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Forward-lobbying along the value chain: explaining the cement industry's global energy advocacy efforts.

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Abstract

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The paper looks at the governance of the cement value chain in order to show how the cement industry pursues a strategy of entrenching the use of cement even further by recourse to climate change arguments. It thus deepens the already existing lock-in into the highly carbon emissions intensive cement paradigm and reduce the political feasibility for pricing cement's carbon emissions. The paper identifies narratives the cement industry draws upon in conjunction with other actors from the construction value chain and shows the diverse mechanisms by which it seeks to further entrench its product. It demonstrates the additional insights that can be gained by not just looking at carbon pricing in isolation but by completing the analysis through integrating value chain specifics aspects of governance. It shows how an explanatory model of corporate strategy in environmental politics can be usefully extended by integrating it with the notion of governing along the value chain and by considering the benefits corporations can derive from attention economics and the continuation of their products' entrenchment in downstream sectors.

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1. Introduction

Cement emissions are a difficult to address problem with global environmental significance but that, besides the *Paris Agreement*, so far lacks a comprehensive agreement to address them. This does make their study less amenable to rigorous hypothesis testing or intricate refinements of existing theories than well-established regimes (Dauvergne and Clapp 2015, 7). However, it is also important to explain prevailing unsustainable practices. This paper shows how the case of the cement industry can inform a cumulative research programme in business strategy in environmental politics (Meckling 2015).

This paper shows how the existing lock-ins into carbon-intensive production forms of the construction industry are not only determined through technological and institutional factors but how the benefactors of the status quo use sustainability arguments in order to defend it. The paper contributes towards political economy explanations for the persistence of emissions-intensive processes in industry.

Neo-Pluralism (Falkner 2010; Falkner 2008) and Neo-Gramscianism (Levy and Newell 2002; Newell and Paterson 2011; Newell 2012) are the two major business-centered approaches in global environmental politics (Meckling 2011a, 3ff.). The Neo-Pluralist perspective argues that the privileged positions of business in international environmental politics doesn't translate into a dominant influence over outcomes due to the presence of limiting countervailing forces, in particularly those arising from the divisions and conflict among heterogeneous business actors themselves (Falkner 2008, 17). The Neo-Pluralist framework emphasises the role of business conflict in environmental politics and locates its roots in the *perception* of how a regulation may differentially distribute costs and benefits onto different actors and thus affect their competitive position (Falkner 2008, 35). Neo-Gramscianism has a stronger focus on structural and discursive forms of power, it is more interested in the 'hidden face of power' and thus in the shaping of perceptions, institutional biases, explanation of why certain things don't make it onto the agenda and ideology more generally (Lukes 2004; Shapiro 2006). It tends to often go hand in hand with Foucauldian interpretative approaches to the power/knowledge nexus and the study of *dispositifs* (Lemke 2001; Gill 2008; Foucault 2009). I will show how recent steps towards a cumulative research program with a more Neo-Pluralist bent can be usefully extended to take into account how different policy processes target different segment of the value chain and how framing processes can help to support the otherwise less plausible application of a typology geared towards the explanation of corporate strategy in environmental politics (Meckling 2015). This aligns pluralist concerns with firm and industry level explanatory factors and the differential effects of regulation with more discursive approaches to the persistence of unsustainable patterns of production and consumption that highlight the role played by different problem framings and interpretations in a power/knowledge fashion (covering at least the 'second face' of power concerned with agenda-setting (Lukes 2004)).[1] This alignment, however,

[1] In addition, approaches that highlight how practices can be ingrained within humans and

remains within the confines of a highly empirical research programme.

Cement is a particularly interesting case as cement companies are very good at emphasising certain ecological aspects over others, thus possibly keeping "one eye closed" for longer. Already more than 20 years ago Davidovits (1994) wrote that "the solution to [the cement problem] should not be left to the Portland cement manufacturers alone" as "[i]t seems obvious that the western cement industry will go on in intensively lobbying the US and EC administrations by preventing any regulation focusing on chemical-CO2 emission", which would "restrain the flow of pertinent information".

On important distinction in the assessment of the climate impact of products, services or infrastructures is that between operational and embodied emissions (Connaughton et al., n.d.). Whereas operational emissions are the ones that occur during the use-phase, embodied emissions are those that were emitted during the different stages of production of a good. In the lingo of the Greenhouse Gas Protocol[2] they would be considered as *Scope 3* emissions. The assessment of Scope 3 emissions relies on rather complex and potentially contestable processes of aggregating information and so does the calculation of the relation between embodied and operational emissions.

The NHBC Foundation writes that "[e]mbodied CO2eq has historically been a niche area of investigation, due to both the difficulty in analysing it, and its perceived lack of importance when compared with operational CO2" (NHBC, p. 4). The question arises whether this perceived lack of importance has been occurring in a 'natural way' or whether there is political agency that biases perception against a more prominent role for embodied emissions (one the "second face of power" see Lukes 2004; Shapiro 2006).

I show how the cement industry allies with other parts of the building sector and the climate change policy-making and action community in order to emphasise operational over embodied emissions, future carbon savings over current ones and markets cements as parts of a climate change adaptation programme. The industry works through processes of institutionalisation via industry initiatives that engage with the whole value chain, standards-setting as well as by working with government.

As the true scope of climate policy and its challenges becomes apparent, climate policy takes on more and more aspects of a wider resource policy. In doing so, climate policy turns the industrial ecology of contemporary societies into its object of evaluation and potential intervention. A 'mainstreaming' of climate policy suddenly suffuses architecture and things apparently mundane to social scientist, such as cement blends, with political meaning.

The awareness of the critical role of emissions reductions from the energy intensive industries is relatively novel. Yet, the timeframe that is provided by science and the importance of these sectors are arguments in favour for students of global environmental politics and governance to engage with these sectors and seek to reveal their political dynamics and

institutions situated in value chains are taken into consideration.

