SUSTAINABILITY ACTION
Our NHS Our People Our Planet

NHSScotland

Sustainable Healthcare and *Building towards Net Zero*

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NHS SCOTLAND

NHSScotland Building towards Net Zero

- Where are we now?
- Where do we need to be?
  (e.g. 2025, 2030, 2038, 2040 targets)
- How do we get there?
  (recent tools & pilots)

Unlocking the Potential: NHS Greenspace 2020 (nature.scot)

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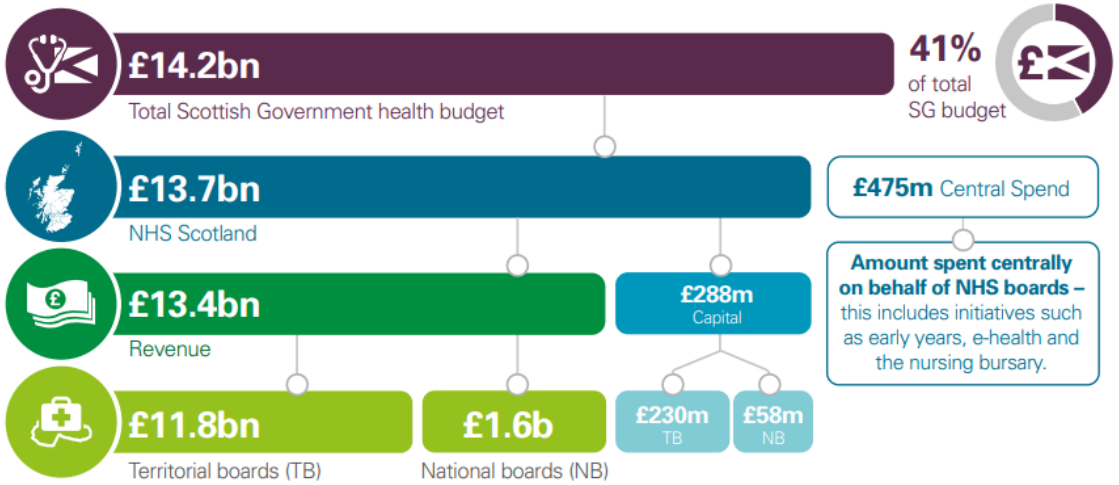
Scotland's Health & Care Assets: 2020

NHS SCOTLAND

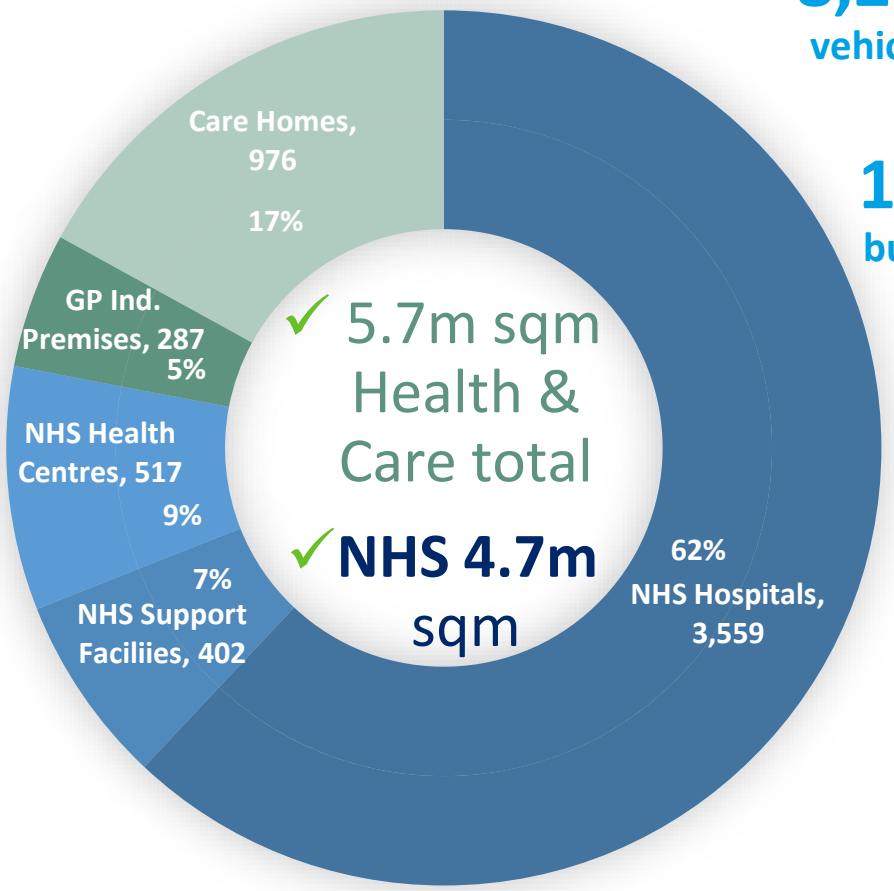


KEY AREAS OF SPEND

£7.6bn
Staffing costs
(2018/19 - £6.9bn)
+9.4%

£2.4bn
Drugs and medical supplies
(2018/19 - £2.3bn)
+4.4%

£2.1bn
Other operating expenses
(2018/19 - £1.9bn)
+13.4%



8,250 vehicles

1,250 buildings

£ 1bn med.equip

www.audit-scotland.gov.uk/report/nhs-in-scotland-2020/

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Scotland Health & Care Assets: 2022

NHS SCOTLAND

Headcount
September 2022

180,325

0.6% increase since September 2021

Mar 17 — Sep 22

Whole-time equivalent
September 2022

155,913.5

1.0% increase since September 2021

Mar 17 — Sep 22

Staff joining
2016/17 — 2021/22

Staff leaving (turnover rate)
2016/17 — 2021/22

Vacancy rates
September 2022

Nursing and midwifery
9.0%
Up from 4.5% in March 2017

Allied Health Professionals
8.7%
Up from 3.9% in March 2017

Temporary staffing costs[1]
2021/22

Nursing bank
£232.2m
Up from £142m in 2016/17

Sickness absence
2021/22

5.7%
Up from 5.2% in 2016/17

www.audit-scotland.gov.uk/report/nhs-in-scotland-2022/

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NHSScotland 2020 = 430,000 tCO_2e

1990

- 64%

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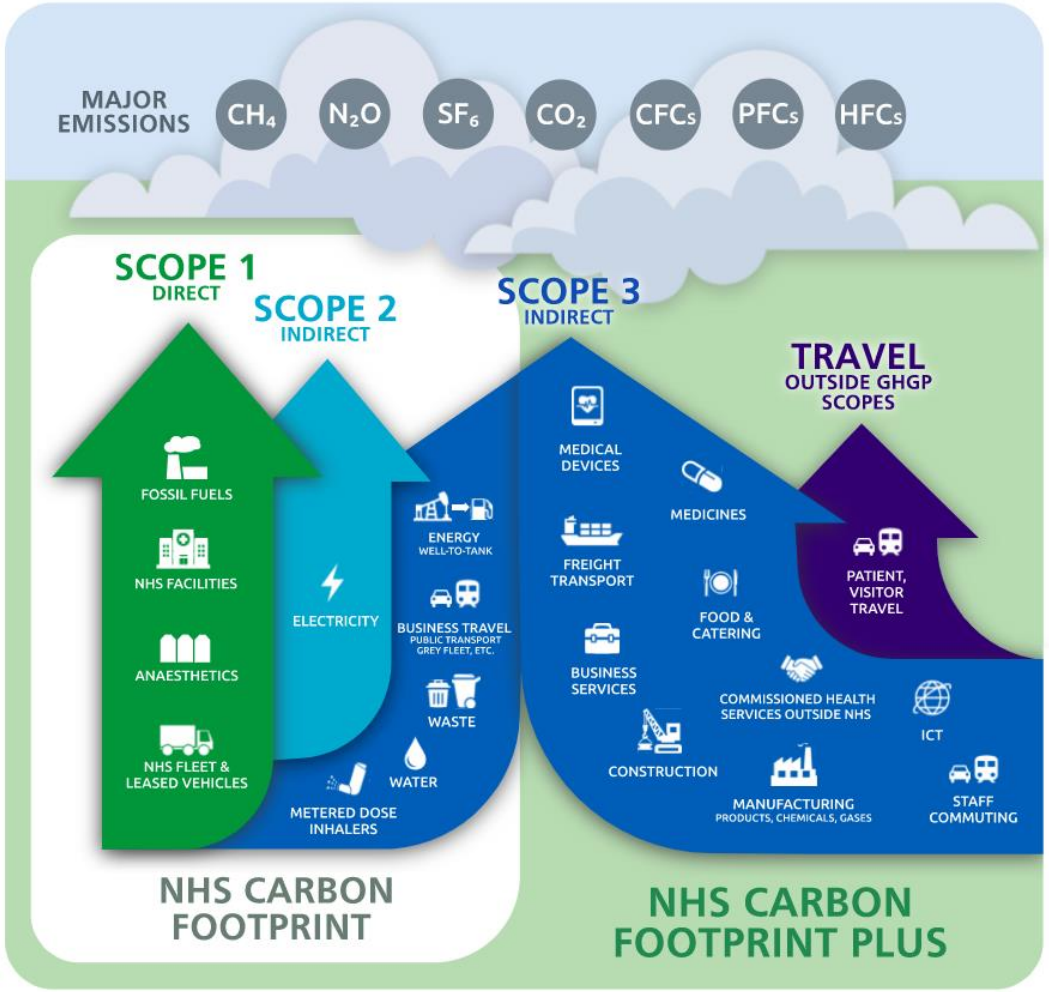

