CLIMATE CHANGE: DISASTER RISK AND BUILDING RESILIENCE

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ABSTRACT: Social contracts share reciprocal rights, obligations and responsibilities regarding our environment and our responses to climate change. The recent pandemic creates opportunities to rethink these existing and evolving social contracts and make changes regarding risk management and the need to build a better program of resilience in the face of change and uncertainty.

This paper is about resilience thinking. We discuss how the capacity to recover from difficulties may be improved. Examples include the impact potential of Spekboom in South Africa; Pinus Radiate in New Zealand, the Empress tree and the treasury of plants and products from revolutionary science already underway. Social -ecological system elasticity and examine insights on creating resilience in a warming world.

Focus is on social rearrangement and activity that may enhance responses to ecosystem change, yet unusual weather events, and the consequences of some social-ecological changes already undertaken around the world. Examples include changes adopted in the McKenzie River Valley, the grasslands in Romania, a novel weighted index of spatial resilience for Spanish olive landscapes; and the future potential from the European eLTER project.

The harvest from resilience thinking provides valuable insight for the social ecological thinker and ways to build resilience and social security in a warming world.

KEYWORDS: *Social ecological change, risk, resilience, South Africa, New Zealand, Canada, social contracts.*

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INTRODUCTION

Social contracts share reciprocal rights, obligations, and responsibilities. These are determined, as John Locke, by the laws made by 'civil government'. Social contracts may also incorporate widely accepted cultural norms, and this is "especially true as more and more of us communicate daily" (Meyer, 2014) across the invisible borders of which pre-global societies were largely unaware. Many of these borders continue to be invisible where there has been insufficient focus by world media.

The severe acute respiratory syndrome (SARS) pandemic found many nations worldwide healthcare risk management systems unprepared for an "unseen epidemic" (Susman, 2005). The recent acute respiratory syndrome (Coronavirus) again found, worldwide, an "invisible enemy," (Rayasam & Kenen, 2020).

Why did the focus of worldwide healthcare attention fail to see the risk of recurrence of acute respiratory syndrome virus? The focus of worldwide attention is still short-term, on items (however accurately reported) that appear to have impact. The current pandemic also illustrates the human cause of much pollution as swans return to Venice's canals now " clear enough to see fish" (Jacobo, 2020). and "people in some regions of India can see the Himalayas "for the first time in 30 years, thanks to reduced air pollution" (Rochard, 2020).

So even in the short-term the impact of climate change, the pollution of human traffic, is visible.

This paper:

This paper is concerned with the visibility, the long-term practical solutions, related to the disasters caused by human traffic. The paper's focus is on pollution risk mitigation and growing awareness of the natural means need for carbon emission mitigation that surround us.

This paper seeks also to build resilience, the capacity to recover from our present difficulty, and to grasp the potential for and ongoing continuous improvement in the mitigation of carbon emissions.

The context for carbon emissions mitigation is considered. Potential opportunities for providing reasonable mitigation from existing experience, science, and nature is then considered.

Our Atmosphere:

"Earth's atmosphere is resilient" (Buis, 2019) to human activity changes. That resilience as Buis further notes "has been proven throughout our planet's climate history." We are seeing just now pollution that kills can quickly be dissipated if only our society can be more resilient without a pandemic.

Chart 1:
What's in the Air?

	Volume
Nitrogen	78.00 %
Oxygen	21.00 %
Argon	0.93 %
Carbon dioxide	0.04
Trace gases	0.03 %
Total Volume	100.00 %

Source: (Sharp, 2017)

While changes to our atmosphere are relatively short-lived, as the pandemic reduction in pollution (e.g. nitrous oxide) has shown, carbon dioxide "is a different animal" (Bios, 2020) and "hangs around" for a long-time. Hence the importance of carbon emission migration.

History does provide a guideway to resilience. We recognize how the treatment and reclamation of polluted surfaces is an ongoing feature of civilization. In the 1960s Lake Erie was "extremely polluted" (Rotman, 2010) and in 1969 the Cuyahoga river caught fire several times (Boissoneault, 2019) contributing to recognition of a national Environmental Protection Agency in 1970. Here we find resilience where a onetime industrial waste dump has become an "unmatched recreational resource" (Gabriel, 2015). In Europe, the European Environment Agency monitors pollution concentrations (Schlanger, 2018) and these are displayed on their website.

Long-term Solutions

Past climate change is seen in the context of impact. The Ice Age widely predicted short-term in the scientific literature of 1970s (Ebell & Milloy, 2019) brought limited acknowledgement of failure. The short-term Artic, "Ice-free by 2016" (Wadhams, 2013) is still inconveniently ice bound. As noted in Breitbart "Climate experts are 0-41 with short-term predictions" (Perry, 2019).

