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Deforestation: The Varying Drivers and the Policy Consequences (How deforestation drivers are different among regions and how it impacts the deforestation-reduction policy)

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A B S T R A C T S

The importance of keeping forest has been widely recognised by the international community. In addition to that, the purpose of this study is to examine the authors' statement to other literary works. Difference and similarity of deforestation across regions that were found in other researches will be discussed. Also, the implication of the different deforestation drivers to the anti-deforestation policy will also be discussed. The difference in deforestation drivers can be seen at various spatial scale. Because each region can have different deforestation drivers, anti-deforestation policies that should be taken are also different among regions. The sector, the actor, and even the commodity that drive deforestation should be identified because the identification helps the policymaker and the public in taking the right action. Consequently, we can adjust our policy over time to guarantee that we always have the most relevant and the most effective policy to combat deforestation.

1. INTRODUCTION

Forest cover loss is a major environmental issue due to its impacts on the Earth environment, including the climate system (Seymour and Harris, 2019). Deforestation releases carbon to the atmosphere, contributing over 10% of total carbon emission in the world (Schadler, 2016). The direct impact of deforestation can also be experienced in the form of changing local surface temperature through a change in albedo and evapotranspiration (Prevedello et al., 2019), and changing precipitation pattern due to change in moisture cycle (Chambers et al., 2017).

The importance of keeping forest has been widely recognised by the international community. Intergovernmental Panel on Climate Change (IPCC) report by (Nabuurs et al., 2017) mentioned that, as a mitigation effort against climate change, reducing deforestation is more critical than reforestation. Seymour and Busch (2016) also highlighted the importance of fighting deforestation because keeping forest not only preventing carbon emission but also allows carbon sink from the atmosphere. Stopping tropical deforestation has the potential of reducing 30% of global carbon emission (Seymour and Busch, 2016).

In a recent Perspectives article in Science, Seymour and Harris (2019) discuss tropical deforestation reduction. In the article, they propositioned that deforestation drivers are varying across regions and changing over time. Consequently, these drivers are affecting the policies that should be taken in a region (Seymour and Harris, 2019). To explain the proposition, Seymour and Harris (2019) compare deforestation drivers and anti-deforestation efforts in three particular tropical regions, which are Brazilian Legal Amazon, Congo Basin, and Indonesia.

This essay was written to examine the authors' statement to other literary works. Difference and similarity of deforestation across regions that were found in other researches will be discussed. Also, the implication of the different deforestation drivers to the anti-deforestation policy will also be discussed.

2. THE DIFFERENCE IN DEFORESTATION DRIVERS

In the Perspective article, Seymour and Harris (2019) mentioned that cattle ranching is the prime contributor of deforestation in Brazilian Legal Amazon. Different drivers are found in Indonesia, where palm oil and pulpwood industries as the primary contributor of deforestation (Seymour and Harris, 2019). Meanwhile, in the Congo Basin, deforestation is mostly driven by small-scale commercial farmers that plants for their own or local needs (Seymour and Harris, 2019). The drivers in the three regions illustrate the difference between drivers that can exist among regions, and other studies also find differences in deforestation drivers at various spatial scale.

At a worldwide area of study, De Sy et al. (2019) and Sculion et al. (2019) identify the deforestation drivers across continents. Using remote sensing data between 1990-2000, De Sy et al. (2019) found that small-scale crop plantation was the driver of deforestation in Asia and Africa, while ranching was responsible for most deforestation in

Latin America (De Sy et al., 2019). A meta-analysis by Sculion et al. (2019) discovered that logging has the highest responsibility for causing deforestation across continents, except in Latin America in which agriculture plays a more dominant role to deforestation in that region.

Differences in deforestation driver can also be found at a continental scale. Armentaras et al. (2017) observe deforestation drivers in each type of forest (differentiated by the forest's latitude and altitude) in Latin America. In most of the forest type in Latin America, agriculture is the main drivers, followed by cattle grazing (Armentaras et al., 2017). However, a distinct driver was found in the Atlantic Forest region, where infrastructure expansion is the second dominant driver after agriculture.

Austin et al. (2019) investigate the causes of deforestation in Indonesia, and at a national level, differences in deforestation drivers can also be found. Research by Austin et al. (2019) point out that there are four distinct deforestation drivers in main Indonesian islands, which are timber plantation (can be found in Sumatera), palm oil plantation (Kalimantan), small scale agriculture (Sulawesi, Java, Bali, and Nusa Tenggara), and infrastructure (Papua).

