

# THE WORLD IN 2050: LOOKING AHEAD AT SUSTAINABLE DEVELOPMENT

## Water, Energy and Agriculture in the context of Climate Change and the 2030 Sustainable Development Agenda – mitigating risks to a sustainable future for Australia

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### Abstract

Despite having been the dominant paradigm of growth for over 25 years, the subject of a global dialogue about what sustainability means and how to implement it, Sustainable Development (SD) continues to challenge the governance of natural resources and development. Governments around the world (including Australia's) have been committed to SD as a policy goal, supported by policies ranging from international agreements, national strategies, regional programs and local plans. This culminated on 25 September 2015 with the adoption by world leaders of the 2030 Agenda for Sustainable Development – *Transforming Our World* (2030 Agenda), which includes the Sustainable Development Goals (SDGs). Identifying specific goals gives renewed impetus to global development efforts to stimulate action in areas where progress has stalled, and to respond to new challenges for the period 2015 to 2030 and beyond. Climate change is one such challenge. It is a long-term problem and the defining environmental issue, in that all policy decisions need to be considered and implemented within the context of climate change. Indeed, climate change threatens to undermine decades of social and economic development, as well as efforts to protect the environment as temperatures increase, with flow on effects to land and water, and more frequent and extreme weather events. As one of the driest inhabited countries, whose economic development relies on sound water and land use management, Australia faces the critical steps necessary to secure its future. This article explores some of the key challenges ahead and possible pathways that Australia could choose to follow over the coming decades.

Keywords: Climate change, the 2030 agenda for sustainable development, the new sustainable development goals, Australia national circumstances

### Introduction

Finding effective and sustainable solutions to environmental challenges in the context of climate change is a very daunting task. It requires in-depth understanding of resource relationships and interconnections across multiple scales, expertise in more than one area of research and recognising that climate change is a 'super-wicked problem'<sup>1</sup> surrounded by many deep uncertainties and controversies. According to some observers, long-term sustainability can only be achieved through careful assessment of the interrelation between sectors and working within resource constraints, including the prevailing development and

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<sup>1</sup> Levin, K., Cashore, B., Berstein, S. and Auld, G. (2012) Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sciences* 45(2), 123-152.

political-economic environment.<sup>2</sup> Significantly, decisions and actions relating to natural resource use often are often politically charged and contested.

In recent years, profiling water, energy and food (or agriculture which is responsible for growing food) as a nexus (WEF) has been promoted as a conceptual tool to achieve SD. In 2011, the World Economic Forum launched a landmark report *Water Security: The Water-Food-Energy Climate Nexus*<sup>3</sup> calling on the world's political and business leaders to examine the interrelations between water, energy and food. Although the World Economic Forum presented the nexus framework from a security perspective, subsequent versions include alternative components. For example, in 2011 Hoff produced a background paper titled *Understanding the Nexus*<sup>4</sup> with water resources as a central component, which became an influential statement of nexus framing and applications of the term. Put simply, a nexus is defined as one or more connections linking two or more items.

While the nexus concept is not new and has been used in a variety of contexts dealing with natural resource use, it faces significant conceptual and practical challenges. Nonetheless, the approach was recently central to the Post-Development Agenda and regarded as a key driver to foster dialogue on broad development issues. Transforming Our World: The 2030 Agenda for Sustainable Development<sup>5</sup> document sets out to craft a strong post-2015 road map built on the foundation laid by the Millennium Development Goals (MDG).<sup>6</sup> The SDGs go further than the MDGs by creating a cross-sectorial approach to development rather than advocating a sector-specific focus, which suggests that nexus thinking was influential in the decision-making processes for the new SD Agenda. In September 2015, more than 150 governments adopted the new 2030 Agenda, including the SDGs<sup>7</sup>, attesting to their renewed commitment to stimulate action in areas of critical importance for the period from 2015 to 2030.

Yet the role of climate change is inexorably interrelated with the objectives and global focus of a nexus perspective and SD, in the sense that all policy decisions need to be considered and implemented within the context of their long-term effects. As temperatures increase, with flow on effects to water, land (food and agriculture) and energy, climate change will exacerbate pressure on the WEF nexus and thus have significant consequences for SD. Australia is especially vulnerable due to its arid to semi-arid climate. As one of the driest inhabited developed economies, whose economic development relies on sound water, land and energy use management, Australia faces critical steps to secure its future.

To explore these issues in more detail, this article proceeds in four sections. First is a brief critical evaluation of the WEF nexus, a concept used to describe and address the complex and interrelated nature of our key resource systems. The second part of the article briefly evaluates the 2030 Agenda as the road map for the current 15-year period 2015 to 2030. This section also explores in more detail the interdependency of the WEF nexus, the 2030 Agenda and the Paris Agreement. The third part briefly assesses the Paris Agreement and remaining challenges, and the fourth examines how Australia proposes to manage risk in the

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<sup>2</sup> Weitz N., Hubert-Lee, A., Nilsson, M., Davis, M. and Hoff, H. (2014). Cross-sectoral integration in the Sustainable Development Goals: a nexus approach. Stockholm Environment Institute (SEI), Discussion Paper.

<sup>3</sup> World Economic Forum, The Water-Food-Energy-Climate Nexus 2011 [http://www3.weforum.org/docs/WEF\\_WI\\_WaterSecurity\\_WaterFoodEnergyClimateNexus\\_2011.pdf](http://www3.weforum.org/docs/WEF_WI_WaterSecurity_WaterFoodEnergyClimateNexus_2011.pdf) (accessed 07/07/2017).