[2] www.ghgprotocol.org

the complex relations they have with the various institutions and activities that traverse contemporary economies.

A lot has been written about the transformation of the energy-sector. Due to REDD by now there is also a good literature on climate change and forest governance. The impact of agriculture governance on climate change has also been well researched. However, the building sector has largely been dealt with an emphasis on the use phase rather than with an analysis of its embodied carbon. Most of the social science literature on cement and climate, where it refers to policy processes, deals with possibilities for ETS reform (Cook and Ponssard 2011; Boyer and Ponssard 2013; Branger and Sato 2015).

I will demonstrate that the cement industry's strategy of engaging with the supply chain runs the danger of further entrenching unsustainable consumption practices globally and thereby may lead to higher emissions earlier from the buildings sector than we could have with alternative approaches to buildings policy.

The paper continues with a presentation of Meckling's typology towards an explanation of business strategy in environmental politics and a suggestion for an extension of its property space. Section 3 describes cement production as a problem for climate policy. Section 4 gives a quick overview of the potential challengers to the dominance of the cement paradigm. Section 5 looks at socio-technical lock-in, incumbent power and barriers to innovation. I identify a number of factors can potentially be in the the way of innovation processes that could help to decarbonise the building sector. Section 6 details the corporate strategy of the cement sector in dealing with the climate challenge. Here, the a short treatment of the European Emissions Trading System, on the one hand, and the energy advocacy activities of cement producers, on the other hand, are presented as the relevant cases. I problematise the energy efficiency agenda by pointing out that there are good reasons to discount future emissions and to expect a decarbonisation of energy supply. Section 7 argues for jointly analysing the two cases in order to increase the explanatory power of Meckling's typology and section 8 suggest how to do that by also considering the economics of attention and the institutionalisation of practices as part of the differential effects in the payout-matrix.

2. Business strategies in environmental politics: integrating the value chain

Meckling (2015, 19) posits that "basic preferences of firms are translated into strategies in the context of institutional environments". Next to the perception of distributional effects and the structure of industry representation another important aspect is the regulatory pressure that is perceived by firms.

Meckling suggest four firm strategies, consisting in *opposition*, *hedging*, *support* and *non-participation*. Firms choose the strategies based on "different sets of distributional effects and perceived regulatory pressure" (Meckling 2015, 19). Figure 1 (taken from Meckling 2015, 23) presents a typology of how different combinations of regulatory pressure and distributional effects result in different business strategies in environmental politics.

Business Strategies in Environmental Politics

	Distributional Effect	
Regulatory Pressure	*Costs > Benefits*	*Costs < Benefits*
Low	Oppose	Abstain
High	Hedge	Support

Figure 1: Business Strategies in Environmental Politics

Meckling (Meckling 2015, 20) highlights "hedging strategies" as an "increasingly prevalent form of corporate engagement with environmental politics [which] suggests an analytic focus on the role of corporate influence in instrument choice and policy design instead of a binary analytic lens of corporate support versus opposition."[3] Hedging occurs when the regulatory pressure is perceived to be high while regulation is perceived to affect a business negatively.[4]

Meckling's (2015, 25) account has the additional virtue that it also explains non-participation. It e.g. may be explained by the assumption that firms could reap gains from regulation, yet regulatory pressure is not high enough to provide a sufficiently large incentive for engaging with the regulatory process.

However, there is a gap in Meckling's typology as it only contains $\textit{Costs} > \textit{Benefits}$ and $\textit{Costs} < \textit{Benefits}$ yet a negligible amount of either costs and benefits $\textit{Costs} \approx \textit{Benefits} \approx 0$[5] is missing. While this may seem trivial and running the danger of unnecessarily complicating a parsimonious typology, including this third set of cases guards us against assuming that where there is corporate action towards a policy it must be in response to *immediate* gains or losses from the policy in question.

As such, we arrive at the following table:

The usual assumption of any policy where $\textit{Costs} \approx \textit{Benefits} \approx 0$ is that the business strategy would be to abstain. In the manner of the causality-assuming motto "Where there is smoke, there must be fire"[6] this would still lead us to the assumption that any corporate political strategy aimed at influencing policy[7] – where grounded in 'rational' business considerations

[3]This makes the larger-n analysis of change in corporate stances towards environmental policies more complex and thus makes it more difficult to account for learning processes.

[4]In the words of a Duke Energy CEO: "If there is a high probability that there will be regulation, you try to position yourself to influence the outcome" (Hoffmann and Woody, 2008: 74, in Wright and Nyberg 2015, 56f.).

[5]I thank Jun Rentschler for suggesting this formula.

[6]"Bollo: No smoke without fire. \ Howard Moon: Why does everyone keep saying that? What about smoke machines? \ Bollo: [shrugs] Dry ice." (The Mighty Boosh 2007)

[7]As opposed to corporate social responsibility measures aimed at improving aspects of a company's performance.

Regulatory pressure	Distributional Effect		
	Cost > Benefits	Costs ≈ Benefits ≈ 0	Costs < Benefits
Low	Oppose	Abstain	Abstain
High	Hedge	Abstain	Support

Figure 2: Extended Typology of Business Strategies in Environmental Politics

– must be grounded in either costs or benefits. However, its inclusion does make us more attentive to cases with negligible costs or benefits and thus more ready to question to what extent the motivation for corporate political action is *directly* related to the policy in question.

Having extend the typological matrix by *Costs* $\approx$ *Benefits* $\approx$ *0* we can better explain cases where there is political action while, sticking to looking only at one policy field, we would expect no political action action to occur, i.e. companies to abstain from action. This may guard us against suspecting fire wherever we see smoke, or at least fire within the immediate vicinity. While some benefit may be *necessary*[8] for firms to become advocates for a certain policy, a small benefit in itself may not be *sufficient* (on necessity and sufficiency see Mahoney, Kimball, and Koivu 2009).

In order to demonstrate the utility of this approach, I present two case studies.

