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PROTECTING OUR NATURAL RESOURCES

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PRESIDENT'S MESSAGE

Protecting our natural resources

There is a classic United Nations animated feature that tells the story of a fictional planet called *Pakaskas* and its inhabitant species who spent day and night consuming the planet's resources.[1] They ate the mountains and trees, they slurped up the rivers and lakes, and little by little, their planet began to disappear from the sky. One of the inhabitants pleaded with them to stop destroying their home, but they paid him no mind. In the end, he left with his family in search of a new home, and the planet they left behind eventually vanished, along with its inhabitants.

Although it was scripted with children in mind, the story of *Pakaskas* held a powerful and timely message for all audiences. At its core, it was a story about sustainability — about the dangers of reckless consumption without thought for the future. Like the inhabitants of that fictional planet, we too are recklessly consuming our planet's resources and risk pushing it past irreversible tipping points. We too need to stop and heed the warnings; to realise that if we continue along our current path, there could be no Earth-as-we-know-it for our children to inherit.

We need to better manage our resources, replenishing what we can and conserving what we must. Our freshwater reserves, for example, are being impacted in complex ways by climate change. Already vulnerable populations are at risk of experiencing even more acute water shortages — rising sea levels lead to

saltwater intrusion in groundwater sources; more erratic precipitation patterns are increasing the frequency and intensity of droughts; rising temperatures and floods alike can lead to the proliferation of water-borne diseases. We therefore need to be mindful of how we consume and distribute the water we have.

Our forests are another natural resource we must carefully manage. A very important forest ecosystem in the context of climate change adaptation and mitigation is the mangrove forest — renowned for its prolific carbon sequestration capability, its protection of coastal areas against erosion and storm surges and its services as a habitat for diverse species. Mangrove forests are often sacrificed in the course of urban development, but restoration of these wetlands could hold a key to managing the impact of our changing climate.

For resources such as our fossil fuels, the challenge is different — what we need to immediately address are the emissions produced when they are consumed. Renewable energy technologies are part of the solution, as they allow us to reduce our reliance on fossil fuels and the carbon footprint of energy production. Green hydrogen is one promising option that is being explored locally, with the potential to help decarbonise other industries such as ammonia manufacturing — one of the leading export industries in Trinidad and Tobago.

In this edition of *GASCO News*, we delve further into these topics, exploring different angles of resource use and management, and some of NGC's projects that dialogue with these issues. As always, we hope to leave our readers better informed — not only around the work we are doing at The NGC Group, but around the need for collective action, and the individual responsibility we all carry to protect the planet we call home.

Mark Loquan
President

[1]https://www.unmultimedia.org/avlibrary/asset/1956/1956116/

RESTORING OUR WETLANDS — NGC EMBARKS ON NEW MANGROVE REHABILITATION PROJECT

Estimated read time: 6 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

Mangrove forests provide valuable ecological, geographical, socioeconomic and climate change mitigation services.

Mangrove wetlands are being lost or degraded due to urbanisation, agriculture, pollution and other factors linked to land use and settlement.

NGC is embarking on a landmark project with the Institute of Marine Affairs (IMA) to rehabilitate wetlands in the vicinity of Couva/Point Lisas.

In the quiet evening of the Caroni Swamp, against the canvas of a sunset sky, hundreds of scarlet ibis make for home from across the Gulf of Paria, settling atop the stilted mangroves like red blossoms. Flat-bottomed boats glide across the water, ferrying mesmerised visitors through and past, to witness this daily spectacle in the company of trilling insects and more reclusive wetland creatures.

For many years, through boat tours of the west-coast Caroni Swamp, locals and tourists alike have experienced in microcosm the beauty and biodiversity of Trinidad and Tobago's mangrove forests, which grow in wetland or coastal intertidal zones. Although popularised as a bird sanctuary, the mangroves of the Caroni wetlands – and others around the country - are a productive habitat for many marine and freshwater species of flora and fauna. However, these ecosystems do more than just house a menagerie of life. They provide valuable geographical, socioeconomic and climate change mitigation services. Unfortunately, mangrove wetlands are being lost or degraded due to urbanisation, agriculture, pollution and other factors linked to land use and settlement.

In recognition of the need to preserve mangrove coverage in Trinidad and Tobago, NGC is embarking on a landmark project with the Institute of Marine Affairs (IMA) to rehabilitate wetlands along the west coast of Trinidad, in the vicinity of Couva/Point Lisas. This area is being targeted because of significant mangrove dieback in these wetlands - identified by IMA studies - and its adjacency to the Point Lisas Industrial Estate, parts of which occupy lands that were formerly covered by mangrove forest.

Restoring our wetlands – NGC embarks on new mangrove rehabilitation project | CONTINUED

WHY MANGROVES?

Since 2005, NGC has been investing in restoration of local forest cover, largely through its signature 315-hectare reforestation programme. The aim of that initiative was to replant acreage cleared during NGC's pipeline construction activities, building natural carbon sinks and terrestrial habitats in the process.

Upon conclusion of this project in 2023, NGC began to explore options to extract even greater value from national forests through a sequel project called 'Beyond 315'. Under this new project, in addition to agroforestry and eco-tourism initiatives, NGC has decided to focus on mangrove restoration, for several reasons.

Ecology

Mangrove forests are vibrant ecosystems teeming with life. The cavernous root systems of mangroves serve as fertile breeding grounds for fish, shrimp, clams and crabs. Globally, over 1,500 species depend on mangroves for their survival, with as many as 15 per cent of these facing threat of extinction.[1]

IN TRINIDAD AND TOBAGO, THE CARONI SWAMP ALONE IS HOME TO 190 SPECIES OF BIRDS, INCLUDING 20 ENDANGERED SPECIES.[2]

Restoration of mangrove forest is key to preserving these vital and versatile habitats, and ensuring the survival of all species that depend on them for shelter and food.

Economics

The value of ecosystem services is difficult to quantify.

HOWEVER, IT IS ESTIMATED THAT MANGROVES PROVIDE AROUND US$33-57 THOUSAND PER HECTARE PER YEAR TO THE NATIONAL ECONOMIES OF DEVELOPING COUNTRIES WITH MANGROVES.[3]

A significant share of that value is generated from economic activity linked to fishing. Locally, fish and shellfish harvested from mangrove forests generate income for many households, with trade in the hairy crab, the blue crab and the mangrove oyster being especially important.[4]

As eco-tourism destinations, mangrove forests also create economic opportunities for local tour guides.

Investment in mangrove restoration can therefore create and support livelihoods. As an adjunct benefit, since they support productive fisheries, mangrove forests can also help build food security.

Green infrastructure

Perhaps the most underestimated services provided by mangroves are those they deliver as 'green infrastructure' solutions.

Mangrove trees can serve as natural structural reinforcements to coastlines and surrounding areas. Their above-ground roots encourage deposition of sediment and can help bind and build soils – a feature which offers some protection against rising sea levels. They also buffer waves and help protect inland areas from storm surges, which can often cause severe flooding.

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[1]https://www.unep.org/news-and-stories/story/inside-look-beauty-and-benefits-mangroves
[2]https://www.ima.gov.tt/wp-content/uploads/2018/04/Mangrove-Conservation-in-TT.pdf
[3]https://www.unep-wcmc.org/en/news/5-facts-about-mangroves-and-why-we-must-protect-them
[4]https://www.ima.gov.tt/2021/07/26/why-international-day-for-the-conservation-of-mangrove-forests/#:~:text=In%20Trinidad%20and%20Tobago%2C%20the,Maynard%20and%20Oxenford%2C%202014).

