



Energy's lost weekend



Nothing
as it seems



Climate change
forces virus migration



Design a doughnut-shaped city:
a change-proof approach



Methanol:
from grim to green



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The environmental challenge was one of three main themes of the 2008 Olympic games in Beijing (China). Photo credit: Nico Villanueva

Nothing as it seems

GIANNI SERRA
ONE

One of the most unexpected gifts of the Covid-19 lockdown: after nearly half a century the Himalayan peaks are visible from Nepal's Kathmandu valley, 200 km away. Those mountains are an unprecedented sight for young people, and a forgotten one for the eldest, used to living with a grey sky obscured by traffic smog and factory fumes.

Last June, for the first time the Indian Ministry of Earth Sciences (MoES) in its report "Assessment Of Climate Change Over The Indian Region" correlated the 1901-2018 average temperature increase to the greenhouse effect. In comparison to recent decades (1976-2005), they are projecting a national average temperature increase of 2.7 degrees Celsius in the best scenario, 4.4 in the worst.

In Western countries, India is often portrayed, together with China, as the main obstacle to achieving the 2015 Paris Agreement's goals. Any effort made by Europe or the US is bound to fail due to Chinese and Indian policies on coal and other fossils. A typical refrain that does not help to fix the problem, but seems designed to justify more deregulation, and fewer ties for the West once again.

Yet in the ranking of the Climate Action Tracker (CAT), which measures countries' degree of fulfilment of their commitments made in the Paris Agreement, we see that behind Morocco and Gambia, the only two nations capable of carrying out a CO₂ emission reduction program consistent with the 1.5-degree scenario, there is India. According to the CAT, the Indian government is carrying out a plan compatible with a 2 degrees increase, thanks to a steady rise in the share of renewable energy sources. A figure that can be improved, but still remarkable when compared to notoriously virtuous countries such as Norway and New Zealand, which are in line with the 3-degrees scenario. Even worse are China, Japan, Russia, Ukraine, the USA, Saudi Arabia, Turkey and Vietnam, whose commitments are well above the 4-degrees scenario. But if you think India should be toasted as the new unexpected environmental champion, then the latest World Air Quality Report from IQAir informs us that six Indian cities make up the world's ten most polluted urban areas. Data which seems more coherent with the wall of grey clouds surrounding the Himalayas. But even within this list we struggle to find consistency. Pakistan (three towns) and China (one) complete the air pollution top 10, and 48 Chinese towns make the top 100, whereas Beijing has dropped out of IQAir's rankings of the top 200 most polluted cities, and it has been hailed as a model by the UN Environment Program - PM_{2.5} levels in Beijing have diminished for seven years in a row. Beijing's air quality turnaround is maybe the best and most surprising legacy of the 2008 Olympic games, which proved that everything could be changed. Conflicting messages that do not allow to reach a quick verdict on any country or on any situation.

The proliferation of independent organisations providing data, analysis and rankings deserves credit and praise. Paradoxically, rather than giving one larger and unique picture and reinforcing the adoption of global policy goals, the abundance of data is favoring increasingly individualistic choices on climate, with each nation using statistics that are the most convenient to justify its choices and counter criticism from abroad. Even the exceptional images of the Himalayas or the crystal clear waters in the canals of Venice – rather than stimulating a more determined claim for change, innovation, protection of the environment – are used by those who deny or ridicule the climate issue to highlight nature's ability to fix any human-made damage in a couple of weeks. Any claim, even the most flawed, finds useful statistics – a peculiar law of evidence, not trustworthy at all. **ONE**

Energy's lost weekend

With most countries imposing some form of lockdown on their economies, the dramatic fall in energy consumption worldwide has been likened to a 'prolonged Sunday' by the International Energy Agency.

TOBY LOCKWOOD

ONE

The coronavirus pandemic is first and foremost a health crisis, but it will have long-lasting effects on most areas of the global economy, not least the energy sector. With most countries imposing some form of lockdown on their economies, the dramatic fall in energy consumption worldwide has been likened to a 'prolonged Sunday' by the International Energy Agency. In its *Global Energy Review* released in April, the IEA forecast a 6% contraction in energy demand for the whole year – the largest ever in absolute terms, with oil demand down by up to 9%, coal by 8%, and gas by 5%. Renewable sources of power on the other hand, are expected to weather this storm rather better, having already seen slight growth in output despite the falling demand for electricity.

These contrasting fortunes have provoked numerous headlines on the death of the fossil sector, aided by eye-catching records such as the UK recently passing two months without using any coal power. Renewables are faring well during this period of low demand as they have no fuel cost and therefore tend to be dispatched first to the grid – this priority is often also a regulatory requirement. Generators operating at the margin are the first to lose out and, in Western Europe and North America, that increasingly means coal plants.

In the USA, the shale gas revolution has driven gas prices down enough to make gas power cheaper than coal power, while carbon prices have helped tipped the balance

in gas's favour in parts of Europe. However, the decline of coal in the West is not a new trend, and its fading economic viability in these countries should not be extrapolated to elsewhere in the world. Coal's future will be decided in Asia, where the picture is more nuanced.

Even in China, renewables have bucked the trend and seen growth for the first quarter of 2020, whereas thermal power output declined by over 7% compared to the same period last year. But a recent report by Kevin Tu for Columbia University's Center on Global Energy Policy provides a more sobering outlook for those hoping for signs of a universal shift away from coal. China's 14th five-year plan – set to be finalised early next year – was seen as a crucial juncture at which China could upgrade its climate ambitions from the modest commitments made under the 2015 Paris Agreement.

Currently, the country aims to reach peak CO2 emissions by 2030 and reduce the carbon intensity of its economy by up to 65% (from 2005 levels) by the same date. Since Paris, Tu notes that climate change has become less of a priority for China, as policy pressure from the US has been

replaced with a damaging trade war. Now coronavirus has taken centre stage, the key UN climate meeting planned for November 2021 is postponed, and the chances of positively influencing China's climate ambitions in the 14th five-year plan are weakened. Despite the fact that

Despite the fact that China currently has excess coal capacity, with power plants operating on average for only around half the year, investment in new plants remains enormous relative to any other country. In spite of the pandemic, nearly 10 GW of new coal plants were approved in the first quarter of 2020.

Photo credit: Simon Robben from Pexels



China currently has excess coal capacity, with power plants operating on average for only around half the year, investment in new plants remains enormous relative to any other country.

The 13th five-year plan placed a 1100 GW cap on total coal capacity, but there are calls in the industry to raise this to 1300 GW for 2030 and, in spite of the pandemic, nearly 10 GW of new coal plants were approved in the first quarter of 2020. In the report, Tu suggests that China could increasingly turn to its own abundant and affordable coal as the go-

vernment seeks to stimulate an economic recovery while entrenching its stance on energy independence.

The latest frontier for coal power is in South-East Asia, where many countries have bold plans for coal power expansion; here too, there is little indication that the pandemic will bring about a U-turn.

Most of these economies are more fragile than China's, and leaders may be even more likely to see coal power projects – particularly where linked to domestic mining – as a less risky

A thermal power plant in Lengshuijiang, Hunan, China.
Photo credit: Huangdan2060



economic boost than an acceleration in the green transition.

On the other hand, several countries across the region had already started delaying overly ambitious power expansion plans in the face of looming overcapacity, largely due to overestimating demand growth. In the face of a global recession, that trend is likely to continue, but may hit power projects of all stripes.

How governments plan to spend their way out of the inevitable coronavirus recession is undoubtedly the critical issue for

climate change mitigation worldwide. While the global financial crisis of 2007 saw some bright spots for renewables in stimulus packages, it is widely regarded as having set back investment in clean energy as many governments shifted priorities, reigned in spending, and carbon prices collapsed.

This new crisis may well see a renewed determination to redesign the economy on low-carbon principles in developed economies, but it is much less certain that emerging economies will take the same pathway. After our enforced 'Sunday', will it be business-as-usual on Monday? **ONE**



Design a doughnut-shaped city: a change-proof approach

EUSEBIO LORIA

ONE

How can cities become socially just and secure homes for people while respecting the health of the planet in a post-pandemic world? Is protecting the population incompatible with the environment and social justice? Part of the answer can be found in a "doughnut", a tool for sustainable development based on a holistic approach that balances social and ecological aspects, both locally and globally.

The basic idea of the doughnut model is simple. There are two circles: a larger one on the outside representing ecological boundaries, and a smaller one in the middle delineated by social barriers.

The inner ring represents the basic needs and the twelve dimensions that define the minimum standard of living, according to the social priorities established by the United Nations' Sustainable Development Goals (SDGs). They range from food and clean water to housing, sanitation, energy, education, health care, gender equality, income and political voice. No one should be left in the hole of the doughnut below the "social ceiling". The basics for a living should be there for all.

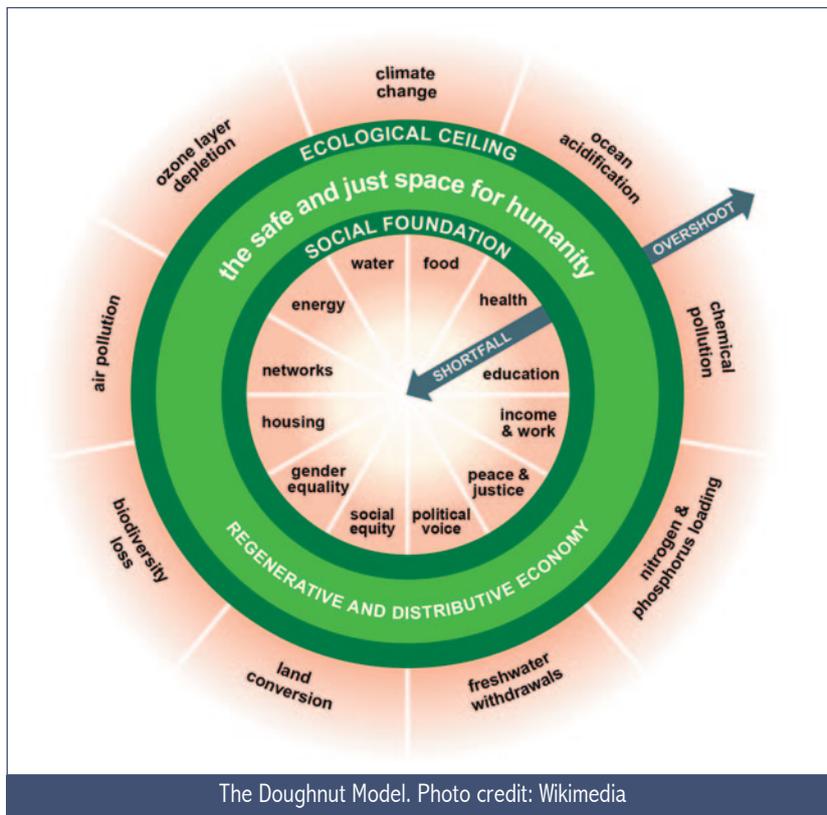
The large circle represents the planet's capacity, which is ideally self-sufficient. It includes the ecological goals (nine

planetary boundaries), developed by environmental scientists in a study published in *Nature* in 2009 (A safe operating space for humanity, Rockstrom et al.), to preserve a stable climate, fertile soils, healthy oceans, a protective ozone layer, plentiful freshwater and abundant biodiversity on earth. For each ecological system, there is an "environmental ceiling" beyond which massive and irreversible changes may happen. Between the rings, there's the good stuff: the real doughnut, where people's needs are met, is "an ecologically safe and socially just space in which humanity can thrive".

Wellbeing depends on enabling every person to lead a life of dignity, health and opportunity while safeguarding the integrity of Earth's life-systems. Climate change, ocean acidification, and biodiversity represent the front line of this battle. All countries must develop policies that lie in between the two circles. A balanced economy should never exceed the bounda-

ries, otherwise social and economic deficiencies will reproduce inside the doughnut and emergency situations will develop for the planet outside.

