

## **APPENDIX 1**

### **Leverage Points – Where to Intervene in a System<sup>1</sup>**

Use the following to develop indicators for your CEPA programme. They are in increasing order of effectiveness as leverage points to intervene in a system.

#### **WEAK INDICATORS**

**12. Constants, parameters, numbers (such as subsidies, taxes, standards):** Parameters are points of lowest leverage effects. Though they are the most clearly perceived among all leverages, they rarely change behaviours and therefore have little long-term effect. Say for example a contractor is managing a local forest or wetland on behalf of the local authority. They are doing a poor job, and the local authority suggests they develop a new set of management standards. Just checking whether standards have been developed and to what level (as opposed to being implemented), is a weak indicator for change.

**11. The size of buffers and other stabilizing stocks, relative to their flows:** A buffer's ability to stabilize a system is important when the stock amount is much higher than the potential amount of inflows or outflows. Buffers can improve a system, but they are often physical entities whose size is critical and can't be changed easily. In a forest ecosystem, the presence of a wetland may buffer the system from climate change towards hotter, drier conditions.

**10. Structure of material stocks and flows (such as transport networks, population age structures):** A system's structure may have enormous effect on operations, but may be difficult or prohibitively expensive to change. Fluctuations, limitations, and bottlenecks may be easier to address. For example, a conservation agency wants to rehabilitate a degraded wetland, but a major road runs through it. Rather than to move the road entirely, culverts or stream redirection can be considered. In a CEPA system, it is useful to identify where there are bottlenecks in systems, for example, busy teachers are often bottlenecks when local authorities want to work with school children, in which case they may rather work with existing after-school youth clubs.

**9. Length of delays, relative to the rate of system changes:** Information received too quickly or too late can cause over- or under reaction, even oscillations. Consider breaking news about criminal activities in a local forest under council's protection. Communication specialists cannot release information too early, before pertinent facts and suitable responses have been established, as it may cause panic and calls for the forest to be re-zoned for housing; if the information is released too late, on the other hand, the chance to act to stop the criminal activity or the risks associated with it, may be lost.

**8. Strength of negative feedback loops, relative to the effect they are trying to correct against:** A negative feedback loop slows down a process, tending to promote stability. The loop will keep the stock near the goal, thanks to parameters, accuracy and speed of information feedback, and size of correcting flows. An example is the "polluter pays principle". Say a local business has an outflow into a wetland which causes high levels of pollution, particularly during spillage events. Asking the company to pay for every clean up after a spillage event is likely to motivate the company to look for

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<sup>1</sup> Meadows, Donella, *Places to Intervene in a System*, The Sustainability Institute, Vermont, 1999. Local government and CEPA specific examples have been added by the current authors.

ways to reduce the number of spillage events.

**7. Gain around driving positive feedback loops:** A positive feedback loop speeds up a process. In most cases, it is preferable to slow down a positive loop, rather than speeding up a negative one.

## MORE POWERFUL INDICATORS

**6. Structure of information flow (who does and does not have access to what kinds of information):** Information flow is neither a parameter, nor a reinforcing or slowing loop, but a loop that delivers new information. It is cheaper and easier to change information flows than it is to change structure. For example, a monthly public report of water pollution levels, especially near to the pollution source, could have a lot of effect on people's opinions regarding the industry, which may in turn provoke a response. Information about special species and their needs, placed along a forest path, may encourage more conservation friendly behaviour along that path.

**5. Rules of the system (such as incentives, punishment, constraints):** Pay attention to rules, and to who makes them. An increase of the tax amount for any water containing a given pollutant, will have an effect on water quality in a wetland (if enforced). Issuing fines to dog walkers who don't clean up behind their pets along the forest path, or who don't constrain them with a leash, should directly improve behaviour in the forest, even more so than information.

**4. Power to add, change, evolve, or self-organize system structure:** Self-organization describes a system's ability to change itself by creating new structures, adding new negative and positive feedback loops, promoting new information flows, or making new rules. For example, microorganisms have the ability to not only change to fit their new polluted environment, but also to undergo an evolution that makes them able to biodegrade or bio-accumulate chemical pollutants. This capacity of part of the system to participate in its own eco-evolution is a major leverage for change. In a CEPA context, once forest users or youth clubs start taking joint ownership with the local council for managing a wetland or forest, their desire and capacity for change may increase significantly.

## INFLUENTIAL INDICATORS

**3. Goal of the system:** Changing goals changes every item listed above: parameters, feedback loops, information and self-organization. A city council decision to change the zoning of an urban forest area from commercial development, to a protected conservation area with recreational access, will have an enormous impact on the area. That goal change will affect several of the above leverage points: information on plant and animal species numbers and status will become mandatory, and legal punishments will be set for any destructive use of the area.

**2. Mindset or paradigm from which the system — its goals, structure, rules, delays, parameters — arises:** A societal paradigm is an idea, a shared unstated assumption, or a system of thought that is the foundation of complex social structures. Paradigms are very hard to change, but there are no limits to changing paradigms. Paradigms might be changed by repeatedly and consistently pointing out anomalies and failures in the current paradigm to those with open minds. A current paradigm is "Nature is a stock of resources to be converted to human purpose". What might happen if we were to challenge this collective idea?

**1. Power to transcend paradigms:** Transcending paradigms happens when we go beyond

challenging fundamental assumptions, into the realm of changing the values and priorities that lead to those assumptions, and being able to choose among value sets at will. Many today see Nature as a stock of resources to be converted to human purpose. Many indigenous peoples on the other hand, like Native Americans, see Nature as a living god, to be loved and worshipped. These views are incompatible, but perhaps another viewpoint could incorporate them both, along with others.