



Innovate  
UK

# The Impact of the CLIMATES Programme

Building REE-silience  
for the Future



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# Foreword

Chris McDonald MP

Minister for Industry



Throughout the 19th Century and most of the 20th Century, the UK confidently built a competitive advantage from its critical minerals industry. We shaped the global economy in the process. Now, we have the chance to do so again.

**We know that global demand for critical minerals is set to quadruple by 2030.** I want British businesses to take full advantage of this increasing demand. Through our Critical Minerals Strategy, Vision 2035, this government is giving them the tools to do it.

It shows how we intend to meet the growing need for critical minerals by creating the right environment for investment and commercialisation. It also sets out our ambition to harness our critical minerals strengths so that we spur growth in the key sectors of the UK's Industrial Strategy.

**One of those strengths is magnets.**

The UK now has all the building blocks of a mines to magnet supply chain. That is a significant shift from where we were only three years ago.

**Much of this success is owed to Innovate UK's CLIMATES programme.**

It has supplied innovation-boosting funding to magnet manufacturers while building the UK's resilience in the supply of rare earth elements. With £15 million of funding, CLIMATES has leveraged over £250 million of indicative co-investment. It has also supported a strategic cohort of companies focused on growth.

**One of those businesses is Ionic Technologies.**

With support from the CLIMATES programme, it has developed pioneering rare earth recycling technology, culminating in the world's first electric vehicle motor built from 100% recycled rare earths.

Meanwhile, **CLIMATES support has helped HyProMag to restore UK rare earth magnet manufacturing for the first time in 25 years.** The company has developed a world-leading magnet recycling and manufacturing facility at the University of Birmingham.

**We now have a real opportunity to build on these gains.** By recovering, recycling, and reusing materials at scale, we can strengthen the UK's industrial resilience.

To that end, the Critical Minerals Strategy sets clear and important targets, including meeting 10% of annual demand through domestic production by 2035, and 20% of UK demand through recycling by the same year.

The Government's focus now is on crowding in the investment and support needed to make these goals a reality. We want to marshal our capabilities and resources, both public and private, to ensure the UK's long-term future minerals security. Thanks to the CLIMATES programme and Innovation UK, we are building on strong foundations. The successes highlighted in this brochure show it. We will continue to lead in critical minerals over the coming years and decades, securing the UK's competitive advantage and shaping the world, just as we have done in our past.

# Executive summary

Martyn Cherrington

Programme Lead, Innovate UK



Critical minerals underpin almost everything we do, including communicating, travelling, working and relaxing.

This brochure celebrates the impact, achievements and benefits of the CircuLar critical MATerials Supply chains, (CLIMATES) Programme, delivered by Innovate UK with the [Department for Business and Trade](#).

The CLIMATES programme, a strategic three year initiative, supported the delivery of the 2023 UK's Critical Minerals Strategy Refresh. This strategy set out to deliver resilience in a changing global environment to safeguard British industries.

CLIMATES focused on strengthening UK industrial resilience and minerals security for **rare earth elements** (REEs), which are vital metals for the UK economy. Rare earth permanent magnets (REPMs) are fundamental components of the

technologies that power our everyday lives, enable renewable energy, decarbonise industry and deliver net zero goals. Without REPMs there are no **offshore-wind turbines, electric vehicles** on our roads, or **smart-phones** allowing us to communicate.

By bringing together businesses, academia, and government to innovate collaboratively, CLIMATES has successfully seeded **innovation-driven growth** in REPM supply chain capabilities and boosted the circular economy for REEs.

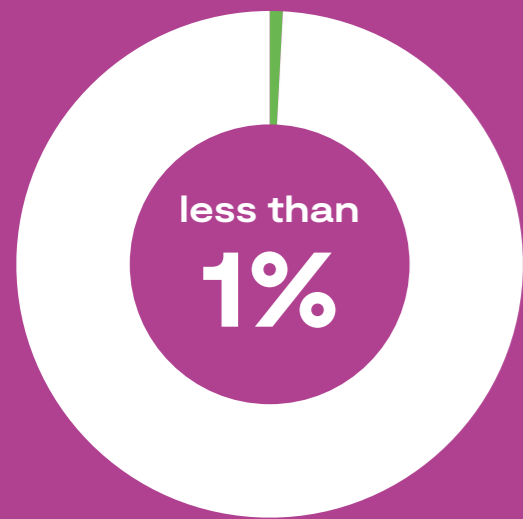
CLIMATES has addressed a major opportunity to innovate by expanding the use of recycling and other circular approaches to capitalise on the “urban mine” of REE containing end-of-life products and “re-mine” REEs, and other metals, from industrial waste. By creating a more sustainable and profitable market the programme will facilitate **innovation-driven minerals security** of REEs for the UK from secondary material feedstocks.

The UK's 2025 **Critical Minerals Strategy** identified the REE supply chain as a significant opportunity for UK businesses, with domestic demand for REEs projected to rise to 37.9 ktonnes by 2035. The impacts of the CLIMATES programme will support a UK source of REEs to ensure this forecasted demand can be met.

**CLIMATES** enabled the UK to **reshore sintered rare earth permanent magnet manufacturing** for the first time in 25 years, delivered the building blocks of an **end-to-end value chain** for rare earth permanent magnets from recovered and recycled feedstocks and nurtured a **nascent UK re-mining sector** for critical metals.

All of this combines to deliver **REE-silience for the future**.

**Martyn Cherrington**  
Programme Lead, Innovate UK



of the magnets we use in our phones, laptops and electric cars are recycled



We're creating a circular economy to change this

>£250m

indicative co-investment

£18.1m


Total R&I project costs


52

funded projects

36

R&I projects

 Promote innovation-driven growth of a secure and resilient rare earth supply chain

 Foster investment to scale industrial capability

 Build UK and international innovation partnerships

 Develop a skilled and diverse workforce

 Enhance sustainability, standards and best practices

To create a more resilient and sustainable UK through the opportunity of building a stronger supply chain for high-performance magnets, position the UK as a world leader in rare earth elements recycling, and help meet net zero targets.



