Regenerative development, the way forward to saving our civilization.

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Abstract:

Humankind has taken a dangerous path with its current global development trends. We are in a time of rapid population growth coupled with overconsumption and massive destruction of Nature. These trends, potentiated by technological developments have resulted in human induced impacts even in the most remote places. Change is accelerating and increasing in magnitude and consequences making it impossible to be in denial. Communication has never been better, faster and cheaper. We are flooded with alarming news from around the world yet we are continuing to promote degenerative development. In order to reverse the damage and allow for life on the planet to continue – though with changes – we need to implement regenerative development, based on a holistic approach that integrates six layers:

1) regeneration of functional landscapes, where we produce and conserve, maximizing ecosystem function;
2) social strengthening by community organization and development, to cope with adaptation to climate change and reduce sumptuous consumption patterns;
3) a new paradigm for economic development where people matter more than markets and money, measured according to the well-being of humans and all life forms;
4) conservation and valuation of living culture which is the necessary bond for community life, where local knowledge, values and traditions are shared within family, friends and the community as a whole, giving meaning to these terms;
5) rethinking and redesigning current political structures so they reflect true participatory democracy without the influence of money and power and especially fostering long term vision and actions that seek increased livelihoods and happiness and not only gross income, and most importantly;
6) fostering deep spiritual and value structures based on ethics, transparency and global well-being to allow humanity to live in peace with itself and Mother Earth.

Introduction

We are already living in a different world, a world of changes so rapid that much of humanity is being left behind. In 2016, the same amount of data was produced as in all previous years including 2015 (Helbing et al, 2017). We have more information and knowledge than needed to save our planet, yet we have not been able to transform it into wisdom, enlightenment and action. The digital revolution,

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especially artificial intelligence, will dramatically change our world over the next few years (not decades), meanwhile we are not able to keep our life supporting planetary services, putting our civilization together with many other life forms at risk of extinction.

Over the last three decades, we have been discussing sustainable development, holding hundreds of conferences all over the world, first to agree on a definition and then on how to achieve it, with hundreds of beautiful booklets and reports printed. In May 2016, looking up "sustainable development" in Google came up with 14.300.000 entries, in January 2017 the number had climbed to 105,000,000. Yet, we never achieved it or curbed the rate of global destruction. I truly believe sustainable development is not achievable anymore; we are 20 years too late. In the early definitions, sustainable development was about leaving future generations, similar conditions to the ones we inherited. Now, it is about all present human beings, irrelevant of age, class or race, being able to make the change that will allow our civilization as a whole to have a future. By now, it will be a different future, but the more we wait to take action, the more people will be vulnerable, the more people will suffer and the whole foundation for our current civilization will be undermined.

In order to revert our self-destructive pathway, we need to modify what we have been doing so far, moving to holistic approaches that optimize Earth's biocapacity (the planet's biologically productive land areas) while keeping our footprint within the planetary boundaries.

How is the health of our planet?

It is clear that Earth's capacity to maintain life, as we know it, is seriously compromised. We have reached the most important crossroad in the history of humanity. "*We stand at a critical moment in Earth's history, a time when humanity must choose its future*" (The Earth Charter , 2000). Global change is with us, its consequences also. From more "simple" problems as vanishing pollinators, plummeting fish stocks and plastic pollution to complex issues such as climate change and poverty, we have managed to push our planet into a different future.

We have promoted degenerative development with massive resource extraction. If we look at the relation between the ecological footprint and biocapacity, we have clearly surpassed Earth's capacity to satisfy our current consumption; today we require the equivalent of 1.6 planets to provide the resources used and to absorb the waste produced. What we consume in one year takes Earth 18 months to regenerate (Global Footprint Network, 2017). Most of the developed countries have surpassed their biocapacity over half a century ago, meaning that achieving their status was only possible due to consumption of resources coming from elsewhere. Many least developed countries still have a larger biocapacity than their footprint, but in most cases, the distance between both values is closing rapidly.

In this destructive pathway, it seems that humans have forgotten that the natural world is what makes life possible, including ours. Over a decade ago, the Millennium Ecosystems Assessment (2005) reported that "*approximately 60 percent (15 out of 24) of the ecosystem services examined … are being degraded or used unsustainably, including fresh water, capture fisheries, air and water purification, and the regulation of regional and local climate, natural hazards, and pests. The full costs of the loss and*

degradation of these ecosystem services are difficult to measure, but the available evidence demonstrates that they are substantial and growing. Many ecosystem services have been degraded as a consequence of actions taken to increase the supply of other services, such as food. These trade-offs often shift the costs of degradation from one group of people to another or defer costs to future generations".

Planetary Boundaries

The planetary boundaries approach defines the "*safe operating space for humanity*" – the conditions required for human societies to develop and thrive, based on the biophysical processes that regulate the stability of Earth's system (Steffen, 2015). Four of nine planetary boundaries have been crossed: loss of biosphere integrity (biodiversity loss) land system change, the biogeochemical flow and climate change, putting the future of the planet in danger. *"Two core boundaries—climate change and biosphere integrity—have been identified, each of which has the potential on its own to drive the Earth system into a new state should they be substantially and persistently transgressed."*

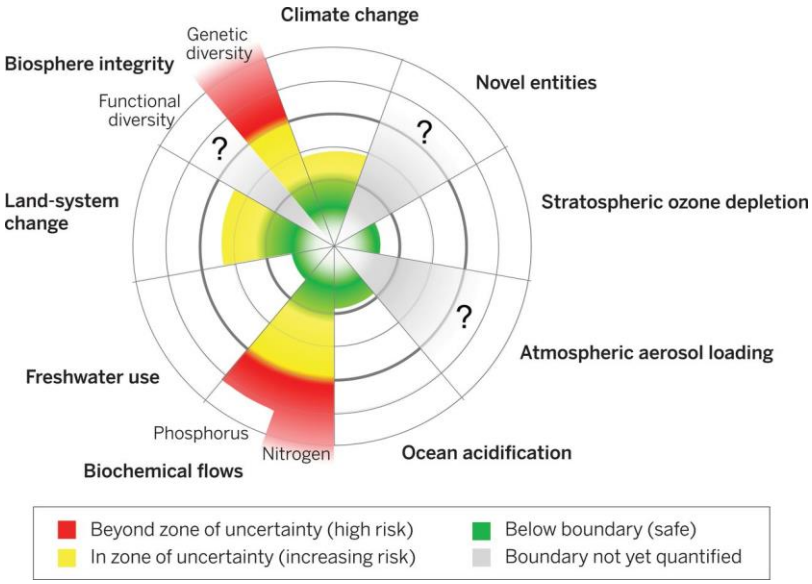


Fig. 1 Planetary boundaries. Current status of the control variables for seven of the planetary boundaries. The green zone is the safe operating space, the yellow represents the zone of uncertainty (increasing risk), and the red is a high-risk zone. Steffen et al. 2015.

Loss of biosphere integrity:

Biodiversity loss has escalated to unprecedented levels. How much loss ecosystems can tolerate before losing their capacity for supporting life on Earth, including humans', is not yet clear from the scientific perspective. In practice, signs of ecosystem changes are visible throughout the planet: flooding in deforested lands, coastal erosion from destruction of mangroves, depletion of fish populations, massive death of coral reefs, massive death of marine life washing on shores transformation of cloud forests into rain forests, loss of life in soils, and many more. Pollinators are declining rapidly (Pensoft Publishers, 2014), affecting agricultural and natural systems, while pests and invasive species are causing unprecedented harm to food security. Thousands of reports confirm the graveness of the situation.

At the World Summit for Sustainable Development in Johannesburg in 2002, more than 190 countries adopted the Biodiversity Target through the Convention on Biological Diversity to significantly reduce biodiversity loss by 2010 (Marton-Lefevre, 2010). In preparation for the COP10 in Nagoya, the Biodiversity Outlook 3 report was presented. Ban Ki-moon summarized the results: "*Having reviewed all*

available evidence, including national reports submitted by Parties, this third edition of the Global Biodiversity Outlook concludes that the target has not been met. Moreover, the Outlook warns, the principal pressures leading to biodiversity loss are not just constant but are, in some cases, intensifying. The consequences of this collective failure, if it is not quickly corrected, will be severe for us all. Biodiversity underpins the functioning of the ecosystems on which we depend for food and fresh water, health and recreation, and protection from natural disasters. Its loss also affects us culturally and spiritually. This may be more difficult to quantify, but is nonetheless integral to our well-being" (Secretariat for the Convention on Biological Diversity, 2010).

Having participated as a national negotiator with the Costa Rican and the IUCN delegation in Nagoya, I witnessed how economic, political and even national sovereignty issues were given higher priority in the discussions than life on Earth. After 21 days, the Strategic Plan for Biodiversity 2011-2020 (CBD, 2010) was agreed upon together with 20 very concrete targets, allowing countries ten more years to stop biodiversity loss – to kick the ball forward. In the mid-term assessment (Leadley, 2014), the Executive Secretary of the CBD Braulio Dias stated that: "…*while progress is being made towards the attainment of most Aichi Biodiversity Targets, significant work remains before us; on our current trajectory we are unlikely to reach the majority of the Aichi Biodiversity Targets by their deadline*." At COP 13 in Cancun, only 4 years away from the 2020 target, many success stories were presented, important commitments were again made by countries and organizations, even the business sector presented a "Cancun Business and Biodiversity Pledge" (Global Partnership for Business and Biodiversity, 2016), nevertheless, 2/3 of the countries are far away from reaching the Aichi Targets. On December 3rd, countries committed again through the 'Cancun Declaration on Mainstreaming the Conservation and Sustainable use of Biodiversity for Well-Being' "*To work at all levels within our Governments and across all sectors to mainstream biodiversity, establishing effective institutional, legislative and regulatory frameworks, and incorporating an inclusive economic, social, and cultural approach with full respect for nature and human rights, tailored to national needs and circumstances and in line with other relevant international agreements*" (CBD, 2016).

