Mega-projects as displacements*

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Introduction

Dams, roads, ports, urban developments, pipelines and petrochemical plants, mines, and vast industrial plantations both reflect and instantiate the larger social projects of colonialism, development, and globalisation. An emphasis on mega-projects helps us to see the relationship between these abstract processes and the biogeophysical and social transformation of particular landscapes. Mega-projects are spatially situated and inherently displacing. Extending Schumpeter's (1947) use of the term, we argue that mega-projects entail "creative destruction" in a material sense: they transform landscapes rapidly and radically, displacing mountaintops, rivers, flora and fauna, as well as humans and their communities.

We argue that displacement is intrinsic to mega-project development and that both are socio-natural phenomena. The ideologies that inform project development and help to account for the persistence of displacement are the work of epistemic communities, elite groups of actors from state agencies, international lending and donor institutions, and the private sector. Members of these communities consider mega-project displacement as an externality to be either ignored or addressed through remediation, much to the consternation of transnational advocacy coalitions.

To understand how mega-project displacements are produced and why they persist, we first define mega-projects and the displacements that they engender. We then describe a range of primary and secondary socio-natural displacements. Third, we argue that the ideologies and cultural biases of epistemic communities shape project processes in ways that foster displacement. We close by considering for whom mega-projects are creative and for whom they are destructive.

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Defining mega-projects, redefining displacement

Definitions of mega-projects differ. Most are inexact and tied to specific project types.[1] We define mega-projects broadly as projects which transform landscapes rapidly,[2] intentionally, and profoundly in very visible

ways, and require coordinated applications of capital and state power. They use heavy equipment and sophisticated technologies, usually imported from the global North and require coordinated flows of international finance capital (Strassman and Wells 1988). International construction firms, private and public international financial institutions, and public-works bureaucracies form transnational epistemic communities wielding considerable power in support of mega-projects, especially in developing nations (Goldman 2001, Haas 1989).

Mega-projects can be divided analytically into four types: (i) infrastructure (e.g., ports, railroads, urban water and sewer systems); (ii) extraction (e.g. minerals, oil, and gas); (iii) production (e.g. industrial tree plantations, export processing zones, and manufacturing parks); and (iv) consumption (e.g. massive tourist installations, malls, theme parks, and real estate developments). However, these project types usually occur in combination. Railroads on industrial sugar plantations carry cane to refineries; dam projects entail roads and power lines. Many mega-project developers build housing for workers, project beneficiaries, or displaced people. One activity may be associated with multiple mega-projects: the bauxite-aluminium complex, for example, includes mines, roads, and railroads equipment, hydro-electric plants to provide energy for refining, and refineries (Barham, Bunker, and O'Hearn 1994).

The contributors to this issue seek to broaden economistic definitions of displacement, which in principle allow for measured compensation of objectively defined victims. Michael Cernea (2000), an internal critic at the World Bank, lists a set of economic and cultural losses as dimensions of displacement leading to impoverishment. Vandergeest includes in his definition people effectively displaced in contexts of constrained choices. We argue for a definition of displacement that simultaneously embraces natural or material as well as social dimensions. Second, we see displacement as an ongoing dialectical process. To better understand the unfolding of this process in space and time we differentiate between primary (direct) and secondary (indirect) displacement. Third, we argue that the discussion of primary social displacement should be expanded to include populations who move in order to build projects.

TABLE I. Dimensions of displacement

	Biogeophysical	Social
Primary (direct)	– flooding of reservoir – water diversion and other hydrological changes – soil compaction and paving – mountain top removal and stream filling (by tailings) – reduction/depletion of particular minerals and species – deforestation – creation of barriers to species migration	– planned eviction and resettlement – labour camps – loss of resource base in project area due to construction and/or flooding
Secondary (indirect)	– landslides, floods, and earthquakes (from dams) – water quality decline – soil salinisation – loss (or gain) of fish and wildlife populations – ecosystem changes leading to pest problems or disease – aquifer disruption causing problems downstream – loss of fish species leads to loss of migratory bird species	– loss of access to resources (and property) – unemployment with project completion – psychosocial stresses – creation of new identities – urbanisation as labour camps become permanent – unsustainable agriculture in resettlement area leading to soil erosion – ethnic conflict due to resettlement

Table 1 presents several dimensions of displacement as a four-cell table. The table suggests a dualism between the social and the natural, which has a certain heuristic value for analysis of primary displacement, but breaks down somewhat when we consider secondary displacement (hence the dotted rather than solid line separating biogeophysical from social).