# The CLIMATES Programme

The energy transition is intensifying electrification across energy, transport, and industry. This is directly affecting an increase in demand for rare earth permanent magnets (REPMs), making a secure supply of rare earth elements (REEs) essential.

The CLIMATES programme vision was to establish a **more resilient, more sustainable** UK by **strengthening the supply chains** for **REPMs** and position the UK as a **world leader in REE recycling**.

## CLIMATES helped deliver the UK government's goal of net zero by 2050

The CLIMATES mission was to explore, develop and integrate the supply chain opportunities. By building, coordinating and enabling a community across businesses, investors, researchers and government to improve security of supply and create resilience through four routes:

1. Sourcing and processing REEs
2. Manufacturing magnets in the UK
3. Recycling magnets as part of a circular economy
4. Enabling research into the next generation of magnetic materials



To deliver the mission and to seed innovation-driven growth CLIMATES aimed to:

- Establish a diverse **portfolio of innovative projects** across the whole supply chain
- Enable the development of **UK value chain capability**
- Address the **skills gap** for critical materials to facilitate growth
- Develop **international collaborations** for bilateral innovation projects with allied nations
- Raise **awareness** of the importance of REEs and REPMs
- Build a community to deliver industrial, and policy focused **standards**
- Unlock **private investment** to enable business growth
- Deliver a **resilient supply chain** underpinned by the “Global Britain” vision.



# The origins

## A Prosperous Future

The UK is committed to creating a green and prosperous future, leading global efforts to reverse climate change and achieve net zero emissions by 2050. Historically, the UK's reliance on imported critical minerals has left supply chains vulnerable to disruption and geopolitical

risk. The CLIMATES programme is an innovation-driven response to that risk.

For over a century, the UK has imported minerals and materials from remote regions through complex global networks to meet industrial needs. Today, as

21st-century technologies advance, demand for these minerals continues to soar. Rare earth elements (REEs) underpin technologies vital to achieving Net Zero, including electric vehicles, wind turbines, and advanced electronics.

## Supply Chain Gap

The UK does not have a viable domestic primary supply of REEs from mining and is reliant on imports.

UK strengths lie in the midstream processing of REEs and bonded magnet production. However, metal processing is energy-intensive, and the UK's high energy costs reduce industrial competitiveness on a global stage.

Domestic industrial capability to manufacture sintered rare earth permanent magnets (REPMs) was lost in the early 2000s. This significant gap in UK supply chain capability poses a risk to UK firms. All sintered REPMs are imported from Asia, Europe or the USA, with the majority coming from China.

REEs are embedded in end-of-life products, they are not being effectively recovered, and materials are lost rather than recycled and reused.

## Driving the Electric Revolution

CLIMATES evolved from UK Research and Innovation (UKRI) Driving the Electric Revolution (DER) Challenge Programme, delivered by Innovate UK, which was a £452 million initiative to create and grow UK supply chain capabilities for power electronics, machines and drives (PEMD), the fundamental system of technologies that underpin electrification.

Electric vehicle traction motors, offshore-wind turbine generators, robotic actuators, drone flight propulsion and advanced electronics all typically require REPMs, either neodymium iron boron or samarium cobalt, as fundamental components.

DER commissioned a report in 2021, produced by Innovate UK Business Connect, on the "UK supply chain opportunity in materials for permanent magnets". The report highlighted a strategic opportunity for the UK to build capabilities in REE processing, become a global leader in magnet recycling and

strengthen innovation in future magnet materials. This identified potential to:

- Develop new chemical treatment & separation technologies
- Support early-stage innovations in REE recycling
- Build and strengthen cross-sector communities
- Explore market shaping mechanisms for OEMs
- Coordinate UK research infrastructure for the next generation of magnet materials

This led to the conceptualisation of the CLIMATES programme.

In February 2023, the £15 million CLIMATES programme was launched, as part of the UK's Critical Minerals Strategy Refresh. This initiative by Innovate UK worked closely with the Department for Business and Trade to support the delivery of the strategy.





# Programme pillars

The CLIMATES programme was structured into 5 pillars, those 5 pillars sat on a foundation of businesses, investors, researchers and government

that the CLIMATES programme convened into a coordinated community to foster collaborations and enable innovation-driven growth across the REE value chain.

China plays a central role in the global supply chain for REEs, accounting for around 60% of global mining output and approximately 90% of global separation and refining capacity. It also produces an estimated 90–95% of REPMs. UK industries are highly dependent on China for a source of REEs and REPMs. While this concentration reflects China’s longstanding investment and capability in

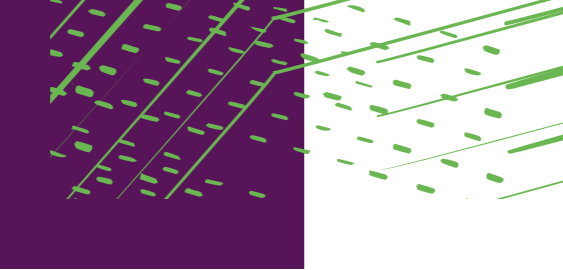
the sector, reliance on a single dominant supplier can create strategic vulnerabilities for the UK and adds fragility to global critical mineral markets.

Adopting circular-economy approaches by prioritising end-of-life disassembly and recycling to recover valuable secondary materials will enable the UK to increase security of supply, de-risk the criticality

of REEs, and deliver more sustainable, lower-carbon products. Extracting materials from existing products is far quicker than developing new mines that typically take 10 to 20 years to reach production. Today, only around 1% of rare-earth magnets are recycled, highlighting the major untapped opportunity to improve supply security and sustainability.




