Implementing the SDGs
Responding to the Challenges of Interconnectivity and Balance

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IMPLEMENTING THE SDGs

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Preface

Southern Voice on Post-MDG International Development Goals is a network of 49 think tanks from Africa, Asia and Latin America. Since its inception in 2012, it has served as an open platform to provide structured inputs from the global South into the negotiations on the post-2015 development agenda, with a view to addressing the 'knowledge asymmetry' and 'participation deficit' that usually afflict such global discussions.

After a substantial negotiation process, the *2030 Agenda for Sustainable Development* was finally adopted at the Seventieth Session of the UN General Assembly on 25 September 2015 by the member states. With the 17 new Sustainable Development Goals (SDGs) placed as oncoming development priorities, *Southern Voice* is currently working to examine national experiences in meeting the early challenges of delivering the 2030 Agenda.

The research programme titled *National Level Implication of Implementing SDGs* is based on call for proposals among its network members, and through a peer process eleven country studies were commissioned for nine countries across Africa, Asia and Latin America. The broad areas of concern of the country papers are the following: (i) investigate the means of mainstreaming the SDGs into national planning process, within the context of its national priorities; (ii) explore the adequacy of coordination, management and leadership of the SDG implementation process, including the monitoring and evaluation mechanism; (iii) examine the adequacy of financing and other specific means of implementation for the SDGs; (iv) investigate the extent of partnerships and stakeholder participation, including institutional arrangements for implementing the SDGs; and (v) evaluate the capacity of the national statistical agencies and other data-related issues.

This country paper on Sri Lanka titled **Implementing the SDGs: Responding to the Challenges of Interconnectivity and Balance** is the sixth of the eleven country studies to be published under the Southern Voice Occasional Paper Series. The paper has been authored by *Ms Karin Fernando*, Senior Research Professional at the Centre for Poverty Analysis (CEPA) and *Mr Navam Niles*, Research Analyst at the Janathakshan (GTE) Ltd.

The study explores interconnectivity and balance through a network analysis of the Sri Lankan policies or plans associated with SDG 7 that advocates clean energy security. The findings of the analysis reveals strong connectivity between the SDG 7 and other SDGs, as well as a skew towards the environmental dimension over the economic and social dimensions. The paper emphasises on network analysis as a planning tool in building an integrated approach to develop sustainable policies and plans in the country.

I would like to take this opportunity to recognise the support of The William and Flora Hewlett Foundation towards *Southern Voice*, particularly of *Dr Ruth Levine*, Programme Director and *Ms Sarah Lucas*, Programme Officer of the Global Development and Population Programme, at the Hewlett Foundation.

In connection to the publication of this paper, contribution of *Ms Umme Shefa Rezbana*, Senior Research Associate, Centre for Policy Dialogue (CPD) and the focal point at the Southern Voice Secretariat for overseeing the programme is highly appreciated. *Ms Tarannum Jinan*, Administrative Associate, CPD is acknowledged for providing useful contribution in following-up of the country papers. I would also like to thank *Mr Michael Olender* for his editorial inputs and feedback.

Hoping that the paper will be a useful addition to the ongoing discussion on challenges of implementing SDGs in developing countries.

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Acknowledgements

Abstract

The Sustainable Development Goals (SDGs) present two challenges for integrated planning and implementation at the national level. One is that policies and plans need to identify and accommodate interconnectivities amongst the SDGs. Second is the need to balance the three dimensions: economic growth, social inclusion and environmental protection. This paper uses network analysis to explore interconnectivity and balance of the Sri Lankan policies or plans in relation to SDG 7, that advocates clean energy security. The findings suggest that the selected policies or plans are not only clearly linked to SDG 7, but also shows strong connectivity to SDG 1 (poverty), 10 (inequality), 11 (cities) and 12 (sustainable consumption and production) as well as other SDGs. This emphasises the need to recognise sectoral cross links for an integrated plan. In terms of balance there is a skew towards the environmental dimension over the economic and social dimensions. There are also conflicts between the environmental and economic dimensions that need to be acknowledged and reconciled, while more focus is needed to meet the objective of energy for all. Lastly the paper shows that network analysis can assist policymakers and planners to move towards building an integrated approach to develop sustainable policies and plans.

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Acronyms

EEN	Energy Empowered Nation: Sri Lanka Energy Sector Development Plan for a Knowledge-based Economy
EIU	Economist Intelligence Unit
GDP	Gross Domestic Product
HLP	National Action Plan for Haritha Lanka Programme
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contributions
LTGEP	Long Term Generation Expansion Plan 2015-2034
MDG	Millennium Development Goal
NAP	National Adaptation Plan for Climate Change Impacts in Sri Lanka: 2016 to 2025
NCCAS	National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016
NEPS	National Energy Policy & Strategies of Sri Lanka
NPP	National Physical Planning Policy and Plan: Sri Lanka – 2030
NPSCP	National Policy and Strategy for Cleaner Production
SDG	Sustainable Development Goal
SME	Small and Medium Enterprise
WRMMP	Western Region Megapolis Planning Project: Review of the Western Region & Colombo Master Plan
WWF	World Wildlife Fund

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1. Introduction

In September 2015, the 70th United Nations General Assembly adopted the Sustainable Development Goals (SDGs) to succeed the Millennium Development Goals (MDGs). With a deadline of 2030, the SDGs aim to promote just, equitable and inclusive development, encompassing economic growth, social inclusion and environmental protection, to benefit current and future generations without any form of discrimination (United Nations, 2015b). Sustainable development, however, remains an unsettled concept, with broad consensus on its three dimensions – the environment, the social, and the economy – but not on the specificities of how it may be interpreted and used (Beyerlin & Marauhn, 2011). Accordingly, this paper begins by building a working conceptualisation of sustainable development using the specific principles of sustainability.

Development should be understood as progressive improvement in the quality of life of human beings, which should be measured in terms of both material and non-material outcomes. Sen (1999), for instance, argues that such improvement depends on the realisation of individual freedom to achieve one's full potential. This freedom is determined by the institutions of a society, which North (1990, p. 3)describes as "rules of the game": frameworks of enforceable formal or informal rights and obligations. Thus, institutions determine the type of development that a society experiences. Further, good institutions fall into multiple overlapping categories. The Democracy index of the Economist Intelligence Unit (EIU), for instance, uses five categories: electoral process and pluralism, the functioning of government, political participation, democratic political culture, and civil liberties. Such institutions enhance individual freedom whenever they enable and enhance development. For example, differences in institutions explain differences in the development standards of North Korea and South Korea (Acemoglu & Robinson, 2012). Sustainable development builds on the idea of development enabled by good institutions.

Sustainable development adds two explicit conditions to the progressive improvement in quality of life in terms of material and non-material outcomes: social equity and environmental protection. This thinking is becoming explicit among international legal entities. The International Law Association's (2002, p.212) New Delhi Declaration of Principles of International Law Relating to Sustainable Development describes sustainable development as involving "a comprehensive and integrated approach to economic, social and political processes, which aims at the sustainable use of natural resources of the Earth and the protection of the environment on which human life as well as social and economic development depend." This sentiment was echoed at the World Summit on Sustainable Development in 2002. The precise nature and elements of social equity and environmental protection are context-specific, but key principles, three of which are particularly relevant to this paper, include inter-generational equity, development that integrates environmental protection, and the sustainable utilisation of natural resources.

