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Climate-compatible Development in New Zealand

Abstract

Like many countries, New Zealand is grappling with how to reduce greenhouse gas emissions while adapting to climate change. We are working through a Zero Carbon Bill and the implications of transitioning to a low-carbon economy. The country is being told it needs a more co-ordinated and effective way to prepare for climate change impacts, as local government is formulating adaptation and mitigation strategies in an uncertain and, as discussed below, at times confusing legal and policy framework.[1]

Potentially helpful is a concept evolving internationally, climate-compatible development. This promotes the idea of explicitly combining strategies and policies for emissions reductions and adaptation initiatives while enabling improvements in human well-being. This article explores the usefulness of such a concept for New Zealand.

Keywords climate change, adaptation, mitigation, local government

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Policy on reducing greenhouse gas emissions or offsetting them (mitigation) and adapting to climate change impacts has evolved separately in New Zealand. This approach is changing as the country considers legislation to reduce emissions (Ministry for the Environment, 2018), while clarifying what needs to be done to adapt (Climate Change Adaptation Technical Working Group, 2018), because impacts are already occurring (Ministry for the Environment and Statistics New Zealand, 2017).

A challenge is avoiding contradictory outcomes due to poor policy integration between adaptation and mitigation, while enhancing potentially complementary actions. Climate-compatible development aims to avoid clashes and contradictions within and between the economic, social and environmental sectors and create more effective outcomes (Bickersteth et al., 2017).

Climate-compatible development evolved as a response to climate change in developing economies. This influences the definition, assumptions and approach,

particularly its emphasis on social justice. The historical, cultural and governance framework is different for developed economies. Despite this, climate-compatible development might be relevant to New Zealand.

Climate-compatible development: the concept

The Intergovernmental Panel on Climate Change recognises that both mitigation and adaptation are essential for all countries (Klein et al., 2007). Mitigation focuses on reducing emissions of the range of gases contributing to enhanced climate change. Adaptation looks to reduce the impacts of climate change on human society and ecological systems. Impacts include, but are not confined to, more frequent and/or intense droughts and floods, enhanced coastal erosion and storm surges, the spread of pests and disease, reduced food security, and social disruption.

While mitigation is vital for reducing the probability and scale of future impacts, many climate change effects are now unavoidable and must be prepared for. The United Nations' Sustainable Development Goals, including eradicating human poverty and increasing equality, add another dimension to policy development (Granoff et al., 2015). A co-ordinated approach reduces the risk of undermining certain aspects of climate change preparation, or sustainable development (Locatelli et al., 2015; Kongsager and Corbera, 2015; Kongsager, Locatelli and Chazarin, 2016). Joint pursuits may create better or even synergistic outcomes (Bickersteth et al., 2017). For example, adaptation may build resilience for a mitigation strategy, which means it will last longer than otherwise (Locatelli et al., 2015). An example is changing agricultural systems to cope better with drought, and in doing so improving soil condition and so improving atmospheric carbon sequestration and storage. Knowing this shapes how the adaptation project is delivered.

From a broader view, pursuing mitigation will always improve adaptation strategies by reducing the scale of future impacts of climate change (Klein et al., 2007). However, there is difficulty attaching measurable benefit to marginal increases in mitigation, making local benefit–cost assessments difficult. Understanding this is important to ensure that policy evolution accounts for efficient and effective ways to manage climate change. It may be possible to take a global carbon budget approach (Le Quéré et al., 2017) whereby sources and sinks at different scales are cumulatively significant. Combined with estimated risk of significant impacts from exceeding global average temperature limits (Lehner et al., 2018), this adds weight to reducing emissions over adapting to effects. A manifestation of this is the January 2018 launch of the United Nations QUIAO Plan funding instrument for developing economies. The plan includes support for development initiatives that identify the climate mitigation and adaptation potential of ecosystems as part of climate action and nature conservation.[2]

Facilitating resulting trade-offs to minimise contradictions and take advantage of synergies will have policy and regulatory implications.

Policy integration

Climate-compatible development is similar in approach to that used for strategic environmental assessments. Strategic environmental assessment is a tool used to assess programmes, policies and plans from a strategic perspective, and preferably prior to implementation, in terms of their effect on identified environmental outcomes (Therivel, 2010; Paridário, 2012). From this perspective, climate-compatible development could be used to assess current programmes, policies and plans in terms of:

- how they account for climate change adaptation;
- how they account for emissions reductions;
- how they address cross-sector aspects of both adaptation and mitigation;
- what interim targets have been identified;
- the provisions for monitoring and reporting; and
- implications for not meeting targets.