Scientific analysis is wonderfully malleable: short one liners so easily obscure timelines and other science assumptions. Too often the latest models, without peer-review, may make plausible what is highly unlikely. From serious intellectual analysis, the talking-heads, can fake likely disaster. So real long-term solutions for our future safety are kept off screen.

So, let us focus o some long-term solutions which look to solving the problems caused by carbon emissions. What existing capacity does nature provide us which may have escaped out attention and more importantly the research and development funds they could use.

Carbon recovery:

A careful look around the natural world offers many opportunities for carbon emission mitigation. Examples include

- The impact potential of Spekboom in South Africa:

  The Spekboom is "a marvelous drought tolerant" phenomenal carbon sponge (Lindeque, (2019). Portulacaria is known by several names. These include elephant bush, dwarf jade, porkbush and in the Afrikand language Spekboom. A sprawling shrub or a small tree with a red trunk and a dense crown of succulent leaves with an attractive full bloom. The plant's leaves are edible (elephants' favorite) and the plant has many medicinal values. The plant is easy to grow and remarkably in that "it stores solar energy to perform photosynthesis at night" (Shamwari, 2020) making the plant "10 times more effective" at carbon emission mitigation than any tropical rainforest. In the past "a thicket the size of Cyprus" (Matthews, 2020) could be found in South Africa and clearly as the BBC Future Planet found replanting Spekboom is just one of the ways "shrubs can help solve climate change.

- Pinus Radiate in New Zealand:

  This pine species, a native of California, when transferred to New Zealand, was free from the endemic pests in the Monterey soils and has proved to have potential to absorb and reduce carbon in the atmosphere better than other trees native to New Zealand. Pinus Radiate "grows like a weed" and "has a superpower" (Gibson, 2020). The tree is "adept at hoovering carbon dioxide while young." Research into recovery of de-afforestation is being researched as the potential for the capture and storage of Cos using plant and vegetation continues (CLA 20200.

- The Royal Empress tree:

  Native to central and western China, is the world's fastest growing shade tree (Gardener, 2020). Recognized for its growth rate in the Guinness Book of World Records, the tree is a member of the Paulownia family. The tree has large heart-shaped leaves and is extremely fast growing (Nelson, 2020).

- The treasury of plants and products from revolutionary science:

  Examples from the last 50 years and their summing up of the current and future state of plant science (Eshed and Lippman, 2010) identify the increased productivity and adaption of plants to modern scale farming practices. There is potential for breeding programs so that conventional and underutilized plants can be adapted to meet our future needs while promoting a sustainable environment and carbon emission mitigation (Cold Spring Harbor Laboratory, 2019)

  Focus is on social rearrangement and activity that may enhance responses to ecosystem change, yet unusual weather events, and the consequences of some social-ecological changes already undertaken around the world.

Social-ecological perspective:

While attention needs to be focused on the potential of our natural habitat, social rearrangement and activity may also enhance responses to ecosystem change. Social ecological change means different activities to different people because we place value on different social elements (Andrachuk and Armitage, 2015). Transformation may come from unusual weather events, and other community perceptions of changes that need to be made. Many social-ecological changes have already been undertaken around the world.

Examples include:

- Social-Ecological change adopted in the McKenzie River Valley:

  Here the links between landscape and community developed so that "dramatic changes driven by market competition" (Inman et al, 2018) led to a logging community transitioning to a retirement and vacation community.

- Management of the Columbia River Basin:

  Lewis and Clark identified the ecologically diverse Columbia River Basin noting "the multitude of salmon indeed are almost inconceivable (Lewis et al, 1814). The conservation of the Columbia River Basin as with other similar environments "requires consideration of interacting and often competing ecological and social factors" (Hand et al, 2018).

- Grassland biodiversity in Romania:

  European farmlands provide splendid opportunities for socio-ecological sustainability "because of their significant land coverage and potential for integrating food production with biodiversity conservation" (Nita et al, 2019).

- A novel weighted index of spatial resilience for Spanish olive landscapes:

  The spatial structure of agricultural landscapes can affect crop resilience to potential pest development. Research on distancing has proved successful in increasing crop yield quality and volume. Studies have found several spatial landscape metrics related to the abundance of the olive fruit fly, Bactrocera oleae, (Ortega M et al 2020). A new spatial index is helping eliminate the olive fruit fly and offers opportunity for preventing pest activity in other crops.

So, the harvest from resilience thinking has provided valuable insight for the sociological ecological thinker and we need to focus attention on many ways to build resilience and social security in a warming world.

Long Term Ecosystem Research in Europe is underway with the eLTER project. Grants have been made by the European Union including the EU H2020 funded project. Certainly, this is a major project and it is good to find that at last a network of Long-Term Ecosystem Research sites and socio-ecological research platforms are at last being set-up. Let us hope this not too little and not too late.

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