

How Is the World Shaped by Infrastructure Projects That Have Been Cancelled or Stalled?

Dana J. Graef, Montina Cole, Alan P. Covich, Jorge A. Huete-Pérez, Amanda Maxwell, Jonathan Peyton, Andrew Stuhl, and Julie Velásquez Runk



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Front cover photo: “Yukon Flats River and Oxbows, Yukon Flats National Wildlife Refuge,” June 14, 2004. Decades after the Rampart Dam was first proposed on the Yukon River in Alaska, a protected area was created to prevent development in the area. Image author: US Fish and Wildlife Service. Accessed via Wikimedia Commons (https://commons.wikimedia.org/wiki/File:Yukon_Flats_River_and_Oxbows.jpg); image is in the public domain. Permission: PD-USGov-FWS.

Back cover photo: Evening in Annapolis, Maryland, during the Unimplemented Development Synthesis Workshop, January 21, 2020. Photo by Dana J. Graef.

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Summary

This report is the result of an interdisciplinary, international effort to examine the socio-environmental consequences of large-scale infrastructure projects that have been planned but not built—and reasons why projects have been cancelled or stalled. Collectively, our team examined eight cases of cancelled or stalled infrastructure projects in the Americas, drawing from our experiences in academic research and professional practice.

We gathered at the National Socio-Environmental Synthesis Center (SESYNC) in Annapolis, Maryland for a three-day meeting motivated by the question: How has the world been shaped by infrastructure projects that have been cancelled or stalled? Our group synthesis process included responding to common questions about each case to establish interconnections, and facilitated discussion to identify themes.

Across cases, we found that projects were cancelled or stalled for interrelated reasons including environmental impact assessments, litigation and legislation, strong opposition and media attention, and/or increasing costs and faltering justifications.

Our work further shows that cancelled or stalled development projects can create socio-environmental consequences that persist and cascade over time. The consequences of unbuilt infrastructure projects include the following: the development of new research networks; the establishment of precedents for socio-environmental assessment; the strengthening of social movements, often against the proposed development; changes in land use and land tenure; the exposure of environmental racism and injustice; and shifted development interventions.

In sum, paying attention to cancelled and stalled projects provides a transdisciplinary lens for understanding broader processes of development, knowledge, power, science, and socio-environmental change. We conclude that when proposed large infrastructure projects are assessed, additional attention needs to be given to how they may shape landscapes and societies even if they are never built.

Introduction

Large-scale infrastructure projects—including mines, dams, highways, canals, and pipelines—attract massive financial investments throughout the world. These megaprojects can cause significant socio-environmental changes, from deforestation and land tenure change to migration and displacement of local communities (e.g., Nor-Hisham and Ho 2016; Tilt and Gerkey 2016; Lasso 2019). The impacts of such projects have received scholarly attention in the natural sciences, the social sciences, and the humanities, as well as from government agencies, funding organizations, corporations, and NGOs (e.g., Carse 2014; Dai and Liu 2013; Fearnside 2016; Kleinschroth et al. 2019; Li 2015).

But many proposed large-scale projects are not actually built (e.g., Carse and Kneas 2019; Covich 2015; Graef 2013; Keiner 2017; Miller 2014; Peyton 2011; Velásquez Runk 2015). Highways and pipelines have been met with public opposition and lawsuits (e.g., Buzbee 2014; Rutkow 2019; Hamilton 2016; Hinzo 2018); dams have been planned, cancelled, and the land turned into parks (e.g., Albert 2005; Cooke 1964; USFWS 2018); mines and canals have been envisioned, debated, and approved but never excavated (e.g., Hébert 2016; Huete-Pérez et al. 2016). Projects may be cancelled or stalled due to a combination of factors including environmental opposition and litigation (Buzbee 2014), social justice movements (Estes 2019; Martinez-Alier et al. 2016), the withdrawal or loss of project funding (Mao and Schmidt 2015), changing political landscapes (e.g., Riordan 2000; Shear and Davenport 2021), or fraud (Tsing 2000). Meanwhile, many large-scale projects go through decades-long cycles of being stalled, cancelled, and then revived again (e.g., Flyvbjerg 2017; Herrera 1996; Van der Post 2014).

Studies of such projects' impacts have often focused on the potential socio-environmental changes they could cause in the future, if they are completed (e.g., Roy et al. 2018; Tosi and Zadroga 1975). While assessments of proposed projects tend to place an emphasis on social and environmental changes that are yet to come, the impacts of cancelled and stalled projects are not solely relegated to the future: many have very real consequences despite not being built. Land is purchased and sometimes excavated; money is invested (Riordan 2000); and people's lives are placed in limbo as they wait to know if they will be relocated (Amnesty International 2017, 13). Cancelled and stalled large-scale projects can lead to changes in law and policy, the establishment of parks and protected areas (e.g., USFWS 2018), and the creation of social movements that persist beyond the lifespan of development plans.

With such far-reaching and multifaceted consequences, unimplemented development projects merit interdisciplinary attention and analysis that integrates academic and practitioners' perspectives. During three days of discussions at the National Socio-Environmental Synthesis Center (SESYNC) in Annapolis, Maryland, we considered eight different cases of large-scale infrastructure projects that were planned but not completed in

the Americas (see Table 1). Each of us has come to know one or more of these cases through the lenses of our distinct disciplinary perspectives and professional experiences—including anthropology, ecology, economics, geography, history, and law—and through academic research as well as work with or as part of environmental coalitions and NGOs. We collectively analyzed these diverse cases to examine the following: Why were projects cancelled or stalled? What are the socio-environmental consequences of unimplemented development projects? How has the world been shaped by things that haven't happened?

Shifting statuses and definitions

For the purposes of this work, unimplemented development refers to a broad category of projects that have been cancelled or stalled before becoming operational (Graef 2013). Such projects can likewise be seen as “projects that never happened” (Covich 2015), creating “unbuilt environments” (Peyton 2017) with “lasting effects” (ibid, 7; Velásquez Runk 2015). Narratives of such projects can be seen as “ghost stories” (Peyton 2016) or as “shadow histories” of “pathways not taken” (Carse and Kneas 2019, 15), with their own “afterlives” (Morris 2021; Pike 2019) and legacies. Unbuilt infrastructure projects have been classified in different ways: as “zombies” that are proposed, killed off, and come back to life (Gleick et al. 2014, 123); “shelf projects” that “persist in a prospective state between closure and renewal” (Carse and Kneas 2019, 22); or alternate visions of futures that haven't come to pass (ibid, 20).¹

Based on our experiences with such projects, we recognize that the pathways of development are not linear or predetermined (see Ballesterio 2019; Carse and Kneas 2019, 10; Keeling and Sandlos 2017; Sizek 2021). Mindful of many planned projects' shifting statuses, we see project completion—and the construction of physical infrastructure—as potential stages in an iterative development process. Some projects remain in the realm of ideas that were envisioned, imagined and proposed without further development or approval; others are conceptualized and approved but not built; still others are partially built before ultimate cancellation. Projects may be cancelled or stalled at different stages in the decision-making process—while some are abandoned before being approved, others are either decisively cancelled or more passively abandoned after approval. These different stages are all aspects of development; physical infrastructure is only one part.