The principle of sustainable utilisation of natural resources deserves special attention. The academic discipline of ecological economics has introduced the concept that such resources must be used

without exceeding biophysical limits. Consequently, there are three key principles of sustainability that should guide the use of natural resources and can underpin a working conceptualisation of sustainable development. First, the rate of consumption of non-renewable resources should not exceed their regenerative capacity. Second, the rate of consumption of renewable resources should not exceed investment in renewables. Third, the rate of waste generation should not exceed the assimilative capacity of the natural system (Farley & Daly, 2006). These principles of sustainability can link the three dimensions of sustainable development. Application of the principles requires economic growth projections and processes to be based on biophysical limits. It is also necessary to have a more equitable distribution of the benefits of economic development to optimise the utilisation of limited natural resources. These principles, however, need to be promoted and supported by conducive governance structures, innovation, investment, and ethics and values. Such linkages reinforce the idea that sustainable development must engage multiple institutions simultaneously. The main transformative elements introduced through this conceptualisation are the acknowledgement that resources are limited and the use of the principles of sustainability to guide decision making. Such a conceptualisation has important implications for the way that the SDGs are assessed.

The SDGs are designed to be interconnected and indivisible – each goal is part of a collective global effort towards sustainable development. The goals are also designed to strike a balance between the three dimensions of sustainable development. Various studies have already examined both aspects. Le Blanc (2015), for instance, examines the interconnectivity of the SDGs, while Cutter (2015) addresses how the SDGs balance the various dimensions of sustainable development. These studies, however, do not use an in-depth elaboration or framework of sustainability to assess balance. Additionally, they do not examine the interdependence and balance of national policies associated with sustainable development.

This paper studies the interconnectivity and balance of Sri Lankan public policies or plans associated with SDG 7 on energy. This goal outlines two requirements for sustainable energy: first, it must ensure energy security; second, it must advance clean energy. This paper describes the combination of these requirements as "clean energy security." Energy security refers to "the uninterrupted availability of energy sources at an affordable price" (IEA, 2014, p.13). This is reflected in SDG target 7.1, which calls for "universal access to affordable, reliable and modern energy services." Clean energy refers to zero-carbon or low-carbon energy that requires cleaner energy sources as well as using energy efficiently. This is reflected in SDG target 7.2, which calls on member governments to "increase substantially the share of renewable energy in the global energy mix," and in target 7.3 that stipulates the need to "double the global rate of improvement in energy efficiency" (United Nations, 2015b). These elements, represented in the concept clean energy security, forms the criteria used in this paper to examine the interconnections between SDG 7 and the other SDGs; and to determine the balance between economic growth, social inclusivity and environmental protection in Sri Lankan energy policies or plans. The analysis is intended to direct policymakers towards useful SDG clusters, recommending policy modifications to ensure that the ambitions of sustainable development can be met.

2. Building Consensus on Interconnectivity and Balance

There is broad consensus on the need for interconnectivity and balance in national policies to implement the SDGs. There is, however, a lack of consensus on what an ideal integrated model would look like or how that would be implemented. Opinions vary depending on economic, social and political, and environmental situations. The lack of consensus is exacerbated by the lack of principles needed to study trade-offs, synergies and contradictions that may emerge between different SDGs. The first step necessary to address these weaknesses is the development and utilisation of appropriate tools such as network analysis, which this paper uses to visualise the interconnectivity and balance of Sri Lankan energy policies or plans.

2.1 Interconnectivity

The interconnectivity of a SDG refers to how much that SDG must depend on other SDGs to be effective and vice versa. An appropriate level of interconnectivity is necessary since the SDGs are designed to work together. This paper infers the appropriate interconnectivity – in other words, how many goals SDG 7 should depend on – by reviewing the SDGs and the existing literature on interconnectivity. The observed level of interconnectivity between SDG 7 and the other SDGs will represent a baseline. This baseline could be used to compare the level of interconnectivity of Sri Lankan energy policies or plans that concern clean energy and energy security. The rest of this section discusses how energy issues are connected to other SDGs by analysing the wording of targets in the SDGs as presented in *Transforming our world: The 2030 Agenda for Sustainable Development* (United Nations, 2015b).

SDG 1 on eradicating poverty requires governments to provide the poor and vulnerable with "equal rights to economic resources, as well as access to basic services . . ." (target 1.4). It also calls on them to "build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters" (target 1.5). Energy is understood to be a pre-requisite for poverty alleviation, which can improve standards of living, educational attainment, job opportunities, socio-economic mobility, access to information, and a range of other aspects that contribute to reducing poverty.

SDG 8 on economic growth encourages governments to "sustain per capita economic growth in accordance with national circumstances" (target 8.1) and "improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production" (target 8.4). Sustaining economic growth requires sustainable energy sources. Moreover, decoupling economic growth from environmental degradation requires structural changes to both energy production and consumption. Together, achieving these targets of SDG 8 will require achieving the key targets of SDG 7.

SDG 9 on infrastructure and industrialisation urges governments to "develop quality, reliable, sustainable and resilient infrastructure" (target 9.1). Additionally, it calls on governments to "upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes" (target 9.4). Such references encompass clean energy development, which involves ensuring access to all energy services, increasing the use of renewable energy, and improving energy efficiency.

SDG 10 on inequality, in turn, enjoins governments to "progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average" (target 10.1). Also, this goal stresses broader requirements for equality and addressing discrimination. For instance, it requires governments to "empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status" (target 10.2). It further urges them to "ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation ..." (target 10.3). As highlighted with SDG 1, progressive income growth depends heavily on energy reliability. The explicit references in SDG 10 to improved incomes, equal opportunities, and anti-discrimination are predicated heavily on energy access and affordability.

SDG 11 on resilient cities exhorts governments to "ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums" (target 11.1) and "enhance inclusive and sustainable urbanization ..." (target 11.3). This goal also refers to transport, calling for governments to "provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport" (target 11.2). Both housing and transport require affordable, accessible and clean energy, plus better management of energy resources.

SDG 12 on sustainable consumption and production calls on governments to "implement the 10-Year Framework of Programmes on Sustainable Consumption and Production" (target 12.1). The global framework mentioned in this target calls for a paradigm shift in consumption patterns and lifestyles and associated production processes, which makes SDG 12 the most transformative of all the SDGs. This paradigm shift is closely linked to how energy is produced and used. Further, governments are encouraged to "rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities" (target 12.c). The need to phase out subsidies is particularly relevant to Sri Lanka. The International Monetary Fund (IMF) estimates annual Sri Lankan fossil fuel subsidies to be USD 2.16 billion (Coady *et al.*, 2015). In general, Coleman (2014) argues that where fossil fuel subsidies exist, the richest 20 per cent of households capture the bulk of a subsidy since they use around six times more energy than the poorest 20 per cent of households.

SDG 13 on climate change asks governments to "integrate climate change measures into national policies, strategies and planning" (target 13.2). This goal is associated with reducing greenhouse gas emissions, and therefore is inextricably linked with the energy sector, which is the main source of emissions. For example, the recently concluded Paris Agreement on climate change (United Nations, 2015a) calls on governments to reduce their emissions via their Intended Nationally Determined Contributions (INDC). Notably, the Least Developed Countries Expert Group (2012) developed guidelines for adapting to climate change that urge governments to integrate national development policies with climate change policies.

