The Routledge Handbook of Sustainable Cities and Landscapes in The Pacific Rim

Edited by
Yizhao Yang and Anne Taufen

First published 2022

ISBN: 978-0-367-47114-9 (hbk)
ISBN: 978-1-032-18994-9 (pbk)
ISBN: 978-1-003-03353-0 (ebk)

Chapter 30

Introduction to Section 5

Renewable energy landscapes across the Pacific Rim

Makena Coffman and Yekang Ko

DOI: 10.4324/9781003033530-35

Routledge
Taylor & Francis Group
LONDON AND NEW YORK

30
INTRODUCTION TO SECTION 5
Renewable energy landscapes across the Pacific Rim

Makena Coffman and Yekang Ko

Introduction

A recent study estimates that daily global CO_2 emissions decreased by 17% in April 2020 compared to 2019 levels, and for the year could decline by up to 13% depending on the duration of COVID-19 lock down conditions (Le Quéré et al., 2020). While this is a dramatic one-year drop, it will take targeted intervention to slow the rise of emissions with the reopening of the economy. To the contrary, fears of additional economic ramifications on top of COVID-19 disruptions may further delay large-scale decarbonization – compounding one crisis to another. In the early months of the COVID-19 pandemic, many commentators drew analogies to the climate crisis. Two seem particularly relevant. First, the way that communities have mobilized against COVID-19 reflects the urgency and necessity of how they should also mobilize against climate change. Second, the experience of COVID-19 shows the consequences of ill-preparation and ignoring sound science. Though quite opposite messages, both resonate and give insight into how we might learn from the global pandemic in global climate response: we must move both quickly and well informed by data and science.

This section focuses on our work on *energy transition and renewable energy landscapes*, a critical component of addressing the climate crisis, drawing upon the APRU SCL Working Groups on renewable energy in 2017, 2018 and 2019. Wildfire smoke loomed over Portland in 2017 during the first convening of the APRU SCL. One of us currently sits in Eugene, Oregon, again in a community filled with smoke. The house has been sealed for over a week, and outside the sky is yellow and orange, blazing like the sun. Though thousands have evacuated, that also seems a perilous option during the pandemic. The increasing incidence (and spread) of wildfires and other extreme weather events is coming to fruition as predicted by climate scientists, though at even more alarming pace. Through these unfortunate events, we hope that there is a silver lining in motivating not only adapting to new circumstances but also mitigating the cause – greenhouse gas (GHG) emissions.

Guiding the Working Group's conversation and underpinning these chapters is the motivation and acknowledgment that response to the global climate crisis needs to be at a scale and urgency of the crisis itself – where it all too often falls short. Starting in 1989 with the U.N. Framework Convention on Climate Change, there have now been three decades of international negotiations for mitigating the global impacts of climate change, largely through

DOI: 10.4324/9781003033530-35

renewable energy deployment. While the landmark 2015 Paris Agreement was a huge step forward for global cooperation, it also means that the great lapse in time requires ambitious targets. The research from the group Climate Action Tracker finds that with current pledges the globe is heading toward an approximately 2.4–2.7°C increase (relative to pre-industrial times) by 2100 (Climate Action Tracker, 2020). This represents improvement relative to the 4–5°C pathway that the world was on, but there is much more to be done to achieve the 2°C target from the Paris Agreement (Climate Action Tracker, 2020). The Intergovernmental Panel on Climate Change Special Report: *Global Warming of 1.5°C* further motivates a lower emissions pathway; for example, an estimated 10 million fewer people will be impacted by sea level rise if warming can be limited to 1.5°C rather than 2°C (IPCC, 2018). Recently, major economies across the Pacific Rim have started to respond to this alarming call. In September 2020, China, the world's largest GHG emission contributor, pledged to achieve carbon neutrality by 2060. A month later, Japan and South Korea followed to commit themselves to achieve net zero emissions by 2050. The U.S. rejoined the Paris Agreement in early 2021 with the new Biden Administration. In sum, commitments globally are moving forward but still more urgent actions, and actual implementation, are desperately required.

