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Environmental impact bonds as a transformative policy innovation: Frames and frictions in the construction process of the Nutrient-EIB

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ABSTRACT

Impact bonds have emerged as a policy innovation with the potential to change public policies towards being more outcome-based and pre-emptive – and more effective in answering sustainability challenges. This financial instrument has been used for social problems and only recently for environmental issues. One example is the Nutrient-EIB (environmental impact bond) which is in preparation to be implemented in Southwest Finland. We study involved stakeholders' framings of the Nutrient-EIB's potential for solving problems of eutrophication of the Baltic Sea and the lock-in situation of recycled fertiliser development. Based on stakeholder interviews, we identify three interpretative frames: applying the impact investing logic, challenging agri-environmental policy, and extending experimental policy-making. We recognise frictions between the frames regarding the required knowledge base and scale. We discuss how visions of transformative outcomes may challenge each other and what kinds of barriers transformative policy innovations may face.

1. Introduction

Recent discussions in the sustainability transitions literature have emphasised the need to focus on the specific ways in which finance may contribute to transitions (Nykvist & Maltais, 2022; Steffen & Schmidt, 2021; Penna et al., 2021; Hafner et al. 2020; Loorbach et al., 2020; Naidoo, 2020). These studies note, that while transitions scholarship has acknowledged the role of finance in transitions, this role has hardly been subjected to in-depth research. Additionally, scholars have more specifically pointed out that while the finance sector could be an influential mediator of transitions, the role of the public sector is decisive in 'crowding in' investment, and that policies are needed to share risk between the private and public sector (Nykvist & Maltais, 2022; Penna et al., 2021; Deleidi & Mazzucato, 2021). This implies the need to study and develop transformative policy through which finance could be steered to contribute more to activities such as investing in low-carbon technologies and forming sustainable markets (cf. Hyysalo et al., 2022; Hafner et al., 2020; Boon et al., 2022).

In this article, we discuss a policy innovation that has been proposed to have potential for this kind of transformative investment. Impact bonds (IBs) are defined as outcome-based contracts between the public and private sectors, where private investors take the financial risk of the success of the project, and the public sector only pays the investors their investment back, with revenue, if the

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project proves effective (Tan et al., 2021; Clifford & Jung, 2016; Horesh, 1989). IBs thus seek to provide a way for 'win-win-win'--policies, where: the public sector gains a way to deliver more ambitious and innovative interventions while shifting the upfront costs and risks to investors; investors are promised a blended value proposition of both financial and social/environmental return; and service providers receive flexible, long-term funding and produce social or environmental impacts (Williams, 2020; Fraser et al., 2018; Balboa, 2016). Compared to existing methods and instruments of sustainability investing, such as responsible investment standards, investment screening, and Green Bonds, IBs are to provide a more proactive, impact-oriented investment strategy by utilising the logic of impact investing (Penna et al., 2021; Tan et al., 2021). In addition to this 'private financial sector reform narrative', IBs have also been suggested to reform the public sector by providing solutions to entrenched problems that the public sector alone has been unable to solve (Fraser et al., 2018). Hence, they may promote 'radical changes and create synergies at multiple levels in different socio-technical systems' (Penna et al., 2021, 25).

Until now, IBs have mostly been experimented with in the context of social problems. Social impact bonds (SIBs) have been used for issues such as recidivism, youth unemployment, and homelessness, in at least 250 projects in over 30 countries (GO Lab, 2022). Also the research literature on SIBs has grown significantly during recent years (Chiapello & Knoll, 2020; FitzGerald et al., 2020). In comparison, only three environmental impact bonds (EIBs) have been launched thus far globally (GO Lab, 2022; Brand et al., 2021). Accordingly, the literature on EIBs is only in an early stage of analysing what kind of socio-technical transitions EIBs might participate in and how (see, however, Brand et al., 2021; Carè & De Lisa, 2019; Christophers, 2018; Hall, 2017; Balboa, 2016).

The lack of IBs in the environmental policy sphere is peculiar. It can be argued that environmental impacts should be a top priority for sustainable investments in Nordic welfare states and other countries in the Global North. Many already-achieved social sustainability targets in these regions rest on large-scale environmental loads and excessive consumption of natural resources (BIOS, 2020; Hickel, 2020). In Finland, however, endeavours for introducing IBs that aim for environmental impacts have recently emerged. Eleven IBs are currently being developed or implemented in Finland, including two EIBs (MEAE, 2022). The Nutrient-EIB is the more advanced one of the two. Its objective is to construct a circular economy around manure-based nutrients in Southwest Finland to help solve the eutrophication problem of the Baltic Sea, accelerated by intensive animal production, and to enhance the use of recycled fertilisers. The Nutrient-EIB strives to solve this systemic environmental problem by providing new incentives via investment for farmers to participate in more sustainable farming practices.

The construction of the Nutrient-EIB provides a fruitful case to investigate whether and how the EIB could be a transformative, finance-led policy innovation. With the concept of policy innovation, we refer here to the EIB being a policy instrument that introduces several novel components in a particular policy context (eg. Jordan & Huitema, 2014; Upham et al, 2014), namely a new vision for solving an entrenched nutrient problem and new leverage mechanisms offering novel roles for public and private actors in policy implementation. To investigate the transformative character of this policy innovation, we focus on how stakeholders involved in the preparation of the Nutrient-EIB understood the policy innovation in relation to the existing context of implementation. We investigate the frames through which the stakeholders interpreted the EIB and analyse how it was expected to trigger transformative outcomes (Ghosh et al., 2021). In doing so, we seek to understand better and more concretely the complex intersection of policy, finance, and transitions at the core of transformative investment (cf. Steffen & Schmidt, 2021; Penna et al., 2021).

The paper is structured as follows. In Section 2, we first introduce our theoretical background of analysing policy innovations via the transformative outcomes they seek to provide, then existing research literature on IBs. In Section 3, we present our research materials and methods. In Section 4, we provide our analysis that identifies three frames used to interpret the transformative potential of the EIB and frictions between the frames. Finally, in Sections 5 and 6, we discuss our results and conclude how our results align with existing research on the relationship between policy instruments, transformative outcomes, and the finance sector.

