Futureproofing healthcare

Towards a low-carbon, sustainable and resilient healthcare system





ERA ENERGY RESEARCH ACCELERATOR

MI HEALTH

madano

Contents

Methodology statement:

This report is informed by four online stakeholder workshops held during May 2026 convened by the Energy Research Accelerator (ERA) and Midlands Innovation Health (MI Health) with the support of Madano. Participants included senior representatives from the NHS and wider healthcare sector, alongside academics and researchers from the Midlands Innovation universities and partner research institutes. Workshop discussions were recorded, transcribed and analysed to identify common themes and priorities. Madano drew the findings together to produce this report, with the final recommendations reviewed and endorsed by ERA and MI Health. The report provides an evidence-informed overview intended to support further discussion, collaboration and practical action.

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Aston University BIRMINGHAM UK · University of Birmingham · Cranfield University · Keele University · University of Leicester · Loughborough University · University of Nottingham UK | CHINA | MALAYSIA · University of Warwick · British Geological Survey

Foreword

The Energy Research Accelerator (ERA) and Midlands Innovation Health (MI Health), two thematic programmes within the Midlands Innovation partnership, convened the Futureproofing healthcare: energy, climate and sustainability series to move the regional conversation from ambition to implementation. The purpose of the four workshops was to identify actionable strategies that can support the NHS and community care sectors to deliver net zero and wider resilience, productivity and health benefits, while fostering collaboration between academia, industry and healthcare and capturing evidence, examples and barriers that can inform regional and national policy.

That purpose is timely because healthcare organisations are facing linked pressures that cannot be solved in isolation. Climate change is already a health risk, energy systems are under strain, estates are ageing, supply chains are exposed to disruption, and demand for care continues to rise. Add to this the challenges of financial constraint and workforce capacity, and the case for action is evidently not solely environmental. There is a need for organisations in the Midlands region to work with the National Institute for Health and Care Research (NIHR) and across the NHS to solve these challenges.

> The Midlands has a distinctive opportunity to lead this agenda. The region combines the major healthcare demand of its 11 million citizens with strengths in energy systems, industrial decarbonisation, advanced materials, sustainable medical technology, manufacturing, data science, supply chains, transport, clinical innovation and workforce development.

Its hospitals, universities, local authorities and industrial partners are well placed to come together around place-based solutions, using healthcare sites as anchor points for energy, circular economy and resilience projects.

Major hospitals and community facilities are also regional infrastructure assets. They can act as anchor institutions within local energy systems, as reliable demand centres for heat, power and flexibility, and as real-world environments in which new products, service models and data tools can be tested. The Midlands combines this demand with strengths in energy systems, engineering, advanced manufacturing, medical technologies (MedTech), clinical research, materials science, data, supply chains, transport and implementation. The region is, therefore, well placed to demonstrate how national priorities can be put to the test on a regional basis, evaluated rigorously and translated into wider adoption in the healthcare sector.

The report's principal recommendation is that the Midlands should develop a coordinated delivery model, led through a Midlands Healthcare Net Zero Accelerator (detailed on page 30). The Accelerator, which would be co-designed with relevant stakeholders, would not replace existing partnerships or initiatives such as those of NIHR's 5-year commitment to funding decarbonisation or create another standalone research centre. Its purpose would be to connect and add to them around shared challenges, a portfolio of demonstrators, developing a living evidence platform (similar to the SPARK.EU database) and a route from regional proof to national policy, procurement and standards.

Figure 1: Headline Midlands NHS infrastructure figures: [1], [2]

11
Integrated care systems (ICSs)
merging to 5 in April 2027

42
NHS trusts
in the Midlands region

30
Community diagnostics centres

1,953
Trust-reported sites
(Estates Return Information Collection (ERIC) 2024/25)

5.11m m^2
Gross internal floor area

4.75m m^2
Occupied floor area

£2.31bn
Reported backlog maintenance requirement

About the Team

Together, the following partners have produced this report to stimulate discussion, inform policy and support practical action towards a more sustainable, resilient and future-ready healthcare system.

Energy Research Accelerator

The Energy Research Accelerator (ERA) is a partnership of eight Midlands universities and the British Geological Survey, working with industry and government to accelerate research, innovation and skills across the energy sector. Since 2016, ERA has supported collaborative programmes that help translate world-class research into real-world impact, bringing together academia, industry and policymakers to support the UK's transition to Net Zero. ERA partners are the Universities of Aston, Birmingham, Cranfield, Keele, Leicester, Loughborough, Nottingham and Warwick, and the British Geological Survey.

Nick King
ERA Marketing & Communications

Amanda Baxendale
ERA Senior Business Development Manager

Anu Khandelwal
ERA Project & Executive Coordinator

Midlands Innovation Health

Midlands Innovation Health (MI Health) is a research and innovation partnership that coordinates and combines the collective excellence of seven Midlands universities to deliver improved health and regional growth. Driving disruptive translational interventions and influencing nationally, MI Health draws together a critical mass of innovative regional stakeholders to impact national and global health challenges using local training strengths, expertise, networks, best practice and facilities. MI Health also links the Midlands-based universities within a joint academic-NHS-industry innovation environment, to push forward research, collaboration and skills in the Midlands medical sector. MI Health partners are the Universities of Aston, Birmingham, Keele, Leicester, Loughborough, Nottingham and Warwick.

Alex Archibald
Midlands Innovation Health Project Manager & Business Development Manager

Madano Partnership Ltd

Madano is a strategic consultancy specialising in complex and highly regulated sectors such as energy, net zero transition, sustainability, healthcare, science and public policy. It works with businesses and organisations to support stakeholder engagement, evidence generation and policy development, helping to turn complex challenges into practical action.

Tim Field
Director
Madano

Troy Aharonian
Associate Director
Madano

Anna Butcher
Senior Account Manager
Madano

Pictured right, from top: Delegates at the UK Energy Expo 2026 Hydrogen workshop, ERA team winners of 'Best Thought Leadership' at the 2026 Hydrogen UK Awards in Birmingham. The Midlands Health and Care Inequalities Policy Commission House of Lords launch, and MI Health promoting partner capabilities at East Midlands Tech Week.

ERA's HyDEX hydrogen development programme has **won two prestigious national awards** for place-based innovation and thought leadership

ERA has established **23 major energy research and demonstration facilities** across the Midlands

MI Health has built collaborative **academic-industry-NHS networks,** utilising advanced evidence and capabilities mapping

MI Health delivers successful advocacy platforms: with two **Immunology Showcases** attended by **over 500 delegates**

Executive summary and recommendations

Across all focus areas, participants voiced a consistent message: healthcare sustainability cannot be delivered through separate estates projects, procurement exercises or isolated innovation trials. Sustainability is part of how the NHS and community care sectors will deliver safe, affordable, productive and resilient care in a changing climate. The most valuable interventions are those where several benefits overlap, such as reducing energy and material demand, improving patient pathways, avoiding cost, strengthening resilience and making services easier to operate.

The national context supports this integrated approach. The NHS has its statutory targets of Net Zero by 2040 for emissions it controls directly and by 2045 for emissions it can influence. The 10-Year Health Plan is built around the shifts from hospital to community, analogue to digital and sickness to prevention. The Design for Life roadmap seeks a circular economy for MedTech, while the 2026 Life Sciences Sector Plan links NHS reform, regional growth, manufacturing resilience, innovation adoption and Net Zero.[3], [4], [5], [9]

The following seven recommendations are presented as one delivery framework for further co-design. The first, a collaborative whole-system view, is the organising principle for the rest. The seventh, the Midlands Healthcare Net Zero Accelerator, is the proposed mechanism for turning the recommendations into action.

1. **Adopt a collaborative whole-system view.** Plan estates, clinical pathways, community care, medicines, devices, digital infrastructure, transport, procurement and waste as parts of one system. A change that reduces energy demand at an acute hospital may increase travel, device use or data demand elsewhere, while an apparently sustainable product may create new logistics or disposal burdens. Decisions should be assessed against a common set of outcomes: patient safety, health equity, carbon, cost, productivity, resilience and deliverability.

   Research and innovation challenge: ERA and MI Health to convene a Midlands whole-system taskforce that brings NHS trusts and ICSs together with local and combined authorities, industry, researchers and national bodies to define shared challenge statements and test methods for making integrated decisions.

2. **Create data that is robust enough to act upon.** Build a shared evidence and decision-support platform that links estate and energy data, climate risk, care pathways, travel, products, suppliers and waste. The objective is not a perfect regional carbon inventory before action can begin. It is decision-ready information that identifies hotspots, makes options comparable and helps local teams build credible business cases. Existing NHS platforms and datasets, as well as those from the Medical Research Council, UK Research and Innovation (UKRI) and NIHR, should be connected rather than duplicated.

   Research and innovation challenge: MI Health and academics in the region to evaluate existing options to enhance or develop a federated evidence platform with the purpose of combining non-patient operational data, product and pathway evidence and case studies, while distinguishing what is ready to implement, what requires demonstration and what remains a research gap.

3. **Reduce avoidable demand before major capital investment.** Apply the same hierarchy across energy, care and materials. Improve controls, metering, maintenance and building fabric before replacing energy systems. Prevent waste and unnecessary product use before investing in new disposal routes. Support prevention, earlier diagnosis, medicines optimisation and appropriate home-based care before higher-carbon acute intervention. These measures frequently provide the fastest route to cost, carbon and capacity benefits.

   Research and innovation challenge: ERA to work with academics to support trusts in the Midlands to quantify avoidable energy, material and service demand across representative sites and patient pathways, then test which interventions deliver the strongest combined carbon, financial and health outcomes.

4. **Plan healthcare as part of place-based energy and climate resilience.** Treat hospitals and community facilities as critical infrastructure within local energy planning. Electrification, cooling, digital systems and transport will increase electricity dependency at the same time as overheating, flooding, water stress and price volatility create new operational risks. Healthcare organisations should work with network operators, local government, universities, industry, housing and transport partners on shared heat, renewables, storage, flexibility, microgrids and adaptation.

   Research and innovation challenge: ERA and MI Health to work with stakeholders in the region to establish two or three integrated healthcare energy and resilience demonstrators, generating evidence that can inform Local Area Energy Plans, Regional Energy Strategic Plans and future NHS technical guidance.

5. **Use procurement and circularity to shape markets.** Move from upfront price towards whole-life value, including carbon, durability, repair, reuse, water, maintenance, staff time, patient experience, supply resilience and end-of-life treatment. Apply the waste hierarchy consistently and give suppliers clearer forward signals. Circularity should begin with using less and designing for life and afterlife, instead of simply finding a different disposal route.