# Innovation



 **£18.1m**  
total project value

 **£12.4m**  
grant funding

 **52** unique organisations funded

 **36** projects awarded

 **5** innovation landscape reports

 **5** iX Challenges

 **2** R&D Competitions

CLIMATES carried out targeted activities to identify future innovation opportunities for the REE value chain & invested £12.4 million of grant funding into business-led research and development activities. This seeded innovation-driven growth of world leading UK capabilities for a circular REPM value chain, enabling innovation-driven minerals security for REEs.

## Activity highlights

- Delivered 2 **collaborative R&D funding competitions** that sought early-stage feasibility studies and mid and late-stage projects to invest in to accelerate commercialisation of processes and technologies.
- Facilitated 5 **Innovation Exchange (iX) challenges** that supported businesses to seek innovative solutions to defined problem statements and de-risking the 'proof of concept'.

- Undertook a **landscape analysis** of the innovation opportunities for REEs, delivered through stakeholder interviews across industry and academia.

## Impact & Outcomes

- Enabled the UK to **reshore sintered rare earth permanent magnet manufacturing** for the first time in 25 years
- Delivered the building blocks of an **end-to-end value** chain for rare earth permanent magnets from recovered and recycled feedstocks
- Nurtured a **nascent UK re-mining sector** for critical metals
- Identified **priority areas for future research and innovation** for REEs and broader strategic critical minerals
- Positioned Innovate UK and Innovate UK Business Connect as **thought-leaders across government and industry**
- Grown a **cohort of over 200 people** across 52 organisations
- Facilitated more than **250 introductions** that resulted in more than **40 collaborations**.

## CLIMATES focused on 5 thematic innovation areas:



### Extraction

Exploring novel and sustainable mining and up-stream processes for primary beneficiation and production of mixed rare earth elements (REE) concentrates.



### Processing

Resource-efficient mid-stream processes for rare earth separations and more sustainable routes to rare earth alloys.



### Magnet Manufacturing

Looking for new and more sustainable manufacturing routes for rare earth permanent magnets (REPMs), and routes towards increased specification of high-performance magnets.



### Circular Economy

Identifying effective routes for recycling through the economic collection and sorting of end-of-life products containing REPMs and investigating sustainable routes for recovering REEs from industrial waste.



### Alternatives

Exploring alternative materials for high-performance magnets and opportunities to substitute different materials in high-performance magnets to reduce reliance on REEs.

## Case study spotlight

# ionic technologies

### Building a circular supply chain for rare earth elements

Ionic Technologies is a UK-based company focused on the recycling and recovery of rare earth elements. Ionic Technologies pioneering approach is a chemical, rather than just mechanical, process that can take any grade of end-of-life magnets and recover and efficiently separate the rare earth oxides (REOs). The advantage of this innovative approach is that the recovered rare earth oxide is of equal or higher purity than the primary equivalent. This means recycled material can be used to manufacture any grade of new magnet; creating a resilient, circular supply chain for critical rare earth materials.

The CLIMATES Programme came at a pivotal moment for Ionic Technologies. They participated in four major CLIMATES

projects – advanced R&D with Ford and Less Common Metals (LCM) and a second project with LCM exploring a novel feedstock; a feasibility study with the British Geological Survey; and a proof-of-concept project with the University of Swansea and the Materials Processing Institute.

### Unlocking commercial scale

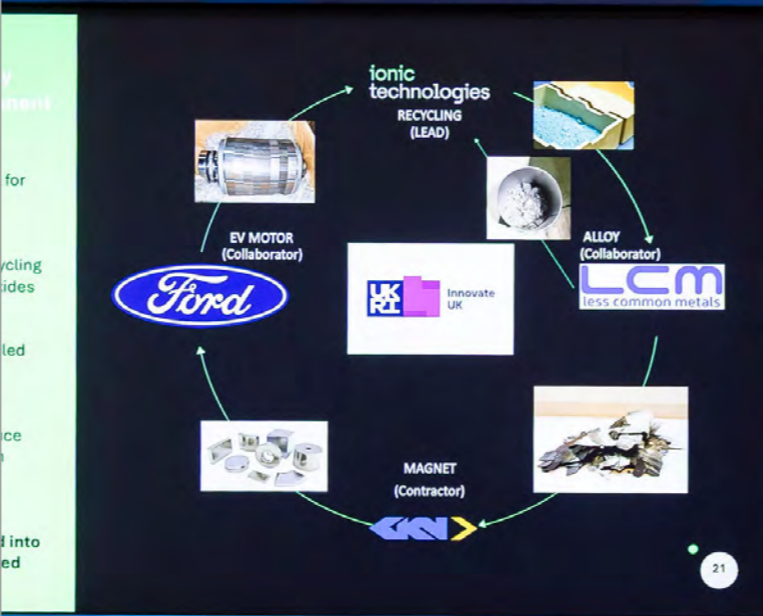
CLIMATES funding underpins Ionic Technologies' commercial plant, a ground-breaking magnet recycling facility that will produce 400 metric tonnes of high purity (99.5%+) separated REOs a year, using Ionic Technologies' patented long-loop recycling technology. The £85 million plant is planned to be operational by 2027, giving the UK its first commercial-scale capability to produce magnet-grade rare earth oxides.

### The power of a circular supply chain

The demonstrator project between Ionic Technologies with Ford and Less Common Metals produced the world's first electric vehicle motor using 100% recycled rare earths. Thomas Kelly explained:

**“The project with Ford and Less Common Materials is significant in terms of demonstrating what a domestic, circular supply chain could deliver.**

**Producing magnets that are appropriate for use E-motors from 100% recycled Rare Earths represents a huge breakthrough globally.”**



Headline Sponsor

HENRY ROYCE INSTITUTE

Supported by



Engineering and Sciences Council



## An Innovate UK programme that made a real difference

“The CLIMATES team has been phenomenal. It went far beyond funding. They worked hard to understand our needs and the technology. Their support directly moved us toward commercialisation.”