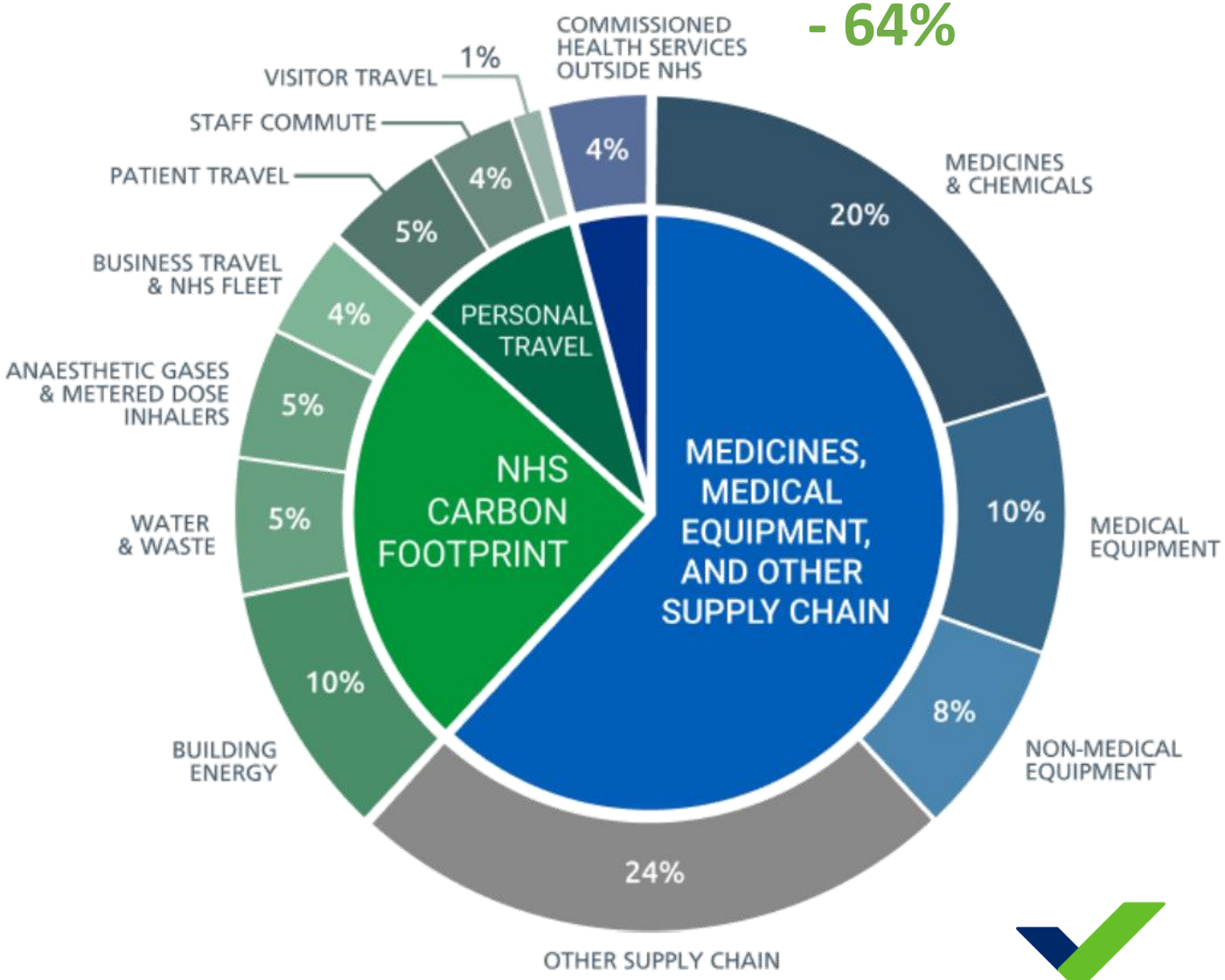

www.england.nhs.uk/greenernhs/a-net-zero-nhs/

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NHSScotland Sustainability & Net Zero targets

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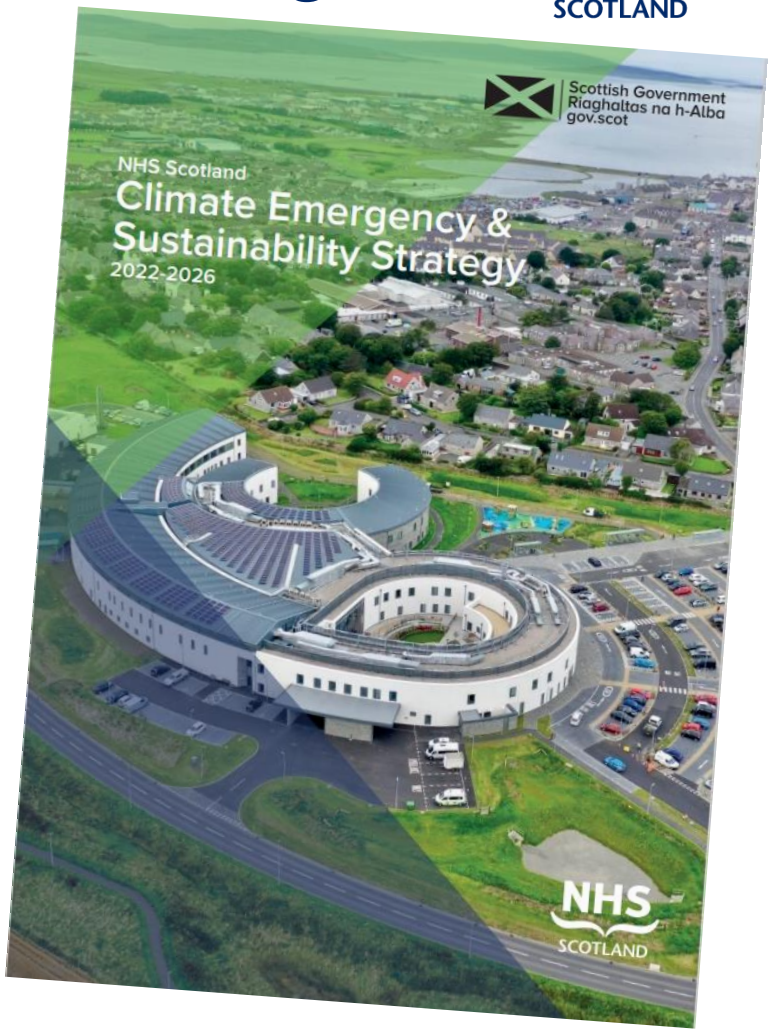
- Ensure that NHS Scotland bodies, as an integral part of their commitment to the **health and wellbeing** of the community, contribute to achieving the UN Sustainable Development Goals.
- Ensure that NHS Scotland becomes a **net-zero** greenhouse gas emissions health service by **2040** , or earlier where possible.
- Ensure NHS Scotland's assets and activities are **resilient** to the impacts of a changing climate, incl. extreme weather events.
- NHS Scotland **culture of stewardship**, i.e. natural resources are safeguarded & responsibly used, to provide sustainable care.
- NHS Scotland as a **circular economy** , i.e. designing out waste & pollution, keeping products in use, and use of natural systems.
- Improve NHS Scotland's impact on **ecological & biodiversity** emergency.



www.gov.scot/publications/nhs-scotland-climate-emergency-sustainability-strategy-2022-2026/

DL(2021)38 - a policy for NHS Scotland on the climate emergency and sustainable development

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NHSScotland Sustainability & Net Zero timelines

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Scope 1 and 2 emissions

12. All NHS Scotland bodies to reduce emissions from their activity, the activities under its control and from the electricity, steam & heat purchased by it to net-zero by **2040**, or earlier… without offsetting.
13. All NHS owned buildings must be heated from renewable sources by **2038**, or earlier.

Scope 3 emissions

14. All NHS Scotland bodies, as a minimum, to reduce their associated emissions from the following to net-zero by **2040**, or earlier:
    - waste disposal
    - business travel, including grey fleet
    - energy transmission and distribution

Now

- NHS Board Climate Emergency and Sustainability governance
- annual **N**HS Board **S**ustainability **A**ssessment **T**ool reporting
- every 3yr NHS Board **biodiversity** increase reporting
- **Net Zero** emissions in major facility investment on opening. Where proven currently impractical, a credible route map is needed for **Heat** ≤ 2038 & **ALL** ≤ 2040

2025

- >15% less dom. **waste**; >70% recycle/compost rest
- Zero petrol or diesel cars in owned & leased **fleets**

2030

- >75% less emissions of 1990 **energy** baseline
- Net Zero ALL owned & leased **fleets** (ex.contracts ≤ 2032)

2038

- Net Zero **Heat** emissions ALL NHSS owned buildings

2040

- Net Zero **ALL** NHS emissions scope 1 & 2, and 3(part)

DL(2021)38 - a policy for NHS Scotland on the climate emergency and sustainable development

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Net Zero Public Sector Building (NZPSB) Standard + NHS England Net Zero Building Standard

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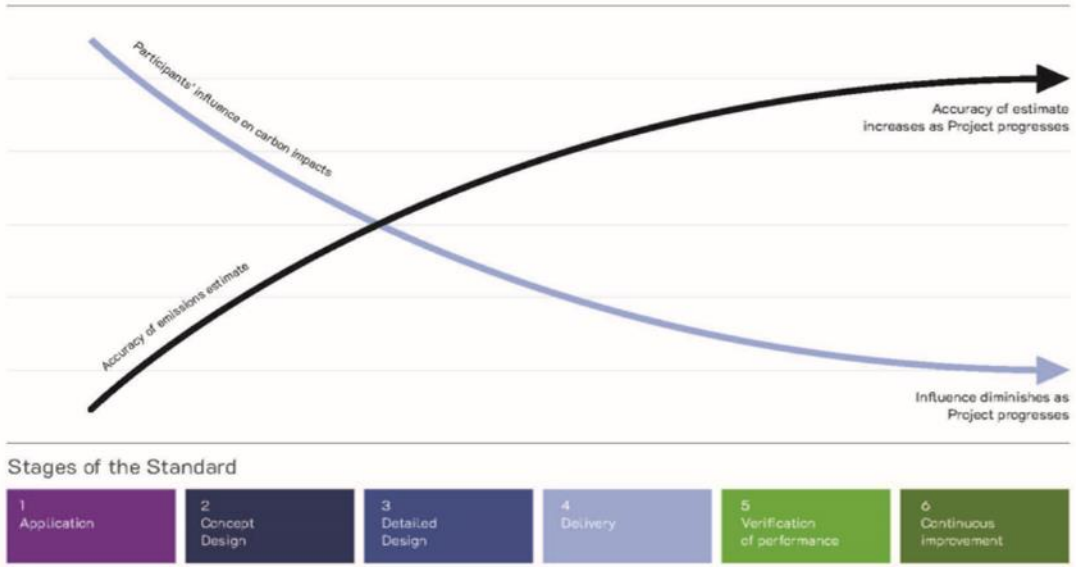
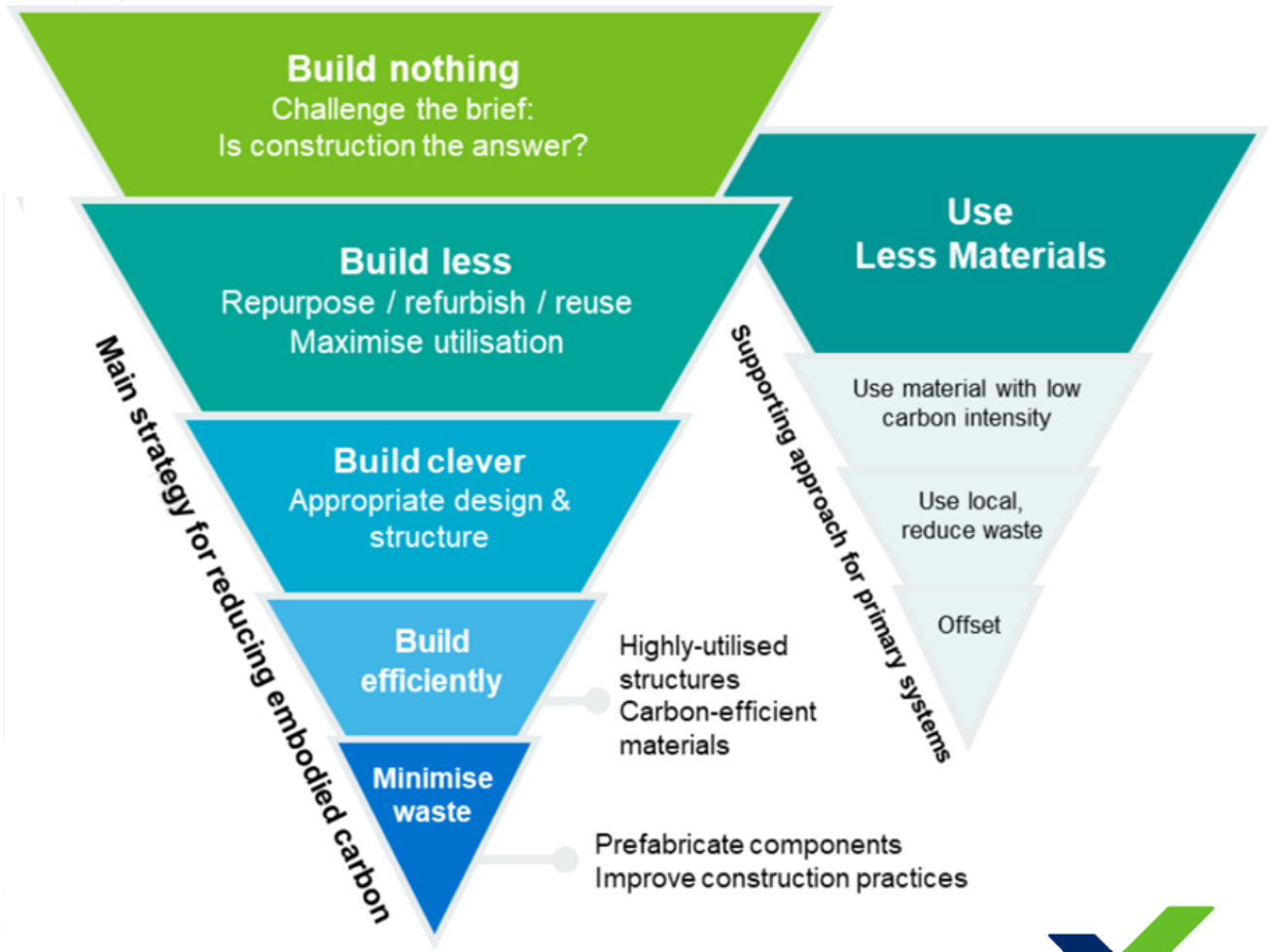
Building to Net Zero standards

