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## An Evaluation of The Water-Energy-Food Nexus and Its Alignment With The Sustainable Development Goals

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**AN EVALUATION OF THE WATER–  
ENERGY–FOOD NEXUS AND ITS  
ALIGNMENT WITH THE SUSTAINABLE  
DEVELOPMENT GOALS**

*Dr. Waseem Ahmad Qureshi<sup>+</sup>*

*Since 2011, the water–energy–food (WEF) nexus has become a popular term, widely deliberated upon by policymakers and scholars alike around the world. It has been referred to with different acronyms, depending upon their foci of interest: WEF for hydro-centric researchers; EFW for energy securitization policy researchers; and FEW for agrarian-based policy frameworks. By contrast, environmentalists, who like to include the variable of climate change within the nexus to use it as a primary element of research, prefer to call it the CLEW (climate–land–energy–water) nexus. This paper is an attempt to explain the WEF nexus in relation to the varied interpretations given by writers. The intricate task of unraveling the nexus and interdependency of the three variables has been taken up in this paper by delving in great detail into the criticism hurled at the term. In the process, it goes so far as to question whether the term adds anything substantial and novel to the existing literature in the field of resource securitization. Moreover, as one of the foremost criticisms of the WEF nexus, this paper will investigate the selection of elements (water, energy and food) employed, and test whether climate change, environmental concerns, livelihood issues, and population growth can be included in the nexus approach to find sustainable answers for future generations. Moreover, the relevant Sustainable Development Goals (SDGs) associated with the nexus are also explored. The paper gauges the potential interconnectedness between the WEF nexus and the SDGs to assist in achieving its goals and targets, while deliberating on experts’ ideas on the subject. To enhance our understanding of this domain, Pakistan’s commitment to the SDGs and nexus will be fleetingly touched upon through a brief analysis of the Climate Change Act 2017. Furthermore, the paper investigates whether the WEF nexus is of any value considering that population, livelihood, and environmental concerns—as essential elements—have not been included. Finally, this paper will try to recommend concepts through which the WEF nexus can be improved.*

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## I. INTRODUCTION

The world as we know it today has a population of 7.8 billion people,<sup>1</sup> billions of whom have no access to the three major resources of water, energy, and food. 2.1 billion people lack access to safe water, readily available at home, according to a 2017 World Health Organization report.<sup>2</sup> In 2019, 940 million people had limited

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<sup>1</sup> WORLDOMETER, <https://www.worldometers.info/world-population> (last visited July 26, 2020).

<sup>2</sup> *2.1 Billion People Lack Safe Drinking Water at Home, More than Twice as Many Lack Safe Sanitation*, WORLD HEALTH ORG. (July 12, 2017), <https://www.who.int/news-room/detail/12-07-2017-2-1-billion-people-lack-safe-drinking-water-at-home-more-than-twice-as-many-lack-safe-sanitation#:~:text=lack%20safe%20sanitation,-2.1%20billion%20people%20lack%20safe%20drinking%20water%20at%20home%2C%20more,as%20many%20lack%20safe%20sanitation&text=Some%203%20in%2010%20people,report%20by%20WHO%20and%20UNICEF> (last visited July 26, 2020).

access to electricity,<sup>3</sup> 4 billion people had no access to clean cooking fuel,<sup>4</sup> and 820 million people were undernourished.<sup>5</sup> Almost half a century ago, in 1972, Meadows predicted that if the trajectory of population, pollution, industrialization, and food production continued at the same rate, the growth rate of this planned growth would be stunted within a century.<sup>6</sup> In 2004, Meadows confirmed that the human economy was close to breaking point.<sup>7</sup> Within the next few years, food prices hiked exponentially, leaving mass populations unable to afford food and subsequently becoming malnourished.<sup>8</sup> During this period, the World Economic Forum (WEF) shed light on freshwater as a major non-substitutable resource: that is, it was being depleted in major regions across the globe at an alarmingly high rate.<sup>9</sup> Similarly, in 2015, Sachs noted that, compared to other pressing needs of humanity in the modern era, energy had acquired great prominence as a key sector that required instant and urgent consideration.<sup>10</sup> This essentially means that the growing human population on this planet has developed an insatiable need for high resource consumption in the water, energy, and food sectors. A WEF and SABMiller report from 2014 noted that all of this scarcity and increased demand for resources was due to the increased growth in the human population, which was adding

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<sup>3</sup> Hannah Ritchie & Max Roser, *Access to Energy*, OUR WORLD IN DATA (Sept. 2019), <https://ourworldindata.org/energy-access#:~:text=Summary,to%20clean%20fuels%20for%20cooking> (last visited July 26, 2020).

<sup>4</sup> *Id.*

<sup>5</sup> *World Hunger is Still Not Going Down After Three Years and Obesity is Still Growing—UN Report*, WORLD HEALTH ORG. (July 15, 2019), <https://www.who.int/news-room/detail/15-07-2019-world-hunger-is-still-not-going-down-after-three-years-and-obesity-is-still-growing-un-report> (last visited July 26, 2020).

<sup>6</sup> DONELLA H. MEADOWS ET AL., *THE LIMITS TO GROWTH* 23, 126 (Other Potomac Associates Books 1972).

<sup>7</sup> DONELLA H. MEADOWS ET AL., *LIMITS TO GROWTH: THE 30 YEAR UPDATE XIV* (Earthscan 2005).

<sup>8</sup> Rabi H. Mohtar & Bassel Daher, *Water, Energy, and Food: The Ultimate Nexus*, *ENCYCLOPEDIA OF AGRICULTURAL, FOOD, AND BIOLOGICAL ENGINEERING*, 1–5 (2d ed. 2012); MEADOWS., *supra* note 7, at 3.

<sup>9</sup> WORLD ECON. FORUM, *WATER SECURITY: THE WATER–FOOD–ENERGY–CLIMATE NEXUS* 9 (Dominic Waughray & James G. Workman eds., 2011).

<sup>10</sup> JEFFREY D. SACHS, *THE AGE OF SUSTAINABLE DEVELOPMENT* 200 (Columbia Univ. Press 2015) (ebook).

millions of additional people fighting for the same finite resources.<sup>11</sup> As a result of this growth—according to the NIC—the demand for water, energy, and food resources will be (up to) twice its 2012 levels by 2030.<sup>12</sup> The WEF also identified that the Earth will be a hungry, hot, and thirsty planet in the near future due to these increased demands for resources.<sup>13</sup>

Then Secretary-General of the United Nations, Ban Ki-moon, emphasized that the integrated problems of the water–energy–food (WEF) nexus are among the hardest policy challenges for humanity.<sup>14</sup> In the same year (2011), a WEF nexus conference was convened in Bonn which served as a catalyst for wider interest of researchers, scholars, experts, and policymakers working on this nexus.<sup>15</sup> Therefore, it is relevant to understand what is meant by this nexus approach. What does the WEF nexus involve? Is it something novel or just repackaging of old concepts? (The new packaging of old concepts does not in any way mean that the concept is unserviceable or serves no purpose.)

Accordingly, this paper is divided into seven sections. Section 1 sheds some light on the understandings of the WEF nexus from different perspectives. Next, Section 2 explores whether the WEF nexus is a novel approach. Section 3 investigates the selection of the three main elements in the WEF nexus. Afterwards, Section 4 briefly discusses the challenges in the integration of diverse sectors in the WEF nexus. Section 5 explores the alignment of the WEF nexus with the SDGs, within which Pakistani law on climate change in relation to the WEF nexus will be briefly touched upon. Subsequently,

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<sup>11</sup> SAB MILLER & WWF, THE WATER–FOOD–ENERGY NEXUS: INSIGHTS INTO RESILIENT DEVELOPMENT 2, 4 (2010), [http://assets.wwf.org.uk/downloads/sab03\\_01\\_sab\\_wwf\\_project\\_nexus\\_final.pdf](http://assets.wwf.org.uk/downloads/sab03_01_sab_wwf_project_nexus_final.pdf) (last visited July 26, 2020); IRENA, RENEWABLE ENERGY IN THE WATER, ENERGY AND FOOD NEXUS (2015).

<sup>12</sup> NAT'L INTELLIGENCE COUNCIL, GLOBAL TRENDS 2030: ALTERNATIVE WORLDS IV (2012).

<sup>13</sup> WORLD ECON. FORUM, *supra* note 9, at 8-10.

<sup>14</sup> Gareth B. Simpson & Graham P. W. Jewitt, *The Development of the Water–Energy–Food Nexus as a Framework for Achieving Resource Security: A Review*, 7 FRONTIERS IN ENVTL SCI. 2 (2019) [hereinafter *Simpson & Jewitt*].

<sup>15</sup> *Id.*

Section 6 will question the helpfulness of WEF nexus and, finally, Section 7 will provide recommendations to improve the WEF nexus.

## II. UNDERSTANDING THE WEF NEXUS

The literal meaning of the word “nexus” is the connection between parts of a system or a group of things.<sup>16</sup> These parts can be independent or interdependent. Therefore, the WEF nexus means the study of connections between water, food, and energy resources. These connections can be synergies, tradeoffs, conflicts, dependences, management, or relations depending on the context, location, and main focal point (*i.e.*, food for energy, energy for food, food for water, water for food, energy for water, or water for energy).<sup>17</sup>

Some scholars believe that the precise meaning of the concept WEF nexus is uncertain because there are a number of corresponding and opposing explanations,<sup>18</sup> while others say that the WEF nexus is just a buzzword that has an ambiguous meaning<sup>19</sup> that takes an immature approach toward resource security.<sup>20</sup> Gain claimed that some developing countries are not even aware of the concept,<sup>21</sup> while Cairns propounded that, in the United Kingdom, the use of the term WEF nexus is ambiguous and broad, which undermines its significance.<sup>22</sup> Furthermore, if we were to consider the selection of the resources to be discussed in the nexus, it seems that the selection

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<sup>16</sup> *Nexus*, CAMBRIDGE DICTIONARY, <https://dictionary.cambridge.org/dictionary/english/nexus> (last visited July 26, 2020).

<sup>17</sup> Simpson & Jewitt, *supra* note 14, at 2.

<sup>18</sup> Mohammad Al-Saidi & Nadir Ahmad Elagib, *Towards Understanding the Integrative Approach of the Water, Energy and Food Nexus*, 574 SCI. TOTAL ENV'T 1131 (2016); David Benson et al., *Water Governance in a Comparative Perspective: From IWRM to a 'Nexus' Approach?*, 8 WATER ALTERNATIVES 756 (2015).

<sup>19</sup> Jeremy Allouche et al., *Technical Veil, Hidden Politics: Interrogating the Power Linkages Behind the Nexus*, 8 WATER ALTERNATIVES 610 (2015).

<sup>20</sup> Rose Cairns & Anna Krzywoszynska, *Anatomy of a Buzzword: The Emergence of 'the Water-Energy-Food Nexus' in UK Natural Resource Debates*, 64 ENVTL. SCI. POL'Y 164 *passim* (2016).

<sup>21</sup> Animesh K. Gain et al., *The Water–Energy–Food (WEF) Security Nexus: The Policy Perspective of Bangladesh*, 40 WATER INT'L 895 (2015).