Amidst projects' shifting statuses and ever-changing timelines, at our workshop we asked what such projects *do* in the world (see Peyton 2017, 15).² When brought together, different fields and disciplines reveal varying perspectives on planned, cancelled, and stalled projects. For example, legal studies have parsed the consequences of litigation against planned projects (e.g., Hamilton 2016; Tarlock 1974); work in agrarian studies has explored the implications of land speculation in response to proposed development (e.g., Borrás et al. 2012; Grandia 2013; Campbell 2015); and environmental justice research has shown the role of environmental racism in the siting of extractive projects in marginalized

¹ In their 2019 review of “unbuilt and unfinished” infrastructure, Carse and Kneas suggest a typology for understanding such projects in relation to time: “shadow histories,” “present absences,” “suspended presents,” “nostalgic futures,” and “zombies.”

² As Macfarlane writes in the context of dark matter in physics, “To perceive matter that casts no shadow, you must search not for its presence but for its consequence” (2019, 56). A similar logic can be applied to unbuilt infrastructure projects.

communities (e.g., Bullard 2000; Cole 2019a; Malin et al. 2019; Schelly and Streetsy 2009). In multiple disciplines, scholars have further shown how lands targeted for extractive development have been mischaracterized as empty or unproductive (e.g., Bastos Lima and Kmoch 2021; Voyles 2015).

Our work together shows that focusing on cancelled and stalled projects provides a transdisciplinary lens for understanding broader processes of development, knowledge, power, science, and socio-environmental change. Our experiences have shown that as a result of planned projects, landscapes are surveyed and studied, environmental coalitions are formed, citizens engage in efforts to gather information about their local environments, and scientists build careers. Media and public attention to planned projects reveals unequal power relationships and exposes environmental racism. During drawn-out periods of time when it is unclear if a project will be built, communities experience psychological consequences of living in places that are targeted for extractive development.

Project ideas, and their impacts, further persist over time, as laws are changed, land tenure shifts, and protected areas are created. When assessments operate on the assumption that impacts are triggered by project completion, they miss the socio-environmental consequences that begin with project conceptualization.

Group Process and Cases

Examples of unimplemented development span geographic regions, time periods, and types of infrastructure, posing methodological possibilities as well as challenges.³ Each of the eight projects we considered represents an example of a cancelled or stalled large-scale infrastructure project that has had identifiable consequences. Planned throughout the Americas, the cases represent distinct types of large-scale construction, including cancelled or stalled dams, pipelines, canals, a mine, and a section of highway. The consequences of such projects can be obscured from view when considered from afar—or without emplaced knowledge and experience. Therefore, each of us has long-term professional experience engaging with such projects and/or working in the areas where projects have been planned.

Our analysis and discussion is based on the following cases, summarized in Table 1: an incomplete section of the Pan-American Highway in Panama known as the Darién Gap (“PAH”); a defunct plan to create a sea-level canal in Panama using nuclear explosions (“SLC”); the proposed Interoceanic Canal Project in Nicaragua (“ICP”); competing plans to divert the Yukon River in Canada and the United States (“YKD”); a proposed Aluminum Company of America (Alcoa) bauxite mine in Costa Rica (“ACR”); the approved but not built Mackenzie Valley Pipeline in western Canada (“MVP”); a series of cancelled dams in Chile that were planned by the company HidroAysén (“HAP”); and the now-cancelled Atlantic Coast Pipeline in the eastern United States (“ACP”).⁴

These cases range from projects that have been definitively cancelled for decades to those that are currently stalled; they include transnational transportation projects, plans for mineral extraction and related hydropower production, and proposed projects for energy production. Illustrating the dynamic nature of many large-scale projects, the status of several of these cases has continued to change since we began this research effort in mid-2019.

³ Underlying this effort was a broader methodological question: How can unimplemented development projects be collectively analyzed and understood across different disciplines and locations? Such projects can be linked to—and distinguished from—one another in multiple ways, for example: by the kind of infrastructure planned (mines, canals, dams); by the goals or purposes of the project (transportation, resource extraction, energy); by geographic proximity; by chronology; by the nations or corporations involved; by degree of completion; and by reasons for opposition or protest.

⁴ See Appendix A for examples of further readings on each of these cases and their social, political, historical, and environmental contexts. Our previous writing on these cases includes the following: Cole 2019a; Covich 2015; Graef 2013; Huete-Pérez, Meyer and Alvarez 2015; Maxwell 2014; Peyton 2016; Stuhl 2016; and Velásquez Runk 2015.

Table 1. Eight cases of unimplemented development in the Americas

Project	Brief Description	Key Timeline	Current Status
Project Purpose: Transnational Transportation			
Darién Gap in the Pan-American Highway, Panama and Colombia (PAH)	An incomplete 106-km section of the Pan-American Highway in the borderlands of Panama and Colombia	Highway first proposed in 1920s; construction through Gap was blocked in 1975 following litigation	Not built, but smaller roads slowly doing the same work; again being considered as a possibility
Trans-Isthmian Sea-Level Canal, Panama (SLC)	Sea-level canal across Darién, Panama to be excavated through nuclear explosions	First proposed in 1950 as part of Project Plowshare; cancelled in 1975 due to perceived risk	Cancelled, no longer under consideration
Interoceanic Canal Project, Nicaragua (ICP)	300-km canal through Nicaragua connecting the Pacific to the Caribbean via Lake Nicaragua	First proposed in 1897; renewed proposal announced in 2012; approved in 2013; currently stalled due to loss of funding	Stalled, but not cancelled
Project Purpose: Mineral Processing and Extraction and Related Energy Projects			
Yukon River Diversion Schemes, Canada and United States (YKD)	Competing plans to divert Yukon River for hydroelectric generation, including construction of tunnels through the Canada/US border	US plan first proposed in 1946; competing Canadian plan proposed in 1950s; both plans abandoned in 1970s	Not built in proposed location; no longer under consideration
Alcoa Bauxite Mine, Costa Rica (ACR)	Proposed bauxite mine in a 200-square km mining concession in southern Costa Rica	Planned in the 1960s; approved in 1970; stalled due to public opposition; contract cancelled in 1975	Never built

Project Purpose: Energy Production and Transport			
Mackenzie Valley Pipeline, Canada (MVP)	1,200-km natural gas pipeline from Northwest Territories to processing facilities in northern Alberta, Canada	First proposed in 1974; shelved in 1977 following a judge's review; revived in 2004; approved in 2011; Joint Venture dissolved in 2017	Approved but not built
HidroAysén Hydroelectric Project, Chile (HAP)	Five large hydropower dams in Chile's Patagonia, one smaller dam, and a 1,200-km transmission line	Proposed in early 2000s; Environmental Impact Assessment submitted in 2008; permits received in 2011; permits revoked in 2014 following public opposition; company dissolved in 2017	Cancelled
Atlantic Coast Pipeline, United States (ACP)	600-mile (966-km) natural gas pipeline from West Virginia through Virginia into North Carolina, US	First announced in 2014; approved in 2017; stalled due to litigation, and cancelled in 2020 ⁵	Cancelled

Process

In coming to know these projects individually, we have employed methods including ethnography, archival research, ecological assessments, and professional practice.⁶ While each of us has previously written about and engaged with this topic from our unique disciplinary, professional, and geographic perspectives, in taking a synthesis approach (see Alexander et al. 2020; Palmer et al. 2016), our project was designed to consider our cases in relation to one another—and not in isolation. To provide a productive structure for collaborative analysis, each of us provided preliminary written responses to a common set of questions about our cases before our meeting. This preliminary writing was intended to

⁵ In the case of the ACP, while some construction and related preparations occurred, including the felling of some trees, the pipeline was mostly unconstructed.