Amsterdam is the first city to test the doughnut economics model, as it emerges from the coronavirus emergency.



The large circle represents the planet's capacity, which is ideally self-sufficient. It includes the ecological goals (nine

While striving to keep citizens safe, the Dutch municipality with the help of Kate Raworth, a senior researcher at Oxfam and also the creator of the doughnut model, planned the city's restart in a post-Covid-19 world.

The capital of the Netherlands has the chance to inspire towns, villages, and neighbourhoods to take such a holistic approach, as they begin to re-imagine and re-shape their own futures. It's a balancing act and, just like for climate change, there is no single, targeted solution that provides self-sufficient, safe, comfortable and healthy living spaces. The problem cities have to face is much larger and systemic than COVID in the air. It is not only an environmental but also an urban planning problem and includes social and economic indicators of city life.



Kate Raworth is British Senior Researcher at Oxfam GB, economist of the University of Oxford's Institute for Environmental Change and author of the book, *Doughnut Economics*. Photo credit: Arbeid & Milieu

On April 8th, 2020, there was the launch of the Amsterdam City Doughnut initiative, which downscales the global concept of the doughnut to city size and turns it into a tool for transformative action. Amsterdam deputy mayor, Marieke van Doorninck, told *The Guardian* newspaper that this approach could help the city overcome the impact of the coronavirus crisis: "It might look strange that we are talking about the period after that but as a government we have to..." she said. "It is to help us to not fall back on easy mechanisms."

The Dutch capital is a great place for launching the project because it has already placed the doughnut at the heart of its long-term vision and policymaking (see Building blocks for the new strategy-Amsterdam Circular 2020-2025). It also hosts the Amsterdam Donut Coalition, a network of inspiring change-makers who are already putting the doughnut into practice in their city.

But what's going on in the rest of the world? Nations, cities, neighbourhoods and households are living through a historically unprecedented time, collapsing under Covid-19 pressure and facing non-linear and irreversible consequences. COVID-19 placed many things on hold, giving breath to the climate, but also exacerbated existing problems. The fight against climate change seems to be overshadowed by the pandemic and global economic crisis.

On the other hand, Covid was not only a health emergency, but also a social, political and humanitarian crisis, and cities have immense potential to re-shape humanity and to drive the necessary response in balance with the planet. There's an urgent need to oppose the potential longer-term effects of the lockdown on the global economy and to accelerate deadlines for a real Sustainable Development of countries and cities.

"We simply cannot return to where we were before Covid-19 struck, with societies unnecessarily vulnerable to crisis. We need to build a better world" said António Guterres, United Nations Secretary-General. The Doughnut model is a happy but also uncompromising approach to meet this challenge. It sets a vision for an equitable and sustainable future.

In the 20th century, the economy followed the goal of growth, leading to social inequality and ecological collapse. On the one hand, economic growth led to poverty reduction, better health, technological innovation, and (local) environmental improvement. On the other hand, it pushed the environment into the "red-alert zones".

The doughnut model doesn't allow economic growth and prosperity to be a goal in itself. The aim is to thrive rather than to grow, and to improve humanity's quality of life while preventing the ecological limits from being overcome.

After Covid-19, we need a social perspective that shapes - by design - inclusive, equitable, sustainable and healthy economies. Only then humanity will be brought into the doughnut.

Raworth insists there has never been a better time to adopt the doughnut. "The world is experiencing a series of shocks and surprise impacts which are enabling us to shift away from the idea of growth to 'thriving'. Thriving means our wellbeing lies in [the] balance. We know it so well in the level of our body. This is the moment we are going to connect bodily health to planetary health". Once the health crisis is over, we cannot let business-as-usual practices lead the way once again. **ONE**

Methanol: from grim to green

Used as feedstock for thousands of everyday products and characterised by a fast-growing market, methanol can now be widely produced from renewable sources and become a clean energy carrier, giving rise to the "Methanol economy" proposed in 2005 by the Nobel prize winner George A. Olah.

ALBERTO PETTINAU

ONE

Isolated for the first time in 1661 by the Irish chemist and physicist Robert Boyle from the distillation of boxwood, methanol (or methyl alcohol) was originally produced from biomass via pyrolysis. And the original name itself, the French word "méthylène" proposed by Jean-Baptiste Dumas, includes the Greek word *ύλη* (hyle), which means wood, forest, suggesting – according to today's terminology – its "renewable" nature. But, despite its name, since the late 20s of the last century, methanol has mainly been produced from natural gas and, especially, from coal via gasification processes.

Renewable methanol

Methanol represents the past and the present of the chemical industry. But mainly the future. In April 2005, the Nobel prize winner George A. Olah published an essay titled "Beyond oil and gas: the methanol economy", where methanol was proposed as the fuel of the future, capable of feeding zero-emissions internal combustion engines and fuel cells.

With several advantages over hydrogen, including higher density and easier transport and storage, methanol can make use of conventional infrastructure for its distribution. Most importantly, Olah's methanol economy would need to be based on renewable methanol instead of the fossil-derived form it mostly takes today.

Green is the colour

How is this possible? The original production method via biomass pyrolysis is feasible for small-scale production. But new technologies allow CO₂ (captured from power generation or industrial plants, or directly from the atmosphere) to be used as feedstock, together with hydrogen from renewable sources. This is a clear example of the circular economy, enabling carbon dioxide to be recycled as a green product that can replace the corresponding fossil-derived chemical, with a net reduction of greenhouse gas emissions. Instead of being a problem, CO₂ becomes a resource. But there is a significant additional advantage of green methanol: its capacity for

energy storage. The recent diffusion of intermittent renewable sources (i.e. solar and wind power) raises several issues relating to the stability of the electricity grid, since power generation is governed by weather conditions, independent of demand.

Today, batteries represent the easiest way to store electricity, making it available when and where it is required. The easiest, but definitely not the cheapest nor the cleanest! The overproduction of renewable power (some 480 TWh per year in Europe) could instead be used for the production of green methanol (through hydrogen), as chemical energy storage.

Where are we now?

A first commercial-scale application is already operating: since 2011, Carbon Recycling International (CRI) has produced some 4,000 tons per year of green methanol in the "George Olah Renewable Methanol Plant" near Reykjavik, in Iceland. CRI's technology is expected to be suitable for large-scale production plants (up to a nominal production capacity of 100,000 tons of methanol per year) in just a few years.

Several projects are under development in Europe and China, also for medium and small-scale applications: the European MeCO₂ project is testing the technology in a pilot unit (with a capacity of 1 ton of methanol per day) to study its possible use at various scales, from 4,000 to 50,000 tons per year. Following these successful projects, in 2018 Thyssenkrupp launched the Carbon2Chem® technology centre in Duisburg, Germany, as the first application of methanol (and ammonia) production from CO₂ captured from the steel industry. A pilot unit is expected to be commissioned in 2020, and an industrial-scale plant will be established by 2025.

If, a few years ago, green methanol was hardly competitive with the fossil-derived alternative, now the situation is different. Costs are falling, and opportunities are growing. Green methanol can also be used as a renewable fuel for heavy-

goods transportation, with a significant contribution in terms of greenhouse gas emissions reduction. Today, the shipping and aviation sectors are mainly based on fossil-derived fuels, with more than 300 million tons of CO₂ emitted every year in Europe (according to the data published by Eurostat and the European Environmental Agency). Green methanol can help to decouple this sector from fossil fuels.

The way was opened by the Swedish shipping company Stena Line in 2015 when the "Stena Germanica" ferry was modified to be fed with green methanol. Several companies are launching similar initiatives.

A fast-growing market

The international methanol market is currently going through a phase of huge expansion, with a worldwide production estimated by the Methanol Institute as about 110 million tons per year and a daily demand of 200,000 tons: a global industry that generates \$55 billion each year with over 90,000 jobs.

Methanol is now widely used in the chemical industry for the production of thousands of everyday products: construction materials, foams, resins, plastics, coatings, polyester; a countless number of pharmaceutical products, and many more. And, more recently, as a clean fuel or as an energy carrier for the production of other fuels, including gasoline.

The final challenge

The challenge now is to make green methanol fully competitive to boost its commercial diffusion in place of fossil-derived

methanol. Advanced materials and new concepts have been recently proposed to capture CO₂ from power generation and industrial plants or directly from the environment. A key role can also be played by novel technologies for hydrogen production from renewables that are expected to become competitive in 5-10 years.

And, last but not least, further optimisation of the CO₂ hydrogenation process – at the core of green methanol production – is required to improve both conversion efficiency and plant flexibility. New technologies, such as solid oxide electrolyser cells (SOEC) are under development to enable cheaper and more flexible hydrogen production. But the most critical role will be played by optimisation of the catalyst materials needed to accelerate the key reaction between CO₂ and hydrogen. Currently, most of the CO₂-to-methanol units use conventional copper-based catalysts developed for methanol synthesis from syngas, capable of combining low costs and high activity - a measure of how much the catalyst increases the reaction rate.

Several specific solutions for CO₂ hydrogenation have been recently proposed to maximise both the carbon dioxide conversion and the selectivity of the catalyst. The Sardinia-based Italian company Sotacarbo has developed the recently patented "Actirem" catalyst, based on copper and zinc oxides and designed to combine two innovative methods. It brings together a high conversion efficiency, tolerance to oxygen, and a stable activity without any pre-treatment, as well as significant advantages in terms of cost and safety. It took some time, but Boyle's seeds are finally sprouting more than ever. 

Stena Germanica moored in Kiel harbour.
Photo credit: Ein Dahmer



Investors' role in a carbon-neutral 2050



AMANDA WHITE
Top1000funds

Internationally only a handful of pension funds have committed to achieving net-zero emissions by 2050 and have developed an approach to achieving that goal. In July last year, the Governor of New York State Andrew Cuomo passed the Climate Leadership and Community Protection Act which sets out ambitious climate plans including net zero emissions by 2050.

The pension fund for the state's workers, the \$210 billion New York Common Retirement Fund has a long history of addressing climate change in its portfolio and has been ranked by the Asset Owners Disclosure Project as third in the world, and number one in the US, in addressing climate change-related investment risks and opportunities. (Sweden's AP4 and the French sovereign wealth fund, FRR were ranked first and second).

The state comptroller, Thomas DiNapoli who is the sole trustee of the pension fund, has made addressing climate change risks and opportunities a priority for the fund. Following the recommendations of a Decarbonisation Advisory Panel, set up by Cuomo and DiNapoli to advise the fund on a path forward, the fund's 2019 climate action plan outlines action including identification and assessment, investment and divestment as well as engagement and advocacy.

One of the panel's recommendations was for a specific climate-focused program and resources for such an effort. The fund has since committed to creating a formal, multi-asset-class Sustainable Investment-Climate Solutions Program (SICP), similar to the emerging manager programs common at public pension funds, with dedicated funding for sustainable investment strategies. It will also hire investment staff including a senior sustainable investment officer and formally integrate climate risk assessment and engagement into investment processes. New York Common currently has a \$10 billion commitment to climate investments and has a goal of doubling that commitment

over the next decade. The Canadian C\$325 billion CDPQ, also recognised as a leader in reaching net zero by 2050, has committed to factoring climate change into every investment decision it makes. Back in 2017, the fund set an aim of \$26 billion invested in low carbon investments by 2020 but this was achieved by 2018, so a revised target of \$32 billion was fixed. It also set out to reduce the portfolio's carbon footprint per dollar invested by 25 per cent between 2017 and 2025. To do all this, it is focusing specifically on reducing higher carbon intensive assets, acquiring low carbon assets, and improving the practices of portfolio companies. It has made many significant investments in renewable energy including solar and wind assets. To support its position on climate change, CDPQ has also resolved to become carbon neutral by offsetting the carbon emissions arising from its energy consumption and from employee business travel.

