Ministry for Primary Industries
Manatū Ahu Matua

MPI Insights

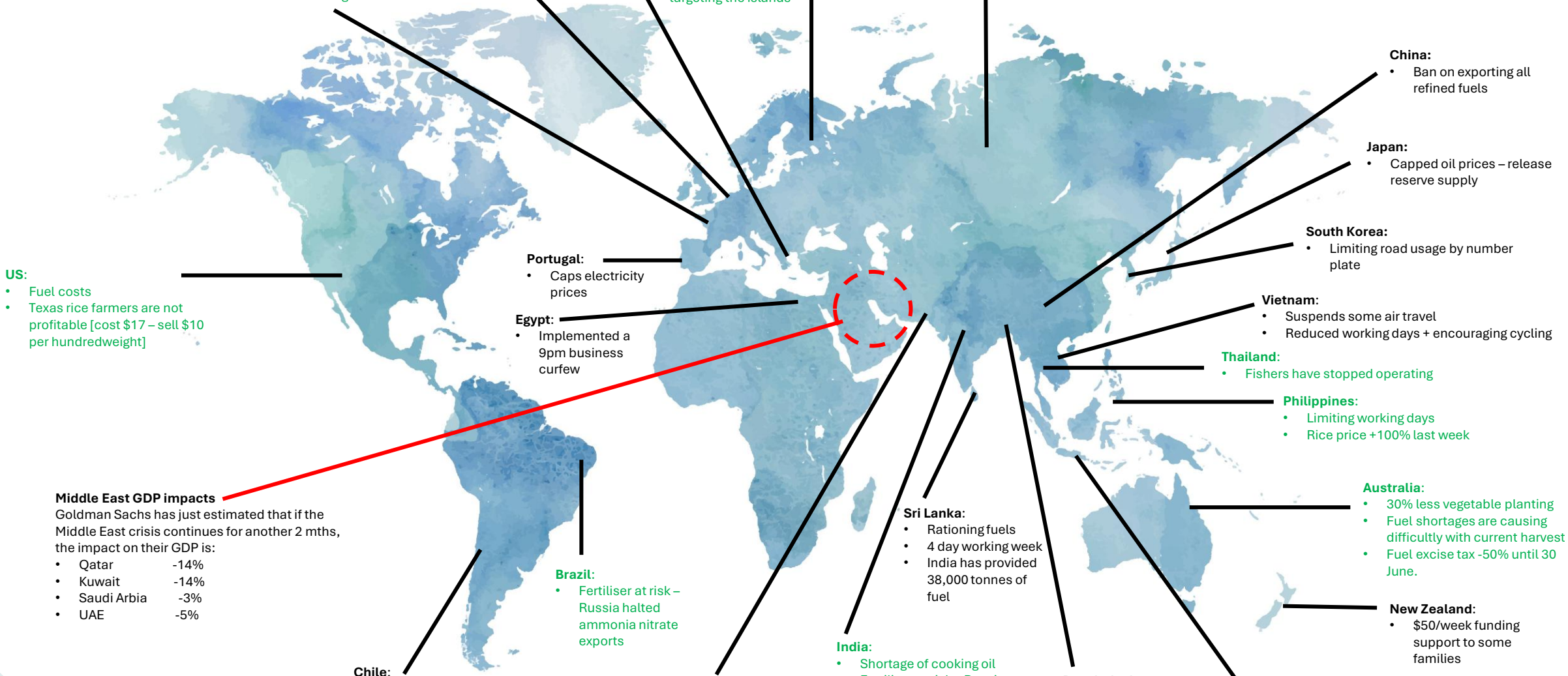
Navigating change within a disruptive global environment

NOT GOVERNMENT POLICY

Examples of global impacts/actions

Food system impacts

General information



Russia:
- Ban on the export of refined fuels [roughly 11% of global supply]
- Halted export of ammonium nitrate
- Naphthalium and naphtha continue to be affected by sanctions and/or war damage to production facilities

Netherlands:
- Fishing fleet has stopped 50% of activities

France:
- 20c/lt fuel support for transport, fishing & agriculture sectors
- Tax relief for agri sector

Greece:
- Subsidies for fuels and fertilisers – targeting the islands

Finland:
- Fishing fleet has stopped some activities

China:
- Ban on exporting all refined fuels

Japan:
- Capped oil prices – release reserve supply

South Korea:
- Limiting road usage by number plate

US:
- Fuel costs
- Texas rice farmers are not profitable [cost $17 – sell $10 per hundredweight]

Portugal:
- Caps electricity prices

Egypt:
- Implemented a 9pm business curfew

Vietnam:
- Suspends some air travel
- Reduced working days + encouraging cycling

Thailand:
- Fishers have stopped operating

Philippines:
- Limiting working days
- Rice price +100% last week

Middle East GDP impacts
Goldman Sachs has just estimated that if the Middle East crisis continues for another 2 mths, the impact on their GDP is:
- Qatar -14%
- Kuwait -14%
- Saudi Arbia -3%
- UAE -5%

Australia:
- 30% less vegetable planting
- Fuel shortages are causing difficultly with current harvest
- Fuel excise tax -50% until 30 June.

Sri Lanka:
- Rationing fuels
- 4 day working week
- India has provided 38,000 tonnes of fuel

New Zealand:
- $50/week funding support to some families

Brazil:
- Fertiliser at risk – Russia halted ammonia nitrate exports

India:
- Shortage of cooking oil
- Fertiliser at risk – Russia halted ammonia nitrate exports