ON THE GREEN AGENDA

WITH THEIR TRUNKS ABSORBING SOME OF THE IMPACT OF WAVES, MANGROVES HAVE PROVEN TO BE AN EFFECTIVE DEFENCE AGAINST TSUNAMIS, REDUCING WAVE HEIGHTS BY AS MUCH AS 35%.[5]

Researchers have estimated that if all mangroves in the world were lost, 18 million more people would be flooded every year on average, and annual damages to property would increase by US$82 billion.[6]

NGC's recently launched Climate Adaptation and Resilience Portal (CARP) has highlighted how sea level rise is projected to affect coastal communities along Trinidad's west coast in the next few decades. In that context, protecting, restoring and planting mangrove belts was identified as one useful strategy to help make settlements in that area more resilient to the impacts of climate change.

Carbon sequestration

An invaluable benefit of reforestation is the creation of natural carbon sinks. Trees remove carbon dioxide from the atmosphere and sequester the carbon in their root and shoot biomass. In so doing, they play an indispensable role in the mitigation of climate change.

The inundated soils of mangrove forests make them particularly adept at sequestering carbon. Due to low oxygen levels, the carbon that gets incorporated into the soil through dead organic matter decomposes very slowly, resulting in longer term storage. Studies suggest that mangroves and coastal wetlands sequester carbon 10 times faster than mature tropical forests on an annual basis, and store three to five times more carbon per equivalent area than tropical forests.[7] This is considered 'blue' carbon, since it is stored within an aquatic ecosystem. NGC has elaborated commitments to reduce and offset its carbon footprint through various initiatives, in support of national emissions reduction targets. Given the carbon sequestration potential of mangroves, a focus on wetland restoration will help the company deliver on its commitments.

NGC and IMA Teams, led by Mark Loquan and Dr Ava Maxam, at the recent signing at NGC's Head Office

PROJECT DETAILS

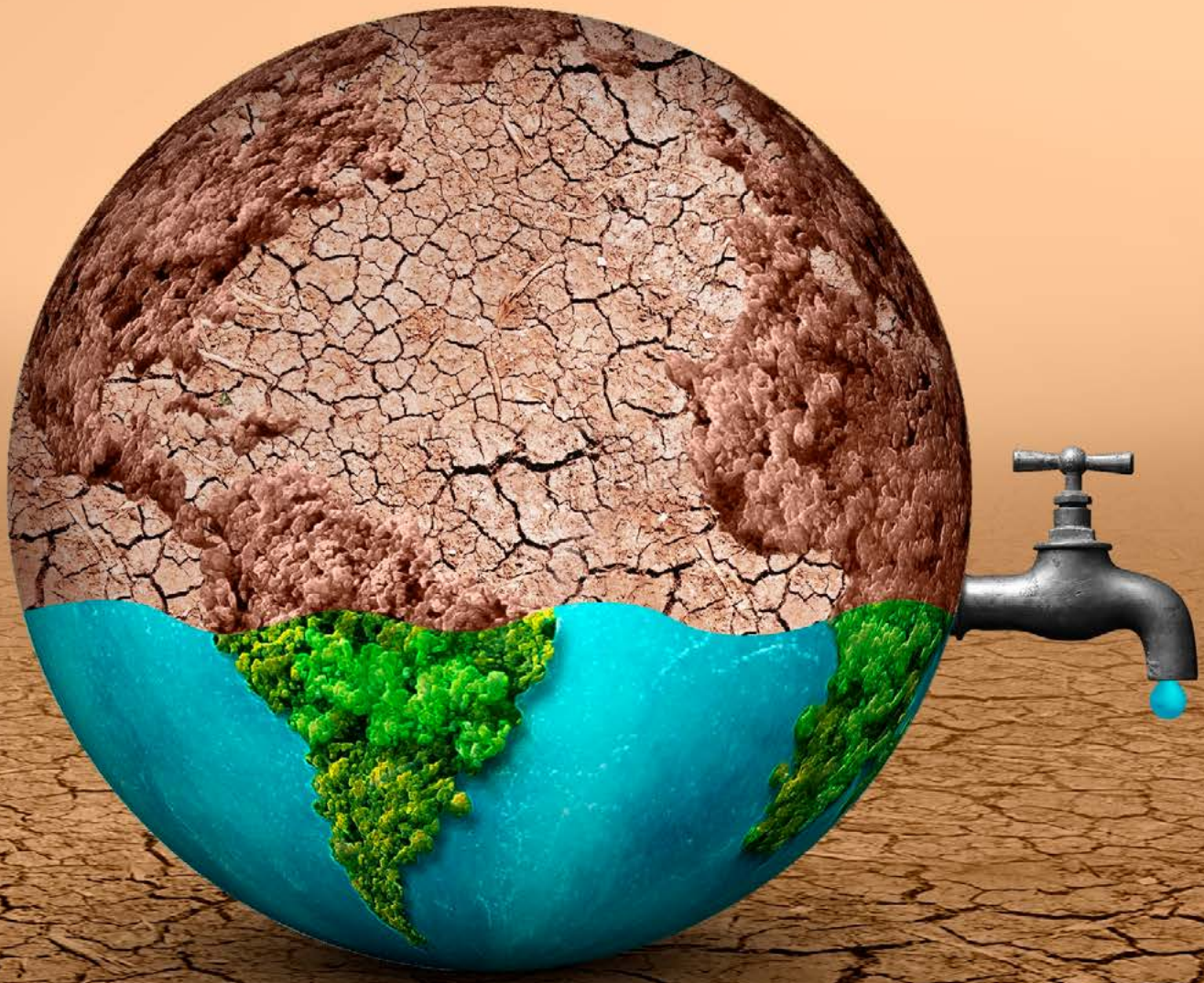
On November 15th 2023, NGC signed a Memorandum of Agreement (MOA) with the IMA to collaborate on a mangrove rehabilitation project in the area north of the Couva River. This two-year project will include a public education and awareness campaign to teach community stakeholders about the importance of conserving wetlands, and capacity building training to enable community participation in the restoration activities. This will help create sustainable livelihood opportunities for residents. The IMA will also conduct assessments to determine the main causes of mangrove dieback in the area, to ensure rehabilitation efforts address those factors.

A mangrove nursery will subsequently be set up to generate seedlings for the project, and once the site is prepared, a planting exercise will be executed in partnership with the community. The site will be monitored thereafter – with the support of NGC's satellite technology and drones – to determine the success of the project and generate data and lessons for future undertakings.

As with NGC's reforestation programme, it is expected that this new project will return significant benefit not only to Couva and environs, but to the wider national community working to build a more sustainable home and future. Importantly, through its attendant communications and knowledge-sharing campaigns, it will turn a spotlight on the need to protect our valuable and vulnerable mangrove wetlands.■

[5]https://www.unep.org/news-and-stories/story/inside-look-beauty-and-benefits-mangroves
[6]Ibid
[7]https://oceanservice.noaa.gov/ecosystems/coastal-blue-carbon/#:~:text=Current%20studies%20suggest%20that%20mangroves,equivalent%20area%20than%20tropical%20forests.

FOCUS ON FRESHWATER – ADDRESSING CLIMATE IMPACTS ON WATER RESOURCES



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ON THE GREEN AGENDA

KEY TAKEAWAYS

Climate change is impacting the supply of fresh water around the world.

A combination of strategies is necessary to protect water reserves, including climate mitigation and adaptation measures.