<sup>22</sup> Cairns & Krzywoszynska, *supra* note 20.

of only water, energy, and food as important resources or sectors is arbitrary.<sup>23</sup> Arguably, the pressing need to secure air quality, diminish pollution, and consider climate change are equally important, since they have the potential to wipe the entire human population from the earth.<sup>24</sup> This has consequently resulted in the introduction of an alternative approach to the resource security nexus known as climate–land–energy–water use (CLEW).<sup>25</sup>

Overall, the World Economic Forum places water security as the main focal point of concern, which is why it is referred to as the WEF nexus. This only means that, for hydrologists, the nexus preferred is the WEF nexus; for agriculturalists and food-related policymakers and researchers, it is the food–energy–water nexus (FEW); and, in the energy sector, it is the energy–water–food nexus (EWF).<sup>26</sup> Based on these differing approaches, it can be safely established that the nexus approach is a fluid, developing concept that can be tailored in accordance with the use and context of its employability by the understanding of its researcher or policymaker. The use of the WEF nexus in scholarly works also varies in scope, both narrow and broad. It is narrow when only water–energy–food is discussed in a limited way, restricting it to these three resources; whereas it is employed in a wider perspective when the foci of discussions include pollution, climate change, and other diverse domains. Moreover, the emphasis of the nexus approach can be selectively applicable, too, as in the case of growth impact (*i.e.*, sustainable development, the green economy, synergies, tradeoffs, and optimization,) while at other times it aims to cover resource

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<sup>23</sup> Dennis Wichelns, *The Water-Energy-Food Nexus: Is the Increasing Attention Warranted, from Either a Research or Policy Perspective?*, 69 ENVTL. SCI. POL'Y 113 (2017).

<sup>24</sup> MARIANNA POBEREZHSKAYA, COMMUNICATING CLIMATE CHANGE IN RUSSIA: STATE AND PROPAGANDA 19 (Routledge ed., 2016).

<sup>25</sup> Manuel Weirich, Global Resource Modelling of the Climate, Land, Energy and Water (Clews) Nexus using The Open Source Energy Modelling System (OSEMOSYS), (2013) Internship Report (July 1, 2013) (unpublished M.E.3. thesis, on file with the Division of Energy Systems Analysis of the Royal Institute of Technology Stockholm (KTH)) [hereinafter *Weirich*].

<sup>26</sup> Simpson & Jewitt, *supra* note 14.

scarcity, (*i.e.*, the depletion of natural resources, poverty alleviation, and management of livelihoods).<sup>27</sup>

### III. IS THE WEF NEXUS A NEW APPROACH?

A number of scholars and authors maintain that the WEF nexus approach is not novel at all and has actually existed for a couple of decades.<sup>28</sup> For instance, with agriculture as the main focal point of research, a 2014 FAO WEF nexus report asks whether the WEF nexus is “old wine in [a] new bottle” or whether it contributes anything to policymaking on sustainable development.<sup>29</sup> Along the same lines, the selection of water, energy, and food as the three main resources is also questionable, given that climate change, livelihoods, governance, and urbanization are equally important to be included in the debate on integrated research of sustainable development.<sup>30</sup> Wichelns believes that the WEF nexus framework of thinking is not a tested and agreed-upon approach.<sup>31</sup>

While questioning the novelty of the WEF nexus, Muller maintains that it is evident from the 1977 U.N. conferences that the international community was fully aware of the interconnected dependence of major resources on one another.<sup>32</sup> The influential work of Meadows in *The Limits of Growth* (1972) identified that all the major concerns of the world are interconnected in several constructs.<sup>33</sup> Similarly, Cai found that the Harvard Water Program was already undertaking interdisciplinary research on the water sector

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<sup>27</sup> *Id.*

<sup>28</sup> Wichelns, *supra* note 23; Benson et al., *supra* note 18, at 756–73; Allouche et al., *supra* note 19; Simpson & Jewitt, *supra* note 14; Mike Muller, *The “Nexus” as a Step Back towards a More Coherent Water Resource Management Paradigm*, 8 WATER ALTERNATIVES 675 (2015).

<sup>29</sup> FOOD & AGRIC. ORG. OF THE UNITED NATIONS, THE WATER-ENERGY-FOOD NEXUS: A NEW APPROACH IN SUPPORT OF FOOD SECURITY AND SUSTAINABLE AGRICULTURE 6 (2014).

<sup>30</sup> Simpson & Jewitt, *supra* note 14.

<sup>31</sup> Wichelns, *supra* note 23.

<sup>32</sup> Muller, *supra* note 28, at 675–94.

<sup>33</sup> MEADOWS ET AL., *supra* note 6.

in the 1960s.<sup>34</sup> This is supplemented by Wichelns, who noted that the integration of sectors for policymaking had existed as early as the 1940s.<sup>35</sup> Benson also agrees that the policy literature during the 1990s was already working with the interconnectedness of different sectors.<sup>36</sup> The discourse of sustainable development explicitly states that resource security, population growth, energy sector, urbanization, and the food sector are all well-connected with each other in numerous ways.<sup>37</sup>

But, if the WEF nexus approach is not a novel thing, and the discourse of sustainable development and interdisciplinary resource management and security researches were already working on the interconnectedness of different sectors to explore interdependence, conflicts, management, and security, then why has there been a sudden surge in developing a need to work on the WEF nexus by such actors as multinational corporations (such as Coca-Cola), the development sector, the WWF, and the World Economic Forum? Pandey is of the view that this WEF nexus approach is a way to cater to and recognize sustainable development in our times,<sup>38</sup> while Sharma and Wichelns, in contrast, posit that the WEF nexus approach has more to do with an understanding and responding to the contemporary requirements of fighting climate change because climate change has primarily influenced the water, energy, and food sectors.<sup>39</sup> Both of these narratives are true to some extent: the current surge in research for the WEF nexus is driven toward addressing

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<sup>34</sup> Ximing Cai et al., *Understanding and Managing the Food-Energy-Water Nexus – Opportunities for Water Resources Research*, 111 *ADV. WATER RES.* 259, 259–73 (2018).

<sup>35</sup> Wichelns, *supra* note 23.

<sup>36</sup> Benson et al., *supra* note 18, at 756–73.

<sup>37</sup> *See generally* GRO HARLEM BRUNDTLAND, *OUR COMMON FUTURE: REPORT OF THE WORLD COMMISSION ON ENVIRONMENT AND DEVELOPMENT* (1987).

<sup>38</sup> Vishnu Prasad Pandey & Sangam Shrestha, *Evolution of the Nexus as a Policy and Development Discourse*, in *WATER-ENERGY-FOOD NEXUS: PRINCIPLES AND PRACTICES* 13 (Salam et al. eds., 2017).

<sup>39</sup> Golam Rasul & Bikash Sharma, *The Nexus Approach to Water–Energy–Food Security: An Option for Adaptation to Climate Change*, 16 *CLIMATE POL’Y*, 682–702 (2016); Wichelns, *supra* note 23.

both the impact of climate change and the management and security of resources in relation to sustainable development.

Similar to this advancement in the WEF nexus approach to find an interdisciplinary interdependence between different sectors—under sustainable development during the 1990s—the term “integrated water resources management” (IWRM) was heavily employed to cater to linkages among different sectors.<sup>40</sup> The United Nations, in its Millennium Development Goals, integrated the concepts of IWRM.<sup>41</sup> Bogardi believes that the tenets of IWRM were satisfactory for dealing with addressing nexus connections across different sectors.<sup>42</sup> However, Benson disagrees, arguing that, in addition to IWRM, the WEF nexus highlights the interdisciplinary sectors in a more holistic way, while promoting IWRM concerns,<sup>43</sup> which means that there is potential overlapping of both concepts. So, wider academic circles do believe that the nexus approach in WEF is not novel, yet it is important to note that, while IWRM only provided a water-centric approach to the multipolarity of the interconnectedness of sectors, the WEF nexus gives us the flexibility to choose our own focal point of main research, which is highly complementary toward food-centric and energy-centric researchers and policymakers.<sup>44</sup> Moreover, the WEF nexus is fully capable and flexible enough to integrate the evolving concepts and impacts of pollution, climate change, and development of urbanization for the interdisciplinary modeling, planning and policymaking sector. However, there are some serious problems in WEF nexus integration. For this reason, the next section of this paper will explore the issues and perspectives related to selection of the elements of the WEF nexus.

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<sup>40</sup> Mathew Kurian, *The Water-Energy-Food Nexus: Trade-Offs, Thresholds and Transdisciplinary Approaches to Sustainable Development*, 68 ENVTL. SCI. POL’Y, 97–106 (2012).

<sup>41</sup> Benson et al., *supra* note 18, at 756–73.

<sup>42</sup> Jonas Bogardi et al., *Water Security for a Planet under Pressure: Interconnected Challenges of a Changing World Call for Sustainable Solutions*, 4 CURR. OPIN. ENVTL. SUSTAIN. 35–43 (2012), <https://doi.org/10.1016/j.cosust.2011.12.002>.

<sup>43</sup> Benson et al., *supra* note 18, at 756–73.

<sup>44</sup> Simpson & Jewitt, *supra* note 14.

## IV. SELECTION OF WEF ELEMENTS

Taking into consideration the selection of resources to be discussed in the nexus, it seems that the selection of only water, energy, and food as important resources or sectors is arbitrary.<sup>45</sup> Arguably, the pressing needs of a burgeoning population, pollution (air, land, water), and the consideration of climate change are equally important since they have the potential to upend the entire progress on global development.<sup>46</sup> The selection of three main resources—water, energy, and food—is also questionable on the basis that climate change, livelihoods, governance, and urbanization are also equally important to be included in the integrated research for global sustainable development.<sup>47</sup> So, in addition to the livelihood and climate change concerns by aligning the securitization of resources with SDGs and climate change impacts, are there any more elements of nexus that are critical to improve the WEF nexus perspective? What about adding human population as an interrelated element?

## A. Population as an Element in the WEF Nexus

The main crux of the WEF nexus is the securitization of water, energy, and food resources.<sup>48</sup> But for whose sake are we concerned about securing these resources? Of course, it is to ensure a sustainable future for humanity and development in perpetual balance with nature.

Owing to an ever-increasing human population, the demand for water utilization, energy, and food consumption is increasing.<sup>49</sup> We as human beings have failed to protect Mother Earth from manmade pollution, environmental change, change in landscapes,

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<sup>45</sup> Wichelns, *supra* note 23, at 114.

<sup>46</sup> POBEREZHSKAYA, *supra* note 24, at 19.

<sup>47</sup> Simpson & Jewitt, *supra* note 14.

<sup>48</sup> Gain et al., *supra* note 21.

<sup>49</sup> FLORIAN HARKORT, FOOD BUSINESS AND THE GLOBAL WATER CHALLENGE 5 (Grin Verlag 2008); *see also* NATIONAL INTELLIGENCE COUNCIL, GLOBAL TRENDS 2030: ALTERNATIVE WORLDS IV (2012).

change in the hydro-cycle,<sup>50</sup> deforestation, decrease in animal populations, and climate change. Humankind has altered the functioning of this planet so harshly that the Earth is under intense environmental pressure.<sup>51</sup> For these reasons, many scientists suggest that humanity should revert to using natural ways of utilizing freshwater and adapt its ways of living in harmony with nature for the sake of its own survival.<sup>52</sup> This paper understands that all other elements in the WEF nexus are resources, and that climate change is not a resource, which is why the inclusion of population growth can be viewed as “comparing apples with oranges.” But the idea of including population in the WEF nexus is not to view humanity as a resource but to highlight the importance of population growth on all other resources, so that the main foci of research can be improved. This inclusion of a non-resource element in the WEF nexus exists in other instances where researchers have employed non-resource variables within the acronym of the nexus approach. For instance, climate change is not a resource, yet it is used and highlighted by environmentalists in the WEF nexus by referring to it as the CLEW nexus.<sup>53</sup>

Therefore, the WEF nexus does implicitly include human population<sup>54</sup> and its expected growth while calculating the need for these resources. The quintessential solution for this problem of increased demand is to increase supply of these resources, and to employ greater efficiency and efficacy in utilization of the resources. But the question arises: is the consideration given to human population within the WEF nexus enough to provide sustainable answers? This paper argues that the human population should be the main focal point in the WEF nexus because all other problems in the sustainable development, including climate change and

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<sup>50</sup> JEREMY DAVIES, *THE BIRTH OF THE ANTHROPOCENE 2* (Univ. of California Press 2016); JEREMY J. SCHMIDT, *WATER: ABUNDANCE, SCARCITY, AND SECURITY IN THE AGE OF HUMANITY 2–3* (NY Univ. Press 2017).

