



Water, Energy and Food Goals Post 2030 Can Carbon be the Currency to a Just World?

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Universities play a critical role in accompanying change and progress as creators and disseminators of knowledge and as drivers of innovation.

Alongside government and industry, universities also contribute significantly to economic development and societal wellbeing. As the global community begins to look to a post-Sustainable Development Goals agenda, universities must now be at the vanguard of those considering diverse world views of change and progress.

As a global research-centred knowledge resource, UNSW is committed to strategic accompaniment with key partners such as the United Nations (UN), and other multilateral and regional organisations to support community- determined outcomes in the Asia-Pacific region. These partnerships, alongside government and industry, seek to provide practical support and solutions for resilience to some of the most divisive contemporary global sustainability challenges such as climate change exacerbated displacement; environmental and health issues in small island developing states; water, energy, food security; and coastal/marine adaptation. Emphasising a community-centred approach, UNSW research and training partnerships place community capabilities and dignity at the centre, while also acknowledging contextual factors that cause vulnerability.

Since 2022, UNSW has adopted a whole-of- institution approach to support the UN to accelerate sustainable development. In collaboration with the United Nations Development Coordination Office, UNSW has jointly curated and convened interactions in Australia, Thailand, Timor-Leste, Indonesia, Papua New Guinea and Fiji between the UN and academia to pilot knowledge partnerships on development priorities in the Asia Pacific region.

Alongside our partners at the UN, UNSW honours the global effort to achieve the UN Sustainable Development Goals (SDGs) by 2030 and accepts that success will be partial. Notwithstanding the fact that the SDGs have provided a multi-decade framework for collective action on sustainability across the world absent any other, now is the time to consider other orientations of change and progress as they relate to human beings and nature. As a content partner for the Times Higher Education Global Sustainable Development Congress 2024, UNSW is committed to conversations that intentionally provoke self-critical reflections of knowing and encourage new imaginings of how change and progress may be indicated.



CAN CARBON BE THE CURRENCY TO A JUST WORLD?

ABSTRACT

Our global population requires increasing water, energy, and food (WEF) to be provided with minimum adverse socio-ecological impact. To sustainably meet this challenge will require the alignment of global CO₂e emission pathways with WEF goals post-2030 rather than impel unjust choices between carbon and WEF strategies. Carbon sequestration must play a supporting role under major emission reductions if we are to meaningfully address the global climate challenge. With this comes opportunity for social justice. The path forward for WEF systems must bring together traditional knowledge and capacity across water-food systems and support new technology uptake to satisfy growing national energy demands. Carbon sequestration efforts must empower communities and traditional land practices for embedded and sustained impact. This approach will also foster water, energy, and food security while supporting local biodiversity and valuable ecological services.

ROUNDTABLE DESCRIPTION

The roundtable will bring together grassroots experts, government, global and regional multilateral organisations, and researchers to jointly offer a clarion call for rapid and meaningful change to our approach to food, water, and energy security within a world in need of urgent decarbonisation. This roundtable will expand on the current state of knowledge in the Pacific in relation to one of the six societal transformations, identified by the Global Sustainable Development Congress (GSDC), needed to achieve the Sustainable Development Goals (SDGs), sustainable food, land, water and oceans water, energy, and food.

The purpose of the roundtable is to consider the role of carbon at the nexus of increasing water, energy, and food security (Figure 1) towards and post 2030. The event will draw on ongoing collaborations in the Pacific and as well as on wider good practice. In the Pacific, current SDG progress is not on track to achieve any of the SDGs by 2030 with major progress needed across all environmental, societal, and economical realms. Progress towards each of the SDGs should not come at the expense of the others. Adding further complexity, new methodologies to meet recent national targets for net zero greenhouse gas emissions under the 2050 Paris Agreement are now also being developed.

