JIC Sustainability Strategy

April 2023

John Innes Centre
Unlocking Nature's Diversity

Introduction

The United Nations Paris Agreement, which came into force in 2015, highlighted the need to limit global average temperature rises to 1.5°C above pre-industrial levels[1]. To this end, the UK government has committed to progressive decarbonisation and a commitment to 'net-zero' emissions in the UK by 2050[2].

The John Innes Centre (JIC) recognises the threat posed by the climate crisis, the urgency of the challenge and the unique role research institutions play in seeking solutions. As scientific research is a particularly energy and resource intensive field, it is both environmentally and financially important to review and improve on the long-term sustainability of the institute's facilities and working practices. This strategy sets out the roadmap to enhancing sustainability at JIC and is the first, in what will continue to be an annual reporting mechanism, designed to embed sustainability in every aspect of the institute and achieve Net Zero by 2040. Through this strategy, JIC will engage with individuals both internally and externally, to share best practice in combatting the climate crisis.

Author: Ethne Clark, JIC sustainability specialist
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Executive summary

Theme	Topic		Target	Page
Emissions		Carbon footprint	Net zero by 2040; 2025: Improved emissions reporting; TBD: Implementation of the NBI Energy and Carbon Management Strategy' and 'JIC sustainability strategy'; TBD: Development of the NGI project.	4
Facility		Energy	2023/24: Produce an energy profile breakdown; Quarterly: Assess monthly energy data trends; 2023-2040: Progressively implement energy efficiency improvements (targets TBD) and switch to renewable energy sources.	6
		Waste	Quarterly: Assess waste disposal and recycling rates; Annually: Produce a comprehensive report and run an awareness campaign; 2023-2030: Establish and achieve reduction target (TBD by baseline assessment) and achieve 50% waste to recycling.	8
		Water	2023/4: Breakdown water usage; Annually: Report monthly usage totals on an annual basis; 2023-2030: Establish and work towards water use targets.	10
		Procurement	2023/24: Assess goods purchased through stores within the last 12 months for sustainable alternatives; 2023-2030: Engage with suppliers to drive sustainable market change; Date TBD: Assess supply chain emissions.	12
		Biodiversity	2023/4: Assess the biodiversity value of sites, and protect and enhance existing ecological assets; 2023-2030: Assess and enhance grounds maintenance; increase space for nature and overall biodiversity (by amount TBD); and explore funding to support action; Date TBD: Eliminate peat use and switch to a viable alternative.	14

Research		Sustainable science	**Consumables and waste:** 2023/4: Baseline assessment of disposable lab items, to be reviewed annually; 2023-2030: Reduce single use and disposable items compared with 2023 baseline (by % TBD) and increase reuse and recycle routes compared with 2023 baseline.	16
			Equipment and energy usage: 2023-2030: Understand range of equipment items and energy usage; increase consistency of switching off equipment; install timers where of practical benefit; switch bulbs to LEDs; improve cold storage efficiency; assess ventilation energy use and efficiency; embed sustainability considerations into business cases.	
			Practices and procedures: 2023-2030: Produce and implement guidance on sustainable experimental design	
		Research impact	2023-2030: Align JIC research into plant and microbial science to meet the challenges of a sustainable future (as defined by HP[3]). 2023-2030: Achieve sustainability impact, arising from our science, through engaging with the broader research community, policymakers, industry and the public.	21
People		Travel	2023/4: Log business travel data for scope 3 emissions baseline; Annually: Survey of commuting habits; 2023-2040: Increase % active travel and public transport to commute; reduce emissions from business travel (by amount and timescale TBD); replace end of life fleet vehicles with EVs and expand charging points.	23
		Engagement	2023-2030: Develop communication routes for raising awareness; expand on initiatives, events and campaigns; engage with staff through annual sustainability surveys and discussions; encourage participation in a sustainability scheme; 2023-2030: Engage with external stakeholders to relay JIC's aims, encourage best practice, and promote JIC's sustainability successes.	25
		Governance and delivery	2023/24: Sustainability lead and/or steering group established, timescales and targets internally ratified, JIC policy created and strategy endorsed; 2023/24: Wider internal circulation and launch of strategy; Quarterly: Monitor progress of JIC strategy; TBD: External reporting and transparency of JIC strategy and targets.	27

Carbon footprint

We are in a state of climate emergency, requiring immediate action across all sectors to avoid reaching the tipping point of a 1.5°C global temperature rise. In 2019, the UK government committed to 'net-zero' emissions by 2050 (The Climate Change Act, 2019)[3] and in 2021, announced the target of a 78% reduction in emissions by 2035 (compared to 1990 levels - sixth carbon budget)[4]. With this in mind, Norwich Bioscience Institutes (NBI) have set the target of Net-Zero emissions by 2040, in alignment with UKRI.

JIC's carbon footprint represents the total greenhouse gas emissions caused directly and indirectly by the institute. These are categorised under three scopes:

- Scope 1 covers direct emissions, i.e. combustion of gas used by gas boilers and the CHP, fuel use of company owned vehicles, and fugitive emissions from refrigerants.
- Scope 2 covers indirect emissions, from the purchase and use of electricity.
- Scope 3 covers all other upstream and downstream emissions - that we facilitate but are not in direct control of - e.g., from business travel, employee commuting, waste disposal, investments, capital goods, and purchased goods and services.

JIC has Streamlined Energy and Carbon Reporting (SECR) assessments, for scopes 1 and 2, conducted each financial year (from 2019-20). The emissions reported in our last assessment, for the year 2021-22, totalled 11,282 tonnes of CO_2e. It should be said that this figure is conservative, as the scope 3 emissions are underrepresented, and more data is required for an accurate representation.

In 2022, NBI produced the 'Energy and Carbon Management Strategy for 2022-27' which sets out the path to decarbonisation of the institutes (details in table below). The strategy includes the development of the 'Next Generation Infrastructure' (NGI) project, a major site redevelopment which aims to achieve reduced Whole Life Carbon and achieve Net Zero Operational and Embodied Carbon in the new laboratory building.

