

DAM IT! The Site C Dam on the Peace River

Authors: Bradley Jeffery, Pierre-Hugo Lecomte, Sophie Le Noble, Tea Jay Macalanda-Ung

Created: 2015

Introduction and Framing the Problem



Video showing the importance of the Peace River Valley to its local residents. (PVEA Coordinator, 2014). The creation of Site C dam along the Peace River in northeastern British Columbia will be the biggest hydroelectric power project the Province has seen in the last 30 years. It would provide electricity to 450,000 homes annually in British Columbia and create an 83-kilometre-long reservoir upstream of the dam along the Peace River (BC Hydro, 2015). This flooded area is likely to cause massive alterations of ecosystem and biodiversity. It appears that many of the methods currently used to dampen the environmental effects of dams are not actually working and much more must be done to improve the protection of the environment in dam projects (McCartney, 2009).

This construction involves numerous stakeholders, therefore different motivations regarding water use have appeared. On the one hand, federal and provincial governments seek to increase the share of hydropower throughout the Province, while on the other, First Nations people along with local populations are afraid of the environmental impacts such a massive construction could have on biodiversity and their traditional practices. Indeed, the extent of the environmental and societal damage caused by such a vast and unique energy project is highly unpredictable. Negative effects of dams are similar across the world and sustainable dam development lies in the ability of a country's citizens to advocate for protection of their

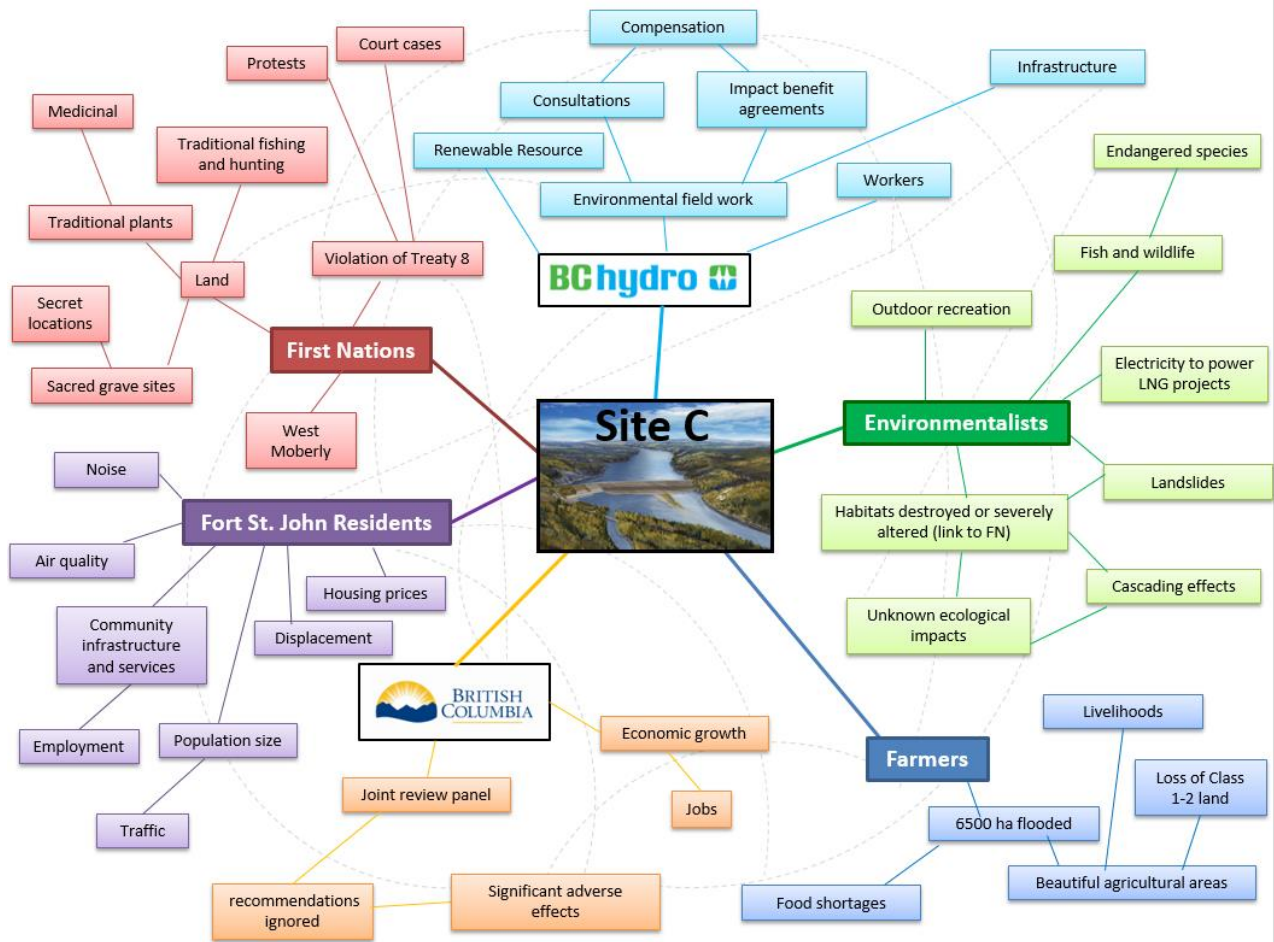
livelihoods and the environment (Beck, 2012). Changing such a massive portion of the landscape has serious ecological repercussions that are hard to predict and require painstaking research to understand given the great complexity and interconnectedness of ecosystems.