   Research and innovation challenge: MI Health to work with academics to convene a Midlands consortium to work across the research and manufacturing supply base to educate SMEs and micro-SMEs on values-based procurement and develop partnerships with organisations to leverage the carbon advantage in a way that is usable and accessible by NHS buyers.

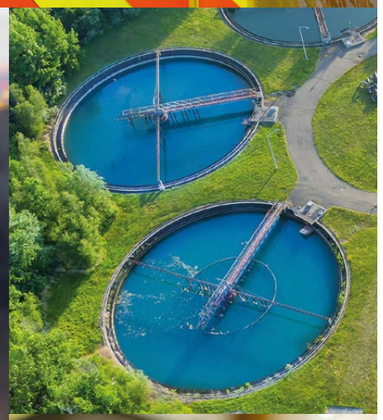
6. **Build implementation capability, skills and behaviour change.** Embed sustainability into the roles and routines that determine outcomes, including clinical practice, estates, procurement, finance, digital, leadership, apprenticeships and professional education. Generic awareness training has a role, but change requires role-specific tools, senior sponsorship, clinical endorsement, communities of practice and practical implementation support. Students and apprentices can contribute where projects are linked to NHS trust priorities and clear lines of authority.

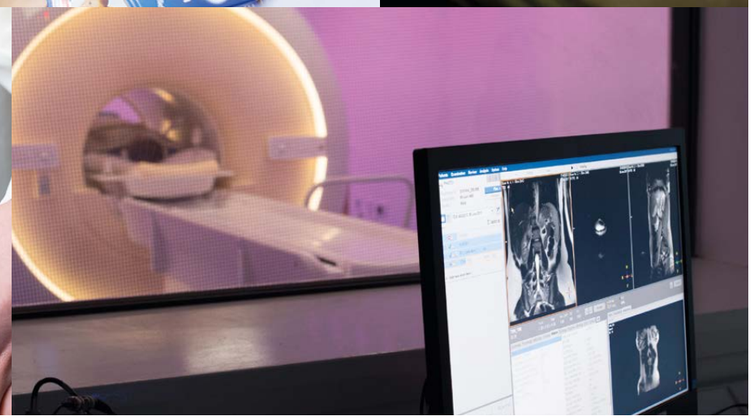
   Research and innovation challenge: MI Health to convene Midlands universities and healthcare partners to create an implementation and skills programme, including fellowships, placements and communities of practice, that measures not only learning but adoption, behaviour change and service outcomes.

7. **Establish a Midlands Healthcare Net Zero Accelerator.** Create a neutral regional delivery framework that connects existing capabilities, selects demonstrators likely to yield results, coordinates funding, supports procurement and implementation, and provides a route from regional pilots to national adoption. The Accelerator and its proposed programme should position the Midlands as a place where national healthcare, energy and industrial priorities can be tested at meaningful scale, without creating a duplicative institution.

   Research and innovation challenge: ERA and MI Health, with NHS partners, to secure an initial coalition of NHS, university, industry, local government and funder partners to co-design the Accelerator and its programme, agree governance and select a first demonstrator and evidence platform within 12 months.

Flagship recommendation: The Midlands Healthcare Net Zero Accelerator should be the organising vehicle for the regional programme. It should connect the demonstrators, evidence platform, procurement support, workforce development and policy engagement described in this report, with a clear focus on implementation and national transferability.





1. Findings

1. The case for integrated futureproofing

Net Zero, resilience and productivity are one agenda

A core finding of this work challenged a persistent tendency to treat sustainability as an additional programme that sits beside the core business of healthcare. In practice, the drivers are inseparable. Energy efficiency can reduce operating cost and exposure to price shocks. Better-insulated and better-controlled buildings can improve comfort, air quality and reliability. Waste prevention can release staff time and reduce procurement and disposal costs. Prevention and care closer to home can reduce avoidable acute activity, although only when the wider transport, digital, device and community infrastructure consequences are understood.

This is why futureproofing is a more useful organising concept than decarbonisation alone. It asks whether the healthcare system can continue to deliver safe, effective and equitable care under different future conditions, including more frequent heatwaves and floods, greater electricity dependence, disrupted supply chains, changing patterns of disease and new models of care. Net Zero is essential within this frame, but it is pursued alongside adaptation, resilience, productivity and patient outcomes rather than in competition with them.

> The national policy direction reinforces this logic. The 10-Year Health Plan's three shifts will change where and how healthcare is delivered. Moving from hospital to community may reduce some acute-site demand, but it also creates new requirements for neighbourhood health centres, pharmacies, virtual wards, remote monitoring, home delivery and return logistics.

Moving from analogue to digital can improve productivity and enable predictive management, but increases dependency on reliable power, connectivity, data governance and computing infrastructure, as well as inclusive support practices. Moving from sickness to prevention is likely to be one of the most effective long-term decarbonisation strategies, but benefits may occur in different budgets and over longer time horizons.[4]

The whole-system lens

A whole-system view does not mean every decision requires an unmanageably complex model. It means defining the boundaries of a decision clearly and checking for material consequences elsewhere, including impacts on human health, communities and the wider environment. Consistent with a One Health approach, this should include relevant effects on ecosystems, animal and plant health, pollution, water and resource use where these could materially influence health and health inequality outcomes. For example, a new home-monitoring device should be assessed not only for clinical performance and avoided hospital visits, but also for manufacturing impacts, device lifetime, digital infrastructure, patient accessibility, collection and end-of-life treatment. A heat network proposal should be assessed not only against a hospital's boiler replacement, but also against local demand, grid constraints, cooling needs, contractual risk and potential community benefit.

Participants repeatedly emphasised that the same evidence can look different depending on the unit of analysis. Building emissions may appear small when divided across an individual clinical procedure, while the emissions from travel may appear small in a product-level life cycle assessment. A regional programme must, therefore, enable both granular analysis and a wider view, so that optimisation of one component does not create a larger problem elsewhere.

> **Whole-system implication:** Every demonstrator supported through the proposed Accelerator should map the patient or operational pathway, estate and energy impacts, supply chain and procurement, workforce and behaviour, data requirements and end-of-life consequences.

Why the Midlands can lead

The Midlands has a strong mix of scale and capability. Its NHS trust estate is large and diverse, ranging from major acute campuses to specialist, mental health, ambulance, community and non-inpatient facilities. The region also contains universities and research infrastructure with expertise in energy systems, geothermal heat, batteries, power electronics, buildings, advanced materials, manufacturing, life cycle assessment, data science, transport and behavioural change, while MI Health provides established links across healthcare research, clinical partners and innovation networks.

This combination matters because sustainable healthcare is an implementation challenge as much as a research challenge. Technologies and operational practices already exist, but they are often tested in isolation, evaluated using inconsistent methods or unable to cross the gap from pilot to routine procurement. A region that can bring research, clinical need, manufacturing, finance, regulation and implementation together around real sites can create evidence that is more valuable nationally than another standalone technology trial.

The opportunity also aligns with regional growth. The Midlands has the UK's largest cluster of MedTech businesses and a major advanced manufacturing base. A sustainable healthcare programme can create demand for higher-value products and services in circular design, data, energy systems, repair, remanufacturing, logistics and resilient supply chains. This links NHS improvement with the 2026 Life Sciences Sector Plan's goals for regional clusters, SME growth, manufacturing resilience and faster adoption.[8], [9], [10], [11], [12]

Scalable case study: Servitisation economics and behavioural change

Professor Ali Bigdeli and Dr Simon Bishop, Universities of Aston and Nottingham

Within the £5.9m Green Healthcare Hub, led by the Brighton and Sussex Medical School, the Universities of Aston and Nottingham are helping to decarbonise the commissioning and delivery of healthcare by supporting changes in purchasing and contracting models, and influencing institutional and behavioural levers, in healthcare settings.

Healthcare procurement is typically based on buying products, even though the organisation purchasing equipment is often not the one using it. This disconnect contributes to high levels of waste, short product lifetimes, and the widespread use of single-use devices, particularly in medical electronics. Meanwhile, the policy and regulatory environment shaping the uptake of lower carbon approaches to delivering care is often complex and requires a wider view to deliver decarbonisation and improve environmental impact. Both of these workstreams are examples of whole-system thinking in action and will enable systemic understanding and evidence-based change.

Find out more at the website:
greenhealthcarehub.org/research

2. Energy, estates and place-based resilience

From individual projects to an estate pathway

Discussion in this area built from NHS England's four-step approach: make every kilowatt hour count, prepare buildings for electricity-led heating, switch to non-fossil heat and increase on-site renewable generation. Participants supported this sequence as a strategic discipline, while recognising that real funding cycles do not always allow projects to happen in the ideal order. The immediate requirement is, therefore, to maintain a site-specific pathway, so that a grant for one technology does not undermine future fabric, electrical capacity or clinical plans.

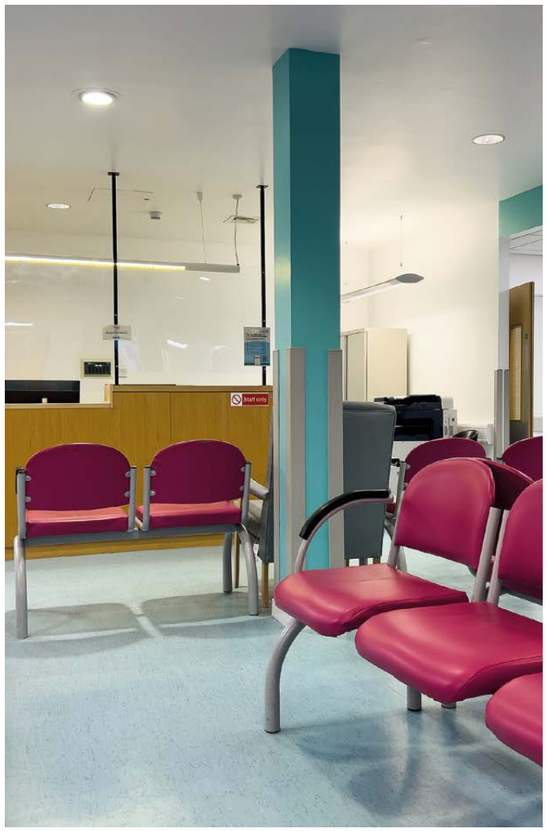
A credible baseline is the foundation, and while ERIC data provides a valuable high-level view, local action needs sub-metering and information at building, system and end-use level. Energy managers need to understand operating schedules, ventilation and cooling demand, sterilisation, kitchens, imaging and other high-load processes. The aim is not measurement for its own sake, nor to achieve full and perfect completion. It is to identify avoidable demand, right-size future systems, expose operational faults and create a project pipeline that can be matched to funding.