While interconnections among the SDGs can be inferred, as done above, some efforts have been made to apply a more rigorous method to identify interconnectivity. The existing literature provides several perspectives on this. Le Blanc (2015) studies interconnectivity using network analysis to construct a visual network of all the goals and targets, which was then examined for explicit cross references in each goal and target. He argues that SDG 7 is connected to SDG 1 on eradicating poverty, SDG 10 on inequality, and SDG 12 on sustainable consumption and production. Cutter (2015) examines interconnectivity without using network analysis, but by examining the wording of the goals or targets for explicit reference to another area of work. She argues that SDG 7 is connected to SDG 8 on economic growth, SDG 9 on infrastructure and industrialisation, SDG 10 on inequality, and SDG 12 on sustainable consumption and production. Cutter goes on to show that the interconnections are one-directional. In other words, while the SDGs are supposed to be "mutually reinforcing without being duplicative" (Cutter, 2015, p. 13), she finds that most of the SDGs rarely reciprocate each other: they do not create "a two-way relationship between thematic areas" (Cutter, 2015, p. 13). In implementing the SDGs, Cutter's assertion becomes highly relevant to public policy coherence, since goals that fail to reinforce each other can lead to fragmented policy positions.

The study of the SDGs and the available literature helps establish a baseline for comparing the level of interconnectivity of Sri Lankan clean energy security policies or plans. Therefore, when reviewing these policies, which are related to SDG 7, it is reasonable to expect interconnectivity to at least seven SDGs: 1, 8, 9, 10, 11, 12 and 13. It should be kept in mind that this is the minimum expected interconnectivity.

2.2 Balance

Balance refers to the attention that each SDG pays to the three dimensions of sustainable development. Ideally, there would be equal attention to economic growth, social inclusion and environmental protection. Well-balanced SDGs would ideally avoid putting a greater emphasis on any of these dimensions. This paper explores two important issues concerning balance: the criteria needed to determine the balance of dimensions, and the expected balance between the different dimensions

associated with SDG 7. The criteria will form the basis for inferring the balance of Sri Lankan policies that concern clean energy security. An equilibrium between the different dimensions will represent the baseline. This baseline can then be used to compare the level of balance found in Sri Lankan energy policies or plans.

The criteria for inferring balance depend on what is necessary to achieve the targets of clean energy security across the three dimensions. In the environmental dimension, clean energy security must involve a reduction of global greenhouse gas emissions, of which carbon dioxide accounts for about 75 per cent. To reduce emissions, energy policies or plans must emphasise decarbonisation, which involves three elements: increasing energy efficiency (i.e. improving output per unit of energy input), increasing the use of zero-carbon energy sources (i.e. hydroelectric, wind, solar, and geothermal energy), and encouraging electrification by replacing technology that uses fossil fuels with technology that uses electricity generated by low-carbon sources (Sachs, 2015). Better energy use may also depend on changing production and consumption patterns. Jackson (2009), for instance, argues that society must also develop systems and lifestyles that attempt to use less energy or ensure that energy use is optimised.

In the social dimension, clean energy security must focus on increasing social inclusion. Thus, policies or plans must involve two elements: availability and affordability of energy. Achieving such inclusion must involve addressing the economic inequality and economic discrimination that may emanate from legal and cultural sources (Sachs, 2015). Economic inequality refers to the asymmetric distribution of income and wealth across a population. Such asymmetric distribution can cause energy to be unaffordable for segments of the population. In situations where energy is affordable yet inaccessible, the problem may be economic discrimination. Governments engage in economic discrimination when their policies systematically exclude individuals or groups from economic activity because of, for instance, their gender, sexual orientation, ethnicity, physical ability, geographic region or political affiliation. National energy policies or plans must therefore include provisions to increase affordability by reducing costs and improving access by expanding energy networks.

In the economic dimension, clean energy security must focus on increasing economic growth and development. Thus, policies or plans must involve two elements: increasing energy reliability and reducing wasteful incentives. Energy use is positively correlated with economic growth (Sachs, 2015). Thus, to achieve economic growth governments need to satisfy rising energy demands. Policies or plans that enhance reliability are those that seek to meet rising energy demands and reduce disruptions with existing energy supplies. Clean energy security also requires reducing subsidies that encourage wasteful energy use. Governments spend billions on fossil fuel subsidies that encourage waste and discourage the development of cleaner energy sources (Coleman, 2014). Therefore, removing fossil fuel subsidies should be a priority for achieving clean energy security. Removal usually involves allowing prices to gradually rise to the match market prices. Exceptions, however, should be expected in circumstances where governments are trying to improve energy affordability and energy access to disadvantaged or marginalised groups. It is possible that governments may pursue energy reliability at the expense of environmental protection and social inclusion. For instance, increasing the use of fossil fuels may improve energy reliability, but it will not improve environmental protection. This paper is sensitive to this contradiction, which is highlighted in the review of Sri Lankan energy policies or plans.

The expected equilibrium that represents the baseline depends on the model used to simulate the different dimensions of sustainable development. This paper reviewed three models that simulate the balance of all the SDGs: first, a doughnut model (Raworth, 2014) based on planetary boundaries and social foundations; second, a sustainability model (Fernando & Gunawardena, 2014) built on the principles of ecological economics; third, an inclusive development model (Gupta & Vegelin, 2016) built on a definition of inclusive growth. The overarching consensus is that the SDGs do a good job of covering the social dimension, but do a relatively poorer job of covering the economic and environmental dimensions. Raworth (2014) scores the SDGs highly for coverage of the social dimension, but faults

them for inadequately covering the economic dimension, primarily because gross domestic product (GDP) growth still drives the economic paradigm. These sentiments are echoed by Fernando and Gunawardena (2014), who argue that the social dimension is covered most consistently across all the SDGs with clear targets and aspirations. The SDGs, they find, are far less ambitious in the economic sphere and do not adequately promote the crucial ecological balance related to biophysical limits and waste assimilation. Gupta and Vegelin (2016), point out the emphasis on economic growth in the interpretation of sustainable development without attention to redefining the concept of growth and the limits of acknowledging the ecological systems *(eco space)*. Also, they conclude that social inclusiveness and emphasis on the most marginalised are well articulated in the SDGs.

The analysis of SDG 7 based on existing literature, however, reveals a disproportionate distribution of balance. SDG 7 puts a greater emphasis on the environmental dimension, followed by the economic and social dimensions. This is established by Cutter (2015), who uses the World Wildlife Fund's (WWF) analysis of the distribution of balance across the various SDGs. The WWF analysis divides each SDG target into three slots representing the potential to include each of the dimensions. Ideally a balanced target will record three different dimensions for each of the slots. For example, if target 'X' refers to all three dimensions, one slot will be economic, one social and one environmental. If, target 'X' refers to only two dimensions – perhaps, economic and social – and if the economic dimension receives a stronger emphasis, two out of three slots will record the economic dimension while one slot will record the social dimension. By counting the number of slots for each of the targets of a goal – such as SDG 7 – Cutter (2015) determines the distribution of balance. This means a proportional distribution would require each goal to contain 33 per cent of slots from each dimension. Based on this reasoning, the analysis finds that SDG 7 is primarily focused on the environmental dimension, which accounts for 44 per cent of the slots. The economic and social dimensions respectively account for 33 per cent and 22 per cent of the slots.

Together with the criteria for balance, the expected distribution of balance helps set a baseline for what should be expected from the Sri Lankan clean energy security policies or plans. The ideal standard will be 33 per cent for each dimension.

3. Methodology

This section outlines the scope of the study and the overall research design used to examine Sri Lankan policies or plans associated with clean energy security. The methodology draws from the definitions of sustainable development, the criteria for clean energy security, and the studies on interconnectivity and balance of the SDGs described in the introduction.