A picture of the Peace River Valley (Peterson, 2015).

The reason why this project is referred to as a 'wicked problem' might be explained by the fact that stakeholders consider the outcomes of Site C dam at different scales and all have conflicting water uses. Firstly, according to the Joint Review Panel, working under Canada's Minister of the Environment, and the BC Minister of Environment, Site C has the potential to create significant economic benefits for future electricity consumers in British Columbia (Ministry of Environment, 2014). The report states that greenhouse emissions in BC could be reduced by investing in hydroelectric power instead of liquefied natural gas (LNG). The panel concludes that there is no need for such a massive hydroelectric project in the near term and that smaller, less economically risky, and less environmentally costly alternatives exist that BC Hydro is not willing to invest in.

Secondly, the report emphasizes the fact that the economic benefits will come with significant negative social and environmental impacts that will be borne by the First Nations and residents of the Peace region whose traditional activities are mainly based on local ecosystem services. It appears that BC hydro has underestimated the social and environmental costs of the Project and the panel to conclude that the Crown corporation has not performed enough research on these topics which has resulted in erroneous conclusions (Ministry of Environment, 2014).



Mind Map that interconnects all the relevant stakeholders to the Site C project.

As with any project of this scale, there is some uncertainty and instability involved. Although the problems seem easy to define they are dynamic, as conditions could change drastically over the 100-year lifespan of the project. There is a clear solution that would please each individual party, but there is little room for a compromise.