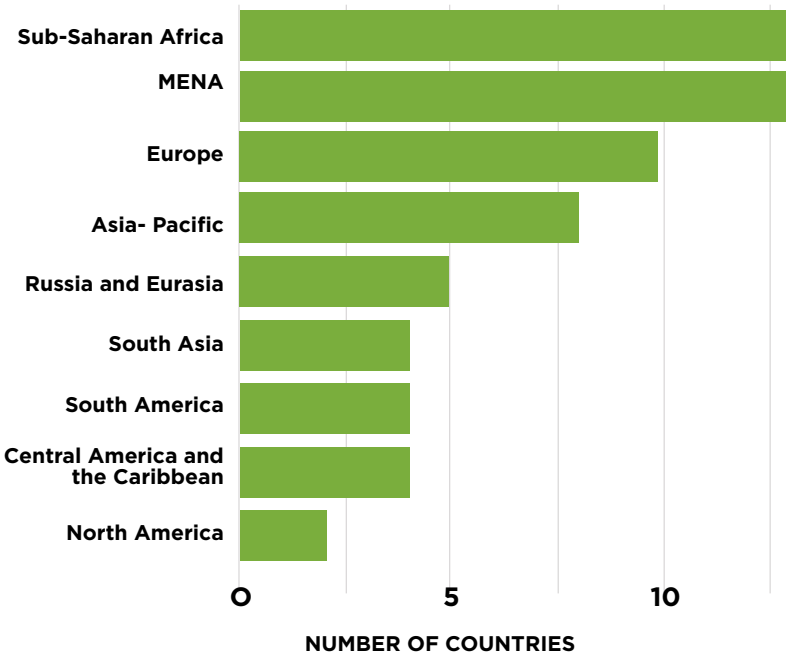
Water is essential for life on Earth. Water comprises 60-75 per cent of the weight of the average human body. A human being can survive for up to a month without food, but not more than three days without water. The body will experience dehydration if it loses three per cent of its water and 15 per cent loss of body water can be fatal.

Water is also essential for healthy, thriving societies and communities. Water is necessary for drinking, sanitation, hygiene, agriculture and manufacturing. Ground and surface water form a crucial part of life-sustaining systems such as forests and mangroves. Without fresh water from rivers, lakes, aquifers and wetlands, the planet would be uninhabitable.

Climate change – long-term shifts in temperature and weather patterns – is impacting the supply of fresh water around the world. Unpredictable weather is resulting in increased incidents of droughts, hurricanes, snowstorms, and flooding. Impacts also include pollution caused by sediment run-off; forest fires; pesticides and weedicides; pharmaceuticals; microfibres; microplastics; and saltwater intrusion into groundwater.

Developing states, particularly those located in the tropics and global south, generally lack the infrastructure and waste management systems to ensure water purification and distribution following extreme weather events. As of 2022, over two billion people were estimated to be living under water stress (UNEP 2022), and that number is expected to increase if climate resilience strategies are not implemented urgently. According to the Ecological Threat Report 2022 published by the Institute of Economics & Peace, countries in Sub-Saharan Africa and the Middle East and Northern Africa (MENA) face the greatest threat of severe water stress by 2040. The number of countries experiencing extremely high water stress is also projected to grow to 63 in 2040 from 17 in 2022 (Institute of Economics & Peace 2022).

Chart showing the number of countries projected to experience high water stress in 2040: By 2040, the Middle East and Northern Africa (MENA) are projected to have the same water stress levels as sub-Saharan Africa.



Source: WRI; IEP Calculations

The challenge is indeed great, but there is still hope. Recognising the importance of water to the planet's survival, the UN included management of water resources in the Sustainable Development Goals (SDGs). UN SDG #6 – Clean water and sanitation – contains targets related to:

- Equitable access to clean and affordable drinking water
- Minimisation of release of hazardous chemicals and untreated wastewater
- Increased efficiency in water utilisation
- Restoration of water-related ecosystems
- International cooperation for capacity building in developing countries in the areas of water harvesting; desalination; water efficiency; recycling; and reuse technologies

Climate mitigation and adaptation strategies can also play a role in building resilience to climate change. The UN defines climate mitigation as human actions needed to reduce greenhouse gas (GHG) emissions while exploiting carbon sinks such as forests, to reduce emissions of carbon dioxide and other GHGs into the atmosphere. Individuals and communities can contribute to climate mitigation by practising energy efficiency and limiting consumption. Climate adaptation refers to a combination of natural, technical and technological options, as well as social and institutional measures, to mitigate damage due to climate change. Climate adaptation is likely to yield rapid benefits, mainly at the local level (UN Water 2020).

Water management can contribute significantly to climate resilience, as water-related ecosystems absorb carbon dioxide, provide food and water needed to sustain lives and livelihoods. NGC is contributing towards climate adaptation and resilience in Trinidad and Tobago and the Caribbean through public education. The company recently launched the Climate Adaptation and Resilience Portal (CARP), which provides information on natural disasters in the context of climate change. The portal contains data and resources for resilience planning, including interactive maps, climate information, and case studies from different countries. NGC also provides information through its CariGreen site that highlights energy efficiency and renewable energy projects being undertaken across the region. Individuals can also access NGC's Energy SmarTT app that provides resources for calculating the energy consumed by individuals and households. NGC remains committed to leading the conversation about climate adaptation and resilience to effect positive change across the nation. ■

References

Institute of Economics & Peace. 2022. Ecological Threat Report: Analysing Ecological Threats, Resilience & Peace. Sydney: Institute of Economics & Peace.

Sargen, Molly. 2023. The Harvard University The Graduate School of Arts and Sciences. November. Accessed December 07, 2023. https://sitn.hms.harvard.edu/uncategorized/2019/biological-roles-of-water-why-is-water-necessary-for-life/.

UN Water. 2020. UN World Water Development Report: Water and Climate Change. United Nations.

UNEP. 2022. Freshwater Strategic Priorities 2022 - 2025. UNEP Inter-Divisional Water Group.

HOW A TINY ISLAND IN THE CARIBBEAN IS HELPING FEED THE WORLD

Estimated read time: 5 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

Despite its size, Trinidad and Tobago plays a major role in feeding the world as one of the largest exporters of ammonia in the world.

Ammonia, a compound of nitrogen and hydrogen, serves as a critical raw material in the production of fertilisers, which are crucial for enhancing soil fertility and promoting plant growth.

To support sustainable food production, the carbon intensity of ammonia production must be addressed through the adoption of greener production technologies and strategies.

Trinidad and Tobago is a small island nation in the Caribbean with a population of 1.5 million. One of its best kept secrets may come as a surprise to many. Despite the diminutive size of the country, it plays a significant role in feeding the ever-growing global population. This is due to its long history and stable position as one of the largest exporters of ammonia in the world.

AMMONIA PRODUCTION HUB

Trinidad and Tobago boasts of having 11 world-scale ammonia production plants, with a collective capacity of 5.2 million tonnes per year. This production capacity places the nation among the top exporters of ammonia globally, competing and holding its own in the ammonia industry with industrial giants such as China, Russia, India, the United States and Saudi Arabia.

LINKAGES TO FERTILISER PRODUCTION

Ammonia, a compound of nitrogen and hydrogen, serves as a critical raw material in the production of fertilisers. Nitrogenous fertilisers, derived from ammonia, are crucial for enhancing soil fertility and promoting plant growth. Trinidad's ammonia output plays a pivotal role in the global fertiliser industry, supporting agricultural activities worldwide.