3.1 Scope

This paper uses publicly available Sri Lankan policies or plans that have a direct or indirect role in energy issues in the country. While there are no plans or policies explicitly labelled as "clean energy security," the analysis covers policies that contain references to any of its components related to clean energy and energy security. The analysis categorises such policies or plans based on their level of exclusivity to the components of clean energy security: first, policies or plans that are exclusive to the components of clean energy security; second, policies or plans that include references to the components of clean energy security as part of wider development policies; third, policies or plans that include references to the components of clean energy security as part of cross-sectoral policies.

a. Policies or plans that are exclusive to the components of clean energy security

i)   *Energy Empowered Nation: Sri Lanka Energy Sector Development Plan for a Knowledge-based Economy, 2015-2025* (EEN) (Ministry of Power and Energy, 2015);
ii)   *National Energy Policy & Strategies of Sri Lanka* (NEPS) (Ministry of Power and Energy, 2008);
iii) *Long Term Generation Expansion Plan 2015-2034* (LTGEP) (Ceylon Electricity Board, 2015).

b. Policies or plans that include references to the components of clean energy security as part of wider development policies

i) *Economic Policy of the Government* (Wickremesinghe, 2015);[1]
ii) *National Action Plan for Haritha Lanka Programme* (HLP) (National Council for Sustainable Development, 2009);
iii) *National Physical Planning Policy and Plan: Sri Lanka – 2030* (NPP) (National Physical Planning Department, 2012);
iv) *National Adaptation Plan for Climate Change Impacts in Sri Lanka: 2016 to 2025* (NAP) (Climate Change Secretariat, 2015);
v) *National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016* (NCCAS) (Climate Change Secretariat, 2010).

c. Policies or plans that include references to the components of clean energy security as part of cross-sectoral policies

i) *National Policy and Strategy for Cleaner Production* (NPSCP) (Ministry of Environment and Natural Resources, 2005);
ii) *National Policy Framework for Small Medium Enterprise (SME) Development* (Ministry of Industry and Commerce, 2015);
iii) *Western Region Megapolis Planning Project: Review of the Western Region & Colombo Master Plan* (WRMMP) (Ministry of Megapolis and Western Development, 2016).

In the cross-sectoral category, it was intended to look at policies and plans related to transport and industrial development as sectors that are large energy users. However, a final version of either of these policies was not available in the public domain. In addition, not all the policies or plans stated above specifically made references to energy, and therefore, did not meet the requirements for further analysis. Eight policies or plans met this criterion: EEN, NEPS, LTGEP, HLP, NPP, NAP, NCCAS and WRMMP.

3.2 Overall Research Design

This paper seeks to study both interconnectivity and balance of Sri Lankan public policies or plans associated with SDG 7 on energy and other SDGs. Interconnectivity refers to how well they are networked with the SDGs. Balance refers to the attention paid to the three dimensions of sustainable development.

First, the relevant policies were studied for explicit references to clean energy security. These are specific references to action or results that are ideally, but not exclusively, time-bound. For example, regarding energy efficiency, the NEPS states: "Supply side and end-use energy efficiency will be encouraged through financial and other incentives/disincentives in respect of energy end-use mandatory measures such as appliance energy labelling, building codes and energy audits" (Ministry of Power and Energy, 2008, p. 5A). This sentence goes beyond general principles of efficiency by referring to specific actions.

To determine interconnectivity, the policies or plans were studied for specific references to the targets of SDGs. If such references were found, then the particular SDG(s) were recorded as connections to that policy or plan. For example, if "Policy X" contains a reference to expanding renewable energy, then SDG 7 would be recorded as a connection because one of its targets deals with renewable energy. There are instances where a single reference can refer to multiple SDGs. For example, if "Policy Y" contains a reference to reducing fossil fuel subsidies and improving energy access, then both SDGs 7 and 12 would be recorded as connections, because the former contains targets for energy access, and the latter contains a target to rationalise and reduce fossil fuel subsidies.

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[1]This policy is outlined in the Prime Minister's address to the Parliament.

To determine balance, the references were compared to the criteria of the dimensions that determine clean energy security:

- Environmental Dimension: Energy Efficiency (EE); Renewable Energy (RE); and Electrification (El)
- Social Dimension: Affordability (Af); and Access (Ac)
- Economic Dimension: Reliability (Re) and Subsidies (Su)

If a specific reference matches the dimension's criteria, then it was recorded as such. For instance, if "Policy Z" made a specific reference to increasing renewable energy in the energy mix, it would be recorded as addressing the environmental dimension. An action, such as supplying renewable energy in rural areas, would be recorded as addressing the environmental (renewable energy) and social (energy access) dimensions.

Network analysis is utilised to visualise both the interconnectivity and the balance of clean energy security policies or plans. There are three types of nodes: policies/plans, SDGs and dimensions. This paper focuses on three network configurations: policies/plans and SDGs; policies/plans and dimensions; SDGs and dimensions. In this manner, the network analysis maps the interconnections between the clean energy security policies, the associated SDGs, and the balance of dimensions. The strength of the connections – in other words, the number of references – determines the thickness of the arrows connecting the nodes.

4. Results

The analysis of Sri Lankan policies or plans relevant to clean energy security, identified 86 separate references to specific actions or results. The results for interconnectivity and balance are listed separately, since each reference to a specific action or result can involve multiple dimensions and SDGs. There are 165 references to various SDGs (see Table 1) and 127 references to the various dimensions of clean energy security (see Table 2).

Table 1: Number of References to Various SDGs in Sri Lankan Energy Policies and Plans

Policy/Plan	SDG 1	SDG 2	SDG 4	SDG 7	SDG 8	SDG 9	SDG 10	SDG 11	SDG 12	SDG 13	SDG 15	Total
NPP	1	0	0	3	0	1	1	0	1	0	0	7
NCCAS	0	0	0	1	0	1	0	0	1	0	0	3
LTGEP	0	0	0	7	0	0	0	0	0	0	0	7
NAP	0	0	0	6	0	1	0	2	0	2	0	11
NEPS	10	0	2	41	4	2	10	6	9	1	1	86
WRMMP	0	0	0	3	0	0	0	0	0	0	0	3
HLP	0	1	1	9	0	3	0	3	5	1	0	23
EEN	3	0	0	16	0	0	3	2	1	0	0	25
Total	**14**	**1**	**3**	**86**	**4**	**8**	**14**	**13**	**17**	**4**	**1**	**165**

Source: Authors' elaboration.

Table 2: Number of References to Various Dimensions of Clean Energy Security in Sri Lankan Energy Policies and Plans

Policy/Plan	Environment			Social		Economy		Total
	EE	RE	EI	Af	Ac	Re	Su	
NPP	0	2	0	0	1	3	0	6
NCCAS	1	1	0	0	0	0	0	2
LTGEP	0	4	0	0	0	7	0	11

(Table 2 contd.)

(Table 2 contd.)

| Policy/Plan	Environment			Social		Economy		Total
	EE	**RE**	**EI**	**Af**	**Ac**	**Re**	**Su**	
NAP	1	3	0	0	0	6	0	10
NEPS	10	17	1	9	8	10	6	61
WRMMP	1	2	0	0	0	1	0	4
HLP	6	5	0	0	0	0	0	11
EEN	4	3	2	1	3	9	0	22
Total	**23**	**37**	**3**	**10**	**12**	**36**	**6**	**127**

Source: Authors' elaboration.

4.1 Interconnectivity

Sri Lankan clean energy security policies make 165 references to a total of 11 SDGs: SDG 1 on poverty, SDG 2 on hunger, SDG 4 on education, SDGs 7-13 on energy, economic growth, infrastructure, inequality, urban resilience, sustainable consumption and production, and climate change, and SDG 15 on terrestrial ecosystems (see Table 1).

