“Cumulative Effects & Cumulative Effects Assessment: a Conceptual Model”

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Conclusion 1: Human undertakings must proceed in a way that acknowledges the limitations of our biosphere.
Habitat

Interactions

Biota

Photo credit: http://agatelady.blogspot.ca (left); http://cdn.firespring.com (right)
“the incremental impact of (some) action when added to other past, present, and reasonably foreseeable future actions”
— US Council on Environmental Quality
Canadian Environmental Assessment Act (1995), Section 16(1) demands consideration of...

“...any cumulative effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out”
Effect-based Indicators (Bioindicators)
Conclusion 2: For assessing Cumulative Effects, Biological indicators are superior to stressor-based indicators (Jones et al. 2002, Dube et al. 2006)
Planning/Regulation

Scientific Assessment

Photo credit: http://www.aberdeencity.gov.uk (left) and http://www.theredhillacademy.org.uk (right)
Planning/Regulation

Scientific Assessment

acceptable (normal) range

predicted cumulative effect

acceptable (normal) range

observed cumulative effect
Conclusion 3: Planning/regulatory and scientific assessments are complementary.

Photo credit: http://www.aberdeencity.gov.uk (left) and http://www.theredhillacademy.org.uk (right)
Conclusion 4:
A formal and transparent process, and public participation in that process, helps to ensure that CEA is rational.
Conclusion 5: Valued ecosystem components must be used to provide a tractable scope.
Conclusion 6: Monitoring and Modeling have complementary roles
Conclusion 7:

Numerical methods for assessing cumulative effects are well developed.
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<th>Status quo impact assessment</th>
<th>Needed cumulative effects assessment</th>
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<td>project multiple scales</td>
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<td>temporal context</td>
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<td>scope</td>
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(adapted from Noble 2010)
“...Project proponents operate in the silo of stressor-based approaches to identify and mitigate project stressors, with governments as gatekeepers. The scientific ...community operates in the silo of effects-based science to understand ecosystem functioning and environmental effects in response to landscape disturbances. Land-use planners and managers are focused on broader environmental planning and social matters, while incremental impacts at the project level continue to accumulate”.

— Noble (2010)
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**Conclusion 8**: Cumulative effects assessment reflects a paradigm shift from project-based environmental assessment.
Hallmarks of Cumulative Effects Assessment

1. Limits are acknowledged
2. Biological indicators are prominent
3. Monitoring and modeling have complementary roles
4. The decision making process is formal, transparent, and participatory
5. Scope is restricted to valued/Significant ecosystem components
6. Knowledge inputs & outputs of Planning, regulation, and scientific ecosystem assessments are linked
7. Appropriate numerical methods are used to assess and model cumulative effects
8. A paradigm shift from traditional planning and regulation: ecological limits recognized; possible futures explored at regional scale; complexity acknowledged; avoidance (not mitigation); stakeholder participation; effectiveness assessed
Activity

T-5  T-4  T-3  T-2  T-1  T+1  T+2  T+3  T+4  T+5  T+6  T+7  T+8  T+9  T+10

acceptable
(normal)
range

predicted
cumulative
effect
Avoid
Minimize
Restore
Offset
If not possible
Don’t Allow

(Raiter et al. 2014)