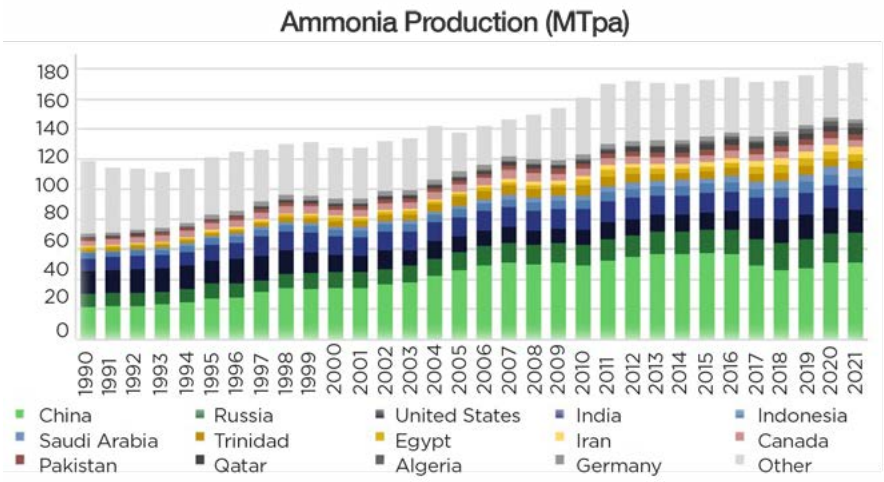
IN 2021, TRINIDAD AND TOBAGO EXPORTED US$748 MILLION WORTH OF NITROGENOUS FERTILISERS, RANKING AS THE 15TH LARGEST EXPORTER GLOBALLY.

The main destinations of nitrogenous fertiliser exports from Trinidad and Tobago (2021) were: United States, Colombia, France, Mexico, and the Dominican Republic.

THE GLOBAL IMPACT OF NITROGEN ON FOOD SECURITY

The invention and widespread use of nitrogenous fertilisers produced from ammonia, have played a crucial role in significantly increasing global food production.

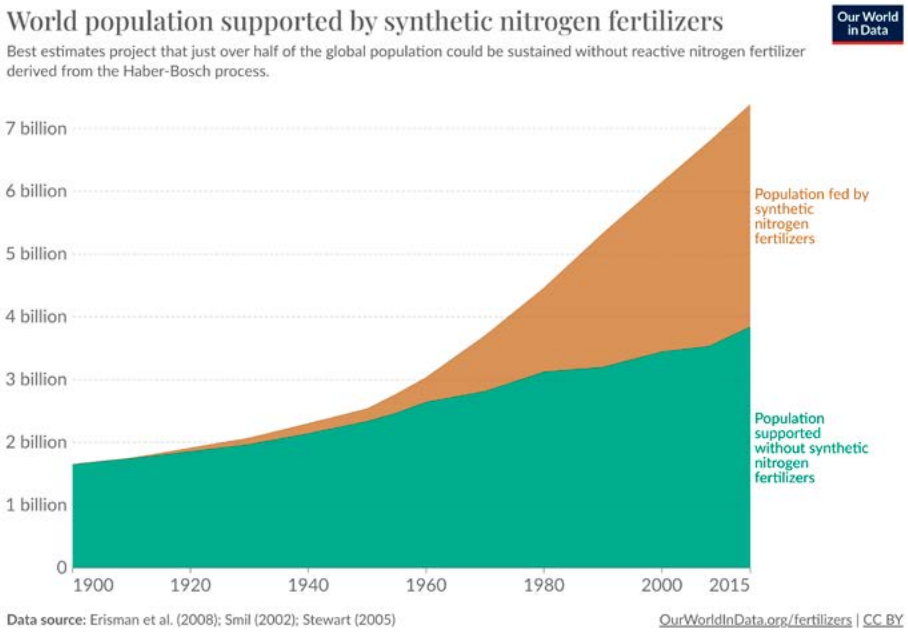
WHILE IT IS DIFFICULT TO PIN DOWN EXACTLY HOW MANY PEOPLE ARE FED AS A RESULT OF NITROGENOUS FERTILISERS, GENERAL ESTIMATES CONVERGE ON A FIGURE IN THE RANGE OF 40-50 PER CENT OF THE GLOBAL POPULATION TODAY.



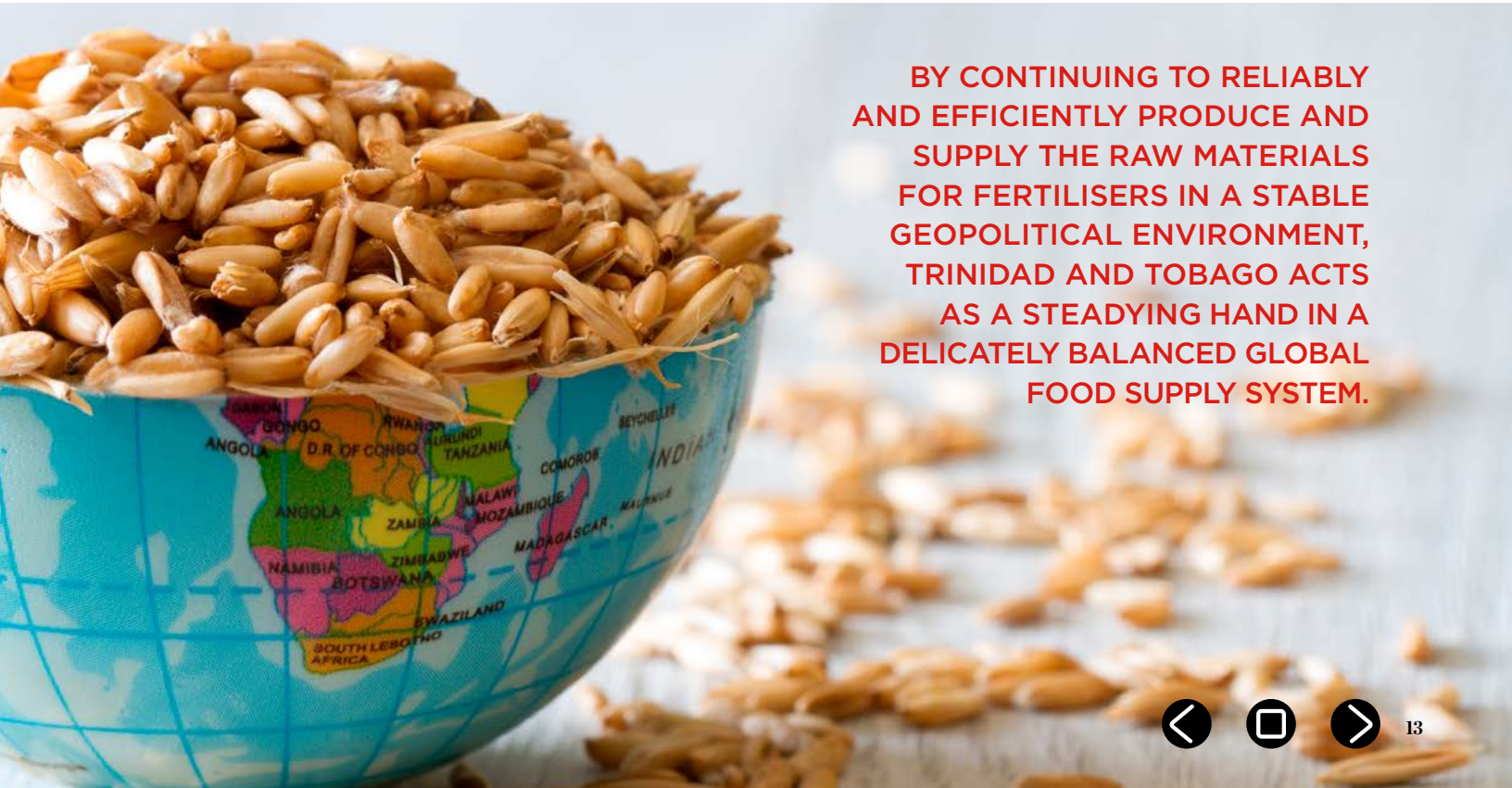
According to the IEA (2021), "ammonia makes an indispensable contribution to global agricultural systems through its use for fertilisers. Ammonia is the starting point for all mineral nitrogen fertilisers, forming a bridge between the nitrogen in the air and the food we eat. About 70 per cent of ammonia is used for fertilisers, while the remainder is used for various industrial applications, such as plastics, explosives and synthetic fibres."

