued that international competitiveness of Dutch industry was threatened, if electricity was not generated using the cheapest fuel (Molkenboer, 1971, 123). Civil servants preferred a short period of transition and frowned upon complicating reconstruction by linking mining and the generation of electricity. Later, the sector became strategic in steering energy use, as we will see. The times were, at first glance, favourable for the vast project of reconversion. The labour market was tight. A survey found in spring 1966 less than 30% of the locals dissatisfied with the reindustrialization plans (De Bruyn, Nelissen, 1966). However, the pace of closure soon became quicker than expected, a combination of what many policy makers preferred and of nagging contradictions between plans and reality. New firms insisted upon a supply of young workers. Exit of young miners played havoc with the strategy to give priority to the threatened age cohort while continuing extraction. The State Mines also reduced its efforts at a specific point. Its reindustrialization team was moved out of house when the government asked it to start industrialising the north of the country. Transformation was thus not as collective as it might have been. The larger private mines, producers of household coal, had an optimistic outlook and tended to influence the transition accordingly. In any case they were at the end of the queue of closure. The proactive stance of the Dutch State Mines at the start meant that later a gap emerged, which was not easily filled by the state. The more so because national and regional authorities disagreed by 1970 whether the job was almost done.

Policy makers were caught off guard when unemployment started to rise quickly after 1970. It coincided with the start of the last phase of ending coal mining. Structural headwinds became noticeable. The disappearance of mining affected supplying firms. Many young people entered the labour market. With the economic down-turn subsidized jobs were under threat, as were the foreign jobs which had induced 'shuttling', daily or weekly migration. Both newly attracted and existing companies struggled and many failed. The 1970s were the crisis period, perhaps most of trust. A mismatch developed between indicators, suggesting that conditions were not that bad, and deeply felt private fears. The 'official reports rob us of our voice', concluded the spiritual mentor of the catholic miners' union. Policy makers started to talk about a neurotic region where vitality had vanished. Gradually one realized that change involving people would take a long time, until well beyond shutting the last pit. Chaos resulting from the economic fall-out ensured that regional authorities got the role of directing the transformation from 1978 onwards. The government had promised a 'program of perspective' and it delivered, albeit with a delay of 6 years. The programs of reconversion were ended in 1990; for the old mining district three years later.

In total, the transition took 25 years or more; thus almost half of the life time of the mining industry (1899-1974). A new economy did emerge. In the larger region of Limburg, where the mines were situated, there are now 1,117,941 inhabitants, which make up 6.6% of the Dutch population. Regional GDP is €36b, 6.0% of Dutch GDP. The old mining region nowadays promotes itself with a competitive advantage in a number of high-value added sectors, including life sciences and health services, chemical processing, logistics, tourism, business services and horticulture, financial-administrative services. Many of these industries have been cultivated, drawing on a joint strategy of creating framework condutions (such as knowledge infrastructure), support for industrial network creation, and clustering specific strengths of sub-regions of the wider region. This has led to the development ofindustrial clusters – some of which have their roots in early restructuring.

Dutch State Mines continued as the chemical company DSM. It is an acknowledged textbook example of successful reinvention, transforming its immediate environment into a bio-region (Cooke, 2007; Jeannet, Schreider, 2015). The change required substantial investment.

Table 2. Expenditure dedicated to the reconversion of the Dutch coal mining district (mln Euro of 1980)

	1965-1969	1970-1972	1973-1977	1978-1981	1982-1985	1986-1990
State subsidies mln euro	766	606	799	614	586	542
of which mining % total	**59**	**68**	**38**	**5**	**19**	**28**
levelling international competition % total	40	29	21	0	0	0
cooperation private mines % total	19	39	17	0	0	0
of which conversion % total	**41**	**32**	**62**	**95**	**81**	**72**
market strengthening % conversion	30	27	54	51	50	57
infrastructure % conversion	41	25	18	10	15	19
building/labour market % conversion	23	44	28	38	34	24
well being % conversion	6	4	0	1	1	0
Subsidies % Regional Product	**11,54**	**7,67**	**9,62**	**6,45**	**6,21**	**6,16**
Subsidies % National Product	**0,16**	**0,17**	**0,12**	**0,1**	**0,09**	**0,06**
Subsidies % National Gasdividend	**166,59**	**25,83**	**5,1**	**2,57**	**1,76**	**3,08**

Source Kasper (2013a), 51, 63, 80; own calculations

Table 2 gives an overview of the subsidies allocated by the Dutch state to ending domestic coal production. The sub-periods are determined by the official spans of planning.[7] Subsidies peaked in real terms in the period of crisis. The biggest injection came at the beginning of the transition. Relative to the economy or the boon of gas, expenditure was substantial, but bearable.