**Thomas Kelly**

Director of Operations,  
Ionic Technologies.



Find out more about this project

## Case study spotlight



First of a kind offshore wind turbine recycling to recover rare earth magnets

EMR is a major global materials recycling company focused on sustainable, circular-economy solutions. Through the CLIMATES programme, EMR's Re-Rewind project delivered the UK's first offshore wind turbine disassembly to recover rare earth permanent magnets (REPMs), strengthening circular economy ambitions, energy security, and the UK's Critical Minerals Strategy.

While most end-of-life wind turbine components have established recycling routes, magnets are a challenge. EMR's Wind Turbine Processing Centre enables whole-turbine circular pathways, supporting innovative materials recovery, and positions offshore wind turbines as a major future

opportunity for urban mining through the collaborative Re-Rewind project.

### From idea to innovation

CLIMATES funding was instrumental in moving the Re-Rewind project from concept to reality. As Jack Lemm, Innovation Project Manager at EMR explains: "Recovering materials that contain rare earth elements is incredibly labour intensive. On paper, the business case does not always stack up. Innovate UK gave us the push to try something and get the understanding and foundations to move forward".

The scale and duration of the CLIMATES funding also gave EMR the confidence to invest in people, recruit specialist staff and build key partnerships with innovative companies in the sector.

### Learning for future impact

The Re-Rewind project has demonstrated the feasibility of safely and efficiently extracting REPMs from end-of-life turbines, and EMR can now offer a commercial solution for magnet recovery. Technical learnings from Re-Rewind are also informing other projects, which is helping expand EMR's expertise in recycling challenging materials.

**" This was not just about one project – it is about building the knowledge, confidence and skills that allow EMR to tackle increasingly complex materials and components in the future."**

**Eve Andrews**  
Head of Renewables, EMR.

## Innovate UK's support has been pivotal

**"Without the funding and structure from Innovate UK, this project may have remained just an idea. Instead, it is a tangible, scalable solution that strengthens the UK supply chain and inspires the sector."**

**Mike Hogan**  
Business Developer, EMR.

### Looking to the future

Re-Rewind has laid the foundations for further innovations. EMR continues to refine turbine disassembly processes, including also exploring blade recycling. The facility is now a fully-fledged offering, creating green jobs and playing a key role in positioning Scotland as a leader in circular renewables.

Find out more  
about this project



# CLIMATES Innovation Exchange (iX)

Innovate UK's iX programme accelerates knowledge transfer by matching industry challenges with trailblazing solution providers. CLIMATES applied iX in a strategic way to help cohort members identify cross-sector innovations to enhance their capabilities.

Successful solution providers benefited from a £25,000 grant to carry out proof-of-concept projects to test and demonstrate whether their proposed solution could be successful.

**CLIMATES iX delivered challenges on behalf of 5 innovative UK SME challenge holders:**

**ionic technologies**

**emr METAL RECYCLING**

**HYPROMAG Magnet Recycling**

**HIRST**

**MKANGO**



## Outcomes of CLIMATES iX

- 10 Innovative solutions identified to address commercial challenges
- B2B and B2R partnerships formed
- Commercial relationships developed
- UK REE capabilities enhanced
- Expanded the UK REE community

Find out more about iX



## Case study spotlight



### Advancing rare earth magnet recycling through collaboration

HyProMag has restored UK rare earth magnet manufacturing for the first time in 25 years, validating new short, medium and long loop recycling routes that deliver high performance magnets while strengthening domestic capability and reducing supply chain vulnerability.

Innovate UK and CLIMATES support enabled HyProMag to move from early-stage innovation to scaled-up UK manufacturing, including the development of a new, world-leading magnet recycling and manufacturing facility at the University of Birmingham. This milestone significantly

strengthens the UK's rare earth recycling and manufacturing capability.

Crucially, it marks the UK's first domestic production of sintered REPMs since the millennium, enabled using end-of-life magnet-containing components as feedstock. Together, these achievements mean the UK now has every critical element required for a complete rare earth permanent magnet value chain.

### Innovation Exchange – flexibility and partnership

Alongside larger CLIMATES funded projects, the Innovate UK Innovation Exchange (iX) played a crucial role in allowing HyProMag to explore coating technologies for recycled magnets. The

flexible, fast-moving nature of iX allowed the company to test multiple approaches with different suppliers.

**“The flexibility of Innovate UK’s iX is one of its biggest strengths... It allowed us to explore different suppliers and approaches quickly, and test ideas that would not have been possible otherwise. One iX connection has already developed into a likely long-term partnership – the impact of iX has only been positive.”**

**Rob Arnold**  
Senior Metallurgist, HyProMag.

**“Without Innovate UK funding, we simply would not be where we are... It gives manufacturers the focus and freedom to invest in innovation – and that’s what turns long-term ambition into something real.”**

**Nick Mann**  
Managing Director, HyProMag.

### Looking to the future

Following successive support through Driving the Electric Revolution and CLIMATES, HyProMag is now focused on combining short-, medium- and long-loop recycling routes to deliver high performance magnets while minimising carbon intensity and cost.

Find out more  
about this project



# Innovation Landscape Reports

CLIMATES published five reports and an executive summary that explored innovation opportunities for the REE value chain, documenting:

- Current UK technologies for processing and recycling REEs.
- UK organisations that are driving technological developments.
- Benchmarking global and UK technologies.
- Identify areas where the UK could innovate to gain a competitive advantage.