<sup>51</sup> See JEREMY DAVIES, *THE BIRTH OF THE ANTHROPOCENE 2* (Univ. of Cal. Press 2016).

<sup>52</sup> Schmidt, *supra* note 50, at 2–3.

<sup>53</sup> Weirich, *supra* note 25, at 8.

<sup>54</sup> *Water, Food and Energy*, UNITED NATIONS, <https://www.unwater.org/water-facts/water-food-and-energy> (accessed July 26, 2020).

environmental concerns, and all the WEF nexus elements including water, energy, and food resources securitization are primarily related to human population and its growth.

Over the past 60 years, the human population has more than doubled, from 3 billion people to almost 7.8 billion people.<sup>55</sup> If our population continues to grow at this rate, then by 2100 the human population will reach a staggering number of more than 16 billion people. If this vicious cycle of high production and resource consumption is allowed to proceed at the same rate, no possible amount of resources available in the world would ever be enough to cater to the needs for food, energy, and water for the ever-increasing human population. The scenario raises the question: are the SDGs and WEF nexus analysis aligned with the problem of human population growth? And should the SDGs include any goal or a target to stop this growth in human population? More importantly, should the WEF nexus consider human population a crucial element in its analysis? Similar implications will be discussed in Section 5, which discusses the criticality of improving the WEF nexus. The next section will discuss the problems and challenges associated with WEF nexus integration.

#### IV. CHALLENGES IN WEF NEXUS INTEGRATION

Critics of the WEF nexus argue that a comprehensive analysis of only one sector is very intricate, so integrating several sectors in a nexus approach is problematically complex. Wichelns agrees that, given the unsuccessful stories of IWRM, the mere existence of the WEF nexus should be probed. IWRM was calamitous because it failed to estimate the precincts of administration as their main foci

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<sup>55</sup> Max Roser et al., *World Population Growth*, OUR WORLD IN DATA (2013), <https://ourworldindata.org/world-population-growth> (last visited July 26, 2020).

was on the hydrological biosphere.<sup>56</sup> For these reasons, IWRM nosedived from achieving its designated goals.<sup>57</sup>

In contrast, the problem of interdisciplinary understanding in IWRM, which resulted in its demise, can be solved by the WEF nexus, since the WEF nexus works as a complement to the interdisciplinary sectors involved in IWRM by providing a better understanding of the world. In facilitating IWRM, the nexus approach can decrease the baggage of “institutional silos” that are ubiquitous in the policymaking and governance domains.<sup>58</sup>

Another criticism of the WEF nexus is its very nature of involving and integrating a number of sectors, which means that the interdependence and cross-sector tradeoffs will result in the demise of the WEF nexus. The notion of integrating the water, food, and energy sectors may seem attractive in theory, but in practice its implementation is hard to implement.<sup>59</sup> In response, Wicaksono maintains that the integration of the WEF nexus existed before its academic prominence, and it has been successfully applied and implemented in some regions under different terminologies.<sup>60</sup> Daher also realizes the problem of complex integration of discrete sectors as he argues that there is no one-size-fits-all solution in the WEF nexus.<sup>61</sup> Instead, to cover intricacies in tradeoffs and synergies, each case needs its own contextualization and scaling.<sup>62</sup> It does indeed seem an impossible task to standardize the methods and approaches of the WEF nexus to cater to the multifaceted problems in different

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<sup>56</sup> Kurian, *supra* note 40, at 97–106.

<sup>57</sup> Rob C. de Loë & James J. Patterson, *Rethinking Water Governance: Moving beyond Water-Centric Perspectives in a Connected and Changing World*, 58 NAT. RESOUR. J. 75-99 (2017).

<sup>58</sup> Antti Belinskij, *Water-Energy-Food Nexus within the Framework of International Water Law*, 7 WATER 5396–415 (2015).

<sup>59</sup> Hayley Leck et al., *Tracing the Water-Energy-Food Nexus: Description, Theory and Practice*, 9 GEOGR. COMPASS 445-60 (2015).

<sup>60</sup> Albert Wicaksono et al., *Water, Energy, and Food Nexus: Review of Global Implementation and Simulation Model Development*, 19 WATER POLY 440-62 (2017).

<sup>61</sup> Bassel Daher et al., *Modeling the Water-Energy-Food Nexus: A 7-Question Guideline*, in WATER-ENERGY-FOOD NEXUS: PRINCIPLES AND PRACTICES 55–66 (Salam et al. eds., 2017).

<sup>62</sup> *Id.*

sectors. However, Torres et al. have made a decent effort in proposing a systemic and standardized procedure to develop WEF nexus thinking.<sup>63</sup> Based on the knowledge compiled and compared from more than 300 papers, Torres et al. devised a step-by-step methodology for developing WEF nexus thinking.<sup>64</sup> They propose: first, elaborating the conceptions; then, constructing the methodologies while scaling it to the given geographical region; next, moving toward adjustments, improvisation, and validation of procedures; and, finally, concluding with the proposed decision support system as a final benefit.<sup>65</sup>

Besides this, there are two other major challenges in following the nexus approach: the problem of including virtual water in the WEF nexus and the problem of incorporating the issue of globalization/modernization. Both of these matters are also interconnected. The globalization issue stems from the fact that the international market has globalized liberally, which complicates matters when the problems cross borders.<sup>66</sup> For instance, take the example of large-scale land acquisitions (LSLAs). LSLAs are actions undertaken by multinational corporations and by the developed world in vulnerable poor and developing countries to secure water and land resources in relation to power, food, and energy production.<sup>67</sup> What happens in such LSLAs is that, in order to secure the needs of the developed world (in the name of water security, food security, and energy security) on the pretext of economic liberalization, the poor global community is adversely impacted as its natural wealth gets exploited. This means that an inverse effect on the livelihood of an already affected poor people in the global community has the side effect of securing resources by LSLAs for

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<sup>63</sup> Cássia Juliana Fernandes Torres et al., *A Literature Review to Propose a Systematic Procedure to Develop Nexus Thinking Considering the Water–Energy–Food Nexus*, 11 SUSTAINABILITY 7205 (2019).

<sup>64</sup> *Id.*

<sup>65</sup> *Id.*

<sup>66</sup> Simpson & Jewitt, *supra* note 14.

<sup>67</sup> See Giuseppina Siciliano et al., *European Large-Scale Farmland Investments and the Land-Water-Energy-Food Nexus*, 110 ADV. WATER RESOUR. 579–590 (2017) (looking at Siciliano’s 2017 work on LSLAs in the developed world in Mozambique, Guinea and Sierra Leone).

the developed world.<sup>68</sup> By contrast, in regard to the virtual water problem, when the food crisis crosses international borders, an unfathomably large amount of water is exchanged in such transactions. The idea is that the number of liters of water used to raise a kilogram of, for example, rice is actually the amount of water exported to developed nations in the form of virtual water.<sup>69</sup> For instance, a kilogram of beef production requires 15,500 liters (15.5 tonnes) of water.<sup>70</sup> The problem is that the measurement tools and units for food and water are so different that the data analysis required to undertake tradeoffs and synergies of exporting food with that of water scarcity and water stress is not only complex but also very challenging to achieve the necessary scrutiny.<sup>71</sup> Holistically, this problem is connected with the globalization of the international trade market, with impacts being reflected on the economic and resource security of the developed world at the expense of agricultural economies, with high costs being incurred by nations like Pakistan.

To see how a globalized market—which exchanges the hands of virtual water and food resources—is inversely affecting the developing world’s ability to secure resources for the developed world in a regional context scaling, let’s discuss the case studies undertaken by Rasul and Ringler in 2015<sup>72</sup> and 2013<sup>73</sup> respectively. Rasul identifies that South Asia, which only has 5% of the world’s surface area, caters for the food demand of more than 25% of the global population.<sup>74</sup> It can be argued that South Asia, in itself, is densely populated. But this cross-border trade of food and virtual water is forcing agricultural economies to subsidize energy prices and encourage farming.<sup>75</sup> At the same time, the overall food production processing to cater for the same needs is depleting water and energy

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<sup>68</sup> Simpson & Jewitt, *supra* note 14.

<sup>69</sup> Andrew Biro, *Water Wars by Other Means: Virtual Water and Global Economic Restructuring*, 12 GLOBAL ENVTL. POL’Y 86 (2012).

<sup>70</sup> *Id.* at 97.

<sup>71</sup> Simpson & Jewitt, *supra* note 14, at 4.

<sup>72</sup> Rasul & Sharma, *supra* note 39, at 682–702.

<sup>73</sup> Claudia Ringler et al., *The Nexus across Water, Energy, Land and Food (WELF): Potential for Improved Resource Use Efficiency?*, 5 CURRENT OPINION IN ENVTL. SUSTAINABILITY 617, 617-24 (2013).

<sup>74</sup> Rasul & Sharma, *supra* note 39, at 682–702.

<sup>75</sup> See “No-brainer” nexus in Ringler et al., *supra* note 73, at 622.

resources at alarming rates in this region. This in turn adversely threatens the food security paradigm.<sup>76</sup>

Furthermore, in addition to the challenges of incorporating virtual water data in globalized economies, the WEF nexus needs to cater to the regional and temporal scaling of research in order to reap any employable application of nexus-related policies. The case study of South Asia discussed above regarding the developing world as the providers of natural resources to the developed world is an example of the regional scaling of the WEF nexus. It can also be scaled down to national and subnational levels for more specific results;<sup>77</sup> whereas, for temporal scaling, a study of the contemporary status quo can be altered to have an idea of the current situation of the WEF nexus. Likewise, a specific period of, say, a month, year or decade can also be selected, depending on the appropriation of the context. But what happens is that, to secure the interests of humanity and of human needs, these studies tend to neglect the other contingent elements of climate change, environment, and livelihoods.<sup>78</sup>

An example of contextually altered scaling of the WEF nexus at the regional level is the case study of Mpumalanga province of South Africa, undertaken by BFAP in 2012,<sup>79</sup> Simpson in 2017,<sup>80</sup> Greenpeace in 2018,<sup>81</sup> and McCarthy in 2011.<sup>82</sup> Mpumalanga province is the power generation hub of South Africa; it also has

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<sup>76</sup> Simpson & Jewitt, *supra* note 14, at 1.

<sup>77</sup> *Id.* at 3.

<sup>78</sup> *Id.* at 4.

<sup>79</sup> BUREAU FOR FOOD AND AGRIC. POL'Y, EVALUATING THE IMPACT OF COAL MINING ON AGRICULTURE IN THE DELMAS, OGIES AND LEANDRA DISTRICTS: A FOCUS ON MAIZE PRODUCTION (2012) [hereinafter *BFAP*].

<sup>80</sup> Gareth Simpson & Marit Berchner, *Measuring Integration – Towards a Water-Energy-Food Nexus Index*, 16 WATER WHEEL 22, 22-23 (2017).

<sup>81</sup> Oliver Meth, *New Satellite Data Reveals the World's Largest Air Pollution Hotspot is Mpumalanga – South Africa*, GREENPEACE (Oct. 29, 2018), <https://www.greenpeace.org/africa/en/press/4202/new-satellite-data-reveals-the-worlds-largest-air-pollution-hotspot-is-mpumalanga-south-africa/#:~:text=Greenpeace%20analysis%20of%20the%20data,NO2%20hotspot%20across%20six%20continents> [hereinafter *Greenpeace*].

<sup>82</sup> Terence S. McCarthy, *The Impact of Acid Mine Drainage in South Africa*, 107 S. AFR. J. SCI. 712 (2011).