Subsidies consisted of two large components, addressing the legacy of the past and securing the opportunities of the future. In the late 1950's, European countries started to support their coal mining industry indirectly – domestic contingents to be used by power plants – and directly, by subsidizing social charges. The Dutch mines took the High Authority of the Union of Coal and Steel to the European Court of Justice for allowing the German miners' premium, which dated from 1956. They lost the case in 1961.[8] In December 1965 subsidies were 0.88 dollars per ton in the Netherlands, in the other countries of the union 5.38, social charges being 4.78. The 'objective' subsidies levelling competition had to bridge this gap. Cooperation of the private mines was bought by the so called 'subjective' subsidies. These mines abandoned the privilege to decide when to close and submitted to the collective process. In April 1974, the minister of Economic Affairs so decided not to postpone the closing of the two remaining private mines, though the owners toyed with the idea. Controlling decline required much money and, around 1970, seemed to drive out investing in the future. Cooperation of the private mines, however, was labelled subjective too, as the subsidy was conditional and came with an understanding of reinvestment in the mining districts. A lag was characteristic of financing early retirement and this explains why money was apparently allocated to mining till 1990.

In the category "reconversion", physical investment was larger than investment in human capital. Market strengthening mainly consisted of investment premiums, which reduced costs of land and building; investment in machinery was added. Loans were guaranteed. Innovation, in contrast to investment, became more prominent later. Some projects under this heading, like measuring mine water, are ambiguous, for they are an externality of past mining.[9] In table 2 building - expenditure for roads or sewers but also devoted to schools or the repair of monuments - is taken together with subsidies oriented towards the labour market. Separating the two is a problem from 1978 onwards. Retraining and employment projects constituted virtually all of earlier expenditure; 100%, 80% and again 100% for the first three periods. Retraining of miners took 68%, 80% and 56% of the post including building. For the last three periods, only the so called perspective program allows a subdivision, but this is a small stream. The extra finance coming from several ministries was much greater, 88% of total. Labour market programs, however, were a minor part of the perspective funds, below 3 per cent.

7 The statistical starting date for the program of closing coal mining was a-posteri set at 1 July 1965.

8 The ruling became guiding for later cases: http://eur-lex.europa.eu/legal-content/NL/ALL/?uri=CELEX%3A61959CJ0030, accessed 15 December 2016.

9 In Belgian Limburg there was not made a provision for measuring and this was later considered a mistake.

Some programs labelled subsidies for the knowledge infrastructure might qualify as labour market finance. Again these were a minute part of that category, which covered subsidies to the United Nations University or to stimulating the automation of libraries.

Interestingly, more than half of the labour market subsidies consisted of mitigating the impact of policy changes. The social and psychological consequences of pit closures had long been a topic of international debate; consensus was that transforming miners into factory workers required a generation (Haveman, 1963, 272-273). Initially financing for human health and well-being was substantial, but it soon became minimal. The government acknowledged the 'big personal problems under the surface', but from 1970 found it hard to translate worry into an effective short term policy response - at least one which went further than the label 'perspective' (Langman, Rietkerk, 1972, 2).

The table is not exhaustive. The support to let the private mines continue production is included in table 2. Dutch State Mines did not receive this bonus and had an interest in internalizing costs, which are not visible here. The company promoted industrialization, but also took participations, amongst others in the car factory which was the first and major symbol of a new activity. The gas proceeds in particular induced activism (Bloemendal, 1971, 274). From 1969 onwards till 2006 the yearly dividends on gas fluctuated between 50 and 64 million euro (Messing, 1988, 351; Jeannet & Schreuder, 2013, 14). Not covered are some costs of the state, like the 18 million euros given for the car factory project, or the costs of relocating governmental institutions, like the Pension-fund of the Civil Servants. So called writing tables had to expand demand for white collar work (Kasper, 2013a, 51).

Reconversion was partially financed by the European Community of Coal and Steel since 1964. The Community operated with loans, but retraining was financed up to 50% and did not have to be redeemed. The reports of the community suggest that the European flow was 9.5 million euro for training between 1970 and 1972. One, however, can also find 43 million as 'realized payments' under this heading. Dutch expenditure was 36 million euro. The European loans for industrial investment might have been 22 million, to be compared with a Dutch outlay of 69 million. From 1989 till 2000, structural funds of the European Union were a main source of finance. Conversion had ended, but the region qualified still as an area of industrial decline. The European funds were 127 million euro between 1989 and 1999. This was co-finance, 26 percent of total; 260 million was financed by regional authorities and others, with a small share coming from the exchequer. European sources suggest a substantially higher stream, 325 million euro over 1994-1999 only (Kasper, 2013a, 86; Verkennis, 2015, 31, 33).