Objective	Target	KPI	Action
Reduce the carbon footprint of JIC	Net zero by 2040.	tCO_2e	Improve reporting of greenhouse gas emissions, expanding on SECR reporting for a more complete assessment. E.g., to include refrigerants, investigate scope 3 emissions, improve travel data capture, and investigate supply chain emissions. Establish a baseline for Scope 3 emissions by 2025. Establish scope 3 emission target.
			Assess, implement and monitor progress of the 'NBI Energy and Carbon Management Strategy for 2022-27' and the NGI project: - Development of the NGI project and associated energy strategy; - Creation of a net zero laboratory building, including an efficient substructure design with reduced concrete use, the selection of low embodied carbon materials such as Fermacell boards for partitions, Cross Laminated Timber floor decks, recycled steel, timber studs and GGBS content where possible; - Targeted investments into the creation of a PV Array; - Improved insulation to remaining legacy buildings; - 2023-30: support for electric vehicle use by installing additional 7 kW charging points; - 2035-40: transition remaining gas fired boilers to local ground or air source heat pumps; - Offset residual carbon from 2040 onwards.
			Implement and monitor progress of the 'JIC Sustainability Strategy', set out in this document.

Stakeholders
NBIP facilities, JIC sustainability specialist, NGI project team, lab managers, horticulture services

Energy

The energy crisis, rising fuel costs, and increased pressure on the grid highlight the need for a more sustainable approach to energy production and usage. Research institutes are incredibly energy intensive: a 2021 study found that median energy usage of laboratories is almost three times that of an equivalent sized office[5], and can be up to 100 times as energy intensive as offices in some cases[6].

JIC uses approximately 50 million kWh gas and 13 million kWh electricity per year (of the approximate 60 million kWh gas and 22 million kWh electricity used by NBI plus third parties on site). For reference, the total of 63 million kWh is equivalent to the average energy consumption of 4228 households[7]. For NBI and third parties on site, gas usage for December 2022 alone cost £536,510, and electricity cost a further £201,000. The total energy cost for JIC for the financial year 2022/23 totaled approximately £5 million. Further, energy monitoring and reporting obligations are increasing for large organisations, making it essential that energy consumption, patterns, and profiles are fully understood.

Currently, to meet NBI's energy demand, imported gas and electricity is procured via a competitive, risk managed framework. To improve efficiency, there is an on-site Combined Heat and Power system (CHP) consisting of three gas turbine engines, which generates electricity while producing medium temperature hot water from the residual heat. Despite its efficiency, this system is still gas powered, and some of the heat generated is not currently used due to the need for further pipework. A more efficient boiler plant has been installed, and plans have been made for additional sub-metering - linked to the existing Building Management System (BMS) – to allow energy profiles for each facility on site to be fully understood.

The 'NBI Energy and Carbon Management Strategy for 2022-27' (in conjunction with developing NGI related energy initiatives) outlines NBI's energy decarbonisation programme. Actions include targeted investments in photovoltaics (for on or near site energy generation); improvements in building insulation; transitioning from gas fired boilers to local ground or air source heat pumps; a significant redevelopment of the site through the NGI project; and collaborations with partner organisations.

Reducing the energy we use is also integral to enhancing sustainability. There has been significant progress with upgrading lights to LEDs across site, with all JIC buildings partially or fully upgraded. Areas not completed are either being replaced with LEDs when the lights fail, or as part of any refurbishment planned over the next 3 years. For details on energy used by equipment, see the 'Sustainable science' section of this strategy.

Objective	Target	KPI	Action
Improve understanding and monitoring of energy usage at JIC	2023/24: Produce an energy profile breakdown, Quarterly: Assess institute energy usage profiles from monthly monitoring data.	Production of reports kWh	Breakdown JIC energy profiles, identifying and filling current gaps in submetering.
			Collect monthly data readings.
			Assess and report these readings quarterly to identify areas of highest usage and investigate any fluctuations and trends.
			Agree potential reduction targets.
			Continue targeted energy monitoring of equipment, as per the 'Sustainable science' section of this document. Use this data to identify energy reduction opportunities.
Improve energy efficiency and sustainability	2023-40: Progressively implement energy efficiency improvements (specific timeline of targets TBD).	kWh	Identify remaining opportunities for LED upgrades and complete progressive replacement.
			Strategically consider lighting for timers and sensors.
			Investigate and improve building insulation and the BMS, according to the 'NBI Energy and Carbon Management Strategy for 2022-27'.
			NGI energy measures include reducing the U-values of the fabric envelope where possible, heat recovery for the air handling units, and designing laboratory areas to minimise their operational energy consumption and associated carbon emissions.
			For detail on energy use of equipment actions, see the 'Sustainable science' section of this document.
	2023-2040: Progressively switch to renewable energy sources.	kWh generated from renewable sources	Implement and monitor progress of the switch to renewables, as outlined in the 'NBI Energy and Carbon Management Strategy for 2022-27': targeted investments in PV array, and ground and air source heat pumps.

Stakeholders
NBIP facilities, energy portfolio managers (World Kinect), JIC sustainability specialist, NBIP finance, lab managers

Waste

Since the 1970s, humans have used more resources than the planet can regenerate. We would need 1.75 Earths to maintain the current unsustainable rate of resource consumption, and we are also the only species on the planet to produce waste that is not naturally recycled into the ecosystem[8]. By using resources more efficiently, striving for circular economy and applying the waste hierarchy (see Figure 1)[9], we help to preserve natural resources, prevent pollution, save money, and future proof the way we live for ourselves and for future generations.

