



GREEN GOVERNMENT & CLIMATE TECHNOLOGY REPORT

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PART 2 CLIMATE TECH INNOVATIONS

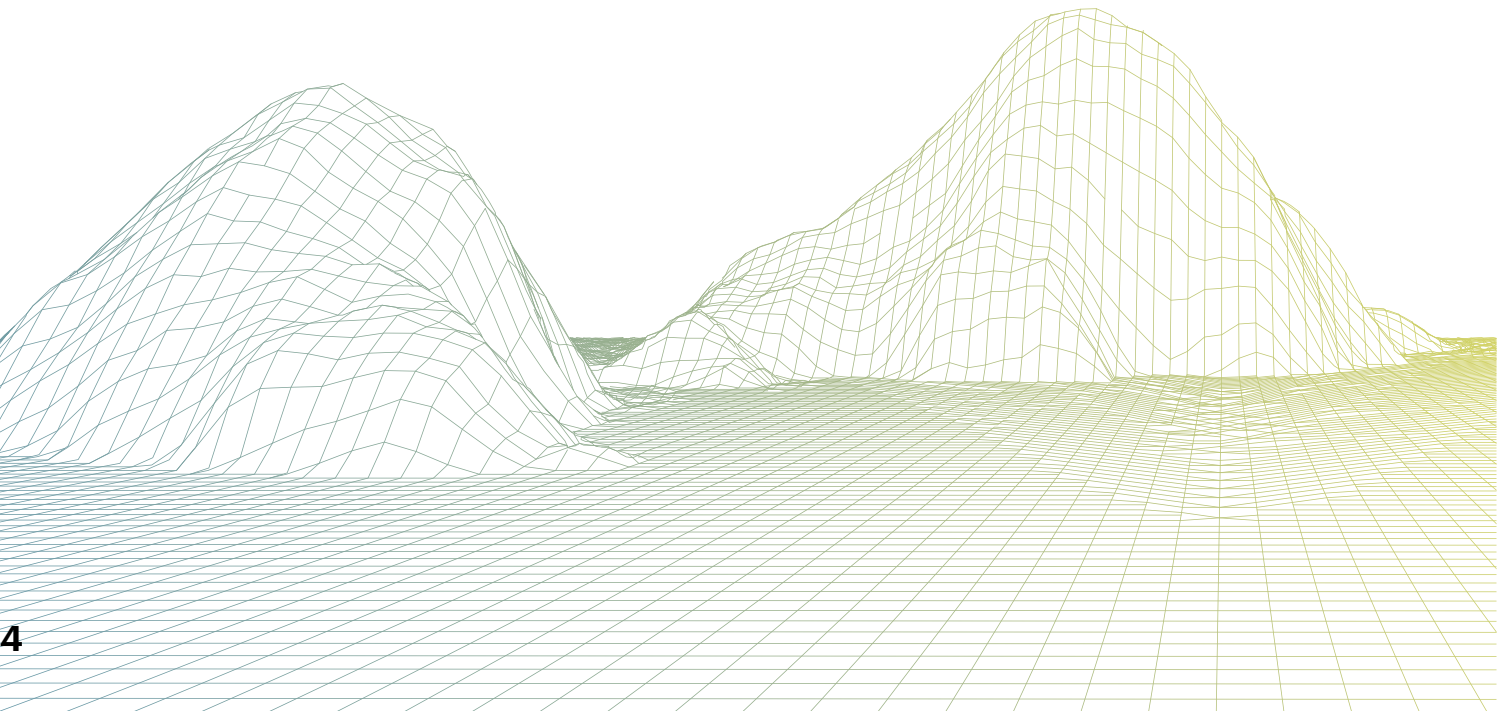
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Introduction

“Green government” operations are operations that minimize an entity’s environmental impact, including its energy use, water use, waste and pollution generation, and greenhouse gas emissions. Likewise, “climate tech” includes technologies that are used to address climate change. While government entities across the world face tight budgets, smart investments can reduce operational costs and demonstrate how to implement climate-friendly, green activities.

Climate change is perhaps the most important issue facing our planet today. It is an existential threat facing every single city and country without discrimination. Governments have a twofold responsibility here. First, they must wield their power to drive change across society, providing incentives and deterrents that can help citizens change habits and assets to become more sustainable and environmentally friendly. Second, governments must demonstrate these societal changes and lead by example to inspire other businesses industries. Often in today’s world, this approach includes public investments in tech solutions to help solve climate problems. The changes provide a healthy model for citizens to emulate and may encourage them to change some of their own wasteful habits at home.

Green government solutions are at the forefront of strategic discussions in 2023, particularly in the Middle East. The annual UN climate change conference took place in Egypt in late 2022 and will happen in the UAE in late 2023. In fact, to capitalize on the global spotlight, as well as emphasize the importance of inspiring collective action towards a more prosperous future, the UAE has officially named 2023 as the “Year of Sustainability”.



Many of the most effective green government and climate tech initiatives are small, simple changes that can easily be implemented. Municipal leaders need not wait for additional budget allocations or silver bullet contraptions to make headway against climate change. Sample projects of this nature include:

- Increasing energy efficiency (e.g., conducting an energy audit and efficiency upgrades at city hall, building city facilities to Leadership in Energy & Environmental Design (LEED) standards, installing a revolving door in high traffic entrances).
- Using alternative energy (e.g., using solar panels to power electronic parking meters, installing a wind turbine to power government buildings).
- Reducing waste (e.g., replacing single-use water bottles with pitchers and reusable glasses at meetings, introducing composting receptacles in staff kitchens, replacing individual trash bins with desk-side recycling bins).
- Encouraging greener transportation choices (e.g., providing bike racks, showers, and locker rooms for city employees who ride to work; incentivizing staff use of public transportation or carpools; purchasing electric or hybrid vehicles for the city fleet).
- Implementing sustainable land use decisions (e.g., locating public services near transit options, limiting the number of parking spots required for public buildings).
- Increasing the resilience of government assets and reducing the heat island effect through government infrastructure (e.g., installing green infrastructure at government facilities, such as green and cool roofs, rain gardens, cool and permeable pavements; paving roads with resilient materials).

Other green government and climate tech initiatives are more innovative and require more resources. This report will focus on these more ambitious projects and 21 different case studies are presented from different corners of the world, showcasing the variety of approaches different national and local governments are taking to reduce their carbon footprint as well as find new business opportunities for both private and public sector partners. This report does not endorse any specific government strategy, but instead analyzes them to help different public sector entities evaluate which might be the most applicable in their specific circumstances.



PART 1

GREEN

GOVERNMENT

1-SINGAPORE'S GREENGOV.SG INITIATIVE:

The Gold Standard in Government Sustainability

SINGAPORE

Formerly known as the Public Sector Taking the Lead in Environmental Sustainability initiative (PSTLES), the GreenGov.SG initiative forms a component and enabler of the Singapore Green Plan 2030. Originally introduced in 2006, the PSTLES initiative was aimed at improving resource efficiency within the public sector. In 2014, PSTLES 2.0 was enhanced to focus on sustainability outcomes and put in place organisational processes to manage resource use. Most recently in 2021 PSTLES has been refreshed and renamed as GreenGov.SG. The name "GreenGov.SG" reflects the cross-cutting role of the Government in supporting the national sustainability agenda.

The 2021 refresh is more than a branding exercise, however: it is a strategic overhaul. Four key shifts in the 2021 initiative include:

More ambitious targets, including a carbon emissions target for the first time.

Target setting will go beyond government-owned offices, to include public sector infrastructure and operations, such as transport infrastructure and healthcare facilities.



Environmental sustainability will be embedded in the public service's core business areas, in areas like green procurement and education. This will raise sustainability awareness and catalyze green practices beyond the public service.

Building a culture of sustainability amongst public servants. Public servants will be encouraged to adopt more environmentally-friendly practices and initiate ground-up initiatives within their agencies.

01

Excel with new and more ambitious targets:

- The public sector aims to peak its carbon emissions around 2025, 5 years ahead of the national target.
- By 2030, the public sector aims to reduce energy and water use by 10% from the average of 2018-2020 levels, and to reduce the amount of waste disposed by 30% from 2022 levels.
- The public sector will set targets for buildings, information technology, transport, and solar deployment that are more ambitious than the national targets.
- For all the above, the scope of GreenGov.SG will be expanded to include public sector infrastructure and operations, such as public transport infrastructure and healthcare facilities.

02

Enable a sustainable economy and green citizenry, by embedding sustainability in their core businesses:

- Require Government agencies to purchase products that meet high efficiency or sustainability standards. This will apply to electrical appliances, as well as water fittings, building materials for interior use, and electric vehicles.
- Factor in companies' sustainability-related policies and practices when evaluating government tenders, starting with event venue and accommodation, and public waste collection contracts. Work towards incorporating sustainability as a consideration in all procurement decisions.

- Incorporate sustainability features at public spaces such as hawker centers and community clubs to raise public awareness. Also educate the community on sustainability issues through the school curriculum and community programmes.

03

Excite public officers to contribute actively to sustainability in Singapore:

- There will be regular sharing sessions organised within the public sector to promote the exchange of ideas, best practices, and the latest technological solutions, so as to inspire and support public officers to champion ground-up initiatives.
- Organize campaigns to raise awareness and encourage public officers to take simple steps to lead a more sustainable lifestyle.

In addition, the public sector is looking to private sector leaders in the space, for assistance in innovations, best practices, and partnerships.



GreenGov.SG is a sustainability movement launched by the public sector to support the Singapore Green Plan 2030

It sets ambitious targets and measures to enable the public sector to peak its emissions around 2025, ahead of the national target



Achieving Singapore's sustainability goals is a whole-of-nation endeavour
We all have a part to play

While the public sector is taking the lead, achieving a national goal of sustainable development is a whole-of-nation endeavour. With the refreshed GreenGov.SG initiative, the Government of Singapore hopes to inspire its people and partners to embrace green practices and make sustainability a way of life. Together, they can chart the way towards a low-carbon and sustainable future for the small island country.

EXCEL ●

With new and more ambitious targets for the public sector

Aim to reduce energy and water use by 10% (from the average of 2018- 2020 levels) by 2023



Aim to reduce amount of waste disposed of by 30% (from 2022 levels) by 2023



To set targets for buildings information technology transport and solar deployment , which are more ambitious than national goals



Targets will also apply to public sector infrastructure and operations



ENABLE ●

A sustainable economy and green citizenry by embedding sustainability in our core business

To purchase products that meet high resource efficiency or sustainability standards



To take into account companies's sustainability related policies and practices, when evaluating government tenders



To continue raising public awareness by showcasing sustainability at community spaces e.g.hawker center



Let's work together to make Singapore a city of green possibilities

GreenGov.SG is a living plan. It will continue to refresh specific targets, strategies and initiatives over time, as new opportunities avail themselves. As the Brookings Institute noted, by placing the green procurement strategy at the center of its Green Plan, it will enhance the government's ability to actually follow through with its ambitious targets, setting it up hopefully for future success.

EXCITE ●

Public officers to contribute actively to sustainability in Singapore

To promote the exchange of best practices and latest solutions to inspire and empower public officers



Support public officers who wish to champion ground-up initiatives



2-Portland Oregon's Sustainable City Principles Dashboard:

Accountability for Local Government Goals

United States

The City of Portland has systematically pursued sustainability in its internal operations since the early 1990s, when City Council first adopted a set of Sustainable City Principles. The city has a long track record of environmental diligence, and it seeks to be a model of sustainable operations — as an example for all Portland residents and businesses. The City currently adheres to a set of ambitious sustainability goals that guide daily management, operations and employee action, which were adopted in 2015 with a goal to be completed by 2030.

The ten Sustainable City Principles include:

- 01

Carbon emissions
(reducing emissions from city operations by 53% from 2006-2007 levels)
- 02

Energy efficiency
(reduce overall energy usage of city operations by 2% annually)
- 03

Fleet emissions
(reduce city fleet vehicle emissions by 10%)
- 04

Harmful pollutants
(eliminate harmful pollutants from indoor environments)
- 05

Natural systems
(ensure over 80% of city-managed natural areas are in healthy conditions)
- 06

Renewable energy
(generate or purchase renewable energy for 100% of city operations)
- 07

Salmon-safe certifications
(receive certifications for keystone fish species for local ecosystems)
- 08

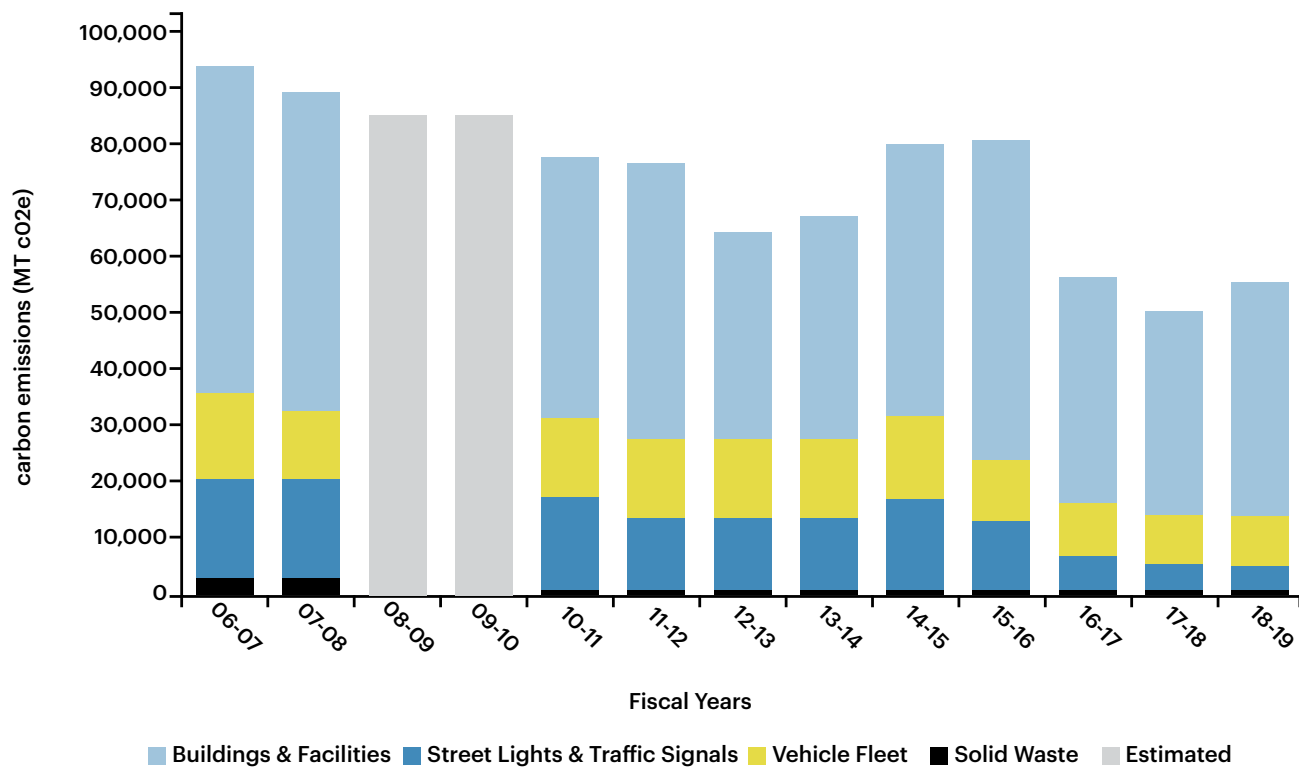
Stormwater strategies
(manage 50% of city-controlled stormwater through sustainable strategies)
- 09

Waste recovery
(recover 90% of waste from city operations)
- 10

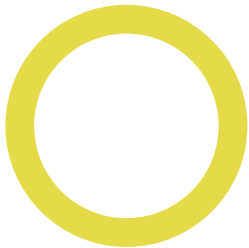
Water use
(water use is the same or less than fiscal year 2006-07 levels)

To track its progress and publicly account on reaching the 10 different sustainability objectives for 2030, the city government created an online interactive portal and dashboard. Each objective page begins with clear information about the 2030 targets, as well as an overall progress grade. The rest of the webpage explains what policy actions have been advanced over the last 15 years (such as legislation changes, passive infrastructure updates, implementing new technology, and so forth), how successful each policy has been, explanations for best practices by government employees and citizens, and data visualizations where possible. For example, regarding carbon emissions, Portland provides annual data to view progress since the dashboard was implemented. Some of the Sustainability City Principles have spurred spin-off or support projects too, which are likewise detailed.

City of Portland total carbon emissions

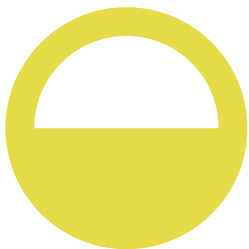


Each Sustainable City Principle is assigned one of four grades, as follows:



NEEDS WORK

Needs work: no significant progress; not on track to achieve goal by 2030



HOLDING STEADY

Holding steady: making progress; still not on track to achieve goal by 2030



ON TRACK

On track: making progress; projected to achieve goal by 2030



ACHIEVED

Achieved: already meeting 2030 targets

As of October 2021, the City of Portland has already achieved 4 of its 10 sustainability goals for 2030. 4 more objectives are on track, 1 is holding steady, and only 1 needs work.

