©2020; Sabine E. Apitz; SEA Environmental Decisions Ltd.

Sustainabile Conceptual Site Model (SustCSM) and the Project Cycle: Linking Management, Restoration, Re-Use and Resilience in a Changing World

Dr. Sabine E. Apitz SEA Environmental Decisions, Ltd. Little Hadham, UK +44 (0)1279 771890; drsea@cvrl.org

.transform information into action





12th International SedNet Conference (online) - from 28 June to 2 July 2021

"Sediment Challenges and Opportunities due to Climate Change and Sustainable Development"



Remediation and waterscape alteration are is not sustainable practices

- We remediate sediment, soil, groundwater to address past, unsustainable practices
- We alter land- and waterscapes to optimise chosen services
- All active management results in (desirable and undesirable) environmental, economic & social impacts on the environment and community
- Given the uncertainty inherent in remedial activities, sometimes we are addressing how to balance certain harm against uncertain benefit
- The challenge is optimization how does one achieve the maximum benefit with the minimum undesirable impact?
 - We use sustainability assessment to seek this balance



Image from http://www.eoht.info/page/Pandora%E2%80%99s+box

There are a variety of assessment tools

These can be evaluated using a range of criteria

Adapted from Sala et al (2015) A systemic framework for
sustainability assessment. Ecological Economics, 119,
314-325.

Criterion	Low Score	Medium Score	High Score
Boundary- orientedness	No reference	Reference values based on status quo or scenarios	Science/Policy - based thresholds
Comprehensive- ness	1 pillar	2 pillars	3 or more pillars
Integratedness	Monodiscipilinary	Multi or interdisciplinary	Transdisciplinary
Stakeholders' involvement	Communication	Resonance	Interaction
Scalability	Local Scale/ limited time frame	Only temporal or spatial scale	Multi temporal and spatial scale
Strategicness	Accounting	Sustainability principle-oriented	Change-oriented
Transparency	Closed model	Partially Open Model	Open model/ transparent values
Quantitation	only quantitative or quantitative data	Semi-quantitative	Integrates qualitative and quantitative

There are a variety of assessment tools

Focus on footprinting looks primarily at resource use

Criterion	Low Score	Medium Score	High Score
Boundary- orientedness	No reference	Reference values based on status quo or scenarios	Science/Policy - based thresholds
Comprehensive- ness	1 pillar	2 pillars	3 or more pillars
Integratedness	Monodiscipilinary	Multi or interdisciplinary	Transdisciplinary
Stakeholders' involvement	Communication	Resonance	Interaction
Scalability	Local Scale/ limited time frame	Only temporal or spatial scale	Multi temporal and spatial scale
Strategicness	Accounting	Sustainability principle-oriented	Change-oriented
Transparency	Closed model	Partially Open Model	Open model/ transparent values
Quantitation	only quantitative or quantitative data	Semi-quantitative	Integrates qualitative and quantitative





Focus on Habitats and/or Ecosystem Services Addresses Another Sub-Set of Impacts

Criterion	Low Score	Medium Score	High Score
Boundary- orientedness	No reference	Reference values based on status quo or scenarios	Science/Policy - based thresholds
Comprehensive- ness	1 pillar	2 pillars	3 or more pillars
Integratedness	Monodiscipilinary	Multi or interdisciplinary	Transdisciplinary
Stakeholders' involvement	Communication	Resonance	Interaction
Scalability	Local Scale/ limited time frame	Only temporal or spatial scale	Multi temporal and spatial scale
Strategicness	Accounting	Sustainability principle-oriented	Change-oriented
Transparency	Closed model	Partially Open Model	Open model/ transparent values
Quantitation	only quantitative or quantitative data	Semi-quantitative	Integrates qualitative and quantitative

There are a variety of assessment tools





Cofrancesco et al (2021) PIANC EnviCom Working Group 195. An Introduction to applying Ecosystem Services for Waterborne Transport Infrastructure Projects. PIANC Secrétariat Général, Brussels, Belgium, 79p. https://www.pianc.org/publications/envicom/wg195

There are a variety of assessment tools



Criterion

Boundary-

ness

Scalability

There are a variety of assessment tools

Tools and approaches can be complementary, may address differing issues or tiers

Criterion	Low Score	Medium Score	High Score
Boundary- orientedness	No reference	Reference values based on status quo or scenarios	Science/Policy - based thresholds
Comprehensive- ness	1 pillar	2 pillars	3 or more pillars
Integratedness	Monodiscipilinary	Multi or interdisciplinary	Transdisciplinary
Stakeholders' involvement	Communication	Resonance	Interaction
Scalability	Local Scale/ limited time frame	Only temporal or spatial scale	Multi temporal and spatial scale
Strategicness	Accounting	Sustainability principle-oriented	Change-oriented
Transparency	Closed model	Partially Open Model	Open model/ transparent values
Quantitation	only quantitative or quantitative data	Semi-quantitative	Integrates qualitative and quantitative





Remedial and disposal alternatives are linked to site conditions, and re-use

- Remediation approach may limit re-use
 - Re-use may affect remediation resilience
- In all but the simplest sites, alternatives will be a blend of media, contamination levels and, thus, remedial approaches
- Technologies are more similar for soils and sediments
 - Technological indicators may be similar
- In terms of accessibility, feasibility and resilience (e.g., long-term rerecontamination)
 - Sediments and groundwaters/NAPL have strong similarities (and indicators)



What is the vision of site re-use?