- ✓ Enables benchmark to Public Sector & Healthcare best practice, e.g. kWhr/sqm or /clinical episode; air quality;
- ✓ Enable shared lessons & regular updates for continuous improvement





Scottish Futures Trust/ Net Zero Public Sector Buildings Standard

www.england.nhs.uk/publication/nhs-net-zero-building-standard/

Smart & Digital Solutions

20:20 Vision: everyone's health better supported by smarter digital technology

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Sustainable Design and Construction Guide

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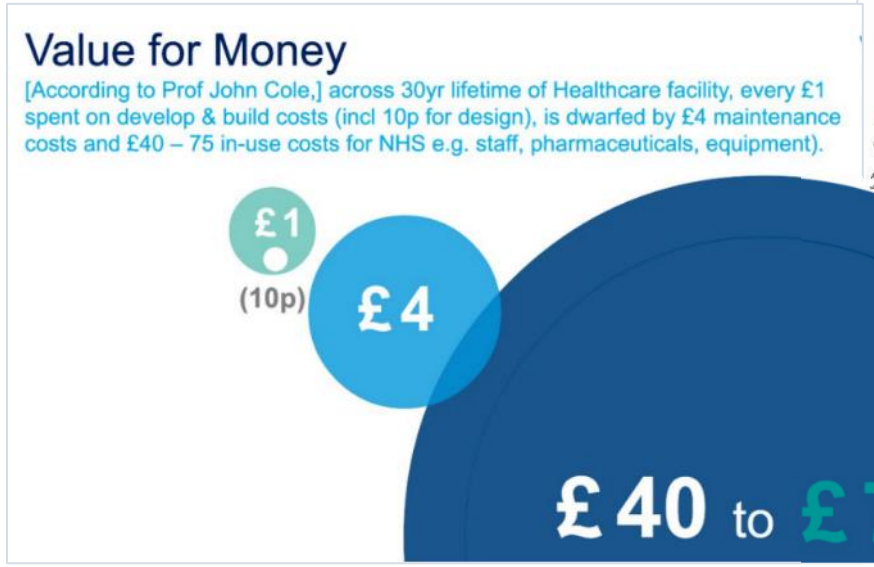
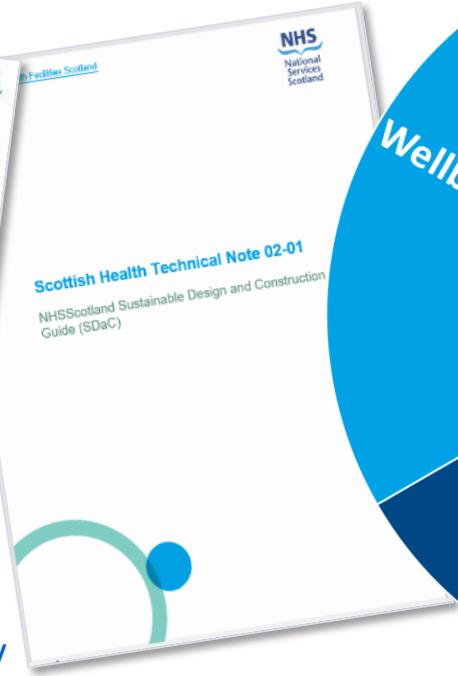
How we define quality

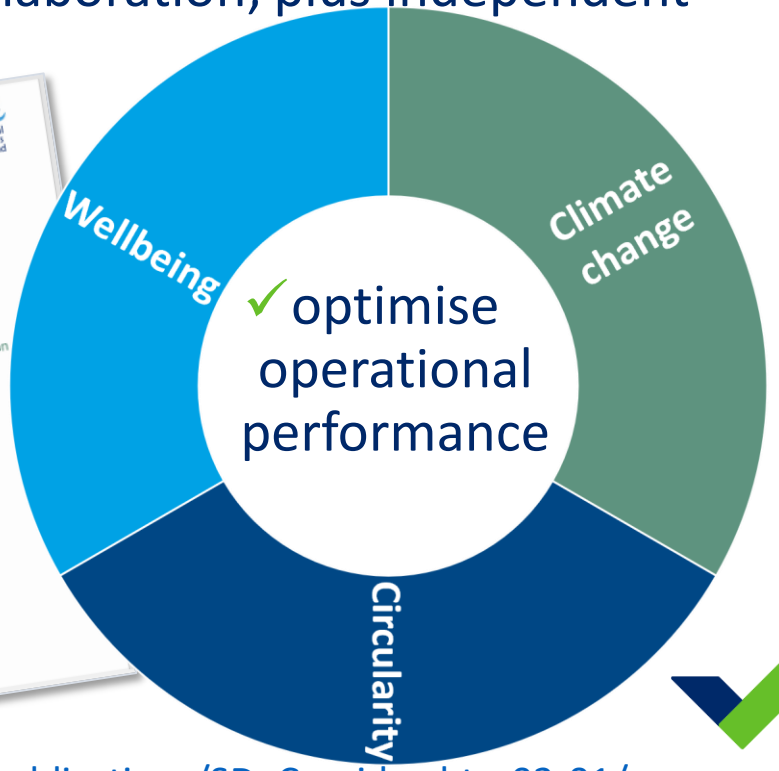
- ✓ Enables benchmark to Public Sector & Healthcare best practice, e.g. kWhr/sqm/ /clinical episode; air quality;
- ✓ Enable shared lessons & regular updates for continuous improvement

How we define sustainably

- ✓ SDaC (SHTN 02-01) is mandated process; setting local, project specific standards
- ✓ Stakeholder optimisation workshops
- ✓ Tools for collaboration; plus independent assessment







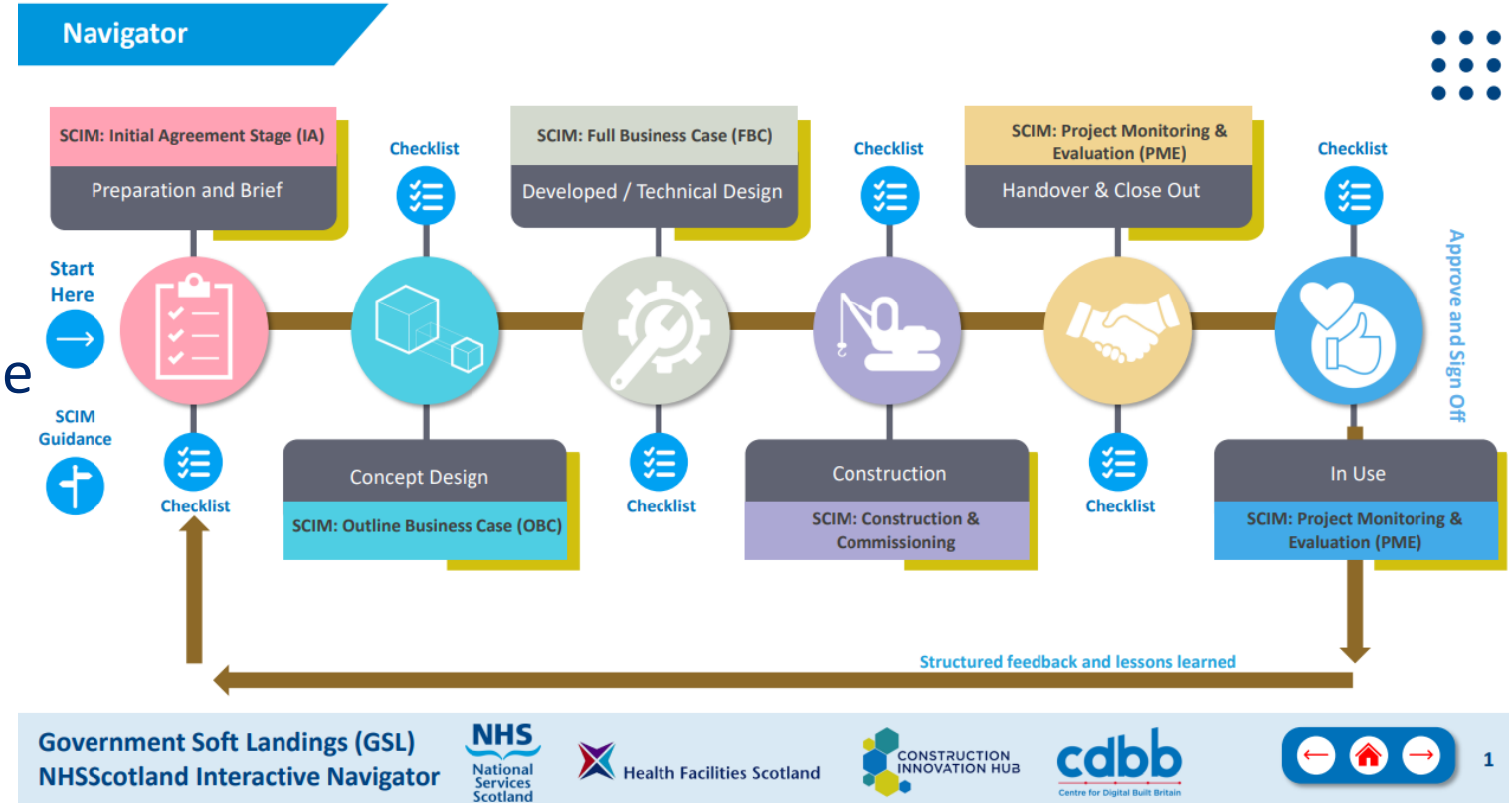
www.nss.nhs.scot/publications/report-on-construction-quality-matters/

www.nss.nhs.scot/publications/SDaC-guide-shtn-02-01/

NHSS Sustainable Design and Construction Guide

Soft Landings: central theme

- ✓ Focus on end-user needs
- ✓ Narrow ‘performance gap’
- ✓ Smooth transition from construction to operation
- ✓ POE - verified outcomes in use



NHSS Sustainable Design and Construction Guide

Wellbeing theme

- **Healthy Places**
  - ✓ Total wellbeing
  - ✓ Place-making
  - ✓ Quality of and connection to outdoor space

Wellbeing Guidance

Issue: Healthy Places - Total wellbeing

The World Health Organisation states that wellbeing is *"a state of complete physical, mental, and social wellbeing, and not merely the absence of disease or infirmity"*. It is therefore vitally important that the design and operation of healthcare buildings strive to support and enhance the total wellbeing of all users.