Figure 1 - The waste hierarchy

Collectively at JIC, TSL, EI and NBIP, we produce around one transit van of waste every day for our main disposal company, and approximately 200 tonnes per year (according to waste weight taken by Veolia), including the 750 disposable coffee cups which are used across site every week. Approximately 31% of this was recycled between 2019 and 2023 with the remaining figure going to energy recovery. Our current waste streams through Veolia include non-hazardous general waste (incinerated for energy recovery), dry mixed recycling, cardboard, glass, wood and metal recycling, Waste Electrical and Electronic Equipment recycling (WEEE), food waste (for anaerobic digestion to produce renewable energy). We also have hazardous waste collections, WEEE recycling for larger equipment, green waste from horticulture (which produces almost the same weight again), and recycling routes for soft plastics, plant pots, coffee cups and other assorted items (see 'JIC Recycling Guide').

It is currently difficult to separate the proportions of waste produced by each institute, but enhanced data segregation, using an alternative waste supplier is currently being explored. Preliminary audits have been conducted this year, to explore specific items and generation sources: i.e. labs, offices, facilities, catering, contractor waste, horticultural waste and packaging from stores. Currently, green waste material is taken to Suffolk for use. Use on site and at the field station is an option, however the ability to compost and spread requires a licence, with a separate licence for transferring waste to site, a potential alternative is to use a company based closer to site.

For details and strategy for laboratory waste, see the 'Sustainable science' section of this report.

Objective	Target	KPI	Action
Monitor and report on waste production and disposal	Quarterly: Assess the total weight of waste disposed, and the % recycled, via main disposal company (initially JIC, TSL and EI combined, with aims to break data down to institute level). Investigate other potential waste routes. Annually: Produce more detailed report, including quantity of waste generated; a comprehensive list of disposal and recycling routes with % of total waste disposed of through each; and investigate specifics of waste produced.	Total weight in kg Recycling %	Establish dates for quarterly and annual assessments.
			Assess performance reports from waste company.
			Expand baseline assessment of waste to include sources not captured by our major disposal company. I.e., hazardous waste, WEEE recycling, green waste and other recycling routes outlined in the 'JIC Recycling Guide'.
			Conduct visual waste audits and investigate procurement records.
			Investigate more detailed data capture and breakdown of JIC specific waste with major waste company.
			Establish waste reduction targets (e.g. keep annual total under so many tonnes per year, or develop a benchmark according to other BBSRC institutes, or aim for an overall reduction every 5 years.
Reduce waste	2023-2030: Apply the waste hierarchy by increasing prevention and reuse (reduction target TBD by baseline assessment).	Total weight in kg	From audits identify non-recyclable waste to prioritise.
			Monitor number of disposable coffee cups used on site and plan strategy for their reduction and elimination.
			Identify opportunities for implementing circular economy.
Investigate and improve recycling	2023-2030: Maintain and improve on recycling rates to reach at least 50% of waste to recycling.	Recycling %	Assess current recycling routes and how they're used.
			Investigating non-recyclable waste that could be recycled, and switch procurement of non-recyclable to recyclable options where most sustainable.
Raise awareness	2023-2030: Ensure staff and suppliers are aware and engaged with our aims (see 'Procurement' and 'Engagement' sections of the strategy). Annually: One awareness campaign a year, perhaps tied into EWWR.	% of positive responses to annual sustainability survey on subject	Report waste statistics to raise awareness amongst the waste producers (staff).
			Clear signage, education, and resources about how to dispose of different items + highlighting alternatives and opportunities.

Stakeholders
NBIP facilities, JIC sustainability specialist, health and safety, wider staff and students, JIC sustainability specialist, waste companies, suppliers, stores

Water

The rates of water abstraction are already at unsustainable levels, pressure that is only increasing with the growing population and changes in our climate. A report from Water UK states that there could be significant deficits in water availability by the 2040s[10], while the National Infrastructure Commission reports there is a 25% chance that, over the next 30 years, many households and businesses will have their water supply cut off because of a severe drought[11].

Due to the nature of research at JIC and the size of the institute, there is a high requirement for water on site. JIC uses approximately 4.8 million litres of water on average per month (not including irrigation on church farm), making up the majority of water used across NBI. This water is used for horticultural irrigation, in labs, in washers, taps, toilets and showers, and can be lost through occasional leaks.

At present, the water is sourced via a mixture of borehole abstraction (on average, 4.6 million litres per month, with an Environment Agency abstraction license), mains water (103,000 litres a month on average), and rainwater capture (55,000 litres a month on average - though varying from 16,000 to 142,200 L in a month over the last year - and used exclusively in horticultural irrigation). The rainwater capture system comprises a 70,000 L rainwater collection tank, from which rainwater collected off the S60s glasshouses range feeds into four 40,000 L supplementary tanks. This provides UV filtered and PH balanced water to the south 60s and 70s growing areas, with view to expansion to B51 (with more powerful pumps). Lastly, as part of site review, closed loop water systems are being investigated for irrigation in B18, i.e. through treating water for reuse.

Objective	Target	KPI	Action
Understand and monitor water usage	2023/4: Breakdown water usage. Annually: report monthly usage totals on an annual basis.	Production of report	Map the breakdown of water usage across JIC and the field station, and the quantity used from each water source.
			Establish baseline figures and reduction targets (considering data from previous years and annual fluctuations).
			Explore whether metering could or should be enhanced.
Increase water use efficiency (with view to reduction TBD)	2023-2030: Establish and work towards water use targets.	Litres used	Explore and implement efficiency interventions: - Fittings and technologies (e.g. low-flow, dual flush toilets, or retrofit with water saving kits; low-flow faucets including automatic, aerated and non-concussive taps; check EU water labelling for equipment efficiency) - Processes and behaviours (e.g. running washers on full load; using plugs and washing up bowls; monitoring for, reporting and fixing leaks) - Consider water efficient landscaping as part of new site upgrades - Check if water company provides water saving services or visits.
			Explore options for on-site reuse: - Explore greywater reuse (e.g. for landscaping or flushing), water exchange networks, water pinch analysis and closed loop systems (e.g. for RO water).
			Explore alternative water supplies: - Increasing rainwater and stormwater capture (e.g. to new capital projects).

