An analysis climate change of the curriculum in Indonesia

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Abstract. This study aims to analyze climate change content integrates into the new geography curriculum in Indonesia. This research uses content analysis method of curriculum document consisting of basic competence and syllabus. Results represent that overall basic competence provides a huge opportunity for students to learn climate change. But the condition is not supported by the syllabus. The topics of climate change in the syllabus are a bit and also dominated by aspects of cognition of climate change. Those are serious problems to integrate the climate change in curriculum. The Teachers will get into difficulty to teaching maximum because the teacher's understanding of the concept of climate change in Indonesia is very limit. Therefore, it needs to be supported by a syllabus that explicitly presents topics and learning activities. The findings of this research are essential to provide input to the government in future curriculum reviews.

1. Introduction
Climate change is the serious threat to inhabitants of the earth [1,2]. Currently, climate change has affected hydrometeorological disasters such as floods, tornadoes, landslides, and abrasions [3]. In Indonesia, the impact of climate change has been increasing. The trend of natural disaster events from the years 1900 - 2015 dominated by hydrometeorological with 251 registered. The incident has claimed the death of 12,248 and the loss of US $ 31,972,792 [4].

The most impact of climate change is the increased incidence of rob floods resulting from rising sea levels. Especially in big cities in Indonesia such as Jakarta, Surabaya, and Semarang located close to the coastal. These cities are vulnerable to drowning in the next few years. Caused by the decline of the soil surface by the high exploitation of groundwater as happened in the city of Jakarta [5]. If this condition continues, climate change will be a disaster threat to the people of Indonesia [6].

As a developing country, Indonesia is very vulnerable to the impacts of climate change due to socio-economic conditions of the community and the high number of the poor population [7,8]. Furthermore, Indonesian children also become vulnerable caused by mostly school located in disaster-prone areas [9]. The magnitude of the hazard of climate change impacts, make the Indonesian government began integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) into the school curriculum in 2010.

The program is a means to form students cognition early on as an effort to improve disaster resilience [9–11]. Education will increase awareness of climate change, so the students can adapt and act appropriately to reduce the impacts of climate change [12].

One of the recommended subjects for integrating climate change into the curriculum is geography [13]. Geography is closely related to the interaction between humans and the environment [2,14–16].
The Crucial aspect in the learning of geography is the ability to think integrative to the environment [17]. This ability emphasizes students to understand that environmental problems strongly influenced by the interaction between humans and nature. It accords with the development of the geography curriculum paradigm, formerly only in the context of the understanding of the region has now expanded to the relationship between humans and the environment.

The characteristics of geography are using the principal approach include spatial, environment, and regional complex [18,19]. The environmental approach in geography emphasizes human interaction with nature [20]. Geography subject in the school educates students on various efforts to support sustainable development [21]. Therefore, the major of geography contribute to protect the environment and reduce the impact of global climate change [22].

Climate change issues can be taught on a variety of topics in geography subjects such as weather and climate, natural resources, the environment, and the hydrosphere. Teaching climate change on the topic should be supported by a curriculum integrated with climate change adaptation content. Therefore, this study aims to analyze the content of the new edition of geography curriculum consisting of basic competence and syllabus in Indonesia. The focus of analysis is only in the senior secondary school of 10th and 12th grade. Because in that grade, geography becomes an independent subject. Whereas in the junior secondary school, geography integrated into social science group consisting of history, economics, and sociology [23].

2. Methods
This study uses content analysis method which aims to perform the systematic and objective analysis [26, 27]. The contents analyzed are curriculum documents covering basic competence and topics in the 10th-12th grade geography syllabus in Indonesia. Basic competence is a minimal ability set by the government to be capable students in a subject. The syllabus is a derivative of basic competence consisting of topics and learning activities. Basic competence and syllabus are guidelines in the lessons used by geography teachers throughout Indonesia.