Download the reports here



Rare Earth Exploration, Extraction, Beneficiation and Concentration



### Focus

To examine UK capabilities and innovation opportunities in mining and early-stage processing of REEs, including AI-driven exploration and ESG improvements.

### Findings

Limited domestic geology for rare earth elements places greater emphasis on innovation, international collaboration, and targeted capability development to support global projects, advance sustainable technologies, and secure a resilient future REE supply chain.



Rare Earth Processing



### Focus

Reviews technologies for separating and refining REEs from primary and secondary sources, highlighting solvent extraction and emerging green alternatives.

### Findings

The UK will lead globally in sustainable rare earth element processing by deploying cleaner, more efficient technologies and leveraging digital process control and existing chemical manufacturing expertise to reduce environmental impact and strengthen REE supply chain performance.



Rare Earth Permanent Magnet Manufacturing



### Focus

An assessment of UK strengths and gaps in magnet production, focusing on automation, reconfigurable supply chains, and reducing heavy REE use.

### Findings

Designing REE products for end-of-life disassembly is vital for strengthening the UK REPM sector. Continued support for innovation and skills development, establishing industry-led collaboration groups, and creating a central UK knowledge hub will help stakeholders better understand supply-chain environmental impacts, conduct effective research, and drive forward new green technologies.



Rare Earth Permanent Magnet Alternatives



### Focus

A deep exploration of strategies to reduce or replace REEs in magnets through new materials, design optimisations, and reformulation

### Findings

Increasing funding for innovation, skills, and commercialisation, and establishing industry-led collaboration and research centres, will support the UK in effectively developing alternatives to rare-earth permanent magnets. More industry regulation, improved understanding of environmental impacts, and the development of agile magnet prototyping facilities are also key to advancing the alternative sector.



Rare Earth Circular Economy



### Focus

Investigates recycling and reuse pathways for magnets, design-for-disassembly principles, and barriers to implementing a circular supply chain in the UK.

### Findings

Interest in the REE circular economy from end-of-life products is growing as supply chain risks and Net Zero goals loom on the horizon. Despite barriers, progress in recycling magnets is being made, and investment and research support are uncovering innovative opportunities across the supply chain.

# Investment

 **2** Investment Readiness Programmes

 **2** Investment Showcases

 **1** Under-represented Founders Clinic

 **1** Barriers to Investment Report

 **1** UK Critical Minerals Investment Prospectus

 **1** Investors Forum

 **4** Investors Partnership Projects

## Unlocking Private investment to grow the emerging sector

CLIMATES primary objective was to seed innovation-driven growth of supply chain capabilities for REPMs. To build on this foundation, private investment is required to complement public funding to ensure and accelerate the scaleup of these new, or enhanced, capabilities.

The CLIMATES programme unlocked private investment to grow the emerging sector through targeted activities that included:

- Building a community of engaged investors focused on critical materials and related technologies.
- Creating investment opportunities through training early-stage founders to pitch for investment through an Investor Readiness Programme (IRP).
- Targeted networking events to support companies with investment strategy and making investor connections.

## Investment: Impact and Outcomes

CLIMATES has:

- Published a [Private Investment Report](#), highlighting key challenges to private investment.
- Mobilised a **community of 78 investors**.
- Enabling UK firms to pitch for investment that resulting in **£12 million raised** across **four investor partnership** projects.
- Published the [UK Critical Minerals Investment Prospectus](#) in partnership with DBT and the Critical Minerals Association.

- Leveraging the Investor Partnerships funding model, to invest in equity-matched, grant-funded R&I projects.

Read the full CLIMATES Private Investment Report



## Why Investment in Rare Earth Elements Matters



### Supports the UK Net-Zero Transition

Batteries, semiconductors, and magnets are symbiotic to electrification. All require critical minerals such as cobalt, lithium, and rare earth elements, which are essential for technologies like electric vehicles, wind turbines, and batteries. These materials will drive the Net Zero transition, making investment crucial to secure resilient, domestic supply chains.



### Boosts UK Economic Growth & Global Competitiveness

Building processing and manufacturing capabilities within the UK critical mineral industry will attract private capital, creating an abundant and secure future. Continued investment will create a virtuous circle of innovation and job creation, positioning the UK as a forerunner in the green economy.



### Reduces Supply Chain Risks

By developing local capabilities in the UK reliance on external sources, especially dominant suppliers like China, will decrease. Greater investment in innovation will strengthen a job-rich, resilient, and nationally secure supply chain.



### Stimulates Innovation Across the Value Chain

From extraction to recycling, investment enables breakthroughs across the entire critical mineral lifecycle, fostering a circular minerals economy that is both economically and environmentally sustainable.

**“Collaboration rather than competition is crucial to accelerate private investment”**

**Martyn Cherrington**

Programme Lead CLIMATES, Innovate UK



**Scaling rare earth recovery from complex industrial process and waste streams**

Much of the UK's hazardous waste, which contains vital critical metals for the UK economy, is shipped overseas for treatment and processing. Seloxium is a UK company who has developed a solution enabling the recovery of platinum group metals, gold and rare earth elements to be sourced directly from this hazardous waste. Seloxium's patented technology, known as Selectal™, enables the selective recovery of critical metals, including rare earth elements from dilute industrial streams - especially wastewater and mine tailings.

**From lab to pilot scale**

Following a CLIMATES funded £364k precursor feasibility study, Seloxium secured a £2 million Innovate UK Investor Partnership project and a £900k grant, funded by CLIMATES, to accelerate the development of a containerised, modular pilot scale system.

The pilot project focuses on building a transportable engineering system that uses selective flocculation to extract rare earth elements directly from complex industrial streams. By enabling treatment at customer sites, Seloxium's system reduces emissions, costs and environmental risk associated with global waste transport.