ENSURING FOOD SECURITY THROUGH AMMONIA EXPORTS

The link between Trinidad and Tobago's ammonia production, fertiliser exports, and global food security is undeniable. Nitrogenous fertilisers produced with ammonia from the island, contribute significantly to agricultural productivity. They enhance crop yields, improve soil structure, and ensure the availability of essential nutrients for plants.



Any disruption in ammonia output from Trinidad and Tobago could exacerbate an already vulnerable global food production system. The war in Ukraine, the stresses of climate change on water availability and variability, and the increasing prevalence of pests and diseases, have all converged to drive up food inflation, reduce overall agricultural productivity, and worsen food insecurity in regions already grappling with the challenges of feeding growing populations.



BY CONTINUING TO RELIABLY AND EFFICIENTLY PRODUCE AND SUPPLY THE RAW MATERIALS FOR FERTILISERS IN A STABLE GEOPOLITICAL ENVIRONMENT, TRINIDAD AND TOBAGO ACTS AS A STEADYING HAND IN A DELICATELY BALANCED GLOBAL FOOD SUPPLY SYSTEM.

ON THE GREEN AGENDA

MEETING THE CHALLENGES OF DECARBONISATION IN AMMONIA PRODUCTION

It is no secret that ammonia production is one of the most carbon-intensive industries.

IT ACCOUNTS FOR APPROXIMATELY **2%** OF TOTAL FINAL ENERGY CONSUMPTION AND CONTRIBUTES **1.3%** OF CO_2 EMISSIONS FROM THE GLOBAL ENERGY SYSTEM. THE DIRECT EMISSIONS FROM AMMONIA PRODUCTION ARE CURRENTLY ESTIMATED TO BE 450 MILLION TONNES OF CO_2, MAKING IT AN EMISSIONS-INTENSIVE PROCESS.

According to the IEA (2021) "ammonia is one of the most emissions-intensive commodities produced by heavy industry... it is nearly twice as emissions-intensive as crude steel production and four times that of cement, on a direct CO_2 emissions basis".

The dilemma faced by the planet is that the use of ammonia as a key component in fertiliser production is expected to continue growing to meet the demand for food, while at the same time, the urgency of reducing global carbon emissions is intensifying.

To address this dilemma, innovative approaches, such as the adoption of greener technologies like green and blue ammonia production[1], and carbon capture, storage and utilisation[2] (CCUS) to reduce the carbon intensity of ammonia production, will help secure a more sustainable pathway for meeting the growing demand for food across the globe.

Trinidad and Tobago is well positioned to leverage its existing infrastructure in ammonia production to deploy a transition strategy to a lower carbon model that could help the world meet its emissions reduction targets while growing more food sustainably.

CONCLUSION

Despite its small size, Trinidad and Tobago continues to play a crucial role in addressing the global challenge of food security. Through its significant ammonia exports and its transformation into fertilisers, the island contributes to the sustenance of agricultural systems worldwide. As the demand for food continues to rise, the role of nations like Trinidad and Tobago becomes increasingly vital in ensuring a well-fed and thriving global population while remaining responsive to the need to transition to more sustainable food systems that are resilient to the challenges of climate change. ■

Sources

https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage

https://www.sciencedirect.com/science/article/pii/S2589004223014669

https://www.energy.gov.tt/our-business/lng-petrochemicals/petrochemicals/ammonia/

https://www.ammoniaenergy.org/articles/green-ammonia-in-trinidad-tobago/

https://www.statista.com/statistics/1391119/ammonia-leading-exporting-countries/

https://www.reuters.com/business/energy/trinidad-ready-boost-lng-ammonia-exports-once-more-gas-is-online-2022-10-19/

https://oec.world/en/profile/country/tto
https://oec.world/en/profile/bilateral-product/nitrogenous-fertilizers/reporter/tto

IEA (2021), Ammonia Technology Roadmap, IEA, Paris https://www.iea.org/reports/ammonia-technology-roadmap, License: CC BY 4.0

https://thundersaidenergy.com/downloads/ammonia-synthesis-the-economics/

[1]Green and blue ammonia production represent innovative approaches to ammonia synthesis with a focus on reducing carbon emissions, contributing to sustainability in the chemical industry. Green and blue ammonia production methods aim to address the environmental impact of conventional ammonia synthesis. While green ammonia relies on clean hydrogen from renewable sources, blue ammonia integrates carbon capture technologies into the production process, allowing for more sustainable and environmentally friendly ammonia production.

[2]Carbon capture, utilisation, and storage (CCUS) is an approach aimed at mitigating carbon dioxide (CO_2) emissions from various industrial processes and power generation. The process involves capturing carbon dioxide emissions, utilising the captured CO_2 for productive purposes, and safely storing it to prevent its release into the atmosphere.

THE GREEN HYDROGEN VALUE CHAIN – OPPORTUNITIES FOR TRINIDAD AND TOBAGO

Estimated read time: 5 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

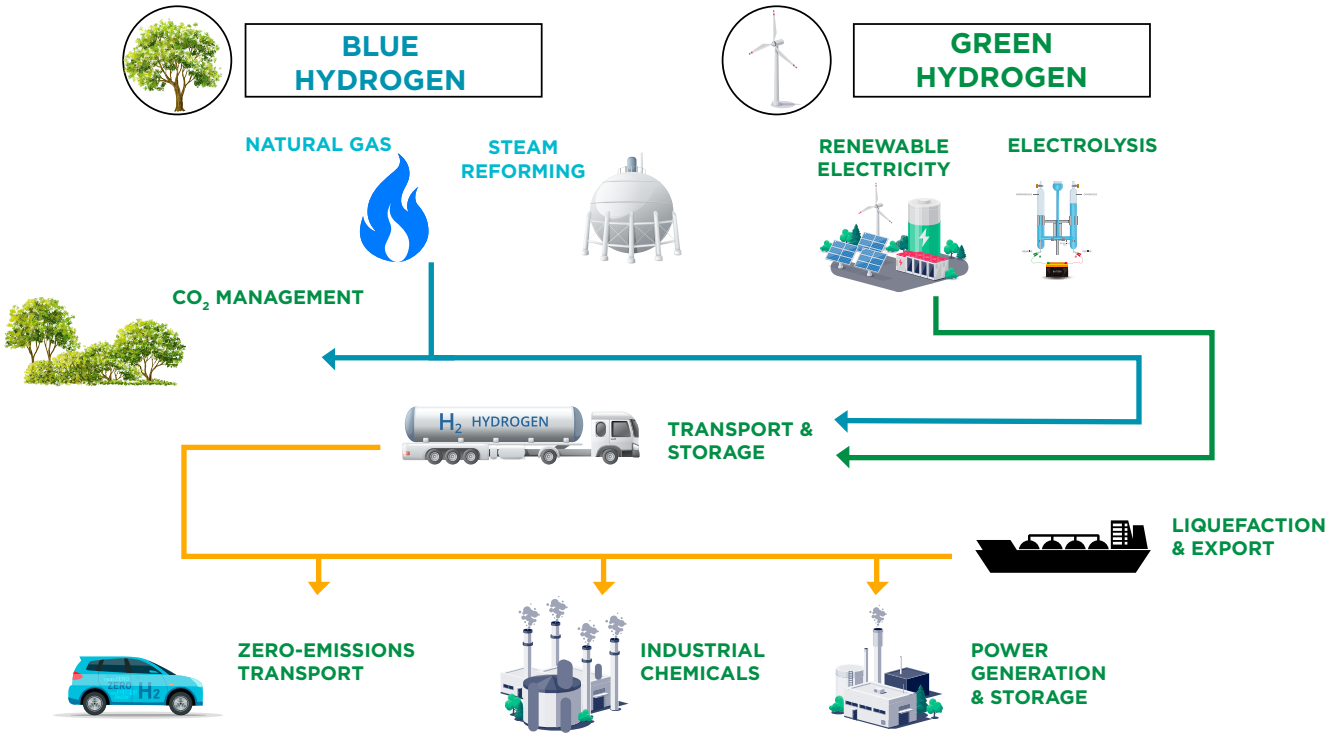
Green hydrogen can play a major role in the future of the domestic energy sector, as it can simultaneously help reduce greenhouse gas emissions, decarbonise existing petrochemicals, and potentially create new jobs.

