

Jonathan Boston

Investing in New Zealand's Future Well-being protecting and enhancing our natural capital

Introduction

The election of the new centre-left government in New Zealand provides an opportunity to reflect on the enduring question of how societies should invest for a prosperous, secure and sustainable future, one where all generations can flourish. This article focuses on the contribution of natural capital to human well-being and suggests a series of policy reforms designed to protect and enhance New Zealand's natural assets.

Natural capital is essential for intergenerational well-being: without a healthy, vibrant and resilient environment, economic and social sustainability are impossible. Natural capital can be defined in various ways, but basically it embraces the total inventory of the earth's natural resources, including biodiversity, across three main biophysical domains, namely the atmosphere, the terrestrial environment and the marine environment.¹ These multiple resources can, in turn, be divided into two broad categories, namely stocks and flows. The stock of natural capital includes non-renewable resources, like minerals and fossil fuels; unconditionally renewable resources, like sunlight; and conditionally renewable resources, like soil, aquifers, forests and fisheries. Nature also produces an extraordinary diversity of what are often called 'ecosystem services'. These services are essentially flows or streams of goods and services. There are four main types: 1) *supporting services*, such as soil formation, water and nutrient cycling, and plant pollination; 2)

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provisioning services, such as energy, water, food, fibre and genetic resources; 3) *regulating services*, such as pest and disease control, water and air purification, carbon sequestration and climate regulation; and 4) *cultural services*, such as the opportunities for recreation, scientific discovery, education, spiritual refreshment and therapy.

Collectively, these ecosystem services sustain the planet's remarkable biodiversity and productivity. In so doing, they enable multiple forms of human flourishing. Importantly, too, ecosystem services are intricately connected and interdependent, with many complex feedbacks. Some of these have long-term, if not irreversible, effects. Hence, significant damage to one particular ecosystem service, such as the planet's system of climate regulation, can have harmful and enduring implications for many other ecosystem services, such as the rate of carbon sequestration, the productivity of ocean and freshwater fisheries or the survival of vital pollinators. Such negative feedbacks will, in turn, have deleterious impacts on intergenerational well-being. It is imperative for prudent environmental stewardship and long-term sustainability that we gain a better understanding of these sorts of effects, non-linearities and environmental limits.

The state of natural capital in New Zealand

How well is New Zealand managing its valuable and often unique forms of natural capital? Unfortunately, our environmental performance, as judged against a range of biophysical indicators (i.e. atmospheric, terrestrial and marine), is falling far short of the widely acclaimed aspiration to be 'clean and green', if not '100% pure'.² In many areas, in fact, the natural environment – in terms of both stocks and flows – is declining. By definition, this is unsustainable.

New Zealand has one of the world's worst records for loss of biodiversity and native habitat. In 2011, close to 800 native species were threatened with extinction, with more than 400 species in a critical state. This includes a significant proportion of freshwater fish, reptiles, marine mammal species, and bird species that breed in New Zealand. Nitrogen levels have worsened in the majority of monitored river sites in

agricultural areas, largely because of the intensification of dairy farming in recent decades. Similarly, soil erosion remains a serious problem, with the rate of soil loss annually about ten times the global average. Soil productivity is also being reduced as a result of the compaction caused by large dairy herds. Limited monitoring of the country's marine and coastal environments makes it difficult to assess trends, but there is no question that many coastal ecosystems have been degraded. The problems include marine pests, large inflows of nutrients, climate change, high rates of sedimentation, seabed dredging and trawling. Finally, the country's gross greenhouse gas emissions per capita increased by 23% between 1990

pressures, to constrain negative environmental externalities (whether through price-based mechanisms or regulations), identify acceptable thresholds and benchmarks, and impose safe biophysical limits;³

- poor environmental monitoring and a widespread lack, across multiple levels of government, of stringent environmental enforcement (Brown, 2017);
- a misalignment between land use planning and investment in infrastructure;
- a failure to give adequate attention to cumulative effects, interdependencies and path dependence; and
- the relative non-inclusion of natural

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and 2014 and are among the five highest in the OECD (OECD, 2017, p.20). Net emissions during the same period rose by over 60%, primarily due to high rates of deforestation and reduced replanting.