46.6% of the arable land of a country, of which only 1.5% is dedicated to be arable.<sup>83</sup> The energy in this province is produced by burning coal found in its mines, and these open-cast coalmines decrease the area of arable land in the region.<sup>84</sup> Not only does the mining of coal in this province decrease the arable land in the region, which threatens food security; it also contaminates water<sup>85</sup> and air quality by pollution.<sup>86</sup> So, the WEF nexus approach in this regional study suggests that the country and its province should develop and adopt an alternative, renewable, and sustainable approach to generating power/energy.<sup>87</sup>

Since the WEF nexus approach is a way to cater to and recognize sustainable development in our times,<sup>88</sup> it is relevant to ask whether sustainable development has anything to do with the WEF nexus. And, do the Sustainable Development Goals (SDGs) integrate the WEF nexus in their goals and targets? If so, then what connections and links of interdependence do the SDGs make, in addition to the independent sectoral goals of water security, food security, and energy security? The independent inclusion of WEF nexus elements in the SDGs is sufficient to promote interdisciplinary research, modeling, and policymaking in the WEF nexus. So, any additional overlapping, and explicit cross-sector reference of WEF elements in SDGs is purely complementary.

## V. THE SDGS

With intergovernmental cooperation, the United Nations member states devised the SDGs in 2014 for the international

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<sup>83</sup> BFAP, *supra* note 79, at 5.

<sup>84</sup> Simpson & Berchner, *supra* note 80, at 23.

<sup>85</sup> McCarthy, *supra* note 82.

<sup>86</sup> Greenpeace, *supra* note 81.

<sup>87</sup> Simpson & Jewitt, *supra* note 14.

<sup>88</sup> P. Abdul Salam et al., *The Need for the Nexus Approach*, in WATER-ENERGY-FOOD NEXUS: PRINCIPLES AND PRACTICES 3 (Salam et al. eds., 2017), [hereinafter Salam et al., *The Need for the Nexus Approach*]

community for the period 2015–2030.<sup>89</sup> Previously, the Millennium Development Goals (MDGs) had been set as goals for the international community to be completed by 2015: these included commitments from UN member states to “combat poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women.”<sup>90</sup> The SDGs, as the successor to MDGs, were intended to address interconnected issues faced by the global community related to “poverty, inequality, climate change, environmental degradation, peace and justice.”<sup>91</sup> In an effort toward a sustainable future, the SDGs cover a larger range of issues than their predecessors.<sup>92</sup> Therefore, they are intended as universal guideposts for all countries—developing and developed—alike.<sup>93</sup>

All stakeholders, including policymakers and consultants, have yearned for a nexus among the diverse sectors needed for the integration of policies. This longing for integration comes from goals set out in the nexus regarding links, synergies, and tradeoffs within different sectors.<sup>94</sup> Since policies function in “silos,” and owing to the need of interconnectedness in diverse fields, the conductive framework is of great value.<sup>95</sup>

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<sup>89</sup> Rep. of the Open Working Group of the General Assembly on Sustainable Development Goals (2014), U.N. Doc. A/68/970 [hereinafter *Report of Working Group on SDGs*].

<sup>90</sup> *Millennium Development Goals (MDGs)*, WORLD HEALTH ORG. (Feb. 19, 2018), [https://www.who.int/topics/millennium\\_development\\_goals/about/en/](https://www.who.int/topics/millennium_development_goals/about/en/) (accessed July 26, 2020).

<sup>91</sup> *Sustainable Development Goals (SDGs)*, UNITED NATIONS (Jan. 1, 2016), <https://www.un.org/sustainabledevelopment/sustainable-development-goals> (accessed July 26, 2020) [hereinafter U.N., *SDGs*].

<sup>92</sup> *Id.*

<sup>93</sup> David Le Blanc, *Sustainable Development Goals and Policy Integration in the Nexus*, in *THE WATER, FOOD, ENERGY AND CLIMATE NEXUS* 47 (Felix Dodds & Jamie Bartram eds., 2016) [hereinafter Le Blanc].

<sup>94</sup> *The Global Goals for Sustainable Development: Questions & Answers*, THE GLOBAL GOALS, <https://www.globalgoals.org/faq> (last visited Nov. 18, 2020) (“The new Goals are universal and apply to all countries, whereas the MDGs were intended for action in developing countries only.”).

<sup>95</sup> Nina Weitz et al., *A Nexus Approach to the Post 2015-Agenda: Formulating integrated Water, Energy, and Food SDGs*, 34 SAIS REV. OF INT’L AFF. 37, 38-39 (2014).

Setting goals by international agreement carries a certain weight for the development region, in terms of both setting universal targets/goals and highlighting key issues in political circles. Through these goals, national and international institutions are provided with collective standards, against which their actions and responses can be judged, implemented, and monitored.<sup>96</sup> So, if international goals are devised in an integrated way (where one goal is referred to and linked with another goal), nexus policies can also be given an extra push by the same SDGs for policymakers and development agencies.<sup>97</sup>

For this reason, the experts in nexus research and studies are concerned with the exploration of the WEF nexus in the SDGs, in the hope of finding and relating nexus connections within the SDGs.<sup>98</sup> One way to do that is to investigate the integration or overlapping of goals to see the nexus connections, while another way is to compare the SDGs with MDGs to explore whether the integration of sectors/goals have enriched the SDGs or whether there is still room for improvement.<sup>99</sup> One stance takes an optimistic view: that the SDGs are adequate to embrace the integration of sectors. The other holds a pessimistic approach: that the current goals set in SDGs are not sufficient to accommodate the incorporation of the nexus.

This section does not intend to discuss both of these positions. Instead, it attempts to explore whether the framework of the current SDGs is conducive to incorporate the integrated nexus. To do this, it will investigate the existing linkages among the SDGs, and compare them with the connections available in the scholarly literature on the WEF nexus.

#### A. Nexus Connections

The “nexus” is mentioned and referred to in different ways based on the foremost emphasis in the research. For instance, contemporary climate change analysts prefer to use CLEW, that is,

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<sup>96</sup> Le Blanc, *supra* note 93, at 47–48.

<sup>97</sup> Le Blanc, *supra* note 93, at 47–48.

<sup>98</sup> Le Blanc, *supra* note 93, at 48.

<sup>99</sup> *Id.*

climate–land–energy–water,<sup>100</sup> whereas energy scholars use EFW, energy–food–water;<sup>101</sup> food strategy experts employ food–energy–water (FEW);<sup>102</sup> and, water security researchers choose to call it water–energy–food nexus (WEF).<sup>103</sup> The CLEW perspective has used modeling and planning tools to bring all four sectors together,<sup>104</sup> and Weirich’s 2013 modeling on CLEW connects the climate change, land, energy, and water sectors with material consumption.<sup>105</sup> The prevalent arrangement of the nexus does not generally integrate climate change,<sup>106</sup> yet it has a strong influence on all networks of the nexus.<sup>107</sup> Though the CLEW nexus does not seem to be mainstream focus in nexus studies, it has still been used in both theory and modeling at subnational, national, and global levels.<sup>108</sup> So, for the purposes of this section, this paper will use the CLEW nexus for the discussion.

Numerous studies and reports have stressed the necessity to deliberate on the connections for tradeoffs, synergies, and links in resource sectors. Most importantly, the United Nations Report of 2014 (the Prototype Global Sustainable Development Report) interconnects the components of CLEW in detail.<sup>109</sup> Weitz’s 2014 report is another example that highlights the importance of considering the nexus in relation to international sustainable goals.<sup>110</sup> Similarly, Blanc’s paper on the nexus provides great insight into the comparison of sustainable goals with CLEW.<sup>111</sup> However, the significance of individual links in the nexus may vary in accordance

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<sup>100</sup> Blanc, *supra* note 93, at 48-50.

<sup>101</sup> Giovanni Bidoglio et al., *The Water-Energy-Food-Ecosystems (WEFE) Nexus*, in ENCYCLOPEDIA OF ECOLOGY 459-466 (2019).

<sup>102</sup> Simpson & Jewitt, *supra* note 14.

<sup>103</sup> *Id.*

<sup>104</sup> Bazilian et al., *supra* note 94.

<sup>105</sup> Weirich, *supra* note 25.

<sup>106</sup> Simpson & Jewitt, *supra* note 14.

<sup>107</sup> Le Blanc, *supra* note 93, at 48.

<sup>108</sup> *Id.*

<sup>109</sup> *Report of Working Group on SDGs*, *supra* note 89.

<sup>110</sup> Weitz et al., *supra* note 95.

<sup>111</sup> Le Blanc, *supra* note 93.

with the context and settings of the region applied.<sup>112</sup> For some settings, water may be the most important link in relation to energy,<sup>113</sup> whereas in other instances—such as agrarian economies—food and water can be most stressed link in nexus research.<sup>114</sup>

Below are the nexus interlinkages with all the sectors within the CLEW nexus, provided by Blanc’s paper.<sup>115</sup>

	<b>Climate</b>	<b>Land/Food</b>	<b>Energy</b>	<b>Water</b>
<b>Climate</b>		“Climate change and extreme weather affect crop productivity and increase water demand in most cases.”	“Climate change alters energy needs for cooling and heating and impacts the hydropower potential.”	“Climate change alters water availability and the frequency of droughts and floods.”
<b>Land/Food</b>	“Greenhouse gas emissions from land use change (vegetation and ‘soil carbon’) and fertilizer production.”		“Energy is needed for water pumping, fertilizer and pesticide production, agricultural machinery and food transport.”	“Increased water demand due to intensification of agriculture, and effects on the N/P cycles.”

<sup>112</sup> Weitz et al., *supra* note 95; *Report of Working Group on SDGs*, *supra* note 89.

<sup>113</sup> Le Blanc, *supra* note 93, at 49.

<sup>114</sup> Simpson & Jewitt, *supra* note 14.

<sup>115</sup> Le Blanc, *supra* note 93, at 49.

<b>Energy</b>	“Fuel combustion leads to GHG emissions and air pollution.”	“Land fuels for biofuels and renewable energy tech. (solar, wind, hydro, ocean), crop/oil price correlation.”		“Changes in river flow, evaporation in hydropower dams, biofuels crop irrigation , fossil fuel extraction (esp. unconventional).”
<b>Water</b>	“Changes in hydrological cycles affect local climates.”	“Changes in water availability for agriculture and growing competition for it affect food production.”	“Water availability for biofuels, energy use for desalination but also storage of renewable energy as fresh water.”	

## B. SDGs Regarding CLEW

The SDGs were formed after rigorous intergovernmental discussions and negotiations. They outline universal goals for the global community. They are merely a reflection of multipolarity of international concerns. In no way are they intended to show the specific understanding of the world to prove outcomes of their goals based on socioeconomic scenarios.

Since SDGs encompasses a variety of sectors, they are highly useful for policymaking owing to their extensive array of groundings. Within this context, they are particularly useful for the CLEW nexus, because the SDGs have accommodated each of the elements of

CLEW. This inclusion of all CLEW sectors in SDGs improves nexus conspicuousness. The climate change sector is mentioned as Goal 13; land and food are Goals 2 and 15; energy is Goal 7; and water is Goal 6.<sup>116</sup> Below are the specific nexus goals/targets explicitly mentioned in the SDGs.

### 1. Climate Change

There is no specific time-based target for climate change in Goal 13. Instead, the Act Now Program is “[p]rimarily an online and social media campaign [that] will educate and encourage individual actions, mainly by adjusting consumption patterns. [It is believed that by] changing our habits and routines, and making choices that have less harmful effects on the environment, we have the power to confront the climate challenge.”<sup>117</sup> In addition, this SDG has a six-layered goal to fight climate change, focusing on governmental actions toward: (1) investment in green-decarbonized economies, (2) green jobs for growth, (3) green economy, (4) investments in sustainable solutions (*e.g.*, alternatives for fuel); (5) confrontation of climate risks; and, (6) international cooperation for all of this.<sup>118</sup> However, Goal 13’s non-timebound targets require actions toward maintaining resilience against natural hazards,<sup>119</sup> integration of climate change measures,<sup>120</sup> improvement of awareness,<sup>121</sup> implementation of state commitments,<sup>122</sup> and promotion/improvement in climate change–related fighting measures.<sup>123</sup> SDGs refer to the energy sector

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<sup>116</sup> *Sustainable Development Goals*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/sustainable-development-goals> (last visited Oct. 27, 2020).

