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Acting and Modeling the Future of Dams: Knowledge Production Processes in Sustainability Science

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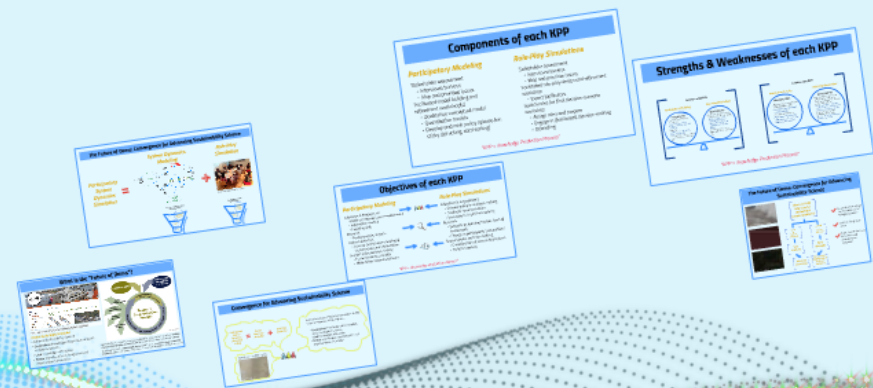
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Thank you!

Acting and Modeling the Future of Dams

Knowledge Production Processes in Sustainability Science



UNH Graduate Research Conference
April 11, 2017

Presenter: *Natallia Leuchanka*

1st Year Student, Natural Resources & Earth System Science Program, UNH
Research Assistant, New England Sustainability Consortium & the EPPS Lab
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National Science Foundation # IIA-1539071



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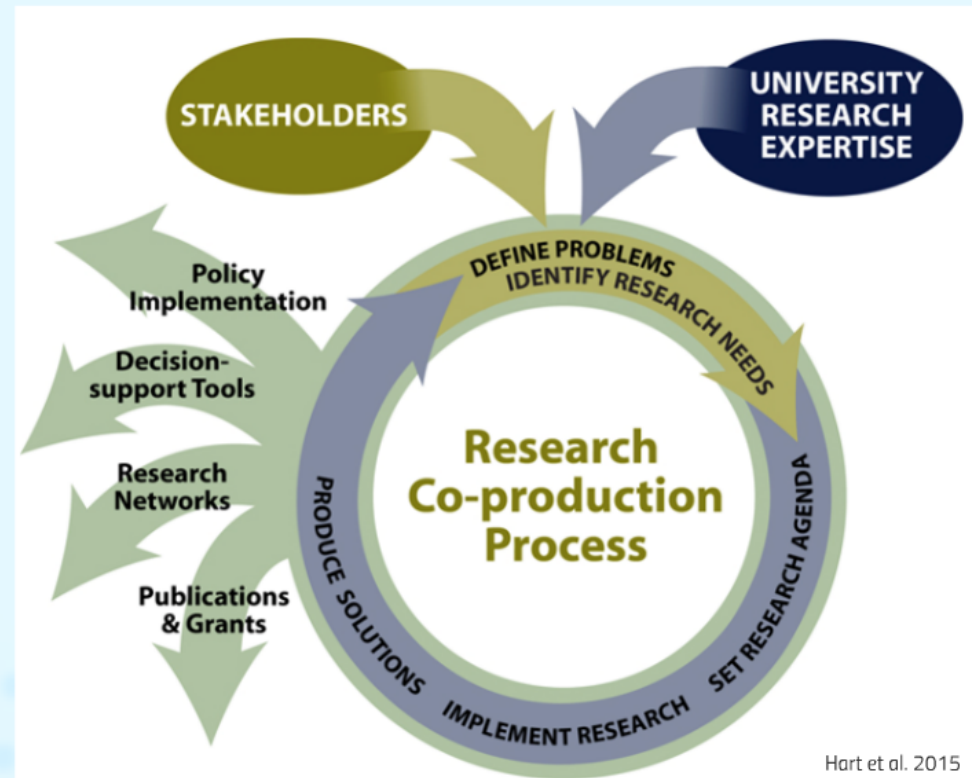
What is the "Future of Dams"?



