Pacific Northwest NATIONAL LABORATORY

Place-based renewable energy infrastructure at scale

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U.S. DEPARTMENT OF ENERGY BATTELLE

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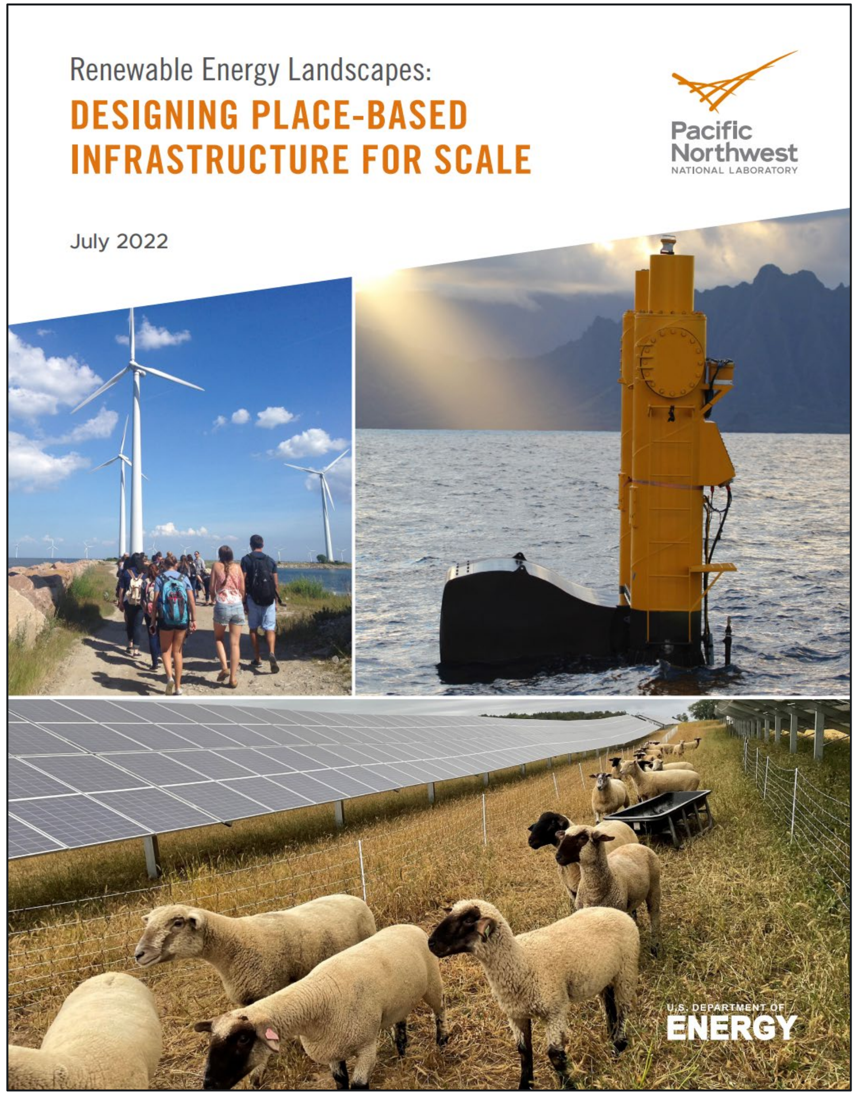
Overview