Chapters

The slow response of global leaders across the Pacific Rim to address climate change, the U.S. government as a prime example in undermining both the Kyoto Protocol and the Paris Agreement, has resulted in large-scale sub-national efforts toward climate action. Chapter 31 (Barrett et al.) of this section explores municipal efforts to promote socio-technical transitions for rapid decarbonization. It presents three illustrative cases: San Francisco (California, U.S.), Fukushima Prefecture (Japan) and Australian Capital Territory (Canberra and other small townships, Australia). These sub-national government efforts represent "front-runners" within their own national contexts to push decarbonization policies. The analysis assesses each case in relationship to 12 socio-technical criteria for the purpose of revealing opportunities and challenges associated with sub-national acceleration of decarbonization. This chapter provides a contextual foundation for the other chapters in this section examining the environmental, ecological, community and landscape impacts associated with decarbonization transitions.

Rapid deployment of renewable energy is perhaps the most critical component of rapid decarbonization. Burning fossil fuels for energy accounts for 89% of global GHG emissions (Le Quéré et al., 2018). Renewable sources for electricity generation are growing at a double-digit pace. China has emerged as the leader, with 40% of the growth in renewable-based electricity generation (IEA, 2019). However, growing electricity demand globally is outpacing the increase in renewable electricity generation – meaning that decarbonization of the electricity system is still far-off (IEA, 2019). Renewable energy (and complementary storage technologies) is being motivated by a combination of forces, from declining prices to policy interventions like renewable portfolio standards, feed-in-tariffs and carbon pricing. From where we write, Oregon has a renewable portfolio standard of meeting 50% of electricity generation through renewable energy by 2040; and Hawai'i requires 100% of net sales from renewable sources by 2045 (EIA, 2019). Though these kinds of renewable energy targets have been important to the transition to renewable sources of electricity, decision makers are often caught between policy mandates to meet energy production targets versus potentially opposing economic evaluations of costs and benefits that challenge the financial feasibility of projects. Chapter 32 (Ribe) discusses these dilemmas and demonstrates a theoretical approach to understanding the interaction of private and public capital values to provide a way to clarify the constraints, trade-offs and delayed feedbacks that impact energy policy choices.

The majority of renewable energy deployed is through large-scale projects. This has raised new conflicts around land use change. Contention with nearby communities as well as consequences to ecological systems like habitat destruction or fragmentation has relatively slowed the deployment of large-scale renewable energy development, a phenomenon occurring across the globe. Chapter 33 (Ko et al.) presents a series of case studies demonstrating this emerging conflict between multiple "green" agendas, namely the clash between rapid large-scale renewable energy development and communities and/or biodiversity. The case studies provide a number of examples from across the Pacific Rim, including from South Korea, Taiwan, Japan and the U.S. The cases span both land and ocean-based sources for renewable energy. They are used to develop a generalized planning framework for best practices in least-conflict siting of large-scale renewable energy projects.

Chapter 34 (Fiorelli et al.) shifts the focus of best practices toward smaller-scale renewable energy projects, solar photovoltaic technology in particular, that emphasize co-benefits through co-location. This chapter presents options for symbiotic land uses, across both urban and rural landscapes, that minimize the overall land use impacts of renewable energy deployment. Some land uses more efficiently use previously degraded areas (brightfields), while others provide benefits like solar canopies for agricultural production (agrivoltaics). This chapter presents ways in which the current challenges of renewable energy location can be leveraged into opportunities. Similarly, Chapter 35 (Dimond) complements and continues this idea with a presentation of design principles and site design strategies for urban solar photovoltaic systems. It presents best practices in Building Adopted Photovoltaics, ground mounted systems and canopy mounted systems. The aim is to have a more integrated and humanized use of new urban infrastructure that is part of the solution to urban challenges, rather than exacerbating current conditions.

Lastly, Chapter 36 (Mulvaney) broadens our perspective of planning and design for solar photovoltaics to include environmental and social impacts along the supply chain. This chapter focuses on lifecycle impacts of solar-based energy, from extraction to disposal. As solar power continues to rise as a key decarbonization strategy, its deployment will demand for specific materials, natural resources and lands. This creates new environmental pressures as well as motivates considerations for fair labor standards within emerging industrial areas. At the end-of-life, solar photovoltaics also require environmental management for waste disposal and recycling challenges that will have implications for environmental justice, but also offer opportunities for harnessing circular economies in these critical materials. Drawing on the vision of a *just transition*, this chapter offers a roadmap for sustainability solutions along the solar energy commodity chain.