Stakeholders
NBIP facilities, horticulture services, NGI project team, JIC sustainability specialist, wider staff

Procurement

With baseline reporting of scope 3 emissions a priority, investigation of procurement and JIC's supply chain is a way to influence JIC's upstream and downstream emissions. Purchasing decisions are an effective means of expanding the institute's influence beyond our direct impact, and a way to share best practice.

Stores at NBI are centralised, which allows for better control and oversite of procurement decisions. Additionally, this facilitates bulk orders to be made from a more limited pool of major suppliers, thus reducing transportation miles. The central supplies approach to purchasing policy also places the onus on suppliers to reduce waste and carbon emissions. The 'Supply Chain Code of Conduct for JIC, QIB, EI , TSL & NBIP suppliers' requires all new suppliers to commit to actively working on their environmental impact and to have a clear net zero plan in place. Further, NBI is signed up to the London University Purchasing Consortium (LUPC), which facilitates responsible procurement. Membership provides framework agreements between contracting authorities and suppliers, these set out terms and conditions that ensure value for money from the suppliers, in a way that benefits society, the economy, and minimises damage to the environment, while facilitating scope 3 reporting, and includes most of our suppliers.

Other site procurement comes in the form of external purchasing requests, and from the contracted catering provided by Genuine Dining, who on their website state "*We only work with small and independent suppliers so that only the best, local and seasonal ingredients are going into our developing menus*"[12].

Objective	Target	KPI	Action
Assess and improve the sustainability of JIC's supply chains	2023/24: Assess goods purchased through stores within the last 12 months for sustainable alternatives.	Spreadsheet of procurement items considered for alternatives	Systematically assess procurement records to identify sustainable alternatives to stores items, and promote sustainable options (initial focus on most commonly purchase items). E.g. investigate reusable items, consider materials, consider stocking exclusively rechargeable batteries, replace or remove disposable plastic cups, and strive for energy efficient, low waste, lifecycle assessed goods. For detail on lab consumables, see 'Sustainable science' section of this strategy.
			Consider the format of the intranet purchasing site to inform more sustainable options. E.g., adding an icon to signify a sustainable option.
			Consider using https://www.warp-it.co.uk/ to recycle unwanted furniture and equipment items and request items which others may have but no longer use.
			Explore the principals of sustainable procurement, as laid out by ISO 20400, and the Flexible Framework (DEFRA).
			Assess catering provided at the institute and discuss opportunities for improving sustainability – e.g. to reduce packaging and disposable coffee cups, increase locally sourced, seasonal and plant based options, and reduce high impact foods.
	2023-2030: Use JIC's purchasing power and engage with suppliers to drive sustainable market change.	Responses to supplier engagement	Engage directly with main suppliers and express JIC's sustainability aims to reduce waste and carbon emissions. Continue to ask new suppliers to commit to the '*Supply Chain Code of Conduct for JIC, QIB, EI, TSL & NBIP suppliers*', and progressively engage with existing suppliers to communicate our aims.
			Liaise with other institutes (e.g. the Crick and Babraham institutes) to increase pressure on suppliers – e.g. to reduce packaging and single use plastics, and show evidence of carbon reduction plans.
	Date TBD: Assess supply chain emissions.	tCO_2e	Breakdown the scope 3 emissions sources relating to procurement to produce a baseline assessment. Investigate using NBI's LUPC membership to facilitate this.

Stakeholders
Purchasing and stores, catering (Genuine Dining), suppliers, JIC sustainability specialist, NBIP facilities

Biodiversity

We are currently living through a mass species extinction event. Global biodiversity – i.e., the variety of genes, species, and ecosystems on Earth – is falling, and 41% of UK species have declined since the 1970s[13]. As this decline is caused by human activity, it is our responsibility to reverse the trends.

Regarding our area of influence, we are responsible for the land occupied by JIC on the Norwich Research Park (NRP); this is maintained by horticulture services on the JIC site, EI, and by the contractors 'Countrywide' on Anglia Innovation Partnership (AIP) owned land. The site is situated in the Yare valley, between the River Yare at Earlham Park to the east and the Bowthorpe marshes to the north. Both areas are of ecological importance and - with the veteran oaks, hedgerows, and rare Breckland-like grassland on our site - we should aim to be a green corridor connecting the two. We are also responsible for the 110 hectares of Church Farm in Bawburgh, at the Dorothea de Winton Field Station; this arable land is split into 15 plots, with scattered hedgerows, trees, and marl pit ponds, and is also situated in the Yare Valley.

A handful of staff (particularly driven by Anne Edwards) have already been spearheading biodiversity initiatives on site: planting tree and hedge saplings along the Hethersett road in 2017 and the Watton road in 2022; clearing ponds; surveying a roadside nature reserve; leading nature walks; planting a copse of 50, potentially disease resistant, ash trees; and instating bird boxes, feeders, log piles, wormeries and beehives. Further work should therefore support and enhance what has already been achieved.

In addition, the UK Government have announced a ban in England on the sale of horticultural peat to retail consumers by 2024 and to professional growers by 2028 respectively. This ban is in place to protect against the destruction of peatlands, vital ecosystems which constitute the UK's largest store of carbon. Horticulture services have thus been conducting trials to develop the next generation of peat free composts for use in science. The challenge: to end our dependence on peat, by overcoming the inconsistencies of organic compost, thereby maintaining scientific integrity.