<sup>4</sup> Understanding the Nexus, Background Paper for the Bonn2011 Nexus Conference (Stockholm Environment Institute, 2011) [http://wef-conference.gwsp.org/fileadmin/documents\\_news/understanding\\_the\\_nexus.pdf](http://wef-conference.gwsp.org/fileadmin/documents_news/understanding_the_nexus.pdf) (accessed 07/07/2017).

<sup>5</sup> United Nations General Assembly, Transforming Our World: The 2030 Agenda for Sustainable Development UN Doc A/RES/70/1.

<sup>6</sup> United Nations Development Millennium Goals <http://www.un.org/millenniumgoals/> (accessed 07/07/2017).

<sup>7</sup> United Nations, Sustainable Development Goals: 17 Goals to Transform Our World <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (accessed 07/07/2017).

context of climate change and the 2030 Agenda. The article concludes that Australia faces a number of critical challenges. Yet there are various pathways that over the coming years could secure Australia's future. For example, Australia's critical advantage of wealth and technological knowledge create the capacity to drive change, providing action is aligned with policy

### **Water, Energy and Agriculture (or food) – the nexus**

In recent years, the WEF nexus has been promoted as a global research agenda. At the core of the debate are natural resource scarcities and the recognition that water, energy and food are interconnected in a web of complex relations where resource use and availability are inextricably linked.<sup>8</sup> In other words, actions in any one sector influence one or both of the other two.<sup>9</sup> 'Nexus thinking' was first conceived in early 2011 by the World Economic Forum to promote the inseparable links between the use of resources to fulfil basic rights to food, water and energy security.<sup>10</sup> The idea of the WEF nexus was launched later that year at the Bonn Nexus Conference when the German Federal Government organized the international conference titled 'The Water Energy and Food Security Nexus – Solutions for the Green Economy' to contribute to the Rio + 20 Summit (SD Rio+20).<sup>11</sup> According to Hoff,<sup>12</sup> the nexus concept emerged within the international community in response to climate change, population growth, economic growth, urbanization and globalization. These issues exacerbate pressure on water, energy and food resources, suggesting the need for more trade-offs in response to competition and potential conflicts over dwindling resources.<sup>13</sup> Indeed, demands for water, energy and food are forecast to increase respectively by 40%, 50% and 35% by 2030,<sup>14</sup> pointing to complex and pressing future challenges.

In 2014, the United Nations Food and Agriculture Organization (FAO) stated that the:

water-energy-food nexus has emerged as a useful concept to describe and address the complex and interrelated nature of our global systems, on which we depend to achieve different social, economic and environmental goals. It is about balancing different resource user goals and interests, while maintaining the integrity of ecosystems.<sup>15</sup>

In other words, nexus thinking identifies the need to cooperate across sectors and to engage across the disciplinary divide. According to some commentators,<sup>16</sup> the aim of the nexus is

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<sup>8</sup> Hoff, H. (2011). Understanding the nexus. Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus. Stockholm Environment Institute. Stockholm; Dupar, M. and Oates, N. (2012). Getting to grips with the water-energy-food 'nexus'. London: Climate and Development Knowledge Network [https://cdkn.org/2012/04/getting-to-grips-with-the-water-energy-food-nexus/?loclang=en\\_gb](https://cdkn.org/2012/04/getting-to-grips-with-the-water-energy-food-nexus/?loclang=en_gb) (accessed 07/07/2017)

<sup>9</sup> Rasul, G. and Sharma, B. (2016). The nexus approach to water-energy-food security: an option for adaptation to climate change. *Climate Policy* 16(6), 15.

<sup>10</sup> World Economic Forum (WEF) (2011). Water Security: The Water-Food-Energy Climate nexus. World Economic Forum, Washington DC.

<sup>11</sup> Bonn 2011 Conference, Nexus – The Water, Energy, Food Security Resource Platform <https://www.water-energy-food.org/about/bonn2011-conference/> (accessed 07/07/2017).

<sup>12</sup> Hoff above n 8.

<sup>13</sup> Endo, A., Tsurita, I., Burnett, K. and Orenco, P. M. (2015). A review of the current state of research on the water, energy, and food nexus. *Journal of Hydrology: Regional Studies* <http://dx.doi.org/10.1016/j.ejrh.2015.11.010> (accessed 07/07/ 2017).

<sup>14</sup> United States National Intelligence Council (US NIC) (2012). Global trends 2030: Alternative Worlds, US NIC. Washington DC, USA, 137.

<sup>15</sup> United Nations Food and Agriculture Organization (FAO), 2014. The water-energy-food nexus a new approach in support of food security and sustainable agriculture <http://www.fao.org/3/a-bl496e.pdf> (accessed 07/07/2017).

<sup>16</sup> Leck, H., Conway, D., Bradshaw, M. and Ress, J. (2015). Tracing the Water-Energy-Food Nexus: Description, Theory and Practice, *Geography Compass* 9(8), 445-460.

ambitious: to capture multiple interdependencies across major key sectors, across disciplines and across scales, which could be its downfall. Some observers also question whether the nexus contributes anything new or innovative to distinguish it from existing holistic framings such as, for example, integrated natural resources management.<sup>17</sup> Similarly, other commentators argue the nexus framing bears similarities to or builds on principles from other approaches used for environmental decision-making, including integrated resources water management (IWRM) and SD.<sup>18</sup> Nonetheless, Pittock *et al*<sup>19</sup> argue the nexus framing could strengthen cross-sectorial approaches given the persistent lack of attention to the complex interactions that exist between sectors and resource systems in policy-making. Indeed, the sheer scale of WEF resource used globally<sup>20</sup> and their effective management underpin development progress. As such, the WEF nexus warrants attention. By its magnitude, this nexus could create the momentum necessary to establish another approach to problem solving, as part of a wider repertoire of responses to global environmental change.<sup>21</sup>

Meanwhile, it is anticipated that increasing future demand for water, energy and food will pose significant security challenges. This is because resources in the WEF nexus are fundamental to the functioning of society;<sup>22</sup> water is deeply connected with food and energy and it is this nexus that needs to be understood in order to balance development and growth. To this end, SD has for the last 25 years been a key concept for development and growth. In fact, SD was an attempt to acknowledge the 'limits of growth' first argued by the Club of Rome in 1972, while at the same time reconciling the need for economic growth and development with environmental protection.<sup>23</sup> Water, energy and food are core elements to the success of the SD paradigm.