To this end last year HESTA, the Australian superannuation fund for health workers, became the first and only fund in that country to be certified as carbon neutral under NCOS for its trustee operations. This measures electricity, staff commute, electricity, waste, water and transport including taxis and air travel. HESTA's key initiatives to reduce emissions in the past year included improving lighting controls, introducing energy education programs and improving labelling and signage of waste streams. But despite the good effort HESTA has made in its own operations, and the leading position it has taken on SDG integration, it has not made the same impact in its investments: with Australian equities and international equities exposures 1 per cent more carbon intensive than the benchmark; and property 5 per cent more carbon intensive than the benchmark.

In 2018, the Australian fund for construction workers, Cbus Super, published a Climate Change Roadmap which set out metrics and targets. Under that roadmap, Cbus has set a target for all its property holdings to be net zero emissions



by 2030. It currently holds around A\$5 billion in property but because of its growth those assets could be as high as A\$10 billion by the time the deadline comes around.

Property fund managers have been given until this year to outline their roadmaps for net zero emissions holdings targeting 2030. Australian and New Zealand investors are enthusiastic about climate aligned investment strategies but few have set specific targets, a report commissioned by the IGCC has shown. [The chair of Cbus' investment committee, Stephen Dunne, is also chair of the IGCC.]

The report, which looks at Australian and New Zealand investors with funds representing more than A\$1.3 trillion in assets, shows that only 35 per cent have set specific targets for their whole portfolio and just over 40 per cent of real estate investors and less than 25 per cent of listed equities investors have set targets. From a total portfolio or multi-asset view, the A\$24 billion VicSuper has embarked on a pathway towards a net zero emissions portfolio but has not formally set a deadline. VicSuper was one of the first Australian super funds to measure the carbon intensity of its equities portfolio and as at June 2019, VicSuper's equities investments had a weighted average carbon intensity of 240 tonnes of CO₂e/A\$M against a benchmark of 245 tonnes.

The fund has an international equity customised carbon strategy and has reached its target of A\$3 billion in sustainable outcomes. The fund reports carbon intensity on equities, fixed interest and real assets in recognition of a net zero emissions target by 2050. Some of the investments the fund has made in the past year include a reduced carbon intensity of small cap strategies working with existing small cap Australian managers to achieve a 25 per cent reduction in carbon intensity. It also invested in a waste to energy company, ESG Australian and global bond

index funds, and a real estate office fund. In July this year the merger between VicSuper and First State Super, to create one of the country's largest superannuation funds with A\$125 billion in assets will be finalised.

Meanwhile the largest pension fund in the US, the \$402 billion Californian fund CalPERS has recently made a commitment to achieve net-zero by 2050 by becoming the first US investor to join the Net Zero Asset Owner Alliance. CalPERS, which was a founder and convenor of Climate Action 100+, has been a leading voice advocating that climate change is a systemic risk for investors and is active through mediums such as the SEC's Investor Advisory Committee and the International Financial Reporting Standards Advisory Committee. It also annually joins the Global Investor Statement on Climate Change. CalPERS's goal is to have 100 per cent of its investment policy and procedures integrate sustainability factors, including climate change, across the total fund portfolio by 2021 as part of the strategic plan on sustainable investment.

Last year, it also announced it would pilot research by Wellington Management and Woods Hole Research Center to research potential links between climate models and financial risks and how to develop investment insights. CalPERS has also estimated carbon foot printing for three out of four asset classes – global equity, global fixed income, and real assets – representing 90 percent of the fund's investments by value.

The UK government is looking at whether to require pensions to disclose their climate change strategies under the Taskforce on Climate-Related Financial Disclosures, but many of the UK's largest funds are not waiting for the directive. The £30 billion Brunel Pension Partnership set out a comprehensive new climate policy in January that goes way beyond its own actions and includes a five-point plan



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for building a financial system that is fit for a zero-carbon future. This includes working with policy makers, encouraging more investable climate-related products and a promise to ensure all its external managers integrate climate change. As an example of how seriously the fund is taking this, it just carbon footprinted all 20 managers shortlisted in a global high alpha mandate, from which five won mandates.

Under the Paris agreement, the EU has committed to carbon neutrality by the second half of the 21st century and it's Europe that leads the world in terms of institutional investor action to reduce climate related risk. The Dutch funds, APG and PGGM, as well as the French, Swedish and Danish funds are leaders in sustainability. The Danish pension sector has committed to invest €47 billion in the green transition by 2030, supporting the government's climate ambitions of reducing greenhouse gas emissions by 70 per cent. It represents about one sixth of the total private pension assets in that country.

Looking at the activities of Sweden's AP4 shows how far behind other large institutional investors currently are. AP4 has been investing in low-carbon strategies since 2012 and was the founding pension fund member of the Portfolio Decarbonisation Coalition which has now mobilised \$800 billion for low carbon investments. AP4's target is to have 100 per cent of its global equities portfolio invested in low carbon strategies.

In 2014 it set a target of 10 per cent and by 2017 just over 30 per cent of the global equity portfolio was in low carbon strategies. And as far back as 2014, the carbon footprint of AP4's listed equities portfolio was 28 per cent lower than the benchmark index. When AP4 initiated its low carbon equity initiatives, there was a lack of suitable investment products for large institutions but that didn't stop its progress. Instead it worked with providers to become instrumental in designing indexes, and an early investor in strategies, in order to help build the market. At the beginning of 2019 new investment guidelines for the Swedish AP funds stated that special emphasis must be given to

how sustainable development can be promoted. Most recently the largest pension fund in Europe, the €450 billion Dutch ABP, which has long been a leader in sustainability, set out its sustainability and responsible investment plan for 2025 this January. The plan sets out long term objectives – in line with the goal of a climate-neutral economy by 2050 – as well as the short term steps to achieve that.

The fund achieved its 2020 goals, set in the strategic plan of 2015, which saw it reduce its carbon footprint by 30 per cent since 2015 and commit €10 billion to renewables. The new plan increases those goals to 40 per cent and €15 billion respectively in what is a continuous target. But the 2025 strategic plan does more than set targets, it takes the sustainability leader into the next decade and beyond, expanding the scope beyond climate to include resource scarcity and digitalisation.

Recently the largest pension fund in Europe, the €450 billion Dutch ABP, which has long been a leader in sustainability, set out its sustainability and responsible investment plan for 2025 this January. The plan sets out long term objectives as well as the short term steps to achieve that.

ABP says to achieve a climate-neutral global economy by 2050, the transition to a circular economy is essential and it wants to accelerate this transition so that by 2030 efficient and socially responsible raw material supply chains are common practice in companies. It has said it will invest more in companies with circular business models and innovative solutions for food and natural resource scarcity.

It has also connected sustainability and digitalisation, saying that by 2050 digitalisation

should lead to responsible value creation and provide solutions to challenges such as climate change and the scarcity of natural resources. One of ABP's goals is to have more invested in companies that can demonstrate a contribution to this by 2025 and it will also set criteria to assess whether companies respect the digital rights of employees, consumers, and users.

It's a bold step for a fund already at the forefront, and another indicator of what sustainability leadership looks like.

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Climate change forces virus migration

While climate change may not be the direct cause of the COVID-19 epidemic, scientists believe that it can contribute to the spread of new diseases.

By LENORE HITCHLER
ONE

“All the world is topsy-turvy, and it has been topsy-turvy ever since the plague.” This quote is from *The Scarlet Plague* written by Jack London and published in 1912. It evokes both the Coronavirus-19 epidemic and climate change. There are actually many similarities between the two.

Climate change is caused by deforestation and burning fossil fuels which increase carbon dioxide in the atmosphere. This leads to the greenhouse effect and subsequent global warming. The Coronavirus-19 (COVID-19) disease is caused by a specific coronavirus strain from a large family of viruses. Coronaviruses are found in various animal species and are transmitted from their animal hosts to humans. Some other examples of coronaviruses are the Severe Acute Respiratory Syndrome (SARS) and the Middle East Respiratory Syndrome (MERS).

News reporters and commentators state that climate change did not cause the Coronavirus-19 epidemic. Instead, the media and politicians blame the epidemic on the wet market in Wuhan, China which sold live animals. These animals had probably come in contact with the original hosts of the disease which scientists believe were bats. They report that the genetic sequence of COVID-19 is almost identical to a distinct strain of the virus found in bats. While climate change may not be the direct cause of the COVID-19 epidemic, scientists believe that climate change contributes to the spread of new diseases. The World Health Organization (WHO) states that “changes in in-

fectious disease transmission patterns are a likely major consequence of climate change.”

Both climate change and recent epidemics are caused by human disruption of the environment. Dr. Diarmid Campbell-Lendrum, Head of the Climate Change and Health Program at WHO, stated that: “it’s very clear that the damage that we’re doing to the natural world does make it more likely that these diseases will emerge.”

Deforestation is one of the major ways that humans damage the environment. Trees are cut down to make room for cattle ranches as well as other agricultural products such as soybeans, palm oil, sugar cane, coffee, tea, and chocolate. Land is also cleared to facilitate mining the metals used in manufacturing computers and cell phones.

Deforestation is one of the causes of climate change. It is estimated that more than 1.5 billion tons of carbon dioxide are released every year because of deforestation. Another estimation is that deforestation produces 25% of all greenhouse gases. Deforestation results in the loss of biodiversity. According to the UN Environment Programme, biodiversity helps prevent the proliferation of diseases. Illnesses that spread from animals are called Zoonoses or zoonotic diseases. According to the US Agency for International Development, 75% of new diseases are zoonotic. Zoonotic diseases quadrupled in the last fifty years, and they currently cause over two billion cases of human illnesses annually. The Inter-



Deforestation in Central Kalimantan, Borneo.
Photo credit: Andrew Taylor/WDM

national Livestock Research Institute found that more than two million people die every year from zoonotic diseases.

Besides leading to epidemics, deforestation destroys wildlife habitat. According to a study published in the journal *Proceedings of the Royal Society B*, deforestation leads to a lower number of large mammals. Therefore, because they have less predators, the animals that harbor pathogens increase in number. Ecologist Felicia Kessing, professor of biology at Bard College in NY, adds that “When biodiversity declines—particularly as a result of habitat loss—it doesn’t do so in a random way; certain kinds of species are more likely to disappear than others. The ones that tend to thrive after biodiversity declines are the ones that are also most likely to give us new diseases.”

A study published in *Nature* reports that the species that survive are more likely to host diseases that are even more virulent. Smaller sized species, such as rats and other rodents, increase in population because they are more resilient to degraded habitats or can thrive among humans. This leads to increased human exposure to disease. Rodents account for more than 60% of the infections transmitted from animals to people. The warmer temperatures and higher rainfall associated with climate change combined with the loss of predators make the rodent problem

even worse. Rodents are not the only carriers of disease. Bats are frequently the original hosts of viruses. One study found that bats harbor more than 3,200 strains of coronaviruses. In 2018, biologists at the University of Warsaw published “*Bats, Coronaviruses, and Deforestation*” which linked the destruction of bat habitats to the spread of coronaviruses. **Additionally, climate change forces animals to migrate north to cooler environments resulting in the disruption of the ecology of both their new and former habitats. Scientists state that climate change causes bats to migrate, and fruit bats have already done so.** Still more scientists corroborate the relationship of epidemics to both climate change and environmental change. Carlos Zambrana-Torrel, vice president for conservation and health at EcoHealth, analyzed over 704 different infectious disease outbreaks between 1940-2008 and found that deforestation preceded pandemics.

Veterinarian Christine Johnson, PhD, is the Director of the EpiCenter for Disease Dynamics at the One Health Institute, an interdisciplinary epidemiological program at the University of California, Davis School of Veterinary Medicine. **She stated that recent major epidemics, such as SARS, COVID-19 and Ebola spread to humans from wildlife undergoing climate change and displacement from their origi-**

nal habitat.

