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Values and knowledges in decision-making on environmentally disruptive infrastructure projects: insights from large dams and mines

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Large infrastructure projects generate irreducible trade-offs between different societal values towards nature. We asked what kinds of values and knowledges are articulated in decision-making around these projects, and specifically how well marginalised are values and the values and knowledges of marginalised stakeholders incorporated in it. Focusing on dams and mines, we chose and systematically analysed a set of well-documented cases from the Environmental Justice Atlas to answer this question. We found that there is substantial overlap between the values and knowledges articulated by proponents and opponents of such projects: values for human life, material livelihood and well-being are invoked by both sides, as is modern scientific knowledge, while relational value for nature and experiential knowledge are highlighted by ecosystem-dependent communities. It is, however, the lack of a value for democratic process and for justice towards marginalised people, that contributes the most to environmental concerns being overlooked in decision-making, thereby obstructing transformative change.

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The question

Major infrastructure projects, including large dams, mines, ports or highways, pose a special challenge to societal decision-making. Dams provide irrigation, hydropower or flood control benefits, and mines provide useful minerals — all uses of 'abiotic' nature that are seen as essential to modern ideas of human material well-being. But in the process, these projects dramatically and irreversibly transform (or destroy) ecosystems (natural or modified). Large dams[1] submerge forests and agricultural ecosystems, displace thousands of people and change upstream and downstream hydrological regimes [3•]. Large mines[2] also lead to loss of forests and/or agricultural lands, displace communities and generate air, water and soil pollution. Other infrastructure projects such as ports

[1] 'Large' dams are defined as 'a dam with a height of 15 m or greater from lowest foundation to crest or a dam between 5 m and 15 m impounding more than 3 million cubic metres.' https://www.icold-cigb.org/GB/dams/definition_of_a_large_dam.asp, or, in the case of hydropower, of more than 10-MW capacity [1]. Currently, there are more than 7300 large dams in existence and around 2000 large dams under construction (using data from Ref. [2]), majority of which will be in the Global South. Most of the dams that have been built since the 1990s are in the Global South.

[2] 'Large' mines vary significantly by type of mineral (e.g. coal versus gold), method (underground versus open-cast), structure and legality (corporate/formal versus artisanal/informal) and scale (tonnes per year). Here, we refer to all mining that does not qualify as artisanal mining [4].

or highways have similar positive benefits and negative environmental impacts, but large dams and mines perhaps epitomise this situation where trade-offs between the (largely) instrumental or material values[3] of (largely abiotic) nature and the instrumental, intrinsic and relational values that ecosystems or biotic nature provided earlier are inevitable.[4] These trade-offs between values are accompanied by trade-offs between different stakeholders (local communities face the costs, while regional and national populations get the benefits). Moreover, the socio-economic positions of these stakeholders are invariably unequal, since large dam and mining projects disproportionately affect marginalised communities, including Indigenous Peoples [7,8••]. Transformation towards a just and sustainable future thus requires better decision-making, leading to better outcomes *vis-à-vis* such projects.

Given the inevitable trade-offs, 'better outcomes' in this context could range from mitigation of post-project environmental impacts, scaling down of the project to reduce adverse impacts or better resettlement or compensation for affected communities, if there is a relative consensus on going forward with the project to rejection of the project if local inhabitants decide so or if wider environmental impacts are considered unacceptable by a wider set of stakeholders. In other words, the question is not whether such large infrastructure projects can be carried out without any adverse socio-environmental impacts, but *how well are marginalised values (such as relational or intrinsic value) [9] and associated knowledges of nature on the one hand and the values and knowledges of marginalised stakeholders on the other articulated and eventually included in decision-making processes*. This becomes particularly relevant in the context of promoting transformative change towards just and sustainable futures as visualised in the Values Assessment of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services [10].

We explored this question as part of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services Values Assessment (https://www.ipbes.net/the-values-assessment), specifically as part of the chapter on 'Value expression in decision-making' [11]. The methodology we used is explained in detail in Ref. [12]. In brief, we used key reviews, namely, the report of the World Commission on Dams (WCD) [3•] and Refs. [13,14•] for dams, and Refs. [15••,16] for mining to help us understand decision-making processes around such projects, then used the Environmental Justice Atlas (www.ejatlas.org) to identify well-studied cases. The lead author then approached scholars who had engaged in-depth with these cases in various ways — multi-year research, multi-year engagement in action and policy advocacy, analysis of academic and grey literature and interactions with decision-makers — and sought their responses to a set of questions about value and knowledge articulation in decision-making around these projects. Where necessary, the authors conducted additional interviews with multiple stakeholders to fill gaps. We ended with five specific in-depth cases: Sardar Sarovar dam in India (SSD), Ilisu dam in Turkey (ID), Hidrosogamoso dam in Colombia (HD), Niyamgiri bauxite mining (NBM) and North Karanpura Coal mining (NKCM) in India. In addition, two authors (Harris and Moore) pooled their experience from International Rivers and the WCD to provide inputs to the same questions for multiple sites globally and specifically the Klamath River dam conflict. Overall, the discussion is focused more on countries of the Global South, because new large dams and mining projects are almost entirely located in this part of the world, and future large mining projects are also likely to come up in this region (along with Canada and Australia). The literature covered in each case study is listed in Ref. [12]; here, we only cite a few key references.

