Cumulative Effects Assessment

International Association for Impact Assessment

While many development activities can be individually insignificant, together their impacts can have serious local, regional, and even global repercussions.

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Cumulative effects assessment (CEA) has been a key element of good-practice impact assessment for more than 40 years in countries such as the United States and Canada. It is now implemented widely in many countries in a variety of project-based, regional, and strategic contexts. The International Finance Corporation (IFC) (2013:21) of the World Bank defines CEA as:

> *The process of (a) analyzing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen [valued component] over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risks to the extent possible.*

Ecological and socio-economic systems can be remarkably effective at absorbing or adapting to change—but not indefinitely. The increased pace and intensity of resource development in many regions of the world, combined with increased concern for environmental protection, has elevated the importance of CEA and management in recent years. Governments, non-government organizations, and project proponents are seeking innovative ways to address cumulative effects arising from climate change, worsening air quality, fresh water shortages, deforestation, noise and light pollution, and wildlife habitat fragmentation.

Cumulative effects are typically the result of incremental changes to the environment caused by multiple human activities and natural processes. For example, wildlife habitat fragmentation has many possible causes such as road building, clearing native vegetation for land development, and water diversion projects. However, cumulative effects can also result from repetitive actions such as cyclical or episodic discharges of liquid waste or sewage into a water body or many wells tapping and depleting an aquifer. There are many different types of cumulative effects including additive, interactive, and synergistic, and they manifest in different ways whereby the ability of the valued component (VC) to absorb or adapt to the effect is ultimately exceeded. Ideally, CEA leads to decisions that maintain VC resiliency.

Some specific examples of cumulative effects include:

- Sulfur dioxide and nitrous oxide pollution created by electricity generation, factories, and vehicles which is transformed into acid rain, leading to acidification of wetlands and water bodies and loss of species diversity.
- Greenhouse gas emissions leading to atmospheric warming resulting in glacier melt, rising sea levels, and loss of polar bear habitat.
- Indigenous peoples' loss of access to traditional forests and lands over time, resulting in loss of culture and adverse impacts to quality of life and well-being.

PRACTICE OF CEA

The crux of a CEA process is to identify the relative contribution of a proposed initiative (policy, plan, program, or project) to the total stresses on a VC, and determine whether that VC will be able to sustain the additional stress. To accomplish this, CEA methodology typically involves scoping, baseline studies and analysis of change trends, mitigation, significance determination, and adaptive follow-up including monitoring. A variety of tools may be used such as questionnaires and interviews, indicators and indices, checklists and matrices, conceptual

and numerical modeling, network and systems diagrams, spatial/trend analysis using GIS, etc. For example, CEA applied to an industrial facility in a forested environment often evaluates the following kinds of cumulative effects:

- Habitat fragmentation and loss due to land clearings
- Sediment discharges into waterways
- Interruptions of traditional land use such as hunting
- Labor force needs for social services and housing

In any context, to be successful, CEA requires early consideration for maximum influence on policies, plans, and project design; the use of local and indigenous knowledge and community engagement to assist with impact identification and evaluation; and effective communication and creative environmental management partnerships among all stakeholders.

FURTHER READING

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FIVE IMPORTANT THINGS TO KNOW

1. Not all cumulative effects can easily be traced back to their origins, especially in highly developed areas. However, it is still important to try to identify which activities or broad land use patterns or processes are driving environmental change and causing significant stress on VCs.
2. Ecological and socio-economic systems do not always respond to stress in a predictable, linear fashion. Cumulative effects can occur some distance away in time or space.
3. Each additional impact to a VC, even if it is perceived to be individually minor, has the potential to result in irreversible effects to that VC and therefore should be carefully evaluated.
4. Adopting a regional scale of analysis (e.g., eco-region, sub-watershed, watershed, or planning unit) is typically necessary to assess cumulative effects on VCs.
5. Cumulative effects can be desirable and undesirable. Desirable cumulative effects of development can, for example, include stabilized local economies, higher rates of education, and lower rates of unemployment.

FIVE IMPORTANT THINGS TO DO

1. Valued component selection should be participatory (though it is value-based and disparate views are common). Spatial scoping should vary by VC. Use a temporal scale that accounts for, at minimum, the lifecycle of the initiative, plus decommissioning and reclamation activities.
2. It is not enough to develop a "snapshot" of a VC's current condition at the time of the proposed initiative. It is important to understand changes over time and long-term trends.
3. Enhance cumulative effects analysis by comparing the effects of alternative future development scenarios, including management options.
4. Do not evaluate the effects of the proposed initiative "compared to" the effects of other actions. Rather, evaluate them "in addition to" the effects of other actions. It is the total effects on VCs that matter.
5. Implement a long-term follow-up and monitoring plan with clear assignment of responsibilities among proponents, regulators, and stakeholders. Seek data that help detect prediction errors, adapt mitigation strategies, and support better CEA in the future.