### **The 2030 Agenda and the new SDGs**

The concept of SD defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' has been at the heart of global, national and local efforts to respond to the dual imperative of environmental protection and economic development.<sup>24</sup> The concept was taken a step further post-Rio in the 1990s with the emergence of the 'triple bottom line', which calls for integration at the economic, social and environmental levels. Although 25 years since the term SD was first formulated, the principles remain elusive; both a working definition and how SD can be best

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<sup>17</sup> Pittock, J., Hussey, K. and McGlennon, S. (2013). Australian climate, energy and water policies: conflicts and synergies. *Australian Geographer* 44(1), 3-22; Rees, J. (2013) Geography and the nexus: presidential address and record of the Royal Geographical Society (with IBG) AGM. *The Geographical Journal* 179(3), 279-282.

<sup>18</sup> Allouche, J., Middleton, C. and Gyawal, D. (2014). Nexus Nirvana or Nexus Nullity? A dynamic approach to security and sustainability in the water-energy-food nexus. STEPS Working Paper 63. Brighton: STEPS Centre; Stringer, L. C., Quinn, C. H., Berman, R. J., Le, H. T. V., Msuya, F. E., Orchard, S. E and Pezzuti, J.C.B (2014) Combining nexus and resilience thinking in a novel framework to enable more equitable and just outcomes. Sustainability Research Institute Paper No. 73, Centre for Climate Change Economic and Policy Working Paper No. 193.

<sup>19</sup> Pittock, above n 17.

<sup>20</sup> Globally, the agriculture sector is the largest user of freshwater.

<sup>21</sup> Leck, above n 16, 445.

<sup>22</sup> Brazilian, M., Rogner, H., Howells, M., Hermann, S., Arent, D., Gielen, D., Steduto, P., Mueller, A., Komor, P., R. J., and Yumkella, K. K. (2011) Considering the energy, water and food nexus: Towards an integrated modelling approach, *Energy Policy* (39)12, 7896-7906; for more details also see Rasul, above n 8, 687.

<sup>23</sup> Jacobs, M. (2012). *Green Growth: Economic theory and political discourse*, London Ingggris: Grantham Research Institute on Climate Change and the Environment, London School of Economics and Political Science (LSE) <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2012/10/WP92-green-growth-economic-theory-political-discourse.pdf> (accessed 07/07/2017).

<sup>24</sup> World Commission on Environment and Development. (1987) *Our Common Future*.

achieved.<sup>25</sup> More recently, renewed effort was given to global sustainability when the 2030 Agenda was unanimously adopted in September 2015 at the UN headquarters in New York. The Agenda has the potential to change the prevailing development paradigm by emphasizing the deeply interrelated nature of SD and its global relevance.<sup>26</sup> It also sets out to craft a strong post-2015 road map that aims to build on the success the MDGs, which set out to tackle broader issues, including the eradication of poverty, education, health and equality by the year 2015.<sup>27</sup> However, there were limitations to their achievements, with progress highly variable across goals, countries and regions.<sup>28</sup> On 1 January 2016 the 2030 Agenda, including the SDGs, came into force attesting to national governments' commitment to stimulate action in areas where progress has stalled and respond to new challenges for the 15-year period from 2015 to 2030.

The SDGs offer member countries an opportunity to commit to a more integrated development agenda across a range of significant challenges. With 17 Goals and 169 targets (the MDGs have eight goals and 21 targets), the SDGs are very ambitious in scale. Yet they provide a more systematic approach to combatting the root causes of global problems. For example, the SDGs recognise that ending poverty, a central part of the SDGs with the first of the 17 Goals aiming to 'Ending poverty in all its forms everywhere',<sup>29</sup> must go hand-in-hand with strategies that build economic growth and address a range of social needs including health, education, job opportunities and social protection, while tackling climate change and environmental degradation.<sup>30</sup> By emphasising a cross-sectorial approach to development, the SDGs point to the critical need to tackle the reality of poverty simultaneously with development, rather than targeting a particular aspect of poverty.<sup>31</sup> Weitz *et al*<sup>32</sup> assert, while the MDGs aimed to lift people out of poverty but fell short in identifying cross-sectorial goals, the SDGs aim to keep people out of poverty by ensuring that development is both socially and environmentally sustainable,<sup>33</sup> thus promoting integration through a nexus approach.

Long-term sustainability means recognising that many of the resources that support development are finite and that demand for the world's most precious resources, water, energy and food, are projected to grow. Thus, the nexus approach could be applied to promote cross-sectorial collaboration and integration. The SDGs include Goal 6, exclusively dedicated to water and sanitation; Goal 7 to ensure access to affordable, reliable, sustainable and modern energy; and a goal committed to climate change, Goal 13. Yet the document clearly acknowledges that the United Nations Framework Convention on Climate Change (UNFCCC) remains the driving force to promote action on climate change,<sup>34</sup> suggesting that the SDGs are not the main platform to address this issue. Nonetheless, the need to tackle rising emissions and prepare countries for the inevitable effects of climate change is embedded throughout the document, pointing to the critical relationship between

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<sup>25</sup> Cadman, T., Eastwood, L., Lopez-Casero Michaelis, F., Narayan Maraseni, T., Pittock, J. and Sarker, T. (2015) *The Political Economy of Sustainable Development: Policy Instruments and Market Mechanisms*, Edward Elgar Publishing: Cheltenham, UK.