David Quammen, author of *Spillover: Animal Infections and the Next Pandemic*, stated that “We disrupt ecosystems, and we shake viruses loose from their natural hosts. When that happens, they need a new host. Often, we are it.” There are many species of animals that

harbor pathogens that could cause the next epidemic. According to the *Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services*, there are 1.7 million viruses in mammals and birds that could potentially infect humans.

In addition to the disruption of animal habitats leading to disease, the health of animals is also endangered by climate change. Rising temperatures stress immune systems making them less effective in combatting pathogens. Scientists in Tokyo reported that mice subjected to warmer temperatures were less able to resist influenza. Jeanne Fair, biosecurity and public health expert at Los Alamos National Laboratory in New Mexico pointed out that stressed animals are more susceptible to disease. She stated that “When you’re stressed, you’re immunocompromised.” More viruses are then shed infecting other animals and people. To exacerbate matters, as temperatures warm, viruses are adapting to hotter environments.

Erratic weather caused by climate change also increases human vulnerability to pathogens and increases the virulence of these pathogens. The 2017-2018 flu season was both longer than usual and infected more people. A study in *Environmental Research Letters* linked this particular viral outbreak to extreme weather and unusual swings in temperature.

Climate change and new epidemics have been predicted by scientists for quite a while. These threats have been ignored, and preventative measures have not been undertaken. **Scientists have warned about climate change since at least the mid 1960s.** A Federal Sciences Report in 1965 warned President Lyndon Johnson that bur-

“We disrupt ecosystems, and we shake viruses loose from their natural hosts. When that happens, they need a new host. Often, we are it.”

ning fossil fuels adds carbon dioxide to the atmosphere. This would cause “marked changes” in climate. This report is fifty-five years old! Scientists have continued to alert every president since then. Warnings about future pandemics have also been sounded for decades. Various authors discussed how climate change and human

disruption of the environment were going to lead to epidemics. Some books on the subject are *A Dancing Matrix* written by Robin Marantz and published in 1993, *The Coming Plague—Newly Emerging Diseases in a World Out of Balance* written by Laurie Garrett and published in 1994, and *Emerging Viruses*, edited by Stephen Morse and published in 1996.

Another similarity between Coronavirus-19 and climate change is that both disproportionately endanger racial minorities and the poor. A study of the fifteen largest US cities found that climate change would likely increase heat-related deaths by at least 90%. Research has shown that people of color are twice as likely to perish in a heat wave. Racial minorities and the poor are more likely than white people to live near oil refineries. Refineries contribute to climate change and also release many air pollutants. Dr. Aaron Bernstein, MD. is Director for the C-Change Center for Climate, Health, and the Global Environment at Harvard University’s School of Public Health. He stated that “We have lots of research that shows that air pollution, particularly particulate matter air pollution, increases the risk of people getting sick with bacterial and viral pathogens that cause pneumonia, and that people who are exposed to more air pollution get sicker when they get exposed to those kinds of pathogens.”

He also stated that “A study done on SARS, a virus closely related to COVID, found that people who breathed dirtier air were about twice as likely to die from the infection.” Another study reported that even a small exposure to air pollution in the years preceding the COVID-19 epidemic was linked to a 15% higher risk of death. In 2002,

68% of African Americans lived in counties that violated federal air pollution standards. An air pollution study was published in the *Proceedings of the National Academy of Sciences*. Researchers found that fine particulate matter (PM2.5) is disproportionately caused by the consumption of goods and services by white people but disproportionately inhaled by African American and Hispanic minorities. On average, African Americans are exposed to about 56% more PM2.5 pollution than caused by their consumption. For Hispanics, it is 63%.

Air pollution is not the only adversity facing ethnic minorities and the poor during the COVID-19 epidemic. They are much more likely to be essential workers. Because of the nature of their work, they are more exposed to those harboring the disease than other people. Essential workers include those who labor in the food processing industry, grocery and pharmacy employees, bus drivers, and delivery truck drivers. Essential workers also labor in warehouses and are employed in the health field and personal care. Many essential workers lack protective gear, hazard pay, and lack health insurance. They frequently are deprived of paid sick days which means they feel forced to go to work and then they could potentially expose others to the virus.

The following statistics of deaths from the Coronavirus-19 came from various sources published during April and May. Numbers change from day to day, but they can show who is perishing from the disease. In the entire country, African Americans accounted for 50% of deaths, even though they comprise only 13% of the population. From the west coast to the east coast, African Americans have high death rates from the virus. Los Angeles County, with some of the worst air quality in the country, had a 50% higher death rate than the rest California. In Louisiana, African Americans comprise around a third of the population, but 70% of the fatalities. The Midwest follows the racial pattern of higher virus death rates. In Chicago, Illinois, African Americans represent 33% of the population, but have a death rate of 70%. In Illinois, they comprise 15% of the population, but

42% of deaths. In Milwaukee County, Wisconsin, African Americans make up 26% of the population, but account for 81% of deaths. Wayne County, Michigan, includes Detroit, which according to the American Lung Association had the country's twelfth worst soot pollution in 2019. The death rate was 250% higher than Michigan's average. **In both Michigan and Wisconsin, African Americans represent 14% of the population, but 40% of deaths.** New York City also follows the pattern. African Americans and Latino residents died at twice the rate of white people. These extensive statistics reflect the relationship between inequality and the disproportionate death rates from the epidemic. Death and human suffering are caused by both the Coronavirus-19 epidemic and climate change. They are interrelated even though the relationship between them is not linear like a nuclear family parent-child relationship. It is more like an extended family. Deforestation causes both climate change and the disruption of habitats leading to the spread of new epidemics. Burning fossil fuels leads to both climate change and air pollution which in turn leads to higher death rates from the virus.

The well-known poem by John Donne entitled "No Man is an Island" provides a perfect metaphor of how both Coronavirus-19 and climate change affect humanity. John Donne lived during *The Little Ice Age*, which was a time of climate change. Therefore, it is ironic that he refers to a clod being washed away by the sea, which in the present day evokes coasts inundated by rising sea levels caused by climate change.

While sick and isolated during an epidemic, Donne listened to church bells ringing for those who had perished. He became aware that everyone is connected and what hurts others also hurts us. Donne felt compelled to write: *No man is an island entire of itself; every man is a piece of the continent, a part of the main; if a clod be washed away by the sea, Europe is the less, as well as if a promontory were, as well as any manner of thy friends or of thine own were; any man's death diminishes me, because I am involved in mankind. And therefore never send to know for whom the bell tolls; it tolls for thee.* **ONE**

The soil solution

LAURA POPPICK

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On a steely November morning, Dorn Cox tours me around the dairy farm where he works in Freeport, Maine. The hummocky coastal landscape has begun to brown for the winter, and the scraggly pastures feel lifeless as we shiver in freezing rain. But Cox, research director at the 600-acre Wolfe's Neck Center for Agriculture and the Environment, paints a far brighter portrait of these dreary fields. He describes networks of fungi bustling with activity beneath the wilting grass – feeding on sugars at tips of roots, sponging up rainwater and extending tendrils that nourish the pasture with nutrients. To him, this ground is a subsurface garden teeming with life. “Soil is not built, it’s grown,” he says.

The key ingredient fueling all this life: carbon. Plants generate it through photosynthesis and trade it with soil microbes in exchange for nutrients. It’s a virtuous cycle – the more carbon that plants send toward the soil, the more plentiful microbes become, and the healthier the plants grow. **And because carbon locked up in soils is carbon not floating in our atmosphere, carbon-rich soils make for a healthier climate, too, Cox says. “It’s very difficult to improve soil health and not have a climate benefit.”** Lush soils appeal not just to farmers but, increasingly, to policymakers and entrepreneurs scrambling to slow climate change, with mounting pressure from the 2015 Paris Climate Agreement that calls on nations to keep global warming from reaching 2 degrees Celsius above pre-industrial levels this century. (The United States has taken steps to withdraw from the agreement, but nearly 200 other nations remain committed.)

A growing body of research from the Intergovernmental Panel on Climate Change recognizes sustainable agriculture as key to slowing warming. So scientists like Cox are probing and tweaking farm practices to optimize soil health, and a soil-centric carbon marketplace has begun to emerge offering farmers financial incentives to adopt these practices. Now, as technologies allow farmers to share more data and monitor their soils more readily than ever, new tools are available to further cultivate this multipronged solution sitting right beneath their feet. To harness this momentum, Cox and colleagues have launched an ambitious project to pool all these new data into a single online platform and encourage researchers and farmers to share strategies on how best to keep carbon underground. Cal-

led OpenTEAM – Open Technology Ecosystem for Agricultural Management – the project aims to woo farmers to change their practices in relatively minor ways that could eventually have major impacts on their bottom line, and the environment. So far, the team consists of about 20 regional “hub farms” around the country including research farms, production farms and combinations of the two like the Wolfe’s Neck Center, which sells all its milk to the organic yogurt and dairy company Stonyfield. These hub farms will host field trials of the OpenTEAM software during the 2020 growing season to help iron out kinks and get other farmers on board and comfortable with the system.

“It’s exactly the sort of collaborative platform that’s needed,” says Peter Smith, a soil scientist at the University of Aberdeen in Scotland. Soil carbon storage, he says, is a no-brainer tactic in mitigating climate change, though it is limited in how far it can take us: At their best, global soils can store just 2 to 5 of the roughly 37 gigatons of carbon dioxide emitted into the atmosphere each year. And, over time, they can become saturated and stop absorbing more. But given all the ways that soil carbon boosts farm productivity, there’s no reason not to include it in the suite of tools used to meet the Paris Agreement, Smith says. “Just about everything it does is beneficial.”

Shoots to soils

Carbon worms its way into soil through several pathways that research has recently helped clarify. It turns out that living plants play a much larger role in sending carbon underground than scientists had once thought, says Steven Banwart, a soil scientist at the University of Leeds and author of a report on soil ecology in the 2019 Annual Review of Earth and Planetary Sciences. **Farmers have perceived dead plant material as a key source of soil carbon (plants are roughly 45 percent carbon), and mulches and composts as the means to get it into farm fields.** But this is just a fraction of the story, Banwart says. “Plants are actually pushing carbon, minute by minute as they are photosynthesizing, out into the soil.” Up to a third of the sugars plants create during photosynthesis goes not to leaf and stem growth, but to growth of fungi that rapidly spread out of plant roots and into the soil – sometimes expanding by up to a centimeter per day. In return, the fungi

offer up nutrients like nitrogen and phosphorus that plants can't make on their own. Biologists have known about this symbiosis for years, but new technology allows scientists to quantify it and watch it unfold. In the lab, researchers can expose plants to carbon-14 – a radioactive carbon isotope – and use imagery to track the isotope as it travels from the air, into leaves and down through roots within hours. “You'll suddenly find, within a day, bright spots on that image out at the tips of these fungi,” Banwart says.

These images show that carbon storage calls for more than just compost – it requires an ongoing boost to those underground alliances. But many conventional farming practices hurt rather than help those relationships, Cox says. The heavy steel plows that churn up topsoil during tillage, for example, rip fragile fungal threads that facilitate symbiosis. Low-till or no-till methods keep those threads intact by more delicately managing fields. But low-till methods take more time and effort than quick-tilling rides through fields on a tractor, and this can push farmers away from these practices. That's especially since the capacity of soils to hold carbon – and thus crop yield and overall farm health – have largely been anecdotal, Cox says. He hopes that the data-driven evidence compiled through OpenTEAM will help persuade more farmers to adopt soil-friendly practices. Cox describes OpenTEAM as an “ecosystem” of soil maps, satellite imagery, app software and other soil analysis technologies that have existed scattered around the Internet but have never been pulled together on a single platform. In many cases, they have been hard to find or difficult to use. Cox hopes pooling these tools will make them collectively stronger and more user-friendly for farmers.

