UNDERSTANDING ASSAM'S SUSTAINABILITY ISSUES

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ABSTRACT

Assam was the first state in India to have undertaken the Global Sustainable Development Goals (SDGs) as a long-term guiding strategy for development. At the end of five years, before the state election, evaluating the work on SDGs in Assam is essential to follow up on the commitment of the government. But before we start evaluating the SDGs it is important to understand the development road Assam has taken over the last 100-150 years and why we must make a new turn. This study has tried to understand certain loopholes which have hampered the progress of SDGs in Assam along with how much Assam has been able to address its sustainability issues and how we can progress. We have reviewed the performance of the state based upon the official performance index released by NITI Aayog, Government of India. Our review of the index reflects that Assam has performed relatively poorer than the other states of the country. However, the ethnic culture of the region was deeply rooted in nature which the state can now adopt and harness to achieve its SDGs.

KEYWORDS: *Sustainable Development Goals; Assam Election; Indigenous Knowledge; Citizen Science; Polycentric Governance*

1. INTRODUCTION

In 2015, the 17 Sustainable Development Goals (SDGs) were adopted by the countries. It was a new historic agreement on climate change with a shift in opinions on international commitments to sustainability and development (Scoones, 2016). Unlike the Millennium Development Goals (MDGs) the SDGs primarily focused on economic security, social security and environmental sustainability (Arora & Mishra, 2019). Particularly the SDGs have given more emphasis to environmental sustainability as 6 out of 17 goals which include goals 6,7, 12,13,14,15 are directly related to developing a sustainable environment (Arora & Mishra, 2019). While the MDGs had goals on environmental sustainability but it mainly focused on poverty eradication for underdeveloped countries, the SDGs, on the other hand, constituted 17 goals which apply to all the nations of the world (Arora & Mishra, 2019). These goals are much broader as they contain more varied dimensions than the MDGs. Many countries have adopted the SDGs and India too has marched forward towards achieving these SDGs.

In light of this event, the Government of Assam started its path on Implementation of Sustainable Development Goals in Assam in January 2016. The Government of Assam launched Assam 2030, a guiding

document that defines the ambition of the state. The document quantifies itself to ensure the health, happiness, prosperity and wellbeing of every citizen of Assam, as well as the conservation and preservation of the State's unique bio-diversity, which is critical for the sustainable development and economic growth of Assam (Bhamra & Niazi, 2016). Assam is the first state in India to have undertaken the Global Sustainable Development Goals as a long-term guiding strategy for development in the state (Assam Agenda 2030, 2016).

Assam was a tribal-dominated resource-rich area, which has developed itself through multiple migration waves resulting in a diverse ethnic and cultural enrichment of the region (ENVIS Center, 2016). Assam, as well as its sister states of North East, has a close cultural link with nature. It has a unique geo-climatic condition (ENVIS Center, 2016). Almost the entire state lies in the Brahmaputra valley and the northern and eastern part of this valley is bounded by Himalayan frontal thrust which makes the state more prone to various natural calamities such as floods, earthquakes and landslides (ENVIS Center, 2016).

And the ever-increasing population and competition among the different ethno-religious groups can further complicate resource sharing and development. This has and can further intensify conflicts and division (Shrivastava & Heinen, June 2007). Sustainable Development can be portrayed as a manageable and holistic pathway to international as well as local development. However, several questions lead to disagreement as to what the goals mean and how and who shall benefit and where the responsibilities lie (Scoones, 2016).

It has been four years since the Assam government has adopted the agenda in 2030. Therefore, at this point, it becomes imperative to review the goals based on environmental sustainability and how far Assam has been successful in achieving these goals. The Assam Development Agenda can be divided into three parts (Chatterjee, 2018). The first phase consists of developing the Vision document (Chatterjee, 2018). The Vision 2030 document has analysed the 17 goals and 169 targets and proposes a broad approach to achieve the SDGs (Chatterjee, 2018). Consequent to this document, what we may call as the second phase, there has been a 7-years Strategy Paper and 3 years Action Plan that minutely details out the road map to achieve the targets set by the Vision document (Chatterjee, 2018). This article has tried to critically understand the requirements, benefits and responsibilities identified and taken up by Government of Assam to address the needs of the citizens both in urban and rural context as reflected on the initiative for

Sustainable Development Goals in Assam. However, before we start our discussion on sustainability and development undertaken by the government it is imperative to understand the socio-economic structure and development of the region at least from colonial days. This will help us to understand the requirements, benefits and responsibilities identified and undertaken by the Government.