Most references, however, are from the main energy-related policies or plans (see Figure 1). The NEPS accounts for more than half of the total number of references. Policies or plans that are not directly related to energy accounted for about 30 per cent of all references. Interestingly, the HLP which is a wider – cross-sectoral development action plan shows a similar share of references (14 per cent) as the EEN (15 per cent) that deals directly with the energy sector. This demonstrates how policies or plans from two (or more) different sectors have to be considered to meet the overall objectives of clean energy security.

Figure 1: Share of References on Clean Energy Security in Sri Lankan Energy Policies and Plans (86 References)
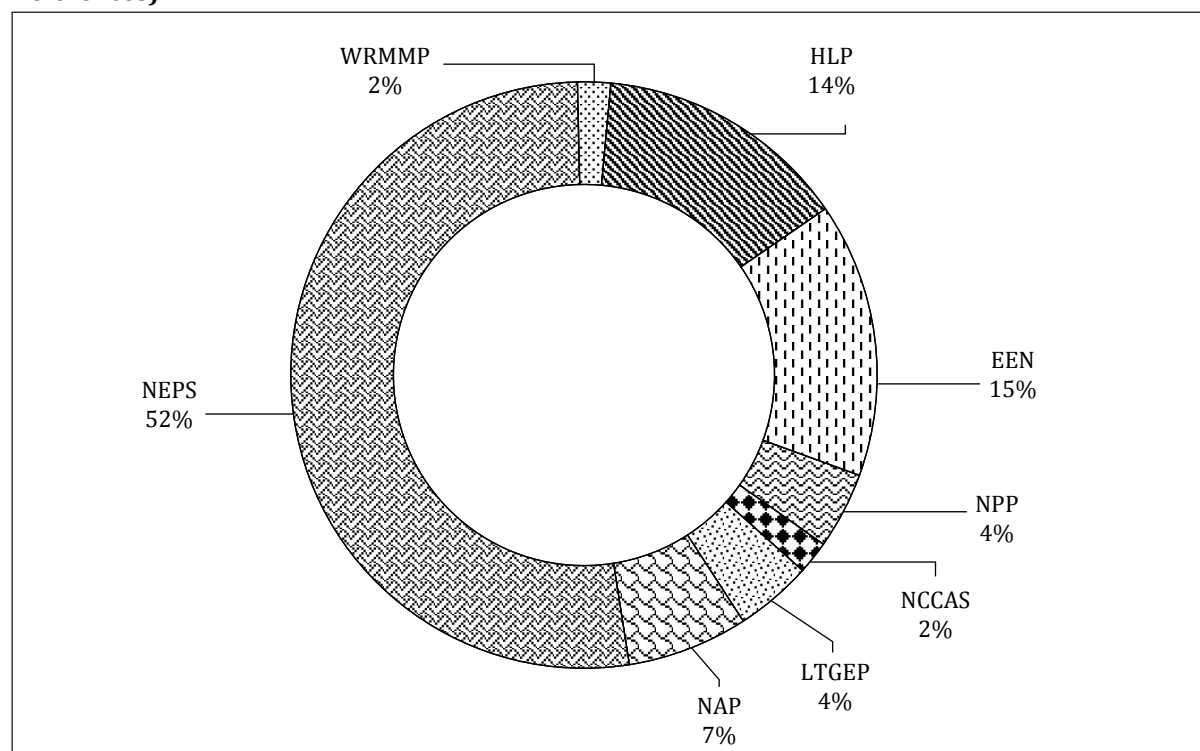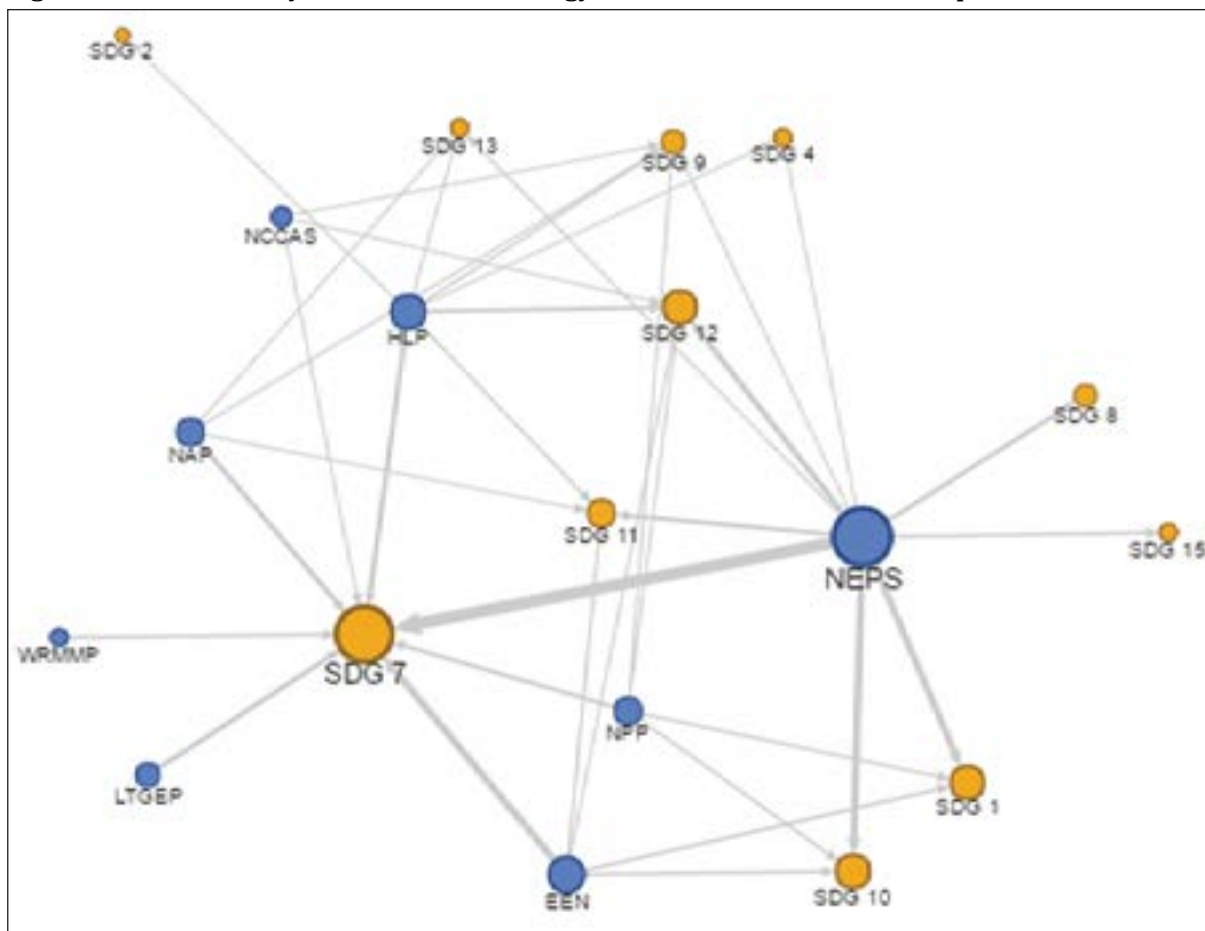

Source: Authors' elaboration.