Chile:
- civil unrest due to consumer prices

Pakistan:
- Shuts schools, universities and work from home for 2 weeks

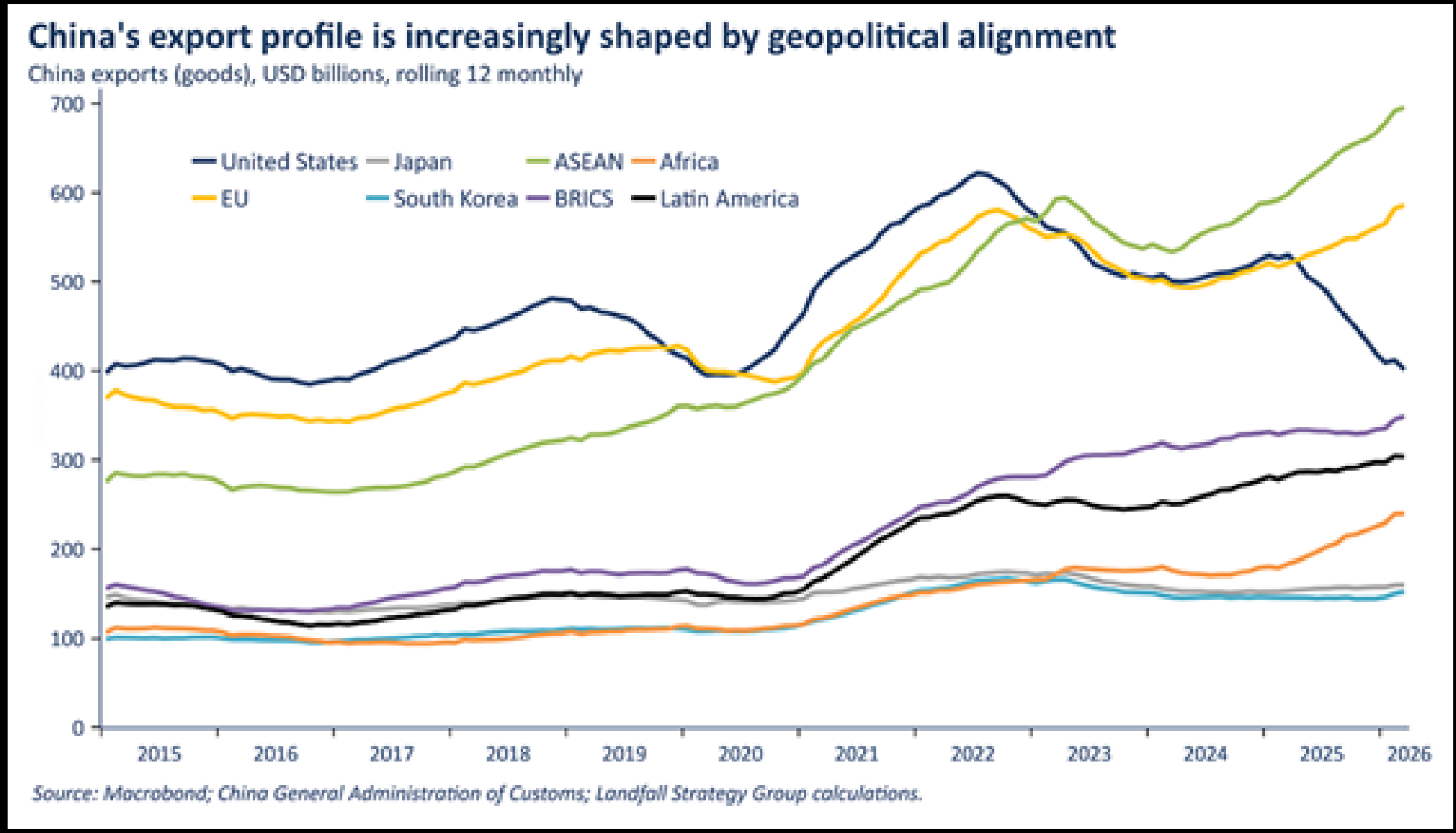
Bangladesh:
- Shuts universities early to save power

Indonesia:
- Issues work from home plan in place

Change we're watching…

US 10 Year Bond Yield

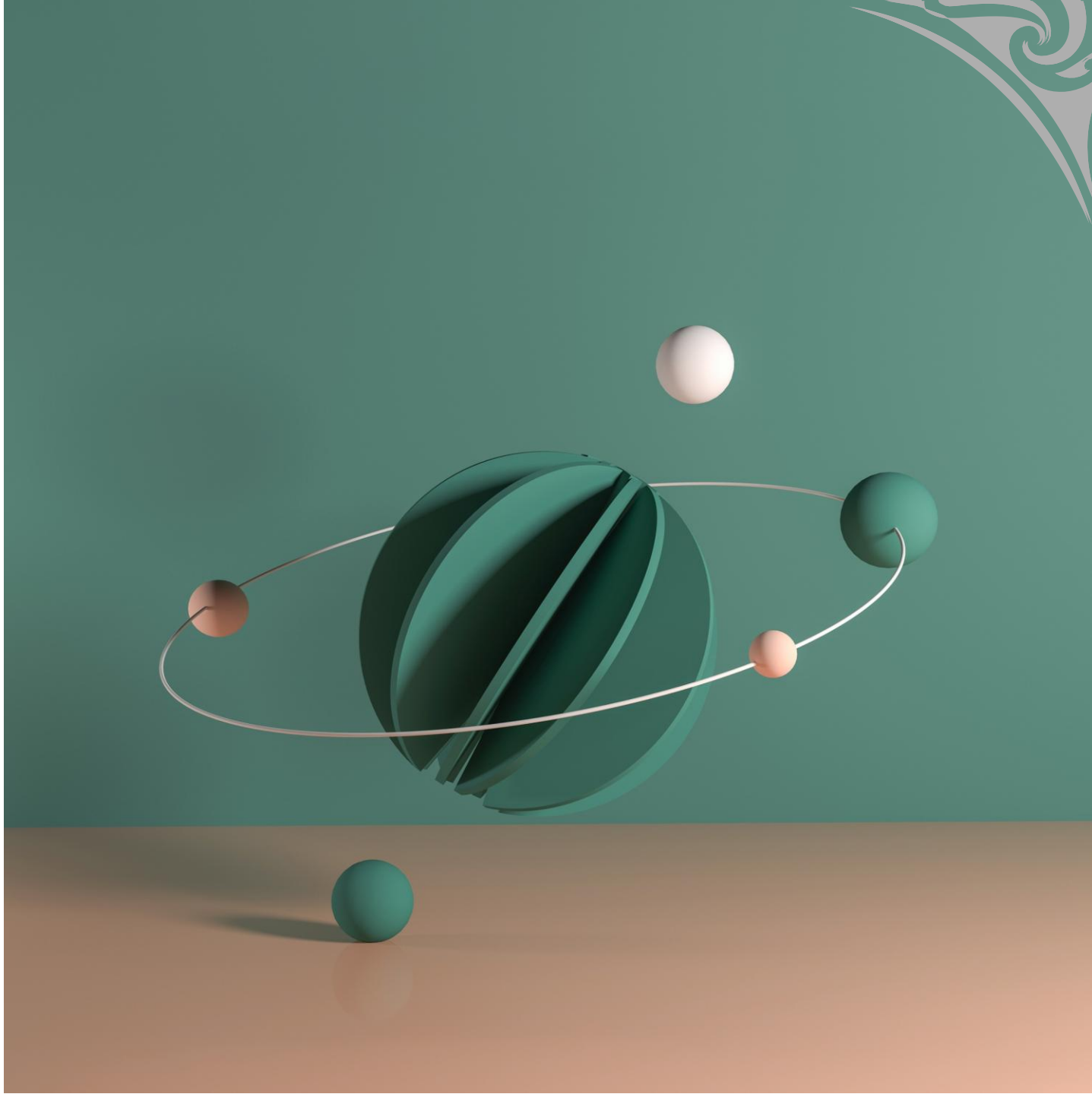
Geopolitics are shaping exports…



Food & tech system connections…

“If you don’t like change, you are going to like irrelevance even less.”