Displacement as a socio-natural process

All mega-projects displace dirt and substrate, thereby altering the biological, geological, and physical attributes of landscapes significantly. Mountaintops are removed to fill streambeds, harbours deepened and protected by artificial piers, river and aquifer courses altered, lands cleared, levelled, and planted with neat rows of trees. Changes in soil characteristics, land forms, and habitat result in changes in species composition with long-term economic, cultural, and health consequences. So, when we think about displacement by mega-projects, we need to look beyond the fate of humans displaced by roads, mines, and rising reservoir waters to include (1) displacement of significant volumes of rock and soil, (2) displacement of hydrological patterns, (3) the displacement of natural habitats and the creation of new ones (e.g., stagnant pools of water for mosquito breeding or open fields on military bases), (4) displacement of species and plant and animal communities that goes along with displacement of niches, and (5) the resultant disappearance of livelihood opportunities for resource-dependent communities.

Those who imagine, define, and transform landscapes bring about material changes in the biogeophysical environment, which in turn influence social organisation, values, understandings, and actions. A major challenge for social scientists is to produce analytical frameworks that can capture these interactions in a built environment (see Bunker 1985, Freudenburg, Frickel, and Gramling 1995, Swyngedouw 1999). Anthropogenic activities imply unforeseen biogeophysical changes, which may have unpredictable secondary effects on the ''natural'' environment and far-reaching implications for human lives and livelihoods. Large demographic shifts and the imposition of new settlement patterns further (re)shape landscapes.

We use the term ''socio-natural'' to refer to these complex processes. Our use of this term (Gellert 2002) builds on the actor-network approach and the work of Swyngedouw (1999: 445), who argues ''natural or ecological conditions and processes do not operate separately from social processes, and (…) the actually existing socionatural conditions are always the result of intricate transformations of pre-existing configurations that are themselves inherently natural *and* social''. By seeing nature and society as conjointly constituted, we can recognise elements of nature as forceful actants[3] in landscape transformation and displacement. Thus, displacement refers to the ways in which human and biogeophysical elements in the landscape interact and change as mega-projects are introduced.

Primary and secondary displacement

Primary displacement is integral to the project process. Secondary displacement is an indirect consequence of project development. The latter is temporally and/or spatially less immediate. Primary displacements are more predictable; at least their magnitude can be estimated. Therefore, in principle, project planners can mitigate their worst effects. Secondary displacement is subject to far greater uncertainty. Both primary and secondary displacement may be biogeophysical or social, and the latter likely is a combination.

Primary displacement by rising waters and highways is well documented (Berman 1983, McCully 1996, Qing 1998). Social scientists frequently do not include destruction of flora, fauna, and habitat in their analyses when reservoirs fill, however, nor the effects of compaction and road building on water courses. Although, conceptually, socio-natural change occurs at this stage, many biological, geological, and hydrological effects are not immediate and better treated as secondary displacement.

Primary displacement not only refers to the movement of people ''out of the way'' of project development, but the movement of workers into areas where the demand for project labour

Life in 2001 in the Chinese city of Badong, which was being demolished in preparation for flooding by the Three Gorges dam reservoir. Richard Jones. SINOPIX-REA

outstrips the local supply. Major construction firms have hired as many as 15,000 workers for a single project (Linder 1994: 152). These major demographic shifts occur in a context of structural inequality. Choices to move for project work are often driven by economic need, but not all are free to choose. Transplanted corvée workers built canals and roads and mined tin from precolonial to twentieth century Peru; Egyptian forced labour dug the Suez canal (Linder 1994); prisoners built the Trans-Siberian Railroad (Michaelsen 1899) and roads in the American south; and forced labour has reportedly been deployed for pipeline construction in contemporary Myanmar (Burma). Also, regular forces and, increasingly, paramilitary and mercenary armies are deployed to protect as well as to build projects.

