Waterways
Centre for Freshwater Management

The relationship between community engagement in urban waterway management and community well-being

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TITLE: **The relationship between community engagement in urban waterway management and community well-being**

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Executive summary

The Waterways Centre for Freshwater Management was engaged by Christchurch City Council to review the published international literature on collaborative community management of urban water resources in order to: highlight the social, cultural, economic and environmental benefits that communities can derive from participation in collaborative management efforts; and present examples of monitoring frameworks or key indicators used to measure the contribution of such engagement and collaboration for community well-being.

In introducing the review it is noted that collaborative community management groups, which are proliferating internationally, have a variety of 'reasons for being'. These range from involvement in high level planning and decision making, to on-the-ground care taking and restoration, and many different roles in between. However the collaborative element of community engagement is seen to provide benefits across the groups involved, and the wider communities in which they are embedded, and from a brief review of research on collaborative management we see both normative and pragmatic arguments for its use.

A holistic framing of community well-being, encompassing social, cultural, economic and environmental dimensions was institutionalised in New Zealand's Local Government Act as part of local government's core purpose. However the definitions of these well-beings (often referred to as the 'four well-beings') are not provided by legislation, and individual organisations and local authorities must therefore develop their own interpretations. The efforts of different government ministries and departments to define different well-beings reveal that the concepts have considerable overlap and interdependence. Therefore this review adopts categories of benefit derived from a thematic analysis of the literature, which are in part normative and in part based on The New Zealand Treasury's 'Four Capitals' framework of well-being. Each category contributes to the 'four well-beings' in some way.

Collaborative management groups are widely assumed to have positive environmental impacts at different scales. However, research suggests that this is not to be taken for granted, and the environmental effectiveness of such groups in practice depends a wide range of contextual factors and characteristics of the groups and their roles. Therefore, while this review notes some reported environmental benefits from collaborative management groups, as the body of literature addressing this is very large and divided in its findings, these are provided primarily as context for the types of benefit communities themselves can derive. In relation to the benefits to the community three overarching categories emerged: human capital, social capital, and economic benefit.

We see evidence that mental and physical health are improved, and cultural identity is supported, both from participation in collaborative processes and from the enhanced local environment that may result from the projects involved. The technical knowledge of lay and expert participants alike is increased by participation, with positive spill-over effects for the wider community through both purposeful outreach and informal conversation. Personal capacity – e.g. in the form of communication, professional, and leadership skills – is also enhanced through participation. Together with health and technical knowledge, these benefits are seen to enhance human capital, in the sense of the ability of individuals' to interact productively and constructively in society. Social capital, or the ability of a group to

function effectively, is built on trust and networks of relationships, both of which are supported and developed in collaborative groups, and can help foster more resilient communities. The economic benefits of community collaboration are in most cases less direct, but can be enhanced by the development of transferrable skills and networks, or by new or enhanced business opportunities in the improved environment. On the other hand, participation and collaboration usually cost the participants in time, money, and/or labour, and this investment by the community should not be overlooked.

None of the literature reviewed specifically attempted to measure increases in community well-being as a result of involvement in collaborative environmental groups. There were nonetheless several worthwhile lessons to in relation to the community benefits of community collaboration and engagement. The first is that long term environmental impacts are not necessarily a good measure of a group's success due to the often considerable time lag between a group's activities and any observable impact. Furthermore, difficulties in attributing a certain environmental impact to the activities of a given community group are only compounded by such time lags. Instead, monitoring of intermediate measures is recommended, not only because recognising the 'small wins' can help to maintain the momentum of the group, but also as a means to track and report progress to funders or resource providers. Some studies used outputs such as activities completed, agreements reached, or knowledge gained as indicators of a group's success, and a much smaller number used economic measures such as property value increases. Other authors recommended measuring groups' structural or procedural characteristics, such as goal specificity or clarity, or how constructive their communications are, as indicators of adaptability and therefore sustainability. In seeking to assess outputs, or structures and processes, we also find that due to the subjective nature of many aspects of well-being (e.g. trust), participants' perceptions of a measure are often taken as an indicator of success. Participants' perceptions and experiences of collaborative groups are generally obtained by survey or interview methods.

The key conclusion and recommendation to emerge from this review is that collaborative environmental community groups do provide a range of social, cultural, economic and environmental benefits, therefore they should be supported by agencies normally responsible for environmental management. Almost every study reviewed provided recommendations for collaborative group success. In light of this, the following recommendations summarise key messages from the literature, and might inform agencies considering supporting such groups.

It is recommended that agencies supporting community groups provide:

- An experienced facilitator, who can assist in bringing clarity to goals, roles and processes, as well as to administrative tasks and coordination between parties;
- An extended time frame of support, sufficient at least to demonstrate (intermediate) measures of success;
- Flexibility in the goals they will support at the outset, and in allowing these to be adapted over time as needed;
- Appropriate funding for the project and facilitator.

Furthermore, it is recommended that agencies support groups which:

- Allow for the inclusion of all relevant stakeholders, but can include a selection of members to provide an initial pool of social capital;
- Pursue projects with:
    - A place-based connection with its members;
    - Goals for education and social aspects alongside environmental goals;
    - Hands-on activities.

Contents

1 Introduction

In recent decades there has been a rise in groups of community members taking on responsibilities for caring for their local environment, or co-managing environments or resources with local or central government. This is evidenced in the burgeoning number of case studies published on such groups in the international literature. The primary purpose of these groups can be wide ranging. At one end of the spectrum are groups primarily tasked with planning and decision making, for example co-governance groups such as the Greater Lansing Regional Committee for Stormwater Management (Michigan, USA), in which community members and government officials are jointly afforded a high degree of decision making power in creating and implementing a Watershed Management Plan (Rinkus et al., 2016). At the other end of the spectrum are groups whose primary purpose is closer to that of a caretaker, carrying out action on the ground, for example the Cashmere Stream Care Group (Christchurch, NZ) in which community members engage in activities like planting, citizen science, advocacy, or education centring around a single catchment or sub-catchment in the community's local environment (Opawaho Heathcote River Network, 2018). There is of course a wide range of groups with a variety of roles between those two examples, and much of the literature aims to identify which aspects of groups' membership structure or procedural characteristics contribute to its success (or lack thereof). For examples see Rinkus et al. (2016); Shandas and Messer (2008); Sommarstrom (2000). Within this body of work, however, the common thread that is seen to provide benefits for the community itself is the participatory, or collaborative, nature of these efforts to manage the local environment.

The Christchurch City Council engaged the Waterways Centre for Freshwater Management to provide a report highlighting the social, cultural, economic and environmental benefits to the community (i.e. contributions to the 'four well-beings') of collaborative community groups, and any frameworks or key indicators used to measure them. The following review therefore seeks first to provide a background on the basis of general discussion of collaborative management in the literature, and then to investigate the context set by the four well-beings. Discussion of the different types of benefit is then divided among environmental and community dimensions, with the community dimension further sub-divided according to human and social capital and economic benefits. The report then highlights insights from the literature about how to measure the success of a collaborative community group. Due to the sheer number of suggestions and recommendations found in the literature, only the major themes are identified here. The report closes with conclusions and recommendations for organisations considering why or how to support collaborative community groups.

1.1 Background: Collaborative management and community engagement

The literature around benefits of collaborative management makes both normative and pragmatic arguments for stakeholder and community collaboration (Reed, 2008). Focusing first on the pragmatic rationale for collaboration, many benefits are seen to arise from having a larger number of people working on an issue. Further, benefit is attributed to the involvement of local actors with local knowledge not usually available to remote experts or

state actors. Through a more complete understanding of the local context or problem situation, higher quality outcomes can be expected, which are more relevant to the local environment and socio-cultural values, and which are therefore more likely to endure (Reed, 2008). Collaboration can also foster more creativity in proposed solutions, as well as increase the uptake of solutions by creating a sense of ownership among participants (Reed, 2008). Beyond fostering uptake of certain practices or compliance with an agreed outcome, community collaboration can create new norms and expectations of achieving higher goals in areas both within and beyond the group's scope (Rogers & Weber, 2010). It can also prompt actors to do more on a voluntary basis (in part to avoid regulation) than regulation could actually enforce (Ritchie, 1997).