A Yale-based group called Quick Carbon, for example, is designing an app to help farmers estimate soil carbon out in fields based on reflectivity (darker soils tend to contain more carbon) using a handheld tool called a reflectometer. It would offer a less cumbersome and less expensive alternative to lab-testing soil samples. But to strengthen those field estimates, Quick Carbon needs ample, well-tested data to calibrate measurements, and OpenTEAM members could help compile them. Cox and colleagues are now working to ease the flow of such data so that the information can travel seamlessly from one online platform to the next, with a goal of completing the preliminary setup this year.

Brewing the incentive

Pooling tools and data like this is “a terrific idea,” says Lini Wollenberg, a natural resource management specialist with CGIAR, a global research consortium, and the University of Vermont. But for the information to really make a change, farmers will need to stick with the methods. Carbon is constantly in flux, and soil accumulations can quickly travel back into the atmosphere as environmental conditions change or as farming practices shift. A farmer practicing no-till methods over several

seasons, for example, can fast undo progress by resorting back to tillage. One way to encourage farmers to stick with carbon-friendly practices is to provide an immediate financial incentive. That's what the Seattle-based startup Nori is doing, by building a marketplace that rewards farmers for storing carbon in their fields. (Nori is a partner of OpenTEAM, along with more than a dozen other companies, nonprofits and research groups tackling soil health from different angles.)

Through Nori, farmers commit to adopting a suite of sustainable practices – such as low-till methods or cover cropping to keep carbon-friendly root masses intact year-round. **At their best, these practices can increase carbon storage by up to about 1.5 metric tons of carbon dioxide per acre per year**, Nori estimates, and farmers can sell what are called Nori Carbon Removal Tonnes (NRTs) to individuals or corporations interested in taking climate action. Once farmers have chosen their methods, Nori connects them with an accredited third-party verifier who estimates how much carbon their practices will store over a 10-year period.

“No one is being forced to pay for carbon removal, but they see its value,” says Christophe Jospe, Nori cofounder and chief development officer. Corporations, for example, may experience pressure from their shareholders to reach certain sustainability goals, or they may recognize marketing potential in taking this voluntary step. **The first pilot project was launched last year at Harborview Farms, a 13,000-acre operation in Maryland that grows soybeans, corn and wheat, and several other pilots are in the works to demonstrate the supply and demand within the market.** For now, the NRTs are listed at \$15, though farmers will ultimately be able to choose rates based on supply and demand, similar to sale at a grain elevator. “The farmer is generating a digital crop that they can take to the elevator based on the market price,” Jospe says.

As Cox and I walk along the muddy road through sleet, he mentions that food companies are increasingly wising up to benefits of sourcing from climate-conscious farms. Stonyfield, Wolfe's Neck's primary client, was a founding member of OpenTEAM. And General Mills also has jumped on board in hopes of encouraging its supply farms to adopt more sustainable practices and so help the company meet its own climate goals.

Passing a dairy barn on our right, Cox adds that these companies haven't before had a good way of quantifying how close they were to meeting their goals. He hopes OpenTEAM will change that – and, in the end, that the project cultivates not just a thriving techno-ecosystem, but actual ecosystems, right on farms. “We are creating habitat,” he says.

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Avenger Planet: is the Covid-19 Pandemic Mother Nature's response to human transgression?

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TomDispatch.com

As the coronavirus sweeps across the planet, leaving death and mayhem in its wake, many theories are being expounded to explain its ferocity. One, widely circulated within right-wing conspiracy circles, is that it originated as a biological weapon developed at a secret Chinese military lab in the city of Wuhan that somehow (perhaps intentionally?) escaped into the civilian population. Although that "theory" has been thoroughly debunked, President Trump and his acolytes continue to call Covid-19 the China Virus, the Wuhan Virus, or even the "Kung Flu," claiming its global spread was the result of an inept and secretive Chinese government response. Scientists, by and large, believe the virus originated in bats and was transmitted to humans by wildlife sold at a Wuhan seafood market. But perhaps there's another far more ominous possibility to consider: that this is one of Mother Nature's ways of resisting humanity's assault on her essential life systems.

Let's be clear: this pandemic is a world-shattering phenomenon of massive proportions. Not only has it infected hundreds of thousands of people across the planet, killing more than 40,000 of them, but it's brought the global economy to a virtual stand-

still, potentially crushing millions of businesses, large and small, while putting tens of millions, or possibly hundreds of millions, of people out of work. In the past, disasters of this magnitude have toppled empires, triggered mass rebellions, and caused widespread famine and starvation. This upheaval, too, will produce widespread misery and imperil the survival of numerous governments.

Understandably, our forebears came to view such calamities as manifestations of the fury of gods incensed by human disrespect for and mistreatment of their universe, the natural world. Today, educated people generally dismiss such notions, but scientists have recently been discovering that human impacts on the environment, especially the burning of fossil fuels, are producing feedback loops causing increasingly severe harm to communities across the globe, in the form of extreme storms, persistent droughts, massive wildfires, and recurring heat waves of an ever deadlier sort. Climate scientists also speak of "singularities," "non-linear events," and "tipping points" -- the sudden and irreversible collapse of vital ecological systems with far-ranging, highly destructive consequences for humanity. Evidence for such



tipping points is growing -- for example in the unexpectedly rapid melting of the Arctic icecap. In that context, a question naturally arises: Is the coronavirus a stand-alone event, independent of any other mega-trends, or does it represent some sort of catastrophic tipping point? It will be some time before scientists can answer that question with any certainty. There are, however, good reasons to believe that this might be the case and, if so, perhaps it's high time humanity reconsiders its relationship with nature.

Humans vs. Nature

It's common to think of human history as an evolutionary process in which broad, long-studied trends like colonialism and post-colonialism have largely shaped human affairs. When sudden disruptions have occurred, they are usually attributed to, say, the collapse of a long-lasting dynasty or the rise of an ambitious new ruler. But the course of human affairs has also been altered -- often in even more dramatic ways -- by natural occurrences, ranging from prolonged droughts to catastrophic volcanic activity to (yes, of course) plagues and pandemics. The ancient Minoan civilization of the eastern Mediterranean, for example, is widely believed to have disintegrated following a powerful volcanic eruption on the island of Thera (now known as Santorini) in the 17th century BCE. Archaeological evidence further suggests that other once-thriving cultures were similarly undermined or even extinguished by natural disasters.

It's hardly surprising that the survivors of such catastrophes often attributed their misfortunes to the anger of various gods over human excesses and depredations. In the ancient world, sacrifices -- even human ones -- were considered a necessity to appease such angry spirits. At the onset of the Trojan War, for example, the Greek goddess Artemis, protectress of wild animals, the wilderness, and the moon, stilled the winds needed to propel the Greek fleet to Troy because Agamemnon, its commander, had killed a sacred deer. To appease her and restore the essential winds, Agamemnon felt obliged -- or so the poet Homer tells

us -- to sacrifice his own daughter Iphigenia (the plot line for many a Greek and modern tragedy). In more recent times, educated people have generally seen coronavirus-style calamities as either inexplicable acts of God or as explicable, if surprising, natural events. With the Enlightenment and the Industrial Revolution in Europe, moreover, many influential thinkers came to believe that humans could use science and technology to overpower nature and so harness it to the will of humanity. The seventeenth-century French mathematician René Descartes, for example, wrote of employing science and human knowledge so that "we can... render ourselves the masters and possessors of nature."

This outlook undergirded the view, common in the last three centuries, that the Earth was "virgin" territory (especially when it came to the colonial possessions of the major powers) and so fully open to exploitation by human entrepreneurs. This led to the deforestation of vast areas, as well as the extinction or near-extinction of many animals, and in more recent times, to the plunder of underground mineral and energy deposits. As it happened, though, this planet proved anything but an impotent victim of colonization and exploitation. Human mistreatment of the natural environment has turned out to have distinctly painful boomerang effects. The ongoing destruction of the Amazon rain forest, for example, is altering Brazil's climate, raising temperatures and reducing rainfall in significant ways, with painful consequences for local farmers and even more distant urban dwellers. (And the release of vast quantities of carbon dioxide, thanks to increasingly massive forest fires, will only increase the pace of climate change globally.) Similarly, the technique of hydraulic fracking, used to extract oil and natural gas trapped in underground shale deposits, can trigger earthquakes that damage aboveground structures and endanger human life. In so many ways like these, Mother Nature strikes back when her vital organs suffer harm. This interplay between human activity and planetary behavior has led some analysts to rethink our relationship with the natural world. They have reconceptualized



Deforestation in Madagascar. Photo credit: Rod Waddington

the Earth as a complex matrix of living and inorganic systems, all (under normal conditions) interacting to maintain a stable balance. When one component of the larger matrix is damaged or destroyed, the others respond in their unique ways in attempting to restore the natural order of things. Originally propounded by the environmental scientist James Lovelock in the 1960s, this notion has often been described as “the Gaia Hypothesis,” after the ancient Greek goddess Gaia, the ancestral mother of all life.

Climate Tipping Points

Posing the ultimate threat to planetary health, climate change -- a direct consequence of the human impulse to dump ever more greenhouse gases into the atmosphere, potentially heating the planet to the breaking point -- is guaranteed to generate the most brutal of all such feedback loops. By emitting ever more carbon dioxide and other gases, humans are fundamentally altering planetary chemistry and posing an almost unimaginable threat to natural ecosystems. Climate-change deniers in the Trumpian mode continue to insist that we can keep doing this with no cost to our way of life. It is, however, becoming increasingly apparent that the more we alter the climate, the more the planet will respond in ways guaranteed to endanger human life and prosperity.

The main engine of climate change is the greenhouse effect, as all those greenhouse gases sent into the atmosphere entrap ever more radiated solar heat from the Earth's surface, raising temperatures worldwide and so altering global climate patterns. Until now, much of this added heat and carbon dioxide has been absorbed by the planet's oceans, resulting in rising water temperatures and the increased acidification of their waters. This, in turn, has already led to, among other deleterious effects, the mass die-off of coral reefs -- the preferred habitat of many of the fish species on which large numbers of humans rely for their sustenance and livelihoods. Just as consequential, higher ocean temperatures have provided the excess energy that has fueled many of the most destructive hurricanes of recent times, including Sandy, Harvey, Irma, Maria, Florence, and Dorian. A warmer atmosphere can also sustain greater accumulations of moisture, making possible the prolonged downpours and catastrophic flooding being experienced in many parts of the world, including the upper Midwest in the United States. In other areas, rainfall is decreasing and heat waves are becoming more frequent and prolonged, resulting in devastating wildfires of the sort witnessed in the American West in recent years and in Australia this year. In all such ways, Mother Nature, you might say, is striking back. It is, however, the potential for “non-linear” events and “tipping points” that has some climate scientists especially concerned, fearing that we now live on what might be thought of as an avenging planet. While many climate effects, like prolonged heat waves, will become more pronounced over time, other effects, it

is now believed, will occur suddenly, with little warning, and could result in large-scale disruptions in human life (as in this coronavirus moment). You might think of this as Mother Nature saying, “Stop! Do not go past this point or there will be dreadful consequences!”

Scientists are understandably cautious in discussing such possibilities, as they are harder to study than linear events like rising world temperatures. But the concern is there. “Large-scale singular events (also called ‘tipping points,’ or critical thresholds) are abrupt and drastic changes in physical, ecological, or social systems” brought about by the relentless rise in temperatures, noted the U.N.'s Intergovernmental Panel on Climate Change (IPCC) in its comprehensive 2014 assessment of anticipated impacts. Such events, the IPCC pointed out, “pose key risks because of the potential magnitude of the consequences; the rate at which they would occur; and, depending on this rate, the limited ability of society to cope with them.”

Six years later, that striking description sounds eerily like the present moment.