Social relations on the worksite are hierarchical, with differentiation among grades of workers reinforced by ethnic, national, gender, and/or racial stereotyping. These unequal relations are inscribed in the geography of company towns and worker settlements (Clark 1998, Finn 1998, Lawless and Seccombe 1993, Linder 1994). Some migrant workers live in contractor-built settlements segregated by job classification and ethnicity (Carstens 2001). Camp rules reproduce and often accentuate inequalities present in the firms' home countries. Other migrants build informal settlements near the project site and live in a limbo of illegality, such as the Brazilian *favelas*, where those who build the urban roads, tunnels, and tourist hotels reside.

The socio-natural quality of primary displacement is evidenced by the health problems suffered by migrant workers. Workers building railroads in Ecuador (and elsewhere in the tropics) fell ill when they traversed landscapes with endemic pathogens (Clark 1998). Soil compaction on the Panama Canal and Pan-American Highway building sites created puddles that were habitats for mosquitoes transmit-

ting malaria and yellow-fever. More recently construction sites in Brazil and Lesotho became nodes for HIV transmission (McCully 1996). In a mutually reinforcing process, mega-projects can create environments for the spread of disease, and disease and attempts to control it reshape project environments.

Secondary displacement

Secondary displacement can be seen as a ripple effect: people and landscapes at increasing distances from the project site experience its consequences later in time and in less profound ways with risk of displacement diminishing over time and distance. But this does not always happen. Therefore, we define secondary displacement as the product of political and/or socio-natural interactions that result in path-dependent phenomena where the pathways and intensity of the displacement-causing disturbances are seldom predictable.[4] It is an ongoing socio-natural process that takes myriad forms. It can occur close to or at some remove from the project site. It is subject to greater uncertainty than primary displacement and is therefore less amenable to control.

The so-called ''resource curse'', or distortionary effect of extractive booms on national economies, is complicated when we add the actual biogeophysical toll of project development. To illustrate, gold mining initially brought wealth into the area surrounding Cotuí, Dominican Republic. But in the mid-1990s, as mine tailings grew and the toxic effects spread, small farmers complained bitterly about land loss and water contamination. Similarly, Yopal, a Colombian oil field city, witnessed widespread early benefits from an oil mega-project. Its population tripled in five years, and the oil companies paved roads and brought electricity into the area. Over time, local water and sewer systems proved inadequate and crime and rents rose (TED 2002). We often think of mega-projects as benefiting cities at the expense of the countryside, but the displacement possibilities are more complex. Just as rural projects like mines create new urban and periurban landscapes, urban transport, water and sanitation projects, and real estate developments also displace human communities, biota, and geophysical features.

Mega-projects have also produced unanticipated geological changes that have had displacing effects. We can predict that sedimentation will reduce the utility of dams over time, but McCully (1996: 114) reports 70 instances where reservoirs have created seismic effects and cites reservoir-induced seismicity as a factor in the Konya Dam collapse in Maharashtra – an accident which killed 180 people, injured 1,500, and left several thousands homeless. Secondary biogeophysical changes produce secondary social displacement: when salinisation renders irrigated lands uncultivable, depopulation often results. Secondary displacement occurs at sites quite distant from the mega-project as when people involuntarily displaced are resettled on lands that are already used or occupied (Qing 1998).

Even without physical relocation, displacement of livelihoods in communities dependent on local resources occurs when biodiversity is diminished by a mega-project, as when forests are clear cut and planted with monocultures. One of former President Suharto's last projects, aimed to convert one million hectares of peat swamp into rice fields in South Kalimantan, Indonesia, was opposed by activists because the potential effects on the nutrient recycling and flood-control properties of the peat swamps were simply not known.

Project workers may also suffer the impoverishing effects of secondary displacement. With project completion, demand for labour diminishes. Most engineers and professionals leave when construction is complete. Operation of mines, plantations, and older ports can be labour intensive, but hydro-electric plants, pipelines, or container ports require fewer workers. Some idled workers follow construction firms to new projects; others stay behind hoping to create new communities and find new jobs. The workers who built Brasilia, for example, settled in satellite cities and complicated urban planning by their presence (Holston 1989).

In sum, although the magnitude and rate of some kinds of mega-project-related displacement can be measured, the broader socio-economic consequences of mega-project development cannot be assessed objectively because the full impact of environmental degradation is incalculable and landscape transformations and ecological crises are unpredictable. In this setting,

definitions of displacement become objects of political struggle.