Normative rationales for participatory management tend to point to democratic values that may be enhanced through open, representative, and fair processes that vest control in those that have a stake in the issue at hand. Such benefits can also serve practical ends in many ways. For example, the increased legitimacy associated with a process or a group that is seen as having been conducted or organised in a fair and inclusive way, can contribute to the increased durability, adoption, and ownership of outcomes (Reed, 2008). Similarly, where a collaborative group process creates mutual understanding and acceptance of each other as individuals, as well as of the environmental issues at stake, it may foster higher levels of trust and a higher degree of agreement on solutions, also making the outcomes more likely to be effective (Muro & Jeffrey, 2008; Reed, 2008; Rogers & Weber, 2010). Social learning, which occurs where greater understanding of other participants and their perspectives leads to the transformation of (even previously adversarial) relationships to create new and productive ways of working together, has been found to emerge out of participation in collaborative groups (Ansell & Gash, 2008; Reed, 2008). Indeed, Muro and Jeffrey (2008) see social learning as a prerequisite to action for both individuals and groups, though they do note that it will not guarantee action, which also requires certain other conditions (see also Reed, 2008). Via social learning, and the new relationships and norms of interaction that it entails (Rogers & Weber, 2010), social capital is built up, and becomes available to the group members for purposes beyond the original scope of the project or initiative (Ritchie, 1997). Collaborative management also fosters human capital via the development of technical skills among participants and the co-generation of knowledge, which is just as relevant to the lay members of a group as it is to officials and 'experts' (Muro & Jeffrey, 2008; Reed, 2008; Rogers & Weber, 2010). Through this process, group members become empowered to use and share their knowledge, and this further builds trust between individuals and/or with departments or organisations involved (Cooper et al., 2008; Reed, 2008).

The body of literature on collaborative management, even when limited to the environmental context, is very large. The general background provided here is purposefully brief, as we focus below in greater detail on studies that have examined outcomes of collaborative community management of urban waterways. It is expected that while there may be some findings that remain particular to urban waterways, many will be more widely applicable to collaborative and community-based environmental management. The next section discusses the New Zealand context, against which we seek to consider potential benefits arising from collaborative urban waterway management.

2 The ‘four well-beings’

In 2002 the purpose of local government in New Zealand was laid out in the Local Government Act (2002) (LGA), as enabling communities to support their own environmental, economic, social, and cultural well-being. The social, cultural, and economic dimensions of community well-being were already embodied in the Resource Management Act since 1991 as part of the purpose of this environmental legislation and its definition of ‘sustainable management’ (RMA 1991, s. 5). What have been termed the ‘four well-beings’ were also incorporated into the purposes of the Civil Defence Emergency Management Act (2002), and the Greater Christchurch Regeneration Act (2016), and set the context for the National Policy Statement for Freshwater Management (2017). While the four well-beings were removed from the LGA in 2012 by the government at the time, they are currently at the Select Committee stage of being re-introduced (New Zealand Parliament, n.d.), and therefore constitute a relevant framework within which to consider the community benefits of collaborative management of urban waterways.

While relevant, the framework is not simple, largely because it lacks clear definitions of each of the well-beings. None of the legislation that uses the terms provides a definition for them, so organisations have had to develop their own interpretations. The Ministry for Social Development (2016) includes indicators of social well-being that cross human capital, social capital, and economic benefit. The Ministry for Culture and Heritage (n.d.) defines cultural well-being as “the vitality that communities and individuals enjoy through: participation in recreation, creative and cultural activities; and the freedom to retain, interpret and express their arts, history, heritage and traditions”. The Ministry’s definition does not relate specifically to Māori culture, but rather pertains to all cultures, which is in line with the thinking of Dalziel et al. (2006) and Smith (2018), where support for Māori cultural needs is a significant factor in the New Zealand context given the Treaty of Waitangi relationship, but where New Zealand is also seen as a country of immigrants whose cultural expression also needs to be provided for. The Treasury (2018) departs from a purely economic view of well-being, to develop a Living Standards Framework, which encompasses human capital, social capital, natural capital, and financial/physical capital.

What the range of work on well-beings makes clear, and which constitutes a second key reason for difficultly in using the four well-beings framework, is that the well-beings are highly interdependent and overlapping. For example, there has been much discussion of how cultural well-being should fit into a well-being framework, but as Smith (2018) notes, it overlaps significantly with both human and social capital, thus in Treasury’s four capitals framework it is not included as a separate capital, but rather aspects of cultural well-being are specifically referenced in their description of social capital, and it can be inferred in the physical and mental health aspect of human capital.

Given the difficulties in applying the four well-beings framework in a straightforward way to collaborative groups, the discussion below is organised according to categories that have emerged from the analysis of benefits described in the literature. First, a distinction is drawn between environmental benefits and community benefits, wherein the former are seen as benefitting the environment itself, which is perhaps closer to a normative view of the environmental well-being concept. In relation to community benefits, the concepts of human capital, social capital, and economic benefits are used to organise the discussion, and the

conceptualisation of human and social capital largely follows The Treasury's approach. Human capital is used to capture the attributes and characteristics of an individual that allow them to participate in society (The Treasury, 2018). The greater depth and/or breadth of human capital a person has, the more broadly they will be able to participate in civic life. This includes the physical and mental health of community members, their technical competencies, and their interpersonal skills. While human capital is about the individual, social capital is about the relationships between people and the norms and values that underpin them (Curtis, 2003; The Treasury, 2018). Finally, a normative view of economic benefits is applied, which is likely close to that intended by the economic well-being category of the four well-beings.

These categories relate to the four well-beings approach as articulated in the Local Government Act, and align with practice at the local government level. In particular, there is considerable overlap between the categories, the four well-beings, and the Christchurch City Council's 17 Community Outcomes[1]. Table 1 shows the community outcomes set by Christchurch City Council, grouped by strategic theme.

Table 1: The Christchurch City Council's community outcomes grouped by theme

Strong communities	Liveable city	Healthy environment	Prosperous economy
Strong sense of community	Vibrant and thriving central city, suburban and rural centres	Healthy waterways	Great place for people, business and investment
Active participation in civic life	A well connected and accessible city	High quality drinking water	Equitable economy with broad based prosperity
Safe and healthy communities	Sufficient supply of and access to a range of housing	Unique landscape and indigenous biodiversity	A productive, adaptive and resilient economic base
Identity through arts, culture, heritage and sport	21st century garden city we are proud to live in	Sustainable use of resources	Modern and robust city infrastructure and facilities
Valuing the voices of children and young people			

Source: Reproduced from Christchurch City Council (n.d.).

The concept of social capital, as defined here in terms of development of networks and relationships, clearly aligns with the goal of a 'strong sense of community', which would support social and cultural well-being. Both social capital and human capital built up through collaboration and engagement in local environmental groups – such as through the development of personal skills and capacities in leadership, and competence in engagement with authorities – would directly foster increased 'active participation in civic life', again

[1] https://ccc.govt.nz/the-council/how-the-council-works/20182028-vision/community-outcomes/

supporting social and cultural well-being. These two well-beings would be further enabled by the development or reinforcement of a local sense of place, which would directly support the 'safe and healthy communities' and 'identity through arts, culture, heritage and sport' outcomes. Social well-being would be enhanced by the 'valuing the voices of children and young people' outcome, and the systems leading to the sense of control and fairness identified as health benefits would be an avenue for the youth voice.

Alongside direct environmental benefits, the development of human capital and the application of the technical competencies acquired in the process, would likely influence each of the Healthy Environment themed outcomes, and thereby shape environmental well-being. Human capital and skill development can however also contribute to economic well-being by increasing participants' base of employment-relevant skills, and so support the 'productive, adaptive and resilient economic base' outcome. This outcome would further be served by the development of skills and problem-solving capacity, and adaptive learning at the level of individuals and the community.