Values articulated

We find that there is substantial overlap between the values articulated in favour of large projects and those articulated in calls for their modification or rejection. In particular, values for human life, material livelihood and human well-being, which may be called instrumental values, are expressed by both sides and dominate the discourse. Dams and mines are proposed for their instrumental values: electricity to urban consumers, metals to industries and their consumers, irrigation water to farmers, and jobs. Those negatively affected also highlight most prominently the material impacts on their lives, health and livelihoods — whether it is loss of agricultural and forest-based livelihoods and displacement (SSD, ID and NKCM), fishing (HD), livestock rearing (ID) or threats due to air pollution (NKCM). The attention drawn to the negative climatic impact of forest loss from such projects is also based on an instrumental value for nature. Additional values such as national energy security, revenue generation, promoting industrialisation or more broadly 'development' or 'nation-building' are often invoked to further bolster support for the projects [16].

Relational values, not surprisingly, are largely expressed by local communities opposed to the project: highlighting ties with the forest, farm, river or fishery that is

[3] Mines and dams may admittedly create their own relational values [5], but these get created post facto.

[4] This is, theoretically speaking, in contrast to payments for ecosystem services programmes reviewed in a companion paper in this issue [6] that claim to bring about a 'win–win' between an environmental benefit (biodiversity conservation, soil/water conservation, pesticide use reduction or carbon sequestration) to a wider society and some livelihood or economic benefits to the ecosystem owner/manager. This means that decision-making around large infrastructure projects is perhaps destined to be the most contested and conflictual of all environmental decisions.

to be modified or destroyed [17]. Moreover, relational values are not limited to ecosystems — the ID opponents highlighted the cultural value of the historical town of Hasankeyf, which is being submerged by the reservoir created by the dam. Biodiversity concerns — which may represent instrumental, relational or intrinsic values — were raised largely by regional and global stakeholders. The intrinsic value of nature, captured by the idea of 'rights of nature', has gained prominence in recent times [18], but is yet to achieve visibility in the discussions around specific projects. On the other hand, the 'intrinsic value of human life and livelihood' (i.e. human rights) has been commonly cited, usually against [19] but occasionally in favour of [20] the project as well.

Sustainability (as a concern for the future or future generations) is invoked in all cases by the negatively affected groups, citing the destruction of biotic nature (forests, riverine ecosystems and agriculture), which is renewable and therefore can provide sustained flows of benefits across generations. This of course presumes that the current users of biotic nature are doing so sustainably, which may not always be the case,[5] but they are certainly potentially much more sustainable than say mining. Again, the current value that is to be sustained is largely instrumental use of nature for human well-being. Interestingly, proponents of hydropower dams also point to the renewability of this energy source and invoke its contribution to 'sustainability' in this narrow sense [22]. More generally, proponents of such projects argued that the loss of natural capital is compensated by the increase in human-made capital, thereby ensuring non-declining human well-being in the future, thus implicitly invoking the 'weak sustainability' principle [23].

The sharpest difference in the value positions of the proponents and opponents of these projects emerges in their commitment to and articulation of intra-generational distributive justice [16]. Those negatively affected by the projects, which are also by and large the more marginalised in society, highlight strongly the values of environmental and social justice (a Rawlsian perspective), whereas the proponents invariably adopt a utilitarian ethic (the greater good of greater numbers), as evidenced also from their espousing the use of cost–benefit analysis or by their measuring or invoking contributions of the project to gross domestic product. The simple aggregation of economic costs and benefits inevitably undervalues the socio-environmental costs of such projects because most of the costs are faced by poorer communities [24].

[5] For instance, in SSD, Baviskar ([21], chapter 7, p.168) points out that indigenous communities were not particularly conservation-oriented or gender-equal.