2. A BRIEF HISTORY OF SUSTAINABILITY AND DEVELOPMENT IN ASSAM

The modern development in Assam started after it was annexed by the British in 1826 after tea was discovered in Upper Assam in 1823 (Sharma et al., 2012). Since then (from 1837 onwards) vast areas of forest lands were converted into tea plantations and the forest department that was set-up in the area went about exploiting the resources systematically. Loss of biodiversity is generally attributed to tea-plantation in Assam (Saikia, 2011; Sharma et al., 2012). Due to the scarcity of local labourers, indentured workers were brought from central India (Sharma et al., 2012).

During colonial times, the global market was introduced to the region and it opened up new demands. Two of the most important industries at that time were the tea industry and sawmill industry. In the upper Brahmaputra valley, large tracts of lands were cleared to encourage the growth of the tea industry. Various incentives by the government were started such as Wasteland Rules of 1838 through which wastelands were leased to planters at nominal prices (Sharma et al., 2012). Further to this, peasants were encouraged to colonise and transform forested lands into agricultural lands (Saikia, 2005). Environmental historians put importance on Assam Land Revenue Settlement, 1886 and Assam Forest regulation of 1891 that has changed the forest cover in the region. Due to such policies, tea plantations which represented 8% of the total settled land grew to one-seventh of the entire state area.

With the discovery of coal and oil, the Brahmaputra valley became a strategic location for the British. To transport oil, tea, timber and coal from the valley, the Assam Railways and Trading Company was started. The advent of the railway system in Assam also exerted a lot of pressure on the forests as at that time, railway sleepers were made of wood (Saikia 2008, Sharma et al, 2012).

However, after World War 1, when the global depression had hit the world in 1929, tea export was reduced and as a result, plantation workers were laid off. The plantation workers moved into adjoining

forestlands and river islands where they clumsily converted forest land into agricultural land in their economic desperation (Tucker, 1988; Sharma et al, 2012). This led to deforestation and degradation of the forests. An estimation by Guha, 2006 shows the land-use change for cultivation increased from 45,325 ha (the early 1900s) to 106,028 ha (1920s). Moreover, since the 1930s, migration from other parts of India increased the population exponentially. The population growth of Assam was the second-highest in the world from 1901 to 1961. From 3.7 million in 1901 it rose to 12 million within 60 years (Dass 1980; Sharma et al, 2012) This factor, however, rested on the natives who were reluctant to work in tea gardens and the workforce was imported by the colonial rulers from central India. These labourers caused the transformation of the demography of the valley and also exerted pressure on the natural resources.

The provincial forest department which was set-up to systematically exploit the forest also curtailed the rights and privileges of the natives and restricted the use of forest products. However, it reciprocally also helped in maintaining the forest cover and resources from planters, imported and migrant labourers. This was done by introducing the concept of reserve forests. Most of the reserve forests established in the pre-independence era still survive under the forest department (Saikia, 2005). But by the Second World War, a huge amount of timbers were exploited for the war effort. The timber production increased twice while fuel wood production went up thrice by 1945 (Tucker, 1988).

In short, even though there was a big economic revolution, i.e. a transition from a quasi-feudal system to a global market, it came with a price of massive ecological destruction. Though there was an economic transition, this did not translate to the development and prosperity of the valley. Centuries later the region still remained underdeveloped. Eminent economic historian Amlendu Guha has termed this phenomenon as "a big push without a take-off".

In the 1940s, one of the predominant problems faced by the region was the land and resources conflict. Post-independence, the population in the valley rose drastically due to migration from the adjoining region (Sharma et al., 2012). Assam has varied climate and soil conditions. The state contains both hilly regions and plains and among them there are variations. In hilly areas, the economy was predominantly based on Jhum cultivation while the upper Brahmaputra Valley was already distinguished as a mineral-rich area. However, by the 1950s several major earthquakes in the area changed the landscape to a great extent.