⁶ These methods and forms of engagement have included the following: collaborative ethnographic and community-based research in Panama (Velásquez Runk/PAH); tropical ecological fieldwork and assessments in Panama (Covich/SLC); the organization of international workshops in Nicaragua (Huate-Pérez/ICP); geographic and archival research in Canada (Peyton/YKD); ethnographic and archival research in Costa Rica (Graef/ACR); archival research, interviews, participant observation, and community-based research in Canada (Stuhl/MVP); environmental NGO campaign work in Chile (Maxwell/HAP); and NGO advocacy work and litigation opposing the ACP in the United States (Cole/ACP).

provide common ground to promote synthesis across multiple disciplines and ways of knowing.

Responding to similar questions for each case was further intended to stimulate collective thinking around a broader question—how our world is shaped by things that haven’t happened—while maintaining awareness of the distinction of each of the cases. In our preliminary work, we profiled each of the cases and addressed questions about projects’ status and consequences. We each responded to questions including: What different reasons have contributed to the project being cancelled or stalled? What consequences has the cancelled or stalled project had, despite not being built? How definitively was the project cancelled? Has the project gone through a series of cancelations and revivals? What factors seem to contribute to these oscillations?

Our three days of integrative discussion and analysis at SESYNC in January 2020 began with a facilitated group discussion of the question: Why does it matter to pay attention to unimplemented development? We then presented and discussed each of the eight cases—including similarities, differences, and connections between them. On the afternoon of the second day, we moved into a facilitated analysis (see Graef et al. 2021; Kaner et al. 2014) of the reasons why projects were cancelled or stalled, as well as the consequences these projects have had, despite not being built. Having identified a set of common themes across our cases (see Appendix B), on the final day of our meeting we spent time collectively contributing to a collaborative preliminary draft that summarized our findings. The themes and areas of connection that we identified during our synthesis meeting inform the following sections of this report.

Synthesis: Why Were Projects Cancelled or Stalled?

The reasons why the projects we examined were cancelled or stalled are multifaceted and interrelated. Opposition to a project and its eventual suspension has been based on the findings of an impact assessment, for example—as well as media coverage and collective memories of historical injustices (e.g., ACR, ACP). Over time, political conditions in countries have shifted from an administration that supports a project to one that opposes it. Perceptions of the risks associated with development—whether economic, environmental, technological, or social—have grown to outweigh assessments of potential benefits (e.g., ICP, PAH, SLC). And ultimately, some planned projects were unable to transcend the limits of geography and distance (e.g., YKD, MVP).⁷ While the trajectory of each individual case was influenced by distinct political, economic, historical, geographic, ecological, and social contexts, in synthesizing across cases, broad factors emerged that can inform further studies of cancelled and stalled projects.

Assessments and risk

Across these cases, environmental and social impact assessments raised concerns that required more time and funding for extended studies, as well as issues that indicated a lack of sufficient economic, social, or environmental benefits relative to costs. Evaluation processes generated central sources of information, and in many cases these assessments were made partially available for public discussion and review during various stages (e.g., MVP, SLC). These discussions were sometimes important in triggering responses from different stakeholders, leading to suggested changes to the original project, or the eventual decision to end the project (e.g., ACR, HAP, SLC). In some cases, it was not the finding of an assessment, but the quality that led to project delays, litigation, and eventual suspension or cancellation (e.g., HAP, PAH). Poor quality assessments may have been due to rushed efforts to hasten approval (Huete-Pérez, Alvarez et al. 2015)—yet, ultimately, such haste often leads to lengthened timelines.

In the case of the proposed Interoceanic Canal Project in Nicaragua, most prominent scientists and environmentalists have regarded the canal as a huge

⁷ For example: while the Yukon River Diversions were proposed to use the river to generate cheap power for an envisioned aluminum economy in Alaska and Northern Canada, the schemes would have required connections to bauxite deposits in far off locations such as Palau and French Guiana, and would have had a customer base across the globe. The region was ultimately too far away from the sites of consumption.

environmental threat (Huete-Pérez et al. 2016; Huete-Pérez, Meyer and Alvarez 2015; Meyer and Huete-Pérez 2014). The Academy of Sciences of Nicaragua alerted the Nicaraguan government and populace to numerous negative ramifications of the canal's structural design and construction methodology. A panel of scientists invited by the Academy recommended a robust and independent scientific examination of the canal project in its entirety before the government and canal concession-holder, the Hong Kong Nicaraguan Development Group (HKND) proceeded any further.

This attention to the project may have had unexpected consequences. In Nicaragua, some believed that the project was purely speculative and there was no intention to build the canal. There were critiques that the attention given to the canal through study and environmental assessment gave the project validity and elevated its status to a *project* rather than a *process*—as a result it became more than a speculative idea. Yet at the same time, the process of evaluating the project was significant in raising the importance of environmental issues in Nicaragua.

Litigation and legislation

Litigation and existing legislation have played a critical role in slowing and ultimately stopping proposed development (e.g., ACP, PAH). Laws and regulations—including requirements for environmental impact assessments, consultation with impacted communities, conservation policies, and nations' constitutional principles—have established frameworks that enabled project opponents to challenge and delay proposed development (e.g., ACR, HAP, MVP). Many of these proposed projects were in violation of local, national, or international laws; litigation was a tool to hold project developers accountable. Litigation further built coalitions and connections between project opponents, and media attention has shed light on power dynamics and the consequences of siting development projects in marginalized communities.

Litigation regarding the Atlantic Coast Pipeline, for example, stalled development efforts. One issue focused on the US Forest Service's approval of the ACP's intended path through the Appalachian Trail.⁸ The issue of whether the ACP could cross the Appalachian Trail ultimately reached the US Supreme Court. In June 2020 the Supreme Court ruled in favor of the ACP developers (see Barnes 2020). Social justice litigation also stalled development, including an appeal in the US Fourth Circuit Court of Appeals of a Virginia state environmental agency decision to grant an air pollution permit for a controversial ACP gas compressor station to be located in the historic African American community of Union Hill.⁹ Evidence was offered by several stakeholders that the ACP would produce myriad health, environmental, and other harms, including disproportionate harm to already disadvantaged environmental justice communities, all in violation of state and federal laws (e.g., Clarke et al. 2019; Zimpleman et al. 2019).

⁸ After the federal Fourth Circuit Court of Appeals overturned the Forest Service permit in December 2018, and then denied the developers' appeal, the pipeline developers asked the US Supreme Court to hear an appeal of the Fourth Circuit's decision. The Federal Energy Regulatory Commission (FERC) and other pro-pipeline entities filed in support of the request. In October 2019, the Supreme Court granted their request.

⁹ Oral arguments on the case were heard on October 29, 2019. In January 2020, the Fourth Circuit revoked the developer's permit for the compressor station (Schneider 2020).

Opposition and media

Local, national, and international opposition played a significant role in projects' cancellation or lack of completion, and often impacted political and, at times, financial support (e.g., ACR, HAP). Opposition took many forms, from organized coalitions of NGOs to broad social movements to loose allyship between communities. Opposition manifested with tools including protests, participation in formal government processes, communications campaigns, and capacity building efforts. Social movements in opposition to planned projects focused on issues including land expropriation (e.g., ICP), environmental racism (e.g., ACP), the loss of national sovereignty (e.g., ACR), and the findings and shortcoming of impact assessments (e.g., HAP). In some cases opposition further coincided with anti-colonial or anti-imperial political climates (e.g., PAH, SLC, ACR).