**New Market Opportunity**

By proving that Selectal™ can be applied to rare earth elements, an area characterised by conservative and highly monopolised supply chains, Seloxium has unlocked a major new domestic opportunity. Innovate UK's support has significantly de-risked this expansion and aligned the company's work with the UK's industrial strategy.

Once operational, the system will allow Seloxium to process alternative feedstocks such as ionic clays, volcanic tuffs and mine waste, opening new UK based routes into critical materials supply chains.

**Looking to the future**

With the pilot system nearing completion, Seloxium's next phase is deployment at customer sites, demonstrating performance under real world conditions and paving the way for commercial rollout. With continued Innovate UK support, Seloxium is positioned to reshape how the UK recovers and secures critical rare earth materials.

**“Innovate UK has supported us through our entire journey. This project has helped us take something proven in the lab and scale it into a real system. We have demonstrated that the technology works at lab & pilot scale and now we are proving it for a mobile system. Having a modular containerised solution that can treat waste at source without being shipped is a gamechanger and will allow for the profitable extraction of critical metals at source. The CLIMATES investment allowed us to make that leap.”**

**Christian Peters**  
CEO & Co-founder, Seloxium.

**Find out more about this project**





# International



**1** Global Expert Mission



**3** Global Business Innovation Programme missions



**2** G7 conferences as UK delegation members



**1** International Roundtable hosted



The supply of critical minerals is a global challenge. This is especially true for rare earth elements (REEs), where 60% of the world's mining and 90% of the global separation and refining capacity occurs in China, making REEs geopolitically vulnerable.

CLIMATES sought to reduce this geopolitical risk by creating opportunities for innovation-driven minerals security through building international relationships to exchange knowledge and innovation. Working internationally ensures the UK remains aligned with world-renowned

standards and policies and positions it for exciting investment and market opportunities. Through global collaboration and networking, CLIMATES championed the UK as leaders in innovation in circular REEs.

CLIMATES delivered strategically targeted international activities through a variety of mechanisms, including:

- Global Discovery Visits to rapidly explore opportunities for future strategic opportunities with international partners.
- Global Expert Missions (GEM) to visit priority countries and sectors, gather deep market and innovation insights, and identify strategic opportunities for collaboration, partnerships and future programmes with international partners.
- Global Business Innovation Partnerships (GBIP) to create opportunities for UK businesses to build partnerships and collaboration with key economies.
- Aligned bilateral innovation funding competitions.
- Providing intelligence and insights to UK Government.



“Innovate UK’s role as both advisor and funder means it can test policy ideas in practice, helping us better understand the impacts of innovation, regulation, and incentives. This enhances the UK’s credibility when engaging international partners. For example, Innovate UK joined the UK delegation to the Conference on Critical Minerals and Materials in Chicago, helping ensure the UK’s perspectives were heard across all technical sessions.”

**Joel Watson**

Head of Geopolitical Strategy, International Critical Minerals Team, Foreign, Commonwealth and Development Office.

“The UK is unlikely to have a viable primary mineral source of rare earth elements. Therefore, international relationships and collaborations are key to developing resilient and secure supply chains.”

**Martyn Cherrington**

CLIMATES Programme Lead, Innovate UK.

## Impacts and outcomes

The CLIMATES programme has:

- Developed relationships with international partners including Canada, USA and Australia leading to collaboration opportunities for 28 UK businesses.
- Explored bilateral innovation opportunities with South Africa, Kazakhstan and Brazil.

**“The Global Business Innovation Programme has helped to initiate meaningful partnerships and accelerate international collaboration.”**

**Toby French**  
Process Engineer, Altilium.

## International Activities

- Bilateral funding competition with Canada (2023-2024)
- Bilateral funding competition with India (2023-2024)
- International stakeholder roundtable meeting (in collaboration with the Critical Minerals International Alliance) at the Rare Earth Permanent Magnet conference at the University of Birmingham (2023)
- GEMs to US & Canada (2022) and Australia (2023)
- GBIPs to Canada (2023 and 2025) and Australia (2026)
- Virtual discovery visits to South Africa (2025), Kazakhstan (2026) and Brazil (2026)
- Members of the UK delegation at the Conference for Critical Minerals and Materials (Ottawa 2024, Chicago 2025)
- Invited experts at the UK/US roundtable on critical minerals at the British Embassy Washington DC (2025)

**“The Global Business Innovation Programme has been a fantastic opportunity to discover the Canadian market and create strong relationships with Canadian partners.”**

**Alix Leroy**  
CEO, Auyan.

**“The Global Business Innovation Programme has opened our eyes to the sales opportunity offered by the Canadian market.”**

**David Cadwell,**  
Project Manager, Gravity Mining.



## Case study spotlight



### Pioneering sustainable rare earth element recycling

Nanomox is a UK based company focused on sustainable production of advanced materials and recovery of critical minerals from waste. The CLIMATES programme has supported them to develop scalable, circular approaches to rare earth element recovery. Funding enabled projects from proof-of-concept to a pilot with Mkango Rare Earths UK, testing Nanomox's Oxidative Ionothermal Synthesis (OIS<sup>®</sup>) technology beyond the laboratory for the first time, strengthening UK capability and reducing reliance on global supply chains.

### De-risking innovation

Innovate UK funding has been critical in helping Nanomox move from the laboratory scale to full system-level validation.

**“Innovate UK funding allowed us to scale OIS<sup>®</sup> beyond the lab, validating performance, process scalability, and environmental impact – critical for industrial adoption and downstream investment decisions,”**

**Frank Roche**  
Head of R&D at Nanomox.

### Going global

Building on its CLIMATES funding, Nanomox has also participated in several CLIMATES initiated international activities through the Innovate UK Global Business Innovation Programme (GBIP), which supports SMEs to collaborate internationally and explore global markets to accelerate business growth. Nanomox identified several potential scale-up partners in Canada to support the commercialisation of its technology.

