

**THE ECONOMIC COMPARISON OF RESERVOIR
TYPE AND RUN OF THE RIVER TYPE HYDROPOWER
PLANTS: A CASE STUDY FOR UPPER KOTMALE**

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Degree of Master of Science

Department of Electrical Engineering

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Declaration, Copyright Statement and the Statement of the Supervisor

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Abstract

At present, greenhouse gas emissions are considered as a factor even for hydropower because of the identified gas emission possibilities. Thus when planning a large hydropower project at a selected location, it is important to take the decision on which type of power plant to construct (such as a reservoir type or run of the river type) based on an economic comparison including environmental considerations.

Out of the implemented two large run of the river type hydropower projects in Sri Lanka, Upper Kotmale was selected as the case study for this research. The existing Talawakele run of the river project and an earlier suggested Caledonia reservoir project were selected for the comparison as competitive projects.

Net greenhouse gas emissions from the both projects were estimated in this study. For the economic comparison, the levelized cost of electricity of both projects were calculated considering related costs, benefits under Clean Development Mechanism, and annual electricity generation. The results show that the unit cost of electricity generation from run of the river type project is substantially lower than that of reservoir type project. As Upper Kotmale is a peak serving plant in Sri Lanka, a separate comparison between the two projects was done considering their night peak operation. The results show a loss to the country by energy reduction due to not using the potential for reservoir type.

Based on the results of the case study, it is concluded that for future large hydropower developments, a detailed study, including Clean Development Mechanism benefits, to be carried out case by case before taking the decision on reservoir construction. The research outcome will not only be important to any remaining hydropower potential development in Sri Lanka but also to other hydropower dominant countries in the world.

Dedication

I dedicate my MSc research dissertation to my parents and all the lecturers of Department of Electrical Engineering, University of Moratuwa.

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List of Abbreviations

Abbreviation	Description
CBSL	Central Bank of Sri Lanka
CDM	Clean Development Mechanism
CGD	Concrete Gravity Dam
E/S	Engineering Services
ECRD	Earth-Core Rockfill Dam
EIA	Environmental Impact Assessment
F/S	Feasibility Study
GEF	Grid Emission Factor
GHG	Greenhouse Gas
GOSL	Government of Sri Lanka
GPP	Gross Primary Production
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
KP	Kyoto Protocol
KPS	Kelanitissa Power Station
LCIA	Lice Cycle Impact Assessment
LCOE	Levelized Cost of Electricity
LKR	Sri Lankan Rupees
NPP	Net Primary Production
NPV	Net Present Value
O&M	Operation & Maintenance
ROR	Run of the River
UKHP	Upper Kotmale Hydropower Project

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