In several transnational contexts, projects were considered threats to national sovereignty (Quesada 2010; Amnesty International 2017). In the case of the Interoceanic Canal Project in Nicaragua, for example, the signed concession establishes that Nicaraguan law does not apply within the area of the canal. In response to the proposed canal, a new social movement emerged (Amnesty International 2017). The campesino movement brought together the peasants whose land would be expropriated as a consequence of the canal's construction. The movement has organized at least 100 marches against the canal; leaders of the movement have been threatened, harassed, and some have been killed.

Opposition to many projects reflected a response to—and rejection of—power discrepancies that have been perpetuated over time. Media coverage drew public attention to the roles of corporate and political power that were pushing for projects, often in the relative absence of public input. Media attention also allowed opportunities for individuals to suggest alternatives, and laid bare the racial and/or economic inequities that were foundational to projects' conception. In leading the Mackenzie Valley Pipeline Inquiry—a years-long public inquiry into the pipeline's potential impacts and benefits—Judge Thomas Berger ensured that both national, mainstream media and regional, Indigenous-led media in northern Canada covered all hearings into pipeline impacts. This coverage helped highlight the divergent viewpoints on the development project and the need to consider Indigenous rights alongside ecological conservation and energy production (Berger 1977; Sabin 1995).

And by illustrating alternative routes to the ACP in the United States, media and activists made the public aware that the construction did not need to pass through Union Hill. Media reports and advocacy organizations addressed the political power and influence of Dominion Energy—one of the project's developers—on the project's federal and state regulators, the Virginia governor, and on Capitol Hill, where Dominion sought federal legislation to overturn the Fourth Circuit decision preventing the ACP from crossing the Appalachian Trail (ABRA 2019). Strong grassroots movements developed in opposition to the project, and citizen scientists and citizen regulators monitored and collected evidence on developer noncompliant construction activity and on water quality near the pipeline path (ABRA n.d.; Hand 2018). Many activists and other stakeholders have experienced stress, anxiety, and anger regarding the prospect of the ACP. At the same time, many have also gained strength and a sense of purpose in fighting the pipeline.

Costs and needs

Planned projects' actual and estimated costs often increased over time, making projects harder to justify (e.g., HAP, ACP).¹⁰ These increasing costs were for various reasons, including unanticipated costs for communications and public relations efforts to counter public opposition or to engage with impacted communities (e.g., HAP); higher than expected costs of developing a project in a particularly difficult geographic location (e.g., YKD); global market prices of key materials like concrete increasing during the project's evaluation (e.g., HAP); and market changes decreasing the price of alternatives to the proposed projects (e.g., HAP, MVP). Succinctly put, the economics of these projects did not add up in the end, which discouraged outside investment and rendered projects unviable.

Projects were also cancelled or stalled when their justifications faltered. Proponents argued that their respective project would fulfill an important “need.” The rationales included bolstering energy supply, increasing connectivity, promoting development, and creating jobs and promoting economic growth. Yet perceived needs often contributed to projects' failures, as over time, external forces and markets rendered the projects unnecessary or too expensive to meet a given need—or, in some cases, exposed the fact that the “need” never existed to begin with. In the case of the Mackenzie Valley Pipeline, for example, external factors—including an increase in fracking, which flooded North American markets with inexpensive natural gas—made the revived proposal for the pipeline less competitive.

The cancellation of HidroAysén (see Hernando-Arrese and Tironi 2019; Maxwell 2014; Romero Toledo 2014) also occurred within the context of a changing energy sector in Chile. Project proponents argued that Chile needed large amounts of new energy to meet future energy demand projections—largely driven by the northern mining sector—and that that demand could only be met by either the proposed dams or coal-fired power plants. Historically, the country had relied on large hydroelectric dams, coal and diesel for electricity generation. However, around 2010, Chile's vast resources for solar and wind power started to be recognized, and the country's non-conventional renewable energy sector began to develop (e.g., Lodoño 2017). The development of renewable energy, advances in energy efficiency—as well as a massive 2,100 MW coal-fired power plant called Castilla, which was being proposed at the same time—negated the “need” for HidroAysén.

¹⁰ In the case of HidroAysén, the projected costs of the dams and the transmission line doubled (Maxwell 2011). In the case of the ACP, the project's cost estimate increased from US\$ 4.5 billion to \$7.5 billion over time (Cole 2019a).

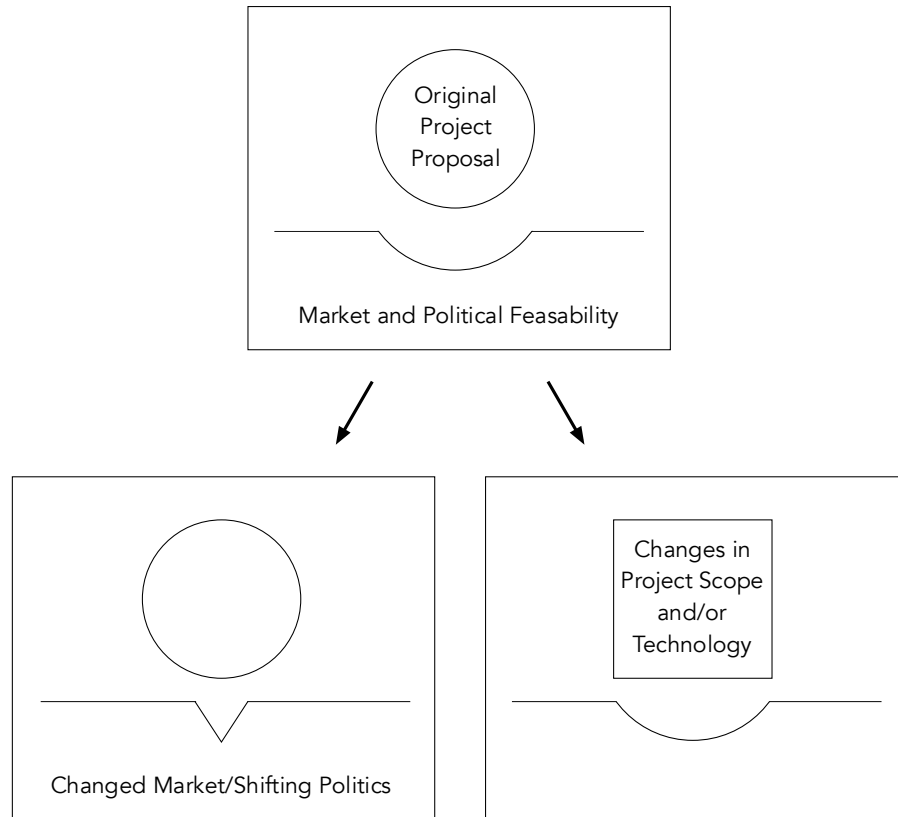


Figure 1. Shifting conditions and changing projects. Over the course of decades-long processes of planning, approval, assessments, opposition, re-evaluation, and often litigation, projects can change in scope and/or technology. Political, cultural, and economic conditions also shift in the places where projects are planned, shaping projects' evolution and trajectories. Adapted from diagrams by Andrew Stuhl during group discussion of reasons why projects are cancelled or stalled.