Many factors have contributed to this unsatisfactory state of affairs. Above all, there has been a tendency for decision makers over many decades to prioritise short-term interests over long-term interests, and a related propensity for a silo mentality or sector-specific considerations to prevail over more holistic, system-based approaches. Other related problems have included (see Brown et al., 2015; OECD, 2017):

- weak and indifferent environmental governance, including inconsistent, reactive and otherwise defective regulatory frameworks and a lack of proper ecosystem-based management;
- an unwillingness by policymakers, often in the face of powerful vested interests and short-term political

capital in critical strategic, planning and performance management frameworks – including governmental investment strategies, annual budgetary processes and national accounting regimes.

Policy principles and goals

How might these deficiencies be rectified? To start with, we need broader and more systematic frameworks for analysing policy issues and options, as well as more comprehensive ways of measuring progress.⁴ More specifically, any strategy for greater economic, social and environmental sustainability must, at a minimum, ensure that the quantity, condition and value of New Zealand's natural capital does not decline over time. This minimum requirement is consistent with the principle, based on the so-called Lockean proviso, that each generation should leave its successors with natural resources that are 'equally as good' as, or

at least in a broadly comparable state to, those which it inherited.

Interpreting such a principle, however, poses problems. For instance, should it apply to both non-renewable and renewable resources or only to the latter? Likewise, does it have implications only for the *aggregate* quantity and condition of natural resources (somehow assessed) or does it apply to each and every distinct kind of natural capital, including individual species and ecosystems? Among the many issues at stake in this regard are the extent to which different types of natural capital are readily substitutable (including being substitutable for other types of capital), what unit of measurement should be

that 'the aggregate level of renewable natural capital should be kept at least constant, and there should be *general* capital compensation for the depletion of non-renewables' (ibid.). Under the latter rule, it would be legitimate to compensate for the extraction and use of non-renewable resources through investments in other forms of capital (e.g. human or manufactured capital). Both rules would require significant changes to current policy settings in New Zealand, the former more so than the latter.

Second, a good case can be made that it would be incompatible with the requirement for each generation to leave its successors with natural resources that

Weiss, 1989) This would entail repairing, wherever technically feasible and affordable, the environmental damage inflicted by previous generations and thus improving the overall condition of the country's natural capital across multiple types and domains. In so doing, we would become probably the first generation in history to leave the natural environment in a better, rather than worse, state.

Policy implications – how to make things better

How could such an ambitious goal be realised? What kinds of policy and regulatory reforms might enable New Zealand to lift its environmental performance in a durable manner, and thus leave a lasting positive legacy?

There is no silver bullet. The challenges facing policymakers are large, multiple, deeply rooted and urgent. The pursuit of wise environmental stewardship is beset with deep uncertainty, complexity, path dependence, interdependencies and various incommensurable goods, and poses difficult intragenerational and intergenerational trade-offs. Moreover, in the context of global climate change, ocean acidification and large-scale biodiversity loss, New Zealand lacks full control over its environmental destiny. In such circumstances, an effective governmental strategy for sustainable development, including betterment where possible, must be systematic, multi-pronged yet adaptive, with sufficient flexibility to cope with unexpected contingencies.

There are doubtless many ways to improve long-term environmental outcomes in New Zealand.⁵ Among these are: better enforcement of existing rules; new legislation and policy instruments to promote the decarbonisation of the economy; amendments to resource management legislation to enhance proactive environmental stewardship; additional price-based mechanisms to incentivise cost-effective efforts to reduce negative environmental externalities; extra public funding to support major conservation initiatives, such as the goal of a predator-free New Zealand by 2050; new public-private partnerships and collaborations, including better ways to tap voluntary contributions and effort; and

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employed and hence what constitutes the appropriate level of disaggregation, what is meant by a 'broadly comparable state' and hence what forms of compensation for losses are acceptable, and how biophysical thresholds should be set and the related risks assessed.

These are complex matters and there is not the space to explore them in detail here. Several brief points must suffice. First, in terms of protecting aggregate stocks of natural capital, the economist Dieter Helm has proposed two possible policy rules. The first, and stronger, rule would require that 'the aggregate level of renewable natural capital should be kept at least constant and the value of the economic rents from the depletion of non-renewable natural capital should be invested in renewable natural capital' (Helm, 2015, p.64). This would imply that all surplus revenues from the extraction of minerals and fossil fuels should be used to restore and improve renewable natural assets (e.g. forests and wetlands). The second, and weaker, rule would require

are 'equally as good' to focus exclusively on protecting *aggregate* capital stocks, such as the total quantum of all types of renewable resources. This is because each and every form of natural capital has a distinctive value and most forms are non-substitutable. On this argument, therefore, replacing one type of renewable natural capital (e.g. fish stocks) with a totally different type (e.g. additional forests) would be unacceptable. Rather, the full range of species and ecosystems (and the many services they provide) must be protected.

Third, irrespective of how a requirement to preserve existing stocks of natural capital is interpreted, a more demanding and ambitious goal is worth striving for. After all, since human settlement in New Zealand there has been widespread environmental degradation and destruction. Hence, mere preservation or maintenance of what remains is not sufficient. Instead, the nation's goal should be *betterment* – that is, *renewal*, *restoration* and *regeneration* (see, for instance, Brown

new funding instruments to facilitate equitable and effective adaptation to the impacts of climate change, especially sea level rise.

Yet while policy reforms of this kind are desirable, arguably broader, more profound changes are needed, not just in policy terms but also in relation to public attitudes and ethical norms. Above all, there must be a transformation in humanity's understanding of its relationship with, and dependence upon, the natural environment and hence a radical shift in how nature is valued and treated. Consistent with this, consideration of natural capital and ecosystem services must move from being largely marginal, optional or residual in human decision making, whether governmental, corporate or individual. Instead, sound environmental stewardship must occupy a pivotal place in our economic, social and political institutions, including all relevant decision-making frameworks, systems and processes. In other words, nature must be fully 'embedded' in the societal norms, intellectual 'infrastructure' and information systems that govern our collective and individual decision making. This includes our conceptual and analytical frameworks, measurement and reporting systems, public and corporate systems of accounting⁶, and performance management systems.

A strategy of embeddedness

In practical terms, pursuing a 'strategy of embeddedness' has at least four implications. First, it means improving the range and quality of the information available to voters, investors and policymakers about environmental performance and the likely impacts of their choices on natural assets and ecosystem services. This will require additional investment in research, monitoring and evaluation. Second, it means devising more open, transparent, deliberative and accountable decision-making arrangements, ones which ensure that the environmental consequences of decisions (including the failure to make decisions) are more readily apparent. Third, it means enhancing the ecological awareness and knowledge of citizens and decision makers through better and more extensive educational programmes. This must include a clearer understanding

of the wide range of nature's stocks and flows that provide humanity with benefits. Finally, and perhaps most fundamentally, a strategy of embeddedness means changing societal preferences so that nature is perceived differently and valued more. This must include a proper recognition of nature's current and future *use value*, as well as its *non-use value* (e.g. its existence value and bequest value). Collectively, these use and non-use values constitute the 'total economic value' of nature. Too often, however, the full value of nature is not recognised. What is needed, therefore, is an ethical transformation – or what Pope John Paul II once called an 'ecological conversion'. This implies not simply the provision of more and better information

Both these tasks constitute formidable undertakings, conceptually, analytically, ethically and practically. They will doubtless take many years to design and complete. But the scale of the challenge provides no grounds for despair or delay. While the aim must remain ambitious and bold, there is nothing wrong with starting small, and moving forward methodically and incrementally until the tasks are eventually complete.

A natural capital approach

In brief, a 'natural capital approach' entails constructing a systematic framework for measuring, monitoring, reporting, valuing and accounting for natural capital. This means, among other things, measuring

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about the natural environment, but also a profound normative shift and a reprioritisation of individual and collective goals.

From a policy perspective, there are various ways to pursue a strategy of embeddedness. Two broad proposals are considered here. The first is to develop and implement a so-called 'natural capital approach' to sustainability and the integration of this approach comprehensively across all budgetary and regulatory processes, preferably within both the public and private sectors. The second proposal is to enact a statutory requirement for governments to prepare periodically a detailed, integrated, long-term plan to maintain and improve the nation's natural capital and enhance environmental outcomes. Ideally, such plans should be formulated via strongly participative and deliberative processes, with a high degree of community engagement.

natural capital (i.e. in terms of its physical extent and condition, as well as its monetary value) and establishing stock and flow accounts. To design and implement a natural capital approach comprehensively and holistically would require many separate actions. These could include:

- enhancing the current regime of environmental reporting under the Environmental Reporting Act 2015, including the development of a more comprehensive set of performance indicators and a risk register for all vulnerable and threatened forms of natural capital;
- incorporating natural capital more explicitly and fully into the annual budgetary process in central government, including the preparation of commentaries for the *Budget Policy Statement and Fiscal Strategy Report* outlining the expected impacts of planned

- budgetary changes on the stocks and flows of natural capital;
 - incorporating natural capital into the Treasury's four-yearly *Investment Statement*, with explicit analyses of: a) how natural capital contributes to current and future well-being; b) the relationship between natural capital and other capital stocks, including issues of substitutability; and c) whether, and by what means, the government's planned long-term investment programme will meet the goal of maintaining and enhancing the quantity, condition and value of the country's natural capital;
 - gradually incorporating natural
- taxing more fully the depletion of all non-renewable natural assets (i.e. minerals and fossil fuels) and establishing a national wealth fund that can contribute to the restoration of depleted or degraded renewable natural capital and the protection of biodiversity.

There is not the space here to reflect in detail on each of these initiatives. But some brief comments on the idea of natural capital accounting – which is perhaps the most complex and controversial of the suggested changes – may be helpful.

The idea of natural capital accounting is not new. Much analytical work has been undertaken over several decades.⁷ New

Bank launched an international partnership in 2010 to advance natural capital accounting. Known as Wealth Accounting and the Valuation of Ecosystem Services (WAVES), the partnership involves a growing list of developed and developing countries. The aims of WAVES include the implementation of accounts that are relevant for policymaking, the development of methodologies for ecosystem accounting, and the provision of training and knowledge sharing.

Various governments have started to employ the methodologies for measurement and valuation enshrined in SEEA to prepare accounts of their natural capital. In Britain, for instance, the Office of National Statistics committed in 2012 to producing a comprehensive set of national natural capital accounts by 2020. This includes developing eight broad habitat accounts, as well as monetary estimates for the value of the country's aggregate natural capital. Significant progress has been made in recent years. New Zealand has yet to make a similar formal commitment. Nevertheless, since the early 2000s Statistics New Zealand has undertaken various analyses of natural capital accounting and produced a series of environmental accounts for specific resource stocks, drawing on the SEEA framework. Recent releases include: fish monetary stock account (1996–2016); forestry physical stock account (1995–2016); forestry monetary stock account (1995–2016); and water physical stock account (1995–2014).

Plainly, efforts to quantify, assess the condition of, and place a monetary value on different types of natural capital, together with the ecosystem services they provide, face formidable challenges. Putting a price on nature is inherently problematic. There are many different methodologies for assessing the value of non-market goods and services (including their use and non-use value), and these can generate very different valuations. Accordingly, all estimates must be treated with caution. At best they can only ever be indicative, not definitive.

There is also room for caution about the political and policy impacts of having better data on trends in natural capital (or, indeed, wider estimates of a nation's 'comprehensive wealth' incorporating

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- capital into the Crown accounts, as part of a wider strategy to develop more complete assessments of the nation's 'inclusive' or 'comprehensive' wealth. This will entail the eventual creation of a national balance sheet reflecting the value of New Zealand's natural assets, estimates of the depreciation of these assets (to the extent that such depreciation occurs), and a corresponding redefinition of how income and savings are measured in the national accounts;
- ensuring that ecosystem services are properly identified, quantified and valued, and taken into account in all planning and resource management decisions;
- promoting natural capital valuation, accounting and reporting in the private sector, in recognition of the fact that a significant proportion of the country's natural capital is privately owned and managed; and

accounting standards for the development of natural capital accounts (also known as environmental accounts and natural resource accounts) have been agreed internationally via the United Nations Statistical Commission and have been enshrined in the UN System of Environmental Economic Accounting (SEEA). The SEEA framework embraces a rigorous regime of concepts, definitions, classifications and accounting rules designed to enable the production of authoritative, comparable, consistent and reliable statistics on environmental performance and to facilitate the integration of economic and environmental statistics.⁸ The accounting structure adopted is broadly consistent with the System of National Accounts that is used to generate GDP data. Under the SEEA framework, more detailed advice has been developed to guide accounting for specific resources or sectors, such as energy, water, fisheries, agriculture, land and ecosystems. Alongside the SEEA framework, the World

other forms of capital). Admittedly, some researchers are optimistic. Kirk Hamilton and Cameron Hepburn, for example, believe that a more rigorous and comprehensive asset-based approach to governmental accounting could help transform how governments and citizens think about progress. In so doing, it could alter how policy options are assessed and change intertemporal preferences. In particular, it could increase public pressure for longer-term wealth-enhancing policy initiatives, including greater investment in natural capital, rather than short-term income-boosting measures. To quote Hamilton and Hepburn:

If wealth numbers were widely available ... they would be used, and they would provide us with a key tool in tackling a whole host of intertemporal and intergenerational problems, ranging from infrastructure provision, investment in education and innovation, and addressing environmental problems such as biodiversity loss and climate change ... Country wealth rankings, or ranking of changes in wealth, may shift the focus away from short-term consumption and towards long-term investment ... People might tolerate lower levels of consumption today if it is clear that this is to generate wealth, and thus higher consumption, in the future. In short, focusing on wealth might lead to greater investment in human, social, and physical infrastructure, innovation, and the maintenance of underlying productive asset bases, including natural capital, and greater long-run welfare. (2014, pp.2, 4-5)

These hopeful expectations may be correct. Having robust and comprehensive natural capital accounts – and ultimately even broader measures of comprehensive wealth – could result in elected officials, policy advisers, financial markets and citizens viewing economic performance and societal progress differently. The ‘economy’ would be seen through a different and broader lens. In particular, changes in the nation’s assets – such as declining stocks of natural capital – would

be given a sharper focus. In this way, both the current state of affairs and the implications for the future would be made clearer and more concrete. The so-called *availability heuristic* is relevant here (Kahneman, 2011). Hence, policymakers would be under greater political pressure to take corrective measures and make more prudent long-term investments. They would also be more politically accountable for their stewardship of the nation’s capital stocks, not just changes in GDP.

But various caveats are worth noting. Better measurement of capital stocks does not guarantee better management of resources or improved long-term

own to alter fundamentally citizens’ mindsets or governments’ policy preferences. Transformative change requires more than better national balance sheets. But such balance sheets should help rather than hinder the goal of sustainability.

An integrated, long-term environmental plan
Recent New Zealand governments have committed to several important long-term environmental goals (e.g. to be pest free and net carbon zero by 2050). They have also issued various national policy statements under the Resource Management Act covering specific areas of environmental

One option would be to follow the approach being adopted in Britain, which is currently formulating a 25-year environment plan based on the recommendations of the Natural Capital Committee (NCC) ...

governance. The data generated via the creation of natural capital accounts may neither be compelling nor attract much media or political attention. Alternatively, any worrying results may be contested. For one thing, the available data are always likely to be partial and incomplete. As noted, measuring natural capital stocks and ecosystem services is highly complex, with fundamental issues over the appropriate unit of measurement and what to include and exclude. There also remains extensive scientific uncertainty over where the critical thresholds lie for the long-term sustainability of many renewable resources. Hence, any measures of the current quantity or economic value of such resources may give little indication of their actual future viability. For another, the results generated will depend hugely on the methodologies chosen – not least what is included and excluded.

Hence, while developing national natural capital accounts has significant merit, such an exercise is unlikely on its

policy (e.g. relating to coastal management, urban development, freshwater management and renewable electricity generation). But New Zealand has never developed a comprehensive, integrated, long-term environmental plan covering all relevant domains and sectors. Having such a plan would provide an authoritative mechanism for devising, agreeing upon, and then enforcing a national strategy for environmental sustainability. And the process of drafting such a plan could furnish a unique opportunity for vigorous, in-depth public engagement, education, deliberation and consensus building.

Obviously, a long-term plan could take many forms. One option would be to follow the approach being adopted in Britain, which is currently formulating a 25-year environment plan based on the recommendations of the Natural Capital Committee (NCC) (which is an independent, expert advisory group to the government). As proposed by the NCC, the plan would have several distinct elements:

- a clear, understandable and ambitious national vision (e.g. to arrest the long-term decline in the natural environment, make 'a net positive contribution to the global environment' and demonstrate international leadership in sustainable management);
- specific goals covering multiple domains;
- explicit, measurable, evidence-informed targets and milestones;
- a strategy to achieve the plan's objectives; and
- a governance framework for allocating responsibilities, monitoring and reporting results, and ensuring accountability for outcomes.

The goals, for instance, could cover such things as air quality standards, freshwater quality standards, greenhouse gas emission reductions, access to local green space and recreation, protecting the habitats of threatened species, the sustainable management of soils, restoring contaminated sites, enhancing resource efficiency and reducing waste, and securing an overall net increase in natural capital (including both renewable and non-renewable resources). Alongside these goals, the NCC suggests the specification of a more detailed list of targets and the development of investment strategies to enable these targets to be met. In accordance with such an approach, the formulation and prioritisation of the specified investments in natural capital should be based on the best available scientific evidence and an explicit valuation

and accounting framework, with 'detailed institutional natural capital accounts' covering both the public and private sectors (as discussed above) (Natural Capital Committee, 2017, p.8).

If New Zealand were to follow this model, it would be imperative to give proper attention to the principles of the Treaty of Waitangi and mātauranga Māori. Careful attention would also need to be given to the question of substitution, namely the extent to which it is legitimate and desirable to substitute one form of capital for another (e.g. natural capital for manufactured capital or non-renewable resources for renewable resources). Plainly, too, any plan would need to be a living document, capable of iteration and updating in the light of changing circumstances and evidence.

Obviously, any attempt to develop an integrated, long-term environmental plan in New Zealand would be a major undertaking. It would require sustained, high-level political leadership, detailed coordination across numerous government agencies, an in-depth dialogue between national and subnational government, and deep engagement with interest groups, the business community and the wider public. Without these ingredients such an exercise is likely to falter and fail.

Conclusion

New Zealand needs an inspiring and ambitious national vision for the management of its extraordinary natural environment. At a minimum, such a

vision must include arresting the long-term decline of many of our natural assets and ecosystem services. Ideally, however, it would also embrace a commitment to a long-term strategy of betterment – that is, renewal, restoration and regeneration. To achieve such a goal will require new policy frameworks and tools, as well as a significant investment of time, effort and public resources. Such an investment will, in turn, require dedicated political leadership and a transformation of societal values and priorities. Is this possible? Future generations must surely hope that it is.

- 1 See, for instance, Helm, 2014, 2015; Helm and Hepburn, 2014; Natural Capital Committee, 2013, 2014, 2015.
- 2 See, for instance, Brown et al., 2015; Chapman, 2015; Joy, 2015; Ministry for the Environment, 2017; OECD, 2017; Parliamentary Commissioner for the Environment, 2017; Warren, 2014.
- 3 For analyses of the problem of short-termism in democratic decision making see, for instance, Boston, 2017a, 2017b; González-Ricoy and Gosseries, 2016.
- 4 See, for instance, Au and Karacaoglu, 2015, Boston, 2017a, 2017b; Helm, 2015; Helm and Hepburn, 2014; Stiglitz, Sen and Fitoussi, 2009.
- 5 See, for instance, Ministry for the Environment, 2017.
- 6 See the article by Jane Diplock in this issue of *Policy Quarterly*.
- 7 See, for instance, Arrow et al., 2012; Gleeson-White, 2014; Hamilton, 2014; Hamilton and Hartwick, 2014; Hamilton and Hepburn, 2014; Sukhdev et al., 2008; Wentworth Group of Concerned Scientists, 2016.
- 8 Further analytical work has continued, including the development in 2012 of the SEEA Experimental Ecosystem Accounting (EEA) standards. These cover the measurement of the flow of services supplied by ecosystems, as well as the condition of ecosystems (i.e. their capacity to provide services). The SEEA EEA has yet to be adopted as a UN statistical standard.

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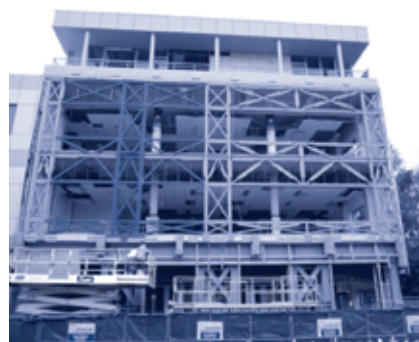
References

- Arrow, K. et al. (2012) 'Sustainability and the measurement of wealth', *Environment and Development Economics*, 3 (17), pp.317-53
- Au, J. and G. Karacaoglu (2015) 'Using the Living Standards Framework: update and policy examples', *New Zealand Journal of Sociology*, 30 (3), pp.27-40
- Boston, J. (2017a) *Safeguarding the Future: governing in an uncertain world*, Wellington: Bridget Williams Books
- Boston, J. (2017b) *Governing for the Future: designing democratic institutions for a better tomorrow*, Bingley: Emerald
- Brown, M. (2017) *Last Line of Defence: compliance, monitoring and enforcement of New Zealand's environmental law*, Auckland: Environmental Defence Society
- Brown, M., R. Stephens, R. Peart and B. Fedder (2015) *Vanishing Nature: facing New Zealand's biodiversity crisis*, Auckland: Environmental Defence Society
- Brown Weiss, E. (1989) *In Fairness to Future Generations: international law, common patrimony, and intergenerational equity*, Tokyo: United Nations University
- Chapman, R. (2015) *Time of Useful Consciousness: acting urgently on climate change*, Wellington: Bridget Williams Books
- Gleeson-White, J. (2014) *Six Capitals: the revolution capitalism has to have – or can accountants save the planet?*, Sydney: Allen & Unwin
- González-Ricoy, I. and A. Gosseries (eds) (2016) *Institutions for Future Generations*, Oxford: Oxford University Press
- Hamilton, K. (2014) 'Biodiversity and national accounting', in D. Helm and C. Hepburn (eds), *Nature in the Balance: the economics of biodiversity*, Oxford: Oxford University Press
- Hamilton, K. and J. Hartwick (2014) 'Wealth and sustainability', *Oxford Review of Economic Policy*, 30 (1), pp.170-87

- Hamilton, K. and C. Hepburn (2014) 'Wealth', *Oxford Review of Economic Policy*, 30 (1), pp.1-20
- Helm, D. (2014) 'Taking natural capital seriously', *Oxford Review of Economic Policy*, 30 (1), pp.109-25
- Helm, D. (2015) *Natural Capital: valuing the planet*, New Haven: Yale University Press
- Helm, D. and C. Hepburn (eds) (2014) *Nature in the Balance: the economics of biodiversity*, Oxford: Oxford University Press
- Joy, M. (2015) *Polluted Inheritance: New Zealand's freshwater crisis*, Wellington: Bridget Williams Books
- Kahneman, D. (2011) *Thinking, Fast and Slow*, London: Macmillan
- Ministry for the Environment (2017) *Briefing to the Incoming Ministers – environment and climate: making Aotearoa New Zealand the most liveable place in the world*, Wellington: Ministry for the Environment
- Natural Capital Committee (2013) *The State of Natural Capital: towards a framework for measurement and valuation*, report from the Natural Capital Committee, London: Natural Capital Committee
- Natural Capital Committee (2014) *The State of Natural Capital: restoring our natural assets*, second report to the Economic Affairs Committee, London: Natural Capital Committee
- Natural Capital Committee (2015) *The State of Natural Capital: protecting and improving natural capital for prosperity and wellbeing* London, third report to the Economic Affairs Committee, London: Natural Capital Committee
- Natural Capital Committee (2017) *Advice to Government on the 25 Year Environment Plan*, September, London: Natural Capital Committee
- OECD (2017) *OECD Environmental Performance Reviews: New Zealand*, Paris: OECD
- Parliamentary Commissioner for the Environment (2017) *Taonga of an Island Nation: saving New Zealand's birds*, Wellington: Parliamentary Commissioner for the Environment
- Stiglitz, J., A. Sen and J. Fitoussi (2009) *Report by the Commission on the Measurement of Economic Performance and Social Progress*, Paris: Commission on the Measurement of Economic Performance and Social Progress
- Sukhdev, P. et al. (2008) *The Economics of Ecosystems and Biodiversity: an interim report*, European Communities
- Warren, K. (2014) 'Evidence of resilience of New Zealand's capitals', internal Treasury paper, Wellington
- Wentworth Group of Concerned Scientists (2016) *Accounting for Nature: a scientific method for constructing environmental asset condition accounts*, Sydney: Wentworth Group



PUBLICATIONS



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