Current extinction rates are about 1000 times above the background rates (Pimm, 2014). "*This exceptionally rapid loss of biodiversity over the last few centuries indicates that the sixth mass extinction is already under way*" (Ceballos, 2016). In 58.1 percent of the land surface of the planet where 71.4 percent of humans live, biological diversity has fallen below the proposed planetary boundary (Newbold, 2016). According to Living Planet Report 2016 populations of vertebrate animals have decreased in abundance by 58 percent from 1970 to 2012, being the main driver for this the loss and degradation of habitat, and states that "*To maintain nature in all of its many forms and functions and to create an equitable home for people on a finite planet, a basic understanding must inform development strategies, economic models, business models and lifestyle choices: we have only one planet and its natural capital is limited. A shared understanding of the link between humanity and nature could induce a profound change that will allow all life to thrive in the Anthropocene*" (WWF, 2016).

Climate change is accelerating and is one of the main drivers for the loss of biodiversity through changing precipitation patterns and increasing temperatures with important impacts on species distribution, trophic chains, breeding cycles, genetics, invasive species, and more. Research over the last

two decades in the Monteverde Cloud Forest in Costa Rica, reveals a transition from a cloud forest to rainforest; atmospheric warming has raised the clouds and there has been a dramatic decline of dry-season mist frequency. Monteverde is also the site for the first documented climate change related extinction in 1987, that of the golden toad (*Bufo periglenses*) that followed synchronous population crashes that led to the disappearance of 40 percent of the species of frogs and toads that year (Pounds, 1999).

Land system change

Land use change and human development have been tied together for millennia. The amount of change over the last couple centuries has reached levels that impact the globe. It is an important driver in biodiversity loss and climate change. Globally, 15 years ago, over one billion hectares of land were already degraded by humans, corresponding to 550 million in Asia Pacific, followed by Africa with 500 million and Latin America with 300 million (IFAD, 2002). In Africa, this means that 65 percent of arable land is already damaged (The Montpellier Panel, 2014) while in Latin America in 2007 an estimated 50 percent of land was degraded with some countries reaching 91 percent (CEPAL, 2007).

Additionally, agricultural expansion through land-use-change has increased significantly the demand for water. At global level, irrigation accounts for 70 percent of global water withdrawals with least developed countries reaching more than 90 percent (UNWATER, 2016). For ecosystem services to keep on supporting life, land-use change must be halted, and actually, reverted to functional ecosystems. Complete restoration of ecosystems will require decades or centuries, and might never be possible. Nevertheless, we must allow nature to recover, to regenerate itself.

Biogeochemical flow

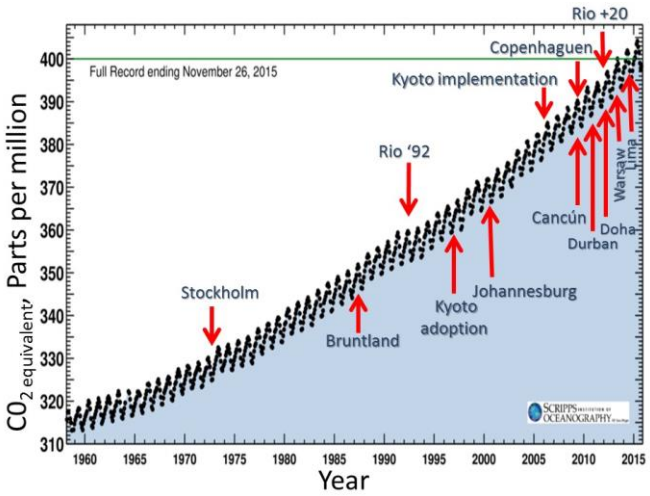
Excessive use of nitrogen and phosphorus has led to the crossing of another planetary boundary (Steffen, 2015). Disturbances to the nitrogen cycle are greater than those of the carbon cycle (Fields, 2004). Anthropogenic nitrogen leakage to the environment can harm the ecosystems and human health and contributes to changes in the global climate system (Davidson, 2009) (Sobota, 2015). Academic institutions and the petrochemical industry in what was called the Green Revolution, somehow managed to convince the world that in order to produce food for all, it was necessary to use "agricultural packages" consisting of agrochemicals, irrigation, high yielding varieties and mechanization. Abundant short-term experiments in research plots show exponential increases in productivity, nevertheless, long-term consequences are now being harvested. A recent report from the United Nations (2017) states: "*There continues to be a general lack of awareness of the dangers posed by certain pesticides, a condition exacerbated by industry efforts to downplay the harm being done as well as complacent Governments that often make misleading assertions that existing legislation and regulatory frameworks provide sufficient protection*" (United Nations, 2017). The expansion of monocultures, especially in large scale and corporate agriculture, the impacts of chemicals, the increase in the use of high yielding crops including GMOs, the increase in irrigation and other related factors have changed the face of the earth. With 30 percent of the total global land area degraded with an annual global cost of about US$300 billion (Nkonya, Mirzabaev, & von Braun, 2016), the long-term net benefit is questionable.

Additionally, a review of 50 years of research on the relationship between fertilizers and insect pests concludes that due to high level, nitrogen in plant tissue decreases resistance and increases susceptibility to pest attacks; "*…most studies assessing the response of aphids and mites to nitrogen fertilizer have documented dramatic expansion in pest numbers with increases in fertilizer rates"* (SARE, 2017). This study suggests that organic agriculture on the other hand leads to lower concentrations of nitrogen in plant tissue and fewer insect pests.

If we take into account the impacts beyond agriculture, it becomes even more questionable if we can keep on with current agricultural practices. Agricultural side effects and externalities are not well studied and the full cost of cleaning up the environmental consequences is passed on to society as a whole. Pesticide manufacturers are not charged with the full cost of their products' side effects. Externalities' costs are usually neglected, have a time lag, damage groups that have little saying in political decision-making and the source of the externality is difficult to establish (Pretty, 2006). Between 30 and 80 percent of nitrogen applied to farmland escapes and contaminates both soil and the atmosphere (Pretty, 2006). Nitrous oxide is the third most important greenhouse gas (IPCC, 2014) with a global warming potential almost 300 times that of CO_2 (EPA, 2016).

Run-off fertilizers are severely damaging marine systems and the future of fisheries, which are already affected by overfishing. Since the 1960s, the number of marine dead zones (hypoxia) has doubled each decade with over 1000 dead zones globally. Until 2008, over one billion square kilometers of seabed were covered by oxygen minimum zones (Diaz, 2008). The Bay of Bengal has reached a tipping point with a dead zone greater than 60,000 km^2 (Bristow, 2017). Estimates of potential damage to freshwater ecosystems in the United States had a median of US$252 $ha^{-1}yr^{-1}$ with a maximum value of US$2255 $ha^{-1}yr^{-1}$ with potential health and environmental damages in the early 2000s totaling US$210 billion per year (Sobota, 2015). In the Baltic alone, it is estimated that 264,000 metric tons of carbon in biomass, representing 30 percent of the total secondary production, are lost annually. The reduction of nutrient loads is essential to reverse eutrophication-induced hypoxia but we need to act now (Rabalais, 2010).

Climate change



2 Atmospheric CO2 levels. Adapted from SCRIPPS, 2016

Climate change is another planetary boundary that has been crossed. Most of the recent climate change information indicates a great urgency for action if our current civilization is to survive. What was once debatable doom and gloom information is now underpinned by the most rigorous scientific evidence. Scenarios vary but more and more, the worst-case ones are proving to be the most probable.

Most importantly, climate change is already underway and nature as a whole is being affected with clear consequences for millions of people in every part of the globe. CO_2 levels

have increased steadily; 22 years of climate negotiations have not been able to curb the trend (Fig. 2). The Paris agreement from 2015 is the first one where actually countries committed to reduce emissions, nevertheless, these commitments still lead to global warming above the 1.5C that the UNFCCC has set as maximum. We are getting used to information reporting that 16 of the 17 warmest years on record have been observed since 2001 or that 2016 was the warmest year on record (WMO, 2017) taking the title from 2015 which took it over 2014 (Shepherd, 2017); that the globally-averaged land surface temperature was 1.43C above the 20th century average (NOAA, s.f.); or that Artic sea ice is at a record low (National Snow and Ice Data Center, 2017). In February 2016 global temperature reached 1.35C (NASA GISS, s.f.) which is very close to the 1.5C mark that is supposed to be reached in 83 years, a clear reason for immediate action.

Several feedback mechanisms are not clearly reflected in the models used by the IPCC and thus changes are happening faster than previously expected. Examples are the unprecedented Arctic temperatures 20 degrees Celsius above normal in November 2016 (Labe, 2016) with spikes to around 30C above normal in February 2017 (Sutherland, 2017) and the consequent loss of sea ice and snow (NOAA, 2016) and the reduction of the albedo effect that can trigger further warming and Arctic sea ice shrinking (The Guardian, 2016). Forest die-offs like the one in California, involving more than 100 million trees (U.S. Forest Service, 2016) or the drying out of the Amazon rainforest (Hilker, 2014) (Duffy, 2015) which ultimately end up in large releases of CO_2, are also not contemplated. An even more dramatic increase in GHG emissions may come from the melting of permafrost, that holds almost twice the amount of carbon than currently found in the atmosphere (Schaefer, 2016). Katey Walter Anthony has been reporting on methane release from permafrost thaw using ^{14}C, demonstrating increases over the last 60 years with 0.2 to 2.5 Pg of permafrost carbon released (Walter Anthony K. A., 2011) (Walter Anthony K. e., 2016). Recent reports indicate an acceleration of methane increase in the atmosphere at more than ten times the rate during the last years, requiring urgent attention to reduce emissions (Aaunois, 2016). The economic value of permafrost-increased impact of climate change is estimated at US$43 trillion (Hope, 2016). In spite of this, methane emissions are "*not currently simulated in most global climate models*" (Zona, 2016). The release of methane from permafrost or Arctic and Antarctic sea beds could cause abrupt climate change (Kennett, 2003) and though it is acknowledged by the IPPC (Solomon, 2007) stating that "*warming increases the likelihood of a positive feedback in the climate system via permafrost melting and the release of trapped methane into the atmosphere*"; scientists still have not come to a consensus and could be underscoring its importance. At COP 20 in Lima, the Arctic Methane Emergency Group stated that we are in a planetary emergency due to loss of Arctic sea ice and methane release, and that "*the meltdown is accelerating and could become unstoppable as early as Sept 2015, immediate action must be taken to refreeze the Arctic to halt runaway melting, greenhouse gas emissions reduction, however drastic, cannot solve this problem, calculations show that powerful interventions are needed to cool the Arctic, any delay escalates the risk of failure and that the arctic meltdown is a catastrophic threat for civilization*" (Arctic Methane Emergency Group, 2014).

