A lesson from New Zealand to Nepal: Hydroelectric Power Utilization

Bimal Bhattarai
EGEE 497
April 11, 2019
Overview

- Both Countries background information
- HydroElectric In New Zealand
- Nepal’s energy crisis
- Nepal’s HydroElectric Potential
- Lesson for Nepal from New Zealand
## Background Information

<table>
<thead>
<tr>
<th>New Zealand</th>
<th>Nepal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population: 5 million</td>
<td>Population: 29 million</td>
</tr>
<tr>
<td>Area: 103,483 sq. miles</td>
<td>Area: 56,827 sq. miles</td>
</tr>
<tr>
<td>GDP: $199 Billion</td>
<td>GDP: $84 billion</td>
</tr>
<tr>
<td>GDP per capita: $40,266</td>
<td>GDP per capita: $2,842</td>
</tr>
</tbody>
</table>

- Two diverse countries, both in terms of economic and culture
- Both share similarities in potential in Hydroelectric
- While New Zealand has been able to effectively use hydro power, Nepal has not
- There is a lesson to be learned for Nepal from New Zealand
Hydroelectric in New Zealand

- Started to build hydroelectric in early 1900s due to enormous potential
- Has 100 hydroelectric generating plants
- Last 10 years, Hydroelectric provides 50-60% of electricity for the country
- Provided 82% of the electricity generated from the renewable sources
- In 1980, peak production provided around 84% of the country’s electricity
Prominent Power Stations: Waikato River Stations

- Longest river in New Zealand
  - 264 miles in length, and runs through North Island

- Has 8 dams and 9 hydro electric powers stations with combined power capacity of 1000 MW
  - Power scheme begins from lake Taupo to last power station at Karapiro

- Power stations along the river generated approx. 4000 GWh electricity annually
  - provides approx. 13% of New Zealand’s electricity
Prominent Power Stations: Manapouri

- Located in the South Island, build in 1964 and operational fully in 1972
  - Country’s biggest hydro station
  - 2nd biggest power station

- Has seven 122 MW generating units, which operate at max. Output of 800 MW
  - enough to power 619,000 avg. homes in NZ annually
Energy Background in Nepal

- Nepal Electricity Authority, government authority owns and operates the national grid

- Approx. only 60% of the 30 million people have access to regular electricity - rest of 40% population relies on primitive form of power

- Annual consumption of electricity in the country per person is about 100 KWh - consumption rate is considerably lower compared to New Zealand’s 8,240 KWh

- The country need to meet the growing demand for power, which is rising by 10% each year

- Hydroelectric power could be a solution for the country's growing need for more power
Hydro Availability in Nepal

- Nepal has huge potential for hydropower due to many perennial rivers
- Start from the Himalayas, which are 8000 m high in the north and flow through towards southern plains
- Sources of such water flow is due to snow melt, glacier and rainfall
  - Nepal receives annual avg. rainfall of 1,500 mm
- Country has the hydro potential of 80,000 MW
  - As of 2018, only 1,000 MW of hydro capacity installed
Four Major Hydro Contributors

- Karnali and Mahakali rivers combined have potential of 36,000 MW
- Gandaki has the potential of 20,650 MW
- Koshi river has the potential 22,350 MW
- Other small rivers combine have 4,110

- However studies conducted estimated only half of the total potential is economically feasible
Current and Future Projects

- Figure shows existing, under construction, and planned hydropower projects
- Seven plants already exist, which generate less than 1,000 MW of power
- One in under construction with peak potential of 456 MW
- While several others are still in the planning phase, some withheld due to political reason
Lessons to be Learned: A way forward

- Due to enormous hydroelectric potential, Nepal can learn from New Zealand regarding hydroelectric power
  - Four major rivers in Nepal have more potential than Waikato
  - Nepal should build series of power stations along one of four major rivers just like Waikato
  - Any one of the four could provide an answer to solving energy problems within the country

- Government needs to invest more in the infrastructure of the country to make transmission of power easier
- Gov. could also establish a better policy to renewable energy
- Look for private investments as well
- If Nepal can harness even half of ¼ of its total hydroelectric potential, it could considerably lessen the energy crisis