<sup>26</sup> Papas, M. (2017) The 2030 Sustainable Agenda and the Paris Climate Agreement – taking urgent action to combat climate change: How is Australia likely to fare? *Asia-Pacific Journal of Environmental Law* 20, 97.

<sup>27</sup> United Nations Development Millennium Goals <http://www.un.org/millenniumgoals/> (accessed 07/07/2017).

<sup>28</sup> Sachs, J. (2012). From Millennium Development Goals to Sustainable Development Goals, *Lancet*, 2206.

<sup>29</sup> United Nations, Sustainable Development Goals, Goal 1: Ending Poverty in All Its Forms Everywhere <http://www.un.org/sustainabledevelopment/poverty/> (accessed 07/07/2017).

<sup>30</sup> United Nations, Sustainable Development Goals, the Sustainable Development Agenda <http://www.un.org/sustainabledevelopment/development-agenda/> (accessed 07/07/2017).

<sup>31</sup> Papas, above n 26, 98.

<sup>32</sup> Weitz, N., Huber-Lee, A., Nilsson, M., Davis, M. and Hoff, H. (2014). Cross-sectorial integration and the Sustainable Development Goals: a nexus approach. Stockholm Environment Institute (SEI), Discussion Paper, 1.

<sup>33</sup> *Ibid*, 1.

<sup>34</sup> United Nations, Sustainable Development Goals, Goal 13: take Urgent Action to Combat Climate Change and Its Impacts <http://www.un.org/sustainabledevelopment/climate-change-2/> (accessed 07/07/2017).

understanding climate change and achieving SD.<sup>35</sup> Meanwhile, Weitz *et al* suggest that most governments have separate agencies to oversee water, energy and agricultural food and set policies for each sector separately.<sup>36</sup> He says a ‘silo’ approach to each resource leads to silo policy development, despite these sectors being closely linked to local, regional and global water, carbon and energy cycles.<sup>37</sup> It is also worth pointing out that decisions and actions relating to natural resources occur within politically charged and highly contested contexts. This suggests a nexus approach could face challenges previously encountered by other integrative approaches. According to Allouche<sup>38</sup> and others,<sup>39</sup> integrative approaches have failed to deliver effective policies because of vested interests and framework design, which has resulted in inadequate implementation.

The 2030 Agenda could also face a number of implementation challenges. For example, the SDGs are not legally binding; instead, individual countries are expected to take responsibility for implementing the goals and establishing national frameworks and relevant agencies to achieve the goals and targets set out in the document.<sup>40</sup> In other words, the cost of implementation could be prohibitive in developing countries, despite the goals intended long-term benefits.<sup>41</sup> It has also been pointed out, although Goal 17 (strengthening the means of implementation and revitalize the global partnership for SD) is dedicated to implementation, the targets assigned to this goal are largely silent about interdependencies between goals.<sup>42</sup> Consequently, a number of issues need to be further clarified, including guidance on long-term strategies to help strengthen countries’ ambitions. The launch of the SDG Index and Dashboards Report<sup>43</sup> (SDG Report) could be critical to monitoring progress across all SDGs in the future. The purpose of the SDG Report is to help countries identify priorities for early action, understand the main implementation challenges and identify the gaps that must be addressed to achieve the SDGs by 2030.<sup>44</sup>

In relation to taking urgent action to combat climate change, and as preciously mentioned, Goal 13 of the SDGs points to the role of the UNFCCC. The UNFCCC Paris Agreement is a key framework to drive some of the actions needed to achieve its goals and the 2030 Agenda, and ultimately the WEF nexus. Indeed, climate change will threaten WEF long-term security. Jeff Erikson, senior vice president at environmental consultancy SustainAbility explains:

Water is required all the way through the lifecycle of electricity and power generation, from fuel extraction to production; electricity is required to move and process water, while agriculture accounts for 70% of the freshwater consumption worldwide [...], [t]hen you put climate change on top of that, which is going to have a significant impact on both agriculture and water availability.<sup>45</sup>

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<sup>35</sup> Papas, above n 26, 98.

<sup>36</sup> Weitz, above n 32, 1.

<sup>37</sup> Ibid.

<sup>38</sup> Allouche, above n 18.

<sup>39</sup> Peronne, D. and Hornberger, G. M. (2014). Water, food, and energy security: scrambling for resources or solutions? *WIREs Water* 1, 49-68; see also Mergerum, R. D. and Robinson, C. J. (2016). Introduction: the challenges of collaboration in environmental governance. In Richard D. Mergerum and Cathy. J. Robinson (eds) *The Challenges of Collaboration in Environmental Governance: Barriers and Responses*. Edward Elgar Publishing: Cheltenham, UK.

<sup>40</sup> United Nations, above n 20.

<sup>41</sup> Jaiyesimi, R. (2016). The Challenge of Implementing the Sustainable Development Goals in Africa: the Way Forward, *African Journal of Reproductive Health (Revue Africaine de Sante de la Reproduction)* <http://www.ejrh.info/index.php/ajrh/article/view/157> (accessed 07/07/2017).

<sup>42</sup> Ibid.

<sup>43</sup> SDG Index and Dashboards, Report and Data <http://sdindex.org/download/> (accessed 07/07/2017).

<sup>44</sup> Ibid.

<sup>45</sup> See SustainAbility, Making our future the cause of the present <http://sustainability.com/> (accessed 07/07/2017).