The network analysis of references reveals the spread and strength of the connections between the policies and plans and the SDGs (see Figure 2). While the connecting arrows point to the different SDGs that are referred to in the policies or plans, the strength of the connection can be seen through the thickness of the arrows. The thickest line is to SDG 7, but it also shows strong connectivity to SDG 12 (17 references), SDGs 1 and 10 (14 references each), and SDG 11 (13 references). In addition, the less connected SDGs can also be seen; for example in the case of SDG 2, the HLP directs the government to "develop and adopt energy saving technologies in agriculture" (National Council for Sustainable Development, 2009, p.30), which are linked to sustainable agriculture (target 2.4). In the case of SDG 15, the NEPS indicates that "biomass-based energy projects will be developed in areas where land resources are available, enabling new industrial activities in such areas, emphasising on creating rural income generation avenues" (Ministry of Power and Energy, 2008, p.6A). This reference is associated with target 15.2 on sustainable management of forest resources. This visualisation also helps to show how multiple SDGs are being addressed by multiple policies and plans (or vice versa) and can be cross-referenced to identify synergies or contradictions.

The Sri Lankan energy policies or plans that refer to clean energy security are interconnected with all the expected SDGs (as per the baseline drawn from the literature), specifically SDGs 1 and 7-13. They are also interconnected with other SDGs, such as SDGs 2 and 15. Both the EEN and the NEPS, which are exclusive to the components of clean energy security, are connected to multiple other SDGs. The NEPS makes references to 10 different SDGs, with more than five references to four of them: SDGs 1, 10, 11 and 12 (see Table 1 and Figure 2). The EEN makes references to five different SDGs: 1, 7, 10, 11 and 12 (Table 1 and Figure 2). The references to SDG 1 and 10 address issues such as: providing electricity for all; providing energy for rural development; providing livelihoods as energy producers (specifically referring to fuelwood farming); subsidies for renewable energy so that it does not represent an

Figure 2: Network Analysis of Sri Lankan Energy Policies and their Relationships with Various SDGs

Source: Authors' elaboration.

additional burden on the end user; as well as subsidies, special packages and life-line tariffs for low-end consumers, it addresses *Samurdhi* – the national poverty alleviation programme – recipients and those with special social circumstances. The references to SDG 11 address fuel switching, improved efficiency of transport models, and increasing and electrifying the number of trains. The references to SDG 12 address resource efficiency, waste-to-energy projects, use of new technology, and energy conservation. The NEPS has fewer references to SDG 8 on economic growth, but references are made to sustained economic growth through adequate energy supply and commercial development of biomass. Unlike the NEPS, however, the EEN mostly focuses on SDG 7, while none of the other goals receive more than three references. Interestingly, the EEN makes no references to SDG 8. The LTGEP, similar to the WRMMP, refers only to SDG 7.

The overarching national development and sustainable development policies or plans that contain provisions relevant to energy, such as the HLP, NPP and NAP, also show evidence of interconnectivity (see Table 1 and Figure 2). The HLP refers to seven different SDGs: 2, 4, 7, 9, 11, 12 and 13. The NPP refers to five different SDGs: SDGs 1, 7, 9, 10 and 12. The NAP refers to four SDGs: SDGs 7, 9, 10 and 13. There are many clean energy security references that refer to multiple SDGs. For example, the Sri Lankan Government sets itself the following task in the NPP: "Support the development and use of alternative power sources such as solar, wind, oceanic, mini hydro and biogas energy for domestic purposes, particularly in rural areas by another 300 [megawatts]" (National Physical Planning Department, 2012, p. 50). Here the NPP refers to renewable energy (SDG 7) and emphasises rural areas, which are poorer and less developed than urban areas (SDGs 1 and 10). The NAP directs the government to begin the "development of climate resilient infrastructure and production facilities," (Climate Change Secretariat, 2015, p. 84) with an emphasis on the industrial and energy sectors. Here the NAP refers to energy (SDG 7), infrastructure and industrialisation (SDG 9), climate-resilient settlements (SDG 11), and policy response to climate change (SDG 13).

The baseline for interconnectivity, outlined in the literature section, was met and exceeded by the policies or plans studied. Yet, the strength of these connections is not uniform and since there is no standard for the quality of connections, it is difficult to provide a final verdict. Additionally, there is an argument to be made that the baseline itself is too low. It is important to question why SDG 7 does not refer to other relevant SDGs, such as SDG 2 on hunger, SDG 3 on health, SDG 5 on gender, and SDG 6 on water. For example, SDG 6 on water has no targets applicable to water sharing or integrated water management for energy or irrigation purposes, and therefore, it was not referenced in this analysis. The lack of linkages seems to be a weakness in the design of the SDGs and one that affects the overall integration exercise.

4.2 Balance

Sri Lankan policies and plans make 127 references to the three dimensions of clean energy security, and these references are disproportionately distributed amongst the dimensions (see Table 2). The environmental dimension accounts for 63 references, accounting for 50 per cent of the total number of references (see Figure 3). The economic dimension accounts for 42 references (33 per cent) and the social dimension accounts for 22 references (17 per cent).

The network analysis visualisation (see Figure 4) presents the three domains based on the criteria used in each domain (i.e. access and affordability for the social domain) of each of the policies or plans. The NEPS and EEN together account for most of the references – 61 and 22, respectively. The NEPS is the only policy that refers to every dimension (see Table 3). It strongly emphasises renewable energy (17 references), but without neglecting other aspects, namely energy efficiency (10 references), energy affordability (9 references), and energy access (8 references). The only exception is electrification, to which only one reference was made. Only the NEPS refers to removing unsustainable energy subsidies. The EEN has more references to energy reliability (9 references), than to any other sub-dimensions, and no reference to energy subsidies. Considering that EEN is newer than the NEPS and specifically designed to guide clean energy and energy security, the omission of a reference to fossil fuel subsidies

Figure 3: Share of References on Dimensions of Balance of Clean Energy Security in Sri Lankan Energy Policies and Plans (127 References)
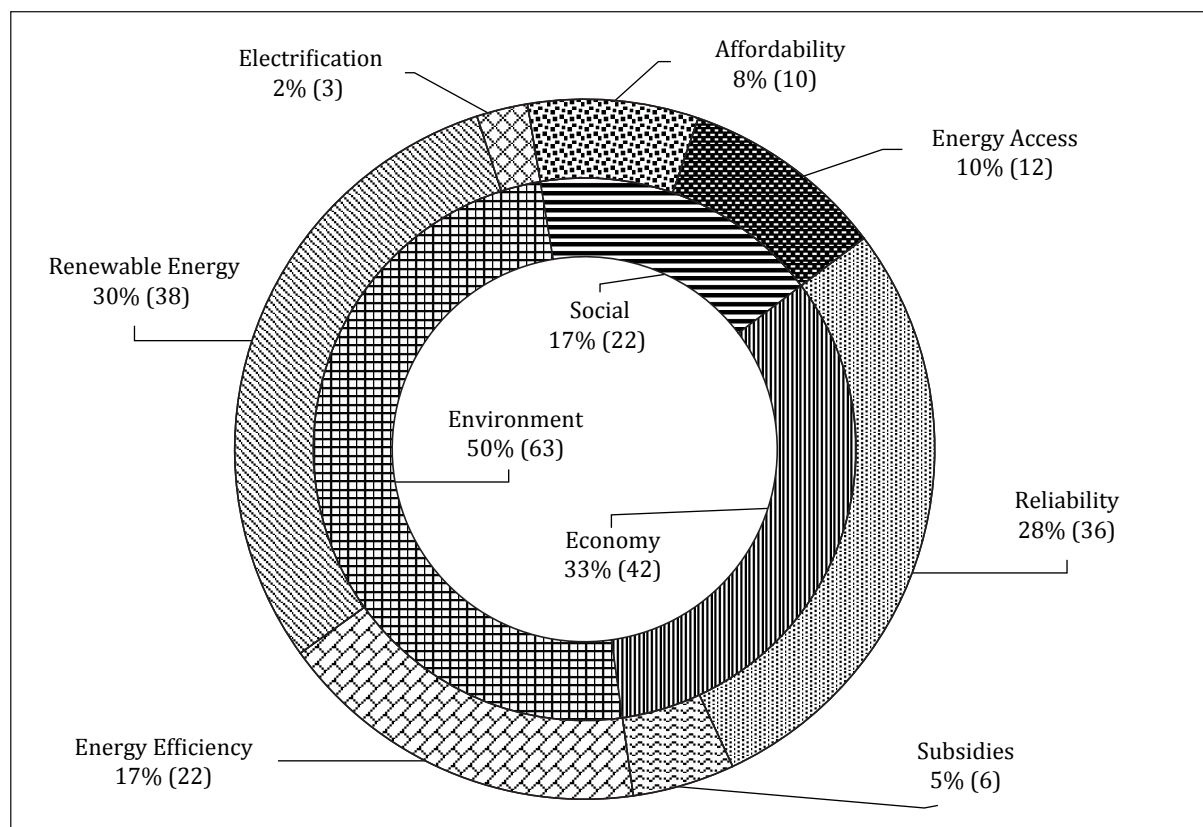
Source: Authors' elaboration.