Deforestation drivers are also changing over time (Rudel et al., 2009; Austin et al., 2019). In general, deforestation actors has changed from smallholder farmers in the pre-1990s to large-scale enterprise in recent years (Rudel et al., 2009). A shift in dominant drivers is also identified in Brazilian Legal Amazon, where the contribution of soy plantation to deforestation has been shrunk since 2004 (Seymour and Harris, 2019), and in Indonesia, where palm oil plantation contribution to deforestation has significantly dropped from 50% in 2006 to 15% in 2016 (Austin et al., 2019). These driver changes show that deforestation driver is dynamic.

Although the exact causes are varying, in general, similarities of deforestation drivers can still be found. For instance, most of the drivers mentioned by Seymour and Harris (2019) are related to agriculture. Some studies also classified agriculture as a group, rather than individual commodities. In these studies, agriculture is the dominant drivers of deforestation (Kissinger et al., 2012; De Sy et al., 2019; Sculion et al., 2019; Busch and Ferretti-Gallon, 2019), contributing around 80% of world's deforestation (Kissinger et al., 2012). Taking successful actions in the agriculture sector can have significant impacts on the number of deforestation.

3. DRIVER-BASED ANTI-DEFORESTATION POLICY

Identifying deforestation drivers is an essential part of developing a deforestation reduction policy (Honosuma et al., 2012). An effective anti-deforestation policy requires in-depth knowledge of local drivers and underlying causes of deforestation (Armentaras et al., 2017). Multiple Conference of the Parties (COP) of United Nations Framework Convention on Climate Change (UNFCCC) reports mentioned the importance of identifying and addressing deforestation drivers to stop deforestation (UNFCCC, 2008; UNFCCC, 2011; UNFCCC, 2014). In the Perspective article, Seymour and Harris (2019) give examples of driver-based policies in the three regions.

Deforestation actors is an important aspect of deforestation drivers that should be noted, and different policy approach should be taken regarding the deforestation actors. In Brazilian Amazon, where industries are the main deforestation actors, a moratorium to punish high deforestation municipalities was enforced and cause a decline in forest loss (Seymour and Harris, 2019). Meanwhile, in the Congo Basin, where smallholders are the main deforestation actors, the policies must involve farmers engagement and provide the farmers with an alternative source of income (Seymour and Harris, 2019). Past research by Rudel (2017) also supported this argument. In a region where the large-scale industry is the main contributor of deforestation, Reducing Emissions from Deforestation and Degradation (REDD+) programs should be managed by national governments (Rudel, 2017), because the governments can directly approach companies. Meanwhile, in a region where smallholders are the dominant actors, REDD+ program is better implemented through local organisations (Rudel, 2017), because community-based organisations are usually closer to individual farmers.

Another example of deforestation drivers that have distinct policy set is forest fire. Forest fire is associated with dry condition (De Groet, 2007). Therefore, reducing forest fire risk can be achieved through rewetting peatlands (Seymour and Harris, 2019). Early warning system can also be developed for better forest fire mitigation and management (De Groet, 2007; Boer et al., 2017). These policies will not be useful to address other deforestation drivers, such as agriculture and timber plantation.

Agriculture is an interesting driver. Studies are suggesting a policy that addresses agriculture as a group rather than suggesting different policy for each commodity (Angelsen, 2009; Kissinger et al., 2012; Busch and Ferretti-Gallon, 2019). For example, the establishment of protected areas on the borders of agriculture plantation by the Brazilian government was proven to be effective in reducing deforestation (Seymour and Harris, 2019). Although agriculture can be addressed as a group, identifying the specific agricultural commodity is still essential. Specific commodity identification allows policymaker and public to target the right commodity for advocacy campaign and green certification. Seymour and Harris (2019) mentioned that the advocacy campaign pressured the soy traders that drive deforestation in Brazilian Amazon. A similar event also takes place in palm oil commodity. NGOs activism pressures palm-oil industries and the Indonesian government to conduct a more sustainable production (Khor, 2011; Dauvergne, 2017). Green certification also introduced to ensure sustainable production of agricultural commodities, including minimising the impact of agriculture commodities on forest. Green certification was initiated separately for soy and palm oil through Round Table on Responsible Soy (RTRS) and Roundtable on Sustainable Palm Oil (RSPO) respectively.

4. CONCLUSION

Seymour and Harris (2019) have the right proposition. Deforestation drivers are, indeed, varying spatially and temporally. The difference in deforestation drivers can be seen at various spatial scale. Because each region

can have different deforestation drivers, anti-deforestation policies that should be taken are also different among regions. The sector, the actor, and even the commodity that drive deforestation should be identified because the identification helps the policymaker and the public in taking the right action.

We need to keep improving our efforts in identifying and understanding the deforestation drivers. Research on deforestation drivers also needs to be conducted regularly because deforestation drivers are dynamic and can change over time. Regular research on deforestation drivers will ensure that we have the latest information on why deforestation is happening in a region. Consequently, we can adjust our policy over time to guarantee that we always have the most relevant and the most effective policy to combat deforestation.

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