

Scottish Research Innovations Futures

Just Transition to a Net Zero Carbon Society

Event Report | 28th July 2021



“Government policy is that we are going to have to achieve a just transition to net zero carbon. Between now and 2045, we need to decrease CO₂ equivalent emissions, but at the same time create jobs and grow the economy. Good jobs and green jobs is the goal.”

Scottish Research Innovation Futures is a challenge-focused workshop series, organised by Research Innovation Scotland (RIS) in collaboration with KTN. The series aims to explore how collaborative research and innovation can tackle grand challenges and help Scotland build back better from Covid-19.

This third workshop in the series, ‘Just Transition to a Net Zero Carbon Society’, focused on two key areas: sustainable mobility and manufacturing, exploring the immediate and long-term challenges and how collaborative research and innovation can tackle these.

The workshop was led by three Scottish Research Pools – ETP (Energy Technology Partnership), ScotCHEM and SRPe (Scottish Research Partnership in Engineering) – in collaboration with KTN.

This report was published online in November 2021. All quotes throughout the report come from workshop participants.

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1. Introduction

“With time pressures and emerging markets in some areas, do we need a change of focus in research and innovation?”

As set by Scotland’s Just Transition Commission, a Just Transition should seek to: build on the existing economic and workforce strengths and potentials; develop resource efficient and sustainable economic approaches; and design and deliver low carbon investment and infrastructure while making all effort to create decent, fair and high value work which does not negatively affect the current workforce and overall economy.¹

As Scotland seeks to make a just transition to a net zero carbon society, the mobility and manufacturing sectors must be at the forefront of change and innovation. This third workshop in the Scottish Research Innovation Futures (SRIF) series brought various actors of the Scottish innovation ecosystem together with leading researchers, businesses, funders and policymakers working in Scotland and across the rest of the UK; their remit was to discuss:

- challenges, opportunities and priorities in reaching net zero carbon in mobility and manufacturing
- the role and contribution of collaborative research and innovation
- how to work together to influence funding and policy to drive these ideas forward
- desired next steps and activities for Research Innovation Scotland (RIS) partners and others

This event report gathers the views of invited participants and aims to present them as they were received. The workshop was an exercise in information gathering and will help to inform the actions that RIS may wish to pursue in continued support of the national challenge toward net zero and a just transition in the areas of sustainable mobility and sustainable manufacturing.

2. Setting the Scene

*“All the conversations we are having today are with the backdrop of the Scottish Government refreshing its energy strategy, which came out in 2017. Surely now what we’re looking at is **deployment**, and that means costs, scale and skills.”*

Two introductory presentations set a course for the workshop, giving an overview of the challenges and progress across sustainable mobility, and sustainable manufacturing.

John Birtwhistle, Head of Policy at First Group, presented two contrasting visions for the decarbonisation of transport, illustrating the complex issues facing policymakers and wider society:

- A “Dystopian” vision involving the replacement of private cars with electric vehicles (EVs), which he believes would retain problems around road congestion, inefficient use of road space, and inequity of access to transport.

¹ <https://www.gov.scot/groups/just-transition-commission/>

- o A “Utopian’ vision with a high degree of (green) public transport and active travel, which could deliver reduced congestion, better use of transport infrastructure, and greater social equity.

To deliver the utopian vision would require policymakers and society to address some significant issues: incentivisation of greener vehicles, how to effect a ‘modal shift’, allocation of road space, and twin track deployment of hydrogen and electric technologies. He advocated looking at mainland Europe for measures that could inform our approach in the UK, such as the European Commission’s proposed new Regulation for the deployment of an alternative fuels infrastructure.

Transport is responsible for ca 27% of carbon production in the UK

John Hand, of the High Value Manufacturing Team at Scottish Enterprise, covering sustainable manufacturing in the chemical, processing and manufacturing industries, summarised what was needed to move towards sustainable manufacturing:

- o more use of clean energy vectors, eg electrification, hydrogen
- o more use of bio-based solutions (both biomass and biotechnologies) eg low carbon protein
- o maximising circularity through remanufacturing, recycling, process cascades, waste valorisation
- o continuous resource efficiency improvement (as part of business as usual)
- o digitalisation of both process and supply chains
- o climate mitigation technology, eg Carbon Capture and Storage
- o multi-disciplinary, whole system approach
- o all whilst maintaining international competitiveness and avoiding carbon leakage².