In summary, the overarching categories of community benefits that have emerged from the literature review – human capital, social capital, and economic benefits – support the principles underpinning the Christchurch City Council's approach to community well-being as articulated in its 17 Community Outcomes, as well as the four well-beings approach that informs the Local Government Act and other legislation. While these do not correspond on a 1:1 basis, this is to be expected given the interrelated nature of the concepts. The review therefore presents perspectives and evidence from the literature that should help decision-makers to connect the activities of collaborative community environmental groups to environmental benefits and community benefits that support existing goals and principles.

3 Benefits from community engagement in urban waterway management

In searching for evidence of benefits specific to community groups' engagement and management activities around urban waterways, the literature was reviewed through a keyword search in the Scopus database[2]. The abstracts of peer-reviewed articles were screened to arrive at a shortlist of 112 results. Each paper was then reviewed in more detail for relevance. Additional references from the papers were also consulted where applicable, producing a final list of 156 papers that were reviewed. Assessment of these yielded a final sample of 96 papers, which were found to have particular relevance to the topic, and are discussed below.

[2] The search string used was as follows: (urban AND water* AND particip* OR collab* AND communit* OR partnership).

3.1 Environmental benefits

Much literature focuses on whether any tangible environmental improvement can be attributed to collaborative management efforts. Most of the evidence in relation to this question exists in the form of specific case studies. For example, Sommarstrom (2000) estimated that 12 of the 14 projects they surveyed were 'clearly' or 'likely' to have brought about positive changes in the environment with respect to restoring salmon supporting capacity. Scott (2007) cites improved water quality as a result of community group efforts around the Tamaki Estuary in Auckland, and Ramires Junior et al. (2015) found a link between the number of community leaders taking action, and lower biochemical oxygen demand (a measure of pollution) in their local waterway. There is a commonly held view, however, that while collaborative groups can make important gains, they also tend to avoid the most difficult and controversial (and often most important) environmental issues. Despite this, Leach et al. (2002) found that the collaborative groups they studied both acknowledged the key problems in the catchment as management priorities, and dedicated the most effort to those problems. A large-N study conducted by Scott (2015, N=357 catchments) in the US concluded that the activities and input into planning from collaborative groups did not result in any deterioration in environmental parameters, and confirmed that collaborative groups can have positive environmental impacts.

While the question of how collaborative groups can benefit the environment is of interest to researchers and policy-makers, and some studies have attempted to measure environmental impact (see above), the relationship is a very difficult one to evaluate, and so the number of such studies is limited. Therefore, in this review the primary focus is on what benefits communities themselves gain from collaborative environmental groups and management processes. First, though, to put some context around the types of activities that community groups might become involved in, and the types of environmental benefits their activities might have, some key examples of environmental benefits are discussed here.

Ecological restoration in catchments, and in particular revegetation and planting of the riparian zone, is commonly studied (Hardy & Koontz, 2010; Peters et al., 2015; Ritchie, 1997; Scott, 2007; Shandas & Messer, 2008). This is likely because urban waterways have tended to be channelised and riparian vegetation has been removed in the process of urban development. Wetland restoration is another focus of urban community group action (Davenport et al., 2010; Ritchie, 1997). Restoration efforts in both riparian margins and wetlands may include regular weed control including removal of exotic pest plants, such as the Japanese walnut in the Waikato region, which can also then promote a natural increase in native species flourishing (Peters et al., 2015). In some urban areas, community groups have been active in preventing land degradation and securing the preservation of undeveloped areas, which serves to protect valuable habitat (Hardy & Koontz, 2010). In other areas, protection of valued species is aided by community-led animal pest control (Peters et al., 2015). Where environmental issues arise as a result of aged or faulty infrastructure, such as obsolete stormwater and wastewater systems or other engineering issues, community groups have been effective in achieving environmental improvement via advocacy and lobbying at the local government level (Hardy & Koontz, 2010). More straightforward and ubiquitous issues, such as rubbish, can be directly targeted by the community group itself through simple clean-up actions (Peters et al., 2015). Development and enhancement of amenities around waterways may also be a focus of community group action, such as the

installation of a playground and amphitheatre (Thomsen, 2008), or creation of walkways to open spaces up to recreation and provide easier access for further restoration work (Peters et al., 2015). Community groups have also worked to promote and facilitate investment in decentralised infrastructure and green infrastructure, such as stormwater swales, eco-roofs, rain gardens, and rain tanks, which have helped reduce stormwater flows and contaminant loads to local waterways (Shandas & Messer, 2008; Thurston et al., 2010). Finally, various community/government partnerships are commonly involved in stormwater management planning at the whole catchment scale, but few studies have been able to extricate the environmental impact of the plan itself from the effect of other aspects of the collaborative planning and management process.

3.2 Community benefits

As discussed above, benefits to community members and the community as a whole are divided here into human capital, social capital, and economic benefit, and studies from the literature which detail improvements to each are described separately below.

3.2.1 Human capital

In examining how collaborative management contributes to strengthening human capital, three main themes emerge from the literature that relate broadly to people's ability to participate fully in society: human health; technical competencies; and interpersonal skills.

Human health

When urban waterways and the environments surrounding them are improved, community members' physical and mental health, which are increasingly understood to be closely interlinked, may benefit. Benefits can derive both from the act of being involved in improving the local environment, and from the tangible changes made to the environment insofar as these constitute environmental restoration or enhancements.

In a report on the benefits of the long-established Landcare groups in Australia, GHD (2013) found that through the groups' activities, participants had the opportunity to create a meaningful connection with their environment. Davies et al. (2011) described indigenous individuals' involvement in Landcare initiatives as providing an opportunity for them behave in a 'right and proper' way with respect to their communities and environment – i.e. in a manner consistent with their traditions and worldview, which reduced stress and mitigated associated negative health outcomes. GHD (2013) also noted that maintenance or re-establishment of a place-based connection facilitated by involvement in collaborative environmental initiatives can be of particular importance for indigenous communities in supporting their cultural identity. The exercising of kaitiakitanga (guardianship/stewardship) of natural resources by Māori in New Zealand is a way of maintaining mana (authority or prestige) (Blair, 2010), so is an important aspect of cultural identity for Māori. While collaborative community partnerships do not necessarily centre around the practice of kaitiakitanga specifically (as they often involve participants other than Māori), Ryks et al. (2014) found that even a limited increase in the level of inclusion in local government decision

making served as a reaffirmation of Māori values and identity, and in this sense community collaborations that partner and are co-designed with Māori may facilitate kaitiakitanga and enable kaitiaki.

Wessells (2010) described how physical labour, for which there is limited opportunity in modern urban environments, helps people to 're-place' themselves in new environments. Many urban residents therefore use recreation and leisure time to create a connection with their physical surrounds (Wessells, 2010). Restoration projects and gardening allow for physical work to be done in the environment which facilitates this 're-placement' and is also recognised as a generally restorative activity (Krasny & Tidball, 2009; Wessells, 2010). Furthermore, the creation of recreational spaces such as walking or cycle paths allow for increased recreation thus facilitating a connection to place. Indeed, Yamashita et al. (1992) found that people who took part in urban river enhancement projects themselves then made more use of the area for recreation and amenity.

Several case studies have also noted the transformation of some urban areas such that crime is reduced and sense of safety enhanced, and an attractive environmental space with facilities for cultural and social expression is created that contributes to a safer feeling in the neighbourhood or community overall (Scott, 2007; Thomsen, 2008). Maas et al. (2006) identified that the more green space that is available to urban residents, the more people perceive themselves as healthy, and that this correlation is strongest for the younger and older age groups, and lower socio-economic groups. Corroborating this, Ward Thompson (2011) finds from a review of perceptions of green space across centuries and cultures, that it is consistently associated with mental and physical health benefits. While collaborative environmental groups and projects in the urban water environment often involve the green spaces surrounding waterways, and therefore are likely to realise benefits through restoration and interaction with green space, White et al. (2010) found the effect of 'blue space' (i.e. water-based features in the built environment) to be even greater than green space with respect to participants' preferences for landscapes. In their review of the emerging field of health benefits of blue space, Völker and Kistemann (2011) identified benefits ranging from spiritual connection, to relaxation from a stressed state, to social and recreational opportunities. A range of human health benefits can therefore be expected to arise from improvements made to urban waterways, encompassing restoration and enhancement of both green and blue space.