3-Egypt's Green Roof Initiative:

Optimizing Underused Urban Space

Egypt

As with other large urban environments in hot climates, Cairo is suffering from numerous environmental problems, such as



urban heat islands

(cities become warmer than surrounding rural areas, especially at night, due to built environment absorbing instead of dissipating heat)



poor energy efficiency of buildings

(partly due to modern architecture is not adapted to desert climates)



stormwater runoff

(due to excess impervious surfaces through the city and poor drainage infrastructure)



air pollution

(due to vehicle congestion and industrial activities),
diminishing biodiversity (due to habitat loss from human development)

In parallel over the last decade, Egypt's Ministry of Electricity and Energy has sometimes instituted power cuts as a means of trying to conserve energy and meet the growing demand, which is outstripping supply.

Green roofs are one effective strategy to solve each of these problems. Green roofs involve the creation of new agricultural spaces on the roofs of buildings, and can directly combat aforementioned urban heat islands, poor energy efficiency, stormwater runoff, air pollution, and diminishing biodiversity, as well as enhance the lifespan of the roofs themselves. Overall, this gives urban communities with green roofs economic, health and environmental advantages: streets become more pleasant to live in, buildings can possibly see increased property value, and communities can endure stormy weather better, among other benefits. In terms of temperature, green roofs can be as much as 7 degrees Celsius lower. In terms of finances, green roofs are both cost efficient and require little maintenance.

In recent years, there have been several initiatives and campaigns in Egypt to promote urban gardening on rooftops and elsewhere, in order to encourage more eco-friendly solutions across the country. Fortunately, there has been a positive response from both Egyptian residents and the government in following and implementing such initiatives. A significant portion of the required activity involves retrofitting existing buildings. Green roofs are helping with energy conservation.

Because conventional soil and sand are heavy, alternatives are common such as

Crushed peanut shells	Perlite	Compost	Vermiculite	Crushed clay pots
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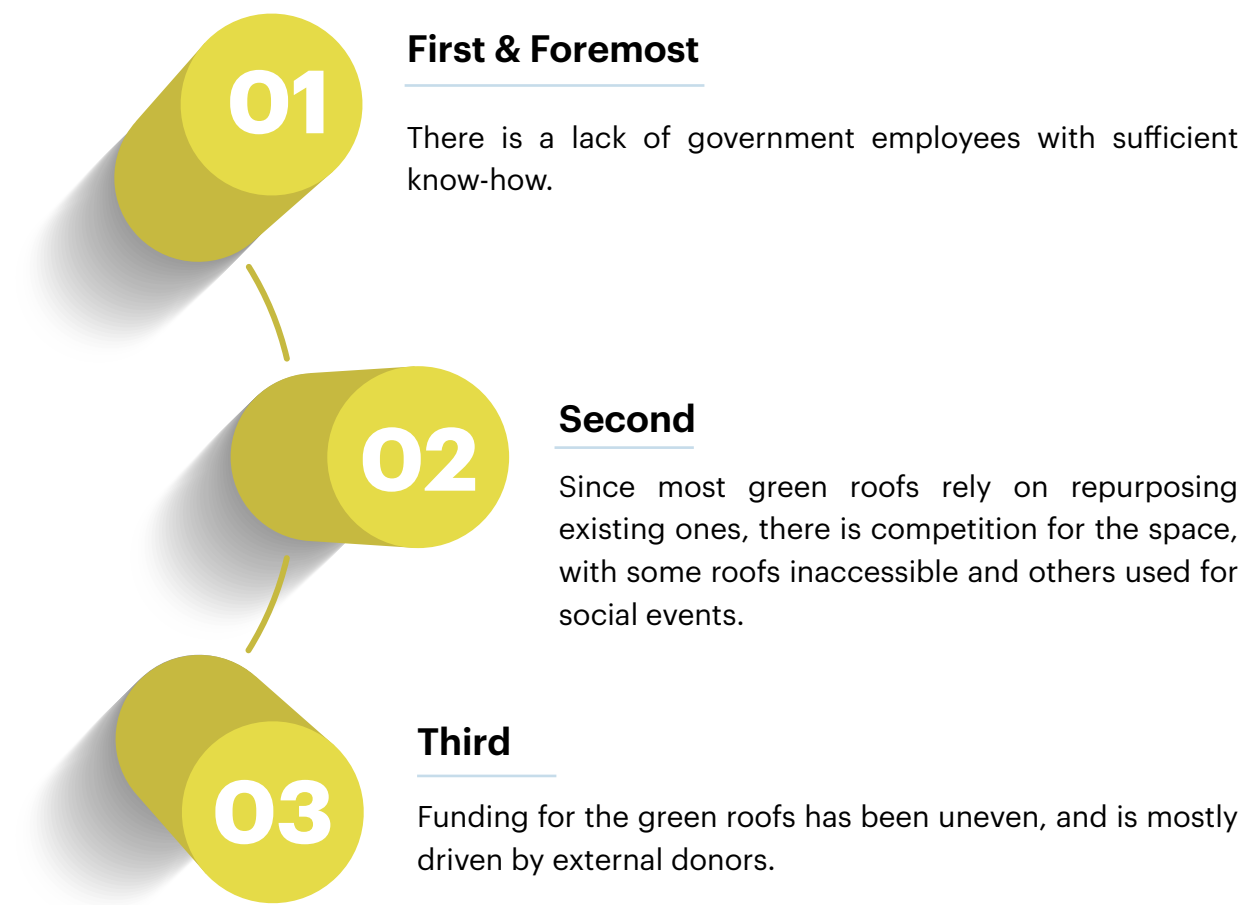
No direct planting process is used on the roof itself; instead, plants are grown on wooden tables or other raised surfaces. Many schools are already using this technology to provide a new source of fresh and healthy food for students.



In 2019

Egypt’s Ministry of Environment launched a nationwide green-roof initiative to encourage planting roofs of buildings and facilities, including on government properties such as schools, to reduce pollution levels in the country and provide a more eco-friendly use of space. This was not the first effort to encourage widespread adoption. For example, in 2018, three governmental buildings affiliated with the ministry of Agriculture in Hurghada city were given extensive green roofs with ornamental, medical and aromatic plants.

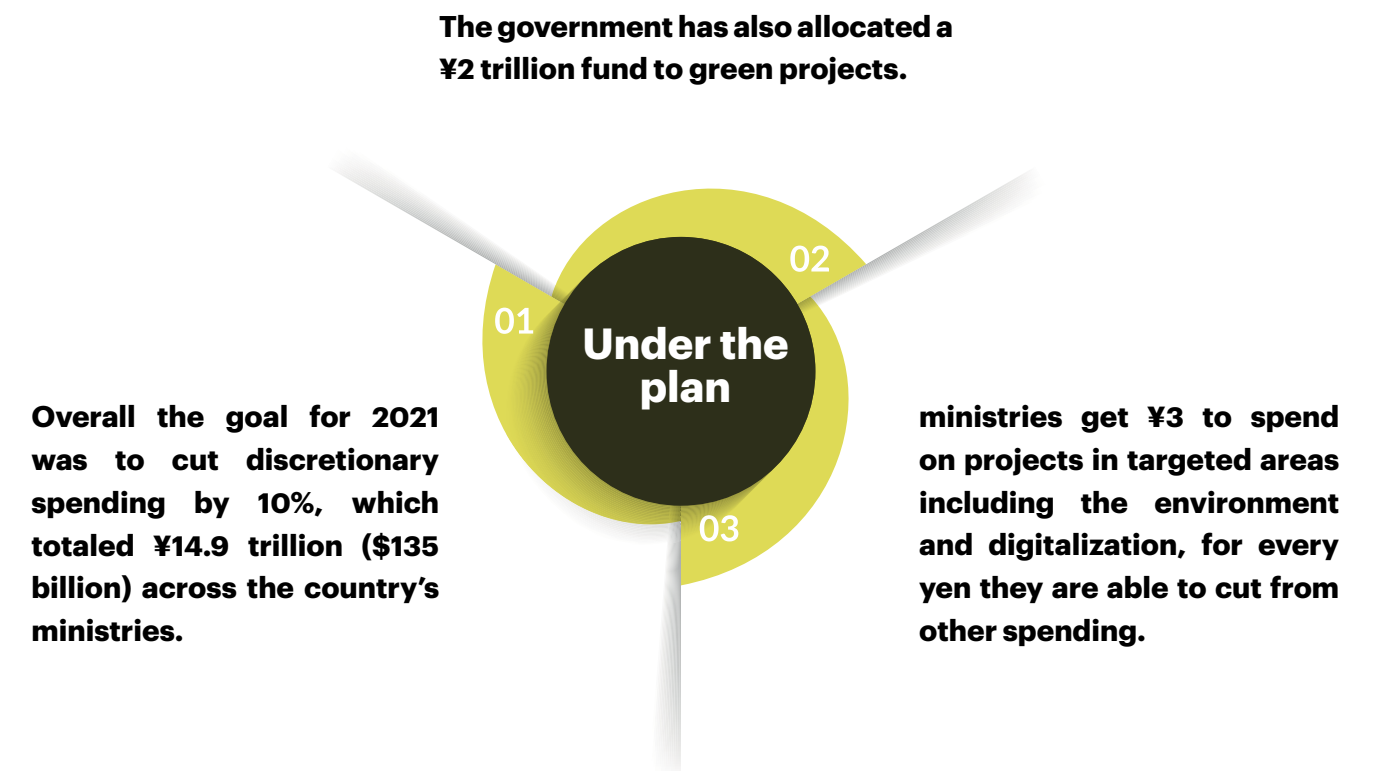
Thus far, there are several issues with widespread implementation.



The American University of Cairo’s Research Institute for a Sustainable Environment has also been working on designing and implementing green roofs in Cairo, to support sustainable agriculture. Covered with vegetation and succulent plants, which are planted over a waterproofing membrane, the roof serves a variety of environmental, economic and aesthetic purposes, in addition to creating a space for learning and teaching. The university studies different green roof options to better understand the various technologies, substrate mixes, plants, irrigation schedules, drainage, weight and ways to work with aquaponics.

4-Japan Ties Green and Digital Investments to Government Cost Cutting

Like many countries, Japan has adopted new targets for reducing greenhouse gases, aiming for net-zero emissions by 2050. However, analysts are skeptical the goal will be met without significant economic changes to both the public and private sectors. To try to minimize the financial burden of new green and other growth initiatives, Japan's government unveiled a new budgeting mechanism in July 2021: tying funding to cost-cutting results at the country's many ministries.



Japanese Prime Minister Yoshihide Suga has pushed for investment into green and digital technologies even as the government struggles under the developed world's heaviest debt burden. This new budgeting mechanism is an attempt to fix that problem by providing incentives for Japan's bureaucrats to cut costs while also funding the country's new growth projects.

Japan

In addition, another key reason for introducing the new budget mechanism was the COVID-19 pandemic, which pushed the Japanese economy into a slump. In particular, the pandemic showcased how old local government IT services were, which in turn hindered government response efforts. Therefore, finding methods to increase the budget in these sectors become a matter of national urgency.

While developing the annual budget in late 2020, private sector parties urged the government to deploy all the budgetary, tax and deregulation tools it had available to boost growth. Also considered for a budgeting mechanism was a dedicated large-scale investment fund.

Using cost-cuts to pay for needed investments may not be easy because the Japanese government is already so lean. Public sector employment is one measure of that. Fewer than 6% of Japanese workers are employed by the public sector, far below the 18% average of peer countries in the Organization for Economic Cooperation and Development.

Austerity is not the only recent financial tool introduced by the Japanese government, however; for example,

- In June 2021, The Bank of Japan unveiled complementary plans that include offering zero interest loans to financial institutions that boost green loans or investment in aforementioned targeted industries.

- This approach might feel slightly removed from the market, but was chosen because it allows the central bank to stay neutral throughout the innovation process.

- Japan is so committed to this strategy it will dip into its massive foreign reserves to kickstart green investments.

- Also forthcoming are non-monetary policy steps such as new research into the financial risks of climate change.



5-Balikpapan Indonesia's Landfill Gas Plant:

Capturing Greenhouse Gases to Convert into Electricity and New Revenue Stream

Indonesia

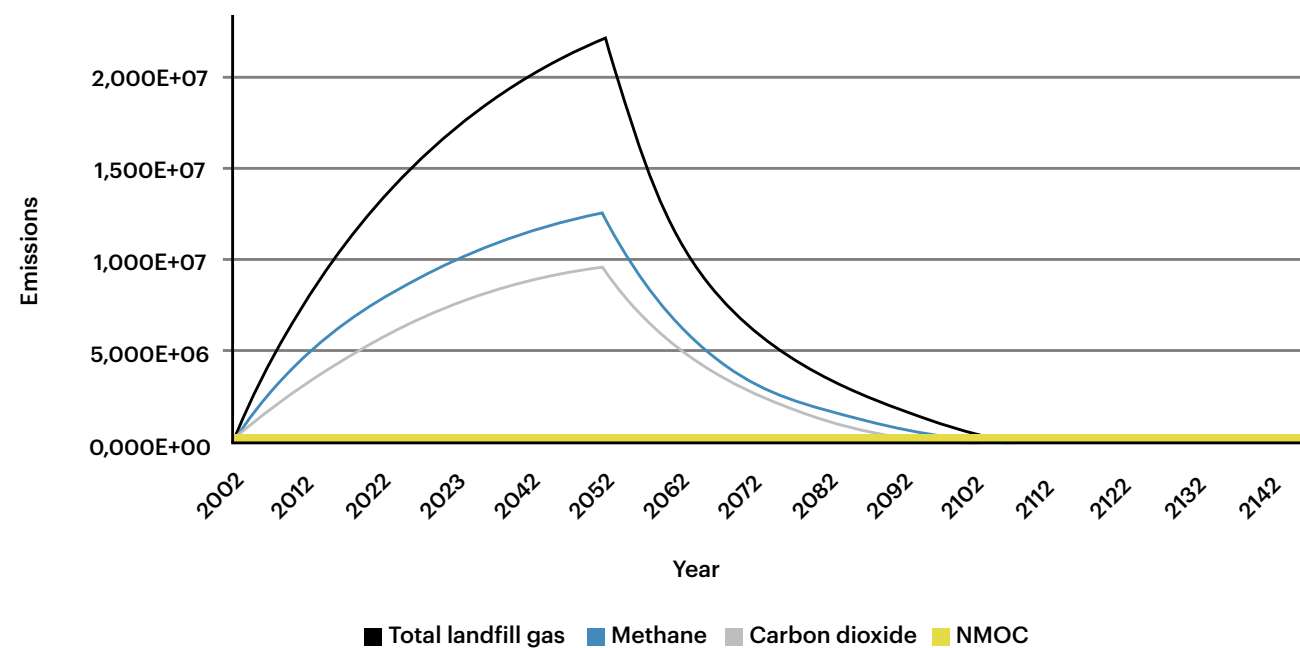
Solid waste management is usually one of the most labor- and cost-intensive services provided by local governments in both developed and developing countries. In Indonesia, landfilling is the most common method used to handle municipal solid waste. It is considered a cheap and convenient method since it is not restricted to advanced technology for treating and managing waste. Despite its economic advantages, however, landfilling has many adverse impacts on the environment. These include soil pollution, groundwater contamination, and air pollution due to emission of greenhouse gases like methane. According to the UN, landfills globally are responsible for about 30% of methane emitted into the atmosphere.

In Balikpapan

An Indonesian city on the island Borneo and an important regional center of petroleum production, a particular landfill named Manggar has become a new source of sustainable development. City leaders set a goal to decrease greenhouse gas emissions by about 20% by 2020, and have been looking for new ways to lower their carbon footprint as well as drive new industries.

With a rapidly growing population reaching almost 1 million today, the city's waste footprint has grown tremendously

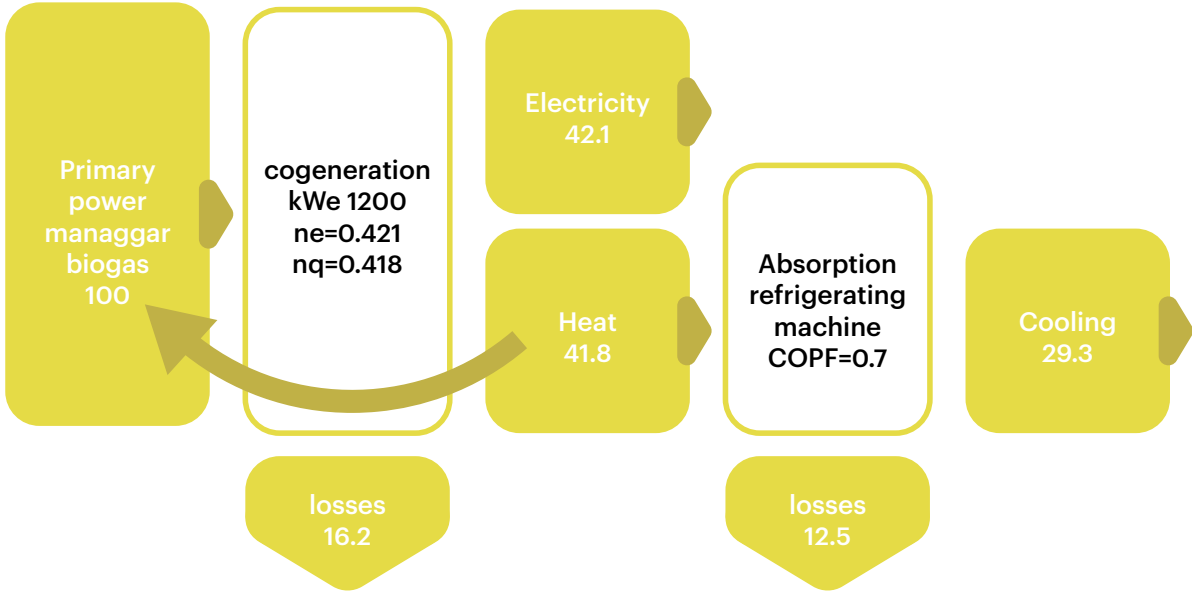
- The Manggar landfill for example has doubled its annual volume of solid waste since opening in 2002.
- In addition, this landfill's high concentration of organic waste compounds has made it a massive source of methane and carbon dioxide gases.
- While both these gases contribute to climate change, methane has untapped potential as an energy source, called biogas.
- The biogas produced by landfilling can be burned for cooking or to produce heat for warmth and electricity.
- Furthermore, this source of methane lasts for decades, while waste and sewage slowly decompose and release gases on a time delay.



