1. **Weather forecasts and Hydropower**

Weather forecasts in Nepal has been primarily used for general information, aviation, and most recently, as a part of disaster preparedness programs such as flood early warning system. Another application of weather forecasts that is often overlooked is in the field of renewable energy systems. Hydroelectric systems produce electricity by converting the mechanical energy of diverted water flow into electrical energy through turbines and generators. The diversion of water can be through a weir (run-of-river hydro) or through a reservoir built by erecting a dam (storage-based hydro). Both these forms of hydropower depend on inflow of water through streams/rainfall for energy production.

Information of future inflow can be used for better optimization of hydroelectric systems. Future inflow information is obtained through streamflow forecasts. An important parameter for streamflow forecasts is precipitation forecasts, which is a common output of weather forecasting models. The streamflow forecasts can be used by both utility/grid operator and power producer for optimized operation of the hydro facilities and their energy output.

1. **Applications for Power Producer and Grid Operator**

An electrical utility/grid operator needs to ensure that energy demand meets supply at any instant of time. Knowledge of future energy production from each of the hydro electric systems help the **grid operator** for efficient grid management by prioritizing energy from specific systems and balancing exports/imports of electricity to/from the regional grid accordingly.

For day-ahead electricity markets that require power producers to bid their production beforehand, the inflow forecasts are pivotal. In the case of Nepal, there is a fixed Feed-In-Tariff scheme for most systems. So, this application is not possible. However, the storage-based hydro or Peaking Run-of-River (PROR) **hydro operators/owners** can use this information to optimize water level in the reservoir such that maximum energy can be produced when the energy prices are at the highest.

Hence, the major application of the weather forecasts for Nepal could be for grid operator or for storage/PROR owners. Accordingly, my research project aims to explore the value added to the current practices by the introduction of weather forecasts for operation of hydroelectric systems.

1. **Information from grid operator**

Before exploring the further applications of weather forecasts for a grid operator, it is important to understand their decision-making process. The following questions would help understand the decision-making process of a regional grid operator:

* 1. How is the daily electricity demand profile calculated?
  2. What is done in case there is low/high electricity production in the region?
  3. In case of over production of electricity, how is the curtailment decided?