> No-regrets actions include improving controls, commissioning and maintenance, reviewing operating hours, optimising combined heat and power systems while they remain in service, addressing air leakage and insulation, and improving metering. These measures can reduce cost and demand before high-capital heat or electrical upgrades. They also improve the quality of the business case because the replacement system can be sized against a more realistic future load.

Decarbonising heat without compromising care

Healthcare buildings are difficult heat users. Some require high flow temperatures, continuous operation, strict ventilation and infection-control conditions, and resilience that cannot be interrupted during retrofit. The age and condition of the estate vary widely, and some roofs, electrical systems or plant rooms are not ready for the technology that appears attractive on paper. A one-size-fits-all mandate would, therefore, be counterproductive.

Air-source heat pumps will be appropriate for many sites, but participants warned against treating them as the automatic answer. Ground-source heat pumps, deeper geothermal heat, heat networks, thermal storage, waste heat and hybrid systems may provide better solutions for some long-term sites. The Midlands has particularly relevant expertise in geothermal energy, subsurface characterisation, storage and integrated systems. Hospitals with long-term ownership and stable demand can provide anchor loads, but commercial viability may require neighbouring universities, industry, housing or public buildings to join the scheme.



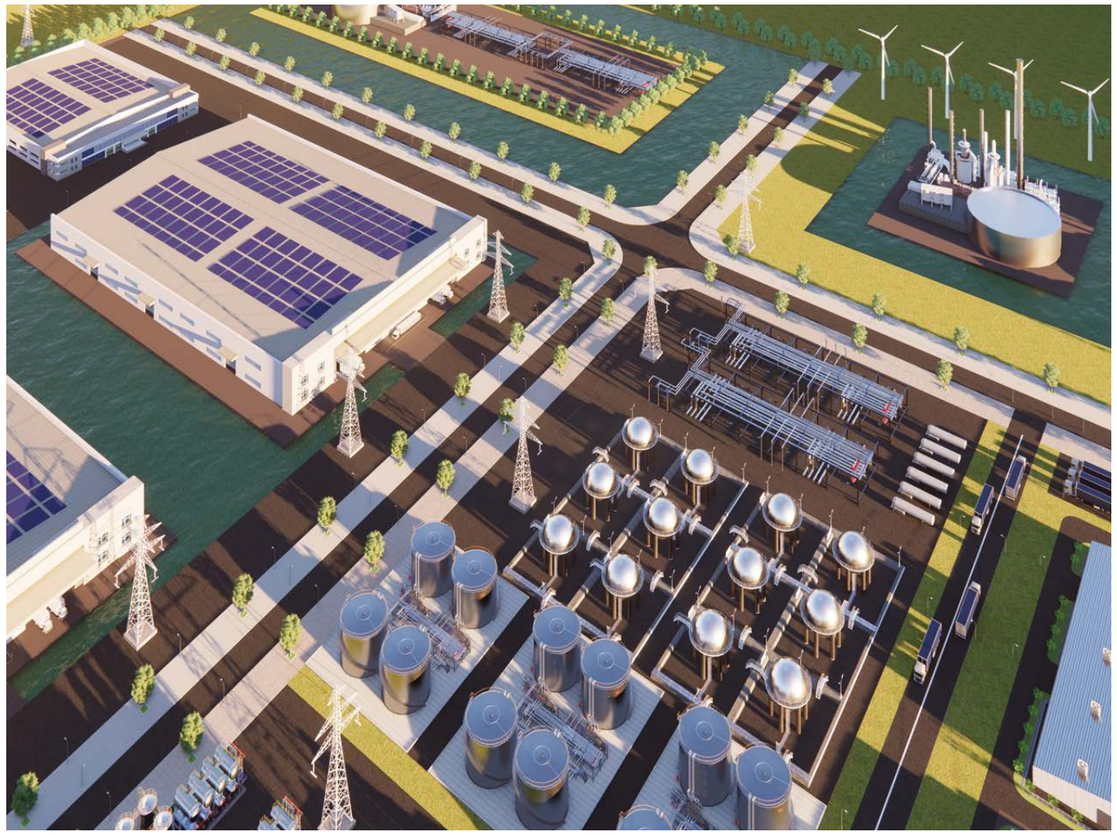
Cooling must be planned at the same time as heating. Climate change increases overheating risk in wards, theatres and treatment areas, while sealed or heavily insulated buildings can trap heat if ventilation and shading are not addressed. Passive measures, nature-based solutions and better controls should be considered before simply adding mechanical cooling, which may increase peak electrical demand and create new grid constraints.

Healthcare as critical local energy infrastructure

Electrification of heat, fleets, diagnostic equipment and digital systems will increase reliance on local electricity networks. Energy resilience can no longer be defined only by the presence of a backup generator. It includes the ability to manage peak demand, maintain critical services during disruption, secure affordable supply and recover from climate events. Microgrids, batteries, on-site generation, flexible demand and shared energy infrastructure could strengthen resilience where clinical governance and commercial arrangements are robust.

Major healthcare sites should, therefore, be integrated into place-based energy planning. Local Area Energy Plans and emerging Regional Energy Strategic Plans should consider NHS load, decarbonisation trajectories, criticality, generation potential and adaptation needs. Healthcare organisations in turn need a seat at the table early enough to influence network and infrastructure investment, rather than seeking capacity after plans are fixed.

> **Whole-system implication:** **An estate project should be assessed against future care models and local infrastructure. Investment in a retained acute building may be essential, but plans must also consider the energy and transport impacts of neighbourhood health centres, virtual wards and home-based care.**



Priority demonstrator: place-based healthcare energy and resilience

An initial demonstrator could integrate several technologies and operational questions around a major healthcare site, rather than testing one component in isolation. Potential elements include geothermal or low-carbon heat, solar, battery and thermal storage, smart controls, cooling and passive adaptation, grid flexibility, waste heat exchange and service continuity. The demonstrator should include a community or non-acute setting to test how the shift in care changes demand and resilience requirements.

- Select a site with a long-term estate strategy, credible data baseline and committed executive, clinical and estates leadership.
- Co-design with the distribution network operator, local and combined authorities, universities, nearby heat users and commercial partners.
- Use a whole-life business case that values resilience, avoided maintenance, productivity, carbon and wider local benefits alongside energy cost.
- Produce transferable technical, commercial and governance templates for other trusts and national NHS teams.

3. Policy, data and system-level innovation

Decision-ready evidence, not another reporting burden

This activity highlighted the gap between information and action. NHS organisations collect energy, estate, waste, finance, activity and risk data, while suppliers increasingly report through national platforms. Yet local teams still struggle to assemble evidence that is consistent enough for a business case or comparable across trusts. Scope 3 emissions (indirect emissions that occur in an organisation's wider value or supply chains that it does not own or control), travel, climate risk and product-level carbon are especially difficult.

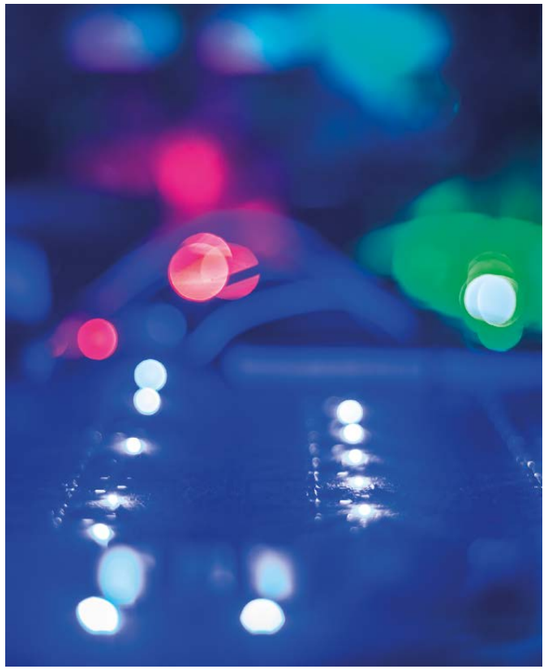
The response should not be to build a parallel data system that duplicates national platforms. Instead, the proposed Midlands evidence platform should act as a connective layer with a clear operating model which signposts authoritative datasets, hosts agreed regional methods, supports appropriately governed access to non-patient operational data, captures demonstrator results and provides practical decision tools. It should also record data quality and uncertainty, so users understand what the evidence can and cannot support.

"Good enough" data is a critical principle. A trust does not need a perfect carbon footprint for every item it buys before reducing unnecessary consumption or targeting the largest categories. Product-level data should be prioritised where it can change a procurement decision, where volumes or impacts are high, or where a demonstrator could establish a reusable method. The same proportionality applies to life cycle assessment, which should illuminate choices rather than become a barrier to them.

Digital foundations before advanced tools

Digital twins, artificial intelligence and predictive analytics can improve energy optimisation, maintenance, space utilisation and scenario planning. However, several participants stressed that many healthcare sites first need reliable metering, modern building management systems, asset information and interoperable data. Advanced analytics applied to incomplete or inconsistent data can create false confidence rather than better decisions.

A digital twin demonstrator should, therefore, be framed around a defined operational decision, such as sequencing heat decarbonisation, predicting cooling demand, improving theatre ventilation schedules or identifying maintenance risks. It should compare the value of the tool with the data, staff time and computing resources required. Human oversight, cybersecurity and accountability must be designed in from the start, and the energy and water footprint of data processing should be acknowledged.



Local policy alignment and governance

Participants repeatedly described the NHS as a "system of systems". Estates, clinical services, finance, procurement, digital teams, integrated care boards, NHS England and external partners have different responsibilities and incentives. For example, a technically strong project can stall because benefits occur in another budget, because a professional body has not endorsed a process, or because local infection-prevention teams interpret risk differently.

Clear national direction can accelerate change, but regional governance is needed to translate it into delivery. This requires visible NHS co-leadership and representation to ensure the integration of patient, carer, primary care and social care perspectives. The Midlands programme should establish a neutral forum where clinical, technical, financial, procurement and research perspectives are brought together early. This can reduce rework, identify approval requirements and expose where a local pilot needs national regulatory or policy engagement.

The evidence platform should also create stronger feedback loops to national tool developers and policymakers. Local users need a route to explain why a dataset or framework is not usable, while national teams need structured evidence from real sites rather than isolated anecdote. The Midlands can provide this through a consistent portfolio and common evaluation approach.