The screenshot shows the website of the New England Sustainability Consortium. The header features the consortium's logo and a photo of people on a beach. The main content area is titled "The Future of Dams" and includes a sub-header "Helping New England Communities Use Science to Make Decisions about Dams". The text describes hydropower as a major source of renewable energy in New England, with more than 50 dams scheduled for relicensing in the next decade. It also mentions that dams can have adverse effects on coastal ecosystems and economies. A small image of a dam is visible on the right. The left sidebar contains a navigation menu with links to "About Us", "Safe Beaches & Shellfish", "The Future of Dams", "Dams in the News", "Publications", "Videos", "Education", and "Volunteer". The URL <http://www.newenglandsustainabilityconsortium.org/dams> is displayed at the bottom.

Project Goals & Key Principles:

- Advance Sustainability Science
- **Co-produce** knowledge about coupled social-ecological systems
- **Link** knowledge with action
- **Foster** interdisciplinary integration and organizational innovation

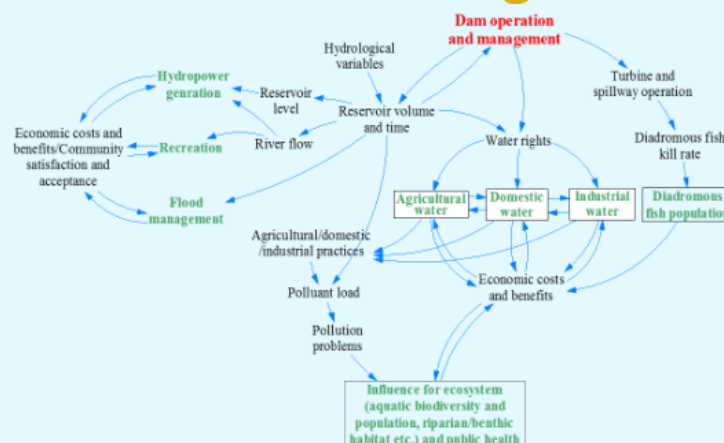


Sustainability science (or the science of sustainability) describes the concept of "**multiple sciences addressing the common theme**" of sustainability (Clark and Dickinson, 2003).

SS calls for "**innovative interdisciplinary research** that is both **problem-focused and use-inspired** to advance the theory and practice of sustainable development." (Hart et al. 2015)

