


Rethinking climate policy with alternative framings of carbon dioxide

Jarkko Levänen¹  and Janne I. Hukkinen²

¹Department of Sustainability Science, Lappeenranta-Lahti University of Technology LUT, Mikkulankatu 19, 15210, Lahti, Finland and ²Environmental Policy Research Group, Helsinki Institute of Sustainability Science, University of Helsinki, PO Box 54, Unioninkatu 37, 00014 Helsinki, Finland

Intelligence Briefing

Cite this article: Levänen J, Hukkinen JI (2019). Rethinking climate policy with alternative framings of carbon dioxide. *Global Sustainability* 2, e25, 1–4. <https://doi.org/10.1017/sus.2019.24>

Received: 9 January 2018

Revised: 6 November 2019

Accepted: 7 November 2019

Keywords:

carbon dioxide; circular economy; climate policy; framing; recycling

Author for correspondence:

Jarkko Levänen,

E-mail: jarkko.levanen@lut.fi

Abstract

Since the earliest stages of international climate policy, carbon dioxide (CO₂) has been framed and widely accepted as a problem that needs to be solved by reducing its amount in the atmosphere. In principle this is a correct and relevant starting point for efforts to decarbonize societies. At the same time, however, the unquestioned and one-sided framing of CO₂ as a problem has significantly biased the strategies for tackling climate change. We introduce the origins, meanings and implications of one-sided framing of CO₂ in climate policy. We also discuss how alternative framings could impact policymaking and eventually our capacity to mitigate climate change. We introduce a paradox: framing CO₂ as a problem often translates into policies that hamper the implementation of technologies to decrease the amount of CO₂ emitted into the atmosphere. We suggest that plurality in framing CO₂ could lead to innovative ways and strategies to combat climate change.

Social media summary

New article suggests alternative framing of carbon dioxide as a fruitful starting point for climate policy.

1. Introduction

Even though climate change increasingly threatens the wellbeing of humankind and this threat was recognized decades ago (IPCC, 1990), responses have remained weak (Rogelj *et al.*, 2016). It seems more than obvious that current and past efforts to tackle climate change have been seriously insufficient. Given carbon dioxide's (CO₂) role as the main greenhouse gas and the urgency of actions needed to meet the goals of the Paris agreement – most importantly staying well below 2°C increase in global average temperature – we need to profoundly rethink our approach to CO₂ management. In this paper, we argue that taking different perspectives on CO₂ is a fruitful starting point for such an effort.

In the battle against climate change, the first thing to accept is that carbon neutrality is no longer an ambitious enough goal. Carbon negativity is needed, i.e. ensuring that CO₂ converted into solid or liquid form stays that way over centuries. It will be very difficult to meet global temperature goals without carbon removal from the atmosphere with negative emission technologies (IPCC, 2018). Although the development of these technologies contains great uncertainties (EASAC, 2018) and they should not form the basis of a mitigation agenda (Anderson & Peters, 2016), they still play an important role in global response to climate change. Therefore, functional incentives for the development and implementation of negative emission technologies are urgently needed.

We suggest that an alternative framing of CO₂ can increase political support for policies and technologies that otherwise remain unutilized despite their significant potential for addressing problems brought about by climate change. The main argument for an alternative framing of CO₂ is that it transforms the perceived solutions to tackle climate change. Framing CO₂ as a valuable resource or a source of innovation, for example, strengthens the idea that CO₂ reduction is not only a challenge, but also an opportunity. Plurality in CO₂ framings allows the development of a richer variety of climate strategies and provides support for industrial efforts to facilitate carbon removal from the atmosphere.

CO₂ reduction has been considered a costly business, making it difficult to find global consensus on actions needed to tackle climate change (Sunstein, 2007; Keohane & Victor, 2016). Alternative framings can encourage research and development activities that could reduce costs. As an example, a change in framing can enable the creation of practices for profitable utilization of CO₂ instead of its costly storage. The possibility to make a profit from clever utilization of CO₂ would probably reduce the reluctance of many actors to take part in the battle

© The Author(s) 2019. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution, and reproduction in any medium, provided the original work is properly cited.

against climate change. In addition to opening new profit streams, alternative framings would provide political support for new innovative technologies and policies.

2. Current framing and its origins

One explaining factor behind the failed climate policy is that for too long scientists and politicians have framed CO₂ unequivocally as a problem. Over the decades the one-sided definition of CO₂ as a problem has become a doctrine that has been difficult to challenge even though it unnecessarily simplifies the complex operational environment of CO₂ management. The resulting policies have delayed action and narrowed the perceived solution space.