Objective	Target	KPI	Action
Enhance site biodiversity	2023/4: Assess biodiversity value of sites	Production of document	Assess and report on diversity, plant cover, connectivity, and habitat types present in our outdoor spaces, and their context in the wider landscape (e.g. phase 1 habitat survey). Identify specific areas for protection and enhancement.
	2023/4: Protect and enhance existing ecological assets	Agreed protected areas	For features identified to be of specific ecological importance, put measures in place for their protection and enhancement (e.g. ponds, veteran trees, wildlife corridors, roadside nature reserve, rare floral communities).
	2023-2030: Assess and enhance grounds maintenance	TBD	Assess current management regimes and explore those of the wider NRP.
			Produce a comprehensive and sympathetic management plan for JIC owned land, including plans for future site developments, collaborating with NRP grounds maintenance to enhance our efforts on a broader landscape context. Considerations: • Mowing regimes should be minimised (e.g. only mowing paths), and sympathetic to seasonal events such as flowering and seed setting; • Inputs (water, compost, chemicals) and new planted species should be assessed (prioritising those native, drought tolerant, suited to the environment, requiring minimal inputs, and with pollinator benefits); • Manual or battery powered equipment should be preferred over petrol and diesel powered.
	2023-2030: Increase space for nature and overall biodiversity (by amount TBD)	Simpson's diversity index, % plant cover, ratio of native to non-native species	Consider, collaborate on, plan, and implement biodiversity enhancing actions, for instance: • At Church Farm – plant wildflower meadow in the Watton Road field, maintain newly planted trees, restore gaps in hedgerows, pond enhancements, consider pollinator and bird borders; • At JIC - consider 'Grey-to-Green' opportunities (e.g. green 'barriers' such as hedges and trellises, green roofs, increasing unpaved areas); • Co-ordinate further tree-planting, hedgerow restoration, and maintenance activities; • Wildflower plots, pollinator borders, bird and insect houses, bat boxes, log piles, bird baths.
			Ensure biodiversity net gain across capital projects
	2023-2030: Explore funding to support action	Funding bids	Explore potential financial support schemes, e.g. https://www.sustainabilityexchange.ac.uk/finding_funding, carbon offsetting initiatives, and Societal Impact Funding.
Phase out peat	Date TBD: Eliminate peat use and switch to a viable alternative (by date TBD)	Kg peat-based products purchased	Continue and complete peat free trials
			Investigate hydroponics and aeroponics
			Pilot use of peat free growing medium in a research project for proof of concept
			Expand use to replace peat-based products

Stakeholders
Horticultural services, AIP and Countrywide, EI, Church farm staff, JIC sustainability specialist, Anne Edwards, NGI project team

Sustainable science

Scientific research generates remarkable discoveries and innovations which are key to achieving a sustainable and liveable future. However, laboratories are also incredibly resource intensive, in terms of single use plastics and energy consumption. The following facts have been taken from the 'Sustainable Laboratories' report published by the Royal Society of Chemistry in 2022[14]:

- *"An estimate from 2008 is that laboratories consume five to ten times more energy than an equivalent-sized office building. That figure can rise to as much as 100, for example for laboratories with clean rooms or high process loads."*
- *"A 2021 study found that median energy usage of laboratories is almost three times that of an equivalent sized office."*
- *"University-level data, collected as part of estates management, shows that water consumption is highest for research-intensive universities. For example, in the UK the Higher Education Statistics Agency publishes estates data annually."*
- *"A widely quoted study from the University of Exeter, UK, estimated that, worldwide, institutions involved in biological, medical or agricultural research produce about 5.5 million tons of lab plastic waste per year: equal to around 2% of global plastic waste."*

Much is already being done to improve the sustainability of JIC's laboratories, especially through participation in the Green Impact scheme. To further tackle the complex challenge of enhancing lab sustainability, this topic is broken down into three main sections:

1) Lab consumables and waste
2) Equipment and energy usage
3) Lab practices and procedures

Lab consumables and waste

<table>
<tr><th>Objective</th><th>Target</th><th>KPI</th><th>Action</th></tr>
<tr><td rowspan="3">To assess lab waste, identify potential reuse and recycle alternatives, and reduce unnecessary waste generation</td><td>2023/4: Complete a baseline assessment of single-use and disposable lab items, to be reviewed annually (to inform reduction goals).</td><td rowspan="2">Number of disposable items purchased through stores</td><td rowspan="2">Conduct a lab waste audit: review lab waste streams and assess procurement records to identify common disposable lab consumables and ascertain baseline figures. Using this, establish a % reduction target.

Systematically consider waste reducing, reuse and recycling opportunities for the disposable consumables:
- Use refill solutions wherever possible. Rerack pipette tips with stacked tips, or 3D print a re-racking device for loose tips[15]. Consider loose centrifuge tubes, rather than pre-racked to avoid polystyrene.
- Consider single use plastics that could be replaced with glassware (or other non-plastics), or that could be decontaminated and reused (e.g., switching 50 ml plastic falcon tubes to glass durans). Assess the practicality of washing, identify non-sterile lab and media preparation work where changes could be implemented, and assess any safety implications to be aware of[16][17][18].
- Consider the benefits and practicality of investing in a tip or multi-well plate washer.
- Consider decontamination for recycling[19].
- Explore vendor recycling options (e.g., we already take part in the StarLabs tip box takeback scheme, NEB polystyrene box recycling and 2BScientific ice pack recycling), see reference[20] for suggestions.
- Identify repurposing opportunities – e.g., using empty chemical containers for pipette tip waste, or Winchester bottles to contain liquid waste.</td></tr>
<tr><td>2023-2030: Reduce single use and disposable items compared with 2023 baseline (by % established by baseline assessment).</td></tr>
<tr><td>2023-2030: Increase reuse and recycle routes compared with 2023 baseline.</td><td>Number of reuse/ recycle routes</td><td>Identify causes of waste generation and systems to combat waste:
- E.g. our green dot scheme, where packs of consumables that have been opened are autoclaved and marked to signify that they are sterile despite being opened and part-full packs.
- Consider systems to donate unused consumables to other laboratories, where they would otherwise end up in the waste stream (such as the section of the lab exit form which highlights anything to be transferred to other labs).
- Consider the feasibility of sharing surplus chemicals through a chemical inventory (as done through the chemistry platform).