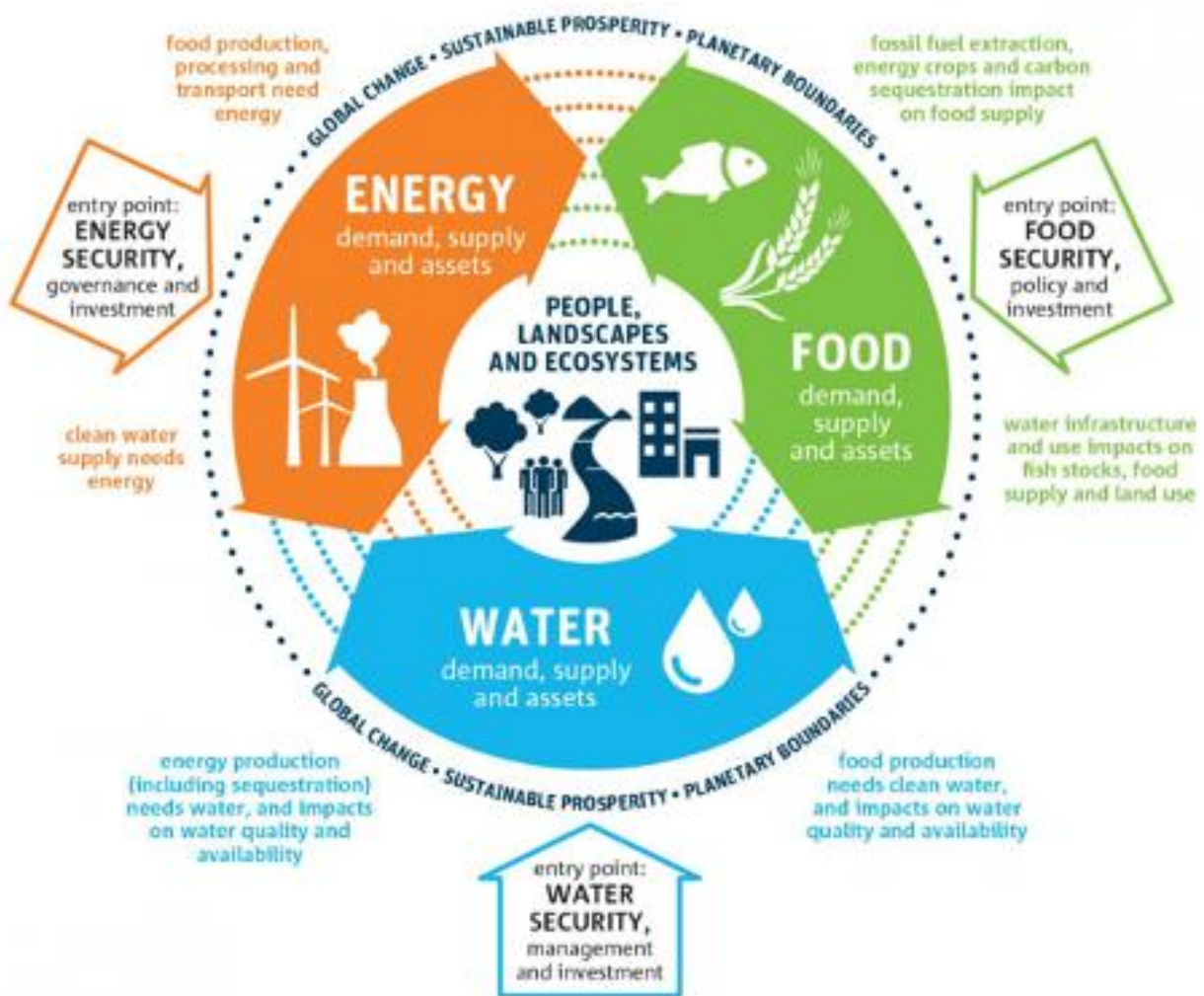


Figure 1 The water, energy, and food nexus concept showing examples of the linkages between sectors, the central role of people and ecosystems, and the outer sustainability principles within which the nexus approach operates (CSIRO 2015).

AIMS AND OBJECTIVES

The Pacific is at the forefront of both the call for increased ambition to address anthropogenic climate change as well as its ultimate and irreversible impact, forced migration. In this context, Pacific voices and knowledge will be fundamental as the world interrogates and explores new ways to respond to these challenges, and importantly, to ensure that there is a just transition to a net zero economy.

In line with this, the roundtable aims to:

- Identify the interactions between water-food, food-energy, and energy-water to inform prioritised actions that will increase WEF security on the path towards decarbonisation.
- Specifically consider the role of traditional knowledge and land management practices in providing measurable progress towards food security and the need for these to be the basis for and carbon sequestration credit generating activities.
- Specifically consider the role of innovation and technology in transitioning energy to clean, affordable, and reliable sources that satisfy ever-growing energy demands.
- Identify the major risks that carbon credit and markets pose; both to local communities and to meaningful climate change mitigation.

FRAMING

The Roundtable is framed within a nexus approach in the Pacific (Box 1) and on the global climate leadership of the Pacific. This paper is designed to provoke critical discussion on the role that carbon as a tradable commodity may or may not play in delivering social justice. With social justice being defined as a fair and equitable division of resources, opportunities, and privileges in society, we will specifically consider how post-SDG and NetZero target design and measurement ensure water, food, and energy security while simultaneously moving to a rapidly decarbonized world.

BOX 1: PACIFIC CONTEXT – LESSONS FROM A MICROCOSM OF THE WORLD

In the Pacific freshwater resources are highly variable, comprising some of the global extremes in terms of availability and access. This region, covering approximately a fifth of the planet's surface, supports extensive biomes from arid deserts to lush tropical forests so also is home to tremendously diverse food systems. The diversity in food systems sees an array of animal and plant species that have been important to food security for millennia, and traditional knowledge that has enabled this security. But again, traditional knowledge is diverse, as distinct as the biomes that have supported people living in this region. Human presence ranges from estimates of over 50,000–60,000 years in Australia to more recent estimates of 3,000 years ago in remote parts of Polynesia. In the last few hundred years these natural and societal systems have been upended through the global impacts of colonialization and an increasingly industrialized world. Water and food security in this region now face major challenges, and the need for energy now greatly exceeds household requirements and is a driver of concern for national security and economic stability and growth. It is in this post-colonial period of globalization that the water, energy, and food nexus approach offers opportunity to pivot as quickly as possible to a more sustainable use of water resources, a more sustainable use of land and sea for food production, and a more sustainable generation of energy by looking both to the past and to the future. In order to manage sustainably across water, food, energy, and the environment a holistic approach that leverages the diverse and location-specific traditional knowledge is essential. Addressing the sectors of water, energy, and food simultaneously must be absolute in that the underpinning biomes and environment that support them are healthy and functioning.

(Dansie, Alleway & Böer, 2024)

Historic carbon emissions are positively correlated to the “development” of a country, as measured by GNI/GDP, with those countries classified as “High-income” by the World Bank having emitted more CO2e per capita than less “developed” countries. How can wealth generated from carbon as a resource similarly empower World Bank classified “Low-income” and “Middle-income” countries to retain and restore giant swaths of natural environment, led by community priorities, ownership, and wealth generation?

In recognition of the complexity and limited impact to date of carbon markets globally, we will examine if there is a role that carbon can, or will play in a WEF nexus approach that is centered on a healthy environment (Figure 1) and provides a foundation to then sustainably address societal and economical SDG and development target aspirations (Figure 2).