General Eric Shinseki retired Chief of Staff, US Army



Accelerationists view of AI's growing capabilities

- Quantum computers tackle a century-old math puzzle | LANL
- Math, Inc. (Gauss auto-formulisation agent - Prime Number Theorem in Github)
- AI Breakthrough Finally Cracks Century-Old Physics Problem

Capability milestones:

AI is writing 50% of Google's code (progressed from 25% to 50% in two years).

Others: Amazon 25%, Microsoft 25-50%, Robinhood ~ 50%

Recursive self improvement is achieved for coding, allowing LLM models to self improve

Math is solved (can solve 80% of grand challenges) – creating the opportunity for Physics, Engineering, Programming, biology and chemistry (esp materials, compounds, proteins, peptides, genomics, health and longevity to become solvable).

AI capability measurement shifts from testing to outcome focus.

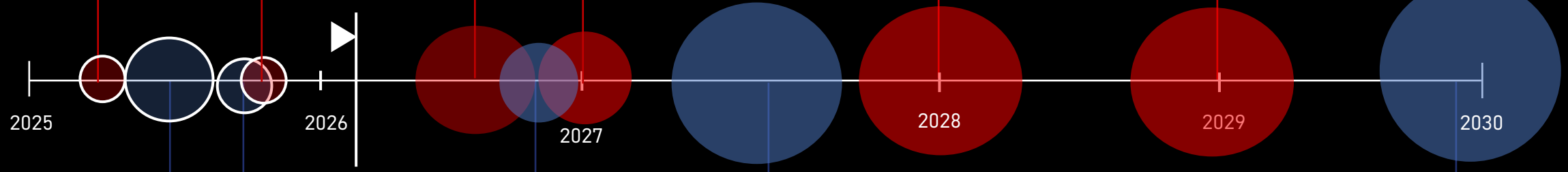
Recursive self improvement loops are likely to be adopted by the end of 2026.

Disabled and aged people pilot brain interface into humanoid robots to provide support and undertake simple tasks.

Igniting the humanist v trans-humanist debate

The flippening happens – capital/equity captures 90% of the value minimising labour's role in the economic system.

Forcing economic and regulatory changes.



Product developments:

Chat GPT 5 is launched regaining the lead from GROK4 heavy

- Perplexity launches Comet – agentic AI that understand user intent to handle tasks autonomously (replaces traditional search capabilities)

- OpenAI release a web browser to compete with Google – will be ChatGPT-style AI to handle agentic tasks – targeting 500m weekly ChatGPT users.

- Humanoid robots go into large scale production (10,000's per month) – first phase is manufacturing and logistics support applications, as they scale further first in house use begins

- Tailored AI teaching goes mainstream (2025 pilot - Nigerian GPT-4 delivered two years learning in 6 weeks - 1200% faster)

Markets, internet commerce and global trade is rebased for agentic AI products, including:

- Financial system (+RWAs)
- Block chain
- Commodity markets
- Global systems – trade & logistics

Debate over realising super general intelligence ignites as Ai and quantum computing capabilities converge

AI powered robots are coming…

Figure – CEO Brett Adcock has a near term goal to manufacture and deploy one million Figure units by 2030, within that:

- 12,000 within 2025
- Commercial partner is BMW (using Figure 02)
- Operates Helix 2 operating system for independent operation

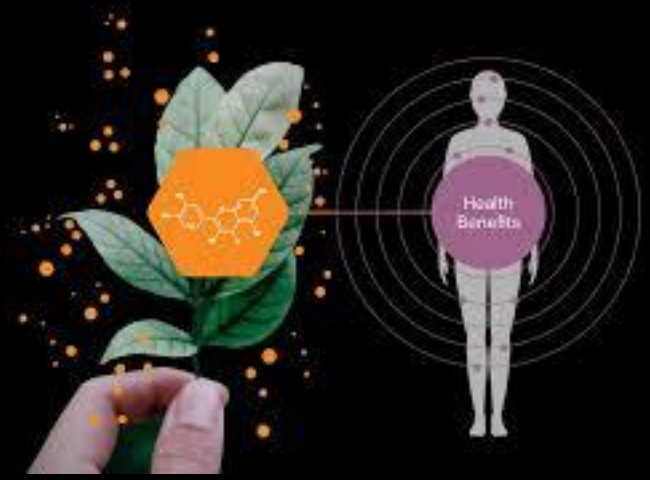
Atlas – is targeting manufacturing and distribution centres due to its 50kg lift capacity:

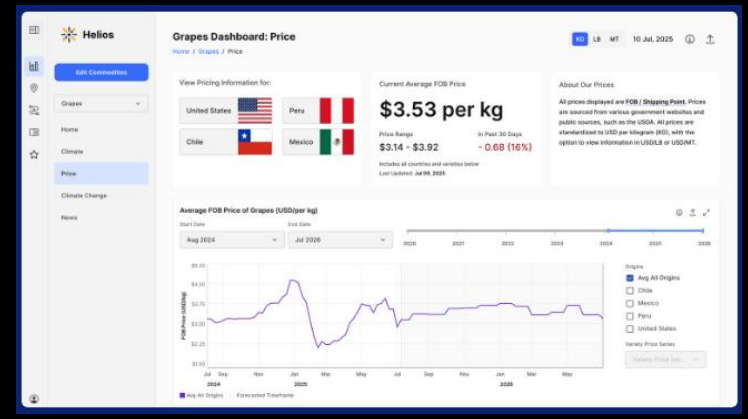
- Targeting annual production of 30,000 annually by 2028
- Piloting with Hyundai and Google Deepmind in 2026
- Targeting a purchase price of US$130k per unit within 4 yrs

Optimus Gen 3 – Tesla is pivoting from cars to robot production, seeking to have one million production capacity by 2030:

- Commercial production to begin in Fremont Factory in 2026 – initially targeting tens of thousands per year
- Addition of Giga Texas would lift production to 10 million per year
- Projected purchase price of US$20-30,000