“The GBIPs were really helpful,” says Frank. “Finding global partners is particularly critical. We are dealing with waste streams and transporting them internationally is incredibly difficult – it could undermine the sustainability of our process.”

Nanomox also identified a series of waste stream producers where the technology can be applied. “We successfully secured a UK-Canada CR&D grant (MAGSIN) from Innovate UK,” explains Frank. “This validated our technology for magnesium recovery from waste and opened up a further new commercial opportunity for our technology. It was also instrumental in identifying potential sources of funding in Canada for future scale up activities.”

### Looking to the future

Nanomox is now preparing to move beyond feasibility to larger-scale demonstrations and pilot integration. After project completion, Nanomox raised £2.4 million from investors in the UK, US, Canada, and Europe to build a UK commercial pilot and R&D facility, scaling materials production while advancing its platform for recovering rare earth elements and metals.

Find out more  
about this project



**“The support from Innovate UK has been pivotal... It allowed us to validate our technology, build confidence with investors and partners, and demonstrate a viable route to sustainable, circular REE supply chains in the UK.”**

**Francisco Malaret**  
CEO and founder, Nanomox.



## Skills



2 STEM partnership to grow outreach



1 Skills roadmap developed



Canolfan Darganfod Gwyddoniaeth  
Science Discovery Centre



Cultivating a strong and diverse talent pool is crucial to establishing and growing robust critical minerals and materials supply chains in the UK. There is a requirement for highly specialised skills and knowledge across a wide range of disciplines including geology, chemistry, materials science, metallurgy, chemical engineering, and many more.

By investing in talent and fostering diversity, CLIMATES strengthens the UK's domestic capability, drives innovation, and enhances supply chain resilience, reducing reliance on imported expertise and supporting both economic growth and strategic technological leadership in this vital sector.

### Mine to Magnet STEM Workshop

The CLIMATES programme partnered with Xplore! Science Discovery Centre and Less Common Metals to support the development, growth, and outreach for their co-developed Mine to Magnet workshop for pupils in years 5 and 6. As the first of its kind, this National Curriculum workshop was designed to help children understand the materials behind clean technology.

Drawing on the fields of geography, chemistry, and geology, the Mine to Magnet workshops provide a fun, engaging and effective approach to nurture future

STEM talent, whilst teaching the next generation about sustainability. The workshops interactively guide students through six interactive stages: identifying rare-earth sources, extraction, oxide crushing, alloy forging, magnet formation, and application in EV motors. Support from CLIMATES has enabled the Mine to Magnet initiative to expand 6-fold and be delivered to over 1,500 students across 13 counties in the UK.

### Skills Roadmap

The CLIMATES programme and the Critical Minerals Association (CMA) have undertaken a skills roadmap for critical minerals and materials. This builds on previous skills initiatives, delivered by the Critical Minerals Association (CMA), the Institute of Materials, Minerals and Mining and the Royal Society of Chemistry.



Find out more about The  
Critical Minerals Association  
(UK)





# Standards



**3** BSI-led projects funded



**1** UK Critical Materials Standards Hub



**1** Landscape Report



**1** Circular Economy Landscape



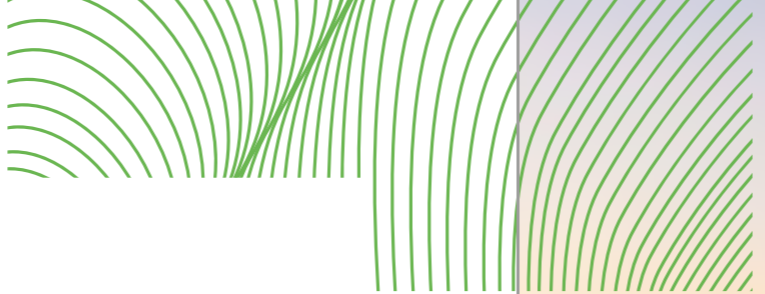
**1** Critical Materials Standards Database

Standardisation is essential for growing domestic circular REEs capability. It provides a common framework that ensures quality, safety, reliability, and interoperability across the entire supply chain from extraction to end-use applications. Standards offer the language, rules, and assurance needed to use these materials carefully, efficiently, and sustainably across industries, markets, and different countries.

The CLIMATES programme worked closely with the British Standards Institute (BSI), delivering three phases of work that:

- Delivered a comprehensive review of the standards landscape.
- Identified REE specific circular supply chain challenges and opportunities.
- Defined priority areas for standards to support the growth of circular supply chains for REEs.

- Created an online standards hub to be a focal point for UK companies, with c.180 members.
- Produced an online data visualisation tool of the UK's circular economy landscape for REE standards.
- Convened stakeholders across industry, government and standards technical committees.
- Developed a roadmap for standards development focused on supporting the delivery of the UKs critical minerals strategy and the G7 critical minerals action plan.



## Case study spotlight



**Communities**  
Critical Materials Standards Hub

**Accelerating best practice to help shape the UK's future critical material circular economy.**

The **Critical Materials Standards Hub** exists to facilitate a coherent understanding of current best practices, standards, challenges, and opportunities across the UK critical materials ecosystem. It aims to lay a foundation for future formal standardisation of the supply chain.