Within this, we prompt participants to reflect on and discuss the distinct opportunity for stronger collaboration between universities, civil society, government, and industry to address the increasing development challenges we face as a society, and the role each should play in establishing the evidence base to inform the way we develop solutions.

The remainder of this paper includes contributions from the participants that form the basis of the Roundtable discussion.

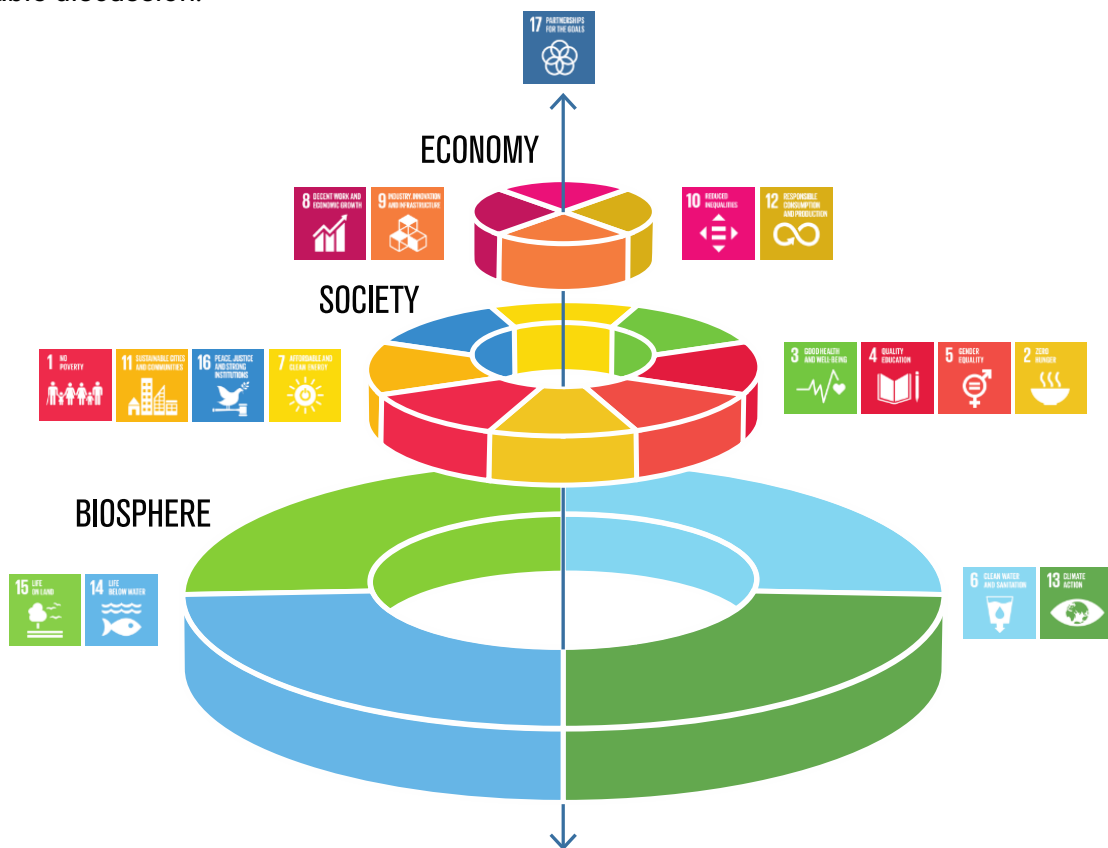


Figure 2 Environmental systems and functions are essential to supporting subsequent societal and economical SDG aspirations (Stockholm Resilience Center, 2016).

CONTEXT SETTING

EGO LEMOS, *Good Will Ambassador and Special Envoy for Culture, Environment and Water Resources, Office of the President of Timor-Leste*

The constitution of Timor-Leste ensures environmental protection is a fundamental constitutional right such that, 'Everyone has the right to a humane, healthy, and ecologically balanced environment and the duty to protect it and improve it for the benefit of the future generations.' Through Article 61 the government seeks to reverse effects of deforestation and biodiversity loss while dealing with climate change and the sustainable management of natural resources.

Translating this constitutional ideal into practice is constrained by limited resources and capacity constraints. The Permatil approach is to work with people, especially the youth, to strengthen food sovereignty, facilitate environmental regeneration, mitigate climate change and build resilient and sustainable communities everywhere. This approach is based on engagement and collaboration in communities across the 14 provinces to understanding their needs, knowledge, and practices.

The key challenge to strengthening food sovereignty is access to water through the dry months. Our campaign of 'planting water' campaign is based on community led spring restoration through the construction of recharge basins to enable expansion of permaculture, land stabilisation, restoration of degraded lands, protecting biodiversity hotspots. Improving the environment is central to climate change mitigation, while a focus on training and capacity building for climate-resilient agriculture, diversifying livelihoods, preserving cultural traditions, building robust local economies and governance structures, and ensuring equitable access to opportunities. Bottom-up, culturally appropriate solutions are critical. Overall, the Permatil approach empowers local communities as the driving force behind positive environmental, social and economic transformation in their regions.

HEIDI ALLEWAY, *Senior Aquaculture Scientist, The Nature Conservancy*

Few things shape our planet on the scale that food does; it has altered Earth's ecosystems more than any other human activity. Food production is the cause of 80% of global habitat loss, a trend that is accelerating, and accounts for 70% of all freshwater usage and 24% of greenhouse emissions.

Yet, the foundations of our food system are also the powerhouse behind the earth's capacity to cycle and take up carbon. The ocean is the world's largest active carbon store, followed by soils, which store more carbon than that retained in the atmosphere and vegetation combined. Ensuring Earth's oceans and soils can continue to play their vital role as carbon sinks is, therefore, critical.

