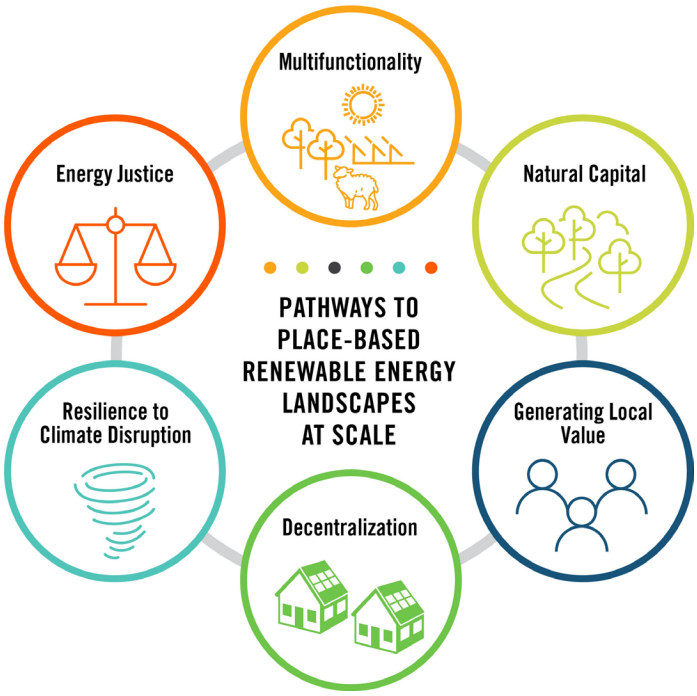
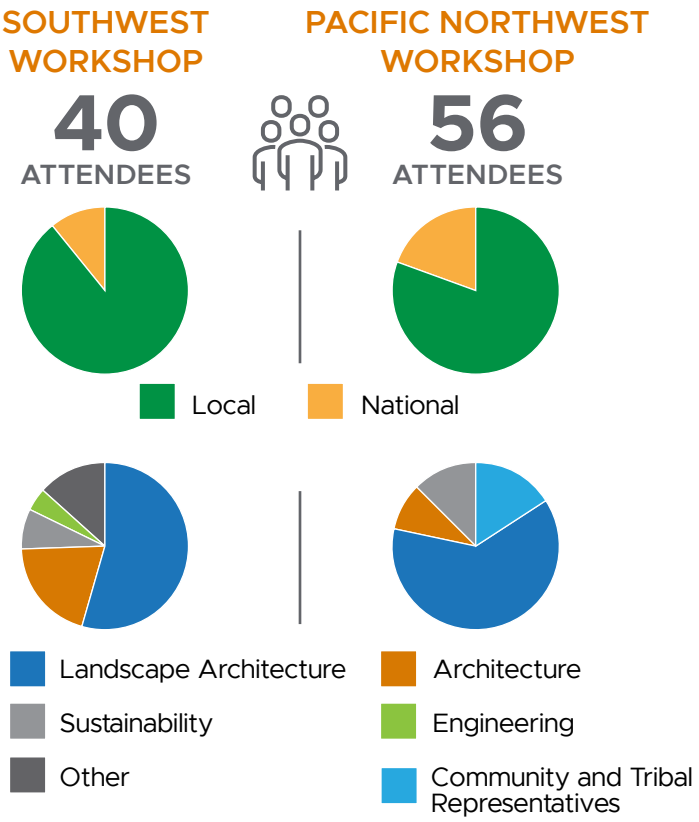
Pacific Northwest
NATIONAL LABORATORY

Designing Renewable Energy Landscapes:

SOUTHWEST AND PACIFIC NORTHWEST WORKSHOPS

The transition to a clean energy future will create new sociotechnical dynamics across the nation's landscapes. While traditional energy system development has often prioritized energy and economic outputs, a broader suite of values and perspectives can support at-scale technology adoption in this emerging reality. Community-centered and place-based design can guide researchers and practitioners alike in establishing these benefits and encouraging broader stakeholder engagement.





