

Scotland's Rural College

Hydropower benefit-sharing and resettlement: a conceptual review

Schulz, Christopher; Skinner, Jamie

Published in:

Energy Research and Social Science

DOI:

[10.1016/j.erss.2021.102342](https://doi.org/10.1016/j.erss.2021.102342)

Print publication: 01/01/2022

Document Version

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Schulz, C., & Skinner, J. (2022). Hydropower benefit-sharing and resettlement: a conceptual review. *Energy Research and Social Science*, 83, Article 102342. <https://doi.org/10.1016/j.erss.2021.102342>

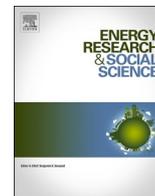
General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Review

Hydropower benefit-sharing and resettlement: A conceptual review

Christopher Schulz^{a,*}, Jamie Skinner^b^a Department of Geography, University of Cambridge, Downing Place, Cambridge CB2 3EN, United Kingdom^b International Institute for Environment and Development, 1 Borloughloch Square, Edinburgh EH8 9NJ, United Kingdom

ARTICLE INFO

Keywords:

Benefit-sharing
Compensation
Dams
Hydropower
Local development
Resettlement

ABSTRACT

Globally, hydropower developers are increasingly expected to share benefits with people living in project-affected areas. Nevertheless, hydropower benefit-sharing has not found sufficiently widespread application, and the concept is not yet widely understood. The present paper aims to make the following contributions: First, we clarify the commonalities and differences between benefit-sharing, compensation and related concepts, which refer to processes in which developers transfer resources to project-affected people. We suggest that benefit-sharing can be understood as a 'sustainability intervention', i.e. the focus is on making an additional and positive long-term development impact, beyond replacing or marginally improving on lost assets. Further, we propose that benefit-sharing is defined by the transfer of resources and services that are 1) substantively different from those serving as compensation for lost assets; 2) determined via participatory processes with project-affected people and 3) delivered in the later stages of the timeline from dam planning to operation. Second, we explore some governance challenges on the pathway towards 'good' benefit-sharing, highlighting: (i) that effective participation by project-affected people requires capacity building over time, involving a gradual transfer of control over spending decisions; and (ii) that the appropriate institutional set-up for benefit-sharing may be dependent on the existing capacity of governments in the dam-hosting location. Legally mandated benefit-sharing mechanisms to raise funds may be more appropriate in the context of high existing state capacity, whereas developer-led mechanisms will be required where the existing capacity is low. In practice, a mix of multiple institutional arrangements and benefit-sharing mechanisms is possible and desirable.

1. Introduction

Globally, but particularly in the Global South, hydropower developers are increasingly expected or required to share benefits with people living in project-affected areas [1–4]. As more and more hydropower dams are being built around the world, not least in the context of climate change mitigation [5,6], designing effective benefit-sharing mechanisms is of great practical relevance today [7–10]. A growing number of development banks, international organisations, and professional associations such as the International Hydropower Association (IHA) have begun to develop guidelines for benefit-sharing [3,11,12]. Despite this, hydropower benefit-sharing has not found sufficiently widespread application thus far (see e.g. [10,13–16]). The IHA suggests that it is "a relatively new term in the hydropower sector, with interpretations, objectives and practices that are not yet widely understood" [11] (p. 14).

At its most basic, benefit-sharing can be seen as a moral obligation to ensure that project-affected people's livelihoods are improved as a result

of hydropower dam construction [17]. Project-affected people are those displaced by dam reservoirs, as well as those who see their livelihoods affected as a result of changed hydrological and ecological dynamics, which may affect fishing or farming in riparian areas [18,19]. Making project-affected people better off is all the more important since new dams are typically justified by citing their contribution to economic development, which is intended to benefit wider society [20,21]. Hydropower dams in particular may generate significant financial revenues to the private or public entities that operate them, while potentially curtailing development opportunities for local people. Especially people who were displaced by a dam project may struggle to adapt [22] and develop new livelihoods [1,23], and are often worse off after dam construction [8]. Researchers continue to highlight the social injustice of excluding resettlers from the economic benefits that hydropower development can produce [16].

As noted by academics and practitioners from the hydropower sector, there is scope for clarifying the boundaries between hydropower benefit-sharing and other relevant concepts in the context of

* Corresponding author.

E-mail addresses: cs998@cam.ac.uk (C. Schulz), jamie.skinner@iied.org (J. Skinner).

hydropower development and dam-induced displacement and resettlement [8,10,11,23,24]. Here we focus on benefit-sharing with project-affected people in the vicinity of a hydropower dam, but it is important to clarify how the term is also being used in other contexts. Benefit-sharing can refer to both inter-state agreements and intra-state mechanisms, which in turn may involve state actors as well as the private sector [2,25]. Within the water sector, inter-state agreements about the transboundary benefits (and costs) of large hydropower dams have been discussed under the headline of ‘benefit-sharing’ (see e.g. [26,27]). Beyond hydropower, benefit-sharing is of relevance wherever people voluntarily or involuntarily provide land, resources, or knowledge to facilitate economic activities by outside actors. This may be the case for example in the context of the forest conservation programme REDD+ (e.g. [28,29]) or intellectual property rights around traditional knowledge on genetic resources and medicine (e.g. [30,31]).

The present paper aims to contribute to the debate by clarifying the boundaries of the concept of hydropower benefit-sharing, and how it is different from other relevant concepts such as compensation (section 2). This conceptual review is complemented with a discussion of the particular governance challenges of hydropower benefit-sharing in the context of involuntary resettlement of communities or flooding of communal land by (large) dam reservoirs (sections 3 and 4), covering normative and analytical aspects. We focus on the institutional dynamics of compensation and benefit-sharing in relation to the timescales of dam construction and management, with a particular focus on the allocation of benefit-sharing funds (section 3). We also discuss the wider institutional context of individual hydropower projects, and the roles of developers and governments in particular, presenting various mechanisms to raise funds in the first place (section 4).

While there is a relative wealth of publications on hydropower benefit-sharing from a practitioner and policy perspective (e.g. [11,12,32–35]), here we aim to contribute to the comparatively small, but growing academic literature on the subject (e.g. [2,4,7,9,10,36]). For practitioners, the IHA’s recently published how-to-guides on hydropower benefit-sharing [11] and resettlement [24] may be of interest, as well as a series of case studies on hydropower benefit-sharing [35] that was commissioned by the International Finance Corporation (IFC) of the World Bank Group. In contrast to the applied focus of these publications, here we discuss the subject from a primarily conceptual perspective, making only occasional reference to case examples.

2. Benefit-sharing, compensation and beyond: Conceptual clarifications

The immediate benefits of hydropower dams are obvious to developers and their clients, who will cite improved supply, reliability and access to electricity, potential for industrial development, and the replacement of polluting fossil fuels (e.g. [37]). Yet costs and benefits of hydropower dams are unevenly distributed, and often it is project-affected people who bear the brunt of costs, while receiving few of the benefits [13–17,20].

In the following, we aim to clarify what benefit-sharing is, and what it is not. Conceptually, hydropower benefit-sharing is most often discussed in conjunction with compensation, and the boundaries between the two are not always sufficiently clear, since both encompass a transfer of resources or services from hydropower developers and/or governments to people living in project-affected areas [11]. Some have argued that benefit-sharing is a type of compensation (or vice versa, e.g. [38,39]), in a moral sense, that acknowledges the disruptions caused and aims to generally improve the living conditions of project-affected people, rather than strictly restoring what has been lost. The term ‘benefits’ has also been applied in a generic way to describe elements of the rural livelihoods available to resettled people, such as access to water (e.g. [40]), without specifying whether these were the result of benefit-sharing agreements between developer and project-affected people. Given that usage of the terms ‘benefit-sharing’ and

‘compensation’ comes with strong implications for policy, here we explicitly distinguish between the two, offering a series of criteria below. We also highlight that many activities, including various types of transfers of resources or services to project-affected people, may not actually belong to either category, despite often being thought of as ‘benefits’.

In principle, compensation for lost assets and resources is a right and a universally accepted feature of hydropower development around the world that is supported by legal systems. Benefit-sharing has yet to reach a similarly universal uptake. It is often voluntary, although legally mandated benefit-sharing mechanisms exist for example in Nepal [33] and Brazil [41]. The implementation of both compensation and benefit-sharing mechanisms is difficult. Compensation has often been inadequate, unjust, or otherwise problematic, due to inadequate budgets, poor planning and management, or unforeseen events [42–44]. Few peer-reviewed case studies exist of successful restoration of livelihoods following resettlement [8], and in most projects there will be some element(s) that cannot be fully restored [1,36].

It is also worth noting that compensation is sometimes understood in a broader sense, encompassing any activity that aims to offset negative social and environmental impacts of hydropower development. In this context, authors have referred to ‘ecological compensation’ [45–47], which may include ecological restoration or mitigation measures to address the direct negative ecological impacts of hydropower development (e.g. greenhouse gas emissions [47]), as well as the indirect ecological impacts that are associated with the resettlement of people [46]. Different economic valuation and accounting methods have been developed to quantify the size of payments that would be required for effective ecological compensation [45–47]. In contrast to this use of the term ‘compensation’, here we use it in a narrower sense, to refer to the transfer of resources to displaced and resettled people to compensate or replace lost assets or resources.

Throughout this paper, we adopt a definition of benefit-sharing as a ‘sustainability intervention’, i.e. its focus is on making an *additional* and positive *long-term* development impact, beyond replacing or marginally improving on lost assets. This requires a tangible improvement in development status from a location-specific social baseline [17]. In the following three sections, we discuss several conceptual dimensions of benefit-sharing. Section 2.1 considers substantive aspects of benefit-sharing, with an overview and discussion of concrete resources and services that may or may not form part of benefit-sharing agreements. In section 2.2, we discuss normative bases that support benefit-sharing approaches, such as the 1986 UN Declaration on the Right to Development [48], which also suggest that benefit-sharing should contain a strong degree of participation by project-affected people. Section 2.3 describes the temporal dynamics of benefit-sharing, and how benefit-sharing and similar concepts are connected to the timeline of dam planning, construction and operation.