AI discovery and value chain capabilities are scaling…





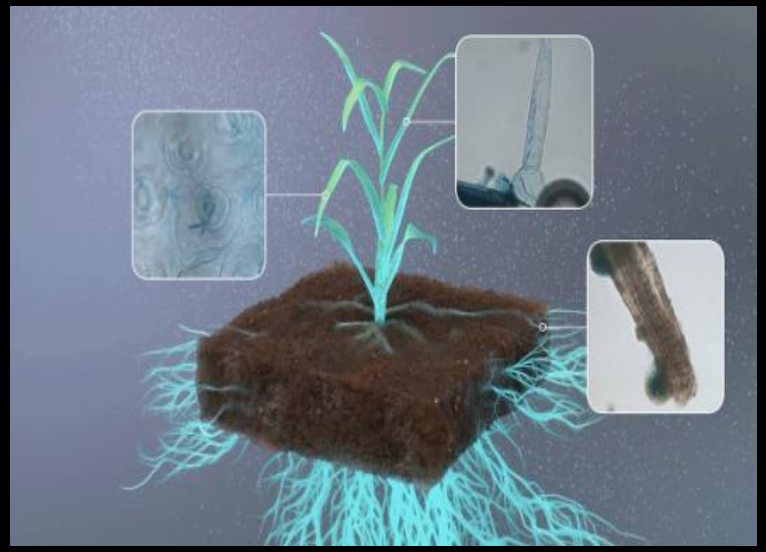
Forager™ – analyses plant genetics, biochemistry and health research to develop human health solutions from plants that possess novel health properties. Science knows 100,000 compounds from plants, which have yielded things like aspirin and metformin – by 2025, Forager™ will have analysed 10 million.

Tastewise – analyses billions of data points from 22 billion social media interactions, 5 million home recipes and 1 million restaurant to find what's trending. Predicts consumer preferences with much greater accuracy than point-of-sale data.

Helios AI – agricultural commodity price forecasts up to 12 months out, explains what is driving the change., provides a breakdown by commodity, region and variety.

On-farm capabilities developing quickly…

Pivot Bio's ProveN – uses microbes to convert atmospheric nitrogen into plant available nutrition – no loss, leaching or volatilization. Study showed 25% less nitrogen used, no yield loss and savings of US12.56 per acre.



Azotic – uses **Gluconacetobacter diazotrophicus (bacteria) that enters the plant to fix nitrogen from air – up to 50% of the plants needs (currently used for corn, rice, potatoes, etc), has been used on approx 2m acres. Also supports phosphorus availability, pest management and crop enhancements.**

Bionema – uses natural soil bacteria to capture up to 50kg/ha of nitrogen from the air – trialling a UK tailored biofilm delivering 40-50% reduction in fertiliser and 20-30% increase in yields.

AI led gene tech – are merging to create new capabilities and make rapid advancements - has now been used to design CRISPR gene-editing proteins OpenCRISPR-1. Multiple AI capabilities – ProFluent's ProGen (California) and Stanford University's EVO AI models are both actively seeking to create more AI designed CRISPR tools

The European Parliament (EP) on a set of rules that establish a legal framework for new genomic techniques (NGTs), expected to go to the EP Plenary in May and then published and commences formal implementation. Rules automatically apply 20 days + 2years after publication.

Water creation is scaling…

Atoco – having just won the Nobel prize from Chemistry, Omar Yaghi is expected to bring his startup's air water capture technology to market in 2026.

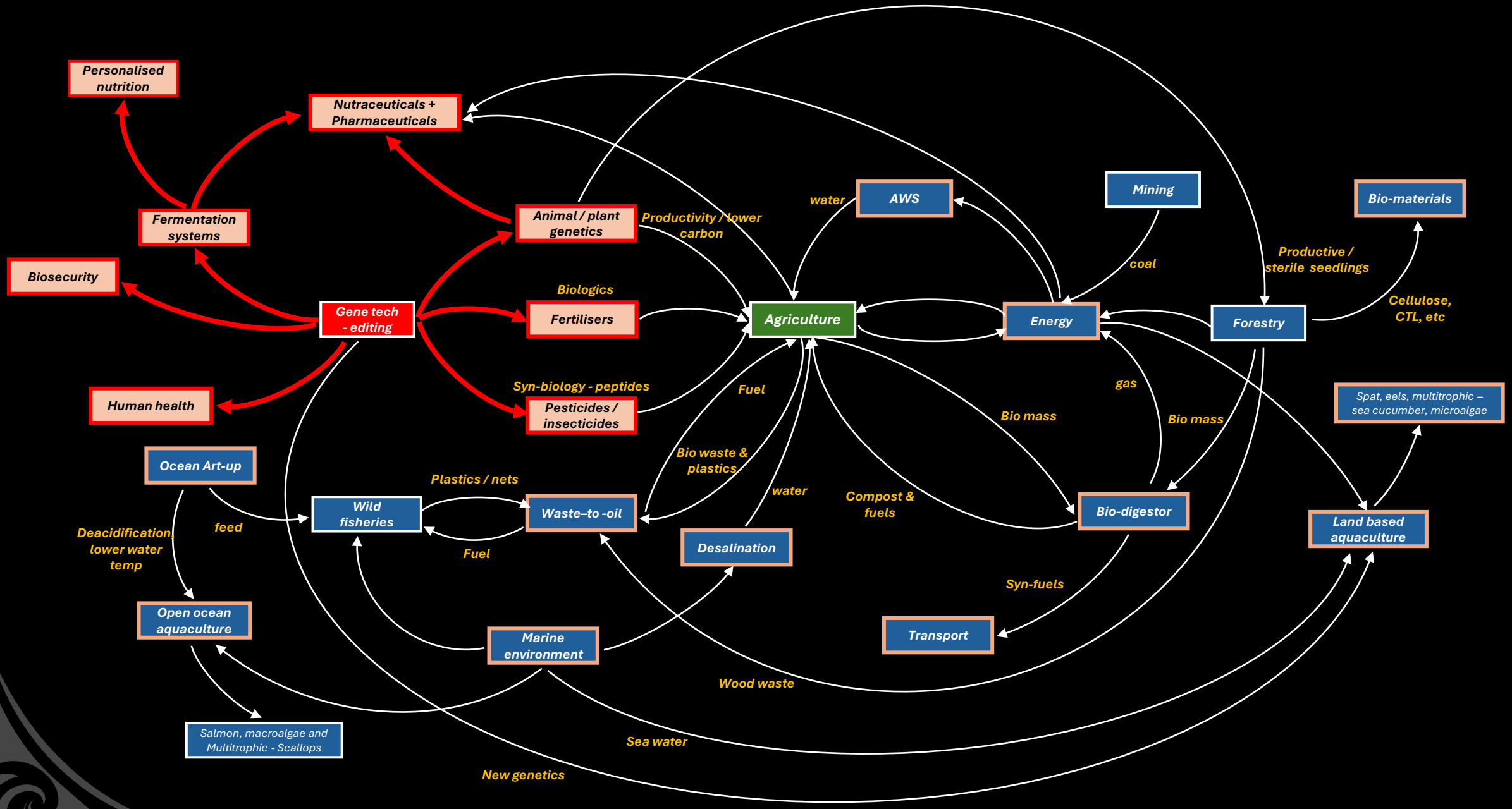
The first model will come in a 20ft container and able to produce 4,000lt of water per day when connected to the grid, or 1,000lt when operating off grid.