Table 1
Transformative outcomes, adapted from Ghosh et al. (2021)

Macro-process	Transformative outcome	EPEs (experimental policy engagement) contribution
1. Building and nurturing niches	1.1 Shielding	Offering protection for niche experiments and normalising these protection measures
	1.2 Learning	Induce first- and second-order learning in niche experiments
	1.3 Networking	Create high-quality opportunities for collaboration between actors, strengthening their networks
	1.4 Navigating expectations	Create spaces for articulating expectations around societal challenges and appraising these expectations to enhance their credibility, quality and stability
2. Expanding and mainstreaming niches	2.1 Upscaling	Increasing adoption by users of the new emerging system
	2.2 Replicating	Intentionally facilitating the replication of specific niche experiments in other contexts
	2.3 Circulating	Identifying and promoting circulation of ideas, people, blueprints, and technologies between niches on a more continual basis
	2.4 Institutionalising	Mainstreaming the rules of the niche (behaviours, beliefs, and values) among existing and new niche actors
3. Opening up and unlocking regimes	3.1 De-aligning and destabilising	Facilitating the development of disruptive policy frameworks and governance arrangements (such as organisational and administrative reform) that challenge existing systems
	3.2 Unlearning and deep learning in regimes	Facilitating unlearning and deep learning among regime actors, helping them reassess the regime rules in comparison to new alternative rules for solving systemic problems
	3.3 Strengthening regime-niche interactions	Creating linkages between niche and regime actors, and their ideas and resources with the aim to empower niches and make them more competitive
	3.4 Changing perceptions of landscape pressures	Facilitating processes to challenge individual and collective perceptions about landscape pressures of diverse groups of regime actors; policymakers, producers, and businesses

2. Theoretical background

Societal challenges demand new policies that shift a grand-scale socio-technical change towards sustainability both via the mediation of finance and more commonly (Nykvist & Maltais, 2022; Schot & Steinmueller, 2018; Chaffin et al., 2016; Weber & Rohracher, 2012). The characteristics, principles, and goals of such policies have been addressed in discussions of transformative innovation policy. Transformative innovation policy is defined broadly as a generation of policies shaped less by an economic, technology-oriented, and firm-centred tradition and more by the inclusion of a wider variety of actors, activities, and modes of innovation aiming for transformative socio-technical change (Ghosh et al., 2021; Diercks et al., 2019; Weber & Rohracher, 2012). However, the question of how transformative innovation policies could be applied in practice remains unclear (Haddad et al., 2022; Ghosh et al., 2021). We seek to engage in this discussion by analysing how a policy innovation, the EIB, relates to its potential transformative outcomes. By doing so, we explore how expectations and the reality of transformative change are related.

2.1. Transformative policy innovations and their potential outcomes

First, it is necessary to consider how policy innovations may, in general, shift public policy regimes towards sustainability and contribute to transformative change. While developing innovations in niches remains an essential part of any transformative change, transformative policies may complement and strengthen these developments and open opportunities for finance to contribute to transitions (Nykvist & Maltais, 2022; Penna et al., 2021; Jacob & Ekins, 2020). Concerning this, Ghosh et al. (2021) suggest that transformative innovation policy may contribute to transitions in twelve ways according to the transformative outcomes it provides (Table 1). These twelve outcomes can be divided into three macro-processes of building and nurturing niches, expanding and mainstreaming niches, and opening up and unlocking regimes, following the Multi-level Perspective (Rip & Kemp, 1998; Geels et al., 2016). In addition, the heterogeneity of policy processes is sought to be handled with the concept of experimental policy engagement, stressing how experimentation is not only about creating novelty and building niches as isolated projects but also about expanding niches and destabilising dominant practices or regimes (Ghosh et al., 2021; Torrens et al., 2018; Turnheim, 2018).

In this article, we use the categorisation of transformative outcomes and macro-processes to investigate EIB's transformative potential. We see that this perspective could be used not only for analysing implemented policies and experiments but also for mapping how suggested policy innovations are visioned to provide transformative change.

2.2. The policy innovation of the impact bond

While the question of the transformative potential of the EIB is, for us, primarily empirical, contextualising its emergence is useful. Here, transformative investment is generally considered to shift the role of finance from an enabler of the current socio-technical regime toward an active mediator of sustainability transitions (Penna et al., 2021; Naidoo, 2020). In doing this, financial instruments such as IBs are used as policy tools to create transformative changes for its stakeholders (FitzGerald et al., 2020; Fraser et al., 2018).

In their core logic, IBs are based on the idea of impact investing (II). II is an investment practice where social or environmental impact is pursued together with economic profits, and emphasis is given to evaluating impacts (Agrawal & Hockerts, 2021; Penna et al., 2021; Chiapello & Knoll, 2020; Jackson, 2013). II has its roots in venture finance and philanthropy, where after the 2008 financial crisis, the financial industry sought new ways to contribute positively to society (Barman, 2015). The II logic of valuating and

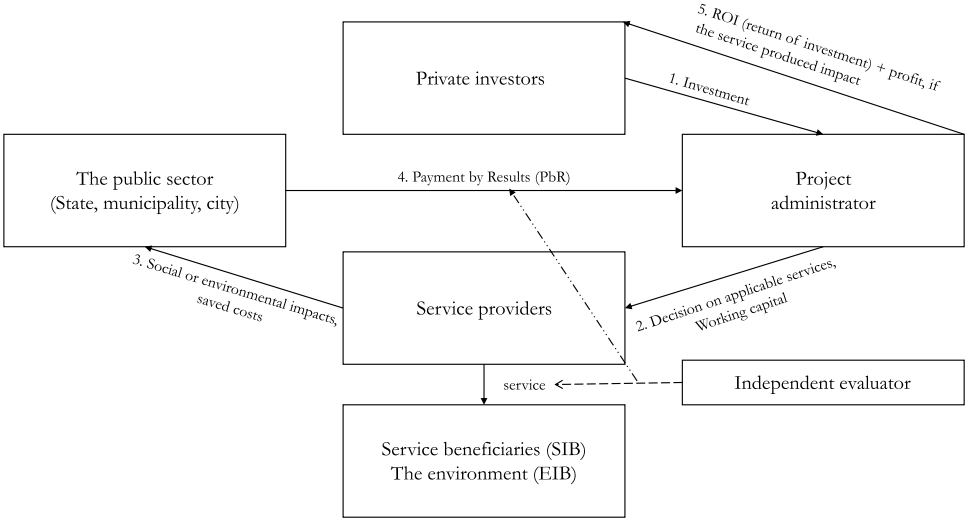

Fig. 1. The IB structure.

modelling processes was adopted to pursue social and environmental impacts and provide necessary resources for the underdeveloped field of sustainable finance.