Collaborative groups and processes may provide a forum for building mutual respect and understanding, and therefore for avoiding, defusing, or resolving conflict. Some collaborative initiatives are even set up with specific plans and procedures for resolving disputes (Hardy, 2010). Where these processes are open and transparent, participants are likely to feel that they are able to participate on an even footing and get a fairer hearing alongside opposing or competing interests (Lubell, 2005). Participation can be viewed as a means to reduce the risk of generating unfavourable outcomes for the participants (Ansell & Gash, 2008), and also as a way of being involved in decision making and action on a meaningful level, and thus providing a 'sense of control' and efficacy (Davies et al., 2011; Hassall & Associates Pty Ltd, 2003). As a forum that can achieve greater political power from the collective than likely from individual action, a collaborative group can also provide a means for marginalised communities to have a greater role and voice (Wessells, 2010). Engagement and collaboration in local environmental activities that increase people's sense of control, and wherein people

feel they have been able to participate fairly, is therefore conducive to improved mental health and well-being among members of the community.

This can be contrasted with the outcomes of some environmental improvement projects carried out without community input or engagement, such as the case of the River Alt in England, as discussed in Eden and Tunstall (2006). In this case an urban stream was daylighted in order to achieve certain environmental and amenity benefits and to deliver environmental improvement in these terms. However, as the community was not meaningfully engaged or involved, there was no opportunity for community concerns around access, safety, and crime to be addressed. The process was therefore found to have aggravated existing fears and heightened mistrust between two communities divided by socioeconomic factors, rather than to have provided a more pleasant or healthy physical environment.

Technical competencies

Education of the public is a common goal and often cited outcome of a wide range of collaborative management groups and processes (Hardy, 2010). Participants in collaborative groups have been shown to have gained knowledge of basic stormwater management strategies, and how stormwater impacts the ecology and quality of their local waterways (Herringshaw et al., 2010). In particular research has found an increased understanding of the diffuse nature of issues impacting urban waterways (Lubell, 2005). The direction of knowledge transfer is not restricted to flows from technical experts to laypeople, rather it can arise from exchange among any members of the group (Thomsen, 2008). Participants' learning may also extend to skills outside of the science/engineering arena, and include administration skills such as managing funding applications and reporting to meet project requirements (Scott, 2007).

An outreach approach to educate the wider community beyond the activities of a given management group is also common (Hardy, 2010; Hutcheson et al., 2018). For example, groups have created resources to communicate weed and pest control strategies to the wider community in New Zealand (Scott, 2007), and in Australia, shared indigenous knowledge via the compilation of an ecological field guide (Ens et al., 2016). In the Tuākana/Teina Water Warriors Project based in Christchurch, Callaghan et al. (2018) found that participants in this bi-cultural student education project based on local urban waterways had gained an understanding of the complementarities between mātauranga Māori (Māori knowledge) and western science. Education programs focused on urban watersheds, which were organised by a community collaborative management group and aimed at high-school students, were found to stimulate interest in environmental science and improve the students' perceptions of their ability in science (O'Connell et al., 2004). Intergenerational knowledge transfer has also been observed via discussions between parents and children about environmental education programs, and research finds that this is particularly likely to occur where the program had an action component (as opposed to being solely classroom taught) (Ballantyne et al., 2001; Curtis, 2003). Intergenerational knowledge exchange between elders and youth was also observed in the case studied by Ens et al. (2016), wherein youth were invited to accompany elders to the field to participate in biodiversity surveys.

Citizen science is another common activity carried out by collaborative community groups. For example, Peters et al. (2015) found that 282 of 540 community environmental groups in New Zealand were engaged in monitoring activities, requiring volunteers to learn and apply scientific monitoring skills. Because monitoring in itself yields no environmental benefits, research has mostly focused on whether or not the resultant data is of sufficient quality to make sound management decisions (for example see Coates, 2013; Cunha et al., 2017; Fore et al., 2001), and whether volunteer training and supervision is adequate to support them to provide high quality data (McGoff et al., 2017; Shupe, 2017; Zhang et al., 2017). However, aside from these specific implications, participants reportedly learn technical skills such as water and biodiversity sampling, testing, and assessment techniques, as well as gaining a wider understanding and appreciation of issues affecting the sites they sample and monitor (Church et al., 2018; Nicholson et al., 2002; Thomsen, 2008). Therefore, in this sense citizen science is often highly beneficial from a community educational perspective, regardless of potential uses for its data outputs.

Building interpersonal skills

There are several skills and capabilities that participants can develop through taking part in local collaborative groups and processes that do not centre around technical competencies so much as around interpersonal skills, often called 'soft' or 'professional' skills. Participants in collaborative environmental groups have been noted to have developed leadership capabilities (Scott, 2007), and of particular note is that this capability development has been seen in participants from otherwise marginalised groups such as women in rural communities via the Landcare groups in Australia (GHD, 2013). Leadership capability has the potential to be applied outside of the initial group setting, and this has indeed been observed in participants becoming representatives to other local organisations (GHD, 2013).

The collaborative process has been seen to foster adaptive learning approaches (Krasny & Tidball, 2009), and to thereby increase participants' capacity for problem-solving and decision-making (Hassall & Associates Pty Ltd, 2003). Tackling smaller projects and simpler problems therefore increases group learning and participants' capability of dealing with larger and more complex issues later (Shandas & Messer, 2008).

Participants learn how to work productively together through enhancing their interactions with each other, and this is as true for the experts who develop their ability to engage and interact with laypeople, as for the laypeople and community members who gain an understanding of the many and varied values and priorities of the wider community (Petts, 2006).

Participants also develop an increased familiarity with bureaucratic process, and an ability to interact effectively with bureaucracy, by developing self-organisation (Krasny & Tidball, 2009), a professional approach to finance and how to document key performance indicators for projects (Curtis, 2003), and the ability to find information and complete applications in accordance with specific criteria (Hassall & Associates Pty Ltd, 2003). All of this promotes the ability of groups and participants to 'pull-down' resources to achieve their goals (Curtis & De Lacy, 1996). A specific way of doing this is via advocacy, which is often acknowledged as a tactic and skill developed in these groups (Irvin & Stansbury, 2004). Peters et al. (2015) noted

in their study of community environmental groups in New Zealand, that many groups wrote submissions to government, and some even attended Environment Court hearings, and these activities were in some cases able to increase political leverage for their communities (Curtis & De Lacy, 1996).

3.2.2 Social capital

Social capital helps a community to function more effectively as a group. Collaborative groups therefore rely on social capital to some extent to come together and become active, and to produce successful outcomes (Curtis, 2003). However, collaborative processes themselves are commonly found to develop and strengthen social capital among the participants (Curtis, 2003; GHD, 2013; Krasny & Tidball, 2009; Reed et al., 2015), and in many cases this is an explicit objective of the group alongside their environmental aims (Peters et al., 2015). Social capital building relies on increasing trust, diversity, new networks and relationships, all of which collaborative processes have been found to foster (Bos & Brown, 2015; Hardy, 2010; Krasny & Tidball, 2009)

Networks and relationship building

The role of collaborative groups in building new networks among participants and beyond is a ubiquitous finding in the case study literature (for example see GHD, 2013; Rinkus et al., 2016; Ritchie, 1997). Indeed Korfmacher (2000) noted that in spite of having no funding, no authority to make decisions, and no clear vision, the local environmental group in their study generated new networks that were used to realise opportunities beyond the initial scope of the group. This extension of networks beyond the original mandate and purpose of a given group or initiative is a key to how strengthening social capital through community collaboration can build resilience in communities (GHD, 2013; Ritchie, 1997). Research has observed how relationships that have been built between communities and local government agencies have helped the community to achieve their goals and have greater influence in local decision making within and beyond the group focus (Curtis, 2003; Hardy & Koontz, 2010; Ritchie, 1997; Scott, 2007). But stronger and more extensive networks can also benefit local authorities and 'experts'. In one case studied by Hardy and Koontz (2010) a community partnership helped the government to achieve compliance with national stormwater regulations, and in the case studied by Ens et al. (2016), a partnership with indigenous land rangers facilitated access by university researchers to private land for research purposes.