Similarly, climate change is highly related to the 2030 Agenda in the sense that SD cannot be achieved without first addressing the effects of temperature increase.<sup>46</sup> Thus, the need to tackle climate change is an indivisible problem with cause and effect, and the outcome of SD and WEF nexus thinking. Their success hinges on the need for low emissions, climate resilient communities and the broader efforts to build a more sustainable and prosperous future. Yet, the prospect of an effective global climate change agreement, both in terms of collective global commitment and responsibility to deliver stringent temperature limits set out by the Paris Agreement remains a work in progress.

### Climate Change: Beyond the Paris Agreement

The adoption of the Paris Agreement on 12 December 2015 (United Nations Framework Convention on Climate Change 2015) and the Agreement's coming into force on 4 November 2016, a mere 11 months after the deal was brokered, reflects a genuine intention by governments to recalibrate the global response to climate change and the political will to de-carbonize within the coming decades. The Paris Agreement reaffirms the goal of keeping average global warming below 2C (a goal set in the 2009 Copenhagen Accord<sup>47</sup> and the 2010 Cancun Agreement)<sup>48</sup> while urging parties to the Paris Agreement to pursue '... efforts to limit the temperature increase to 1.5C above pre-industrial levels' (article 2(1)a and 2(2) respectively). The task is a colossal undertaking since fossil fuels power nearly every aspect of the modern industrial world.<sup>49</sup> Nonetheless, there are signs that renewable sources of clean energy such as wind, solar and hydroelectric will be used extensively in the future<sup>50</sup> despite climate sceptics unwavering support for the coal industry.<sup>51</sup> However, the unexpected announcement on 1 June 2017 by President Donald Trump that the US will pull out of the landmark Paris Agreement<sup>52</sup> could slow progress in this area, although some commentators<sup>53</sup> see no reason why the rest of the world could not succeed in coordinating an effective global climate policy despite the withdrawal of the US.

The Paris Agreement encourages a bottom-up pledge and review approach through Nationally Determined Contributions (NDCs). Specifically, the Agreement requires each party to 'prepare, communicate and maintain successive NDCs that it intends to achieve'.<sup>54</sup> Parties are also obliged to communicate successive NDCs every five years (article 4(9)) and to report regularly on progress in implementing and achieving their targets. In short, more ambitious progression from each NDC than from the NDC that preceded. Yet, it remains unclear which mechanism or guidelines will be used to ensure parties commit to their new

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<sup>46</sup> Papas, above n 26, 96.

<sup>47</sup> Intergovernmental Panel of Climate Change (IPCC), Copenhagen Accord (December 2009) UN Doc FCCC/CP/2009/11/Add.1

[http://unfccc.int/documentation/documents/advanced\\_search/items/6911.php?preref=600005735beg](http://unfccc.int/documentation/documents/advanced_search/items/6911.php?preref=600005735beg) (accessed 07/07/2017).

<sup>48</sup> Intergovernmental Panel on Climate Change (IPCC), Cancun Agreements (December 2010) UN Doc FCCC/CP/2010/7/Add.1 <https://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf> (accessed 07/07/2017).

<sup>49</sup> Wood, M.C. (2014). *Nature's Trust: Environmental Law for a New Ecological Age*. Cambridge University Press, UK.

<sup>50</sup> Zhou, Y. (2015). State power and environmental initiatives in China: Analyzing China's green building program through an ecological modernization perspective, *Geoforum* 61, 1-12.

<sup>51</sup> Ebell, M.T. (2017). Trump 'will definitely pull out of Paris climate change deal'. *CBC News* (Monday 30 January 2017) <http://www.cbc.ca/news/technology/trump-climate-accord-myron-ebell-1.3958452> (accessed 07/07/2017).

<sup>52</sup> Shear, M. (2017). Trump Will Withdraw U.S. From Paris Climate Agreement. *The New York Times* (1 June 2017) <http://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html> (accessed 07/07/2017)

<sup>53</sup> Trexler, M. (2017) Does information matter for completing the 1,000,000 piece climate change jigsaw puzzle? <http://realkm.com/2017/06/30/does-information-matter-for-completing-the-1000000-piece-climate-change-jigsaw-puzzle/> (accessed 07/07/2017); see also Ott, H. E., Hermwille, L. and Obergassel, W. (2017) International Climate Policy: Trumping Trump. *Wuppertal Institut* In brief 03/2017

[https://wupperinst.org/fa/redaktion/downloads/publications/In\\_Brief\\_2017-3\\_en.pdf](https://wupperinst.org/fa/redaktion/downloads/publications/In_Brief_2017-3_en.pdf) (accessed 07/07/2017).

<sup>54</sup> Article 4.2.

targets given that individual countries are responsible for determining how much (or how little) they intend to contribute to the collective mitigation effort. By its flexibility, the Paris Agreement does not provide the necessary ambition required for countries to fulfil their obligations articulated in article 2. Nonetheless, as some have commented, the Paris Agreement provides the framework through which major emitters can set their own targets, which should increase countries' sense of obligation and responsibility.<sup>55</sup> The NDCs represent a tremendous opportunity to link climate change to the WEF nexus and address the 2030 Agenda.

Indeed, by aiming to deliver stringent temperature limits set out by the Paris Agreement and deliver further guidance relating to NDCs at successive Conferences of the Parties (COPs), the Agreement leaves a number of issues to be negotiated further. These relate specifically to providing further procedures and guidelines for a transparent framework for action; for example, refining the mechanisms that facilitate implementation and mechanisms to promote compliance and global stocktake.<sup>56</sup> This suggests that the impacts of the Agreement will not be fully felt for some time. Meanwhile, the drivers behind countries' climate policy vary considerably, as the US President's recent announcement illustrates, Australia in particular faces its very own challenges.