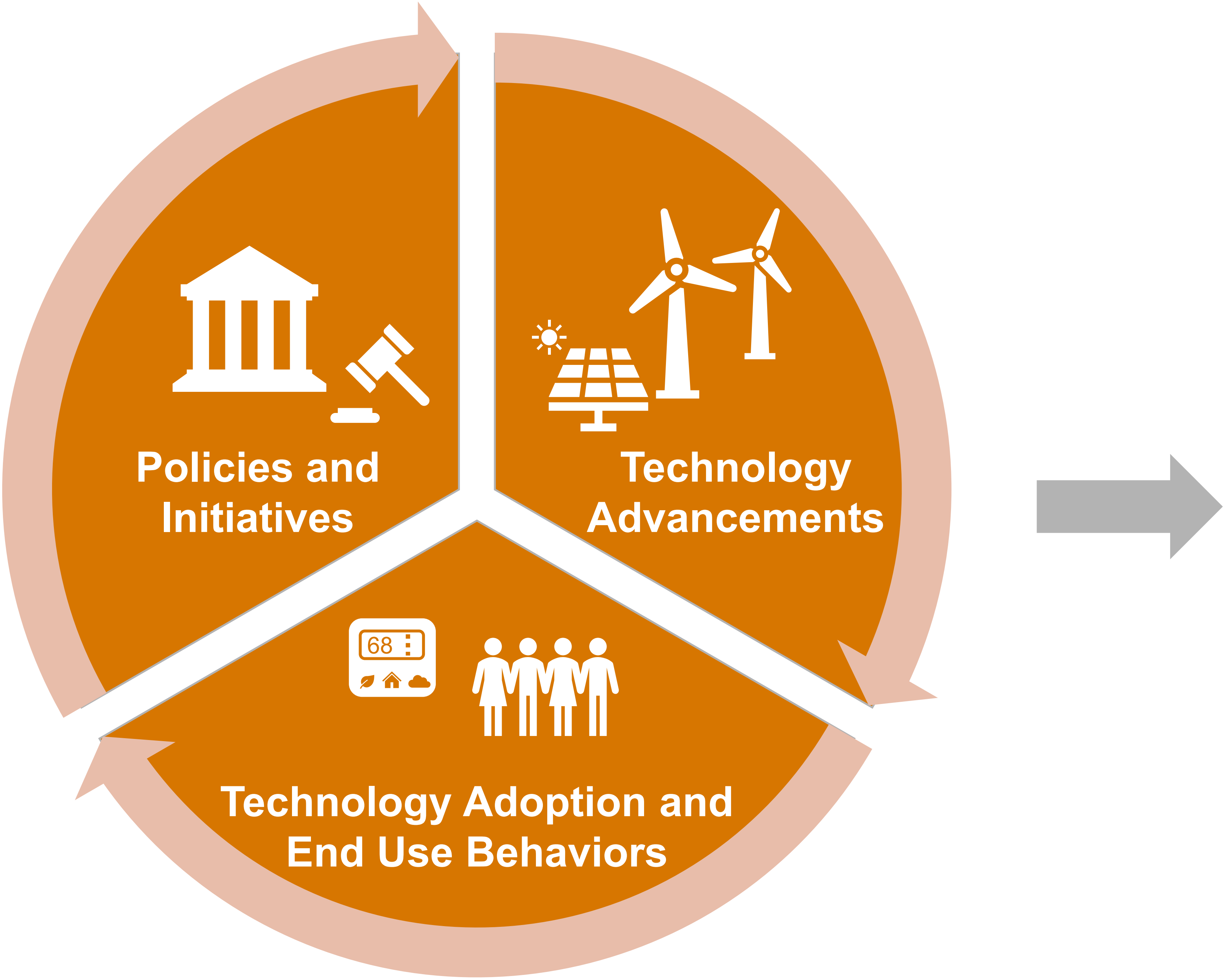


Opportunities, Challenges, and the Promise of Place-Based Infrastructure → Design Pathways → Historical Lessons and Looking to the Future

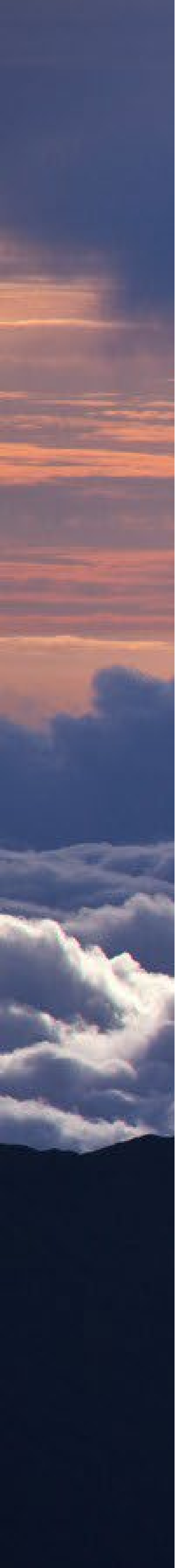
Pacific Northwest NATIONAL LABORATORY | UNIVERSITY OF OREGON | THE UNIVERSITY OF ARIZONA | Penn UNIVERSITY of PENNSYLVANIA

https://www.pnnl.gov/projects/renewable-energy-landscapes

The Opportunity: A Changing Energy System



Just Energy Transition



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The Challenge: A Development Dichotomy?