Current projections suggest that methane emissions from the Manggar landfill will continue to climb until about 2050, and then diminish until the end of the 21st century. In other words: the landfill will produce an exploitable gas resource for the next century, and all Balikpapan needs to do is harness it.

Crucially, this methane has already become a source of revenue for the local government. First, some of the gas itself is captured and distributed to hundreds of local families as fuel for cooking. Second, the landfill itself burns the gas to produce electricity and power its own operations; excess energy is then sold back into the local electricity grid. As of 2020, electricity from Manggar was primarily used to power the city’s street lights.

Unfortunately, because the city is part of a developing country, it has numerous issues with its biogas infrastructure. To start, the landfill was not originally built with biogas exploitation in mind, so capturing the methane is highly inefficient and not as profitable as it should be. Local garbage trucks actually broke some of the pipes used to capture methane, and the remaining pipes are only sufficient to produce 25 MWh annually. A 2017 study estimated the landfill has the capacity to meet the energy demands of over 10,000 inhabitants, if the electricity generation process was properly optimized. Another issue is the lack of monitoring equipment around the landfill, which will hopefully be implemented in the near future after securing funding in 2020.



A suggested improvement to the facilities at Balikpapan is the inclusion of trigeneration, a thermodynamic process that creates a simultaneous production of electricity, heat and cooling from a single source. The main difference for Balikpapan is that the cooling produced can be used for air conditioning, a rapidly growing need in Indonesia.

6-Peterborough New Hampshire – USA Renewable Energy Leadership:

Inspiring Neighbors to Accelerate
Solar Adoption

United States of America

While US President Joe Biden has issued executive orders aimed at reducing America's carbon footprint, efforts to curb greenhouse gas emissions at the local level have been gaining strength for years. The absence of federal action on climate change during the past few years has actually contributed to the growing trend, by prompting a lot of local governments to make a commitment to clean energy.

Those efforts include a growing number of local governments switching to alternative energy to power office buildings and other public structures. The initial costs of moving to solar, including installing solar panels, have decreased by 90% over the past decade, often making renewable energy more affordable than using the electric grid which, in many regions, continues to be powered by burning coal. These efforts encourage local residents and businesses to install solar panels, and by putting solar panels on their own buildings, these local governments are leading by example.

The small town of Peterborough, New Hampshire In the northeast corner of the United States

- Is one such town converting the public sector to solar power.
- The city was one of the first communities in the State to pass a resolution to reduce its carbon footprint.
- One early part of this initiative was building the largest solar array in the State.
- With overwhelming support and enthusiasm from the public, several acres of underutilized wastewood lagoons were turned into the home of over 3000 panels.
- That array now powers the town's wastewater treatment plant, which saves over \$20,000 in energy costs per year in operational costs.

To afford the price of installation, Peterborough had a power purchase agreement with a local private company that paid for all the solar energy costs upfront, including buying and installing solar modules. The county’s chief of energy and sustainability called it a win-win situation: the government buys power from the company at a rate that saves them money in the long run, and it is less expensive than buying power directly from their local utility company.

Solar is not the only source of renewable energy, of course. Peterborough recycles agricultural residue from nearby agriculture into biomass pellets -- basically a fancy way of describing firewood made from crop scraps -- and uses them as heaters and boilers in most municipal buildings.

To repeat, the backing of local residents is crucial for these project successes. In late 2020, residents voted to expand previous renewable energy efforts and require the town to be 100% clean energy powered by 2050, with a detailed plan to reach that goal finished by 2022.

The city’s climate leadership is rubbing off on its neighbors. By 2019, two dozen other solar projects totalling 215 MW were at various states of development across the state, and other city governments were introducing municipal climate action plans to get their jurisdictions weaned away from fossil fuels. In the end, the solar array powering Peterborough’s wastewater treatment plant only kept the record of largest solar array in New Hampshire for 2 years, before another project took the crown. However, this is a virtuous cycle started by Peterborough: kickstarting the local solar industry, pushing hard for the public sector to lead by example in clean energy, and developing continued plans for future success are all ingredients for a more resilient future.



7-Monza Italy's Nature-Based Solution for Stormwater Management:

Creating a Green Infrastructure Suitability Map



Italy

Intense urbanization over the past few decades has significantly changed land-uses and greatly increased the proportion of impermeable surfaces around the world. Climate change has led to an increasing number of flooding events in urban areas due to the insufficient capacity of conventional drainage systems. Urban rainwater drainage systems are essential infrastructures for cities, which are needed to collect and convey rainwater away. Conventional stormwater management systems (so-called gray infrastructures) are systems primarily oriented towards a single objective: the control of water quantities. In Italy, most of the grey infrastructure is represented by the sewerage network. It is a mixed network which collects both rainwater and wastewater, then transports it to the treatment plant.

At present, there exists a need to consider other important aspects of water management in urban environments:



Nature-based solutions can contribute to stormwater management both by reducing the volume and flow rate of stormwater runoff and removing contaminants from stormwater. Nature-based solutions traditionally included urban parks and open spaces, wetlands, green roofs, bioswales, rain gardens and detention and retention ponds promote water storage and infiltration, each reducing stormwater runoff. Cities with combined sewer infrastructure will see improvements from nature-based solutions arising from reductions in stormwater quantity and reduced sewage overflows.

In Italy, several regional authorities have adopted laws and regulations aimed at urban planners and designers in order to satisfy the hydraulic-hydrologic invariance principles in land-use plans and new developments design (i.e., the maximum outflow rate should be at greenfield runoff). These principles can be carried out by dimensioning appropriate grey infrastructure (for example, water storage tanks) or nature-based solutions to balance the soil sealing effects.

These laws utilize new technologies to create “sustainability maps” to steer green infrastructure development, especially in stormwater management. Geographical Information Systems (GIS) are a key support system for the localization of nature-based solutions. GIS allows users to manage and consider many territorial characteristics visually, overlay geographic data layers, develop models, support choices of land-use planning, and define possible alternative scenarios. The primary goal was to identify areas where there was the potential to install green Infrastructure for stormwater management at the municipal level, in particular infiltration sustainable drainage which reduce both the flow and the volume of runoff.

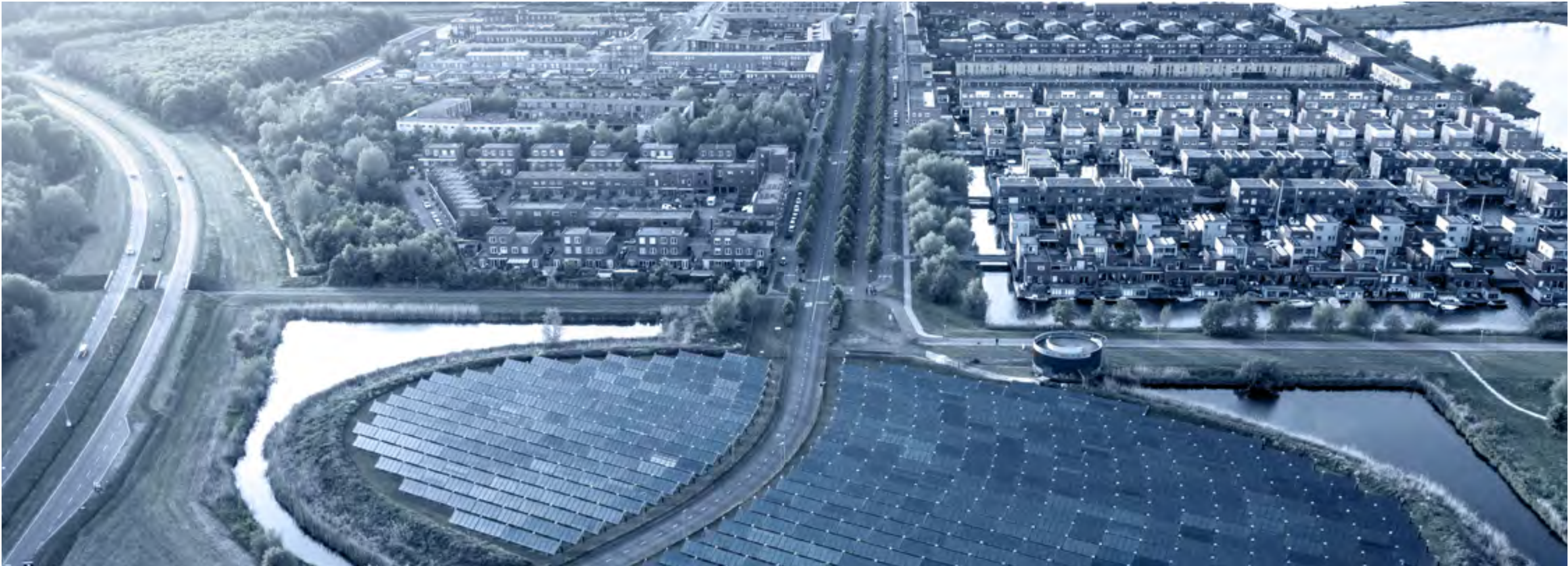
Overall, the Green Infrastructure Suitability Map is a new tool that municipal authorities can use for the following purposes:

An informative basis in the land-use planning process in order to set up or update the municipal plan with reference to rainwater management, in accordance with local regulations.

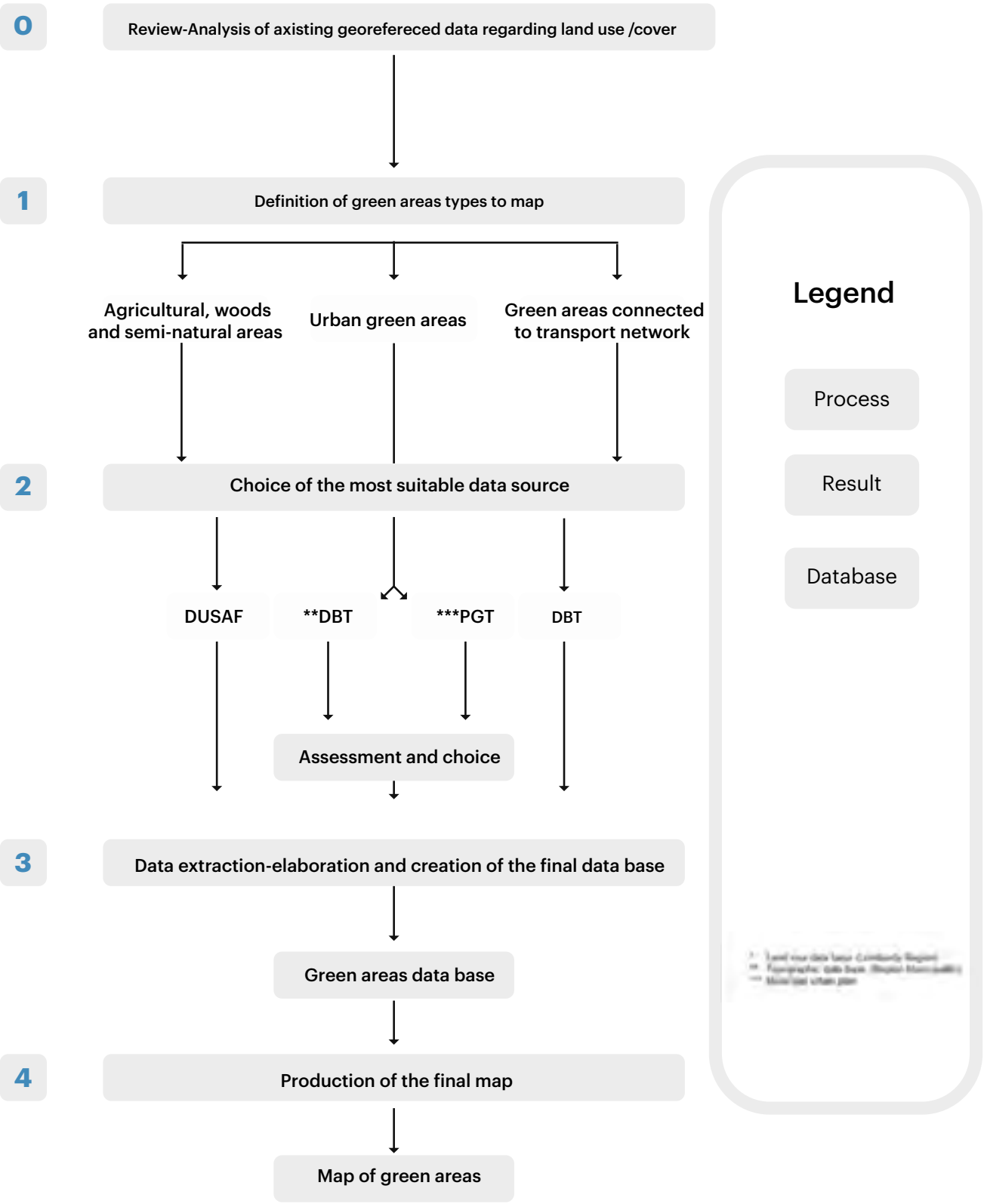
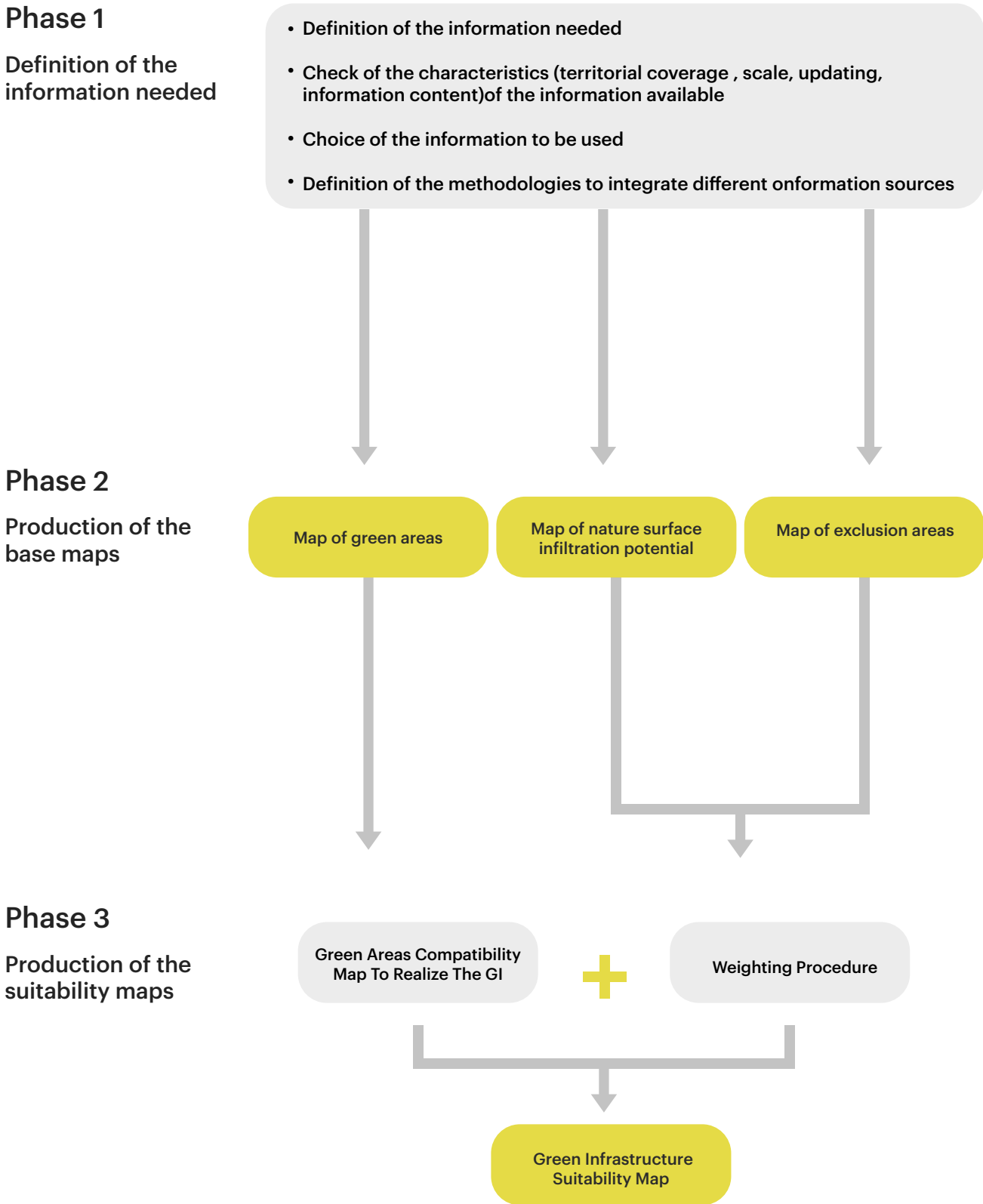
01

A necessary knowledge basis for the definition of municipal stormwater management plans, particularly related to the choice of the most appropriate nature-based solutions for each location.