Skills, workforce and transport as system issues

Sustainability capability is uneven across roles. Energy managers increasingly need expertise in data, planning, procurement and complex capital projects. Procurement teams need practical methods for carbon and whole-life value. Clinical teams need relevant prompts within normal practice rather than another generic training requirement. Finance leaders need evidence that links carbon and resilience to productivity and risk mitigation.

Universities can support this through partnership working, role-specific education, placements, fellowships and implementation research. There is a practical opportunity to connect staff, implementation fellows, students and apprentices with trust priorities in areas such as waste audits, travel analysis, procurement reviews and departmental improvement. These projects work best when the learner has a named sponsor, a realistic sphere of influence and a route for the result to be adopted.

Travel and access also require regional coordination. Staff travel, patient travel, public transport, active travel, fleet electrification and logistics sit across the responsibilities of trusts, integrated care systems, mayoral authorities, local authorities, transport bodies and major employers. A Midlands working group should select shared corridors or sites where coordinated intervention can improve access, reduce emissions and support health equity.

Whole-system implication: Data and digital innovation should help decision makers see connections between climate risk, population health, clinical demand, estate performance, travel and supply chains. The objective is better decisions, not a separate "sustainability dashboard".

Scalable case study: EnergyMind

Dr Abed Alaswad, Aston University

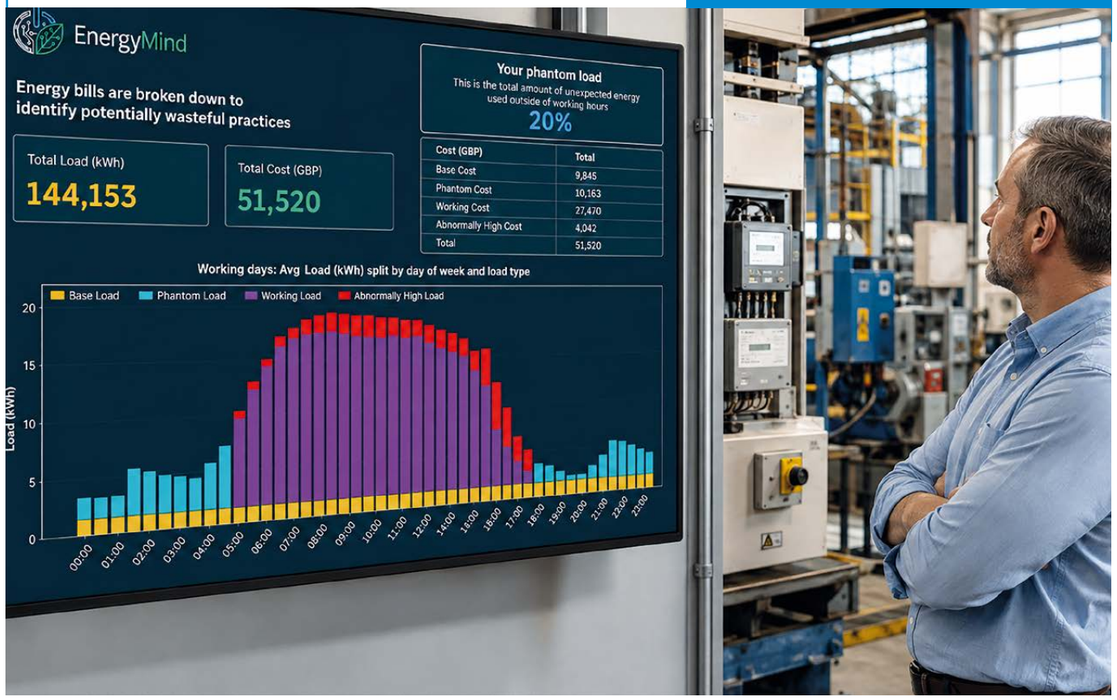
A new platform developed by Aston University researchers is helping manufacturers turn their energy data into practical recommendations for reducing costs, energy consumption and carbon emissions. EnergyMind has been validated with more than 40 energy-intensive businesses across the West Midlands. It identified potential annual cost savings ranging from £9,300 to £312,000 per business, alongside possible carbon reductions of between 24 and 880 tonnes of CO_2e. The platform uses engineering expertise, data analytics and artificial intelligence to rank opportunities including:

- **Energy-efficiency improvements**
- **Operational changes**
- **Tariff optimisation**
- **Future investment priorities**

EnergyMind is now being made available more widely, with early adopters invited to help shape its next stage of development. The approach illustrates how similar data-led decision support could be applied across complex healthcare estates.

Find out more:
tinyurl.com/EnrgMnd

Identified potential **annual cost savings ranging from £9,300 to £312,000** per business



4. Sustainable MedTech, advanced materials and design

A regional strength with national growth potential

The Midlands already has a very strong platform with close to 800 MedTech businesses identified in the Office for Life Sciences' Bioscience and health technology sector statistics (2023 to 2024), the largest number in any UK region, and employing almost 30,000 people while generating an estimated £6.9 billion in turnover. Meanwhile, the Midlands MedTech Sector Analysis found that 65 per cent of Midlands businesses were micro enterprises and a further 34 per cent were small or medium-sized, meaning almost the entire regional base is SME-led, delivering an agile market. MedTech productivity was estimated to be 40 per cent above the wider Midlands average.[8], [13]

This business profile is an opportunity and a constraint, as smaller firms can be agile, specialised and close to technical innovation. However, they may lack the finance, regulatory capacity, NHS access and procurement resource needed to move from prototype to scale. The same analysis identified clusters around Nottingham and Birmingham, with further concentrations in Loughborough, Leicester, Derby, Coventry and Stoke-on-Trent, and specialisms in assistive technology, hospital hardware, single-use technologies, infection control and respiratory systems.[8]

> Sustainable healthcare can become a growth market for this ecosystem. The Design for Life roadmap calls for greater reuse, remanufacture and recycling of medical technology, while the Life Sciences Sector Plan seeks faster adoption, stronger manufacturing, resilient supply chains and support for SMEs.

A Midlands testbed can help convert these national priorities into investible product and service opportunities, particularly in design for circularity, advanced materials, reverse logistics, product data, repair, remanufacturing and low-carbon manufacturing. This can create further value for businesses by driving innovation, supporting alignment with European legislation and opening opportunities in other markets.[5], [9]

Design for life and afterlife

Findings emphasised that clinical safety and performance remain non-negotiable, but products should also be designed for durability, modular replacement, safe disassembly, reuse and material recovery. Large equipment can often be refurbished or remanufactured. Smaller devices, including sensors, glucose monitors, inhalers and insulin pens, are more difficult because they combine low-value plastics, electronics, batteries and potentially contaminated components.

The research opportunity extends beyond an improved recycling technology. It involves the redesign of the whole system around the product. This includes material choice, marking and traceability, reusable or replaceable components, cleaning and validation, packaging, take-back routes, user behaviour, waste classification and procurement. Product passports or material markers could help identify composition and use history. Modular design could allow only the patient-contact component to be replaced. Overall, values-based procurement is the clearest route to achieve these outcomes.

Advanced materials can reduce weight, improve durability and enhance clinical performance, but they may also create new end-of-life problems. The region's materials scientists, chemists, designers and manufacturing specialists should be engaged at the earliest stage, alongside clinicians, infection prevention, waste operators and procurement. Life cycle assessment should test whether a proposed material reduces impact across manufacture, use, repair, cleaning, transport and disposal, including during community care, rather than shifting it between stages.

Prevention, medicines and care closer to home

Sustainable MedTech is also about avoiding high-carbon care. Earlier diagnosis, better management of long-term conditions, remote monitoring and appropriate non-pharmaceutical interventions can reduce admissions, travel and intensive treatment. The benefit depends on good pathway design. A wearable that reduces hospital attendance but has a short life, high data requirements, low user uptake and no return route may still create material, time and digital burdens.

Medicines require the same balanced approach. Manufacturing, packaging, cold-chain logistics, waste, inhalers and anaesthetic gases are significant sources of impact. Lower-carbon alternatives should be used where clinically appropriate, but changes must protect disease control and patient choice. Medicines optimisation, prevention and reducing avoidable waste can provide benefits without assuming that all products or patients can follow the same pathway.

Systems modelling can reveal inefficiencies and enable all these variables to be deployed together for maximum effectiveness, efficiency and economy.

From innovation to adoption

The Midlands has many promising technologies. The challenge is evidence, economics and implementation. Innovators need a clear route to clinical need, regulatory advice, health economics, real-world evaluation and procurement. NHS organisations need confidence that a product is safe, affordable, supportable and scalable. Funders need to work together to bridge the gap between research, demonstration and adoption rather than treating each stage as a separate competition and delivering separate funding/infrastructure. Alignment with existing routes is critical, such as the Life Sciences Sector Plan, which commits NIHR to support the Innovation Catalyst, one of the bridges available between concept and adoption.

A Midlands Sustainable MedTech and Circularity Testbed should provide this pathway. It should select challenges alongside NHS partners, involve SMEs through accessible calls, support life cycle and health economic evaluation, and test products alongside logistics and procurement. The testbed should connect to existing Health Innovation Networks rather than duplicating them, and work alongside Medilink, NIHR and regional and national MedTech programmes.

> **Whole-system implication:** A sustainable product is not defined by a lower-carbon material alone. It must also offer a product, service and logistics model that improves patient care, can be procured and maintained, and has a safe route at the end of use.

Priority demonstrator: circular MedTech and reverse logistics

- Select two or three high-volume or high-value product categories, including at least one community or home-use device.
- Test product design, take-back, cleaning or decontamination, material recovery, user behaviour, procurement and business model together.
- Create a common life cycle and whole-life cost method that is proportionate for NHS buyers and small suppliers – these could be modelled on risk classifications set out by MHRA.
- Use the demonstrator to identify regulatory or waste-classification barriers that require national resolution, recognising developments in European standards which the UK may follow.

Scalable case study: SMART

Professor Shahin Rahimifard & Phil Sheppard, Loughborough University

Formed in 2024, the Centre for Sustainable Manufacturing and Recycling Technologies (SMART) aims to advance technologies related to sustainable manufacture and to promote effective end-of-life product retirement strategies in the wake of European legislation and corporate social responsibility. Activity goes beyond current incremental process improvements and focuses on next generation sustainability initiatives capable of dealing with challenges in resource scarcity, climate change, and global social and ethical inequities.

The mission is to develop new strategies, methodologies and supportive technologies for a sustainable approach to design, production, consumption and disposal of products that meets the customer's needs as well as legislative, environmental and ethical standards whilst safeguarding the future prosperity of manufacturing businesses.