Community place-based development	Approaches to Development	Scaled, urgent, and national deployment
Unstructured, optional, and early-stage activity	Process	Regulatory requirements
Local (tax base, workforce, construction environmental, property values)	Effects	System (reduction in GHG, cleaner resources, economic investment)
Uncompensated (community prefereces cultural significance, social value)	Attributes	Compensated (energy services, cheaper resources, incentives)
Holistical local paradigms	Project Development	Development through consumer developer decisions & market diffusion

Meeting the Moment: Creating Synergy

Renewable Energy Landscapes
A landscape whose physical characteristics have been significantly transformed by renewable energy infrastructure

Place-Based at Scale
Deployment of infrastructure systems in a way that balances the ability to be replicated widely (at scale), with careful attention to unique local character of specific places

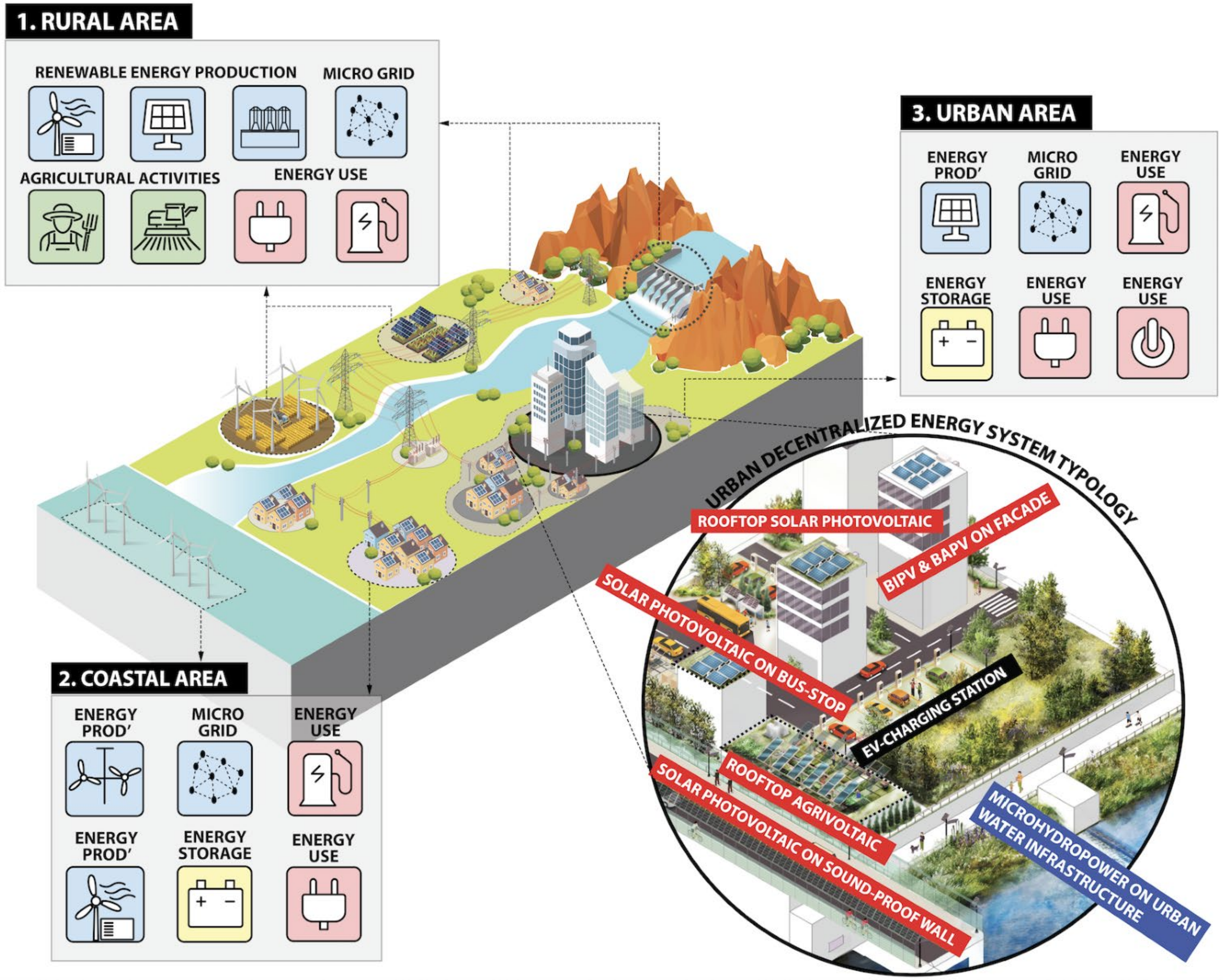
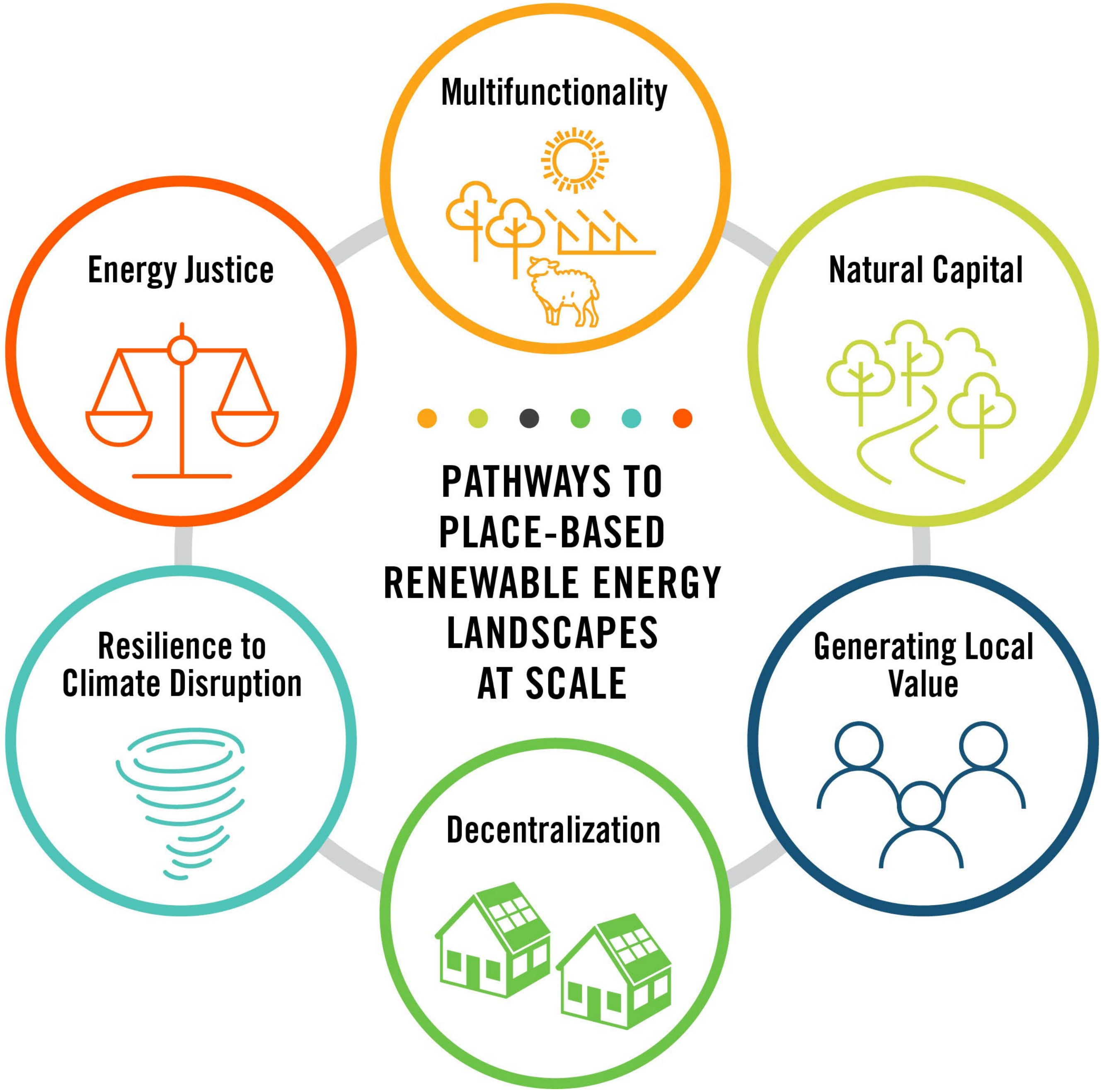


Image Credit: Yeongseo Yu, University of Oregon

Pathways for Renewable Energy Landscapes



Multifunctionality

Concept: Collocating renewable energy technologies with other technologies and land uses

Agrivoltaics at Jack's Solar Garden in Longmont, Colorado, a 1.2-MW, five-acre community solar farm. Photo credit: Werner Slocum/NREL