Highly reputable scientists are affirming that critical tipping points have been crossed or are in the verge thereof. The widely endorsed maximum atmospheric CO_2 limit to maintain the climate to what humans and nature are adapted is 350ppm (parts per million) (Hansen, 2008); this was crossed back in 1988

(NASA GISS, 2017). Twenty-two years of negotiations were not able to change the constant increasing trend of CO_2 equivalent in the atmosphere. In my view, this was due mainly to the question of 'who is responsible' and who must reduce more. Countries such as Bolivia kept pointing their fingers at the 'capitalist nations', blaming them for all of climate change and claiming the right to have access to the 'remaining carbon budget' to reach development.[2] I personally consider the estimated 'carbon budget' to be a technocratic instrument that only serves the political sphere.

COP 20 in Paris was different, for the first time, countries agreed that everyone had to contribute and countries were required to submit their "*Intended Nationally Determined Contributions (INDCs)*". Article 2, paragraph 1(a), of the Paris Agreement is fundamental and contains the collective commitment to "*Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change*". Nevertheless, actual INDCs are not enough to reach the 1.5 or even the 2C goal. *"…while significant progress has been made with regard to the pre-2020 period, global aggregate emission levels in 2025 and 2030 resulting from the implementation of the communicated INDCs do not fall within the scope of 2 °C or 1.5 °C scenarios*" (UNFCCC, 2016). If we eliminate the diplomatic UN language necessary for convention work, we can summarize that the INDCs presented at Paris are only 30 percent of the required reductions to avoid disaster, taking the planet up to 2.6-3.1 C (Rogelj, 2016) or even 3.4C (UNEP, 2016) and, this is before Donald Trump became president of the United States (President Obama had pledged an 80 percent emissions reduction from 2005 levels by 2050) (Fransen, 2016).

Climate change not only causes direct changes in most of Earth's systems but also fosters other anthropogenic process ending with rapid deterioration of basic conditions for life, seriously compromising land, freshwater and oceanic ecosystems. Natural and productive ecosystems are becoming less resilient. Countries are losing more and more crops and food shortages are affecting millions of people, especially the poor. Water supply is decreasing in many regions at alarming rates. We urgently need new approaches, policies, and actions to create 'counter-tipping points' to balance human development with the natural world. Climate change adaptation and mitigation require that the root causes of global change be addressed and that we move from knowing to doing.

How are we managing knowledge?

The linear economic model imposed on us with the promise that ever increasing economic growth and the globalization of markets would trickle down benefits to everyone, has left hundreds of millions of people without access to the so called "development". For me, one of the main causes of the disaster we are facing is the reductionist approach that has been consolidated by the academic and institutional framework of the western world. "*Our latest scientific understanding tells us that, notwithstanding its many achievements, today's form of capitalism rests upon outdated reductionist thinking that is*

[2] I personally heard this from President Evo Morales at a pre-G77+China Summit in Santa Cruz, Bolivia, May 2014 http://www.opinion.com.bo/opinion/articulos/2014/0513/noticias.php?id=127849&calificacion=4 .

fundamentally at odds with both the finite boundaries of the biosphere and the laws of systemic health in an interconnected world" (Fullerton, 2015).

Complex problems such as global change, poverty, global unrest and many others will not be solved through disciplinary approaches alone. We have "*large numbers of scientists working competitively in silos without combining their efforts*" (Munafo, 2017). Complex problems require complex thinking and holistic approaches that do not fit into an academic world with ever growing specialization, set up in 'little boxes', where scientists are recognized and praised by how many other scientists are using their information, even if it has little or no impact in the real world. I have heard hundreds of times "*My job is getting peer review articles into renowned journals, it is not to communicate my results to decision makers or even the broader audience*"- *"I do not have the skills required for this".* Academic careers and university rankings are still strongly tied to the number of publications (Times Higher Education World University Rankings, 2016) with little if any weight put on how much and how fast the results of these publications get used by policy makers to take decisions and actions, let alone to be incorporated into university curricula. Researchers working on holistic approaches and complexity have still today little or no possibility to publish in the 'best renowned' journals. Much of the information they could publish is qualitative, highly variable, and sometimes even intuitive.

Scientific and technological development has brought us far ahead in many fields, from nanotechnology to artificial intelligence. By 2015, over 47 percent of the world's population was using the Internet (International Telecommunication Union, 2016) with Facebook alone having 1.79 billion monthly active users in 2016 (Facebook, 2017). Social Networks have increased scientific communication and many organizations and individuals are now bringing scientific information out to the general public, though it has also allowed for the fast growth of misinformation (Del Vicario, 2016).

We are living in a time where human impacts are significantly changing the planet and while the changes are accelerating and pretty obvious to everyone, it has taken scientists almost two decades to decide if we are moving from the Holocene to the Anthropocene. "*The 35 scientists on the Working Group on the Anthropocene – who voted 30 to three in favor of formally designating the Anthropocene, with two abstentions – will now spend the next two to three years determining which signals are the strongest and sharpest*" (Carrington, 2016). We are now well into the sixth planetary extinction (Ceballos, 2016), and the paradox lies in that this is the best scientifically documented planetary extinction in history; we know exactly what we are doing wrong and what the consequences are. The disconnect between science and social, political and business decisions is huge. Scientists are demanded to have total and convincing proof, making it difficult to eliminate phrases such as 'could', 'possibly', 'probably'. While climate change experts are reluctant to classify current changes as climate change or global change and confuse the public with 'climate variability', climate change deniers do not hesitate to clearly state that climate change does not exist, based on all the 'evidence'. The lack of clarity of the scientific community is partially responsible for years of unfruitful climate change negotiations under the UNFCCC – there was always a small possibility that what 97 percent of scientists were affirming could be wrong. This was quickly taken by the oil and other industries to make bold political statements that would block any agreement to curb their business expansion.

To make things worse, science has been questioned and there is growing concern that most current published research findings are false. There is an urgent need to increase the credibility of published scientific literature. In order to guide this process, several authors proposed earlier this year a "Manifesto for reproducible science" (Munafo, 2017).

A recent survey published in *Nature* found that more than 70 percent of researchers have failed to reproduce experiments from other scientists across different fields and close to 90 percent in areas such as chemistry (Baker, 2016). Macleod et al. (2014) report that 85 percent of investments in research (US$200 billion in 2010), is wasted. Ioannidis (2005) states clearly "*It can be proven that most claimed research findings are false*" especially when results are reported on a single study, with statistical significance but with high rates of non-replication. This author gives several reasons for this, including modeling being the framework for false positive findings, bias that leads to manipulation of analysis or reporting of findings, where "*claimed research findings may often be a simply accurate measure of the prevailing bias*". The same author in a 2012 publication mentions the possibility that there is massive destruction of evidence. This sounds almost impossible, but many scientists are not giving public access to raw data, protocols and analysis codes, and the large majority of published papers are "*synoptic advertisements of the actual research*", not allowing the reproduction of the study. "*Empirical evidence from diverse fields suggests that when efforts are made to repeat or reproduce published results, the repeatability is dismal*". "*The distinction between creative exploratory analysis, falsification, and fraud should ideally be easy to make, but in real life it is not always so*." "*If there is also modest bias (Ioannidis, 2005), then the prevalence of unchallenged fallacies may represent even up to 95 percent (if not more) of the significant findings in some areas of the psychological literature*" (Ioannidis, 2012).

Another constraint of modern science and its education is that it must be fact based; any spiritual or intangible component is traditionally not contemplated. I personally feel that without the spiritual component, advancement in solving our complex problems of today will be slow. Technology of course plays an increasing role in solving problems and is progressing at exponential leaps, but it will not change the way humans behave in the period required to save life on Earth. In personal discussions with presidents, chancellors and other representatives of well renowned universities from the North, I have seen reluctance towards spirituality since "*it cannot be evaluated or measured and thus cannot be included into the study plans"*. Nevertheless, most of today's wrong decisions and actions, be them individual, corporate or governmental, originate from a global-wide lack of ethics and values. What is called corruption in some countries is legal and denominated 'lobbying' in others – buying a decision from a politician. At the bottom line, many of these decisions benefit a small group and not the community as a whole.

Nicolescu (2002) in his Manifesto of Transdisciplinarity summarizes the issue of our current knowledge: "*How is it that the accelerating proliferation of disciplines makes the unity of knowledge more and more impossible to even imagine? How is it that as the exterior universe becomes more known, the meaning of our life and of our death declines to insignificance, even absurdity. Must atrophy of interior being be the price we pay for scientific knowledge? Must the individual and social happiness that scientism first promised recede indefinitely, like a mirage? One hears that humanity has always been in crisis but that it has always found a means to escape. Formerly, that affirmation was true. Today, it amounts to a lie,*

because for the first time in its history humanity has the possibility of complete self-destruction, with no possibility of survival."

"Modern science was born through a violent break with the ancient vision of the world. It was founded on the idea—surprising and revolutionary for that era—of a total separation between the knowing subject and Reality, which was assumed to be completely independent from the subject who observed it. This break allowed science to develop independently of theology, philosophy, and culture. It was a positive act of freedom. But today, the extreme consequences of this break, incarnated by the ideology of scientism, pose the potential danger of self-destruction of our species" (Nicolescu, 2010).

A key process for future success is that the path from information to knowledge culminates with wisdom that enables correct action.

Regenerative development:

As discussed earlier, we are now entering an era where sustainable development is not any more achievable. We have degraded the planet to such an extent that the capacity of ecosystems to deliver the life supporting services as they have for millions of years is seriously compromised. We need to promote regenerative development.

Regenerative development has holistic approaches in its heart. This implies the true understanding Aristotle's quote that "*The whole is greater than the sum of its parts*." As discussed, it is not possible to solve complex problems with disciplinary approaches; we need to work with systems, with special emphasis on the interactions more than the components. In the Rio+20 declaration, in article 40, countries called for "*holistic and integrated approaches to sustainable development that will guide humanity to live in harmony with nature and lead to efforts to restore the health and integrity of the Earth's ecosystem*". Article 76(c) underscores "*the importance of interlinkages among key issues and challenges and the need for a systematic approach to them at all relevant levels*" (United Nations, 2012).