Due to mass immigration, ecological imbalance due to earthquakes, as a result, armed civil unrest spread across the region which had important impacts on the socio-economic development history of the state. This became the Assam Movement or Agitation in 1985 after which the stagnant economy of the state was set to revive. However, despite being the largest producer of tea, oil, plywood and forest products, it continues to be a relatively underdeveloped state (Sharma et al., 2012)

Post-Independence, one of the major economic bases and thrusts for the state has been agriculture. Though initial Five-Year plans focused on increased productivity of agriculture, however, there was a mere 2% increase in arable land. Hence, it can be said that there was no agricultural intensification or expansion. In addition to this, Assam was outside the purview of India's Green Revolution. Post-Independence immigration from Bangladesh and other parts of India increased the pressure on lands (Dass, 1980) and as a result forest covers were cleared. Example: In undivided Lakhimpur and Sibsagar districts, forest cover decreased up to 45% (Goswami, 2002).

'Industry' was another sector which created a base for development in Assam. They generally consisted of the colonial industries such as tea, coal, oil and timber. Unfortunately, keeping up with the colonial extraction traditions, few new ancillary industries were facilitated from the existing ones which otherwise could have paved the pathway for development. `

Environmental issues have become a matter of deep concern as the new developments taking place in the field of industries and all other sectors contribute towards environmental pollution. The UN office for the coordination of Humanitarian Affairs has stated "climate change is not just a distant future threat, but it is the main driver behind rising humanitarian needs and we are seeing its impact". Keeping this in mind and Assam's fragile ecology, the state's development has to consider a sustainable path. The Assam Agenda 2030 is a good step towards achieving it. However, a review is required to assess the actions undertaken by the stakeholders towards this goal.

3. SUSTAINABLE DEVELOPMENT INDEX OF ASSAM

The Sustainable Development Goal (SDG) India index which came in 2018 is an important indicator to monitor the progress of different states and UTs every year. It is an instrument to help the states to ponder upon their strategies if they are not working and devise appropriate strategies to reach the desired targets by 2030 (N.I.T.I, Aayog, 2018). The index measures the

performance in terms of the SDGs of all the states and ranks them based on their performance (N.I.T.I, Aayog 2018). The index has created 4 categories in which all the states are divided according to their performances (N.I.T.I, Aayog, 2018). The first category is known as the aspirant category whose score is below 50, the next category is known as the 'performer category' and includes all those states and union territories whose composite score is between 50-64, the third category is known as the 'front runner category' and includes all those states and UTs with a composite score between 65-99 and the final category is known as the achiever category with a composite score of 100 and beyond (N.I.T.I, Aayog, 2018).

Assam has devised a time-bound strategy of various short term, medium-term and long-term goals which are needed to be achieved between the period (2019-2030) for reaching the desired level of targets by 2030 (N.I.T.I, Aayog, 2018). Therefore, it is imperative for the state to reach the performer category by the end of 2022 and the third category by the end of 2026 and finally the 'achiever category' by the end of 2030 and further maintain it beyond 2030 (N.I.T.I, Aayog, 2018). This time-bound strategy has been developed to maintain steady progress of the state. However, Assam's performance in the SDGs has been relatively poor compared to other states like Kerala, Andhra Pradesh, etc. as indicated by the SDG India Index Baseline Report prepared by NITI Aayog in 2018. The index pointed out that Assam stands almost at the bottom of the list with a score of 49 against a national average of 57, just above Bihar (48) and Uttar Pradesh (42) (N.I.T.I, Aayog, 2018). While most of the states have a score of above 50 including the other northeastern states, it has become a matter of concern that despite being the first state to adopt the SDG in 2016, Assam has not been able to reach the score of 50.

The report further stated that Assam's performance has been pathetic in Goal 3, Goal 5, Goal 6, Goal 7, Goal 9 and Goal 11. Even though the state has scored 100 in Goal 15 i.e. (Life on land sustainability manages forest, combat deforestation) but due to the above-mentioned goals, the overall score of Assam was below the national average score (The Sentinel, 2019). However, the 2019 SDG India index reported that the national average has gone up to 60 from 57 in 2018, and Assam along with Bihar and Uttar Pradesh has also reached the Performers category with a score of 55, 50 and 55 respectively (The Sentinel, 2019). Assam has improved its performance in Goal 6 and 7 and moved to the front runner category from the aspirant category (N.I.T.I, Aayog, 2019). But the state's performance has dropped to the front runner

category from achievers category in Goal 15 and the state is still in the aspirant category in Goal 13 along with Goals 3, 5, 9 and 11 (N.I.T.I, Aayog, 2019). Therefore even though Assam has improved its performance from the previous year's report but to achieve a highly ambitious target by 2030 the government need to buckle up and should consider restructuring of some of the administrative policies so that it could achieve the desired level of success within the stipulated time and become a good model for the other states to follow it.