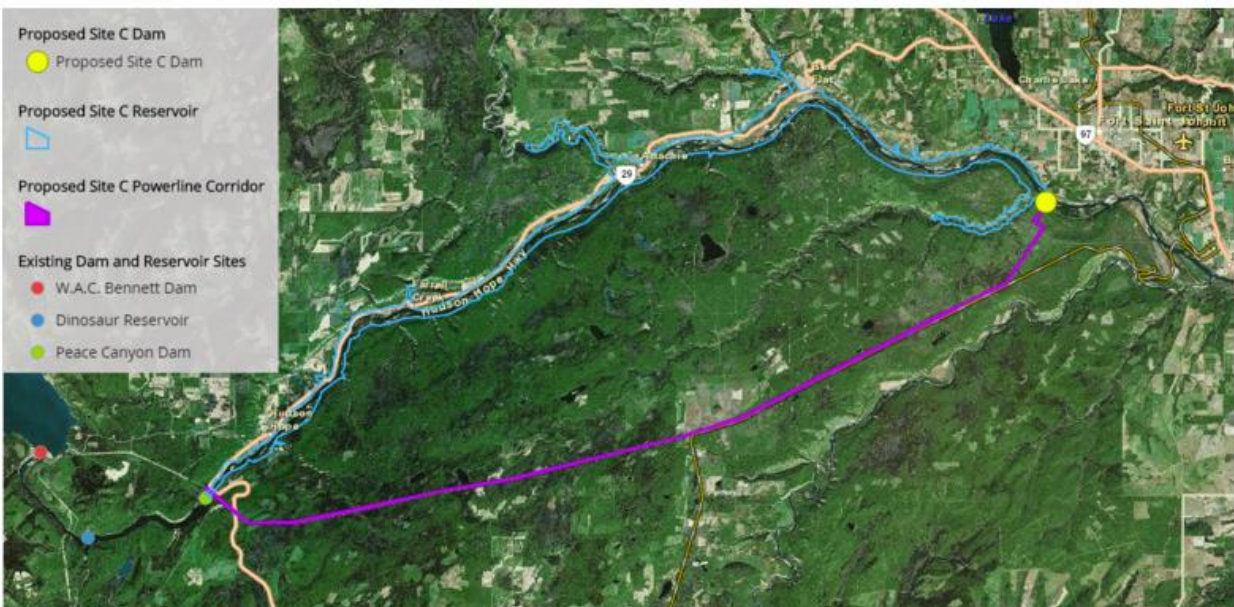
Governance Practices

The controversial Site C project is surrounded by many different stakeholders of conflicting interests. In order to come to a resolution involving any large issue, there must exist a solid decision-making matrix that adequately represents all parties' interests. This structure, or lack thereof, becomes apparent when analyzing the project's governance framework.

With the Site C dam, the British Columbia provincial government and the Canadian federal government are the key decision-makers. The federal government is required to assess environmental impacts, and social and economic feasibility of large projects where influence reaches beyond the provincial border. Having significant and direct influence, the provincial government and its ministries are heavily involved in the creation and alteration of provincial legislation. Legislation leading to the current situation began with the province merging British Columbia Electric with British Columbia Power Commission to create the crown corporation

BC Hydro (Ministry of Energy & Mines) in 1962. This merger made the government the sole shareholder of the BC energy industry and gave them enough influence to implement any policy desired.

Currently no international agreements govern the development of hydroelectric dams in Canada. However, the Canadian and BC government have both adopted climate change and clean air policies (Government of British Columbia, 2015). The 2007 Energy Plan and the 2008 Climate Action Plan have implemented steep emissions goals of 93 percent clean energy generation and require fossil based electricity generation to have a net zero greenhouse gas emissions target (Ministry of Energy & Mines). Following the energy independence goals laid out in these documents by the government, there is little room for non-renewable energy growth in BC.



Overhead view of of Peace Valley and Hydroelectric infrastructure. (Environmental Research Institute Systems, 2015).

Regionally there are agreements in place with the intent of protecting the lands and indigenous peoples. The area that the reservoir will be flooding is within the lands of the First Nations that are protected under the Treaty 8 agreement from 1899 (Madill, 1986). This treaty is in place to protect the traditional use of the lands by the First Nations, an agreement that will be violated by the Site C project. Local hiring agreements have also been made to ensure a small portion of the economic growth will remain in the area. However, these hiring agreements have been used more often as an advertisement campaign and are not enforced (Hunter, 2015).