Table 1 provides an example of what this process might look like, applying climate-compatible development to a hypothetical proposal to build 1,000 new homes on greenfield land. The objective is to identify policies, plans or programmes that potentially reinforce or contradict each other, and/or provide opportunities for other co-benefits. The issue of monitoring and accountability is not addressed here, as that requires analysis beyond the scope of this article. Much of the assessment will be after the fact: that is, once policies, plans or programmes are in place. Ideally, eventually, this should be done during the drafting of them.

Facilitating resulting trade-offs to minimise contradictions and take advantage of synergies will have policy and regulatory implications. Three examples of how these implications might be accounted for relate to transport funding, local government warnings to and restrictions on landowners relating climate change impacts, and the use of existing statutory processes to integrate both adaptation and emissions management.

Transport funding

The Government Policy Statement on Land Transport provides funding guidelines for achieving government transport goals. The New Zealand Transport Agency's economic evaluation manual provides procedures for funding applications to evaluate the economic efficiency of transport investment and assess alternatives. The current iteration of the Government Policy Statement on Land Transport (2018) shows a greater awareness of the emissions implications of transport than previous versions, and the 2016 economic evaluation manual introduced climate

Table 1: Climate-compatible development pillar identification matrix, modified from the work of Harkes et al., 2015. Black text is a positive and blue a negative trade-off

Intervention	Adaptation outcomes	Mitigation outcomes	Development outcomes	Co-benefits
Subdivision of 1,000 new lots	– Reduction in agricultural land for food production – Risk from any potential natural hazards in area increases OR – Reduced exposure if climate change impact projections accounted for in location	– High-density subdivision increases emission efficiency of land use – Opportunity to reduce emissions if build in energy efficiency – Urbanisation of green/natural space that could be used for carbon sequestration – Increased demand for driving	– New land available for development – New housing stock may reduce dwelling costs BUT – Higher up-front build costs for efficient housing	– Attach ecological enhancement requirements to consents for carbon sequestration and storage, biodiversity, and cultural and recreational values
Dwelling design and construction x1,000	– Designed for current and future climate change impacts OR – Fail to incorporate adaptation requirements, leaving houses exposed to hazards	– Sustainable design incorporated from outset: double glazing, insulation envelope, water tanks, solar to reduce energy OR – Follow current practice and fail to integrate such features	– Work for design, construction and real estate sectors and demand for building materials – Potential for investment in innovative sustainable housing designs and solutions	– Increase to Auckland housing stock: potential benefits in affordability – Quality homes and better public health
Transport: private vehicle, public transport, walking and cycling.	– Increased access reduces risk from natural hazards by providing exit strategies – Road access may induce further development in more exposed areas – needs to be accounted for	– From outset designed for better pedestrian and cyclist outcomes to help reduce emissions BUT – This may create 'sustainability ghettoes', where active transport occurs within a subdivision but driving is required outside it – Production/construction emit greenhouse gases and these need to be offset – Induced road transport increases emissions	– Work for road-building sector – Increased access across new areas – Generates demand for vehicle (motorised and non-motorised) sales and maintenance – Integrates with other public transport and action travel options – May generate more road traffic and congestion	– Active transport can improve population health and create demand for local goods and services
Underground infrastructure – electricity, water, wastewater, stormwater, fibre internet	– Increased capacity pre-built to account for demands of future climate change – Exposure to intruding groundwater or increased flooding	– Fibre internet creates opportunities to work from home, reducing need to drive	– More public assets – More opportunity to establish self-employment/small business and a flexible economy to help the transition to a low-carbon system	– Water-sensitive design minimises offsite stormwater flows, reduces pollution, and augments biodiversity and recreational and cultural values

change impact assessment procedures, which were absent from the 2013 manual.

Despite this, there is no mandated ability to link emissions implications with urban development generally, or resource consents for subdivisions specifically. An example is peri-urban development aimed at reducing housing costs which exposes purchasers to higher commuting costs. This compromises attempts to reduce emissions from transport. In addition, if, carbon prices rise subsequently (or in the case of Auckland, a regional fuel tax is applied), this imposes disproportionate extra costs on those who may have fewer transport alternatives.