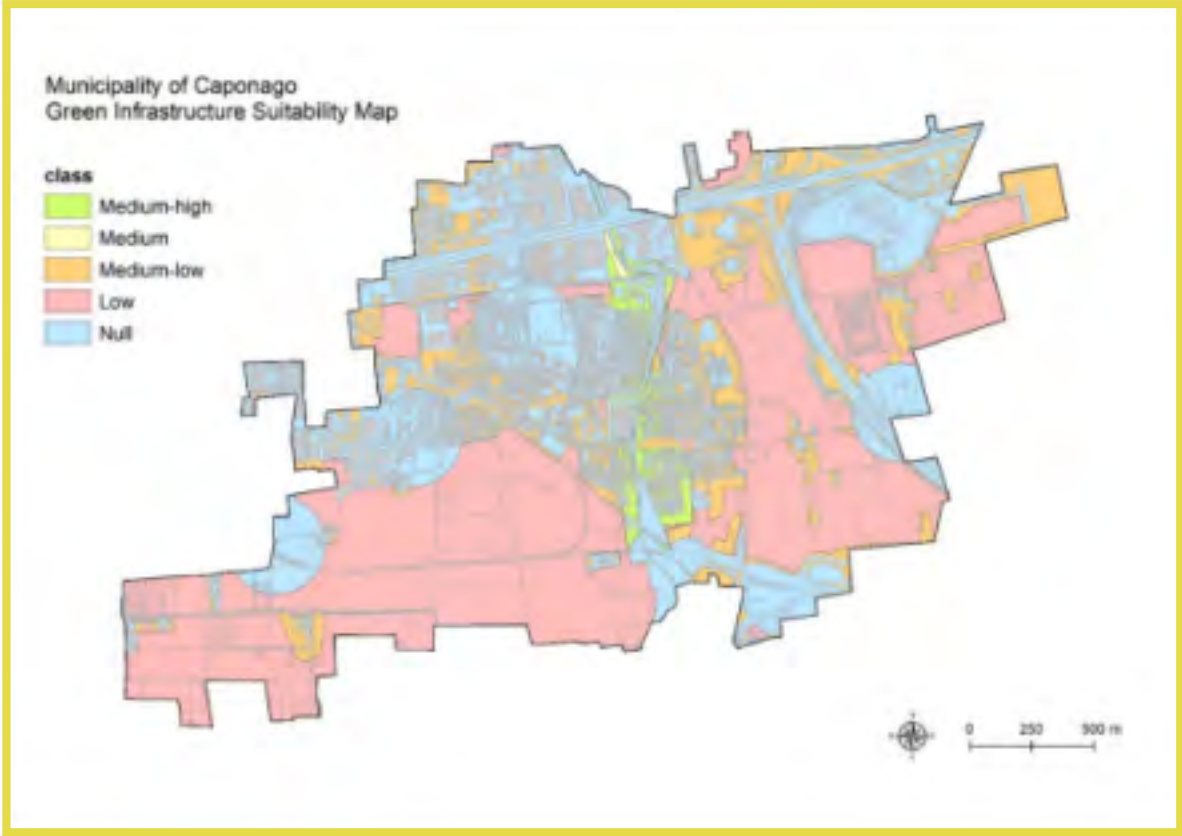
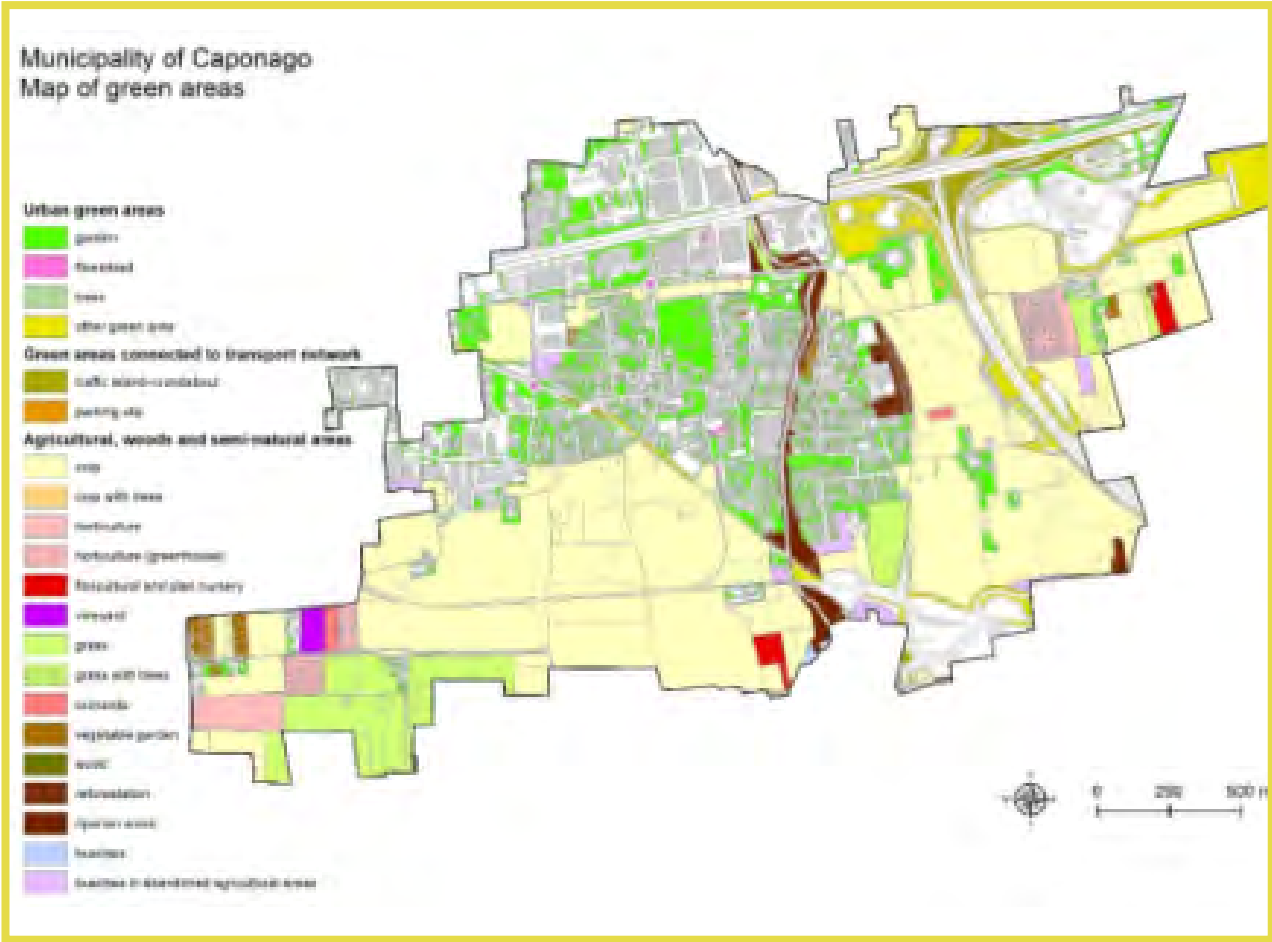
02



The methodology and procedure are described below.



As a specific case study using the methodology described above, researchers combined multiple datasets of Caponago, a town near Monza, Italy, to produce one such sustainability map, shown below. It was determined that the non-sealed areas in the municipality cover 67% of the municipal area. The remaining areas are water, 0.58%, and impervious surfaces, 32%. Most of these areas are agricultural, wooded and semi-natural areas, while urban green areas represent 15% of the municipal area and 22% of green areas.



Despite the small size of the municipality of Caponago, the characteristics of the study area are those typical of an area with intermediate land-use intensity.

With regards to the areas compatible with the construction of new green infrastructure, the green areas with high compatibility are close to urban areas and road networks and represent only 18% of the municipal territory. This means that about three-quarters of the permeable areas of the municipality have from medium to null compatibility with the construction of new green infrastructure. There were no areas with high suitability, mostly due to characteristics of the soil.

The most appropriate green infrastructure intervention can then be made on the basis of the assessed territorial characteristics. These include the type of prevalent function required (for example, detention, retention, flow control, infiltration, filtration, or evapotranspiration), context (urban or rural-natural), expected use (accessible to people or not), and maintenance needs. These maps are just one tool in the development of a more complete process of identifying the type of nature-based solution which is best suited to address various specific local problems.

8-USA and Canada Combine Forces and Introduce International Forum to Collaborate on Greening Government Initiatives

United States of America

As a first step of their collaborative work on greening government, the White House Council on Environmental Quality and the Government of Canada's Treasury Board Secretariat are creating the first of its kind forum for countries to cooperate on greening their government operations. The Greening Government Initiative will enable countries around the world to have an opportunity to share lessons learned, promote innovation and, where relevant and possible, set common greening government goals to support the work underway by countries to meet their commitments under the Paris Agreement.

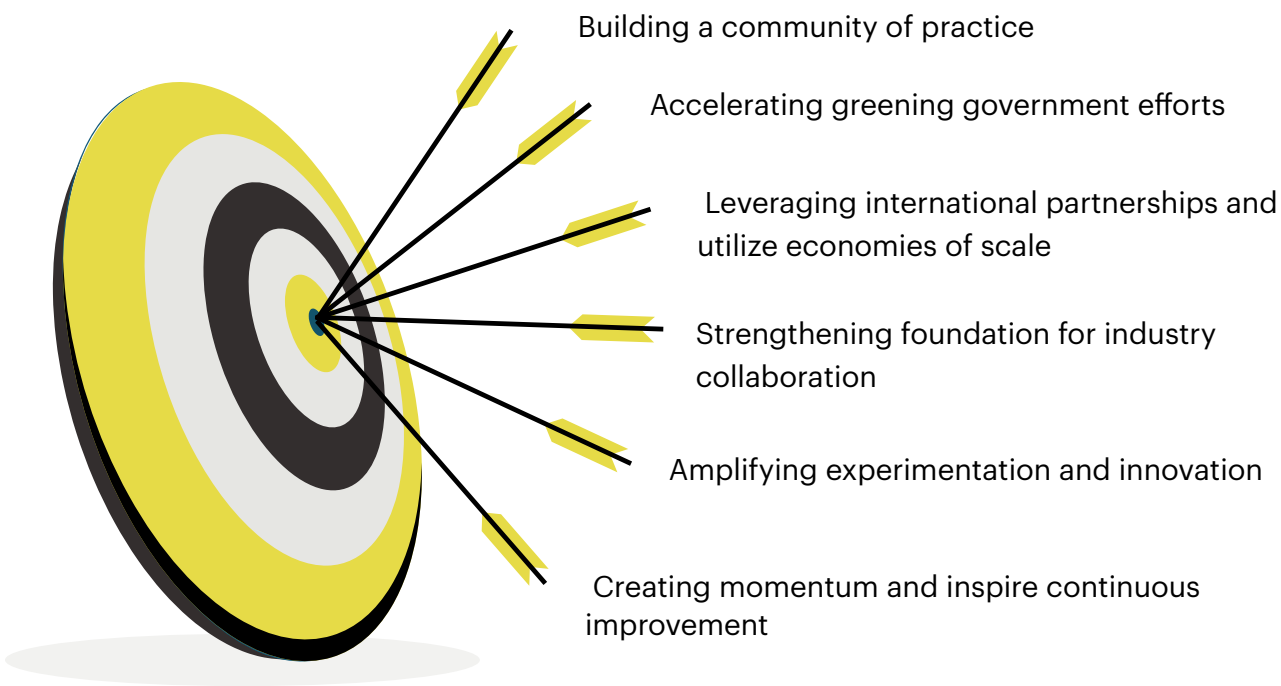
The Greening Government Initiative will enable formal and informal international cooperative opportunities, including



The collaborative work being initiated by the United States and Canada also includes bilateral work to leverage shared purchasing power to drive government operations to net-zero greenhouse gas emissions and increase the climate resilience of fixed assets.

Both countries agree to work together to identify a pathway to net-zero supply chains for our buildings (ex. renewable energy, concrete, steel), and fleet (zero-emission vehicles and clean fuels).

The overall goals include:



There is no commitment required other than sharing and learning from others through forum activities. There is no expectation for financial commitments or setting new goals. The Green Government Initiative is intended only to be a forum where government sustainability leaders navigating similar issues can engage in conversation to support best practices and further national objectives.

The GGI hosted its inaugural meeting on September 22, 2021, with plans to hold future meetings quarterly. The meeting was open to all interested countries and occurred virtually. More than 55 countries from Asia, Africa, the Americas, and Europe participated to learn how countries are transitioning national fleets to zero emission vehicles, electrifying and enhancing the resilience of government buildings, and establishing sustainable procurement policies.

Some of the showcased countries included:

- The US outlined the goals of GGI and discussed examples of topics the Green Government Initiative could advance before providing highlights of the forthcoming US Federal Sustainability Plan.
- Canada shared their national Greening Government Strategy and provided more details about its activities and desired outcomes.
- Germany described its ambitious goal to have a carbon neutral federal administration by 2030 and how they are taking an interdisciplinary approach to greening government operations through Innovation teams for developing concrete measures to support this goal.
- Morocco outlined their greening government program, underscoring the proactive policy for sustainable government operations supported at the highest level of the state, the important role of a dedicated agency, and shared lessons learned on financing this work.
- Sweden shared the key role of both collaboration and regulation to signal leadership priorities and shared specifics of their strategies to lead by example on sustainable public procurement and fossil free transportation.

New countries that want to get involved are encouraged to join; during the four annual sessions there will be opportunities to suggest ideas, initiatives, challenges or other topics of interest to the other participating countries. It is expected that governments will elect to collaborate on a bilateral basis as the United States and Canada have done over the past six years.

9. Dubai Statistics Center's Sustainable Procurement Policy - UAE

United Arab Emirates

The Dubai Statistics Center (DSC) promotes and empowers the main drivers of sustainable procurement by

- Identifying and understanding the needs
- Expectations of customers
- Raising competitiveness in the field of government work
- Rationalizing expenditures by developing internal smart systems that contribute to reducing time, effort and financial cost

The DSC is also keen on securing its supply chain through conducting strategic partnerships that ensure the continuity of the supply of vital services under fair contract terms agreed on between all parties to achieve mutual benefit. This is reinforced with the application of the sustainable procurement policy. The DSC is also eager on contracting directly with the main suppliers of services and materials; as it relies on local suppliers completely in order to improve the status of our society and economy.

DSC’s Leadership team approved the Sustainable Procurement Management System, in accordance with the first global guidelines on green procurement, as directed by the International Standard Organization (ISO 20400:2017). Additionally, the leadership team has published the sustainable procurement management system policy through available channels to allow access to interested parties such as employees, suppliers and the local community. As part of the standard require, DSC commitments include:

- Fulfilling the requirements of Sustainable Procurement Management System, and endorse the system’s continual improvement process.
- Purchasing DSC’s business needs along with the required quality, specifications and in a timely manner with competitive prices.
- Endorsing procurement integrity, equality and transparency in all contractual processes.
- Promoting fairness and equality in all procurement aspects such as giving an equal contractual opportunity, fair proposals evaluation, and fair suppliers’ performance evaluation.
- Giving a privilege/priority to the funded members of Mohammed Bin Rashid Establishment for Small and Medium Enterprises.
- Conducting a fair and transparent investigation on all suppliers’ complaints and feedbacks in a professional manner.
- Increasing the expenditures’ efficiency in all aspects of the procurement process.
- Maintaining sustainability in multiple dimensions such as environment, society, economy, health and safety for all DSC’s employees’, customers’, and suppliers’ aspects during the procurement and contractual process.

The DSC continues to target sustainability objectives for all its organizational units and supervise their realization along with ensuring and developing statistical sustainability for seamless data flow to enable decision makers. The organization’s environmental goals exceed the mandates of the international standards and include a cultural shift to be best-in-class for sustainability. Such actions include:

- Preserve environmental sustainability through minimizing the consumption of environmental resources and managing the residues produced from its processes.
- Ensure building partnerships with entities that have high sustainability standards.
- Periodically spread awareness to all employees on social, environmental and economic subjects.
- Periodically publish sustainability reports that transparently convey all related information.
- Share its expertise and knowledge on sustainability with other organizations for the continuity of those practices.