**Note:** Numbers in parentheses indicate the numbers of references.

is significant. Additionally, power generated from thermal sources, coal, oil and natural gas that increases the power supply falls into the category of energy reliability. EEN includes the intention to generate 100 per cent of the electricity requirement by 2020 by using renewable and indigenous sources. Indigenous sources include oil and natural gas, which are not clean energy sources. Moreover, additional coal power plants are included in the LTGEP.[2] These references, although in line with energy reliability, are contradictions in the context of moving towards a clean energy strategy.

The network analysis visualisation (see Figure 4) also reveals that certain sub-dimensions are mostly neglected. Five policies or plans, namely the NCCAS, LTGEP, NAP, WRMMP and HLP, do not make any references to the social dimension. In addition, the HLP and the NCCAS – that are intended to be sustainable development-based plans, focus only on the environmental dimension. This is indicative that sustainable development policies or plans that are formulated in the environmental sector, tend to focus on the environment. However, given the three-dimensional focus that sustainable development is intended to take, the lack of references to the social and economic dimensions is a cause for concern. Out of the six references to energy in the NPP, three are on the economic dimension dealing with increasing the energy supply, while two refer to environment (renewable energy), and one on social dimension (access to rural areas) and shows a better balance.

Certain references, however, focused on multiple dimensions. For example, the NEPS indicates that "biomass-based energy projects will be developed in areas where land resources are available, enabling new industrial activities in such areas, emphasising on creating rural income generation avenues" (Ministry of Power and Energy, 2008, p. 6A). In this case, the reference to renewable energy is clear.

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[2]This issue has already been highlighted by the Public Utilities Commission of Sri Lanka, which has rejected the LTGEP twice for its emphasis on coal and other issues related to the options provided (Daily FT, 2016).

Figure 4: Relationship between Various Sri Lankan Energy Policies and Dimensions of Balance
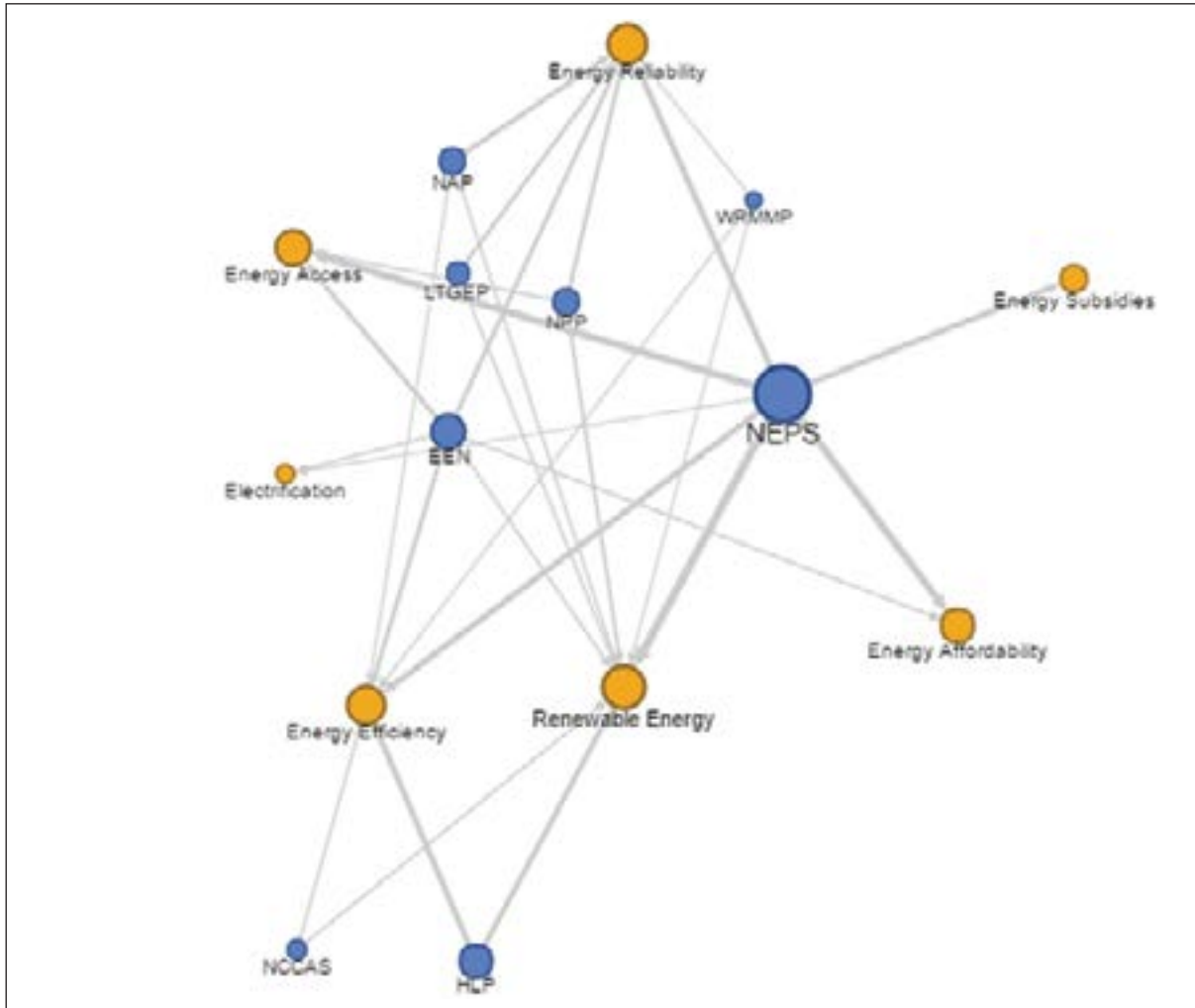
Source: Authors' elaboration.

This action also involves energy access and energy affordability, since rural areas often lack access to energy, and biomass should also enable income generation opportunities.

The baseline for balance, outlined in the literature review, suggested a strong emphasis on the environmental dimension – 44 per cent – followed by the economic and social dimensions, which respectively accounted for 33 per cent and 22 per cent of the segments. The ideal distribution, however, was 33 per cent for each dimension. In comparison, Sri Lankan energy security policies exceed the baseline with an even stronger emphasis on the environmental dimension – 53 per cent – followed by the economic and social dimensions, which respectively accounted for 29 per cent and 18 per cent. The stronger emphasis on the environment has come at the cost of both the economic and social dimensions. This level of skew should be a high concern for policymakers.