2.1. Substantive dimensions: What activities qualify as benefit-sharing?

Apart from their different purposes (i.e. compensating a loss versus providing a benefit), compensation and benefit-sharing are also characterised by substantive differences with regards to the resources and services provided (see Fig. 1). Benefit-sharing covers a wide range of potential benefits, ranging from physical infrastructure to preferential employment schemes and scholarships. These benefits may be directly or indirectly financed by revenues generated through the sale of hydropower [36], for example via financial mechanisms such as a percentage share of project revenues, community development funds [49]¹, or as part of the initial investment (see also section 4). Since benefit-sharing agreements primarily target communities or groups of project-

¹ On community development funds, see also the International Finance Corporation’s handbook on strategic community investment [114].

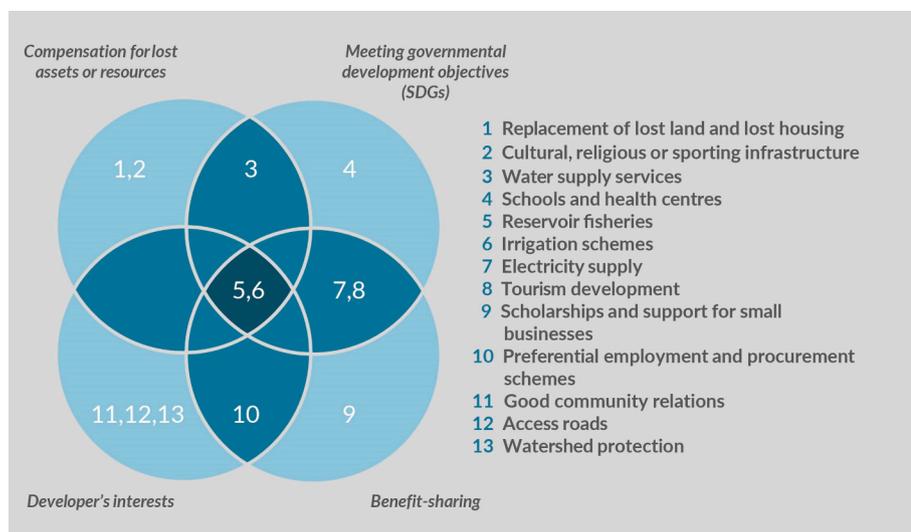


Fig. 1. Substantive differences between benefit-sharing, compensation, developer's interests and governmental development objectives (categorised, e. g., within the UN Sustainable Development Goals, SDGs), to illustrate what may and may not count as a benefit to be delivered via hydropower benefit-sharing. Although some items are classified as in the interest of developers ('developer's interests'), all other items can in principle also be thought of as in the interest of project-affected people. This figure is a heuristic device and the categorisation represents typical or ideal-type cases.

affected people, rather than distributing cash to individuals, benefits typically have a collective, 'public good character' to them. Yet it is important to highlight that not all resources and services that project-affected people receive would fall into that category and few can be exclusively thought of as benefit-sharing. We review these systematically below.

Our analytical framework for understanding benefit-sharing and related concepts from a substantive perspective is shown in Fig. 1. We propose that some resources and services normally fall into the categories of 'compensation' or 'benefit-sharing', as well as the two additional categories of 'developer's interests' and 'governmental development objectives' (a general framework for classifying governmental development objectives, are, e.g., the United Nations' Sustainable Development Goals, see [50]). Overlaps between two or more categories are frequent, which may hold the potential for confusion around terminology when it comes to benefit-sharing. The remainder of section 2.1 is structured around the resources and services listed in Fig. 1, explaining why they might be typically associated with one or more of the four categories listed here.

The proposed categorisation applies our definition of benefit-sharing above, and clarifies that many resources and services that are sometimes thought of as benefits, actually belong elsewhere. This is important, as each category is attached to a different set of decision-makers and governance structures, with government organisations normally expected to have a say in those resources and services falling into the category 'governmental development objectives', whereas investments in 'developer's interests' are more determined according to the priorities of the hydropower developer.

2.1.1. Replacement of lost land and lost housing

To begin with, there are some resources or services that are always part of compensation, not benefit-sharing. These are replacements of lost land and of lost housing, which would normally be identified early on via Resettlement Action Plans (RAPs), with little ambiguity about the legal obligation of the developer to organise a replacement [8,24,49]. Often, lost land and lost housing would have been used or owned by private individuals, but even where it is communally owned, such like-for-like replacement should be understood as compensation, not benefit-sharing. Such physical infrastructure-based compensation is often carried out by contractors hired by the hydropower developer. Although the planning and budgeting may appear to be comparatively straightforward, given the tangible nature of the assets that are being replaced, seemingly minor questions such as the architectural style, sizes or building materials of new houses can pose significant challenges that

may test the relationship between developer and project-affected people [51]. Where resettlement processes are required to meet international donor safeguards, any new land allocated to resettled displaced people must provide equivalent crop yields to traditional fields. National legislation may be less constraining, for example, lacking precise methodologies for determining the value or quality of replacement land.

2.1.2. Cultural, religious or sporting infrastructure

It appears straightforward that developers need to replace cultural, religious or sporting infrastructure that is lost as a result of dam construction; these resources thus clearly fall into the category of 'compensation'. Examples may be houses of worship, community meeting halls or football pitches that need rebuilding in resettled communities. Often, this may present an opportunity for an upgrade of the quality of such physical infrastructure, and the building work can be contracted out to third parties by the developer, ideally in close consultation and constructive dialogue with project-affected people.

It is also worth noting that despite these potential improvements, their objective is only replacement and compensation for what is lost (rather than any enhancement), thus, this group of resources should not be classed as benefit-sharing. IFC Performance Standard 5 on land acquisition and involuntary resettlement, for example, suggests that "new resettlement sites [...] must offer improved living conditions", which may include improvements to cultural, religious or sporting infrastructure [52] (p.5). In some cases, replacement may be attempted, but is de facto impossible, where religious, sacred, or historical sites are concerned. One example is the flooding of cemeteries and ancestral shrines, which can never be adequately compensated, and which may be traumatic for project-affected people [53]. Likewise, the submergence of archaeological sites is problematic (even if some have argued that submergence may raise needed funds for archaeological fieldwork) [54], and compensation can never properly replace what is lost, leaving mitigation as the only option in such cases.

2.1.3. Water supply services

The dynamics around replacing lost water supply services are similar to those around the replacement of lost community infrastructure described in Section 2.1.2. Governments may place a duty on developers to replace lost water infrastructure, often with a vision to improve quality in resettled communities. Given that many rural communities in countries with low-income economies still drink water from open wells or unsafe rivers and ponds, reliable access to a safe water supply for every citizen is a key development goal for many countries where dams are currently being built [55], besides also being a fundamental human

right. This is thus not just compensation, but also contributes to meeting governmental development objectives (see e.g. [40]). This reflects the reality that many dams displace poor and remote rural communities, where simple 'like for like' replacement of lost resources and assets would set an overly low bar. These investments thus represent the fulfilling of government duties to all its citizens that are independent of dam construction. Only their timing may be directly determined by the dam-related process of resettlement.

2.1.4. Schools and health centres

Building schools and health centres in resettled communities is overall very similar to improving water supply infrastructure. It clearly contributes to meeting governmental development objectives. Yet, while most communities would have had some form of water supply prior to displacement, the same cannot be said of schools and health centres, which tend to exist in a minority of cases only [34]. Thus, this is an example of an asset or resource that would not normally be covered by compensation agreements, since it is not being replaced. However, schools and health centres do not fall into the category of benefit-sharing either, since a clear government duty exists to provide education and health to all citizens, independent of dam construction. As with improved water supply services, only the timing of construction, and the type of financing, can be directly linked to hydropower development.

2.1.5. Reservoir fisheries

Some benefits may fall into more than two categories, with reservoir fisheries being a typical example. Some reservoir fishing activities would compensate for lost river fisheries that existed pre-dam construction (see e.g. [40]); national and local governments may encourage fishing to create livelihoods and economic development in resettled communities and beyond; but fisheries can also be seen as benefit-sharing, where it is a novel activity for those participating (or there is inward migration of fishers from elsewhere) and not simply replacing previous fishing livelihoods. This illustrates well the 'additionality' element of our proposed definition for benefit-sharing above. Finally, creating reservoir fisheries may also be in the interest of developers, since the prospect of a novel source of livelihoods and associated economic gains may make a project more attractive to governments and funders.

2.1.6. Irrigation schemes

Irrigation schemes may be built to compensate for the negative impacts of hydropower development on agricultural production, which may have been dependent on natural flood cycles, or which might be disrupted where rain-fed agricultural land is flooded by a reservoir [1]. Such land may also have been in communal ownership, and the scheme may thus be a way of compensating for this loss. Developers may seek to emphasise efficiency and productivity gains from irrigation schemes, considering that it is often not possible to identify replacement rain-fed agricultural land of an equivalent size and quality near a dam site as all available good quality land is usually already occupied [56]. The economic value of production from irrigated agriculture may also make such multi-purpose projects more attractive to governments and funders (an example is the planned Pwalugu Dam in Ghana [57]); thus irrigation schemes are potentially in the interest of hydropower developers as well.

Irrigation schemes may have a communal character that goes beyond resettled people, in the sense that any novel benefits arising from them can also benefit the community as a whole. Developers may want to make irrigation available even to residents who may not necessarily have owned land previously, but who would be eligible to participate in benefit-sharing agreements. Thus irrigation schemes can be both compensation and benefit-sharing. The technological modernisation associated with introducing irrigation may contribute to meeting governmental development objectives, particularly in semi-arid countries, where seasonal agriculture can be replaced by year-round irrigated agriculture thanks to the water stored in the reservoir, or due to the stabilisation of dry-season flows downstream of the dam [58,59] (but

see [60]).

2.1.7. Electricity supply

Electrification of project-affected communities is a typical benefit, and maybe the most obvious non-monetary candidate for hydropower benefit-sharing agreements, since it directly links communities with the benefits produced by hydropower development [11,12]. In most cases today, rural communities would not normally have had electricity before dam construction (see e.g. [2]), so creating access to this service following hydropower development would not be classed as 'compensation'. Yet this does contribute to governmental development objectives [61], with most governments seeking to provide universal access to all their citizens. Thus, electricity supply is an example of how benefit-sharing agreements may accelerate the implementation of government responsibilities.