Though broad climate change and clean air agreements can have some influence, the majority of control comes in the form of provincial and federal legislation. No evident local legislation exists that will have any impact on the Site C dam. Primary motivation comes from the province that gains profit from the crown corporation's energy sales. The provincial government has created very specific loopholes and legislations nearly ensuring the future of Site C dam. With most cases in BC, the Clean Energy and Utilities Commission Act gives

very strict guidelines and procedures that must be followed to ensure that the project lies in the best interest of the public as a whole. When the act was first created in 2010, there were three important sections from which Site C was made specifically exempt.

In summary, the exempt sections state that a project must prove necessary before construction is started, anyone may file a complaint to cease construction on the project, and any energy contract made must prove that it is also in the public's interest (Government of British Columbia). It could be argued that neglecting all three of these was necessary to move forward with the dam. There has not been any proof showing absolute necessity of the Site C dam, in fact alternatives are lined out in the Joint Panel Review (Canadian Environmental Assessment Agency, 2014). Local complaints have largely gone ignored (Hume, 2015) and even with plenty of media coverage the government still has not swayed. It is also unclear whether previous energy contracts have been in the public's interest (Henton, 2008). The government knows its position well and sees no need to yield to public opinion (Stodalka, 2015). It is evident that this conflict was foreseen by those writing legislation and the documents were edited in favour of the provincial government.

Huge disparities in influence are apparent upon inspection of the governance framework of large hydroelectric projects in British Columbia. Perhaps the most egregious factor is not the Site C dam itself, but the way government legislation has been fine tuned to meet a biased set of goals. The energy development path has not changed since the inception of BC Hydro as a crown corporation in 1962. Since then, the provincial government has been cutting out any undesirable stakeholder dissention. Even with research and information is available, such as the Joint Panel Review, it has been cast aside in favour of blind economic development. The incredibly narrow mindset of the legislation in BC must be changed in order for future projects to be properly accountable in the decision-making processes.

Moving Forward



Stop Site C Logo. (Wilderness Committee, 2015).

Overall, the Site C dam has potential to create significant economic benefits for future electricity consumers in BC while reducing greenhouse gas emissions as an investment in hydroelectric power instead of non-renewable power. However, the economic benefits Site C provides will come with significant negative social and environmental impacts that will be borne by First Nations and residents of the Peace region. It is also uncertain when the electricity generated from the dam will be needed in the future: there is currently no demand for greater electricity supply in BC (Ministry

of Environment, 2014). Site C will therefore cause serious financial losses in the short term, with potential benefits accrued in the distant future (Ministry of Environment, 2014). As a group, we have come to the conclusion that there is no need for such a massive hydroelectric project in the near term. The aim of our solutions is to stop the dam from being built and to encourage the BC provincial government to consider smaller, less economically risky, and less environmentally costly alternatives instead.

One potential solution entails changing the pricing of electricity in BC. Currently, residential consumers of electricity in BC have the third lowest rates in North America (Hydro Quebec, 2015). Feasibly, BC Hydro could introduce a time-of-use pricing system on electricity consumption to reduce overall energy use. Time-of-use pricing consists of charging customers more for electricity during peak hours. Studies have shown that the demand for electricity is elastic; people will change their consumption behavior depending on the price of electricity, suggesting the consumption of electricity will fall as price increases (Albadi and El-Saadany, 2008). A time-of-use pricing system would thus incentivize people to reduce their overall consumption of electricity in a day as well as shift their use of electricity from peak hours to non-peak hours (Herter, 2007). To understand the full benefits of time-of-use pricing, one must also consider the amount of power required to generate electricity throughout a day. It takes a lot of power to supply electricity to many consumers all at once (i.e. during peak hours). If usage was spread throughout the day, BC Hydro could provide the same amount of electricity to users while using less power overall (Corson, Regan, and Carlson, 2014). Time-of-use pricing also makes alternative green energy sources such as wind and solar more economically competitive because it causes the price of energy to be higher at peak hours. In all, time-of-use pricing is an effective tool that would reduce the amount of energy consumed in BC and potentially eliminate the need for a large scale hydroelectric development with a very low cost.