Manufacturing in Scotland accounts for 11% of the economy, 54% of R&D spend, & contributes to 54% of exports

Scotland’s **strengths** in this transition, he said, would include its clean energy generation potential; natural capital and bio-resources; appetite for a just transition and supportive policy initiatives; skilled engineering offshore workforce; compact size and collaboration culture; and strong research base.

Challenges would include how to source and consolidate bio-based feedstocks at competitive gate prices; competition for biomass and land use; public engagement; grid balancing and reliability; and ability to invest.

Areas of opportunity for the Scottish R&I community include:

National portfolio programmes being ‘worked up’ by Scottish Enterprise	UK Innovation Strategy: 7 technology families of UK strength and opportunity’
Zero emissions Heavy Duty Vehicles	Advanced materials and manufacturing
Decarbonising heat	AI, digital and advanced computing
Scotland in space	Bioinformatics and genomics
Digital scale-up and level-up	Engineering biology
Health for wealth	Electronics, photonics and quantum
Future healthcare manufacturing	Energy and environment technologies
Hydrogen economy	Robotics and smart machines

² https://ec.europa.eu/clima/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en

3. Insights for a Just and Timely Transition: Breakout Sessions

“The insights being gained by the people and businesses tackling this transition are vitally important. We need to disseminate these insights and lessons learned as broadly as possible.”

Four **Sustainable Mobility** groups and four **Manufacturing** groups were formed, with each comprising a mix of participants from industry / research / policy / funding etc and each allocated one of these four themes on their respective areas: **Technology & infrastructure; Policy; Behaviour; Skills**.

Each was asked to debate the challenges and opportunities within each theme, the actions needed to drive innovation, and any other areas to be addressed.

Across all the groups, there was general echoing of the challenges, strengths, capabilities, opportunities and urgency mentioned in the introductory plenary session (and other related workshops in the series). Alongside these, an abundance of other points and examples emerged, often highlighting the overlaps between policy, technology, skills and behaviours. These points are summarised below.

4. Technology & Infrastructure Breakouts

“How do we move at pace and stay competitive? We need a blend of bottom-up and top-down activity and legislation.”

4.1 CRITICAL CHALLENGES AND BARRIERS



The **mobility** group underlined the overlap between technology / infrastructure and policy with references to: the need for policymakers to support, or give clear signals about, zero emissions mobility; the possibility that change could be eased by public ownership of assets; the need for industry and government to share the costs of infrastructure; the key co-ordinating role of local authorities; and the risk that free market solutions could lead to competing technologies rather than collaborative/complimentary solutions (eg the VHS / Betamax scenario).

Among other challenges and barriers raised were:

- more capture, use and open sharing of data is essential to get consumer buy-in, and a framework for information management is needed, including standards for which data is required and how it is collected and disseminated
- the need to look holistically at all forms of transport – road, rail, air and sea – rather than cherry-pick, whilst ensuring sector specific needs are considered
- the need for sector guidance and best practice examples of transition to net zero carbon



In the **manufacturing** breakout on technology and infrastructure, the roles of policymakers and private sector also peppered the discussions. Participants noted a need for policy / legislative intervention (as well as bottom-up innovation and private sector action) in a range of areas from materials strategy, sustainable packaging and infrastructure development (with hydrogen mentioned repeatedly) to addressing supply chain resilience in critical areas.

Around 70% of Scotland's manufacturing base is made up of SMEs

As in other breakouts and workshops, there were pleas for greater dissemination of insights and lessons learned, and a call for a more holistic approach to lifecycle analysis that considers offshoring and imported carbon. Specific gaps included the need for:

- local infrastructure to support sustainable packaging, eg for medical / food and drink packaging
- a national materials strategy in the NHS to promote use of biodegradable materials, and reuse and remanufacturing of medical equipment
- local infrastructure and capabilities in Scotland to support increased recycling of materials, in particular, for electrical remanufacturing.

4.2 KEY STRENGTHS AND OPPORTUNITIES

Scotland's strengths around R&D expertise, the strong innovation ecosystem and connectedness were seen as positives in both mobility and manufacturing.



The **mobility** group saw a clear retrofitting opportunity and advocated further exploration of the role Scotland could play in driving the “embryonic market” in retrofitting internal combustion vehicles.



In the **manufacturing** breakout, a specific strength was Scotland's “remanufacturing community for marine, automotive, aircraft and HGVs”. The challenges and gaps highlighted above were also seen as areas of opportunity. Other specific opportunities mentioned included:

- ethical disposal and reuse of decommissioned wind turbines / aircraft
- sourcing rare earth metals for use in magnets, using secondary recovery and reprocessing
- creation of a centre for urban mining to recover high-value materials from electrical waste.