2.1.8. Tourism development

The reservoir lakes created by storage dams transform the local landscape, and may often make it attractive for recreational activities, such as boating, sailing or recreational fishing [62]. Hotels and other accommodation providers may be opened near a reservoir, creating business and employment opportunities. These are clearly additional benefits directly resulting from dam construction, so project-affected people may seek support in developing them within the framework of benefit-sharing agreements; without support, they may find that outside actors and newcomers will be more equipped to realise such opportunities. In the best case, tourism can thus create livelihoods in the formal economy, this way contributing to governmental development objectives through hydropower benefit-sharing. Tourism development is not necessarily in the interest of dam developers, who may wish to minimise risks of interference with reservoir management and water quality [63].

2.1.9. Scholarships and support for small businesses

Agreements between hydropower developers and project-affected people may often include scholarships and micro-credit schemes for local community members [12], which are paid for by the revenues of selling hydroelectricity. These are good examples of what one may consider benefit-sharing only, since both represent an opportunity for development for project-affected people that is additional, and would not have existed without the construction of the hydropower dam. Both scholarships and micro-credit schemes are based on the recognition that returning to exactly the same livelihoods as before dam construction may not be fully possible or desirable for all project-affected people; and both are in principle sufficiently flexible for project-affected people to decide their own development priorities (see also section 2.2).

2.1.10. Preferential employment and procurement schemes

Like micro-credit schemes and scholarships, preferential employment and/or procurement schemes are clear and frequent examples of a benefit or service that can result from benefit-sharing agreements [49]. In the best case, they offer stable long-term employment to project-affected people that would come with training opportunities and improved income as compared to pre-dam construction. Where developers can identify suitable locally based candidates for employment or service provision at their site, this is clearly in their interest, since it would be likely to reduce local opposition to hydropower development (see also the next section 2.1.11). Moreover, workers rooted in the community are more likely to want to stay in their jobs long-term, reducing turnover and retaining work- and site-specific expertise.

2.1.11. Good community relations

Good community relations are primarily in the interest of developers. They will be the result of engagement and dialogue between developer and project-affected people, for example in the context of grievance redress mechanisms [3], but could also be a side-effect of implementing benefit-sharing agreements on some of the material

resources and services outlined elsewhere in section 2.1. Benefit-sharing may thus increase public acceptance for development activities and reduce local public opposition, this way ensuring that development activities can be carried out as smoothly as possible [12]. Given that dam construction is often associated with local conflicts and social resistance (see e.g. [64,65]), advantages to developers may be substantial, at a relatively moderate cost [32]. Benefit-sharing in general has been proposed as a mechanism for shifting the focus away from conflict, and, in the best cases, transforms conflict into cooperation [66]. That said, although good community relations may be fostered through benefit-sharing, they should not be thought of as benefits, but as a means for gaining a social licence to operate (SLO) for the project. A SLO has been defined as “obtaining and maintaining the acceptance and/or approval of an activity by local and other stakeholders” [67] (p.123). In the context of hydropower development, a SLO is often thought of as a key requirement to implement a project successfully, ensuring that it earns legitimacy, credibility and trust of project-affected people and communities [68] (see also section 4.1).

2.1.12. Access roads

While access roads to a dam (construction site) certainly represent an improvement of the local physical infrastructure, they should not be classed as a benefit for project-affected people, even if in some cases they may constitute shared infrastructure [11]. Developers would need to build these roads anyway, so they do not represent an additional benefit coming from the investment of hydropower revenues. More importantly, such roads are built according to the priorities of the developer, and project-affected people do not participate in decision-making around them. In this sense, their construction does not meet the process criteria for benefit-sharing agreements (see section 2.2) even if they do improve access to remote areas.

2.1.13. Watershed protection

Watershed protection, such as the planting of native vegetation upstream of a dam or establishing biodiversity reserves is also primarily in the interest of the developer. Such reserves can help reduce the amount of sediments entering a river, which improves the lifespan of a dam, while also enhancing environmental credentials. Although such biodiversity protection contributes to the ‘greater public good’, it might not necessarily directly benefit project-affected people. Newly created reserves may cause further displacements or be accompanied by the introduction of access or use restrictions [69]. Occasionally, watershed protection is implemented through Payments for Ecosystem Services (PES) schemes, which may financially benefit local land owners and managers, but few successful examples exist [38,70].

2.2. Process dimension: Legitimising benefit-sharing arrangements through participation by project-affected people

Benefit-sharing is often considered a moral duty, as recognised by international law and policy [25,30]. In 1986, the United Nations proposed that every person had the right to economic (and other forms of) development, and that states had a duty to develop policies that would ensure “active, free and meaningful participation in development” as well as “the fair distribution of the benefits resulting therefrom” [48]. Similar normative considerations are reflected in the recommendations made by the World Commission on Dams [17]² and in the World Bank’s policies on resettlement, which require that project-affected people are “no worse off and preferably better off than before” [71] (p.313). Hydropower benefit-sharing represents one concrete strategy to translate such normative principles into concrete action on the ground.

² For an overview of (human) rights-based approaches for dam planning, construction, and management, see chapter 7 of the report by the World Commission on Dams [17].

The specific political and economic dynamics around hydropower development heighten the moral importance of benefit-sharing arrangements. Where outside actors (often distant governments and energy-hungry cities) benefit from the natural resources in certain locations, resulting in social and environmental impacts causing disruptions to project-affected people, it seems fair that these should benefit as well [4]. This is accentuated by the often massive differences in political and economic power between such outside actors and project-affected people [39]. Many scholars have justified the need for benefit-sharing by citing political and economic inequalities and the moral duty to counter them [72–74]. Equity and fairness are moral principles that are often attached to benefit-sharing, for example in the context of sharing the benefits of genetic resources and traditional knowledge on plants and the environment as per the UN Convention on Biological Diversity [72]. Yet reaching a generally accepted definition of ‘fair and equitable benefit-sharing’ remains difficult [25,73], and the realisation of competing and sometimes contradictory governance-related values and principles [75], which are implicit in these moral considerations, remains a significant challenge.

Nevertheless, in practice, scholars seem to converge on one normative principle that should define benefit-sharing: the meaningful participation of project-affected people in decision-making processes around benefits [23,25,39]. The concept of ‘empowerment’ is often linked to participation (e.g. [76]), that is, the ability of project-affected people to influence outcomes of decision-making processes and to determine their own development trajectory. This ability to influence is a crucial criterion, as local people’s participation in natural resource management often ends up being superficial or ‘tokenistic’ (see e.g. [77]). In the context of hydropower benefit-sharing, that means that project-affected people should be able to influence decisions on the spending of their share of hydropower revenues. Where these revenues are directly transferred to resettled communities, the allocation of resources would then be determined through local governance structures. But even where non-monetary or monetary benefits are directly provided to communities by the hydropower developer or a contractor, benefit-sharing arrangements can be designed to allow for the strong participation of project-affected people in determining their shape and nature.

Participation of project-affected people in benefit-sharing raises the likelihood that ‘benefits’ truly are benefits. Local people will have detailed insights into real needs and priorities. This may make benefit-sharing more effective and beneficial in the long term, even if it is also necessary to acknowledge the often underestimated practical and conceptual challenges of participation by local people or communities in natural resources governance (see also Section 3.2) [78,79], particularly in low-income countries [80]. Participation relates well with the adaptive nature of benefit-sharing. As needs and priorities may constantly change over time, benefit-sharing agreements need to be sufficiently flexible and adaptive to cope [66]. This again suggests that project-affected people would have trusted and effective formal channels of communication with developers. Participation implies that project-affected people and developers work in partnership; benefit-sharing does not include scenarios where benefits are unilaterally determined and imposed by developers [23,25].

2.3. Temporal dimension

To conclude our conceptual review, here we distinguish benefit-sharing from related concepts in relation to the timeline from project selection to dam operation. Benefit-sharing is typically implemented late in that timeline (see Fig. 2). Since a majority of direct benefits from hydropower dams can only be shared once it is operational (for example, where they are financed through the sale of electricity), this might be one criterion for distinguishing benefit-sharing from compensation, which occurs mostly during the construction phases prior to reservoir flooding. The main exception might be preferential employment and

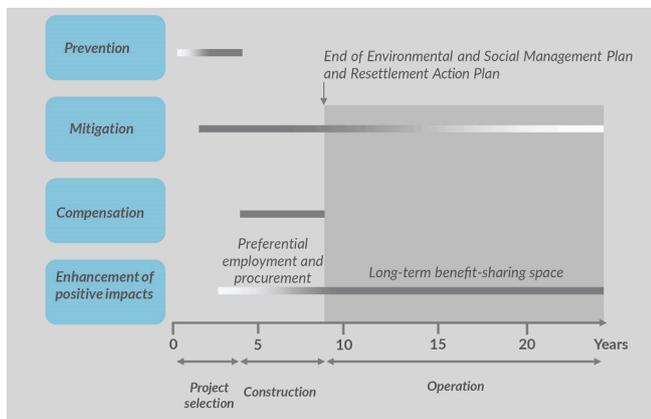


Fig. 2. Benefit-sharing in the timeline from dam planning and design to operation; Note that preferential employment and procurement schemes can be thought of as a benefit that can be shared during or potentially before the construction phase.

procurement schemes during construction (see section 2.1.10). Throughout the life cycle of a dam, negative impacts should be avoided, minimised or mitigated, and positive impacts enhanced and shared. Yet many negative material impacts for affected people are concentrated during the relatively short period of construction, while positive impacts, such as electricity production, are spread out over the much longer period of operation. Compensation targets these relatively well-defined and abrupt negative impacts, which cannot be prevented or mitigated (see “Prevention” and “Mitigation” in Fig. 2), for example the flooding of houses or land.³ But while prevention of negative impacts is a concern mainly at the earliest planning stage, mitigation may continue throughout the life cycle of a dam [81].

From a policy perspective, compensation is a short-term legal right, delivered within the framework of environmental and social impact assessments (ESIA), and is therefore usually financed as a non-negotiable part of the initial investment [81]. Hydropower projects have traditionally undertaken ESIA leading to environmental and social management plans, and, where required, resettlement action plans [24,34]. These are typically time-bound, often lasting 4–5 years during project construction, although some have argued that resettlement action plans should be developed after (E)SIAs have been completed, and construction can only begin once the resettlement action plan is ready for implementation [82].

