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Mercury's Effects on Aquatic Ecosystems

Chang Kuang*

Climate and Ecosystem Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, USA

Abstract

The amount of Mercury (Hg) in fish is higher than the threshold limit set by the European Union in all Swedish lakes. Even though the primary source of Hg is airborne emissions from fossil fuels, forestry has a minor but significant impact because some forestry processes assist move and alter Hg, raising Hg burdens in aquatic ecosystems further down the food chain. Climate change is simultaneously increasing the pressure on trees to provide biomass as a replacement for fossil fuels. Therefore, when it comes to how to deal with the issue of forestry's effects on Hg in aquatic ecosystems while still securing other ecosystem services, decision-makers are faced with a complex scenario, a "wicked conundrum."

Keywords: Mercury; Fish; Migration; Aquatic; Ecosystem

Introduction

In Sweden, a trans disciplinary approach has been utilized to examine the level of responsibility of forestry as well as potential remedies for this issue. This approach included a structured debate with participants from relevant governmental organizations, forest businesses, and forest associations. The analysis demonstrates that while the problem can be constructively addressed, it also necessitates taking into account not just present forestry management methods but also current regulatory aims and environmental objectives due to its complexity. The Hg problem is one of a group of challenging problems in forestry where output based on stands or properties affects a larger spatial scale. This means that regulating forestry's more immediate effects must be balanced with the potential effects of such legislation on the larger ecosystem issue [1].

There are also requests to increase logging in order to combat climate change, but long-term plans to cut carbon dioxide emissions (via intensified logging) may also result in increased transfer of mercury from forest soils to aquatic environments. However, forestry does not cause a rise in Hg levels in forest soils, and it is unclear how much the influence of forestry on downstream Hg may be reduced by changing forestry techniques. Even if forestry operations could be controlled so that they did not contribute to the mobilization of Hg, this would not be sufficient to address the issue of excessive Hg levels in aquatic biota. Therefore, while the fact that forestry activities exacerbate Hg issues in aquatic ecosystems in the forest landscape is a problem that needs to be addressed, the task of allocating responsibility as well as developing pertinent and effective management strategies is at the same time very challenging. It seems to be a "wicked" problem, meaning that it is difficult to understand and has a hard time finding a solution. There is no proper legal framework for handling the situation, the aims for forestry and Hg in fish are at odds with one another, and the problem is characterized by ambiguous knowledge [2].

Thus, we are in a profoundly challenging governance situation, and the question of how to solve this seemingly intractable issue arises. This is evident when looking at the topic of this essay, which is forestry and mercury in aquatic environments. Natural science is required to improve our comprehension of the relationships between Hg production from soils and Hg bioaccumulation in aquatic environments as well as the reasons behind the wide range in how forestry operations affect Hg output. But social science is also necessary to research the social processes that gave rise to it as a political issue and to investigate the societal elements influencing how it is handled. There is no quick and easy method to come up with feasible and acceptable options for action for an issue like this that involves numerous parties with varied interests and situated at various regulatory levels. The absence of information on the consequences of water quality effects, such as mercury mobilization from soils, was used by environmental organizations involved in the certification of forestry as a justification for delaying a decision on stump harvesting. Public organizations decided to fund this issue's research as a result. Parallel to this, the adoption of the Water Framework Directive by the European Union as a framework for regulating Sweden's waters and aquatic ecosystems assisted in elevating the importance of water issues for forestry [3-6].