Similarly, project-affected groups more prominently raised the two other dimensions of justice, namely, recognition and procedural justice [25]. They used different articulations that are not commensurable with material values, let alone being measurable in monetary terms: human rights, democratic rights, due process and 'social justice' for marginalised communities. In most cases, however, the concept of 'eminent domain' of the state and the 'larger public interest' overrides such considerations. In exceptional cases where the judiciary supported the demand for procedural and recognition justice (NBM), the project ended up getting cancelled [26•].

Knowledge mobilised

Decision-making regarding environmentally disruptive projects is fundamentally framed by values, but it also involves knowledge about the form and magnitude of the impacts and the trade-offs, measured in various ways. Therefore, understanding the process of generating or mobilising knowledge about the impacts of such projects in terms of the different values that society holds is also needed. In most countries, public decision-making regarding environmentally disruptive infrastructure projects has, for several decades, required some form of formal appraisal of environmental and social impact analysis/assessment/appraisal, coupled with public consultation or hearings.

The case studies we examined in-depth echo the findings of a separate review [27], namely, that there is a big gap between theory and practice of these formal appraisals (usually conducted by project proponents), in terms of the dimensions included, the technical rigour of appraisal and the openness to *ex ante* and *ex post* public input.

Interestingly, the project opponents also mobilised modern scientific knowledge. Environmental Impact Assessments (EIAs) were contested heavily by opponents (all projects except SSD and NBM, where no EIA was carried out, but environmental impacts were contested nevertheless), alternative cost–benefit analyses were done (SSD) using modern scientific data, social impact assessments and extra pollution studies were demanded (HD, NKCM) and fresh biodiversity inventories were carried out (ID). Affected communities also articulated their experiential knowledge (HD), but they sought to integrate it with modern science (e.g. at HD, fisherfolk demanded an ecological study on water quality and fish decline and a seismological assessment of earthquake risk). Alternatives or modified designs were proposed in several cases (SSD, ID and HD). Those opposing mining have also looked for alternative development strategies [28–30]. But they typically lacked the resources to flesh out alternative proposals in

detail. Whether such detailed alternative proposals would have actually influenced the ultimate decision remains unknown, but appears unlikely for reasons we now outline.

Decision-making processes, institutions and power relations

Decision-making involves more than the articulation of values about nature and technical or pluralistic impact assessment. Hence, the WCD sought to outline a set of principles for a good decision-making process [3•]. Key among these are recognition of the rights of affected communities, inclusion of stakeholders in decision-making, free–prior–informed consent from affected indigenous peoples and local communities and transparent processes. The Extractive Industries Transparency Initiative (EITI) has also adopted some of these principles for mining [31]. The WCD template is often seen as a 'gold standard' for sound decision-making processes [32,33].

Reviews indicate, however, that the on-the-ground impacts of the WCD report have been limited [34], and that of the EITI even more so [35–39]. Our case studies also indicate that these principles were rarely followed. In all cases, the 'in-principle' decisions to go ahead with the projects preceded socio-environmental appraisals by years or decades. Public hearings were not carried out because they were not legally required at that time (SSD, ID) or were carried out after construction had commenced (HD) or were carried out perfunctorily (NBM, NKCM), reflecting a pattern highlighted in the broader review of environmental appraisal [27]. Decisions to proceed were endorsed by expert committees and finalised at the political level without any wider consultations. It was taken for granted (or explicitly claimed) that the political system as it stood (representative democracies in all cases) adequately represented the wishes and interests of the stakeholders. In that sense, procedural justice was repeatedly undermined, just as a utilitarian focus on aggregate benefits undermined distributive justice.

Alternative forums or processes were invoked in all cases, and were effective to some extent in a subset of cases. The first step was typically to explore the formal mechanisms involved, such as demands to hold statutory environmental impact analysis/assessment/appraisal that were skipped (ID), public hearings that were missing (HD), or to conduct fresh studies (NKCM). These approaches yielded some modifications or mitigation measures (ID) but did not go much further. The wider literature supports these conclusions that formal appraisal and consultative processes largely result in only minor mitigative measures [27]. The Klamath river basin programme on decommissioning of dams perhaps represents one of the few multi-stakeholder efforts that were successful to an extent in influencing the trajectory of the project [40,41].

A somewhat more effective alternative strategy for getting marginalised voices heard was mobilising public opinion across regional, national and international scales and building cross-national networks to put pressure on project funders. In two cases (ID and SSD), funders withdrew from the project. But this method of value articulation appears to be less effective in mining projects, which are less capital-intensive. Moreover, funders are not decision-makers, even if they do exert some influence over decision-makers. Thus, in both ID and SSD, national governments made it a point to go ahead with the project using their own funds or other national funding sources.