Building on existing activity focused on the complex nature of medical devices, the Centre is looking to expand to deliver a national CiRcular economy for small Medical Devices (ReMed) programme. This UK-leading activity will create novel design and material specifications, reprocessing technologies, and digital tools to demonstrate the technical, economic and operational viability in the UK of circular lifecycles for small Medical Devices (www.remed.uk).

For more information, visit SMART:
www.centreforsmart.co.uk

5. Supply chains, circular economy and waste

Start with the waste hierarchy

Our findings reinforced a simple but important point: circular economy is not the same as finding a better disposal route. The order should be prevention, reduction, safe reuse, repair and remanufacture, recycling, energy recovery and final disposal. Waste-to-energy can be appropriate for unavoidable contaminated materials, but it does not preserve material value and should not displace work on product design and consumption.

Some of the most straightforward solutions are already in use. Examples discussed included avoiding unnecessary glove use, not opening sterile packs before they are needed, removing non-essential disposable coverings, improving material segregation and reducing surplus medicines. These actions can cut purchasing and disposal costs as well as carbon, but they require clinical endorsement, clear exceptions and reinforcement in daily practice.

> Reusable products must be assessed across the whole system. Laundering, transport, water, energy, staff time, infection prevention and loss rates may change the result. Single-patient reuse can be an effective intermediate model in some categories, allowing multiple uses without the complexity of cross-patient reprocessing. A whole-life comparison should make these trade-offs explicit.

Procurement is the market signal

The NHS can influence suppliers at scale, but sustainability criteria are difficult to apply when teams lack comparable data, practical templates and specialist capacity. Price remains dominant under financial pressure, even where a lower-carbon option may reduce waste, maintenance or resilience risk over time.

> Whole-life value should be considered routinely when specifying and evaluating solutions, rather than being treated as an optional social-value consideration added late in the procurement process.

The Evergreen Sustainable Supplier Assessment provides a common route for suppliers to report their organisational sustainability maturity, while the NHS Net Zero Supplier Roadmap sets progressively stronger carbon-reporting requirements, including product-level carbon footprinting requirements from 2028. The national value-based procurement guidance for MedTech should provide the principal framework for translating this supplier and product information into purchasing decisions. It enables NHS buyers to assess wider value through standard questions and scoring criteria covering social value, efficiency, patient and staff outcomes, supply-chain resilience, intended purpose and whole-life cost, rather than relying primarily on purchase price.

> Regional work should use and connect these national mechanisms rather than create duplicate questionnaires or assessment frameworks. The Midlands contribution should focus on helping buyers apply the guidance consistently, making carbon and circularity evidence usable within whole-life assessments, and supporting SMEs to provide proportionate evidence without facing disproportionate cost or administrative burden.

The Innovator Passport proposed through the 10-Year Health Plan should complement this approach by allowing relevant information to be recognised across NHS organisations after their assessment. Together, value-based procurement and the Passport could create a more coherent route from evidence generation to assessment and adoption, although the Passport should not be presented as a sustainability accreditation and local organisations will still need to consider pathway fit and implementation requirements.[6], [7]

Early market engagement and forward procurement can give industry time to respond, while the Innovator Passport should reduce repeated evaluation once products are ready for adoption. Where the NHS knows that a category must become reusable, lower-carbon or free from a particular material, it should communicate the direction, expected value and evidence requirements before the tender. Suppliers should then be able to submit common regulatory, clinical, economic and technical evidence once, with that information recognised across NHS organisations where the relevant standards have been met. This creates a more credible market for investment and allows regional firms to collaborate with researchers and healthcare users on product redesign. It should also reduce the burden on SMEs of navigating multiple local assessment processes, while allowing individual NHS organisations to concentrate on implementation, pathway fit and operational risk.

Resilience and the global value chain

Healthcare supply chains are global and complex. Onshoring every product is neither feasible nor necessarily sustainable, because raw materials, specialist manufacturing and regulatory capability may remain international. Resilience, therefore, depends on understanding critical products and dependencies, diversifying where appropriate, improving inventory and demand forecasting, and developing domestic or regional capability where it adds strategic value.

A Supply Chain Observatory function within the proposed programme could map selected high-risk medicines, reagents, devices, components and materials, combining carbon and resilience rather than treating them as separate exercises. While this would need to tie into the NHS Supply Chain work and the Innovation Passport, it would also help identify where local manufacturing, repair, remanufacturing or recycling is viable and where the priority should be supplier engagement, substitution or contingency planning.

Local and regional supply options should be judged by whole-life value and capacity, not geography alone. Smaller suppliers may offer innovation and responsiveness but struggle with volume, compliance and cash flow. The Accelerator should help aggregate demand, provide clearer challenge specifications and connect SMEs with larger partners, manufacturers and investors.

Waste infrastructure and reverse logistics

Products are efficiently distributed into hospitals, community services and homes, but return systems are much weaker. Reverse logistics can determine whether reuse and recycling are economically viable. Potential routes include courier backhauls, pharmacy returns, retailer collection, local authority partnerships and standardised packaging. Each route needs clear responsibility, safe handling, communications and sufficient volume.

Contaminated materials create additional constraints. Decontamination technology, waste classification, transport rules and emissions controls all affect what can be recovered. Demonstrators should involve the Environment Agency, MHRA, NICE, waste contractors, infection-prevention teams and standards bodies early, so that technical success is not blocked at the point of movement or approval.

Whole-system implication: Circularity must connect product design, procurement, clinical use, behaviour, logistics, decontamination and end markets. Solving collection without a viable processing route, or designing a recyclable product without a return system, will not create a circular economy.

Priority demonstrators: procurement, waste reduction and supply-chain resilience

- A whole-life procurement pilot in two product categories, comparing cost, carbon, safety, water, staff time, resilience and disposal.
- A trust-level demand-reduction programme covering gloves, sterile packs, couch roll or another high-volume consumable, with clinical exemptions and behaviour evaluation.
- A reverse-logistics pilot for a home-use device, medicine-related product or packaging stream.
- A supply-chain observatory pilot mapping critical materials and carbon hotspots in one pathway or product family.

Scalable case study: Transformation through Sustainable Pharmaceutical Packaging for Decarbonised Healthcare

Dr Daniel Keddie, University of Nottingham

SusPack addresses the significant environmental impact of single-use plastics in pharmaceutical packaging, with the NHS alone consuming approximately 133,000 tonnes annually. Traditional concerns over contamination and strict regulatory requirements have historically limited the adoption of sustainable alternatives.

Over £8m of investment from Innovate UK's Sustainable Medicines Manufacturing Innovation Programme, led by the National Physical Laboratory, will enable the University of Nottingham's School of Chemistry to work with partners across industry to pioneer greener solutions.

The project focuses on accelerating the uptake of sustainable pharmaceutical packaging by leveraging green chemistry and innovative manufacturing practices. It adopts a holistic, circular supply chain approach, targeting both primary packaging and secondary packaging used within the sector. Working closely with long-term industry partners Nextek, the Nottingham team are principally focused on developing methods for recycling of pharmaceutical blister packs, by levering the unique properties of supercritical carbon dioxide.

The SusPack programme will demonstrate that environmental goals can be met without compromising product safety or performance. SusPack is set to shape the next generation of pharmaceutical packaging, offering a scalable model for decarbonising healthcare supply chains.

Find out more at the website:
tinyurl.com/GrdCha

Scalable case study: Green Surgery

Professor Aneel Bhangu, University of Birmingham

Surgery accounts for up to 70% of NHS waste, but the NIHR-funded Green Surgery team based in the Surgical Data & Policy Hub at the University of Birmingham can safely reduce that. Surgical teams are the biggest producers of waste in the NHS, with most of it incinerated or sent to landfill, but initiatives (including the safe reuse of equipment) can significantly reduce the amount of equipment that is considered single-use only.

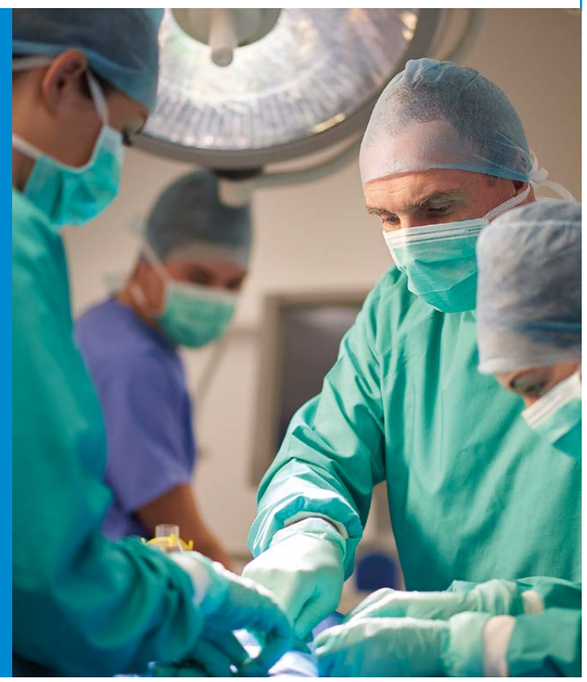
Through the 'Rethinking the UK's Approach to Surgical Waste' report the team has showcased how NHS operating theatres around the UK can reduce the estimated 156,000 tonnes of medical waste produced each year. It also includes case studies of NHS hospitals around the UK which have implemented sustainable practice in operating theatres and in operating theatres and in surgery.

But, as the report highlights, there is still more to do. Waste segregation varies considerably across different hospitals, with many unsure of the correct waste collection methods and whether any sustainable measures are available. A large number of hospitals want to see more sustainable measures for disposal.

The Surgical Data & Policy Hub continues to deliver high-impact, pragmatic research in environmentally sustainable surgery, as well as raising awareness on the urgent need for sustainability in healthcare with dissemination events and training.

Find out more:
tinyurl.com/SrgWst

NHS operating theatres around the UK **can reduce the estimated 156,000 tonnes of medical waste** produced each year.



6. Shared barriers and enablers

Despite the focus areas of this work covering different technologies, patient pathways and parts of the healthcare system, the same barriers and enablers appeared repeatedly. These are significant because they explain why good ideas remain local and why additional research alone will not deliver change. The Midlands programme should, therefore, treat them as cross-cutting workstreams, with common methods and support available to every demonstrator.

Data: enough confidence to decide

Finding: Fragmented or high-level information, limited sub-metering, inconsistent Scope 3 and product data, and weak access to non-patient operational data.

Why it matters for delivery: Decision-ready evidence allows teams to identify hotspots, compare options and build business cases. The priority is common methods, proportionate analysis and transparent uncertainty.