Interestingly, the sustainable procurement guidelines are now considered to be applicable for International Standard Organization’s risk management certifications. This is because averting future environmental disasters is crucial to building more resilient supply chains.

10. UAE Ministry of Climate Change and Environment - Green Barjeel Project:

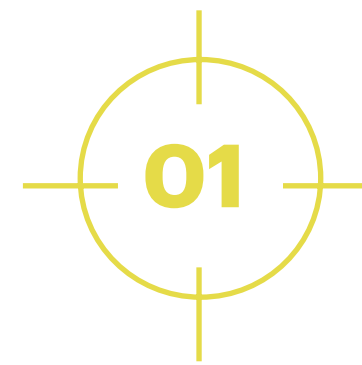
A research educational innovative platform for Green Algae production for bio-energy and bio-fertilizers

United Arab Emirates

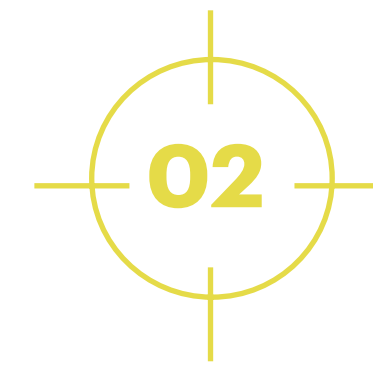
The standard of green architecture is the design and construction of public outdoor spaces while minimizing ambient air emissions in order to provide communities with the ability to enjoy clean, renewable urban air. There are many examples of such designs being tested around the world, but there are few, in any, that are designed and tested in desert environments.

As a result, and in order to follow innovation standards in green architecture to ensure a green life in cities, the UAE Ministry of Climate Change and Environment has funded the design and construction of a research station that can be used as a testing- base (Pilot) for new systems in the UAE, its designed to reduce air pollution emissions.

The objectives of this applied research project are



to create an innovative, multi research platform to study the use of microalgae in reducing CO2 emissions



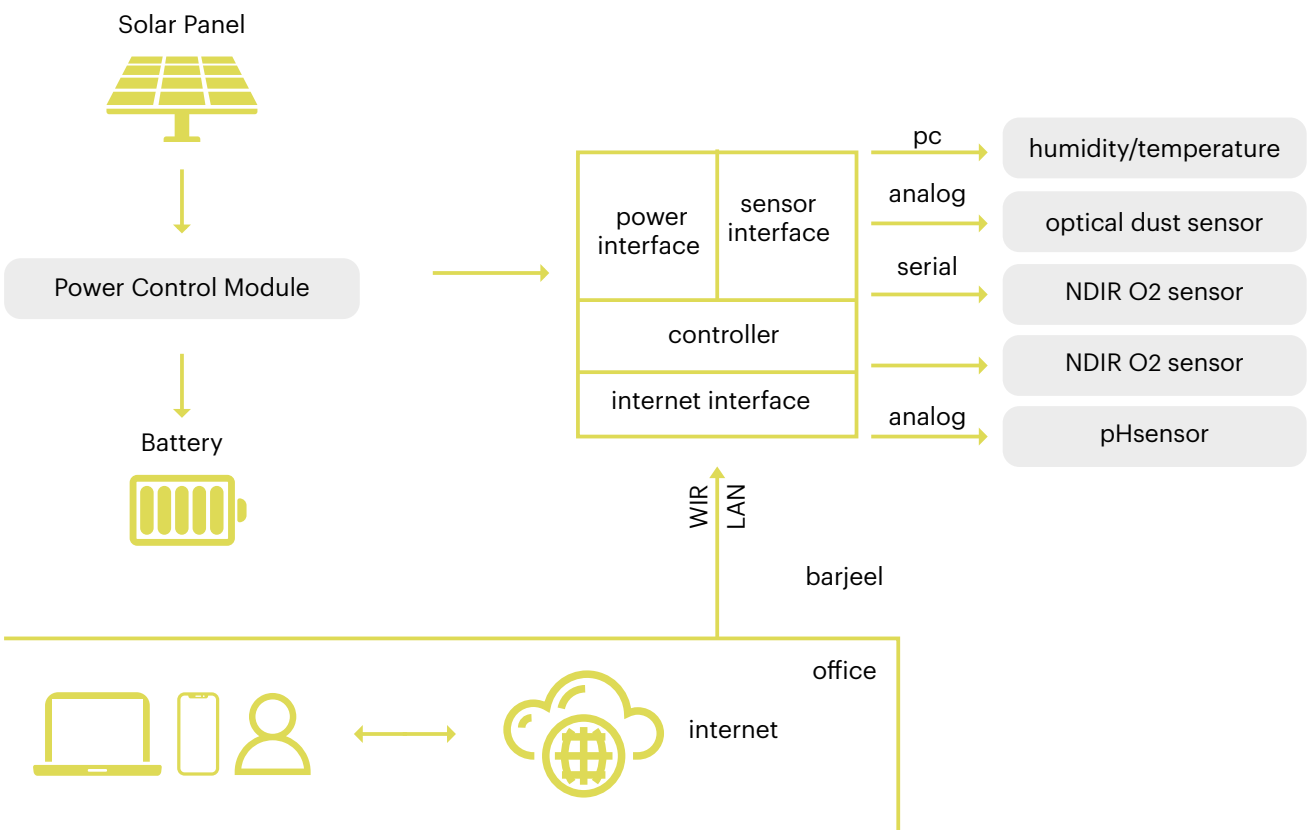
to create a micro-biological environment for growing microalgae biomass and other high-value material for organic chemical products



to provide a platform for the dissemination of educational material

Features and criteria used in the project:

- The Green Barjeel is designed for use in crowded urban areas, as it is small in size and can be set up in a bus stop space or a car park.
- The system used in Barjeel purify the surrounding air through a carbon storage system in micro-algae and remove dust and other harmful surrounding fumes. Where it produces clean air to be released again in the vicinity of the system, thus reducing air emissions and increasing oxygen levels in the system.
- The design of the green barjeel as a passive cooling system to help mitigate the high temperatures produced in urban environments incorporates traditional wind catch design elements to help drive airflow through the barjeel. The system uses evaporative cooling to aid the flow of air through the barjeel, thus recirculating cool air from the top of the barjeel to the streets close to the barjeel.
- Green Barjeel is designed as a modular, self-supporting structure that can be deployed in public places with little or no impact on the surrounding environment, reduces environmental pollution harmful to health, and will add to the aesthetics of urban public spaces.



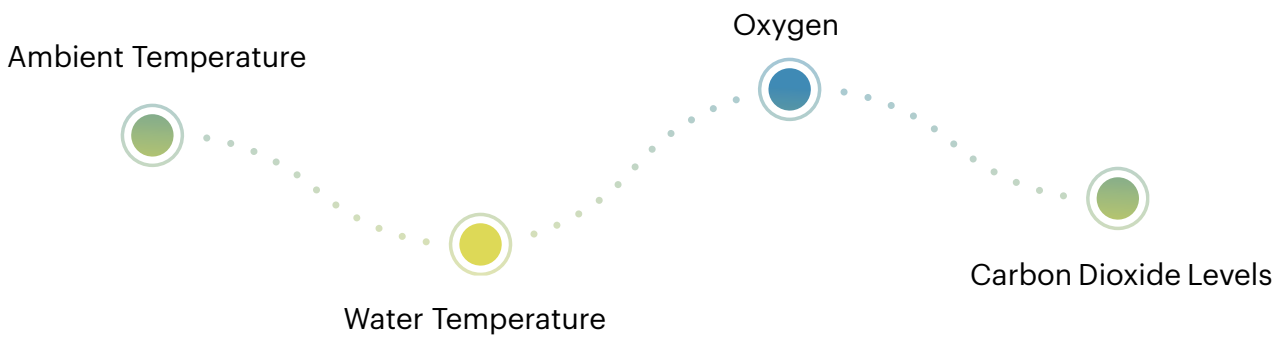
Stages of Development:

The Ministry of climate change and environment has developed a number of studies and research in cooperation with the academic sector at the Green Barjeel Station, with the aim of:

- Designing and validating the production and development of local microalgae in the UAE for use as a source of biofuels and organic foodstuffs.
- Design and validation of air emission parameters of the micro-algae produced in green barjeel and for the removal of airborne dust particles (particulate air).
- Design and validation of a passive cooling tower system to provide cooled air near the Green Barjeel platform.
- Establishing a research station to be used as an educational platform and as a station for academic and industrial researchers.



The first model of the Green Barjeel Research Station is located in the Garden of the Ministry of Climate Change and Environment HQ office in the Emirate of Dubai, United Arab Emirates. The Barjeel is equipped with sensors that collect a series of environmentally sensitive data, such as



so that changes in these devices are monitored and the data are collected, processed and displayed in an electronic smart board for the project.

Also, the Ministry of Climate Change and Environment sponsored a graduation project for students from the College of Chemical Engineering at the American University of Sharjah, through which the student team used the Green Barjeel Research Station and carried out a number of studies and laboratory research related to biofuel production standards by extracting fuel from green microalgae. The results of these studies come in the possibility of developing a facility for the production of biofuels on a large scale from microalgae in the United Arab Emirates.

Partners

The UAE Ministry of Climate Change and Environment, in collaboration with the American University of Sharjah (AUS) and Khalifa University (KU), designed and validated an integrated microalgae growth system for biofuel and organic food production, capturing airborne dust particles and reducing carbon dioxide emissions. , as well as a passive cooling system for use in public places in the UAE.



Results and Impact

The Green Barjeel plant is designed to contribute reducing ambient carbon dioxide emissions and help reduce air pollution. The analysis of collected data and laboratory results using modeling software and laboratory methodologies showed that the growth of microalgae in green barjeel will reduce the carbon dioxide concentration due to the growth of microalgae biomass. Modeling analysis shows an 80% 70% reduction in CO2 due to a carbon sequestration of microalgae biomass, a 100% increase in oxygen levels and a 160% increase in microalgae.

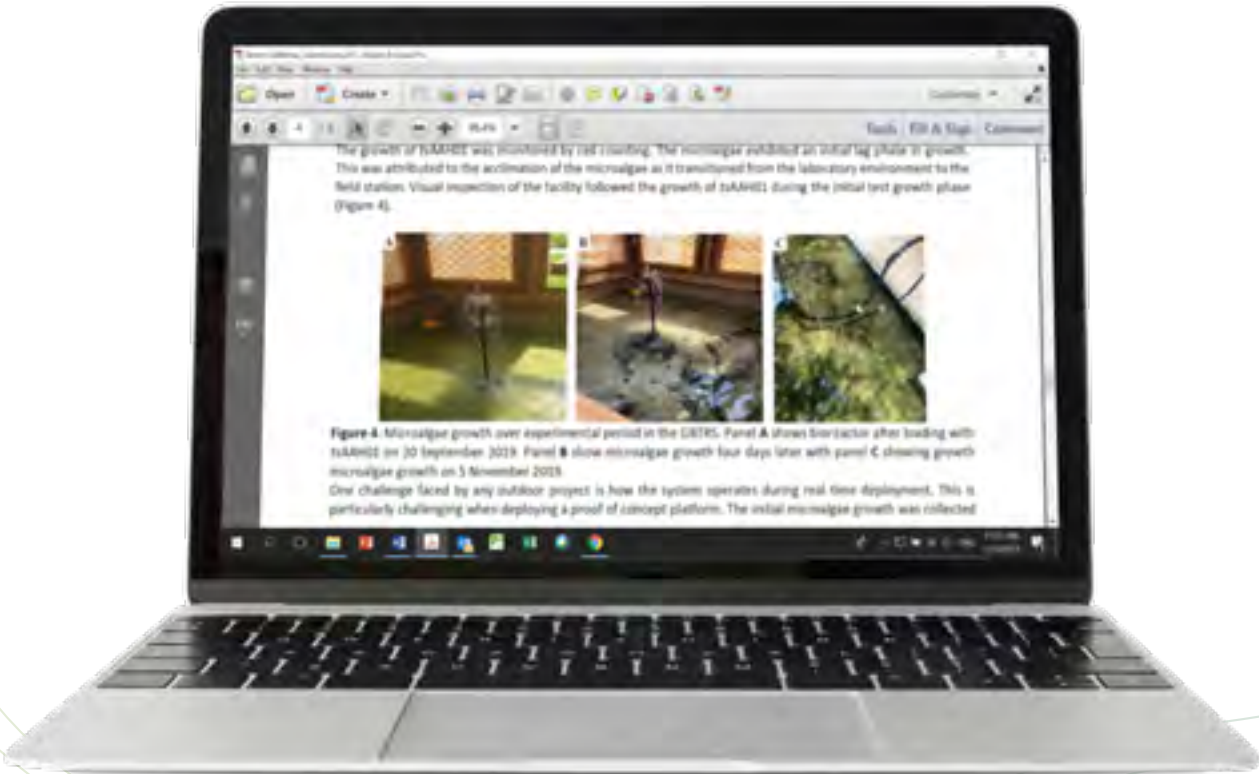
It was also concluded that the percentage of biofuel extracted from local microalgae used in green barjeel was 42%, based on laboratory studies carried out by the work team in cooperation with the American University of Sharjah and Khalifa University.

Future Plans

The project is expected to produce an innovative platform that uses local micro-algae in the UAE as

- A source of high-value organic chemicals and nutrients
- Provides an opportunity to remove airborne dust particles
- Reduce carbon emissions
- Can be used as a local source of passive cooling for public use, which contributes to enhancing the quality of life and public health.

The results of these projects will lead to a better understanding of how sustainable materials respond to the desert environment in the UAE and drive the design of new bio-products.



PART 2

CLIMATE TECH INNOVATIONS

For the second half of this double-feature report, we shift from policymaking and changing government operations to technology-focused solutions, sponsored or otherwise backed by public sector actors. In many cases, close coordination with the private sector is necessary, since new technologies or business models are often first discovered through startups or corporate research and development.

1-Scotland Startup Works With Governments to Use AI and Space-Based Mapping in Order to More Accurately Analyze Natural Resources

United Kingdom

Edinburgh-based satellite data company Space Intelligence gathers, processes, and analyses satellite data, and then sells actionable business intelligence to businesses seeking to mitigate their carbon footprint and environmental impact. Its core services are the classification of landscapes using AI and machine learning applied to big data from space; including the mapping of deforestation and forest degradation to help tackle the global climate emergency.

Space Intelligence is working to develop repeatable maps of habitats and land use in over 15 countries to improve how they calculate their 'natural capital'.

Natural capital is a term for the habitats and ecosystems that provide social, environmental and economic benefits including the ability of habitats to store and even absorb carbon.

Space Intelligence uses satellite data and AI to create maps for whole countries that can be repeated, helping to identify and measure change.

For example,

The firm is working with partners to detect elephants roaming across vast areas of a national park in Southern Mozambique. In 2020, Space Intelligence used similar techniques to monitor Scotland’s wild red deer. The project combined imagery collected by satellite and light aircraft to detect the animals. It is hoped to offer a greener and cheaper alternative to helicopter-based counts. This innovative approach could vastly improve the monitoring of threatened elephant populations across a wide range of habitats. The data is also used to classify the animals’ habitats and identify potential risks such as the likelihood of wildfires. As the technique does not depend on people on the ground, it can be used in remote areas, supporting efforts such as counter-poaching.

Although peatlands cover such a large proportion of the UK landmass, it’s difficult to pinpoint the most damaging and polluting peatlands and not much is known about them. Therefore, work needs to be carried out to identify those peatlands that require the most immediate and greatest attention.