Conclusion: sustainable energy landscapes to achieve SDGs

This section centers around the U.N. Sustainable Development Goal (SDG) 7: Affordable and Clean Energy, 11: Sustainable Cities and Communities and 13: Climate Action. In addition, taking climate action dramatically impacts SDG 15: Life on Land as well as SEG 14: Life Below Water as described in this section. The adoption of renewable energy systems will reduce (and eliminate) fossil fuel burning for energy needs, the root cause of climate change. The cost of renewable energy systems has declined dramatically over the past two decades; moreover, once considering the tremendous environmental and human damages from climate change, they lead to much more cost-effective sources of energy (Bastien-Olvera and Moore, 2021). The U.N. has stated that the COVID-19 outbreak highlights the importance of mitigating threats to ecosystems and wildlife related to zoonotic diseases (U.N., 2020). Though there are many threats to biodiversity that need to be addressed, it is important to not exacerbate degradation through the rapid pursuit of renewable energy aimed at climate change response. This section emphasizes the importance of city-landscape interplay in decarbonization. The emphasis on case studies demonstrates a wide spectrum of geopolitical representation across the Pacific Rim and provides best practices that allow for mutual learning. As noted in the Handbook Introduction, understanding the interaction between cities and landscapes is the key of the many "wicked problems" in this century (Rittel and Webber, 1973). Cities consume more than two-thirds of energy globally and be responsible for over 70% of GHG emissions (IEA, 2016). The conventional way of generating and supplying energy for cities has been imposing tremendous impacts on surrounding landscapes, including rural communities and fragile ecosystems. The transition to renewable energy can unfortunately exacerbate this trend when not cautiously and proactively considering a more sustainable city-landscape relationship. Therefore, this section primarily explores local and regional actions that support decentralized energy systems and multifunctional energy landscapes on or near urban areas. Additionally, responsibly locating utility-scale renewable energy infrastructure and lifecycle management will ensure a more equitable approach within the transition.

The discussions of the APRU SCL Working Groups, from 2017 to 2019, as well as the current crises of both COVID-19 and climate change, strongly motivate us to think about collective action and maximize the co-benefits of positive change. This work is built upon the guiding principles of the APRU SCL Hub by calling for transformative actions in policy, planning and design by critically assessing a variety of social, ecological and land use impacts within the urgently needed energy transition. Of particular importance, highlighted by the fallout of the COVID-19 pandemic, is to address issues of environmental justice for underrepresented and often marginalized communities during the renewable energy transition. We hope that this section on renewable energy and energy landscapes helps to inform decision makers, from local to national efforts, on ways to mitigate negative impacts of land use change while accelerating climate action.

References

Bastien-Olvera, B., & Moore, F. (2021). Use and non-use value of nature and the social cost of carbon. *Nature Sustainability*, *4*, 101–108.

Climate Action Tracker. (2020). *Global mean temperature increase by 2100*. https://climateactiontracker.org/global/temperatures/

IEA. (2016). Cities are in the frontline for cutting carbon emissions. *New IEA Report Finds*. https://www.iea.org/news/cities-are-in-the-frontline-for-cutting-carbon-emissions-new-iea-report-finds

IEA. (2019). *Global energy & CO2 status report 2019*. https://www.iea.org/reports/global-energy-co2-status-report-2019#global-trends

IPCC. (2018). Summary for policymakers. In V. Masson-Delmotte, H. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.), *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

Le Quéré, C., Andrew, R. M., Friedlingstein, P., Sitch, S., Hauck, J., Pongratz, J., Pickers, P. A., Korsbakken, J. I., Peters, G. P., Canadell, J. G., Arneth, A., Arora, V. K., Barbero, L., Bastos, A., Bopp, L., Chevallier, F., Chini, L. P., Ciais, P., Doney, S. C., … Zheng, B. (2018). Global carbon budget 2018. *Earth System Science Data*, *10*(4), 2141–2194. https://doi.org/10.5194/essd-10-2141-2018

Le Quéré, C., Jackson, R. B., Jones, M. W., Smith, A. J. P., Abernethy, S., Andrew, R. M., De-Gol, A. J., Willis, D. R., Shan, Y., Canadell, J. G., Friedlingstein, P., Creutzig, F., & Peters, G. P. (2020). Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. *Nature Climate Change*, *10*(7), 647–653. https://doi.org/10.1038/s41558-020-0797-x

Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*, 155–169.

United Nations. (2020). *COVID-19 response*. https://www.un.org/sustainabledevelopment/biodiversity/

U.S. Energy Information Administration (EIA). (2019). *Renewable energy explained: Portfolio standards*. https://www.eia.gov/energyexplained/renewable-sources/portfolio-standards.php