The Future of Dams: Convergence for Advancing Sustainability Science

*Participatory
System
Dynamics
Simulation*

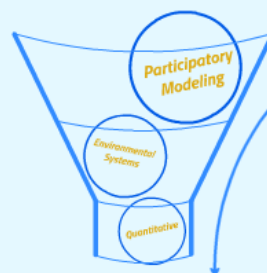


*Role-Play
Simulation*

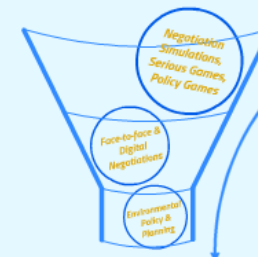


Image credit: www.waterfutures.org

System Dynamics Modeling (SDM)
Literature Boundaries

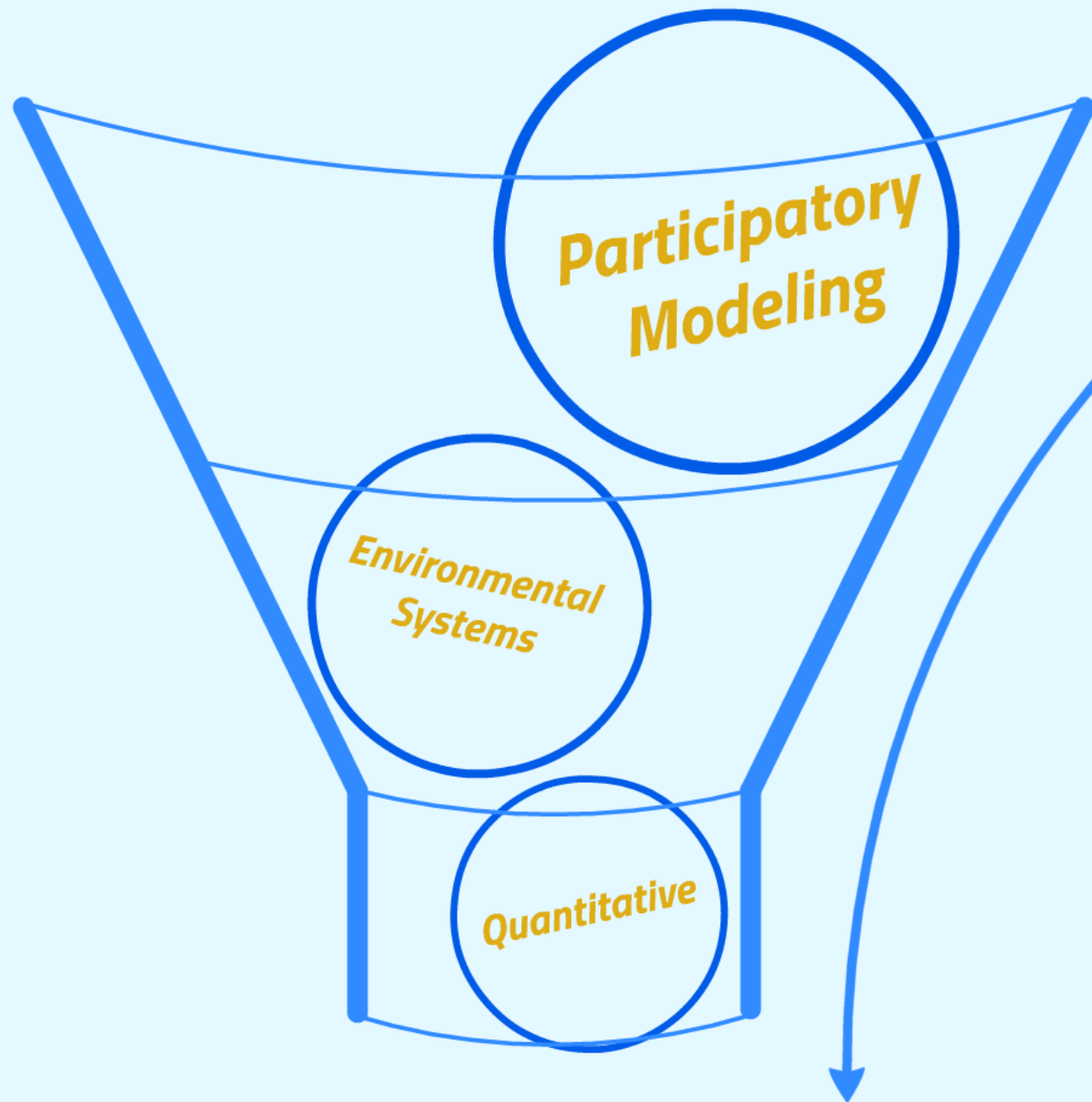


Role-Play Simulation (RPS)
Literature Boundaries

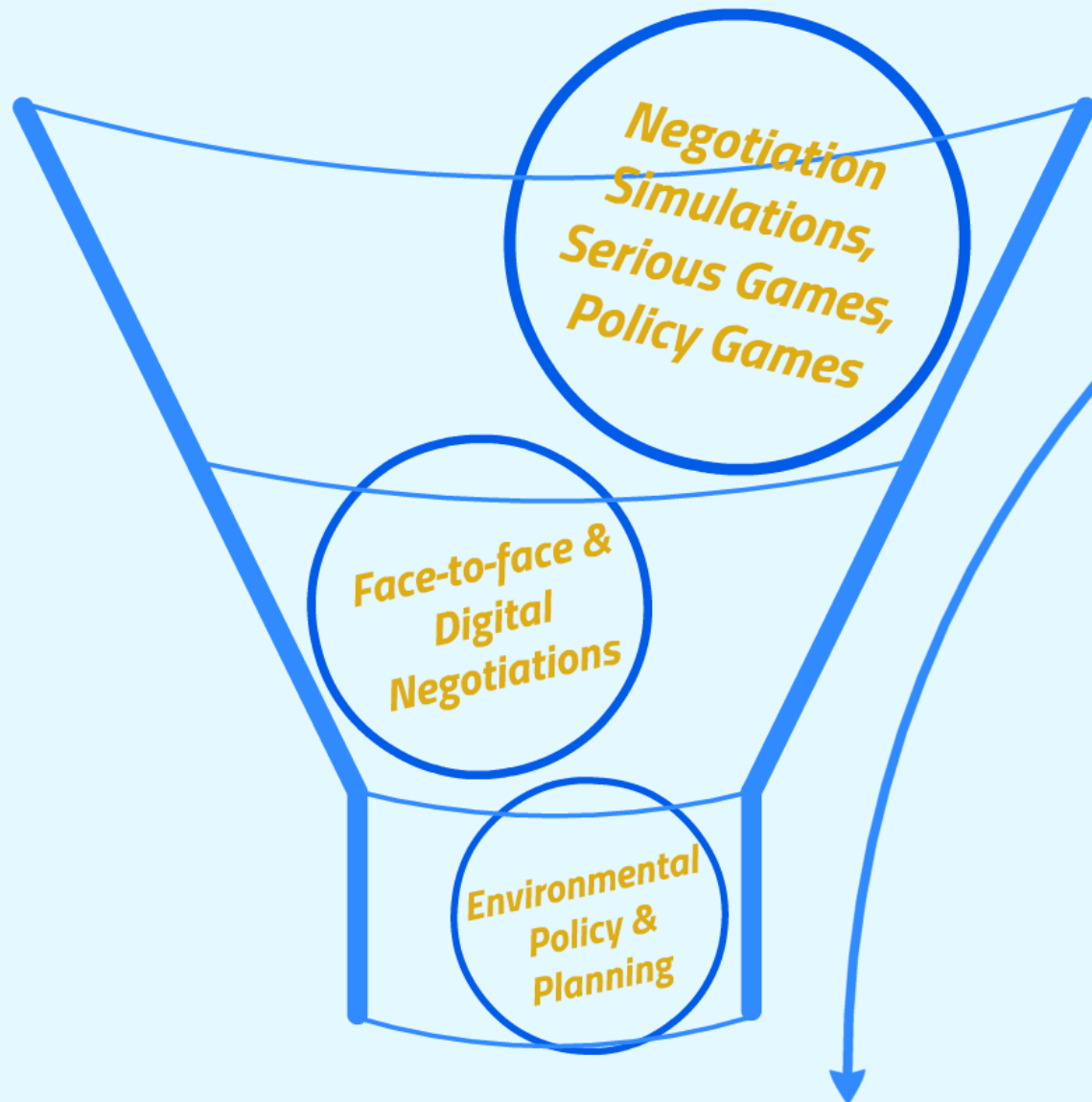


System Dynamics Modeling (SDM)

Literature Boundaries



Role-Play Simulation (RPS) Literature Boundaries



Convergence for Advancing Sustainability Science

*Participatory
System
Dynamics
Simulation
(PSDS)*

=

*System
Dynamics
Modeling*

+

*Role-Play
Simulation*

Context: Dams in New England



Credit: Laura Wildman



In what ways can PSDS advance sustainability science? How can PSDS help us...

- **Co-produce** knowledge about coupled social-ecological systems
- **Link** knowledge with action
- **Foster** interdisciplinary integration and organizational innovation

Objectives of each KPP

Participatory Modeling

Education & Engagement

- Public engagement and empowerment
- Information sharing
- Modeling skills

Research

- Evaluate equity impacts

Problem definition

- Develop shared understanding of system issues and relationships

Support policy decision-making

- Foster consensus (model)
- Make better recommendations



Role-Play Simulations

Education & Engagement

- Science-policy in decision-making
- Facilitate communication
- Innovations in problem-solving

Research

- Evaluate as learning tool (ex. level of immersion)
- Change in participants' perspectives

Support policy decision-making

- Consideration of new policy options
- Build consensus

KPP = Knowledge Production Process

Components of each KPP

Participatory Modeling

Stakeholder assessment

- Interviews/surveys
- Map and prioritize issues

Facilitated model building and refinement workshop(s)

- Qualitative conceptual model
- Quantitative models
- Develop and rank policy options (ex. sticky dot voting, card sorting)