There are, however, several limitations and challenges that arise with this approach to energy conservation. If creation of the Site C dam is stopped, many current and future jobs will be lost. Employment rates are a very good indicator of social stability in our province. Our current provincial government puts jobs at the forefront: there would be significant backlash from a large group of workers and families if Site C did not go through. Lost work positions from Site C could, however, be replaced by alternative positions. Many new research, design, engineering, environmental, and labour positions need to be filled if alternative energy sources or time-of-use pricing systems are to be developed in BC. Another challenge is the unforeseen consequences that could result from the raised electricity costs associated with a time-of-use system. Many people, especially those with lower incomes, might become upset and cause public uproar. It would not be in the best interest of our current Liberal provincial government to change the pricing of electricity in BC since they could lose current supporters and therefore future elections.

A second potential solution could be to invest instead in smaller scale renewable forms of energy. BC will accumulate a serious financial loss in the short term if Site C is developed (Ministry of Environment, 2014). Developing alternative energy sources such as geothermal would be a much smaller investment that would allow the supply of energy to better match demand. Geothermal power is a renewable source of energy that comes from heat stored within the Earth. It is a clean, sustainable and less environmentally destructive alternative to hydroelectric power generation (Ministry of Environment, 2014). In recent years, many geothermal resources have been discovered along the coast of BC. BC Hydro claims a massive amount of power is potentially available from geothermal resources at a reasonable

price range (Ministry of Environment, 2014). Moreover, The Canadian Geothermal Energy Association has proposed a portfolio of geothermal plants as an alternative to the Site C dam. The company claims there are easily accessible pockets of energy that could be developed for only a fraction of the cost of Site C, and could provide BC with an immense amount of energy (Stueck, 2014). As a less environmentally destructive alternative with low emissions and reasonable development costs, geothermal energy presents a viable alternative to the creation of Site C.



Chief Roland Wilson of the West Moberly First Nation and other advocates against the Site C dam. (Morison, 2015)

Although turning to geothermal power would be a safe investment that would eliminate the initial financial losses of Site C, switching from one form of energy to another is not a simple endeavor (Ministry of Environment, 2014). BC Hydro has not done a lot of research on alternative sources of energy thus would require a great deal of time to have them implemented. This has resulted from the restraint the provincial government has put on BC Hydro that forbids the company from developing alternative energy projects. The BC provincial government would therefore have to lift the policies that bind BC Hydro to large scale non-renewable and hydroelectric energy projects if geothermal power is to be developed. This change would likely be initiated from pressure the citizens of BC put on the provincial government and represents a hard task to accomplish. Given such setbacks, alternative energy sources may not be developed in time.

Perhaps combining the two potential proposed solutions offers the best alternative to Site C. A system could be developed where hydroelectric dams produce the baseline of electricity

using a time-of-use charging system and alternative green energy sources such as geothermal generate power during peak hours. In any case, it is evident that the costs of implementing the dam far outweigh its benefits, and many viable alternatives exist. It will be very difficult for citizens to convince our rigid provincial governments of this fact, given their all-controlling power on the issue. We must work together to show our government that economically feasible solutions exist that would reduce the large scale social and environmental damage caused by the Site C dam for the potentially increasing demand for electricity in BC.

References

Peer Reviewed Articles

Albadi, M.H. and El-Saadany, E.F. 2008. A summary of demand response in electricity markets. *Electric Power Systems Research*, 78, 1989-1996. doi: [10.1016/j.epsr.2008.04.002](https://doi.org/10.1016/j.epsr.2008.04.002)

Beck, M. W., Claassen, A. H., & Hundt, P. J. (2012). Environmental and livelihood impacts of dams: common lessons across development gradients that challenge sustainability. *International Journal of River Basin Management*, 10, 73-93. doi: 10.1080/15715124.2012.656133