The specific aims of this phase vary between projects, but beyond simply replacing lost material assets, they may also include more complex forms of compensation, such as livelihood restoration activities in the resettled areas. Additionally, mitigation plans associated with the negative impacts of the project can be part of this phase. In some cases implementation of these plans can end simply with some degree of compensation; in others it can include significant investments in new agricultural production systems and support for the most vulnerable. Fig. 2 highlights how benefit-sharing is defined by the timeline of these activities: once environmental and social management plans and resettlement action plans are concluded, the provision of additional benefits can be understood as benefit-sharing. These additional benefits are financed from the revenues of a project and last for the entire lifetime of a dam.

³ Prevention and mitigation were not covered in section 2.1, since they do not involve a transfer of ‘new’ resources or services, unlike compensation (where they replace lost assets or resources) or benefit-sharing (where they are incremental from a pre-project baseline).

3. The institutional dynamics of benefit-sharing and compensation over time

In this section, we describe how the institutional dynamics of compensation and benefit-sharing may change over time in a stylised way, as visualised in Fig. 3. These are strongly associated with the management of the resettlement transition. In exploring these dynamics, we also aim to highlight the significant challenges that various actors and institutions will face on the pathway towards ‘good’ benefit-sharing. For the purposes of this review, this discussion will necessarily be presented in simplified and idealised terms. In practice, there is great diversity of interests and behaviours within the three groups described below.

3.1. The developer

We begin with the perspective of a private or public–private hydropower project developer. In the context of dam construction in remote rural areas, developers are initially the actor or institution that is most prepared to deal with the specific challenges and disruptions that a new dam brings, since only they would have had previous experience with dams (as opposed to local government or project-affected people).

In the early stages of a hydropower project, developers will be legally required to arrange adequate compensation. In that period, which coincides with the filling of the reservoir, developers will thus be in full control of resources transferred to project-affected people (as seen in Fig. 3). This includes the appropriate spending of funds to restore livelihoods and infrastructure, such as roads or water supply (anything that falls into the category of ‘compensation’ in Fig. 1). Developers may fulfil these responsibilities themselves, or they might outsource them to a contractor. Even in a context of weak enforcement, developers will normally accept such legal requirements to compensate, although the quality of implementation may vary considerably from project to project, and many developers have failed to allocate sufficient budgets for proper compensation (see e.g. [56,83]).

In the longer term, developers prioritise their core business: operating dams for optimal hydroelectric energy production. Managing benefit-sharing arrangements and dealing with project-affected people would not normally rank highly among a developer’s interests, even if preferential employment and procurement schemes and the good community relations resulting from well managed benefit-sharing agreements may benefit developers, too (see Fig. 1).⁴ As outlined in section 2.3, benefit-sharing is typically implemented late in the timeline from dam planning to operation, and in the best case, project-affected people will have strong control over these resources (section 2.2). This dynamic is visualised in Fig. 3 as well: as the focus shifts from compensation to benefit-sharing, the control of developers over resources, and in this sense, their role in the resettlement transition, will be reduced. Even then, however, developers will require some accountability concerning how funds are used, and cannot sign off a ‘blank cheque’ [11]. This can be aided by regular external reviews, for example, every five years. Where benefit-sharing is legally mandated (e.g. Nepal), the power to make spending decisions can still be passed on to project-affected people or government entities [33].

Considering financial aspects, developers might be more comfortable with a stronger role for project-affected people and benefit-sharing in later stages as well. Once a project has repaid the majority of its debt, about 10–12 years after commissioning, there is an increase in available funds as a hydropower project begins to return revenues to the developer and the risks to investors decrease substantially. The last 15–20 years under a private concession for a dam would typically be the most cash rich for the developer, opening up the opportunity for flexible

⁴ This also implies that making benefit-sharing a legal requirement would strongly increase its prevalence.

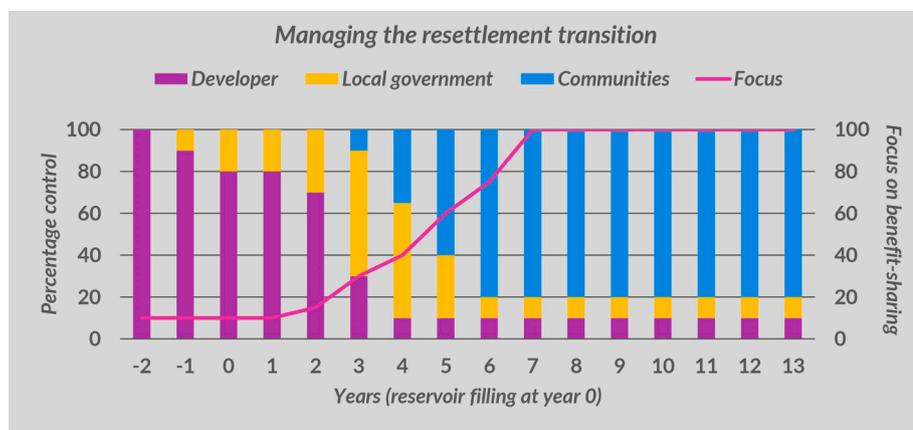


Fig. 3. Stylised institutional dynamics of benefit-sharing vs. compensation; ‘control’ refers to control over financial resources; ‘focus’ refers to the focus on benefit-sharing vs. compensation (0–100%). During construction phases compensation will be the almost exclusive focus of institutions involved in hydropower development; during operation, there will eventually be an exclusive focus on benefit-sharing. Years are given in relation to the filling of a dam reservoir, and are approximate only.

financial investments in benefits for project-affected people and communities [84]. It is also the case that, because developers (or their financial planners) assess projects using a discounted cash flow model, they are less sensitive to requests during project negotiations for additional benefits for stakeholders which occur late in the project timeline, than those which occur in the first 8–10 years. Thus, allocating higher benefits later in the project life is more likely to be financially viable for the developer and may also provide benefits for those project-affected people not old enough to be entitled to a share of the initial compensation payments. Giving communities an equity share in the project may have a similar effect, as dividends tend to rise as the project progresses past the debt repayment phase [33].

3.2. Project-affected people and communities

As outlined in section 2.2., the UN and other international bodies consider the participation of (project-affected) people in development as a (human) right, and hydropower benefit-sharing is a logical consequence of such normative considerations [17]. Participation has a strong temporal dimension, however, as shown in Fig. 3. In an ideal-type scenario, project-affected people and communities would control most of the financial resources via benefit-sharing agreements a few years after reservoir filling.

Handing over control of financial resources to project-affected people requires building of novel institutional capacity. No matter how strong traditional governance structures may be, dealing with a substantial influx of money will pose significant and novel governance challenges to project-affected people. Yet, as empirical research on displacement and resettlement has amply demonstrated, pre-construction and construction phases are already frequently characterised by tensions, conflict, confusion, misunderstandings and miscommunication between parties [85], which continue for varying amounts of time post-resettlement [86,87]. Making the transition from this ‘predictably chaotic’ stage to a more coordinated form of joint decision-making by project-affected people and communities necessarily takes time. Thus, the transfer of decision-making power to project-affected people in benefit-sharing agreements needs to be a gradual process (see Fig. 3) that enhances their agency; ideally, developers lay the groundwork for this process as early as possible, seeking to build trust through genuine dialogue with project-affected people [81]. As more time passes, flexibility and adaptive capacity in benefit-sharing arrangements increase in importance, as unexpected events or community dynamics may change priorities (see e.g. [44]). Delivering the benefits outlined in Fig. 1 requires flexible arrangements, financed by a continuous financial revenue stream, which help communities to cope with uncertainties [66].

While project-affected people and communities need to react and respond to a proposed dam project when first engaged, collectively

deciding how to spend funds allocated to them via benefit-sharing is an altogether different question. There are multiple political challenges that need to be overcome. For example, the required novel decision-making structures can suffer from power imbalances among project-affected people themselves, or elite capture [74], which may further marginalise weaker members within this group. Decision-making authority within communities may not be clear, as traditional and modern authorities may have competing influence among project-affected people, leaving developers and state actors in a position where they need to negotiate with multiple local representatives [88]. The role of community heterogeneity has also been cited as a relevant factor, with ethnically homogenous communities more likely to act collectively and share benefits equitably [89]. Within communities, younger generations may not see their future in rural areas and may prioritise opportunities for migration to urban areas to find paid work [90].

Benefits may therefore not reach all project-affected people. This might be the case where certain social groups lack full citizenship rights or do not have formal documentation proving their residence or resource use rights in a project-affected area [91]. Sometimes, migrant outsiders may capture benefits intended for project-affected people. Those who are affected downstream of a reservoir dam might also often struggle to access any benefits, and tend to get overlooked already in ESAs (see e.g. [92]). Insights and experiences with implementing the principle of Free, Prior and Informed Consent (FPIC) that gives indigenous peoples the right to consent or not to the development of projects that affect them [93], might be useful to consider in addressing the challenges of local participation described above (including and beyond indigenous peoples). Likewise, it is important to consider the gender dimension in benefit-sharing, since gender disparities tend to become aggravated following the social and economic disruptions caused by involuntary resettlement [94].

3.3. Local governments

Local governments are typically required to work towards development objectives, such as schools or health centres (‘governmental development objectives’, as categorised in Fig. 1), yet they are often limited by their lack of capacity and funds. With regards to managing the resettlement transition from developer-led compensation to project-affected people-led benefit-sharing, local governments take a mediating role (see Fig. 3), engaging with both sides to ensure that funds are spent in an appropriate way [95]. In an ideal-type scenario, they manage funds received from the developer in a transparent manner, towards achieving development goals [12]. Local governments work for all citizens, meaning that they can try to harmonise relations between resettled and non-resettled citizens, considering strongly differential impacts of dams on these groups [22], although this is not an easy task. Local governments have the advantage that they are often seen as legitimate

actors for shaping development by national governments. However, especially in the case of very large hydropower projects, they may sometimes be sidelined as well, given the strategic importance of large dams for a country [95].

4. Balancing the roles of governments and developers in benefit-sharing

In this section, we consider how the choice of an appropriate institutional set-up for hydropower benefit-sharing may be dependent on the existing capacity of government in the dam-hosting location, as visualised in Fig. 4 below. We discuss both developer-led benefit-sharing mechanisms (section 4.1) as well as government-led benefit-sharing, often achieved through general regulations and policy (section 4.2). This section especially discusses mechanisms for raising funds for benefit-sharing. As in section 3, this discussion necessarily presents an idealised picture, and in practice, there will be a diversity of scenarios among the two benefit-sharing categories covered in this section.