Enablers: Data is both a technical and a governance issue. The region should agree a minimum set of evidence for each project, including baseline, cost, carbon, clinical outcomes, resilience, adoption and equity where relevant. It should also record the assumptions and system boundary. This will make projects comparable without forcing every team into a full life cycle assessment.

Funding: bridge the implementation gap

Finding: Short-term grants, capital and revenue separation, narrow funder remits, and benefits that fall in different budgets (potentially for different organisations) or future years.

Why it matters for delivery: Whole-life business cases and staged demonstrator funding can bridge research, implementation and adoption. Funding should include evaluation, procurement, maintenance and workforce support.

Enablers: Many innovations fail between pilot and adoption because funding stops once technical feasibility is shown. Demonstrator budgets should cover implementation science, workflow redesign, procurement, training, health economics and follow-up. The Accelerator should coordinate bids across ERA, MI Health, NHS partners, local authorities and industry so that projects contribute to a common portfolio rather than compete as disconnected proposals.

Governance and procurement: design the route to scale at the start

Governance

Finding: Split responsibilities, variable trust processes, late clinical or infection-prevention involvement, and unclear routes to national approval.

Why it matters for delivery: Bring clinical, technical, finance, procurement, digital and research perspectives together at challenge definition and design stage. Use clear governance and escalation routes.

Procurement

Finding: Upfront price, optional sustainability criteria, limited comparable data and burden on SMEs.

Why it matters for delivery: Use whole-life value, forward procurement, shared supplier data and practical templates. Procurement is the route through which successful pilots become routine practice.

Enablers: Each demonstrator should identify the eventual adoption route before it begins. This includes who would buy the solution, what technical or clinical standards apply, which national bodies need to be engaged and what evidence a finance director or procurement team will require. Early engagement can prevent a successful pilot from producing evidence that is interesting academically but unusable operationally. Engagement with existing support infrastructure (such as the Health Innovation Networks) throughout this process is critical.

Skills and behaviour: people are the implementation infrastructure

Skills and capacity

Finding: Small sustainability teams, limited time, uneven specialist knowledge and dependence on individual champions.

Why it matters for delivery: Role-specific education, communities of practice, placements, fellowships and implementation support create repeatable capability rather than isolated enthusiasm.

Behaviour change

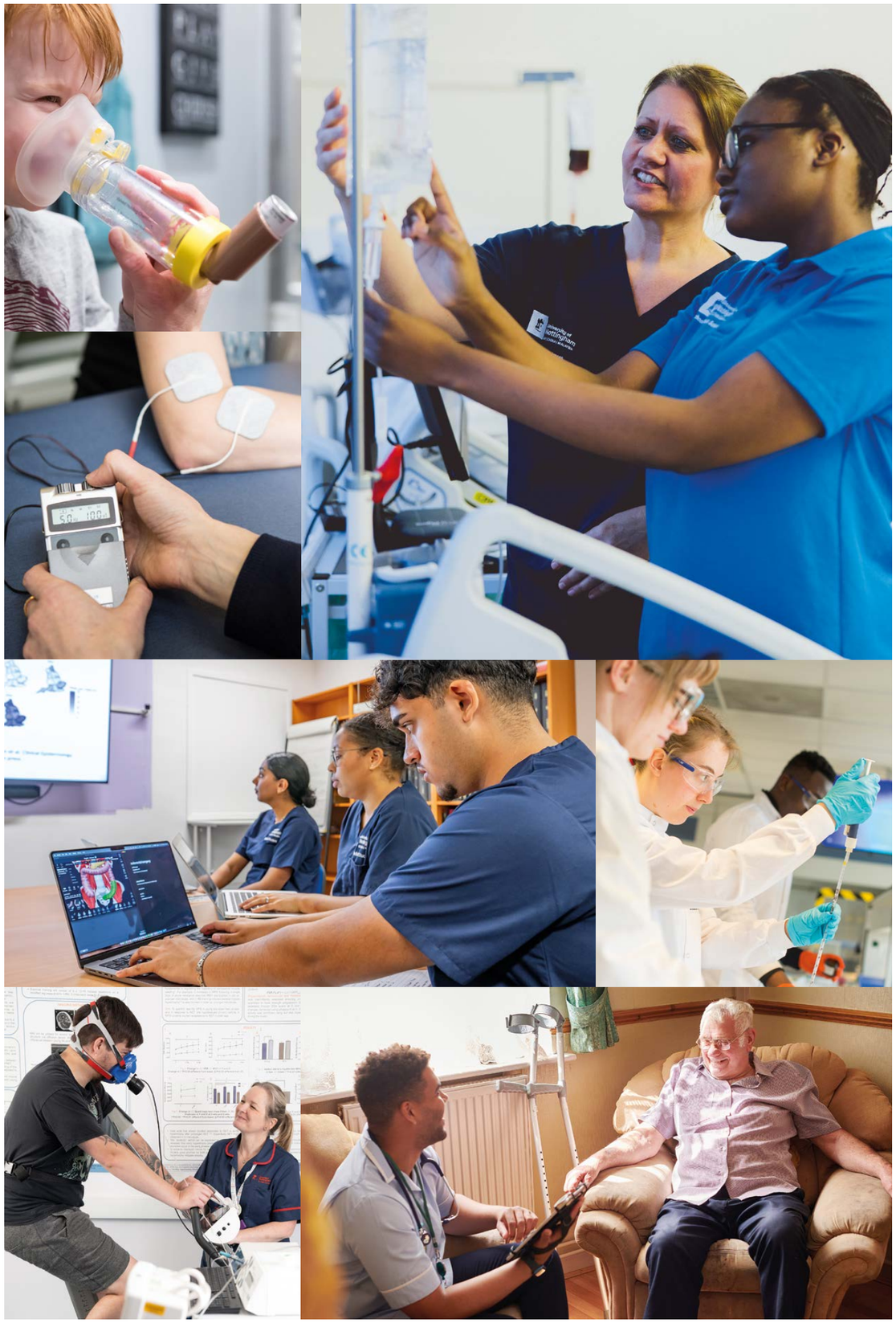
Finding: Habit, clinical pressure, staff turnover, unclear agency and interventions that feel additional to care.

Why it matters for delivery: Design change into normal workflows, secure senior and clinical sponsorship, use clear exemptions and feedback, and involve behavioural and communications expertise. An organisational ethos for sustainability can reduce the burden on individuals.

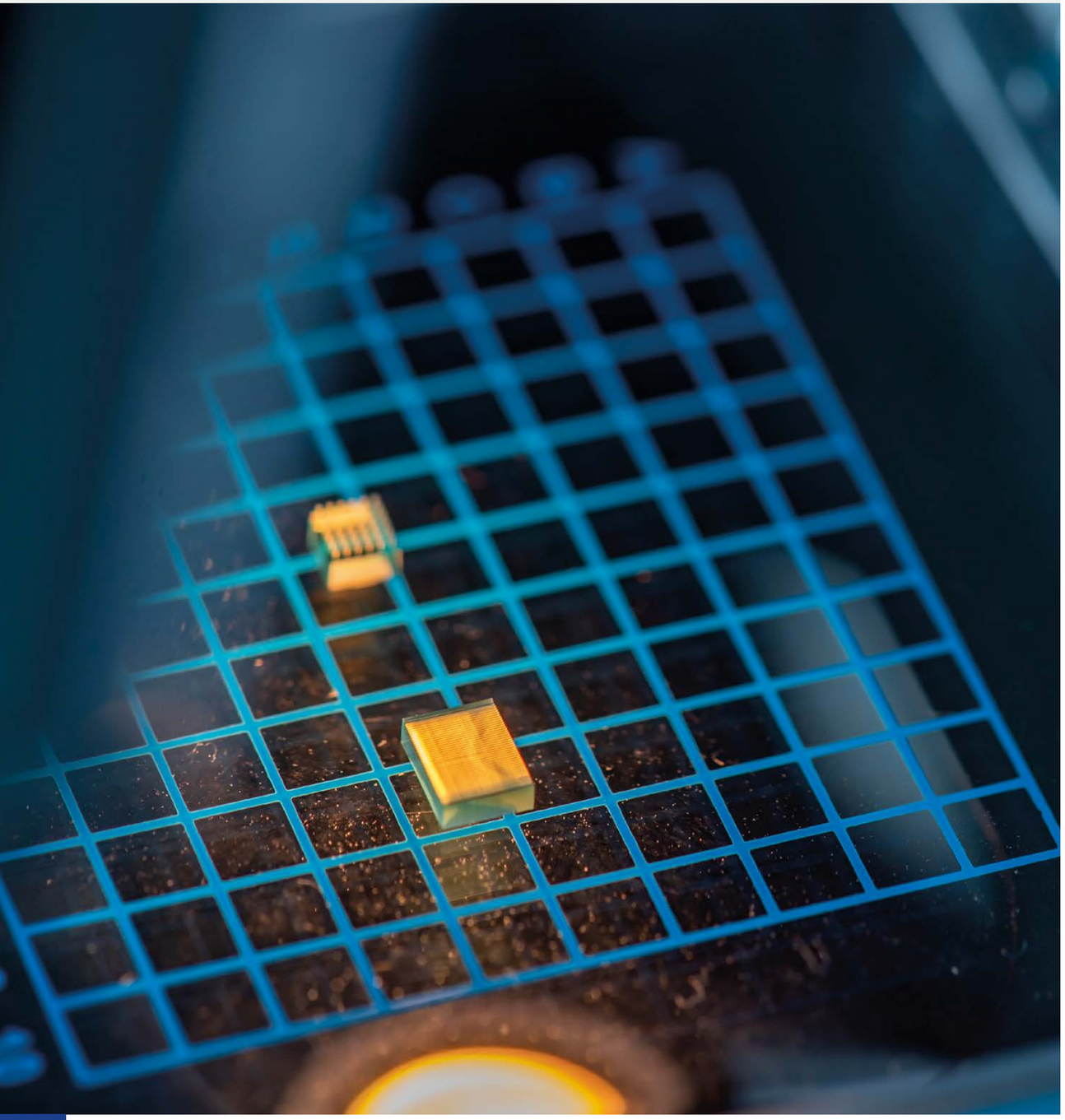
Enablers: Technology does not implement itself. Busy clinical and operational teams will adopt change when it is safe, practical, relevant and supported. A joint programme should use role-specific learning, peer networks, clinical champions and clear executive accountability. Behavioural science and communications should be included in project teams, particularly where the intervention depends on repeated actions such as segregation, product use, energy control or return of devices.