Research has demonstrated that wellbeing can be linked to a number of different benefits including improved physical and mental health, faster recovery times from illness, greater productivity and an overall healthier lifestyle.

The relationship between building design, green and blue infrastructure and wellbeing is one that is well documented and recognised as having significant impact on an individual's health and wellbeing. For a development to be considered truly sustainable, the health and wellbeing of all users should be prioritised and considered alongside the environmental and economic impacts.

Place Based Approaches

The National Performance Framework (NPF) is Scotland's wellbeing framework. It recognises the importance of understanding, respecting and developing relationships between people and place and how this can improve wellbeing.

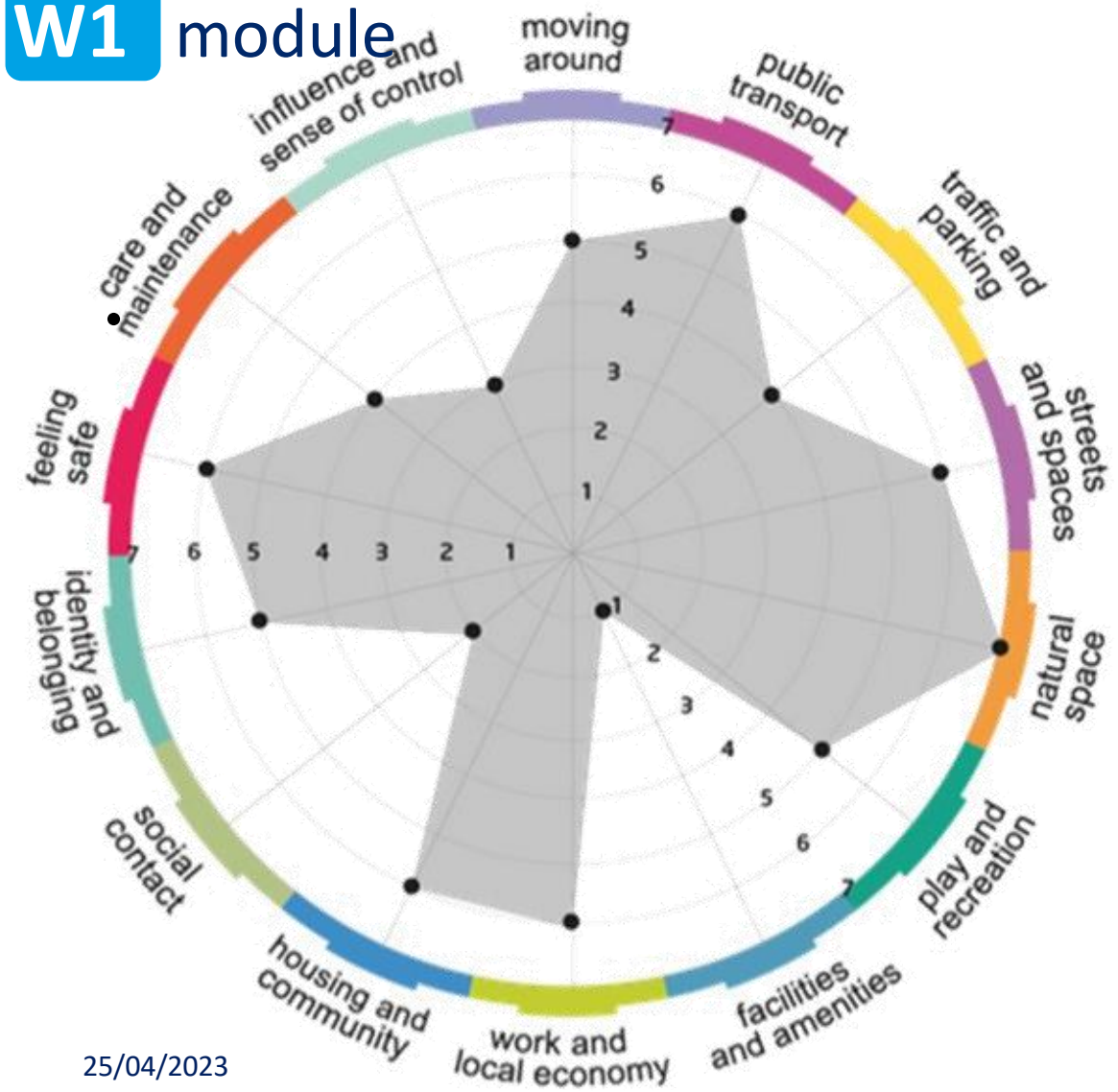
The Place Standard supports the national outcomes that are referenced within Scotland's NPF and provides a framework that enables these to be delivered. The Place Standard tool[7] can be used to identify aspects of a Place within a community setting that need to be targeted to improve people's health, wellbeing and quality of life.

'Our wellbeing is shaped by the places where we live, learn, work and visit'- Place Standard Strategic Plan.

Figure 3: Alignment of NPF and the Place Standard outcomes Source: Scottish Government

Place Standard (with Climate Lens) Tool

W1 module



NHSS Sustainable Design and Construction Guide

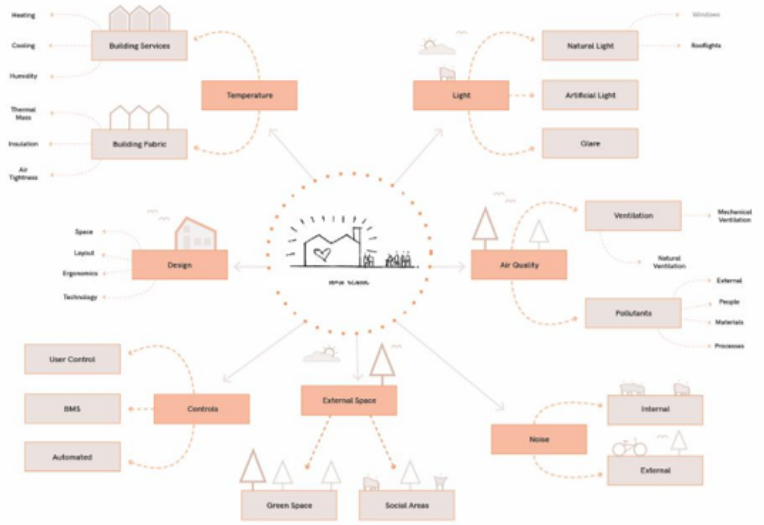
Wellbeing theme

- **Indoor Environmental Quality**
  - ✓ IEQ strategy promotes wellbeing of all users
  - ✓ Thermal comfort
  - ✓ Indoor air quality
  - ✓ Air pollutants
  - ✓ Acoustics
  - ✓ Visual comfort
  - ✓ Water quality

Issue: Indoor Environmental Quality

A building's internal environment can have a significant impact on the health and wellbeing of the occupants. With building standards and passive design strategies requiring buildings to be more tightly constructed, a greater importance is being placed on the quality and comfort levels of the indoor environment.

Figure 5: Design considerations and the impact on Internal Environmental Quality



An Indoor Environmental Quality (IEQ) plan can be used to determine the quality of conditions inside a building. IEQ can be determined by a number of factors and consists of both qualitative and quantitative measures. Factors to consider include:

- Thermal comfort: Temperature and humidity levels and responsiveness of building controls;
- Indoor air quality: Levels of CO_2 concentrations, moisture and ventilation rate;
- HAI-SCRIBE duties: e.g. location of fresh air intakes;
- Odours: Movement of air, dispersion of odour and air pollutants;
- Acoustics: Internal acoustic levels and internal and external sources of noise pollution;
- Quality of light: Quality and use of natural and artificial lighting levels and glare;
- Functional aspects of space: Adequate provision, layout and access to equipment and sufficient space for occupants;
- Controllability: Level of local and centralised control and the management and effectiveness of these;

NHSS Sustainable Design and Construction Guide

Circularity theme

- **Circular design and construction practices**
  - ✓ Design out waste and pollution
  - ✓ Keeping products and materials in use
  - ✓ Regenerating natural system
- **Circular procurement**
  - ✓ Responsible sourcing and supply chains
  - ✓ Building, equipment & supply chains

Circularity guidance

Issue: Circular design and construction practices

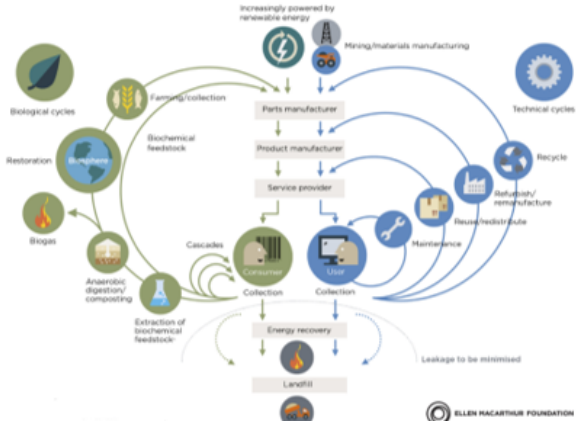
A circular economy is now considered an essential part of the solution to the recognised global climate emergency; where products, services and systems are designed to maximise value and minimise waste.

"A circular economy is one that is restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles" – Ellen MacArthur Foundation[21].

Moving towards a more circular economy can have a hugely positive impact on communities, the environment and businesses. Adopting circular design and construction processes increases supply chain resilience and certainty and reducing the amount of money lost on wasted construction materials. 80% of Scotland's carbon footprint is caused by the goods and materials which we produce consume and often waste. Switching to a circular economy is a key part of the solution to responding to the climate emergency. Some studies estimate that making this shift could eradicate almost 20% of Scotland's overall carbon footprint by 2050.

Guidance published by Zero Waste Scotland (ZWS) estimates that Scottish public sector spending on products and services amounts to £11 billion (10% of the Scottish GDP) annually[22]. Considering that the built environment sector accounts for around 50% of Scotland's resource use, with some studies reporting that 13% of construction waste is new, unused material, it is evident that there are significant environmental and economic benefits as a result of transitioning to a more circular economy. Furthermore, Circular Economy case studies published by ZWS estimate that taking action on reducing waste in projects can result in savings of up to 2% of the total construction project value.

Figure 5: : The Circular Economy, Source: Ellen MacArthur Foundation



NHSS Sustainable Design and Construction Guide

Climate Change theme

- **Operational energy and emissions**
  - ✓ Net Zero operational emissions
  - ✓ Operational energy targets
  - ✓ Responsible energy hierarchy approach
  - ✓ Zoning and metering strategy that supports end user needs
  - ✓ Detailed operational templates
  - ✓ Detailed simulation modelling
  - ✓ Performance review workshops
  - ✓ FM strategies
  - ✓ Quality Construction monitoring
  - ✓ Commissioning, Training, Handover and Aftercare

Climate change guidance

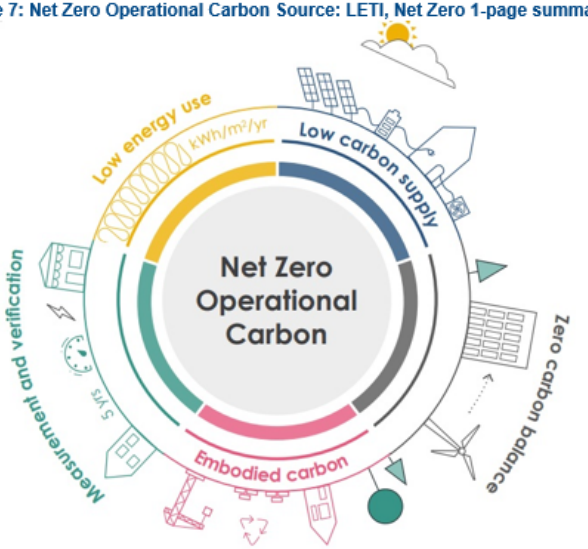
Issue: Operational emissions

Net Zero

Net zero is defined as a building with net zero operational greenhouse gas (GHG) emissions that has zero or negative emissions associated with its annual operational energy usage. The building is highly energy efficient and provided with 100% on-site and / or off-site renewable energy and is achieving a level of energy performance in-use in line with Scottish Government's Net Zero Public Sector Buildings Standard[5] or NHSS equivalency.