In principle, most countries consider their water resources to be public goods. Yet, realising water uses, such as hydroelectric power production, requires varying degrees of restricting access and allocating rights to benefits [96]. This, in turn, requires strong regulatory frameworks, or at least, some form of policy consensus regarding how water uses are managed in a given place. The governance of water resources raises particular challenges, however, given that water does not respect human-defined political boundaries, different uses of water may be mutually exclusive, and the resulting complex institutional arrangements often lead to conflicts between various institutions and actors [97].

In the past few decades, global water policy has made considerable progress with developing the normative bases for water resources management. These are sometimes summarised under the headline ‘from government to governance’, that is, taking decisions collaboratively among a wide range of relevant actors within society, as opposed to a more hierarchical relationship between the state and society [98]. The adoption of the 1992 Dublin Principles was a milestone for the global water agenda, which stressed collaboration and participation [99,100]. Other dominant concepts, such as ‘nexus-thinking’ or ‘integrated water resources management’ (IWRM) similarly emphasise integrated management of water in all its forms, involving diverse water user groups, and taking into account multiple spatial and temporal scales [101–103].

Hydropower benefit-sharing is embedded in this global water policy context and shares many of these challenges. For example, the collaborative approach between developers, project-affected people, and governments aligns well with the normative ideals of participation described above (cf. [101]). Yet, putting these ideas into practice has

proven to be a complex and often problematic undertaking (see e.g. [104,105]), and this is exacerbated in the case of hydropower benefit-sharing, given the additional challenge of dealing with the displacement and resettlement of people. Also, different water users may be affected in different ways by dam construction, while affected river users and those in need of resettlement may not necessarily be the same people. Every benefit-sharing agreement will entail a different configuration or allocation of responsibilities between governments and developers (see Fig. 4), as discussed below.

4.1. Developer-led benefit-sharing

In Fig. 4, we propose that developers may need to take a leading role in delivering benefit-sharing agreements, where the capacity of government in the dam-hosting location is low. This might often be the case in countries with low-income economies, particularly at local or provincial levels of government (see, e.g., [106] or [107], on the link between economic development and capacity of government), for example, due to shortages in public funds for infrastructure, among many other potential reasons [108]. In such scenarios, government entities may often lack the budget or capacity to aid in the design and implementation of benefit-sharing agreements, and employing some outside expertise (i.e. by the developer) can be necessary.

Examples of mechanisms that require a more central role by the developer are community development funds that are administered privately, in consultation with project-affected communities [11]. Some of these development funds may allocate monies following dialogue with communities, others may award grants on a basis of applications by residents [34]. Any type of corporate social responsibility (CSR) spending by the developer also falls into this category, if implemented in collaboration with project-affected people. In all privately-led benefit-sharing arrangements, developers will require an internal policy to administer funds. Given the absence of government-determined regulations, such benefit-sharing mechanisms may be project-specific and tailored to local circumstances.

Yet, as mentioned above, for most developers, managing benefit-sharing is a secondary task as compared to managing dams for technically sound and smooth hydroelectric power production. A lack of public policy and oversight over benefit-sharing is thus in principle problematic; private developers in particular will have sufficient resources to defend themselves in any potential legal disputes with weak state institutions around their responsibilities. Ideally, governments across all scenarios would thus build up capacity to take a regulatory role in hydropower benefit-sharing in the longer term.

Nevertheless, in the short to medium term, developers can help fill the void that lack of government capacity in a dam-hosting location may create. As discussed in section 2.1.11, this might be in their own interest,

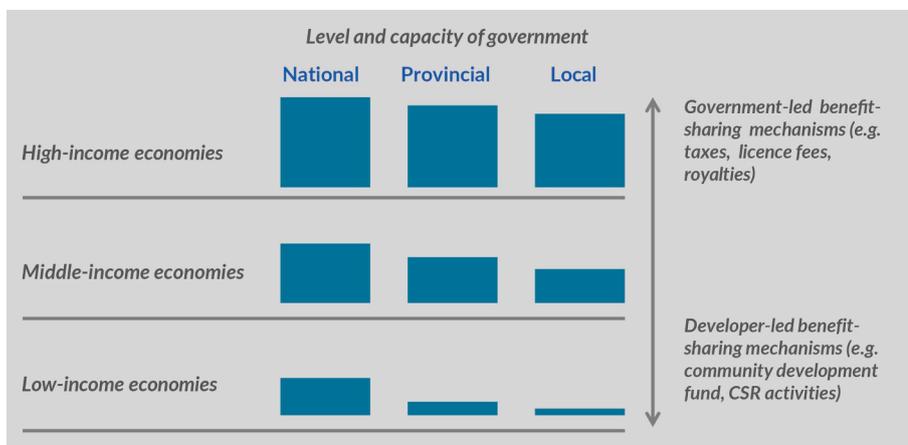


Fig. 4. The institutional context for benefit-sharing agreements; with high existing government capacity, government-led benefit-sharing mechanisms may be most appropriate to ensure that benefit-sharing with project-affected people does take place; with low government capacity, there is a strong need for developers to adopt responsible CSR policies; overall, government capacity tends to be higher at national levels and in countries with high-income economies. The categorisation above represents stereotypical cases and is used for illustrative purposes only.

since good relations with project-affected people and communities can help avoid disruptions and delays, caused by the extensive repertoire of activities they might employ to protest against infrastructure development [109]. Such protests are often interpreted as indications of developers lacking a SLO. For example, it has been argued that a weak SLO led to the cancellation of the Chilean Neltume hydropower project after more than 10 years of planning and substantial investment [110]. Deficient SLOs have also restricted investment in hydropower in the context of global climate finance in the past [111].

Funders may choose to make investment decisions conditional on the existence of a clear strategy for implementing benefit-sharing [111], which may help with obtaining a SLO, mitigating the risk of conflict and interference by local residents over the extended period of dam operation [11,49]. Yet, social risks are just one among a large number of risks that developers consider before making investment decisions [108] and it is not yet clear that following best practices in benefit-sharing is, on its own, sufficient to enable a developer to establish a strong SLO.

4.2. Government-led benefit-sharing

In the context of comparatively high existing government capacity, legally mandated benefit-sharing mechanisms such as taxes, licence fees or royalties may be more appropriate, since these will more reliably ensure that some form of benefit-sharing will be realised. This is typically (but not exclusively) the case in countries with high-income and middle-income economies, and more likely at the national level of government (see Fig. 4).

Government-led benefit-sharing mechanisms may operate at national, provincial, or local levels of government. Local taxes in particular allow (democratically legitimised) local authorities to tailor spending priorities according to local preferences and needs [112]. Hydropower projects will normally also incur general corporate and personal income taxes, VAT or property taxes, which are sometimes redirected to project-affected areas [11]. Likewise, direct revenue transfers or royalties can be negotiated between developer and local authorities. In Québec, Canada, royalties are directly tied to revenues (e.g. a certain percentage), whereas taxes are paid independent of the volume of electricity sales [36]. In Nepal, royalty payments are dependent on the installed capacity of a hydropower plant and the annual generation of electricity, and are shared between central government, regional authorities, and local district development committees [33]. Another mechanism consists of equity-based benefit-sharing arrangements, where local people may hold a share in hydropower projects. This way, revenues from the sale of electrical energy are directly shared with residents, who can determine their own spending priorities at the household level. While Nepali equity shares have gained in value for project-affected people thus far, this may fluctuate. Equity shares thus contain a financial risk to local shareholders, which they do not always fully appreciate [33].

Government-led benefit-sharing implies that developers lose some influence over the benefit-sharing process; however, if implemented well, they may also increase predictability of the business, with developers effectively 'outsourcing' part of their social and environmental responsibilities to government institutions. These, in turn, may profit not only from increased public budgets, but also from the capacity development that takes place around the investment process. Ultimately, determining this balance between public interest and private profit in the management of water resources is the responsibility of governments.

Where there are many privately-led or mixed public-private hydropower projects in a country, there is a stronger need to regulate benefit-sharing arrangements via a national policy, for example via a taxation regime. This will also facilitate planning and decision-making by financial investors. Conversely, where there are few, and government-led hydropower dams, benefit-sharing can be more tailored to local contexts, often via a 'bespoke' policy. For example, Ghana's Akosombo Dam was the only major hydropower dam in the country for several

decades after its construction, so there was no need to develop a national benefit-sharing policy. Instead, Ghana's Volta River Authority, which operates the dam, has been in charge of managing benefits to local communities, although not always to the satisfaction of resettlers [113].

In practice, a mix of government-led and developer-led benefit-sharing mechanisms is likely and desirable, and may enhance overall effectiveness and flexibility to adapt to changing needs and preferences. It may also reduce opportunities for corruption, with both sides having an external party overseeing their work. A strong involvement of local authorities will also help tailor benefit-sharing arrangements to local realities even if, at present, they are not always fully engaged when benefit-sharing is driven by national governments. Indeed, the scenarios described above and visualised in Fig. 4, represent a 'minimum standard' of what can best be achieved under given circumstances. Yet, for hydropower benefit-sharing to realise the normative visions of the global water policy agenda requires significant advances that go well beyond the proposals described here.

5. Conclusions

This review sought to make two main contributions to the debate on hydropower benefit-sharing, where local people are displaced and resettled due to large reservoir dams. The first contribution centres on defining benefit-sharing and clarifying the boundaries between benefit-sharing and other relevant concepts. We propose that benefit-sharing should be understood as a 'sustainability intervention', which has long-term and additional positive impacts on project-affected people, well beyond marginally improving on lost assets. Benefit-sharing, if implemented well, should support livelihoods for resettled people over the long term and avoid many of the negative outcomes currently recorded in too many cases. We outline how benefit-sharing is different from related concepts such as 'compensation' by offering a typology of benefits and other resources and services that may be transferred to project-affected people. These may sometimes be misidentified as benefits, for example, when they are, in fact, compensation measures, part of governmental development objectives, and/or in the interest of developers (though many overlaps exist between these categories). We further discuss the normative bases for benefit-sharing which imply that decisions about benefits or the allocation of funds must be taken in a participatory process with project-affected people. We also discuss the temporal dimension, suggesting that most benefit-sharing activities coincide with the operation phase of a hydropower project, emphasising its long-term and adaptive nature.

