Reconciling wellbeing and resilience for sustainable development

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Preface

Securing wellbeing and building resilience in response to shocks are often viewed as key goals of sustainable development. Here, we present an overview of the latest published evidence as well as the consensus of a diverse group of scientists and practitioners, drawn from a structured analytical review and deliberative workshop process[1]. We argue that resilience and wellbeing are related in complex ways, but in their applications in practice they are often assumed to be synergistic. Although theoretically compatible, evidence we present here shows they may in fact work against each other. This has important implications for policy.

Main

As society grapples with the associated challenges of global development and environmental change, securing individual and collective wellbeing and building social-ecological resilience are key global and national policy targets. We suggest that narrow interpretations of resilience or wellbeing are not necessarily positively related. Trade-offs between wellbeing and resilience can reduce the chances of meeting policy targets for either, for example in those set under the United Nations' Sustainable Development Goals (SDGs). This article characterises the narratives that lead development agencies to pursue resilience and wellbeing simultaneously. It gives examples where this strategy has created trade-offs that undermine either resilience or wellbeing, and suggests that adopting broad, holistic interpretations of resilience and wellbeing, whilst acknowledging temporal and spatial scales can help avoid these trade-offs so that policies and interventions can successfully promote both.

Resilience and wellbeing as process and outcome

Wellbeing and resilience approaches have evolved considerably since they were introduced, and they have both gained prominence in development policy and practice. Wellbeing is seen as an alternative, more meaningful, measure of social progress, in the face of growing criticism of economic measures[2], while resilience is promoted as an essential aspect of development in an uncertain world of disturbance and surprise.

However, in their application, they often remain ambiguous, and it is not clear which conceptions of wellbeing or resilience are used by different organisations, or different conceptions are conflated when implemented, as in the case of social and individualistic notions of wellbeing [3].

Wellbeing is increasingly understood as a multi-dimensional concept that consists of objective measures (of what people have achieved or are able to achieve) and subjective measures (how they evaluate their situation [4]). Some frameworks also give attention to a relational dimension, acknowledging that wellbeing outcomes are largely produced through relationships, between people and with their social, economic and environmental contexts [5]. As such, a wellbeing approach does not assume limitless growth or progress, but instead looks at the ways in which people construct wellbeing in resource-constrained environments. **Resilience** is also multi-dimensional and has often been defined as the capacity of a system to withstand perturbations whilst maintaining its structure and functions [6]. Whilst contemporary definitions increasingly encompass the capacity to adapt to and transform in response to change [7], applications of resilience for sustainable development often emphasise buffering, coping and seek to maintain stability of status quo[8]. Drawing on insights from complex social-ecological systems theory, the resilience approach provides a way of understanding change as non-linear and spanning spatial and temporal scales [7]. Resilience approaches are called for in numerous policy fora and are central to some, such as the Paris Agreement of the United Nations Framework Convention on Climate Change.

Both of these concepts are multi-dimensional and are increasingly understood as being dynamic and socially contingent [7]. One cannot simply acquire resilience or wellbeing and hang on to them like an asset or money in the bank. Therefore, resilience or wellbeing can be seen as both process and outcome [9]. Accounting for context-specific needs, values and circumstances in their practical applications is crucial for ensuring that wellbeing and resilience processes and outcomes are socially just, equitable and sustainable. This warrants an improved integration of objective and subjective measurements of wellbeing and resilience indicators. So called analytic-deliberative

processes are increasingly used to integrate such different types and sources of relevant information, bringing together scientific knowledge and objectively observable conditions with more subjective, context-specific knowledge, values and lived experiences [10].

This ensuing discussion extends long established debate about poverty-environment conflicts, bringing more systemic and interdisciplinary analysis and understanding. By emphasising dynamic, causal relationships rather than outcomes per se, it exposes and probes some of the hidden trade-offs, inconsistencies and assumptions in the pervasive and persuasive discourses surrounding wellbeing and resilience that potentially undermine the achievement of global sustainability goals.

An idealised relationship between resilience and wellbeing

The pursuit of wellbeing and resilience is also prevalent throughout the SDGs and made explicit in seven of the goals (Table 1). These two concepts are expressed in goals and targets, and as means to achieve them. In some instances, goals related to wellbeing, such as no poverty, no hunger and good health (which are all considered essential domains of wellbeing [11]) have targets that explicitly mention resilience. This creates a narrative of greater resilience leading to greater wellbeing. Conversely, some environmental resilience related goals which aim to protect species, habitats, prevent irreversible regime shifts and sustain the provision of ecosystem services [12] have wellbeing targets such as improving education or supporting a diversity of nature-related values [13,14]. This forms a narrative that greater wellbeing sustains greater resilience.

Table 1: Operationalised relationships between resilience and wellbeing amongst the sustainable development goals.