Lastly, after-shocks with a long lag create costs still today and a discussion about who should bear these. Polluted sites were cleaned too superficially in the 1970s and 1980s. Shafts from the 18th century, to be found in a small area, constitute a risk. In some place there is increased risk of subsidence due to mine waters rising. These issues have made the notion that liability should be limited over time and when liability of the state is supposed to end a matter of dissent.

What was the impact of all this money? In 1990, reconversion was evaluated officially. The closing of the coal mines eliminated 75.000 jobs; that already was the official estimate of 1965. Of those 75.000 occupations, 25.000 had not been 'compensated' (Derix, 1990, 233). The programs possibly created directly 17.100 lasting jobs. Expenditure per job then was 416 thousand euros of 1980 between 1965 and 1977 and 310 thousand between 1978 and 1990 (Kasper, 2013, 74). Assessing the overall efficiency of programs was invariably hard. The goals of policy shifted from supporting business to stimulating (selective) investment in the 1970s and then to innovation around 1980. Furthermore, a substantial part of finance had come without strings attached. The disappointment of early, qualitative evaluations changed gradually into something milder, as costs became taken for granted.

Externalities are difficult to incorporate, but are unjustly ignored. A scandal similar to the one, in 1993, around KS, the nationalised amalgamation in the nearby Belgian field, did not arise. Site reclamation, however, led to unorthodox business practices, as was more generally the case with building. A parliamentary committee, looking back from scandals in the national building industry during the 1990s, believed that conversion in Limburg was the first example of network criminality. Estimates put the level of grease money at 14 up to 30 percent of the infrastructural subsidies mentioned in table 2 (Tweede Kamer der Staten Generaal, 2003, 108; the estimate of the source is two times more: Dohmen, 1996, 17). The number is all but exact, but the hint is serious.

Macro-data provide the best 'thermometer' of the process. The provincial accounts show a divergence with the national average, from 90% of value added per capita in 1960 to a minimum of 79 in 1982, followed by a gradual rise to 89% in 2010. There was more movement when the mines expanded, from 60 to 81% before the Second World War. Taxed income figures are geographically more specific. The 'old' mining region started to diverge clearly from the national average by 1965, but convergence began in 1978. In this case too, entry and exit of mines were not symmetric, if one looks at the evolution before 1940. Unemployment is the commonly used indicator; to be more precise, the regional component of unemployment. Unemployment shot up from 1971 and continued to rise till 1984. The national pattern was similar, but the region was hit more. The regional component steadily increased till 1978 – it was 6 percent above the national average of almost 13 percent total unemployment - and only then came down slowly.

Reconversion changed the structure of the volume of labour. The prematurely retired and unfit to work determined about half of the regional component in the work force, which itself declined by beween -3 and -6 percent between 1965 and 1973, and then stagnateduntil well after 1980. All in all, improvement did set in around 1980. By 1990, the provincial component had disappeared in unemployment. This was formally heralded as the end of conversion. Timing conversion by a regional component is sensible, but ad-hoc. Both regionally specific unemployment and disability increased again since the mid- 1990s and led to renewed soul-searching. Was this a very much delayed after-shock of the closure process or a consequence of ending the reconversion (Derks, 2005, 193)?

The major lesson to be learned was that conversion was a lengthy process (Kasper, 2013a). Furthermore that one should be wary of optimism and easy results. Successes did often not last and that had a big impact upon trust. Policies undervalued the risk and impact of economic cycles. Subsidising business directly got a negative stigma. Reliance upon the central government might have been taken too far. It was a recipe for delays and a hurdle for policies geared to local conditions. And it induced passivity. Moving governmental institutions, however, efficiently created lasting jobs. Experience learned that subsidising with restrictions was preferable to financing without strings. This was the lesson of the understanding connected to the subjective subsidies given to the private mining companies. The reconversion was a huge and incidental operation straining known routines; designing new ways and checks therefore was crucial.