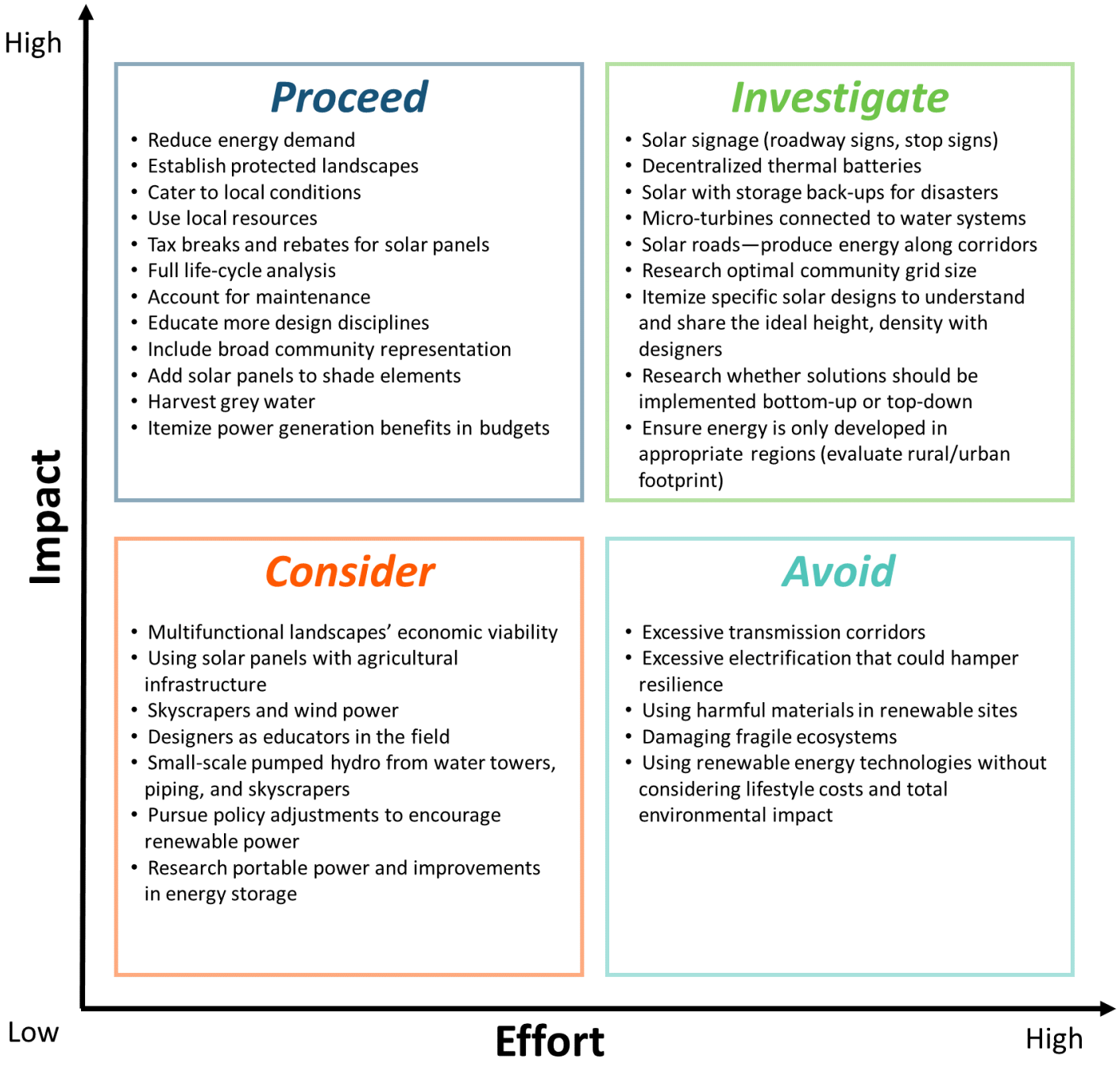
Landscape architecture and other design disciplines are well-suited to support holistic assessments of social and environmental factors through established and innovative methods. These practices offer a foundation for incorporating design considerations into planning and development processes. To explore an expanded role for landscape architects in the energy sector, the University of Arizona and the University of Oregon hosted virtual workshops with support from Pacific Northwest National Laboratory in January 2023.

The workshops were attended by nearly 100 individuals with significant local representation. Participants included landscape architects, design and planning professionals, community representatives, tribal representatives, academic scholars and educators, energy analysts, and undergraduate and graduate students. Two complementary approaches that embedded six design pathways anchored the workshop discussions.

SOUTHWEST WORKSHOP

The Southwest Workshop, hosted by University of Arizona, structured discussion around three biomes in the Southwest United States: low desert, chaparral, and high desert and plains. In doing so, participants approached the design challenge from a broad scale. Throughout the workshop, participants categorized actions and principles to address regional challenges that could translate to individual site implementation.

