POLITICS OF BIG DAMS

- Dams have been used to supply water, control floods, and irrigate agriculture since 3000 BCE.
- World’s first hydroelectric dam built in 1882 in Appleton, Wisconsin.
- Hoover Dam built in 1935, initiating a new era of widespread big dam construction.
- Shift in global attitude towards big dams during the 1980’s and 1990’s.
- Many argued that the promised development benefits of big dams never materialized.
- Environmentalist groups gain worldwide attention and call for a moratorium on big dams.
- Today, we are in the middle of a resurgence of big dam construction (3,500 planned project, 2012 NBC news).
- Supported politically because of perceived job creation and supposed clean energy.

Political Motivations for Building a Dam:
- Hasten national development
- Provide electricity to the nation
- Fortify geopolitical alliances
- Expand and solidify state authority
- Attract foreign aid and corporate investment
- Often believed to be environmentally friendly

Political Disincentives to Building a Dam:
- Lasting repercussions of displacement
- Loss of human life
- Exacerbates social tension and inequality
- Negative publicity at home and abroad
- Prohibits land use to dam-affected communities
- Severe cost overruns and potential for corruption
- Often environmentally unfriendly

Going Forward:
- Questioning the rhetoric of eco-friendly big dams
- Respect to indigenous land claims and rural needs
- Reparations for past projects and extensive community consultation prior to new construction
- Strict and competent oversight during the construction process
- Implementation of alternative energy sources and water use
- Public environmental impact assessments, accurate cost predictions, and requirement of community consent

Political Challenges:
- Local/National/Global
- Local vs. State
- Environmentalist vs. Corporate
- Indigenous vs. Colonialism
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SOCIAL IMPACTS of big dams

Examples of Social Impacts
(Many of which are interrelated)

- Displacement
  (+) Resettlement compensation
  (-) Aid limited to those with legal title

- Jobs
  (+) Demand for workers
  (-) Short-term jobs

- Human Health
  (+) Better sanitation
  (-) Disease Spread

- Gender Roles
  (+) Equal education opportunity
  (-) State-imposed gender biases

- Development
  (+) Connect local economy to national market
  (-) Increased competition threat

- Irrigation
  (+) Commercial income opportunity
  (-) Higher food prices

- Indigenous
  (+) Transnational support through media
  (-) Lost cultural identity

Challenges
- Temporal Scale: impacts are felt in the long term, beyond scope of research time
- Spatial Scale: many dimensions simultaneously involved (ex: local, national, international)
- Qualitative Nature: in a society where quantitative data is preferential
- Unequitable Impact: certain populations benefit/suffer more than others
- Lack of Voice: the poor, vulnerable, and marginalized struggle most to be heard
- Lag Time: unforeseen consequences and delayed reparations

Some Future Considerations...
- Assess possible stakeholders (and their livelihoods) at upstream, downstream, and at-dam sites
- Increase knowledge and cultural sensitivity to local demographics
- Include local opinion in planning, development, operation, and decommissioning
- Beyond resettlement, provide economic and social programs
- Find ways to minimize food insecurity, disease spread, and economic competition
- Work to decrease gender stereotypes
Rachel Loo


**Habitat Alteration**

**Blockages and habitat fragmentation**
- Dams cause mortality to upstream migrants such as anadromous salmonids.
- The mortality of some species can remove competitive pressures from other fish species, and change the species composition.
- Compensation programs for the loss of anadromous fish have led to hatchery rearing programs which can negatively affect wild stocks.

**Habitat Simplification**
- The elimination of side channels can reduce commercial fish harvest especially in regions where side channels are important feeding, nursing and spawning areas for commercially harvested fish.
- Floodplains can be highly reduced and this can lead to the disappearance of birds.
- Decline in riparian areas due to reduced floodplains can lead to obligate riparian fish and bird species being outcompeted.
- Flow heterogeneity is lost and vegetation heterogeneity can become limited as a result.
- There are examples of rivers which have been diverted to increase flow through a series of dams. This dewatering can lead to a loss of habitat in the adjacent streams as well as to shoreline erosion.