The value of analytical modesty is strengthened by international comparison. Cooperation is seen by the Dutch as a major factor of success of painful transitions. However, conflict might also generate success, perhaps even more success. The farewell to Dutch coal mining between 1965 and 1975 coincided with similar processes in nearby regions in Belgium (1964-1992) and Germany (1965-1992/1997). The areas belonged to the same field crossing borders. In Belgium and Germany, the process of ceasing extraction took off in the 1980s. The reconversion which followed was smoother. Comparative differences, however, are easier to observe than to explain. For conversion was a cooperative process in Germany, as it had been in the Netherlands. In Belgium change went together with massive conflicts. This kind of comparing tends to stress specifics. The Dutch orientation upon national government is one, as is the label entrepreneurial for the Belgians (Kasper, 2013b, 31; Kraats, 1988, 163). There are common, but unexplored factors. Runiewicz-Wardyn looked at European structural funding. In her analysis, Dutch-Limburg did not score well with the valorisation of a potential, which was high. Knowledge absorptive capacity might be a cause (2013, 60, 69). Another, rather proximate factor should not be overlooked. In 1988, Kraats brought together figures as in table 2 (Kraats, 1998, 159-163). His numbers are not transparent and conversion was an ongoing process. However, weighted by employment in 1964, the costs of the programs were 1.8 times higher in Belgian Limburg and 1.9 times higher in Aachen.[10] International differences might have been a matter of levels of funding, besides efficiency, culture and luck. Was cost effectiveness then a Dutch specificity? Or was it the result of a policy ahead of facts ending mining relatively early?

10 Kraats gives an employment figure for Aachen two to three times higher than the common sources. The latter were used.

The revival and staying power of coal

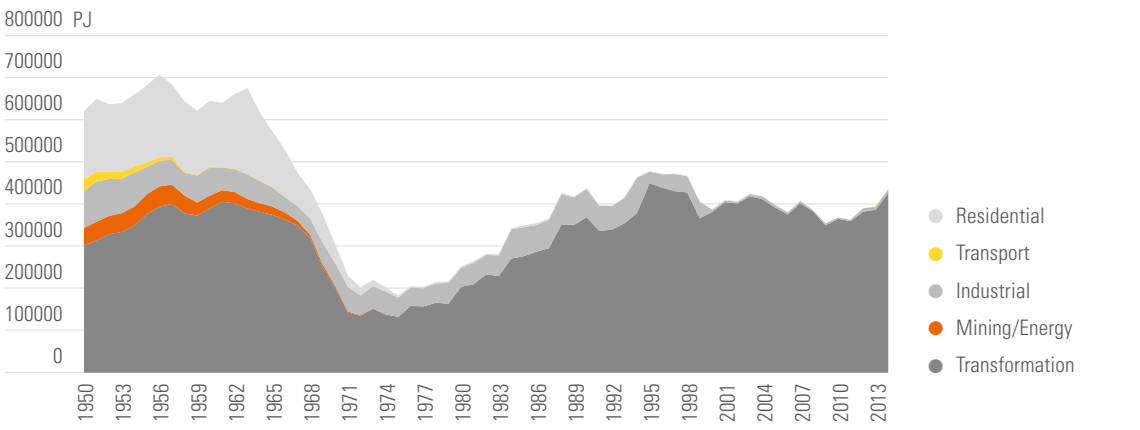
Though coal consumption was minimal by the mid-1970s, it became substantial again. The revival happened in the transformation sector, where coal changed into electricity (**Figure 2**). Power generation became as coal based as it had been in the past. The gas revolution implied a much more limited reduction in the consumption of coal than most Dutch are aware of. Coal disappeared behind the plug-socket.

Cheap oil and high expectations of nuclear energy, had led in the 1960s to the decision to consume the newly discovered natural gas riches as quickly as possible (Lubbers & Lemckert, 1980). The oil crises of the 1970s made it repeatedly clear that the Dutch energy system was vulnerable and that the value of domestic natural gas was higher than expected. The energy crises had two major impacts. First, the policy of hastily extraction was revised in favour of a more long-term extraction policy. Secondly, the oil crisis had revealed how dependent the Netherlands was upon few suppliers. Diversification of suppliers and of resources was therefore encouraged (Hölsgens, 2016).

Diversification led to a renewed interest in coal. The lost two mines were still producing. Both regional and national policy makers decided to separate the closure program and social adversity from reactivation of domestic extraction. In the government's main reaction to the dearth of oil, Den Uyl, now minister president, showed clearly his aversion of 'wage-intensive' extraction of coal and its 'environmental-hygienic harms' (Den Uyl a.o., 1973, 5-6). The minister of Economic Affairs argued that closing the mines as planned minimised uncertainty of the workers. The miners were assured that they would be given fitting work without dismissal also after production was terminated (Lubbers, 1974a).

Reactivation, opening or reopening domestic coal mines, became a separate debate. The never finished colliery Beatrix had been saved for the future and one of the closed mines had been conserved. The Minister of Economic Affairs rejected a report by the State Mines, 'the methodology used being not appropriate for drawing conclusions" (Lubbers, 1974b, 111). Several options – reopening, finishing the Beatrix and planning extraction both in the Netherlands and Germany, gasification underground, thus non-conventional mining,– were considered, but rejected as too risky, if not outright uneconomical, and foremost as socially difficult. If coal was necessary, it should come from outside the country. In the end, the Minister of Economic Affairs, Lubbers, reported to Prime-Minister Den Uyl that "the price to be paid for a piece of supply security would be disproportionate to its contribution to the supply security" (Messing, 1988, 433). The government reiterated so in 1977 the position taken years before. The major effect of this debate was to

Figure 2. Use of coal in sectors, 1950-2014



Source: IEA, Energy Statistics of OECD countries. The IEA data were extended backwards from 1960 using OECD, Basic Statistics of Energy.

end the conservation measures; the closed pit was abandoned definitely. The option of reactivation had been an embarrassment for reconstruction despite the formal disconnection of the issues.