Until now, the tipping points of greatest concern to scientists have been the rapid melting of the Greenland and West Antarctic ice sheets. Those two massive reservoirs of ice contain the equivalent of hundreds of thousands of square miles of water. Should they melt ever more quickly with all that water flowing into neighboring oceans, a sea level rise of 20 feet or more can be expected, inundating many of the world's most populous coastal cities and forcing billions of people to relocate. In its 2014 study, the IPCC predicted that this might occur over several centuries, at least offering plenty of time for humans to adapt, but more recent research indicates that those two ice sheets are melting far more rapidly than previously believed -- and so a sharp increase in sea levels can be expected well before the end of this century with catastrophic consequences for coastal communities. The IPCC also identified two other possible tipping points with potentially far-reaching consequences: the die-off of the Amazon rain forest and the melting of the Arctic ice cap. Both are already under way, reducing the survival prospects of flora and fauna in their respective habitats. As these processes gain momentum, entire ecosystems are likely to be obliterated and many species killed off, with drastic consequences for the humans who rely on them in so many ways (from food to pollination chains) for their survival. But as is always the case in such transformations, other species -- perhaps insects and microorganisms highly dangerous to humans -- could occupy those spaces emptied by extinction.

Climate Change and Pandemics

Back in 2014, the IPCC did not identify human pandemics among potential climate-induced tipping points, but it did provide plenty of evidence that climate change would increase the risk

Scientists believe that the Ebola virus (like the coronavirus) originated in bats and was then transmitted to gorillas and other wild animals that coexist with people living on the fringes of tropical forests.

of such catastrophes. This is true for several reasons. First, warmer temperatures and more moisture are conducive to the accelerated reproduction of mosquitoes, including those carrying malaria, the zika virus, and other highly infectious diseases. Such conditions were once largely confined to the tropics, but as a result of global warming, formerly temperate areas are now experiencing more tropical conditions, resulting in the territorial expansion of mosquito breeding grounds. Accordingly, malaria and zika are on the rise in areas that never previously experienced such diseases. Similarly, dengue fever, a mosquito-borne viral disease that infects millions of people every year, is spreading especially quickly due to rising world temperatures.

Combined with mechanized agriculture and deforestation, climate change is also undermining subsistence farming and indigenous lifestyles in many parts of the world, driving millions of impoverished people to already crowded urban centers, where health facilities are often overburdened and the risk of contagion ever greater. "Virtually all the projected growth in populations will occur in urban agglomerations," the IPCC noted then. Adequate sanitation is lacking in many of these cities, particularly in the densely populated shantytowns that often surround them. "About 150 million people currently live in cities affected by chronic water shortages, and by 2050, unless there are rapid improvements in urban environments, the number will rise to almost a billion."

Such newly settled urban dwellers often retain strong ties to family members still in the countryside who, in turn, may come in contact with wild animals carrying deadly viruses. This appears to have been the origin of the West African Ebola epidemic of 2014-2016, which affected tens of thousands of people in Guinea, Liberia, and Sierra Leone. Scientists believe that the Ebola virus (like the coronavirus) originated in bats and was then transmitted to gorillas and other wild animals that coexist with people living on the fringes of tropical forests. Somehow, a human or humans contracted the disease from exposure to such creatures and then transmitted it to visitors from the city who, upon their return, infected many others.

The coronavirus appears to have had somewhat similar origins. In recent years, hundreds of millions of once impoverished rural families moved to burgeoning industrial cities in central and coastal China, including places like Wuhan. Although modern in so many respects, with its subways, skyscrapers, and superhighways, Wuhan also retained vestiges of the countryside, including markets selling wild animals still considered by some inhabitants to be normal parts of their diet. Many of those animals were trucked in from semi-rural areas hosting large numbers of bats, the apparent source of both the coronavirus and the Severe Acute Respiratory Syndrome, or SARS, outbreak of 2013,

which also arose in China. Scientific research suggests that breeding grounds for bats, like mosquitoes, are expanding significantly as a result of rising world temperatures. The global coronavirus pandemic is the product of a staggering multitude of factors, including the air links connecting every corner of the planet so intimately and the failure of government officials to move swiftly enough to sever those links. But underlying all of that is the virus itself. Are we, in fact, facilitating the emergence and spread of deadly pathogens like the Ebola virus, SARS, and the coronavirus through deforestation, haphazard urbanization, and the ongoing warming of the planet? It may be too early to answer such a question unequivocally, but the evidence is growing that this is the case. If so, we had better take heed.

Heeding Mother Nature's Warning

Suppose this interpretation of the Covid-19 pandemic is correct. Suppose that the coronavirus is nature's warning, its way of telling us that we've gone too far and must alter our behavior lest we risk further contamination. What then? To adapt a phrase from the Cold War era, what humanity may need to do is institute a new policy of "peaceful coexistence" with Mother Nature. This approach would legitimize the continued presence of large numbers of humans on the planet but require that they respect certain limits in their interactions with its ecosphere. We humans could use our talents and technologies to improve life in areas we've long occupied, but infringement elsewhere would be heavily restricted. Natural disasters -- floods, volcanoes, earthquakes, and the like -- would, of course, still occur, but not at a rate exceeding what we experienced in the pre-industrial past. Implementation of such a strategy would, at the very least, require putting the brakes on climate change as swiftly as possible through the rapid and thorough elimination of human-induced carbon emissions -- something that has, in fact, happened in at least a modest way, and however briefly, thanks to this Covid-19 moment. Deforestation would also have to be halted and the world's remaining wilderness areas preserved as is forever. Any further despoliation of the oceans would have to be stopped, including the dumping of wastes, plastics, engine fuel, and runoff pesticides.

The coronavirus may not, in retrospect, prove to be the tipping point that upends human civilization as we know it, but it should serve as a warning that we will experience ever more such events in the future as the world heats up. The only way to avert such a catastrophe and assure ourselves that Earth will not become an avenger planet is to heed Mother Nature's warning and cease the further desecration of essential ecosystems.

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As sea level rise threatens their ancestral village, a Louisiana tribe fights to stay put

They survived the BP oil disaster, Hurricane Katrina, and decades of industry spoiling their wetlands. Whatever their future holds, the people of Grand Bayou want to decide it for themselves.

BARRY YEOMAN

Nrdc.org

Ten years ago, as news of the BP oil disaster reached Louisiana's Grand Bayou Indian Village, Rosina Philippe dispatched her brother Maurice Phillips on a reconnaissance mission. Phillips pointed his flatboat toward the Gulf of Mexico and motored through a series of canals and inlets until he reached a fertile fishing ground called Bay Jimmy, eight miles from home. He returned with a passenger: a brown pelican, alive but slathered in petroleum.

Philippe and her brother belong to the Atakapa-Ishak/Chawasha Tribe. They live in their ancestral village, an hour's drive south of New Orleans near the town of Port Sulphur. Most of the tribe's estimated 400 members live elsewhere, but a remnant remains in Grand Bayou, a community that has shrunk over the years as its land has slowly slipped into the surrounding waters. The village consists of 14 homes and a nondenominational church. Surrounded by water, most of the buildings sit atop wooden pilings, and there are no roads to connect them. The houses line the bayou and can be reached only by boat.

For generations, the Atakapa-Ishak/Chawasha have relied on the fertility of the Mississippi River Delta. They

catch seafood and forage for wild celery, green onions, and a leafy green called morelle noire. They used to forage for persimmons, too. They trapped muskrats, packing the meat in salt and preserving it in oak barrels. They hunted for deer and rabbits—and still hunt ducks—and grew vegetables in large backyard gardens. In recent decades, however, these resources have contracted. The tribe has withstood one environmental assault after another, standing its ground in a disappearing wetland. As they scrambled to save the pelican (which they later turned over to a wildlife rescue center), Phillips told his sister that he saw other oiled birds but could wrangle only that one onto his boat. What's more, Bay Jimmy was covered in thick, gooey crude. Nearly two months after the April 2010 disaster, then governor Bobby Jindal visited the same bay and declared that BP's oil was "killing the marsh."

The Deepwater Horizon explosion and resulting 87-day oil spill proved catastrophic for Grand Bayou. The community had just rebuilt after Hurricane Katrina, which devastated the area in 2005, and residents had returned in time for the 2010 commercial shrimping season. "A lot of guys, what little bit of cash they had, they invested into making repairs on their boats because they envisioned

the seafood to come,” says Philippe, a tribal elder. The springtime waters brimmed with shrimp. “So, it was almost like the anticipation of Christmas morning.”

Except that Christmas never came. The oil spewing from BP’s open well about 5,000 feet below the Gulf’s surface shut down the nearby fisheries for months. Grand Bayou’s fleet remained docked long after officials insisted that Gulf seafood posed no health risk. The fishermen didn’t agree. “As long as they believed that it was unsafe to eat,” Philippe says, “they refused to go out and catch it, even though they were in dire straits financially.”

Now, with the 10th anniversary of the explosion approaching next week, the tribe is clear on two points. First, the BP disaster cannot be viewed in a vacuum. It is part of a litany of stresses that Grand Bayou has survived for decades, including the loss of more than 5,000 acres of fertile Delta land. And, second: They have no plans to leave.

“We’re resilient,” says Carmalita Sylve, who grew up in Grand Bayou, moved to Colorado after Hurricane Katrina, and returned to a rebuilt home in 2009. From the tribe’s mainland headquarters, she gestures outside toward a grass-lined bank where boats dock and neighbors come to fish. “It’s like this grass out here. You smooch it down, but you know what? It will come right back. And that’s how we are. You think that you’re going to just overcome us with the different ways. But we’ll adapt.”

Fateful Omissions

The threats faced by the Atakapa-Ishak/Chawasha reflect, and amplify, what’s happening in vulnerable communities all along the Louisiana Gulf Coast. Since the 1930s, about 2,000 square miles—more than 10 times the land area of sprawling New Orleans—have disappeared from the state’s coastline. Grand Bayou lies outside the protection of the state’s levee system. It lies outside the planning loop, too: The tribe was not formally consulted when the state developed its most recent master plan for coastal restoration. That \$50 billion plan, published in 2017, is essentially a detailed wish list. At its core are

large engineering projects like pipelines to pump sediment into degraded wetlands in order to elevate the land and restore the marshes. “What is in the plan is not necessarily funded,” says Stuart Brown, who oversees the plan’s development at the Louisiana Coastal Protection and Restoration Authority (CPRA). Rather, he says, it’s a “prioritization effort.”

The master plan also lays out risk-reduction strategies for communities facing increased flooding. Depending on the projected flood levels and the type of building, it recommends one of three alternatives: floodproofing, elevation, or “voluntary acquisition.”

Nothing in the plan explicitly calls for the tribe’s, or anyone’s, relocation. But neither does it offer resources or a long-term vision for Grand Bayou to remain an intact village as the surrounding wetlands continue to erode. Members of the Atakapa-Ishak/Chawasha say they feel a tacit, and sometimes explicit, pressure to plan a future elsewhere. That pressure, elders say, fails to consider the tribe’s connection to the bayou. It is so ancient, so sacred, that any discussion of resettlement evokes comparisons to the Trail of Tears. Grand Bayou predates the oil companies and the levee builders; predates the refineries and borrow pits that line the nearby highway; predates Louisiana statehood. The prospect of leaving feels, to them, like cultural erasure.

Place Markers

Last year a group of scientists, public officials, lawyers, and coastal residents met in New York City at a conference organized by Columbia University’s Earth Institute to discuss “managed retreat,” an idea that has gained traction in planning circles. The notion is that life along certain coastlines has grown untenable and that orderly relocation is the logical solution. A handful of U.S. communities have already confronted the decision. After the 1993 Mississippi River floods inundated Valmeyer, Illinois, residents voted to rebuild their town 1.5 miles to the east and 400 feet up a bluff. Shishmaref, Alaska, an Inupiat village on a barrier island that is eroding from mel-



A 2016 aerial view of Isle de Jean Charles, Louisiana, which has lost 98 percent of its land area since 1955. State officials and tribal leaders are at loggerheads over relocating the community. Photo credit: Julie Dermansky

ting permafrost and sea ice, is currently waiting on federal funds to move to the mainland. (According to PRI's *The World*, climate-change denialism has held up the money.)