In a win-win for people and nature, regenerative solutions in food systems can address the ecological and societal challenges of climate change, by protecting, sustainably managing, and restoring ecosystems.

On land regenerative food production has been shown to:

- increase biodiversity

- improve soil health and reduce eutrophication in rivers and coastal waters
- prevent soil and waterway erosion

In the ocean, through restorative aquaculture, it can:

- increase the availability of habitat for species to forage, shelter and reproduce
- remove excess nitrogen and phosphorous
- and reduce the effects of ocean acidification

In the Pacific, restorative aquaculture, could be an especially unique and untapped opportunity, because the region has some of the highest rates of seafood consumption globally, but lowest quantities of seafood production contributed by this farming sector.

Importantly, regenerative practices are inherently found at the nexus of humanity's three key needs – food, water, and energy – providing the opportunity to couple solutions for greater gains in each. However, while the concept has gained popularity in recent years it is important to recognize the approach is not new. For thousands of years, Indigenous communities have used regenerative practices, growing food in alignment with ecological and climatic conditions; their knowledge is vital to getting these solutions right. By centering Indigenous voices in climate and food system conversations, and by respectfully complementing their knowledge with new science and technology, regenerative approaches could also be a vehicle for equality.

However, while promising, regenerative solutions can be difficult to implement and the transition to some approaches can be costly. Farmers that use regenerative practices are currently rewarded with better farming outcomes and good dose of altruism, but they aren't rewarded for the broader benefits these practices have for nature.

In this regard the science is clear, in combination with other strategies, carbon markets could be one of the most effective short-term tools to provide much-needed incentives for faster climate action.

Their impact has so much potential that it is critical that we make sure they are done right. Rules must be science-backed and independently verified, to build trust and prevent greenwashing. We must prioritize addressing technical challenges such as additionality, permanence, and leakage of CO₂, and we must ensure effective safeguards are implemented; safeguards that recognize that traditional owners and local communities are the critical stakeholders that make advancing carbon projects possible.

The challenges ahead of us are significant. Leveraging the existing power of nature to build a regenerative food system and economy is a solution we already have at our disposal. To decarbonize the global economy and secure a liveable future for all, high quality carbon markets that support genuine regenerative outcomes and Indigenous Peoples rights must be prioritized.

BENNO BÖER, *Chief, Natural Sciences Unit, United Nations Educational, Scientific and Cultural Organization (UNESCO) New Delhi Cluster Office*

This summary will examine four key messages as it relates to the WEF nexus in the Pacific; one on funding-mechanisms, and three on population:

1. Financing mechanisms

There are financing mechanisms to reduce the triple planetary crisis. The Global Environmental Fund, the Adaptation Fund, the Green Climate Fund and the International Climate Initiative come to mind. The mechanisms can support proposals on 'climate resilience', 'climate protection', 'climate adaptation' etc. I have been in contact with all of them and helped to raise funds. In doing so, I have learnt that these mechanisms need to be simplified. They need to provide funds much faster as we have no time to lose. These financing mechanisms are often slow, sometimes not responsive or simply not interested in promising ideas. These funding mechanisms should have a team of ecology and environment experts (instead of outsourcing), supported by an efficient administration to approve, or reject proposals within weeks or months, not years. Let us remember the Paris Agreement, which aims to keep global warming below 1.5°C by 2030. We must not waste these years. Environmental degradation is still progressing much faster than conservation and restoration.

2. The second message is about the triple planetary crisis and credible population projections:

The triple planetary crisis consists of biodiversity loss, climate change and pollution. Add to this the already existing water crisis, where billions of people lack sufficient fresh water, the food crisis, where more than 800 million people struggle to eat enough every day, and the energy crisis, where over a billion people have limited access to electricity. And then there is the energy paradox: we know that human-caused deforestation and greenhouse gases are contributing to rapid changes in the atmosphere, biosphere, cryosphere, hydrosphere, and lithosphere, but we continue to burn fossil fuels on a large scale, even though we knew about the problem long before the 1970s Global Energy Crisis.

We must expect an expansion of the unbridled exploitation of natural resources due to significant population growth. We all, including people who will be born in the future, need clean air, clean drinking water, energy, shelter, and sufficient food. So, we must remember that this planetary crisis is already a reality and is likely to develop into an even bigger crisis. It will bring even greater loss of biodiversity and habitat fragmentation, increasing pressure on coastal and marine fisheries. In addition, sea level rise will cause the habitable coastline to retreat inland, shrinking the space for human settlements and agriculture. Saltwater intrusion will lead to salinization of farmlands, for example in the Mekong, the Nile and other major river deltas.

3. The third message concerns what UNESCO can do on the issue of ecological conservation:

UNESCO is the host agency of three of the important United Nations-designated conservation sites, including Biosphere Reserves, World Natural Heritage Sites, and Global Geoparks. Even though there is good progress with coastal UNESCO-designated sites globally, there is room to establish many more coastal Biosphere Reserves, with science-based management plans that aim to apply, test, and demonstrate best practices for human living in harmony with nature.

Moreover, of course, UNESCO, as the United Nations specialized agency with Education and Science in its mandate and name, with its partners, can deliver far-reaching impact via schools, universities, and communities, to assist people to attain knowledge on climate resilience, and important skills on water resources management, biodiversity conservation, the application of clean energy, community-clean-ups, and promoting green jobs and entrepreneurship.

4. The fourth message is that we need to improve our own mental model and mindsets:

It is not good enough to have a multitude of expensive and carbon-intensive international conferences going on year after year, without producing sufficient local impact globally. These conferences should be mostly online and climate-neutral.

In addition, it is highly advisable to reach out to all schools and encourage them to apply good environmental practices on the school yard, in the buildings, and improve their own behaviour. All school students should become environmental stewards. This is important. It can be done, and it needs to be done very soon, if we wish to keep our human life-support-system, which is our planet, intact.