If a cross-sector climate-compatible development-type approach were being taken, both the Government Policy Statement on Land Transport and economic evaluation manual would cross-reference to emission reduction targets, thereby enabling the New Zealand Transport Agency (which must give effect to the policy statement) and local government (which applies for transport funding using the economic evaluation manual guide) to include targets in any benefit–cost analysis. The result might be a need to subsidise the building of lower cost inner-city housing at a level that is in proportion to the assessed future liabilities of not meeting emissions reductions

targets. This could occur under the proposed Zero Carbon Act.

Local government warning about climate change impacts

As an adaptation example, courts have been clarifying what councils can and cannot include in land information memoranda (LIMs) or proposed plan changes in terms of warnings about, or avoidance of, climate change-exacerbated hazards. Essentially, councils can act cautiously and restrict activities as long as actions rest on sound evidence and are proportional (Iorns Magallanes, James and Stuart, 2018). But this is an ad hoc guide and there is a lack of certainty for landowners and councils.

Our own analysis of recent court cases suggests that courts reinforce a conservative (take no action) approach by regulatory authorities. This is because, in order to demonstrate negligence, landowners need to show that councils have a duty of care, that this duty was breached, and that the breach led to a particular impact. It has been very difficult to date for landowners to prove this in court (see *Resource Planning & Management Limited v Marlborough District Council; Monticello Holdings v Selwyn District Council; Weir v Kapiti District Council*).[3] It is argued that this is changing and that councils and insurers will end up with 'unexpected liabilities' in future (Storey and Noy, 2017, p.69). However, currently, councils wishing to be more proactive may end up attracting legal action by property owners concerned about the erosion of existing use rights. So it is a matter of weighing up current legal and financial liability against what might happen in the future, and when.

The above reinforces previous calls for clarity over how communities need to respond to climate change impacts (Parliamentary Commissioner for the Environment, 2015). It also raises broader issues of accountability. If councils (or governments) know of dangers, what responsibilities do they have for responding to them? We return to this below.

The role of the insurance industry needs to be clarified. Insurers need to work closely with councils to identify ways to reduce hazard exposure. A recent *Resilient Cities Report* notes that insurers are 'in a unique position to leverage and incentivise local governments to undertake appropriate preventive measures' (ICLEI, 2018, p.18) and co-design infrastructure with local government. The report notes innovations including 'resilience bonds', whereby insurers provide necessary financing liquidity to put in resilience measures such as flood barriers. As cities capitalise on savings from avoided disasters, insurance costs drop.

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Combining adaptation and mitigation

The final example of policy implications looks at the potential for combining emissions management and adaptation by conserving and enhancing coastal wetlands.

Globally, coastal wetlands reduce the probability of human-enhanced climate change occurring through carbon sequestration and storage, as well as providing coastal protection, which reduces the scale of climate change impacts.[4] Carbon sequestration and storage capacity is difficult to assess. However, using climate zone delineation based on global studies and species and habitat comparability, and making conservative estimates of the past and current extent of coastal wetlands, inferences can be drawn (Khodabakhshi, 2017). Auckland is used as an example.

Using a social cost of carbon[5] estimate of US$220 per tonne (Moore and Diaz, 2015), Khodabakhshi concludes that carbon sequestration and storage services of mangrove forests and saltmarshes in the Auckland region are worth about US$9.6 million per year. By extension, recent wetland losses are worth about US$4.4 million per year in terms of forgone carbon sequestration and storage services. Consequently, per hectare sequestration and storage benefits associated with individual parts of the Auckland coastline can be estimated. Notably, this would not include any benefits associated with protecting coastlines, terrestrial, estuarine or marine biodiversity, or water quality.

The benefits of wetlands for coastal protection are site-specific. Protecting assets by maintaining or enhancing coastal wetlands may be economically significant, depending on the value of the assets. On the other hand, wetland restoration may require removing coastal development, with associated direct costs, or, alternatively, ruling out certain development, with associated opportunity costs. Hence the value of protection will depend on the value of existing infrastructure.

If a development in a particular catchment could demonstrate benefits to coastal wetland protection or enhancement through either avoided reclamation, or direct protection, this could contribute to compensating for emission impacts of the development. This would be in addition to any protection (adaptation) benefits linked to the specific infrastructure being protected.

Difficulties arise as parts of the Auckland coastline that historically had sandy beaches now have wetlands, particularly mangroves. While this compensates ecologically, in part, for mangroves lost through such activities as reclamation, it creates tension due to local amenity and other ecosystem value losses. Mangrove management involves controlling catchment sedimentation rates

associated with changing land use – from native bush to forestry and farming, and urbanisation. Directly removing mangroves is a temporary solution. Debates on the proposed Thames–Coromandel District Council and Hauraki District Council Mangrove Management Bill capture this tension. Another significant technical challenge is that those shorelines most needing protection from storm surges may not overlap with areas that see coastal wetlands establishing.

Accepting these technical challenges, what is also required is a policy framework working across land use and aquatic systems. The National Policy Statement for Freshwater Management and the proposed Zero Carbon Act offer such a frame.

The 2014 National Policy Statement for Freshwater Management sets objectives and limits for freshwater quality and quantity standards to be achieved by managing land use at a catchment level through freshwater management units. Regional councils and unitary authorities must comply with these environmental bottom lines, and have the discretion to go beyond these minimums.

Achieving freshwater improvements in some catchments requires land use changes. This is in order to reduce the source of contaminants in the first place. In addition, improvements can be made through riparian planting and re-establishing or creating wetlands to filter out contaminants, along with other ecologically-based design features aimed at significantly reducing storm water run-off (Auckland Council, 2015). This opens up opportunities for riparian and wetland planting to also contribute to both climate change adaptation and mitigation, as well as biodiversity enhancement.

In terms of climate-compatible development, the National Policy Statement for Freshwater Management establishes a catchment-based system that particularly suits adaptation initiatives, where land use changes associated with development could be used to directly benefit adaptation within the same catchment. Contributing to adaptation is not required as part of the policy statement. However, if property owners and developers could earn extra credits for contributing to adaptation, this could provide additional incentives to improve ecological values.

While carbon sequestration and storage would benefit systems outside the catchment as much as within it, the additional dimension of earning carbon credits could further boost riparian and wetland enhancement. Credits could be used to help offset extra costs of undertaking such actions as fencing off and/or planting alongside waterways. Enhancing coastal waterways would contribute to improving water quality, while also potentially improving adaptation values.

The policy enabling this approach could result from the Zero Carbon Act. One option proposed during public consultation on the bill is managing short-lived (methane) and long-lived (carbon dioxide and nitrous oxide) greenhouse gases differently (Ministry for the Environment, 2018). If this was done, and depending on the price of carbon and the evolution of the New Zealand emissions trading scheme, the prospect of short-term (pine) and long-term (native) offset plantings may become a more refined process. This could lead to targeted planting meeting a range of sequestration and other benefits relating to, for example, erosion control and biodiversity goals.

Currently it is difficult for local government to implement initiatives to address emissions (Resource Management Act, ss 70A and 104E), due to the centralised New Zealand emissions trading scheme.

Limitations of climate-compatible development

The integrated approach of climate-compatible development demands a high level of specialised knowledge and resources to avoid costly mistakes (Locatelli et al., 2015; Kongsager, Locatelli and Chazarin, 2016). An intimate understanding of local conditions, including the views and wishes of the local people, is important (Leventon, Dyer and Van Alstin, 2015; Kongsager and Corbera, 2015). There remains the potential for adaptation and mitigation projects to clash, or development and climate change goals being at odds (Klein et al., 2007; Locatelli et al., 2015; Ficklin et al., 2017).

Equally, attempts are being made to combine science, policy formulation and community input. The Hawke's Bay Regional Council's approach to coastal management is an example.[6]

Currently it is difficult for local government to implement initiatives to address emissions (Resource Management Act, ss 70A and s104E), due to the centralised New Zealand emissions trading scheme. Equally, while local government is required to address adaptation (RMA, s30(1)(c)(iv)), to date there has been a reluctance to explore more long-term and revolutionary adaptation options. An unpublished review by Kate Scanlen, one of the authors of this article, established the extent to which provisions preparing Auckland for climate change were weakened between the original proposed Auckland Unitary Plan and the final version.

For climate-compatible development to work, it would be necessary to integrate climate change more thoroughly into risk assessment and benefit–cost analysis for development projects. At present, climate change is largely absent from this critical area, with the exception of hazard risk management. This process may not necessarily require approaching a project with the intention of making every action a mitigation/adaptation measure. Rather, decision-makers must ensure that actions do not undermine mitigation or adaptation goals, and aim to find potentially synergistic

climate-compatible outcomes at the most efficient cost.

The example of coastal wetlands illustrates this point. Other examples include using forestry to offset emissions while providing soil stabilisation and water collection to buffer against increasingly intense storm events; or using electric vehicles to reduce road transport emissions while contributing to an alternative electricity source. The latter would be part of creating distributed and renewable energy projects, contributing to avoiding emissions from the increasing use of gas- or coal-fired generation to meet population growth, while increasing energy supply resilience to increasingly damaging storm events. However, such apparent additional benefits require close scrutiny. For example, alternative energy production and distributed energy systems create significant challenges around integrating into the national grid.

Conclusions

Climate-compatible development collects together ideas and concepts that are not necessarily new. Its contribution is to emphasise the need to think about adaptation and emissions reductions as an integral part of economic development. In this context, we advance the following proposals.

- Legislation addressing mitigation and adaptation needs to be reviewed and aligned. It is anticipated that this will be done as part of reviews of the New Zealand emissions trading scheme and the proposed Zero Carbon Act.
- The question of liability needs to be addressed, in relation both to adapting to climate change impacts and meeting emissions reduction targets. The former currently sits with communities and local government, while the latter has been seen primarily as a fiscal risk borne by the state. An equity principle could be applied. Individuals and communities overtaken by climate change-related events need to be helped by wider society, given its contribution to greenhouse gases. In return, councils need to be protected from unwarranted legal action in order to avoid the 'chilling' of effective adaptation action. The associated principle is that individuals investing in assets known to be exposed to climate change-related hazards may not be eligible for compensation for either an impact, or a perceived loss of property rights due to council planning provisions.
- Insurance costs and availability will have a role in this process. For example, the insurance industry influences development pathways, and innovative arrangements could be made linking improved community resilience to climate change impacts to reduced insurance costs. Equally, the insurance industry can identify hazard exposure and generate a response more quickly and directly than policies or plans. Ensuring this is done in a co-ordinated way is important.
- In tandem, there should be stricter requirements on communities to reduce emissions. Failure to achieve reductions should be met by a required action to mitigate, including to offset emissions.
- An assessment of the emissions reduction and adaptation implications of all district and regional plans, and significant national policies, should be undertaken. This is in order to identify whether and how actions complement or contradict other actions. Where there is a contradiction, compensatory action should be identified.
- The last point reinforces the value of identifying co-benefits. The coastal wetland example demonstrates how ecological enhancement that improves ecosystem functioning in principle improves adaptation and mitigation, as well as creating economically sound investments. The latter comes about through reduced exposure to risks that are both physical (due to poor adaptation) and financial (emissions offset costs from exceeding allocations).

Finally, there remains the challenge of the resourcing needed for assessing ways to adapt and mitigate, as well as to monitor success. However, this challenge exists with or without climate-compatible development. More fundamentally, climate-compatible development's overt linking of mitigation and adaptation is within a framework that assumes that action can occur while still improving human well-being. As indicated in this article, such an assumption may no longer apply.

1 http://www.lgnz.co.nz/our-work/publications/climate-change-project-on-a-page/.
2 https://www.unsouthsouth.org/2018/01/13/united-nations-launches-qiao-united-action-plan-on-climate-change-and-conservation/.
3 *Resource Planning & Management Limited v Marlborough District Council* HC Wellington CIV-2001-485-814, 10 October 2003; *Monticello Holdings v Selwyn District Council* [2015] NZHC 1674; *Weir v Kapiti District Council* [2013] NZHC 3522.
4 Material in this section is summarised from Khodabakhshi, 2017 and Knight-Lenihan, 2017.
5 The social cost of carbon is the estimated price of the economic or social costs or damages caused by each additional tonne of CO_2 emitted, and has been commonly used to assess the benefits of climate change mitigation policies (Nordhaus, 2014).
6 https://www.hbrc.govt.nz/hawkes-bay/coast/coastal-hazards/.

Acknowledgements

This research was made possible by a University of Auckland Creative Arts and Industries Faculty Research Development Fund grant. The authors thank the anonymous reviewer's detailed and helpful comments.

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