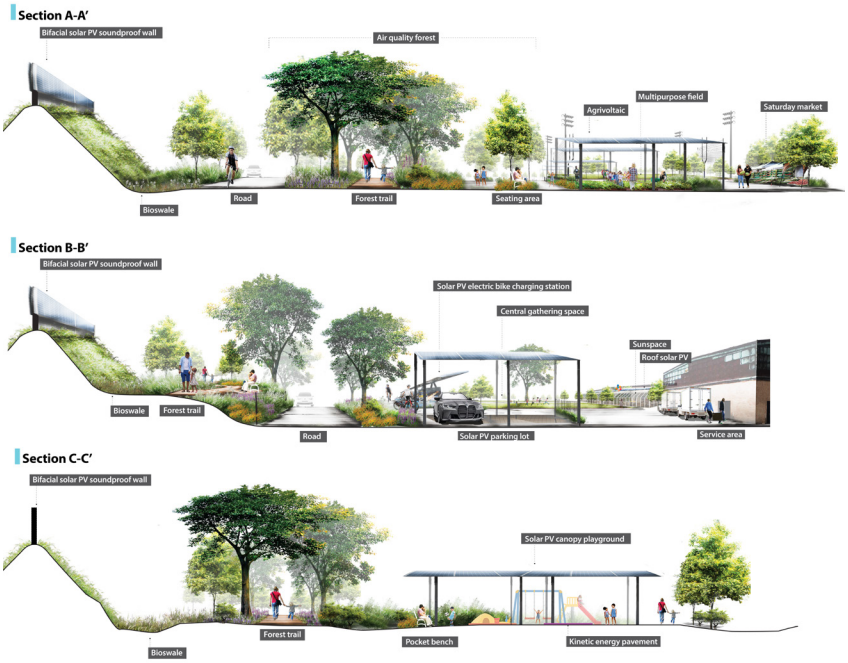
Southwest Workshop participants characterized actions to support place-based energy infrastructure deployment by identifying: (1) actions deemed to have high impact with low effort [***Proceed***], (2) actions with low effort with low impact [***Consider***], (3) actions with high impact requiring a high amount of effort [***Investigate***], and (4) actions that require significant effort and have less impact [***Avoid***].



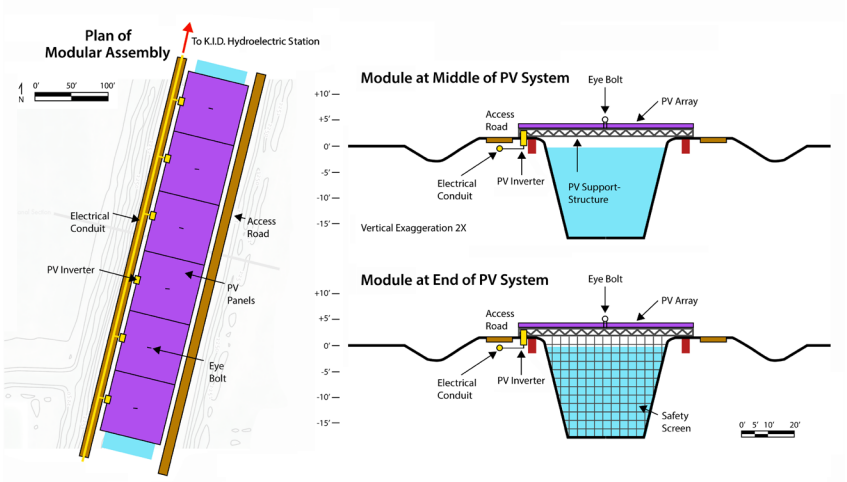
PACIFIC NORTHWEST WORKSHOP

In contrast, the Pacific Northwest Workshop, hosted by University of Oregon, targeted three sites across the landscape transect. These sites were chosen to address place-specific goals that are representative of wider challenges faced by Pacific Northwest communities. The Pacific Northwest sites included: Oliver P. Lent Elementary School in Portland, Oregon (urban); irrigation canals in Klamath Falls, Oregon (rural); and a heritage center for the Lummi Nation in the San Juan Islands, Washington (coastal).