As these cases illustrate, project completion is not inevitable. A closer look at the reasons why projects stall reveals complex social interactions among economies, technologies, environments, knowledges, public interests, media, and political feasibilities. These interactions reveal a rich landscape for scholarly inquiry, especially as they unleash cascading consequences—even if a project is never built or completed.

Cascading Consequences of Cancelled and Stalled Projects

Once proposed, large-scale infrastructure projects have cascading social and environmental consequences that can linger long after development plans have become inactive.

Consequences of planned projects can flow from different stages of the development process—including project conceptualization or reconceptualization, approval, cancellation, or preliminary or partial construction. In some cases, the initial development proposal led to increased land speculation (e.g., ICP), peripheral changes in unsustainable land uses (e.g., PAH), and other side effects that were not considered in the environmental and social impact assessments. Planned projects further shaped societies in different ways: as a result, scientists have built careers and connections; social movements have emerged and changed; environmental racism has been exposed; history was learned and remembered; and new legislation was proposed that continues to influence landscapes and societies.

Research networks and connections emerge

Across these cases, new connections and coalitions emerged and developed in the interest of better understanding projects' impacts, from a citizen science coalition that collected water quality data in the region where the ACP was planned to scholars who gathered in Costa Rica to debate and better understand the potential impacts of the Alcoa mine (e.g., ABRA n.d.; FEUCR 1969). In response to Project Plowshare and the planned Sea-Level Canal in Panama, which was to be excavated with nuclear explosions, a Committee on Ecological Research was established through the US National Academy of Sciences (see Covich 2015, 58), and intellectual interdisciplinary networks emerged. Despite a lack of Congressional support for much of the proposed research, new partnerships among universities and large corporations such as Battelle developed and still remain active.¹¹ This corporation helped organize canal studies in Darién with US and Panamanian scholars (Golley et al. 1969; McGinnis et al. 1969; Keiner 2020; Torres de Araúz 1967).

In response to Project Plowshare, scientific studies of the potential impacts of radioactivity on ecosystems further transformed a new field of “Radiation Ecology” (Creager 2013; Rothschild 2013). Some of these results later proved useful in evaluating disruptions of nuclear power plants in the United States, Japan and Ukraine. Ongoing, long-term studies of Chernobyl still use some of the technology and ecosystem concepts

¹¹ Battelle currently administers the National Ecological Observatory Network (NEON) funded by the National Science Foundation.

developed by scientists working on Atomic Energy Commission projects to evaluate the impacts on natural systems and human populations (Beresford et al. 2020; Matsala et al. 2021).

In similar ways, the procedural choices made by Judge Berger in the Mackenzie Valley Pipeline Inquiry—in regard to separating “technical hearings” featuring scientific and engineering testimony from “community hearings” for local residents in the proposed development corridor—informed the elaboration of impact assessment processes within academic scientific communities and national regulatory bodies in Canada, the United States, and beyond (Gamble 1978). The accelerated baseline studies conducted in advance of the Inquiry on social and ecological impacts of pipeline construction, operation, and maintenance employed dozens of researchers, launched careers for graduate students in social, natural and engineering sciences, and, with unusually large budgets for field science, allowed testing of new methods and equipment (Stuhl 2016).

Precedents for assessment and consultation are established

The impacts of assessment processes further linger in landscapes and legislation (e.g., PAH, MVP). In Canada in the 1970s, for example, Judge Berger held a series of public hearings in communities along the pipeline route and in major southern Canadian cities. In addition to recommending a moratorium on pipeline construction until land claims settlement, he also recommended a pipeline never be built across the northern Yukon territory, which was critical calving grounds for regional caribou populations (Berger 1977). Canada moved on this recommendation to withdraw a parcel of the northern Yukon from development; later Parks Canada worked with several Indigenous governments to set aside the area as several national parks (Arnold et al. 2011).

The decision to set up a public inquiry into the Mackenzie Valley Pipeline’s social and environmental impacts set a precedent in North America and other parts of the world for impact assessment procedures, not only for federal regulatory authorities, but also project proponents and public interest groups (Nuttall 2010). In the wake of the Mackenzie Valley Pipeline Inquiry, scientists across North America convened conferences on how to improve field research specifically for decision-making, and the Canadian government built out a new structure for managing environmental impact reviews, which included new offices, staff, and legislation to guide this process. The inquiry also allowed for the growth and recognition of a new generation of Indigenous political leaders (Stuhl 2016). Following the decision on a moratorium, this new social awareness of Canada’s colonial history and resilient Indigenous communities infused negotiations over unsettled land claims in the Northwest Territories (Stuhl 2019).

Land use and land tenure change

In anticipation of planned projects, new laws and policies have also been developed that govern how people can access, use, and own land in areas where development was planned, and in many cases land tenure has changed (e.g., ICP, ACR, PAH). In Nicaragua, in the region where the canal is planned, there has been increasing land speculation within the project concession, for example (Ye 2021). And in Panama, three large proposed development projects—the Bayano Dam (executed), previous plans for the sea-level canal,

and a Highway extension—were preceded by government efforts to move eastern Panama’s Indigenous Emberá and Wounaan residents into villages (Herrera 2012; Wali 1993; Herlihy 1986; Torres de Araúz 1970).

Beginning in the late 1960s, this village formation, or villagization, enabled government control of the people, lands, and resources for large infrastructure developments (Velásquez Runk 2015). It also permitted the migration of cattle ranchers from the country’s western province, displacing and diminishing the land holdings of the historic Indigenous and Black residents. Over time, efforts to create roads and pathways through the Darién Gap have led to changes in land use and land tenure in the region. An extension of the Highway in the 1980s caused logging, land speculation for teak plantation, migration by cattle ranchers, and logging conflicts, as well as the legalization of Emberá and Wounaan reserve lands (*comarcas*) (Herlihy 1986; Herrera 2012). The original Highway extension and its more recent paving had numerous socio-ecological effects. With the Highway paving, completed in 2009, the government was to secure all residents’ land tenure. It secured most people’s tenure in Darién, except those of Indigenous peoples outside their *comarcas* (Velásquez Runk 2017).

Conservation areas are created

In several cases, regions where development was proposed or planned have become protected areas (e.g., PAH, ACR, MVP). In the case of the Darién Gap, two national parks, one on Panama’s side and one on Colombia’s side, were created when environmental concerns were raised about the Pan-American Highway’s extension through the borderlands. In 1972, Panama created the Alto Darién Protection Forest, which became Darién National Park in 1980, a World Heritage Site in 1981, and a Biosphere Reserve in 1983. Meanwhile, in 1974, Colombia established Los Katios National Park adjacent to Panama’s Darién National Park. In Canada, national parks were created as a result of the Berger Inquiry (Ivvavik National Park, created in 1984 and renamed in 1992, and Vuntut National Park, created in 1995); and in Chile, after HidroAysén was cancelled the Patagonia National Park was officially created in land that would have been flooded. While some parks were created in direct response to planned development—as in the Darién Gap—other parks were already planned, but were not finalized until after development was cancelled, as was the case with HidroAysén and Patagonia National Park.



Figure 2. Ivvavik National Park in Canada. Image author: Daniel Case, via Wikimedia Commons, shared under a CC BY-SA 3.0 license.¹² Photo taken July 9, 2015.

Social movements develop and adapt

In response to planned projects, social movements have emerged that have had consequences that reach beyond the cancellation or suspension of the projects that instigated them (e.g., HAP, ACP, ACR). Social movements in response to projects—including HidroAysén in Chile and Alcoa in Costa Rica—have influenced further public engagement with environmental issues. In Chile, for example, after public protests against HidroAysén mobilized tens of thousands of people, public participation in environmental decision-making processes became more robust.