Trial changes where necessary, disseminate information, and instigate as site-wide practice.</td></tr>
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Equipment and energy usage

Objective	Target	KPI	Action
To assess energy usage of lab equipment and maximise energy efficiency	2023-2030: Understand range of equipment items and energy usage.	Population of the energy monitoring master spreadsheet and equipment tracker	Continue energy audits using plug-in energy monitors and submetering.
			Simplify and update the equipment tracker; use the database to extrapolate energy data and cost for the number of equipment items across site.
			Identify most energy intensive equipment across site and potential energy saving opportunities (see actions for specific equipment items in following targets): - E.g., consider using thermal beads in energy intensive water baths to half their energy consumption. - Systematically consider CERs, growth rooms and freezers to ensure there are inventories and systems in place for sample space optimisation, and that materials are only stored for the necessary duration. - Continue regular, documented maintenance and servicing of large equipment. - When purchasing energy-intensive equipment, ensure it is 'right sized' for tasks with opportunities for as high loadings as possible (e.g., incubators, shakers, drying ovens, autoclaves), and that energy efficiency and lifecycle assessments have been done. - Equipment is shared wherever possible between groups via a booking system. - System in place to minimise 'hoarding' of unused equipment (advertise at institute or consider reselling).
	2023-2030: Increase consistency of switching off equipment (where feasible).	% items left on during annual spot audit	Identify the equipment that can and should be turned off, and the energy savings to be made (e.g. chilled centrifuges, ovens, heating blocks etc.).
			Energy-awareness stickers and/or posters on lights and equipment (on the plug or switch where necessary). Ensure switches are accessible.
			Clear policy and/or responsibility plan to ensure lights and equipment are turned off overnight in the lab. Conduct occasional spot checks and report back.
	2023-2030: Install timers where of practical benefit.	% identified equipment with timers installed	Identify equipment that would benefit from timers (e.g. water baths, hot plates, heaters etc), Opt for programmable rather than mechanical timers to save energy at weekends.
			Share guidance for how to programme and override timers.
	2023-2030: Switch to LEDs.	% LED lights	Examine and audit remaining opportunities for switching bulbs to LEDs (for instance in growth chambers, microscopy, plant growth rooms, biosafety cabinets, and fume cupboards).

	2023-2030: Improve cold storage efficiency (ULT freezers, -20°C freezers, fridges).	% ULT freezers at -70°C KWh used by cold storage across site	List freezers (and age) and compile a schedule: fortnightly ice scraping and annual defrosts; regular cleaning, maintenance and servicing (cleaning heat exchange coils, filters, vents, checking seals and that freezers are ≥15cm from the wall); annual clear-outs of unnecessary materials.
			Consider ULTs at -70°C and provide written policies/guidance on storage temperatures for common sample and material types. Use the database created by UC Boulder and UC Davis for reference on sustainably storing biological samples at -70°C[2122].
			Establish a clear universal labelling system for materials; maintain a live inventory of details, active users, expected disposal date and location in freezer.
			Consolidate freezer space to reduce cold storage requirements. Ensure little or no empty space in freezers by racking and using polystyrene boxes or ice packs.
			Energy monitor ULT freezers that are over 10 years old and assess benefits of replacing with more efficient models (identified through monitoring).
			Aim to keep ULT freezers in rooms of 15-18°C for maximum efficiency.
	2023-2030: Assess ventilation energy use and efficiency.	kWh used for ventilation	Currently, the air flow of Biffen and Bateson fume cupboards is not adaptive to sash height but is a constant flow, the Chatt has a mixture of adaptive and non-adaptive hoods, although the impact of sash height on energy consumption here is still negligible. For labs that are staying through planned NGI site renovations – investigate fume cupboard energy usage, and potential upgrades and controls such as bypass valves, econ systems and PIR sensors (while maintaining face velocity at around 0.55 m/s).
			If upgrades make flow adaptive, communication and reporting are in place to ensure sashes are closed when not in use (stickers, training, audits). Conduct checks to ensure fume cupboards are not used for storage between experiments, and that there is nothing blocking vents or airflow.
			Biosafety and laminar flow cabinets are switched off when not in use for extended periods, where it is possible and when safe to do so, e.g. there is no effect on pressure requirements. Lab users should be trained on how and when they should switch cabinets off.
			UV sterilisers in safety cabinets are avoided wherever possible. When they are used, UV sterilisers are only left on for a maximum of 30 minutes unless in exceptional circumstances.
	2023-2030: Embed sustainability into business cases.	Inclusion of sustainability considerations in bids	Embed sustainability considerations into business cases and capital plans.

Lab practices and procedures

Objective	Target	KPI	Action
Improve sustainability in lab practices	2023-2030: Produce and implement guidance on sustainable experimental design.	Production of guidance	Provide lab users with guidance to inform the design of experiments, examples follow: - Optimise experimental design and minimise procedural steps, using the minimum number of tubes, tips, plates, etc., as required for each experiment. - Maximise use of multiwell plates by running several experiments on one plate. - Use the smallest plastic vessels feasible for the task. - Use refill solutions wherever possible, i.e., re-racked pipette tip boxes. - If gloves are needed, use the appropriate thickness for the task, checking breakthrough safety data for the chemicals used. - Avoid excessively pure water usage: consider the necessity of RO, DI, Ultrapure, or untreated water, and which is required for the experiment. - The carbon footprint used for washing and decontaminating is far less than that to remake, transport and dispose of plastics. Consider using reusable alternatives to single use plastics, where research integrity and safety is unaffected, and the required setup for any decontamination is factored in: o Reusable silicone lids can be used to cover conical flasks instead of tinfoil. o Reusable metal inoculating loops or glass spreaders. o Use wooden toothpicks for picking bacterial colonies instead of pipette tips. o Glass serological pipettes and universal vials, silicone or Pyrex weighing boats, autoclavable reservoirs, etc. - Make good inventory management a priority and only order what your lab will use. - Implement the 12 principles of green chemistry where possible and relevant.