Since then, the core idea of II – pursuing impacts through investment activity – has been imported to various political contexts through instruments such as IBs, first developed and experimented with mostly in the UK and the US (Tan et al., 2021; Golka, 2019). II has been adopted in policy-making also in nations such as Finland, where the role of the welfare state has traditionally been central to providing services and solving societal and environmental problems (Pennanen, 2020; Tiikkainen, 2019; cf. Chiapello & Godefroy, 2017; Pesonen & Riihinen, 2002). The focus of IBs has been summarised by its proponents as the pursuit of systemic change by using the II logic to make public policy more outcome-based, pre-emptive, and flexible – and thus more effective in answering social and environmental problems (Tan et al., 2021; Fraser et al., 2018).

In IBs, the role of the public sector is to operate as a service purchaser (Fig. 1; see also Carter et al., 2018; Clifford & Jung, 2016). A public authority such as the state, municipality, or city pays for services that seek to solve social or environmental problems that affect the public sector and cause expenses. Private investors fund the production of the services. A project administrator facilitates the contract between the stakeholders and is responsible for seeking out and distributing the working capital to the service providers – businesses or NGOs – producing the actual impact for service beneficiaries (SIB) or the environment (EIB). Last, an independent evaluator evaluates whether the desired impacts have been achieved and whether the investors are paid back, creating a 'Payment by Results' or 'Pay for Success' proposition for policy (Carter, 2021; Albertson et al., 2018).

Compared to conventional models of policy making, IBs are expected to be more efficient, pursue evidence-based policies, yield savings for the public sector, and harness innovations (FitzGerald et al., 2020). However, both the ability of IBs to provide results and evaluate impacts are under debate since project results and the quality of used evaluation practices have varied considerably (Fox & Morris, 2021; Williams, 2021; Carter et al., 2018). More generally, IBs can be characterised as a 'strategically ambiguous policy tool' (Tan et al., 2021) since they can be and have been adopted in such heterogenous ways that no uniform judgment about the extent to which they may be transformative can be made, at least for now. This calls for both a comparative understanding of the factors that shape IBs, as well as close empirical examination – especially in the novel case of EIBs.

3. Material and methods

We investigate how the EIB was perceived in Finland as a tool to solve the systemic problem of nutrient recycling lock-in and the Baltic Sea eutrophication. We interpret the EIB as a potential transformative policy innovation, targeting systemic changes and made possible by a novel financial and organisational logic. In the following, we describe how the Nutrient-EIB came into being and how we approach its emergence and adoption methodologically.

3.1. The Nutrient-EIB

Adopting IBs within environmental policy in Finland was first considered in 2017 (Sitra, 2018). The Nutrient-EIB emerged from a series of expert workshops organised by the Finnish Innovation Fund Sitra, the Ministry of the Environment of Finland and the Ministry of Forestry and Agriculture of Finland to suggest ideas for EIBs. One of the suggestions in these workshops focused on the nutrient load of the Baltic Sea caused by agriculture and the challenges of advancing the use of manure-based nutrients as fertilisers in the fashion of a circular economy.

Southwest Finland was selected as the region for implementing the EIB as it has intensive animal production contributing to the eutrophication of the Baltic Sea. Manure contains phosphorous, nitrogen, and organic matter, which are essential for the growth of plants and the condition of soils, making it a valuable resource in plant production. However, the differentiation of plant and animal production in Finland has, since the 1990s, led to a situation where in some regions, there is a surplus of manure compared to its demand in plant production. Accordingly, areas focusing on plant production would have more demand for manure than available (Ylivainio et al., 2015). However, the processing and logistics of transporting manure are difficult to organise feasibly for several reasons (Åkerman et al., 2020; Luostarinen et al., 2019). Therefore, the nutrients of manure remain underutilised as recycled fertilisers. Simultaneously, the risk of nutrient leakages to water bodies increases in the areas of intensive animal production, particularly in fields with high phosphorous levels. Increasing the use of manure as a processed fertiliser would help reduce the use of inorganic fertilisers, particularly phosphorous, which is an exhaustive resource. Also, the production of nitrogen fertilisers is highly energy-intensive, which underlines the importance of nitrogen recycling (Valve et al., 2020).

Surplus manure affects the eutrophication of river basins and associated coastal areas of the Baltic Sea. The spreading of manure on fields with already high phosphorous levels accelerates this development, which is why it is regulated and steered by governmental actions such as the agri-environmental policy schemes and environmental permits of animal production farms (FFA, 2021). Despite numerous policy programmes, research and development initiatives, pilots, and active co-operation between farms, research institutions, and governmental actors, solutions to increase manure processing into recycled fertilisers have progressed slowly (Nylén, 2021; Åkerman et al., 2020).

The Nutrient-EIB seeks a new solution for these problems. In the Nutrient-EIB, the Ministry of Forestry and Agriculture and the Centre for Economic Development, Transport and the Environment of Southwest Finland are to be purchasers who pay investors based on whether the EIB achieves the impact objective of accelerated nutrient reuse and diminished eutrophication in the area. The instrument aims to diminish the phosphorus load by 10% 'in an economically and ecologically sustainable way' by 2045. The short-term objective – also measured and used as the indicator for the Payment by Results proposition – is to transfer 25% of the area's phosphorus-overload causing manure, 500 000 tons, to the production of manure-based fertilisers and then finally to fields benefitting

from the phosphorus-based nutrients by 2028. (MEAE, 2022)

The Nutrient-EIB is thus to especially the challenge the economic thinking behind the current regime of agri-environmental policy. Currently, farmers are paid compensation for the costs of treating manure according to compensation scheme rules (FFA, 2021; Hyvönen et al., 2020). In contrast, the EIB aims for a more market-like situation where farmers are paid for transmitting manure to produce recycled fertilisers. The EIB aims to invest in developing the processing and logistic chains to construct a market of recycled nutrients gradually.

