the need for a
SOCIAL ENVIRONMENTAL OPEN NETWORK[1]

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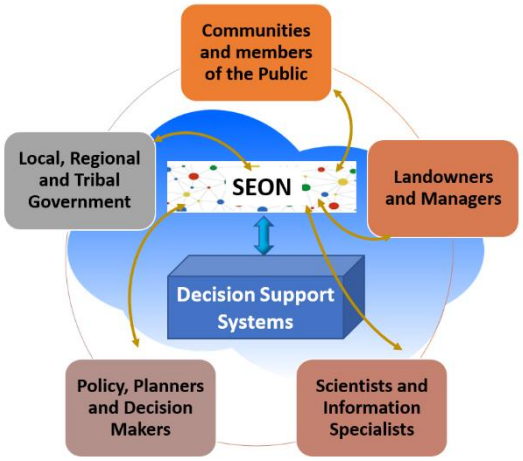
As the challenges facing our environment increase in scale and complexity, we need to increase our capacity to collect, synthesize and share information, collaborate, make decisions, fund, and implement priority actions. In short, we need an Open Knowledge Network.

The Social Environmental Open Network (SEON) is one such open knowledge network. It is an online platform intended to help people share and access information and connect in a variety of ways. SEON provides links to existing databases and analytical tools, plans and reports, as well as other information to help people better plan, support, and implement actions.



The core concept for this open network was developed in a National Science Foundation project by Murphy, Hashisaki, and others (2019-2021). It is being used in California by teams led by Anna Olsen focused on fire prevention in Santa Barbara County and by Dr. Patrick Huber working on food security. In Oregon, Dr. John Gallo leads a team working on biodiversity and in Washington, a team led by Dr. Philip Murphy is using it for determining permit applicability for proposed projects in mapped locations and to document spatial decision support systems for fish passage barrier removal projects.

Key benefits of a Social Environmental Open Network (SEON)

1. Collaboration: Information about who is doing what and where can be extracted from multiple sources and queried to match people working on similar issues or at the same location so they can better share information, resources, and create peer networks.
2. Resource efficiencies: Collaborations can increase efficiencies by reducing duplication of effort, speeding adoption of proven best practices, sharing surplus resources, and identifying new sources of funding and volunteer labor.
3. Governance and decision-making: Improving access to information and decision-support tools can lead to better decisions. The open network can increase transparency and accountability by facilitating access to planning documents and supporting information.
4. Addressing complex questions: Climate change and population growth are fast moving trends that add layers of complexity onto existing problems of ecological degradation and social inequality. Questions such as, "how are cumulative effects measured, how do we respond to threshold and tipping points, what actions today move the dial under different future scenarios, where should we allocate limited resources, and when do we course correct?" need answering. SEON integrates information on data, models, and analytical tools to measure and quantify change to answer these questions.

[1] This document is prepared in support of a Salish Sea Conference Panel Presentation (April 2022). Co-presenters include Philip Murphy, InfoHarvest, Sono Hashisaki, Springwood Associates, Paul Williams, The Suquamish Tribe, Charlene Andrade and Tara Newman, Wash. Dept. of Commerce and Steve Hinton, The Tulalip Tribes.

5. Interoperability: Third party analytical tools can connect to SEON to leverage its information. This enables people and organizations to build, review, and integrate multiple portfolios of actions, evaluate if and when the actions will be sufficient to meet goals, and at what cost. Cross-sector trade-offs and decision making can then be made explicit, quantifiable, science-based, and values-driven with broader community engagement.
6. Community engagement: Change impacts communities where they live, and residents can be powerful advocates for local planning. Community members contribute to citizen science, serve as advocates, voters, and informed consumers. By participating with SEON, residents will be able to share information, ask questions, and find and review agency and organizational plans.
7. Planning and communication: Communicating the need for integrated solutions, justifying the benefits of such solutions, and sharing outcomes with larger and more diverse audiences is more important than ever. Planners can use SEON to integrate information and tools to assess scenarios and experiment with alternative solutions and share why and how proposed strategies will produce specific results.

The Social Environmental Open Network Community

The Social Environmental Open Network provides an online platform for all people and organizations to share data, knowledge, and ideas they have already stored on-line. It is a way for people to access, learn and ask questions of that data to further individual and collaborative actions. This open network platform will provide a tool similar to Wikipedia for reading, uploading, editing, curating, and sharing information related to current and future-focused questions, formally connecting the concepts underlying the information. The public can ask detailed questions which the platform answers by exploiting logical and spatial relationships between categories of information stored in the platform. The SEON platform could provide a tool for users to evaluate data and tools (similar to consumer reports).