Even the complete elimination of forestry's effects would not bring Hg levels to close to or below the EQS established by the EU and WHO, as Hg levels in fish exceed the EU criteria for acceptable Hg levels (0.02 mg/kg) and exceed even the WHO's much less stringent human consumption limits (0.5 mg/kg) in more than half of Swedish lakes. The guidelines for excellent harvest practices for addressing other problems are generally agreed upon when it comes to steps that could lessen forestry consequences when conducting harvest operations. These precautions include riparian buffer zones, bridges over waterways, and a reduction in rutting. However, the model places the Forest Agency the national body in charge of carrying out the forest policy in a precarious position because of its notion of freedom with responsibility. The Agency is in charge of ensuring that forest owners take the proper steps to protect the environment when undertaking forestry operations, one of which is to prevent the degradation of water quality. The Forest Agency has established several rules to help with this (some mandatory and some recommendations). Some of these are important to stop the increased mobilization of mercury, and MeHg in particular, to surface waters [7].

***Corresponding author:** Chang Kuang, Climate and Ecosystem Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, USA, E-mail: changcky@lbl.gov

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Discussion

The WFD, the NEQOs, and the Forest Agency's mandatory and suggested rules for safeguarding water quality generally are used to define the criteria for water quality in Sweden's five water districts. Some of these guidelines and recommendations, such as encouraging the use of ground protection when driving logging equipment through wet areas and leaving buffer zones near streams, wetlands, and lakes, in which practices like forest harvest, stump harvest, and/or site preparation are restricted, are suitable for reducing the mobilization of Hg to surface waters. Initially, the idea of "wicked problems" was formed in opposition to the rational-technical method, which at the time was the preeminent conception of planning. This strategy assumed the existence of knowledge that was both pertinent and certain, as well as goals that were both separate from one another and did not conflict with previously stated goals. Planners and decision-makers must deal with considerably more intricate and varied scenarios in the actual world. Even when it is theoretically possible for science to define a specific issue in a limited and precise way, this is insufficient because the issue is seen differently by various stakeholders and also because it arises in various contexts and situations that present their own unique set of difficulties [8].

Conclusion

Application of alternative ways capable of creating temporary and accepted solutions in anticipation of better ones is therefore required in order to be able to bridge the gap between policy and governance/management, especially as this is frequently better than business as usual. This study has made the case that risk governance may offer decision-makers and stakeholders an alternative because of its more reflective and dynamic approach to both governance processes and their results. We may gradually obtain better results by building a knowledge base that will influence how we define the regulatory object, so decreasing complexity, recognizing a spatial identity, and allocating responsibilities. However, more effective mechanisms for policy integration and adaptive management must be developed in tandem with the development of a risk governance framework [9, 10].

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Conflict of Interest

None

References

1. Trewin B, Cazenave A, Howell S, Palmer MD et al. (2020) Headline indicators for global climate monitoring. Bull. Am Meteorol Soc 102: E20-E37.
2. Hastings RA, Rutterford L A, Freer JJ, Simpson SD et al. (2020) Climate change drives poleward increases and equatorward declines in marine species. Curr Biol 30: 1572e2-1577e2.
3. Munasinghe M (2010) Addressing the sustainable development and climate change challenges together: applying the sustainomics framework. Procedia Social Behavl Sci 2: 6634-6640.
4. Kyte R (2014) Climate Change Is a Challenge for Sustainable Development. Gaidar Forum Moscow, Russian Federation.
5. Princiotta FT, Loughlin DH (2014) Global climate change: the quantifiable sustainability challenge. J Air Waste Manag Assoc 64: 979-994.
6. Martens P, Mcevoy D, Chang CT (2016) Climate change: responding to a major challenge for sustainable development. Sustainability Science.
7. Wigley, TM L (1983) The pre-industrial carbon dioxide level. Climate Change 5: 315-320.
8. Dash SK, Hunt J C R (2007) Variability of climate change in India. Curr Sci 93: 782-788.
9. Smith JB, Stephen HS, Oppenheimer M, Yohe GW, Hare W (2009) Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) "Reasons for Concern". Proceedings of the National Academy of Sciences of the United States of America 106: 4133-4137.
10. Shekhar MS, Chand H, Kumar S, Srinivasan K, Ganju A (2010) Climate change studies in the western Himalaya. Ann Glaciol 51: 105-112.