Dutch coal was a minor component of a wider debate. As we saw, coal, that is imported coal, made a remarkable come-back the very moment indigenous production was given up. A new era had begun, so declared the second Energy report in 1979 (Aardenne, 1979, Part 2, 5). The liberal minister of Economic Affairs wanted a more active state. That was received wisdom after the oil-crises. Already in 1974, a committee of scientific advisors – some to be involved in the reconversion of Limburg – stressed that markets and market-oriented policies failed in diversification and improving efficiency. Furthermore, the advisors concluded that publicly funded research was too much oriented upon nuclear power (VWRR, 1974). The new era was the whished for return of coal. The minister of Economic Affairs set out in 1979 to address the 'substitution-fiction': the problem that the market did not increase the share of coal in the energy mix. Again, policy did not follow or ease markets; it prompted some markets to switch back to coal.

The policy of 1979 was in line of earlier objectives, but radicalised the previous approach. In the wake of the oil crisis, experts and then policy makers started to argue that the share of coal and nuclear in the energy mix had to rise. Consumption of oil and natural gas should be set aside for efficient use. This line of thinking followed upon the argument of the 1960s that natural gas should be reserved for premium use. Household use was then premium use; in the 1970's energy-intensive industrialisation projects were highlighted. All this fitted in planning for selective growth, as was the then fashionable label for structure policy. The generation of electricity was singled out as the space where societal interest in energy use and efficiency had most impact. We cannot discuss here the governance of the utilities, but national government was increasingly defining itself as a central actor. A major motive to assume this role was to discourage the use of gas for electricity. The share of coal used in the utilities should increase 2 to 10 percent by 1985. This was planning against market signals. According to the white paper of 1974, a coal firing plant would be a quarter more expensive than one using gas (Lubbers, 1974b, 113, 152-153). This price of switching to coal was nevertheless taken lightly. The price also explains why a more radically tuned policy followed.

The oil crisis already had stimulated the building of coal plants ahead of need. Pricing policies later stimulated gas plants being made suitable for coal firing.[11] The policy of the new era focussed upon the building of big coal-fired plants; it defined the ideals. The ideals of 1979 were great. The government expected the Netherlands to need around 30 million coal-equivalents by 2000, twice as much as what would be in fact consumed. The aim was to increase the share of coal substantially; overall from 5 to 20%, but to 40% in power generation. It might be more. The prognosis for 2000 noticed that a substantial gap in the expected supply of energy would then still exist, to be filled either with coal or by nuclear energy. The major message of 1979 was that the use of gas (and oil), which had been discouraged, would be curtailed forthwith. Gas became so a 'forbidden' kind of energy for transformation (Aardenne, 1979, Part 2, 25). Electricity plans and concerted consultation were the instruments changing goals into practice. Natural gas remained in fact the dominant fossil in power generation, but the remarkable return of coal is the result of the ambitions and pressure. Low prices did help subsequently.

A major sequel of the transition to coal was the change in research. It is remarkable how successfully a country undergoing a gas-revolution shifted research to coal. This was another result of ambitions entertained in 1974. Research in burning coal underground was rejected; a hint later that it might be economical by 2000 was not good enough (Boswinkel, 1984). Burning above ground was another matter. The natural gas revolution had just started, but another future was envisaged in a report, commissioned by the Ministry of the Environment: "if coal is bound to play a major part in the supply of energy of the Netherlands, the route of gasification is an important, if not an essential avenue" (Projectgroep kolenvergassing, 1980, 154). The white paper on Energy had insisted in 1974 that the Netherlands should become internationally outstanding in the 'exploitation and up-grading' of coal. This referred to gasification above ground. Coal gas was interesting because it matching a perceived Dutch competitive advantage: its infrastructure of pipe-lines for natural gas (Lubbers, 1974b, 113).

11 In 1971, the electricity plant of the State Mines was changed into a gas firing one. A decade later, the boilers were reconstructed, so that coal could be used again (Emde et al, 1997, 30, 32).