The origins of the concept of regeneration go back to J.I. Rodale who in 1942 used the term organic farming for a natural way of agriculture (Rodale, 1989) "*which seeks to save and rebuild soil worn out by conventional farming*" (Fowler, 1990). In the '80s, about the same time that the term 'sustainable development' became popular, his son Robert Rodale used the term *regenerative agriculture* for farming going beyond 'sustainable' (Rodale Institute, 2014) based on "*continuing organic renewal of the complex living system … as the basis for healthy soil and, in turn, for healthy food and healthy people"* (Mang, 2012).

In the early 80s in Central America, following the work of Howard Thomas Odum, Robert Hart started developing the concept of agroecosystems and systems analysis and quantification in order to better understand the flow of energy and other resources within a farm and within a region (CATIE, 1981). As part of the team under his guidance, we continued developing the farming systems concept and modeling of farming systems (CATIE, 1982) and started working on how to integrate multidisciplinary approaches to crop – animal farming systems (Müller, 1982) (CATIE, CARDI and Winrock International, 1982).

In 1994, John Tillman Lyle published the book "Regenerative Design for Sustainable Development" where he defines Regenerative Design as the "*means for replacing the present linear system of throughput flows with cyclical flows, consumption patterns and sinks*". He also states that a "*regenerative system provides for continuous replacement, through its own functional processes, of the energy and materials used in its operation"* and that "*Regeneration has to do with rebirth of life itself, thus with hope for the future*". Two years later Lyle publishes 'A practical guide to the theory and design of regenerative systems' (Lyle, 1996) stating that "*The blending of continuity and change – sustainability and development – will require approaches to reshaping the landscape quite different than those of the past two centuries*."

Foss (2012) gives in my understanding a clear insight: "*What it comes down to is that the principles of regenerative development can blow everything we've come to know about sustainable development right out of the water. The philosophy goes to the root cause of human imbalance with the planet, and offers a surprisingly fresh approach on how to reconcile this relationship. In its essence, regenerative development is centered around the idea that the earth can be healed and regenerated through human development. This recognition comes from the understanding that humans have always developed the places they've inhabited, and that many cultures throughout history have had symbiotic and sophisticated partnerships with the land that can come to be seen as mutually enhancing. The goal of regenerative development is to rekindle this wisdom, partner it within the evolutionary insights of modern science, and apply it to the development and regeneration of physical places*".

Mang (2012) defines Regenerative Development as *"a system of technologies and strategies for generating the patterned whole system understanding of a place, and developing the strategic systemic thinking capacities, and the stakeholder engagement/commitment required to ensure regenerative design processes to achieve maximum systemic leverage and support, that is self-organizing and self-evolving*".

Today several organizations are working with regenerative agriculture and animal production including Regenesis Group, Savory Institute, Regeneration International, Organic India, Alliance for Regeneration, just to name a few. Some other areas are also developed under the regenerative concept. Capital Institute (2017) published a '*Field Guide to a Regenerative Economy*' under the "*Regenerative Capitalism Framework*". More applications can be found in areas such as regenerative architecture (REGENARCH, 2017), building industry (Sblendorio, 2017) and even regenerative urban development (Woo, 2013) (Girardet, 2010).

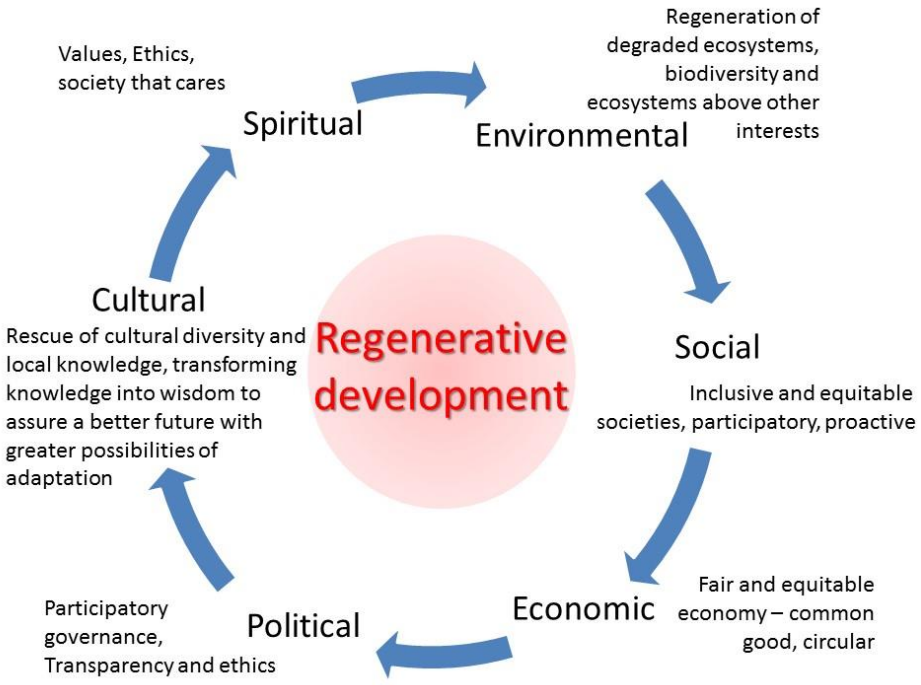
In my opinion, the use of the term regenerative development goes beyond just another definition. It is a new way of looking forward. Restoration ecology has to do with trying to get ecosystems back to the original state. With a rapidly changing planet, I believe we need to generate the capacity for ecosystems to achieve a functional status, which probably will be different than the original state. "…*regenerative development takes a different approach, by asking the question: How can we re-align human activity with the evolution of this ecosystem? How can humans be partners in that evolution?"* (Regenesis Group, 2015). Today it is known that indigenous communities have managed ecosystems for millennia (Levy Tacher, 2012) (Ford A. a., 2016) (Meggers, 1996) as will be discussed further on in this chapter.

At the University for International Cooperation (UCI) in Costa Rica, we started working on holistic approaches linked to biosphere reserves under the UNESCO-MAB program in 1994, where biodiversity conservation, development and, research and education have to be integrated in a territorial approach. In practice, the integration of social, economic and environmental factors – which was the basic concept for sustainable development in the early 90s – proved not enough to generate significant changes that would allow the biosphere reserve concept to be successfully implemented. We discovered that culture, policy and politics, and spirituality had to be contemplated. Culture and spirituality are very closely linked and provide the "glue" for societies, giving distinct identities to people from one country to another and even within regions of a same country. Politics and policy must be integrated and are a key factor, mostly due to permanent change in visions, interests and actions.

We must prepare for changes, by now it is clear the planet will never be the same again. We can regenerate ecosystems and make them productive again, develop more just economies that strengthen societies to make better choices in politics and bond together with stronger culture and spirituality. We do not have to reinvent the wheel; we can actually look how nature works and imitate it in our human world. "*Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies"* (Biomimicry Institute, 2016). "*To design regenerative systems we need to better understand both the bases of the regenerative capability of natural systems and how human systems can engage these systems in a manner that provides meaningful, useful, and health catalyzing interconnections"* (Eisenberg, 2003).

Implementing regenerative development:

In order to advance with the implementation of regenerative development we must reinforce the need for a holistic approach, integrating the following six processes:



- Functional regeneration of ecosystems and their services, supporting biodiversity and allowing life to continue thriving throughout the planet.
- Social strengthening which fosters community organization and development to be able to cope with adaptation to climate change and reduce sumptuous consumption patterns.
- A new paradigm for economic development where people matter more than markets and money, where entrepreneurship for youth is more important than employment, where economic development is promoted at all levels of society allowing for more opportunities to achieve better living standards.
- Conservation and valuation of living culture which is the necessary bond for community life, where local knowledge, values and traditions are shared within family, friends and the community as a whole, giving meaning to these terms.
- Rethinking and redesigning current political structures so they can reflect true participatory democracy without the influence of money and power and especially fostering long term vision and actions that seek increased livelihoods and happiness and not only gross income.
- And most importantly, fostering deep spiritual and value structures based on ethics, transparency and global well-being to allow humanity to live in peace with itself and Mother Earth.

These processes have to be looked upon as 'layers' or 'blankets' that fall onto a given territory. They are closely interlinked and cannot be dealt with using disciplinary approaches. There may be different sequences for action, according to local conditions and challenges. In one territory, land degradation might be limiting production and services, affecting the local economy and reducing social resilience. This then generates lack of governance, exclusion and crime. It will be difficult to work with the communities unless the ecological systems are regenerated, helping to reverse the process. In other places, for example with migratory movements as can be observed in the Peruvian jungle, where communities from the highlands are rapidly spreading through the Amazon region, the natural resource base is still present – though disappearing quickly, but the cultural attachment to this land is not present and people don't recognize the new territories as 'home'. I have witnessed difficulties in trying to get these communities to produce more sustainably; they do not value the land and live in a sort of 'transition' stage – when resources are out they move on to 'new' land. To work with these communities, social, cultural and spiritual approaches are needed in order for them to develop higher self-esteem, community bonds and solidarism.

The 'vertical' links between all six layers are multiple, in direction and strength. They are also dynamic, and change is now a constant, not an exception. We must re-educate professionals so they can go beyond their 'boxes' of knowledge and expertise. One of the most difficult aspects we have encountered is the process of 'unlearning'. We must 'erase' many of the traditional concepts and approaches that have been deeply embedded through a lifetime education. We need to remove the 'blinders' that have been placed, especially through higher education, much as the blinders that are put on horses to pull wagons, avoiding 'distractions'. The ever specialization process that professionals face today often limit the angle of view.

There are several modern tools that can be used to work with regenerative development, too many to mention here. Nevertheless, I would like to draw attention to one that has been very useful for us. We call it 'creative management'. Traditional management establishes goals through different planning processes and once the cycle is reached, we look back to see what we could accomplish and what not, and the reasons behind this. The big problem is that with permanent change, it is not practical to look back, instead we must look forward. Creative management is about looking into the future, using climate change and socio-economic scenarios. By selecting the best scenarios or the 'less bad' ones, we ask ourselves what has to be done in order to achieve them. This can give us a path that reduces risks by contemplating many different aspects that affect the outcomes of our choice, ahead of the action.

Socio-economic scenarios are being used in different fields. At UCI we have been working with the Future Scenarios Project (CCAFS-CGIR a, 2016) in the development and use of socio-economic and climate change scenarios in agriculture (CCAFS-CGIR b, 2016). In Honduras, at cross policy levels, with the help of scenarios, the country was able to make the climate adaptation policy more robust (CCAFS-CGIR c, 2016). We also used scenario-guided development of Costa Rica's Intended Nationally Determined Contribution (INDC) that was presented in Paris for COP20 (Veeger, 2015).