**Unnatural discharge regimes**
- Big dams change the natural variability of river high and low flows. Periods of high and low flow have ecological importance which regulate the life cycles of river biota as well as foodwebs; Certain species are more tolerant to the impacts of flooding, and will dominate in times of high flow, while others will dominate in times of low flow.
- The loss of flushing flows due to dam construction can allow invading alien riverine species to flourish when they would otherwise be suppressed.
- Reduced flow can allow vegetation to encroach into river channels where the establishment of reeds traps sediments thus increasing evapotranspiration and further decreasing the surface water.
- Extreme flow fluctuations may eliminate endemic species if management holds little regard for the minimum flow needed to sustain particular fish.
- Low water conditions after spawning may expose eggs to variable temperature and oxygen concentrations and put them at risk of desiccation. As well, low water conditions may lead to fry becoming trapped in shallow pools where they can be exposed to predation, high temperatures and oxygen depletion.

Note: The figure included above illustrates increasing orders of impact as a result of dam construction. The orders of impact increase with increased complexity and time-scale of interactions.

**Energy Flow Changes**
- Reduction in downstream flow can lead to lack of nutrient deposition necessary for primary production, as well as lack of gravel deposition necessary for spawning habitats.

**Greenhouse Gas emissions**
- Methylmercury accumulates in the fish themselves, a process which originates from the microbial transformation of inorganic mercury naturally present in the soil and vegetation once soils have been flooded.
- The release of atmospheric CH4 and CO2 is caused by the flooding of organic matter as a result of reservoir creation.
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LARGE DAMS: ECONOMIC ISSUES

BUILDING DAMS TO DRIVE ECONOMIC GROWTH:

Dams have been hailed as tools of economic progress through infrastructure development. There are a variety of direct economic benefits provided by dams – “the provision of irrigation water, electricity, municipal and industrial water supply, and flood control” (World Commission on Dams, 2000). But dams actually have a much wider impact on an economy through indirect benefits. These indirect benefits can be broken down into “inter-industry linkages [that result] in an increase in the demand for outputs of other sectors,” as well as “consumption-induced impacts arising from additional incomes generated by the dam project” (qtd. in Bhatia, 2008).

MULTIPLIER EFFECTS FROM THE BHAKRA DAM:

The Bhakra Dam in India led to irrigation-derived benefits of “surplus foodgrains.” These surplus products were then distributed at affordable prices to poor urban and rural populations through stores and school feeding programs. With migration from India’s poorest states to these regions, remittances continued to drive multiplier effects throughout the country. This has led to the decrease in urban and rural poverty in Punjab and Haryana as well as economic benefits in other regions of India (Bhatia, 2008).

Unfortunately, evaluating the dollar amount of the multiplier effect of dams on a country’s economy is extremely difficult. As the World Bank has explained, “accounting for such a large number of multi-sectoral direct and indirect, intended and unintended, negative and positive, inter-temporal and spatial impacts of dams poses as challenge for their effective assessment” (qtd. in Bhatia, 2008).

As argued by Goldsmith and Hildyard, there is an “entrenched belief that large-scale water development schemes are an essential part of the process of economic development – a process which we have been taught to see as the only means of combating poverty and malnutrition, and of assuring health, longevity and prosperity for all” (“Fudging the books,” 1984).

However, this is not necessarily the case. There are also unintended negative consequences of large dam projects on economic development. The Global Freshwater Program found that between 40-80MM people were displaced between 2000 and 2010, leading to challenges for access to health care, education, and employment – all key indicators of economic success (Minard, 2010, Goldsmith and Hildyard, “Dams and society,” 1984). Furthermore, dams have prevented 472 million people worldwide from relying on their traditional sources of food and incomes, severely stunting economic growth in some regions (Minard, 2010).

Environmental consequences have also impacted economic growth – to fix the unexpected environmental impacts of dams either through their removal or through modifying flows costs millions of dollars (Minard, 2010).