Analysing social outcomes of collaborative research groups, Thomsen (2008) found that participants commented on the relationships, the people, and the diversity of both of these, as being major contributing factors in their interest and motivation in taking part in the group. Collaborative groups have been found to create links between community members who would otherwise have little or no contact (Scott, 2007), and in some cases have been seen to smooth interactions between traditionally very divided groups (Chakravarti et al., 2012), and create respect between groups subscribing to very different ways of knowing, such as western science and mātauranga Māori (Callaghan et al., 2018).

Networks formed and built up through collaboration may be formal, in the sense of the establishment of new arrangements and organisations among new constellations of actors to emerge out of a collaborative group process, or informal, in the sense of new personal connections or relationships among participants that might be called upon in future (Koontz, 2003). Collaborative processes do not only foster new networks, but may also help rejuvenate pre-existing networks by providing new purpose or focus and identifying new issues to address (Ritchie, 1997). Herringshaw et al. (2010) observed in their study of urban ecosystem restoration, that the collaborative group expressed an interest in a 'reunion' the year following the close of the group, which suggests that the network and relationships developed in the group were valued in a social sense rather than in a purely pragmatic and project-specific sense.

3.2.3 Economic benefits

It is likely that some economic benefit will accrue to communities through protection and restoration of urban waterways. Vallance and Tait (2013) estimated that developing the red zone around the Avon River in Christchurch could attract community food gardens, markets and festivals, cafes serving those using the area for recreation on and by the water, protect heritage plants, and provide a link to the Eastern suburbs, totalling a benefit of $131 per household per year, $50 million per year in avoided healthcare costs, and $8.8 million per year in avoided costs for flood and stormwater mitigation. There is a wealth of literature on the valuation of ecosystem services, which would be potentially relevant to approximating the full economic implications of urban waterway restoration and enhancement. As this review is focused primarily on the benefits communities can derive from collaboration and engagement, as opposed to from the actual environmental impacts of particular projects and initiatives, the ecosystem service valuation literature is not reviewed here (however for an entry point see Gómez-Baggethun & Barton, 2013).

In considering economic implications of participation in collaborative environmental groups and projects, it is evident that collaboration often actually ends up costing the participants in terms of time, money and resources, as they volunteer in various ways. GHD (2013) estimated that for every dollar invested in the Australian Landcare projects by the state, between two and five times more was leveraged from the community via their donations of funds, expertise, labour, or equipment. In a previous efforts in collaborative natural resource management in Australia, the National Heritage Trust required communities to match funds applied for to carry out improvement projects, but Hassall & Associates Pty Ltd (2003) found that the community actually provided between four and eight times the amount contributed by the Trust in cash and labour.

The main way participants and communities derive economic benefit from collaborative groups and processes is indirect, through the skills they develop in the human and social capital domains. While these are indirect, they are certainly not unimportant, and further research needs to be conducted to establish the value of these benefits. Scott (2007) did cite four cases of participants being offered paid employment as a result of the skills they developed through volunteering in collaborative projects, though in much of the rest of the literature it is simply assumed that increased human and social capital will have economic multiplier effects for communities (for example see Peters et al., 2015).

4 Measuring success

Success – in relation to collaborative processes and the activities of collaborative groups – is defined in a myriad of ways in the literature. Most case studies attempt to assess or measure success somehow, and it is clear that when there are multiple goals being pursued, there is a need for multiple measures to capture progress towards those goals (Leach et al., 2002). It is particularly evident in recent work to develop measures of well-being in New Zealand, that multiple measures are necessary. This has led to a 'dashboard' approach to well-being (King et al., 2018; Smith, 2018), wherein attempts are made to identify, measure, and monitor a suite of distinct indicators (Huppert, 2014). The international literature identifies two important themes in relation to the measurement of success of collaborative groups: the need for intermediate measures of success, and; the need for a distinction between measuring outputs and structures/processes.

4.1 Intermediate measures

While as Leach and Sabatier (2005, p. 240) claim, "[t]he ultimate measure of partnership success is the extent to which a partnership has improved the social and environmental problems in the watershed" it is also widely acknowledged that this is incredibly difficult to measure. It is indeed commonly understood that using environmental impact (i.e. the longer-term cumulative effect on the environment in, for example, improved water quality) as the measure of success for a collaborative management group is often unrealistic due to the extensive time lag between changes and expected improvements, the difficulties in obtaining sufficient monitoring data pre and post project, and challenges in attribution of causes over long time periods (Fien et al., 2001; Leach et al., 2002; Rinkus et al., 2016; Thorp et al., 2010). Even the writing of formal agreements to support restoration plans, themselves a possible indicator of future success rather than proof of impact, can take a long time. For example Leach et al. (2002), in their study of watershed partnerships in California, found that it took at least 48 months just for groups to develop restoration plans. Similar challenges arise with efforts to measure long term impacts on the community. For example, in the 44 cases studied by Leach et al. (2002), the median age of the watershed partnership was 46 months but, as the authors noted, hydrosocial change occurs over a much longer timescale than this.

As those funding and resourcing collaborative management processes and groups typically want to see demonstrable benefits in the short to medium term (Fien et al., 2001), most authors acknowledge the need for intermediate measures of success. Ansell and Gash (2008) describe the need to recognise small wins that build momentum for achieving larger goals, such as the completion of a joint fact finding mission where the information can be used to inform a restoration plan. They also acknowledge though, that small wins can be important in their own right, as they build what we have described above as social and human capital. Smith et al. (2016) echo the need to define short term environmental and social goals that build support for, and drive, further action in ongoing processes.

In the assessment of progress or success against both short term intermediate outcomes, and long term outcomes, researchers have used two broad approaches and sets of indicators, which seek to assess collaborative processes and groups according to (1) outputs, and (2) structures and processes.

4.2 Measuring outputs

As outlined above, this review is primarily concerned with understanding the community benefits that can result from both environmental improvements delivered through collaboration, and participation in the processes and practices of collaboration itself. Although, as noted above, these are difficult to measure or quantify, it is still relevant to consider what collaborative groups can achieve in terms of environmental outputs –even intermediate achievements that might be a foundation for further progress such as pest control activities carried out, or increased likelihood of stock exclusion being implemented (Chard, 2004; Curtis, 2003). To measure environmental outputs, Weber and Ringold (2015) propose metrics based on a thematic analysis of community interview responses around what contributes to a river being considered in 'good condition' – ecological features such as certain levels of flow and vegetation, presence of fish and other wildlife, human factors such as the presence of people and infrastructure for recreation, and the absence of odour, graffiti and rubbish.[3]

Leach and Sabatier (2005) defined the success of a collaborative management group in part by whether the group has actually implemented restoration or other projects, which as Leach et al. (2002) show, could also fulfil education or outreach functions within the community. Chard (2004) also noted that a collaborative group could consider itself successful based on projects implemented, such as environmental restoration projects, enhancements to amenities, or community education programs. Peters et al. (2015) found that three quarters of the nearly 300 New Zealand environmental groups they studied also had a social objective, such as providing advocacy services, increasing pride and cohesion in the community, or educating people. Therefore, assessing performance against a group's own objectives as a measure of success is likely to draw attention to measures of community benefit as well as environmental gains. These outcomes, however, still may not capture all of the wider (and often unanticipated) benefits to the community in terms of human and social capital development.