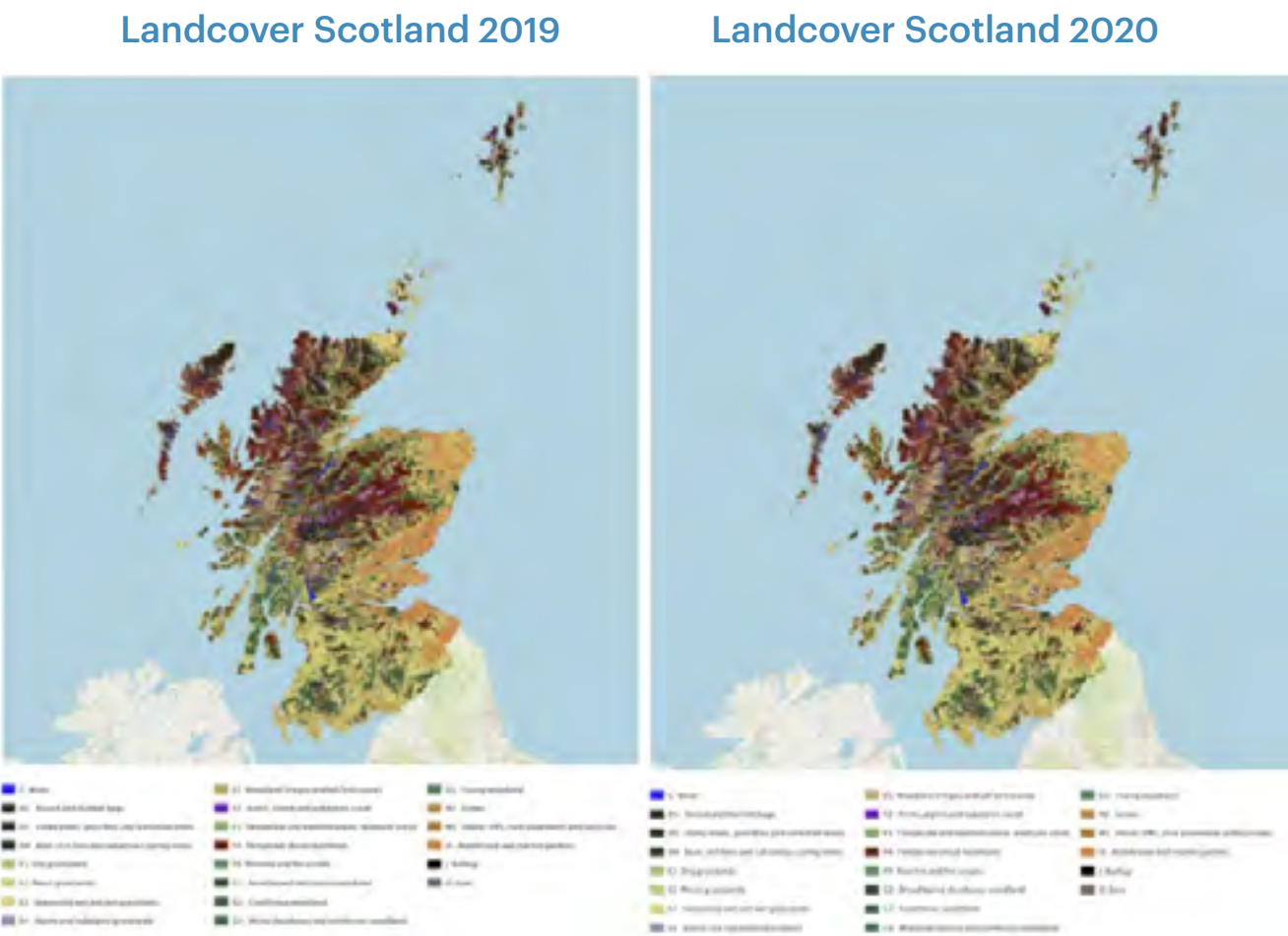
Space Intelligence works with the Scottish Government to identify and track satellite maps of where the degraded peatlands are. It will then analyse them to identify peatland that is in poor condition but could be restored in a cost-effective manner. Peat soils contain around a third of the carbon locked up on the Earth’s surface but take up less than 3% of land cover globally, so protecting and restoring them will have an outsized impact on the climate. Looking at it another way, if we do not protect and restore peatland, we have no hope of preventing dangerous climate change.

For another example,

Space Intelligence is helping reverse the damage caused by humans to peatlands around the world to reduce the rate of climate change. Peatlands are wet, boggy environments that are rich in carbon from partly degraded organic material and cover roughly 10% of the UK landmass (and about 3% of the world’s). When peatlands are degraded (normally through human interventions such as agriculture or the creation of drainage ditches) they dry out and the carbon stored in them is released into the atmosphere. This is a huge potential problem as the volumes of carbon stored in them are enormous. And without proper interventions to protect and restore them, it could make the mission to combat climate change and for the UK to reach its zero-emission goals even harder.

The project will ultimately provide a high-resolution picture for the first time of how Scotland’s landmass is changing and how this will impact upon our natural capital. It will also enhance Scotland’s position at the forefront of advanced satellite mapping and AI technologies.

Should the peatlands project be a success, up to £3 million would become available in the future for expansions. This would support the development of new peatland monitoring products or tools for other international markets, and if required, launch new nanosatellites to gather additional global peatland data from space.



(Sample interface of land use in Scotland from Space Intelligence)

2-Urban Heat Watch for 14 Us Cities



United States of America

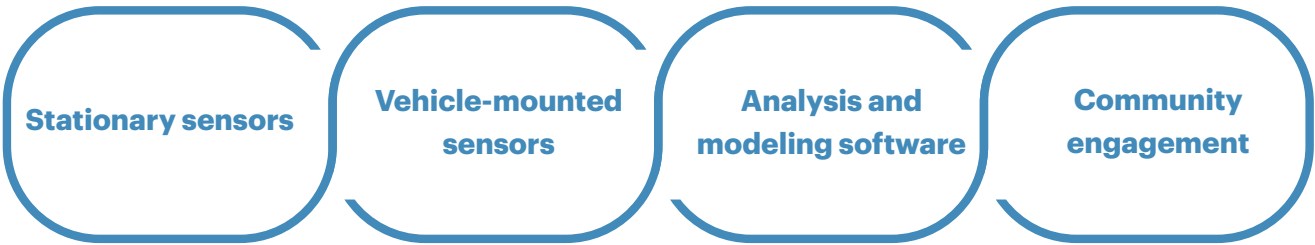
Over the past five years, the National Oceanic and Atmospheric Administration (NOAA) has provided financial and scientific support for 40+ community-led campaigns to map urban heat islands. As a reminder, artificial urban infrastructure absorbs heat during the day more acutely than natural alternatives, leading to cities having higher temperatures than their surrounding countryside. In fact, particularly bad neighborhoods can be up to 10 degrees warmer. Since the program has been so successful, it has recently expanded internationally to include cities in Brasil and Sierra Leone as well.

Extreme heat kills more Americans than any other weather event, but not everyone's risk is the same. As climate change worsens heat waves, critical information about urban heat islands will help bring local and equitable solutions for those facing the greatest threats.

Using heat sensors mounted on their own cars or bikes, volunteer citizen scientists, led by a team of local partners in each city, traverse their neighborhoods in the morning, afternoon and evening on some of the hottest days of the year. The sensors record temperature, humidity, time and the volunteers' location every second.



The end-to-end program, including



The end-to-end program, including stationary sensors, vehicle-mounted sensors, analysis and modeling software, and community engagement, allows communities to develop hyper-local descriptions of heat and strategize mitigation options specific to each region of the country. In particular, local governments will determine which communities are particularly exposed to extreme temperatures. During the 2021 urban heat island campaign, 799 citizen scientists took 1.2 million measurements in 24 communities. The final deliverable is publicly available and can be used to communicate risk, measure health impacts, and advocate for resources to address those health impacts, such as green infrastructure and weatherization resources to cool the hottest neighborhoods.

The 2022 heat mapping campaign also features new, NOAA-funded instruments to better characterize urban climate and health hazards. Columbus, Ohio, and Philadelphia, Pennsylvania both use mobile air quality monitors to develop an understanding of the related impacts of heat and air quality. Las Vegas, Nevada, and Columbia, South Carolina, have installed stationary temperature and humidity sensors to provide more information for decision-making through monitoring the urban heat island effect over the length of the summer.

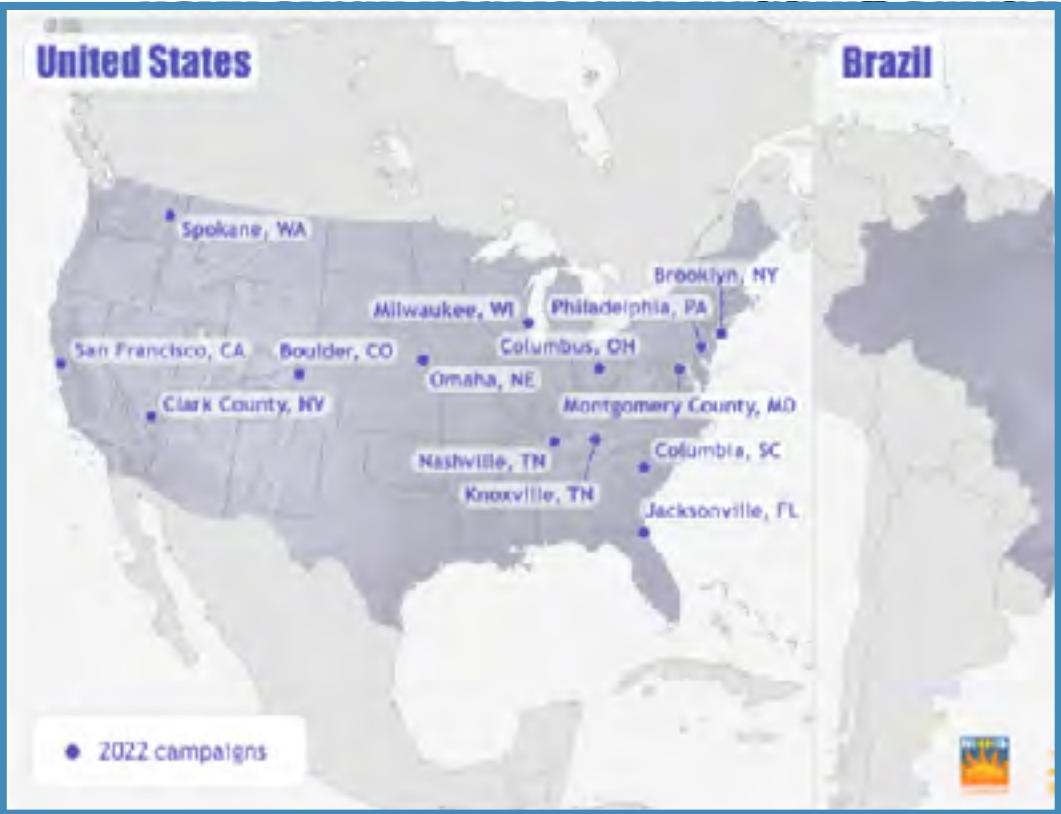
Cities from past campaigns have used their heat island maps to develop heat action plans, add cooling stations to bus shelters, educate residents and policymakers and inform new research. Last year, the United States’ Federal Government funded five new applied research projects in cities across the country to help develop tools for equitable heat intervention, investigate heat in rural areas and smaller cities and investigate the effect of coastlines on urban heat patterns.

The 2022 cohort for the program include:

-
- Boulder, Colorado;
 - Clark County, Nevada, which includes Las Vegas;
 - Columbia, South Carolina;
 - Columbus, Ohio;
 - Jacksonville, Florida;
 - Knoxville and Nashville, Tennessee;
 - Milwaukee, Wisconsin;
 - Montgomery County, Maryland;
 - Omaha, Nebraska;
 - Spokane, Washington;
 - Philadelphia;
 - Brooklyn, New York;
 - San Francisco.
- In addition, NOAA is working with local groups in Africa and Brazil on international campaigns in Freetown, Sierra Leone and Rio de Janeiro, Brazil.



NOAA Urban Heat Island Mapping Campaigns: 2022 Locations



NOAA's mapping program

is part of a whole-of-government effort to ensure that federal agencies work with states and local communities to make good on promises to deliver 40% of benefits from federal investment in climate and clean energy to disadvantaged communities. When evaluating applications for the 2022 heat island mapping campaigns, the federal teams gave significant weight to applications emphasizing environmental justice. Communities involved in the 2022 program assisted with tracking and reporting the allocation of benefits to ensure adequate inclusion of environmental justice communities, and these outcomes are shared with the White House.



3-Microsoft Deploys First Underwater Data Centers

Microsoft has carried out an innovative research project that has put working data centers at the bottom of the ocean, leading the way toward more sustainable facilities with faster transmission speeds.

Dubbed Project Natick, the first datacenter was put into a sealed container and placed half a mile from the coast. The benefits are twofold.

01

Lower latency

(the time it takes to transmit and receive data) by bringing data closer to populations and could open the door to wave or tidal powered facilities in future.

02

Lower operational costs

by keeping the data centers naturally cooler underwater, instead of paying a lot of money to artificially cool down a building.

With the global demand for cloud services growing quickly year on year, so too does the demand for submarine transmission networks that carry data internationally as well as the power these sites need to run and keep at a stable temperature. The entire internet is completely dependent on undersea cables to carry data from one country to another – everything you do online from reading websites to watching Netflix to playing video games requires information from a physical data center somewhere on Earth. Finding ways to lower the operating costs and improving sustainability of those data centers is imperative for the future of the internet.

The world's oceans at depth are consistently cold, offering ready and free access to cooling, which is one of the biggest costs for land-based data centers. **Underwater data centers could even serve as anchor tenants for marine renewable energy such as offshore wind farms or banks of tidal turbines, allowing the two industries to evolve in lockstep.**

Another potential win for the project is deployment time. Building the first container took 90 days which is a game changer for the industry when compared to the rigorous process to get land facilities built including procurement and construction. Thanks to an array of sensors, Microsoft Research were able to fully control the facility remotely from their Redmond campus.

Microsoft's Project Natick team deployed its first underwater data center 35 meters deep to the seafloor in spring of 2018. For the next two years, team members tested and monitored the performance and reliability of the datacenter's servers. Lessons learned from Project Natick also are informing Microsoft's data center sustainability strategy around energy, waste and water. Microsoft also worked with the 400-year-old Naval Group from France to create the submarine container for the datacenter.

The original idea initially came from a random Microsoft employee, who having served in the Navy for three years had seen complex computing underwater. He had seen sophisticated electronics work under water already, successfully shielded from salt water, and therefore knew there was a way to adapt those testing processes for data centers.

What's more, the proven reliability of underwater data centers has prompted discussions with Microsoft's cloud teams that's looking to serve customers who need to deploy and operate tactical and critical data centers anywhere in the world. As 5G continues to roll out and more data centers closer to end users are needed, small underwater units could be a solution. In industry jargon, these are called "edge devices".



4-European Governments Fund Sustainable Battery Plant in Sweden

Sweden

In 2020, the European Investment Bank (EIB) signed a \$350 million loan agreement to support the financing of Europe's first home-grown gigafactory for lithium-ion battery cells, in Sweden, made by the firm Northvolt. The financing is supported by the European Fund for Strategic Investments (EFSI), the main pillar of the Investment Plan for Europe. Previously in 2018, the EIB also supported the establishment of the demonstration line from Northvolt, as a proof of concept which produced its first battery cells in late 2019, and which paved the way for Europe's first home-grown gigafactory.

The site will serve as Northvolt's primary production site, hosting active material preparation, cell assembly, recycling and auxiliaries. When it ramps up to full capacity, Northvolt will produce 16 GWh of battery

capacity per year in its initial phase, to be scaled up at a later stage to potentially 40 GWh. Northvolt's batteries are designed to be used in automotive, grid storage, and industrial and portable applications.

But momentum has continued to grow, and as of 2022, 3 different gigafactories are under construction. The newest factory, to be built in Germany, will have an annual potential production capacity of 60 GWh, sufficient for some one million electric vehicles. In addition to being centrally positioned in the emerging European battery supply chain connecting Scandinavia and continental Europe, the region also provides the space required to establish a battery plant of sufficient size to leverage the economies of scale in production which are key to reducing battery costs.



Northvolt

Is an innovative Swedish technology company that produces batteries with an 80% lower carbon footprint. They partner with automotive manufacturers for EV production, bicycle firms for e-bike production, industrial players for factories, and city governments for electrical grids. They are also developing recycling technologies for battery materials.

Their battery gigafactories are an important building block in the creation of a broad and stable value chain for electric vehicles in Germany and Europe. It is currently under construction in Skellefteå in northern Sweden – a region home to a prominent raw material and mining cluster, which has a long history of process manufacturing and recycling. Noting the region’s clean power base, building the factory in northern Sweden will enable Northvolt to utilise 100% renewable energy within its production processes.

In addition, the factories will source significant volumes of its raw material requirements from recycled battery metals, as part of Northvolt’s commitment to source 50% of its raw material needs from recycling by 2030.

In addition to the financing from the EIB, funds gathered so far have also come from France, Germany, Japan, and South Korea. In total, Northvolt has thus secured over 3 billion US dollars.

The projects are a fruit of the European Battery Alliance, which also started in 2018. Its goal is to help build Europe’s strategic autonomy in a technology that is key to its competitiveness and low carbon future. EIB

financing support for Northvolt has been a textbook example of how financial and technical due diligence can help crowd in private investors to visionary projects.

As of 2022, the company is also engaged in developing cutting-edge wood-based batteries in partnership with the massive Finnish industrial company Stora Enso. They are working towards creating sustainable batteries that use lignin-based hard carbon produced with renewable wood from Nordic forests. The goal is to develop the world’s first industrialized battery featuring anode sourced entirely from European raw materials, lowering both the carbon footprint and the cost. Both companies bring key components,

competence, and expertise to the battery partnership. Stora Enso will provide its lignin-based anode material Lignode, originating from sustainably managed forests, while Northvolt will drive cell design, production process development and scale-up of the technology. Lignin is a plant-derived polymer found in the cell walls of dry-land plants. Trees are composed of 20–30% of lignin, where it acts as a natural and strong binder. It is one of the biggest renewable sources of carbon anywhere.



5-Kenya's Solar Freeze Assists Farmers With Reducing Waste Through Mobile, Renewable-Powered Cold Storage

Kenya

In developing countries around the world, small-scale farmers see up to 80% post-harvest losses on their fresh produce. The most significant factor contributing to this large-scale food loss in Africa is the lack of proper cold storage facilities. Most small-scale rural farmers do not find refrigeration feasible due to unreliable sources of local electricity, the high cost of conventional cooling and the lack of technical knowledge. It's hard to power fridges in a region where hundreds of millions of people live off the grid. As climate change makes each harvest more important and increases food insecurity, access to refrigeration and renewable energy are more essential than ever before.

