

Opponent's report on dissertation thesis Ing. ALPO MPANDE KAPUKA entitled

**Social-ecological aspects of climate change impacts and adaptation in southern Africa**

The submitted opponent's opinion on the dissertation of Ing. Alpo Kapuka was prepared based on a request from the Dean of the Faculty of Forestry and Wood Technology, Czech University of Agriculture in Prague.

The thesis comprises 118 pages, with the primary focus being a collection of four articles that have been published in journals with an impact factor. In these articles, the doctoral candidate assumes the role of the lead author. Within the main body of the text, three pages are dedicated to providing a background introduction, followed by one page outlining the objectives, and a six-page literature review. The methodology is expounded upon four pages, while the results, presented in the context of the aforementioned four articles, span an extensive ninety pages. These findings are further supplemented by a nine-page discussion, as well as recommendations for practical application and policy implications, both addressed within two pages only. In terms of formal presentation, the thesis demonstrates a commendable standard, with only a marginal presence of graphical inaccuracies.

According to the assignment, the objective of dissertation is to enhance the understanding of the interactions within the social-ecological systems under climate change in southern Africa. Such objective is very complex and ambitious. Therefore three main objectives were established, specifically to: i) understand the current state of knowledge on various aspects of climate change in southern Africa; ii) assess projected climatic vulnerability of major woody species in southern Africa and risk for the provisions of main ecosystem services and iii) evaluate the patterns of vulnerability of the human societies to natural hazards in Namibia as a case study. I would like to note here that the assignment of work was approved only in mid-July 2023, which is rather non-standard (however, this can only be caused by minor changes in the assignment). In the dissertation itself, the individual objectives are elaborated in detail, which particularly concerns objective i). Specifically, there dissertation aimed to (1) understand the temporal development of climate change research, its geographical differences, coverage of different thematic areas, and level of research internationalization in ten southern African countries, and (2) understand observed and projected impacts of climate change on various species, populations, and ecosystems, with management and policy recommendations aiming to mitigate these impacts in nine southern African countries. The results of this objective were presented in the form of two review articles.

It is quite unusual that half of the articles that make up the dissertation are in this category. Since all articles have already gone through a peer review process before their publication, it is not the purpose of my review to evaluate the submitted articles separately again. Moreover, despite that fact some questions arise after reading them. Typically, for example, with the first review. It is not entirely clear to me why it was assessed whether the author(s) is/are affiliated with any of the African institutions. That does not mean they are African.

In any circumstance, the presented format of the dissertation should encompass more than just a mere recapitulation of findings extracted from the articles; it should also introduce an additional layer of value. However, from my point of view, the supplementary contribution appears to be rather modest. Both the Background and Literature Review sections appear to repeat content that is already expounded upon within the individual article reviews. Moreover, certain aspects remain unclear. For

instance, the rationale behind the inclusion of chapter 3.3 remains unclear, especially when the addressed issue is not given significant attention (from a societal perspective) in the results section. The section detailing Material and Methods is outlined within the separate articles themselves. These methodologies are aptly applied and effectively contribute to the attainment of the stipulated objectives. A parallel situation to that observed in the Literature review is also evident in the discussion section. The pivotal chapter, denoted as Key Findings, was anticipated to synthesize the results cohesively. Regrettably, it predominantly duplicates the outcomes previously presented within the individual articles.

From my perspective, the most notable strength of the dissertation lies not in the actual results – (which, to some extent, are predictable) – but rather in the comprehensive exploration of knowledge gaps and deficiencies. In this aspect, the author undertook a quasi-reviewer role, identifying and delineating research gaps, whether stemming from methodological constraints or other pertinent factors. This approach significantly streamlined my role as an reviewer, as otherwise, I would have been compelled to independently highlight these specific limitations. I extend my gratitude for this facilitation. 😊

One of the weaknesses of the work is its imbalance. As directly stated in the literature review: ... *all definitions (of resilience) demonstrate that the main characteristic of resilience is maintaining a balanced state of the social-ecological systems...* However, the "ecology" component is primarily addressed in the dissertation, but the "social" component is rather secondary. This is particularly evident from the results of article 3 (Climate change threatens the distribution of major woody species and ecosystem services provision in southern Africa), where this component is taken into account only in the part dealing with selected ecosystem services. Similarly, the entire article is the result of modeling the impact of climate change on the spread of selected tree species (i.e. the ecological part), but the social component is left more or less static. It is only possible to speak of a certain balance in the last article (Namibia as a case study).

Final evaluation:

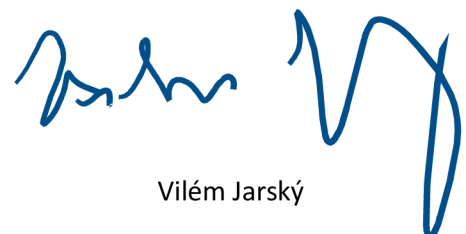
The dissertation deals with a current and important topic. The methods used are correct, they show the author's ability to orientate himself in modelling issues. The results are original; they were published in four articles in which the PhD student is the first author. At the same time, the results are also important for the studied region, where they can be used in management or political measures.

After carefully studying the dissertation, I agree that the thesis should be accepted for defence and Ing. Alpo Kapuka be awarded the title "Doctor".

Questions for the defence:

1. In the same way that ecological/environmental relations are modelled, is it possible to model socio-economic variables as well? Why was this option not used in the dissertation?
2. The entire dissertation is based only on quantitative data. Could the analysis of qualitative data also help in the solved problem? Please provide examples.

Prague, September 4, 2023



Vilém Jarský