Why displacement happens: ideology and practice

Displacement is made to seem inevitable by the practices and modernising ideologies associated with colonialism, development (capitalist and state socialist), and more recently globalisation. Mega-projects serve the material interests of powerful actors in the process: notably capital accumulation, especially for financial institutions and construction firms, and modernisation and territorialisation ambitions for states. These interests are reflected in and reflect the ideologies of communities of actors engaged in project development. Such ideologies inform an optimistic culture of decision-making that favours massive, rapid landscape change and excludes potentially affected populations from decision making. Together, these ideologies and practices rationalise some forms of displacement and disguise others.

Modernising ideologies and displacement

While the material aim of mega-projects may be alteration of property relations or commodification in general, particular projects are supported by modernising ideologies. Three elements of the modernising ideologies common to colonial, state socialist, and capitalist states directly encourage displacement. One is the idea that individuals must sacrifice themselves for the public good, which is based on economic notions of average individual utility. Cernea (2000) acknowledges that mega-projects are necessarily displacing and argues that they are unjustifiable if they do not contribute significantly to poverty eradication. However, he uses the public good notion to argue that some big projects are worth undertaking and suggests that their negative impacts can be minimised by adequate attention to remediation.

A second element has to do with the definition of progress as "evolution toward urban life". Development-induced displacement that creates rural–urban migration and "free" labour from the land is viewed as desirable because it encourages people to participate more fully in the national or global economy (Goldman 2001). Third is an idea of rational control over nature coupled with an assumption that technology can mitigate if not reverse the worst effects of displacement – whether social or natural. Taken together, these elements of mega-project ideology interpret the real and ontological separation of "man" from "nature" as progressive evolution.

Blatant and subtle forms of racial and other discrimination complicate modernising ideologies: indigenous peoples, their livelihoods, and values with regard to landscapes are systematically depreciated, undermining ideals of equity and participation. For example, the modernising ideas of equality and progress called for freeing peasants from the bonds of servitude to become construction and industrial workers. On the other hand, racialist ideology allowed the state to use coercion to prevent workers from fleeing project sites (Clark 1998). Similar contradictions between progress and equality on the one hand and racial (and urban) superiority continue to govern treatment of migrant workers (Carstens 2001) and dam-affected populations (Goldman 2001).

Epistemic communities and the project process

The shifting combinations of actors who undertake and shape mega-projects within particular sectors – and even some who oppose them – constitute "epistemic communities" (Haas 1989). These communities share a project culture defined by the ideological elements described above: the public good, progress, rationality, and racial biases. The culture of the epistemic community shapes its members' values and determines to a large extent what they will and will not see in the socio-natural landscape.

Key epistemic community members include multilateral, state, and private lending institutions; the construction industry; consultants, increasingly those producing environmental impact assessments (EIAs); state bureaucracies; and, on the fringes, NGO and other civil society actors. Perhaps the best-scrutinised lending institution engaged in mega-project development is the World Bank. However, as the World

Bank adopts a more cautious posture toward investment in mega-projects other public and private lenders are picking up the slack (Palmieri 1998). A second, less conspicuous set of actors represent the construction industry. Multinational firms are crucial ''agents of penetration of the Third World'', whose fortunes are tied to international development lending (Linder 1994). They play a key role in transferring capital-intensive technologies to developing countries, influencing state behaviour, spurring labour migration, and defining economic development trajectories in the countries where they operate.

States and their agencies constitute a third component of epistemic communities. At both national and sub-national levels, multinational firms engaged in mega-project development have had a powerful impact on governance. Internally, different state actors have their own interests in and expectations of mega-projects, and their clout varies widely. Not all agencies are committed to project development, but public works, finance, and, among exporters, natural resource-related ministries have been very powerful in developing countries, and large projects often are delegated to special executive authorities protected from line agency or legislative oversight. With the proliferation of structural adjustment loans and increased privatisation of the energy and infrastructure sectors, states increasingly play an enabling rather than a directive role in mega-project development. For example, in both the Mekong hydropower development and port and petrochemical complex construction in Gujarat, the Laotian and Indian governments created a policy and finance environment friendly to foreign investment.