A good guide to the new leadership we need is presented by Scharmer and Kaufer (2014) in 'Leading from the Emerging Future'. "*The more dramatic the changes in our environment, the less we can rely on past patterns, and the more we need to learn to pay attention and tune in to emerging future opportunities.*" They further describe the 'blind spot' in global discourse: "*how to respond to the current waves of disruptive change from a deep place that connects us to the emerging future rather than by reacting against the patterns of the past, which usually means perpetuating them". "…responding from the emerging future requires us to shift the inner place from which we operate. It requires us to suspend our judgments, redirect our attention, let go of the past, lean into the future that wants to emerge through us.*

There is no standard procedure, no recipe, and every case has to be analyzed separately. The approach cannot be technocratic; the human component is of vital importance; any start has to be with the people. Different dynamics, workshops, practical projects and many others can be used. Working at the spiritual level with values, ethics and recovering cultural heritage can motivate a community for collective action. In the following paragraphs, I go a little more in-depth on the different 'layers'.

1. Functional regeneration of ecosystems and their services

Conservation efforts all over the world have generated success stories yet we are still losing the battle. We have been successful establishing protected areas, not so much managing them efficiently. We have tried to establish biological corridors, with a few successful sites. We see organic farming growing. The concept of watershed management has been around for several decades. But vast areas, both terrestrial and marine are already degraded and degradation continues.

In my opinion, the biggest challenge to be successful is interlinking all efforts with focus on the territory. We must regenerate diverse and functional landscapes that, as the biosphere reserve model from UNESCO suggests, has a gradient of uses that allow for *development through conservation*. The focus

should be on functioning ecosystems that provide services for all life, including human. This requires looking at the interactions within the system, more than the components of the system. It requires dynamic approaches since change is now permanent.

Functional landscapes require the integration of protected areas into the broader landscape and seascape, especially through connectivity conservation. There is enough knowledge and instruments to effectively achieve this. The ecosystem approach (EA) is defined as "*a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way*" and is the primary framework for action under the Convention on Biological Diversity (Convention on Biological Diversity, 2016). Sadly, the EA has not been broadly applied. Nature-based Solutions (NbS) are defined by IUCN as "*actions to protect, sustainably manage and restore natural or modified ecosystems, which address societal challenges (e.g. climate change, food and water security or natural disasters) effectively and adaptively, while simultaneously providing human well-being and biodiversity benefits*." NbS are a solid pillar for regenerative development, integrating different approaches at the landscape scale, including natural and technological solutions. These are site specific, and must be aware of natural and cultural contexts and more importantly, integrating science and local knowledge, producing equitable and fair societal benefits by fostering local participation and transparency while fighting climate change, both in mitigation as well as adaptation (Cohen-Shacham, 2016). Ecosystem-based Adaptation (EbA) is a very effective approach that incorporates biodiversity and ecosystem services as part of adaptation strategies to climate change. By enhancing crucial ecosystem services, it allows humans to develop management initiatives to reduce vulnerability (UNEP, 2016). Additional tools such as payment for ecosystem services or determining the total economic value of ecosystems and biodiversity may help with decision-making (TEEB, 2010).

The integration of different approaches should lead to a 'map' of land uses, clearly defining the gradient in the intensity of use, where areas with higher 'protection' can serve as seed banks for the regeneration of watersheds, connectivity conservation, and increased resilience to agricultural landscapes. These maps must be designed in a participatory manner with the local communities, since no one can better identify which areas could be set aside for natural regeneration and which areas can benefit from agroecological practices to increase productivity and livelihoods. Technical assistance and orientation are crucial, as long as they are transdisciplinary and holistic. Science should be brought down to the local knowledge complementing any gaps that may arise.

On the productive side, we need to shift away from traditional agriculture; especially chemical monoculture agriculture that has proven, as discussed earlier, not to deliver the expected results and the 'collateral damage' has risen beyond logical proportions. We know now that agro-ecological approaches are not only friendly to environment and human health but can increase productivity once life has been brought back into the soil. Significant mitigation opportunities are an increasingly important byproduct. A study conducted in 286 projects in transition to agro-ecology in 57 countries showed a 79 percent mean relative yield increase with positive side-effects in improving natural, social and human capital with an important mitigation factor as carbon sink with 0.35 t carbon per hectare per year (Pretty, 2006). Integrating organic or regenerative farming with nature has proven beneficial in both directions. Water resources are more resilient with functioning ecosystems, interlinking forests and

corridors with agriculture results in better pollination, lower temperatures and protection against pests. Fostering diversity is the key.

Soils are among the planet's largest carbon reservoirs and represent an important carbon sink. Increases in soil carbon aid in atmospheric CO_2 reduction (Hansen, 2013). "Carbon farming" has become a common term (Barth, 2016) (Toensmeier, 2016). Some scientists state that it could sequester from 10 percent (FAO, 2017) up to 40 percent of CO_2 emissions (LaSalle, 2009) while others say there is a limited potential (Sommer, 2014) (He, 2016). The use of indigenous knowledge (Dietmont, 2009) however shows that 5 percent more organic soil matter can be achieved by using traditional knowledge methods of ecological restoration (Levy-Tacher S. a., 2004) restoring soil fertility (Diemont, 2005).

The QUIVIRA Coalition states that in the USA, a two percent increase in soil carbon, produced by two percent of the population with a cost of two percent of the GDP would solve the CO_2, water and food problems with concrete experiences where soil carbon has doubled in less than ten years on a 500-acre organic operation near San Francisco, California (White, 2015). This was achieved by applying compost, no-till cultivation, seasonal rotation of sheep grazing and riparian area restoration. In Cuba, having been left without chemicals after the retreat of the Soviet Union summed with the commercial blockade, the need to feed the population triggered what is called today 'organoponic agriculture'. Soil beds are constructed using compost, often worm compost, and the use of drip irrigation. A variety of vegetables are planted together with certain patterns in order to avoid pests, using plants that deter insects along the outside of the beds, others plants such as sunflowers to attract ladybugs for pest control or aromatic plants that are avoided by insects. This very dynamic process enables large production of fresh vegetables all year around. There are close to 1000 hectares of organoponics in Cuba with over 4000 units. The national average is 23,9kg/m^2 (239t/ha) per year (Suarez, 2017). There are no post-harvest losses since produce is sold right at the farm, harvested on-demand.

Cattle are considered the most important producer of GHG emissions, especially through methane production, being responsible for more global warming than the transportation system (IPCC, 2014). I am not sure if these estimates are 'true' or could be biased by disciplinary and linear approaches. Holistic approaches seem to be providing evidence that restoration or regeneration of the world's grasslands can mitigate climate change. Sacks (2013) states that "*Grazing animals are the path to restoration of the world's grasslands, which has the potential to pull all of the legacy carbon out of the atmosphere and put it back into the ground where it belongs. And keep it there for thousands of years. It's a most convenient truth*". In the field, more and more farmers are achieving increased carbon capture in pastures through alternative processes. The Gilgai farm in Australia achieved this through careful stewardship, using cattle and sheep in one herd with rotational grazing, promoting the diversification of plants, going from 7 to 136 species, allowing wide access to nutrients (White, 2015). Teague et al. (2016) propose that "*with appropriate regenerative crop and grazing management, ruminants not only reduce overall GHG emissions, but also facilitate provision of essential ecosystem services, increase soil carbon sequestration, and reduce environmental damage"*. The Savory Institute's mission is to "*promote large-scale restoration of the world's grasslands through holistic management*" and has established a global network and compiled and curated a portfolio of peer reviewed documents and case studies (Savory Institute, 2016). In Costa Rica, under the Nationally Appropriate Mitigation

Actions (NAMA), sustainable systems for livestock management have been developed with the objective to reduce emissions from livestock production, which account for 30 percent of national emissions (Nama News, 2015). Since 2014, certified carbon neutral beef is readily available.

The following are quotes from EcoWatch (EcoWatch, 2015) that clearly define the status quo:

"*Industrial agriculture regards soil as merely a root-holding medium on which to apply petroleum products while manipulating genetics. Regenerative organic agriculture views soil as a holistic system, and understands the interconnected soil biology—teeming with the billions of bacteria and fungi that, along with earthworms and organic matter, indicate good health. Healthy soil yields healthy foods that, in turn, nourish a healthy society…Soil, not oil, is the wise path forward."*

"Tom Newmark, ex-CEO of New Chapter and co-founder of the Carbon Underground Project, has said it best: "Many NGOs view carbon and agriculture as the 'enemy.' The regenerative movement sees carbon as our friend, and agriculture as our natural ally to help our friend carbon return to the land. The challenge is that the enemies of all things natural, i.e., Monsanto, DuPont and Syngenta, are culture jamming in hope that the regenerative message won't go viral."

The mission of the Carbon Cycle Institute (part of the Marine Carbon Project) is "to stop and reverse global warming by advancing natural, science-based solutions that remove atmospheric carbon while promoting environmental stewardship, social equity and economic sustainability." The institute is also focused on carbon-cycle literacy, a form of savvy still greatly lacking in the general population, by educating and empowering people to make more informed choices and to demand that elected officials do the same.

Natural systems thrive because they are regenerative, but for regeneration to happen, we have to actively support Nature, avoiding any future damage and allowing degraded ecosystems to regenerate on their own or assist them in the process.

2. Regenerating functional societies:

The modern world has changed societal function significantly. When I was growing up, our playground was 'outside', where we would meet neighbors and invent many different games, be it running, on bike or swimming. Obesity was an exception; most kids were very fit. When TV became available, we were allowed one program a day on weekends. Lots of family time was spent playing table games in the living room. On weekends, a family outing to a riverside for picnics was frequent, often with more families coming together. Strong bonds were established. We knew our neighbors well and often organized social events jointly.

This setting is still around in a few places but is more and more challenged by modern life. Chats on WhatsApp have replaced conversations; we are overwhelmed with news and information, much of which we did not actually search for. Attention span has become shorter. The dynamics of day-to-day life do not allow for 'think time'. Purchasing new 'stuff' has replaced lasting happiness with short-term enthusiasm. Family outings are to the mall where kids are deposited at the movies or the food court to

consume junk food. Overweight from over consumption is a main issue throughout the population with huge consequences for kids.