Considerations

- Land-use efficiency vs. generation efficiency
- Type of site and renewable energy
- Existing land-use regulations

Natural Capital

Concept: Leveraging natural resources that generate the ecosystems on which communities depend to provide societal and economic benefits

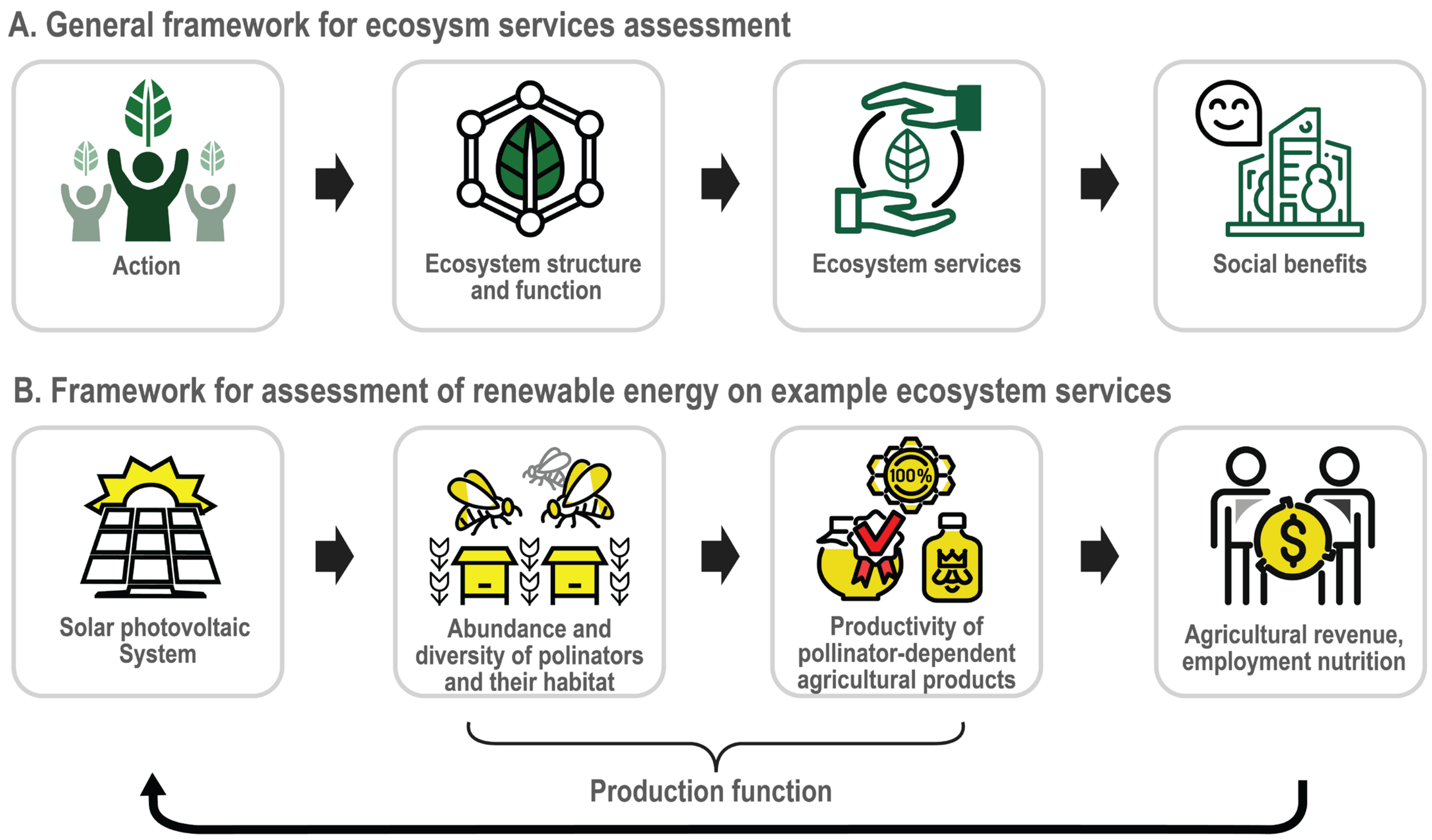


Image Credit: Yeongseo Yu, University of Oregon, adapted from Olander et al. 2018.