Over longer timescales, memories of past protests and opposition can also have continuing effects. Four decades after protests against the proposed Alcoa bauxite mine in Costa Rica, for example (see Chaves Zamora 2020; Quesada 2010; Romero-Pérez 2010), public memories of Alcoa influenced opposition to an open-pit gold mine, Crucitas, which a Canadian company intended to build in northern Costa Rica. While the President of Costa Rica, Oscar Arias, declared Crucitas to be in the public interest in 2008 (Poder

¹² CC BY-SA 3.0 license: <https://creativecommons.org/licenses/by-sa/3.0/deed.en>; Wikimedia Commons link: https://commons.wikimedia.org/wiki/File:Hikers_looking_out_from_summit_of_Engigstciak,_Ivvavik_National_Park,_YT.jpg.

Ejecutivo 2008; Villalobos 2016), opponents argued that the mine went against environmental guarantees in Costa Rica's constitution, among other issues (e.g., Dyer 2008). Some project opponents also drew connections between Alcoa and Crucitas—two North American corporations seeking to extract national resources at different times (e.g., Villasuso n.d.). In its own right, Crucitas became another example of an extractive development project that was cancelled, with broader socio-environmental and legislative effects: in November 2010, Costa Rica voted to ban open pit mining in the country, and permission for the mine was annulled (BBC 2010; Villalobos 2016, 140).

Environmental racism and injustice are exposed

Projects have further exposed environmental racism and injustice in many cases, showing linkages between past and current oppression (e.g., PAH, ACR, ACP). In Costa Rica, even after Alcoa's mining plans were abandoned, the idea of an associated hydroelectric project persisted for decades (Graef 2013; ICE 1974). In the early 2000s, the government renewed efforts to build a dam on the Térraba River; initial plans would have flooded areas of the Brunka Indigenous territory of Rey Curré, and subsequent plans would have flooded areas of the Bröran Indigenous territory of Térraba. Protests drew national attention to Indigenous rights and the unequal impacts of development (Leiva 2000; Chacón 2018). In the United States, environmental racism has been a defining feature of the Atlantic Coast Pipeline project. The developer resisted efforts to prevent placement of a polluting gas pipeline compressor station in a historic African American Freedman community in Virginia and a Native American community in North Carolina, including through its failure to admit the racial make-up of the community in Virginia and sponsorship of a flawed environmental justice analysis (Cole 2019b; Emanuel 2017; Zimpleman et al. 2019).

Virginia's governor ignored his environmental justice advisory board's advice regarding the pipeline's threat to the historic African American community, and removed members from a state regulatory board who were deemed sympathetic to Union Hill before they could vote against a permit for the compressor station (see Cole 2019a). A Virginia state agency's approval of an air permit for the compressor was overturned by a federal court, largely on environmental justice grounds. Descendants of slaveholders have benefitted from land sales to the developer for property for the compressor station—property containing the burial grounds of enslaved people—while the property, health and wellbeing of the descendants of enslaved people in the area would have been negatively impacted by the compressor (Clarke et al. 2019, 6). As a result, systemic inequities and slavery legacy issues in Union Hill are being revealed and remembered. As cases rekindled memories of past oppression, histories of injustice were learned by those who were unaware and remembered by those who might like to forget.

Development shifts

The impacts of planned projects further linger in landscapes and societies as a result of shifted or partially complete development (e.g., ACR, PAH, YKD). One example of this is in the Darién Gap, where smaller secondary roads have pre-empted the construction of the Highway that was initially planned. The lack of a highway has not meant the lack of need to travel, and huge footpaths and secondary roads have been chipped away through the Gap.

Over the last decade, the Colombian government has pressured to complete the Highway and the region is now part of established global routes for human smuggling and other trafficking (Colectivo Darién 2021). At this time, an array of scholars and business leaders are promoting the Highway (e.g., Jaén Suárez 2019) while being countered by environmentalists and Indigenous peoples.

Partial and displaced development associated with the Yukon River Diversions (see Naske 1991; Peyton 2016) offer another series of examples of lingering effects. The first element of the YKD project—which involved dams at Miles Canyon south of Whitehorse—was built in the late 1950s, even while the YKD was still being considered, in order to generate hydropower for the town. It is still operational and is the primary source of electricity in the region.

Meanwhile, the idea for the YKD was transported further south. While the Aluminum Company of Canada project was not built where it was originally planned, it moved to a “better” location, halfway down the British Columbia coast. In order to generate cheap electricity for an aluminum smelter at Kitimat, 40 percent of the Nechako River was diverted down a 16 km tunnel to a dam on the Kamano River; a town of 15,000 people was planned and built; and a smelter and deep sea port facilities were built to produce and transport the product to markets worldwide (Coates 2007). The facilities are all still there, and Kitimat harbor has been proposed as the location for multiple liquid natural gas projects currently under various stages of environmental impact assessment in British Columbia. As these cases show, the shifting social and environment effects of megaprojects often result in “unintended consequences” that are displaced across time and space (McNeill 2000, xxii; cf. Ferguson 1994; Stunden Bower 2011; Bonnell 2014).

Conclusions

Midway through our three-day meeting, a whiteboard wall was covered with post-it notes—each one a different consequence of one of the cases we were discussing (see Appendix B). During a facilitated discussion, we had identified different themes that showed areas of connection across the cases. One thematic consequence was knowledge—from the baseline data that were collected in areas of proposed development to the involvement of citizen scientists and citizen regulators. Another theme was change, as we recognized that because some projects were not carried out, habitats and species were not lost—while in other cases, environmental change was set in motion by project planning. Another cluster grouped together shifts in legislation, land tenure and conservation—from the creation of new laws to the establishment of parks and protected areas.

In another cluster, we identified different ways that power dynamics changed as a result of proposed projects—including increasing support for sovereignty, and the exposure of undue corporate influence and environmental racism. Communities have also been empowered and gained experience through opposition to proposed projects. In another cluster we identified social movements that emerged, and a final cluster addressed the theme of shifted development—including the development of other extractive economies in the location where projects were cancelled, industries shifting tactics, and the development of alternatives such as renewable energy that emerged as a consequence of project cancellation. As we contemplated this breadth of consequences, one member of the group asked: How are these consequences different from projects that are actually built?

As a result of completed projects, land tenure also changes (Hausermann et al. 2018); coalitions form; legislation may shift; and landscapes are studied. In many ways, our analysis of these projects demonstrates the multifaceted consequences of development itself (Ferguson 1994; Harvey and Knox 2015; Li 2015). Yet in the specific history and context of each case, cancellation matters. A particular place that might have been transformed by a mine or a pipeline—or that might have been flooded as the result of a dam—was not. What happens next shows that projects do not vanish after cancellation; they often become part of complex processes of social and environmental change in places where projects were planned. The outcomes of many of these cases further represent moments of social and political transformation (see Appel et al. 2018, 30), and the pursuit of alternatives to existing development plans (see Bebbington et al. 2020, 21830).