4.3 Limitations

This paper had three limitations. First, this paper only analysed the references to SDGs made by the various clean energy security policies or plans: the linkages from SDG 7 to other SDGs. A full understanding of interconnectivity, however, requires an analysis of how policies or plans associated with other SDGs are related to SDG 7. For example, since SDG 7 refers to multiple SDGs, such as SDGs 1 and 8, it is important to examine whether and how policies or plans related to those SDGs (i.e. documents concerning poverty and economic growth) refer back to SDG 7. A degree and quality of reciprocity adds a valuable level of analysis to the study of interconnectivity. This paper did attempt this analysis in relation to industries, which are covered by SDG 9 on infrastructure and industrialisation,

and transport, which is covered by SDG 11 on resilient cities. But due to lack of access to certain policies, it was not a thorough analysis. Therefore, the paper may overstate or underestimate the level of interconnectivity and coherence.

Second, the policies or plans that were analysed show considerable differences in their development, details and presentation. At times, they signify a political ambition rather than a researched strategy. Hence, the state of publicly available policies or plans had considerable bearing on the richness of the analysis. Despite these limitations, these policies or plans are the most transparent and accessible documents that are available to judge the Sri Lankan Government's intentions and hold it accountable. It is possible that various publicly unavailable policies or plans guide energy production and consumption. These documents may enhance or weaken aspects of interconnectivity or balance.

Third, although this paper records references concerning interconnectivity and balance, it did not adjust or qualify the resulting scores for coherence. For instance, references to renewable energy were recorded as part of the environmental dimension, while references to improving energy reliability using fossil fuels were recorded as part of the economic dimension. In such cases, energy reliability contradicts decarbonisation and environmental protection. Even if coherent, there may be varying degrees of coherence. There are two reasons the paper avoids adjusting the scores. First, identifying coherence statements was difficult, because while government policies or plans pay attention to the various dimensions (i.e. balance), they did not make explicit coherence statements. Second, inferring coherence would require a separate standard for coherence. This is problematic since there are no absolute or relative thresholds of coherence that are immediately clear. Building such a standard would require attention to the country's own development status and the standards of sustainable development, which were explored in this paper. This does, however, point to an important research avenue for the future.

A future scoring system, however it defines coherence, must consider the coherence within and between policies. Some policies may only supplement other policies: a unidirectional relationship. For example, a policy encouraging renewable energy credits could increase the uptake of renewable energy. Some policies may compliment other policies: a bidirectional relationship. For example, regulations for electrified public transport could increase demand for low-carbon or zero-carbon energy, which in turn could make electrified transport more attractive. An ideal scoring system should discriminate between coherent and incoherent policies and assign different weights to different types of policies, such as those that promote supplementary actions or complementary actions.

5. Recommendations

This section presents some recommendations based on the network analysis on improving policy integration and aligning it to the SDGs and also on using the network analysis for this purpose.

5.1 Developing an integrated policy on energy in Sri Lanka

Acknowledge and purposively build on synergies in sectoral policies and plans

The network analysis shows that already some linked elements exists in sectoral policies and plans; however, in order to move towards a more integrated policy or plan, it would require a deliberate attempt to define the objectives for energy (in this case) with a larger stakeholder group in other sectors that will also recognise the multi dimensionality of the issues. This would allow for greater synergies and ability to minimise the contradictions or duplications that may arise and increase the overall impact of the intervention.

Striving for balance, but also to proactively reconcile the tension between clean energy and energy security

On the one hand, various policies or plans support clean energy security through the increase in renewable energy, energy efficiency and electrification (especially of transport services). On the other hand, many of these same policies seek to increase energy reliability by expanding fossil fuel-based energy, which then causes a contradiction. In addition, the lack of focus on how to deal with fossil fuel subsidies must also be addressed. A more coherent approach is needed to phase out fossil fuels and establish and develop a low-carbon energy system.

Design and develop an economic strategy conditioned on appropriate infrastructure development and sustainable consumption and production

The current business-as-usual approach, which envisions economic growth as a separate and independent dimension, should be re-evaluated. While some connectivity can be seen to these dimensions, a more systematic approach to urbanisation, industrialisation and sustainable agriculture is needed. Moreover, any approach to an economic strategy must be built on the principles of deep decarbonisation: energy efficiency, zero-carbon energy sources and fuel shifting. Such an approach would not necessarily involve reducing or stalling economic growth. It may, however, require a thoughtful and inclusive debate on the type of growth to which Sri Lanka should aspire.

Sharpen focus on the social dimension of clean energy and energy security and provide politically responsive solutions

Currently, energy policies or plans make references to "energy for all," emphasising the needs of vulnerable communities such as rural populations and the poor (recipients of social security benefits, such as *Samurdhi*) to be covered. Yet, greater attention and explicit identification must take place across the range of policies and plans to determine and address the characteristics of energy poverty. This is also a central tenant of the SDGs in its attempt to "leave no one behind."

Use holistic planning to implement the SDGs

The ambitions of the SDGs need to be integrated into the current planning processes rather than targeted through a separate action plan or agenda overseen by a single ministry. In other words, the positioning and ownership of the SDG agenda must be accepted as the main thrust of development. Hence, the overarching goals of development, which should be based on the principles of sustainability, should be defined and backed by key policymakers. Political commitment and citizen support are fundamental to facilitate this change.

Additionally, sustainable development requires principles to manage conflicts, balance competing demands, and ensure equity

Sustainable development requires societies to implement wide-ranging reforms with scarce resources and make explicit judgement calls on what the outcomes and who the winners and losers will be. This process cannot be left to chance. Consequently, an inclusive, credible and transparent process is vital to ensure that the decisions made are fully understood.

5.2 Insights for carrying out network analysis as a planning tool

Network analysis has proved useful for mapping Sri Lanka's clean energy and energy security policies, their dimensions, and the balance of competing priorities and concerns. It could be developed further and applied across all the SDGs and other national policies or plans.

In future research, network analysis could also be employed to simulate and visualise the ideal network structure of interconnectivity and balance. This ideal structure could be derived from political-economic models and existing literature on sustainable development. It would unveil the ideal path length, clustering coefficient, and degree distribution of clean energy and energy security policies. The ideal structure could then be compared to actual policies, assisting policymakers to determine politically responsive reforms.

A larger simulation should include planners and stakeholders who have a good knowledge of relevant sectors and policy agendas. This method should include a scoring tool that can be discussed and applied scientifically to prevent biases to some extent. Also, it should involve a visual tool that illustrates the strongest links and their relationships as well as missing links, which would serve as an objective basis to improve or modify policies (Fusion Tables, free software powered by Google, was used for this paper since it enables institutions to undertake such an analysis internally; it is much simpler to use than other network analysis packages, such as R). The simulation and tools would provide means to avoid cherry-picking goals and to rationalise which targets to focus on. They could also point to clusters of sectors and policies that can be integrated for better achievement of the SDGs.

Applying a criteria clean energy security that incorporates all three dimensions of sustainability allowed this paper to hone in and assess policies or plans against a specific objective. Similar conceptualisation maybe needed for each goal to increase the specificity of purpose and efforts. As it is necessary to see how all the SDGs are integrated and how synergies can be done across a wide range of sectoral policies or plans and the SDGs, it would be useful to take this a step further, and apply it across the SDGs using a broad conceptualisation of sustainability.

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