Stakeholders
Lab users, lab managers and supervisors, lab technicians, platforms, horticulture services, health and safety, JIC sustainability specialist

Research impact

Alongside delivering our science sustainably, we will continue to provide research, advocacy, and outreach to policymakers, industry and the public to help deliver solutions to global environmental challenges and pave the way to a more sustainable future.

The institute's vision for the future of research at JIC is set out in HP3 - Healthy Plants, Healthy People, Healthy Planet:

- Healthy Plants: protecting and improving food source
- Healthy People: protecting humanity from disease and unlocking the health benefits of plants and microbes
- Healthy Planet: harnessing the power of plants and microbes to combat climate change

"*Healthy Plants, Healthy People, Healthy Planet (HP^3) is JIC's vision for achieving a safer, healthier and more sustainable future through the power of plant and microbial science. The John Innes Centre and The Sainsbury Laboratory are at the forefront of efforts to bring this vision to life, and our ambitious programme of redevelopment will enable a step change in capability. The proposed redevelopment will create a state-of-the-art flexible science campus, a hub to seize new opportunities and boost the national and international impact of plant and microbial research, from a wider research cluster at the Norwich Research Park. In essence we want to establish the very best plant and microbial science laboratory infrastructure anywhere in the world.*"

Objective	Target	KPI	Action
Achieving a safer, healthier, and more sustainable future through JIC research	2023-2030: Align JIC research, into plant and microbial science, to meet the challenges of a sustainable future.	ISPs and papers relevant to HP^3 aims	Align and deliver research to meet the ambitions set out by the HP^3 vision: health plants, healthy people, healthy planet.
	2023-2030: Achieve sustainability impact, arising from our science, across key stakeholder groups: the broader research community, policymakers, industry and the public.	No. of collaborations, partnerships, and engagement events	Support JIC staff in delivering impact relevant to sustainability at all stages of the research process. Enhance partnerships with the broader research community (in the UK and worldwide) to tackle emerging threats, such as ash dieback, Xylella, and currently unforeseen threats to food production and human health Inform and support government policy including the UK's agricultural and crop strategies, industrial strategy, and clean growth goals. Engage with and support industry and the private sector to apply the findings of JIC's research. Continue to foster public support and awareness through outreach activities.

Stakeholders
JIC directorate, JIC science, JIC communication and engagement, JIC knowledge exchange and commercialisation, JIC's partners, NGI/HP^3 project team, wider agricultural, research and governmental sectors, industry, and the public.

Travel

Latest statistics published in 2022 show transport to be the biggest source of emissions in the UK, accounting for 28% of the national total[23]. Travel therefore features heavily in the UK Government's decarbonisation strategy. This includes the ban on the sale of new petrol and diesel cars and vans by 2030; funding for Ultra Low Emission Vehicles; development of electric vehicle (EV) charging points; and a hydrogen advancement programme.

It is important to note that sustainable travel does not solely entail reducing emissions, but ensures accessible, environmentally friendly, and economically viable travel which meets the needs of its users.

JIC already incentivises lower carbon commuting, with bus subsidies and cycling facilities, such as changing rooms, showers, bike racks, tools, and safety equipment. Further, the NBI Bicycle Users Group have helped NBI meet the criteria set out by Cycling UK to ensure that NBI are cycle-friendly-employers: with an on-site bike mechanic, vouchers, pool bikes for hire, tax incentives via the Cycle to Work scheme, and workplace events.

Full scope 3 travel emissions are not currently included within our carbon footprint. This data is important to collect, as carbon emission data reporting may soon be mandatory to access future funding. Travel data is currently recorded, but a centralised system would be useful for data collection purposes.

Objective	Target	KPI	Action
Enhance our travel data collection	2023/4: Log business travel data for scope 3 emissions baseline. Annually: Survey staff to understand commuting habits.	tCO_2e	Enhance and centralise our business travel data collection process: i.e., to capture date, mode of travel, mileage, reason for travel (and potentially fuel type). Initial meeting with computing confirms that this system can be developed for the intranet, and a specification has been drafted. Follow up on data capture system development. Consider also, the benefits of using a external travel management company.
			Include commuting habits in annual staff survey.
Promote sustainable travel	2023-2040: Increase % of staff and students using active travel and public transport to commute.	% car and taxi usage as per staff survey	Continue to promote and incentivise these modes of transport and raise awareness of the support available (incentives for public transport, BUG, cycle-to-work scheme, facilities). For instance, run a sustainable travel campaign week, aligned with a relevant national event.
	2023-2040: Reduce emissions from business travel (by amount and timescale determined by baseline assessments).	tCO_2e	Review and update JIC travel policy – e.g., no internal flights (by removing funding), and prioritising videoconferencing and lower carbon travel over more carbon intensive modes.
			Develop a carbon offset/inset policy for business travel by air, where the carbon generated in tonnes is calculated, and a charge per tonne is applied to fund sustainable ventures, with funding from sustainability grants (e.g., from the Wellcome Trust).
	2023-2040: When the time comes to replace fleet vehicles, opt for hybrids or EVs, with expansion of charging points.	% of fleet vehicles that are zero emission	Assess the lifespan of NBI and JIC owned vehicles and investigate suitable hybrid or EV replacements to reduce scope 1 emissions.
			Increase number of charging points, in accordance with the 'NBI Energy and Carbon Management Strategy for 2022-27'.

Stakeholders
NBIP facilities, science administrators, wider staff, NBI BUG, computing, JIC sustainability specialist, JIC directorate, HR

Engagement

It is impossible to reach JIC's net zero goals without the engagement of staff, students, and external partners.