In the domain of energy efficiency in buildings, the cement industry doesn't have much to win directly, yet it is as ardent supporter. In contrast, in the European Emissions Trading System, it can be located between opposition and hedging.

3. The cement problem

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Although in popular perception climate change is often confined to its association with energy, the deep decarbonisation necessary to stay within the 2 degrees aim requires to change the way that some of the most fundamental and ubiquitous materials flows that travel though economies. According to the findings of the Deep Decarbonization Pathways Project (**???**-:2015, p. 11), "deep emissions reduction in industry and freight transportation will pose the greatest challenge, and require intensive efforts in research, innovation, demonstration and commercialization". The building sector is the single largest contributor to global GHG emissions (Gibbs and O'Neill 2015, 134). In the EU the building sector is responsible for 40% of GHG emissions and 50% of abiotic resource extraction (citing EC 2011: Bringezu et al. 2015, 35). According to the World Resource Institute (WRI) of total global emissions from 2005[9] fuel and power for

[8] In a probabilistic, not in a deterministic sense.

[9] http:/www.theguardian.com/environment/2011/apr/28/industries-sectors-carbon-emissions

buildings accounted for 16.5% of emissions and cement production for 5.0%. Clinker, an essential ingredient of conventional cement, is produced by the calcination of limestone in a rotating kiln. This chemical process releases around 0.53 tCO2 per ton of clinker (Branger and Sato 2015, 6).

As we will see, the construction industry and – as part of its value chain – the cement (as well as the steel industry) makes the argument that these 16.5% of buildings emissions can be reduced by using cement and steel in intelligent ways and perhaps even in greater magnitude. Timber is a potential rival to both cement and steel in the construction industry. In 2005 deforestation accounted for 11.3% of emissions and reforestation for -0.4%. This shows how reforestation and subsequent use of timber for construction may have some potential for rivalling cement and steel in certain applications.

4. Alternatives

As it becomes clear that a further expansion of the consumption of cement, under the present production paradigm[10], is incompatible with deep decarbonisation, the question of a transformation of the sectors of the economy that rely on cement is raised. From a holistic perspective, one shouldn't focus entirely on the decarbonisation potentials of the cement sector proper but should also take downstream sectors into account, whose transformation could contribute to a relative demand reduction for cement.

More potential than cement alternatives or improvements can be found in concrete (Bringezu et al. 2015, 36f.). Even more potential than in cement or concrete innovation can be found in wholesale architectural innovation and better adaptation to local climatic conditions and raw material availabilities.

Suppliers of alternative low carbon building materials may not be organised enough. Adopting a sustainability transitions perspective, Gibbs and O'Neill (2015, 133) focus on "the niche green building sector outside the dominant building regime". Gibbs and O'Neill (2015, 133f.) emphasise that that the eco-pioneering niche actors in the building sector are not a cohesive set but better be conceptualised as a "set of nested sub-niches". This lack of cohesiveness, while encouraging for experimentation and innovation, also means that if is more difficult for policy-makers to pick a challenger that may be worthy of support in the face of incumbents. Even worse, if solutions are confined to locally appropriate measures, it is more difficult to galvanise support for them beyond their local context.

In the interviews with niche actors in the building sector conducted by Gibbs and O'Neill (Gibbs and O'Neill 2015, 139) there emerged a theme focusing on the "use of natural and locally-based materials".

As long as the cement industry can command the loyalty of downstream users and regulators, their grip on market dominance can make them seem without alternative and thus any significant carbon pricing will meet resistance as it seems not to disincentivise a specific form of construction but to punish construction itself.

[10] And without a massive roll-out of CCS.

5. Lock-in, incumbent power and barriers to innovation

A number of factors can potentially be in the the way of innovation processes that could help to decarbonise the building sector by reducing the utilisation of clinker.

First, in the building sector there is a requirement for tried and tested products and processes. With investments made with a perspective of decades or even centuries house-builders don't want to experiment.

Second, cement producers should have an interest in ensuring that the productions facilities with new cement types can be well integrated with their existing plants in order to prevent a devaluation of their assets. The cement industry is very capital intensive. It takes about 25-30 years for a clinker plant to amortise. If demand increases for cement and new facilities are built, the companies are going to have incentives for keeping up demand. However, this can severely limit the range of potential innovation pathways. For example, Imabi et al (Imbabi, Carrigan, and McKenna 2012, 214) suggest that the problem of integrating the production of Novacem's[11] carbon-reducing cement with operational cement plants, in addition to the substantial startup costs involved, may contribute to this novel cement eventually being overlooked. On the other hand, Project Aether emphasises that "trials confirmed the feasibility of industrial-scale production of [lower carbon] Aether clinkers in kilns designed for Portland Cement (PC) clinker production, using similar process parameters and fuels" (Aether-Cement 2016).

Third, there is a tension between regional raw materials availability and multinational corporations' (MNCs) desire to streamline processes: For Phair (2006, 772) "Green chemistry encourages innovation in the methods and technology for cement processing so that they may be transferable to different regions and adaptable to local supplies of raw materials for the manufacture of a desired product." As Bringezu et al assert (2015, 36), a secure raw materials basis is important for the development of alternative cements. This points to the importance of stirring innovation that is regionally differentiated according to local raw materials availability (and perhaps also climatic conditions). However, MNCs tend to be interested in streamlining operations across regions and jurisdictions. For example, Imbabi et al (2012, 207) mention that the raw materials for Novacem are not as abundant or uniformly distributed on land as those for Ordinary Portland Cement (OPC)[12]. Due to concerns with economies of scale MNCs in the cement industry may lack interest to invest in locally specific, idiosyncratic solutions.[13]

[11] Now out of business, with intellectual property rights bought by Calix.

[12] The standard cement with about 95% clinker content.

[13] Also (national) building codes and innovation programmes may neglect the regional availability of (potential) building resources.