This source is a peer-reviewed research paper that examines the social and environmental impacts of dams in different regions of the world that are at different stages of economic development. The main arguments in this study are that the negative effects of dams are similar across the world and sustainable dam development lies in the ability of a country's citizens to advocate for protection of their livelihoods and the environment. The methods used to come to these general conclusions about the effects of dams include researching many different case studies on dams' projects in different regions of the world to examine common emerging themes in environmental impacts. This paper effectively draws on information from an enormous amount of other peer-reviewed journal articles to come to an overall understanding of the impacts of dams. It will be very useful for my research because of its over-arching findings and as well as its reference to many other papers on hydroelectric dams that I could potentially use for my research. It also shows that, in general, the effects of dams are universal, allowing me to apply general research done on dams in other countries to Site C. I believe this paper is a reliable source since the authors are all highly qualified in their field of study and have published their article in a reputable, peer-reviewed journal. The sheer amount of references in this article shows that the authors were taking an unbiased approach to the topic and considering the issue from all potential points of view.

Herter, K. (2007). Residential implementation of critical-peak pricing of electricity. *Energy Policy*, 35, 2121-2130. doi: [10.1016/j.enpol.2006.06.019](https://doi.org/10.1016/j.enpol.2006.06.019)

McCartney, M. (2009). Living with dams: Managing the environmental impacts. *Water Policy*, 11, 121-139. doi: 10.2166/wp.2009.108

McCartney's peer-reviewed journal article focuses on the impacts dams have on ecosystems and biodiversity and the ways these negative impacts are mitigated in today's society. The author's main argument is that many of the methods used to dampen the environmental effects of dams are not actually working and much more must be done to

improve the protection of the environment in dam projects. This article is relevant to my research because it explains the general effects dams have on the environment. I can apply this information to the Site C since it is a new project that has yet to be heavily researched. The conclusions in this paper are also quite noteworthy since the article draws on so many other articles and is able to bring forth insightful ways that future dam planning could be improved. I believe this article is reliable because the author is highly qualified in his field of study and was able to publish this article in a renowned journal. The author also draws on information from many other valid sources. However, I would ensure I find other articles that also support the ideas from this paper before I incorporate them into my research because the article is only written by one author that could have potentially shown some bias in his research on the topic.

Government Documentation

British Columbia Ministry of Energy & Mines. (retrieved 2015). The Evolution of British Columbia's Industrial Electricity Policy. *Ministry of Energy & Mines*. Retrieved from <http://www.empr.gov.bc.ca/>

This is literature from the British Columbia Ministry of Energy & Mines. It is intended to give an overview of the Province of British Columbia's industrial electricity policy. This presents factual evidence on historical decisions in policy making in BC. It focuses on the changes that have occurred since the creation of the British Columbia Hydro and Power Authority (BC Hydro). Since this is a historical overview it can be considered a strong reference source. The discussion section can be bias towards the authors perspective, but the rest of the information presented can taken as genuine.

British Columbia Utilities Commission. (2015). Organization profile. Retrieved from <http://www.bcuc.com/CorpProfile.aspx>

Canadian Environmental Assessment Agency. (2014). Report of the Joint Review Panel – Site C Clean Energy Project. Ottawa, ON: *Canadian Environmental Assessment Agency*. Retrieved from <http://www.ceaa-acee.gc.ca/>

Government of British Columbia. (2015). Clean Energy Act. *Queen's Printer*. Retrieved from http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_10022_01#section6

Government of British Columbia. (2015). Utilities Commission Act. *Queen's Printer*. Retrieved from http://www.bclaws.ca/civix/document/id/complete/statreg/96473_01

Ministry of Environment. (2014). Report of the Joint Review Panel – Site C Clean Energy Project. Retrieved from: <https://www.ceaa-acee.gc.ca/050/documents/p63919/99173E.pdf>