Biodegradable biomass based hydrogel – UT Austin is leading the development of hydrogels for drinkable water creation – and now states agriculture is a target use case. Now generate 14.19 litres of water per kg per day. The research team is now working on scaling production and designing real-world device systems for commercialization, including portable water harvesters, self-sustaining irrigation systems, and emergency drinking water devices.

Reference: "Molecularly Functionalized Biomass Hydrogels for Sustainable Atmospheric Water Harvesting" by Weixin Guan, Yaxuan Zhao, Chuxin Lei, Yuyang Wang, Kai Wu and Guihua Yu, 13 February 2025, *Advanced Materials*.
DOI: 10.1002/adma.202420319

Water solutions – environmentally friendly scalable desalination – Oneka Technologies can produce 1,000-50,000 of drinkable water per day per unit. Flocean and Oceanwell – environmentally friendly scalable desalination systems – using the pressure from the ocean to replace energy and lower environmental impacts – able to produce enough water for a city

Food system map – pending gene tech outcome (April 2026)



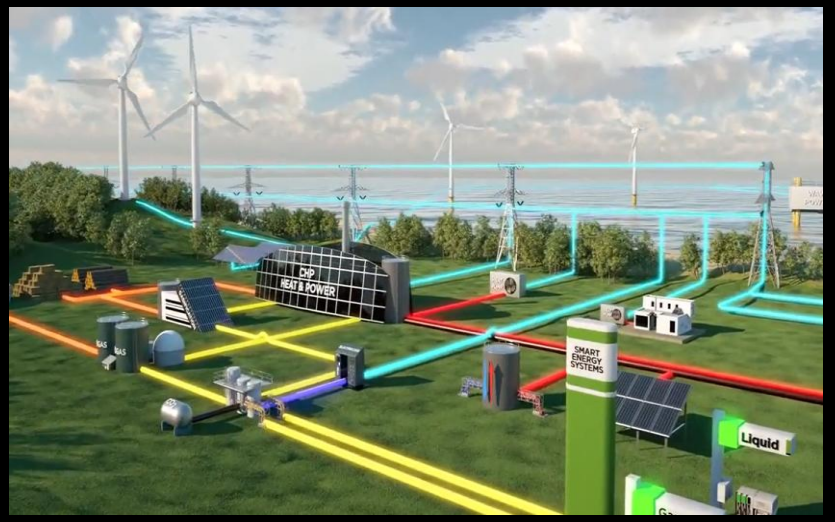
Circular systems are expanding their capabilities…

Cirkular Bio has taken a large step towards a circular food system – fish raised on mycoprotein. Cirkulär Bio leverages genetic and fermentation engineering to develop filamentous fungi (microorganisms characterised by tubular filaments known as hyphae) and a patented method of precision fermentation, Cirkulär Bio converts lignocellulosic side streams from the paper and pulp industries (low-value plant-based residues such as straw, husks, and stalks that contain cellulose, hemicellulose, and lignin) into high-quality mycoprotein containing healthy fibres and nutrients.

The use of biomass to underpin future energy systems

Biomass systems are now widely used, and continuing to scale – from the first biodigester built for a leper colony in India in 1859 to now providing products across economies (e.g. gas, fuels, fertiliser, industrial heat, compounds, CO2, etc). As an example, the Uk provides gas to 2m homes using biodigesters today and has scope to increase that over the next decade.

Whole of country strategic approach



Denmark's Energy independence scheme – Smart Energy Systems: 100% renewable at a national level – Six of Denmark's biggest companies are teaming up to launch one of the world's largest green hydrogen projects, as they look to create emission-free fuels suitable for ships, trucks, aircraft and heavy industry. The first hydrogen facility powered by offshore wind will be in place by 2023 and supply methanol for ships and aircraft.

Smart Energy Systems: 100% Renewable Energy at a National Level (Full Version)

Company level investments

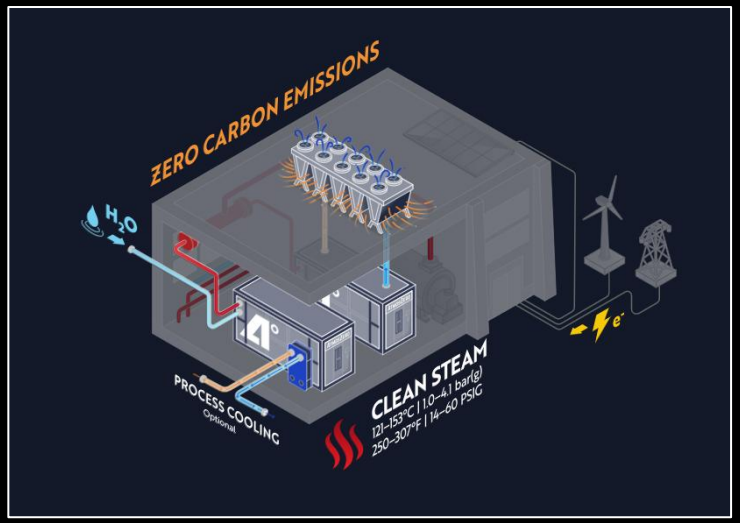
Kalfresh (A$291m investment) – Australian vegetable grower has secured A$80m in climate investment from Wollemi Capital and the Queensland Investment Corporation (QIC) to build Australia's first integrated food and energy precinct, using anaerobic digestion to convert farm waste into renewable natural gas, electricity and sustainable fertiliser.
the Kalfresh Bioenergy Facility will use anaerobic digestion to transform food waste and crop residues into renewable natural gas, with capacity to power up to 31,000 homes or fuel up to 98 million kilometres of truck and bus travel annually.

Queensland farm waste to fuel biogas facility in A$291m Australian first - Bioenergy Insight Magazine | Bioenergy Insight Magazine

Home level capabilities

HomeBiogas – on average, can produce clean gas for up to 3 hours of cooking and 5-10 litres of clean natural liquid fertilizer daily. So, the output is quite definitely a worthwhile amount of fuel to have and to use in the home. But, one advantage should also be to reduce food waste.

A few waste reduction technologies – reuse v remove…



Sierra Energy (FastOx gasification): FastOx gasification uses steam and oxygen to break down waste at the molecular level. Organic materials turn into energy-dense syngas. Inorganics melt into non-leaching stone and metals. Waste turns into particulate and tar-free syngas suitable for conversion into high-value end products. There are no waste by-products created.
FastOx Gasification - Sierra Energy

Synhelion (German): uses solar in summer and uses a unique 300kw resistive electric heater to 1200C steam (has a 1MW ceramic brick energy storage), then uses biogas (animal waste) - once it goes through the catalyst and refined it produces 70% AV gas, 20% diesel and 10% naphtha.
Synhelion's technology: proven, scalable, and cost-competitive | Synhelion

Licella (plastic neutral): technology is being implemented globally to address plastics within economies.

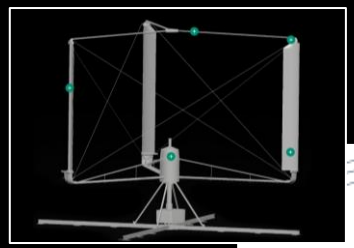
AtmosZero: high temperature heat pump capable of 150C (targeting 200C) with a at a ratio of 1:2, and for every 1MW of heat you get 200-300kw of free cooling.

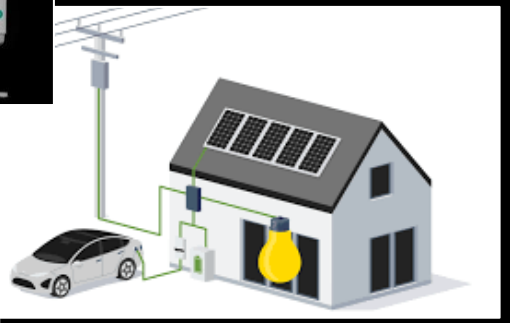
Already being rolled out to a brewer in the US, but can be used in food processing pharmaceuticals, speciality chemicals, FMCG goods or heating campuses buildings hospitals and science providers.

"By combining the cheapest renewable carbon and energy sources with the most efficient process, we can produce renewable synthetic fuels at scale for under EUR 0.8 per litre."

Philipp Furler, Co-CEO and Co-Founder of Synhelion

Energy technologies scaling…





Gevi – Eol-IA is the first vertical-axis micro wind turbine that continuously learns from the wind.

LONGi – the world's most efficient solar panel, capable of generating over 700W of power with a 25.9% efficiency in a more compact surface area.

Bidirectional charging & batteries – the electric car can be your home's personal power plant, quietly supplying electricity for days, plus dramatically cut your monthly electricity bills by automatically using your car's stored energy when grid electricity is most expensive, and participating in utility programs that actually pay you for helping balance the grid.

Eavor: first project in Germany, project Geretsried. Drill depth of 4.5km producing 8.2MW of energy and 64 MW of thermal output for centralised heating (total cost 350 million euros).

Quaise: project Obsidian targeting 250MW using super deep drilling capability (up to 40km deep) to reach 500 degree celsius rock (looking to raise US$200m).

Others to watch: Fervo Energy and Zanskar Geothermal

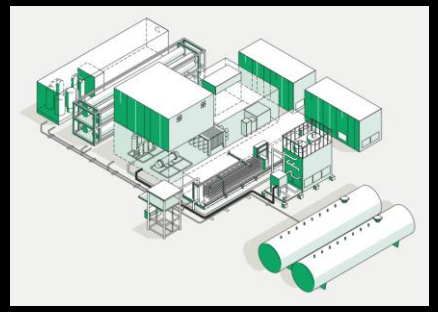
Corpower – wave power system out of the EU as now starting to be deployed, plans are to integrate into existing ocean wind systems as it provides up 40% implementation savings.

Abundance of possible solutions – what's your strategic context…

Sources of scaled ammonia

Topsoe ModuLite™: for facilities requiring capacities up to 600 MTPD, a Topsoe ModuLite Green Ammonia plant is supplied as prefabricated, truckable modules. The benefits of a ModuLite plant include rapid deployment, a plug-and-play architecture, and less work on site – all of which gets production and revenue flowing sooner. ModuLite Green Ammonia plant is available in 300 and 600 MTPD versions.

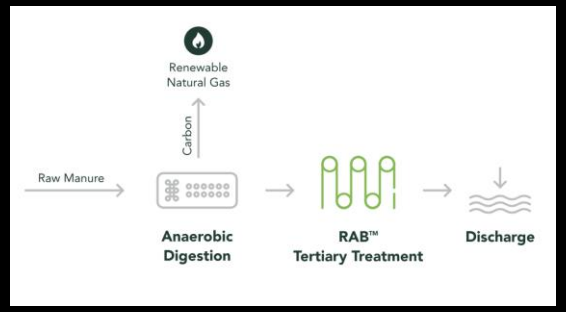
Localised production



TalasAg: produces green ammonia at or near the point of use from power, water, and air, stabilizing the cost of the essential raw material and guaranteeing supply certainty for local agriculture communities, mining sites, and maritime shipping ($20m plant = 5.1m tonnes/yr).

Landus programme: 75,000 sq foot green ammonia fertilizer production from air, sun and water (in Boone Iowa). Attracts a $3.00/kg tax subsidy but works out to be 30% cheaper and be 20-30% lower carbon intensity (aiming to have 300 plants in next 2 yrs).

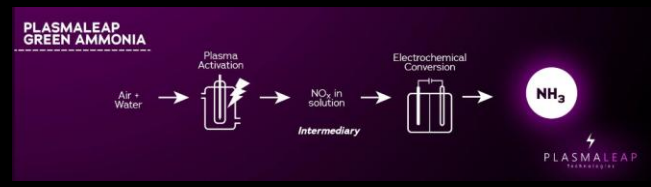
Circular systems - waste



Gross-Wen Technologies: patented technology that recovers nutrients from wastewater with algae and then recycles the nutrient-rich algae into slow-releasing algal-based fertilizer.

The RAB™ technology uses vertically oriented conveyor belts that grow algae on their surface. As the algae grow, it consumes nitrogen and phosphorus from the wastewater while it uses sunlight and carbon dioxide from the atmosphere to rapidly grow algae biomass.

Recently announced



PlasmaLeap: developed technology and reaction pathways capable of synthesising zero-emissions Ammonia and Hydrocarbon eFuels. Our Ammonia reactors consume only Air and Water and are highly compatible with Variable Renewable Electricity.

"is forecast to be commercially competitive with traditional Ammonia & Ammonia derivative production"

Satellite tech targeting global issues…

InSAR (Interferometric Synthetic Aperture Radar): a satellite-based remote sensing technique that analyses phase differences between multiple radar images to map Earth's surface deformation. It measures mm-to-cm scale movements, providing detailed, all-weather monitoring of landslides, earthquakes, volcanic activity, and land subsidence.

Sentinel-1 is the first of the Copernicus Programme satellite constellations for Earth observation operated by the European Space Agency. Data collected via the satellites are used e.g. for marine and land monitoring, emergency response to environmental disasters, and economic applications.