Role-Play Simulations

Stakeholder assessment

- Interviews/surveys
- Map and prioritize issues

Facilitated role-play design and refinement workshop

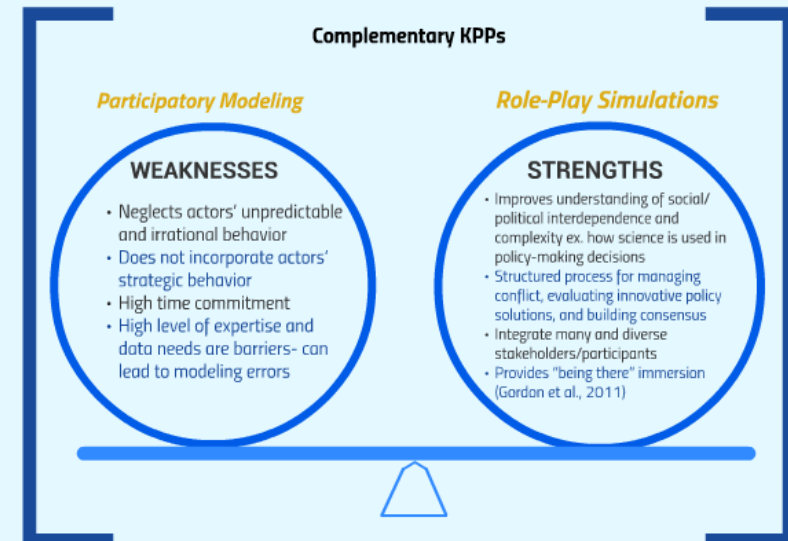
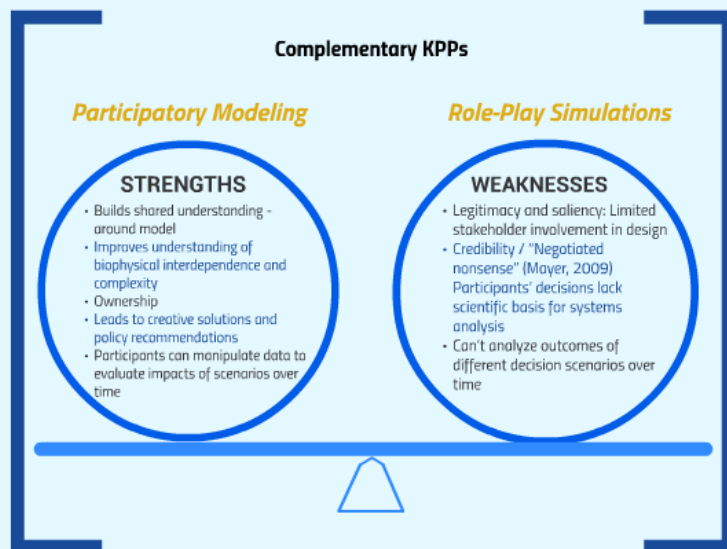
- Expert facilitators

Switch roles for final decision-scenario workshop

- Assign roles and prepare
- Engage in (facilitated) decision-making
- Debriefing

KPP = Knowledge Production Process

Strengths & Weaknesses of each KPP



KPP = Knowledge Production Process

Complementary KPPs

Participatory Modeling

STRENGTHS

- Builds shared understanding - around model
- Improves understanding of biophysical interdependence and complexity
- Ownership
- Leads to creative solutions and policy recommendations
- Participants can manipulate data to evaluate impacts of scenarios over time

Role-Play Simulations

WEAKNESSES

- Legitimacy and saliency: Limited stakeholder involvement in design
- Credibility / "Negotiated nonsense" (Mayer, 2009)
Participants' decisions lack scientific basis for systems analysis
- Can't analyze outcomes of different decision scenarios over time