6. Cement corporate strategy

The cement producers' corporate strategies towards dealing with the challenges of climate change regulation can be usefully distinguished into those *internal* to the cement production process and those that are targeted *externally* at the level of policy-makers or at the value chains of which cement forms a (potential) part of. The two (brief) case studies are located at the level of external strategies.

6.1. Internal to cement

The cement industry seeks to reduce emissions by using different fuel types for heat generation, increasing energy efficiency, reducing the clinker content of cement and aspiring to use carbon capture and storage (CCS).

By now often waste such as old car tyres are used for heat generation. Energy efficiency is regularly increased. Clinker is often blended with by-products from coal-firing and virgin steel production to the reduce the clinker content in cement. As these are not attributed emissions, cement seems to become less emissions-intensive. While in one way this is indeed the case, this decrease in emissions intensity is only possible on the basis of highly emissions intensive way of generating electricity and increasing the stock of steel. This could be described as a form of high carbon 'industrial osmosis'. The process emissions from the clinker production themselves cannot be reduced beyond a certain minimum as they are the results of the underlying chemical reaction (Neuhoff et al. 2014; Hicks, Caldarone, and Bescher 2015; Bringezu et al. 2015). CCS for the cement industry is still at an early state of development.[14] These strategies are partly coordinated and benchmarked by the Cement Sustainability Initiative (CSI), a sector initiative of the World Business Council for Sustainable Development (WBCSD). The CSI "is a global effort by 25 major cement producers with operations in more than 100 countries who believe there is a strong business case for the pursuit of sustainable development. Collectively these companies account for around 30% of the world's cement production and range in size from very large multinationals to smaller local producers."[15] CSI data is widely cited in the research literature (Cook and Ponssard 2011) and has been instrumental in the design of ETS benchmarks (Fraunhofer Institute for Systems and Innovation Research, Ecofys, and Öko-Institut 2009).

In addition, the cement industry also actively seeks to shape innovation processes in the building materials realm. Like other topics in environmental policy, cement is a highly technical one. This endows the cement industry with technological power (Falkner 2008). As they are most invested in and most knowledgeable about the subject, they can both steer innovation processes towards certain directions and shape the impression of what's technologically feasible. This technological power can thus easily be converted in "discursive" power.

[14] http://ieaghg.org/docs/General*Docs/IEAGHG*Presentations/J.*Davison*IEAGHG-Cement_IndustrySEC.pdf
[15] http://www.wbcsdcement.org/

6.2. External to cement

6.2.1. Case study 1: the ETS

Under the EU emissions trading system (ETS) and, in its wake, the Californian ETS (now linked to Quebec's) industries considered to be energy-intensive and under the threat of "carbon leakage" are granted free allocation of emissions permits. For many industries this free allocation is based on the performance benchmarks of specific product categories.

Meckling still located the energy intensive industries in the opposition quadrant for the period 1999-2008 (Meckling 2015, 26). However, due to the introduction of free allocation based on benchmarks there was sufficient pressure, with the ETS being a *fait accompli*, to warrant a hedging approach that seeks to minimise compliance costs (on the hedging approach see Meckling 2015, 23). In addition, the consultative nature of the benchmarking policy process itself (Fraunhofer Institute for Systems and Innovation Research, Ecofys, and Öko-Institut 2009; Egenhofer and Georgiev 2010) was highly conducive to hedging rather than outright opposition strategies.

A carbon price could help to reduce demand by providing the right incentives for substitution and more efficient use. However, the current ETS, in conjunction with the trade regime, is not designed to allow for full transmission of the carbon price signal to energy-intensive industries.

The ETS was even a subsidy for some European installations and possibly led to a higher share of carbon-intensive clinker in European cement blends than without the ETS (Sandbag 2016).

What would a price signal accomplish without alternatives? If elasticity is low a higher price wouldn't help so much in cutting down emissions, which could pose a barrier to future deep decarbonisation efforts.

6.2.2. Case study 2: Strategies towards the built environment

Cement companies' climate strategies are not limited to influencing the shape of the ETS but are also accompanied by attempts at governance along the value chain.

As free allocation based on benchmarks effectively limits the decarbonisation of the sectors to incremental progress, with rather clear physical limits in sight, the alternative attempts at decarbonisation further downstream also need to be taken into account as they interact with the ETS as the EU's "flagship" climate policy. By largely bracketing out cement from carbon pricing, decarbonisation is largely left to the downstream policy field of construction. When it comes to energy-intensive industries, in order to understand industry resistance to decarbonisation efforts, it is not sufficient to look at policy that is explicitly framed as mainly climate policy. We need to look at how the products of energy-intensive industries flow through the economy along the value chain and analyse how, on the one hand, multiple actors defend the status quo, and how on the other hand, how others have latent or manifest interests in change. This requires a holistic perspective on how industrial lock-ins jointly block climate and resource policy. In order to understand how the cement industry is governed by and how it co-governs climate policy we need to adopt a perspective that doesn't just focus on the regulation of cement emissions proper but that encompasses the entire production network (Henderson et al. 2002; Levy 2008) in which cement is embedded. We need to understand lobbying as value chain lobbying. From such a perspective the *carbon supply chain* of cement can be delineated and analysed.

A value chain, or rather a production-network, perspective needs to be taken into account in order to understand policy response to the challenge of decarbonising economies. As different parts of the value chain are regulated by different branches of the executive at multiple levels, with different parts of the legislative, civil society, research and industry having each specific interests and competences, the impetus for change may at times be taken up and strengthened and at other times weakened. Cement companies show that they are conscious of value chain approaches to governance in their express desire to streamline the cement value chain downstream towards energy efficiency.[16][17]

We have to understand the market/non-market strategy of the cement industry as intricately intertwined with the downstream construction sector. It is by harnessing the epistemic and lobbying power of the downstream users that the cement industry can preserve high cement utilisation rates. I would call this *forward*-lobbying along the value chain. This notion of forward and potentially backward lobbying points to the the need to trace political-ecological conflicts along industrial ecology streams (relate to industrial metabolism).