Another institution that has been explored and appears to provide space for broader value articulation is the judiciary. In countries where the judiciary has interpreted the fundamental right to life to include the right to be safe from environmental harm, or have upheld the need for due process in general and for special protection for the rights of indigenous communities to have a say in decisions affecting them, the eventual decision-making process has been more rigorous and democratic than the original one. The one case in this set where the project was dropped (NBM) was a case in which the Supreme Court of India upheld the right of the indigenous communities affected by the project to have a veto over projects that affect their customary environmental resources/landscapes. The Supreme Court of Colombia has also upheld the right for full consultation of Indigenous groups [42], but not exactly the right to veto. But it is noteworthy that the judiciary has focused on recognition and procedural justice, and not on placing relational or intrinsic value claims such as 'sacredness', 'intrinsic value of nature' or 'rights of nature' as being superior to instrumental ones, even when the latter values have been invoked by local stakeholders (NBM). Thus, the role of the judiciary appears to be key [43–45], but accessing judicial remedy remains a practical challenge even when green courts have been set up [46].

Finally, the option of street protest has been pursued in most cases. In SSD, the anti-dam movement conducted mass actions and street protests at various scales for more than two decades; these protests, combined with litigation, led to better rehabilitation. In some mining conflicts, the innovation has been to call for local referendums on the issue [15,47]. Unfortunately, governments have usually responded with repressive measures: refusal of permission for protest marches, counter-propaganda and arrests [48]. That is, even the 'right of democratic expression' has often been rejected by project proponents and suppressed by elected governments.

Finally, the gold standard of setting up multi-stakeholder platforms to decide upon the rights and risks associated with the project and the alternatives available, as suggested by the WCD, was never met in the case studies reviewed or the sector at large. The Klamath River Basin programme on decommissioning of dams represents perhaps one of the few multi-stakeholder efforts in recent times that built a multi-stakeholder platform through sustained efforts and reached an agreement. But it is still held up for various reasons [40,49] and has in fact been criticised for watering down the rights of indigenous communities [41]. In the mining sector, no equivalent of the WCD proposal even exists. The EITI assumes that mining will occur, and focuses on transparency *vis-a-vis* mining company payments to the government [36]. Even the broader Global Mining Initiative assumes that mining is essential for sustainable development [50].

One element of the WCD principles that has found some acceptance is free–prior–informed consent. The NBM case is one example of it being rigorously implemented, because of judicial support; in subsequent cases in India, however, this has been repeatedly bypassed [51]. Globally, the interpretation of free, prior and informed consent principles as defined in the non-binding United Nations Declaration on the Rights of Indigenous Peoples remains contested [52] and has not translated into a veto power over socio-environmentally disruptive projects.

Conclusions

It appears that, in the case of large infrastructure projects such as big dams and mines, the outcomes are generally far from meeting any definition of 'better outcomes' outlined at the beginning of this review. To an extent, the marginalisation of relational or intrinsic values for nature and for sustainability may explain this pattern. But, by far, the biggest factor is the non-recognition of or under-representation of the values or concerns of certain socially and politically marginalised communities, who espouse both material and relational values towards nature. Correspondingly, there is significant inattention to the knowledge relevant to these concerns, whether generated through experience or by modern scientific methods. In other words, it is the low priority given to procedural and distributive justice, or the *broad values that society holds 'for/towards people' rather than values held 'for/towards nature'* that play the biggest role in shaping decision-making processes and outcomes. Improved decision-making, including recognition of rights of affected communities (including resource-dependent people, women and landless), inclusion of stakeholders in decision-making, free–prior–informed consent from indigenous communities and transparency ([53], p.12), can lead to a better balance between improving well-being, justice and sustainability, that is, a shift towards 'transformative change' visualised by the Values Assessment [10]. But such improvements are unlikely to happen unless the extreme power imbalance between growth-focused governments and profit-focused corporations on the one hand and adversely affected communities on the other is redressed [54]. Social movements have sought to redress this imbalance through various means, building networks, coalitions and discursive strategies [55]. But this is likely to be insufficient unless there is a larger shift in the discourses, away from utilitarianism and towards stronger formulations of equity, social justice and democratic process in decision-making [56–58]. Thus, within the broad strategy of seeking convergence among the values and worldviews of different stakeholders [59], particular attention needs to be paid to building convergence on ideas of equity, justice and democracy. Our analysis perforce focuses on the values and knowledges articulated by individual stakeholders in decisions on individual projects. Given, however, that values held by people co-evolve with the institutional structures in which they are embedded, it becomes necessary to confront the challenge at both ends, individual and structural [60].

Data Availability

No primary data were used for the research described in the article.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships that may be considered as potential competing interests: Sharachchandra Lele is on the Editorial Board of COSUST.

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