Find out more about The Critical Materials Standards Hub



# Impacts and outcomes

With £15m and three years, the CLIMATES programme has:



Leveraged indicative co-investment of **>£250m**



Delivered the building blocks of an end-to-end value chain for rare earth permanent magnets from recovered and recycled feedstocks



Identified priority areas for future research and innovation for REEs and broader strategic critical minerals



Enabled the UK to reshore sintered rare earth permanent magnet manufacturing for the first time in **25** years



Nurtured a nascent UK re-mining sector for critical metals



Grown a cohort of over **200** people across **52** organisations



Facilitated **>250** introductions resulting in **>40** collaborations



Established the UK Critical Minerals Standards Hub with an active community of c.**180**



Delivered relationships with international partners including Canada, USA and Australia leading to collaboration opportunities for **28** UK businesses



Explored bilateral innovation opportunities with South Africa, Kazakhstan and Brazil



Mobilised a community of **78** investors enabling UK firms to pitch for investment resulting in **£12m** raised across four investor partnership projects



Positioned Innovate UK as the thought-leaders across government and industry



Partnered to grow a Mine to Magnet STEM workshop increasing its outreach 6-fold to more than **1,500** pupils per year



Expediated the development of a UK skills roadmap for critical minerals



Published the UK Critical Minerals Investment Prospectus in partnership with DBT and the Critical Minerals Association

# Afterword

Jeff Townsend

Founder, Critical Minerals Association



The CLIMATES programme stands as a clear demonstration of what can be achieved in the United Kingdom when strategic intent is matched with targeted, well-executed intervention.

In a short period of time, Innovate UK through CLIMATES has transformed a £15 million public investment into a thriving, multi-million-pound ecosystem spanning innovation, industry, investment and supported by meaningful international collaboration. What has been built is not simply a collection of projects, but the foundations of a new industrial sector. A sector that strengthens the UK's security of supply in a time of geopolitical uncertainty,

supports its green industrial and climate change ambitions. The work of the team positions the UK strategically within the regional rare earth elements value chain and ensure that our nation will play a significant role in the future of the British and European economy.

The programme's ability to move beyond theory and into delivery has multiplied the value of the fifteen million pound investment. CLIMATES has brought together businesses, academia, investors, and policymakers to create real outcomes: building industry, unlocking significant private capital, and advancing the circular economy for rare earth elements. In

doing so, it has proven that the UK can act decisively and effectively in areas of strategic importance. This has positioned the UK a global leader in critical mineral circular economy.

This work comes at a pivotal moment. As global competition for critical minerals intensifies and supply chains are increasingly shaped by geopolitics as much as economics, the importance of programmes like CLIMATES cannot be overstated. CLIMATES has provided the tools to respond to these challenges and the blueprint for how the UK can be a global leader.



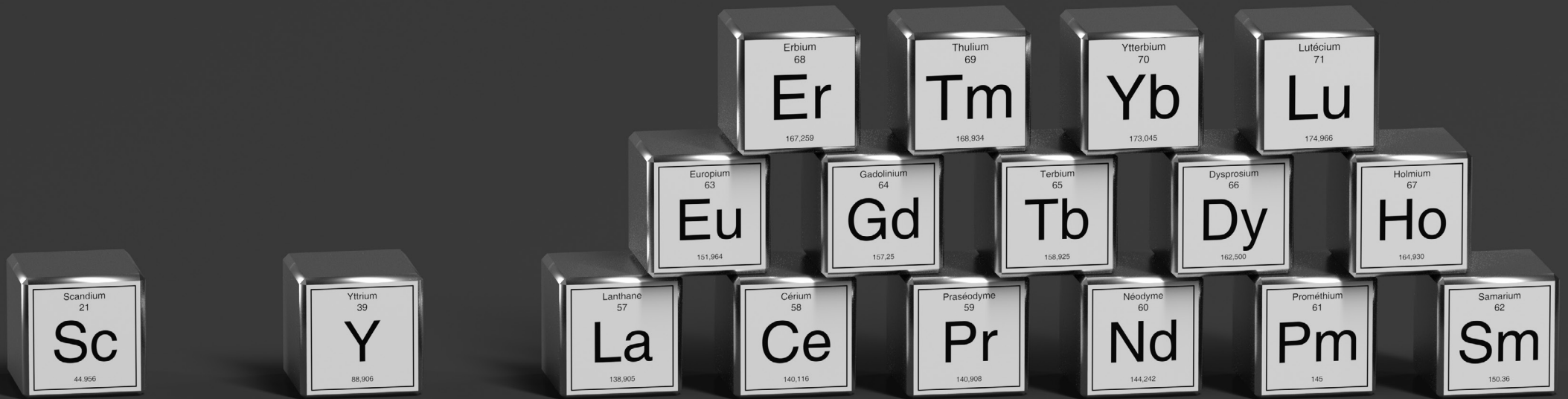
The success of CLIMATES to date must not be seen as an endpoint, but as a starting point. The opportunity now is to build on this momentum; to scale what has been proven, to deepen our innovation and to continue shaping a resilient, globally competitive critical minerals sector.

As the Advisory Group Chair, I am honoured to have been just a little bit of the wonderful success of the programme and I would like to commend the entire CLIMATES team, Innovate UK, and all delivery partners for their exceptional work. Their efforts have laid the groundwork for a sector that will be central to the UK's future prosperity. I also want to thank our

exceptional industry who have risen to the challenge and shown that with a little support the United Kingdom can foster an environment where innovation matures into a successful industry. Now we must turn these green shoots into mighty oaks.

I look forward with great confidence to what Innovate UK and the team will achieve in the years ahead, and to the role they will play in defining the United Kingdom's place in the global future economy.

**Jeff Townsend**  
Founder, Critical Minerals Association



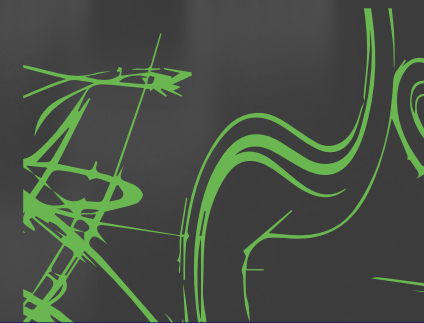
## CLIMATES: Circular Critical Materials Supply Chains Programme

[Learn more](#)



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