2021 年 8 月 18 日

# 博士論文審査結果報告

**Report on Ph.D. / Doctoral Dissertation Defense**

National Graduate Institute for Policy Studies (GRIPS)
Professor（joint-appointment） Toshio KOIKE

審査委員会を代表し、以下のとおり審査結果を報告します。

On behalf of the Doctoral Thesis Review Committee, I would like to report the result of the Doctoral Dissertation Defense as follows.

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| 学位申請者氏名<br>Ph.D. Candidate | Nguyen Van Hoang | | |
| 学籍番号<br>ID Number | DOC18132 | | |
| プログラム名<br>Program | Disaster Management Program | | |
| 審査委員会<br>Doctoral Thesis Review Committee | 主査<br>Main referee | 小池　俊雄<br>KOIKE, Toshio | 主指導教員<br>Main Advisor |
| | 審査委員<br>Referee | 江頭 進治<br>EGASHIRA, Shinji | 副指導教員<br>Sub Advisor |
| | 審査委員<br>Referee | 廣木　謙三<br>HIROKI, Kenzo | 副指導教員<br>Sub Advisor |
| | 審査委員<br>Referee | 渋尾 欣弘<br>SHIBUO, Yoshihiro | 副指導教員<br>Sub Advisor |
| | 審査委員<br>Referee | 道下　徳成<br>MICHISHITA, Narushige | 博士課程委員会委員長代理<br>Acting Chairperson of the Doctoral Programs Committee |
| | 審査委員<br>Referee | 鼎 信次郎<br>KANAE, Shinjiro<br>（東京工業大学 教授<br>Professor, Tokyo Institute of Technology） | 外部審査委員<br>External Referee |
| 論文タイトル<br>Dissertation Title<br>(タイトル和訳)※<br>Title in Japanese | 水力発電の最大化と洪水被害軽減のための統合的な貯水池操作に関する研究<br><br>Integrated Operation of Reservoirs for Maximizing Hydropower and Reducing Flood Risk | | |
| 学位名<br>Degree Title | 博士（防災学）/ Ph.D. in Disaster Management | | |
| 論文提出日<br>Submission Date of the Draft Dissertation | 2021 年 6 月 1 日 | 論文審査会開催日<br>Date of the Doctoral Thesis Review Committee | 2021 年 6 月 29 日 |
| 論文発表会開催日<br>Date of the Defense | 2021 年 6 月 29 日 | 論文最終版提出日<br>Submission Date of the Final Dissertation | 2021 年 8 月 17 日 |
| 審査結果<br>Result | 合格<br>Pass | 不合格<br>Failure | |

※ タイトルが英文の場合、文部科学省に報告するため、和訳を付してください

Please add a Japanese title that will be reported to MEXT.

1. 論文要旨 Thesis overview and summary of the presentation.

To respond to the significant public interest in more effective operation of existing reservoir systems for mitigating flood damage as well as for increasing hydropower generation, this study develops an integrated method for quantitative evaluation of contributions of current hydropower generation dams to flood risk reduction, and sophisticated reservoir operation strategies by coupling an ensemble prediction system with a set of dam operation rules considering the prediction uncertainty.

Six chapters constitute this Ph.D. dissertation.

Chapter 1 explains the general background, reviews the literature comprehensively, and identifies objectives of this study clearly.

Chapter 2 introduces the study area and summarizes the past floods and the actual dam operation in the study area. Then, an overall research framework is proposed as follows:

1) To evaluate contributions of the current operations of the existing hydropower generation dams to flood risk reduction in the downstream.
2) To propose an integrated reservoir operation for reducing flood risk without any loss of power generation.
3) To provide policy recommendations to the stakeholders in the study area.

Chapter 3 introduces an integrated system to quantitative evaluation of contributions of current hydropower generation dams to flood risk reduction. The evaluation system includes a hydrological model, i.e., the Water and Energy Balance based Rainfall-Runoff-Inundation (WEB-RRI) model, which can reproduce spatial distribution of inundation depths and their temporal changes as well as flood discharge with reasonable accuracy after calibration and validation by using the flood mark survey data and the satellite-based synthetic aperture radar data. To investigate the effect of

dam operations on flood control, two hydrological scenarios with and without dam operations are compared. The results indicate that the lowering of the reservoir water level of an upstream dam may have contributed to reducing flood hazard areas and inundation depths in the downstream area during a flood event. The proposed approach is not limited to the study area, but it can be widely applied to other regions.

Chapter 4 proposes an integrated system to improve the dam operation strategy for reducing flood risk without loss of power generation by coupling an ensemble flood prediction with a set of dam operation rules considering the prediction uncertainty. The system is applied to the following three typical cases and demonstrates its high performances by simulation as follows:

1) The system suggests to release water earlier and longer than the duration of the actual operation. By increasing the capacity for storing the floodwaters and decreasing the release discharge when the flood reaches its peak, the system can enhance the flood reduction role of the reservoir apparently.
2) The system finds that the dam doesn't need to release water in advance and should keep water, while the dam carried out pre-release in the actual operation and the water level could not recover after the flood.
3) After successfully storing the first flood, the dam actually raised the water level by setting the release less than inflow. The system, however, because of the warning information about the second flood peak, keeps the ratio between the release and the inflow for ensuring water storage capacity, and allows the free volume to cut the second flood peak successfully.

Chapter 5 provides policy recommendations to the stakeholders in the study area based on the scientific evidences driven from this study.

Chapter 6 concludes and summarizes the finding of the study and the future research directions.

**2. 審査報告 Notes from the Doctoral Thesis Review Committee (including changes required to the thesis by the referees)**

The review committee members evaluated this study as follows:

(1) This study develops innovative scientific and technological bases on the integrated water resources management for reducing flood risk without any loss of water use by integrating cutting-edge forecasting models and a set of dam operation rules considering the prediction uncertainty.

(2) The dissertation is well organized to ensure understanding of readers on the technical viability and limitation, novelty of the study and potential areas of further studies by keeping practicality and applicability within real-world policy context.

The dissertation was regarded as pass with minor revisions because the median score of individual evaluations of all the reviewers was 5. The review committee members asked the main adviser to check the revisions.

**3. 最終提出論文確認結果 Confirmation by the Main Referee that changes have been done to the satisfaction of the referees**

The main adviser found that the revised thesis addressed appropriately all the issues raised by the review committee members.

**4. 最終審査結果 Final recommendation**

The doctoral thesis review committee recommends that GRIPS award the degree of Ph.D. in Disaster Management to Mr. Nguyen Van Hoang.