Riverscope
Case Study: Batang Toru, Indonesia Summary
TMP Systems | August 2021
1. OVERVIEW

The electricity produced by large-scale hydropower is expensive in commercial, social, and environmental terms. Dams have significant and irreversible impacts on societies and ecosystems while being exposed to huge operational and financial risks. The way that these projects are assessed systematically underestimates these impacts and risks, meaning that investors, developers, and regulators often make the wrong decisions based on incomplete information.

This document summarizes an assessment of the proposed Batang Toru hydropower project in Indonesia, using the “Riverscope” assessment tool. Riverscope offers a new way to assess large dams by combining geospatial analysis, expert investigation, and financial modeling. Riverscope is unique in that it presents a commercial comparison between hydropower, solar, and wind, alongside a rapid but wide-reaching environmental and social risk analysis. As such, it provides relevant information and analysis for governments, investors, and the third sector. The full assessment report and methodology is available at www.riverscope.org.

This Riverscope assessment of Batang Toru shows that:

1. The project could be delayed by up to 9 years, mainly because of a combination of social and environmental challenges. This delay significantly reduces the dam’s financial value.

2. Under the most likely scenario, Batang Toru will be 46% more expensive than solar by 2027 (the most probable starting date of operation), and 87% more by 2034.

3. Alternative energy technologies could deal with energy poverty and security more cheaply and more rapidly than Batang Toru without incurring substantial negative impacts.

2. COMMERCIAL ASSESSMENT

Our commercial assessment of Batang Toru evaluates three key areas of commercial risk: delays/slippage, the Levelized Cost of Electricity (LCOE), and offtake arrangements. In this case, perfect implementation might produce a competitive project. However, Riverscope shows that cost and time overruns are likely to make Batang Toru highly unattractive financially.

DELAYS AND SLIPPAGE

Batang Toru was originally slated to start operation in 2019, but recent announcements suggest the dam will not operate before 2025 because of lender withdrawal on account of environmental and COVID-19 delays. Our analysis based on similar
cases suggests further delays are likely and the earliest plausible date of operation will be 2027. As seen in the graph below, delays and deferred cash flows would lead to a considerable decline in the Net Present Value (NPV).

A delay of 1-2 years without overspend translates into a 10%-21% decline in NPV, or a loss of $114-$218 million, respectively. A similar delay with typical overspend (33%) translates into losses of $188-$286 million.

LEVELIZED COST OF ELECTRICITY (LCOE)

The investment case for Batang Toru appears to be weak, particularly when compared to alternative energy technologies. The commercial superiority of local solar and wind projects becomes clear through a comparison of the LCOE of Batang Toru with representative local values for solar and wind.

The graph below shows how the competitiveness of Batang Toru deteriorates in proportion to delay. If Batang Toru begins operations in 2025 without any budget overruns, it would still be around 5% more expensive than solar, and wind would be competitive. But by 2027 both solar and wind are cheaper (13% and 6%, respectively). If we assume that Batang Toru also experiences the budget overruns that are typical for hydropower projects (33%), then the dam will be 46% more expensive.
than solar in 2027. If the project is delayed to 2034, which is entirely feasible according to our model, its electricity will be 87% more expensive than local alternatives.

OFFTAKE ASSESSMENT

PLN has already signed an offtake agreement for Batang Toru, which should reassure other project backers. However, there is increasing evidence that this would be a bad deal for PLN. In addition to unfavorable LCOE, demand for Batang Toru’s energy is weak, especially in the wake of COVID-19. PLN could find itself paying a high price for electricity that it is unable to sell. Transmission-line construction and upgrading will likely expose the project to further delays, and Batang Toru could join several examples of energy projects in emerging markets that have been similarly hamstrung.7

### 3. ENVIRONMENTAL RISK ASSESSMENT

This section summarises substantial environmental risks for Batang Toru, which undermine the investment case because they are very hard to manage or avoid. Resulting controversies and measures taken by developers to deal with or preempt them will hamper implementation and increase costs.

Biodiversity risks are significant and likely to drive delays, in part because they may have been systematically underestimated in official impact assessments. Batang Toru is just one of many projects being developed in the sensitive ecosystems in this area of North Sumatra that are driving major land use changes. The problems picked up in this assessment should therefore be seen in cumulative, or landscape level, terms.

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SCORE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species Richness</td>
<td></td>
<td>This is one of the most biodiverse terrestrial areas in the world, which is highly sensitive to further disruption.</td>
</tr>
<tr>
<td>Sediment Flux</td>
<td></td>
<td>The dam could disrupt important sediment transfers, creating problems for biodiversity and food security.</td>
</tr>
<tr>
<td>Upstream Drainage</td>
<td></td>
<td>These low scores suggest that water availability and variability are unlikely to be issues. This would be expected in North Sumatra, particularly in an area scoped for a run-of-river dam. However, the recent IPCC report confirms that variability is likely to increase in Indonesia.</td>
</tr>
<tr>
<td>Inter-Annual Variability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drought Severity</td>
<td></td>
<td>This score suggests biodiversity risks and the lack of official protection for very biodiverse areas.</td>
</tr>
<tr>
<td>% Irrigated Cropland</td>
<td></td>
<td>There are low levels of cropland. Dams tend to have greater problems in remote areas.</td>
</tr>
</tbody>
</table>
BIODIVERSITY (PS 1 AND 6)

This project has a severe impact on local biodiversity despite efforts to mitigate the problem. The area is simply too sensitive for these mitigation efforts to be truly effective. It is the last stronghold for Tapanuli orangutans, a species already severely threatened by local hunting activities, agricultural expansion and other industrial developments. Any further loss raises the severe threat of extinction, and Batang Toru is therefore non-compliant with IFC Performance Standard 6.