Closer to home, the planned resettlement of Louisiana's Isle de Jean Charles Biloxi-Chitimacha-Choctaw Tribe, whose ancestral island has nearly disappeared, has been mired in a conflict over tribal sovereignty. The tribe's leaders say they're not being treated as co-collaborators—in fact, they learned about the state's purchase of land for resettlement by reading a press release. State officials say they have tried to work with those leaders but are “not in a legal position” to acknowledge the sovereignty of a tribe that is not federally recognized. Valmeyer, Shishmaref, and Isle de Jean Charles could be the vanguard of something bigger. The U.S. government's 2018 National Climate Assessment envisioned the future relocation of “millions of people” as retreat from rising seas becomes an “unavoidable option.”

“That's what the people in Miami are facing. That's what I'm facing in New Orleans,” says Mark Davis, director of the Tulane Institute on Water Resources Law and Policy. Climate change, he says, will make some places uninhabitable, even if residents want to stay. “Sooner or later, they are going to be dealt a hand they cannot play.”

Among those attending the Columbia conference were representatives of four Louisiana tribes, who spoke toge-

ther on a panel. Rosina Philippe was among them. Fewer phrases pique the Grand Bayou elder faster than “managed retreat.” Given the arc of U.S. history, she worries that it's the rebranding of an old policy: making life-altering decisions about communities without their participation or consent.

“They're couching it in such agreeable terms. ‘Managed retreat.’ Well, managed by whom?” Philippe asks. “We've seen so many instances of

other people looking at indigenous

populations and deciding they should go there, or they can't go there, and thinking that they were doing the right thing. And we learn through the historic context that it was to the tribe's detriment. But yet they continue to not learn from the past mistakes.”

To understand the depth of this sentiment, one must understand the value of place in Grand Bayou, where money is scarce but biological and social capital are ample. That sense of abundance stems from an era, within the memory of elders, when the village had dozens of households and looked very different. “You see water back here, but all of this was ground,” says Carmalita Sylve. “High ground,” says Philippe. “You could walk probably just about almost to the Gulf of Mexico,” says Sylve. When Sylve and Philippe were children, houses had yards, and there was enough land to raise goats and plant peach orchards. The wetlands provided nurseries for fish and shellfish. Add to that the game and foraged plants, and there was little reason to visit the mainland other than for staples like rice and flour.

Here, self-sufficiency meant interdependence. If someone's bulkhead had loose planks, there would be an announcement at one of the tribe's regular gatherings or from the pulpit at church. Neighbors would then make plans to fix it. Without ready access to physicians, even health care was a communal effort. The tribe had traitors, traditional healers, who used medicinal plants from

the marshlands. Older residents talk about “making the veillée,” or holding vigil, at the home of sick neighbors: cooking, cleaning, and brewing coffee so the immediate relatives didn’t have to.

With a social fabric so deeply tied to the wetlands, it’s hard to separate identity from geography. “It’s like we’ve incorporated our very DNA into what’s around us in the land, the air, the water, the other life forms that share the space with us,” says Philippe. “We see ourselves as having our pail full because we have the history of cohabitation, the history of the knowledge of place, of belonging.” Leaving, she says, would upend that relationship. “We would be somewhere else, in a different place with an empty pail. And that’s a feeling almost like a death, like a bereftness.”

The fact that most of the tribe has already left doesn’t diminish that feeling. Loved ones return and pack their relatives’ houses for holidays, summer vacations, and biennial tribal reunions. Some own land in the village. “My grandkids, even though they were born in Tennessee, they claim Grand Bayou as their heritage,” says Geraldine Phillips Ancar, the village’s oldest resident. Ancar, who is in her eighties, co-pastors Grand Bayou’s Light Tabernacle Church with her husband, Bennie. When their youngest grandson, a U.S. Marine, comes to visit, he spends entire days exploring and photographing the wetlands. Those who stay feel responsible for maintaining the village for the diaspora. “We’re like place markers on the table,” Philippe says, “waiting for everybody else to come and dine.”

Defeats of Engineering

About a decade ago, when he was working on his Ph.D. at the University of New Orleans, Matthew Bethel collaborated with Grand Bayou residents to map the 27-square-mile “livelihood base” where they fished, trapped, and hunted. He studied aerial photos and quantified the landscape changes over four decades. Bethel calculated a net land loss of 5,449 acres—the shedding of vast productive habitat even before the BP spill soiled so much of what

remained. In 1968 there were 2.62 land acres for every water acre. By 2009 that had fallen to 0.48 land acres. Bethel, now the associate executive director of research at Louisiana Sea Grant, published his findings in 2011 in the *Journal of Coastal Research*.

These losses, all along the Louisiana Gulf Coast, are the cumulative byproduct of humanity’s attempts to engineer the land. Starting in the 1930s, the state’s oil and gas industry cut 10,000 miles of canals into the Mississippi River Delta to transport drilling equipment and lay pipelines. Scientists say the canals destroy wetlands by funneling saltwater into freshwater marshes. That, in turn, kills the freshwater plants whose roots hold the land together. The “spoil banks,” piles of dredged material that run parallel to the canals, also interfere with the natural water flow. In addition, the leveeing of the Mississippi River, particularly after the Great Flood of 1927, has blocked sediment-rich water from overtopping the riverbank during floods. The levees impede the natural process of rebuilding wetlands as they subside, or sink. There are other causes of land loss, too, including oil from the BP spill, which harmed root systems, and hurricanes. As the climate continues to change, scientists expect sea level rise to increase exponentially, compounding the problem. According to the state’s master plan, sea level rise on the Louisiana Gulf Coast could exceed six feet by 2100. In Grand Bayou, Philippe says the phrase “land loss” underplays the damage. “That’s habitat loss,” she says. “Those are the nursery for the young shrimp and for the animals around us.” The wetlands also offer protection from storms. As they disappear, communities become more vulnerable. Some people leave for safer harbors.

When Hurricane Katrina hit, Grand Bayou residents hunkered down in boats near the small city of Belle Chasse. They stayed for months, cooking and doing laundry together. It took almost five years to reconstruct their homes with the help of church and community-development groups. By the time returning became an option, some had built new lives on the mainland. “My husband would like to move back,” says Philippe’s younger sister,

LaDonna Sylve, an artist visiting Grand Bayou from her home in Belle Chasse. “But my grandbabies are right there”—in Belle Chasse—“and they’re a big part of my life. I want to be near them, to nurture them and teach them some of the ways that we had here.”

Feats of Resilience

Since their return to Grand Bayou in 2010, the Atakapa-Ishak/Chawasha Tribe has experimented with adaptations they hope will help them survive climate change, rising waters, and hurricanes.

They’ve turned a barge into a floating home.

They’ve built portable gardens in canoes and small boats called pirogues. They’re working with the nonprofit Coalition to Restore Coastal Louisiana to protect sacred sites with reefs built from oyster shells recycled from New Orleans restaurants. Such reefs not only protect against

erosion but also create new oyster habitat. The tribe has also advocated for a low-tech coastal restoration project: backfilling those canals that were dug by oil and gas companies. In a 2018 study, coastal scientists R. Eugene Turner and Giovanna McClenachan concluded that filling the canals with spoil-bank material “could be a dramatically cost-effective and proven long-term strategy” for reversing land loss. The scientists estimated that backfilling all the canals would cost about \$335 million, less than 1 percent of the state’s \$50 billion coastal master plan. “It’s really cheap. You can’t beat it,” says Turner, a professor of oceanography and coastal sciences at Louisiana State University. And yet, “if you go through the master plan and look for the word backfilling, you won’t find it.” (This is true.)

Brown, the CPRA official, agrees that backfilling works. But he also calls Turner’s paper “a little bit hyperbolic” and says that the state’s plan focuses on higher-impact

projects. The tribe is particularly worried about one of those projects: the \$1 billion Mid-Barataria Diversion, which would add a series of gates to a Mississippi River levee 15 miles from Grand Bayou. Those gates would allow sediment and freshwater through, nourishing the wetlands and building an estimated 30,000 acres. According to a 2017 study, however, the diversion could increase flooding in Grand Bayou as it enhances wetlands elsewhere. CPRA’s Brown calls flooding a “reasonable concern” and says the state is preparing an analysis.



Grand Bayou residents are experimenting with different adaptations to land loss, including a floating barge home. Louisiana’s coastal master plan does not allow for innovations like this. Photo credit: Barry Yeoman

Beyond specific projects, Grand Bayou residents see a bigger problem with Louisiana’s master plan: When it was last updated, in 2017, they were never officially consulted. “People are making plans for our lives,” says Philippe. “And they’re not letting us self-determine and be a part of that conversation.”

While individual mem-

bers have met with CPRA to discuss specific concerns, all the tribe can do, she says, is speak at public meetings and submit written comments. These are inefficient ways to address existential policy concerns.

The coastal agency did convene a “community focus group” as it developed the 2017 plan, which included representatives from 11 organizations. They included three tribes that the state of Louisiana officially recognizes, though the federal government does not. (Three individual members of the focus group described it as perfunctory. Sandy Ha Nguyen, executive director of Coastal Communities Consulting, a nonprofit serving fishing families and related small businesses, called it a “waste of time.”) The Atakapa-Ishak/Chawasha, who lack even state recognition, were not invited. CPRA’s Brown acknowledges this communication shortfall. “I think that is a fair complaint,” he says. “We did have meetings with se-

veral tribes. Grand Bayou is not on that list.” As the state prepares to revise its master plan in 2023, “we are trying to be more intentional about how we reach out—not only to the tribe but to many folks who have not been involved in the process.”

Even open communication has limits, though. Coastal planning involves large state and federal bureaucracies with rigid policy options. Creative solutions like the ones Grand Bayou wants to develop—houses on barges, for example—are typically off the table. “Nobody’s talked to them about innovative ways to stay,” says Cyn Sarthou, executive director of Healthy Gulf, a New Orleans-based nonprofit. “It’s just ‘You have to fit into our model, or you have to leave.’”

Brown concedes that the state can only consider conventional solutions, because government funding comes with strings. “They are 100 percent correct that programs that fund that work are not going to be nimble,” he says. “That’s a very legitimate criticism.” But he reiterates that no one is forcing the Atakapa-Ishak/Chawasha to relocate. “We don’t have a forever solution, but we don’t believe it’s unreasonable that Grand Bayou can continue to exist for 30 or 50 years,” he says. (The 25-year flood maps are ambiguous, but Grand Bayou appears to straddle the line between elevation and voluntary acquisition.) Any longer is beyond the state’s planning horizon, Brown notes, and the latter part of the century is likely to bring more land loss, sea level rise, and storm surge.

Coexistence

Grand Bayou’s biggest building is Light Tabernacle Church. Its size mirrors the importance of religious life here. “People still have that desire to put God first in their life,” says Ancar, the pastor. Inside is one of the tribe’s greatest treasures: a set of stained-glass windows depicting life on the bayou. There are images of shrimp boats, a burial site, and wildlife like a crab and an alligator, plus a large, abstract triptych suggesting a sunset over the marsh. The story behind the stained glass tells a bigger story about place and resilience. The windows

were produced by stained-glass artist Mary White, whose father, geographer Gilbert F. White, was the founder of the University of Colorado’s Natural Hazards Center. Until his death in 2006, he believed that behavioral changes, rather than building ever more levees and dams, were the best ways for humans to coexist with flooding. The Natural Hazards Center convenes an annual workshop. At one of these events, a Grand Bayou resident named Paul Sylve approached the pioneering geographer and serenaded him in Louisiana French as a way of honoring his work. Mary White witnessed this tribute to her father and was moved. After Hurricane Katrina, she offered to craft the windows of the new church under construction. Grand Bayou residents provided drawings and photographs, and three young women from the tribe traveled west to help with the design.

