

Systems Thinking is Critical in Developing Solutions to Sustainability Challenges

Posted on October 8, 2019

Introduction

The concept of sustainability has gained increasing momentum in recent decades. During the 1987 World Commission on Environment and Development Summit, the United Nations defined sustainability as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations n.d.). United Nations' definition of sustainability has provided a very broad and holistic concept. However, various contemporary journals have identified two major areas of concern that sustainability theories apply to: environmental and social sustainability, respectively (Carroll & Shabana 2010; Enjolras & Aubert 2018). That said, having only the mindset to pursue sustainability is inadequate to achieve future sustainability goals (Enjolras & Aubert, 2018). Williams, Kennedy, Philipp, and Whiteman (2017, p. 866) expressed that many contemporary sustainability decisions emphasized short-term sustainability. Lack of systems thinking in their sustainability decisions causes such decisions to be ineffective in the long-term or misaligned with long-term sustainability goals. The purpose of this written report is to discuss the concept of systems thinking and its application to sustainability challenges. To elaborate on the provided discussion topic, the written report will use the deforestation issue to exemplify how systems thinking can resolve this wicked problem.

Discussion

Conceptual Framework on Systems Thinking

Prior to the discussion of sustainability, the concept of systems thinking should be the central theme of discussion. The theoretical framework of systems thinking derives from the term system, where a system could be any group of interrelated parts that are integrated to become a complex and unified whole (Kim n.d.). There are several key characteristics of a successful system. For example, one of the keys to a system is that each part that operates within the system is interdependent with its other parts. Therefore, all parts of the system must be in place for the system to operate effectively. This is essential because each part of the system is interdependent with the others (Kim n.d.). Therefore, it is often impossible for the system to function appropriately or identically without all of its parts (Kim n.d.). In addition to that, purpose is another vital characteristic of a system. The purpose of a system is what drives the system to move towards an intended goal or direction (Kim n.d.).

With that in mind, when the concept of systems is applied to systems thinking, systems thinking intends to consider issues and problems from a more holistic perspective (Williams et al. 2017).



Figure 1: Traditional Thinking versus Systems Thinking (Williams et al. 2017)

Noting from Figure 1, traditional thinking is often demonstrated as an event-oriented process, where one event is used to derive the following event. In this case, event A or event B derives event C, and after which event C derives event D (Williams et al. 2017). However, the critical issue with traditional thinking is that there is no interdependence between event A and event B with event D (Williams et al. 2017). Therefore, the connection between Event A and Event B with the final outcome of Event D is causally related, and there is less guarantee for Event D to be achieved as a result of Event A and Event B (Williams et al. 2017). On the contrary, according to the diagram on the right, systems thinking is a more holistic approach to thinking, where each event becomes more interdependent as they are locked in a circular flow (Williams et al. 2017). Therefore, under systems thinking, there is greater causality between Event A and the final outcomes of Event D and Event E (Williams et al. 2017).

Application of Systems Thinking to Sustainability

Applying concepts of systems thinking to issues of sustainability, when sustainability is considered using a traditional thinking approach, resolutions are often short-term oriented (Molderez & Ceulemans, 2018). For example, there are two popular solutions to carbon dioxide emissions from fossil fuel-powered vehicles in the contemporary world, these being biofuels and electric-powered vehicles, respectively (Molderez & Ceulemans 2018). The invention of these solutions can be explained by the traditional thinking approach demonstrated in Figure 1, where biofuel and electric-powered vehicles denote A and B in the traditional thinking model, respectively, and these two inputs are trying to derive objective C (reduction in carbon emission from vehicles), so that environmental sustainability (objective D) can be achieved. However, many researchers have pointed out that these seemingly logical solutions to sustainability issues can be ineffective in the long term (Molderez & Ceulemans, 2018).