The second contribution of this review is an exploration of the particular governance challenges of hydropower benefit-sharing. We argue that effective benefit-sharing with project-affected people requires building capacity and trusted channels of dialogue with developers over time. Due to the highly disruptive nature of hydropower dam construction, benefit-sharing capacity needs to be gradually built up, and the lead role in decision-making processes needs to evolve from developers to project-affected people and communities as the reservoir is filled. Local governments can play a mediating role between project-affected people and developers. We also suggest that the choice of an appropriate benefit-sharing mechanism might be dependent on the existing capacity of government in the dam-hosting location. Where capacity is high, government-led mechanisms such as taxes, royalties or licence fees can ensure that some form of benefit-sharing will be taking place, whereas developer-led mechanisms such as community development funds or CSR activities may be required where government capacity is low. In practice, a mix of benefit-sharing mechanisms and institutional arrangements is possible and desirable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

the work reported in this paper.

Acknowledgements

The authors would like to thank Bill Adams, Andrew Norton, David Hulme, Udisha Saklani, Jérôme Koundouno and two anonymous reviewers for their helpful comments on earlier versions of this paper. They are also grateful to Judith Plummer Braeckman for advice on hydropower finance. This work was supported by the UK Research and Innovation Economic and Social Research Council [ES/P011373/1] as part of the Global Challenges Research Fund.

References

- [1] M.M. Cernea, Financing for development: benefit-sharing mechanisms in population resettlement, *Econ. Polit. Wkly.* 42 (12) (2007) 1033–1046.
- [2] I. Dombrowsky, J. Bastian, D. Däschle, S. Heisig, J. Peters, C. Vosseler, International and local benefit sharing in hydropower projects on shared rivers: the Ruzizi III and Rusumo Falls cases, *Water Policy* 16 (6) (2014) 1087–1103, <https://doi.org/10.2166/wp.2014.104>.
- [3] F. Vanclay, P. Hanna, Conceptualizing company response to community protest: principles to achieve a social license to operate, *Land* 8 (6) (2019), 101, <https://doi.org/10.3390/land8060101>.
- [4] D. Wichelns, Sharing the benefits of hydropower: endeavoring to enhance livelihoods and protect the environment, *Water Resour. Rural Dev.* 4 (2014) 1–2, <https://doi.org/10.1016/j.wrr.2014.10.003>.
- [5] L. Berga, The role of hydropower in climate change mitigation and adaptation: a review, *Engineering* 2 (3) (2016) 313–318, <https://doi.org/10.1016/j.eng.2016.03.004>.
- [6] C. Zarfi, A.E. Lumsdon, J. Berlekamp, L. Tydecks, K. Tockner, A global boom in hydropower dam construction, *Aquat. Sci.* 77 (1) (2015) 161–170, <https://doi.org/10.1007/s00027-014-0377-0>.
- [7] Y. Duan, S. Ali, H. Bilal, Reforming benefit-sharing mechanisms for displaced populations: evidence from the Ghazi Barotha Hydropower Project, Pakistan, *J. Refug. Stud.* (2021), <https://doi.org/10.1093/jrs/feab019>.
- [8] M. Hay, J. Skinner, A. Norton, Dam-induced displacement and resettlement: a literature review, *FutureDAMS Working Paper 004*, The University of Manchester, Manchester, UK, 2019.
- [9] I. Jiménez-Inchima, J.-A. Polanco, M. Escobar-Sierra, Good living of communities and sustainability of the hydropower business: mapping an operational framework for benefit sharing, *Energy Sustain. Soc.* 11 (2021), 9, <https://doi.org/10.1186/s13705-021-00284-7>.
- [10] S. Price, W.A. Van Wicklin III, D. Koenig, J. Owen, C. de Wet, A. Kabra, Risk and value in benefit-sharing with displaced people: looking back 40 years, anticipating the future, *Soc. Change* 50 (3) (2020) 447–465, <https://doi.org/10.1177/0049085720953409>.
- [11] J. Hartmann, How-to-guide: hydropower benefit sharing, International Hydropower Association (IHA), London, UK, 2019.
- [12] C. Wang, A guide for local benefit sharing in hydropower projects, Social Development Working Papers, Paper No. 128, The World Bank, Washington, USA, 2012.
- [13] S. Annys, E. Adgo, T. Ghebreyohannes, S. Van Passel, J. Dessein, J. Nyssen, Impacts of the hydropower-controlled Tana-Beles interbasin water transfer on downstream rural livelihoods (northwest Ethiopia), *J. Hydrol.* 569 (2019) 436–448, <https://doi.org/10.1016/j.jhydrol.2018.12.012>.
- [14] E. Atkins, J. Hope, Contemporary political ecologies of hydropower: insights from Bolivia and Brazil, *J. Polit. Ecol.* 28 (1) (2021) 246–265, <https://doi.org/10.2458/JPE.2363>.
- [15] H. Hausermann, “Ghana must progress, but we are really suffering”: Bui Dam, antipolitics development, and the livelihood implications for rural people, *Soc. Nat. Resour.* 31 (6) (2018) 633–648, <https://doi.org/10.1080/08941920.2017.1422062>.
- [16] X. Zhao, L. Wu, Y. Qi, The energy injustice of hydropower: development, resettlement, and social exclusion at the Hongjiang and Wanmipo hydropower stations in China, *Energy Res. Soc. Sci.* 62 (2020), 101366, <https://doi.org/10.1016/j.erss.2019.101366>.
- [17] World Commission on Dams, *Dams and development: a new framework for decision-making*, Earthscan, London, UK; Sterling, USA, 2000.
- [18] M.W. Beck, A.H. Claassen, P.J. Hundt, Environmental and livelihood impacts of dams: common lessons across development gradients that challenge sustainability, *Int. J. River Basin Manag.* 10 (1) (2012) 73–92, <https://doi.org/10.1080/15715124.2012.656133>.
- [19] J.S. Hecht, G. Lacombe, M.E. Arias, T.D. Dang, T. Piman, Hydropower dams of the Mekong River basin: a review of their hydrological impacts, *J. Hydrol.* 568 (2019) 285–300, <https://doi.org/10.1016/j.jhydrol.2018.10.045>.
- [20] A. Mayer, L. Castro-Diaz, M.C. Lopez, G. Leturcq, E.F. Moran, Is hydropower worth it? Exploring Amazonian resettlement, human development and environmental costs with the Belo Monte project in Brazil, *Energy Res. Soc. Sci.* 78 (2021), 102129, <https://doi.org/10.1016/j.erss.2021.102129>.
- [21] C. Schulz, J. Martin-Ortega, K. Glenk, Understanding public views on a dam construction boom: the role of values, *Water Resour. Manag.* 33 (14) (2019) 4687–4700, <https://doi.org/10.1007/s11269-019-02383-9>.
- [22] L. Wiejaczka, D. Piróg, J. Fidelus-Orzechowska, Cost-benefit analysis of dam projects: the perspectives of resettled and non-resettled communities, *Water Resour. Manag.* 34 (1) (2020) 343–357, <https://doi.org/10.1007/s11269-019-02451-0>.
- [23] C. de Wet, Can the benefits of development projects be shared in the context of development-enforced displacement and resettlement? Paper presented at: Meeting of the International Network on Displacement and Resettlement (INDR), Nanjing, China, 30 August - 3 Sept. 2019.
- [24] H. Locher, How-to-guide: hydropower resettlement, International Hydropower Association (IHA), London, UK, 2020.
- [25] E. Morgera, The need for an international legal concept of fair and equitable benefit sharing, *Eur. J. Int. Law.* 27 (2) (2016) 353–383, <https://doi.org/10.1093/ejil/chw014>.
- [26] S. Lee, Benefit sharing in the Mekong River Basin, *Water Int.* 40 (1) (2015) 139–152, <https://doi.org/10.1080/02508060.2014.978974>.
- [27] R. Tawfik, The Grand Ethiopian Renaissance Dam: a benefit-sharing project in the Eastern Nile? *Water Int.* 41 (4) (2016) 574–592, <https://doi.org/10.1080/02508060.2016.1170397>.
- [28] M.F. Gebara, Importance of local participation in achieving equity in benefit-sharing mechanisms for REDD+: a case study from the Juma Sustainable Development Reserve, *Int. J. Commons.* 7 (2) (2013) 473–497, <https://doi.org/10.18352/ijc.301>.
- [29] F. Vanclay, Principles to gain a social licence to operate for green initiatives and biodiversity projects, *Curr. Opin. Environ. Sustain.* 29 (2017) 48–56, <https://doi.org/10.1016/j.cosust.2017.11.003>.
- [30] M. Buck, C. Hamilton, The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, *Rev. Eur. Community Int. Environ. Law.* 20 (1) (2011) 47–61, <https://doi.org/10.1111/j.1467-9388.2011.00703.x>.
- [31] D.D. Soejarto, H.H.S. Fong, G.T. Tan, H.J. Zhang, C.Y. Ma, S.G. Franzblau, C. Gyllenhaal, M.C. Riley, M.R. Kadushin, J.M. Pezzuto, L.T. Xuan, N.T. Hiep, N. V. Hung, B.M. Vu, P.K. Loc, L.X. Dac, L.T. Binh, N.Q. Chien, N.V. Hai, T.Q. Bich, N.M. Cuong, B. Southavong, K. Sydara, S. Bouamanivong, H.M. Ly, T. Van Thuy, W.C. Rose, G.R. Dietzman, Ethnobotany/ethnopharmacology and mass bioprospecting: issues on intellectual property and benefit-sharing, *J. Ethnopharmacol.* 100 (1–2) (2005) 15–22, <https://doi.org/10.1016/j.jep.2005.05.031>.
- [32] L. Haas, Improving benefit sharing around large dams, in: J. Skinner, M. Niasse, L. Haas (Eds.), *Sharing the benefits of large dams in West Africa*, Natural Resources Issue 19, International Institute for Environment and Development (IIED), London, UK, 2009; pp. 21–46.
- [33] P. Shrestha, A. Lord, A. Mukherji, R.K. Shrestha, L. Yadav, N. Rai, Benefit sharing and sustainable hydropower: lessons from Nepal, ICIMOD Research Report 2016/2, International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal, 2016.
- [34] J. Skinner, J. Krauss, P. Newborne, Redistribution of revenues from hydropower dams: review of benefit-sharing mechanisms and local control, International Institute for Environment and Development (IIED), London, UK, 2014.
- [35] E. Wojczynski, Case studies on local benefit sharing in hydropower projects, *Capturing Hydropower’s Promise Report Series*, International Finance Corporation (IFC)/World Bank Group, Washington, USA, 2021.
- [36] D. Égré, V. Roquet, C. Durocher, Monetary benefit sharing from dams: a few examples of financial partnerships with Indigenous communities in Québec (Canada), *Int. J. River Basin Manag.* 5 (3) (2007) 235–244, <https://doi.org/10.1080/15715124.2007.9635323>.
- [37] M. Hassan, M.K. Afridi, M.I. Khan, An overview of alternative and renewable energy governance, barriers, and opportunities in Pakistan, *Energy Environ.* 29 (2) (2018) 184–203, <https://doi.org/10.1177/0958305X17743036>.
- [38] L. Lebel, P. Lebel, C. Chitmanat, P. Sriyasan, Benefit sharing from hydropower watersheds: rationales, practices, and potential, *Water Resour. Rural Dev.* 4 (2014) 12–28, <https://doi.org/10.1016/j.wrr.2014.10.006>.
- [39] D. Suhardiman, D. Wichelns, L. Lebel, S.S. Sellamuttu, Benefit sharing in Mekong Region hydropower: whose benefits count? *Water Resour. Rural Dev.* 4 (2014) 3–11, <https://doi.org/10.1016/j.wrr.2014.10.008>.
- [40] Y. Kura, O. Joffre, B. Laplante, B. Sengvilaykham, Redistribution of water use and benefits among hydropower affected communities in Lao PDR, *Water Resour. Rural Dev.* 4 (2014) 67–84, <https://doi.org/10.1016/j.wrr.2014.09.001>.
- [41] S.M.P. Pulice, E.M. Moretto, The financial compensation and the development of Brazilian municipalities flooded by hydroelectric dams, *Ambient. Soc.* 20 (4) (2017) 103–126, <https://doi.org/10.1590/1809-4422asoc0169r1v2042017>.
- [42] F.M. Cooke, J. Nordensvard, G. Bin Saat, F. Urban, G. Siciliano, The limits of social protection: the case of hydropower dams and indigenous peoples’ land, *Asia Pacific Policy Stud.* 4 (3) (2017) 437–450, <https://doi.org/10.1002/app5.187>.
- [43] T.M. Hang Bui, P. Schreinemachers, Livelihood changes of affected households under resource scarcity: the Son La hydropower project in Vietnam, *Kasetsart J. Soc. Sci.* 41 (2) (2020) 321–328, <https://doi.org/10.1016/j.kjss.2018.08.004>.
- [44] T. Scudder, A retrospective analysis of Laos’s Nam Theun 2 Dam, *Int. J. Water Resour. Dev.* 36 (2–3) (2020) 351–370, <https://doi.org/10.1080/0790627.2019.1677456>.
- [45] R. Tian, Z. Meng, J. Xu, Y. Liu, Research on Fengjiashan Reservoir ecological compensation mechanism based on ecosystem service function, *IOP Conf. Ser. Earth Environ. Sci.* 769 (2021), 032041, <https://doi.org/10.1088/1755-1315/769/3/032041>.