<sup>117</sup> *Act Now*, UNITED NATIONS, <https://www.un.org/en/actnow> (last visited Nov. 18, 2020).

<sup>118</sup> *Goal 13: Take Urgent Action to Combat Climate Change and Its Impacts (SDGs)*, UNITED NATIONS (Jan. 1, 2016), <https://www.un.org/sustainabledevelopment/climate-change> (accessed July 26, 2020).

<sup>119</sup> *Id.* at 13.1.

<sup>120</sup> *Id.* at 13.2.

<sup>121</sup> *Id.* at 13.3.

<sup>122</sup> *Id.* at 13.A.

<sup>123</sup> *Id.* at 13.B.

in their targets in connection with climate change, specifically when referring to alternative and sustainable fuels to fight climate change.<sup>124</sup>

The Pakistani legal system is an example of employing the CLEW nexus in its climate change laws.<sup>125</sup> Though it does fleetingly mention targets and interdisciplinary sectors in relation to research, production, and security, it does so in such a very flexible and subtle way that it can be classified as a narrow connection of the CLEW nexus in the legal system. This narrow connection in the resources and variables is comparable to the SDGs' narrow connections with the CLEW nexus.

#### a. *Legal Perspective of CLEW Nexus in Pakistan*

The current population of Pakistan is 216,565,318<sup>126</sup> per World Bank data. It is already marked as a water-stressed country and is moving fast toward being a water-scarce country.<sup>127</sup> According to current prognoses, Pakistan's freshwater reserves will be exhausted by 2025.<sup>128</sup> Moreover, owing to floods in Pakistan's history, more than 18 million people have been displaced because of climate change,<sup>129</sup> translating into a \$43 billion USD loss to its economy.<sup>130</sup> Similarly, the Baluchistan and desert regions of Pakistan are hit by a

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<sup>124</sup> *Id.* at 13.

<sup>125</sup> Pakistan Climate Change Act, No. 10 of 2017, THE GAZETTE OF PAKISTAN EXTRAORDINARY, Apr. 3, 2017 [hereinafter CCA].

<sup>126</sup> *Population*, WORLD BANK, <https://data.worldbank.org/indicator/SP.POP.TOTL> (accessed July 28, 2020).

<sup>127</sup> Jo-Ellen Parry et al., *Making Every Drop Count: Pakistan's Growing Water Scarcity Challenge*, INT'L INST. FOR SUSTAINABLE DEV. BLOG (Sept. 29, 2016), <https://www.iisd.org/library/making-every-drop-count-pakistan-s-growing-water-scarcity-challenge#:~:text=Pakistan%20is%20facing%20a%20serious,have%20already%20crossed%20this%20threshold> (last visited July 28, 2020).

<sup>128</sup> Shah Meer Baloch, *Water Crisis: Why Is Pakistan Running Dry?*, DW (July 6, 2018), <https://p.dw.com/p/2z568>.

<sup>129</sup> Press Release, Singapore Red Cross, Pakistan Floods: The Deluge of Disaster – Facts & Figures as of 8 September 2010 (Sept. 8, 2010), <https://reliefweb.int/report/pakistan/pakistan-floodsthe-deluge-disaster-facts-figures-8-september-2010> (accessed July 28, 2020).

<sup>130</sup> Press Release, Singapore Red Cross, Pakistan: Flood loss estimates rise to \$43bn: PM (Sept. 2, 2010), <https://reliefweb.int/report/pakistan/pakistan-floodsthe-deluge-disaster-facts-figures-8-september-2010> (accessed July 28, 2020).

severe drought every year.<sup>131</sup> The conditions of Pakistan are intensifying so much due to climate change that, in 2015 alone, almost 1,000 people lost their lives in a heatwave.<sup>132</sup> If we talk about Pakistan's contribution to global climate change, it is 153rd in the world.<sup>133</sup> Unfortunately, it is seventh when it comes to the countries most affected by climate change.<sup>134</sup> So it is in Pakistan's interest in relation to the WEF nexus approach to sustainably cater to the needs of its growing demand for hydro-energy, food, and clean water, and to deal with ecological and environmental changes. In this regard, Pakistan should make and execute WEF nexus policies in both the short and long term.

As a response to an international climate change agreement (Paris Agreement), keeping in view the WEF nexus concerns, Pakistan enacted its first piece of legislation on climate change, the Climate Change Act (CCA), in 2017.<sup>135</sup> This act established three main institutions: the Pakistan Climate Change Council (PCCC), the Pakistan Climate Change Authority (PCCA), and the Pakistan Climate Change Fund (PCCF).<sup>136</sup>

In relation to the PCCC, section 3 of the CCA provides for representation from all parts of the federation, including the Azad Kashmir, Gilgit-Baltistan, chief ministers, and members of civil society.<sup>137</sup> The CCA uses the WEF nexus and interconnects food production with environmental concerns by including federal ministers in the divisional subject of water, food, and energy resource

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<sup>131</sup> Zahra Khan Durrani, *Lessons for Pakistan from Droughts in the Past*, CSCR (July 20, 2018), <https://cscr.pk/explore/themes/energy-environment/lessons-pakistan-droughts-past> (accessed July 28, 2020).

<sup>132</sup> *Pakistan Heatwave: Death Toll over 1,000 in Sindh*, BBC (June 25, 2015), <https://www.bbc.com/news/world-asia-33274171#:~:text=The%20death%20toll%20from%20a,treated%20for%20heatstroke%20and%20dehydration> (accessed July 28, 2020).

<sup>133</sup> Sarim Jamal, *Examining the Pakistan Climate Change Act 2017 in the Context of the Contemporary International Legal Regime*, 5 LUMS L.J. 108 (2018).

<sup>134</sup> Jamal, *supra* note 133.

<sup>135</sup> CCA, *supra* note 125.

<sup>136</sup> CCA, *supra* note 125.

<sup>137</sup> CCA, *supra* note 125, at § 3.

production and security.<sup>138</sup> This is an example of employing the CLEW nexus at the national level in the legal system of a country, which shows Pakistan’s commitment to the protection of the environment.

However, the problem with the PCCC is the same as it was with its predecessor, the Pakistan Environmental Protection Act of 1997 (PEPA).<sup>139</sup> While there is a requirement for at least two meetings a year and no upper limit on the number of meetings,<sup>140</sup> owing to political lack of interest and intermittent policymaking, only two meetings were held under PEPA annually, which resulted in its demise.<sup>141</sup> The WWF’s executive officer highlighted this same issue in the CCA.<sup>142</sup> Moreover, the PCCC is also responsible for enforcing the CCA, and for aligning the SDGs with its policies.<sup>143</sup> But there are no punitive repercussions in the CCA for violations of these responsibilities. This is also true for other policymakers: there are no consequences for not enforcing the legislation or policies. Overall, we can say there is no accountability drafted into the CCA.<sup>144</sup>

Under section 5 of CCA, the PCCA as a corporate body is responsible to mitigate climate change–related catastrophes, to take preventive measures, and to take suo moto actions related to climate change concerns.<sup>145</sup> In addition, the CCA under section 8 has included the Paris Agreement mitigation policies, which require the PCCA to submit “national determined contributions to the Framework Convention on Climate.”<sup>146</sup> The PCCA also has the function of “establish[ing] institutional and policy mechanisms for implementation of Federal and provincial adaptation and mitigation policies, plans, programmes, projects and measures, including plans for renewable energy and clean technology measures for energy

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<sup>138</sup> *Id.*

<sup>139</sup> Pakistan Environmental Protection Act, No. 34 of 1997, THE GAZETTE OF PAKISTAN EXTRAORDINARY, Dec. 6, 2017 [hereinafter PEPA].

<sup>140</sup> CCA, *supra* note 125, at § 3; *see also* PEPA, *supra* note 139, at § 3.

<sup>141</sup> *Jamal, supra* note 133.

<sup>142</sup> *Id.*

<sup>143</sup> CCA, *supra* note 125.

<sup>144</sup> *Jamal, supra* note 133.

<sup>145</sup> CCA, *supra* note 125, at § 5.

<sup>146</sup> *Id.* at § 8.

efficiency and energy conservation and awareness-raising and capacity-building programmes.”<sup>147</sup> As a reference to and employment of the WEF nexus, section 8 of the CCA explicitly links the environmental concerns of climate change to clean and green energy production.<sup>148</sup>

However, there is a one major flaw in CCA’s framework regarding the implications of joining hands with foreign partners.<sup>149</sup> Section 10 of the CCA states that the PCCA cannot have a foreign partner without executive permission from the government.<sup>150</sup> Jamal is of the view that this prohibition is a bureaucratic block on the smooth working of this institute.<sup>151</sup> It can, however, be argued based on assumptions that this requirement of executive permission is for the purposes of national security, and it should not be a problem for the smooth functioning of the organization because foreign partnerships—if designed for long-term relationships—are not signed on a regular basis. Jamal also believes that section 10 is applicable to the acceptance of any foreign funds, which he sees as a major problem given most of the climate change funding is foreign.<sup>152</sup> However, section 10 of the CCA explicitly talks about the “establishment” of partnerships with foreign entities,<sup>153</sup> which usually involves the implementation of projects. This means that, contrary to Jamal’s argument, arguably, receiving donations without involving partnerships with foreign organizations should not be hindered by section 10 of the CCA. Instead, to maintain the smooth functioning of PCCA, the CCA requires the PCCA to partner with nongovernmental organizations to set and reach targets of reducing carbon emissions.<sup>154</sup>

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<sup>147</sup> *Id.*

<sup>148</sup> *Id.*

<sup>149</sup> *Id.* at § 10.

<sup>150</sup> *Id.*

<sup>151</sup> Jamal, *supra* note 133.

<sup>152</sup> *Id.*

<sup>153</sup> CCA *supra* note 125, at § 10.

<sup>154</sup> *Id.* at § 8(q).

## 2. Land/Food

Target 2.4 in Goal 2 of the SDGs sets a target for year 2030 for ensuring food security. It requires: “By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.”<sup>155</sup> In addition, Goal 2 also requires that world hunger be ended by 2030,<sup>156</sup> world malnutrition to be ended by 2025,<sup>157</sup> agricultural productivity to be doubled by 2030,<sup>158</sup> the genetic diversity of plant, seeds, and animals to be maintained,<sup>159</sup> investments and international cooperation to be increased,<sup>160</sup> trade restrictions to be prevented,<sup>161</sup> and food-related markets to be facilitated.<sup>162</sup> Moreover, Goal 15 of the SDG also requires: (1) the conservation and restoration of land waters and forests by 2020;<sup>163</sup> (2) sustainable management of all types of forests and halting deforestation by 2020;<sup>164</sup> (3) the restoration of affected lands by 2030;<sup>165</sup> (4) the conservation of mountain biodiversity and ecosystems by 2030;<sup>166</sup> (5) urgent action to halt the loss of biodiversity;<sup>167</sup> (6) the fair sharing in the utilization of genetic resources;<sup>168</sup> (7) urgent action to protect endangered flora and fauna;<sup>169</sup> (8) the implementation of measures for prevention of

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<sup>155</sup> *Sustainable Development Goal 2: Zero Hunger*, *supra* note 117, at 2.4.

<sup>156</sup> *Id.* at 2.1.

<sup>157</sup> *Id.* at 2.2.

<sup>158</sup> *Id.* at 2.3.