Considerations:

- Potential for infrastructure to create positive and negative effects on ecosystems and the benefits they contribute to society
- Meeting community objectives that serve people and nature

Generating Local Value

Concept: Responding to the needs and goals of local communities and landscapes

Solar canopy at parking facility in Denver, Colorado. Photo credit: Dennis Schroeder/NREL.

Considerations:

- New stakeholders and sustained partnerships
- Understanding local goals, challenges, and values
- Monetary vs. nonmonetary value
- More accessible infrastructure

Decentralization

Concept: Transitioning from large, centralized plants to smaller-scale renewable energy generation located closer to where energy is consumed

Small wind turbine in Everson, Washington. Photo credit: Alice Orrell/PNNL

Building-integrated PV in Sacramento, California. Photo credit: Premier Homes

Considerations:

- Integrating technologies into communities and built environments
- Making energy technologies something communities want nearby

Resilience to Climate Change

Concept: Addressing community vulnerabilities that arise from climate-driven, extreme weather events

Photo credit: NOAA (https://www.noaa.gov/education/resource-collections/climate/climate-change-impacts).

Considerations:

- Mitigating blackouts and loss of critical services
- Resilience hubs and microgrids
- Diverse set of energy technologies and demand-side management

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Energy Justice

Concept: Fairly distributing the costs and benefits created by the energy system while enabling impartial decision making and equitable participation


Photo courtesy of sirtravelalot (Shutterstock.cm)

Considerations:

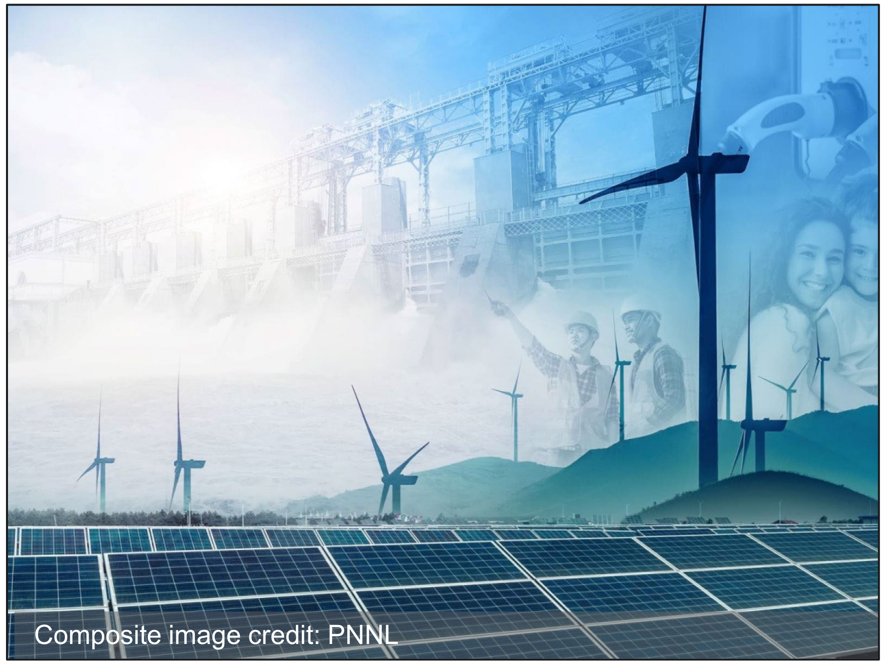
- Sensitive energy development and thoughtful decommissioning
- Countering legacies of harm
- Prioritizing development in communities facing disproportionate energy insecurity or energy burden
- Understanding historical and cultural context

Lessons from History

- Achieving multifunctionality through appropriate and controlled public access
- Enhancing natural and cultural landscape features through infrastructure siting and placement
- Eliminating exclusionary, unequal, and prejudiced energy practices


Photo credit: Danielle Preziuso


Photo credit: Tennessee Valley Authority


Composite image credit: PNNL

Final Thoughts

Take-Aways

- Infrastructure leaves a legacy over time and space
  - How can we enable people, animals, industries, and the environment to thrive alongside one another?
- Now is the time for innovation
  - How can our existing landscapes intersect with renewable energy infrastructure and the loads they serve?

What's next?

- Quantifiable benefits under each pathway
  - Innovating policies and incentives to include non-traditional benefits
- Testing pathways in practice
- Virtual Regional Workshops
  - University of Arizona
    - ✓ January 9th, 2023
  - University of Oregon
    - ✓ January 10th-11th, 2023

Thank you

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