Epistemic communities are often sector-specific and as often dominated by experts from universities, development agencies, consulting firms, and engineering companies of the global North who work all over the world. They build counterpart relationships with host-country bureaucrats, engineers, and scientists who were most likely trained at the same Northern universities. These experts advise representatives of bilateral aid agencies, foundations, the World Bank and national government agencies who are also members of the epistemic community. Some members have lent their expertise to local communities or environmental groups, which are more likely to be included in project discussions if they can demonstrate scientific credibility.

Epistemic communities are rarely egalitarian. In the irrigation project community, for example, civil engineers enjoy greater prestige than their colleagues in agricultural engineering; and men have more clout than women (Lynch 1993). Social and environmental scientists usually rank lower than engineers and economists, although reversals are possible. Local NGOs and community groups have generally been excluded.

The power that different members of the epistemic community can exercise in project decisions is a function of when they are brought into the project process. Those who enter the process early are in a better position to raise questions about a project's value; but the gestation phase is dominated by optimistic technical staff, largely engineers. Economists are brought in to do cost–benefit analyses which could be used to rank competing yet similar projects but which are more often used for project justification. Only when political and financial commitment is secure are social and natural scientists brought in to do social and environmental impact assessment. Where NGOs and community groups are included as ''stakeholders'', they have traditionally been brought into the project process late and in a relatively powerless position. However, as activists demand greater participation in decision-making and fuller consideration of environmental and social impacts, lending institutions are beginning to respond by inviting NGO and community leaders to comment on projects earlier in the process.[5]

Risk, uncertainty and the hiding hand

The relative power and interests of actors within an epistemic community may change over time, but apart from ideological orientation, we find certain constants in their culture – assumptions about their roles that favour action even at the risk of certain displacement. First, within a particular sector at any particular historical moment, members tend to believe that they ''know'' how best to do projects and to assume that, once conceived, a mega-project is inevita-

ble, i.e., "if we didn't do it, someone else would" (Gray 1998). In other words, in moving forward, experts within the epistemic community see themselves as being in a better position than others to minimise risks.

Second is what economist Albert O. Hirschman (1967) called the principle of the Hiding Hand. He argued that if project implementors could foresee how tortuous the path to completion would be, the precautionary principle would prevent them from undertaking projects. He saw ignorance of obstacles as functional to progress. Unfortunately, ignorance may not only create undue optimism about a project's feasibility, but it may also conceal knowable risks about displacement and allow engineers to override the precautionary principle in the face of uncertainties about displacement-inducing phenomena.

Big is beautiful

The faith in technology and belief in domination of nature central to modernisation ideology easily lead to a specific bias toward larger scale on the part of international lending institutions, construction firms, and monumentalist states. Bigger equipment, what Linder (1994) calls "mobile fixed capital", displaces more earth faster, increasing the potential severity of secondary displacements. For example, the huge capacity of new pulp and paper mills, which cost roughly $1 billion, has led to clearcutting of large tracts of forest in South-East Asia that other groups rely on for livelihoods (see Sonnenfeld 2000).

The bias toward larger scale creates a vicious cycle. First, capital accumulation and the institutional logic of international lending institutions favour large loans, even in the face of concerns about environment, displacement, human rights, or even the utility of a project. Second, international lending institutions only support projects amenable to international bidding, so projects must be big enough to interest multinational construction firms. Because the project gestation process is long, transaction costs associated with project identification, feasibility studies, engineering and economic studies, and the costs of drafting and passing enabling legislation bear little relationship to project size.[6] These pressures to move large sums out the door feed the growth of large firms, who in turn solicit state and international investment so that they can keep their inventory of large and highly specialised equipment working and moving with assurance from one job to the next.

Some see an uncertain future for mega-projects; they would argue that their declining numbers, whether due to globalisation's emphasis on flexible production, social protest, or exhaustion of potential sites, indicate that the bias toward scale may be a thing of the past. But, despite obstacles and delays, construction on the Narmada, Three Gorges, and Malaysia's Bakun projects continues, and the scale of container ports, petrochemical facilities, and urbanisation projects continues to increase. Mountaintop mining in Appalachia and planned "dry canal" and energy-export projects in Central America suggest that the bias toward scale will continue into the future. The bias is likely to prevail in the financial sector as well: as private loans become more important sources of mega-project funding (Palmieri 1998), rapid return on investment becomes increasingly important. This favours investment in large-scale construction equipment to speed up the project process.