3.2. Methodology: interpretive policy analysis and frame analysis

Since IBs and especially EIBs are novel policy innovations both in Finland and globally, we hypothesised the Nutrient-EIB would be interpreted in different and contested ways by its various stakeholders, and these differences might affect its progress (cf. Dewulf, 2011; Stirling, 2011). Accordingly, we drew our analytical approach from interpretive policy analysis, which provides an analytic framework for investigating the complexity of making sense and implementing new policy tools in multi-stakeholder interactions (Arrona & Zabala-Iturriagagoitia, 2019; Yanow, 2000).

Interpretive policy analysis emphasises that the adoption of policy innovations is characterised by conflicting interests, policy goals, and operational logics between different actors (Arrona & Zabala-Iturriagagoitia, 2019; Hajer & Laws, 2006; Yanow, 2000). Furthermore, path dependencies caused by previous practices, instruments, and norms impact how policy innovations are made sense of and negotiated (Cairney, 2013). Two points are emphasised for understanding the transformative potential of innovations such as the EIB. First, stakeholders interpret innovations relative to the current regime and its logic. Second, despite innovations having core logics, they may be interpreted and applied differently, affected by political, national, and regional contexts (Jordan & Huitema, 2014; Voß & Simons, 2014; Dewulf et al., 2011). Accordingly, research should focus on the interpretative relation of the current regime and the innovation to consider whether an innovation may affect the system in a transformative way (Schot & Steinmueller, 2018; Hess, 2014; Geels, 2002).

Our analysis, seeking to consider the above-mentioned objectives, is based on a dataset of 14 stakeholder interviews (I1-14) conducted during 2020. We interviewed all central stakeholders of the Nutrient-EIB active in the construction process of the EIB. This included scientists and experts participating in modelling and design tasks, civil servants at the Center of Expertise for Impact Investing, located in the Ministry of Economic Affairs and Employment of Finland, and public sector representatives on both ministry and regional levels[1]. We carried out the interviews as semi-structured: we sought answers to pre-planned questions on the transformative potential of the EIB (Schmidt, 2004). Additionally, we followed the rationale of abductive analysis (Timmermans & Tavory, 2012) in generating theory driven discussions based on notions emerging during the research process with both the dataset and existing research literature.

Our data analysis began with data-driven qualitative content analysis (Elo & Kyngäs, 2008), where we identified any themes associated with the Nutrient-EIB in the informants' speech. We found connections to various content themes, such as emphasising the pursuit of impacts, EIB's specific nature as a financial innovation, and the lack of examples and experiences in implementing EIBs. These we discussed and categorised jointly to analyse the relationship between the policy instrument and transformative outcomes. We concluded that the interviewees made sense of the instrument in ways that integrated different themes and provided a structured method of comprehending its nature and viability. The patterns of sensemaking were partly shared between interviewees, even if their evaluations of the instrument varied. This observation directed us towards frame analysis, as applied in interpretive policy analysis (Hajer & Laws, 2006; Yanow, 2000).

In the second phase, we drew from frame analysis (Creed et al., 2002; Goffman, 1974) and categorised how our informants made sense of the transformative potential of the Nutrient-EIB through different frames of interpretation. We understand frames as devices of interpretation through which meaning is formed and which guide and enable action (Schot & Steinmueller, 2018; Wagenaar, 2011; Hajer & Laws, 2006). We recognised frames by analysing what kind of metaphors and analogies stakeholders of the Nutrient-EIB used to create meaning for the policy innovation in relation to how it might trigger transformative outcomes. On this basis, we identified three interpretive frames: the EIB as an adaptation of II, the EIB as the potential challenger of the agro-environmental compensation scheme, and the EIB as experimental policy. By analysing these frames and the frictions between them, we aim to understand the transformative dynamics of applying the EIB: in what kind of policy environment is it applied, what kind of features differentiate it from current policy, and what kind of transformative outcomes (Ghosh et al., 2021) was it seen to provide?

4. Analysis & results

As the result of the analysis, we categorised interpretations of the Nutrient-EIB in three frames (Table 2). In addition, we identified two themes that were frictional between the frames. In the following, we first present the three frames (Sections 4.1– 4.3), then proceed to analyse the frictions (Sections 4.4 & 4.5).

[1] We also utilized snowball sampling in the interviews to reach any potential stakeholders. The views of potential service providers, investors or project administrators are not represented in our data, since the EIB process had not advanced to the point of these actors to be identified.

Table 2
The frames and frictions of the EIB

	Frame 1: The EIB as an adaptation of II	*Frame 2: The EIB as the potential challenger of the agro-environmental compensation scheme*	*Frame 3: The EIB as experimental policy*
Core interpretation	The EIB utilises the logic of II in the context of nutrient recycling	The EIB challenges the current regime of environmental policy: the agro-environmental policy scheme	The EIB is a successor of policy experiments but does not fit their traditional definitions
Friction 1: Knowledge base	The knowledge base of the EIB is based on modelling	The knowledge base of the EIB is too narrow in relation to more large-scale environmental policy	The EIB would need successful examples as its knowledge base to succeed
Friction 2: Scale	The (re)construction of the ecosystem of nutrient-use	The scale of the EIB is too small to be able to achieve systemic change	The systemic change implied by the EIB should be cut up into smaller, experimentable fractions

4.1. Frame 1: the EIB as an adaptation of II

Transitions research emphasises building and nurturing niche innovations as drivers of socio-technical transformations (Geels, 2002; Rip & Kemp, 1998). However, the first identified frame was based on a different understanding of the logic of transformation supported by the background of II. Here systemic change and long-term impact are taken as the starting points from which more exact actions are derived (Agrawal & Hockerts, 2021; Chiapello & Knoll, 2020).