Quickly lowering produce temperature after harvest extends shelf life by reducing metabolic activity and microbial growth. And with so many small-scale farmers and inconsistent harvests, market prices rise and fall drastically. Farmers who can store produce longer can take advantage of better prices and therefore take better care of their families.



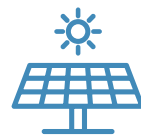
Growing up in rural Kenya, the founders of Solar Freeze witnessed firsthand how smallholder farmers struggled financially, losing 40-60% of their harvest due to the lack of refrigeration. When food losses are at such a high rate, food security also becomes an issue. About 30% of Kenya’s population faces food insecurity and poor nutrition each year, and agricultural food loss in Africa plays a significant role.

These founders wanted to utilize their knowledge and skills in renewable energy to make an impact on small-scale farmers, specifically women and youth, and food insecurity in Kenya.

Enter Solar Freeze – a company that provides mobile solar-powered cold storage units for small-scale farmers.



Solar Freeze is pioneering mobile cold storage units powered by renewable energy for rural smallholder farmers, to help them reduce the huge challenge of post-harvest loss. Solar Freeze includes four innovative technologies within its system:



Mobile Solar-Powered Cold Rooms

The Solar Freeze units are portable cold storage units that derive their source of energy from solar power. This off-grid solution allows small-scale farmers to store their temperature-sensitive produce like fruits, vegetables and dairy products in a temperature-controlled environment to ensure longer shelf life and maintain freshness.



Cold Storage as a Service

Smallholder farmers and traders can use the Solar Freeze app and SMS service to locate the nearest mobile cold storage unit. Through the use of mobile and cash payments, farmers can pay for Solar Freeze’s storage service for affordable rates, saving costs in spoiled food, refrigeration hardware and physical storage space.



Cold-Chain Distribution, Logistics and Transportation

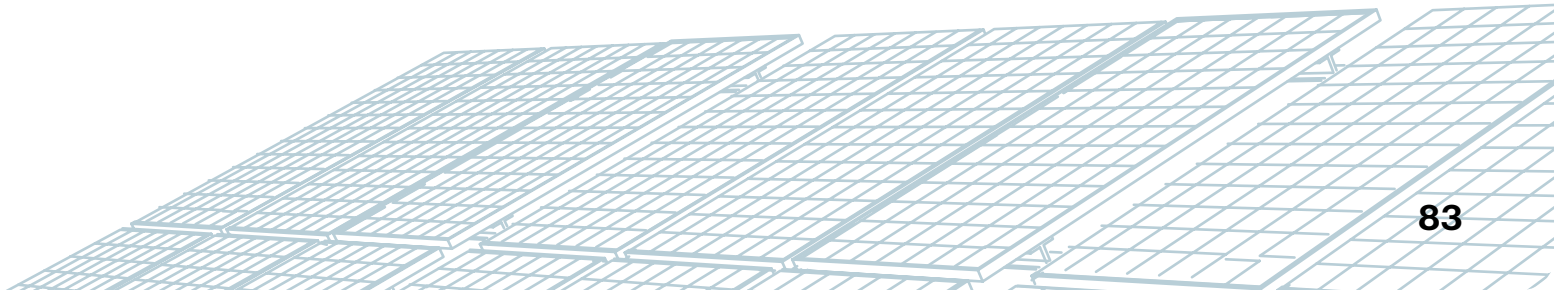
Solar Freeze’s mission is to provide not only cold storage but also refrigerated transportation. Small-scale farmers should eventually be able to move smaller amounts of produce more frequently and cheaply with a cold storage “Ubering” service that does not require an internet connection to place shipping orders.



Solar Freeze Mobile App and IoT Monitoring

Farmers will be able to monitor real-time data from the cold storage management system through the Solar Freeze app and IoT platform installed within the cold storage units.

Solar Freeze takes on a micro-franchise business model that aims to integrate its technology and knowledge with village women and youth. The goal is to get more women to own and operate the cold storage units as independent micro-franchisee entrepreneurs. The innovative technology and implementation of Solar Freeze aim to transform rural agriculture in Africa, making agribusiness more efficient and profitable. It also plans to aid in ending women and youth unemployment, food loss and hunger in Kenya and Africa.



6-Government-Funded UK Firm Converts Household Waste Into Energy

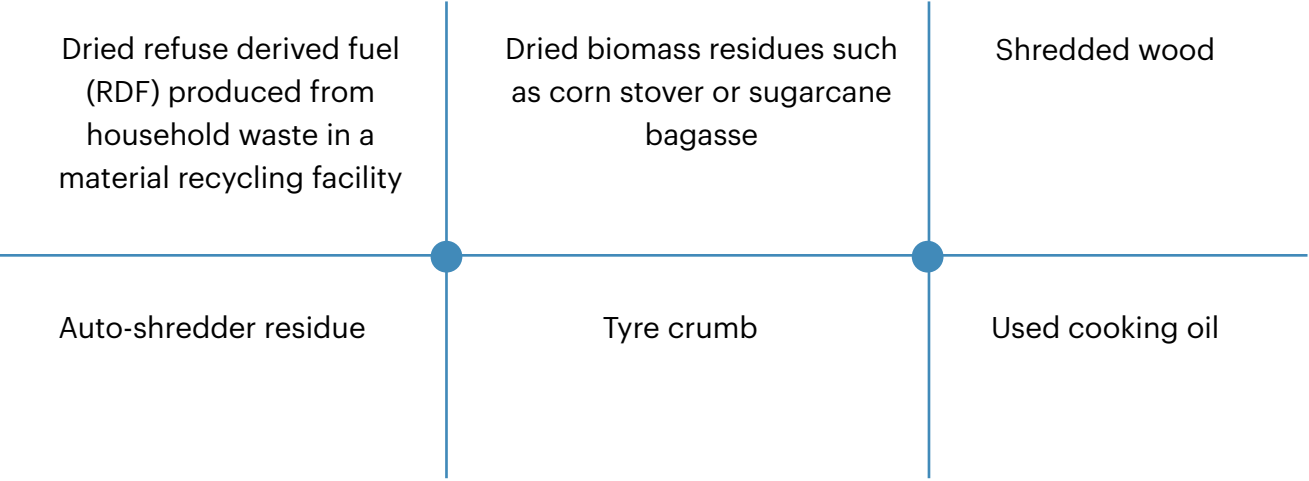
United Kingdom

UK-based Advanced Biofuel Solutions (ABSL), in collaboration with University College London and the city government of Swindon, are building a plant that can convert gas from household waste into low carbon hydrogen for use in the transport industry.

Waste collected from Swindon homes will be shredded and the recyclable material will be removed. Instead of going to landfill or being incinerated, this prepared waste will be brought to the plant in moving floor trailers, where ABSL's groundbreaking technology converts it into more useful products like natural gas. The natural gas is then injected into the grid and the carbon dioxide is liquefied and used by industry. Gasification of residual waste, after recyclable material has been separated off, may be a good solution compared to burning it in the fight against climate change. However, it all depends on the process efficiency that can be achieved and the other waste products produced.

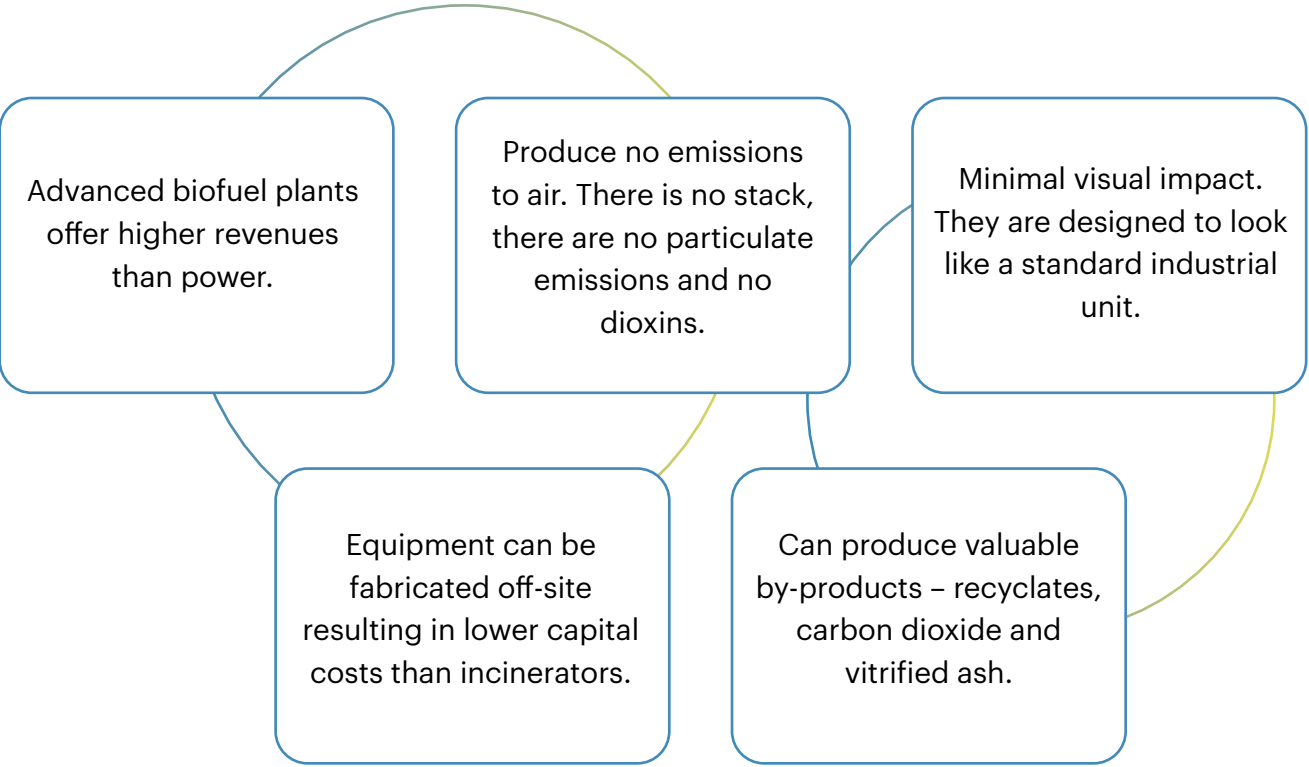
Their first facility, located in Swindon, UK, a city of 250,000 people about 70 miles west of London, converts 8,000 tonnes of waste into 22GWh of gas (either natural gas or hydrogen) each year – initially considered enough to heat 1,800 homes or fuel 75 HGVs. The plant however is integrated into a pipe network that services over 7.5 million UK residents across southwest Britain. The company believes that wastes should be converted to fuels such as biomethane, biohydrogen or sustainable aviation fuel to decarbonise heat and transport.

The gas conversion process combines a conventional gasifier that converts feedstock into a dirty, tar-laden syngas, with a catalytic chamber that breaks down those tars using oxygen free-radicals to catalyse the reformation reactions. The tar-free syngas is then cooled using a waste heat boiler and passed through a filter system to remove any residual particulates. The process is omnivorous and has been demonstrated to work from a variety of biomass waste sources, including:



The project was first announced in 2020, and in 2021, they received permission to inject the produced biomethane into the region’s pipeline ecosystem. This has reduced local carbon emissions by up to 5,000 tonnes for almost 2,500 local homes. The biomethane produced at the plant also has a hydrogen content up to 1%, which has required an exemption to standard requirements.

ABSL’s processes are considered more flexible and environmentally friendly technology for waste processing than incineration. The key differences between it and incineration include:



This latest development builds on national commitments to prepare the gas network to transport green gases like hydrogen and biomethane – which supports the decarbonisation of home heating, heavy industry, businesses and transport. Also in 2021, a consortium of companies and government agencies set out the detail of the activity to turn Britain’s hydrogen ambitions into reality – including working towards blending up to 20% hydrogen into local gas grids by 2023 and converting villages to run on 100% hydrogen by 2025.

In total, £10 million has been pledged by managers ABSL to complete the construction of the advanced biofuels facility. If this works well, it will create a template for more plants around the country and more opportunities for low-carbon tech that could also be used for making aviation fuel and hydrogen.



7-Green Investment Fund New Zealand

In 2018, the government of New Zealand announced a \$100 million green investment fund which aims to invest with businesses to reduce emissions while also helping them make a profit. The Climate Minister said at the time how an increasing number of investors were looking to fund clean, sustainable ventures, and that the \$100 million start-up capital injection will help achieve this.

New Zealand

Although the entire sum of \$100 million won't need to be paid back, the operating capital of \$25 million over five years would be paid back as the fund matures. This fund means the Government is bringing cash and know-how to the table to partner with business to deliver a clean, green future for everyone. For example, the fund could arrange for business borrowers to repay energy efficiency investments directly through savings to their energy bills.

This is not the world's first green investment fund, but the massive financial injection will nonetheless act as a bridge between local investors and key industries and sectors, as well as identifying low emission projects ready for upscaling, commercialisation and use. It is expected the fund would stand on its own commercial footing in subsequent years.

The fund was established because new investment markets take time to develop and investors rely on good information to assess viability and risk. They also need financial products which are structured in a way that fits the market. As a result, there is limited activity initiating and funding low emissions or 'green' investment deals in New Zealand. The Green Investment Fund would help fill this gap.

What will the fund finance? It will have the flexibility and mandate to focus on sectors and industries where the greatest impact on emissions reductions can be made. Potential opportunities include things like electric vehicles, manufacturing processes, energy efficient commercial buildings and low-emissions farming practices.

With New Zealand's electricity supply already using around 85% renewable sources, the fund will instead focus on tackling other sectors. However, there may be opportunities to back smaller scale renewable energy projects, where they are smart and can contribute to making our electricity supply more sustainable as demand for electricity rises. As a standalone commercial entity, the fund will likely focus on solutions that already exist; for example, knowledge and technology being used internationally where there is scope for use in New Zealand.

In 2022, the fund's budget was quadrupled from \$100 million to \$400 million.

Its leadership team noted that with a bigger balance sheet NZGIF could do more in terms of considering which other parties it would work with, over what period of time and the scale of individual investments.

The fund had already allocated about half of the initial \$100m but the leadership team noted there were other investments on the horizon which would take up most, if not all, of that remaining funding. Some of its investments to date include \$5.8 million in Carbon Group, a \$15 million loan to CentrePort, a \$1.1 million equity investment in former Rakon associate Thinxtra, a \$2.7 million equity investment in Energy Solution Providers, and a \$10 million investment in solar energy services company solarZero.

The increase in capital announced in the budget should encourage more co-investors to link up with it. But it was not just about investing money. The bigger size should also enable the fund to have a different dialogue with other players in the market in an effort to encourage more investment in low-carbon technologies.

The government, meanwhile, signaled in its budget allocation that it wanted the increased funds to focus mainly on investments to lower emissions in public transport and in the waste and plastic sectors. It is not yet clear just how quickly the money will be invested.

In terms of co-investment there was a wide range of potential participants, including funds and fund managers, entrepreneurs, the banking sector and local government. The fund's leadership thought about co-investment over time, and it was not just about who would invest in low carbon technologies and initiatives but also about who would benefit from those investments in coming years.

The Green Investment Fund is part of a wider suite of Government work on transitioning towards a net-zero-emissions economy, including the Zero Carbon Act, reviewing the New Zealand Emissions Trading Scheme and establishing the Independent Climate Change Commission.



8-‘Sustaintech Xcelerator’ Boosts Confidence in Nature-Based Carbon Credits

Singapore

In 2020, DBS, Google Cloud, the Centre for Nature-based Climate Solutions at the National University of Singapore (NUS), Temasek, and the World Bank, launched the “Sustaintech Xcelerator”, a six-month global virtual accelerator focused on increasing confidence in carbon credits from nature-based solutions. Nature-based solutions are actions that harness the power of nature to tackle social and environmental challenges; examples include protecting and restoring ecosystems like forests, mangroves and coral reefs.

Sustaintech Xcelerator supports climate innovators who are developing solutions that build more confidence in nature-based solutions – through improved monitoring and verification of their environmental, social, and economic impact. Technologies and solutions that are considered under the accelerator include remote sensing technologies, artificial intelligence and climate science models that improve estimation of carbon sequestration and biodiversity, and IoT technologies for monitoring nature-based solutions projects.



Nature-based solutions have immense potential to achieve the climate goals set out in the Paris Agreement. They play a vital role in absorbing CO2 emissions and their development is critical for achieving the targets set out in the Paris Agreement to limit global temperature rise to 1.5°C above pre-industrial levels. As only a certain amount of global emissions can be reduced by improved technology, the remainder will need to be addressed by carbon offsets.