Examining outcomes beyond the specific objectives of a particular collaborative process, Bos and Brown (2015) measured program uptake in a reverse auction incentive scheme to promote the installation of stormwater mitigation devices on private property. To this end, they sought to measure a variety of outcomes, from the percentage of targeted properties that registered for the scheme, to the number of registered participants that actually bid and/or were successfully funded. Curtis (2003) also used participation rates as a measure of success, and asserted that higher participation led to higher on-the-ground achievement of objectives. However, their study also considered the representativeness of participants as a cross section of the community, and the variety of activities participants took part in, from tree-planting to attending meetings, to contributing to group goal setting. Hassall &

[3] 'Ecosystem services' valuation approaches have been widely used to assign value to the provisioning, regulating, supporting, and cultural services provided by ecosystems, in acknowledgment of the difficulty in evaluating the variety of benefits humans receive from ecosystems. We might expect therefore to see this approach used to assess the environmental outcomes of collaborative management groups. This approach is, however, not prevalent in the literature studying collaborative management of waterways, perhaps because it focuses on the benefits provided by the environment rather than by the collaborative process.

Associates Pty Ltd (2003) used a variety of participation measures as indicators of success, from memoranda of understanding as an indicator of the number and types of participants forming groups, to the number of groups that had successfully accessed funding.

Some studies have included economic valuations of collaborative group success, though they have tended to focus on the increased value of the improved environment, rather than attempting to assign a monetary value to augmented human or social capital. GHD (2013) and Shandas and Messer (2008) analysed financial resources leveraged from the community for project implementation, compared to the level of original funding provided. Another approach has been to estimate increased property values, and increased income from higher use of an area for recreation and tourism (GHD, 2013; Hazenberg & Bajwa-Patel, 2014; Mekala et al., 2015).

Attempts to measure the impacts of collaborative groups in terms of increases in the less easily quantified areas of human and social capital have also been made, though these studies tend to be based on responses to participant surveys or interviews, as opposed to data that is likely to be more readily available. Leach et al. (2002) surveyed participants about relationships formed, technical knowledge gained, and increased understanding of other's perspectives, in order to shed light on human and social capital benefits derived from the groups in their study. Herringshaw et al. (2010) also deployed a survey to measure increases in technical knowledge and human capital development through an urban restoration project. Thomsen (2008) found evidence of human and social capital building, through observation of increased development of technical and interpersonal skills, as well as relationship building through participation in community based research projects, as evidenced by interviews with group participants.

The existence, number, or extent of agreements produced by a process or a group has also been taken as an indicator of success. Such assessments have considered a wide range of agreements, ranging from simple commitments to meet to continue collaborating, to comprehensive plans with specific goals and binding conditions (Leach et al., 2002; Leach & Sabatier, 2005). Ansell and Gash (2008) observe that commitment to the process of collaboration is necessary for collaborative groups to yield beneficial outcomes. This suggests that the degree of agreement among group members on the purpose, structure and functioning of a group would be a predictor of the success of the group and its delivery of social and environmental benefits.

Finally, in assessing collaborative group outputs (rather than processes or structures), participants' perceptions are commonly drawn upon (Hardy & Koontz, 2010; Leach & Sabatier, 2005; Rinkus et al., 2016). Leach and Sabatier (2005) cite stakeholders' perceptions of project effectiveness as their third measure of group success – the use of a proxy for actual impacts being necessary due to the aforementioned difficulties in measuring impacts themselves. They conceptualise a network of relationships between factors that influence group success and outcomes, which is presented in Figure 1.

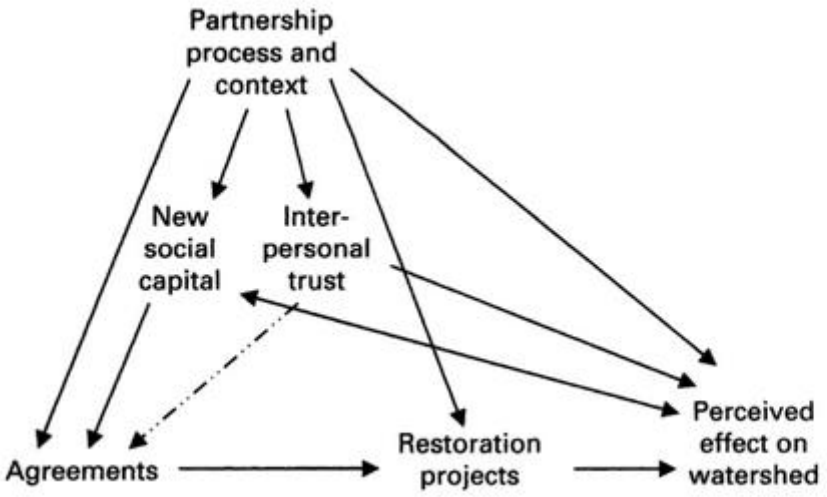

Figure 1: Relationships between factors influencing collaborative group success and outcomes. The dash-dot line applies mostly to groups that have been in existence for a longer period of time (Leach & Sabatier 2005, p. 255).

In Figure 1 the importance of agreements as an indicator of success (discussed above) is evident. Moreover, restoration projects, which may directly deliver environmental benefit, increase participants' perception of the group's efficacy. However, given that we are focused here on the human and social benefits of collaborative groups, the diagram is even more revealing in that it shows social capital, and the trust that contributes to social capital, alongside environmental outcomes and as contributing to participants' perceptions of success. Furthermore, Figure 1 depicts how perception can also indicate the level of social capital development in a group. The authors do warn of a halo effect, however, whereby the level of interpersonal trust and goodwill has more impact on participants' perception of the group's efficacy than the tangible environmental impacts delivered. While this can be seen as a factor to be wary of when gauging environmental outcomes, perceived effectiveness on the part of participants remains a valid indicator of social capital built within a group or through a process.

4.3 Assessing group structure and processes

Considering the underlying factor that Leach and Sabatier (2005) trace group success to (as per Figure 1), the structure and the processes a group follows have themselves been used as indicators of success by other authors. While Kenney et al. (2000) argue that in the end success of a collaborative group must be seen in terms of on-the-ground achievements, they do recognise that effective organisation and processes within the group are often necessary precursors to such achievement. Indeed Brinkerhoff (2002) argues that it is the process and structural elements themselves that should be evaluated, rather than a group's outcomes, because they predict the ability of the group to adapt to new situations and to keep producing outcomes in a sustainable way. They propose an extensive list of indicators to measure the success of a group by the efficacy of its processes and structure, ranging from articulation of a clear shared mission and values, to the existence and type of communication channels, to the balance of decision making power between parties. Sommarstrom (2000) based their evaluation of collaborative group effectiveness on the assessment of structure and function of groups via characteristics such as authority, communication, staffing, and group focus.

They argue that by explicitly considering organisational factors and dynamics, some of the weaknesses of collaborative groups can be mitigated.

Some indicators to measure procedural and structural characteristics of collaborative groups are quantitative, assessing such things as the number of documents expressing the group's mission and vision, or the number of documents detailing the decision making process. Even more detailed metrics of this kind may be available, such as the existence of devolved grant schemes as considered by Hassall & Associates Pty Ltd (2003) as a marker of the sustainability of a group. However, much of the measurement of process/structure characteristics is done by gathering participant perceptions, and testing their levels of satisfaction in how well the processes and/or structure of the group works (Blatner et al., 2001; Kenney et al., 2000; Rinkus et al., 2016). Surveys evaluating participants' agreement with statements such as "constructive communication occurred" or "workshop allowed every party's interest to be considered", as conducted by Blatner et al. (2001), focus in on the mechanisms by which groups are expected to produce effective results, and as Rinkus et al. (2016) describe, this should be used not just as an output measure but as an input to improve the process itself.

4.4 Measurement tools

Some measurement tools are self-explanatory (if not necessarily easy to carry out), such as counting the number of projects implemented, verifying the existence of documents, or calculating the increase in house prices post local or community restoration of a nearby waterway. Some more complex methods have been employed to calculate economic benefits such as correlating ecosystem services with real or surrogate market values to create a marginal value for a restoration project over a baseline (Everard & Moggridge, 2012), or using a point value benefit transfer approach to estimating increased values and avoided costs (Mekala et al., 2015).

