Policy responses to carbon lock-in: The case of the Dutch chemical industry

Heleen de Coninck
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Outline

1. Set the scene: a few key figures from the IPCC SR1.5

2. Why study carbon lock-in and what is it?

3. Is there carbon lock-in in the Dutch chemical industry?

4. Current Dutch climate policy for industry

5. Discussion & conclusion: aligning a national
Halve CO$_2$ in 2030

Net zero CO$_2$ in 2050

Carbon dioxide removal
Modelling results for industry consistent with 1.5C

Section 2.4.3.1:

“CO₂ emissions from industry increase by 30% in 2050 compared to 2010 in baseline scenarios.

By contrast, these emissions are reduced by 80% and 50% relative to 2010 levels in 1.5°C-overshoot and 2°C-consistent pathways from IAMs”
Why study carbon lock-in in chemical industry?

- Large chemical industry in the Netherlands
- Industry toughest sector to reduce emissions – perhaps carbon lock-in is part of the explanation?
- Carbon lock-in studied in other sectors than industry
- Policy response may be different?
What is carbon lock-in?

Adoption of a new low-carbon technology is path-dependent to historical preference and development of the existing technologies in the system. (David, 1985)

Carbon lock-in: “a path-dependent process (...) whereby initial conditions, increasing economic returns to scale and social and individual dynamics act to inhibit innovation and competitiveness of lower-carbon alternatives” (Seto et al, 2016)
Already demonstrated in concrete

Green: procurers risk-averse, lack knowledge resulting in negative expectations

Orange: Lobby waters down regulation favouring clean concrete which already has high entry barriers

Purple: Lobby captures norms and certification bodies

Blue: roadmapping enhancing negative expectations clean concrete
Conceptual framework: Four types of returns to adoption

Existing technologies exhibit increasing returns to adoption (Arthur 1989):

- Economies of scale
- Learning effects
- Adaptive expectations
- Network economies

Hypothesis:
In addition to general barriers, the Dutch chemical industry is at risk of carbon lock-in, given its existing path-dependent, highly optimised and integrated system that has exhibited strong increasing returns to past adoption.
Situation in the Netherlands Fall 2017

2013 Energy Agreement with 100 PJ energy savings aim for industry
EU regulation: ETS, energy efficiency, renewable energy etc.

*October 2017: New coalition government with ambitious climate goals*

- Four parties: liberal-conservative, christian-democrat, social-liberal christian, liberal-democrat

*Government agreement:*
- 49% emission reduction in 2030 compared to 1990, aim to increase to 55%
- Closure of (new) coal-fired power plants in 2030
- List of measures with 18 Mt of CCS in industry (plus another 2 Mt in waste incineration)
Method: Interviews (Nov 2017) & document analysis

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<th>Category</th>
<th>Organization/Role</th>
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<td>NGO</td>
<td>Urgenda Director and founder</td>
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<tr>
<td>Industry association</td>
<td>VNPI (The Dutch Petroleum Industry Association) Director</td>
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<td>VNCl (The Dutch Chemical Industry Association) Head energy and environment department</td>
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<tr>
<td>Industry</td>
<td>Royal Dutch Shell Government relation advisor</td>
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<td>AkzoNobel Manager External Affairs Energy</td>
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<td>Chemelot Executive Director</td>
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<td>Government</td>
<td>Ministry of Economic Affairs and Climate Policy Senior policy advisor</td>
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<td>Senior policy officer</td>
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<td>Public Limited Company</td>
<td>Port Authority of Rotterdam Director of energy and industry, Corporate strategists</td>
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<tr>
<td>Research institute/Consultancy</td>
<td>PBL (Netherlands Environmental Assessment Agency) Senior research scientist energy system &amp; transition, biomass</td>
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<td>Quintel Partner Quintel Intelligence</td>
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## Results: carbon lock-in and other barriers (1)

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<th>Carbon lock-in</th>
<th>Description</th>
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<td>Technological incompatibility</td>
<td>• New technology not congruent with incumbent or alternative new technology (CCS vs electrification)</td>
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<td>System integration</td>
<td>• Highly optimised clusters of chemical industry (industrial symbiosis) makes it more difficult to innovate in one installation</td>
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<td>Sunk costs</td>
<td>• Large investments, long payback times</td>
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<td>Policy inconsistency</td>
<td>• Energy efficiency policy was flagged as potentially distracting from CO₂ reductions</td>
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<td>Safety routines</td>
<td>• In an industry with a well-developed safety culture, new technologies mean starting all over again</td>
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<tr>
<td>Carbon lock-in</td>
<td>Type of increasing returns to adoption</td>
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Results: ‘normal’ barriers (3)

Operational cost: Cost-competitive fossil fuels and feedstocks

Timing: Turnaround and payback times

Risk: Low risk acceptance by capital providers and shareholders

Market: Customer behaviour and choice
Policy developments in the Netherlands after 2017

Climate Law: -95% GHG in 2050 compared to 1990

Climate Agreement: ‘consensus’ document with broad societal support
- Five tables, including industry (14.3 MtCO₂ reduction compared to baseline)
- Initial proposals for industry too weak (‘bonus/malus’)

CCS in industry reduced to ca. 7 Mt max (NGO pressure; framed as benefit to industry)

Controversy on distribution of cost: industry pays too little -> calls for carbon tax

Measures in current Climate Plan for industry:
- Companies need to implement energy efficiency when pay-back time <5 years
- ‘Sensible’ carbon levy
- Subsidy for CO₂ reduction ‘when no cost-effective alternative available’
- Innovation in hydrogen, circularity, electrification, CO₂-free heat
Discussion & conclusion

Conceptually congruent with carbon lock-in literature in other sectors

• Carbon lock-ins like sunk costs potentially stronger
• We did not find the strong lobby findings of Wesseling & Van der Vooren
• Behaviour lock-in less of an issue (identified in transport)

Acknowledge the problem

Long-term targets and plans are key to overcome carbon lock-in
Policy consistency and continuity; trust between government and industry
Government procurement of climate-neutral products
Mix of policy instruments: CO₂ abatement cost compensation, carbon tax, first-of-a-kind subsidies, infrastructure support (e.g. CO₂ transport)
References

IPCC, Global warming of 1.5 °C: an IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, 2018. (Chapter 2, Rogelj et al)