4.3 PRIORITY ACTIONS



Across the two technology & infrastructure groups, the priority actions identified were to:

- explore how to put data at the centre of technology / zero emission mobility roll-out
- build government / industry partnerships on mobility infrastructure
- advise government and ensure their close involvement with developing consistent, standardised life cycle analysis of carbon impact to create a level playing field for all, including SMEs
- undertake a gap analysis in manufacturing to shape broad-based interventions needed and explore how public sector, industry and academia can collaborate to develop a more agile transition
- showcase innovation and best practice examples around sustainable manufacturing and sustainable mobility technology / infrastructure, including retrofitting and routes to market
- identify routes for ethical decommissioning/reuse of major infrastructure such as wind turbines and aircraft
- focus on sourcing, recovery and reprocessing of rare earth metals
- Develop expertise and capability in recovery of high-value materials from electrical waste products
- determine ‘winners’ and what will be critical to Scotland and the rest of the UK in terms of the resilience of infrastructure and supply chain
- continue development of testbeds and demonstrators, especially in energy-intensive sectors, to support SMEs and clusters at local level.

5. Policy Breakouts

“In many respects, there’s a great appetite to do the right things, but sometimes I think we don’t go far enough, fast enough.”

5.1 CRITICAL CHALLENGES AND BARRIERS

Each group pointed to both specific and general / systemic challenges in relation to policy, which in turn raises future questions for RIS partners as to which policy issues should be prioritised and addressed.



The **mobility** group debated the role of policy in generating behaviour change: should change be mandatory (eg low emissions zones) or voluntary? Is EV pricing too attractive compared with public mass transport? How will policymakers address transport poverty and the disproportionate effect of mobility transition on lower-income and other groups? Participants felt that better data was needed to inform these decisions.



For the **manufacturing** group, one systemic challenge was the top-down approach to innovation funding, when it could be more fruitful to focus on ideas coming up from industry. Some also thought that policy risked stifling innovation by being too focused on prescribed approaches and not admitting “left-field” innovation. It was also suggested that funding is not always the incentive for businesses, and other incentives could be explored and developed. There was also a need for gap analysis of businesses’ strengths and capabilities in order to move to a circular economy, and better understanding of what motivates businesses to become circular; both were needed to shape policy.

Finally, there was a view that technology “that is ready, gets deployed”, meaning that we may not focus on the “best technology”. This was in line with mobility group discussions which highlighted the need for investment in the most appropriate, sustainable and adaptable technologies, especially given that technology and mobility needs will evolve. There was a warning that “we ignore autonomous vehicles and responsive solutions at our peril”.

5.2 KEY STRENGTHS AND OPPORTUNITIES

Both groups saw opportunities to learn from other nations or regions on issues from land use to best practice in sustainable mobility and manufacturing. Both groups also saw an opportunity to build on the current appetite and funding for innovation. The **mobility** group highlighted the need for better information provision to consumers; the **manufacturing** group wanted policymakers to sustain the net zero carbon agenda post COP-26 by embedding climate goals in *all* policy, not just climate-focused policy.



The **mobility** group also saw opportunities from exploring policy on road pricing, reuse and recycling of batteries, and mobility credits, to peer-to-peer / vehicle sharing schemes.



In **manufacturing**, participants called for the public sector to focus on the *outcomes* of procurement rather than specific technology (eg ‘zero carbon transport’ rather than ‘hydrogen-fuelled transport’). Areas where participants believed policy could aid progress included: hydrogen; keeping polymers in circulation and out of landfill; and aviation fuel; and recognised that there may be other areas where policy could also aid progress.

5.3 PRIORITY ACTIONS



Overall, the key priorities areas signposted by the two groups were:

- o strong messaging from all levels of government about sustainable mobility
- o running transport systems on a more regional basis (as opposed to national)
- o maximising early wins, eg focus on discouraging single occupancy vehicles in dense areas
- o rural mobility, perhaps using novel approaches to public transport
- o integration of transport policy with land use planning to eliminate need for private transport
- o prioritisation of needs, eg shipping / air solutions needed in 2030s to hit net zero carbon in 2045
- o using green energy policy to drive inward investment in Scotland, and also change mindsets
- o more aggressive / bolder policies and better communication on sustainable manufacturing. Industry and end-users need to be enabled at different levels – from having infrastructure in place to providing practical information on how they move towards zero carbon and circularity. Participants thought further workshops and activity by RIS partners would be beneficial
- o a more holistic innovation approach between government, industry and academia that joins up policy and behaviour change / consumer purchasing power.