The ambition defined a research effort. The IEA statistics of the government's R&D budget devoted to energy show that coal oriented research money expanded significantly; not directly after 1974, but certainly after 1979. Gasification above ground was given priority. Emission control was another one. The ambition was to ensure coal gas a share of 15% of gas consumption outside the utilities by 2000, with domestic natural gas accounting for 51% and foreign gas for 34% (Algemene Energieraad, 1981, 21). A next step was the opening of the world's largest coal gasification combined cycle plant at Buggenum, a demonstration unit of international repute (IEA, 1991, 226). A research complex arose linked to the generation of electricity, but with the ambition to substitute part of the natural gas system.

Coal oriented research was a lasting success, state of the art world wide, but an ambiguous asset. Production of car-fuel or -gas out of coal was identified as a specifically Dutch competitive advantage. It was important, because it went beyond the market for electricity. Policy makers saw Dutch know-how of desulfurization of coal as prime merchandise for the Chinese market (Wijers, 1995, 63, 153). The Netherlands gained a top-position in the technology of carbon capture and storage. There seemed ample possibilities to use this technology nearby. The Ministry of Economic Affairs underlined that the potential of the Dutch underground was big; gas- and oil-extraction had been intensive. A first large-scale test on land was frustrated by public worries. In 2011, the minister decided to use carbon capture only off-shore despite earlier preferences for on-shore. Tellingly, the Energy Report of Economic Affairs started to link the top-position in carbon capture with exporting carbon by ship to Denmark and to inject it there in an offshore oil-field (Ministerie van Economische Zaken, 2011, 30; idem, 2016, 36, 124-125). Such frictions signal above all uncertainty of applying research. The most ambiguous characteristic of the focus of research was that coal oriented expertise and coal use were complements, while success in this area of research implied a poor performance in other fields.

The evolution, started in the late 1970s, was path-dependent. The latter was also the outcome of a shift to policies which focussed upon liberalisation. Changing the energy sector, in particular the generation and distribution of electricity, from a public utility into commercial enterprise admittedly reduced the scope for policy. The energy-intensive structure of the economy focussed attention upon cheap energy as a pre-condition for competitiveness. Leading companies and major consumers like DSM lobbied for building new coal fired power plants when, in 2005, the gap between gas or oil and coal increased. The companies argued that the energy mix made Dutch electricity 10 to 15% more expensive than the German one (Köper, 2012, 100). The ministry gave in, though the issue had been contentious for some time. Or more adequate, the ministry had a similar vision.

Officials had learned from the industrial or structure policies that it was better to operate without 'big' ambitions. Benevolent stewardship amidst an, by nature, unpredictable evolution –admittedly an uncertain quality – was in ill-fame (Fouquet, Pearson, 2012, 4). The relatively energy-intensive Dutch economy, itself a result of switch to oil and gas in the 1960s, was a given. A post coal economy was a too big ambition as long as it came at a cost. Or to put it differently, incumbents and alternatives were given up easily. Liberalisation and advocacy of liberalisation so strengthened the path of the ongoing evolution. Leaving all options open became a structural element of the vision advocated foremost by the Ministry of Economic Affairs. This implied, not only that the share of coal in the energy mix could grow, but also that the Ministry expected it to grow. Reserves worldwide were abundant and European integration meant that the Netherlands had become an attractive location for burning coal. The comparison with Belgium suggests that the evolution was in fact determined more by choice or political fashions than location proper (Sijn et al, 2013, 17).

Biomass gasification illustrates nicely that non-intervention and vagrancy went together. It was a hype in the early 1990's. Liberalisation of the energy sector and deregulation of waste disposal led to a breakdown of expectations by the end of the decade. Biomass gasification was not yet attractive economically and industrial partners choose not to use it. Two, three years later there was a revival. At the time of writing, Negro observed 'history seems to repeat itself as technological optimism turns into disappointment within a very short period of time' (Negro, 2007, 86-87). Ups and downs occurred every few years. The main factor blocking development was, according to the author, the absence of government and of a consistent policy fit for a new technology in the making. The pattern of stop-and go policies had also to do with the difficulty to reconcile energy and

climate ambitions besides reconciling intervention and liberalisation (Köper, 2012; Eames, 2001). Compromises or partial solutions were favoured. Rising concerns about the environment were met by adding biomass to coal, a practice which expanded rapidly after 2000 (Seebregts, Volkers, 2005, 16).

The environment gradually restricted the stance of leaving all options open. Environmentally, the Netherlands had profited from a beneficial start. The transition from coal to natural gas had reduced pressure. Emissions of sulphur dioxide peaked in 1965, after which they decreased rapidly. Emissions of CO_2 continued to increase until 2004. This had an effect upon energy policy. To its amazement, the Ministry of Economic affairs received, in 2011, 'signals from the market' that investing in coal based power stations might not be interesting. In 2016 there was no more room – given the official environmental norms – for new coal plants (Ministerie van Economische Zaken, 2011, 35; idem, 2016, 105, 126-127). That left policy making with the sensitive problem that three coal firing plants were just a year old and that low prices stimulated coal firing.

