

**INFORMATION PAGE ABOUT NEW ACADEMIC AND  
THEORETICAL CONTRIBUTIONS OF THE DOCTORAL THESIS**

1. Thesis title: *Research for developing mitigation scenario of iron and steel production sector in Vietnam.*

Code: 9440221

Major: Climate Change

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Supervisor: Ph.D Do Tien Anh

Education Institution: The Viet Nam Institute of Meteorology, Hydrology, and Climate Change.

3. Introduction to the Thesis:

Climate change is considered one of the biggest challenges to the sustainable development of humanity in the 21<sup>st</sup> century. Vietnam is a developing country, just starting its industrial process over the past three decades and has been heavily impacted by climate change, but has always shown responsibility and proactively implemented international commitments on climate change. Vietnam submitted its Intended Nationally Determined Contribution (INDC) in 2015; Signed and approved the Paris Agreement, and developed a National Plan to implement the Paris Agreement in 2016. The Law on Environmental Protection (2020) has a chapter on responding to climate change that stipulates responsibility for climate change mitigation and adaptation adaptation, implementation of Vietnam's NDC and the Paris Agreement.

Iron and steel production in the world in general and in Vietnam in particular are is considered one of the key source of GHG emissions. In Vietnam, there are three

main technologies applied in iron and steel production field, namely: Blast furnace - oxygen blast blowing furnace (BF - BOF, 08 units), Electric arc furnace (EAF, 34 units) and 38 Induction Furnaces (IF, 38 units). In general, the application of technologies in the iron and steel production in Vietnam consumes a lot of energy as well as a large amount of fuels (gaseous, liquid fuels, coal of all kinds and electricity) of which GHG emissions are significant.

In order to monitor GHG emissions and evaluate potential mitigation potential, the development of GHG mitigation scenarios in iron and steel production sector has been carried out in a number of climate change studies and national reports. However, these studies apply IPCC's default emission factors for different types of technology, with data based on top-down approach data, leading to high uncertainty in the results.

In Vietnam, the development of mitigation scenarios in the steel production sector uses the default emission factors according to the IPCC Tier 3 approach in different types of technology, with the activity data following the top-down approach. All countries use these IPCC default emission factors. However, countries have different equipment and technology status, operating conditions, and input materials, and hence emission factors may be different compared with the IPCC default values. During the framework of the Thesis, GHG emission factors will be determined by using measurement, calculation, and actual monitoring methods to compare with other estimation methods. The research object is Thai Nguyen Iron and Steel Joint Stock Company with a mixed production process of both BOF and EAF technologies. This emission factor will be applied to calculate emissions and develop GHG emission scenarios with a bottom-up approach, which is the recommended approach for conducting inventory and developing GHG emissions scenarios at grassroots-level. It also provides a more accurate calculation results of GHG emissions and proposes appropriate and feasible solutions in Vietnam's steel production sector.

In addition to the introduction, conclusions, and recommendations, the thesis includes the following main chapters:

Chapter 1: Overview of greenhouse gas emissions and scenarios in iron and steel production in the world and in Vietnam.

Chapter 2: Methodologies for identifying specific emission factors and developing GHG mitigation scenarios in iron and steel production in Vietnam.

Chapter 3: Results of the development and evaluation of the GHG mitigation scenario in the iron and steel production sector in Vietnam.

#### 4. New contributions of Thesis:

- Theoretical contributions: The thesis has applied monitoring and measurement methods to determine the emission factors for two types of technology BOF and EAF in Vietnam. It provides a scientific basis for calculating Vietnam's GHG emissions inventory. Based on that, the thesis has developed GHG emission scenarios for steel production activities to evaluate the impacts of the scenarios on the economic development - of society in Vietnam. By measuring and monitoring emissions, the thesis has determined the emission factors for BOF and EAF technologies in Vietnam. The results provide a scientific basis for GHG emissions inventory in Vietnam. Based on emission factors identified, GHG emission scenarios for iron and steel production were developed. In addition, the impacts of these scenarios on socio-development in Vietnam were also assessed.

- Practical contributions: Firstly, the determination of specific emission factors of iron and steel production in Vietnam would improve GHG inventory results, and the development of effective GHG mitigation scenario which is more accurate and suitable to Vietnam's condition. In particular, with determined specific GHG emission factors, when the carbon market comes into operation, it will support identifying carbon credits in a transparent manner. Secondly, the development of GHG mitigation scenarios in the iron and steel production sector will help decision makers in the fields of the iron and steel production and

climate change to identify roadmaps to both GHG reduction and sustainable development.

**Research Supervisor**



**DO TIEN ANH**

**PhD Candidate**



**DOAN THI THANH BINH**