In retrospect, it is understandable that during the late 1980s and early 1990s climate change was conceptualized as an emission problem. At the time, awareness of environmental problems had emerged as a reaction to environmental hazards, such as ozone layer depletion and acid rain (Kowalok, 1993). The rationale in all reactions to these hazards followed the same logic: there needed to be a clear reason for the problem. It was logical that CO₂ as a fundamental cause of climate change was understood and widely accepted as a problem. Likewise, it is logical that policy and technological responses to climate change ever since have focused on CO₂ mitigation. Today the framing of CO₂ as a problem is perceived to be normal to an extent that thinking differently requires a mental effort. We all are used to talking about CO₂ *emissions* per capita and air *pollution* caused by greenhouse gases – all profoundly negative things.

3. Alternative framings

It is possible to frame CO₂ differently. An analytical take on framing helps to understand how social groups collectively value and give meanings to phenomena in particular contexts and situations (Goffman, 1974; Entman, 1993). Shared frames are powerful mental constructs: they highlight some things as normal and appropriate and at the same time direct attention away from other things (Tversky & Kahneman, 1986; Benford & Snow, 2000). On one hand, it is very difficult among people who share a frame to get support for an idea that contradicts the mental premises of the frame (Gamson, 1992). On the other hand, widely accepted frames may become institutionalized relatively easily (Schön & Rein, 1994; Lenschow & Zito, 1998).

Because different actor groups frame things differently, situations with multiple actors often turn into collective issue framing, which can mean anything from mediation to ‘struggles over the naming and framing of a policy situation’ (Schön & Rein, 1994: 29). Issue framing can be used to push a different agenda (Jacoby, 2000) and, in the context of CO₂ management, it significantly affects the ways in which different stakeholders think and talk about CO₂. When there is only one accepted frame, technological and socio-political path-dependencies begin to emerge which can lock in the entire operational environment.

4. Putting framing in practice

In the context of CO₂ management, alternative framings of CO₂ are particularly relevant for efforts to reduce CO₂ after it has been emitted into the atmosphere. In this context, utilization of CO₂ has much in common with the circular economy approach where different fractions of waste are seen as potential raw materials or by-products (Ellen MacArthur Foundation, 2017; Murray

et al., 2017). The predominant framing of CO₂ as a problem hampers the development of a circular economy with respect to carbon management because it limits the utilization opportunities of CO₂.

First, the current framing hampers considering CO₂ as a raw material. Mineralization technology enables converting CO₂ into industrial side streams for new products (Brent *et al.*, 2011) and mineralization-based solutions for carbon capture and utilization (CCU) are currently at lab-scale (Levänen & Eloneva, 2017). The key difference between mineralization-based CCU and conventional geological carbon capture and storage (CCS) is that in mineralization the captured CO₂ is an essential raw material for new products – not a substance that needs to be stored without utilization. For example, through mineralization CO₂ can be combined with steelmaking slag so that the end-product is pure precipitated calcium carbonate (PCC), which is needed in numerous industrial processes, such as filler or coating material in the paper industry (Eloneva *et al.*, 2012). The use of this combination product reduces the need to mine virgin limestone, the traditional raw material for PCC. It has been estimated that in the future CO₂ utilization could mitigate 700 Mt of CO₂ per year (Leung *et al.*, 2014).

Second, the current framing hampers considering CO₂ as a source of innovation for new by-products. CO₂ can also be used as a feedstock to produce renewable energy sources in bio-CCS systems (Rahman *et al.*, 2017). When combined innovatively with diverse catalysts, the captured CO₂ can be converted into numerous types of biofuels, such as methanol, dimethyl ether, ethanol and methane. This would allow the total amount of utilized biofuels to be increased without increased production of crops that are currently used as raw material for biofuels – an issue that has been connected to various socio-economic and environmental problems (Phalan, 2009). Technologies allowing biofuel production from CO₂ are currently at pilot-scale (Olah *et al.*, 2008, 2011; Jadhav *et al.*, 2014). Replacement of fossil fuels with biofuels significantly contributes to global energy transition toward renewable sources and improves long-term energy security as well. The economic potential of bio-CCS has been estimated to be in the range of 2–10 Gt CO₂ storage per year in 2050 (Creutzig *et al.*, 2015).