An IUCN fact-checking exercise identified a series of problems with the project’s environmental assessment and management process. This suggests non-compliance with Performance Standard 1 on risk assessment. The Bank of China’s recent withdrawal from the project due to the pandemic and biodiversity controversies is further evidence of severe environmental impacts.

The image below shows that deforestation over the last two decades has been significant. Batang Toru and its accompanying infrastructure (e.g. transmission lines and substations) require clearance and will open up remote areas to predatory activities, exacerbating this concerning trend. These complications can also contribute to longer delays (see endnote for examples).

CLIMATE (PS 1 AND 3)

Ambitious claims have been made regarding the potential of Batang Toru to displace carbon produced by coal, diesel, and gas. These claims have been overstated, and continued insistence on publicizing these estimates point to issues with corporate governance. Again, this indicates non-compliance with Performance Standard 1.

On the adaptation side, there are indicators that this area may be impacted by climate change, resulting in lower precipitation and increased variability around the dam site. The run-of-river design makes the dam more exposed to this sort of variability, even though this is not currently a pressing concern in Sumatra.

Finally, Batang Toru is also non-compliant with Performance Standard 3, which concerns resource efficiency since alternatives have not been pursued by project backers. We know these alternatives are viable, indeed cheaper, because they are being developed rapidly by others.
4. SOCIAL RISK ASSESSMENT

This social assessment is split into four important areas of social risk: worker conditions, the safety and security of the community, consultation and resettlement, and indigenous peoples. Each of these social risk areas demonstrates non-compliance with Performance Standards.

The results below do not indicate high levels of social risk. However, we are missing data on population density and nighttime lights, however, for which a remote area like Batang Toru may score high. Our qualitative investigation was more concerning and found that social risks have been exacerbated by the approach to project implementation. Conflicts between workers and local people have already broken out, which could add to already long delays for the project.

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>SCORE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Deprived: Sanitation</td>
<td>61</td>
<td>This high score suggests that local people lack access to basic services.</td>
</tr>
<tr>
<td>% Deprived: Schooling</td>
<td>23</td>
<td>This low score suggests people in the area are relatively well educated and have capacity to be informed about the project and its impacts.</td>
</tr>
<tr>
<td>% Deprived: Drinking Water</td>
<td>33</td>
<td>These low scores suggest that local people have access to the most basic services and are not desperately deprived, which reduces risks for the project. However, it also means that local opponents of the project, of which there are many, are likely to have more capacity and influence to stop the project.</td>
</tr>
<tr>
<td>Multidimensional Poverty Index</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Population Vulnerable to Poverty</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Conflict</td>
<td></td>
<td>Social conflict in the areas is low but we have found evidence that Batang Toru could be driving it.</td>
</tr>
</tbody>
</table>
WORKER CONDITIONS (PS2)

Labor rights infringements and threats to employee safety deter responsible investors and can stir discontent among local communities. These issues have operational and reputational importance beyond the Performance Standards.

Conflicts with local people could pose clear and present dangers to employee safety, which means that Batang Toru is non-compliant with Performance Standard 2. These risks are accentuated by the pandemic, which serves to increase suspicion of outsiders and risks manpower shortages.

SAFETY AND SECURITY OF THE COMMUNITY (PS4)

There have been instances of violent confrontation between local people and project employees, which may increase with an influx of workers. There has also been little consideration for how the project exposes local and vulnerable people to COVID-19. These risks contravene Performance Standard 4.

Allegations of poor management of soil heaps and other earthworks indicate that the project could create risks to the safety and security of downstream communities. The dam also creates risks of earthquake and flooding. These issues have been considered in ESIAs but remain controversial.

CONSULTATION AND RESETTLEMENT (PS1 AND 5)

Ongoing local conflicts are connected to problems with the consultation and resettlement process, which did not cover every affected village and possibly contravene Performance Standard 1 and 5. This consultation revealed some support for the project but hid resistance, which has been strong enough to incite violence and blockades. Reports suggest locals repeatedly referred to their legal ownership of land and that the negotiation process explicitly ignored pre-existing customary claims to land. This contravenes Performance Standard 5.

INDIGENOUS PEOPLES (PS7)

Indigenous opposition to the project suggests that Batang Toru did not obtain Free, Prior and Informed Consent (FPIC) and did not properly consider alternatives, contravening Performance Standard 7. Indigenous groups are particularly vulnerable to COVID-19, so extreme steps must be taken to protect their health and ongoing traditional livelihoods. Batang Toru has not taken due steps.

North Sumatra, Indonesia. Photo by Sigit Adhi Wibowo (Shutterstock).
5. ALTERNATIVES

Alternatives have considerable benefits from a commercial, environmental, and social perspective relative to hydropower, despite potential storage, grid, and tariff challenges.

COMMERCIAL PERSPECTIVE

Solar, wind and geothermal technologies can provide peak or base power to the grid or within a grid-tied, mini- or off-grid system and so provide a financially viable way to decentralize electricity production and rapidly meet energy demand. Indonesia has plenty of solar, geothermal and wind potential.18 These alternatives have lower social and environmental risks. The map below shows suitable areas for solar and wind.19

Alternatives can attract considerable private investment, while Batang Toru would be borne entirely by public finance. Alternatives can produce reputational benefits for investors, while Batang Toru creates substantial risks. Finally, alternatives are more accessible to the general market due to lower CAPEX requirements and shorter expected loan periods.

ENVIRONMENTAL PERSPECTIVE

Alternatives can be located nearer to demand, minimizing the need for transmission lines and their associated environmental impacts. Solar and wind technologies are more spatially efficient than hydropower20 and can be sited more flexibly, reducing disruption to surrounding ecosystems and biodiversity (e.g. Tapanuli orangutans). These technologies can still have quite large footprints, bringing them into competition for land with agriculture and conservation. But this problem is relatively easy to manage compared to the environmental impacts of hydropower.

SOCIAL PERSPECTIVE

The decentralized renewable energy sector can be developed rapidly within or close to communities. Their smaller footprint and widespread potential also reduces the need for the relocation of vulnerable groups. This decentralized sector is becoming an increasingly important employer in emerging economies suffering from high unemployment. In some countries, such as India, this alternative energy sector provides a comparable number of jobs to the national utility, and is expected to grow.21 These employment opportunities could promote local socio-economic development in Indonesia, while reducing health risks associated with large migrant work forces.
6. SUMMARY AND RECOMMENDATIONS

Batang Toru does not make sense on commercial, economic, or social grounds. Current plans are expensive and have an unacceptable environmental cost. Batang Toru is unlikely to operate before 2027 at which point it will be 46% more expensive than alternatives.

Our assessment shows that hydropower is not the right technology to deliver energy access. Zero-carbon options could be cheaper and quicker to roll out. These technologies can be located with greater flexibility which makes social and environmental damage easier to avoid and allows a modular approach. Alternatives are much more attractive and suitable for investment than hydropower. Private involvement increases efficiency and reduces the burden on public finances, which can be dedicated to competing priorities in pandemic recovery.

Overall, the case for Batang Toru is extremely weak. This suggests endemic problems in hydropower assessments, particularly in the way that they account for ESG risks. Governments and international financial institutions can create an enabling environment for alternatives by offering them the same sort of concessional finance awarded to hydropower. Clear and well-planned government support for large scale roll out of alternatives can help stimulate the sector.

RECOMMENDATIONS FOR THE FINANCIER:

• Work with PT NHSE, PLN and the Government of Indonesia on the above recommendations, including to avoid impacts on Tapanuli orangutans, which are at critical threat of extinction. Request the implementation of FPIC to secure support from local indigenous communities. Demand higher social and environmental standards from developers.

• Evaluate how alternative technologies might perform in terms of LCOE and delay in different locations if they had access to the same advantages as hydropower. Refresh financial models and impact assessments to account for social and environmental risks appropriately. Use Riverscope for a more reliable assessment of the risks of delay and impacts on NPV.

• Reevaluate demand growth and distribution in the wake of COVID-19. Determine whether a grid-based approach is sensible for this area, where mini-grid and off-grid approaches could prove cheaper and more adaptable to the need.

RECOMMENDATIONS FOR GOVERNMENT:

• Consider alternative sites with lower environmental risks. Adjust energy plans and policy so that large hydropower projects are better assessed. Consult PLN on the project and the options for alternatives. Discuss alternative technologies with PT NHSE to come to a new agreement.

• Ensure that projects deliver benefits (including electrification) locally and equitably. Otherwise, improve the benefits that are delivered to local people from the project.

• Demand high social and environmental standards from developers. Ensure that compliance is independently assessed and monitored. Support local NGOs to enforce existing environmental and social standards, including the IFC Performance Standards.
ENDNOTES

13. Specifically, the dam is compared to coal and diesel rather than floating gas platforms. The output of the dam also ignores its claims to be a provider of peak electricity, which means that it cannot run consistently.


19. Where the Solar DNI is above 1200 KWH/M2 per year and Wind is above 6m/s on average at a 50m and 100m level, Key Biodiversity Areas and Protected Areas are less than 10% of the L2 district area, and the Social Risk score, as calculated by the Riverscope's social indicators, are below 60.

20. Solar and wind have been shown to use far less land per megawatt produced than hydropower, with approximately 17.6ha/MW and 28.6ha/MW, respectively, versus 127.5ha/MW for hydropower (https://www.strata.org/pdf/2017/footprints-full.pdf).


Cover Image: Endangered Sumatran Orangutan. Photo by Ludwig Kwan (Pexels).