As these cases show, projects that have been cancelled or stalled engender cascading consequences, from parks and protected areas that are created to laws that have been passed to prevent similar kinds of development in the future. Furthermore, projects that aren't built exist in networks of interrelation with those that have been built—as the observed consequences of built infrastructure can influence the trajectories of future projects. Even “completed” projects are never finished, as built infrastructure continues to

adapt and change (e.g., Carse 2014; Rankin 2017). Beyond these cases, there are myriad examples of projects that have been cancelled or stalled, throughout the Americas and beyond.¹³ It is worth taking the time to pay attention.

Our consideration of eight cases spanning different kinds of infrastructure and geographic locations inevitably raises as many questions as it answers.¹⁴ During three days of integrative discussion, we raised questions including: What is development? Is it the construction? The money? Talking with people about it? Which projects respond to a problem, and which respond to an opportunity? Should we think of these cases as projects, or processes? Which disciplines are prioritized in the process of developing assessments, and which are marginalized? How is climate change increasingly affecting whether or not projects are cancelled or stalled—from changing projects' viability, to motivating the search for alternatives? Who determines what is sacrificed for development? And how many millions of dollars need to be spent to know that something is a bad idea?

As an interdisciplinary group whose perspectives range from those who practice science to those who critique it, the ways we understand these projects and the lessons we draw from these cases vary. The potential lessons that can be learned are as varied as the cases themselves. Yet taken together, these cases clearly demonstrate that the consequences of planned projects are not tied to completion. As such, when large infrastructure projects are assessed, it is important to consider how they may shape landscapes and societies even if they are never built. By employing an integrative approach that incorporates the perspectives of academics and practitioners, it is possible to collectively analyze the multifaceted meanings, consequences, and implications of planned projects.

As we found, social and environmental consequences can emerge from different stages of project planning—and from the partial completion of projects. Anticipatory changes in land tenure and legislation may be triggered by planned projects before they have been approved. Subsequent project approval can set in motion further socio-environmental changes—from the emergence of social movements and coalitions to citizen science efforts to study landscapes. And, once projects are cancelled or stalled, additional consequences may emerge, from the creation of parks and protected areas to shifted development plans. Planned projects exist in streams of time. As these cases demonstrate, the course of time is not guaranteed. People often see the world as inevitable. Unimplemented development shows other possibilities.

¹³ As Carse and Kneas have written, they are “hiding in plain sight” (2019, 10); for further cases see, for example, Harris et al. (2003) and Schneider (2017). Additional examples of cancelled and stalled projects are cited throughout this report and can be found in the reference section.

¹⁴ Depending on our disciplinary backgrounds and experience, different concepts—from the audacity of plans for nuclear explosions and rerouting rivers, to the persistence of social movements beyond projects' cancellation—were well-known for some but new for others, demonstrating the value of learning across difference and of viewing projects holistically.

Acknowledgments and Appendices

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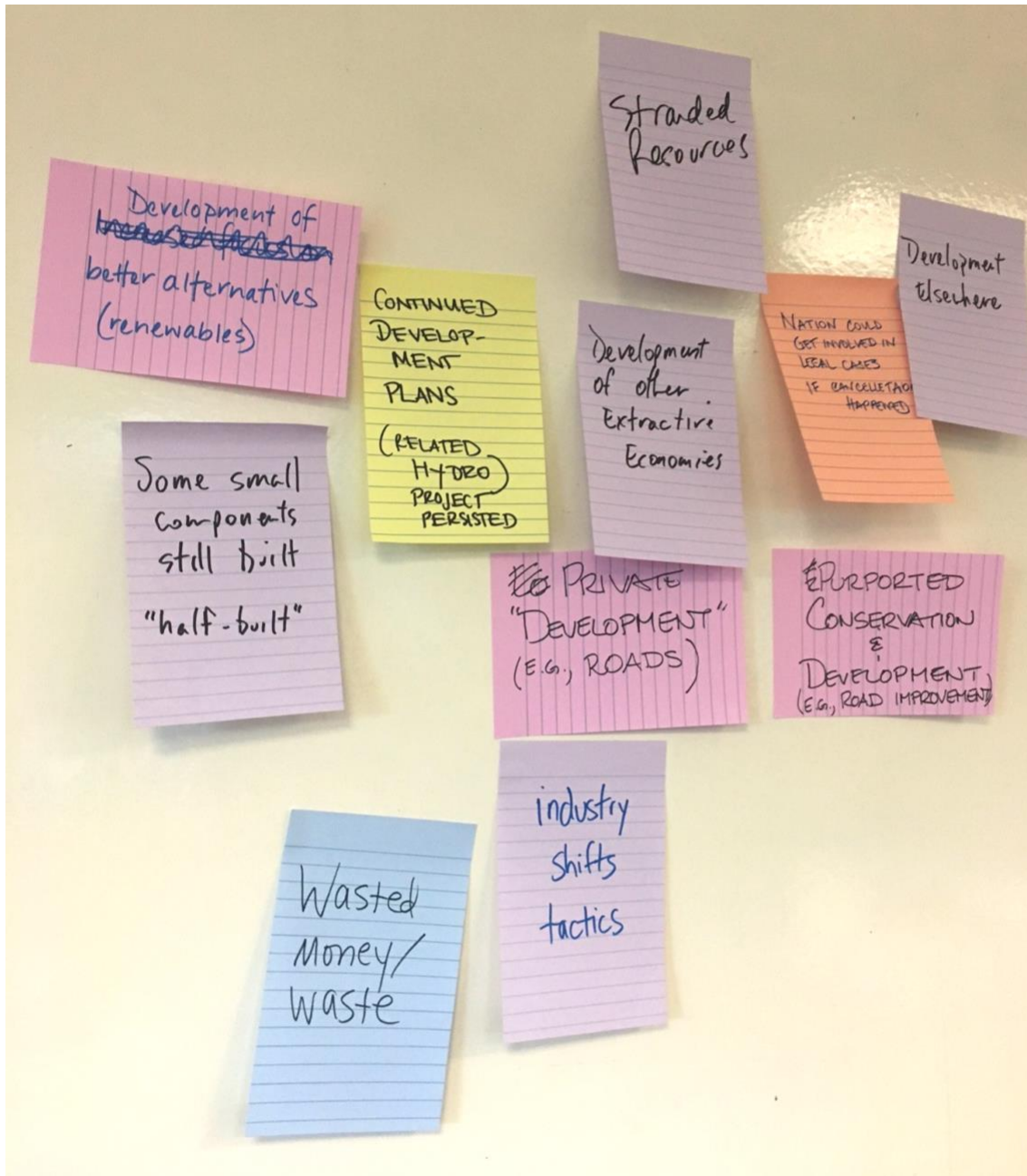


Group members, from left to right: Amanda Maxwell, Alan Covich, Dana Graef, Montana Cole, Julie Velásquez Runk, Jonathan Peyton, and Jorge Huete-Pérez. Not pictured: Andrew Stuhl. Photo by Sabrina Purdy (SESYNC), taken in Annapolis, Maryland, January 22, 2020.