Examples of CO₂ as a potential raw material or a source of innovation demonstrate the power of framing. The idea that the problem of CO₂ can be solved by injecting it underground or beneath the sea is reflected for example in the European Union’s (EU) CCS directive, which defines CCS as ‘environmentally safe capture and geological storage [...] of CO₂’ (Directive 2009/31/EC of the European Parliament and of the Council, article 10a). In practice, this framing means that the EU’s Emissions Trading System (EU ETS) automatically compensates CO₂ that is geologically stored but remains unclear on how emission reductions achieved through other promising methods, such as mineralization and bio-CCS, would be compensated (Levänen, 2015). The uncertainty is problematic for the developers, development funders and potential users of new applications, as it places different technologies in an unequal position (Kainiemi *et al.*, 2015).

Conclusions

It is not problematic *per se* that CO₂ is framed as a problem. The problem is rather that ‘CO₂ as a problem’ is such a strong and exclusive frame that it narrows the opportunities arising from

alternative framings, such as considering CO₂ as a raw material or a source of innovation. Framing is always tightly connected to the prospects of policymaking. In the context of CO₂ management, alternative framings can be utilized in the development of novel policy instruments aimed at reducing the total amount of CO₂ in the atmosphere.

We have highlighted alternative framings that may help in the development of solutions that utilize CO₂ already emitted. Implementation of such solutions can be efficiently supported with economic policy instruments, such as carbon tax or trade. It is critically important that one-sided framing of CO₂ as a problem does not narrow the development of technologies and related policy instruments. Instead, in the management of end-of-life CO₂ all utilization opportunities should be considered equally from the perspective of overall sustainability. In addition, policies need to move upstream in the product cycle to beginning-of-life product planning. In this, alternative framings of CO₂ could turn out to be valuable as well. For example, extended producer responsibility for solid carbon could cover broadly the products of petrochemical, wood, and paper and pulp industries, which would incentivize these industries to lengthen the lifetime of their products.

We recognize that neither alternative framings of CO₂ nor increased deployment of new forms of CCU will provide a quick fix for climate change. However, as we move toward carbon negative societies, the fraction of emitted CO₂ that can be utilized in industries will need to increase continuously. The challenge is to increase the market demand for emitted CO₂ by removing institutionalized barriers to its innovative utilization. It is also important to remember that CO₂ is a raw material for numerous established industries, from beverage production to plastics and fuels. While we have introduced some ideas for alternative framings, other kinds of framings could result in different implications for CO₂ management. We therefore encourage more research on different framings of CO₂.

It matters how we think and talk about technologies, substances and materials. As our examples point out, framings underlying our expressions can translate into justifications for seemingly rational policies and legal definitions with significant unwanted impacts. In the long run, we need to learn to recycle all kinds of substances that the contemporary way of life generates, including CO₂. Seeing emissions as a resource is a logical next step in thinking about the future of post-industrial societies and the development of a circular economy.

Acknowledgements. The authors wish to thank the editor and anonymous reviewers for helpful comments.

Financial support. This research has received funding from the following projects: Decentralizing Finland's energy regime: The triggers and dynamics of transition (DEFEND), Academy of Finland project number 284972; Creative adaptation to wicked socio-environmental disruptions (WISE), Academy of Finland's Strategic Research Council project number 312623; University profiling (Profi), Academy of Finland project number AKA/4/02.04.10/2016.

Conflicts of interest. None.

References

- Anderson, K. & Peters, G. (2016). The trouble with negative emissions. *Science*, 354, 182–183.
- Benford, R.D. & Snow, D.A. (2000). Framing processes and social movements: an overview and assessment. *Annual Review of Sociology*, 26(1), 611–639.