Cross-cutting recommendation: The Midlands Healthcare Accelerator should create one shared implementation support offer for all work packages: data and evaluation, whole-life business cases, procurement and regulatory navigation, skills and behaviour change, and national policy engagement.

Technology does not implement itself. Busy clinical and operational teams will adopt change when it is safe, practical, relevant and supported. A joint programme should use role-specific learning, peer networks, clinical champions and clear executive accountability.



2. Midlands Healthcare Net Zero Accelerator



A delivery framework, not another research centre

The Midlands Healthcare Net Zero Accelerator is the central recommendation arising from the synthesis of the four workshops and the subsequent recommendations work. Its purpose is to move the region from a collection of strong institutions and projects to a coordinated programme with national relevance. It should be co-designed and, ideally, co-led with NHS partners, drawing on the convening reach and complementary capabilities of ERA and MI Health, alongside local government, industry, funders and community partners.

The Accelerator should not duplicate Health Innovation Networks, national NHS programmes, Catapults or existing university centres. It should align these assets around selected healthcare challenges and provide or connect regional delivery functions that participants identified as fragmented or insufficiently joined up: challenge selection, partner formation, demonstrator development, common evaluation, implementation support, evidence sharing and policy translation.

Its distinctive proposition should be that the Midlands is a place where national priorities can be tested regionally at sufficient scale and diversity. Evidence from a portfolio of acute, community, mental health and home-based settings will be more transferable than a single showcase site. Regional testing should be designed from the outset to inform NHS standards, national procurement, funder priorities and government policy.

Proposed objectives

- **Identify and prioritise the most significant sustainability and resilience challenges facing healthcare in the Midlands.**
- **Coordinate collaborative funding and investment propositions that respond directly to NHS and community-care needs.**
- **Establish real-world demonstrators with common evaluation and clear routes to adoption.**
- **Accelerate implementation through procurement, business-case, workforce, regulatory and behaviour-change support.**
- **Support commercialisation, manufacturing and SME growth in areas of regional strength.**
- **Translate regional evidence into national policy, standards and procurement practice.**

A Midlands Sustainable Healthcare Evidence Platform

The evidence platform should be the shared infrastructure of the Accelerator. It should not become a static library of reports. Its value lies in helping a trust, researcher or supplier answer practical questions: Has this been tried in a comparable setting? What evidence is ready for adoption? What data and approval are required? Who has relevant expertise? Which funding route is open? How clearly does it align to national standards?

It should provide and ensure:

- Demonstrator outcomes and implementation case studies, including failures and conditions for transfer.
- Energy, estate and climate-risk benchmarks, with building and service archetypes.
- Scope 3, product carbon and life cycle methods that are proportionate to decisions.
- Procurement templates, supplier evidence, business-case tools and regulatory guidance.
- A research-gap and demand-signalling function for universities, funders and industry.
- Communities of practice and named contacts for peer learning.

National value: **The Accelerator should publish evidence in formats that national bodies can use: technical and procurement specifications, implementation packs, standard evaluation datasets, policy recommendations and clear statements of where national action is needed.**

3. Midlands action plan

The comprehensive findings laid out in this report support a phased action plan that begins with coalition-building and a small number of priorities, then expands as evidence and delivery capability mature. The aim is to demonstrate movement within 12 months, while creating a credible three-year regional programme.

Phase 1: establish and select, first 0 to 6 months

- ERA and MI Health establish an Accelerator design group with NHS trusts and ICSs, local and combined authorities, industry and funder representation.
- Agree three to five regional challenge statements and a common selection framework based on system value, readiness, transferability and national relevance.
- Map existing projects, facilities, datasets, case studies and funding opportunities to avoid duplication and identify quick connections.
- Select an initial place-based energy site and a circular MedTech or procurement challenge for demonstrator development.
- Define the minimum viable evidence platform and common evaluation framework.

Phase 2: launch and learn, 6 to 18 months

- Launch the first two demonstrators with implementation, procurement and behaviour-change support included in the project design.
- Open the evidence platform with regional case studies, baseline methods, partner directory and a clear distinction between ready-to-adopt evidence and research needs.
- Establish a Green Estates Community of Practice and a Sustainable Procurement and MedTech network.
- Create a small cohort of implementation fellows, students or apprentices working on demonstrator-linked trust priorities.
- Publish the first policy and market demand signals, including barriers requiring national resolution.

Phase 3: scale and influence, 18 to 36 months

- Expand the Living Lab network across acute, community, mental health and home-based settings.
- Replicate successful interventions at additional sites using standard implementation packs and whole-life business cases.
- Coordinate larger funding and investment propositions across work packages, including public-private delivery models where appropriate.
- Work with NHS England, Department of Health and Social Care (DHSC), Department for Energy Security and Net Zero (DESNZ), UKRI (particularly Innovate UK), NIHR, and regulators to translate regional evidence into business opportunities, policy, standards and procurement.
- Develop a national dissemination and adoption programme with other regions and Health Innovation Networks.

Priority demonstrator portfolio

Place-based energy and resilience

- **Illustrative scope:** A major hospital and surrounding partners test integrated heat, storage, renewables, flexibility, cooling and adaptation.
- **Core outcomes:** Energy, cost, resilience, clinical continuity, investment and transferable commercial models.

Circular MedTech and reverse logistics

- **Illustrative scope:** Selected devices are redesigned or returned for safe reuse, repair, remanufacture or material recovery.
- **Core outcomes:** Safety, product life, collection rates, carbon, cost, user acceptance and SME growth.

Digital twin and intelligent estate

- **Illustrative scope:** A digital model supports a defined estate or pathway decision using robust data and human oversight.
- **Core outcomes:** Energy and space productivity, maintenance, decision quality, digital burden and transferability.

Whole-life procurement

- **Illustrative scope:** Two high-volume categories are compared using cost, carbon, water, resilience, staff time and end-of-life evidence.
- **Core outcomes:** Procurement method, supplier response, total cost, carbon, safety and adoption.

Community care and transport

- **Illustrative scope:** A neighbourhood or virtual-care pathway tests estate, travel, device, digital and return-logistics impacts.
- **Core outcomes:** Patient access, equity, travel, acute demand, digital inclusion, cost and carbon.

Route from regional pilots to national adoption

National adoption will not happen automatically after a successful pilot. The route needs to be built into project design. Each demonstrator should identify the national owner or decision-maker, the evidence and standards required, and the commercial or procurement route. Evaluation should include implementation conditions, not only technical performance.

A. Define the adoption pathway before launch. Identify the eventual buyer, approving body, standard, funding mechanism and policy owner.

B. Use common evaluation and comparable data. Apply a minimum dataset across projects so national bodies can compare outcomes and understand uncertainty.

C. Produce implementation products. Translate research into specifications, business cases, procurement language, training and operating guidance.

D. Replicate within the Midlands. Demonstrate transfer across at least two different organisations or care settings before claiming national scalability.

E. Engage national partners throughout. Use an advisory route with NHS England, DHSC, DESNZ, UKRI (particularly Innovate UK), NIHR, regulators and professional bodies.

F. Disseminate through existing networks. Work with Health Innovation Networks, professional bodies and national communities of practice rather than creating a separate dissemination system.

Measuring progress

Carbon reduction is essential, but a balanced scorecard will make the programme relevant to finance, clinical, operational and policy leaders. Measures will need clear baselines, assigned ownership, appropriate validation and a suitable reporting schedule. They should include:

- energy and emissions avoided, including Scope 3 where proportionate
- cost avoided, whole-life value and investment leveraged
- waste prevented, products reused or recovered, and supply-chain risk reduced
- patient safety, access, equity and service outcomes
- estate and energy resilience, including continuity under climate or supply disruption
- staff experience, skills, behaviour and adoption
- SME participation, commercialisation, manufacturing and regional jobs
- replication beyond the first site and influence on national policy, standards or procurement.

Policy change

To enable the effective delivery and implementation of the aforementioned work, the Midlands programme should work with national policymakers to create the conditions for delivery rather than requesting another strategy. Fundamental to this should be actions to:

- Recognise healthcare as critical energy infrastructure and integrate NHS organisations into place-based energy and network planning.
- Create funding routes that support implementation, evaluation, procurement and scale-up as well as discovery and technical pilots.
- Reform business-case and procurement approaches around whole-life value, with clear national methods for carbon, resilience and social value.
- Improve access to non-patient operational data and establish consistent national standards for product carbon and life cycle evidence.
- Align health, energy and industrial policy so sustainable healthcare investment supports regional manufacturing, SME growth and supply resilience.
- Clarify regulatory and waste-classification routes for safe reuse, remanufacturing, reverse logistics and material recovery.

4. Conclusion

The Midlands has the assets to become the UK's leading demonstrator region for sustainable healthcare.

> **The findings showed that the required technologies, research strengths and examples of good practice already exist. The primary challenge is connecting them to healthcare need and creating the conditions for implementation at scale.**

A collaborative whole-system view must remain the organising principle. Energy and estates cannot be planned without future care models. Sustainable products cannot be designed without procurement and return logistics. Data tools cannot deliver value without digital foundations and accountable users. Behaviour change will not persist without senior and clinical support. Regional growth will not follow unless SMEs and manufacturers have clear demand, access to real settings and a route to adoption.

The Midlands Healthcare Net Zero Accelerator provides a practical response. It can convene the right organisations, identify shared challenges, support demonstrators, create a living evidence platform and translate regional learning into national action. Its value will be judged not by the number of projects it hosts, but by whether it helps healthcare organisations adopt solutions that improve care, productivity and resilience while reducing carbon and material demand.

The next step should be deliberately tangible: led by ERA and MI Health, establish the coalition, select the first two demonstrators and launch the minimum viable evidence platform within 12 months. Subject to partner commitment and funding, this would evidence how the Midlands can move from discussion to delivery and offer a model for how academia, industry, healthcare and regional government can collaborate on one of the NHS's most complex long-term challenges.

The national challenge for policy makers is to recognise the strengths of the region, support the delivery of this programme, enable the uptake of its demonstrators nationally and make the necessary policy alignments within both the healthcare service and regulatory systems, to enable lasting impact.

Figure 2: Midlands Healthcare Net Zero Accelerator

Midlands ecosystem partners and contributors

NHS & Integrated Care Systems, universities and researchers, industry and SMEs, local government, funders, investors, communities and patients

Appendices

Appendix A | Workshop 1: Energy, decarbonisation and Net Zero initiatives

Session focus

The first workshop focused on the energy transition across NHS buildings and community-care settings. It considered the four-step estate pathway discussed by NHS England: reducing demand, preparing buildings for electricity-led heating, switching to non-fossil heating and increasing on-site renewable generation. The session also looked beyond acute hospitals to prevention, air quality, active travel, sustainable transport and the implications of shifting care into the community.