Appendix A: Further reading about cases and their contexts

Project	Further Reading
Darién Gap in the Pan-American Highway, Panama and Colombia (PAH)	Colectivo Darién 2021; Covich 2015; Darién Subcommittee 1965; Girot 2002; Herlihy 1986; Herrera 2012; Howe 2001; Jaén Suárez 2019; Méndez 1979; Miller 2014; Rutkow 2019; Suman 2007; Tarlock 1974; Torres de Araúz 1970; Velásquez Runk 2015, 2017; Wali 1993
Trans-Isthmian Sea-Level Canal, Panama (SLC)	Covich 2015, 2017; Covich and Nickerson 1966; Frenkel 1998; Golley et al. 1969; Goodland 1977; Keiner 2017, 2020; Kirsch 2005; Lindsay-Poland 2013; McGinnis et al. 1969; Rubio 1962; Torres de Araúz 1967; Velásquez Runk 2015
Interoceanic Canal Project, Nicaragua (ICP)	Amnesty International 2017; CENIDH 2016; Diálogo Chino 2016; FIDH 2016; Huete-Pérez, Alvarez et al. 2015; Huete-Pérez, Meyer and Alvarez 2015; Huete-Pérez et al. 2016; Humboldt Center 2019; Mao and Schmidt 2015; Meyer and Huete-Pérez 2014; Van der Post 2014; Ye 2021
Yukon River Diversion Schemes, Canada and United States (YKD)	Canada Water Resources Branch 1966; Coates 2007; Naske 1991; Peyton 2016; Schramm 1968; United States Bureau of Reclamation 1950
Alcoa Bauxite Mine, Costa Rica (ACR)	Chaves Zamora 2020; FEUCR 1969; Graef 2013; Quesada 2010; Romero-Pérez 2010; Salazar Navarrete 1972; Tosi and Zadroga 1975
Mackenzie Valley Pipeline, Canada (MVP)	Arnold et al. 2011; Berger 1977; CER 2020; Gamble 1978; Joint Review Panel 2009; Marsh and Baker 2018; Nuttall 2010; Sabin 1995; Strong 2017; Stuhl 2016, 2019; Usher 2001
HidroAysén Hydroelectric Project, Chile (HAP)	Hernando-Arrese and Tironi 2019; Maxwell 2011, 2014; Sims and Maxwell 2011; Romero Toledo 2014; Soler et al. 2019
Atlantic Coast Pipeline, United States (ACP)	ABRA n.d., 2019; Barnes 2020; Cole 2019a, 2019b; Clarke et al. 2019; Emanuel 2017; Hand 2018; Schneider 2020; Zimpleman et al. 2019

Appendix B: The emerging theme of “shifted development”



In considering the consequences of projects, one theme we identified during a facilitated session was shifted development. Each post-it pictured above represents a consequence of one of the cases we considered. We built themes by adding the post-it notes to the board one by one when we saw areas of connection with other cases. Collectively, these notes illustrate different ways of understanding the concept of shifted development—ranging from the “development of better alternatives” such as renewables, to the “development of other extractive economies.”

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Biographical Notes

Dana J. Graef is a Senior Research Fellow with the National Socio-Environmental Synthesis Center (SESYNC) in Annapolis, Maryland, part of the University of Maryland. She has researched and written about two interrelated cases of unimplemented development in southern Costa Rica—a planned Alcoa bauxite mine and an associated hydroelectric project on the Térraba River. She led and organized the Unimplemented Development team and synthesis workshop as a Research-in-Action Fellow at SESYNC. She holds a Ph.D. in Anthropology & Environmental Studies from Yale University, and an A.B. in Ecology & Evolutionary Biology from Princeton University.

Montina Cole is the Principal of Jai Green Consulting LLC, working at the intersections of climate policy, racial equity, and resilience. She previously served as Senior Attorney at the Natural Resources Defense Council (NRDC), where she managed advocacy on reform of the Federal Energy Regulatory Commission's (FERC) gas pipeline review policy. Her work included litigation opposing FERC's approval of the controversial Atlantic Coast Pipeline project based on the agency's flawed environmental justice analysis. Prior to joining NRDC, Cole spent nearly 20 years practicing energy law in corporate law firms. She holds a B.A. in political science from Washburn University and a J.D. from the University of Virginia School of Law.

Alan P. Covich is a professor emeritus of ecology and former director of the Institute of Ecology in the Odum School of Ecology at the University of Georgia. His first experience in tropical ecology was in Darién, Panama as part of a group studying the potential impacts of the Pan American Highway and Project Plowshare's proposed new sea-level canal. He received a Ph.D. in Biology from Yale University and A.B. degree from Washington University. Covich is a past-president of the International Association of Ecology, the Ecological Society of America, the American Institute of Biological Science, and the Society for Freshwater Science.

Jorge A. Huete-Pérez is the Senior Vice President of the University of Central America (UCA), Nicaragua. Huete-Pérez was a postdoctoral fellow at Harvard University and a Research Fellow at the Sandler Molecular Parasitology Center of UC San Francisco. In 2009, he became the Founding President of the Academy of Sciences of Nicaragua, serving for two consecutive terms. On behalf of the Academy, Huete-Pérez led the international efforts to create awareness about the possible impacts of the Interoceanic Canal Project in Nicaragua through the organization of two international workshops.

Amanda Maxwell is the Managing Director of the International Program at the Natural Resources Defense Council (NRDC). She guides NRDC's work in China, India, Latin America, Canada and at global forums to combat climate change and protect the environment and communities. Prior to that, she was the Latin America Project Director at NRDC, focusing on promoting clean energy, improving air quality, and protecting wildlife and wildlands throughout Latin America. As part of her Latin American work, she led NRDC's involvement in an environmental coalition that worked to stop HidroAysén in Chile. Before joining NRDC in 2009, Maxwell received her bachelor's degree in history and Spanish from Middlebury College and her master's in international politics

and economics from Charles University in Prague. She also studied at the Universidad de Buenos Aires. She is based in Washington, D.C.

Jonathan Peyton is an Associate Professor at the University of Manitoba in the Department of Environment and Geography, where he teaches courses in environmental, historical and cultural geography. His research focuses primarily on the social, ecological and economic effects of megaprojects in the Canadian North—hydroelectric projects, extractive economies and large-scale infrastructure developments. His book, *Unbuilt Environments: Tracing Postwar Development on Northwest British Columbia* (UBC Press 2017), analyses five cases of imagined, abandoned or half-built development schemes—mines, dams, railways, roads and energy projects—to argue that even failed development dreams produce lasting material and discursive effects on the landscape and in the minds of stakeholders.

Andrew Stuhl is Associate Professor of Environmental Studies at Bucknell University. Trained as an historian, his teaching and research examine the legacies of past social and environmental changes at stake in an era of climate disruption. He is author of *Unfreezing the Arctic: Science, Colonialism, and the Transformation of Inuit Lands* (University of Chicago Press, 2016). For this work, Stuhl visited more than a dozen archives across the United States and Canada and spent two years living in Inuvik, Northwest Territories (Canada) doing interviews, participant observation, and community-based research. His current project explores the history and legacies of Tropical Storm Agnes (1972) in the Susquehanna River Valley, one of the costliest natural disasters in American history on the most flood-prone river in the eastern United States.

Julie Velásquez Runk is Director of the Environment and Sustainability Studies Program and Professor and Weigl Fellow in Environment and Sustainability Studies at Wake Forest University, and a Research Associate at the Smithsonian Tropical Research Institute. Trained as both an ecologist and an anthropologist and retaught by Indigenous Wounaan community members and scholars, Velásquez Runk has just over thirty years fostering environmental justice through interdisciplinary community-based research and collaborative ethnography. She bridges traditional disciplinary boundaries by mixing social sciences, natural sciences, and the humanities, and authors and co-authors work for academic and non-academic publics. Previously, she was an Associate Professor of Anthropology at the University of Georgia. She holds a dual joint Ph.D. in forestry and environmental studies, anthropology, and economic botany from Yale University and the New York Botanical Garden.