Moreover, I often ask myself the question, do we not urgently need key-staff in decision-making positions that have a certified professional background on the subject that they address? I am thinking about authorities dealing with issues related to the atmosphere, the biosphere, the cryosphere, the hydrosphere, the lithosphere. Would it not be better if environmental decision makers would have a professional background in agriculture, biology, earth sciences, ecology, fisheries, forestry, nature conservation, water management, when dealing with environmental sustainability?

If they would have a certified professional background, they would better understand how serious the 'Triple Planetary Crisis' has become. In turn, that would then allow for seriously relocating more attention to where attention is needed, and more budget where budget is needed.

Human Survivability should move to the top of our own and our decision makers priorities. At UNESCO we have begun converting our buildings and behaviour into environmentally friendliness. We have started 'walking the talk'.

FIONA SIMSON, *Chair, Australian Commission for International Agricultural Research, and Chair, Future Food Systems Cooperative Research Centre*

There is a critical conversation to be had to first understand, and then effectively and sustainably integrate carbon markets across the Pacific in a way that does not jeopardize our region's vulnerable communities. Farmers must play a key role in this, and the design of future food systems more broadly.

We know that carbon in the soil helps feed families, communities, and countries. One of the things that frustrates farmers in Australia, however, is that the global accounting systems generally don't account for the carbon managed in rotational and cyclic crops or grazing animals. The reality is that there is a myriad of ways to manage the land and agricultural practices to sequester more and mitigate the impact of carbon emissions, however, if we aren't able to have some input into how these schemes are designed and implemented, we could end up in a situation where the most vulnerable communities are getting a worse outcome because the lands that they would normally use for farming are no longer producing their food.

Carbon emissions have been a significant feature in food systems discussions for a while, alongside other issues such as climate, COVID and conflict. To effectively address the impact and opportunities of carbon however, a multijurisdictional, intricately planned approach will be needed to ensure that people and nations with the most influence (the heaviest emitters) do not target Pacific Island nations

as carbon sinks as opposed to sustainable food producers. There is a win-win opportunity here, but without a collaborative conversation, the Pacific nations may well end up in a worse situation than they are now. The conversation is integral; small island nations are literally sinking, and the ongoing impact of climate change is very real in terms of their food production. The issue is that some of the “solutions” being developed may well make some of their problems worse.

There are sadly a number of examples where attempts to introduce carbon markets in agricultural sectors have had little impact, or worse, a negative impact on the farmer’s livelihoods and access to sustainable and nutritious foods. There needs to be a realistic monetary model developed that accounts for the transition and differences in costs, skills and time to implement alternative farming methods. An ACIAR project in Bangladesh that looked at post-monsoon crop options showed that when mulching and alternative, saline tolerant seeds were introduced to bridge the period between the two seasons, families were able to double their income over the year. In addition to the economic impacts, there was a significant difference in soil health.

This is to say that we must tackle food security in concert with climate change by empowering people through access to the science and technologies that can help reduce their emissions. This technology, despite being well used in Australia, is being used for the first time in several emerging economies and is already making a huge difference. For example, the adoption of simple irrigation management, no-till farming practices, nutrient management for crops and better-quality seeds (i.e. the seed saver program), are increasingly helping farmers diversify their crops, increase their income, and improve their livelihoods.

Sharing and adapting the technology is going to be critical. Research is also critical; however, the important part is then the extension and sustainability of the outcomes. We can do research and work with communities, but there needs to be resources to keep the systems going and evolving the outcomes. There are no one-off, quick-fix technological solutions; it needs to be embedded into the community, adapted and adopted properly. If we rush to make quick siloed decisions about things that are really going to impact food security, then we risk much bigger issues than we are currently looking at.

This is a long-term, collaborative effort. Everyone must be looking at the entire food systems and the transformation that needs to occur. Only once food insecurity and nutrition is addressed, the farmers can start looking into more sequestration for carbon and ensure that the model is structured fairly.

In Australia, the National Farmers’ Federation (NFF) 2030 Roadmap aims for five percent of farmers’ incomes from ecosystem services in 2030. Carbon plays a part of that, but this attribution provides an indication of what level of contribution this should be playing in the balance between climate change and food security. Farmers feel that carbon held in grazing rangelands and rotational crops should be explored further. Likewise, the cyclical benefits of grazing animals.

Maybe as the discussion and the market advances, we can then turn to it.

ROUNDTABLE CONTRIBUTIONS

CORDELIA SELOMULYA, *Director, UNSW Future Food Systems Cooperative Research Centre*

Protected cropping could play a part in designing a resilient food production system in the Pacific. Engineering solutions – both current and novel – can and should be adapted to tackle the challenges posed by limited freshwater availability, changing climate, and lack of infrastructure. Efficient water management, including rainwater harvesting, fertigation¹, and water recycling, is crucial to ensure a reliable water supply for irrigation, in addition to selecting water-efficient crops and utilising solar-powered energy systems. Designing innovative climate-resilient structures, such as low-cost polytunnels with photo-selective films² that alter the sunlight spectrum thus reducing energy requirement for additional lighting, or using cement-free porous concrete³ for temperature control via evaporative cooling, could enhance crop productivity. CO₂ enrichment within protected cropping environments is critical for photosynthesis, promoting plant growth, and achieving higher yields, with works⁴ underway to optimise CO₂ injection in this setting. The appropriate carbon sequestration methods⁵ could contribute to both food security and climate resilience.