Complementary KPPs

Participatory Modeling

WEAKNESSES

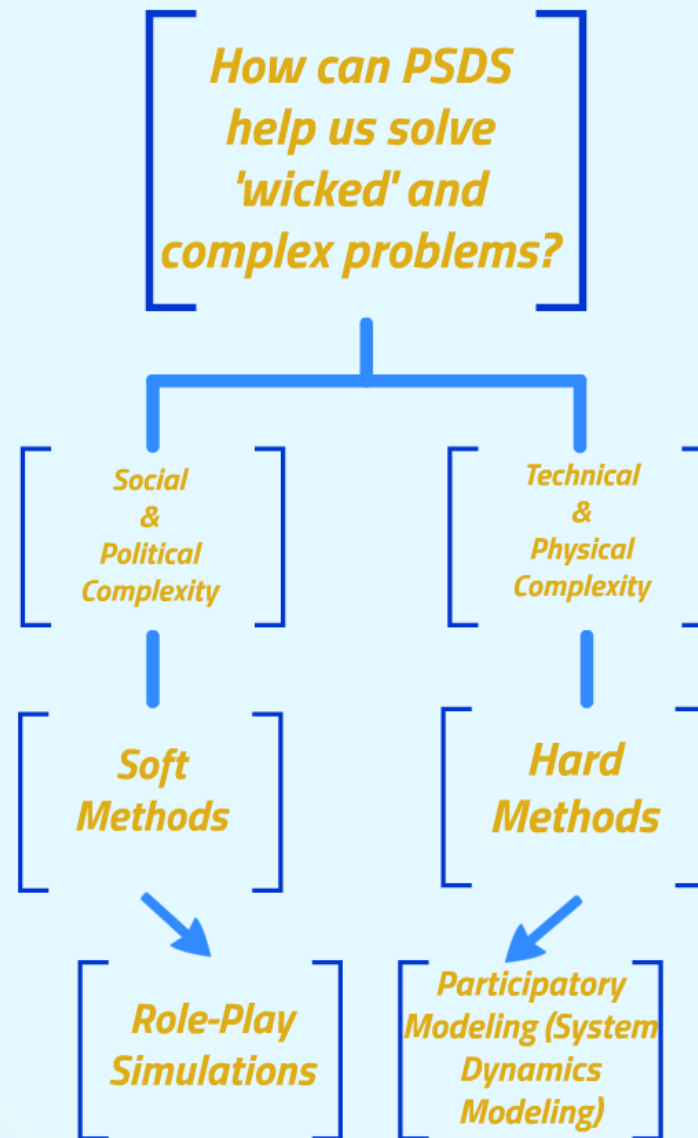
- Neglects actors' unpredictable and irrational behavior
- Does not incorporate actors' strategic behavior
- High time commitment
- High level of expertise and data needs are barriers- can lead to modeling errors

Role-Play Simulations

STRENGTHS

- Improves understanding of social/ political interdependence and complexity ex. how science is used in policy-making decisions
- Structured process for managing conflict, evaluating innovative policy solutions, and building consensus
- Integrate many and diverse stakeholders/participants
- Provides "being there" immersion (Gordon et al., 2011)

The Future of Dams: Convergence for Advancing Sustainability Science



✓ Co-produce knowledge about coupled social-ecological systems

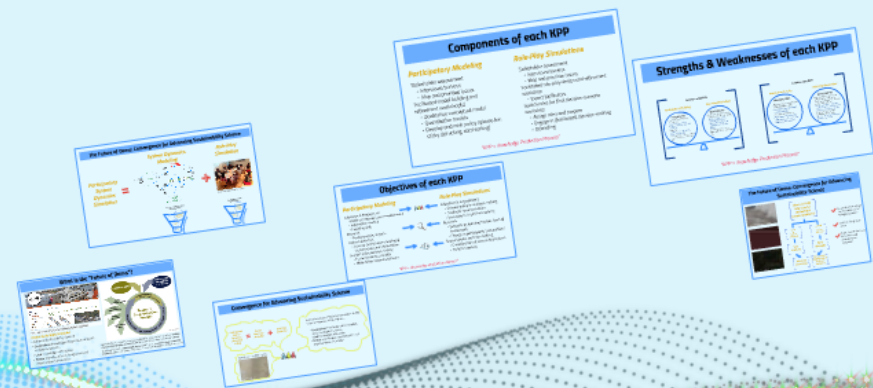
✓ Link knowledge with action

✓ Foster interdisciplinary integration and organizational innovation

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