NHSS is currently contributing around 379,000 tCO2e of GHG per annum from around 1,500 buildings. To meet the net zero aspirations of the Scottish Government, NHSS has committed to all new buildings will be delivered to achieve net zero operational emissions. Every effort should be made on all new developments to optimise solutions in a responsible way and evidence appropriate levels of resilience.

Figure 7: Net Zero Operational Carbon Source: LETI, Net Zero 1-page summary



EUI

Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually, commonly measured in kWh/m².yr. and is derived from benchmarks from existing and similar buildings. Indicative healthcare values can be found in HTM 07-02: EnCO2de 2015, however the values must be considered circumspectly as they are simply the mid-point (median) values from a very wide range of possible values.

NHSS Sustainable Design and Construction Guide

NHS SCOTLAND

Climate Change theme

- **Embodied Carbon**
  - ✓ Whole life carbon approach
  - ✓ Embodied carbon to practical completion target
  - ✓ Whole life carbon objectives
  - ✓ Life Cycle Assessment
  - ✓ Integrated Life Cycle Assessment and Life Cycle Costing
- **Water consumption**
  - ✓ Water hierarchy
  - ✓ Consumption monitoring
  - ✓ Discharge and pollution
  - ✓ Leak detection

Issue: Embodied carbon

Embodied carbon

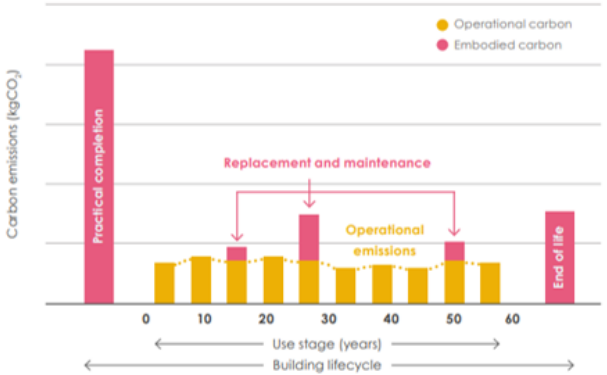
Whole Life Carbon (WLC) refers to operational carbon plus embodied carbon. Whole Life Net Zero Carbon means a building that achieves net zero operational emissions and significantly reduced levels of embodied carbon, as per industry best practice approaches and circular economy principles, with remaining carbon balance offset.

Embodied carbon refers to the amount of greenhouse gas (GHG) emissions generated to produce a built asset. This includes emissions associated at the following life cycle stages:

- **Product:** extraction, transportation to manufacturing plant and manufacture/processing of materials.
- **Construction**: transportation of products and materials to site and assembly of every product and element in the building (includes energy consumption and waste generation).
- **In-use:** maintenance, repair, refurbishment, replacement and emissions associated with refrigerant leakage.
- **End of life:** demolition, disassembly waste processing and disposal of any parts of product or building and any associated transportation.

The Royal Institution of Chartered Surveyors (RICS) has published findings that report the embodied carbon emissions from construction for new buildings can account for as much as 70% of the total carbon impacts associated with the building over its life cycle, with the most significant embodied carbon contributions being made right at the start of the project as a result of the products and materials that are specified for use. This demonstrates the significance of embodied carbon and the urgency to take steps towards drastically reducing this contribution to GHG emissions on all potential construction projects from their outset /earliest opportunity i.e. 0: Strategic, 1: Briefing, and 2: Concept design.

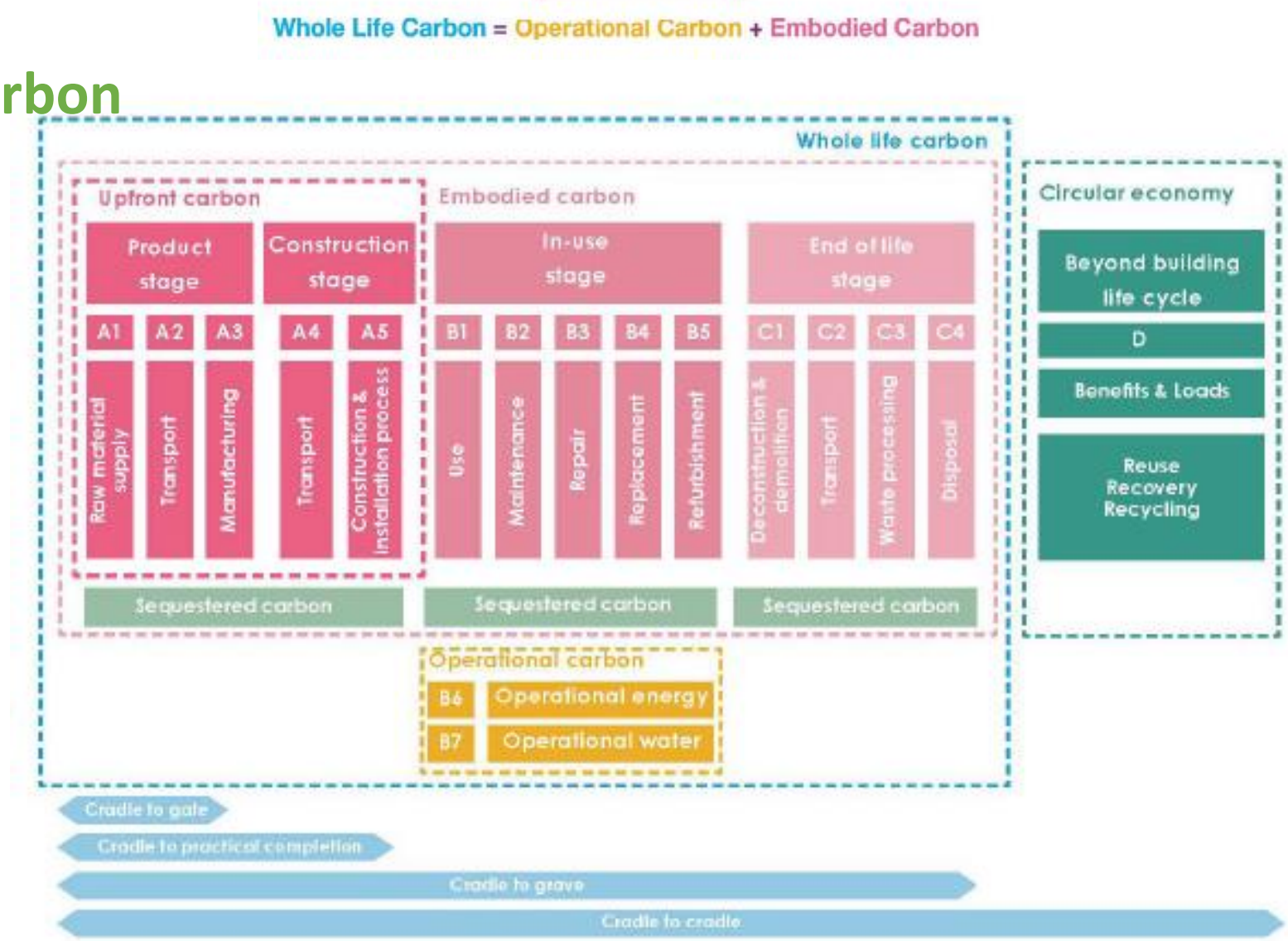
Figure 8: Operational and embodied carbon contributions throughout the lifetime of a building Source: LETI, Climate Emergency Design Guide



RICS: Royal Institute Chartered Surveyors

CC2 module

- **Whole Life Carbon standardised calculation**



NHSS Sustainable Design and Construction Guide

Climate Change theme

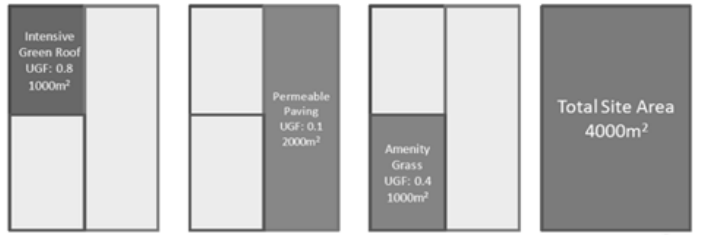
- **Environmental Security**
  - ✓ Integrated, landscape led approach
  - ✓ Green Space Factor
  - ✓ Pollution prevention and mitigation
  - ✓ Integrating greenspace interventions
  - ✓ Protecting and enhancing ecology

Surface Cover Type	Factor
Semi-natural vegetation (e.g. trees woodland, species rich grassland) maintained or established on site.	1
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	1
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm- see linvingroofs.org for descriptions.	0.8
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree – see Trees in Hard Landscapes for overview.	0.8
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket) - meets the requirements of GRO Code 2021.	0.7
Flower-rich perennial planting – see Centre for Designed Ecology for case-studies.	0.7
Rain gardens and other vegetated sustainable drainage elements – see CIRIA for case-studies.	0.7
Hedges (line of mature shrubs one or two shrubs wide) – see RHS for guidance.	0.6
Standard trees planted in pits with soil volumes less that two thirds if the projected canopy area of the mature tree.	0.6
Green wall – modular system or climbers rooted un soil – see NBS Guide to Façade Greening for overview.	0.6
Groundcover planting – see RHS Groundcover Plants for overview.	0.5
Amenity grassland (species-poor, regularly mown lawn).	0.4
Extensive green roof of sedum mat or other lightweight systems that do not meet GRO Code 2021.	0.3
Water features (chlorinated) or unplanted detention basins.	0.2
Permeable paving – see CIRIA for overview.	0.1
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone).	0

In order to calculate the GSF, the area of each surface cover type is calculated and is multiplied by the corresponding Factor (as listed above). This is then divided by the total site area to provide a GSF. Existing green cover on a site that is retained can contribute towards the score. The GSF calculation is summarised below:

Figure 10: Green Space Factors (GSF) calculation methodology for a site

(Factor A x Area) + (Factor B x Area) + (Factor C x Area) / Total Site Area



(0.8 x 1000) + (0.1 x 2000) + (0.4 x 1000) / 4000 = 0.35

NHSS Sustainable Design and Construction Guide

Climate Change theme

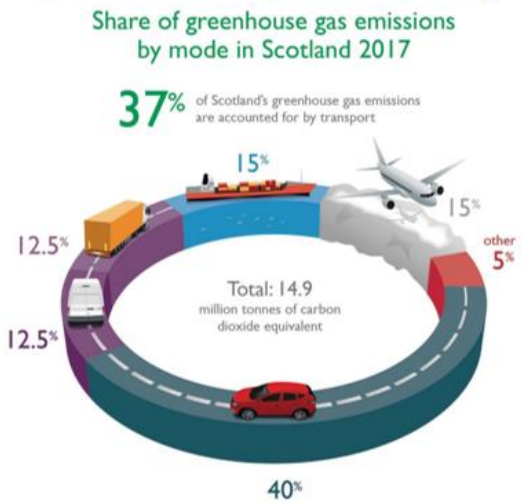
- **Active Travel and Sustainable Transport**
  - ✓ Accessible and sustainable travel options
  - ✓ Option / site appraisal
  - ✓ Places for everyone
  - ✓ Integrated design

Issue: Active travel and sustainable transport

Accessible and sustainable travel options

Transport is currently the largest contributor to Scottish GHG emissions, with single occupancy car journeys making the greatest contribution. More than a third of these car journeys in Scotland are short distance and under 1km. The transport system has a significant impact on local air quality, with road traffic contributing to recorded levels of Particulate matter (PM10) and nitrogen oxides (NOx). Exposure to poor air quality levels can have a considerable impact on health, increasing the risk of diseases such as asthma, respiratory illness and heart disease.