6.2.2.1. Political strategies along the value chain The cement industry pursues a range of discursive strategies in order to legitimise *more* rather than less cement use.

First, it points to it *internal* (see previous section) action aimed at reducing emissions from cement production.

Second, it seeks to shift the focus on how cement can contribute to energy efficiency in the building sector.[18]

[16]LafargeHolcim is one of the 11 companies that joined the Low Carbon Technology Partnerships initiative on Energy Efficiency in Buildings (LCTPi-EEB). LCTPi-EEB is an action plan that was announced at the Lima Paris Action Agenda thematic session on Buildings. According to the WBSCD the"fragmentation of the complex building value chain is a significant barrier to the improvement of energy efficiency in buildings solutions at scale". "The 11 companies joining LCTPi-EEB ... will work with WBCSD and other partners to bring together building value chain stakeholders in local markets to develop a common understanding of these market barriers and initiate actions that tackle them". http://www.wbcsd.org/launch-of-the-global-alliance-for-buildings-and-construction.aspx 2.6.16

[17]Peter Hoddinott, President CEMBUREAU, points out that "it is important to remember that the cement industry does not stand alone. It is part of the European construction sector. ... We do look forward to working with the construction sector, policy-makers, research communities and civil society ... (CEMBUREAU Low Carbon Economy - Concrete Action for 2050 http://www.cembureau.be/cembureau-low-carbon-economy-concrete-action-2050)

[18]CEMBUREAU communicated on its website that "On 29 April 2016, [i] responded to a European Commission consultation on policy supporting actions and market uptake priorities for the future Work Programme 2018-2020, Horizon 2020." There it "indicated that Horizon 2020 projects should provide support to three EU Directives, namely the energy efficiency, renewable energy and the energy performance of buildings Directives. In particular, attention should be

Third, they seek to focus attention on operational rather than embodied emissions. As long as cement emissions are only allocated to cement producers they are not likely to affect building practices. Only when the "embodied" emissions of a building are attributed to the building itself, a comparability across designs emerges. Cement producers thus have a clear interest in focussing more on operational than on embodied emissions.

Fourth, it emphasises the contributions cement can make for a more climate-resilient built environment. Even the climatic effects of emissions and the thus arising need for adaptation is put into the service of more and heavier 'resilient' architecture.

These strategies are pursued at different levels, targeting architects, construction companies, academia, city officials, UN bodies, national government and the European Commission.

An eventual rise of the embodied emissions paradigm could enable challenger companies to eat into the slice currently owned by the cement industry. Already pre-empting such a rise, cement producers seek to influence discourses, institutions and regulations by pushing for more emphasis on energy efficiency, shaping labelling and certification schemes in ways that make cement products appear benign and emphasise the need for resilience in a way that is beneficial to cement demand.

6.2.2.1.1. Shifting the emphasis from cement emissions to its contribution to energy efficiency The Sustainable Concrete Forum notes that the UK concrete industry is committed to "Contribute to the delivery of a zero carbon built environment" (MPA The Concrete Centre 2012). This can, of course, have different implications, depending on whether one only looks at use-phase or also at embodied emissions. On its website, describing the Concrete Sustainability Strategy, the communicative strategy is made explicit: "The overall theme of the extended strategy is a widening of focus from the sustainability of concrete production to the contribution concrete can make to a sustainable built environment."[19] This points to a conscious emphasis on use-phase emissions. In contrast to that, McAlinden (2015) advocates moving "from a vision where zero-operational emissions is the ultimate aspiration to one where minimising whole-life carbon emissions is the norm". A study co-financed by cement producer Lafarge[20] predicts increased cement demand under

paid to provisions which tackle important issues such as building renovation strategies, Nearly Zero Emission Buildings (NZEB) and financial incentives." (http://www.cembureau.be/horizon-2020-projects-should-promote-whole-life-thinking-energy-efficiency-buildings 3.6.16)

[19] http://www.sustainableconcrete.org.uk/top*nav/concrete*sustainable_strategy/commitments.aspx 19.5.16

[20] Now LafargeHolcim.

carbon constraints vis-a-vis business as usual.[21][22] Construction companies conspire with what consumers probably want anyway or at least with what they have never learnt to question. A building's lower operational energy consumption is an attractive economic propositions and can increase its value and "de-risk" it in the face of potential future energy price increases. The ostentatious display of renewable energy generation on site or futuristic/modern architectural elements can portray its inhabitants in a positive light. It's a more marketable solution to the climate crisis than a complicated "embodied emissions" narrative.

6.2.2.1.2. Engaging with a plethora of internationally active organisations A diverse range of organisation drives the energy efficiency agenda forward at the international level and the cement industry forms a supportive part of that. Here incumbent power aligns with energy efficiency experts and advocates in a baptist/bootlegger coalition (Yandle and Buck 2002; Meckling 2011b; Yandle 2012; Clapp and Meckling 2013; Meckling 2015).

For e.g. The World Business Council on Sustainable Development (WBCSD) hosts both the *Energy Efficiency in Buildings project* (EEB) as well as the CSI. LafargeHolcim is one of the EEB Co-chairs. Amongst its partners is the World Green Building Council (WGBC).

The Global Buildings Performance Network (GBPN) also seems to focus entirely on operational emissions. William Sisson, GBPN's Director of Sustainability, serves "as Chair for the World Business Council for Sustainable Development's Energy Efficiency in Buildings Projects".

The C40 city network measure cities' carbon emissions over time. By choosing the city as its boundary, emissions from cement manufacture may be excluded while energy efficiency savings may make a city look better.