### **Australian Case Study: An brief overview**

Of developed countries, Australia is one of the most vulnerable to climate change. In the last five years, Australia has recorded its warmest years on record<sup>57</sup> and according to the World Meteorological Organization's annual statement, global temperatures are set to remain well above average in the near future.<sup>58</sup> Australia, as other countries, needs to address the effect of extreme temperatures on the economy and formulate adaptive responses, particularly given how little has been achieved to date to prepare the country for long-term effects of climate change. Indeed, the policy fixation of blocking progress to reduce GHG emissions and eventually abolishing the federal GHG legislation, the *Clean Energy Act 2011* (Cth)<sup>59</sup> 'as an act of political revenge'<sup>60</sup> has contributed to Australia's neglect in curbing the nation's GHGs.<sup>61</sup> It also highlights Australia's failure to develop a viable policy approach to regulate dangerous emissions. The federal legislation was replaced with the Emissions Reduction Fund (REF); the centerpiece of the government's Direct Action Plan to cut emissions to 5 per cent below 2000 levels by 2020 and between 26 to 28 per cent below 2005 levels by

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<sup>55</sup> Falker, R. (2016). The Paris Agreement and the New Logic of International Climate Politics 92(5) *International Affairs*, 1107-1125.

<sup>56</sup> The Ad Hoc Working Group established at the Paris conference is tasked with addressing many of the elements that need further elaboration and are critical to the Paris Agreement's long term effectiveness. See UNFCCC, 'Ad Hoc Working Group on the Paris Agreement (APA)' <http://unfccc.int/bodies/apa/body/9399.php> (accessed 07/07/2017).

<sup>57</sup> Bureau of Meteorology. Bureau confirms 2015 Australia's fifth warmest year on record <http://media.bom.gov.au/releases/237/bureau-confirms-2015-was-australias-fifth-warmest-year-on-record/> (accessed 07/07/2017).

<sup>58</sup> World Meteorological Organisation. Climate breaks multiple records in 2016, with global impacts (March 2017) <https://public.wmo.int/en/media/press-release/climate-breaks-multiple-records-2016-global-impacts> (accessed 07/07/2017).

<sup>59</sup> The Federal legislation in question is the *Clean Energy Act 2011* (Cth). Cth refers to Commonwealth indicating that the Act is valid Australia wide.

<sup>60</sup> Megalogenis, G. (2015). *The Australian Moment: how we are made for these times*. Hamish Hamilton Publishing, Australia.

<sup>61</sup> Lyster, R. (2011). Australia's Clean Energy Future Package: Are we there yet? *Environmental and Planning Law Journal* 28, 446.

2030.<sup>62</sup> However, the policy has a number of flaws<sup>63</sup> and its future remains uncertain as Australia undertakes its 2017 review of national climate policy.<sup>64</sup>

Australia's position in relation to its endowment of fossil fuels, especially coal, raises some serious concerns. As Mayor et al<sup>65</sup> assert, freshwater is increasingly consumed for oil and gas exploration, often in regions experiencing prolonged drought conditions. Freshwater is also used for coal extraction. For example, the granting of an unlimited 60-year water licence to the Carmichael coal mine, in Queensland's Galilee basin (northern Australian state), drew immense reaction from environmentalists, farmers and local community residents alike.<sup>66</sup> The provision of unlimited water for what will be one of the largest mining operations in the Southern hemisphere<sup>67</sup> is contrary to many of the deep uncertainties around climate predictions and Australia's international obligations to the Paris Agreement. This is particularly true given that on 10 November 2016 Prime Minister Malcolm Turnbull confirmed Australia had ratified the Paris Agreement despite persistent climate opposition and scepticism within the Australian Coalition government.<sup>68</sup> Although the Australian government appears determined to play an active role to reduce emissions alongside other parties to the Agreement, scientists have estimated that in order to maintain global warming below 2°C more than 90% of known coal reserves in Australia must stay in the ground.<sup>69</sup> This may mean the Galilee Basin is 'unburnable coal'.<sup>70</sup> Hence, the position of the Australian government in relation to climate change action, and by implication to the WEF nexus and the pursuit of SD, is perplexingly inconsistent.

Furthermore, as a dry continent with a significant agricultural sector, the role of climate change cannot be underestimated. In the context of the WEF nexus, it points to the potential (or observed reality) that water, energy and food systems will become too stressed to maximise their functions.<sup>71</sup> The effects of a changing climate and increase in demand corresponding to the response of vegetation to higher temperature<sup>72</sup> have been foreseeable for some time particularly in Australia's most prominent river system, the Murray-Darling Basin (MDB). The prolonged 2000 drought, known as the Millennium drought, was the worst drought since European settlement and affected most of southern Australia, including the

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<sup>62</sup> Department of the Environment and Energy. Australia's 2030 climate change target <http://www.environment.gov.au/climate-change/publications/factsheet-australias-2030-climate-change-target> (accessed 07/07/2017).

<sup>63</sup> Hawkins, J. (2014). The Emissions Reduction Fund: A Critique' in Opportunities for the Critical Decade: Enhancing Well-being with Planetary Boundaries. 244. Paper presented at the Australian New Zealand Society for Ecological Economics 2013 conference, the University of Canberra and Australia New Zealand Society of Ecological Economics, Canberra, Australia.

<sup>65</sup> Mayor, B., Lopez-Gunn, E., Villarroya, F. I. and Monteso, E. (2015). Application of water-energy-food nexus framework for the Duero river basin in Spain. *Water International* 40 (5/6), 733-747.