The curriculum document selected in this study is the new edition released by the Ministry of Education and Culture of the Republic of Indonesia in 2016. The content analysis made with the following steps:

1. Establishing a category. the categories used to involve three aspects of climate change: cognition of climate change, impacts of climate change, and adaptation of climate change. The categories are based on literature review.
2. Define the unit of analysis covering basic competence in the geography curriculum and topic encoded in the geographic syllabus. There are 36 basic competencies and 89 topics in the syllabus identified for analysis.
3. Identify and calculate the percentage of basic competencies related to climate change. Researchers identify the extent to which basic competencies offer an opportunity to educate students about climate change.
4. Analyze and calculate the percentage of topics in the syllabus related to climate change.
5. Sorting the topics in the syllabus related to climate change into the analytical category. The data selection is based on phrases explicitly in the topics and learning activities contained in the syllabus. There are several phrases identified for each category (see appendix 1).
6. Calculating the percentage of topics related to climate change into the categories of cognition of climate change, the impacts of climate change, and adaptation to climate change.

3. Result and Discussion
3.1. Basic competencies on climate change in 10th-12th grade
The result of the analysis on the basic competence of the geography curriculum found that overall content of climate change in grades 10-12 was 50.01% consisting of 28, 58% in 10th grade and 21.43% in 11th grade. But in 12th grade, no basic competency related to climate change (table 1).
Based on the table 1, in the 10th grade, there are four basic competencies related to climate change, including:

1. Analyzing the dynamics of the atmosphere and its impact on life. This basic competence emphasizes students' understanding of the dynamics that occur in the Earth's atmosphere such as weather and climate [23]. It provides a large proportion of students' cognition of climate change. It can be as a topic of weather and climate by linking current global climate anomalies, so students understand that climate change poses a dangerous threat to humans on earth [1].

2. Illustrate the process of atmospheric dynamics using maps, charts, drawings, tables, graphs, videos, and/or animations. This basic competence emphasizes the students' skills to represent the various processes of atmospheric dynamics with maps or drawings.

3. Analyze the dynamics of the hydrosphere and its impact on life. In the context of climate change, this basic competence provides the teachers to present various issues concerning the hydrosphere, such as the occurrence of acid rain and the effects of climate change on the hydrological cycle.

4. Demonstrate the process of hydrosphere dynamics using maps, charts, drawings, tables, graphs, videos, and/or animations. This basic competence provides an opportunity for teachers to train students' skills and ability to critical thinking in describing the various problems of hydrosphere dynamics caused by the impact of climate change using maps, charts, pictures, and videos.

Furthermore, in the 11th grade, there are 3 basic competencies related to climate change, such as:

1. Analyzing national food security, provision of industrial materials, and renewable energy potentials in Indonesia. These basic competencies emphasize the students' ability to analyze the national food security issues [23]. It provides an opportunity for teachers to link learning topics to the impacts of climate change on food security in Indonesia. Specifically by presenting the problem of global climate anomaly that impacts on crop failure in some food producing regions in Indonesia.

2. Analyzing the types and handling of natural disasters through education, local wisdom, and utilization of modern technology. The basic competence emphasizes students' ability in analyzing various types of disasters, one of which is the hydrometeorological disaster. The increasing trend of hydrometeorological disaster in Indonesia is the impact of climate change [3]. Hence, the basic competence contributes an opportunity for the teacher to explain about hydrometeorological disaster preventions. By introducing various local wisdom of indigenous peoples in Indonesia for biodiversity conservation.

3. Make sketches, plans, and/or regional potential disaster maps and disaster mitigation strategies based on maps. This basic competence emphasize students' skills in presenting disaster risk indexes using maps, sketches, and floor plans [23]. It provides an opportunity for teachers to coach students to calculate the hydrometeorological disaster risk index in their respective areas. And it also crucial to understand students at the risk of hydrometeorological disaster in their area. Hope that if students already know the threat of disaster, then they can reduce the risk.
3.2. Topics related to climate change on geography syllabus in 10th-12th grade

The findings of the analysis on topics in the syllabus related to climate change get 21.99%, with the percentage of 7.7% in the 10th and 14th grade, 29% in the 11th grade. whereas in 12th grade, there is no topic that discusses climate change (table 2).

### Table 2. Syllabus related to climate change

| Grade | Number of Topics In Syllabus | Topics Related to CC |
|-------|-----------------------------|----------------------|
|       | N | %                        |
| 10    | 39 | 3 | 7.7 %    |
| 11    | 35 | 5 | 14.29 %  |
| 12    | 15 | 0 | 0         |
| Total | 88 | 21.99 %     |

CC: Climate Change

In 10th grade, there are three topics related to climate change including:
1. Classification of climate types and global climate patterns.
2. Climatic characteristics in Indonesia and their impact on human activities.
3. The effects of global climate change on life.