6. Behaviour Breakouts

“We are on a journey with companies publishing more information about their carbon, but to assist with consumer choice, I think carbon data around products and services is a necessary step.”

6.1 CRITICAL CHALLENGES AND BARRIERS



Behaviour change was viewed as a major sustainable **mobility** challenge, with a number of hurdles: including political acceptance and electoral cycles hampering bold policymaking; the difficulty of presenting counter-narratives to existing mindsets (eg the status and perceived reliability attached to personal transport); and a tendency for local groups to “get stuck on past failures”, eg cycle lanes. Covid-19 has raised the barriers to change, stoking public fears about the safety of public transport and car-sharing.



In terms of **manufacturing**, the cost of change and transition was seen as a major barrier. Many businesses did not have enough understanding or clarity about the changes needed, and there was a role for academia in providing information and tools to industry. Business support agencies also had a role here. With consumers too, there was a need to increase information and buy-in; both academia and government were seen to have a role in this. One significant information challenge noted was baselining: industry and consumers both need better information about, eg, their current energy mix, and the carbon impact of their decisions, purchases and activities.

6.2 KEY STRENGTHS AND OPPORTUNITIES



For the **mobility** group, the networks of local climate change groups, champions and influencers offer a good opportunity to drive behaviour change, including through publicising their own behaviour change and action. They also thought that increasing the length of pilot schemes could be used to change mindsets and build belief in sustainable travel.



The **manufacturing** breakout suggested that there was a spectrum of decarbonisation – from single process or product transitions to total transition – and businesses of all sizes needed guidance from government, academia and other businesses. There was a view that showcasing certain industries, businesses and projects, and providing clear strategies, best practices and toolkits (process, design, components and business models), would be effective here, showing the impact of sustainability and the route towards it. Academics could assist with this.

6.3 PRIORITY ACTIONS



Priorities for policymakers and the research and innovation community should be:

- improved use of data (including microanalysis), communication and policy to tackle the car culture, including reducing single-occupant journeys and Covid-related fears about safety of public transport and car sharing
- support better alignment /coordination among local action groups to boost collective influence
- provision and dissemination of exemplars and toolkits for manufacturing sectors
- baselining of carbon data to aid decision-making by businesses and consumers; analogies were drawn with consumer food nutrition labelling and energy ratings on appliances.

7. Skills Breakouts

“There’s a need to work very seamlessly across higher education and further education to make sure the right level of skills are in place.”

7.1 CRITICAL CHALLENGES AND BARRIERS

Both streams identified skills gaps that could impede a just transition to net zero.



In the **mobility** group, these related primarily to EVs, including:

- retraining and upskilling a workforce that has worked on diesel / petrol vehicles to work on EVs (especially in skills needed for EV infrastructure, sales and maintenance)
- retrofitting of existing vehicles
- emergency services training /upskilling
- driver training – how to drive EVs efficiently
- life cycle analysis – decommissioning of the whole EV, not just the battery.



In the **manufacturing** skills breakouts, the issues raised were cultural, including:

- underdeveloped start-up culture in the UK
- lack of traction associated with innovation, with insufficient clarity around UK innovation priorities and some political aspects hampering progress
- a need to raise students’ understanding of the career opportunities in translating research.

7.2 KEY STRENGTHS AND OPPORTUNITIES



These challenges also offer opportunities. For example, training the future workforce for the **mobility** sector will support green jobs and a just transition to net zero carbon.



The **manufacturing** breakout group also saw cause for positivity, pointing to the Central Belt’s strong skills ecosystem of higher education and further education providers, ports, chemical and manufacturing assets, infrastructure and supply chains, and a highly skilled workforce. The task is to make the most of the opportunities this ecosystem offers, eg using Scotland’s resources to drive improvements through apprenticeships.

7.3 PRIORITY ACTIONS



The priority actions identified by the two groups were to:

- address the mobility challenges listed above, especially skills development and education around EV maintenance, salesforce knowledge and driver training
- address behavioural and cultural change – changing perceptions across various generations of careers in manufacturing and looking beyond academic research to do this
- embed aspects of the race to net zero carbon across the academic and skills curriculum, right down to primary school level
- identify key areas where time and resource should be invested in terms of manufacturing skills and net zero carbon transition

8. Final Points and Next Steps

“For energy transition and net zero, we require new collaborations that maybe haven’t worked together or even thought about it. Brokerage will be really important.”