Measures of human health and human or social capital, however, generally require interacting with participants in order to ask them about their experiences. As touched on earlier, surveys are a very common approach, enabling the evaluator to ask a wide range of questions. Surveys often require participants to rate their agreement or disagreement with a particular statement on a likert-like scale, but could also include short answer questions designed to elicit qualitative data (Blatner et al., 2001; Chard, 2004; Curtis, 2003; Eden & Tunstall, 2006; Hardy & Koontz, 2010; Herringshaw et al., 2010; Kenney et al., 2000; Leach et al., 2002). Interviews are another common tool used in the assessment of collaboration and collaborative groups. Participants may be contacted by phone, mail, word of mouth, or directly in person at opportunistic meetings, the interview could be face-to-face or via telephone, formal or informal, and likely semi-structured with open ended questions to allow the participant to respond freely (Brown et al., 2016; Hassall & Associates Pty Ltd, 2003; Leach et al., 2002; Ritchie, 1997). Collaborative group discussions have also been professionally facilitated in several case studies (Eden & Tunstall, 2006; Hassall & Associates Pty Ltd, 2003; Herringshaw et al., 2010; Ritchie, 1997). In analysing interview data, themes or statistics are typically identified from interviewees' responses to uncover important characteristics and trends (for example Brown et al., 2016; Leach et al., 2002). In their study, Hardy and Koontz (2010) carried out a transaction cost analysis based on interview data, survey responses, and document analyses to reveal process and structural characteristics and gauge group success.

5 Keys to success

Most of the literature surveyed in this report works towards recommendations on what a group should include in its activities and how it should be set up and run in order to be successful (regardless of what is considered as success). Indeed some literature goes into depth on this subject (for example see Hassall & Associates Pty Ltd, 2003; Phuong, 2007; Sommarstrom, 2000), while others focus on conditions or actions that detract from success (for example see Curtis & De Lacy, 1996; McCallum et al., 2007; Phuong, 2007). Some research, while initially focused on identification of various group characteristics conducive to success, has discovered other potential explanatory factors. For example, Scott (2015) found that a shift in mind-set (from addressing point source to addressing non-point source pollution) was more important in explaining success than the characteristics of the collaborative groups themselves. A full review of factors constraining and enabling success in collaborative groups is beyond the scope of this review, so here we present a brief account of the most common features identified as key to success in the hope of providing some useful general guidelines.

5.1 What the group does

Place-based connection

Groups that are focused on a physical area that participants feel a connection to are more often found to be successful, and while the place in question can be a site of recreation (potentially located away from where participants live), it is most often the local area or neighbourhood within which group members reside (Campbell et al., 2010; Ritchie, 1997; Sarvilinna et al., 2018; Wessells, 2010). Pride and attachment to a local area is a motivator for participants (Ritchie, 1997; Scott, 2007), and as Wessells (2010, p. 556) eloquently states "Intrinsic, place-based water values give rise to collective political power, which in turn seeks out and develops utilitarian resources to achieve its ends". Phuong (2007) discusses the 'bonding social capital' that develops between neighbours over a long period of time, and how this can help a collaborative group reach success by generating local knowledge not otherwise available to government organisations. Finally, and similarly to the New Zealand context, where a group is focused on a local area, this can be key to engaging indigenous stakeholders. As Hassall & Associates Pty Ltd (2003) note, indigenous Australians do not recognise representation from people who are not of the land they speak for.

Educational aspect

As discussed above, many groups have social objectives, such as providing education or outreach services, in addition to environmental goals. Such educational objectives and motivations are also identified as key to effective project outcomes (Kenney et al., 2000). Herringshaw et al. (2010) noted that through participation in a collaborative group, participants came to place higher value on urban streams due to their improved knowledge of streams' functioning as habitat, and specific identification of aesthetic/scenic values. Wagner (2008) observed that riparian buffers, which are seen by some as undesirable due to their looking untidy or restricting access to a waterway, are more socially acceptable to those who understand their function in supporting the health and habitat status of the stream. Therefore, they are more likely to be supported by members of collaborative groups who have gained an appreciation for these functions through their contributions to and exchange within the groups. Similarly, Ryan and Brown (2004) found that communities need to see the link between their activities and the pollution of stormwater for them to consider changing their behaviour, and Brown et al. (2016) found that the installation of, and educational activities around, demonstration rain gardens helped the public to understand them, which in turn increased the public's willingness to install them on their own land. Thurston et al. (2010) corroborated this in their finding that a reverse auction for a rain garden or tank that was combined with education around their benefits, worked better than both the auction and the education alone.

Hands-on aspect

Physical, hands-on activities that allow participants to explore and get 'stuck-in' to the environment of their focus, aids in motivation. Hands-on activities could be as passive as river walking or biking tours, or as active as maintenance and clean-up activities (Herringshaw et al., 2010; Kenney et al., 2000; Wessells, 2010). McCallum et al. (2007) found that groups involved in more physical activities not only achieved more physical outcomes, but had higher levels of participation and enthusiasm within the group.

Integration of social goals alongside environmental goals

Eden and Tunstall (2006), and Ritchie (1997) both discuss the importance of integrating social aspects and community interests to encourage true engagement. Furthermore, Thomsen (2008) shows that participants found inspiration and motivation in the experiences and relationships formed during the collaborative group process, and therefore stresses the need to support such relationships to maintain effective participation.

5.2 How the group works

Leadership and facilitation

Several authors have commented on the need for active and capable leadership or facilitation of collaborative groups (Ansell & Gash, 2008; Petts, 2006; Phuong, 2007; Scott, 2007).Phuong (2007) suggests that this role may be filled by an individual facilitator from the government or community, or it may be an organisation rather than an individual leading collaboration on a larger scale. Petts (2006) describes the need for the facilitator to strike a good balance between assistance and control of the group, and to help both experts and laypeople communicate effectively so that trust is reinforced and all views are heard and considered valid. In their evaluation of the facilitator role in National Heritage Trust groups, Hassall & Associates Pty Ltd (2003) identifies several aspects of the facilitator role, including assisting participants to complete administrative requirements, showing them where to find information, and acting as a bridge between programs. Sommarstrom (2000) stresses that facilitators need to be experienced and highly skilled, which is corroborated by Curtis (2003), who found that using inexperienced or poorly trained coordinators hampered effective collaboration. Attracting and retaining professional staff to facilitate and lead collaborative processes can be dependent on stable funding (Kenney et al., 2000; Sommarstrom, 2000), but the provision of appropriate structural support can be just as important. This also applies to groups more generally, whereby proactive support from authorities can enable the group to focus more on the aspects that motivate them, such as hands-on activities, rather than being de-motivated by the need to raise funds and carry out administrative tasks (McCallum et al., 2007).

Representativeness

While Petts (2006) and Ansell and Gash (2008) argue that the representativeness of all stakeholders in community groups is important – particularly for groups carrying out projects in a given community – others have cautioned against allowing participant self-selection to propagate the required cross-section of the community. Larson and Lach (2010) found that self-selected participants reinforced existing power structures rather than truly representing the community, and Floress et al. (2011) acknowledge that as social capital is necessary for group success (as well as being a product of success as discussed earlier), purposefully selecting group members who can enhance the initial social capital of the group can be helpful. However they caution that a 'balanced approach' is needed to ensure genuine collaboration opportunities, and avoid undue influence of any particular participants.

Gradual building of trust

The long time lag between collaborative projects and environmental impacts, and the need therefore to identify intermediate indicators of success, was discussed above. Several authors stress that a long time frame is required for collaborative groups to achieve even intermediate goals. This is largely attributed to the extended time frame needed for trust to be built between community and government members, as well as within community and government groups (Bos & Brown, 2015; Herringshaw et al., 2010; Rogers & Weber, 2010). This trust-building process can be particularly important for partnerships and collaboration involving indigenous groups and other stakeholders (Hassall & Associates Pty Ltd, 2003). Issues of trust may centre on questions of whether the project will be supported sufficiently

and for long enough to have worthwhile effects (Herringshaw et al., 2010; Kenney et al., 2000), or whether all participants' views will be treated as valid (Petts, 2006). With trust building in mind, allowing sufficient time for activities such as joint fact finding efforts is considered beneficial for trust building as well as for the additional knowledge gained through the process (Ansell & Gash, 2008; Sommarstrom, 2000).

Flexibility

Related to the process of trust building, and the importance of place-based attachment or association of groups, is the need for groups to be flexible in their goals. In order to support what is of interest to the community, and what motivates group members (who normally require non-monetary motivators), authorities need to be flexible to a certain extent in what they will support, how it will be implemented, how they will accommodate a group's spontaneity in responding or adapting to unexpected issues, opportunities, or changes over time (Bos & Brown, 2015; Campbell et al., 2010; Herringshaw et al., 2010; Holt et al., 2012; Petts, 2006; Ritchie, 1997; Scott, 2007; Shandas & Messer, 2008; Sommarstrom, 2000). This flexibility needs to extend to communication modes, so that all stakeholders can are able to access and share information, and gain a clear understanding of the goals, processes, and activities of the group (Fearon, 2003; Sommarstrom, 2000).

Structure, processes, and vision

Aside from the goals or activities of collaborative groups, many authors suggest that the characteristics of a group's structure, processes, and vision are key factors shaping success. Clarity and transparency are necessary in the roles participants are expected to fill, as well as in the purpose and strategy of the group, and on any problems that arise (Hardy, 2010; Hassall & Associates Pty Ltd, 2003; Kenney et al., 2000; Sommarstrom, 2000). Good coordination between individuals and organisations is needed, both vertically and horizontally, within and between jurisdictions, as is a long term vision with a monitoring and evaluation framework that can accommodate the flexibility discussed above (Campbell et al., 2010; Hassall & Associates Pty Ltd, 2003; Kenney et al., 2000). Furthermore, Hassall & Associates Pty Ltd (2003) cautions against building networks that are overly reliant or primarily focussed on specific people, rather than supporting structural networks between different programs/groups.

Resourcing

Greater environmental and social benefit was found to be correlated with better resourcing of the projects studied by Hardy (2010) and Koontz (2003). Kenney et al. (2000) also highlighted the importance of buy-in and investment in projects run by collaborative groups, whether this comes from stakeholders or government agencies, or both. Where the collaborative group project involves a financial incentive scheme, it is important that participants can see the direct personal benefit from participating, and an upfront payment

or subsidy for participants is typically more effective than a delayed reimbursement (Brown et al., 2016; Lieberherr & Green, 2018).

6 Conclusions

6.1 Well-being and collaborative management

The concepts of social, cultural, economic and environmental well-being that have guided this literature review are drawn from New Zealand legislation, but in fact are not defined in any of the legislation that refers to them. In attempting to interpret them in a manner that is consistent with other New Zealand state actors (such as central government ministries and local authorities), it is evident that the concepts overlap and are highly interdependent. Thus we have used a thematic grouping that borrows from The New Zealand Treasury's Four Capitals approach, acknowledging that these all contribute to the 'four well-beings' in different ways. In doing so, we find that community engagement and collaboration in urban waterway management can benefit the environment *and* the community through building human and social capital, while also delivering some indirect economic benefits to participants and communities.

While it is not straightforward to demonstrate long term environmental impacts from collaborative management processes, we do see evidence that they address high impact issues and result in outcomes commonly understood to be beneficial to the environment, whether through hands-on projects or participation in decision-making processes to inform policies and plans. Our review of this evidence was deliberately set in the context of potential benefits that communities can realise through working in these groups and projects.

Human capital, or individual skills and characteristics that allow a person to participate fully in society, is developed through participation in collaborative groups by three main routes – increases in: health, technical competencies, and interpersonal skills. Mental and physical health is improved where participants develop a meaningful connection with the local environment through hands-on involvement, physical labour, or recreation. This in particular can support the cultural identity of indigenous communities who have deep cultural connections with the environment. Health is also supported by the therapeutic nature of increased and/or improved natural spaces in the urban environment, and by the perception of more open and fair decision making and dispute resolution processes that underpin collaborative management. Technical knowledge and skills developed in participants included scientific water/habitat quality monitoring and assessment skills, and increased understanding of stormwater related issues and indigenous knowledge of the area. Of note is that this technical knowledge can be passed both up and down through the generations, as well as between experts and laypeople. Interpersonal skills and individual capacity building are developed via numerous aspects of involvement in collaborative management. Examples of such benefits might include empowerment of individuals from marginalised groups to represent their community, improvement in participants' communication skills, building

competence to engage with and navigate bureaucracy, or developing project management or advocacy skills.

The ability of a group to work effectively to achieve a common goal often depends to a great extent on the social capital that the group is able to draw on. Social capital both underpins, and is built up through, collaborative groups and processes. Relationships are built between people who may otherwise not meet or collaborate, and this applies equally to individuals and collectives such as state or private organisations and special interest community groups. This can grow respect and trust, even between traditionally opposed groups or individuals. Evidence shows that participants use, or value the potential use, these networks for purposes beyond the original collaborative group, and this builds resilience within communities.

With regard to economic benefits, we see that participation in collaborative groups actually often costs the participants in terms of time, labour, or money. However, aside from the monetary gains possible from having an improved environment (such as recreation and hospitality opportunities), engagement in collaborative management allows participants to develop employable skills through improved human capital, and valuable networks through enhanced social capital.

6.2 Measuring success

When considering monitoring frameworks or indicators that have been used to measure the success of collaborative groups, first we recognise that success is variably defined and always encompasses multiple goals, hence is typically measured by multiple indicators. One key message from the literature was that long term impacts from collaborative projects are not necessarily a useful measure due to time lags and attribution difficulties, so intermediate measures of success are helpful both to maintain the momentum of the collaborative groups, and to satisfy funders and agencies resourcing the groups. There are two categories of intermediate measures used in the studies reviewed: outputs and processes/structures. Some measure outputs such as the number of activities completed, be they planting days or submissions to planning processes, or the number of agreements reached. Researchers have also measured the numbers and characteristics of people participating in various collaborative group activities, the skills learned, and relationships built. None of the studies reviewed here set out to measure changes to community well-being as a result of participation in collaborative projects, but most projects included a social objective, and so success was in part assessed on how well that objective was met. Participants' perceptions of success were commonly used as a relevant proxy for actual success (in terms of environmental impact), and this seems particularly appropriate in assessment of the human dimensions of well-being.

Many authors have analysed the structural and procedural aspects of a collaborative group as a predictor of the groups' ability to adapt and overcome obstacles to meet their goals. This research typically involves analysis of documents such as vision statements or decision making procedures, and eliciting participants' views on topics such as communication and cooperative dynamics within the group. Such data was most commonly collected via surveys and interviews with group participants. While ecosystem services assessment may hold promise as a tool to gauge benefits to communities, we found it to be rarely applied in studies

of collaborative group outcomes, possibly because of its usual focus on benefits provided by the environment rather than by the collaborative process.

7 Recommendations

Based on the conclusions above, which point to the social, cultural, economic and environmental benefits a community can derive from engagement in collaborative management of their urban environment, our first recommendation is that these collaborative groups be supported by the agencies that typically take responsibility for environmental management.

While further specific research could be conducted to elicit how best to support these groups (which was outside the scope of this study), we are able to offer some recommendations on the basis of this review. Therefore, the following additional recommendations are made:

It is recommended that agencies supporting community groups provide:

- An experienced facilitator, who can assist in bringing clarity to goals, roles and processes, as well as to administrative tasks and coordination between parties;
- An extended time frame of support, sufficient at least to demonstrate (intermediate) measures of success;
- Flexibility in the goals they will support at the outset, and in allowing these to be adapted over time as needed;
- Appropriate funding for the project and facilitator.

Furthermore, it is recommended that agencies support groups which:

- Allow for the inclusion of all relevant stakeholders, but can include a selection of members to provide an initial pool of social capital;
- Pursue projects with:
    - A place-based connection with its members;
    - Goals for education and social aspects alongside environmental goals;
    - Hands-on activities.

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