Figure 11: Share of greenhouse gas emissions by mode in Scotland
Source: Scottish Government, National Transoprt Strategy



One of Scotland's public health priorities is to enhance health and wellbeing by encouraging greater levels of physical activity. Physical inactivity contributes to nearly 2,500 deaths in Scotland annually, which is estimated to cost the NHS around £94 million. The Scottish Government and NHSS are both committed to working collaboratively to drive positive change in this area and put active travel at the heart of transport planning.

Changing travel behaviour, in favour of more active and more sustainable options, will have a significant impact on the environment, local air quality and contributions towards the net zero target. An active, accessible and more sustainable transport strategy will also help to enable a healthier and more inclusive society.

NHS Scotland Assure
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NHSS Sustainable Design and Construction Guide

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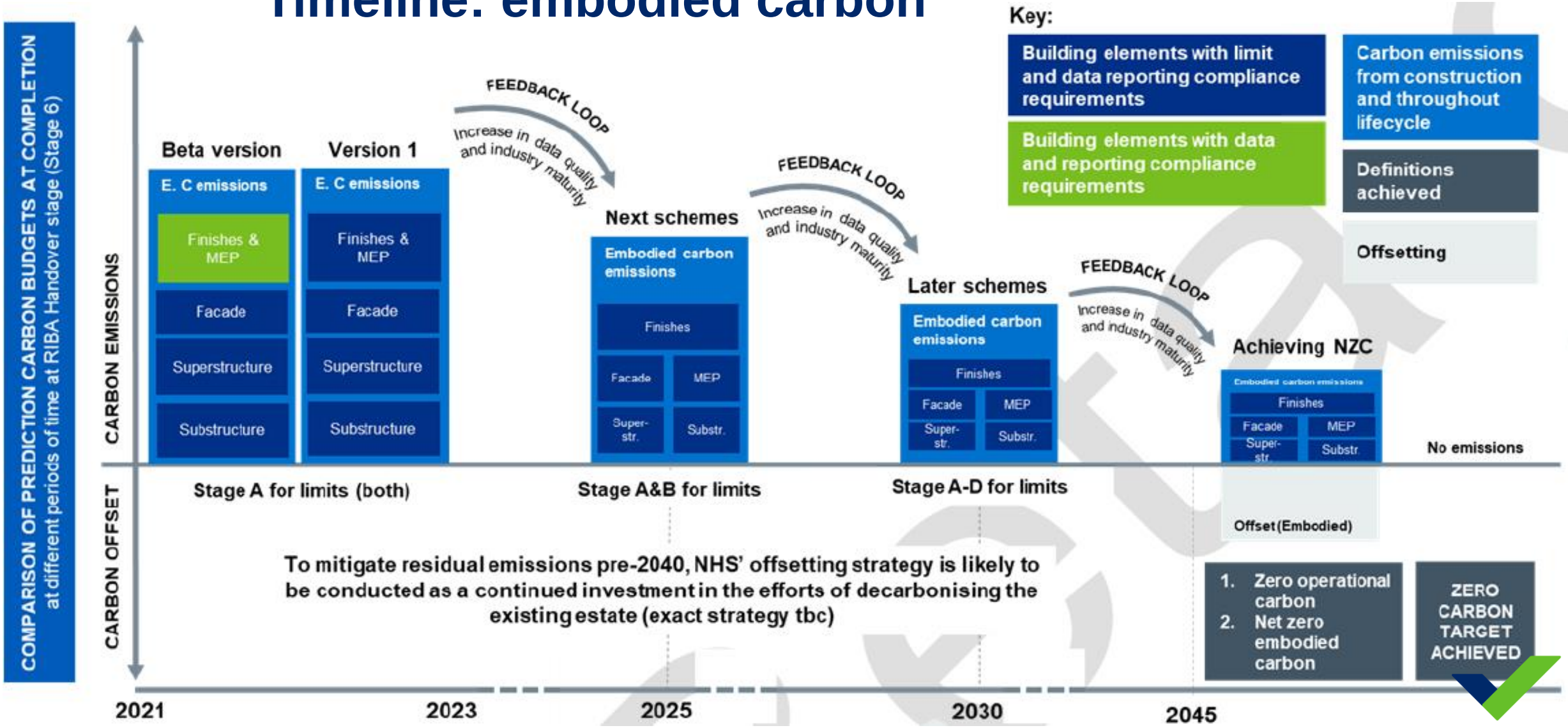
Collaborative co-production workshops

Evaluation Matrix			Wellbeing				Circularity				Climate Change			
SCIM	RIBA Plan of Work		Ref.	W1. Healthy Places - Total Wellbeing		Ref.	W2. Indoor environmental Quality		Ref.	CE1. Circular design and construction		Ref.	CC1. Operational emissions		Ref.	CC2. Embodied carbon		Ref.	CC3. Water consumption	
Strategic Assessment	0 Strategic Definition	Adopt soft landings approach & apply previous POE knowledge and learning	W1.1	Consider how a design that delivers healthy places and supports total wellbeing through the creation of quality, accessible and desirable spaces will support NHSScotland's value and sustainability strategic investment priorities.	1 - Commenced	W2.1	Consider how indoor environmental quality will support NHSScotland's value and sustainability strategic investment priorities (Person Centred, Safe, Effective Quality of Care, Health of Population and Value & Sustainability).	4 - Complete	CE1.1	Consider how circular economy principles will support NHSScotland's value and sustainability strategic investment priorities.	2 - Established	CC1.1	Consider how a building designed to achieve net zero operational GHG emissions will support NHSScotland's value and sustainability strategic investment priorities.	3 - Almost complete	CC2.1	Consider how a building that achieves significantly reduced levels of embodied carbon will support NHSScotland's value and sustainability strategic investment priorities.	4 - Complete	CC3.1	Consider how a building that integrates a water efficiency strategy can support an overall reduction in the operational carbon footprint and will support NHSScotland's value and sustainability strategic investment priorities.	4 - Complete
Initial Agreement / Initial Design Statement	1 Preparation and Briefing		W1.2	Within the brief, commit to: - Promoting design that prioritises physical, social, mental, occupational and economic wellbeing of all users; - Delivering quality space through the adoption of the Place Standard, AEDET and NDAP.	2 - Established	W2.2	Within the brief, commit to: - Prioritising physical wellbeing of users by ensuring internal environments are designed to create healthy and comfortable spaces for all; - Detailed IEQ strategy with defined perf. parameters.	N/A	CE1.2	Within the brief, commit to circular design and construction processes & circular procurement hierarchy - prevent / reduce / reuse / recycle / recover Identify opportunities for intervention - refer to industry guides e.g. UKGBC circular economy guide for construction clients.	N/A	CC1.2	Within the brief, commit to: Delivery of a net zero GHG emissions development; Use of existing data to inform an EUI benchmark; & Min. design performance measures (as referenced within guidance document).	N/A	CC2.2	Within the brief, commit to: A lower embodied carbon development; Comprehensive embodied carbon reduction strategy;& Adoption of consistent methodology for WLC analysis.	3 - Almost complete	CC3.2	Within the brief commit to: -Adopting the water efficiency hierarchy for the development; : - Water efficient components; - Monitoring and leak detection; - Responsible procurement: EU water label scheme	N/A
Early OBC / Final Design Statement	2 Concept Design		W1.3	Design driven by user needs; clinical and functional - a clear connection between design and users; Holistic approach to wellbeing - identify performance parameters that support identified wellbeing outcomes; Creation of valuable internal and external	3 - Almost complete	W2.3	Stakeholder engagement - Recognise and acknowledge feedback from key user groups; Detailed dynamic simulation model - early design analysis, ensuring accuracy of data; IEQ - strategy and technical performance review.	4 - Complete	CE1.3	Inform project strategy with suitable metrics: - Design out waste and pollution / Responsible design, procurement and construction practices / Design for assembly, disassembly and recoverability. - Identify intervention points & analyse design.	4 - Complete	CC1.3	Initial and detailed passive design analysis; Consider healthcare operational process and the accuracy and availability of operational templates; Early detailed simulation modelling and results review workshop; Review optimsation and renewables	N/A	CC2.3	Options appraisal- refurb. or new build / site selection. Establish baseline reporting figure to guide design; Detailed carbon reduction strategy; Ensure accuracy and robustness of data; Iterative WLC assessment - options	4 - Complete	CC3.3	Options appraisal for reducing consumption for building and landscaping: - Feasibility study for rainwater harvesting system; - Avoid the need for dedicated irrigation that requires mains supply. - Effective strategy for waste water pollution	1 - Commenced
Review (pre-option / site selection / masterplan)			Internal approval																		
OBC	3 Spatial Coordination		W1.4	Integrated approach: High-quality, ergonomic design and creation of spaces that support all aspects of wellbeing; Space that encourages movement; Encouraging social relationships; Purposeful design; Inclusive and accessible design.	4 - Complete	W2.4	Monitoring and control strategy: - Intuitive systems to support user interaction; - Responsive control strategy; - Remote monitoring and programming, review with Estates Management and client representatives.	4 - Complete	CE1.4	Supply chain engagement and viability testing: Review of circular product innovations; Review existing and new procurement routes (services as opposed to products). On-going reviews: Monitor design developments, conduct regular reviews, evaluate the overall impact.	4 - Complete	CC1.4	Performance review workshop: - Detailed Simulation Model walkthrough: Consider operational assumptions, internal environmental conditions, performance outcomes & EUI; - Detailed review of metering, programme & control; - CTH and Estates / FM strategy review.	4 - Complete	CC2.4	Carbon budgets, reportinig and updates - Iterative process. Life Cycle Assessment and Life Cycle Cost integration to inform options appraisal. Continue to review and update during design development stages.	4 - Complete	CC3.4	Detailed review of water sub-metering provision, location, specification and operation. Full integration with BMS platform for ease of monitoring and reporting.	4 - Complete
Review (pre-planning)			Internal approval																		
FBC	4 Technical Design		W1.5	Final specifications: - Desirable and usable space: End users feedback and usability testing influences final specification details; Review management and maintenacne requirements.	N/A	W2.5	Detailed dynamic simulation modelling - technical design update; IEQ performance parameters - review and update prior to construction work commencing; Management and maintenance - strategy review and draft BUG content.	4 - Complete	CE1.5	Update results of LCA, LCC and carbon budget: Communicate information with full project team and supply chains before moving to construction stage. Encourage circular supply chains: Inform procurement and tender documentation.	N/A	CC1.5	Change control - Approve any changes before construction and agree change control strategy; Quality assurance - Plan for inspection during construction stage (who, how and when?) Soft Landings review - Technical design 'reality checking'.	4 - Complete	CC2.5	Supply chain engagement - viability assessment; Inform tender / procurement documentation. Update carbon budgets at technical design stage and obtain LCA verification (final technical design).	4 - Complete	CC3.5	Specification of leak detection system: - Automated alert, programmable system; - Integration with BMS (for remote monitoring, programming and alerts).	1 - Commenced
Review (pre-construction)			Internal approval																		
Construction & Commissioning	5 Manufacturing and Construction		W1.6	Provision and purpose of design features and accessible and inclusive spaces to be included and communicated within building user guides.	4 - Complete	W2.6	Quality assurance and pre-completion testing to be completed prior to handover / occupation: - Acoustic pre-completion inspection and testing; - Internal environment - air quality results etc.	4 - Complete	CE1.6	Responsible construction practices: - Responsible procurement and resource management strategies; Agreed metrics and reporting schedule. Change control: - Management of issues, client approval required.	4 - Complete	CC1.6	Quality monitoring: -Quality assurance inspections & client reporting; -Programme of physical testing: fabric integrity / air-quality. Building user guides - review and sign-off	N/A	CC2.6	Carbon management and mitigation strategy implemented and impacts monitored and reported during construction; Quality assurance - Scheduled reviews and regular monthly reporting.	4 - Complete	CC3.6	Quality assurance: - Change control procedure in place requiring client sign-off.	4 - Complete
Project Monitoring & Evaluation	6 Handover		W1.7	Aftercare strategy - part of soft landings approach: - Showcasing of total wellbeing features communicated to end users during handover and aftercare sessions.	N/A	W2.7	Aftercare strategy - part of soft landings approach: - Communication and promotion of internal environment quality aspects and associated benefits to end users during handover and aftercare sessions. - Seasonal commissioning inspections.	4 - Complete	CE1.7	Lessons learned and measuring success: - Workshop to review benefits of applying circular economies to project; - Lessons and learning captured in report.	4 - Complete	CC1.7	CTH strategy in action - review aftercare programme; EPC - Net Zero Carbon 'as-built'; Client in receipt of multi-disciplinary model - BIM, Detailed Simulation Modelling, (to support asset management, maintenance, in-use, adaptation).	4 - Complete	CC2.7	As-built' review and final WLC assessment report; Carbon budget comparator exercise; Review and document lessons learned.	4 - Complete	CC3.7	Programming of leak detection systems - client / end user engagement as part of soft landings training and aftercare programme.	3 - Almost complete
Review (pre-occupation)			Internal approval																		
Project Monitoring & Evaluation	7 Use		W1.8	Extended POE monitoring - Functional performance analysis: occupant consultation, use of space, qualitative data, positive user interactions. Data disclosure - Capture and share lessons.	4 - Complete	W2.8	Extended POE - Functional performance analysis - qualitative and quantitative data; occupant consultation, internal environment monitoring; link with KSAR process. Data disclosure - Capture and share lessons.	4 - Complete	CE1.8	Extended POE - Review of circular business models in operation, updated LCC and WLC operational models Data disclosure- knowledge share, support supply chain development	4 - Complete	CC1.8	FM contracts - performance based: energy consumption and prioritising comfort & wellbeing; Extended POE - commence 3 year programme; Data disclosure - capture and share lessons.	4 - Complete	CC2.8	Extended POE - WLC impacts monitored and reported during operation and at end of life; Data Disclosure - capture and share lessons.	4 - Complete	CC3.8	Extended POE - consumption monitoring, maintenance and management; Data Disclosure - capture and share lessons.	4 - Complete
Review (in-use)			Internal approval																		