How information is stored in the SEON platform

Information in SEON is stored in a type of database called a Knowledge Graph. Knowledge Graphs have a formal schema for categories of information and the links between them. For example, “National Estuary Program funds Near Term Action projects” relates a category, ‘program’, to that of a ‘project’, through the relationship ‘funds’. Real-world examples of categories are stored in the Knowledge Graph as “triples”. Such ‘subject-relationship-object’ triples link information together so that complex questions involving links between many concepts or categories can be posed. Tools in the platform translate a person’s questions into machine queries and return focused answers to them. In addition, as an interoperable platform, SEON can send and receive such machine queries from other systems so that questions can be answered by synthesizing information from multiple sources. Current concepts and categories in the schema include people, projects, organizations, tools, datasets, indicators, locations, regulations, and workflows. Other parties developing similar open networks are currently engaged in gathering information using this schema.

A prototype web-based interface called the Knowledge Manager has been developed with support from the Suquamish Tribe as well as many others. The Knowledge Manager allows users to add information and to search for information. This will be demonstrated at a series of breakfast meetings in March and April, 2022 and at the 2022 Salish Sea Conference.

Finally, as an open community, the Open Network helps implement principles of Findability, Accessibility, Interoperability, and Reusability – e.g. FAIR principles (https://www.nature.com/articles/sdata201618) in support of engagement with new players and participants.

Table 1 below illustrates potential contributions of the Open Network across a diversity of user groups.

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Table 1: Example users and knowledge graph (KG) information categories using Open Networks and Simulation Platforms to answer questions and create new opportunities; A) What questions an Open Network can address, B) How tools on a Simulation Platform can contribute answers, and C) Opportunities for experimentation and learning together in a collaborative environment.

Questions and Opportunities ***Example Users*** *& Info categories*	**A. Social Environmental Open Network: What kind of questions can be asked of the Open Network.**	**B. How tools on Simulation Platforms can leverage information in the Open Network to ask deeper questions.**	**C. New Opportunities: Experimenting and learning together in a collaborative environment.**
Regulators *Organizations, regulations, permits, projects, scenarios, reports/plans, regions, portfolios*	▪ What regulations apply to micro-power projects near a critical area. • Who is working on climate impacts to salmon habitat using scenarios?	▪ Which permits are applicable for micro-hydro power projects in my location? • What indicators have been identified for salmon recovery in the Snohomish Basin?	✧ Where do land use regulations and watershed recovery needs most conflict?
Local Governments and Communities *Tools, datasets, models, indicators, jurisdictions, actions, regulations, objectives*	▪ Which data, tools, models, and indicators should be considered in a land use decision? • What climate change or recovery actions are other local governments implementing?	▪ If we change a land use designation in this part of the watershed, how would that impact ecological and social indicators? • Which actions have the most benefit for human health and should be prioritized?	✧ Cross-sector learning and collaboration for multi-objective management ✧ Bridge across scales from resource prioritization strategies to projects to see gains in regional targets
Resource Managers, Decision Makers, and Tribes *Actions, organizations, objectives, indicators, models, pressures*	▪ What thresholds are known for salmon populations in the Puget Sound? • Across all 5 planning processes for salmon, what types of actions are focused on eelgrass?	▪ How much funding is needed to avoid reaching late summer stream temperature thresholds for Chinook under scenarios? • How large an increase in eelgrass bed size is expected if all proposed actions in the Skokomish estuary were implemented,	✧ Rapid, rough assessments of proposed actions on cross sector indicators under alternative future scenarios ✧ Explore and experiment with new and innovative approaches.
Data Producers, Coordinators, Users, and Tribes *Datasets, indicators, objectives, goals, regions, results chains, actions, plans*	▪ What datasets are used to estimate the Marine Water Condition Index in the South Hood Canal? • Who is working on dissolved oxygen datasets in the Puget Sound and does not work at a university?	▪ What datasets are available for PS Vital Sign indicators that focus on a healthy human population? • What other indicators corelate with trends in dissolved oxygen concentrations from 1990 – 2020 in the South Hood Canal?	✧ LPSEMP: Capture tools (models) used in Puget Sound and their data inputs and outputs. ✧ Develop and operationalize results chains for changes in indicator values for all major recovery action types focused on salmon recovery in the Puget Sound
Youth and Teachers *People, Organizations*	▪ Form collaborations to provide underserved youth with experiences, internships and mentorships	▪ Search to identify who is doing what where to form collaborations	✧ Engage scientists and decision makers. ✧ Customizable games to explain key decision challenges (e.g. culvert replacements).