Investment, infrastructural and regulatory challenges will need to be overcome before the country can build the value chain.

The reality of the "energy trilemma" (the need for energy sustainability, security and affordability) brought hydrogen (H_2)-based energy to the fore. Hydrogen gained traction because of its versatility (low to zero-emissions energy storage, industrial use, vehicle propulsion, etc.) and availability (hydrogen is the most abundant chemical element and can be obtained from water electrolysis and renewable energy – green H_2).

For Trinidad and Tobago, green H_2 can play a major role in the future of the energy sector, as it can simultaneously help reduce greenhouse gas emissions, decarbonise existing petrochemicals, and potentially create new jobs. However, there are also challenges that will need to be overcome.

FIGURE 1: HYDROGEN VALUE CHAIN



Source: Woodside Petroleum, via https://rcglobalfm.com.au/insights/understanding-hydrogens-role-in-energy-transition-to-help-find-investment-opportunities.html

THE GREEN H_2 VALUE CHAIN

The value chain of green hydrogen describes the steps from origin towards end-use of green hydrogen: green electricity production, H_2 production, H_2 distribution and H_2 storage, and H_2 applications. Globally, in recent years, more large energy and industrial projects based on hydrogen and harnessing the potential of hydrogen are being developed. As a result, it is now common to find major energy or industrial projects that are associated with the production and use of hydrogen.

Based on the numbers as at September 2023, annual production of low-emission hydrogen could reach 38 Mt in 2030 if all announced projects are realised. Of that total, 27 Mt will be based on electrolysis and low-emission electricity and 10 Mt on fossil fuels with carbon capture, utilisation, and storage.[1]

Green hydrogen is produced by using clean energy from surplus renewable energy sources (solar or wind power) to split water into two hydrogen atoms and one oxygen atom through a process called electrolysis.[2] The electricity used must be carbon-free to consider this hydrogen as green or renewable. Electrolysis is the most common technique for producing green hydrogen.

Value from hydrogen can be derived from several sources. Regarding green hydrogen, value can be derived from its use in zero emissions transport, production of low emissions chemicals (such as green ammonia and methanol), renewable power generation, use as stored energy, and liquefaction and export. A hydrogen production value chain is shown in Figure 1.

OPPORTUNITIES ON OFFER

For developing countries, the switch to hydrogen is relevant for several reasons. Firstly, green hydrogen can be used as a catalyst for such countries to reduce their reliance on fossil fuels and reduce carbon emissions throughout the economy. Secondly, it can help reduce reliance on imported fossil fuels, reduce energy costs and improve economic stability. Thirdly, by supporting new industries and jobs, it can help reduce poverty and improve quality of life.

For Trinidad and Tobago, it assumes even more potential significance. In an environment of natural gas supply challenges and a mature gas sector, in the long run green hydrogen can help to decarbonise the power sector.

[1]International Energy Agency. Global Hydrogen Review 2023. September 2023.
[2]Green hydrogen production: how does it work? https://www.engie.com/en/renewables/hydrogen/green-hydrogen-production

ON THE GREEN AGENDA

In addition to environmental benefits from cleaner air and reduced greenhouse gas emissions, generating renewable energy - as part of green hydrogen production - means that natural gas formerly used to generate electricity (currently between 240-260 mmscf/d in Trinidad and Tobago) can be diverted to other, more profitable uses.

Green hydrogen can be used to produce low-carbon fertilisers. As a net exporter of fertiliser, this can potentially ensure that the fertiliser produced does not add to global emissions. An initiative around the production of green ammonia from hydrogen forms part of Trinidad and Tobago's current hydrogen roadmap.[3]

In addition, green hydrogen can be used to decarbonise the transportation sector. For Trinidad and Tobago, this may not necessarily be in the form of dedicated hydrogen vehicles, but in enhanced electrification of the domestic transport sector via the use of electric vehicles, (supplemented by CNG for heavy vehicles), and marine transport using green methanol.

Finally, green hydrogen can be used to produce low-carbon steel. While most of Trinidad and Tobago's steel production facilities currently lie idle, widespread adoption of green hydrogen has the potential to revive this industry, through retrofitting of plant and equipment to use renewable electricity and hydrogen as energy.

CHALLENGES

That said, several challenges remain. It is important to note that the development of the hydrogen value chain in Trinidad and Tobago will require significant investment in renewable energy facilities, notably offshore (and onshore) wind turbines. Electrolysers to separate the H_2 from water remain expensive, though production costs are expected to decline. Challenges around hydrogen storage also exist, as dedicated storage facilities for both H_2 and stored electricity would need to be established.

On the regulatory side, the quantum of investment needed would necessitate public-private partnerships (PPPs) to establish the framework for the investments needed, as well as establishing the regulatory framework. More generally, such a large shift would require a significant amount of heavy research and development to enable large-scale production, as well as agreements between firms and countries, agreements concerning trade relations, guarantees of origin, as well as sourcing the budgeting for infrastructure development that scaling up for hydrogen production requires.[4] Figure 2 shows the opportunities and challenges around green hydrogen in Trinidad and Tobago. (See page 19).

Overall, the hydrogen value chain has the potential to play a significant role in the sustainable development of Trinidad and Tobago in the long term, as it can help the country to decarbonise its economy, generate zero-emission energy, create a whole new sector, create new green jobs, and ensure that finite fossil fuel resources are reserved for its most productive uses in the energy transition. While there remain challenges around harnessing the full potential of green hydrogen in Trinidad and Tobago, these challenges are not insurmountable given Trinidad and Tobago's greatest asset: the ingenuity of the people. ■

[3]The roadmap for a green hydrogen economy in Trinidad and Tobago (iadb.org) https://publications.iadb.org/en/roadmap-green-hydrogen-economy-trinidad-and-tobago
[4]National hydrogen strategies - KPMG Global https://kpmg.com/xx/en/home/insights/2021/08/national-hydrogen-strategies.html

FIGURE 2: OPPORTUNITIES AND CHALLENGES AROUND GREEN HYDROGEN IN TRINIDAD AND TOBAGO

Opportunities in H_2 for Trinidad and Tobago

Raw materials and H_2 production
- Trinidad and Tobago can produce green H_2 competitively using offshore wind and purified ocean water
- Capabilities to produce and sell energy globally; execute large capital projects
- Carbon capture; decarbonising other products in the portfolio; potential applications in enhanced oil recovery or synthetic oil production

Storage and transport
- Network of existing natural gas pipelines for transport
- Use of existing infrastructure and capabilities to operate pipelines and ship energy products globally

End users and applications
- Continued use of existing assets that consume hydrogen, such as ammonia and steel production
- Decarbonise products such as steel and synthetic aviation and marine fuels
- Green ammonia, green methanol (fuel and base material), renewable electricity (for residential use, industrial use, internal transport), low carbon steel production; greener cement production
- Capability to develop value chain and demand to de-risk projects

Challenges in H_2 for Trinidad and Tobago

Raw materials and H_2 production
- Hydrogen, although clean and versatile, is not an energy source but an energy vector: it must be produced, transported/stored before being used (converted to other forms of energy, such as electricity or heat, or to other chemicals)
- Reduce cost of production of electroylsers through new technologies, economies of scale, improved production methods
- Very costly to establish sufficient renewable energy capability via offshore wind

Storage and transport
- New storage methods to counter low H_2 density
- Cost to store H_2

End uses and applications
- Reduced fuel cell production cost, improved fuel cell safety
- No guarantee of premium pricing for green products in long term
- Competition from other “hydrogen corridors” of industrial production in developed countries

Source: Derived from Hydrogen: opportunities and challenges of its value chain | CIC energiGUNE at https://cicenergigune.com/en/blog/hydrogen-opportunities-challenges-value-chain


MAYARO GOVERNMENT
EARLY CHILDHOOD CARE
AND EDUCATION CENTRE

RE-ENERGIZE TNT PROGRAMME CONTINUES TO INSPIRE YOUNG ENERGY EFFICIENCY ADVOCATES

Estimated read time: 2 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

NGC partnered with Shell Trinidad and Tobago Limited (Shell) to implement a three-year energy education initiative called Re-Energize TnT.