As a trading country, the Netherlands has a vested interest in coal and that interest increased over the last decades. The end of domestic production implied a shift to trade. Rotterdam and Amsterdam became the new centres of the coal sector. Tonnage handled went rapidly up in the former since the mid-1970s; the latter followed with a lag. The harbour of Amsterdam was more specialised in coal. Much is re-exported. In 1990, a transit of 10 million tons of coal passed the harbours above a net import of 14 million (IEA, 1991, 228). The harbours profited from the overall decline of extraction of coal in Europe and from the new, coal firing power plants outside the country. The Netherland are favourably located, both Rotterdam and Amsterdam had a tradition in handling this cargo and considered coal 'strategic'. Rotterdam and Amsterdam are still the first and second biggest coal harbours in Europe. They face a difficult 'fossil dilemma', which will not be solved readily, despite Rotterdam's climate initiative of 2008 and Amsterdam's ambition to become a leading player in biomass transport (Van Geuns et al, 2016).

Coal and current policy

The share of coal in the total consumption of energy in the Netherlands has stayed rather constant over the last decade at about 12-13% (Gales & Hölsgens, 2016). The actual trend is lightly upwards. Virtually all coal is burned to produce electricity. According to a recent National Exploration, consumption of coal will be stable beyond 2030 (Schoots & Hamignh 2015, 16-17, 121). Currently, seven coal-based electricity plants are in operation, with a combined capacity of 5,700 MW; five can also combust biomass. The less efficient plants have been closed, or will be in the near future. At the same time, three modern coal-based plants have been put in operation. It has been standing policy to make power plants ready for carbon capture and storage technologies. Still, in 2008 the roll-out was not foreseen before 2020.

Energy, mostly the electricity sector, has the highest level of compliance, factual and expected, with policy measures (Wubben, 2000, 22). However policy is variable and contested. Recent public debate focussed upon the new coal-based power plants. Opponents point at the pollution caused by coal. Proponents point out, firstly that these plants are comparatively efficient and draw attention at even more polluting old coal-based plants in other countries. With minister of Economic Affairs Henk Kamp, they underline the necessity of reliable energy supply; especially because domestic extraction of natural gas is bound to be reduced.[12] Policy following facts instead of being ahead of the facts has been the tradition of the last few decades. Coal therefore is seen as a fact of the future. One should not give up on coal because it is cheap and fits the present economy.

Coal does not fit well with the environment and that might be a factor of change. The combustion of coal is an important source of CO_2 pollution. In order to reach

12 Earthquakes induced by the extraction of natural gas cause damages to houses. As a consequence winning has been reduced and the Netherlands is importing more natural gas than it exported since May 2015 (CBS, 2015).

various climate targets the Netherlands has committed to - the Paris Agreement, but also the greenhouse gas reduction enforced by the Urgenda-ruling in a Dutch court – domestic emissions will have to be reduced in the near future. Closure of one or more of the modern coal-based power plants would be the most straightforward route (CE Delft, 2016). Minister of Economic Affairs Henk Kamp does so far not want to contemplate this option. The financial consequences of decisions and the value of "brand-new, but stranded investments" attracted attention internationally. It is told as a 'cautionary lesson for investors' by G. Wynn or as 'the Dutch Coal Mistake' (Wynn, 2016).

Politics suffered from climate fatigue around 2000. It led the government to experiment with a transition approach in the formulation of policies. These would then be incorporated in the fourth National Environmental Policy Plan (Kemp & Rotmans, 2009; Van der Loo and Loorbach, 2012). One can look at the experiment as an attempt to let the outside world – civil society – make policy in a controlled setting, instead of politicians and ministries having to weigh goals and consider instruments (Köper, 2012, 102-104). The experiment was hijacked by the traditional big regime players and later claimed back by the ministry, considering the taskforce too independent. The approach itself largely vanished, in public administration that is; in Dutch research it is still going strong.