Social movements have advocated smaller, incremental projects whose displacing effects would be easier to control or remediate. However, where scaling down is not possible and secondary displacement is inevitable, democratisation of the epistemic community may give those most likely to suffer from mega-project displacement more effective control over the shape of their alternative futures.

In sum, the modernising ideologies that inform project practice justify displacement as "progress", separate people from nature, and remove the planning process from the landscape. These ideologies shape the cultures of the sectorally based epistemic communities that guide the project process in ways that disguise and rationalise displacements. These hierarchical communities share a certain optimism in the face of risk that makes it likely that projects will go forward even where displacing effects can be foreseen. They also share a bias towards large scale that is the product of technology and the practices of international financial institutions. This bias

leads to rapid and profound landscape transformation with its implications for multiple displacements.

Conclusion: the distribution of displacements

We have argued in this paper that displacement is inherent in mega-project development, and that powerful forces of capital accumulation, state interests, and modernising ideology act through epistemic communities to support mega-project proliferation. Unlike those who take displacement as their starting point and ask how to reduce its impoverishing effects, we call for attention to the broader historical social and natural relations of displacement and address the prior question of how displacement is produced. We opened a discussion of how mega-projects are produced by combinations of material interest and ideological practice and argued that epistemic communities guide the project process toward outcomes that are displacing and ensure that their effects will be unequally distributed.

This leads us back to our initial question: for whom is mega-project displacement creative and for whom is it destructive? Some structural tendencies cannot be ignored, although historical cases will vary. It is likely that strong states able to guide the project process will benefit more than weak states that simply play an enabling role for private sector actors. Similarly, all other things being equal, mega-project displacement is less likely to affect wealthy communities and members of dominant ethnic groups. In contrast, societies remote from centres of power are more likely to suffer primary and secondary displacements, although indigenous activism and transnational advocacy networks have helped to overcome the barriers of physical isolation. The biases toward progress and freeing of labour from the land inherent in modernisation ideology will be prejudicial to societies most dependent on the ecological *status quo ante* for their livelihoods, occupations seen as "primitive", and individuals in society who are least able to pick up and move. Finally, when we incorporate workers into our analyses, we can see how the racism associated with modernisation ideology ensures that the effects of displacement will again be felt unequally.

On balance, if we take the biogeophysical dimensions of displacement into account, we may find that everyone within the landscape reshaped by the mega-project "loses", while those "outside" it either are indifferent or stand to gain. That said, mega-project development may create new economic opportunities and social spaces as it closes off old ones, and the landscape changes that mega-projects entail can give rise to new cultural forms and socio-natural interactions. Empirical studies of displacement – in specific mega-project contexts that take into account its socio-natural character and its primary and secondary dimension – can help us to identify winners and losers. At a broader level, understanding the history and epistemic logic of mega-projects can help social scientists to see the multiple displacements and hopefully enable others to see as well.

Notes

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1. For example, ICOLD considers major dams to be those over 15 metres. However, given the variety of physical topographies and hydrological systems in which dams have been constructed, shorter height dams qualify as major if they meet other criteria such as crest length, spillway capacity, and reservoir capacity (Palmieri 1998).

2. Our emphasis on landscape transformation deserves brief comment. The European notion of landscape places the viewer outside of the object of his or her gaze. Mega-project developers often seek to achieve control over a landscape and to make it legible by distancing themselves from it and by removing or displacing human and nonhuman populations and features from their line of sight.

3. Actor-network theorists (e.g., Latour, Callon) use the term "actant" to achieve a conceptual "levelling" of human and nonhuman actors and to emphasise that agency is a "relational effect" of the networks of which particular actants form a part.

4. This definition draws on Bunker's (1985) structural explanation of two intertwined processes: the environmental degradation of the Amazon and the progressive impoverishment of the region.

5. These pressures led to the creation of the World Commission on Dams. Plans for the multifaceted Plan Puebla Panama in Mexico and Central America call for meetings with NGO representatives.

6. This problem is exaggerated when loans are made to governments rather than project authorities. In these cases lending agencies base their determinations of soundness on the borrowing government's overall debt repayment capability, rather than the fiscal soundness of the project per se.

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