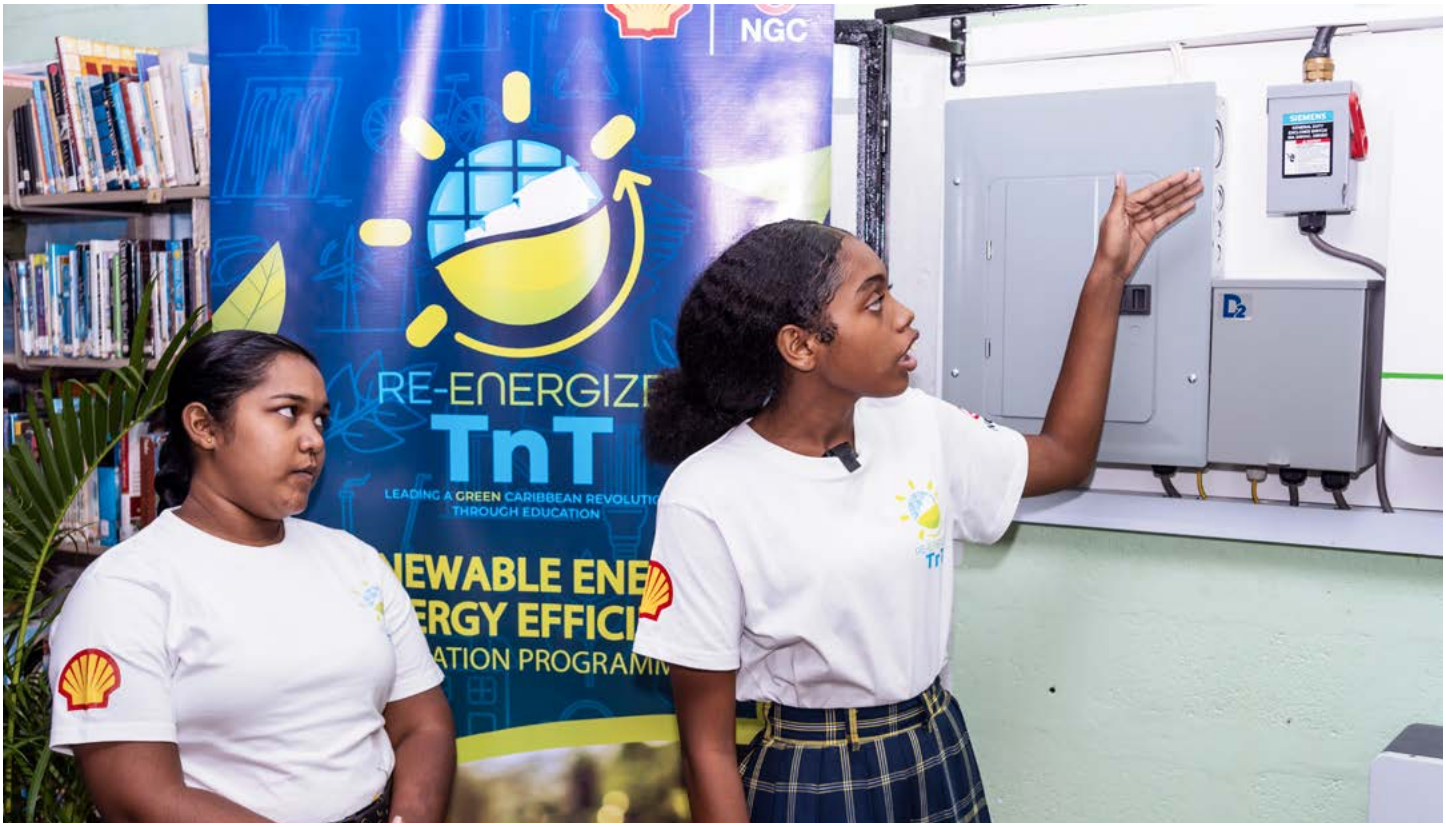
Now in its second year, Re-Energize TnT has grown beyond the classroom, to directly impact the communities in which the programme is being executed.

Re-Energize TnT graduates proudly display their certificates

In 2021, NGC partnered with Shell Trinidad and Tobago Limited (Shell) to implement a three-year energy education initiative – Re-Energize TnT. From the very beginning, this innovative programme has been making a positive impact in the lives of secondary school students in communities across Trinidad and Tobago, as they learn about energy efficiency and renewable energy. Now in its second year, Re-Energize TnT has grown beyond the classroom, to directly impact the communities in which the programme is being executed.

Re-Energize TnT is being delivered by RENEW TT, an organisation that has carried out energy education training programmes across the Caribbean. Over the three-year period, two schools are being selected each year from fenceline communities of both sponsor companies. Mayaro and Woodbrook Secondary Schools participated in the first year of the initiative, while Moruga and Ste. Madeleine Secondary Schools were chosen for the second cohort.

Re-energize TnT programme continues to inspire young energy efficiency advocates | CONTINUED



Students explain how the solar PV system works

The initiative comprises taught curriculum on renewable energy and energy efficiency, as well as practical energy audits and a community green initiative. The content is certified by the Association of Business Executives (ABE) and includes 15 training modules. Students that successfully complete all modules, meeting the attendance and performance requirements, will receive ABE certificates. In September 2023, ABE certificates were distributed to the first cohort of students, all of whom completed the programme.

Mayaro Secondary School were adjudged the overall winners for Year 1, winning the opportunity to participate in the Idea Incubator in which they were guided through the process to develop a 'green initiative' for the community of Mayaro. Mayaro Secondary also copped the prize of a solar photovoltaic (PV) system for their school in the Energy Star inter-school competition, which saw the students conducting energy audits at the school and making recommendations for reducing the school's energy consumption.

Following the Idea Incubator, students decided on a project to install a solar PV system at the Mayaro Early Childhood Care and Education (ECCE) Centre. From 15 – 17 September, RENEW TT along with students and volunteers from Shell and NGC, were on hand to clean and paint the exterior of the ECCE compound and install the solar PV system. On 22 September, the solar PV system installed at Mayaro Secondary School's library was officially handed over to the school.

Following the Cohort 2 inter-school Energy Star competition, Moruga Secondary emerged winners of the solar PV installation, and have proceeded into the Idea Incubator where they are conceptualising innovative projects for greening their community. The third and final cohort of the programme was initiated in October 2023 at the Couva West Secondary and Success Laventille Secondary Schools.■

RE-ENERGIZE TNT TRAINING MODULES

- The importance of energy
- Traditional (fossil fuels) and non-traditional fuels
- T&T's carbon footprint
- What is energy conservation and efficiency
- Conducting an energy audit
- The Paris Agreement and T&T's carbon reduction commitment
- Introduction to Renewable Energy
- Climate smart agriculture
- Introduction to solar energy
- Introduction to wind energy
- Introduction to biofuels
- The future of transportation: Electric Vehicles
- Advocacy and community mobilisation
- Presentation skills
- Stakeholder engagement


NGC


CNG


National Energy


CHAMPIONS OF BUSINESS
2023

NGC GROUP QUARTERLY HIGHLIGHT REEL

COMMERCIAL HIGHLIGHTS

In late September, NGC and Shell Trinidad and Tobago Limited (Shell) signed an amended Domestic Gas Sales Contract to incorporate a share of the natural gas volumes from the Shell-operated Manatee field once the project is sanctioned. The amended contract will entitle NGC to purchase gas produced from one of the country's largest offshore fields, to supply to the downstream sector across the medium term.