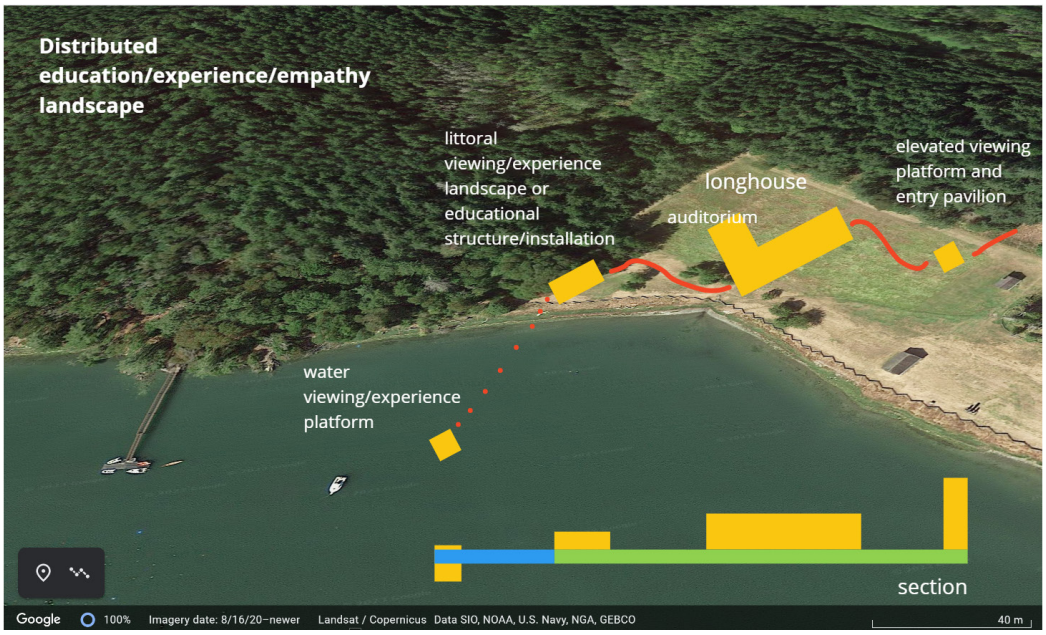
Pacific Northwest Workshop participants proposed a range of design solutions including PV canopies at both the elementary school and over the irrigation canals. Additional PV designs, like PV soundproof walls and pavement, were also recommended for the elementary school. Combinations of land-based and offshore energy technologies that respect and respond to tribal goals and culture were explored with the Lummi Nation.



Design rendering for Oliver P. Lent Elementary School.



Design schematic for PV panels covering irrigation canals at Klamath Falls.



Potential site layout for the Lummi Nation heritage center.

Workshop leaders from PNNL, University of Arizona, and University of Oregon synthesized the outcomes from the events and feedback from participants. A list of principles for designing renewable energy landscapes and practical considerations for moving from theory to practice are offered below. These concepts highlight the perspectives and expertise of workshop attendees; they are intended to serve as a foundation for future discussion and research.

PRINCIPLES

1. There is material value in viewing energy projects as landscape projects. Inter-scalar connections can be derived from a generalist landscape perspective in combination with a diverse group of technical experts.
2. Supporting local identity can be achieved by improving landscapes through renewable energy development "packages" that provide more than infrastructure solely intended for electricity production.
3. Deploying a variety of technologies, particularly at a finer scale, can diversify energy portfolios while supporting improved aesthetics and well-being of communities. This approach also capitalizes on the robustness of place.
4. Landscape performance metrics for renewable energy development must reach beyond energy optimization.
5. A participatory design process can serve as a powerful tool to promote energy justice by amplifying the voices of communities.
6. Avoidance is as important as multi-objective siting for renewable energy in a place-based approach.

PRACTICAL CONSIDERATIONS

1. Overcoming the challenges of convening a large and diverse set of stakeholders gives way to holistic and innovative ideas for designing and deploying energy infrastructure for public good rather than just energy production.
2. Many disciplines understand the challenge of building out energy infrastructure to meet decarbonization goals, but knowledge and data gaps create silos in the solutions proposed to address them.
3. Working across different scales—technology, site, and landscape—creates unique challenges and will require diverse sets of thinkers.
4. With strong parallels between water and energy infrastructure design, landscape architects can draw on the discipline's vast experience with stormwater management and water conservation and apply those lines of thinking to energy systems.
5. Additional work to demonstrate the potential contributions of landscape and design professionals is necessary to fully derive the value of those disciplines in the energy transition.

The workshop outcomes, principles, and practical considerations reflect the current state of innovation in designing renewable energy landscapes. Collective understanding, as established through the events, is on the practical—what is feasible in this moment—rather than pushing the boundaries on what might be possible. Achieving that next step requires that we first catch up to existing innovation in implementation and design since it is not yet commonplace. These workshops served as the first step in reimagining the potential of energy infrastructure across landscapes.

To learn more about this project and the design workshops, visit: https://www.pnnl.gov/projects/renewable-energy-landscapes.

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