- Brent, G.F., Allen, D.J., Eichler, B.R., Petrie, J.G., & Mann, J.P. (2011). Mineral carbonation as the core of an industrial symbiosis for energy-intensive minerals conversion. *Journal of Industrial Ecology*, 16(1), 94–104.
- Creutzig, F., Ravindranath, N.H., Berndes, G., Bolwig, S., Bright, R., Cherubini, F., Chum, H., Corbera, E., Delucchi, M., Faaij, A., Fargione, J., Haberl, H., Health, G., Lucon, O., Plevin, R., Popp, A., Robledo-Abad, C., Rose, S., Smith, P., Stromman, A., Suh, S., & Maserà, O. (2015). Bioenergy and climate change mitigation: an assessment. *GCB Bioenergy*, 7, 916–944.
- Ellen MacArthur Foundation (2017). *The Circular Economy: A Wealth of Flows*, 2nd edition. Ellen MacArthur Foundation Publishing.
- Eloneva, S., Said, A., Fogelholm, C.-J., & Zevenhoven, R. (2012). Preliminary assessment of a method utilizing carbon dioxide and steelmaking slags to produce precipitated calcium carbonate. *Applied Energy*, 90(1), 329–334.
- Entman, R.M. (1993). Framing: toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 51–58.
- European Academies Science Advisory Council (EASAC) (2018). *Negative emission technologies: What role in meeting Paris Agreement targets?* EASAC Policy Reports, 35.
- Gamson, W. (1992). *Talking Politics*. Cambridge University Press.
- Goffman, E. (1974). *Frame analysis: An Essay on the Organization of Experience*. Harvard University Press.
- Intergovernmental Panel on Climate Change (IPCC) (1990). *Climate Change: The Intergovernmental Panel on Climate Change Scientific Assessment*. Cambridge University Press.
- Intergovernmental Panel on Climate Change (IPCC) (2018). *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, sustainable development, and efforts to eradicate poverty*. Intergovernmental Panel on Climate Change.
- Jacoby, W.G. (2000). Issue framing and public opinion on government spending. *American Journal of Political Science*, 44(4), 750–767.
- Jadhav, S.G., Vaidya, P.D., Bhanage, B.M., Joshi, J.B. (2014). Catalytic carbon dioxide hydrogenation to methanol: a review of recent studies. *Chemical Engineering Research and Design*, 92, 2557–2567.
- Kainiemi, L., Eloneva, S., Toikka, A., Levänen, J., & Järvinen, M. (2015). Opportunities and obstacles for CO₂ mineralization: CO₂ mineralization specific frames in the interviews of Finnish carbon capture and storage (CCS) experts. *Journal of Cleaner Production*, 94, 352–358.
- Keohane, R.O. & Victor, D.G. (2016). Cooperation and discord in global climate policy. *Nature Climate Change*, 6(6), 570–575.
- Kowalok, M.E. (1993). Common threads: research lessons from acid rain, ozone depletion, and global warming. *Environment: Science and Policy for Sustainable Development*, 35(6), 12–38.
- Lenschow, A. & Zito, A.R. (1998). Blurring or shifting of policy frames? Institutionalization of the economic-environmental policy linkage in the European community. *Governance*, 11(4), 415–441.
- Leung, D.Y.C., Caramanna, G., & Maroto-Valer, M.M. (2014). An overview of current status of carbon dioxide capture and storage technologies. *Renewable and Sustainable Energy Reviews*, 39, 426–443.
- Levänen, J. (2015). A turning point in the EU's climate policy: carbon capture and the third period of the emissions trading scheme. *FIIA Briefing Paper*, 176. The Finnish Institute of International Affairs. Retrieved from <https://www.fiaa.fi/en/publication/a-turning-point-in-the-eus-climate-policy>.
- Levänen, J. & Eloneva, S. (2017). Fighting sustainability challenges on two fronts: material efficiency and the emerging carbon capture and storage technologies. *Environmental Science & Policy*, 76, 131–138.
- Murray, A., Skene, K., & Haynes, K. (2017). The circular economy: an interdisciplinary exploration of the concept and application in a global context. *Journal of Business Ethics*, 140(3), 369–380.
- Olah, G.A., Goepfert, A., & Surya Prakash, G.K. (2008). Chemical recycling of carbon dioxide to methanol and dimethyl ether: from greenhouse gas to renewable, environmentally carbon neutral fuels and synthetic hydrocarbons. *Journal of Organic Chemistry*, 74(2), 487–498.
- Olah, G.A., Surya Prakash, G.K., & Goepfert, A. (2011). Anthropogenic chemical carbon cycle for a sustainable future. *Journal of the American Chemical Society*, 133(33), 12881–12898.

- Phalan, B. (2009). The social and environmental impacts of biofuels in Asia: an overview. *Applied Energy*, 86, S21–S29.
- Rahman, F.A., Aziz, M.A., Saidur, R., Wan Abu Bakar, W.A., Putrajaya, R., & Hassan, N.A. (2017). Pollution to solution: capture and sequestration of carbon dioxide (CO₂) and its utilization as a renewable energy source for a sustainable future. *Renewable and Sustainable Energy Reviews*, 71, 112–126.
- Rogelj, J., den Elzen, M., Höhne, N., Fransen, T., Fekete, H., Winkler, H., Schaeffer, R., Sha, F., Riahi, K., & Meinshausen, M. (2016). Paris Agreement climate proposals need a boost to keep warming well below 2°C. *Nature*, 534, 631–639.
- Schön, D. & Rein, M. (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. Basic Books.
- Sunstein, C.R. (2007). Of Montreal and Kyoto: a tale of two protocols. *Harvard Environmental Law Review*, 31(1), 1–65.
- Tversky, A. & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, 59(4), S251–S278.