Goal	Target	Idealised Relationship
1-No poverty	1.5 Build Resilience of poor and reduce their exposure to shocks	Greater resilience
2 – Zero hunger	2.4 Implement resilient agricultural practices	

		sustains greater wellbeing
3 – Good health and well-being	3.D Strengthen capacity for early warning, risk reduction and management of national and global health risks	
11 – Sustainable cities and communities	11.7 Provide access to green spaces	Greater wellbeing sustains greater resilience
13 – Climate action	13.3 Improve education	
14 – Life below water	14.7 Increase economic benefits to least developed countries through use of marine resources 14.D Provide small scale fishers access to markets and marine resources	
15 – Life on land	15.9 Integrate peoples' ecosystem and biodiversity values into poverty reduction strategies	

These two concepts are also thought of as mutually beneficial amongst some of the most influential non-government organisations (NGOs) focused on conservation, sustainability and or development. Oxfam, for example, defines resilience as 'the ability of women and men to realize their rights and improve their well-being despite shocks, stresses and uncertainty' [15]. Practical Action, a development NGO, also defines resilience as "the ability of a system, community, or society to pursue its social, ecological, and economic development and growth objectives, while managing its disaster risk over time in a mutually reinforcing way" [16]. Similarly, Conservation International projects that seek to restore degraded land aim to directly improve the wellbeing of communities through enhancing ecological resilience [17]. Other organisations such as the International Fund for Agricultural Development argue that "poor rural people are less resilient" and that building the personal resilience of rural people can be done in part through increasing their incomes and assets, asserting that economic security can be a source of resilience [18] . World Vision, a humanitarian and development organisation, has taken learning from the concept of resilience right into the heart of their programs. They developed a theory of change that incorporates notions of household and community resilience with child wellbeing outcomes [19] . As

such, it appears that resilience to climate change or extreme events, be it either at the system or individual level is often measured through social, economic, community or social capital variables. Although the range of interpretation and degree of embedding resilience and wellbeing into their operations ranges dramatically, these concepts have been internalised by many organisations seeking to improve the lives of communities.

The academic literatures on social-ecological resilience and wellbeing also point to a close correspondence between these two concepts. The social-ecological resilience literature aims for an integrated systems-based view of how human society is linked with ecosystem change, and how change occurs within that linked system [20]. This in turn has provided insights on the role of social-ecological systems for wellbeing, poverty alleviation and development [21–23]. Of note, the concept of social-ecological traps offers a dynamic explanation of social-ecological processes that trap people in multi-dimensional poverty. Cinner's study, on tropical reef fisheries, for example, where poverty is high and local institutions weak, found that overfishing with destructive gear can push coral reef social-ecological systems past key thresholds by reducing coral cover and herbivorous fish. Ecological feedbacks then led to the proliferation of macroalgae, thus locking the system into an undesirable state where overfishing results in poor yields and reef systems are further degraded [24]. Such thinking enables resilience scholars to explore tangible pathways for disrupting social-ecological traps [25] with particular focus on the role of adaptation and transformation for escaping from traps [7,24]. Thus, resilience science helps us to understand what keeps people in different forms of poverty as well as what will lead to improvements to their wellbeing [26]. Broadly defined as the ability to successfully deal with change, resilience levels can also help in identifying who will do better or worse in the face of environmental change and shocks. Further, resilience is defined in terms of wellbeing, for example as the capacity of a person, household or other aggregate unit to avoid poverty over time in the face of various stressors and shocks [27]. With such a 'resilience sustains wellbeing' narrative, resilience is the intermediate target and it is assumed to have positive effects on wellbeing (Fig.1a).

Conversely, recent literature on wellbeing suggests that the material, relational, and subjective domains of wellbeing influence human resilience and the ability to adapt and cope in the face of stressors and shocks [21] . Material wellbeing refers to what people have and includes resources such as foods, income and assets, amongst others [28]. These confer resilience by providing resources that people can draw on to adapt to stressors and shocks [29,30]. In the face of dwindling fish stocks, for example, coastal societies or individuals can draw on financial assets to purchase bigger boats or new fishing gear in order to fish further afield or target different species [31]. Relational wellbeing refers to what people do and how they interact with others to meet their needs and achieve a good quality of life [28]. Here again, it is argued that relationships between individuals, communities and organisations can help build resilience to change by providing social support and access to knowledge and resources [32]. Preparing for or recovering from high-intensity storms, for example, will often require individuals to help one another and for state agencies to coordinate short-term recovery [33]. Subjective wellbeing refers to how people think and feel about their situation [28]. This is also deemed to be important for responding to environmental change as people have little incentive to act unless they believe that their actions can produce desired outcomes or forestall undesired ones [25]. The above suggests that all dimensions of wellbeing can be seen as sources of resilience, for they influence the potential for adaptation and in turn the potential for improved wellbeing through adaptation [29]. This supports a 'wellbeing sustains resilience' narrative (Fig.1b).

>Insert Figure 1<

Where pursuit of one may undermine the other

These two discourses, that wellbeing promotes resilience and that resilience promotes wellbeing, imply positive synergy between the two. However, the literature is replete with examples from different contexts and scales of social organisation, be they at the individual, community or aggregated at a regional level, where the pursuit with a focus on either one has undermined the other. Thus, while we recognize that the pursuit of wellbeing and resilience is necessary to meet global sustainability challenges, we call

attention to the critical need to go beyond tacit assumptions about their relationship to carefully consider when one does indeed sustain the other. Three examples are given below, one stemming from feudal society which illustrates the complexity of this relationship and two from contemporary reports by practitioners which demonstrate how unintended trade-offs can occur between resilience and wellbeing in development practice.