- [46] B. Yu, L. Xu, X. Wang, Ecological compensation for hydropower resettlement in a reservoir wetland based on welfare change in Tibet, China, *Ecol. Eng.* 96 (2016) 128–136, <https://doi.org/10.1016/j.ecoleng.2016.03.047>.
- [47] B. Yu, L. Xu, Z. Yang, Ecological compensation for inundated habitats in hydropower developments based on carbon stock balance, *J. Clean. Prod.* 114 (2016) 334–342, <https://doi.org/10.1016/j.jclepro.2015.07.071>.
- [48] United Nations, The Declaration on the Right to Development. Resolution adopted by the UN General Assembly, 4 December 1986, A/RES/41/128, United Nations, New York, USA, 1986.
- [49] F. Vanclay, Project-induced displacement and resettlement: from impoverishment risks to an opportunity for development? *Impact Assess. Proj. Apprais.* 35 (1) (2017) 3–21, <https://doi.org/10.1080/14615517.2017.1278671>.
- [50] F. Biermann, N. Kanie, R.E. Kim, Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals, *Curr. Opin. Environ. Sustain.* 26–27 (2017) 26–31, <https://doi.org/10.1016/j.cosust.2017.01.010>.
- [51] S.F. Miescher, Building the city of the future: visions and experiences of modernity in Ghana's Akosombo Township, *J. Afr. Hist.* 53 (3) (2012) 367–390, <https://doi.org/10.1017/S0021853712000679>.
- [52] International Finance Corporation, Performance Standard 5: land acquisition and involuntary resettlement, Overview of performance standards on environmental and social sustainability, International Finance Corporation (IFC)/World Bank Group, Washington, USA, 2012.
- [53] D.A.M. Abramph, Strangers on their own land: examining community identity and social memory of relocated communities in the area of the Bui Dam in west-central Ghana, *Hum. Organ.* 76 (4) (2017) 291–303, <https://doi.org/10.17730/0018-7259.76.4.291>.
- [54] D. Shoup, Can archaeology build a dam? Sites and politics in Turkey's Southeast Anatolia Project, *J. Mediterr. Archaeol.* 19 (2) (2006) 231–258, <https://doi.org/10.1558/jmea.2006.v19i2.231>.
- [55] S. Sutton, Self-supply – a cost-effective rural water option for the hard to reach, *Proc. Inst. Civ. Eng. Munic. Eng.* (2018), <https://doi.org/10.1680/jmuen.17.00016>.
- [56] E. Akça, R. Fujikura, Ç. Sabağ, Atatürk Dam resettlement process: increased disparity resulting from insufficient financial compensation, *Int. J. Water Resour. Dev.* 29 (1) (2013) 101–108, <https://doi.org/10.1080/07900627.2012.738497>.
- [57] D. Darko, M. Kpessa-Whyte, E. Obuobie, P. Siakwah, O. Torto, D. Tsikata, The context and politics of decision making on large dams in Ghana: an overview, *FutureDAMS Working Paper 002*, The University of Manchester, Manchester, UK, 2019.
- [58] R. Arunkumar, V. Jothiprakash, Optimal reservoir operation for hydropower generation using non-linear programming model, *J. Inst. Eng. Ser. A* 93 (2) (2012) 111–120, <https://doi.org/10.1007/s40030-012-0013-8>.
- [59] M. Salman, W. Mualla, Water demand management in Syria: centralized and decentralized views, *Water Policy*. 10 (6) (2008) 549–562, <https://doi.org/10.2166/wp.2008.065>.
- [60] J. van Tol, W. Akpan, G. Kanuka, S. Ngesi, D. Lange, Soil erosion and dam dividends: science facts and rural 'fiction' around the Ntabelanga dam, Eastern Cape, South Africa, *South Afr. Geogr. J.* 98 (1) (2016) 169–181, <https://doi.org/10.1080/03736245.2014.977814>.
- [61] J.E. Mbaiwa, O.D. Gontse, Domestic use versus income generating activities in delivering modern energy to rural Botswana, *J. Energy South. Africa*. 15 (4) (2004) 123–129.
- [62] T.D. Mosisch, A.H. Arthington, The impacts of power boating and water skiing on lakes and reservoirs, *Lakes Reserv.* 3 (1) (1998) 1–17, <https://doi.org/10.1111/j.1440-1770.1998.tb00028.x>.
- [63] J. Engström, Hydropower in the Southeast: balancing lakeview and production optimization, *Southeast. Geogr.* 58 (4) (2018) 379–393, <https://doi.org/10.1353/sgo.2018.0037>.
- [64] C. McCulligh, D. Tetreault, Water management in Mexico. From concrete-heavy persistence to community-based resistance, *Water Altern.* 10 (2) (2017) 341–369.
- [65] A. Ranjan, Anti-dam protests in India: examining the profile of the Sardar Sarovar Dam, *New Water Policy Pract.* 4 (2) (2018) 75–94, <https://doi.org/10.18278/nwpp.4.2.5>.
- [66] I. Soliev, I. Theesfeld, Reframing for sustainability: exploring transformative power of benefit sharing, *Sustainability* 9 (8) (2017), 1486, <https://doi.org/10.3390/su9081486>.
- [67] C.C.A. Smits, J.C.S. Justinussen, R.G. Bertelsen, Human capital development and a Social License to Operate: examples from Arctic energy development in the Faroe Islands, Iceland and Greenland, *Energy Res. Soc. Sci.* 16 (2016) 122–131, <https://doi.org/10.1016/j.erss.2016.03.016>.
- [68] D. Hjeljava, F. Vanclay, How a large project was halted by the lack of a social license to operate: testing the applicability of the Thomson and Boutilier model, *Environ. Impact Assess. Rev.* 73 (2018) 31–40, <https://doi.org/10.1016/j.ear.2018.07.001>.
- [69] W.M. Adams, J. Hutton, People, parks and poverty: political ecology and biodiversity conservation, *Conserv. Soc.* 5 (2) (2007) 147–183.
- [70] M.E. Arias, T.A. Cochrane, K.S. Lawrence, T.J. Killeen, T.A. Farrell, Paying the forest for electricity: a modelling framework to market forest conservation as payment for ecosystem services benefiting hydropower generation, *Environ. Conserv.* 38 (4) (2011) 473–484, <https://doi.org/10.1017/S0376892911000464>.
- [71] B. Rich, The emperor's new clothes: the World Bank and environmental reform, *World Policy J.* 7 (2) (1990) 305–329.
- [72] B. de Jonge, What is fair and equitable benefit-sharing? *J. Agric. Environ. Ethics.* 24 (2) (2011) 127–146, <https://doi.org/10.1007/s10806-010-9249-3>.
- [73] L. Parks, Challenging power from the bottom up? Community protocols, benefit-sharing, and the challenge of dominant discourses, *Geoforum* 88 (2018) 87–95, <https://doi.org/10.1016/j.geoforum.2017.11.011>.
- [74] R. Wynberg, M. Hauck, People, power, and the coast: a conceptual framework for understanding and implementing benefit sharing, *Ecol. Soc.* 19 (1) (2014), 27, <https://doi.org/10.5751/ES-06250-190127>.
- [75] C. Schulz, Governance-related values as dimensions of good water governance, *Wiley Interdiscip. Rev. Water*. 6 (1) (2019), e1322, <https://doi.org/10.1002/wat2.1322>.
- [76] K. Kusnandar, F.M. Brazier, O. van Kooten, Empowering change for sustainable agriculture: the need for participation, *Int. J. Agric. Sustain.* 17 (4) (2019) 271–286, <https://doi.org/10.1080/14735903.2019.1633899>.
- [77] R.A. Samndong, The participation illusion: questioning community participation in a REDD+ pilot project in the Democratic Republic of Congo, *Int. For. Rev.* 20 (3) (2018) 390–404, <https://doi.org/10.1505/146554818824063032>.
- [78] H.R. Ojha, R. Ford, R.J. Keenan, D. Race, D. Carias Vega, H. Baral, P. Sapkota, Delocalizing communities: changing forms of community engagement in natural resources governance, *World Dev.* 87 (2016) 274–290, <https://doi.org/10.1016/j.worlddev.2016.06.017>.
- [79] M.T. Stone, G. Nyaupane, Rethinking community in community-based natural resource management, *Community Dev.* 45 (1) (2014) 17–31, <https://doi.org/10.1080/15575330.2013.844192>.
- [80] S.R. Kellert, J.N. Mehta, S.A. Ebbin, L.L. Lichtenfeld, Community natural resource management: promise, rhetoric, and reality, *Soc. Nat. Resour.* 13 (8) (2000) 705–715, <https://doi.org/10.1080/089419200750035575>.
- [81] M. Rowan, T. Streater, Converting project risks to development opportunities through SIA enhancement measures: a practitioner perspective, *Impact Assess. Proj. Apprais.* 29 (3) (2011) 217–230, <https://doi.org/10.3152/14615511X12959673796164>.
- [82] M. Rowan, Aligning resettlement planning and livelihood restoration with social impact assessment: a practitioner perspective, *Impact Assess. Proj. Apprais.* 35 (1) (2017) 81–93, <https://doi.org/10.1080/14615517.2016.1271541>.
- [83] S. Jackson, A. Sleight, Resettlement for China's Three Gorges Dam: socio-economic impact and institutional tensions, *Communist Post-Communist Stud.* 33 (2) (2000) 223–241, [https://doi.org/10.1016/S0967-067X\(00\)00005-2](https://doi.org/10.1016/S0967-067X(00)00005-2).
- [84] J.-M. Devernay, Public versus public-private partnership, in: *Hydro finance handbook*, HCl Publications, Kansas City, USA, 2008: pp. 37–47.
- [85] S. Koirala, D. Hill, R. Morgan, Impacts of the delay in construction of a large scale hydropower project on potential displacees, *Impact Assess. Proj. Apprais.* 35 (1) (2017) 106–116, <https://doi.org/10.1080/14615517.2016.1271540>.
- [86] T. Scudder, The human ecology of big projects: river basin development and resettlement, *Annu. Rev. Anthropol.* 2 (1973) 45–55.
- [87] K.M. Weist, Development refugees: Africans, Indians and the big dams, *J. Refug. Stud.* 8 (2) (1995) 163–184, <https://doi.org/10.1093/jrs/8.2.163>.
- [88] W. Laube, Creative bureaucracy: balancing power in irrigation administration in northern Ghana, *ZEF Working Paper Series*, no. 41, Center for Development Research, University of Bonn, Bonn, Germany, 2009.
- [89] N. Torpey-Saboe, K. Andersson, E. Mwangi, L. Persha, C. Salk, G. Wright, Benefit sharing among local resource users: the role of property rights, *World Dev.* 72 (2015) 408–418, <https://doi.org/10.1016/j.worlddev.2015.03.005>.
- [90] B. Wilmens, Damming China's rivers to expand its cities: the urban livelihoods of rural people displaced by the Three Gorges Dam, *Urban Geogr.* 39 (3) (2018) 345–366, <https://doi.org/10.1080/02723638.2017.1328578>.
- [91] H. Randell, Structure and agency in development-induced forced migration: the case of Brazil's Belo Monte Dam, *Popul. Environ.* 37 (3) (2016) 265–287, <https://doi.org/10.1007/s11111-015-0245-4>.
- [92] J. Hodbod, E.G.J. Stevenson, G. Akall, T. Akuja, I. Angelei, E.A. Bedasso, L. Buffavand, S. Derbyshire, I. Eulenberger, N. Gowmaris, B. Kamski, A. Kurewa, M. Lokuruka, M.F. Mulugeta, D. Okenwa, C. Rodgers, E. Tebbs, Social-ecological change in the Omo-Turkana basin: a synthesis of current developments, *Ambio* 48 (10) (2019) 1099–1115, <https://doi.org/10.1007/s13280-018-1139-3>.
- [93] J. Cariño, M. Colchester, From dams to development justice: progress with 'free, prior and informed consent' since the World Commission on Dams, *Water Altern.* 3 (2) (2010) 423–437.
- [94] J. Skinner, Gender considerations in the restoration of livelihoods: resettlement from hydropower, IIED Briefing Paper, International Institute for Environment and Development (IIED), London, UK, 2018.
- [95] P.S. Mkorosi, P. van der Zaag, Can local people also gain from benefit sharing in water resources development? Experiences from dam development in the Orange-Senqu River Basin, *Phys. Chem. Earth.* 32 (15–18) (2007) 1322–1329, <https://doi.org/10.1016/j.pce.2007.07.028>.
- [96] V. Rijavec, Property issues in the field of public good and limitations in the public interest, with an emphasis on water, *Geod. Vestn.* 56 (4) (2012) 713–724, <https://doi.org/10.15292/geodetski-vestnik.2012.04.713-724>.
- [97] M. Mancilla García, J. Hileman, Ö. Bodin, Collaboration and conflict in complex water governance systems across a development gradient: addressing common challenges and solutions, *Ecol. Soc.* 24 (3) (2019), 28, <https://doi.org/10.5751/ES-11133-240328>.
- [98] C. Schulz, J. Martin-Ortega, K. Glenk, A.A.R. Ioris, The value base of water governance: a multi-disciplinary perspective, *Ecol. Econ.* 131 (2017) 241–249, <https://doi.org/10.1016/j.ecolecon.2016.09.009>.
- [99] M.M. Rahaman, O. Varis, Integrated water resources management: evolution, prospects and future challenges, *Sustain. Sci. Pract. Policy* 1 (1) (2005) 15–21, <https://doi.org/10.1080/15487733.2005.11907961>.

