



The social impacts of dams: A new framework for scholarly analysis

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ABSTRACT

No commonly used framework exists in the scholarly study of the social impacts of dams. This hinders comparisons of analyses and thus the accumulation of knowledge. The aim of this paper is to unify scholarly understanding of dams' social impacts via the analysis and aggregation of the various frameworks currently used in the scholarly literature. For this purpose, we have systematically analyzed and aggregated 27 frameworks employed by academics analyzing dams' social impacts (found in a set of 217 articles). A key finding of the analysis is that currently used frameworks are often not specific to dams and thus omit key impacts associated with them. The result of our analysis and aggregation is a new framework for scholarly analysis (which we call 'matrix framework') specifically on dams' social impacts, with space, time and value as its key dimensions as well as infrastructure, community and livelihood as its key components. Building on the scholarly understanding of this topic enables us to conceptualize the inherently complex and multidimensional issues of dams' social impacts in a holistic manner. If commonly employed in academia (and possibly in practice), this framework would enable more transparent assessment and comparison of projects.

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1. Introduction

The conceptualization of social impacts of infrastructure development is inherently complex, with a multitude of social impacts occurring over various time, space and value dimensions. Shields (1974, p. 265) defined social impacts as "responses of social systems to the physical restructuring of their environments", a definition which does not help define these impacts in a way that can be operationalized, though. The attempt by Vanclay (2002) to conceptualize social impacts illustrated the difficulties of operationalization particularly well; the author suggested as many as 80 variables to be considered.

Such a comprehensive list can serve as an initial guide for scholarly analysis, but lacks focus. Hence, further conceptual advance is needed to develop complex social impact issues of infrastructure development into a usable framework. Frameworks may be broadly defined as a prioritized organization of ideas regarding a topic (Slootweg et al., 2001). They explicate "either graphically or in narrative form, the main things to be studied – the key factors, concepts, or variables – and the presumed relationships among them" (Miles and Huberman, 1994, p. 18). Theoretical discourse on frameworks is rare in the scholarly social impact literature, though (Howitt, 2011). Indeed, scholars in this extremely applied field of study oftentimes seem more concerned with the question of how to collect the data than with the question of what

data to collect – the latter question frameworks help to answer (Howitt, 2011). As a consequence of this lack of conceptual discourse, Harvey (2011, p. 17) even finds that the "[conceptual social impact] refresh button needs to be pushed".

This paper aims to contribute to the conceptual discourse on social impacts induced by infrastructure development and unify scholarly understanding of the topic at hand. A particular infrastructure, namely dams, is chosen for this contribution. This is motivated by three reasons. First, a global boom in dam construction is currently under way and thus dams demand scholarly attention overall (further discussed in the next paragraph). Second, dams feature numerous peculiarities and thus necessitate a specific framework (further discussed in Section 2). Third, the scholarly literature on dams is extremely scattered and thus particularly requires conceptual discourse on existing frameworks (further discussed in Section 3).

Indeed, dams are back on the infrastructure development agenda. Upon publication of the seminal report by the World Commission on Dams in 2000, the rate of construction of dams reduced as funders such as the World Bank largely opted out of dam construction (Schneider, 2013). However, dams are now an investment hotspot again, particularly those generating electricity. One recent study estimated that at least 3700 hydropower dams (>1 MW) are either planned or already under construction. These are expected to increase global hydropower production by 73% (Zarfl et al., 2014). 93% of this production increase will be provided by 847 large dams with a capacity of >100 MW each (Zarfl et al., 2014). 39 GW of capacity was added in 2014 alone (IHA, 2015), equivalent to almost three times of Africa's

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current total installed capacity (World Energy Council, 2015). Up to 47% of the projected USD 57 trillion to be invested in infrastructure by 2030 is expected to be in power and water infrastructure (Dobbs et al., 2013). This increasing rate of dam development is also accelerating the pace of development-induced displacement. No accurate data on the total number of people displaced by infrastructure development is available, however, Scudder (2011) estimates it may be more than 200 million people in the previous century, of which possibly 80 million (40%) were displaced due to dams. The impacts of these displacements are challenging to address for practitioners such as dam developers or governments. Scholarly reflections on the social impact of dams (reviving the idea of “writing as an intervention” (Jordan et al., 2011)) may help prepare the conceptual grounds for addressing these impacts, we believe.

The remainder of this paper is organized as follows. In Section 2, we expand our argument on why frameworks are important and explain why a particular framework on the social impact of dams is needed. In Section 3, we provide an overview of current key scholarly frameworks on the social impact of dams and critically analyze the most commonly used frameworks. We start Section 3 with a note on methods explaining how the alleged key frameworks were derived from the literature. In Section 4, we describe and explain our suggested framework (called ‘matrix framework’) which was developed as an aggregation and result of the analyses in Section 3. We also outline how it may improve current frameworks on the social impact of dams as well as likely limitations. Our argument is summarized in Section 5.