Engaging local communities in developing and maintaining these systems empowers them and fosters sustainable practices. Examples include partnering with local indigenous enterprises to optimise cultivation and management practices to increase the yield of Australian native rice production in North Australia,⁶ and co-designing sustainable tropical greenhouses with students working directly with local agronomists, farmers, and research personnel in Barbados.⁷

ORA RENAGI, *Vice Chancellor, Papua New Guinea University of Technology*

Transforming from subsistence to commercial farming: Fifty years ago, in PNG, living standards of rural population were quite reasonable as subsistent farmers. Given the population increase, resources are scarce, and people are required to transform from subsistent to commercial farming. Water and energy supplies are needed to increase productivity. Technology is required therefore, and supply systems must utilize renewable energy and sustainable agriculture practices which require upfront capital investment.

Educate coastal population on the science of blue carbon and sustainability: Many people in PNG live in the coastal areas and islands and must be better educated with sustainable use of marine resources and the science of blue carbon. This will help conserve mangrove ecosystems and sustainable use of marine products and enhance livelihoods.

¹ <https://www.futurefoodsystems.com.au/wsuo-partner-with-qatar-university-to-develop-sustainable-fertigation-technology/>

² <https://www.futurefoodsystems.com.au/gareema-pandey-optimising-nutritional-content-in-polytunnel-grown-blueberries/>

³ Rahman, et al., *Building and Environment*, 2023, 228, 109867

⁴ <https://www.futurefoodsystems.com.au/optimising-co2-use-to-boost-tomato-yield-cut-inputs/>

⁵ Gao et al., *Chem. Soc. Rev.*, 2020,49, 8584-8686

⁶ <https://www.futurefoodsystems.com.au/gehan-abdelghany-phd-developing-agronomic-protocols-for-cultivating-australian-wild-oryza-species-in-northern-australia/>

⁷ <https://www.mcgill.ca/sustainability/sp0145-bellairs-research-institute-greenhouse>

CLARE STEPHENS, *Postdoctoral Fellow, Hawkesbury Institute for the Environment Western Sydney University*

Maintaining and regenerating native ecosystems will be crucial for mitigating climate change and managing its impacts, but there is evidence that some existing programs are not working as intended.

A multidisciplinary research effort is needed to properly design and monitor land-based carbon sequestration programs, and local communities should be involved in defining the ecological goals of these efforts.

Trees currently provide the only reliable, cost-effective means of removing CO₂ from the atmosphere. Most carbon offset schemes therefore rely on maintaining or regenerating vegetation and soils. However, the effectiveness of some existing programs has been called into question.⁸ Additionally, carbon offset programs have not always been designed in collaboration with local communities, which misses an opportunity to create or maintain environmental assets of value to them.

There is also concern around the impact of future climate change on vegetation and soil health, which brings the longevity of land-based carbon sequestration programs into question. Warming enhances carbon loss from soil⁹ while increased drought and heatwaves could drive vegetation mortality.¹⁰ On the other hand, CO₂ fertilisation could have a positive impact on vegetation growth in healthy environments. These multiscale, interacting processes need to be better understood.

The complexity of ecosystem processes together with the quickly evolving impacts of climate change means that a massive research effort is needed to ensure nature-based carbon sequestration programs are effective now and in the future. Universities and research institutions are well-placed to contribute but require stronger connections with local communities so that ecological and societal goals can also be met.

⁸ Macintosh, A., Butler, D., Larraondo, P., Evans, M. C., Ansell, D., Waschka, M., Fensham, R., Eldridge, D., Lindenmayer, D., Gibbons, P., & Summerfield, P. (2024). Australian human-induced native forest regeneration carbon offset projects have limited impact on changes in woody vegetation cover and carbon removals. *Communications Earth & Environment*, 5(1), 149. <https://doi.org/10.1038/s43247-024-01313-x>

⁹ Viscarra Rossel, R. A., Zhang, M., Behrens, T., & Webster, R. (2024). A warming climate will make Australian soil a net emitter of atmospheric CO₂. *Npj Climate and Atmospheric Science*, 7(1), 79. <https://doi.org/10.1038/s41612-024-00619-z>

¹⁰ Wright, B. R., Nipper, M., Nipper, N., Merson, S. D., & Guest, T. (2023). Mortality rates of desert vegetation during high-intensity drought at Uluru-Kata Tjuta National Park, Central Australia. *Austral Ecology*, 48(4), 699–718. <https://doi.org/10.1111/aec.13290>

VANDA FAASOA-CHAN TING, *NDC Hub Technical Advisor, Secretariat of the Pacific Regional Environment Programme (SPREP)*

There are two main points to share:

1. **Water Security, Energy Security and Food Security are key to the survival of all Pacific Small Island Developing States (PSIDS) past 2030.**
2. Carbon can be the currency to a just world if **funding mechanisms were made easily available and accessible to PSIDS**, noting the vulnerability and special circumstances of SIDS and LDCs (under the Paris Agreement).

As custodians of some of the largest oceanic countries and territories, survival of our people is of utmost importance to ensure our cultural values and heritage continue to be passed down to many more generations in the future. Water Security, Energy Security and Food Security are three of the key catalysts required to ensure Pacific people remain resilient to the ever-evolving impacts of climate change. Energy Security includes access to clean drinking water stored and treated in secure facilities which in turn leads to a more healthy population. Energy security means more integrated locally available renewable energy sources for electricity production using feasible and affordable technologies. Food Security is intertwining Pacific traditional knowledge of farming with modern technologies applicable to our Region.

Accessing Climate Finance for community projects to mitigate climate change, continues to be a real challenge for PSIDS. All Pacific countries have submitted Nationally Determined Contributions (NDCs) under the Paris Agreement, amongst multitudes of other national plans and regional frameworks, demonstrates their genuine commitment to reducing carbon emissions. Having Carbon as a Currency may just be the missing reagent which hopefully will provide the motivation for countries to continue reducing their emissions so we can meet the 1.5C target.