In frame 1, systemic change functioned as the core premise for why the double problem of eutrophication and lock-in of recycled nutrients would benefit from the EIB. Instead of developing niche innovations of nutrient recycling, interpretations utilising the frame emphasised the disconnection of relevant actors and actions. The most central problem of recycling nutrients was that environmental compensations and investment subsidies were allocated to isolated actors such as farmers or processing plants, with little total impact. Against this, the EIB was interpreted as a possibility towards 'totality optimisation', where the transformative potential lies in creating incentives that would benefit the whole system:

… and the ecosystem is starting to be perceivable. … And I think it's already quite close to it. So now the point is about how to apply such incentives, that instead of separate optimisation, they would optimise through the new totality. And to this, I think the EIB would fit well. (I5)

The transformative potential of the EIB was seen to arise from its ability to transform the economic logic of the problem by constructing markets (cf. Boon et al., 2022; Frankel et al., 2019). The instrument aimed to achieve transformative change in a regional ecosystem by mainstreaming existing nutrient recycling practices. The problem and its solutions were seen mainly as economic and the EIB as a financial policy innovation for developing new sustainable markets. Again, the problem was primarily interpreted as a question of isolation, where different procedures were contradictory and the current agri-environmental compensation scheme economically irrational. Thus in frame 1, the EIB could act as a remedy by seating the interconnected problems, solutions and procedures 'in the same table':

In Finland, it's quite strong this, what was it called nowadays, the agri-environmental compensation scheme, so most farmers participate in that. And in that, the logic is that you get paid according to the loss you face when you do an environmental procedure, so it's kind of written in the logic that you always lose economically when you make some [laughs] environmental procedure. But yeah, profitability and the environment, they're in these different conversations, and they should be seated at the same table. So maybe this kind of thing, maybe it could support it, this impact investing. (I9)

In another interview, the EIB was similarly described as 'co-ordinated support'. Instead of providing different kinds of incentives to various stakeholders, the EIB was seen as capable of rationalising the organisation of economic resources by providing incentives that complement each other. A key component of this was also seen to lie in the outcome-based logic, central to II, making it possible to steer policy based on impact:

But that's just the thing: we have different officials giving these aids. Some, like the support to the farmers, comes from somewhere – I'm not sure whether it's from the Ministry of Forestry and Agriculture or where – and then there's the thing from the Ministry of Economic Affairs and Employment, who give investment support to factories. And then there's a third party who gives support for bringing down the climate emissions. And since none of these are co-ordinated, the result is that the support schemes don't work. So basically, this is just kind of more cleverly co-ordinated support, where we follow these actualised emissions and stuff and only pay when we can see that the thing we've wanted has happened. (I12)

In frame 1, the EIB was thus seen foremost as a way of solving the dual problem by constructing market-conform action in the footsteps of II. This could incentivise the whole ecosystem to act advantageously and accomplish a sustainability transition.

4.2. Frame 2: the EIB as the potential challenger of the agro-environmental compensation scheme

In the second frame, the EIB was regarded through the lens of the broader questions relevant to agro-environmental policy. The Nutrient-EIB was interpreted as a challenger to current environmental policies, especially the agro-environmental compensation scheme. In this frame, the interpretations were largely grounded on environmental expertise that emphasised the complex and change-defiant features of recycling, agriculture, and environmental policy (cf. Dewulf, 2011). The policy innovation was given the role of a potential challenger of the status quo, yet its proposed solution was met with caution.

In frame 2, agriculture as a whole was described as a challenging socio-ecological system that could only change very slowly. This was argued based on factors such as scientific expertise in agriculture, the inertia caused by traditions, and how the economic logic of

the EIB might not acknowledge the perspective of the farmers:

On a national level, it is understood in ministries as well. …these questions concerning the climate and the environment. But we need to remember that we also need a ten-year time horizon. Because we need to remember that, especially on these animal farms, they've invested their assets in this, so even if they'd be willing, turning around quickly is not possible. (I10)

Simultaneously, the possibility of challenging the agro-environmental compensation scheme was doubted since the scheme was connected to broader, large-scale policy frames such as the EU agricultural support policies. The current system that aspires to compensate for the economic losses caused by farmers treating manure in environmentally sound ways was thus a consistent part of a larger scheme of policy or a 'policy mix' (Kivimaa & Kern, 2016; Flanagan et al., 2011). In this framing, the Nutrient-EIB was interpreted as reasonable in its pursuits as such, but the chances of it fitting in with the current, interconnected regime were seen as limited. In the frame, the utility of the EIB was thus interpreted as being able to challenge and perhaps incrementally mould agri-environmental compensation policy, yet not replace it. The instrument's transformative potential was considered to lie in contributing to a broader regime change:

The whole field of agricultural production is so regulated, and the systems are rigid. And now that we're changing them, there are years of work that is done in order to change something. So concerning big transformations to the systems, I don't really see them as possible in the near future. But adjusting blocks within this system would be a realistic possibility. (I8)

In frame 2, it was also seen problematic how the Nutrient-EIB might not be compatible economically with the existing agro-environmental compensation scheme. It was argued that the EIB might produce a 'double pay -situation', in which a farmer could take advantage of both the EIB and the agri-environmental compensation. Some questions concerning the equity of the EIB were also presented. For example, that by launching it, the government would provide economic support to certain regions, leaving others in a worse position. Based on the existing policy principles, the creation of fair markets was seen as a transformative ideal, similarly to frame 1. Yet, the EIB was interpreted not to be the best or fair enough solution since it is limited to a specific region:

Why would the state support something in a specific region and not in another? So there's also these kinds of political and equity-related questions between regions. […] This kind of thing, that you don't pay some people even though they're doing the same thing. So if we create a functional market, that's fair in the sense that anyone can participate for whom it'd be reasonable. But if we do this kind of regional support mechanism, then, yeah, you also sort of wonder about these things on some level. (I6)

4.3. Frame 3: the EIB as experimental policy

The third frame through which the nutrient EIB was interpreted was the experimental approach to governance (see Kivimaa et al., 2017; Eckert & Börzel, 2012; Berkhout et al., 2010). The EIB was interpreted in this frame according to how well it could achieve the central benefits of policy experiments: agility, speed, ability to produce and scale experiments, and learning from experimental situations via co-creational approaches.