The task of feeding back from the breakout sessions went to Dr Alan Wiles, ScotCHEM Director of Operations, and Alex Reid, Business Development Manager – Zero Emission Mobility at ETP, who synthesised the discussions in a plenary session chaired by Dr Matthew Reeves of KTN. The virtual floor then opened up to discussion of three questions.

8.1 IN WHICH AREAS COULD COLLABORATIVE R&I HELP IN THE NET ZERO AREA?



Many ideas for collaborative and cross-disciplinary research and innovation are already covered in the breakout summaries on the previous pages. When asked to consider in the plenary session where collaborative R&I could *best* be directed, participants highlighted the following areas.

Hydrogen, digital transformation, the electrification agenda, clean energy, resource efficient manufacturing. Participants from the National Manufacturing Institute Scotland (NMIS) announced during the meeting that they would be hosting multiple industry-facing workshops to understand the granularity of these areas from a manufacturing perspective (eg what to focus on, key assets, interventions) and invited the research and innovation community to engage with these.

Biorefining, and ‘real’ circularity on critical materials through the ability to refurbish, remanufacture and recycle high-value materials from batteries, motors etc.

Standardisation in how the carbon footprint of different activities, products, processes and sectors is understood, in order to level the playing field for businesses and drive behavioural change.

Communication through case studies, toolkits, guidance, provision of data and messaging, bringing in knowledge from different technology areas, data science and business, among others.

Horizon scanning - looking at policy, best practice and novel approaches in different countries. Several examples of this have already been provided within this report.

Making best use of Scotland's connectedness and scale eg as a living lab for energy systems or other net zero carbon innovation.

8.2 HOW CAN WE INFLUENCE FUNDING?



The short answer to this was through being bold and through brokerage.

Being bold means looking to accelerate the pace of change and, crucially, of **deployment**. Contributors pointed out that in manufacturing, mobility and other areas, the capability to transit to net zero carbon may already exist, but we need to steer funding towards deployment. Suggestions on this ranged from entrepreneurship education to focusing innovation on higher Technology Readiness Levels (TRLs). Further discussion was called for here.

Brokerage was also seen as crucial, including for scale-up on deployment. It was posited that funding for innovation tends to favour large, existing collaborations, but that new groupings and clusters were needed. Scotland was well furnished with innovation brokers and cluster builders – with the Research Pools, Innovation Centres, Interface and other bodies being highly effective examples of this. The next move must be to step up the signposting, synergies, matchmaking and exchange of information, while also eliminating duplication. This is a key issue for RIS partners, funders and others to explore further.

8.3 HOW CAN WE WORK TOGETHER DIFFERENTLY TO DRIVE THESE IDEAS FORWARD?



The answers to this have largely been covered above. Centre-stage in the discussions were **scaling up** on deployment; fostering **new collaborations**; and turning the dial up even further on **brokerage**.

Skills was another area mentioned, where participants discussed what was needed to cover the skills gaps mentioned in the breakouts. There was praise for existing skills collaborations, including for industry doctoral programmes delivered by research pools such as ETP and SRPe, and the Energy Skills Partnership. Also critical will be involving colleges in reskilling and upskilling in “net zero skills” (eg in mobility) and digitalisation, and working seamlessly across further and higher education on future skills.

8.4 NEXT STEPS



Throughout the workshop came clear pointers for further collaboration – from knowledge gaps that need to be filled to calls for future discussions and workshops on sectoral opportunities.

The Scottish Research Pools, with their multi-disciplinary expertise and connections, have a clear role here, as do their wider RIS partners: the Innovation Centres and Interface. Together, and working closely with other key players in this sphere, they will ensure the outputs from this workshop are integral to their considerations in planning of their future collaborative activities around the just transition to a net zero carbon society.

“There is definitely the potential of using Research Innovation Scotland as a more central focal point to signpost to the right activities and ensure the right partners are brought together.”

Be Part of Scottish Research Innovation Futures

Scottish Research Innovation Futures is a series of workshops and other activities, organised by Research Innovation Scotland (RIS) with KTN, exploring how collaborative research and innovation can tackle grand challenges and help Scotland build back better from Covid-19. The series themes include Health & Wellbeing, Economic Development and Enterprise: The Future of Work in Scotland ('Manufacturing and Green Economic Recovery' and 'Digital Infrastructure'), Just Transition to a Net Zero Carbon Society, and Climate & Environment.

To register your interest in themes within this series, please visit:

www.research-innovation-scotland.co.uk/ris-ktn-workshops

Thank you to contributing Research Pools, Innovation Centres and Interface:

