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Greening the Future: a case for environmental impact bonds

A central puzzle for environmental economics is how to integrate long-run costs and benefits into present-day decision making. Commonly this puzzle is described in terms of externalities. These occur when 'an activity or transaction by some party causes an unintended loss or gain in welfare to another party, and no compensation for the change in welfare occurs' (Daly and Farley, 2011, p.184). For example, the millions of tonnes of carbon dioxide that a large coal-fired power plant releases annually contributes to the cumulative problem of climate change, yet those who profit from producing electricity do not bear the burden of the negative consequences. Rather, these costs fall disproportionately upon future generations and communities uniquely vulnerable to the impacts of climate change. Thus, the emission of greenhouse gases creates a negative externality, because its costly impacts are external to the accounting of the actors who emit them.

In this way, market mechanisms produce market failures, with grave implications for the environment. Professor Lord Nicholas Stern famously described climate change as 'the greatest market failure the world has seen' (Stern, 2007). Other examples include the degradation of freshwater or soil resources, air pollution, overfishing and mass deforestation. What is economically *rational* from the perspective of short-

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term capital gain is economically *irrational* from the perspective of long-term prosperity. The same problem also hinders remedial action: the costs of interventions are immediate, whereas the avoided costs of environmental damage are months, years, even decades away.

This challenge is not unique to environmental economics, moreover. As Jonathan Boston describes, there are a range of societal problems which 'entail non-simultaneous exchanges', in anticipation of which 'elected officials must impose near-term costs in order to deliver net long-term gains' (Boston, 2017, p.465). These include decisions of fiscal responsibility, health problems with delayed impacts on public health infrastructure, such as obesity and smoking, underinvestment in public infrastructure which retards economic productivity, and social problems that perpetuate the intergenerational transfer of poverty.

Given that these problems share a common payoff structure, it is plausible that solutions which make sense in one policy domain will translate effectively into another. For example, a central insight of the social investment approach to New Zealand's welfare system is that long-run costs can be pre-empted and obviated by targeted interventions in the short term, thereby reducing the state's 'forward liability' – that is, the cumulative present and future welfare expenditure. Colin James has noted in passing that this social investment logic translates very easily into environmental policy (James, 2015, p.2). The estimated future costs of environmental harms could be used to justify the immediate expense of mitigating those harms. The growing literature on ecosystem services – that is, the pricing of environmental functions in respect to their human value – provides the informational resources to generate projections for the forward liability of the status quo (for literature reviews with a New Zealand focus, see McAlpine and Wotton, 2009; Dymond, 2013; and Roberts et al., 2015).

This article examines whether social impact bonds (SIBs) might fruitfully translate into the environmental domain. SIBs can be regarded as an auxiliary to the social investment approach, as an outcomes-oriented financial instrument that is partially justified by the same imperatives used to justify the social investment approach, particularly the imperatives to reduce public sector expenditure and to shift service delivery to the non-governmental sector. I conclude that the SIB model is feasible for environmental interventions, and that, indeed, the shift from social to environmental outcomes might sidestep some of the ethical and methodological challenges that social impact bonds face.

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Impact bonds: an emerging empirical record

This section describes social impact bonds from an advocate's perspective. (A critical perspective is taken below.) I focus on two reports. The first, *Social Impact Bonds: the early years* (Dear et al., 2016), was published in July 2016 by Social Finance, an economic think tank which pioneered the SIB model with the Peterborough Prison bond (2010–15), widely recognised as the world's first. The second report is *The Potential and Limitations of Impact Bonds: lessons from the first five years of experience worldwide*, published in November 2015 by the Brookings Institution in Washington (Gustaffson-Wright, Gardiner and Putcha, 2015).

What makes these reports interesting is that they both draw on empirical insights from the original cohort of SIBs. So, while SIBs have heretofore been promoted on *a priori* expectations, these reports constitute the beginnings of an *ex post* evaluation. Nevertheless, as the reports' authors readily acknowledge, these empirical insights are still partial and incomplete, so we ought not suspend our scepticism entirely.

Social Finance provides this neat definition:

> At its core, a Social Impact Bond is a public-private partnership which funds effective social services through a performance-based contract. Social Impact Bonds enable federal, state, and local governments to partner with high-performing service providers by using private investment to develop, coordinate, or expand effective programs. If, following measurement and evaluation, the program achieves predetermined outcomes and performance metrics, then the outcomes payor repays the original investment. However, if the program does not achieve its expected results, the payor does not pay for unmet metrics and outcomes. (Dear et al., 2016, p.12)

In other words, an outcome funder – typically a government – identifies a social problem that might benefit from outcomes-based funding. An intermediary organisation is tasked with structuring a deal, based on pay-for-performance contracts between the outcome funder, investors, service providers and evaluators. Investors pay a principal which is used as upfront capital by not-for-profits, social enterprises or other community organisations to fund service delivery. Evaluators then assess whether the service outcomes meet agreed-upon impact targets. If they do, then the outcome funder is obliged to pay the principal plus coupon to the investors in accordance with the pay-for-performance contracts upon bond maturity.

Social Finance's survey finds that, as of June 2016, there were 60 SIBs launched variously in the United Kingdom, United States, Australia, Germany, the

Netherlands, Belgium, Canada, Portugal, India, Switzerland, Austria, Israel, Finland and Sweden. These SIBs raised over US$200 million of capital combined, and affected over 90,000 people through service delivery (ibid., p.25). Not captured in this survey, however, are the SIB pilots which were initiated but not completed, and therefore are unaccounted for, some abandoned, others still under negotiation. This includes the Ministry of Health bond in New Zealand, which was launched in late 2013 but stalled in May 2016 when the provider withdrew (Treasury and Ministry of Health, 2016). Such projects are not failures per se; they could equally be seen as victims of a selection process which sorts out adequate from inadequate SIB proposals.

As for the active SIBs, both reports are cautiously positive about the success of these instruments. The Brookings Institution report – which drew on structured interviews and online surveys of contracted parties for the first 38 SIBs up to 1 March 2015 – concluded that 'it is very likely that the impact bond model development process, structure, and application will continue to be adapted in the future' (Gustafsson-Wright, Gardiner and Putcha, 2015, p.50). Over a year later, Social Finance reported 'a promising, if early, record of success', while acknowledging that this is based on 'interim, not final, results' (Dear et al., 2016, p.26). It found that 22 SIBs had reported performance data, 21 indicated positive social outcomes, 12 made outcome payments and four fully repaid investor capital (ibid., p.6).

The Brookings Institution report evaluates the success of SIBs in relation to 'ten common claims', several of which were reinforced by practical experience (Gustafsson-Wright, Gardiner and Putcha, 2015, pp.36-47): namely, that (1) *impact bonds prioritise prevention* rather than remedial interventions; (2) *impact bonds shift focus to outcomes* by identifying impact targets that trigger payment; (3) *impact bonds crowd-in private funding* from both new investors and traditional providers of social grants; (4) *impact bonds improve performance management* by inviting private sector expertise in monitoring success; (5) *impact bonds stimulate collaboration* between stakeholders in the private, public and non-governmental sectors; and (6) *impact bonds reduce risk for government* because public money is used only to reward successful outcomes, while private investors bear the burden of failure.

Two further common claims were less clear. At the time of the survey it was too soon to say whether (7) *impact bonds build a culture of monitoring and evaluation* and (8) *impact bonds sustain impact* over long time frames. However, the interviews uncovered optimism in regards to both.

The claims least supported by early evidence were (9) *impact bonds foster innovation in delivery* and (10) *impact bonds achieve scale*. In regards to innovation, there was no evidence that SIBs had prompted entirely novel models of service delivery – which is hardly surprising given the risk for investors – although there was evidence that conventional models were being applied in novel combinations, novel settings and novel target populations. In regard to scale, there was no evidence that SIBs were scalable in an absolute sense, where they could be replicated nationwide to address large-scale social problems. Indeed, the success of certain SIBs was contingent on them targeting a very specific population (ibid., p.42). However, the report notes that more modest forms of scalability are plausible. The Social Finance report further observes 'signs of standardization in the field, with programs being replicated and adapted to multiple geographies' (Dear et al., 2016, p.8).

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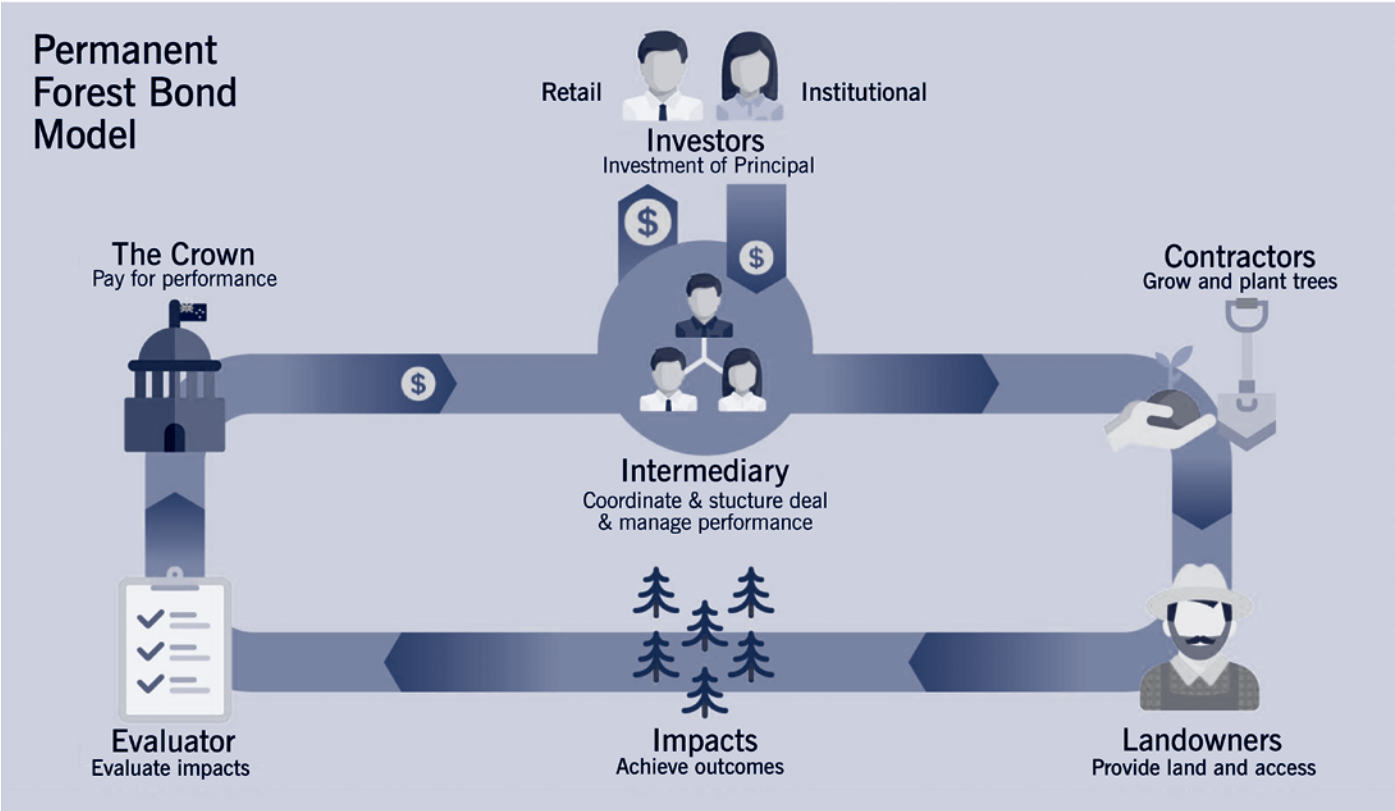
From social to environmental

What then of environmental impact bonds (EIBs)? The adaptation of the impact bond structure for environmental outcomes was hypothesised in 2013 by David Nicola. He notes that '[m]onetization of future cost savings is a staple of environmental finance' and therefore well served by an impact bond where 'investors are paid a return based on the amount of cost savings generated by a particular project' (Nicola, 2013, p.14). Cost savings are expected to emerge from private sector involvement, especially from the capacity for innovation and private sector rigour in the delivery of interventions.

One such bond was issued on 29 September 2016 by District of Columbia Water and Sewer Authority (DC Water). This is billed as the US's first EIB and will manage storm water through the installation of green infrastructure. There is a mandatory tender set for 1 April 2021, when investors will receive either a US$3.3 million coupon if storm water runoff is reduced by over 41.3%; receive no coupon if runoff is reduced by 18.6%–41.3%; or pay a 'risk share payment' of US$3.3 million if runoff is reduced by less than 18.6%. This structure enables DC Water to prove the effectiveness of green infrastructure even while it is constrained from investing public money in risky or unproven solutions, because the EIB redistributes the risk of outright failure onto investors, in this case Goldman Sachs and the Calvert Foundation (Martin, 2017).

Another EIB in the US – still in pilot phase – is a forest resilience bond being developed by Blue Forest Conservation. This is designed to provide upfront capital for forest restoration, particularly the clearing of forest litter to reduce the risk and severity of wildfires. The principal outcome funder is the United States Forest Service, which can justify this immediate investment insofar as it reduces the

Figure 1: Schema for a permanent forest bond



Source: Hall, Lindsay and Judd, 2017

expected future budget for firefighting (Yonavjak, 2016; Blue Forest Conservation, 2017). This is transparently a forward liability approach, although aimed at reducing future government expenditure on nature conservation rather than social welfare.

This author has explored the potential for EIBs in New Zealand to establish new permanent forest (Hall, Lindsay and Judd, 2017). The primary justification for the proposed permanent forest bond is that forest can be established more cost effectively by the private sector under an outcomes-based contract, because the EIB model accommodates innovation and optimal management procedures to produce those outcomes. The secondary justification is a forward liability logic which accounts for the ecosystem services that forests provide, as well as the long-run costs of leaving large tracts of land unforested when it is erosion-prone or located in sensitive water catchments. From this long-term perspective, the immediate cost of permanent forest planting can be justified in terms of avoiding the relatively larger costs of non-forest land uses which promote freshwater deterioration from sediment and nutrient runoff, private and public property damage from erosion and landslips, and future expenses for purchasing carbon offsets from foreign markets to meet international climate obligations. Because these long-run costs are largely externalities that fall upon the wider community and future generations, the most appropriate outcome funders are identified as national or local governments acting on behalf of the Crown. By issuing permanent forest bonds, the Crown invests in long-term prosperity through a structure that prioritises cost-effective interventions. The attractions for other stakeholders are, for retail and institutional investors, a green investment proposition with measurable impacts; and for prospective tree-planters an opportunity to access untapped private capital (see Figure 1).

The bond structure is particularly well-suited for afforestation and reforestation, because forests involve large-scale investment and relatively long timescales (Cranford et al., 2011). However, EIBs could conceivably be used to address other environmental issues, wherever there is the right coalition of interests. The key questions to ask are:

- Do outcome funders (such as the Crown) stand to reduce long-run costs by intervening in this environmental issue? And do they stand to reduce the immediate costs of intervention by outsourcing delivery to the non-governmental sector?
- Do prospective investors have capital available that they are unwilling to donate philanthropically, but would be willing to invest under the expectation of a return on investment that is contingent on impact performance? Do investors have access to adequate scientific knowledge, and sufficient trust in other stakeholders, to justify the investment risk?
- Do contractors (or service providers) currently lack access to upfront capital due to the non-simultaneous exchange of investment and outcome? Are contractors willing and able to operate under the rigour of impact targets?

Accordingly, EIBs could be established to address other environmental problems where the measurement of impacts, and where relationships of cause and effect, are uncontroversial to a degree that is mutually acceptable to the contracting parties. For example, it is plausible to imagine: an EIB for water quality that encompasses not only revegetation but also wider land use strategies and further technologies to reduce effluent and sediment runoff; an EIB for the eradication of herbivorous pests that relies on carbon measurement of forest ecosystems to evaluate impact; or an EIB that increases average rates of soil carbon per hectare by funding the transition to innovative pastoral regimes. By contrast, it is less plausible to imagine the successful negotiation of EIBs for problems where measurement is controversial (such as changes to fish stocks) or where causal relationships are subject to irreducible uncertainty and complexity (such as air quality or coral bleaching). That said, technological advances in measurement and monitoring could overcome these problems.

An environmental advantage?

From an *a priori* perspective, there is little reason to anticipate that the purported merits of SIBs, if valid in the social domain, would not be replicated in the environmental domain. These merits are intrinsic to the impact structure itself, not the object of impact, so should be no less relevant for EIBs than for SIBs. Fundamentally, this structure is about shifting risk onto the seller, rather than the buyer, of outcomes.[1] The purpose of this redistribution of risk is to reorganise stakeholder incentives in such a way that intervention becomes an attractive proposition, prompting stakeholders to fund an intervention that would otherwise not be funded.

Nevertheless, there are important differences between SIBs and EIBs which have implications for their feasibility. Basically, SIBs focus on social systems and their constituent elements, whereas EIBs focus on ecosystems and their constituent elements. This means that the specific challenges of social measurement, social explanation and social prediction are central to the design of SIBs in a way that they are not for EIBs. Of course, it would be imprudent to draw this distinction too starkly, because measurement, explanation and prediction in the physical sciences are not without their challenges and controversies. Moreover, understanding ecosystems in this Anthropocene era of pervasive human influence involves, in part, understanding how ecosystems interrelate with human systems (Sarewitz and Pielke Jr, 2000, pp.12-15): for instance, how human economies influence resource use and how anthropogenic global warming adjusts inputs for local ecosystems. Nevertheless, when it comes to measuring impacts and predicting causal effects, an EIB can always narrow down its focus to basic scientific laws or correlations. By contrast, SIBs must necessarily focus on human subjects, who have a capacity for linguistic and reflexive thought that non-human phenomena do not. This entails a host of ethical and practical issues that are either absent from measuring environmental impact, or can be constrained or compensated for.

Thus, if we look beyond the advocates' view of SIBs and toward the critics', we see points where EIBs might sidestep some of the problems faced by SIBs. For example, one important critique of SIBs is that 'social outcomes are notoriously difficult to measure' (McHugh et al., 2013, p.249). This has several implications. First, this makes it more difficult to agree to appropriate outcome targets in the negotiation phase. Second, if targets are agreed to, there is greater potential for disagreement over whether outcome targets were met, which could lead to disputes over payment. Third, this increases the likelihood that an evaluative framework will need to be tailor-made: '"Off the shelf" measures do not exist for many of the social outcomes which SIBs aim to effect and proxies or new indicators would have to be used' (ibid.). Finally, these various complications will add to the transaction costs required for establishing the bond, particularly for identifying impact targets and methods for evaluation.

These are all genuine problems for SIBs; but note that these objections carry less weight for EIBs. There already exist a range of standardised tools and methods for environmental monitoring and evaluation which an EIB can piggyback on, thereby avoiding the time and costs of developing original metrics (Nicola, 2013, p.27). For example, the Resource Management Act 1991 imposes a responsibility upon local authorities to monitor the human impacts on natural and physical resources, such as contamination of land, air and water; soil conservation; water quality and quantity; and coastal marine areas. The tools, technologies and limits used to fulfil these responsibilities could be co-opted into EIBs. Further targets and measures could be adapted from the Ministry for the Environment's national environmental standards, the national policy statement for freshwater management, and other central government systems for monitoring and evaluation. Furthermore, there are a range of international standards and criteria, such as the quality assurance and quality control (QA/QC) infrastructure within carbon credit standards, which could also be utilised for establishing an EIB.

> … the establishment of [environmental impact bonds] is plausibly less resource intensive than of [social impact bonds], because tools and methods for environmental monitoring and evaluation often already exist.

Not only are there well-established measures within the environmental domain, but also well-established revenue streams, some of which are not government-dependent (ibid.). SIBs tend to rely on government as the primary source of payments, insofar as government pays for outcomes to reduce its forward liabilities in social welfare, public health or criminal justice. Yet EIBs tend to focus on natural assets that often generate revenue streams that are independent of government payments, such as timber, water, fish stocks, and carbon for voluntary markets. Some of these revenue streams will also be realisable within a time frame that isn't unusual for government-issued bonds; Climate Bonds Initiative (2016, p.5) notes that 70% of existing climate-aligned bonds have tenures (time to maturity) of ten years or more. Moreover, opportunities for market revenue do not preclude an EIB from also tapping into government systems of payment for ecosystem services, such as subsidies for erosion control, payments for biodiversity conservation, and carbon credits for compliance markets such as New Zealand's emissions trading scheme. The establishment of new payments for ecosystem services – as environmental externalities are eventually integrated into the accounting of local and national economies – will create future opportunities for revenue.

However, while these revenue streams are constitutive of an EIB's potential return on investment, this revenue should not be confused with the EIB itself, for two reasons. First, the bond structure of the EIB enables it to incorporate these various revenue streams, potentially combining income from both private and government sectors. For example, a hypothetical EIB that focuses on the outcome of reduced sediment yield in waterways could incorporate government subsidies for erosion control, carbon credits from green infrastructure, payments from private hydropower utilities for reduced sediment-related damage to turbines, and payments from fisheries companies for reducing sediment in sensitive spawning grounds. (As discussed below, this complexity involves a trade-off with transactional risk, however, by increasing the number of stakeholders involved.) Second, EIBs are structured to provide *ex ante* financing to fund the original intervention, even though the revenue streams that constitute the return on investment might not mature for several years. So, for example, while carbon markets enable *ex post* performance-based payments for carbon sequestration, an EIB enables *ex ante* financing for the creation of carbon sinks by involving investors who bear the burden of failure if carbon isn't sequestered.

> … it is possible that the initial advantage of an EIB will not be overall fiscal savings; even environmental interventions are undertaken more cost effectively by output-based contracts …

Finally, the environmental focus of EIBs also increases the likelihood of successful standardisation. Again, this point of distinction between EIBs and SIBs should not be overstated, because local contingencies can upset the expected outcomes of environmental interventions, such as the influence of local soils or microclimates on the growth of vegetation, or water quality in a specific catchment. However, environmental phenomena are still relatively more amenable to general explanation than social phenomena, where the dynamics of local history and culture, the contingencies of one-off events and particular individuals, and the reflexive capacity of human action can have a profound influence on actual outcomes. As discussed earlier, the empirical record does not yet support the hypothesis that SIBs can 'achieve scale', but there are reasons to expect that EIBs might do better in this regard, because causal relationships between intervention and outcome are more likely to hold across a range of sites.

Risks and limitations

EIBs are an attractive proposition. But like any funding model, impact bonds have risks and limitations. Some of these are tolerable, some surmountable through good design, and some are questions for political or strategic judgement. But it is important to bear these issues in mind to minimise surprises for participants and to increase the opportunity for designing solutions.