The experiment brought not about a transition to renewables as hoped for by participants, expecting that coal power plants would be soon touristic sites. The experiment showed how to live with coal can be an outcome of another style of decision making. Carbon capture and storage was highlighted, because the industrial participants saw the advent of new coal power stations as a given. The technique would have been identified as promising without the energy transition project. More significant is that the focus upon carbon storage reflected a shift from reducing CO_2 to handling it. Storage stood for the promise that Netherlands might benefit from attracting international flows of CO_2, with Rotterdam as a major hub. 'We're unleashing a new industrial revolution here', pondered a program director in that city (Oost, 2016, 58-59). Policy embarrassment is the other lasting heritage of the transition management approach of policy making. In line with the famous Dutch *polder model,* it gathered lots of stakeholders at the table. The *Energieakkoord* (Energy Agreement) of 2013, reacting to pressures to reduce gas extraction, was again a collaborative effort with various groups. On December 7th, 2016 Kamp presented his *Energieagenda* with the route to, as the subtitle promises, a CO_2-poor energy provision.[13] The report disappointed. The focus was upon other countries; it did not present any specific plans and was silent about the future of coal.[14]

13 Available here: https://www.rijksoverheid.nl/documenten/rapporten/2016/12/07/ea (last accessed 27 December 2016).

14 Coal is mentioned only once in the document: "If we, for instance, close the coal and gas-based power plants, the required electricity might be imported and this may have been produced in less efficient conventional power plants. In this case, there is a reduction of CO_2 emissions in the Netherlands, but not, or barely, on a European or global level." One should acknowledge in this context minister Kamp refused to scrap subsidies for wind power, advocated in 2014 by the scientific institute of his party in the report 'Sure of Energy'.

Conclusion

With the increasing availability of cheap oil, and especially the domestic discovery of Europe's largest natural gas field, the Netherlands seemed to transition away from coal fully and at a rapid pace during the 1960s. The domestic mines were all closed within 10 years and 75,000 jobs had to be created. Coal came back in the 1970s. The domestic mines did not open again, while unconventional mining, gasification, remained a fata morgana. Coal was imported. Since the 1980s, the Netherlands has consumed a fairly stable amount of 350-400 PJ, roughly 12-13% of the total consumption of energy since 2000.

We focussed upon policy in this essay. The end of domestic mining was bought about by policy which went ahead of facts. The parties involved had to read the signs of the times, but the transition out of coal came so early because one did so creatively and had an idea of an alternative. The same was true for the return of coal during the mid-1970s in a country which was the outstanding example of a natural gas economy. The sequel of the transition out of coal was a lengthy and costly process of social conversion, passing phases of optimism and despair. Political ambitions and involvement, though, shaped the conversion and not without success. Successful research in coal was the sequel of the return of coal. The transition to a post coal economy is not materialising. Policies dreading to interfere with market signals strengthened the path-dependent process which began in the 1970s. Policy gave up on being visionary. Courts or civil society might bring a post coal age nearer, but for the moment it seems likely that coal will remain in the Dutch energy mix for a considerable time to come.

Table 3. Transition strategies — Typology (the Netherlands)

Compensation or grandfathering (backward-looking)	Structural adjustment assistance (forward-looking, narrow)	Adaptive support (forward-looking, broad)
Consumers/ households		
Low price policies dominate, but levels managed to what the sub-markets will bear. A tradition of managing consumption, e.g. with building norms as instruments. Major changes like exit out of coal subsidised. Competitiveness the leading idea, but adaptations e.g of the once stimulated energy-intensive production or electricity generation subsidised.	Substantial subsidies for entry into gas as the alternative to domestic coal production. The shift out of carbons contentious and part of a tottering political climate.	Seed subsidising; Advice on energy efficiency.
Workers		
Promiss of no job-loss, which did not exclude job-losses later. A long-lasting pension problem, as the Dutch system is capital based, despite subsidies. Long-lasting problems with occupational hazards. No specific policies in the context of recent coal use or the exit from carbons more generally.	Miners taken out the labour market and younger generations massively trained. Loss of income and costs of employers covered partially.	Limited well-being funding.
Communities		
Local authorities were mostly covered by general programs, which targeted communities for help in structural change, Programs for the exit of gas building-up in response to the earth-quake problem. Repairs etc are a charge of the producer, Reduction of extraction, the constraints of action and extra programs are political issues.	Former mining regions targeted in regional programs. Funding of infrastructural projects, roads in particular. Funding of industrial relocation and in the promotion of tourism. Establishment of university nearby, of the Open University in the region and growth of tertiary schools contributed to human capital building.	Community projects, largely educational. Limiting the effects of policy changes a major outlay of labour market funding.
Corporations		
Involvement of the State coal Mines in the gas industry. Exit subsidies for the private companies. After-math (subsidence) met out of special funds fed by the companies. Issues beyond the period of liability (rising mine water) contentious, but likely with a role for the Exchequer. The costs of natural gas extraction are born by the producer. Reduction of gas extraction reduces state-income.	Much room to invest in another future. Succesful shift of the State Mines in chemicals. Former private mines became or were absorbed by investment institutions, but left the region. Important reallocation of (semi-) government offices. Gas is extracted by oil-companies, which can diversify.	Corporatist environment.

Source: Table content by the author(s). Table concept by Fergus Green.

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