This source is a report done by a joint review panel on the Site C Clean Energy Project. The main purpose of this review is to bring forth an unbiased analysis of BC hydro's plan for the creation of the Site C dam. The report goes into great detail about all aspects of the project and outlines the costs and benefits in terms of the environmental, social, and economic dimensions of Site C. In particular, the report states that Site C has potential to create significant economic benefits for future electricity consumers in British Columbia and that greenhouse emissions in BC could be reduced by investing in hydroelectric power instead of to LNG power. However, the panel also concludes that there is no need for such a massive hydroelectric project in the near term and that smaller, less economically risky, and

less environmentally costly alternatives (such as geothermal power) exist that BC Hydro is not willing to invest in. Moreover, the report emphasizes that the economic benefits will come with significant negative social and environmental impacts that will be borne by the First Nations and residents of the Peace region. The report notes BC hydro has underestimated the social and environmental costs of the project and has not performed enough research on these topics which has resulted in erroneous conclusions. The panel worked under Canada's Minister of the Environment and the British Columbia Minister of Environment. They were thoroughly informed on BC Hydro's plans for Site C and did research on the technological, environmental, social and economic dimensions of creating a hydroelectric dam on the Peace River. They looked at research done on the impact of dams in BC as well as across the world and performed their own research trials in the Site C region. I believe this is a very reliable reference that brings forth an unbiased review of Site C. It is evident the review panel was not swayed by the interests of BC hydro, making the costs and benefits of all stakeholders involved in the project evident. Significant amounts credible research was put into this report that encompasses all aspects of the impacts of the dam. The only weakness to this report is that there are not sources cited for the various claims made, since this is not a primary source of literature. It is therefore difficult to judge the credibility of the research done.

Popular Media

Corson, R., Regan, R., and Carlson, S. (2014). *Implementing energy storage for peak-load shifting*. Retrieved from: <http://www.csemag.com/single-article/implementing-energy-storage-for-peak-load-shifting/95b3d2a5db6725428142c5a605ac6d89.html>

Henton, D. (2008). B.C. gains on Alberta's power pain. *The Edmonton Journal*. Retrieved from http://www.canada.com/story_print.html?id=c4dfeb43-b0ca-4af7-a98a-1e5315ee1f4e

Hume, M. (2015, April 23). Lawyer Argues B.C. government's approval of Site C dam violates Treaty 8. *The Globe and Mail*. Retrieved from <http://www.theglobeandmail.com/news/british-columbia/lawyer-argues-bc-governments-approval-of-site-c-dam-violates-treaty-8/article24094333/>

Hunter, J. (2015, March 8). BC Hydro breaks from the script with Site C labour agenda. *The Globe and Mail*. Retrieved from <http://theglobeandmail.com/>

Stodalka, W. (2015, October 5). Site C Dam will not be diverted to B.C. Utilities Commission. *Alaska Highway News*. Retrieved from <http://www.alaskahighwaynews.ca/>

Stueck, W. (2014, November 30). Report touts 'accessible' geothermal resources, cheaper alternative to Site C. *The Globe and Mail*. Retrieved from <http://www.theglobeandmail.com/news/british-columbia/report-touts-accessible-geothermal-resources-potential-alternative-to-site-c/article21840527/>

Grey Literature

BC Hydro. (2015). Information Sheet about Site C. Site C Clean Energy Project, January 2015. Retrieved from: https://www.sitecproject.com/sites/default/files/info-sheet-about-site-c-january-2015_1.pdf

BC Hydro. (2013). Environmental Impact Statement Executive Summary. Retrieved from: <https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/projects/site-c/site-c-eis-executive-summary.pdf>.

This report was created by BC Hydro officials and summarizes the economic benefits Site C would provide for British Columbians as well the potential negative social and environmental effects and ways BC Hydro will try to mitigate these effects. The main purpose of this document is to show the rationale for development of Site C and how the benefits of the project outweigh the associated costs. This report is useful for my research since it summarizes the environmental impacts of a dam specific to the Site C's region. It is not the most reliable report, since there is an obvious bias present throughout the document. There are small text boxes throughout the report with statements on how strong and reputable of a company BC Hydro is. One must be skeptical about the claims stated in this report as the accompanying research is not directly referenced in this non-technical document addressed to the general public.