Chief among these issues are the transaction costs involved in establishing an impact bond: that is, the time, labour and associated expenses involved in identifying contracting parties, negotiating contracts, and monitoring and evaluating outcomes. As discussed above, the establishment of EIBs is plausibly less resource intensive than of SIBs, because tools and methods for environmental monitoring and evaluation often already exist. However, this does not forestall the basic logistical difficulties of developing complex contracts between multiple stakeholders that involve large sums of money. Of course, these difficulties – and associated risks – will also become greater the more stakeholders are involved, which creates a trade-off with the temptation to enlist multiple outcome funders. These difficulties are likely to be greater than for most output-based contracts, where government pays for services outright, although perhaps no greater than for existing pay-for-performance arrangements, such as the purchasing of *ex post* carbon credits. Thus, it is possible that the initial advantage of an EIB will not be overall fiscal savings, even if its environmental interventions are undertaken at less cost than by output-based contracts (see Wilkinson and Jeram, 2015, p.7). The

advantages, rather, are the redistribution of risk away from outcome funders and the encouragement of innovation, as well as the long-run savings if the EIB is successfully standardised and replicated elsewhere.

Other issues arise from the shift of accountability from outputs to outcomes, and especially toward protecting investments. This addresses a longstanding critique of government intervention being overly focused on process rather than results, but raises the possibility of new tensions and perverse incentives. As Balboa notes, EIBs might not result in long-term solutions to environmental problems, because payment is triggered by short-term outcomes which won't always be long-lasting (Balboa, 2016, pp.36-9). Similarly, the narrow metric-based focus of EIBs creates little incentive to tackle the underlying political or economic causes of environmental harms. Indeed, investors could conceivably have an interest in perpetuating an environmental harm, or even causing an environmental harm, in order to profit from its amelioration through an EIB. Such possibilities highlight the importance of being prudent in choosing which problems to address with EIBs and judicious in choosing impact targets.

Generally, the above considerations illustrate why impact bonds are not appropriate for core sectoral funding, nor as a general substitute for existing funding mechanisms. This is well-recognised within the SIB literature, even among SIB advocates (see Wilkinson and Jeram, 2015, pp.5-6; Dear et al., 2016, p.21; Gustafsson-Wright, Gardiner and Putcha, 2015, pp.3-4). It is best to think of EIBs as one tool in the toolbox, as a funding mechanism that is well-suited to certain types of problem, especially those where there is a lack of upfront capital to intervene immediately, where the intervention focus is preventative, where there is scope for innovation or more rigorous management, and where there is scope for more cost-effective service provision and avoided future costs (Hall, Lindsay and Judd, 2017, p.10).

Conclusion

EIBs are a plausible funding instrument which align with various prevailing public policy preferences: forward liability accounting, cost-effective service provision, use of performance targets, informational richness, an openness to innovation, and a preference for public–private partnerships. Accordingly, EIBs deserve to be considered as a viable funding option for environmental interventions in the present day. EIBs might even serve as a pathbreaker for SIBs, as a proof of viability for the impact bond model generally, which avoid some of the specific ethical and methodological complications faced by SIBs.

Discovering which environmental problems the EIB model is suited to solving will involve trial and error. Fortunately, error will often be identified at the negotiation phase, because the financial risks for investors necessitate a robust actuarial analysis. But even if an EIB is not suitable for addressing a specific environmental problem, this does not mean that the environmental problem is not worth solving. On the contrary, EIBs are one of many funding instruments, which are especially well-suited to bridging the gap between the non-simultaneous exchange of investment and outcome. If an EIB is not suited to addressing a certain environmental problem, then we should be asking ourselves how else we should be solving it.

1 The author would like to thank the anonymous reviewer for this specific formulation, as well as wider comments that improved this article.

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