Saving lives by predicting catastrophic landslides

Potentially deadly landslides and mine or tunnel collapses can be predicted weeks in advance thanks to a new tool developed at the University of Melbourne.

In June 2017, a landslide displaced an astonishing 4.5 million cubic metres of rock and engulfed Xinmo village in China's mountainous Sichuan Province. Forty homes were destroyed and 140 people were initially feared buried. At least 83 died.

In a paper published in Nature Scientific Reports, University of Melbourne researchers demonstrate how the Xinmo landslide – and events like it – can be predicted with unparalleled accuracy well in advance.

Ground truth: When the Earth moves, AI can spot it

24 March 2026

Share Save Add as preferred on Google

Chris Baraniuk

Open Access News | Research & Innovation

NISAR satellite has launched successfully, leading a new era for Earth observations

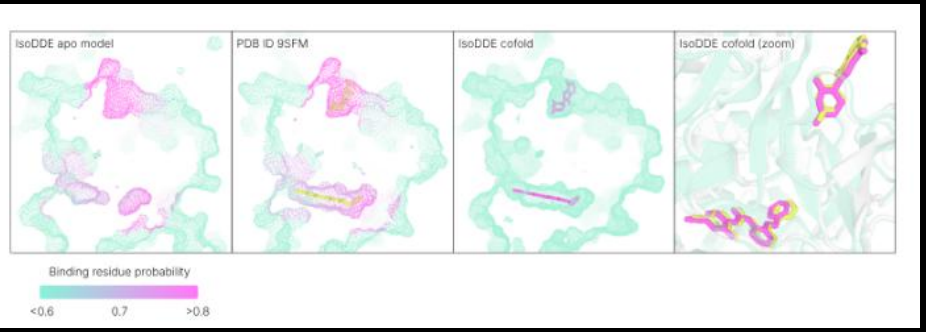
August 1, 2025

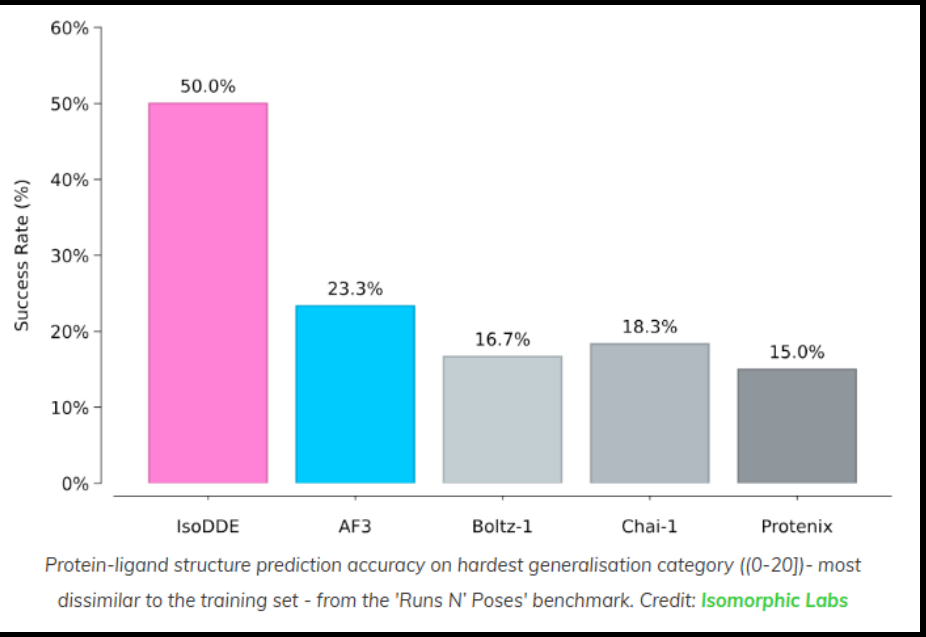
Ministry for Primary Industries
Manatū Ahu Matua

MPI Insights

NOT GOVERNMENT POLICY

Biotech systems are expanding their capabilities…





Protein-ligand structure prediction accuracy on hardest generalisation category ((0-20])- most dissimilar to the training set - from the 'Runs N' Poses' benchmark. Credit: Isomorphic Labs

AlphaFold 3, built by Isomorphic Labs together with Google DeepMind, advanced the field by predicting 3D structures of proteins, including DNA, RNA and small molecules, giving scientists a clearer view of how biological components fit together, but its strength was mainly structural.

Isomorphic Labs Drug Design Engine (IsoDDE), positioning it as a unified, multi-model system that extends beyond AlphaFold 3 into drug-design tasks including generalisation-heavy protein–ligand structure prediction, antibody–antigen modelling, binding affinity prediction, and ligand-blind pocket detection.

According to an Isomorphic Labs spokesperson, where AlphaFold focuses on the question of what a protein looks like, IsoDDE moves toward answering how to design a drug that can bind to it and whether that drug is likely to have a therapeutic effect. IsoDDE also focuses on antibodies, which have large, flexible, loop-shaped binding surfaces. One of the hardest regions for any model to predict is a CDR-H3 loop, which plays a central role in how an antibody recognizes its target and varies a lot in length and sequence, making its 3D shape and how it sits on the antigen especially difficult to model accurately.

Example:
Varroa mite – the mites are parasites that feed on honeybees and larvae, and cost NZ $39m per year (2020 estimate).

Norra – "an effective and long lasting new mode of action for varroa mite"

AI led gene tech – are merging to create new capabilities and make rapid advancements - has now been used to design CRISPR gene-editing proteins OpenCRISPR-1.

Multiple AI capabilities – ProFluent's ProGen (California) and Stanford University's EVO AI models are both actively seeking to create more AI designed CRISPR tools.


from the sky with this
thing.