A historical perspective can shed light on the tensions between resilience and wellbeing of peasants in feudal societies. In these societies, the well-off landowners would provide loans or reduce the taxes of those who laboured their land, when there were poor harvests or the households were going through a tough period. They allowed collection of crop residues from their land for fuel and fodder and helped in educating the children of the peasants [34–36]. Such systems reinforce highly unequal distribution of resources and wellbeing and further the interests of patrons as they ensure the continuation of the community as a whole and ensure support that maintains privileged positions in society [36]. In such situations, any surplus from ecosystem services, in this case agricultural production, that labourers might accumulate in order to lift themselves out of poverty is usually appropriated by higher classes through obligations and uneven property rights [36]. As such, the peasants in this case would not take risks. They foster the relationship with their overlords to maintain their resilience in terms of their ability to survive crises, with the effect of limiting their wellbeing. These social relationships were a major constraint on capital accumulation and hence constituted poverty traps, thus undermining the pursuit of wellbeing for the labourers. The important trade-off to draw attention to is that the clients are willing to sacrifice surplus of harvest for the security of not starving in the hungry season or times of crisis [34]. These patron-client relationships provide the only means of access to credit for the poor and provide loans that match the unpredictable nature of ecosystem service provision [37]. However, the price for flexibility and security are exploitative conditions of transaction that mean that the benefits of ecosystem services accrue very largely to the ‘patron’ [38]. This exemplifies the types of trade-offs that can occur between resilience of the peasant and their wellbeing. It will be wise to review more deeply whether and when promoting resilience or wellbeing

objectives can be expected to improve the other in pursuing the sustainable development goals.

Other examples come from organisations that after attempting to build social-ecological resilience or enhance wellbeing of communities note that these are not always mutually beneficial and the pursuit of one can undermine the other. Médecins Sans Frontieres (Doctors Without Borders) for example, have recently stated that 'building resilience' is often at odds with a core humanitarian approach to crises which seek to enhance wellbeing[39]. They argue that when a response becomes a mixture of 'all things to everybody' (building capacity, reducing vulnerability and ensuring sustainability), often the basics are overlooked. There is a danger that 'building resilience' becomes an excuse for inaction on the basics of saving lives and alleviating suffering [39]. This suggests that a focus on resilience can sometimes ignore direct and necessary wellbeing impacts from sustainable development interventions. Conversely, Greenpeace have argued similarly that projects focused on increasing food production and achieving wider wellbeing goals has left farmers less resilient due to dependence on external inputs and resources that are too costly or unsustainable for farmers [40]. They highlight that certain approaches that sought to enhance wellbeing had created dependence on costly external inputs which led to soil degradation by imbalanced use of nutrients and that they at times relied on utilising resources that were unsustainable such as use of drinking water for irrigation or expanding rice cultivation and irrigation plans in water-limited locations [40]. How can we identify holistic approaches that combine both features that are so vital for sustainability? We argue that a better understanding of potential trade-offs can help to reach synergies amongst these concepts in practice.

The above examples illustrate that the *casual* use of the narrative of resilience and wellbeing being *causally* synergistic can lead to unintended environmental or social consequences. So much so, some agencies have become disheartened as they have experienced trade-offs between resilience and wellbeing when pursuing sustainable development goals [39]. This can have important ramifications if organisations re-focus their attention and specialise on approaches that build resilience or wellbeing in

isolation. We argue that it is important to be aware of trade-offs between these two goals, but that there should be renewed focus on how they can inform each other positively. The question is then, how to realign resilience strategies to work with rather than against wellbeing pursuits and vice versa. Before doing so however it is important to understand the origins of these trade-offs.

The roots of trade-offs between resilience and wellbeing

Despite the complex multi-dimensional natures of wellbeing and resilience, indicators are commonly employed which are simplistic and narrowly-focussed around qualities that are easy to measure such as income or resistance to specific shocks [21]. Decision-makers are led to focus only on those elements that are captured by the indicators and not aspects that are less amenable to quantification, such as power, relational values, culture, slow onset crises or increasing hazards. These narrow interpretations of wellbeing or resilience are often at the root of the trade-offs that are seen to exist between them. For example, efforts to enhance material wellbeing (income) through conservation interventions (biodiversity conservation) which seek to prevent irreversible ecological regime shifts**,** can worsen inequalities and damage the moral fabric of communities by undermining peoples' perception of fairness. This in turn, can weaken their motivation to support such interventions and undermine the resilience of the system [41,42]. The more intangible relational values, power and culture vitally affect how and whether trade-offs manifest and who is most impacted by them.