<sup>159</sup> *Id.* at 2.5.

<sup>160</sup> *Id.* at 2A.

<sup>161</sup> *Id.* at 2B.

<sup>162</sup> *Id.* at 2C.

<sup>163</sup> *Sustainable Development Goal 15: Life on Land*, at 15.1, UNITED NATIONS (Jan. 1, 2016), <https://www.un.org/sustainabledevelopment/biodiversity/>.

<sup>164</sup> *Id.* at 15.2.

<sup>165</sup> *Id.* at 15.3.

<sup>166</sup> *Id.* at 15.4.

<sup>167</sup> *Id.* at 15.5.

<sup>168</sup> *Id.* at 15.6.

<sup>169</sup> *Id.* at 15.7.

invasive species;<sup>170</sup> (9) the integration of ecosystem and biodiversity values in planning by 2020;<sup>171</sup> (10) investment to conserve nature;<sup>172</sup> and, (11) international cooperation.<sup>173</sup> The SDGs include the nexus of food/land in connection with climate change in their targets.<sup>174</sup>

### 3. Energy

Goal 7 of the SDGs intends to prioritize the energy sector, in order to maintain and create an uninterrupted power supply, while keeping vulnerable consumers well connected with energy sources.<sup>175</sup> It comprises five targets: (1) to ensure universal accessible energy by the end of 2030;<sup>176</sup> (2) to increase substantially the share of renewable energy in the global energy mix by 2030;<sup>177</sup> (3) to double the rate of energy efficiency by 2030;<sup>178</sup> (4) to increase international cooperation;<sup>179</sup> and, (5) to expand energy in developing nations by installing sustainable, upgraded, and efficient technology.<sup>180</sup> Arguably, the energy sector in the SDGs includes the interconnection of water, for instance when it refers to hydropower production in form of green and sustainable energy.<sup>181</sup>

### 4. Water

Goal 6 of the SDGs sets targets of: (1) global and affordable access of drinking water by 2030;<sup>182</sup> (2) adequate access to hygiene

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<sup>170</sup> *Id.* at 15.8.

<sup>171</sup> *Id.* at 15.9.

<sup>172</sup> *Id.* at 15.5.A, 15.5.B.

<sup>173</sup> *Id.* at 15.c.

<sup>174</sup> *Sustainable Development Goal 2: Zero Hunger*, *supra* note 117, at 2.4.

<sup>175</sup> *Sustainable Development Goal 7: Affordable and Clean Energy*, UNITED NATIONS (Jan. 1, 2016), <https://www.un.org/sustainabledevelopment/energy> (last visited July 26, 2020).

<sup>176</sup> *Id.* at 7.1.

<sup>177</sup> *Id.* at 7.2.

<sup>178</sup> *Id.* at 7.3.

<sup>179</sup> *Id.* at 7.4.

<sup>180</sup> *Id.* at 7.B.

<sup>181</sup> *Id.* at 7.A.

<sup>182</sup> G.A. Res. 70/1, at 18, Sustainable Development Goals (Sept. 25, 2015).

and sanitation by 2030;<sup>183</sup> (3) improvement in water quality and decrease in water pollution by 2030;<sup>184</sup> (4) sustainable and efficient use of water by 2030;<sup>185</sup> (5) integrated water management and integrated cross-border water cooperation by 2030;<sup>186</sup> (6) protection of freshwater sources by 2020;<sup>187</sup> (7) increased cross-border water cooperation by 2030;<sup>188</sup> and, (8) strengthening and support of local communities in water management.<sup>189</sup> The water sector in SDGs connects the area of land by referring to ecosystems and mountains in water sector goals and targets.<sup>190</sup>

This shows that the goal-centric SDG framework is not an exact reflection of the multifaceted interconnected links in WEF nexus research. However, the SDGs in their goals and targets do include some of the integration of the nexus sectors in cross targets as mentioned above: some of the sectors are well connected, while others are not. This is mainly because the interlinkages present in the goals and targets of the SDGs are in fact an outcome of political deliberations, which can be seen as “political mapping,” different from the “scientific mapping” done in the nexus literature.<sup>191</sup> For this reason, the SDGs provide very narrow regulation for nexus goals, and it is understandable that such limitations are attributable to the political needs to limit the number of goals in the SDGs.<sup>192</sup> In the general settings of interconnectedness in sectors, for defining generic goals, there are so many factors, sectors, and areas that cannot conceivably be covered by mentioning each one of them. Therefore, with regard to policymaking in the nexus literature, the SDGs provide little to no help.

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183 *Id.*

184 *Id.*

185 *Id.*

186 *Id.*

187 *Id.*

188 *Id.* at 19.

189 *Id.*

190 *Id.* at 18.

191 Le Blanc, *supra* note 93, at 51.

192 *Id.*

### C. Experts' Opinions on the Nexus in the SDGs

To scientifically compare the nexus approach and the SDGs in respect of the number of interactions among sectors, there are three main perspectives. The first is the stark contrast approach, where the SDGs are seen as mere political mapping indicators that do not interact with other sectors in other goals as efficiently as the integration of sectors in the CLEW nexus literature. This approach is undertaken by Bazilian,<sup>193</sup> Welsch<sup>194</sup> and Skaggs,<sup>195</sup> whose papers argue that this is because the political mapping is done by considering economic, biosphere, and social concerns, whereas the CLEW nexus literature focusses on modeling and planning tools.<sup>196</sup> Therefore, there are more interactions in nexus research than in relation to SDGs. Moreover, the whole point of nexus-building is to identify and highlight the integration of interconnections in different sectors, so its aims are reflected in its work and language. At the same time, the aim and focus of SDGs was not to locate nexus connections but to generally give direction to sustainable development, irrespective of the interlinked connections in the different sectors. If the goals and targets mention or refer to other sectors, that helps provide detail about how that target can be met, which can be employed in the nexus literature to create policies. Overall, the first perspective of a stark contrast between the SDGs and the CLEW literature concludes that the SDGs have far fewer interconnections among the sectors mentioned in its goals and targets than the multifaceted connections in the CLEW researches.<sup>197</sup>

Rather than counting the numbers of connections, the second approach, comparison thinking by ICSU, identifies CLEW nexus

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<sup>193</sup> Bazilian et al., *supra* note 94.

<sup>194</sup> Manuel Welsch et al., *Adding Value with CLEWS – Modelling the Energy System and Its Interdependencies for Mauritius*, 113 APPLIED ENERGY 1434 (2014).

<sup>195</sup> RICHARD SKAGGS ET AL., CLIMATE AND ENERGY-WATER-LAND SYSTEM INTERACTIONS: TECHNICAL REPORT TO THE U.S. DEPARTMENT OF ENERGY IN SUPPORT OF THE NATIONAL CLIMATE ASSESSMENT (Pac. Nort. Nat. Lab. 2012).

<sup>196</sup> Bazilian et al., *supra* note 94; Welsch et al., *supra* note 194; *Id.*

<sup>197</sup> Le Blanc, *supra* note 93, at 52.

connections in the SDGs' goals and targets.<sup>198</sup> In a blatant divergence from the stark contrast approach, the comparison thinking perspective finds not only that all four sectors of CLEW, including climate change, land/food/hunger, energy, and water, are mentioned in the goals and targets of the SDGs, but also that several goals interconnect with three or more goals from the other sectors: specifically Goals 2, 6, 7, and 13.<sup>199</sup>

The third approach is the independent thinking approach by Weitz.<sup>200</sup> This is a remarkably different approach, because, unlike the other two approaches, it is not dependent on nexus links in the SDGs. Rather, it independently identifies the connections and links of one target in the other targets of the goals, while keeping in mind the connection of the original target with the CLEW nexus.<sup>201</sup> So, in an interesting way, Weitz classified interconnected targets into three broad categories:<sup>202</sup> “targets that reinforce each other; targets that are dependent on each other; and targets that impose conditions on each other.”<sup>203</sup>

Considering all three approaches—stark contrast, comparison thinking, and independent thinking—within a policymaking context, it is clear that the nexus literature has more connected sectors than do SDGs.<sup>204</sup> However, the SDGs do highlight the importance of nexus by including nexus links in cross-sector targets and goals. But this guidance for policymaking is very limited, as the SDGs do not include all the interactions mentioned in the nexus literature regarding synergies and tradeoffs. The policymaking from nexus research can be done by other means, where the direct approaches of

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<sup>198</sup> INTERNATIONAL COUNCIL FOR SCIENCE, REVIEW OF TARGETS FOR THE SUSTAINABLE DEVELOPMENT GOALS: THE SCIENCE PERSPECTIVE III-VI (2015), <https://council.science/publications/review-of-targets-for-the-sustainable-development-goals-the-science-perspective-2015/>.

<sup>199</sup> See Le Blanc, *supra* note 93, at 52–54 (for figure and discussion on ICSU).

<sup>200</sup> Weitz et al., *supra* note 95.

<sup>201</sup> Weitz et al., *supra* note 95.

<sup>202</sup> Weitz et al., *supra* note 95.

<sup>203</sup> Le Blanc, *supra* note 93, at 52.

<sup>204</sup> *Id.*

concrete context, modeling, location, scale, and policy are undertaken.<sup>205</sup>

But, if the whole point of undertaking WEF nexus research is to find a more sustainable way to cater to resource security for the betterment of the human population, as reflected in the WEF nexus literature and the SDGs, then is it not relevant to investigate whether WEF nexus–related policies and work really help the poorest and most affected parts of the human population (as promised in the SDGs)? To answer this question, the next section of this paper will investigate the helpfulness of the WEF nexus in doing the same.

## VI. QUESTIONING THE HELPFULNESS OF THE WEF NEXUS

It is contended that the WEF nexus is actually about securing the interests of humanity’s well-being.<sup>206</sup> In addition, it is noted that the WEF nexus should secure the livelihoods and the human rights of food and water. But, pragmatically speaking, Wichelns maintains that the WEF nexus does not cater to the livelihoods of people in the integration of the water, food, and energy sectors; instead, the poorest of our society are the most harshly affected by the policies coming out of the WEF nexus approach.<sup>207</sup> Grafton responds that this is mainly because, when managing macro-level needs and the concerns of food and water security, the small-scale household-level, neighborhood-level, and city-level complexities and exigencies are overlooked.<sup>208</sup>

In policymaking circles, the rising employment of the WEF nexus is related to the securitization of water, energy, and food sectors, where the WEF nexus has become more of a controlling agenda. It is maintained that the perpetual growth and progression of

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<sup>205</sup> Le Blanc, *supra* note 93, at 55.

<sup>206</sup> A.D. Gupta, *Water-Energy-Food (WEF) Nexus and Sustainable Development*, in *WATER-ENERGY-FOOD NEXUS: PRINCIPLES AND PRACTICES* 223 (Salam et al. eds., 2017) [hereinafter Gupta, *WEF Nexus and Sustainable Development*].

<sup>207</sup> Wichelns, *supra* note 23.

<sup>208</sup> R.Q. Grafton et al., *Responding to Global Challenges in Food, Energy, Environment and Water: Risks and Options Assessment for Decision-Making*, 3 *ASIA PACIFIC POL’Y STUD.* 275 (2016).

humanity will certainly result in the exhaustion of crucial resources.<sup>209</sup> By contrast, in economic terms, Leck<sup>210</sup> and Green<sup>211</sup> noted in 2015 and 2017, respectively, that the private sector is the driving force for this interest and focus on the securitization of water and other resources for their own good,<sup>212</sup> as opposed to the good of the people. In fact, the private sector is influential in the decision-making and policymaking of WEF nexus management.<sup>213</sup> Spiegelberg also concluded in 2015 that the WEF nexus of securitizing resources, which encourages growth in the production of food and energy, is primarily encouraged for economic interests.<sup>214</sup> Allouche concurs that this WEF nexus is a veil for hidden interests in power politics.<sup>215</sup>

This discussion does not end here. Biggs takes it one step further by explicitly arguing that the WEF nexus is a failure when it comes to the security of livelihoods and the benchmark of securing resources for all.<sup>216</sup> He adds that this failure to integrate the livelihoods of all people is counterproductive to its own goals, which requires the protection of resources for the people in a sustainable way.<sup>217</sup> The whole idea propounded at the Bonn 2011 Conference with relation to the WEF nexus was to secure the basic human rights to water and food.<sup>218</sup> This reveals that the approach of securitization in the WEF nexus is in reality not to put human rights and resources for all at its heart. Instead, the hidden motives of the WEF nexus are

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<sup>209</sup> Salam et al., *The Need for the Nexus Approach*, *supra* note 88, at 1-10.