For example, electric-powered vehicles rely on lithium batteries to power these vehicles. However, the carbon emissions released during battery production is very minimal as compared to the consistent release of carbon emissions by fossil fuels during the usage of a fossil-fuel-powered vehicle. However, researchers have revealed that lithium batteries are non-decomposable wastes, and they can cause significant pollution to soil and land when their useful life as batteries ends (Ateskan & Lane 2018). Therefore, when the traditional thinking approach is deployed to attempt to resolve sustainability issues, short-term resolutions may not often lead to the achievement of long-term goals. The example of an electric-powered car demonstrates that the short-term solution will reduce climate change in the short-term; however, issues of environmental sustainability may

become more severe in the long-term (Ateskan & Lane 2018).

Consequently, contemporary researchers have attempted to utilize systems thinking as a more effective approach to resolving sustainability issues in the long term. In comparison, the systems thinking approach tends to place environmental issues within a large system so that each part of the sustainability issue is interrelated to the final sustainability goal (Ateskan & Lane 2018). As a result, resolutions developed under systems thinking holistically consider all of the potential consequences in both the short and long term (Ateskan & Lane, 2018).

Issues of Deforestation

Deforestation is one of the most severe environmental sustainability issues that the planet Earth has encountered during the recent decades (National Geographic n.d.). As a result of the industrial revolution, human kinds have massively deforested the Earth's forests on a massive scale within the past two centuries (National Geographic n.d.). It is anticipated that approximately 45% of total forest areas have been lost within the past two centuries and that forests only covered approximately 30 percent of the world's land area in 2016, as compared to approximately 62% prior to the Industrial Revolution (National Geographic n.d.). Research has shown that approximately half the size of the United Kingdom has been deforested on a yearly basis (National Geographic n.d.).

Deforestation is associated with various environmental issues around the world. Forests (trees) are renowned for their ability to absorb carbon dioxide and release oxygen. Therefore, as deforestation occurs around the world, there are fewer forests to absorb the carbon dioxide released by all different species and activities around the world (National Geographic n.d.). As a result, deforestation has always been identified as one of the major causes of climate change. In addition to that, deforestation has significantly impacted the ecosystem. More than millions of species have vanished and become extinct due to deforestation (National Geographic n.d.). It is declared that approximately eighty percent of Earth's land animals and plants live in forests, many of which cannot survive in other natural environments (National Geographic n.d.).

Consequently, many concerns about deforestation and its subsequent sustainability issues have been voiced by modern society (National Geographic n.d.). However, it is considerably difficult to cease deforestation as a result of the human world's industrial needs (Sheehy, Wylie, McGuinness & Orchard 2000). Many value chains in the modern business world rely on forest resources, i.e., timbers are used in construction, printing, etc. (Sheehy et al. 2000). The wide use of forest resources makes these resources difficult to replace (Sheehy et al. 2000). In recent years, many researches have been devoted to resolve issues of deforestation, and the majority of these researches commenced to resolve such issue from a long-term perspective (Green Peace n.d.). In Sun, Southworth, and Qiu's (2015) published article, they have recognized that corporations are those who are behind deforestation. Therefore, if corporations have the power and ability to deforest, they also have the ability to preserve forests (Sun et al., 2015).



Figure 2: Interconnectedness of different environmental issues (Bosch & Nguyen 2017)

According to Figure 2, it is noted that the deforestation issue is interconnected with various major issues such as energy use, population growth, agriculture, etc., while it is also interrelated to various microscopic issues such as land use and carbon emission (Bosch & Nguyen 2017). Viewing from Figure 2, it is recognized that deforestation is situated in a major part of the modern supply chain (Bosch & Nguyen 2017). Therefore, in order to resolve deforestation, it is vital to find the root causes of deforestation and identify the long-term resolutions that are effective in the long term (Bosch & Nguyen 2017). For example, in Harting's (2013) research article, it is expressed that many contemporary deforestation policies focus on limiting the amount of forests that are allowed to be deforested per annum, i.e., Brazil has required corporations farming mahogany to earn licenses and permits (Harting 2013). However, such a resolution may only temporarily reduce the pace of deforestation; it does not offer a long-term resolution to deforestation (Harting 2013).