<sup>66</sup> Kelly, J. Strong moral case for Adani's Carmichael coal mine: Josh Frydenberg. *The Australian Business Review* (18 October 2015) <http://www.theaustralian.com.au/business/strong-moral-case-for-adanis-carmichael-coal-mine-josh-frydenberg/news-story/23a914ecd30c53befe3f875775996b4e> (accessed 07/07/2017).

<sup>67</sup> The Carmichael coal project will become the biggest mine in Australia, and one of the biggest in the world, producing an estimated 60 million tonnes of steaming coal each year over an estimates life of 60 to 90 years.

<sup>68</sup> Murphy, K. Turnbull signals Australia won't follow Trump lead on Paris climate agreement. *The Guardian* (10 November 2016) <http://www.theguardian.com/australia-news/2016/nov/10/turnbull-signals-australia-wont-follow-trumps-lead-on-paris-climate-agreement> (accessed 07/07/2017).

<sup>69</sup> The Climate Council of Australia (2015). Galilee basin Unburnable Coal <https://www.climatecouncil.org.au/uploads/af9ceab751ba2d0d3986ee39e1ef04fd.pdf> (accessed 07/07/2017).

<sup>70</sup> Ibid, 1.

<sup>71</sup> Berady, A. and Chester, M. V. (2017). Climate change vulnerability in the food, energy, and water nexus: concerns for agriculture production in Arizona and its urban export supply, *Environmental Research Letters* 12 <http://doi.org/10.1088/1748-9326/aa5e6d> (accessed 07/07/2017).

<sup>72</sup> Jimenez, BE et al. (2014) Freshwater Resources in CB Field et al (Eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, 229.

MDB.<sup>73</sup> Furthermore, recent heat spells call for the highest level of adaptive capacity<sup>74</sup> to prepare for the prospect of a future with less water. Although Australia has been at the forefront of water reform<sup>75</sup>, after 20 years of progress questions remain as to what extent current models and strategies effectively address drought risk and meet future water needs. Australia is signatory to the 2030 Agenda for SD (along with more than 150 governments), and thus committed itself in principle by 2030 to:

... ensure the lasting protection of the planet and its natural resources. We resolve also to create conditions for sustainable, inclusive and sustained economic growth, shared prosperity and decent work for all, taking into account different levels of national development and capacities.<sup>76</sup>

Achieving this aspiration requires water governance that promotes sustainable practices, while ensuring that the ability of nature to provide water resources to future generations remains undiminished. Thus water issues in the WEF nexus are intertwined as a policy challenge.

### Looking to the future

The year 2015 was defined by the global quest for a sustainable future: first came the adoption the 2030 Agenda and later that year, the Paris Agreement (which came into force a mere 11 months after being adopted)<sup>77</sup> marking significant progress in global cooperation and a unique opportunity to move towards a more sustainable future. The 2030 Agenda including the SDGs outline a universal set of goals and targets, agreed by more than 150 governments to frame their policy agenda from 2015 to 2030. The Paris Agreement provides a new framework for global climate action and encourages a bottom-up pledge and review approach through NDCs. In contrast, WEF as a global research agenda promotes nexus thinking and addresses the complex and interrelated nature of water, energy and food's fundamental role in the functioning of society. As a concept, it does not provide an action plan or time bound targets, it simply provides another approach in response to complex environmental problems. The instrument that does drive some actions is the Paris Agreement, albeit subject to more COP decisions and concrete measures as to how parties will deliver their obligations. Indeed, there is no formal enforcement mechanism in the Agreement, leaving individual countries responsible for determining their NDCs. However, obligations for nations to report their progress are intended to create international political peer pressure to encourage commitment over the years. Ultimately, compliance tends to be

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<sup>73</sup> Van Dijk, A. I. J., Beck, H. E., Crosbie, R. S., de Jeu, R. A. M., Liu, Y. Y., Podger, G. M., Timbal, B. and Viney, N. R. (2013) The Millennium Drought in southeast Australia (2001-2009): Natural and human causes and implications for water resources, ecosystems, economy, and society *Water Resource Research* 49(2), 1040-1057.

<sup>74</sup> Wentworth Group of Concerned Scientists, Five actions to deliver the Murray Darling Basin Plan '1 full and on time'. (5 June 2017) <http://wentworthgroup.org/wp-content/uploads/2017/06/Five-actions-to-deliver-Murray-Darling-Basin-Plan-Wentworth-Group-June-2017.pdf> (accessed 07/07/2017).

<sup>75</sup> See generally Holley, C. and Sinclair, D. (2016) Rethinking Australian water law and governance: Successes, challenges and future directions *Environmental and Planning Law Journal* 33(4), 275.

<sup>76</sup> United Nations, Department of Economic and Social Affairs, *Transforming our World: The 2030 Agenda for Sustainable Development* (Sustainable Development Knowledge Platform) <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication> (accessed 07/07/2017).

<sup>77</sup> See United Nations, Paris Agreement Paris, 12 December 2015 Entry Into Force (5 October 2015) UN Doc C. N. 735.2016.TREATIES-XXVII.7.d (Depositary Notification).

measured by whether most states vary their behaviour in a way consistent with international commitments.<sup>78</sup>

In light of the above, the following points should be considered. First, both the WEF nexus in the context of climate change and the 2030 Agenda suggest that the new climate change framework and progress in implementing targets can meaningfully contribute to achievement of the 2030 agenda and by implication the WEF nexus. Climate change, as we have seen, is the 'super-wicked problem'<sup>79</sup> with a range of temporal effects that will have significant effects on the achievement of both WEF and SD. Secondly, Australia's inherent challenges stem from its highly variable and dry climate and reliance on fossil fuels. Logically, Australia needs to become more efficient and rapidly move away from fossil fuels to other sources of power. Indeed, efforts to reduce GHG emissions have important implications for the amount of coal that is exploited. The Carmichael coal mine symbolises Australia's failure to address the potential effect of fossil fuel emissions on global warming<sup>80</sup> and the urgent need for environmental approval processes to treat action on climate change as imperative.<sup>81</sup>