NGC completed negotiations with several downstream customers operating on the Point Lisas Industrial Estate:

- Gas Sales Contracts executed with Proman for Caribbean Nitrogen Company Limited (CNC) and Nitrogen (2000) Unlimited (N2000). These GSCs will support production at critical ammonia facilities.
- GSC signed with Proman for Methanol Holdings (Trinidad) Limited (MHTL), which will govern supply to critical methanol-producing facilities on the PLIE.
- GSC signed with Point Lisas Nitrogen Limited (PLNL), to facilitate the continued operations of PLNL's world-class anhydrous ammonia production facility.
- GSC executed with Methanex Trinidad Limited (Methanex) for the supply of gas to the Titan methanol plant.
- GSC signed with PCS Nitrogen Trinidad Limited (Nutrien) for the supply of gas to Nutrien's ammonia plants and one urea plant.

LABIDCO signed an MOU with the National Entrepreneurship Development Company Limited (NEDCO) to become a partner institution for NEDCO's Business Accelerator Programme - an incubator offering entrepreneurs an all-inclusive suite of best-practice business support services for their businesses. The partnership is expected to attract and directly provide support for aspiring and existing entrepreneurs with growth potential in LABIDCO's fence line community of La Brea, and to enable innovative and extraordinary sustainable enterprises to develop and grow. Successful participants will also be given the opportunity to access competitively priced and readily available commercial space on LABIDCO's Industrial Estate for small and micro sustainable-type enterprises.

On December 5th, The Ministry of Energy and Energy Industries announced that an agreement for a new unitised commercial structure for Atlantic LNG has been successfully executed. The new arrangement will allow Trinidad and Tobago to extract greater value from the LNG business.

PROJECTS AND OPERATIONS

Phase 1 of the SAP Business Transformation Programme (SAP BTP) was successfully completed, with the launch of new systems in early December. The SAP BTP involved implementation of a best-in-class technology solution from SAP - one of the world's leading producers of software for the management of business processes – across NGC, National Energy, NGC Green (formerly NGC CNG) and LABIDCO. The new systems will enable the companies to achieve greater synergies and efficiencies in work processes.

In November, LABIDCO conducted its annual full-scale International Ship and Port Facility Security (ISPS) emergency drill at the Port of Brighton. The exercise tests the Company's Emergency Response Plan (ERP) and the Port Facility Security Plan (PFSP) to identify gaps and develop solutions to close them. These drills are important to maintain compliance with the ISPS Code by which the Port of Brighton is certified and to ensure continuous security and safety improvements.

NGC CNG (now NGC Green Company Limited) commenced construction of a public CNG station in Tobago.

LEADERSHIP COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT

In the last quarter, The NGC Group participated in and/or sponsored the following events and conferences:

- PLEA Process Safety Management Conference
- Centre for Chemical and Process Safety 2023 Global Conference on Process Safety and Big Data
- Financial Times' Energy Transition Summit
- AMCHAM HSSE Conference 2023
- Caribbean Energies and Investment Summit
- Arthur Lok Jack Graduate School of Business - Women In Leadership Conference
- Human Resource Management Association of Trinidad and Tobago Biennial Conference
- Institute of Chartered Accountants of Trinidad and Tobago International Finance and Accounting Conference
- Caribbean Corporate Governance Institute Conference Year End Event
- Association of Professional Engineers of TT Awards
- Energy Chamber Local Content Forum
- Caribbean Actuarial Association Conference
- Energy Chamber Downstream Operators Forum
- GoBlue Leadership Conference

NGC convened separate special board meetings with Shell and bpTT to discuss the path forward for energy. Joined by The Hon. Stuart Young, Minister of Energy and Energy Industries, the team discussed long-term gas supply, strategies for decarbonisation of the energy and industrial sectors, and mechanisms to help transition the energy value chain to a low-carbon future.

The Caribbean Shipping Association (CSA) Conference and Exhibition came to Trinidad from 23rd – 24th October and as the largest owner of maritime assets in Trinidad and Tobago, National Energy was strategically positioned as the primary sponsor of the Conference.

NGC hosted a delegation of senior executives from PETRONAS of Malaysia, at its Orinoco House head office in Point Lisas, on November 6th, 2023. The delegation visited Trinidad and Tobago to engage in discussions with key energy stakeholders.

SUSTAINABILITY AND GREEN AGENDA

In a demonstration of its unflagging commitment to transparency and alignment with global best practice, NGC published its 6th annual Sustainability Report, covering the period January to December 2022.

NGC launched a new online platform called the Climate Adaptation and Resilience Portal (CARP), which aims to keep citizens abreast of climate-driven changes impacting Trinidad and Tobago. CARP uses Geographic Information Services (GIS), artificial intelligence and predictive modelling to map and chart climate-related risks such as sea level rise, coastal erosion and vulnerability and maritime alerts, inter alia.

NGC and Methanex partnered to sponsor Sustain-U, a sustainability and ESG (environment, social, governance) training platform developed by Caribbean Ideas Academy. Sustain-U — which was officially launched on October 12th 2023 — will introduce subscribers to the fundamentals of sustainability across all its dimensions and connect the dots between the academic concepts and real-life impacts.

National Energy was announced as the winner of the 2023 AMCHAM T&T's Outstanding OSH & Environment Project Award for the second year in a row. The company's Energy Sustainability Debate Competition which teaches students about climate change and energy sustainability earned the prestigious award in the "Environment" category.

NGC signed a Memorandum of Agreement (MOA) with the Institute of Marine Affairs (IMA) to collaborate on a two-year mangrove rehabilitation project in the Couva/ Carli Bay area.

At COP28, the global Oil and Gas Methane Partnership (OGMP) released its signature report on methane emissions, which outlines the commitments made by member companies to reduce their methane output. In this report, NGC – an OGMP member since 2021 – was highlighted as one of 84 companies achieving the "Gold Standard" status for their level of reporting and methane reduction ambitions. This is the second consecutive year that NGC has achieved this recognition.

NGC CNG Company Limited has been rebranded NGC Green Company Limited, with an expanded mandate to be announced soon.

Group members sponsored industry awards to recognise achievement in sustainability and climate action by other businesses:

NGC sponsored two Trinidad and Tobago Chamber of Industry and Commerce (TTCIC) Champions of Business awards – the Green Agenda award, and the Business Hall of Fame induction.

NGC CNG (now NGC Green) sponsored the Trinidad and Tobago Manufacturer's Association (TTMA) Green Manufacturer of the Year award.

TO REFLECT ON THE BEAUTY THAT SURROUNDS US HERE IN TRINIDAD AND TOBAGO

Matura wetland, Trinidad and Tobago

THE NATIONAL GAS COMPANY OF TRINIDAD AND TOBAGO LIMITED

PHOENIX PARK GAS PROCESSORS LIMITED

LA BREA INDUSTRIAL DEVELOPMENT COMPANY LIMITED

Trinidad and Tobago NGL Limited

ngc Green Company Limited

National Energy CORPORATION OF TRINIDAD AND TOBAGO

THE NGC GROUP OF COMPANIES