Traditional built-in stained glass made no sense for the village; the next hurricane could level the church. The windows needed a bayou-appropriate adjustment. “What do you do with your treasure if you know that you’re housing it in an impermanent structure?” says Philippe. “You make it movable.” That’s what White created. The smaller images hang in front of the windows but are not permanently attached. The nine-foot-wide triptych is set into a light box over the pulpit and can be detached in sections. The removable windows, which depict the tribe’s deep roots, embody Grand Bayou’s two competing realities: The tribe intends to stay. And, true to Gilbert White’s message, it recognizes that fragile landscapes require adaptation.

This is nothing new, Philippe says. Since her grandparents’ days, the tribe has adopted new home designs, new clothing, new motorized boats. Philippe knows that other communities are thinking about how to coexist with coastal erosion. “Those designs exist. We just need to find them and incorporate them in the new norm,” she says. “We intend to exhaust every adaptation designed in our quest to stay.”

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Next Up: The Climate Emergency

Policies deemed radical just months ago will have a much better chance of getting traction as soon as we get through the COVID-19 crisis.

STAN COX
Yesmagazine.org

My new book went to press just as the coronavirus pandemic was starting. If I were still working on *The Green New Deal and Beyond: Ending the Climate Emergency While We Still Can*, I'd add a preface discussing the pandemic's relevance to the climate emergency. We Americans have learned that we do have the capacity to take unprecedented, radical actions that deal with a fast-breaking existential threat like the coronavirus. I'd write that we must be willing to take just-as-drastic actions against our less visible degradation of the global climate.

Because the accumulation of carbon dioxide in the atmosphere is a slow-rolling catastrophe as compared with the spread of coronavirus, we have been lulled into climate complacency for decades. We have waited so long to act that the global economic emergency now requires an immediate, swift, and radical response.

Necessarily bold climate action has long been rejected as too economically disruptive. Now we can see that when our national predicament is dire enough, we have no choice but to set aside the pursuit of profit and growth and deal with the disaster at hand. The climate emergency is just that dire and immediate. Fortunately, policies deemed radical just months ago will have a much better chance of getting traction as soon as we get through the COVID-19 crisis.

Policies to prioritize

The first, most crucial action will be to impose an imperious cap on the total quantity of fossil fuels extracted and allowed into the economy. It would really be three caps—one each on oil, gas, and coal—that ratchet downward year by year until we are completely liberated from fossil fuels, on schedule.

For the sake of argument, let's say we base our rate of fossil-fuel phaseout on the 2019 United Nations' Emissions Gap Report, which calls for an annual greenhouse emissions reduction of 7-8% worldwide if we are to avoid catastrophic warming. Each year, we would reduce fossil fuel supplies by 7%, thereby reaching zero fossil fuel in about 15 years. The government would enforce the cap through a system of non-tradable permits. No company or individual could pull any amount of fuel out of the ground without handing over the permits to cover that amount.

The buildup of wind, solar, and other non-fossil energy capacity won't be able to proceed fast enough during that time to compensate for the huge quantities of dirty energy being taken off-line. The result will be a smaller, less flexible energy supply, and that will have far-reaching consequences that require a deep overhaul of our economy and society.



Air pollution in downtown Los Angeles. Photo credit: Duff

Our responses to the current pandemic, most prominently the business closures and stay-at-home orders, have caused widespread economic disruption. Congress has been forced to scramble in response, with still-unpredictable results. But with an intentional phaseout of fossil fuels, there will be more time to ensure economic security for all households and greater equality for society as the flow of energy into the economy is restricted. In *The Green New Deal and Beyond*, I discuss policies for achieving economic sufficiency and justice, such as planned allocation of resources and production, shorter working hours with full pay, and price controls with rationing of essential consumer goods.

What goods and services are essential?

The past few weeks have seen lots of discussion about which kinds of businesses provide essential goods or services and should be exempt from closure orders. We've also seen daily news of persistent shortages of goods caused by panic-buying and hoarding.

This discussion should seed a nationwide conversation about how to decide, collectively, which products are essential, which are useful to produce if we have the resources, and which should be declared luxuries.

Having that conversation now will prepare us for the phaseout of fossil fuels. As energy availability is restricted, we cannot leave it to an untethered market to make decisions on what to produce. If we do, we will have big surpluses of profitable goods and deficits of products that are needed daily by every household.

In the 1940s, the U.S. War Production Board directed the civilian economy's diminished pool of resources toward production of essential goods. If we have a declining cap on fossil fuels, we will need a Peace Production Board to steer the nation's energy supply toward production of necessary goods and bar its use in wasteful or superfluous production or services.

A lower-energy economy will need to produce less overall—still enough essential goods to go around, but deep cuts in production of stuff that contributes little more than profits to the seller and waste to the landfill. And, in contrast with the struggle against coronavirus, those who produce essential goods and provide essential services in the climate struggle will not be asked to risk their lives to do their jobs.

In the event that shortages of essential consumer goods

Ending the climate emergency will likewise require that we as a society not only take action toward a non-fossil energy buildup but also refrain from taking many ecologically insupportable actions, including heavy energy use.

develop, we will need to prevent the kind of panic-buying and hoarding we're seeing now because of COVID-19. The only remedy for that will be price controls and rationing.

The actions of medical workers to deal with the pandemic have been heroic. But in the response to COVID-19, we are also seeing the power of refraining from actions that would worsen the problem. We're not traveling. We're not operating entire sectors of the economy. Ending the climate emergency will likewise require that we as a society not only take action toward a non-fossil energy buildup but also refrain from taking many ecologically insupportable actions, including heavy energy use.

Energy use and environmental justice

With COVID mitigation efforts, we are experiencing some of the restraint that climate mitigation will require of us. Air travel has plummeted to a small fraction of what it was before the pandemic. Even with gasoline well under \$2 per gallon, personal vehicles are traveling far fewer miles. Electricity consumption is way down. But COVID is also laying bare the economic and environmental injustice that was already endemic in the United States. For decades, low-income populations and communities of color have lived with more severe air pollution than have affluent populations and white communities. Breathing that bad air rendered them much more vulnerable to the coronavirus, and they are being killed at disproportionately high rates.

Millions are suffering economically, and too often an im-

PLICIT assumption is that solving that terrible problem requires a return to profligate resource consumption and greenhouse emissions. In fact, such a return to business-as-usual would mean a return to economic misery for much of America. The pandemic has shone a light on our dire need for a federal jobs guarantee, living wages, and universal basic services, which would ensure access to essential goods and services regardless of income.

Within a matter of weeks, the U.S. economy saw deep cuts in many of the most energy-hungry goods and services. While we are working our way through the current crisis, why not use this time to plan for a more just economy that runs on much less energy while still ensuring sufficiency for all? It's going to be necessary anyway, so let's go ahead and get started.

Don't rely on market forces

The widely expressed hope that investment in solar and wind technology and green infrastructure will work its way through the market (perhaps with an assist from a carbon tax) to automatically eliminate fossil-fuel use and emissions is not supported by the evidence. Historically and materially, GDP is fed by increased energy input. In a growing economy, therefore, new sources of energy don't replace all the old sources but instead add to existing supply.

This has always been the case. The use of coal continued to rise throughout the 20th century as oil became dominant. We kept using more and more oil as natural gas took off in the post-World War II decades. And the bur-

ning of oil and gas has continued to increase despite growth in solar and wind generation.

Between 2009 and 2018, during a historically rapid buildup of U.S. wind and solar capacity, only one-fourth of the new output displaced electricity from fossil-fuel power plants; the other three-fourths went into increasing the total supply.

About that war metaphor

The Green New Dealers and others in the climate movement often invoke the memory of World War II in talking about what needs to be done now. When these folks use the war metaphor, they are harking back to the lightning-speed buildup of productive forces in the 1940s to urge a rapid buildup of wind and solar energy capacity and green infrastructure.

And in many cases, the reference to war is not metaphorical. Bill McKibben, for example, has written, “It’s not that global warming is like a world war. It is a world war.”

But the wartime industrial surge is only half of the story. The more important half is that for those four years, the U.S. civilian economy went into emergency mode and became the opposite of its former and future self, with planning of resource use and production, along with restrained but equitable civilian consumption through price controls and rationing.

What we need to do isn’t just a matter of new industrial technology. Only a statutory, declining cap on fossil fuels will reduce emissions to zero. If we’re going to do that, we will need to ensure sufficiency for all, and therefore should pay attention to the lessons of the 1940s civilian economy.

By the way, a similar debate is going on over whether we should be talking about a war against the coronavirus. I don’t think it’s helpful to characterize the public-health and research struggle against the virus as a war, but the transformation of the “civilian” economy looks somewhat like wartime.

Offsets and Indigenous people

“Offsetting” the carbon emissions produced by affluent countries by contributing to “carbon friendly” projects, usually in low-income countries (a scheme often compared with the medieval selling of indulgences to cancel out sin) often has harsh impacts on the landscapes where Indigenous people live.

For example, when the international soccer body FIFA wanted to “decarbonize” the 2014 World Cup, they bought into a project aimed at curbing deforestation in the Brazilian state of Rondônia, home to the Paiter-Suruí tribe. Tribe members, appalled at the project’s mispending of funds and failure to stop the logging of their lands, carefully documented everything. By 2018, the Paiter-Suruí’s forest was ravaged, and number of trees cut had exceeded the carbon value of all of the credits that the project had sold.

Affected communities are getting fed up. Youth belonging to the Canada-based network Indigenous Climate Action delivered a letter at CoP 25 in Madrid that read in part, “We have proven our peoples’ expertise and knowledge in developing successful nonmarket solutions that surpass current carbon market mechanisms. For these reasons, our rights are essential to mitigating emissions, protecting critical biodiversity and upholding tenets of climate justice.”

Where’s the hope?

There has long been a debate in climate circles over which scale of action is most important: individual, collective, or governmental. If there is one lesson that people in the United States appear to be learning during the pandemic, it is that if we don’t achieve deep, transformative action at all three scales—if instead we simply depend on market forces—we will face consequences that far, far surpass the devastation and suffering that we have seen so far. It seems entirely possible that a similar realization can now energize the climate struggle, and that gives me hope.

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Photo credit: Gngarra



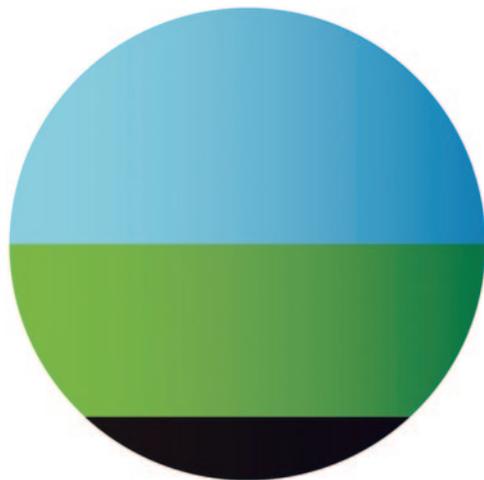
EAST PERTH

The abandoned East Perth Power Station is one of Australia's most significant industrial heritage buildings due to its unique assortment of machinery and equipment that covers the five different stages of power generation technology that took place in the 20th century.

Built between 1913 and 1916 by the Western Australian State Government, the power station was decommissioned and shut down in 1981.

Since 1993 there have been several plans to protect the site. All failed. In April 2020 the West Australian Government named the companies which will transform the former industrial site into a residential and commercial area. **ONE**

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