Risks, opportunities and tradeoffs of management alternatives differ, depending upon the vision of site re-use



More sustainable and resilient decisions are made with the end use in mind





The Water Transport Infrastructure Project Cycle



Cofrancesco et al (2021) PIANC EnviCom Working Group 195. An Introduction to applying Ecosystem Services for Waterborne Transport Infrastructure Projects. PIANC Secrétariat Général, Brussels, Belgium, 79p. https://www.pianc.org/publications/envicom/wg195



"A sustainable CSM can be used as a platform for illustrating how humans and the environment may be affected not only by impacts at a site but also by sustainability impacts caused by...activities."

Holland et al., (2013) Remediation Spring 2013:5-17.





The SustCSM provides a bridge between stakeholder expectations and sustainability assessment, throughout the remedial project cycle

USE PHASE sure - Reuse/ development Evaluation Evaluation Berein B	Phase	Sustainability Role	Stakeholder Interaction
	Site characterization/ scoping	Sustainable Conceptual Site Model (SustCSM) Development Preferred end or future use linked remedial evaluation	Identify key stakeholders; Identify expectations and concerns; link to SustCSM
	Remedial Investigation/ Feasibility Study	Footprinting; Comparative sustainability assessment	SustCSM links stakeholder concerns to assessment; communicates outputs; stakeholder weighting and evaluation
	Remedy Decision	Balancing/ negotiation/ communication	
	Remedial Design	BMPs; Optimization	Adapt to stakeholder concerns; conflict resolution
Monitoring	Remedial Action	SustCSM guides monitoring	Communicate progress; address
Monitoring With AND MONITORING PHASE Remedial design/ Optimization	Monitoring		concerns
	Evaluation	SustCSM informs and communicates	
	Adaptation	SustCSM guides adaptation selection	SustCSM provides platform for communication and negotiation
	Closure/ Reuse Redevelopment	SustCSM bridges between	closure and re-use

Framing perspectives: different sides of the same coin

Environmental risk questions

- What are the risk and vulnerabilities?
- Are we protecting against everything?
- At what spatial and temporal scale?
- What is controllable, what is not?
- Are we developing preventions, tracking changes, selecting responses?

Sustainability questions

- What is it you want to sustain?
- Who benefits?
- For what period of time will benefits be conveyed?
- At what cost (to whom)?
- Who decides?



Indicators of Impact Are Linked to SustCSM



Technical aspects of alternatives can be translated in terms of stakeholder values, and scored to inform decisions



Same alternatives, same data, different viewpoints and aggregation – perspective affects how one prioritizes alternatives

Scored in terms of regulatory criteria

Scored in terms of community impact



Habitat enhancement

Recreation Social uplift



ADAPTIVE ESA

- Predict ES responses to adaptive scenarios
- Similar to prospective ESA but focus on what alterations to the original project design are needed to improve specific ES capacity of the ecosystem

RETROSPECTIVE ESA

- Evaluate how ES were impacted thus far by the project
- Identify opportunities for future improvements and to inform other projects
- Level of ESA detail depends upon data available



ES MONITORING

- Based upon ES impacts predicted by ESA, monitoring strategies will be designed for subsequent steps
- Essential to the understanding and validation of prospective assessments or to support the evaluation phase

BASELINE ESA

- Set the goals and main concept of the project, beyond strictly technical project goals
- ESA : quick-scan level and qualitative
- A reconnaissance of possible development routes for a project

PROSPECTIVE ESA

- ESA : more detailed quantitative
- Knowledge of the biophysical state of the project environment and possible impact of different designs
- Opportunities for enhancement of functions, restoration of degraded ecosystems, ES tradeoffs,...

Cofrancesco et al (2021) PIANC EnviCom Working Group 195. An Introduction to applying Ecosystem Services for Waterborne Transport Infrastructure Projects. PIANC Secrétariat Général, Brussels, Belgium, 79p. https://www.pianc.org/publications/envicom/wg195

Sustainable Systems Models Expand the Scale

From Roy Thun (2021) Applying a Conceptual Systems Model for Sustainable and Resilient Brownfields, SURF talk

Conclusions

Sustainable management seeks to ensure, in terms of environmental, economic and social indicators, that the benefit of undertaking management is greater than its impact, and that the optimum solution is selected through the use of a balanced decision-making process

More sustainable and resilient decisions are made with the end use in mind

The SustCSM provides a bridge between stakeholder expectations and sustainability assessment, throughout the project cycle

Indicators of impact can be linked to SustCSM

Management alternatives can be evaluated in terms of SustCSM indicators to inform

trade-offs,

*monitoring strategies, and

criteria for adaptive measures or closure

Thank you for your time. Questions? drsea@cvrl.org