COST BREAKDOWN AND MEASUREMENTS OF IMPACT:

Most of the capital spending on a large dam project comes from the construction phase – for instance, approximately 80% of the total cost over a hydro dam’s lifetime comes from the construction phase (Hildyard, 1998). Dams often suffer from severe cost overruns, with 20% of dam projects costing 2x the original projection and 10% costing 3x the original estimate (Fernholz, 2014). This can come down to a few factors – the fact that it takes on average more than 8 years to complete a dam project leads to complications with foreign borrowing and currency depreciation, inflation, and challenges from building dams at poorly-suited sites (Fernholz, 2014).

As the World Commission on Dams noted, “Governments and financial institutions continue to use traditional economic and financial analysis – rate of return, discount rates, sensitivity tests and the exclusion or inclusion of indirect costs – as primary data” for measuring impact (World Commission on Dams, 2000). Furthermore, a lens of classical development causes for an increased emphasis on economic output (measured through GDP) as an indicator of success (Pearse-Smithe, 2014). These traditional measurements of impact fail to take into account:

- The crippling debt of host countries after funding dam projects through foreign borrowing, such as Turkey and Pakistan (Leslie, 2014).
- The unequal distribution of benefits towards urban populations and industries rather than rural communities (Pearse-Smithe, 2014).
- The unintended social or environmental impacts that can be extremely costly to remedy later on in the project (World Commission on Dams, 2000).

CONCLUSION:

As large-scale dam projects once again grow in popularity, governments, banks, operators, and other financial backers must factor social and environmental consequences into their impact measurements going forward, to accurately and responsibly evaluate the economic consequences of such projects.
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BIG DAMS CASE STUDY: SITE C DAM

ABOUT
The Site C Dam is a $8.4 billion BC Hydro project and will be the third hydroelectric generating station on the Peace River in northeastern British Columbia. It will be the largest hydroelectric project in British Columbia in the last 30 years and will provide electricity to 450,000 homes annually.

HISTORY
1970s – First time feasibility studies and initial public consultations on Site C were conducted.
1980s – BC Hydro applied for an Energy Project Certificate to allow it to build the dam. After the B.C. Utilities Commission held numerous hearings, the commission ruled that cabinet should defer issuing a certificate until certain conditions were met. Cabinet refused issuing the certificate.
2007 – BC government reinitiated investigation of the Site C dam and completed Stage 1 Review.
2009 – Consultation and Technical Review was completed.
2010 – Government proceeds with Stage 3, Environmental and Regulatory Review. Later that year the provincial government passed the Clean Energy Act. Removing the requirement for regulatory review under the Utilities Commission Act.
2014 – Project received approval from the provincial government to proceed with construction.
2015 – Construction of Site C Dam starts.
2016 – Prime Minister Justin Trudeau approves a Navigation Protection Act permit and Fisheries Act permit for the construction of the Site C dam.

REASONS FOR BUILDING THE DAM
Demand – BC Hydro claims that B.C.’s electricity needs are forecast to increase 40% in the next 20 years. A project such as Site C would support population growth and energy demand.
Clean Source of Energy – BC Hydro claims that Site C is a “clean source of energy” because it will have among the lowest GHG emissions, per gigawatt hour, compared to other resource options including solar and wind.
Location – Site C will rely on the existing Williston Reservoir for water storage. Site C will be able to generate approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area.
Cost Effective – BC Hydro claims that Site C will be a source of affordable power to meet B.C.’s future electricity needs.
Economic Benefits – BC Hydro claims construction and operation of the Project would generate economic benefits at the local, provincial, and federal level due to the purchase of goods and services for construction, operations and sustaining capital investment.

OUTSTANDING RESPONSIBILITIES/ ISSUES
The Site C project has faced legal challenges from First Nations and local residents. Groups ranging from Amnesty International to the David Suzuki Foundation to the Royal Society of Canada have called on Trudeau to halt construction of the dam because of weakness in the regulatory review process, environmental assessment, and potential infringement of Treaty Rights.

REASONS FOR RESISTANCE
Local residents and First Nations are opposed to the dam because of the $8-billion cost to ratepayers, environmental impacts, loss of sacred archeological burial and sites, loss of farm land and impacts on Treaty rights.
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