Notable about frame 3 was that its core perspective concerning the direction of socio-technical change was in effect opposite to frame 1, which emphasised starting from systemic change. Frame 3 underlined that instead of pursuing systems change 'straight away', learning from examples is needed before a transition could be achieved. The lack of examples and renown were interpreted as considerable hindrances in light of the transformative potential of the Nutrient-EIB. The new practices associated with the instrument were thus considered to require more bottom-up learning before they could be mainstreamed:

Nobody knows anything about this. […] If you go to the street and say the word 'EIB', no one has a clue. So for me, the most important thing to do is to first create something based on which we can start to discuss things. (I4)

Appreciation of concrete actions was thus a major feature of frame 3. It was argued that IBs and the notions they entail would not proceed without experiments and case studies since their functionality is difficult or impossible to evaluate. This was interpreted as a significant difficulty in being able to convince investors to take part in the EIB:

And when the investors want to see, and overall everyone wants to see, what you've achieved so far, the track record, it's missing. So that's one major thing you have to struggle with to some extent. If we have a public tendering and want to do something, there's not much evidence around yet, it's quite risky for all parties involved to do things like these. (I11)

The lack of examples was also connected to arguments on why the Nutrient-EIB had thus far been slow to proceed. In frame 3, the concern was raised that investors would not be interested in the EIB since the results of the investment would be reached slowly. Along the same lines, it was emphasised that the governance measures of IBs – modelling impacts, organising the ecosystem, and evaluating impacts – are resource and time-heavy activities, which makes the EIB more burdensome and expensive in comparison to more traditional experiments:

The profit, it's kind of distant in a way. Of course, this investment method is meant for the long-term profit, but for the investor, there's a level that you need to understand this thing, of why it's so long-term so that you can be motivated for it. So if we talk about these kinds of bigger processing plants, where they can really process significant amounts of manure, and a substantial portion of this can be used as a recycled nutrient that is transportable and in which the end-user is interested in, it's really a matter of years before the plant is running properly. And there isn't much happening yet. (I2)

In addition, fitting the EIB with other policies was seen as challenging. Compared to more traditional policy experiments, IBs necessitate more inputs and an in-depth understanding of the problem already in the planning phase. A change towards this was seen as a long process, not currently promoted by the government. Whereas a 'culture of experimentation' (Kivimaa et al., 2017) had been adopted by the Finnish government, adopting policy innovations was considered painstakingly slow. The necessity of policy innovations was thus underlined, yet viewed sceptically in relation to sufficient speed:

Well, yeah, it's still this kind of resistance to change when you want to stick with the old, so when we're experimenting with these new things,

it doesn't happen all that fast there within the government. Like, if you've gone with some old form of subsidies for 50 years, there's a reasonably hard tendency to stick with the old. So that's why these progress quite slowly. They do progress, but quite slowly. (I14)

As visible in the quote above, tensions could thus indeed be distinguished between the different framings of the Nutrient-EIB. This is not surprising, since a diverse set of stakeholders took part in the construction process of it – as is central to IBs and II more commonly (cf. FitzGerald et al., 2020). In the following, we elaborate more closely on these frictions between the frames. By doing so, it is possible to understand better how the three frames relate to each other and where the EIB's transformative potential may lie.

4.4. Friction 1: Knowledge base

The first frictional feature between the three frames concerned the knowledge base necessary to accomplish transformative outcomes. The Nutrient-EIB was strongly motivated by II's outcome-based logic that emphasises the ability to pursue systemic change by knowing and understanding the present situation before it could be changed. This was approached by carefully modelling the double problem of eutrophication and nutrient recycling lock-in.

All IBs are based on some modelling of the social or environmental problem and how it might be solved, which serves as the basis for the evaluational details and the quantified objectives of contracts (Williams, 2021; FitzGerald et al., 2020; Clifford & Jung, 2016; Balboa, 2016). The modelled knowledge base of the Nutrient-EIB consisted of two processes: i) modelling how environmental impacts caused by agriculture affected the Baltic Sea and ii) modelling how nutrient recycling could be considered economically and be shaped into an IB interesting to all stakeholders and useful in forming a circular economy. Out of these two, modelling the environmental impact was generally seen as complex yet possible because it was based on a scientifically robust knowledge base. Attaching this to the actions and decisions of stakeholders of the ecosystem, however, appeared as a considerable organisational challenge, where the development of the EIB was carried out in a more ad hoc fashion. As a result, the process of forming the EIB model was lengthy and thus seen generally as a major hindrance to its development:

In this nutrient-thing, the challenge was the modelling: what kind of model we create was the biggest challenge. When time passed, and there was a new meeting and – just a minute, now we can't have a new meeting because we didn't get the model, the calculations, done. […] So you have to have a reasonable time horizon and the knowledge base needs to be robust because then we can construct the model on that knowledge base. (I10)

Our data shows that only the intermediaries, such as officials at the Center of Expertise for Impact Investing, who had previous experience and know-how on IBs, had an in-depth understanding of how the modelling processes should be merged and how the EIB should function in detail. They contended that modelling as the knowledge base of the Nutrient-EIB was necessary for effectively upscaling existing nutrient recycling practices in the targeted region and institutionalising them among relevant actors (Ghosh et al. 2021). However, such a knowledge base was interpreted as very ambitious, hard to fulfil, and partially problematic from the perspectives of both frames 2 and 3.