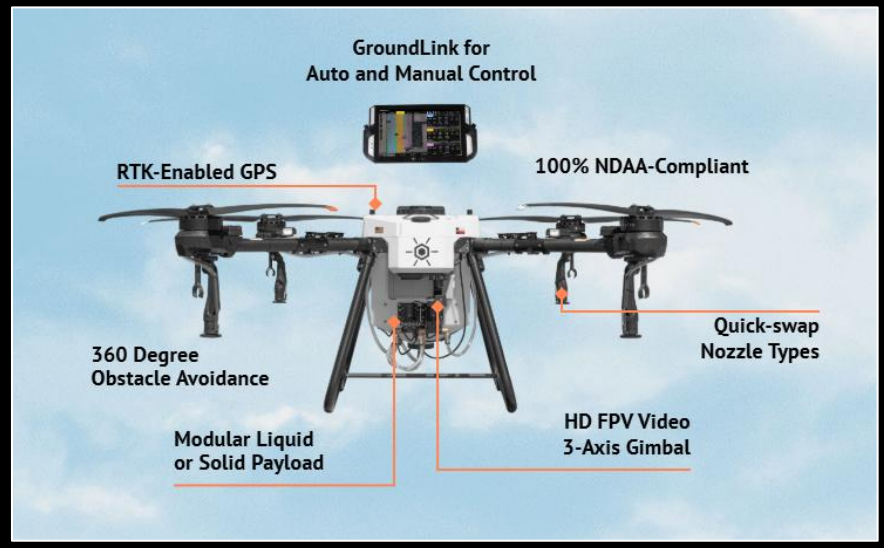
Other tech capabilities accelerating base level capabilities…

AgriLLM: large language models purpose-built for agricultural reasoning - can compress the translation chain from years to days. A validated research finding can become machine-interpretable operational logic embedded directly in farm workflows, applied across thousands of individual paddock contexts, within weeks of publication.

When you combine that with digital twins that simulate whole seasons before a seed touches soil, and agentic AI systems that coordinate irrigation, spray, harvest and market decisions autonomously, you are no longer looking at a technology upgrade. You are looking at the emergence of something new: an operating system for the farm.

Amos Power (bought by FarmX): electric autonomous tractor technology – the acquisition advances FarmX's strategy to deliver a vertically integrated, data-driven agriculture system that combines artificial intelligence, machine learning, autonomy, and electric farm equipment.

Autoagri new on-farm tools: AI powered systems with inter-changeable tools will allow scale and lower costs.



Hylio: AgroSol is easy to pick up and optimized for agricultural work flow. Anyone can easily map, plan, and execute crop treatments using AgroSol.

Global disruptions are testing how the world moves goods and people…

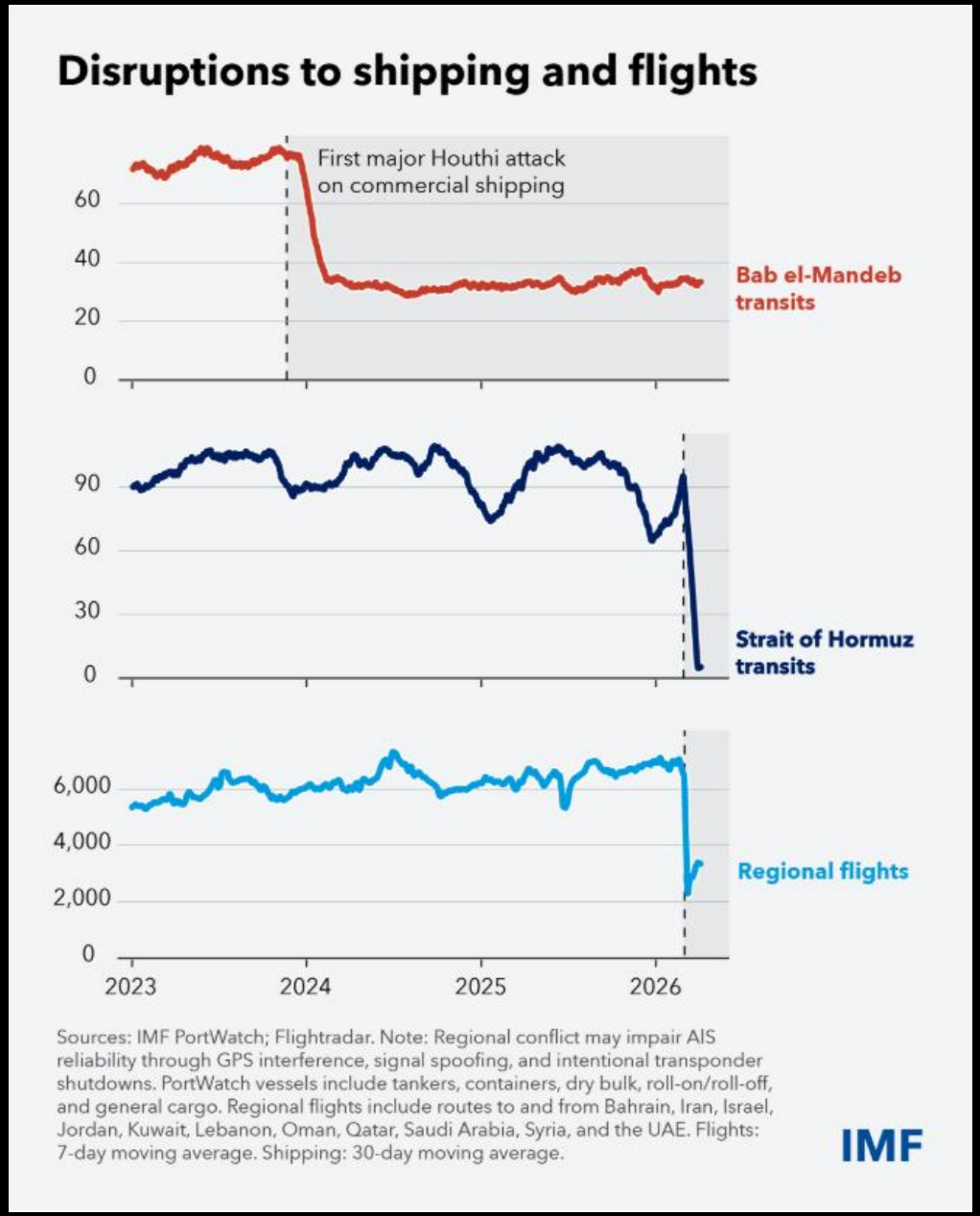
IMF Blog (April 29,2026): Quotes to note –

"The war in the Middle East has severely disrupted maritime and air traffic, damaging infrastructure and interrupting transport corridors that are critical for global energy and goods. Even in the best case, there will be no neat and clean return to the way things were."

"In the Red Sea, attacks on shipping that began in 2023 forced many vessels to reroute around Africa rather than use the Suez Canal. More than two years on, transits through the Bab el-Mandeb strait between Yemen and Djibouti remain stuck at roughly half their pre-attack level."

"The future of Strait of Hormuz transits and regional air traffic remains unknown. However, it's already clear that growth will be slower, even if an enduring peace is reached… Consumers feel this through higher prices on food and essentials, with lower-income households bearing the largest share."

"If Hormuz transits and regional flights recover slowly like the Bab el-Mandeb path, the drag on growth will persist long after the fighting stops. Policies that strengthen the resilience of transport networks are now central to sustaining growth and protecting livelihoods."



Populations are shaping our food opportunities

Our global population is peaking this century – transitions are hard but change creates new opportunities