Beck, M. W., Claassen, A. H., & Hundt, P. J. (2012). Environmental and livelihood impacts of dams: common lessons across development gradients that challenge sustainability. *International Journal of River Basin Management*, 10, 73-93. doi: 10.1080/15715124.2012.656133

This source is a peer-reviewed research paper that examines the social and environmental impacts of dams in different regions of the world that are at different stages of economic development. The main arguments in this study are that the negative effects of dams are similar across the world and sustainable dam development lies in the ability of a country's citizens to advocate for protection of their livelihoods and the environment. The methods used to come to these general conclusions about the effects of dams included researching many different case studies on dams projects in different regions of the world to examine common emerging themes in environmental impacts. This paper effectively draws on information from an enormous amount of other peer-reviewed journal articles to come to an overall understanding of the impacts of dams. It will be very useful for my research because of its over-arching findings and as well as its reference to many other papers on hydroelectric dams that I could potentially use for my research. It also shows that, in general, the effects of dams are universal, allowing me to apply research done on dams in other countries to Site C. I believe this paper is a reliable source since the authors are all highly qualified in their field of study and have published their article in a reputable, peer-reviewed journal. The sheer amount of references in this article shows that the authors were taking an unbiased approach to the topic and considering the issue from all potential points of view.

Hydro Quebec. (2015) Comparison of Electricity Prices in Major North American Cities. Retrieved from: <http://www.hydroquebec.com/publications/en/corporate-documents/comparaison-electricity-prices.html>

Madill, D. F. K. (1986). Treaty research report – Treaty Eight (1899). Retrieved from: <http://www.aadnc-aandc.gc.ca/eng/1100100028809/1100100028811>

Data Resources

Environmental Systems Research Institute. (2015). Agricultural Land Affected by Site C Dam. *Esri*. Retrieved from: <http://www.arcgis.com/apps/MapSeries/index.html?appid=c97e430ab54e4c479e1a4d80f95d5700>

This map shows the 3715 hectares (9180 acres) that have been removed from the Agricultural Land Reserve for Site C dam so far. In all, Site C dam would impact 31,528

acres of land because of the project's flood, but also the access roads being built. However, the Peace River Valley renowned for its high value farmland throughout the country, would lose a huge proportion of land taken out of potential agricultural production. It is said that this area could feed up to 1 million people (1/4 of the province's population). The maps created by Delorme shows the length of Site C reservoir (in blue) and the area that is about to be lost. The interactive map (the link above) aims at visualizing the huge loss of Agricultural Land Reserve in this area by comparing it to the surface of Richmond, Victoria and others.

Multimedia

Morison, A. (2015, April 27). Treaty 8 First Nations Court Challenge against Site C began last week. Stop Site C. Retrieved from: http://www.stopsitec.org/treaty_8_first_nations_court_challenge_against_site_c_began_last_week

Peterson, L. (2014). Site C. *Yellowstone to Yukon*. Retrieved from: http://y2y.net/work/what-hot-projects/site_c_dam

PVEA Coordinator. (2014, October 3). *Peace for a Valley*. [Video File]. Retrieved from: <https://www.youtube.com/watch?v=rQDbBWjbxng>

Wilderness Committee. (2015, November 25). Stop Site-C Dam Logo. *Wilderness Committee*. Retrieved from <https://www.wildernesscommittee.org/sitec>

- [Previous](#)
- [Next](#)



Site Registration

If you want to add yourself to this blog, please log in.

The Department of Geography - Environment and Sustainability Program

Vancouver Campus

1984 West Mall

Vancouver, BC Canada V6T 1Z2

Tel 604 822 2663

Website www.geog.ubc.ca/