GREG LESLIE, *Director, UNSW Global Water Institute*

The UNSW Global Water Institute respects and fully supports community-led approaches to the management of marine, freshwater and urban water resources. Many of our academics have had the privilege of working in partnership with community-led initiatives at the local, regional and national scale. These initiatives address vexing environmental water problems that require collective, collaborative, multi-sector and multi-disciplinary solutions. Strong community leadership and the inclusion of local wisdom, culture and knowledge has been essential in addressing the problems often caused by siloed, one-dimensional projects focussed on resource extraction. Community led projects include; the Food and Water for life project with the Dharrivaa Elders and Walgett Aboriginal Medical Service that seeks to improve health outcomes at the local scale; Project Halophyte with the University of the South Pacific, Swire Shipping and the Fiji Government that seeks to restore and protect coastal communities through mangrove restoration at the regional scale; and, at the national scale, the Pacific Water Leaders Survey with the Water Policy Group and the Pacific Water and Wastewater forum to identify critical coordination, capacity and investment gaps in Pacific Island Countries and Territories and raise these issues in global forums such as UN Water Conference. These projects succeed in doing collectively that which cannot be achieved individually.

"Though we are Small Islands Developing Nations we are also Large Ocean States"

The little big things: Slow cascading changing weather and climate patterns decreases traditional practices and skillset slowly depleting traditional knowledge because of sea level rise directly threatening food security for coastal communities in Fiji. This has also led to an increase in soil salinity, which has forced coastal communities to lose the knowledge of planting traditional root crops like yams, uvi, dalo, and cassava. Staples cannot thrive in high salinity soil.

Upon conducting a food security project in Votua, Ba, villages who are fortunate enough buy land 10 kilometres from their coastal village to grow crops and vegetables to sell or for daily consumption. However, this has led to another issue: the loss of fishers' skillset and 'qoliqoli' or fishing ground because of human displacement. Vunidogoloa being the first 'successful' village to be relocated because of sea level rise are gifted and talented fishers, now displaced several kilometres from their 'qoliqoli'. Vunidogoloa villagers will have to walk several hours to access their fishing grounds and it is highly likely their fishing grounds lack security and is at the risk of exploitation.

The following is required as we chart a way forward:

- **Documentation of planting, and fishing practices to ensure safe keeping for the next generations:** Development of planting manuals with diagrams on how, where, when to plant could be highly recommended, in laymen's term and developed into English and also their native tongue.
- **Best practice case studies:** 248 communities will have to be displaced by 2050 because of sea level rise in Fiji. Documenting the lessons learnt from human displacement from recent experiences like Vunidogoloa need to be well articulated to enhance resilience and protect the best interests and survival of the current and rest of the communities that will be displaced.

Addressing and the implementation of Water security and governance: Fiji is made up of 330 habitant islands, upon visiting the scattered maritime islands of the Lau and Yasawa group, majority of these islands still depend on rainwater for their daily sustenance. Young girls and women with their monthly menstruation, pregnant women, and lactating mothers were ranked with the highest vulnerability followed by children and people with disability.

Solomon Islands for instance, while conducting the Pacific Ocean Climate Crisis Assessment (POCCA) project, my team and I visited the man-made artificial islands of the Langa Langa lagoon, in the Malaita Province. There is a total of ~10,000 people living around the Langa Langa lagoon area and ~<5,000 inhabit the 60 man-made artificial islands. Majority of the habitants of these artificial man-made islands have to paddle 30-45 minutes (on a fine day) one way to mainland just to collect freshwater for their families. The artificial man-made islands of the Malaita Province have been in existence for the past 80 years to a century till date.

JIMMY J HILLY, *UNSW Researcher and Solomon Islands Ministry of Health and Medical Services*

Air security is an environmental health concern for urban areas in the Pacific, affecting vulnerable population groups including children. While Small Island Developing States (SIDS) advocate for a reduction in CO2 emissions, carbon remains a significant factor in our pursuit of development. Many Pacific Island nations continue to rely heavily on fossil fuels, contributing to local air pollution. This pollution is becoming a serious environmental health concern in urban areas, disproportionately affecting vulnerable groups like children. These countries face significant impacts from human-induced climate change and environmental challenges, including air pollution. Air quality data indicate for Solomon Islands and Fiji have shown levels of PM2.5 and PM10 have exceeded the 2021 World Health Organization (WHO) Air Quality Guidelines, posing health risks, particularly to children, who make up a large part of the population. Air quality Data for Tonga and Vanuatu have also indicated similar concern. This is a health concern for children's health exerting strains on the already burdened health system and places financial pressure on families, potentially leading to catastrophic household expenditures. Children of the Pacific are their future leaders and protecting children's health is crucial for their future contributions to socioeconomic development. Access to clean air is a basic human right, hence the time for action is now ensuring air security for all.

A call for action for governments in the Pacific to address local air pollution. Pacific governments including regional partners must address local air pollution, recognizing their social responsibility to foster an environment conducive to energy transition. Despite urging industrialized nations to reduce emissions, Pacific governments need to establish and enforce air quality standards for PM2.5 and PM10. Strengthening regional institutions like the South Pacific Environment Program (SPREP), the Pacific Community (SPC), and the Melanesian Spearhead Group (MSG) is essential in tackling air pollution. Establishing an air quality monitoring network in the Pacific is crucial for providing data to support advocacy, inform policy, and ensure compliance with air quality standards and this is also an avenue for the Pacific to track its progress towards achieve net zero emissions.