Society has to find its track again. I do not think we need to go back to what we had, but we do need to strive for a social web that will make communities more resilient to challenges, be these in food, security, health, political or other. We do not need to restore societies; we need to regenerate them. We need to move to a stage of 'self-awareness' a state of deep consciousness, mindfulness, of active and inclusive participation in defining the future and evolving the present. We need to move from individualism to cooperation, where community rights are above individual rights. The concept of 'the commons' must take the front stage.

Social transformation will be accelerated by artificial intelligence, changing current jobs and ways of living. We might be evolving to a society where time to think and live are made available as work is taken over by robots. The most important principle to remember is that change is now the rule, not the exception, and it is happening fast, faster than the adaptive capacity of society as a whole. This might lead to another type of distortion, such as what happened with the economy, where a small percentage will 'own' the technological advances and have control of society – this has to be avoided! The best way is to educate and inform, establishing resilient and robust networks for cooperation and collaboration and above all, collective decision making, allowing for true democracy.

According to Pinchbeck (2015) "*To build a regenerative society based on resilience and plenitude, we require a strategic and tactical plan of action to transform our social system and culture. We can facilitate this shift in values by generating new, inspiring narratives that foster the necessary paradigmatic shift. Any plan for a rapid transition to a regenerative society must address the following three key areas: technical infrastructure, social structure, and cultural superstructure*".

Bauwens proposes a "*Commons Transition Plan*" based on the Good Living – Buen Vivir – experience originated in Ecuador. *"The emancipatory forces of the world urgently need to move away from the simple market/state duopoly and the false binary choices between 'more market' or 'more state'. As an alternative, we propose that we move to a commons-centric society in which a post-capitalist market and state are at the service of the citizens as commoners. While there are already substantial, if not thriving, social movements in favor of the commons, the sharing society and peer-to-peer dynamics, this is the first coherent effort to craft a transition program in which this transformation is described in political and policy terms".* This implies a transition to a social knowledge economy and society, a *"society and economy that functions as common pools of shared knowledge in every domain of social activity"* (Bauwens, 2016).

In the application of social regeneration, the main goal is to empower local communities in a way that they assume their own development instead of waiting for outside forces to do so. This means that everybody has to have a voice and this voice has to be heard. Voices also have to be informed, which requires capacity development, information and knowledge sharing, co-creation and permanent co-innovation. The final result has to be collective quality of life – a true state of well-being.

The concept of social capital has been used for many decades to describe different forms of relationships within civil society (Foley, 1997). It is often seen as the "*social relations that have productive benefits*" (Social Capital Research, 2004). The concept of social regeneration was initially used related to urban development (Ginsburg, 1999). Other initiatives in social regeneration have specific focus, such as health, education, community facilities, arts and culture, and family and child well-being (Oireachtas Library & Research Service, 2011) or are focused on social exclusion in deprived neighborhoods (Page, 2006). Some deposit the trust of regenerating society in technological innovation (Social Capital, s.f.).

In our holistic approach to regenerative development, we look at social regeneration as the advancement of a community or group of communities towards a more cohesive state where there is bonding and collaboration between people that have affinity but also and very importantly, the inclusion of people with diverse positions, in other words, full inclusion of all. I have experienced that even the 'enemies' within a group have contributions to make and not taking them into account usually means that whatever we are trying to achieve will not happen.

In working with social issues, a key step is to get a community to define a common vision or goal, something to look forward to. Looking ahead usually makes current differences less relevant, since future challenges are very similar for all, especially when threats such as climate change are taken into account. The Local Agenda 21 methodology (San Roman, 2003) for community strategic planning, often used at municipal level, has delivered good results over the past two decades. It consists on establishing a joint vision in all the different aspects that affect society but more importantly, in the dream, especially the collective dream that can be identified. To reach this stage it is highly important to have youth involved, which still have the ability to dream. In many cases, my experience tells me that adults will establish a vision that usually does not go beyond a list of current problems solved. Youth have the ability to develop more abstract dreams that involve quality of life, leisure, justice and transparency. After the vision is established, the community identifies the current situation, usually a set of problems or challenges that pose a burden to well-being. The key to this is what we define as the look through the 'mother-in-law eyeglasses'. This metaphor has to do with the critical look at the surroundings. Often, due to permanent exposure or slow changes, a community or individuals get used to a certain aspect and stop noticing it. Good examples are for example litter within the community, or sewer running alongside the road in open creeks or deteriorated facades of the buildings or run-down playgrounds and schools. It is important to get people to see their reality through these 'eyeglasses'. A good tool is handing them cameras or more recently just using their cell phones to take pictures of 'problems' that are shared among everybody.

The third step is establishing actions or projects to move from the current status to the envisioned one. These actions can be ranked according to requirements, be it complexity, time frame, requirement in human or financial resources or other aspects. Generally, a majority of the problems identified can be solved without significant resources and they should precede other efforts. Getting some of the problems solved allows empowerment, making it easier to solve more complex problems. Once the solution pathways have been identified, the community assigns people responsible and a time frame for making them happen.

Many different approaches have been developed and should be taken into consideration to find the best fit. Successful initiatives such as the Citizen Integration Platform (Plataforma de Integración Ciudadana, 2017), Community Social Planning (Clague, 1993), and many others can complement the process.

3. Regenerating the economic development model

In order to survive, humanity must rapidly shift its economic development model away from the linear economy, which is based on the 'take-make-dispose' economy that foresees that by 2020 about 82 billion tons of raw materials are expected to enter the economic system (Ellen Macarthur Foundation, 2013). The resulting ever-increasing rates of extraction and destruction of natural capital to produce goods and services is a clear symptom that the development model is still disconnected from the fact that the proper functioning of ecosystems are the base for life and for future economic and social well-being. In his book 'The Myth of Progress: Toward a Sustainable Future', Tom Wessels (2006) analyzes the difference between economic growth and economic development and how political leaders are trapped in a false paradigm, based on the belief that the solution to environmental problems is economic growth, when it is actually primarily responsible for today's environmental degradation, especially through the ever-increasing extraction of resources and waste generation. Responsible for this trend is a market society that has promoted an overconsumption of disposable products, many of which have planned obsolescence, which started in the automobile industry over 80 years ago (London, 1932) developed to force consumers to buy new products.

According to the World Bank (Hoornweg, 2012) world cities generate about 1.3 billion tons of solid waste per year, which is expected to climb to 2.2 billion tons by 2025. The vast majority of products are discarded without proper treatment. There are an equivalent of 50kg of copper 'above ground' per person worldwide, with 225 million tons of copper in global landfills and 850 million metric tons of iron in US landfills alone (UNEP, 2010). Plastic debris is accumulating in vast garbage patches throughout the oceans and significant amounts are converted into microplastics, affecting food webs (Cózar, 2015) and possibly human health (Galloway, 2015).

For significant change to occur we must start by changing the way we measure development, we must move away from Gross Domestic Product (GDP). GDP is "*a misleading measure of national success by measuring mainly market transactions while ignoring social costs, environmental impacts and income inequality*" (Costanza, 2014). Wessel identifies three mayor flaws in GDP: 1) Money spent to tackle social, medical, or environmental problems increases GDP, 2) Activities that don't involve exchange of money are not part of GDP and 3) An increase in GDP does not reflect equity and during the last decades has actually increased due to the exponential increase in the richest (Wessels, 2006). According to Anielski (1999), the GDP includes a "*litany of crimes against genuine progress*" in that it does not reflect inequality, it treats crime and family and social breakdown as economic gain while ignoring the value of housework, parenting and volunteering, it actually increases with environmental calamities, pollution and the repairing of damage, it does not include depletion and degradation of natural resources and the environment, war expenditures are an economic gain and ignores liabilities of living on debt. It is time to answer the question as to why we still use GDP to measure 'development'.

Alternative national income accounting systems have been proposed such as the Genuine Progress Indicator (GPI), which attempts to measure the total health and well-being of the economy, society and the environment (Anielski M. a., 2002) (Erickson, 2013). The Gross National Happiness (GNH) index was adopted by His Majesty Jigme Singye Wangchuck, the Fourth King of Bhutan and measures good governance, sustainable socio-economic development, cultural preservation, and environmental considerations (Inspired Economist, 2014). The Happy Planet Index (2016) multiplies life expectancy, well-being and inequality and divides the product by a measure of ecological impact. The Better Life Index, developed by the Organization for Economic Co-operation and Development (OECD, 2016) is based on 11 topics identified as essential in the areas of material living conditions and quality of life. The Social Progress Index has been widely adopted by European countries as well as Costa Rica. It is a global standard based on a range of social and environmental outcome indicators reflecting basic human needs, foundations of wellbeing, and opportunity (Social Progress Imperative, 2017).

In the search of new economic models, several different concepts have come up over the last decades, being the 'circular economy' one of the first to look deeper into how to develop closed loop approaches instead of linear open ones (Pearce, 1989). Again, the need of systems approach may explain in part, why it has not been mainstreamed. Vested interests, especially of the corporate sector, could also be limiting the adoption. The circular economy is inspired by Nature and its function. Already back in 1945, Kumarappa described five types of economies in nature: parasitic, predatory, of enterprise, gregation and service. The latter gives a solid base for the sort of economy that would have made sustainable development possible: "*The highest form of economy in nature is the economy of service. … It functions neither for its present need nor for its personal future requirement, but projects its activities into the next generation, or generations to come, without looking for any reward. Because of its mother love, it contributes disinterestedly, without desire to benefit personally. This comes nearest to what may be called a non-violent economy of permanence"* (Kumarappa, 1945).

A recent report (Ellen Macarthur Foundation, 2013) defines circular economy as *"an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models".* This report analyzes a vast array of benefits that can be obtained from a circular economy approach, especially the positive impacts on business, with net material cost savings in Europe alone of up to 3.9 percent of the European Union's GDP; the shift to a circular economy has begun.

The Capital Institute describes regenerative economy in the context of 'regenerative capitalism'. "*We can — and must — bring our economic theory and practice into alignment with our latest understanding of how the universe and our humanity actually work! The universal patterns and principles the cosmos uses to build stable, healthy, and sustainable systems throughout the real world can and must be used as a model for economic-system design*". The approach is based on the regenerative hypothesis that *"the universal principles that explain healthy energy flow networks in the real world can be applied to the design of human economies, and that the purpose of a Regenerative Economy is to promote and sustain human prosperity and well-being in an economy of permanence". "A Regenerative Economy maintains*

reliable inputs and healthy outputs by not exhausting critical inputs or harming other parts of the broader societal and environmental systems upon which it depends" (Fullerton, 2015).