4. STEPS AHEAD

The SDG India Index Report is an important step towards tracking the performances of different states in terms of implementing the SDGs. Assam being the first state has already prepared a detailed strategy for implementing these goals. Some of the strategies included forming of a nodal department to which will function as the main umbrella department looking after the entire implementing process of the SDGs, under this department a centre has been created to function as a knowledge hub and a cell has also been created for coordination function (N.I.T.I, Aayog 2018). Besides this district planning centres are facilitated to work as a knowledge hub centre for different districts (N.I.T.I, Aayog 2018). Moreover, Assam has also set up 59 core monitorable indicators covering 17 goals and set a baseline as well as final and intermediate targets (Chatterjee,2018). The state has also set up goal wise mapping departments and schemes on SDGs into nine thematic clusters (Chatterjee,2018). However, the SDG India Index 2019 puts Assam in the performer category with an index score of 55 as against the national average of 60 (N.I.T.I, Aayog 2019).

Therefore, the government of Assam should try to find out the loopholes in the strategies. Besides this the state consists of different types of tribal people, therefore if the government can integrate some of the strategies used by these people and devise a unique strategy by combining features of both traditional and modern aspects then it might be able to foster holistic development of the economy sustainably and achieve the targets of SDGs within the stipulated period.

The tribals of Assam such as Bodos, Tiwas, Misings, etc. have various sacred and religious beliefs which led to the preservation and conservation of the environment among the tribal communities (Barman & Phukan,2016). One of the most common features among the tribes is that here the entire community comes together as a whole and holds themselves responsible for the conservation and sustainable use of

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the environment (Barman & Phukan,2016). The Tiwas, for instance, adopted community fishing because of the presence of a large number of water sources which has, in turn, provided an opportunity to organise fairs and festivals like the Jun Beel Mela in the Kamrup district (Barman & Phukan,2016). One of the most prominent features of this mela is that buying and selling of things happen through the barter system (Barman & Phukan,2016). Tribes produce various traditional cakes, rice powder etc by bartering edible items such as ginger, turmeric, chillies, indigo etc. This mela provides an eminent example of conserving and maintaining an ecosystem (Barman & Phukan,2016).

This type of fair generally indicates a close link between community life and the environment and also shows how the environment affects community life and vice versa (Barman & Phukan,2016). Moreover, the Assam government can take references from other neighbouring states like Sikkim, Nagaland etc on how they are integrating a traditional approach of sustainable conservation along with the modern one. For instance, in Sikkim, there exists a traditional system of governance, almost 200 years old known as 'Dzumsa', found especially in North Sikkim (Chakrabarti, 2011). It looks after all the development activities, law and order, as well as regulates the natural resource management in the region (Chakrabarti, 2011). Such type of governance will help to foster sustainable development in an effective manner (Chakrabarti, 2011). Moreover, people of Lachung valley in Sikkim practice a high degree of pastoralism, known as 'gothwala' system (Chakrabarti, 2011). It is a process systematically organised by the Dzumsa where the cyclical movement of the herdsmen along with their herds allows for the grass to regenerate as well as maintaining sufficient fodder for the animals (Chakrabarti, 2011). Also, the dung of animals helps the soil to replenish its fertility (Chakrabarti, 2011). Therefore this system runs in conformity with the definition of sustainable development and generates livelihood without destroying nature (Chakrabarti, 2011).

Another example of increasing community participation through institutional arrangement based on the existing value system is Nagaland's Village Development Boards (VDBs), created by the Nagaland Government, it aims to augment traditional system of agriculture rather than attempt to radically change it (Ramakrishnan, 2007). Another simplistic view of integrated management would be to identify ecological keystone species (Ramakrishnan, 2007). These are socially/culturally-valued species and are important in the agroforestry systems across the Himalayan region.

Such as the Alnus nepalensis and many bamboo species are important for the Jhum system which conserves NPK in the soil (Ramakrishnan, 2007). Therefore, if the government can incorporate some of these features or explore some more indigenous processes specifically in the hilly areas of Assam, it will provide incentives to achieve the goals.

