

Position Paper

Introduction

Resilience is always useful but never more so as in times like these. The loss of biodiversity through loss of habitat, climate change and ongoing crises means that resilience enabled through mitigation and adaptation drive our future. Canada as a nation and Canadians as people must now adapt to continuous change as our ecosystems respond to larger shifts in planetary systems. R2:1 seeks to enable both mitigation and adaptation and thereby increase our resiliency as a whole. Resilience means adapting to one's context appropriately especially as it changes. With climate change and environmental degradation, our context has changed and will keep on changing.

Background

Ecosystems

Ecosystems are defined by temperature range and moisture. The species in an ecosystem evolved for those conditions together and in synch. Species seek their ecological niche with a set of conditions that determine their tolerance limits, including temperature, moisture levels, nutrient supply, soil and water chemistry, living space, etc. Climate change shifts those conditions to another place or removes them altogether. Due to the speed of change, only some species will be able to move or adapt quickly enough. Species also get out of sync with one another which can lead to extinction. A loss of biodiversity threatens all species including human beings.

Due to the activities of humans, deforestation, wetland drainage, coastal area degradation, habitat loss, and climate change, we are now in what is known as the Sixth Great Extinction. Indeed, much of what we do economically strips the landscape and pollutes it – to the detriment of other species and ourselves. Cities, directly or indirectly, are the main drivers of habitat loss, and this habitat loss is the main threat to 85 per cent of species on the Red List (ICUN Red List of Threatened Species at <https://www.iucnredlist.org/>).

Cities

Cities consume up to 80 per cent of the world's energy and 75 per cent of natural resources, much of which are provided by biodiversity (ICLEI at <https://www.iclei.org/>), and their populations are increasing. They also produce pollution and waste products. Cities are under stress from shifts in climate just like any ecosystem. The shifts in temperature and moisture parameters affect the city, a human constructed ecosystem, just like other ecosystems. To be resilient, cities must be planned differently and lived in differently.

Biodiversity & Biocapacity

Climate change exacerbates the crisis of biodiversity that is ongoing globally primarily due to loss of habitats. We have learned that much of the damage humans have done to the planet can be, if not actually reversed, then remediated to some extent. We can restore wetlands. We can reforest. We can design for biodiversity. And we can still create functional urban landscape that humans can enjoy. It means that questions about ecology must underlie all decisions.

Biocapacity is a term used by the researchers at the Global Footprint Network to measure the terrestrial and water resources available for use in a nation. It measures resources purely from a human point of view and is therefore limited in its scope. But it does provide a measure of how we are doing in our own management of our own national resource base which can include fisheries, grazing land, farm land and forest lands.

No matter what type of resource – land or marine based - we need healthy and functioning ecosystems that are diverse and can generate renewable resources while managing wastes. We tend to focus on nonrenewable resources or over use them to the point of collapse and certainly have not figured out how to manage all the waste we produce. We depend upon biocapacity to generate our resources and manage our wastes.

Canada

Biocapacity

Canada is a nation of urbanites, with 80 per cent of the population living in urban areas with limited access to nature. Many of the cities have made a commitment to building more sustainable cities. This needs to include biodiversity considerations in their city planning and management. And further to include thinking about overall provincial and national biocapacity.

Canada currently overuses planetary resources (1.7 earths). Since the mid-20th century, Canada's overall biocapacity has decreased while its ecofootprint has increased due to population growth. In the 60s, Canada's biocapacity ratio to its national ecofootprint was nearly 3:1, now it is not quite 2:1 or less and diminishing.

Climate Change

Warming is happening twice as much and twice as fast in Canada as it is in most of the rest of the planet. In other words, while Canadians often appear to think that global warming is not really affecting them, we are more affected than the rest of the world. This is especially true in the Arctic and subarctic regions. And our cities drive much of climate change in Canada as carbon emissions are

mostly from 1) buildings through burning fuel for heating – 45 percent; and 2) transportation – 28 per cent. When the climate changes ecosystems shift and can shift quickly. This shift affects all species dependent upon that ecosystem. Some species will move. Some will adapt. Many will die off. This affects our ability to harvest resources from the land and sea, which may directly affect our economy.

Resilience

Biocapacity enhancement is critical for Canadians to be resilient in the future. Resilience relies on redundancy in technical supports along with environmental diversity and a community's social capital. One measure of resilience is environmental diversity as a resource for mitigating climate shifts.

Resilience 2:1

Resilience 2:1 is a non-profit dedicated to maintaining and increasing the biocapacity ratio in Canada through education, research, consultation, planning and other activities that engage Canadians in the promotion of healthier, more resilient communities. This includes defining an ideal metric for ensuring resilient communities and a healthy biosphere. 2:1 is the ratio of biocapacity to eco-carbon-footprint currently in Canada according to the Global Footprint Network (at <https://www.footprintnetwork.org/>). Canada enjoys this ratio primarily by accident, as a geographically large nation with a relatively small population. While individual carbon footprints tend to be as large as any on the planet, collectively, Canadians produce a smaller footprint due to small numbers. Enhancing biocapacity is seen as a key to both mitigating climate change and increasing our resilience to the negative outcomes. A ratio of 2:1 is a good thing, a nice thing to be right now; 3:1 would be better; 4:1 even better.