<sup>210</sup> Leck et al., *supra* note 59, at 445–60.

<sup>211</sup> J.M.H. Green et al., *Research Priorities for Managing the Impacts and Dependencies of Business upon Food, Energy, Water and the Environment*, 12 SUSTAINABILITY SCI. 319–31 (2017).

<sup>212</sup> Leck et al., *supra* note 59, at 445–60; Green et al., *supra* note 211.

<sup>213</sup> *Id.*

<sup>214</sup> M. Spiegelberg et al., *Unfolding Livelihood Aspects of the Water–Energy–Food Nexus in the Dampalit Watershed, Philippines*, 11 J. HYDROLOGY: REGIONAL STUD. 53-68 (2017).

<sup>215</sup> Allouche et al., *supra* note 19, at 610-11.

<sup>216</sup> E.M. Biggs et al. *Sustainable Development and the Water–Energy–Food Nexus: A Perspective on Livelihoods*, 54 ENVTL. SCI. POL'Y 389 (2015).

<sup>217</sup> Biggs et al., *supra* note 216, at 389.

<sup>218</sup> *Id.* at 390; *see also* M. Leese & S. Meisch, *Securitising Sustainability? Questioning the 'Water, Energy and Food-Security Nexus'*, 8 WATER ALTERN. 695, 705 (2015).

connected to economic growth concerns for the private sector, which includes big corporations and monetary benefits, as opposed to the fore-fronting of sustainable development of the human population, most particularly the marginalized sectors of our society.

In theoretical and practical terms, the main foci of the WEF nexus are distributional justice and the securitization of resources, because the imperative resources of water, food, and energy are dwindling,<sup>219</sup> owing to the surge in human population and their increased demands. Contrary to this belief and contention of the mainstream literature, Leese argues that, in hindsight, this orchestration, economic considerations, and the corporate concerns of supply and demand are driving the resources securitization agenda, when it should have been guided by the SDGs.<sup>220</sup> He concurs that the notion of the WEF nexus is not at all concerned with the livelihoods and supposed sustainable development targets; the approach of sustainable development in the WEF nexus has been hijacked by the interest of securing/increasing global productivity.<sup>221</sup>

For these reasons, Simpson's 2019 paper maintains that securing one element of sustainable development at the macro level through the WEF nexus is disadvantageous for the other elements of development.<sup>222</sup> Therefore, the WEF approach propounded by the World Economic Forum for the macro-securitization of resources will not necessarily result in meeting the goals of sustainable development.<sup>223</sup> In other words, the securitization of food, even by adopting the WEF nexus, will not inevitably decrease widespread malnourishment (*i.e.*, Goal 2 of the SDGs).<sup>224</sup> Similarly, the security of water as a resource in the WEF nexus at the macro level will not

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<sup>219</sup> WORLD ECONOMIC FORUM, WATER SECURITY: THE WATER-ENERGY-FOOD-CLIMATE NEXUS 1 (WEF, 2011); NATIONAL INTELLIGENCE COUNCIL, GLOBAL TRENDS 2030: ALTERNATIVE WORLDS IV (2012).

<sup>220</sup> Leese & Meisch, *supra* note 218, at 704 (2015).

<sup>221</sup> *Id.* at 703-05.

<sup>222</sup> Simpson & Jewitt, *supra* note 14.

<sup>223</sup> *Id.*

<sup>224</sup> U.N., *SDGs*, *supra* note 91.

result in access to clean water for all with improved hygiene and sanitation (*i.e.*, Goal 6 of the SDGs).<sup>225 226</sup>

## VII. IMPROVING THE WEF NEXUS

The shortcomings of the WEF nexus approach can be minimized by incorporating specified concerns and elements. One method suggested by Salam is to set the SDGs as the primary targets when considering the securitization of water, food, and energy resources in the WEF nexus.<sup>227</sup> Also, Gallagher<sup>228</sup> and Rasul<sup>229</sup> concur that the SDGs can be used as the guiding framework for conducting WEF nexus research in order to make policies more conducive to resource security. Simpson adds that, in addition to securitization of resources, access to water, food, and energy for all should be included in the WEF nexus.<sup>230</sup> In providing access of resources for all, Rockstrom establishes that all the goals in the SDGs—including the target to eliminate malnourishment, hunger, and poverty—are mainly interlinked with the food sector.<sup>231</sup>

The WEF nexus approach has various positive attributes, although it fails to adequately integrate environmental concerns and the livelihood problem in its methodology and framework.<sup>232</sup> For this reason, an increasing number of scholars are inclined toward the integration of environmental, livelihood, and climate change concerns in the WEF nexus literature. WEF nexus studies on environmental

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<sup>225</sup> *Goal 6: Ensure access to water and sanitation for all*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/water-and-sanitation> (last visited Nov. 20, 2020).

<sup>226</sup> Simpson & Jewitt, *supra* note 14, at 5.

<sup>227</sup> Salam et al., *The Need for the Nexus Approach*, *supra* note 88, at 3-10.

<sup>228</sup> L. Gallagher et al. *The Critical Role of Risk in Setting Directions for Water, Food and Energy Policy and Research*, 23 CURR. OPIN. ENVTL. SUSTAIN. 12-13, 15 (2016).

<sup>229</sup> Rasul & Sharma, *supra* note 39, at 696–98.

<sup>230</sup> Simpson & Jewitt, *supra* note 14, at 4-5.

<sup>231</sup> J. Rockström & P. Sukhdev, *How Food Connects All the SDGs*, STOCKHOLM RESILIENCE CENTRE (2016), <https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html> (last visited Oct. 30, 2020).

<sup>232</sup> Simpson & Jewitt, *supra* note 14, at 1.

concerns take an analytical perspective of human impact on flora and fauna and climate change<sup>233</sup> (planetary boundaries) by food production,<sup>234</sup> construction of dams, energy generation,<sup>235</sup> and water management,<sup>236</sup> whereas studies with a focus on livelihoods and the management of marginalized community within the WEF nexus advocate inclusion of access of resources in addition to securitization of resources.<sup>237</sup> The latter perspective is instigated by aligning the SDGs with the securitization of the water, energy, and food sectors in the WEF nexus approach.<sup>238</sup> As an extension of both approaches, a better WEF nexus approach would be to include both environmental concerns and livelihood concerns alongside the alignment of SDGs with the securitization of resources in a sustainable manner.<sup>239</sup>

#### A. Population Element

However, would it really improve the WEF nexus of resource securitization to be aligned with SDGs? The SDGs plan to double our food and energy production and have explicit targets of eradicating hunger and malnourishment. This essentially means that, if the WEF nexus is aligned with SDGs, the guiding framework for the WEF nexus will translate into an increase in the production of resources, food, and energy, through the utilization of water as key resource. The aim of SDGs to make practices of water use and food and energy production more green and efficient is no doubt commendable. But what does it really mean to double food and energy production in a securitization world, in relation to the growth in human population problem discussed in Section 3.1 above? If our goal is to eradicate hunger and provide access to food, energy, and water to all of humanity, would the human population grow more

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<sup>233</sup> Le Blanc, *supra* note 93, at 47-48.

<sup>234</sup> Simpson & Jewitt, *supra* note 14, at 1.

<sup>235</sup> *Id.* at 5.

<sup>236</sup> *Id.* at 3-4.

<sup>237</sup> OBAID SHAH, WATER ENERGY & FOOD NEXUS: FROM MODEL TO POLICY FRAMEWORK, TOWARDS THE REALIZATION OF SDGS-CASE STUDY OF PAKISTAN 2, 5, 7, 19, 40 (McMaster University, 2016).

<sup>238</sup> *Id.*

<sup>239</sup> For example, see Simpson's approach in Simpson & Jewitt, *supra* note 14, at 1.

vigorously? And, in this perpetual circle of constant growth, would it remain sustainable for our future generations?

Scientists are of the view that the contemporary techniques used for hydropower generation and food production, by changing the natural flows of water, are fundamentally altering earth's functioning, which is environmentally catastrophic.<sup>240</sup> So, if food production is doubled, it would require more water supply, and more conversion of landscape to agricultural land and hence less forested cover. This in turn will not only alter the natural flow of waters and the respective hydro-cycle but also weaken the geological settings of the environment and ecosystems.<sup>241</sup> Similarly, to achieve WEF Nexus and SDG goals, if we have to increase our power and food production, then we will need to construct more water reservoirs/dams and generate additional cultivatable land. This means that, in pursuit of hydropower, more dams will be constructed around the world. This, again similar to an increase in food production problem, will change the natural hydro-cycle,<sup>242</sup> and will be catastrophic for the environment, biodiversity, indigenous communities, and climate change because dam construction is followed by an increase in the evaporation rate of water,<sup>243</sup> and the rate of refilling water aquifers also changes for the worse.<sup>244</sup> Moreover, when small streams are diverted by mankind toward larger streams in the construction of dams and water systems for agriculture, the animals and fertile land previously dependent on

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<sup>240</sup> Damian Carrington, *Global Food System Is Broken, Say World's Science Academies*, THE GUARDIAN (Nov. 28, 2018, 2:01 PM) <https://www.theguardian.com/environment/2018/nov/28/global-food-system-is-broken-say-worlds-science-academies>, (last visited July 26, 2020).

<sup>241</sup> See JEREMY DAVIES, *THE BIRTH OF THE ANTHROPOCENE 2* (2016); Schmidt, *supra* note 50, at 1-5.

<sup>242</sup> Schmidt, *supra* note 50, at 1-5 (for hydrological changes).

<sup>243</sup> *Lori Pottinger: The Impact of Dams*, AL-JAZEERA, <https://www.aljazeera.com/program/episode/2011/6/8/lori-pottinger-the-impact-of-dams/> (last visited Nov. 19, 2020).

<sup>244</sup> The levels of ground water is increased close to the dam but is decreased in the lower basin; see Recep Çelîk, *Impact of Dams on Groundwater Static Water Level Changes: a Case Study Kralkızı and Dicle Dam Watershed*, 10 INT'L J. ENGINEERING RES. & DEV. 120, 125 (2018).

those small streams of water will cease to exist.<sup>245</sup> This will all translate into less diversity of plant and animal species and precipitation patterns due to alternation in the hydro-cycle.

Instead, what we should be working toward is the SDG of making the existing use of water connected to food and energy production more efficient, and more robust toward environmental protection. The WEF nexus and the alignment of the SDGs should not mean that the production and supply of each resource should be increased. This reflects the constant need for growth, which will also perpetually result in the growth of the human population. In its place, the goal should be to make the existing methodologies of resource production systems more efficient and more nature-friendly.