Therefore, there is a need to understand that not all traditional ecological knowledge and practices go against the ethics and ethos of conservation. Government initiatives should aim to establish a complementary relationship between conservation and livelihood issues. Enhancement of the positive dimensions of these practices and knowledge base, buttressed with conventional science-based inputs is likely to be a more effective way of resolving conflicts by increasing community participation, improving the socio-economic development of the people as well as contributing towards effective conservation of nature (Ramakrishnan, 2007). Moreover, forestry and diverse agricultural and agro-forestry practices are among the most promising means of carbon management because of their potentials for carbon sequestration, in turn supporting mitigation (Ramakrishnan, 2007). There is also a need to strengthen climate data collection and increase climate change research, which is presently insufficient.

Currently, national and international development organizations are promoting transparency and participation to create evidence-based policy decision making which will be most benefited with a strong connection to citizen science (Hecker et al. 2018). Evidence has also shown it to be a cost-effective and reliable approach to collect data (Hecker et al. 2018, in literature Hyder et al. 2015, McKinley et al. 2017). Citizen Science has proved as a potential pathway towards contributing data to monitor SDGs (Fritz et al., 2019). Its power has been proven immensely in physics and biology however its application towards SDGs, especially in the environmental sector, are emerging yet limited.

We have seen that there is a limited reach of Citizen Science in developing countries. Most of the citizen science projects in these countries are funded by external agencies. But with new ICT tools and sophisticated internet connections and applications; effective data collection by crowd sourcing can be utilized to gather data collection over large spatial and temporal resolutions (Dickinson, Zuckerberg and Bonter, 2010; Schäfer and Kieslinger, 2016; Fraisl et al., 2020). In India, after the launch of Jio Network, internet connectivity became affordable to the majority of the public making India the 2nd largest internet user

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base (Brogen Project), making information and connectivity available to the majority of the population. Citizen Science leads the pathway for developing polycentric governance which helps in highlighting local issues that affect the community. It also helps in taking steps for sustainable development while localizing the global effort.

REFERENCES

1. Scoones, I. (2016), "The politics of sustainability and development". Annual Review of Environment and Resources, 41.https://doi.org/10.1146/annurev-environ-110615-090039

2. Arora, N. K., & Mishra, I. (2019), "United Nations Sustainable Development Goals 2030 and environmental sustainability: race against time".https://doi.org/10.1007/s42398-019-00092-y

3. Bhamra, A. and Niazi, Z. (2016), "Assam Vision 2030 Document – A Review by Development Alternatives." As accessed on 10th October, 2020: https://www.devalt.org/Pdf/L2_SixThemePdfs/Assam%20Vision%202030%20Review.pdf

4. Center for Sustainable Development (2016), "Assam Agenda 2030". Administrative Staff College, Transformation and Development Department, Assam

5. ENVIS (2016), "Assam status of Environment and Related Issues". As accessed on 15th October 2020. http://asmenvis.nic.in/Database/Hazards_840.aspx

6. Shrivastava, R. J., & Heinen, J. (2007), "A microsite analysis of resource use around Kaziranga National Park, India: Implications for conservation and development planning". https://doi.org/10.1177/1070496507301064 The Journal of Environment & Development, 16(2), p.p: 207-226.

7. Chatterjee, S. (2018), "Early Lessons in Implementing the Sustainable Development Goals in India: The Example of Assam (No. 1804)". South and South-West Asia Development Papers 1804,p.p: 7-24

8. Sharma, N., Madhusudan, M. D., & Sinha, A. (2012). "Socio-economic drivers of forest cover change in Assam: a historical perspective". Economic and Political Weekly, p.p: 64-72. https://www.jstor.org/stable/41419850

9. Saikia, A. (2011), Forests and ecological history of Assam, 1826–2000. Oxford University Press.

10. Saikia, A. (2005). Jungles. Reserves, Wildlife: A History of Forests in Assam (Wildlife Areas Development and Welfare Trust, Guwahati).

11. Saikia, A. (2008), "State, peasants and land reclamation: The predicament of forest conservation in Assam, 1850s–1980s". The Indian Economic & Social History Review, 45(1), p.p: 77-114. https://doi.org/10.1177/001946460704500103

12. Tucker, R. P. (1988), "The depletion of India's forests under British imperialism: planters, foresters, and peasants in Assam and Kerala". The ends of the earth: Perspectives on modern environmental history, p.p : 118-140.