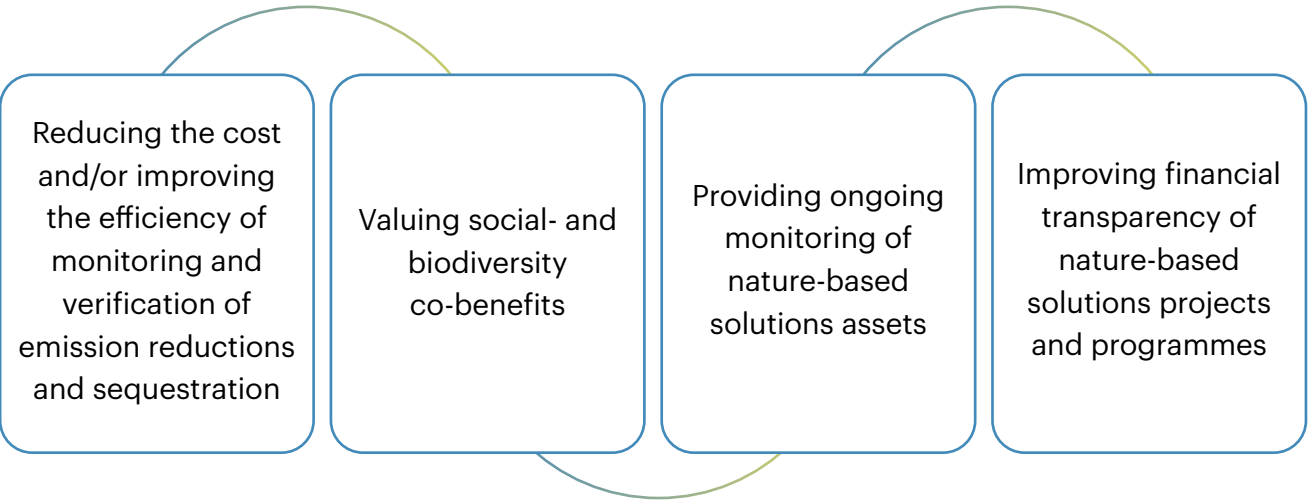
Nature-based solutions, including forestry, marine and agricultural projects, have the potential to supply a majority of these credits. Nature-based solutions projects also often embody significant co-benefits, for example, by supporting biodiversity and providing income for rural communities.

Although demand for carbon offsets is growing, a number of challenges surrounding NbS are limiting their further development. For instance, the monitoring and verification process for nature-based solutions projects relies on infrequent manual auditing. There is also limited transparency for carbon credit buyers around the level of impact and any potential risks associated with different nature-based solutions projects.

The Sustaintech Xcelerator invites start-ups, established companies and academics commercializing new opportunities to help to transform nature-based solutions verification into a more continuous and efficient process – transparently monitoring the performance and outcomes of an nature-based solutions initiative and enabling ongoing issuance of carbon credits. Importantly, these technologies should complement necessary groundwork required for verifying the more intricate social impact of a project.



Selected applicants of the Sustaintech Xcelerator present tangible solutions that address any of the follow nature-based solutions opportunity areas:



To facilitate their innovation journey, the Sustaintech Xcelerator provides mentorship to the selected applicants through its world-leading partners and their networks. For example, Verra, who manages the world’s largest voluntary greenhouse gas program, the Verified Carbon Standard, acts as a knowledge partner to guide teams on the important intricacies of the verification process.

In addition, each selected applicant receives a \$35,000 grant; have access to leading research expertise; as well as given in-kind resources including office space in Singapore (for local teams). All teams have the opportunity to engage in frequent pitching and speaking opportunities, including a public showcase with investors and media. The Sustaintech Xcelerator also supports applicants to remain engaged in the Singapore ecosystem following the program – through academic partnerships and commercial opportunities.

As of fall 2022, Sustaintech Xcelerator is still working with its 2021 startup cohort (although applications for the 2022 cohort are expected to be posted before the year is over), which includes:



Cloud Agronomics

a climate-tech company on a mission to become the standard for quantifying sustainable outcomes on agricultural land.



Farm-Trace

a software platform that delivers verified reforestation impacts created by farmers to brands wanting to reduce their climate footprints.



Rainforest Connection

the world’s first scalable, real-time acoustic monitoring system for protecting and studying remote ecosystems.



Sylvera

a software that brings clarity to the carbon markets by building tools to help businesses ensure that carbon offsets purchased are authentic.

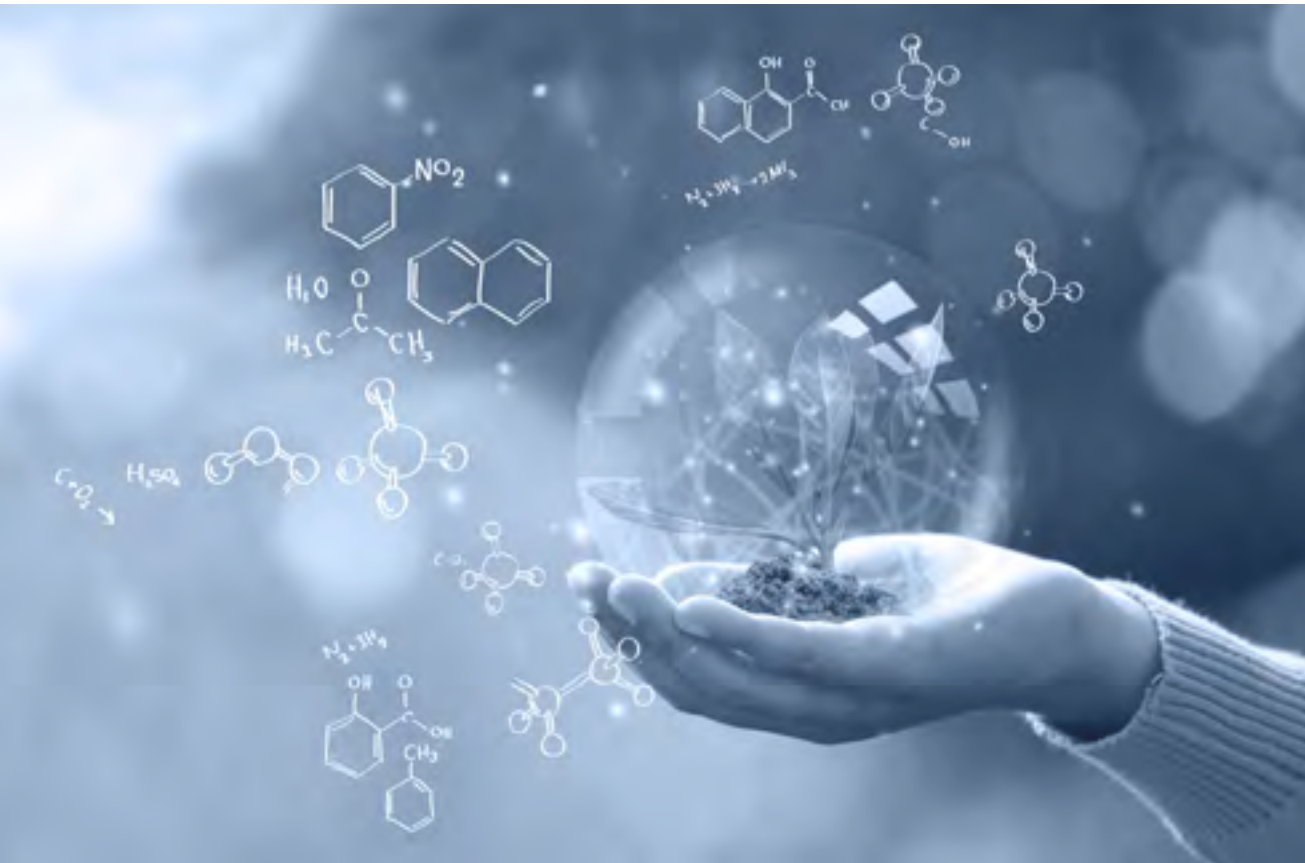


Treevia

a technology company that brings forest monitoring and sustainability together by connecting forests around the world to the internet.

Some examples of technologies and solutions that Sustaintech Xcelerator would consider for future cohorts includes:

Remote sensing technologies (e.g. satellite, drones, SAR, LiDAR etc) for monitoring NbS projects	AI and climate science models that improve estimation of carbon sequestration and biodiversity	Technologies for verifying of soil sequestration
IoT technologies for monitoring nature-based solutions projects	Technologies to support ground audits – both for verifying social impacts and for collecting calibration data	Novel technology-driven approaches to social impact verification
Digital ledger technology (DLT) to support tokenisation, digital auditing and financial transparency around carbon credits		



9. United Arab Emirates Announced It's Net Zero by 2050 Strategic Initiative

In October 2021 during Expo 2020, the UAE government announced the “strategic initiative to achieve climate Net Zero by 2050”, making the UAE the first country in the Middle East and North Africa to announce its goal to achieve climate neutrality.

But this was not an empty commitment: the UAE has over a decade in climate change leadership to back up its goal, and understands the immense economic opportunities available to early movers. New knowledge, new industries, new skills and new jobs will be incubated and scaled across the country in the coming decades.

Furthermore, there are two specific lessons to be learned from UAE's example for other entities considering a Net Zero strategy.



**long term strategic goals must
be backed up with years of action
ahead of time in preparation.**



**such a plan must play to a country's
strengths and comparative
advantages.**

United Arab Emirates

Regarding the first lesson, the UAE has already taken steps to build its green credentials.

- Abu Dhabi became home to the International Renewable Energy Agency headquarters at its founding in 2009.
- To date, the country has invested over 40 billion USD in the renewable energy sector, across six continents around the world, including in 27 climate vulnerable island nations.
- The UAE is now home to three of the largest and lowest cost solar plants in the world, with plans to scale its solar potential even further.
- They are the first country in the Middle East to build and operate a nuclear power plant, which provides emissions-free energy.
- They are also the first country in the region to build industrial-scale carbon capture utilization and storage facilities.
- Plus, the UAE has made anchor investments in offshore wind projects, particularly in the UK, despite not being able to benefit much from the technology much back home.

In addition to proven technologies, the UAE is committed to promising experimental ones. For example, the UAE is increasing investment in clean hydrogen, and launched the first industrial-scale green hydrogen project in the region in May 2021. ADNOC has already started test shipments of blue hydrogen, a fuel seen as crucial to the energy transition.

Regarding the second lesson, the Net Zero by 2050 initiative expands the UAE’s energy leadership from hydrocarbons into all forms of energy, diversifying the economy while creating new economic value through the energy transition. The UAE is also pragmatic about the present, because, even in the swiftest energy transition scenario, the world will still need oil and gas for several decades to come. However, with its decades of institutional expertise in the energy sector, the UAE can synergize with its academic institutions, large scale industrial players and innovative small businesses to create new solutions and jobs in the meantime.

Another field where the UAE has strengthened its strategic interests is food security. Agriculture accounts for one quarter of global greenhouse gas emissions, and inextricably links climate change to food security. Currently, the country is looking at solutions to decarbonizing the agricultural sector. They have invested heavily in agri-tech, and are emerging as a leader in this sector, while creating economic value through new industries. In taking a holistic and coordinated approach, the UAE partnered with the US earlier this year to launch the Agriculture Innovation Mission for Climate (“AIM for Climate”) – a global initiative aimed at accelerating investments in research and development for climate-smart agri-tech.

How to craft an ambitious Net Zero policy

In order to prepare the specific characteristics of the Net Zero strategic initiative, a specially created government accelerator program was established under the Prime Minister’s Office. The accelerator was designed to integrate the work of key government and private sector entities in cross-sectoral teams focused on developing a fast-tracked and enhanced roadmap for raising climate ambition.

The accelerator was driven by the collaborative efforts of



The accelerator was able to provide senior leaders with an economic development road map, based on their expansive expertise and inputs. Program participants identified initiatives for emissions reduction, ideas for future economic and decarbonization acceleration, and required enablers. In total, they identified 192 initiatives across 4 sectors – energy, industry, transport, and the environment – to help hasten the UAE’s sustainable growth trajectory. In each policy suggestion, there was also an intentional effort to improve the quality of life and health across the UAE.

After the accelerator successfully developed outlines for the Net Zero pathway, the strategic initiative was then announced at Expo 2020.

As the UAE celebrates its Golden Jubilee year, they are positioning themselves as a young, inclusive country that believes partnership is the key to progress and to solving global problems. This approach has underpinned their commitment as a first mover in climate action. But far from empty promises, its strategic climate change goals are backed by years of hard work and investment into complementary sectors for its existing economy, namely renewable energy and agri-tech.



10. Uae: Ministry of Climate Change and Environment Launches “Uae Climate-Responsible Companies Pledge”

United Arab Emirates

In August 2022, more than 21 companies across key sectors, such as cement, aluminium and steel, joined the UAE’s “Climate-Responsible Companies Pledge” launched by the Ministry of Climate Change and Environment (MoCCAEC).

This brings the total number of signatories until the end of 2022 to 63 companies. Under the pledge, companies commit to intensifying their efforts to combat climate change by measuring their carbon footprint and taking concrete steps to reduce it, and by integrating sustainability principles into their operations.

The pledge aims to increase the engagement of the private sector in the country’s decarbonisation drive, in line with their goal to reach Net Zero emissions by 2050. This is referred to internally as a “triple helix” of enabling access to finance and strengthening the private sector role to achieving net zero, while accelerating the adoption of competitive and sustainable climate smart technologies and innovations.

Companies who initially joined the pledge include:

Beeah, Emerson, Emirates Nature-WWF (World Wildlife Fund), Majid Al Futtaim Group, Standard Chartered Bank, HSBC, Masdar, Emirates Global Aluminium, Emirates Steel Arkan Group, Aldar Properties, Emirates Environmental Group, Strata, Al Yah Satellite Communications Company (Yahsat), Chalhoub Group, Pure Harvest, AESG, Taka Solutions, Lafarge Emirates Cement, EY, EV Lab and TotalEnergies.



According to the state news agency, WAM, the pledge forms the basis of future collaborations between the private sector, non-governmental organisations and international organisations, including Emirates Nature, in association with WWF, a strategic implementation partner of the pledge, to support the private sector entities in implementing their Net Zero plans.

The launch event of the pledge took place as part of the fourth stage of the National Dialogue for Climate Ambition (NDCA), a series of sector-specific assemblies aimed at establishing a national sustainability culture and highlighting the country’s efforts to achieve climate neutrality.

The companies have committed to intensifying their collective efforts to combat climate change, by measuring and reporting their greenhouse gas emissions in a transparent manner, drafting ambitious science-based plans to reduce their carbon footprint, and sharing these plans with the UAE Government to help achieve the national net-zero target by 2050.

There was much enthusiasm about introducing the UAE Climate-Responsible Companies Pledge at the NDCA, which has previously been a vehicle to build rapport between the public and private sectors. The new pledge will help the UAE government to better engage with entities that are keen to make an active contribution to the climate neutrality movement, and align their efforts to achieve common objectives.

The launch of the pledge is part of MoCCAE’s initiatives aimed at scaling up the UAE’s climate action, and in the preparation of hosting the Conference of the Parties to the United Nations Framework Convention on Climate Change at its twenty-eighth session “COP28”, for countries to adopt higher GHG emission reduction targets.

The keenness of the companies to sign the pledge reflects the awareness of private sector entities of the serious threat posed by climate change and its adverse effects on the environment, food security, water security and public health.



The signatories also pledged to consider climate change mitigation and adaptation in their business and operational models, as well as adopt an all-inclusive approach that promises to engage the youth, women and vulnerable segments of society in drafting their net-zero plans.

11. Uae Set to Launch the Region's First Independent Climate Change Accelerator

In September 2022, during the New York Climate Week, the UAE announced the creation of the Independent Climate Change Accelerators (UICCA). The UICCA is a non-partisan, climate action entity that brings together members of the public and private sector, including academic institutions and non-governmental organisations (NGOs) to drive the UAE's commitment towards net zero by 2050.

In the lead-up to the 2023 United Nations Climate Change Conference of the Parties (COP28), which is set to take place in Dubai, the UICCA will establish an independent body that enables collaboration, cooperation and innovation. This includes advice and recommendations on positive climate actions to reduce the climate-related risk for the UAE before, during, and after COP28 UAE.



United Arab Emirates

Under the direction of key leadership and with the support of industry leaders and subject matter experts, the UICCA operates as a think tank and predominantly focus on providing advice and recommendations to stakeholders on positive climate action that facilitates the transition to a green economy. As per the guidelines laid out by the UN Environmental Programme, the green economy is “low carbon, resource-efficient and socially inclusive”, with social equity, wellbeing and minimal environmental risk at the heart of decision-making. This transition also contributes to boosting GDP growth, increasing job creation, and reinforcing the UAE’s position as a global Environmental, Social and Governance (ESG) hub and first-mover on climate action within the Middle East.

In addition to acting as a catalyst for a knowledge-based green economy and attracting global talent to the UAE’s sustainability sector, the accelerator facilitates international business, innovation, and technology partnerships, that work towards the common goal of tackling climate change. The main sectors of focus include electric mobility, sustainable fuels, energy efficiency, green buildings, smart cities, carbon capture and storage, nature-based solutions, agritech, and climate tech.

UICCA aims to accelerate the transition to a green economy that will be necessary to deliver on the net zero and climate agenda that the UAE has committed to. This will enable the UAE economy to benefit from the global momentum around climate action and will inform the UAE’s policies to enable the transition to a green economy and strategically impact the UAE’s GDP and economic growth. UICCA is registered as an NGO at the Abu Dhabi Global Market (ADGM), the city’s largest financial and investment center.

The Executive Director of UICCA noted that the synergies created by the UICCA will allow for the country to pursue a more sustainable future, far beyond 2050. The UICCA is hoped to become the “nucleus” that can bring this ecosystem to life.