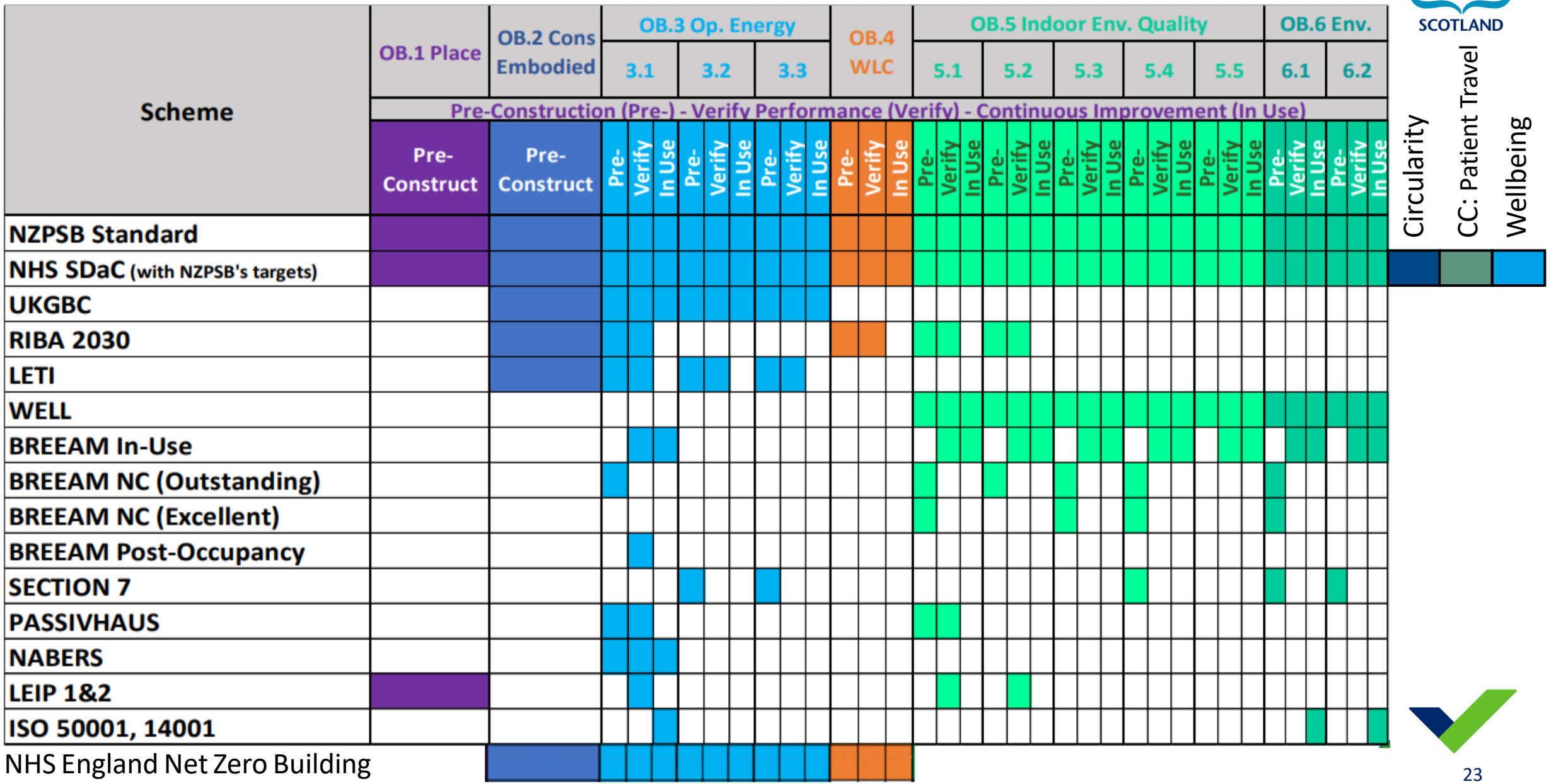
Key:
1 - Commenced
2 - Established
3 - Almost complete
4 - Complete
N/A

www.nss.nhs.scot/publications/sustain

NHSEngland Net Zero Building Standard Timeline: embodied carbon



Alternative Routes to Compliance - NZPSB Standard



NHS Scotland Assure
Quality in the healthcare environment

NHSS Sustainable Design and Construction Guide

NHS SCOTLAND

Oct 2021
Publish SHTN 02-01 NHSS SDaC Guide (Pilot/ Beta) #

Oct 2021 – Oct 2022
Projects' Pilot SHTN NHSS SDaC Guide (Pilot/ Beta)

Oct – Dec 2022
Feedback on SHTN NHSS SDaC (Pilot)

Pilot SDaC projects agreed to-date:
- AA02: NTC Ayrshire
- LK07: Monklands replacement*
- WI01: St Brendan & Barra Campus
- GG19: RadioNuclide Dispensary

New projects may be added via NDAP e.g. as IA stage Design Statement benchmark.
(LK07: *BREEAM NC2018 run in parallel)

Mar 2023
Publish SHTN 02-01 NHSS SDaC Guide (v1)

Apr -Jun 2024
Feedback on SHTN 02-01 NHSS SDaC (v1)

Aug 2024
Publish SHTN 02-01 NHSS SDaC Guide (v2)

SHTN 02-01 publication comm's:
- NHSS Sustainability 10 Nov21 webinar (SHTN 02-01) soft launch#
- NHSS Strategic + facility sub-groups
- Scot Gov Treatment Centre mtgs
- Scot Gov policy CEL(2012)02 update

References to new Guidance/info incl:
- HBN Net Zero Hospital facilities
- SFT Public Sector Net Zero guide

Apr -Jun 2027
Feedback on SHTN 02-01 NHSS SDaC (v2)

Aug 2027
Publish SHTN 02-01 NHSS SDaC Guide (v3)

Ongoing ≤ 5yr updates

SUSTAINABILITY ACTION
Our NHS Our People Our Planet

Pilot example

NHSScotland
Sustainable Healthcare and *Building towards Net Zero*

Susan Grant Principal Architect
NHSS Assure - Health Facilities Scotland

NHS SCOTLAND

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

Refurbishment & extension of a private health surgery facility

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

Refurbishment & extension of a private health surgery facility

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

W1 module

Place Standard (with Climate Lens) Tool

notional benchmark of 350 kWh/m²

NHS Scotland Assure
Quality in the healthcare environment

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

CC1 module

operational energy calculations:

✓ **notional benchmark = 350 kWh/m² /yr**

140 kWh/m² /yr

180 kWh/m² /yr

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

CC2 module

- **whole life carbon calculations:**

Embodied Carbon (A1 – A5)

A1 – A3 – Materials, transport and manufacturing — 350kgCO2e/m2

A4 - A5 - Transport and Construction — pass to contractor

Operational Carbon (B6 & B7)

Operational Emissions (B6) — 180kWh/m2/yr

Operational Water (B7)

Embodied Carbon (B1 – B5)

Maintenance, repair and refrigerants as possible / Carbon Offset — Reduce as much

Embodied Carbon (C1 – C3)

End of Life – Demolition, Transport, Waste Processing & disposal — Carbon Offset

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

CE1 module

- **circularity:**

Material targets:

Timber – use from renewable sources of manufacturing – reclaimed

Concrete – 80% GGBS – addressing local opportunities

Steel – Maximise recycled content to 100% - or AEF processing if virgin material include shipping emissions from EU / abroad – powder coating

Insulation – natural materials addressing low carbon content – target less than 10kgCO2/m2 – identify recycled materials – refer to SEDA non-toxic construction materials guidance https://www.seda.uk.net/design-guides - Toxic chemical reduction & Sustainable Renovation

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

CE1 module

• circularity:

- **Building services** – F-Gas use to be GWP less than 1 – use TM65 for products where manufacturer data LCA is unavailable
- **Plasterboard** – Compare fibre board and traditional plaster boards and alternative timber and recycled options. Options to be less than 1kGCO2/m2
- **Flooring** – Address circular materials and hard finishes. Most flooring is glued and cannot be reused or recycled so alternatives should be addressed looking at finishes and recyclability – address environmental impacts and VOC's and toxic materials for wellbeing / health impacts
- **Re-use materials** should be stored ready for the build date – Reuse products should take highest priority including any site won materials – preference give to EPD products – Health impacts to take concerns address all NON TOXIC material choices

SDaC Pilot example 1

NHS Ayrshire & Arran: National Treatment Centre (NTC), Ayr

W2 module

Indoor Environmental Quality

✓ Toxic Materials

- No formaldehyde board use chipboard resin, materials that off gas formaldehyde, no OBS, glues, furniture, insulation, floor and wall fittings, wall cabinets, MDF board, wood fibre sarking, particle board etc…
- Drastically reduce the use of PVC – PVC free wiring – addressing health, toxicity and carbon impacts – ex EcoPower / EnduroFlex etc…

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

- Improve person-centred services and care.
- Improve patient safety.
- Improve clinical effective-ness, patient experience and clinical outcomes.
- Improve the quality of the physical environment.
- Create flexible, adaptable & sustainable facilities across the health system.

www.nhslanarkshire.scot.nhs.uk/.../monklands-engagement/

NHS Scotland Assure
Quality in the healthcare environment

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

NHS SCOTLAND

www.nhslanarkshire.scot.nhs.uk/.../monklands-engagement/

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

W2 module

Indoor Environmental Quality

- ✓MEP Programme;
  - ✓53 Workshops over 4 months with Stakeholders across the organisation, AE's, APs, RPA & others.
  - ✓Daylight Modelling & Solar Shading.
  - ✓Energy Modelling.
- ✓TM52 Model.
- ✓TM54 Model.

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

CC2 module

Embodied Carbon

Modern Methods of Construction

Pre-Cast Concrete Lattice Planks – Including Topping

DfMA Element	PCC Lattice Slabs
Man-Hours Per Unit - DfMA	9.9 Hours
Man-Hours Per Units - Traditional	28.4 Hours
Forecast Man-Hour Saving Per Unit	18.5 Hours (65%)
Number of Units	1,443 No
Total Forecast Man-Hour Saving	26,695 Hours

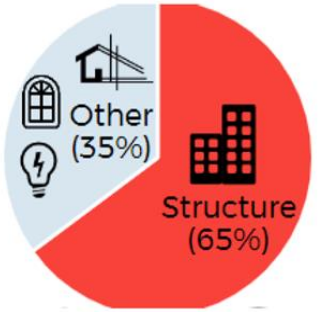
Benchmarking

Embodied Carbon Estimate $kgCO_2e/m^2$	*Alder Hey*	*Dumfries Ward*	*Dumfries Technical Block*	*The Grange*
Substructure	61	99	103	41
Superstructure	196	284	273	229
Total	257	**383**	**376**	270

Non-Domestic

<600 $kgCO_2e/m^2$ LETI 2020 (Total)

<350 $kgCO_2e/m^2$ LETI 2030 (Total)



<390 $kgCO_2e/m^2$ LETI 2020 (Structure)

<228 $kgCO_2e/m^2$ LETI 2030 (Structure)

wsp

NHS Lanarkshire

GB

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

CC2 module **Embodied Carbon**

Option 10

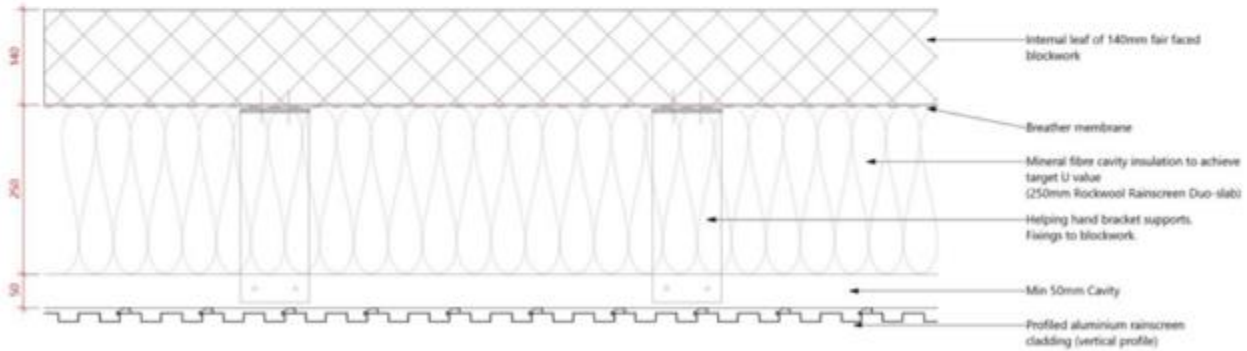
PROFILED ALUMINIUM CLADDING (RAINSCREEN) WITH BLOCKWORK INNER LEAF, ENERGY CENTRE

CO_2 **154 KgCO2e/m2** **HIGH LEVEL BUDGET COST: TBA**

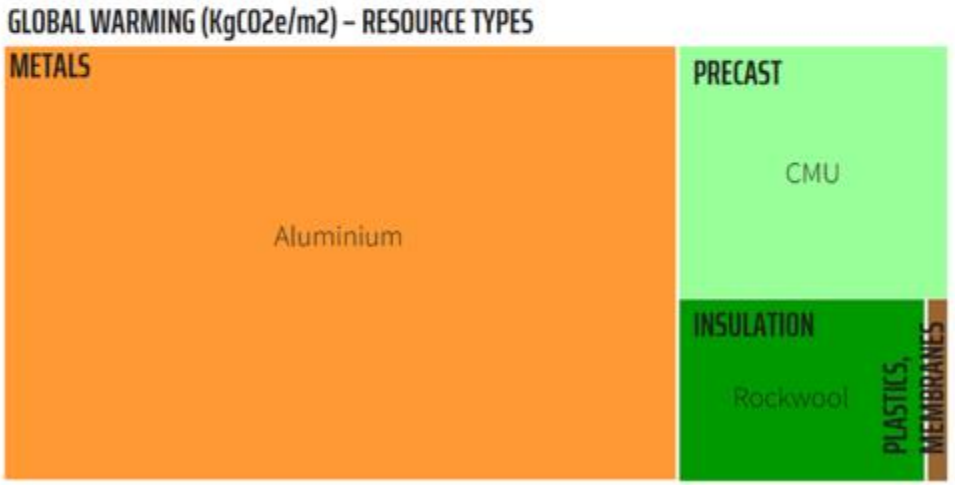
GWP calculation includes for 3mm thick cold formed aluminium sheet. Assumed that sheet will be 2mm thick but allowance made for castellated profile.

Allowance of 2.2kg/m2 aluminium has been made for sub frame (helping hand brackets, rails) but needs to be verified.

Allowance for anodisation of aluminium has been included in calculation (8.3KgCO2e/m2).



Note: Build-up will only achieve 0.16W/m2K (above target value of 0.15W/m2K) when maximum thickness of 250mm Rockwool Rainscreen Duo-slab is utilised as advised by Rockfon. Requirement for U-value to Energy Centre to be reviewed with Wallace Whittle.



NHS Scotland Assure
Quality in the healthcare environment

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

NHS SCOTLAND

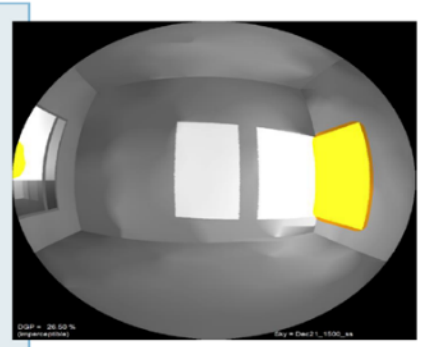
W2 module

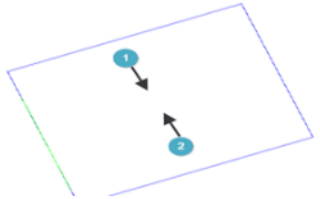
Indoor Environmental Quality

Glare Analysis

IES

- Room Types 2 and 3, within the courtyards, very unlikely to experience glare.
- The more exposed rooms types 4 and 5, consider refining the patient bed position to help limit glare potential.
- Patient bed position 2 shows less potential of intolerable glare than bed position 1.
- Enclave C5 has a higher glare risk compared to the remainder of Block C, due to its greater exposure to direct sunlight.
- W, SE and NW elevations see higher risk for bed position 1.
- W, S, SW and SE elevations are more sensitive for bed position 2.
- W facade followed by SE experiences the greater potential for hours of glare.
- Glare risk mostly during the second half of the day, especially in room types 4 and 5.
- The majority of glare instances occur around 5pm.
- The selection of suitable positions could result in saving 2-3 hours of potential glare.

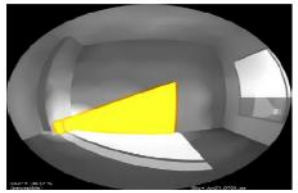




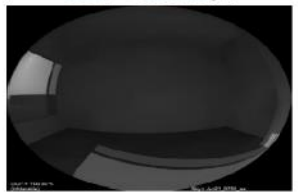
DGP – Observations

IES

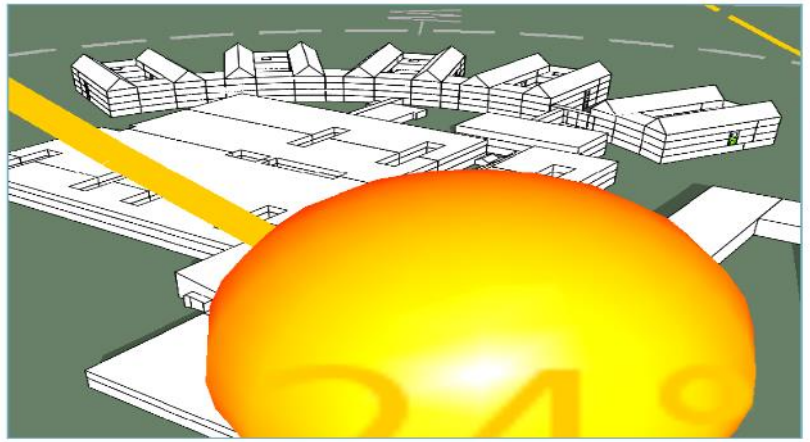
Patient position 1 experiences visual comfort compared to position 2.



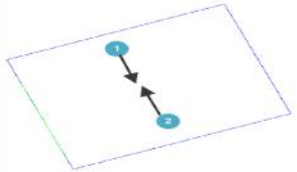
Position 1
DGP=36.07%



Position 2
DGP=100%



June 21st 15h



< 35%	Imperceptible
35 - 40%	Perceptible
40 - 45%	Disturbing
> 45%	Intolerable

SDaC Pilot example 2

NHS Lanarkshire Replacement Monklands Campus

Pilot Lessons Summary

- ✓ Clear Governance for decision-making
- ✓ Regular Stakeholder Engagement
- ✓ Whole Team multi-disc approach, e.g. end users, designers, infection control
- ✓ Soft Landings & NDAP
- ✓ Simulation & Modelling
- ✓ MEP programme
- ✓ Review and Update
- ✓ **Repeat**

SUSTAINABILITY ACTION

Our NHS Our People Our Planet

Thank you

https://nhssustainabilityaction.co.uk

susan.grant6@nhs.scot

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