13. Sarma, J. N. (1966), "Problems of economic development in Assam". Economic and Political Weekly, p.p: 281-286. https://www.jstor.org/stable/4357010

14. Dass, S. K. (1980), "Immigration and demographic transformation of Assam, 1891-1981". Economic and Political Weekly, p.p: 850-859. https://www.jstor.org/stable/4368649

15. Goswami, C. (2002), "Agricultural Land Use in the Plains of Assam". Economic and Political Weekly, p.p: 4891-4893. https://www.jstor.org/stable/4412924

16. NITI Aayog (2018), "SDG India index, baseline report 2018". New Delhi: NITI Aayog.

17. The Sentinel, (2019), "Assam worst in SDGs". As accessed as on 21st October, 2020 https://www.sentinelassam.com/editorial/assam-worst-in-sdgs/#:~:text=Assam%20has%20emerged%20as%20one,set%20by%20the%20United%20Nations.&text=Assam%20in%20fact%20scored%20only,and%20Uttar%20Pradesh%20(42).

18. NITI Aayog (2019), "SDG India index & dashboard 2019-20". New Delhi: NITI Aayog.

19. Barman, M. and Phukan, B. (2016), "Belief Practices And Their Impact On Sustainable Development In Assam, India". International Seminar 2016. As accessed on 22nd October2020: https://www.internationalseminar.org/XV_AIS/TS%205B/5.%20Dr.%20Mayuri%20Barman.pdf

20. Chakrabarti, A. (2011), "Transhumance, livelihood and sustainable development and conflict between formal institution and communal governance: An evaluative note on East Himalayan state of Sikkim, India". In International Conference on Social Science and Humanity IPEDR (Vol. 5, pp. 1-7). IACSID Press, Singapore, 26.02.2011

21. Ramakrishnan, P. S. (2007), "Sustainable mountain development: The Himalayan tragedy". Current Science (00113891), 92(3).https://www.jstor.org/stable/24096725

22. Hecker, S., Bonney, R., Haklay, M., Hölker, F., Hofer, H., Goebel, C., ... & Bonn, A. (2018), "Innovation in citizen science–perspectives on science-policy advances". Citizen Science: Theory and Practice, 3(1). http://doi.org/10.5334/cstp.114

23. Hyder, K., Townhill, B., Anderson, L. G., Delany, J., & Pinnegar, J. K. (2015), "Can citizen science contribute to the evidence-base that underpins marine policy?". Marine policy, 59, p.p: 112-120. https://doi.org/10.1016/j.marpol.2015.04.022

24. McKinley, D. C., Miller-Rushing, A. J., Ballard, H. L., Bonney, R., Brown, H., Cook-Patton, S. C., ... &

EPRA International Journal of Research and Development (IJRD)

Soukup, M. A. (2017), "Citizen science can improve conservation science, natural resource management, and environmental protection". Biological Conservation, 208, p.p: 15-28.https://doi.org/10.1016/j.biocon.2016.05.015

25. Fritz, S., See, L., Carlson, T., Haklay, M. M., Oliver, J. L., Fraisl, D., ... & West, S. (2019), "Citizen science and the United Nations sustainable development goals". Nature Sustainability, 2(10), p.p: 922-930. https://doi.org/10.1038/s41893-019-0390-3

26. Dickinson, J. L., Zuckerberg, B., & Bonter, D. N. (2010), "Citizen science as an ecological research tool: challenges and benefits". Annual Review of Ecology, Evolution, and Systematics, 41, p.p: 149-172.https://doi.org/10.1146/annurev-ecolsys-102209-144636

27. Kieslinger, B., Schäfer, T., Heigl, F., Dörler, D., Richter, A., & Bonn, A. (2018),"Evaluating citizen science-Towards an open framework". UCL Press. https://www.jstor.org/stable/pdf/j.ctv550cf2.13

28. Fraisl, D., Campbell, J., See, L., Wehn, U., Wardlaw, J., Gold, M., ... & Fritz, S. (2020), "Mapping citizen science contributions to the UN sustainable development goals". Sustainability Science, 15(6), p.p: 1735-1751. https://doi.org/10.1007/s11625-020-00833-7.

29. Brogen Project, (2020), "How Jio Transformed Internet Access in India". Accessed in September 2020. https://borgenproject.org/internet-access-india/