In relation to frame 2, modelling the problem of eutrophication and nutrient recycling in the EIB was interpreted to be too limited in its mission of achieving transformative outcomes such as de-aligning and destabilising the current policy regime (cf. Ghosh et al. 2021). Outcome-based thinking and modelling were seen as progressive and necessary orientations. Still, the knowledge base of the Nutrient-EIB was considered insufficient in considering larger policy mixes, such as the Common Agricultural Policy (CAP) strategy of the EU. A thorough understanding of the existing regime was deemed necessary to facilitate processes that challenge current policy frameworks. It was argued that the knowledge base should be consistent with the regime policy more broadly before it could be imported to single themes such as nutrient recycling:

It's this water protection that's anyway been our big question concerning the environmental impact, and it'd be really great if we could achieve this outcome-based way of doing things. But I don't think it's going to work out. […] All the ministry money goes through this common agricultural policy and the [EU] CAP-strategy connected to it. So all environmental impact must come through this way. (I6)

A clear contrast was also visible concerning frame 3. Since only a few examples existed concerning the use of EIBs and even IBs, the knowledge base of the Nutrient-EIB was here considered very uncertain. There was a lot of interest in the EIB's potential, but this was not enough compared to experiments and case studies. Thus, whereas frame 2 stressed the need to include broader policy-mix thinking in the knowledge base, in frame 3, a more certain and tested knowledge base was first demanded from the grassroots level upwards. The current situation was seen as underdeveloped as there were no concrete experiences and in-depth understanding – no outcomes such as learning or circulation (Ghosh et al., 2021) – of the details of the EIB in the ecosystem. Practical knowledge was thought essential for articulating expectations around the new instrument and learning how it works:

Well, my perspective is that everyone whom I've talked with and who has been in the workshops we've arranged, everybody has been really interested. But everybody has also been maybe a bit confused about what this all is about practically, who does what, how you pay for it, and so forth. (I2)

4.5. Friction 2: Scale

In addition to the knowledge base, the scale on which the EIB could provide transformative outcomes was interpreted differently in the frames. In this, too, frame 1 is located between the environmental policy holism of frame 2 and the grassroots experimental policy emphasis of frame 3.

From the perspective of frame 1, the EIB appeared to pursue systems-level change by utilising the outcome-based logic of the IB in the systemic solution of the double problem in a particular region. Central to frame 1 was that the change occurs at the level of governance, not operations. The point was not about producing exact solutions but providing a mechanism through which solutions

may form in the process of the outcome-based contract. This premise was, however, not entirely understood by, for example, regional policy stakeholders:

When you start discussing this with municipalities, they always want to define the operations first. And that's also like the transformation in thinking, that it's not about that. Many people ask us: ''So, what's the operation that you offer?'' But we're not offering any specific operations – rather a different kind of thinking and logic for financing, contracting and procurement, through which we can then offer different kinds of operations to achieve efficiency. (I13)

In frame 1, the EIB would thus scale and make existing innovations more easily governable – not develop innovations themselves but aim to expand and mainstream niches (Ghosh et al., 2021). Hence, the instrument should address an entire regional ecosystem. Technological innovations such as processing techniques would be complementary at most, but the starting point should be at the acceleration and embedding phase of innovation policy, not in exploring (cf. Kivimaa et al., 2019; Safarzyńska et al., 2012). The basic functional logic, the stakeholders and the infrastructure, such as processing plants, should be ready to function right in the beginning when the EIB starts:

Yeah, so maybe the systems need to be quite ready after all. Of course, always when you do something, there's new thoughts, and we can launch new pilots and stuff. But in this, you probably need to have quite a complete system that we know that it works, so it doesn't fail in the situation that the first five years you try to get the plant to work when it should've been working already. (I3)

Within frame 3, the change attempted with the EIB was, however, seen as too slow and heavy. The EIB had already been in a planning phase for a couple of years, and, in frame 3, it was thus interpreted that the scale of the EIB was too big: it did not include the components of building and nurturing niches enough (Ghosh et al., 2021). Consequently, opportunities for fast networking, experimenting, and learning were missed. As an option, it was expressed that the larger problem should have been divided into smaller, more easily approachable and testable components, in contrast to pursuing a systems-level change all at once:

This kind of traditional thing that you study, ponder, interview, argue... And then when it's the moment to do something, then [makes an ungh-sound]. So we haven't even made it to the beginning of the process. Then another thing that I already thought then, was that this could've been attempted in steps. So that we would've gotten some small, simple thing that the government could've funded or something. (I5)

Frames 2 and 3 also interestingly intersected when it came to the scale interpreted. In frame 2, the EIB was interpreted precisely as an experiment that could make only incremental changes to environmental policy possible. Thus whereas from the perspective of frame 3, adapting II logic to the regional problem of nutrient recycling was too big, from the perspective of frame 2, the sought change was not seen as systemic enough. The EIB was interpreted as a potentially transformative innovation. Still, it was seen as insufficient to solve the overall problem of nutrient recycling lock-in and thus contribute to the macro-process outcome of opening up and unlocking regimes (Ghosh et al., 2021):

This EIB is probably this kind of funding mechanism of the future. And it's really good that in it you experiment, you also seek new kinds of funding mechanisms in the environmental field – and those, of course, will appear. But maybe I don't see this nutrition recycling thing as the number one thing here. There are a lot of problems, and it might be wise to solve these problems in some other way. (I6)

5. Discussion: the transformative potential of the EIB

Socio-technical transitions and the incorporation of finance in them demand new policy innovations. For these transformative policy innovations to be implemented, stakeholders must see them as acceptable and appropriate (Weber & Rohracher, 2012). Based on our study of the Nutrient-EIB, we propose that divergent interpretations of the transformative potential of a policy innovation may become an obstacle to its implementation. Essentially, the three framings of the Nutrient-EIB capture different expectations of the transformative potential of the instrument. These findings relate to the recent discussion on transformative outcomes of public policies as distinct macro-processes of socio-technical change (Ghosh et al., 2021) and help understand better what types of barriers there are in incorporating the finance sector as a mediator of transitions via policy innovations (Nykvist & Maltais, 2022).

To sum up, the transformative potential of the EIB was seen in frame 1 arising from advancing the macro-process of *expanding and mainstreaming niches* via finance (Ghosh et al., 2021). The need and feasibility of the instrument were assessed from the vantage point of overcoming barriers in the broader diffusion of niche innovations in nutrient recycling. In contrast, frame 2 included the idea of the Nutrient-EIB contributing to the macro-process of *opening up and unlocking regimes*. Consequently, its ability to destabilise the current agro-environmental policy regime was critically reviewed and concerns about the instrument's feasibility were raised from this perspective. Furthermore, views of the instrument as an experiment, as presented in frame 3, connect with the macro-process of *building and nurturing niches* and emphasised bottom-up learning.