- [100] P. Woodhouse, M. Muller, Water governance – an historical perspective on current debates, *World Dev.* 92 (2017) 225–241, <https://doi.org/10.1016/j.worlddev.2016.11.014>.
- [101] V. Galvez, R. Rojas, Collaboration and integrated water resources management: a literature review, *World Water Policy* 5 (2) (2019) 179–191, <https://doi.org/10.1002/wwp2.12013>.
- [102] S. Ricart Casadevall, Improving the management of water multi-functionality through stakeholder involvement in decision-making processes, *Util. Policy* 43 (2016) 71–81, <https://doi.org/10.1016/j.jup.2016.04.015>.
- [103] H.H.G. Savenije, P. Van der Zaag, Integrated water resources management: concepts and issues, *Phys. Chem. Earth* 33 (5) (2008) 290–297, <https://doi.org/10.1016/j.pce.2008.02.003>.
- [104] A. Ioris, The limits of integrated water resources management: a case study of Brazil's Parafba do Sul River Basin, *Sustain. Sci. Pract. Policy* 4 (2) (2008) 4–11, <https://doi.org/10.1080/15487733.2008.11908017>.
- [105] C. Pahl-Wostl, C. Knieper, E. Lukat, F. Meergans, M. Schoderer, N. Schütze, D. Schweigatz, I. Dombrowsky, A. Lenschow, U. Stein, A. Thiel, J. Tröltzsch, R. Vidaurre, Enhancing the capacity of water governance to deal with complex management challenges: a framework of analysis, *Environ. Sci. Policy* 107 (2020) 23–35, <https://doi.org/10.1016/j.envsci.2020.02.011>.
- [106] K.R. Hope Sr., Capacity development for good governance in developing countries: some lessons from the field, *Int. J. Public Adm.* 32 (8) (2009) 728–740, <https://doi.org/10.1080/01900690902908562>.
- [107] J.E. Stiglitz, Towards a new paradigm for development: strategies, policies, and processes, 1998 Prebisch Lecture, delivered at: UNCTAD, Geneva, Switzerland, 19 Oct. 1998.
- [108] J. Plummer Braeckman, S. Markkanen, N. Seega, An analytical framework for understanding risk and risk mitigation in the context of financing large hydropower projects in low-and lower-middle-income countries, *FutureDAMS Working Paper 011*, The University of Manchester, Manchester, UK, 2020.
- [109] P. Hanna, F. Vanclay, E.J. Langdon, J. Arts, Conceptualizing social protest and the significance of protest actions to large projects, *Extr. Ind. Soc.* 3 (1) (2016) 217–239, <https://doi.org/10.1016/j.exis.2015.10.006>.
- [110] R. Maher, Pragmatic community resistance within new indigenous ruralities: lessons from a failed hydropower dam in Chile, *J. Rural Stud.* 68 (2019) 63–74, <https://doi.org/10.1016/j.jrurstud.2019.03.009>.
- [111] S. Patel, C. Shakya, N. Rai, Climate finance for hydropower: incentivising the low-carbon transition, International Institute for Environment and Development (IIED), London, UK, 2020.
- [112] Norwegian Institute for Nature Research, Eastern Norway Research Institute, The Glomma and Laagen Basin, Norway, WCD Case Study, World Commission on Dams (WCD), Cape Town, South Africa, 2000.
- [113] S.F. Miescher, D. Tsikata, Hydro-power and the promise of modernity and development in Ghana: comparing the Akosombo and Bui dam projects, *Ghana Stud.* 12/13 (2009/2010) 15–53. <https://doi.org/10.1353/ghs.2009.0002>.
- [114] International Finance Corporation, Strategic community investment: a good practice handbook for companies doing business in emerging markets, International Finance Corporation (IFC)/World Bank Group, Washington, USA, 2010. <https://doi.org/10.1596/27842>.