HEMANT OJHA, *Principal Advisor, Institute for Study and Development Worldwide (IFSD), Australia*

The insecurity which humanity is facing on food, water, and energy is a result of inappropriate decisions we took in the past, and the failure to do so at present. To tackle this crisis, and restore sustainability, we must bring governance – which is about how we make decisions and take actions – back to the centre, and fix the gap. In this brief roundtable intervention, I will highlight the need for recentring governance for sustainable WEF systems focusing on three critical questions: Who is making decisions? Who is included and who is excluded? Whose knowledge counts?

I will highlight how we are failing on inclusion in decision making and what opportunities we are missing out to improve. We need to go beyond tokenistic approach to participation and inclusion, to genuinely empower the local communities, local governments, and local actors so they can do what is possible locally. Likewise, WEF problems cannot be solved alone by injecting scientific knowledge from outside, without acknowledging, harnessing and integrating indigenous, feminist, practice based, historic knowledge that underpinned the sustainable people and ecosystem relations in the past. To fix problems of historical injustice, fair and adequate financing is also critical, without which governance work becomes empty rhetoric.

As priority action area, we must revitalise and strengthen localized governance of WEF systems, which empowers communities and leverages their knowledge and capabilities, supported by concurrent reforms at higher governance scales. And of course, governance reform does not end at the local – we need to connect the local with all scales of policy and decision making, through national to the global.

ARONA NGARI, *Former Director, Cook Islands Meteorological Service*

Traditional knowledge and land management practices can sustain food security while contributing to carbon sequestration. Remote islands in the Cook Islands has been using traditional knowledge to guide and implement practices that sustain food security. The use of moon phases to gauge the best method for fishing has been in the culture of these people for decades and probably centuries. There is also the practice of putting a ban on certain part of the lagoons for a period of time so as to recover the marine life as part of food security. Ancestors on 2 of these islands revolved the replenishing of crops on one of these islands while living off the other for a period before exchanging island so as to repeat the feat. This process allows for food security and complements the marine life that is used for sustenance.¹¹

The role of innovation and technology is put to practice in small communities that contribute to clean, affordable, and reliable sources of energy. The allocation of human resources for monitoring of weather and climate services has seen a downturn where it is replaced with technology. Technology increases the monitoring of weather and climate from 8 stations to 15 stations on a more regular basis that contributes more information and metadata for forecasting and research purposes. The stress bestowed on man is reduced while the outcome is greatly enhanced for the benefit of population and the environment.¹²

MICHAEL BURNSIDE, *Manager, UNSW Sustainable Development Reform Hub*

Fiji's National Infrastructure Plan for 2023-2034 exemplifies a forward-thinking approach to resilience. The plan aims to transition away from fossil fuels by investing in renewable energy sources such as solar, wind, and geothermal. This transition is crucial not only for reducing greenhouse gas emissions but also for mitigating the region's dependency on imported fuels. Such investments are essential for improving livelihoods, reducing poverty, and building resilience against environmental shocks.

A flagship initiative under this plan is the **Pacific Blue Shipping Partnership (PBSP)**, an ambitious coalition striving to transform maritime transport and achieve a 100% carbon-free sector by 2050. UNSW's role as the interim Secretariat and its techno-economic analysis have been instrumental in demonstrating the feasibility of these goals. By showcasing how strategic investments can pave the way for zero-carbon options, PBSP highlights the potential for regional cooperation and international support in achieving substantial emission reductions. These efforts are key to enhancing the resilience of communities and reducing economic vulnerabilities.

¹¹ Bernice P. Bishop *Ethnology of Manihiki and Rakahanga; Climate and Oceans Support Program in the Pacific*

¹² *United Nations Environment Program – Green Climate Fund; Pacific Meteorological Strategy 2017-2026; Pacific Weather Ready*

Moreover, the Ocean Accounts initiative, led by the **Global Ocean Accounts Partnership** with its Secretariat at UNSW, underscores the importance of integrating ocean ecosystem services into national economic planning. By valuing the carbon sequestration potential of mangrove forests and other blue carbon ecosystems, Fiji can attract finance and make informed decisions for sustainable development. This initiative not only supports the Sustainable Development Goals (SDGs) and the Paris Agreement but also enhances Fiji's climate resilience and economic stability. Effective management of these natural resources can significantly contribute to poverty reduction and improved livelihoods by sustaining key industries like fisheries and aquaculture.

ANIL BABU, *UNSW Masters of Environmental Management Student*

Integrating Traditional Ecological Knowledges (TEK) and Circular Economy principles: Climate change, water and energy scarcity is intricately connected to the agriculture industry globally; noting that it is both a cause and solution. However, to address food and water insecurity globally and mitigate the impact of climate change, agricultural systems need to be re-designed in a way that can facilitate better yield without compromising our ecosystem's balance. The TEK methods in agriculture have been influential in helping humanity sustain over centuries and is often grounded in a spiritual connection with the land and its biodiversity. Despite this, industrial-scale agriculture has been shifting global farming practices away from these models, which has been recognized as a contributor to climate change, and specific food and water insecurities.

Creating a Global Traditional Ecological Knowledges Database focused on agriculture: Traditional land management and farming practices vary significantly around the world and are grounded in the rich biodiversity, natural resources, and the socioeconomic context in which they are undertaken. Given the shift away from these practices to large-scale industrial farming and its impact on the environment, one simple way to support the integration of traditional practices into contemporary farming models is to develop an accessible database. The database would bring together a network of local elders and their communities, local and international governments, academics and students to examine and share models of regional agricultural practices. The aim would be to provide a foundation for integrating technological advancements to traditional practices with elements of circular economy principles to reduce the consumption of energy and water across the agricultural industry, and ultimately promoting sustainable food systems.



Front page cover image: Man and Woman returning from fishing, near Vitigo village, Viti Levu, Fiji | Project Halophyte