Thus, we contend that the classification of transformative outcomes and their macro-processes (Ghosh et al., 2021) can be used to analyse interpretations of a policy innovation at the early stages when concrete results are yet to be realised. In addition, we propose knowledge base and scale as dimensions that capture differences between interpretations related to different macro-processes. Depending on whether a policy innovation is thought to target niches, scaling, or regimes, stakeholders may have different requirements for the scale of the intervention and the extent of preparation in terms of building a knowledge base. In this, the concepts of deepening and broadening (Ghosh et al., 2021) are helpful in analysing how policy innovations expand the scope and improve the quality and directionality of transition processes (Schot & Steinmueller, 2018). We further suggest knowledge base and scale as key concerns that are dealt with here. Building from these perspectives, our study shows how contested interpretations of a policy innovation's transformative potential may hinder its implementation, suggesting a need for aligning stakeholder interpretations when introducing new transformative policies. For example, when introducing aspects of evaluation as a crucial component of a knowledge base in policy innovations, it would be important to distribute understanding and know-how of it further from the experts who carry out the evaluation, which appeared as a difficulty and an asymmetry in the Nutrient-EIB (cf. Neyland, 2018). Here, the 'strategic

ambiguity' (Tan et al., 2021) of IBs becomes quite clearly visible. We see the transformative outcomes approach useful in pointing out what the ambiguity concerns and where further actions of intermediation, for example, should be directed.

The clash of II ideas with the established policy setting also provided other interesting observations. Experimental policy emphasises unpredictability and learning from the experimentation process. Beforehand planning, modelling, and contractual aspects were however more salient in the EIB, as demonstrated in frames 1 and 2. The notion of scale is constitutive in this aspect. Experiments have been seen as pursuits to affect practices on the local level, through which scaling can then be carried out after learning processes. In contrast, in IBs, the starting point is designating a large-scale impact, such as diminishing the nutrient load of agriculture, and then 'zooming in' towards more exact actions and interventions. From the perspective of the agri-environmental policy frame 2, it was, however, apparent that systemic change in one system is not separate from larger socio-technical contexts (cf., Bergek et al., 2015). In relation to environmental policy and the current regime logic of the compensation scheme, it was evident that specific features of the EIB, such as the logic of modelling impact and holistically incentivising markets, were interpreted as troublesome as similar features were not utilised more widely. In this regard, the problem was seen to lie in divergent notions concerning the apt knowledge base for environmental policy, the possibilities of farmers changing their practices, and a scale too small for actual systems change. Thus, from the perspective of environmental policy more broadly, the potential of the EIB was interpreted to function as a sort of challenger for the regime – as an experiment that might, through some of its features, help to consider environmental policy in a new way. Concerning frame 1, based on the idea of II, this was, however, a truncated version of the objectives of the EIB.

In our view, it is the 'limited' systems perspective that makes the Nutrient-EIB a new kind of option for the double problem of eutrophication and nutrient recycling lock-in that has remained despite various attempts to develop new technologies, business models, and products (cf. Åkerman et al., 2020). As noted above, transformative policy requires new stakeholder relationships and co-operative action (Weber & Rohracher, 2012) or 'multi-scalar work' (Ghosh et al., 2021; Bauer & Fuenfschilling, 2019). The transformative potential of the EIB may lie in this clashing of stakeholders, which more traditional experiments may not reach. The preparation process of the Nutrient-EIB brought together both local, regional and governmental actors, including expert stakeholders in environmental policy-making and II. Thus, it can be considered to support learning in regimes and strengthening regime-niche interactions (cf. Ghosh et al., 2021). These encounters did indeed also cause frictions, but, nevertheless, the preparation process had succeeded in bringing together stakeholders and thematics otherwise located in more separate spheres of policy-making. Thus our results are aligned with those underlining how the formation of consensual interaction and shared policy frames is a slow process yet a precondition to pursuits that begin with the notion of systems change (cf. Dewulf, 2011). While seeing these merits in the EIB as a potentially transformative policy innovation, our results yet point to the question of whether there is enough time for developing and distributing its complex dynamics of evaluation and ecosystemic thinking in intermediation processes (cf. Soberón et al., 2022; Kanda et al., 2020; Kivimaa et al., 2019), considering the acuteness of environmental problems dealt with.

6. Conclusions

Novel financial practices, such as II and IBs, hold the potential to direct resources to interventions that prevent adverse societal outcomes and promote positive ones (Penna et al., 2021; Naidoo, 2020). In this study, we report on the preparation process of Nutrient-EIB, one of the first IBs targeted at mitigating environmental problems. We find that stakeholders involved in the preparation of the EIB hold different interpretive frames concerning the transformative potential of the instrument in relation to its outcomes, and that frictions between these frames may slow down its implementation.

The findings illustrate the challenge of introducing policy innovations that are bound to suffer from limited empirical support in the early stages of their diffusion. Concerning the possibility of the finance sector mediating the pursuit of sustainability transitions via policy innovations, our study emphasises the complex nature of policy processes, where the possibility to use private financial resources does not equal achieved results.

Questions that exceed this article's scope include investigating the use of the EIB and analysing the potential feedback mechanisms of EIBs, IBs and II, such as financialisation, short-termism, and shifts of governance accountabilities (Sinclair et al., 2021; Hafner, 2020; Chiapello & Knoll, 2020; Golka, 2019; Balboa, 2016). Acknowledging both the nature of IBs as a 'strategically ambiguous' policy innovation (Tan et al., 2021) and the pursuit of transformative outcomes as highly context-specific (Ghosh et al., 2021), we encourage transition scholars to investigate further EIBs and other financially motivated environmental policy innovations in relation to both local-level policy processes and the broader socio-technical dynamics of transitions.

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CRediT authorship contribution statement

Olli Tiikkainen: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Matti Pihlajamaa:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. **Maria Åkerman:** Conceptualization, Data curation, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data will be made available on request.

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