Internally, there have been several communication and engagement initiatives promoting sustainability. The Green Impact scheme is in its second year at JIC and NBIP, with 5 award winning teams last year, completing a collective 129 sustainable actions. This year, Green Impact has grown to become a site wide scheme (with the addition of EI, QIB and TSL), which has helped to foster collaboration across the institutes. Other engagement initiatives include the Bicycle User Group scheme, gardening club, and the LoveLeftovers mailing list. There have also been several events including a waste reduction campaign, tree planting and pond clearing at Church Farm and NRP, as well as hosting the 'Sustainability in Research - Cross Institute Symposium' with the Babraham and Francis Crick institutes. In terms of broadcasting information, there is a live sustainability page on the JIC SharePoint News site, with highlights feeding into the monthly newsletter, and information displayed on the intranet, and on screens, posters and noticeboards around site. There have also been sustainability themed workshops and surveys, aiming to empower staff to make decisions that support our shared vision for sustainability.

In addition, JIC has been engaging with external groups including NBI's waste companies, suppliers, other research institutes, the Royal Society of Chemistry, Department for Business, Energy and Industrial Strategy, and the general public (through science outreach and social media) to further the institute's impact and support our aims.

Objective	Target	KPI	Action
Drive a culture of sustainability through effective, transparent, and consistent engagement (with both internal and external stakeholders)	2023-2030: Develop communication routes for raising awareness, and expand on initiatives, events and campaigns.	Positive survey responses	Create a monthly schedule for communications and events to improve consistency and to align communications to global and national events, such as Earth Day, and #LabWasteDay.
			Continue to use and improve upon sustainability awareness communication routes: through SharePoint News, the intranet, social media, digital screens, posters, stickers, departmental and JIC all meetings, through the Voices and the communications team.
			Include relevant aspects of sustainability in training and inductions (e.g., to highlight initiatives).
	2023-2030: Engage with staff through annual sustainability surveys and discussions.	Survey responses	Collaborate with the facilities team to enhance the annual sustainability survey and capture relevant opinions and data.
			Host a 'Sustainability Hackathon' workshopping event for staff and students to have their say and collaborate on ideas and solutions.
			Consider creation of a sustainability network to discuss and take action on environmental issues (for instance, expanding from the Green Impact mailing list).
	2023-2030: Encourage participation in a sustainability scheme.	No. of active members, or creation of local scheme	Organise, promote, and run a sustainability scheme for staff and students – i.e., continue to run Green Impact, or set up a local, self-managed scheme.
	2023-2030: Engage with external stakeholders to relay JIC's aims, encourage best practice, and promote JIC's sustainability successes.	TBD	Communicate relevant challenges and goals to external stakeholders, including commercial tenants, contractors, suppliers, local communities, Norwich Research Park, external institutes, and other organisations as necessary.
			Make use of social media to promote JIC's sustainability successes and goals.
			Create a section of JIC web page (All about the JIC | John Innes Centre) declaring the climate emergency and to be transparent about our Net Zero aims.

Stakeholders
JIC communications and engagement, knowledge exchange and commercialisation, human resources, NBIP facilities, JIC sustainability specialist, science administrators, external stakeholders (as aforementioned)

Governance and delivery

For this strategy to be successfully implemented, there needs to be oversight and direction, support, guidance, monitoring and reporting.

Currently, there is an '*NBI Environmental Policy'* published on the intranet (last edited in 2017), established by the NBI Environment and sustainability Group (last meeting in Nov/Dec 2022), currently chaired by lab manager, Gary Wortley, with membership from key members from across NBIP and the institutes. In addition, local oversite of sustainability activities and strategies at JIC are currently conducted by sustainability specialist, Ethne Clark. Scope 1 and 2 emissions data and Facilities controlled waste disposal is being monitored and reported on, with sustainability written into business plans, planned into prospective site developments, and included in grant applications.

To deliver the 'JIC Sustainability strategy', a localised steering group or lead should oversee strategy implementation and progress at the institute. The targets and delivery timescales should then be ratified, and a timeline of goal posts established, detailing clear and ambitious targets and KPIs (with collaboration with the NBI environment and sustainability group to extend best practice). Reporting and transparency of the strategy and progress is also a priority. This will be key to securing credibility and reputation with internal and external stakeholders, including funders who are increasingly looking at sustainability impacts in grant applications.

As the strategy is a working document, and a long-term vision for sustainability at the institute, the document should be reviewed and updated annually.

Objective	Target	KPI	Action
Successful delivery of the JIC Sustainability Strategy	2023/24: Sustainability lead and/or steering group established.	Lead established and meeting held to discuss delivery	To deliver the JIC Sustainability strategy, a localised steering group or lead should oversee strategy direction, implementation and progress, to be responsible for delivering sustainable outcomes across the institute.
	2023/24: Timescales established and targets internally ratified.	Production of Gantt chart	Circulate and discuss strategy for initial ratification of targets and time frames.
			Create a comprehensive timeline of timescales and/or phases of the strategy (e.g. phase 1 for immediate implementation, phase 2 for next 5 years, phase 3 TBD), in the form of a Gantt chart and/or goal posts. The timeline should be aligned with the financial year (6th April – 5th April) to match current reporting.
			Review and update this document annually on date TBD.
	2023/24: Policy and endorsement.	Production of JIC policy	Create JIC Environmental Policy by updating existing NBI policy to be more aligned with the strategy aims.
			Obtain quote of endorsement from director/directorate, to preface strategy for wider circulation.
	2023/24: Wider internal circulation and launch of strategy.	Launch communications	Communications made to JIC all to announce the launch of the strategy, with an executive summary, and the full document updated and made available on the intranet.
	Quarterly: Monitoring progress.	Production of reports	Following the timeline set out by the Gantt chart, assess performance of targets and KPIs. Report progress to steering group and relevant stakeholders on a quarterly basis.
			Circulate and incentivise participation in the annual facilities sustainability survey.
	TBD: Reporting and transparency.	Production of reports	Create a section of JIC web page (All about the JIC | John Innes Centre) covering sustainability, declaring the climate emergency, and outlining our Net Zero aims.
			Report sustainability data to relevant bodies for environmental compliance.
			Communicate progress with targets to wider staff and student base at JIC.

Stakeholders
JIC directorate, JIC sustainability specialist, NBIP facilities, NBI environment and sustainability group, wider staff

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