Narrowly conceptualised interventions to support resilience can often be limited to the ability to withstand or resist specific stressors and shocks (specific resilience) rather than to build an "all-purpose kind" of general resilience [23]. Critically, resilience theory has shown trade-offs between specific and general resilience [23]. Also, resilience is about more than resistance to disturbance, it is equally about the opportunities that disturbance opens up through adaptation, learning and self-organisation to do things differently [20]. As a result, interventions to support resistance to specific shocks may have unanticipated negative impacts on wellbeing. The negative impacts that can arise

when adapting to specific shocks and stressors have been discussed extensively in the maladaptation literature [43]. However we argue that an understanding of the complex relationship between wellbeing and resilience can help in anticipating and potentially preventing them. For example, following the Asian tsunami in 2004, new legislation in India and Sri Lanka forbade homes and businesses being rebuilt close to the coast in order to create buffer zones and build resilience to future tsunamis[44]. Whilst this reduced exposure to future tsunamis, the re-housing of coastal people, dependent on the sea, to isolated inland villages disrupted livelihoods and cultural and social attachments to the ocean, undermining wellbeing in diverse ways. As such this intervention to enhance resilience to such shocks led to a short term gain yet long term risk to the wellbeing of those displaced. It also highlights that such responses to shocks and stressors are reflective of the political context and power dynamics at play. This opened up the remaining coastal strip for more powerful large-scale tourism development interests and impeded rehoused people's access to fisheries. There was a lack of consideration of what is important for these communities' wellbeing and their resilience to other shocks and stresses such as ill health. Whilst members of these communities might have survived the disaster physically unhurt, the resilience intervention had put their property and livelihood in jeopardy[44]. Pushing a resilience strategy that works against peoples' own priorities is unlikely to work. The re-developed safer settlements inland in Sri Lanka were only occupied by woman and children, whilst male fishers continued to reside and work by the sea therefore countering potential resilience benefits for men [45]. In summary, the focus on responding to a single stressor and shock, the tsunami, in India and Sri Lanka has ignored the erosion of social and economic capital of relocated communities. Thus, attempts to improve resilience to a specific threat reduced wellbeing while also reducing 'general resilience'.

Efforts to improve wellbeing interpreted in a narrow or single dimensional sense can also undermine social-ecological resilience. A focus on income generation to improve wellbeing, for example, led to the rapid expansion and specialisation of shrimp farming in Asia. In Bangladesh, a large number of farmers converted their rice fields to export-oriented shrimp farms. All shrimp farmers, irrespective of size of their farms, have made

profits and now associate this change with increases in income [38]. Shrimp farming has also encroached on agricultural land, resulted in mangrove clearance and caused serious degradation of land and de-stabilization of coastal ecosystems [38]. This large-scale conversion of agricultural land to shrimp ponds has in many cases led to a paucity of vegetables, impacting food security and nutrition. Further, these impacts are set to persist given that the salinization caused by the ponds will likely undermine or even prevent agriculture in the future undermining the social-ecological resilience of the region.

More generally, the progression from low to high standards of living is normally thought to involve people specialising in products that correspond to their competitive advantage [46]. This economic argument has underpinned developments in agriculture (e.g., the promotion of cash crops and monocultures) as well as in aquaculture. In Central Asia during the Soviet era, intensive monoculture production was seen as economically beneficial. However, the removal of traditional resource management practices exacerbated water stress in the region leading to a legacy of environmental degradation [47]. It is increasingly understood that whilst there may be short-term material benefits to specialisation, the adverse environmental consequences can increase vulnerability to climate variability and change [25,48,49]. Further, specialisation is argued to limit households' flexibility and consequent adaptive capacity to deal with stressors and shocks [50]. A focus only on improvements to specific aspects of wellbeing can undermine the longer-term ability to maintain social and ecological diversity, threatening the long-term resilience of social-ecological systems.

Paving the way to synergies

Although wellbeing and resilience approaches are rooted in distinct disciplinary traditions, both concepts have evolved considerably since they were introduced in ways that they can now inform one another. More holistic interpretations of wellbeing and resilience are often considered to be intrinsically linked. Over time, for example, an individual's wellbeing depends on personal resilience and mental toughness, as well as

353 resilience of the social-ecological system which the individual is part of [51]. Similarly,
354 resilience to environmental change requires people to have material assets, social
355 connections and a capacity to act collectively with others. They also need sufficient
356 agency in their adaptive responses [31], all of which are closely linked to domains of
357 wellbeing [52,53].
358
359 Despite the theoretical complementarities that are shared between wellbeing and
360 resilience, we have seen that in practice this relationship is not always synergistic and
361 that the narrow pursuit of one, can undermine the other. Given the policy imperative and
362 importance of finding ways to support both resilience and wellbeing, development
363 actions need to acknowledge the complexity of these concepts whilst finding practical
364 ways to reconcile and apply them. The social theories underpinning wellbeing for
365 example can help to integrate social concepts (e.g. agency) into resilience thinking [54].
366 On the other hand, resilience scholars draw on concepts from systems science to
367 unpack how society and the environment might respond to change, which can occur
368 suddenly or gradually and can be environmental, social, economic and/or political in
369 nature. Cultural aspects are increasingly being highlighted through lessons from cultural
370 evolution [55]. These concepts can enable a more dynamic understanding of how such
371 changes shape poor people's wellbeing over time, including their ability to benefit from
372 ecosystem services and their capacity for resilience. Whilst wellbeing and resilience are
373 intertwined, the relationships are complex and contingent [56]. We argue that a deeper
374 understanding of the synergies and trade-offs between these two concepts can help in
375 predicting the unintended consequences of development interventions and can
376 therefore build on the growing body of literature on maladaptation which focuses on the
377 negative impacts of adapting to shocks [43]. We further argue that it can help address
378 power imbalances for two reasons. First, the **power to identify** tensions between
379 wellbeing and resilience relies on appropriate framings and methodologies which are
380 able to identify trade offs in the first place. Second, is that the **power to address** those
381 trade-offs relies on (often unequal) levels of voice, agency (defined as the power to
382 make a decision and act on it), and political will. This is becoming more recognised in
383 the literature. For example, Daw et al 2015 demonstrate the integration of

multidimensional wellbeing into participatory social-ecological system analysis for small-scale fisheries in Kenya [57]. This enabled a clearer recognition of a range of impacts from different scenarios on different user groups. It highlighted that whilst win-wins between conservation and profitability could be seen at an aggregate scale, it obscured the fact that the less powerful and more marginalised stakeholders within the community were differentially influenced by management decisions. Specifically, the combination of methods illuminated a trade-off between fisheries productivity and lost earnings from women fish traders, who are reliant on cheap 'trash' fish caught using illegal beach seining. As a result, the plight of beach seiners and women fish traders became central to workshop discussions, and how to lessen the disadvantages experienced by these groups. The unanticipated negative impacts on different people for example, can therefore be clarified by understanding multiple domains of wellbeing. To help promote synergies, we suggest a further three sets of actions for practitioners to help policies and interventions support both wellbeing and resilience.

First, we advocate a more process-driven, systemic and dynamic understanding of resilience that measures persistence, adaptation, and transformation in response to multiple disturbances through time. Attempts to specify and assess resilience often limit resilience to the ability to withstand or resist a specific disturbance despite tensions between specific and more general resilience [58]. Resilience thus needs to be thought of as the capacity for ongoing adaptation and even transformation in response to diverse and often co-occurring environmental as well as socio-political shocks and stressors [59]. Methodological approaches have been developed that support a more inclusive analysis of resilience, which is more likely to support long-term wellbeing. Tools such as Wayfinder [60], for example, lead stakeholders through a process of exploring their social-ecological system and the changes, capacities, opportunities and strategies that can adapt or transform the system in line with aspirations and priorities.

Second, policy makers and practitioners should adopt a more complete and holistic understanding of wellbeing not only as a state, or property of individuals, but also as a multi-dimensional phenomenon that emerges from people's interactions with each other

and their environment [5]. Increasingly, the pursuit of wellbeing is not seen as progress on unidimensional metrics. A variety of approaches, such as the 3D [28] approach, and their associated participatory tools, can better capture multiple domains of wellbeing and the diversity of people's aspirations. They also enable understanding of how wellbeing is related to broader processes of change in people's relationships.

Third, emphasise that resilience and wellbeing are socially differentiated across spatial and temporal scales making the process of operationalising these concepts in programmes and interventions inherently political [61]. Across **temporal scales**, possible trade-offs exist between short-term gains in, and long-term risks to wellbeing (and vice versa) as a result of loss of resilience. Approaches that incorporate long-term horizons, such as participatory scenario planning and the structured consideration of future generations' interests, can engage with such temporal interactions between resilience and wellbeing [62]. Equally, interventions should be evaluated according to how they affect wellbeing and resilience at different **spatial scales** and with caution for how interventions may create new vulnerabilities [25]. Resilience in particular can be thought of as individual, community or social-ecological system resilience[63] and consideration to the interactions across these scales is key. Similarly, wellbeing can refer to individuals' or a more aggregate measure of community wellbeing [64]. Available tools such as watershed approaches and shoreline management plans can expand system boundaries to include a broader range of stakeholders and consider effects that cross from one place to another or occur across scales.

These trade-offs and differences across scale mean that wellbeing and resilience of diverse groups of people are differentially affected by attempts to build system-level resilience or improve wellbeing. This **social difference** and the power imbalances that shape them, must be considered in the development of policies and plans in order to support equitable and socially just outcomes. Techniques such as community profiling can identify key social and demographic factors that structure society in a given context, in order to facilitate disaggregated analyses and consideration of equity and social justice. In particular, this can help in identifying those more powerful individuals or those

more marginalised who may have less ability to voice their opinions on how they might be impacted by interventions. These can be coupled with advances that identify different types of trade-offs between environmental and/or social objectives across temporal, spatial scales and between groups of individuals [65,66]. Mapping out the roles and interdependencies of different groups within these trade-offs, for example based on wealth or gender, can help decision-makers and stakeholders identify trade-offs and their implications for equity [67]. Ultimately, genuinely co-creative approaches that are grounded in people's own experiences that aim to counter differential access to power, knowledge, and resources are needed to support equitable outcomes [68]. Of course, these interventions do not take place in a political or institutional vacuum; the wider economic, social and political relations will also determine whose interests, values and knowledge are prioritised and influence what policies and programmes and funded and implemented [69].

Programmes will need to adopt holistic and broad interpretation of both resilience and wellbeing whilst acknowledging multiple temporal and spatial scales and the inherent uncertainties in these. The appropriate approaches and techniques used to reconcile wellbeing and resilience goals will differ across different social-ecological contexts. Thus, experimentation and learning, drawing on the knowledge and experience of multiple perspectives will be needed, as proposed by the adaptive management approaches from the resilience and resource management fields [70]. Such approaches can support an adaptive process of learning through doing (Fig.1c). Hard choices will need to be made where resilience or wellbeing strategies are prioritised, especially when trade-offs are unavoidable. A fuller understanding of the complexities of the resilience and wellbeing relationship may help uncover some of the tensions and anticipate some of the potential consequences, but to make decisions and navigate these trade-offs this information is unlikely to be sufficient, there will be a need to assess both the facts and our values and bring them together to make decisions [71]. Nevertheless, we highlight some mechanisms for reducing or avoiding trade-offs and navigating towards outcomes that deliver on both wellbeing and resilience objectives. These innovations could prove critical for meeting global sustainability challenges.

Contributions

T.C. and K.B. led the writing of the paper, T.M.D., S.C. and L.S. were part of the core writing team. All authors contributed equally to conceptualisation and editing. All authors have read and agreed to the published version of the manuscript.

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Competing Interests

The authors declare no competing interests.

References

1. Navigating Complexity: a digital report linking wellbeing and resilience for sustainable development. https://www.navigating-complexity.com/about.
2. Stiglitz, J. Towards a better measure of well-being. *Financial Times* **13**, (2009).
3. Joseph, J. & McGregor, J. A. Conclusion: A New Trinity of Governance? in *Wellbeing, Resilience and Sustainability* 101–126 (Springer, 2020).
4. Searle, B. A., Pykett, J. & Alfaro-Simmonds, M. J. Introduction to wellbeing research. in *A Modern Guide to Wellbeing Research* (Edward Elgar Publishing, 2021).
5. White, S. C. Relational wellbeing: re-centring the politics of happiness, policy and the self. *Policy & Politics* **45**, 121–136 (2017).

6. Walker, B., Holling, C. S., Carpenter, S. & Kinzig, A. Resilience, Adaptability and Transformability in Social–ecological Systems. *Ecology and Society* **9**, (2004).
7. Brown, K. *Resilience, development and global change*. (Routledge, 2016).
8. Brown, K. Policy discourses of resilience. *Climate change and the crisis of capitalism: a chance to reclaim self, society and nature. Routledge, London, UK* 37–50 (2012).
9. Allen, C. R., Angeler, D. G., Chaffin, B. C., Twidwell, D. & Garmestani, A. Resilience reconciled. *Nature Sustainability* **2**, 898–900 (2019).
10. Peterson St-Laurent, G. *et al.* Designing and evaluating analytic-deliberative engagement processes for natural resources management. *Elementa: Science of the Anthropocene* **8**, (2020).
11. Doyal, L. & Gough, I. *A theory of human need*. (Palgrave Macmillan, 1991).
12. Biggs, R., Schlüter, M. & Schoon, M. L. *Principles for building resilience: sustaining ecosystem services in social-ecological systems*. (Cambridge University Press, 2015).
13. Bahadur, A. V., Ibrahim, M. & Tanner, T. Characterising resilience: unpacking the concept for tackling climate change and development. *Climate and Development* **5**, 55–65 (2013).
14. Cutter, S. L., Burton, C. G. & Emrich, C. T. Disaster resilience indicators for benchmarking baseline conditions. *Journal of homeland security and emergency management* **7**, (2010).
15. Jeans, H., Thomas, S. & Castillo, G. The Future is a Choice: The Oxfam Framework and Guidance for Resilient Development. 43.
16. Resilience that protects. *Practical Action* https://practicalaction.org/expertise-for-impact/policy-and-advocacy/resilience-that-protects/.
17. Restoration. https://www.conservation.org/priorities/restoration.

18. Heifer International | Ending Poverty and Caring for the Earth. *Heifer International* https://www.heifer.org/about-us/news/press/press-releases/heifer-international-ifad-strengthen-partnership-for-rural-farmers.html.
19. *Institutionalising Resilience: the World Vision Story*. https://www.wvi.org/graduating-most-vulnerable-families-out-extreme-poverty/publication/institutionalising-resilience.
20. Folke, C. Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change-Human and Policy Dimensions* **16**, 253–267 (2006).
21. Armitage, D., Béné, C., Charles, A. T., Johnson, D. & Allison, E. H. The interplay of well-being and resilience in applying a social-ecological perspective. *Ecology and Society* **17**, 15 (2012).
22. Dearing, J. A. *et al.* Safe and just operating spaces for regional social-ecological systems. *Global Environmental Change* **28**, 227–238 (2014).
23. Carpenter, S. R. *et al.* General resilience to cope with extreme events. *Sustainability* **4**, 3248–3259 (2012).
24. Cinner, J. E. Social-ecological traps in reef fisheries. *Global Environmental Change* **21**, 835–839 (2011).
25. Eriksen, S. *et al.* Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? *World Development* **141**, 105383 (2021).
26. Lade, S. J., Haider, L. J., Engström, G. & Schlüter, M. Resilience offers escape from trapped thinking on poverty alleviation. *Science Advances* **3**, e1603043 (2017).
27. Barrett, C. & Constas, M. Toward A Theory of Resilience for International Development Applications. *Cornell University* (2013).

28. Gough, I. & McGregor, J. A. *Wellbeing in developing countries: From theory to research*. (Cambridge University Press, 2007).
29. Fisher, J. A. *et al.* Understanding the relationships between ecosystem services and poverty alleviation: A conceptual framework. *Ecosystem Services* **7**, 34–45 (2014).
30. Brooks, N., Adger, W. N. & Kelly, P. M. The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global environmental change* **15**, 151–163 (2005).
31. Cinner, J. E. *et al.* Building adaptive capacity to climate change in tropical coastal communities. *Nature Climate Change* **8**, 117 (2018).
32. Adger, W. N. Social capital, collective action, and adaptation to climate change. in *Der klimawandel* 327–345 (Springer, 2010).
33. Aldrich, D. P. *Building resilience: Social capital in post-disaster recovery*. (University of Chicago Press, 2012).
34. Scott, J. C. *The moral economy of the peasant: Rebellion and subsistence in Southeast Asia*. vol. 315 (Yale University Press, 1977).
35. Briscoe, J. Energy use and social structure in a Bangladesh village. *Population and development review* 615–641 (1979).
36. Wood, G. Staying secure, staying poor: the "Faustian Bargain". *World Development* **31**, 455–471 (2003).
37. Allison, E. H. & Ellis, F. The livelihoods approach and management of small-scale fisheries. *Marine Policy* **25**, 377–388 (2001).

38. Adams, H. *et al.* Defining Social-Ecological Systems in South-West Bangladesh. in *Ecosystem Services for Well-Being in Deltas* 405–423 (Springer, 2018).
39. Opinion and debate: Building resilience by deconstructing humanitarian aid. https://www.msf.org.uk/article/opinion-and-debate-building-resilience-deconstructing-humanitarian-aid (2014).
40. Thomson, K., Kruszewska, I. & Tirado, R. Building environmental resilience: a snapshot of farmers adapting to climate change in Kenya. (2015).
41. Pascual, U. *et al.* Social equity matters in payments for ecosystem services. *Bioscience* **64**, 1027–1036 (2014).
42. Chaigneau, T. & Brown, K. Challenging the win-win discourse on conservation and development: analyzing support for marine protected areas. *Ecology and Society* **21**, (2016).
43. Juhola, S., Glaas, E., Linnér, B.-O. & Neset, T.-S. Redefining maladaptation. *Environmental Science & Policy* **55**, 135–140 (2016).
44. Cohen, E. Tourism and Land Grab in the Aftermath of the Indian Ocean Tsunami. *Scandinavian Journal of Hospitality and Tourism* **11**, 224–236 (2011).
45. Bavinck, M. *et al.* Post-tsunami relocation of fisher settlements in South Asia: evidence from the Coromandel Coast, India. *Disasters* **39**, 592–609 (2015).
46. Bene, C., Mindjimba, K., Belal, E. & Jolley, T. Evaluating Livelihood Strategies and the Role of Inland Fisheries in Rural Development and Poverty Alleviation: The Case of the Yaere Floodplain in North Cameroon. 14 (2000).
47. Lioubimtseva, E. & Henebry, G. M. Climate and environmental change in arid Central Asia: Impacts, vulnerability, and adaptations. *Journal of Arid Environments* **73**, 963–977 (2009).

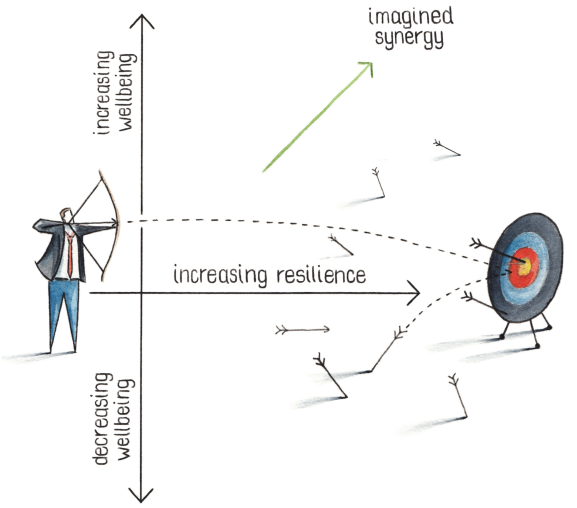
48. Paavola, J. Livelihoods, vulnerability and adaptation to climate change in Morogoro, Tanzania. *Environmental Science & Policy* **11**, 642–654 (2008).
49. Schipper, E. L. F. Maladaptation: When Adaptation to Climate Change Goes Very Wrong. *One Earth* **3**, 409–414 (2020).
50. Eakin, H. Institutional change, climate risk, and rural vulnerability: Cases from Central Mexico. *World Development* **33**, 1923–1938 (2005).
51. Mguni, N., Bacon, N. & Brown, J. F. The wellbeing and resilience paradox. (2012).
52. White, S. C. Bringing wellbeing into development practice. (2009).
53. White, S. C. Analysing wellbeing: a framework for development practice. *Development in Practice* **20**, 158–172 (2010).
54. Szaboova, L. *et al.* Resilience and wellbeing for sustainability. in (Routledge, 2018).
55. Brooks, J. S., Waring, T. M., Mulder, M. B. & Richerson, P. J. Applying cultural evolution to sustainability challenges: an introduction to the special issue. *Sustainability Science* **13**, 1–8 (2018).
56. Hallegatte, S., Vogt-Schilb, A., Rozenberg, J., Bangalore, M. & Beaudet, C. From poverty to disaster and back: a review of the literature. *Economics of Disasters and Climate Change* **4**, 223–247 (2020).
57. Daw, T. M. *et al.* Evaluating taboo trade-offs in ecosystems services and human well-being. *Proceedings of the National Academy of Sciences* 201414900 (2015).
58. Eakin, H. C., Lemos, M. C. & Nelson, D. R. Differentiating capacities as a means to sustainable climate change adaptation. *Global Environmental Change* **27**, 1–8 (2014).

59. O'Brien, K. L. & Leichenko, R. M. Double exposure: assessing the impacts of climate change within the context of economic globalization. *Global environmental change* **10**, 221–232 (2000).
60. Enfors-Kautsky, E., Järnberg, L., Ryan, P. & Quinlan, A. Wayfinder: a resilience guide for navigating towards sustainable futures. (2018).
61. Meerow, S. & Newell, J. P. Urban resilience for whom, what, when, where, and why? *Urban Geography* **40**, 309–329 (2019).
62. Oteros-Rozas, E. *et al.* Participatory scenario planning in place-based social-ecological research: insights and experiences from 23 case studies. *Ecology and Society* **20**, (2015).
63. Folke, C. Resilience (republished). *Ecology and Society* **21**, (2016).
64. Prilleltensky, I. & Prilleltensky, O. *Promoting well-being: Linking personal, organizational, and community change*. (John Wiley & Sons, 2007).
65. Schreckenberg, K., Poudyal, M. & Mace, G. *Ecosystem services and poverty alleviation: trade-offs and governance*. (Taylor & Francis, 2018).
66. Gill, D. A. *et al.* Social Synergies, Tradeoffs, and Equity in Marine Conservation Impacts. *Annual Review of Environment and Resources* **44**, 347–372 (2019).
67. Galafassi, D. *et al.* Learning about social-ecological trade-offs. *Ecology and Society* **22**, (2017).
68. Matin, N., Forrester, J. & Ensor, J. What is equitable resilience? *World development* **109**, 197–205 (2018).
69. Dolšak, N. & Prakash, A. The politics of climate change adaptation. *Annual Review of Environment and Resources* **43**, 317–341 (2018).

70. Allen, C. R., Fontaine, J. J., Pope, K. L. & Garmestani, A. S. Adaptive management for a turbulent future. *Journal of Environmental Management* **92**, 1339–1345 (2011).

71. Dietz, T. Bringing values and deliberation to science communication. *PNAS* **110**, 14081–14087 (2013).

Figure 1 – The narrow pursuit of resilience (1a) and wellbeing (1b) does not always lead to synergistic outcomes. An adaptive process of learning through doing is required to reconcile wellbeing and resilience for sustainable development (1c).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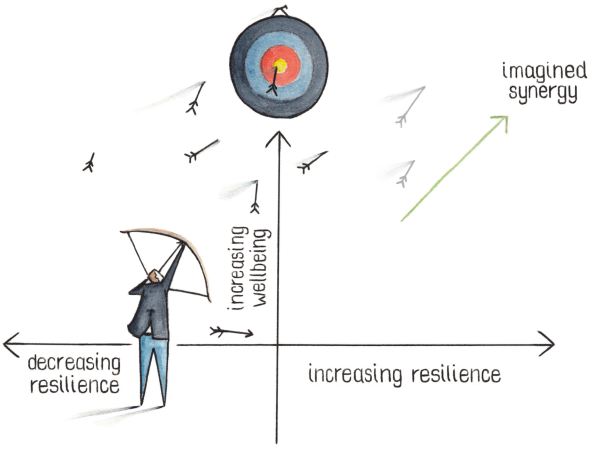
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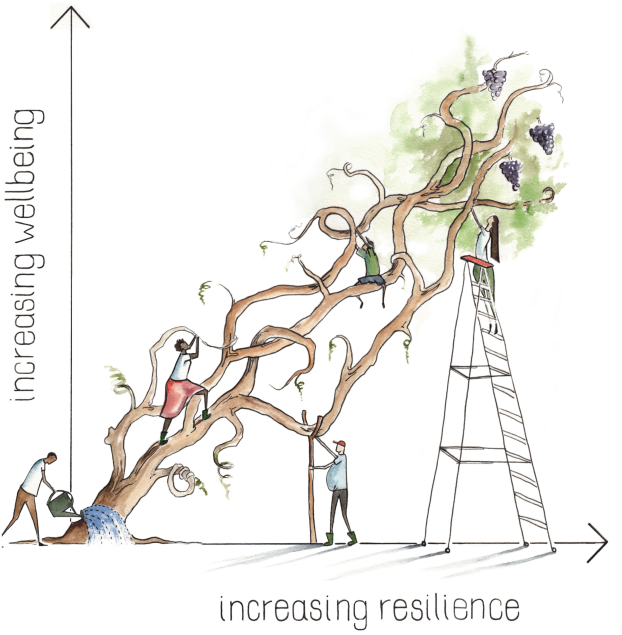
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