2. On the need for frameworks overall and a specific framework for dams

2.1. The significance of frameworks

We understand frameworks as a starting point for any research endeavor on the social impact of dams. Frameworks provide a system indicating which components and dimensions of dams’ social impact to investigate, but can also exclude some. Accordingly, the results of an analysis are interlinked with and frequently the direct result of the framework employed by the scholar (Rossouw and Malan, 2007). A comprehensive framework may ensure that the scholar comprehensively considers the various impacts of a project upfront before (possibly) focusing on specific impacts. This helps to position the analysis and results. Indeed, Vanclay (2002, p. 189) claims that many scholarly studies lacking frameworks are not of satisfactory standard because these reports “failed to consider the full range of social impacts that might be experienced”. General agreement regarding a framework to be used is also central to advance a field of study. Only if scholars employ identical or similar frameworks, studies can be handily compared and aggregated and thus knowledge can accumulate. If every scholar starts his or her analysis conceptually from scratch, this may result in a standstill of the field.

Frameworks are not only essential for scholarly analysis, but also for practitioners. Review committees and the public can only assess impacts objectively across a variety of projects if frameworks are specific and consistent. A lack of framework consistency may eventually lead to a lack of credibility (Harvey, 2011). Social impacts of infrastructure projects are usually assessed by practitioners (e.g. social impact consultants at firms such as Coffey or SMEC) via social impact assessments (SIAs) which are grounded in various frameworks. SIAs may be defined, in the narrowest conceptualization, as “the process of identifying the future consequences of a current or proposed action [e.g. a dam project]” (Becker, 2001, p. 311), ideally helping “to manage the social issues associated with planned interventions” (Vanclay and Esteves, 2011, p. 3). These SIAs are interlinked with scholarly studies on social impact and scholarly frameworks. Indeed, researchers and their conceptual discourse and frameworks on social impacts are acknowledged to contribute to best practice SIA (IAIA, 2016).

While frameworks are designed to be systematic and comprehensive, there are a number of criticisms of them. The (sometimes) narrow focus of frameworks is criticized for blinding those adopting them to any issues falling outside it (Alt and Shepsle, 1990). Furthermore, frameworks are criticized by leading scholars for focusing not on the issues that matter, but only on those that can be easily operationalized (Vanclay, 2004). In addition, a social impact framework may operate “at such high level of generalization that it does not deal adequately with variation” (Scudder, 2006, p. 41).

Admittedly, frameworks are no silver bullet against incomprehensive analyses. Vanclay (2002, p. 200) notes that “the variables [...] important must be locally defined, and there may be local considerations that a generic listing does not adequately represent”. We note that this includes both quantitative and qualitative variables (with qualitative variables frequently difficult to operationalize) and agree that these must always be contextualized instead of mechanically applied when carrying out a scholarly analysis. A high level of generalization, as feared by Scudder (2006), can be circumvented if specific frameworks for specific infrastructure projects are adopted.

2.2. The need for a specific framework on the social impacts of dams

Any framework is generic since it simplifies the issue of study to its (alleged) key components and dimensions. However, the level of genericity can significantly differ from framework to framework (Miles and Huberman, 1994). A universal social impact framework applicable for any infrastructure development is imaginable. However, such a universal framework would be particularly high-level and thus not able to account for peculiarities of specific infrastructures, as pointed out by Juslén (1995) and Scudder (2005, p. 1 ff.) (with the latter author arguing that the WCD policy principles would be superior to those of the World Bank since the WCD principles (unlike the World Bank principles) “apply specifically to large hydro”).

We also pledge for a specific framework on the social impact of dams since dams feature at least three peculiarities which may be disregarded in a universal framework on the social impacts of infrastructure:

- Dams frequently serve several primary purposes (e.g. electricity production, flood control or irrigation), making the components of social impact more complex than for other infrastructure projects. WCD (2000) estimates that 1/3 of dams serve two or more primary purposes, with the share of multi-purpose-dams increasing in recent years. Infrastructure such as a coal-fired power plant or gas pipelines only serves a single primary purpose (in these cases: electricity generation or the transporting of gas). A universal framework would likely be able to account for these single primary purposes, but possibly not the myriad primary purposes of dams.
- Dams have an immediate spatial social impact far beyond the construction activities and the associated displacement, the key spatial impact areas of most infrastructure projects. Dams’ social impact reach upstream populations, e.g. via restrictions on water use in order to fill the reservoir (Duflo and Pande, 2007), downstream, e.g. via benefits from irrigation water and flood protection (with Richter et al. (2010) estimating that 472 million people downstream have been impacted by dam construction); and nationally, e.g. via electricity generation. Of all infrastructure projects we can only think of nuclear plants which may have a comparable spatial impact (with a comparable magnitude only in a case of a meltdown, though; the five largest power plants worldwide are all hydroelectric ones (Platts, 2015)). Thus, a universal framework may conceptualize dams’ spatial social impacts too narrowly.
- Dams are among the most long-lived infrastructure projects, and social impacts can be considered over the entire operational timeframe (for instance, Takesada (2009) has studied the social impacts of Japan’s Ikawa Dam 50 years upon resettlement). Indeed, dams may run for over 100 years, e.g. the construction of Arizona’s still

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