"At this time, as we shift from the ten thousand year old and stable Holocene to the human-controlled and volatile Anthropocene, it is the logical evolutionary path of our economic system and the creative challenge of our age to usher in regenerative economies, bringing the human economy into holistic balance with nature and ourselves" (Fullerton, 2015).

Another dimension that must be mainstreamed to achieve regenerative development is what is called 'internalizing externalities' which means contemplating the true cost of Nature in economic evaluations. Today, even with all available information, global awareness and changing demands, the value of nature is still not adequately reflected in both political and economic decisions. Two decades ago, Costanza et al. (1997) estimated the average value of the world's ecosystem services and natural capital at US$33 trillion per year, while global gross national product was only around US$18 trillion per year. Using the same methods with updated data, global ecosystem services in 2011 were estimated at US$125 to 145 trillion per year with loss of ecosystem services due to global land use changes conservatively estimated between US$4.3 and 20.2 trillion per year (Costanza, 2014).

During the 90s, several initiatives looked into putting an economic value on ecosystem services to get economists and politicians to better understand the importance of conserving ecosystems and their functions. In Costa Rica, the National Forestry Financing Fund was established in 1995 "*to finance small and medium producers for the handling of processes of reforestation, forestation, greenhouses and agroforestry systems, and for the recovery of deforested areas and the necessary technological changes in the use and industrialization of forest resources*". Core funding is provided mainly from 3.5 percent of revenues from a sales tax on fossil fuels with additional revenue from the sale of carbon credits. This program has contributed towards the recovery of the forest cover in the country, going from 21 percent in the 80s to 53.4 percent in 2010 (REDD+ Costa Rica, s.f.). In 1996, four ecosystem services were recognized by law in Costa Rica (biodiversity, water, carbon fixation and scenic value). The first certificates for mitigation of GHG were sold in 1998 at US$ 10 per ton of carbon (Leiton, 1998). By 1999, payment for ecosystem service water was established (Barrantes, 1999).

Since then, technical studies and working groups have emerged in many places and even a global initiative 'The Economics of Ecosystems and Biodiversity' (TEEB, 2010) is focused on demonstrating the value of ecosystems to encourage policy makers to recognize and account for their value. The Global Partnership for Business and Biodiversity (CBD, 2016) is composed by a network of national and regional business and biodiversity platforms that allows sharing of information and best practices.

The 'Green Economy' was one of the two specific themes for Rio+20 summit in June 2012 having a focus on how countries can achieve green growth and low carbon economies (UNDESA, 2012). In spite of many endorsements, no true international commitments were achieved (Barbier, 2012). According to this author, "*in its final outcome document, The Future we Want, Rio+20 should have challenged the G20 to live up to its pronouncements on 'inclusive green growth' through endorsing and adopting concrete green-economy policy actions*", especially since the G20 comprise nearly 90 percent of the global GDP.

According to Gunter Pauli (2010) "*a Green Economy model has required companies to invest more and consumers to pay more, to achieve the same, or even less, while preserving the environment. While this was already a challenge during the heyday of economic growth, it is a solution that has little chance in a time of economic downturn. The Green Economy, in spite of much goodwill and effort, has not achieved the viability so greatly desired*."

Other alternatives seem more promising, such as Christian Felber's 'Economy for the Common Good', a holistic vision where success is measured in terms of human needs, quality of life, and fulfillment of fundamental values instead of the accumulation of money. There are 20 guiding principles; the third principle has to do with the replacement of GDP by the Common Good Product at the macroeconomic level while the Common Good Balance Sheet (CGBS) will replace the financial balance sheet for companies. There is a shift from competition and greed to collaboration and solidarity (Felber, 2015) (Economy for the Common Good, 2013).

The Blue Economy (Pauli, 2010) also lays the ground for innovative approaches to alternative economies. Pauli talks about Nature's MBA – 'Mastery of Brilliant Adaptations'. Learning from ecosystems to design new development strategies is the basis of regenerative development: "*Ecosystems offer tremendous inspiration for devising economic models capable of responding to the needs of all. Natural systems always change, always evolve. That is their power and their beauty. When we attend to nature's MBA, we can begin to understand how to integrate innovations into multifaceted models cascading nutrients and energy, supplying energy from integrated and renewable sources, designing structures that capture and utilize what is minute and transform it into what is grand, into networks that become so efficient that nothing is wasted and we have a net energy gain. If we observe nature, we see that ecosystems evolve towards ever-higher levels of efficiency and diversity thanks to contributions from all players. A Blue Economy addresses the issues of sustainability that go beyond mere preservation. A Blue Economy engages regeneration. We might say that the Blue Economy is about ensuring that ecosystems can maintain their evolutionary path so that all can benefit from nature's endless flow of creativity, adaptation, and abundance*." The Blue Economy book gives 100 examples of true alternative examples where both humans and nature benefit.

The Blue Economy embraces society and its emerging reality in a profound way. *"While the waste of material resources exemplified by modern landfills and incinerators is to be deplored, the waste of human resources is absolutely unacceptable. When the numbers of unemployed youth oscillate between 25 percent in industrialized countries and over 50 percent in the developing world, it is easy to imagine what it means to our global society if its leaders consider the next generation useless – or even worse, if the young and disadvantaged consider themselves useless. It is indicative of a system in severe decline, a society in extreme crisis, underscored by mounting statistics of violence, criminality, terrorism, drug abuse, illegal immigration, relinquished education, and the deplorable treatment of populations or communities already at-risk or underserved"* (Pauli, 2010).

In developing new economic models, we must focus especially at youth. In the past, most education focused on training young professionals for jobs, which were more growingly within the corporate world. Diversity will be the key for the future where small and local will have a huge role, implying that

we must develop the basis for entrepreneurship, giving youth the opportunity for generating their own 'jobs' which they can build through co-creation processes with youth from around the globe.

Business is called to play an active role in correcting the current development path. Corporate Social Responsibility, which in many cases does not go beyond philanthropy, will not produce the desirable results in the time frame required. We need companies to think and act differently. CEOs and shareholders must understand the impending urge for change but moreover business must know what to do and how. We must get Nature into business plans and business must clearly understand the most relevant challenges. It is our job to offer concrete solutions that will allow any business, independent of scope or size to be an active leader and promote the transition into a new developmental paradigm.

4. The cultural dimension

According to the Cambridge dictionary, culture is "*the way of life, especially the general customs and beliefs, of a particular group of people at a particular time*". The Universal Declaration on Culture defines it as a "*set of distinctive spiritual, material, intellectual and emotional features of society or a social group, and that it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs*" (UNESCO, 2002).

Culture is the bond of society; it is what differentiates one national from another and is built by customary beliefs, values, and social practices. It is a regenerative development 'layer' that is very intrinsically related to the other layers. "*If achieving sustainability is first and foremost about making an appropriate use of the planet's resources, then culture must be at the centre of our development strategies, since cultures frame people's relationship to others in their society and the world around them, including the natural environment, and condition their behaviours. Development initiatives and approaches which take local conditions and cultures into account are likely to result in more context-sensitive and equitable outcomes, whilst also enhancing ownership by target beneficiaries. Integrating culture into development policies and programmes, therefore, fundamentally contributes to their effectiveness and sustainability"* (UNESCO, 2016a).

According to UNESCO (2016b) "*No development can be sustainable without including culture. … From cultural heritage to cultural and creative industries, Culture is both an enabler and a driver of the economic, social and environmental dimensions of sustainable development*." Culture must be placed "*at the heart of development policy*" as a pre-condition for globalization processes to happen successfully (UNESCO, 2016c). "*Systematically integrating cultural specificities in the conception, measurement, and practice of development is imperative as it ensures the involvement of the local population and a desirable outcome of development efforts*" (UNESCO, 2016d). In 2005, the Convention on the Protection and Promotion of the Diversity of Cultural Expressions was adopted and has been ratified by 140 Parties (UNESCO, 2015). In 2012, at the Rio+20 Summit, in article 41, countries "*acknowledge the natural and cultural diversity of the world and recognize that all cultures and civilizations can contribute to sustainable development*" (United Nations, 2012).

Recognition of the importance of culture on sustainability is growing. 'Music and sustainability: organizational cultures towards creative resilience' (Kagan, 2016) offers a broad transdisciplinary review

of research at the intersection of music and sustainability where "*social experience and practice of music can contribute to the cultural dimension of sustainability in communities, organizations and society*". Kirchberg (2016) studies the relationship between arts, culture and artists to understand urban development. In Seoul, Korea, organizations have been working on "*the significance, role, and the future of the arts that generate a city's new potential and possibilities in economy, society, and community"* (Seoul Foundation for Arts and Culture, 2016). One of the most successful community development projects promoted by corporate responsibility in Costa Rica, Punta Islita, is based on art and entrepreneurship (Punta Islita Hotel, 2017)

Culture is in constant evolution as new technological advances, especially in communication, become available; new aspects are readily 'imported' into current culture. Cultural erosion is often tied to media and consumerism. The adoption of other values by a society has its consequences; when there is a detachment from traditional values and behavior through the quick adoption of foreign customs, the 'glue' to social relationships within the community gets weaker. I've been able to witness this especially with indigenous groups I have worked with in Nicaragua (Mayagnas and Miskitos), Panama (Emberá Wounan) and Costa Rica (Malekus). The younger generations grow-up wanting to have the latest cell phone and large pick-up trucks. The elders no longer are able to transmit the culture from one generation to another and in the end, the culture is totally lost and with it the traditional knowledge and the bond between Nature and livelihoods. This is not only true for indigenous groups. In Western Europe, migration from the countryside is threatening the 'natural landscapes'.

Over the years, cultural heritage has been revalued in many developing nations, especially in relation with tourism. Nevertheless, too often, it is just portrayed in pictures and postcards and even reinvented to more adequately fit tourists' tastes. You can find Panda bears and bold eagles in Andean and Emberá's handicrafts. You will find the same wooden frogs with a stick to rub the backs and make them croak all over the world. That is part of globalization, but just as biological diversity loss, cultural loss may diminish the possibility of developing new approaches to adaptation to climate change.