In December 2015, as part of COP21, Ségolène Royal, Minister of Ecology, Sustainable Development and Energy, and Head of the French delegation together with Ibrahim Thiaw, UNEP Deputy Executive Director, launched the Global Alliance for Buildings and Construction to combat Climate Change.[23] Next to 20 countries among the "major groups" one can find Lafarge Holcim again and over 50 "national and international organisations, professional networks and funders."[24] The WBCSD is a "co-lead of the GABC Value Chain cluster" and "will work with partners to

[21] Key messages of the report are that a "coherent strategy for the stabilization of CO2 at the global level requires the reinforcement and accelerated renovation of infrastructures" and "The scenarios reducing emissions and stabilizing atmospheric CO2 concentrations at 450 ppm not only require a significant increase in energy efficiency, but also massive and rapid deployment of new technologies: very-low energy buildings, electric vehicles, carbon capture and sequestration in power stations" (Entreprises pour l'Environnement and Institut du développement durable et des relations internationales 2008). Here, clearly the assumption is that higher energy efficiency leads to a reduction in energy demand. However, one could also have a bigger roll-out of renewables and do with less energy efficiency in turn.

[22] "[In [CEMEX'] public and institutional relations efforts, [they] highlight the large and relatively low-cost potential for emission reductions in the building sector, e.g. in position papers, marketing materials, but also in direct interaction with political and other decision makers". (all quotes from CDP 2015).]

[23] http://web.unep.org/climatechange/buildingsday/about-us

[24] http://web.unep.org/climatechange/buildingsday/about-us

promote sustainability across the building value chain, specifically to scale up local action plans on energy efficiency in buildings and harmonization of building-level sustainability assessment."[25] It lists a range of Cement Sustainability Initiative members as part of the "contribution" and locates responsibility for mainstreaming Life Cycle Assessments (LCAs) for buildings and materials – amongst others – with LafargeHolcim. The World Green Building Councils Global Collective Commitment as part of the GABC is to support the achievement of the Alliance's goals ito "advance by 2030 and achieve by 2050 two fundamental goals:

1. Net Zero carbon new building
2. Energy efficiency and deep refurbishment of existing stock"[26]

Green Building Councils (GBCs) have also committed "to collaborate with their countries, national stakeholders, and Alliance partners in supporting the development and implementation of green building policies and strategies including launching national renovation strategies in 13 countries through www.buildupon.eu"[27]

Here one can see how diverse organisations and stakeholders orchestrate (Abbott et al. 2014) global governance towards ways of dealing with the climate crisis that overwhelmingly emphasise energy efficiency over considerations of embodied emissions.

6.2.2.1.3. Influencing building regulations Cement companies advocate changing buildings codes, norms, standards and standards towards a stronger emphasis on use-phase energy efficiency.[28] It is building codes that structure how buildings are made, what innovation has a good chance to work, and subsequently what inventions are sought after. In the case of the UK "[o]perational carbon emissions are being reduced via successive changes to the Buildings Regulations, and this often involves greater use of material resources (e.g. extra insulation, thermal mass, etc." (Connaughton et al., n.d., 2). While this may reduce operational emissions, it runs the danger that embodied carbon doesn't just increase in relative but also in absolute terms. "The continued tightening of the Building Regulations' requirements for operational efficiency (BRE 2006, p.4) may have the unintended consequence of increasing the embodied energy of the buildings they serve. This in turn offsets the carbon savings of the whole-life cost. It is therefore very important to standardise the industry's reporting of embodied energy to prevent merely shifting the time at which energy is 'spent' and actually reducing the net carbon cost of any project."[29]

[25] http://drustage.unep.org/climatechange/buildingsday/wbcsd

[26] http://web.unep.org/climatechange/buildingsday/wgbc

[27] http://web.unep.org/climatechange/buildingsday/wgbc

[28] Lafarge hopes that "Regulation focused on buildings' overall performance rather than the use of specific buildings materials might boost sales of concrete products which have inherent properties that increase buildings' energy efficiency". Acting on this, "Lafarge advocates for changing building codes, norms and standards to accept new low-carbon innovative products".

[29] https://www.ice.org.uk/disciplines-and-resources/briefing-sheet/embodied-energy-and-carbon

6.2.2.1.4. Engaging with the whole value chain to push for energy efficiency in buildings Cement companies aim at engaging with the whole value chain to advance their energy efficiency narrative.[30][31][32]

6.2.2.1.5. Using efficiency narrative to emphasise virtue of cement Cement companies market cement as particularly suitable for lowering operational emissions.[33]

6.2.2.1.6. Emphasis on replacing buildings in order to increase energy efficiency of building stock Cement companies expect the efficiency narrative to result in building more rather than less.[34]

6.2.2.1.7. Shaping labelling and certification schemes Cement companies seek to influence labelling and certification schemes to promote the virtues of cement.[35][36]

6.2.2.1.8. Resilience Efforts to make cities more resilient are seen as new business opportunities for the cement industry.[37] Along the value chain, the interests of cement producers are directly affected by

[30] "Lafarge is leading initiatives such as EEB (Energy Efficiency in Buildings), launched under the auspices of the World Business Council for Sustainable Development (WBCSD) . . . Bringing together players from across the construction sector .. investors, regulators, architects and engineers, material and equipment suppliers, and end users of solutions .. this project is focused on developing new forms of collaboration to achieve an 80% reduction in building energy consumption by 2050." (all quotes from CDP 2015).

[31] Lafarge wants "100% of countries to have a partnership to promote stronger specifications and work with urban planners and architects towards sustainable cities." to "Promote the implementation of sustainable construction solutions for cities" (Lafarge 2015). Via such partnerships the company can shape the sustainable construction agenda.

[32] Lafarge also "co-chair[s] the WBCSD's Energy Efficiency in Buildings (EEB) initiative. Bringing together major companies across the construction value chain, the project aims to achieve a transformation of the building sector, to reach an 80% reduction in energy use by 2050" (Lafarge 2015). Once more, this provides an avenue of emphasising use-phase over embodied emissions.