It is time that humanity thinks hard about what its footprint is on this Earth, as opposed to the SDG and WEF nexus' propensities to make our impact even bigger. If we continue to produce more food and energy, the alteration of the natural landscape will be even larger than its current shape. Our cities are a perfect example of what humans do to our environment. In condensed, unplanned major cities like Delhi and Karachi, there is no noticeable vegetation cover or greenery. Natural freshwater streams are converted into sewerage systems for domestic use, even in planned cities like Islamabad.<sup>246</sup> Tarmacked roads and concrete pavements, along with huge buildings and houses, do not allow water absorption into the ground.<sup>247</sup> Deforestation is happening for land acquisition to build human societies and to convert it into arable land. Trees are chopped down to produce paper. Air is being polluted by our cars and industries. All this results in the intoxication and strangling of nature, which results in the death of both flora and

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<sup>245</sup> Roland Jansson, *The Effects of Dams on Biodiversity*, in DAMS UNDER DEBATE 78-81 (Birgitta Johansson & Björn Sellberg eds., 2006), available at [https://www.researchgate.net/profile/Roland\\_Jansson/publication/265914243\\_The\\_effect\\_of\\_dams\\_on\\_biodiversity/links/542140bf0cf2ce3a91b6d443/The-effect-of-dams-on-biodiversity.pdf](https://www.researchgate.net/profile/Roland_Jansson/publication/265914243_The_effect_of_dams_on_biodiversity/links/542140bf0cf2ce3a91b6d443/The-effect-of-dams-on-biodiversity.pdf) [hereinafter Jansson, *The Effects of Dams on Biodiversity*].

<sup>246</sup> Salman Khan et al., *A Comprehensive Index for Measuring Water Security in an Urbanizing World: The Case of Pakistan's Capital*, 12 WATER 166 (2020).

<sup>247</sup> *Sponge Cities: What Is It All About?*, WORLD FUTURE COUNCIL (Jan. 20, 2016), <https://www.worldfuturecouncil.org/sponge-cities-what-is-it-all-about>.

fauna. In this Anthropocene age, humans are responsible for environmental catastrophes.

If the human population is allowed to grow at the same rate, the pollution of the rivers, seas, and air, the alteration of the landscape by converting forests and mountains into societies and arable lands, and the diversion of water streams for agricultural and power production uses will also be increased. Consequently, the demand for all of the resources will also increase. If we want a sustainable development for our future generations, then increasing the production of water, energy, and food resources as a resource securitization policy, with the SDGs as a guiding principle, is not the key. It is necessary that we include human population as a crucial part of WEF nexus thinking, as well as in the SDGs, so that, in time, we can halt the inevitable devastation of this planet. The demise of this world, or of the environment in which we live, will translate into the extinction of humankind.

Overall, the WEF nexus is vital to understanding the interconnected complexities of resources. But the goal in the securitization of resources with the guiding framework of SDGs should not be targeted toward growth of production. Instead, the goal should be to oversee the future of sustainable development by making resource production systems more efficient; by including the noncorporate livelihoods of the marginalized poor community; and by considering the attendant environmental issues. More importantly, the element of human population and its existence in perpetual balance with nature should be included in the WEF nexus and SDGs as the pivotal constituent of policy thinking.

## VIII. CONCLUSION

Overall, the World Economic Forum places water security as the main focal point of concern, which is why it is referred to as the WEF nexus; this only means that hydrologists prefer to call the nexus WEF. For agriculturalists and food-related policymakers and researchers, it is referred to as the food–energy–water (FEW) nexus,

and in the energy sector it is the energy–water–food (EWF) nexus.<sup>248</sup> However, Wichelns noted that the integration of sectors for policymaking had existed as early as the 1940s,<sup>249</sup> which means that the WEF nexus is not a novel concept.

Moreover, the emphasis of the nexus approach can be selectively applicable too, in the case of growth impact (*i.e.*, sustainable development, green economy, synergies, tradeoffs and optimization), while at other times it aims to cover resource scarcity (*i.e.*, the depletion of natural resources, poverty alleviation, and the management of livelihoods).<sup>250</sup> The main crux of the WEF nexus is the securitization of water, energy, and food resources.<sup>251</sup> However, it is maintained that the WEF nexus approach has more to do with understanding and responding to the contemporary requirements of fighting climate change, because climate change has primarily influenced the water, energy, and food sectors.<sup>252</sup> This has resulted in the introduction of an alternative approach to the resource security nexus, known as climate–land–energy–water use (CLEW).<sup>253</sup>

The WEF nexus does implicitly include the human population.<sup>254</sup> The quintessential solution to this problem of increased demand is to increase the supply of these resources and to employ greater efficiency and efficacy in their utilization. This paper proposes that the human population should be the main focal point of the WEF nexus because all other problems in sustainable development, including climate change and environmental concerns, and all the WEF nexus elements—water, energy, and food resource securitization—are primarily related to human population and its growth.

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<sup>248</sup> Bidoglio et al., *supra* note 101, at 460.

<sup>249</sup> Wichelns, *supra* note 23, at 113-14.

<sup>250</sup> Simpson & Jewitt, *supra* note 14, at 2-5, 7.

<sup>251</sup> Gain et al., *supra* note 21, at 895.

<sup>252</sup> Rasul & Sharma, *supra* note 39, at 1-2; Wichelns, *supra* note 23, at 117-18.

<sup>253</sup> Weirich, *supra* note 25, at 2, 7-8.

<sup>254</sup> *Water, Food and Energy*, UNWATER.ORG, <https://www.unwater.org/water-facts/water-food-and-energy> (last accessed July 26, 2020).

Since the WEF nexus approach is a way to cater to and recognize sustainable development in our times,<sup>255</sup> the nexus is often aligned with the SDGs. The SDGs do refer to interdisciplinary connections in its goals and targets. For instance, it refers to the energy sector within its targets in connection with climate change,<sup>256</sup> includes the nexus of food/land and climate change in its targets,<sup>257</sup> and refers to the interconnection of water and energy while discussing hydropower production in form of green and sustainable energy.<sup>258</sup> Likewise, the SDGs connect the area of land with water by referring to ecosystems and mountains in water sector goals and targets.<sup>259</sup> The Pakistani law (the Climate Change Act) also uses the CLEW nexus and its interconnectedness of climate change, food, energy, and water with environmental concerns by including the federal ministers with responsibility for water, food, and energy resource production and security in the PCCC under the Climate Change Act.<sup>260</sup>

The SDGs are seen as mere political mapping indicators that do not interact with other sectors in each goal as efficiently as the integration of sectors in the CLEW nexus literature. This is because the aim and focus of the SDGs was not to locate the nexus connections but to generally give direction to sustainable development irrespective of the interlinked connections in the different sectors, which can also be seen in Pakistan's CCA. By contrast, in the CLEW nexus approach, not only are all the elements—including climate change, land, food, hunger, energy, and

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<sup>255</sup> Salam et al., *The Need for the Nexus Approach*, *supra* note 88, at 1-10.

<sup>256</sup> *Goal 13: Take Urgent Action to Combat Climate Change and Its Impacts*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/climate-change> (last accessed July 26, 2020).

<sup>257</sup> 2.4 in *Goal 2: Zero Hunger*, (UNITED NATIONS/UN/UN.ORG (UN, January 1, 2016) <https://www.un.org/sustainabledevelopment/hunger>, , (last accessed July 26, 2020)..

<sup>258</sup> *Goal 7: Affordable and Clean Energy: Ensure Access to Affordable, Reliable, Sustainable and Modern Energy*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/energy> (last accessed July 26, 2020).

<sup>259</sup> *Goal 6: Ensure Access to Water and Sanitation for All*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/water-and-sanitation>, (last accessed July 26, 2020).

<sup>260</sup> CCA, *supra* note 135, at § 3.

water—mentioned in the goals and targets of the SDGs, but also several goals interconnect with three or more goals from the other sectors, more particularly in Goals 2, 6, 7, and 13.<sup>261</sup>

It is contended that the WEF nexus is actually about securing the interest of humanity's well-being.<sup>262</sup> By contrast, the WEF nexus does not cater to the livelihoods of people in the integration of the water, food, and energy sectors. Instead, the poorest of our society are the most harshly affected by the policies coming out of the WEF nexus approach.<sup>263</sup> This is mainly because, when managing the macro-level needs and concerns of food and water security, the small-scale household-, neighborhood-, and city-level complexities and exigencies are overlooked.<sup>264</sup>

It is noted that the private sector is the driving force for this interest and focus on the securitization of water and other resources for its own good.<sup>265</sup> In addition, the private sector is influential in decision-making and policymaking of WEF nexus management,<sup>266</sup> and the encouragement of growth in the production of food and energy is primarily encouraged for economic interests.<sup>267</sup> Allouche concurs that this WEF nexus is a veil for hidden interests in power politics.<sup>268</sup> Economic considerations and the corporate concerns of supply and demand are driving the resource securitization agenda, when it should have been guided by the SDGs. Moreover, it is established that the WEF nexus is a failure when it comes to the security of livelihoods and the benchmark of securing resources for all,<sup>269</sup> and this failure to integrate livelihoods of all people is counterproductive for its own goals, which require the protection of

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<sup>261</sup> Le Blanc, *supra* note 93, at 52–54.

<sup>262</sup> Gupta, *supra* note 206, at 221–41.

<sup>263</sup> Wichelns, *supra* note 23, at 116–17.

<sup>264</sup> R.Q. Grafton et al., *supra* note 208.

<sup>265</sup> Leck et al., *supra* note 59, at 449–50; Green et al., *supra* note 211, at 321.

<sup>266</sup> Leck et al., *supra* note 59, at 445–60; Green et al., *supra* note 211, at 319–31.

<sup>267</sup> M. Spiegelberg et al., *supra* note 214.

<sup>268</sup> Allouche et al., *supra* note 19, at 617–18, 622.

<sup>269</sup> Biggs, *supra* note 216.

resources for the people in a sustainable way.<sup>270</sup> Leese agrees that the notion of the WEF nexus is not at all concerned with the livelihoods and supposed sustainable development targets, and that the approach of sustainable development in the WEF nexus has been hijacked in the interests of securing/increasing global productivity.<sup>271</sup> For these reasons, Simpson's 2019 paper maintains that securing one element of sustainable development at the macro level through the WEF nexus is disadvantageous for the other elements of development.<sup>272</sup> Therefore, the WEF approach propounded by World Economic Forum for the macro-securitization of resources will not necessarily result in meeting the goals of sustainable development.<sup>273</sup>

These shortcomings of WEF nexus approach can be minimized by setting the SDGs as the primary targets when considering the securitization of resources in the WEF nexus,<sup>274</sup> by using them as the guiding framework.<sup>275</sup> In addition to the securitization of resources, access to water, food, and energy for all should be included in the WEF nexus,<sup>276</sup> since all goals can be linked to the food sector.<sup>277</sup> The approach should be to include both environmental concerns and livelihood concerns alongside the alignment of SDGs with the securitization of resources in a sustainable manner.<sup>278</sup>

The WEF nexus and the alignment of SDGs should not mean that the production and supply of each resource should be increased. Instead, what we should be working toward is the SDG of making the existing use of water connected with food and energy production more efficient, and more robust toward environmental protection. If we want sustainable development for our future generations, the securitization of resources by increasing supply is not

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<sup>270</sup> Biggs, *supra* note 216, at 390–91.

<sup>271</sup> M. Leese & S. Meisch, *supra* note 220.

<sup>272</sup> Simpson & Jewitt, *supra* note 14, at 5.

<sup>273</sup> *Id.*

<sup>274</sup> Salam et al., *The Need for the Nexus Approach*, *supra* note 88, at 1–10.

<sup>275</sup> Rasul & Sharma, *supra* note 39, at 696–98; Gallagher et al., *supra* note

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<sup>276</sup> *Id.* at 684–98; Simpson & Jewitt, *supra* note 14, at 4–5.

<sup>277</sup> J. Rockström & P. Sukhdev, *supra* note 231.

<sup>278</sup> Simpson & Jewitt, *supra* note 14.

the key. It is necessary that we include human population as a crucial part of WEF nexus thinking, as well as in the SDGs, in addition to the inclusion of noncorporate livelihoods of the marginalized poor community, and by considering the environmental issues.