Meanwhile, Australia's wealth and technological knowledge provides a critical advantage and the capacity to deploy renewable energy, albeit with high coal use but relatively low energy efficiency. More recently, Australia has indicated some level of commitment to reducing emissions with the introduction of a carbon capture and storage (CCS) process as a potential technique for climate change mitigation.<sup>82</sup> In the absence of definitive federal climate change legislation, a number of Australian state governments have adopted a proactive stance on CCS by introducing policy and enacting legislation to regulate CCS activities in their respective jurisdictions in the context of large-scale commercial CCS activities.<sup>83</sup> On 9 June 2017, the release of a review by the Chief Scientist Alan Finkel into Australia's National Electricity Market provided an overview of the main issues confronting the electricity sector.<sup>84</sup> The main purpose of the review was to develop a national reform blueprint to maintain energy security at a time of deep transition in terms of energy sources. The electricity sector New Australian Energy Market Operator chief Audrey Zibelman said the Finkel blueprint for national electricity is 'spot on' and provides strong reliable measures as the costs of wind, solar and storage continue to fall rapidly.<sup>85</sup> Yet one of Finkel's core proposals, a 'Clean Energy Target (CET) intended to provide subsidies to a new low-emissions generation, was rejected due to political infighting and powerful lobbies.<sup>86</sup>

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<sup>78</sup> Haas, P. M. (2003) Choosing to Comply: Theorizing from International Relations and Comparative Politics. In D. Shelton (Ed) *Commitment and Compliance: The role of non-binding norms in the international legal system*. Oxford University Press, UK, 44.

<sup>79</sup> Levin, above n 1, 123-152.

<sup>80</sup> The Carmichael coal mine is a proposed coal mine in central Queensland, Australia. The mine is proposed by Adani Mining, a wholly owned subsidiary of India's Adani Group. The mine has drawn immense controversy about its claimed economic benefits. Indian billionaire Gautam Adani said the company 'was committed to the largest single investment by an Indian corporation in Australia despite opposition from the environmental movement. See Robertson, J. Adani gives 'green light' to A\$16bn Carmichael coal mine, *theguardian* (Tuesday 6 June 2017) <https://www.theguardian.com/environment/2017/jun/06/adani-gives-green-light-to-16bn-carmichael-coal-mine> (accessed 07/07/2017).

<sup>81</sup> Papas, above n 26, 112.

<sup>82</sup> Dwyer, G. (2015). Emerging Legislative Regimes for Regulating Carbon Capture and Storage Activities: To what extent do they facilitate access to procedural justice? *Environmental and Planning Law Journal* 32, 6-7.

<sup>83</sup> *Ibid*, 8.

<sup>84</sup> Department of the Environment and Energy, *Independent Review into the Future Security of National Electricity Market* <https://www.environment.gov.au/energy/national-electricity-market-review> (accessed 07/07/2017).

<sup>85</sup> Chambers, M. Alan Finkel report spot on: AEMO chief Audrey Zibelman, *The Australian* (16 June 2017) <http://www.theaustralian.com.au/business/mining-energy/alan-finkel-report-spot-on-aemo-chief-audrey-zibelman/news-story/4cf5e765df33ca2d07c45d4023f5170a> (accessed 07/07/2017).

<sup>86</sup> COAG is an intergovernmental forum used to negotiate collaborative responses by the Australian Federal government and the states to discuss many environmental issues. The forum has been used since it was first established in 1992. See also The Climate Institute, 'COAG Energy Council Outcome Statement (19 August

Needless to say, a working consensus on energy and a national climate policy has proved elusive, thus far. Yet, there remains a willingness from industry, electricity generators and the private sector to explore alternative sources of energy supply that are long lasting and curtail GHG emissions. Such steps could spell change for Australia if policy delivers effective implementation, and secure a sustainable future for all Australians.

## Conclusion

SD has been the dominant paradigm of growth for over 25 years, despite a lack of clear understanding about what the concept really means and how to achieve it. At the core of the idea is the notion that growth is inevitable, yet economic development should not be made at the expense of the environment and discourage ongoing business-as-usual practices. Thus, SD remains at the heart of the global debate and recently culminated with the adoption of the 2030 Agenda and the SDGs. The SDGs call for action across every country, although the issue of climate change is proving extremely complex. It is global in scope and due to its long-term and potentially irreversible consequences, it will likely be intergenerational in its impacts. This has serious consequences for WEF nexus as global temperature increase with flow on effects to water, energy and agriculture (or food) with potentially enormous economic stakes and the vicissitudes of domestic politics.

Australia, as do other countries, could face an uncertain future. Australia is a dry and potentially at risk because its economy production relies on sound management of water, land use and energy. Its endowment in fossil fuels, particularly coal is a hindrance to Australia's international reputation and commitment to the Paris Agreement. Indeed, improving governance without a better understanding of interconnected links between systems such as WEF and by implication the pursuit of a sustainable future can cause cascading failures and increase systemic risks. Australia has the wealth, capacity and technological knowledge to transition to a future with less GHGs emissions. A future with less carbon in the atmosphere is critical for WEF nexus because as a lifeline of modern societies and core element to the achievement of the SDGs it is a critical to a sustainable future. Nexus thinking can enhance WEF and SD but it needs to be underpinned by policy that can be actioned without delay.

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2016) <http://www.climateinstitute.org.au/artilces/media-release/coag-energy-council-outcome-statement.html> (accessed 07/07/2017).