[33] "It is widely recognized that concrete's thermal properties make it an excellent structural material for energy-efficient buildings in both cold and hot climates, implying that under more stringent efficiency standards the consumption of concrete per unit is likely to increase." (CEMEX in CDP 2015).

[34] "Significantly lowering total energy consumption of buildings will most likely require an increased replacement of existing buildings, which means more construction activity." (CEMEX in CDP 2015).

[35] "Holcim is developing a protocol for accounting GHG avoided emissions along the value chain through cement-based products" (in CDP 2015).

[36] Lafarge also "takes a leading role in working groups and trade associations. As part of its"Sustainability Ambitions 2020", Lafarge committed to become an active member in Sustainable Building Certification organizations in 35 countries (13 at end 2014)."(in CDP 2015).

[37] Holcim sees such environmental regulations as an opportunity where "[r]egulators and cities increase focus on building resilience to climate change. Therefore building codes and customer behavior could value more long lasting and strong material such as concrete". This might result in "Increased demand for existing products/services" (from CDP 2015).

regulation. New building codes may result in a increase or decrease in concrete demand.[38]

6.2.2.2. Problematising the energy efficiency agenda

The strong emphasis on energy efficiency to the detriment of wider climate consideration can be criticised on at least two grounds: it rests on the assumption that it is better to emit more now in order to save emissions later and it downplays the decarbonisation potential from renewable energy.

6.2.2.2.1. Cumulative emissions and the deferall of carbon savings into the future

According to the World Resource Institute (WRI): "To have a likely chance of limiting warming to below 2 degrees C, we need to reduce GHG emissions according to the following timeframe: Carbon dioxide emissions have to drop to net zero between 2060 and 2075. Total GHG emissions need to decline to net zero between 2080 and 2090."[39]

Of course, the emissions curve in the run-up to these years does make a difference. Any emissions created now limited the space for additional emissions later on. For communicative and political reasons people often invoke the idea that emissions need to decline over time. However, if less carbon is emitted now, in the future the decline in emissions needs to be less steep.

As carbon dioxide (CO2) emissions are essentially cumulative, it makes sense to discount future emissions and put a higher weight on current emissions. The idea of a rising price of carbon, however, provides incentives to emit more now and save emissions later (Rhys 2011). This is analogue to the energy efficiency in buildings argument that seeks to emit carbon now for construction purposes in order to save emissions later. Energy efficiency in buildings thus can be regarded as a partial deferral of sectoral responses to climate crisis into the future, which permits a more or less business as usual scenario, even more highly carbon intensive construction activity, with the promise of less emissions in the future. There is a perverse incentive potentially at work. If one assumed rising carbon prices over time, it would make economic sense to use cement now, as long as its carbon content isn't effectively priced, to build more energy efficient buildings for later, when the carbon price is higher.

The fact that disclosure is located at the level of cement companies makes the construction process appear less problematic. Even where the embodied emissions of buildings are measured, they are already expended carbon costs. Unlike operational emissions they are not associated with potential future carbon costs, yet they represent already emitted carbon,

[38] In order to 'manage' this opportunity "...Holcim screens and contributes to the development of policies aiming at increasing the resilience of the built environment". Lafarge similarly expects that "[i]n order to adapt to climate change, governments at all levels (national, regional, local) could develop planning regulations to enforce mandatory climate adaptation systems to ensure cities' resilience such as flood barriers, pervious pavements, etc. Concrete products are well positioned for such usage thanks to their inherent properties". (all quotes from CDP 2015)

[39] http://www.wri.org/blog/2015/12/cop21-qa-what-ghg-emissions-neutrality-context-paris-agreement

thus limiting the future development space in terms of possible carbon emissions.

6.2.2.2.2. Efficiency vs. Electrification European cement lobby organisation CEMBUREAU also includes direct and indirect emissions from electricity generation as part of the use-phase emissions that are supposed to be avoided.[40]. The juxtaposition of such emissions, which in principle could be reduced with renewable energy sources, with the chemically unavoidable emissions from cement production can be misleading when used for the assessment of low-carbon transition pathways.

The Intergovernmental Panel on Climate Change (IPCC) cites a UNEP report when saying that "over 80 % of GHG emissions take place during the building operation phase", and a US Department of Energy report to specify that this is "largely from consumption of electricity for heating, ventilation, and air conditioning (HVAC), water heating, lighting, and entertainment."[41] This shows that many of these operational emissions are not necessarily carbon intensive but that the carbon intensity depends on the provenance of the electricity from the grid. In contrast, there are clear physical limits to reducing the process emissions from the cement production. The industry argues that not acting on energy efficiency would lock economies into a high carbon pathway. Here the argument of a lock-in into energy inefficient infrastructures is used in order to secure the prevailing lock-in into the Portland cement paradigm. However, here carbon and energy efficiency are (consciously?) conflated. For even if the energy efficiency of buildings doesn't increase, a decarbonisation of the electricity supply could make buildings more carbon efficient over time.[42] According to an interview with a junior researcher on buildings and sustainability, apart from the NHBC study to date there are rarely any studies (he wasn't aware of any) that take into account the future decarbonisation of the grid into the calculation of embodied emissions (**???**).

With this in mind it is also questionable whether current ways of relating embodied emissions to operational emissions and thus claims regarding future emissions savings from energy efficient architecture with relatively high embodied emissions are plausible.

7. Arguments for jointly analysing the two policy processes

It is unlikely that the prospect of higher demand for cement from energy efficiency activities alone provides sufficient incentives for a political engagement of cement producers for energy efficiency regulation.