Culture and Nature are inseparable. Many 'natural' landscapes as we know them today have evolved due to human intervention through centuries, even in places we would not imagine. I would dare say that most landscapes with exception of Polar Regions are 'managed landscapes'. The Mayas highly modified the landscape according to their needs in what is called the 'Maya Forest Garden' (Ford A. a., 2009). Even the Amazon has had "*substantial pre-Columbian landscape modification in what is called 'coupled natural human systems'*" (Hechenberger, 2010).

This is known to science (Vitousek, 1997) but I think we need to embed it deeper into ecological education and specially in landscape approaches to conservation and development. It is well known that European natural landscapes have been shaped by humans over centuries. Many of the Spanish biosphere reserves are now in danger of losing these landscapes due to migration of younger generations to cities and the abandonment of traditional farming activities. The Alps are confronting much the same challenges and I've witnessed how cattle grazing has been substituted by government subsidized machine mowing in order to conserve 'natural' flora.

Ellis and Ramankutty (2008) have proposed the term "*anthropogenic biomes*" having characterized terrestrial biomes based on global patterns of sustained, direct human interaction with ecosystems. It is clear that the analysis of ecosystems and landscapes cannot be carried out ignoring human interaction, which has been the weakness in many traditional ecological studies. These authors state that "*Anthropogenic biomes point to a necessary turnaround in ecological science and education… Anthropogenic biomes clearly show the inextricable intermingling of human and natural systems almost everywhere on Earth's terrestrial surface, demonstrating that interactions between these systems can no longer be avoided in any substantial way*". The Ecosystem Approach is clear in setting the framework for action incorporating the human dimension (Convention on Biological Diversity, 2016). We need to get ecologists to work more in the human – nature connection than out in pristine areas.

Traditional knowledge's value in functional landscape management has finally been recognized. Local and indigenous knowledge management systems are fundamental. Scientists have come to realize that local people that grew up in the ecosystems are often the most knowledgeable about their functioning. In my perception, one of the great advantages of local communities, especially indigenous ones, is their holistic view. They look at the system beyond the components and it is the interactions that can maintain or regenerate a system. An interesting review of the contribution of traditional knowledge to ecological restoration can be found in an article published by Uprety and co-workers (2012). In the field, one of the most successful systematizations of indigenous knowledge has been led by Samuel Levy-Tacher and his team working with Manuel Castellanos and the Lacandon community in Mexico (Douterlungne, 2010) (Levy-Tacher S. a., 2005) (Diemont, 2005). The potential for regenerating degraded and abandoned lands overrun by bracken fern and, their turnover to productive ecosystems with high carbon capture and increased soil rebuild is exceptional. This team has gone beyond documenting the experiences, they have actually analyzed the predictive capacity of indigenous knowledge and its usefulness in restoration of ecosystem function (Levy-Tacher S. a., 2004).

An important aspect of working with local people is that we need to bring science to local knowledge. Climate change for example is not embedded into many traditional knowledge systems. Generally, the opposite occurs, when researchers study local knowledge to 'take it back home'. I have heard renowned scientists affirm that they are 'experts' in local indigenous knowledge, after spending only a couple months within a community. In my experience, this superficial understanding leads to communities not wanting to interact with scientists and I have witnessed how they give wrong information on purpose.

5. The political realm

Over the past decades, both national as well as global politics have been increasingly engulfed by powerful corporate sectors and other interest groups. The oil industry knowingly lobbied for decades to keep the status quo, rapidly deepening the climate crisis. Corruption scandals pop-up all over the globe and show how interests of a few are capable of making rapid deterioration and suffering of millions for short term profit. We see companies in mining, pharmaceuticals, seeds and pesticides, construction and many others 'influencing' government. Additionally, recent nationalistic movements are also challenging many globalization trends that were promoted by the 'West' for many decades.

As population and consumption increase, current jobs are lost to robotics and artificial intelligence, resources get scarcer, and food and water production and distribution are more affected by climate change, we will be facing increasing levels of unrest and ungovernance. Reinventing politics and policy making is now urgent.

For politics and policy to change, we need to inspire and educate politicians, we need to work close to them and influence their decision-making. This involves all layers of regenerative development. To reduce corruption, we need to strengthen ethics, values and promote transparency. The Internet has allowed us to follow many political decisions; we now need to use it to influence decisions.

We urgently need a new generation of politicians. Young people are mostly wary of politics and few want to get involved and even less, actually do it. Nevertheless, more and more are active in changing the way of life. Youth movements are popping up everywhere in the world advocating for alternative transportation, bicycle lanes, organic foods, and greener cities. We need to strengthen their abilities and competences and generate a wave of new young leaders to effectively change the status quo.

A few decades ago when media was controlled by powerful sectors, often aligned with government, achieving changes required strong civil participation, often ending in violent protests. Today, social media allow interest groups to come together quickly, often for short term actions. Examples are the Indignado movement in Spain, the Arab Spring, or recent anti-Trump protests. Social networking can overthrow governments, but alone, will not build democracies.

After the fall of several North-African governments, the lack of well prepared, especially young people, that could step in and establish 'new' governments, left a vacuum that ended up in what was called the Arab Winter. We need young people to actively participate in designing their future and not only getting involved for a few minutes every 4 to 6 years for casting a vote. Social media can make this happen but we also have to be aware of social media manipulation and disinformation and how artificial intelligence is starting to achieve this. In any case, social media will for sure have a large role in the future, influencing politics.

Our focus must not be limited to country politics. Local governments are crucial for landing regenerative landscape approaches and adaptation strategies. This is a great challenge because often, people who take office at local level (and some at national level) are not well versed in many issues and especially not in complex issues such as climate change. Rotation of staff is another great challenge. Nevertheless, land-use planning happens at the local level though often overridden by higher interests at national or regional level.

6. The spiritual element

In order to move to regenerative development, we need a change in consciousness; the reestablishment of a deep connection between humans and Nature. This is only possible if we are capable of looking beyond our exterior and strengthening our inner-self. For this to happen, we have to open our hearts and minds and this requires a sense of spirituality. We must pursue a higher value system for our behavior, *"…integrity, ethics, caring, and sharing lead to socially vibrant communities and healthy economies – while at the same time making perfect practical and scientific sense*" (Fullerton, 2015).

"On the spiritual level, the consequences of scientism have been considerable: the only knowledge worthy of its name must therefore be scientific, objective; the only reality worthy of this name must be, of course, objective reality, ruled by objective laws. All knowledge other than scientific knowledge is thus cast into the inferno of subjectivity, tolerated at most as a meaningless embellishment or rejected with contempt as a fantasy, an illusion, a regression, or a product of the imagination. Even the word 'spirituality' has become suspect and its use has been practically abandoned" (Nicolescu, 2010).

Spirituality is essential in human life, even in that of scientists. In the Western academic world, as mentioned earlier, whenever the importance of spirituality in modern education is brought up, I usually get the reply: "*How can you measure it?" "How can you evaluate if students are 'learning' spirituality". "If you cannot measure it, what's the point in 'teaching' it?"* Many years ago while participating in the drafting of the Madrid Action Plan as part of my work at the Man and Biosphere International Advisory Committee, when I insisted on including spirituality as one of the main factors in the conservation and development realm, a prominent scientist stood up and said "*To make you happy, we might as well put a church and a mosque in every biosphere reserve!*" Clearly, there is still confusion between spirituality and religiousness.

"*Despite its importance, development literature and development practices have systematically avoided the topic of spirituality. This avoidance results in inferior research and less effective programmes, and ultimately fails to provide participants with opportunities to reflect on how their development and their spirituality will and should shape each other.*" (Ver Beek, 2000). I personally believe that the 'mess' the planet is in, especially in terms of global change and current geopolitics, is a result of the lack of spirituality, resulting mainly through blind belief in technological and technocratic approaches. This is for me the main difference between United Nation's Sustainable Development Goals (United Nations, 2014) and the Pope's Encyclical Letter *Laudato si*' (Francis, 2014) and being a very strong advocate of the SDGs, I consider Laudato si' the most powerful guide to confront current and future challenges. The Pope's bold statements are clear throughout the detailed analysis of our current situation. "(14) *I urgently appeal, then, for a new dialogue about how we are shaping the future of our planet. We need a conversation which includes everyone, since the environmental challenge we are undergoing, and its human roots, concern and affect us all. The worldwide ecological movement has already made considerable progress and led to the establishment of numerous organizations committed to raising awareness of these challenges. Regrettably, many efforts to seek concrete solutions to the environmental crisis have proved ineffective, not only because of powerful opposition but also because of a more general lack of interest. Obstructionist attitudes, even on the part of believers, can range from denial of the problem to indifference, nonchalant resignation or blind confidence in technical solutions. We require a new and universal solidarity.*" … (15) "*I will then attempt to get to the roots of the present situation, so as to consider not only its symptoms but also its deepest causes. This will help to provide an approach to ecology which respects our unique place as human beings in this world and our relationship to our surroundings. In light of this reflection, I will advance some broader proposals for dialogue and action which would involve each of us as individuals, and also affect international policy. Finally, convinced as I am that change is impossible without motivation and a process of education, I will offer*

some inspired guidelines for human development to be found in the treasure of Christian spiritual experience."

The Earth Charter is another powerful instrument that I have been using in education and community work, having been able to take part in the initial discussions at the Rio+5 meeting in 1997, though the final launch was on June 29th 2000. It is the largest cross-cultural dialogue carried out by civil society. "*The Earth Charter is an ethical framework for building a just, sustainable, and peaceful global society in the 21st century. It seeks to inspire in all people a new sense of global interdependence and shared responsibility for the well-being of the whole human family, the greater community of life, and future generations. It is a vision of hope and a call to action*" (The Earth Charter, 2000). The preamble leaves it clear "*We stand at a critical moment in Earth's history, a time when humanity must choose its future. As the world becomes increasingly interdependent and fragile, the future at once holds great peril and great promise. To move forward we must recognize that in the midst of a magnificent diversity of cultures and life forms we are one human family and one Earth community with a common destiny. We must join together to bring forth a sustainable global society founded on respect for nature, universal human rights, economic justice, and a culture of peace. Towards this end, it is imperative that we, the peoples of Earth, declare our responsibility to one another, to the greater community of life, and to future generations."*

The final paragraph summarizes what regenerative development seeks: "*Let ours be a time remembered for the awakening of a new reverence for life, the firm resolve to achieve sustainability, the quickening of the struggle for justice and peace, and the joyful celebration of life*."

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