Then, in 12th grade there are five topics related to climate change:
1. The Cycle of disaster management
2. Distribution of disaster-prone areas in Indonesia
3. Community participation in disaster mitigation in Indonesia.

3.3. Percentage of climate change categories in the topic of geography syllabus in 10th-12th grade

This study also analyzes the content of climate change cognition, impact, and adaptation on topics within the geography syllabus. The result is the majority of the topics in the geography syllabus are dominated by the cognition aspect with the percentage of 50%. The aspects of climate change impacts and climate change adaptation each contain only 25% (see table 3). This condition is very apprehensive. Because the main objective of climate change learning is to build cognition on climate change and its consequences, also to shape attitudes and awareness through various efforts to reduce the impacts of climate change [2].

### Table 3. Composition of climate change aspects in the topic of geography syllabus

| Category                     | Grade | Total |
|------------------------------|-------|-------|
|                              | 10    | 11    | 12    | N    | %    |
| Cognition of climate change  | 1     | 3     | 0     | 4    | 50   |
| The impacts of climate change| 2     | 0     | 0     | 2    | 25   |
| adaptation of Climate change | 0     | 2     | 0     | 2    | 25   |
| Total                        | 3     | 5     | 0     | 8    | 100  |

3.4. Discussion

This study aims to analyze the extent to which climate change content integrates into the geography curriculum in Indonesia. An important finding in this study is that the percentage of basic competencies related to climate change is very supportive to educate students about climate change in secondary education. It is an improvement in climate change education in Indonesia [7]. In addition, corroborating the findings of previous research [9]. However, it is not supported by topics in the geography syllabus. The percentage of climate change topics in the syllabus is still very low.

This condition is very unfortunate because geography subjects have a big role in shaping the cognition and attitude of students about climate change [28]. Geography has a characteristic environmental approach that is characteristic of geographical studies that distinguish it from other
Another finding is the cognition aspect dominating climate change content in the geography syllabus. Seen from the topics and learning activities in the syllabus, it largely emphasizes the students' cognition and impacts of climate change. These conditions do not conform to the essential nature of the goal of climate change content integration in the geography curriculum. In essence, climate change education should be able to form a comprehensive understanding covering the cognition, impacts of climate change, adaptation and efforts to reduce the damage of climate change.

Necessarily the topic in the syllabus emphasize more examples of human activity that can cause climate change. Once students are aware of the impacts of climate change caused by human activities, they can play a role by engaging in various communities to campaign for appropriate action in protecting the earth to communities and families. In addition, the topics in the syllabus need to present the national action framework for adaptation and mitigation of climate change according to the United Nations Framework Convention on Climate Change (UNFCCC). This is very important because education is a strategic tool to reduce the impact of climate change by strengthening the cognition of students and society.

Moreover, the substance of the latest issue curriculum emphasizes the formation of student attitudes and skills. The curriculum provides a great opportunity for teachers to shape students' awareness of climate change and work to reduce the impacts of climate change. Therefore, this research suggests to the Ministry of Education and Culture of the Republic of Indonesia to revise the topics in the syllabus of geography. It is very important to implement considering climate change education is an absolute requirement for students in Indonesia. As an archipelagic country, Indonesia is experiencing a huge impact due to climate change. It is time for the government to seriously address the issue. This is to prepare future generations that can adapt to climate change and have a caring attitude to the environment with various actions taken to save the earth from the threat of climate change.

4. Conclusion
Overall basic competencies in the geography curriculum provide a great opportunity for learning climate change to the students. The content of climate change in basic competence reaches 50.01%. However, it is not supported by material/topic and learning activities in the geography syllabus. The content of climate change in the syllabus is only 21.99%. These conditions will have implications for learning in schools. This is because most teachers in Indonesia have not fully comprehensively grasped climate change materials.

Therefore, it needs to be supported by a syllabus that explicitly presents topics and learning activities. In addition, the most worrying thing is from the whole topic and the learning activities contained in the syllabus is dominated by the cognition aspect. This will have an impact on climate change learning in Indonesia that has not succeeded in shaping student attitudes in adaptation efforts and contributing to reducing the impacts of climate change with various actions.

Acknowledgement
This research refers to dissertation research project. Therefore, the authors grateful to the Ministry of Technology and Higher Education of the Republic of Indonesia who has provided Ph.D. scholarship to the author.

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