[40] http://lowcarboneconomy.cembureau.eu/index.php?page=sustainable-construction 2.6.16

[41] https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc*wg3*ar5_chapter5.pdf , p. 383

[42] "Grid electricity CO2 intensity is expected to drop over the 120-year study period due to the gradual introduction of renewable generation and carbon-capture technology. Expected impacts have been reflected in this research." NHBC, p. 6

First, there is not necessarily a trade-off between higher energy efficiency and decreased use of cement[43], although extreme emphasis on energy efficiency may lead to the unintended (or perhaps indeed intended) by some, consequence that a decrease in embodied emissions becomes more difficult.[44]

Second, construction activity tends to follow more economic cycles or programmes of government-led infrastructure investment. While energy-efficiency may lead to increased building activity, cement as a standard construction material would benefit from standard construction activity anyway. The pay-out from lobbying activity may therefore be negligible.

Third, at least with regard to the Low Carbon Technology Partnerships and the Energy Efficiency in Buildings (EEB) initiative that are closely related to the WBCSD, the close proximity to the Cement Sustainability Initiative, which has been hosted by the WBCSD for a long time, is suggestive of a joint consideration of the policy fields.

8. Synthesis: Introducing attention economics and the institutionalisation of practices into the payout matrix

How can the value chain approach usefully contribute towards a cumulative typological model of Business Strategies in Environmental Politics (BSEP)? First, we need to locate the extended typological matrix based on Meckling (2015) at different points on the value chain. In our case, we locate Matrix 1 upstream in the realm of the ETS and Matrix 2 downstream in the energy efficiency of the build environment policy field. Without assuming interactions between the policy fields we would assume hedging as the outcome in the case of the ETS and abstention in the case of energy efficiency (Figure 3).

Regulatory pressure *ETS*	Distributional Effect *ETS*		
	Cost > Benefits	Costs ≈ Benefits ≈ 0	Costs < Benefits
Low	Oppose	Abstain	Abstain
High	**Hedge**	Abstain	Support

Regulatory pressure *Energy efficiency*	Distributional Effect *Energy efficiency*		
	Cost > Benefits	Costs ≈ Benefits ≈ 0	Costs < Benefits
Low	Oppose	Abstain	Abstain
High	Hedge	**Abstain**	Support

Figure 3: Extended Typology of Business Strategies in Environmental Politics: up and downstream policy fields without interaction

[43]Interview with academic expert 1 and with academic expert 2 on sustainable buildings.
[44]Interview with academic expert 3 and with academic expert 4 on sustainable buildings.

However, once we start assuming interactions, the benefits in one matrix can be derived from reduced pressure in another one (see figure 4). Reduced pressure can be achieved by

a) attention economics and

b) a continuation of cement's entrenchment in the downstream segments of the value chain.

Attention economics come the bear as in sustainability debates a plethora of different aspects and arguments each vie for attention and – without any wrong claims – emphasises on and the investment of resources into research in certain aspects can frame the debate and shape it towards a certain direction. Here power and knowledge, ideas and interests, come together. While the direct material resources at the disposal of the cement industry are considerable, i.e. what may be termed "relational power", one can also say that they benefit from "structural power", not only due to the physical qualities of cement (pun intended), but also because as providers of an element that is pivotal to modern built infrastructure it is strongly associated with "development" and – as a basis for residential housing – with people's aspiration, too (on relational and structural power see Falkner 2008). Policy-makers trying to interrupt such flows or introducing uncertainties and risks would quickly risks backfire. If sectors are highly relevant for the economy, their interests are easily defined as the national or supranational interest. If no clean alternative for accumulation and growth is presented, it is difficult for environmental interests to prevail. As long as conventional cement is seen as necessary downstream, there will be much stronger resistance to carbon pricing. However, without pricing, alternative measures may not be sufficient.

By engaging with the value chain and actively supporting one's products as part of the solution, one can seek to prevent the rises of challengers. Where there is 'no alternative', reform attempts in the form of pricing may have little success as the elasticity will be low and protest from downstream consumers, i.e. the construction sector, are likely.

9. Conclusion

Cement producers present themselves as striving for more sustainable cement but, of course, that doesn't entail using less cement. The danger is that the current non-market strategies of the cement industry drive out alternative approaches towards reducing building's embodied emissions.

This paper has shown how Meckling's typology for an explanation of corporate strategy in environmental politics can be usefully extended and integrated with a value chain governance approach. It points to the the importance to look jointly at carbon pricing and the intricacies of the value chains that are sought to be transformed. It shows the importance of tracing lobbyism along the value chain and has the potential to generate new thinking on the dynamics of baptists-and-bootleggers coalitions. It shows how disclosure, accounting and framings of temporality are drawn

Regulatory pressure *ETS*	Distributional Effect *ETS*		
	Cost > Benefits	Costs ≈ Benefits ≈ 0	Costs < Benefits
Low	Oppose	Abstain	Abstain
High	**Hedge**	Abstain	Support

Benefit of *support* for energy efficiency = alleviation of ETS pressure due to

- attention economics towards operational emissions and
- continued entrenchment of cement in construction value chain.

Regulatory pressure *Energy efficiency*	Distributional Effect *Energy efficiency*		
	Cost > Benefits	Costs ≈ Benefits ≈ 0	Costs < Benefits
Low	Oppose	Abstain	Abstain
High	Hedge	Abstain	**Support**

Figure 4: Extended Typology of Business Strategies in Environmental Politics: up and downstream policy fields with interaction

upon as strategic devices.[45]

For further research, students of policy learning and policy diffusion could analyse the actual changes that have been take place in the realm of national building codes and urban governance. One could analyse the spread of energy efficiency stipulations in building codes in terms of policy learning, transfer or diffusion (Stone 2008; Evans 2009; Dunlop and Radaelli 2013; Jordan and Huitema 2014).

The study of climate politics needs to become more specific in explaining the absence of change (non-events) and thus the persistence of high carbon practices within sectors. Ultimately, global environmental politics or governance need to adopt a perspective on the political economy that trace carbon flows through the industrial metabolism. Supply chains have each specific relations with other supply chains and need to be situated in global production networks. More meso-level analysis is needed that looks at the interactions across carbon supply chains and among them.

[45] Sustainability tropes have been adopted by the industry to shape processes and perceptions in a way convenient to them.

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