Biodiversity Creation

Urban/Suburban Biodiversity

Urban biodiversity includes green infrastructure, protected and restored natural features, naturalized parks, tree canopy, green roofs, low-impact development, local species, urban wildlife, natural vegetation, vegetative technologies (ICLEI) along with regenerated and healthy soils. These types of biodiverse structures provide food, clean water, flood control, disease control, raw materials, habitat, biological control, pollination, climate regulation, erosion control, soil formation, nutrient cycling, waste treatment, cultural benefits and recreational opportunities (ICLEI).

Green infrastructure is seen as key to mitigating disasters from extreme weather – bioswales, green roofs, restored wetlands. But green/blue infrastructure can go further. And all of it depends upon healthy soils that are respected and nurtured.

Proposal

As educators and others we are concerned about the communication of the ongoing changes due to climate change, the need for shifts in curricula in post-secondary institutions, and the need for new programs to train for the new jobs created by these changes. As professionals we focus on communities, small cities, the landscape, soils, plant diversity, design and other aspects of our lives involved in the changes required to adapt and be resilient. Resilience requires addressing underlying factors that contribute to shocks. It requires thought and planning. Beyond resilience, we need to think about biocapacity, which is connected to biodiversity, to generate renewable resources and deal with waste.

Our proposal is simple, for every measure of consumption and waste we humans produce we need to commit to producing twice as much biocapacity. That means planting trees, many more of them and faster, rehabilitating lost habitats, renaturalizing, rewilding, and renewing ecosystems that have already shifted and changed to enhance their capacities. It is a lot of work, but the end result will be a Canada that can better weather the storms and deal with a changed planet. It involves new ways of thinking, new design work, different ways of producing food, different ways of eating, building and maintaining shelter and getting around from one place to another. In the end, increased biocapacity leads to increased resilience to shocks and changes which leads to a more sustainable life for all of us. Generally, increased diversity leads to increased resilience.

Definitions

Biocapacity: the ability of a place or region to regenerate itself through renewable resources and manage wastes to maintain a healthy state.

The capacity of ecosystems to regenerate what people demand from those resources. Life, including human life, competes for space. The biocapacity of a particular place represents its ability to renew what people demand. Biocapacity is therefore the ecosystems' capacity to produce biological materials used by people and to absorb waste material generated by humans, under current management schemes and extraction technologies. Biocapacity can change from year to year due to climate, management, and also what portions are considered useful inputs to the human economy. In the National Footprint and Biocapacity Accounts, the biocapacity of an area is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor. Biocapacity is usually expressed in global hectares. (Global Footprint Network)

Biodiversity: the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems. Biodiversity forms the foundation of the vast array of ecosystem services that critically contribute to human well-being. Biodiversity is important in human-managed as well as natural ecosystems. Decisions humans make that influence biodiversity affect the well-being of themselves and others. (GreenFacts)

Blue Infrastructure: generally urban infrastructure relating to water. (GreenFacts)

Ecological Processes: Include decomposition, production (of plant matter), nutrient cycling, and fluxes of nutrients and energy. (GreenFacts)

Ecological Services: a variety of services that humans obtain from ecosystems. These include provisioning services, such as food and water; regulating services, such as flood and disease control; cultural services, such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling that maintain the conditions for life on Earth. (GreenFacts)

Green infrastructure: a variety of approaches including tree canopy, biodiverse plantings, bioswales for managing storm water, wetland restoration for stormwater, green roofs to manage water and heat and more.

Mitigation: efforts to reduce or prevent emission of greenhouse gases and the effects of climate change, which can mean new technologies and renewable energies, increased efficiency of older technologies or change in behaviors. (UN Environment)

Prevention: Efforts cities and individuals can do to stop climate change, including, using renewable energies to power buildings, reducing waste water, increasing mass transit use (National Resources Defense Council)

Remediation: the removal of pollution or contaminants from the soil, groundwater, sediment or surface water and is based on human health and ecological risks. (Wikipedia)

Resilience: the capacity of an organism, individual, community, ecosystem or indeed the entire biosphere to recover from shocks and continue with viable life. Thinking of this in human terms means thinking of how individuals, families, communities, cities, regions and nations deal with shifts, shocks, catastrophes, disasters, and long-term changes in ways that enable the whole to survive and then to prosper again. Resilience is the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organization, and the capacity to adapt to stress and change (IPCC, 2007 in Tyler and Moench, 2012)

Toronto Report: Urban resilience is the capacity of individuals, communities, institutions and systems within a city to survive, adapt and thrive in the face of chronic stresses and acute shocks.

Clearly resilience involves the ability to learn from shifting conditions and to alter behavior accordingly.

Rewilding: a comprehensive conservation effort focused on restoring sustainable biodiversity and ecosystem health through protecting core wilderness (wild) areas, establishing connectivity between these areas, and protecting keystone and highly interactive species. (RewildingEarth)

Sustainability: is meeting the needs of the present without compromising the ability of future generations to meet their needs (International Institute for Sustainable Development)

Sources

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ICLEI

Global Footprint Network

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