Key areas of discussion

- The need for credible baselines, energy audits and sub-metering so trusts understand where energy is used and where losses occur.
- Clinical estate constraints, including high-temperature heat, ageing buildings, combined heat and power systems, infection-control requirements and live-service retrofit.
- Local energy opportunities including heat networks, geothermal energy, thermal storage, waste heat, renewables, batteries and microgrids, subject to demand, grid and commercial conditions.
- The need to link estate decisions with care pathways, staff and patient travel, logistics, community facilities and neighbourhood health centres.
- Climate resilience through overheating, flooding, ventilation, air quality and the risk of poorly planned electrification creating new vulnerabilities.

Themes raised

The strongest theme was that energy decarbonisation must be holistic. Participants warned against treating the estate as an isolated technical problem because the same decision can affect clinical productivity, patient experience, grid demand, indoor air quality, staff comfort and local resilience. No single technology pathway will suit every site. Retained core estate should be prioritised for major investment, while less strategically important buildings may require lighter-touch interventions, repurposing or rationalisation.

Place-based collaboration was also central. A hospital can be a major anchor load, but one site may not justify the infrastructure needed for geothermal heat, district energy or major storage. Local authorities, universities, housing, industry and data centres can therefore be essential partners.

Recommendations from the discussion

- Create Midlands demonstrators for place-based energy, testing integrated heat, renewables, storage, flexibility and resilience around healthcare anchor sites.
- Develop heat decarbonisation plans for all retained and strategically important estate, supported by energy audits and sub-metering.
- Prioritise no-regrets measures before major technology replacement.
- Integrate adaptation, cooling, flood risk, ventilation and passive resilience into estate plans.
- Build a regional community of practice for estates and energy managers.

Appendix B | Workshop 2: Policy, data and system-level innovation

Session focus

The second workshop examined the policy, data and system conditions needed to futureproof healthcare. It was framed around predictive and adaptive systems, energy resilience, sustainable procurement, workforce capability, climate-ready infrastructure, modelling and digital tools. Climate change was treated as a direct health and service risk, affecting demand, safety, workforce pressure and supply continuity.

Key areas of discussion

- Scope 3 emissions, supplier reporting and the difficulty of translating broad carbon estimates into local action.
- Data quality and usability across Green Plans, climate risk, building performance, procurement, travel and health-inequality datasets.
- Energy security as clinical resilience, including global price shocks, local energy partnerships and service continuity.
- Digital twins, artificial intelligence and smart energy systems, with value dependent on metering, governance and digital maturity.
- Role-specific training, sustainability in professional education and routes for students and apprentices to support trust priorities.
- Transport and access as a shared regional challenge that individual trusts cannot solve alone.

Themes raised

The workshop exposed the gap between information and implementation. National tools and supplier platforms may exist, but local teams often lack the capacity or confidence to use them in decisions. Reporting should enable action rather than become another compliance process. The fragmented nature of the NHS means that clear policy must be matched by local governance, feedback loops and practical implementation support.

Recommendations from the discussion

- Establish consistent regional methods for Scope 3, climate risk, estates resilience, travel and product carbon.
- Pilot digital twin and smart energy approaches around defined operational decisions.
- Convene a Midlands transport and healthcare access working group.
- Develop practical procurement and sustainability training linked to live decisions.
- Create structured student and apprentice projects linked to trust priorities.

Appendix C | Workshop 3: Sustainable MedTech, advanced materials and design

Session focus

The third workshop considered how sustainable medical technology, advanced materials, design and clean energy technologies can reduce healthcare demand and emissions. It moved beyond individual devices to prevention, diagnostics, home monitoring, low-carbon pathways, product lifetime, reuse, repair, remanufacture, recycling and end-of-life recovery. Medicines, anaesthetics, inhalers, wearables, critical materials and innovation funding were also discussed.

Key areas of discussion

- Small medical devices are difficult to circularise because they are low-value, complex, contaminated, electronic or not designed for disassembly.
- Materials innovation included X-ray garment recovery, lightweight implants, modular design, 3D printing and longer product life.
- Reverse logistics are underdeveloped for products and medicines used in hospitals, clinics and homes.
- Medicines have impacts through manufacturing, packaging, cold chains, waste and clinical choices such as inhalers and anaesthetic gases.
- Wearables and home monitoring can support care closer to home but may shift impacts into electronics, data and domestic waste.
- Waste prevention and segregation have delivered early benefits, but deeper circular models are needed for the next phase.

Themes raised

Products need to be designed for both life and afterlife. Safety and performance remain non-negotiable, but durability, modular replacement, safe disassembly, reuse and material recovery should be considered from the start. Innovation must also include health economics, logistics, regulation and procurement if it is to scale.

Prevention emerged as a major decarbonisation strategy. Earlier diagnosis, medicines optimisation, non-pharmaceutical interventions where suitable, social prescribing and home monitoring can reduce avoidable high-carbon care, provided safety, equity and outcomes are protected.

Recommendations from the discussion

- Develop a Midlands sustainable MedTech and circularity testbed.
- Support prevention, home monitoring and low-carbon prescribing while assessing unintended impacts.
- Strengthen sustainability and circularity criteria in procurement.
- Use forward procurement to signal future requirements to suppliers.
- Create common life cycle methods and user-friendly decision tools.
- Test reverse logistics through pharmacies, couriers, retailers and standardised returns.

Appendix D | Workshop 4: Supply chains, circular economy and waste

Session focus

The fourth workshop focused on the products, materials, supply chains and waste systems behind everyday healthcare. It explored contaminated waste, waste-to-energy, medical plastics, reusable products, procurement, social value, product carbon data, sustainable chemistry, medicine waste, logistics, behaviour and local supply chains. The discussion reinforced that the circular economy begins with using less and keeping materials at their highest value for longer.

Key areas of discussion

- The waste hierarchy, with prevention and reduction ahead of reuse, recycling, energy recovery and disposal.
- Contamination, infection prevention, classification, decontamination and emissions controls as practical barriers.
- Virgin and blended medical plastics, single-use cartridges and the need for early materials and design input.
- Procurement and social value as major levers, constrained by product data and specialist capacity.
- Variation between trusts, professional bodies, boards and clinical workflows, which affects transferability.
- Supply-chain resilience across medicines, reagents, materials, transport, geopolitics, climate and community care.

Themes raised

The fastest opportunities often come from reducing avoidable use, including unnecessary gloves, over-opened packs, disposable coverings, surplus stock, medicine waste and poor segregation. These changes require clinical endorsement and behaviour support rather than major new technology. Sustainability must also become explicit in governance so that it carries weight alongside safety, cost, resilience and productivity.

Recommendations from the discussion

- Build practical product-carbon data for high-volume, high-cost and high-impact categories.
- Launch waste-reduction pilots with clinical exemptions and implementation support.
- Develop decontamination and recovery demonstrators for selected high-value materials.
- Create whole-life procurement templates and training.
- Map critical materials, chemicals, reagents, medicines and devices.
- Include social care and community care in waste and medicines optimisation.

References and further reading

[1] NHS England, Midlands region. Current overview of the Midlands region, including 11 integrated care systems and 42 trusts. https://www.england.nhs.uk/midlands/

[2] NHS England, Estates Returns Information Collection 2024/25. Mandatory official statistics on the NHS trust estate. Regional site, floor-area and backlog figures in this report are Madano calculations from the trust and site CSVs. https://digital.nhs.uk/data-and-information/publications/statistical/estates-returns-information-collection/summary-page-and-dataset-for-eric-2024-25

[3] NHS England, Delivering a Net Zero NHS. NHS Net Zero targets and delivery framework. https://www.england.nhs.uk/greenernhs/a-net-zero-nhs/

[4] Department of Health and Social Care, Fit for the future: 10 Year Health Plan for England. Policy framework for the shifts from hospital to community, analogue to digital and sickness to prevention. https://www.gov.uk/government/publications/10-year-health-plan-for-england-fit-for-the-future

[5] Department of Health and Social Care, Design for Life roadmap. National roadmap for a circular economy in medical technology. https://www.gov.uk/government/publications/design-for-life-roadmap

[6] NHS England, Evergreen Sustainable Supplier Assessment. Single NHS route for suppliers to report sustainability information. https://www.england.nhs.uk/nhs-commercial/sustainability/evergreen/

[7] NHS England, NHS Net Zero Supplier Roadmap. Supplier requirements and direction towards product-level carbon information. https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2024/04/NHS-Net-Zero-Supplier-Roadmap-2024.pdf

[8] Midlands Health Innovation, Midlands MedTech Sector Analysis. Regional assessment of MedTech business scale, employment, productivity, business size and clusters. https://mihealth.org.uk/wp-content/uploads/2024/07/Midlands-MedTech-Sector-Analysis-Print_Final2_MHI.pdf

[9] UK Government, Life Sciences Sector Plan 2026. National plan linking innovation, NHS reform, manufacturing, SMEs, regional clusters, resilience and Net Zero. https://www.gov.uk/government/publications/life-sciences-sector-plan/life-sciences-sector-plan

[10] Department of Health and Social Care, Medical technology strategy: one year on. Update on innovation pathways, procurement, adoption and Design for Life. https://www.gov.uk/government/publications/medical-technology-strategy-one-year-on/the-medical-technology-strategy-one-year-on

[11] Midlands Engine Observatory, Advanced Manufacturing. Current regional advanced manufacturing profile and economic contribution. https://midlandsengineobservatory.org/advanced-manufacturing/

[12] Department for Business and Trade, Healthcare and life sciences investment. Current description of the Midlands as the UK's largest MedTech cluster. https://www.business.gov.uk/invest-in-uk/sectors/healthcare-and-life-sciences/

[13] Office for Life Sciences. Bioscience and health technology sector statistics (2023 to 2024). https://www.gov.uk/government/statistics/bioscience-and-health-technology-sector-statistics-2023-to-2024

Workshop and project source materials

- ERA and MI Health Workshop 1 transcript: Energy, decarbonisation and Net Zero Initiatives in the NHS and the community.
- ERA and MI Health Workshop 2 transcript: Policy, data and system-level innovation.
- ERA and MI Health Workshop 3 transcript: Sustainable MedTech, advanced materials, design and clean energy technologies.
- ERA and MI Health Workshop 4 transcript: Supply chains, circular economy, industrial sustainability and waste management.
- Draft workshop reports 1 to 4.
- Insights Report Outline, Chapters 5 to 7 summary, and Futureproofing Healthcare recommendations.

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