On the other hand, major research on systems thinking resolution to deforestation has highlighted the significance of using corporate social responsibility in constraining corporations' deforestation activity (Harting 2013). In addition to that, contemporary literature reviews have identified the significance of developing alternative resources to replace forest resources (Harting 2013). For example, the usage of laminate materials to replace hard timber in construction can significantly reduce forest resource consumption in the construction industry (Harting 2013). In addition to that, the development of reusable papers will also significantly reduce forest resources consumed in producing wood-made papers (Harting 2013). These alternatives do not directly require corporations to reduce the pace of their deforestation. However, they have significantly reduced the demand for forest resources in the contemporary world (Harting 2013). Many of the short-term resolutions (i.e., banning deforestation) sought to resolve the problem from the supply side, while under the systems thinking approach, the demand side should be emphasized to resolve the deforestation issue in the long run (Harting 2013).

Conclusion

In short, the written report has highlighted issues of deforestation and the application of a systems thinking approach to resolve issues of deforestation. The report has compared the systems thinking approach with the traditional thinking approach to resolve deforestation issues. From a traditional thinking perspective, regulators have sought to resolve the issue by banning deforestation. However, this does not solve the issue in the long-term, considering that demand for forest resources has not been impacted by resolutions derived from the traditional thinking approach. Under the systems thinking approach, the resolution sought to resolve the issue by addressing the demand for forest resources. The systems thinking approach sought to resolve the issue by developing alternatives to forest resources so that demand for forest resources would be reduced. This consequently demotivates corporations from deforesting.

Reference

Ateskan, A, & Lane, J 2018, 'Assessing teachers' systems thinking skills during a professional development program in Turkey', *Journal Of Cleaner Production*, 172, pp. 4348-4356, Social Sciences Citation Index, EBSCOhost, viewed 15 April 2018.

Carroll, A.B & Shabana, K.M 2010, 'The business case for corporate social responsibility: A review of concepts, research and practice.' *International Journal of Management Reviews*, vol. 12, no. 1, pp.85-105.

Enjolras, G, & Aubert, M 2018, 'Short food supply chains and the issue of sustainability: a case study of French fruit producers,' *International Journal of Retail & Distribution Management*, vol. 46, no. 2, pp. 194-209. Available from: 10.1108/IJRDM-08-2016-0132. [15 April 2018].

Green Peace n.d., *Solutions to Deforestation*, Green Peace, retrieved 15 April 2018, <
<https://www.greenpeace.org/usa/forests/solutions-to-deforestation/>>

HARTUNG, K 2013, 'Carbon dynamics: Ever going to stop increasing?', *SEFBIS Journal*, 8, p. 15,

Kim, D n.d., *Introduction to systems thinking*, Systems Thinker, retrieved 15 April 2018, <
<https://thesystemsthinker.com/introduction-to-systems-thinking/>>

National Geographic n.d., *Deforestation*, National Geographic, retrieved 15 April 2018, <
<https://www.nationalgeographic.com/environment/global-warming/deforestation/>>

Molderez, I, & Ceulemans, K 2018, 'The power of art to foster systems thinking, one of the key competencies of education for sustainable development,' *Journal Of Cleaner Production*, 186, pp. 758-770, Business Source Complete, EBSCOhost, viewed 15 April 2018.

Sheehy, NP, Wylie, JW, McGuinness, C, & Orchard, G 2000, 'How Children Solve Environmental Problems: using computer simulations to investigate systems thinking,' *Environmental Education Research*, vol. 6, no. 2, p. 109.

Sun, J, Southworth, J, & Qiu, Y 2015, 'Mapping multi-scale impacts of deforestation in the Amazonian rainforest from 1986 to 2010', *Journal of Land Use Science*, vol. 10, no. 2, p. 174. Available from: 10.1080/1747423X.2013.858785. [15 April 2018].

United Nation n.d., *Sustainable Development*, United Nation, retrieved 15 April 2018, <
<http://www.un.org/en/ga/president/65/issues/sustdev.shtml>>

Williams, A., Kennedy, S, Philipp, F, & Whiteman, G. 2017, 'Systems thinking: A review of sustainability management research,' *Journal of Cleaner Production*. Available from: 10.1016/j.jclepro.2017.02.002. [15 April 2018].