Data Centre Sustainability

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MD Carbon3IT Ltd

DCF Helsinki

4th November 2021

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John Booth

MD - Carbon3IT Ltd
Technical Director – National **Data Centre** Academy

Vice Chair BCS Green IT SG
BSI TCT7/3 Committee – EN 50600 **Data Centre** Standards
EU Code of Conduct for **Data Centres (Energy Efficiency) Joint Author/Reviewer/Committee Member**
Data Centre Alliance – Chair SIG **Data Centre Energy Efficiency & Committee Member Sustainability**
DCD CEEDA (Certified **Energy Efficient Data Centre** Award) Global Lead Assessor
ISO 50001 **Energy Management** Systems Lead Auditor
ISO 22301 Business Continuity Management Systems Lead Auditor
Energy Saving Opportunities Scheme (ESOS) Lead Assessor – Energy Management Association
Certified **Data Centre Audit** Professional (CDCAP™)
Certified **Data Centre Sustainability** Professional (CDCSP™)
Advisory Board - **Sustainable Digital Infrastructure** Alliance
iMasons Sustainability Committee

EU H2020 Projects

- PEDCA - Pan European **Data Centre** Academy
- EURECA – Green Procurement for Public Sector **Data Centre**
- CATALYST – **Data Centres** as Flexible Energy Hubs (Renewables, Grid & Heat Services)

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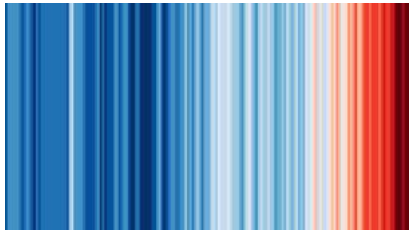
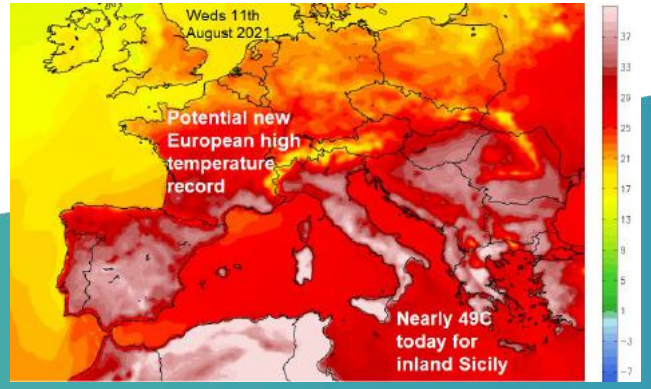
The “Climate Emergency”





Helsinki

Weather and climate change risks in Helsinki

What is “Sustainability”?

Sustainability is defined as “"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.“

The United Nations have published a document that extends this definition into 17 specific goals

https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

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UN Sustainable Development Goals

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What needs to be done!

10 Key Solutions Needed to Reduce Greenhouse Gas Emissions

Source: WRI.

WORLD RESOURCES INSTITUTE

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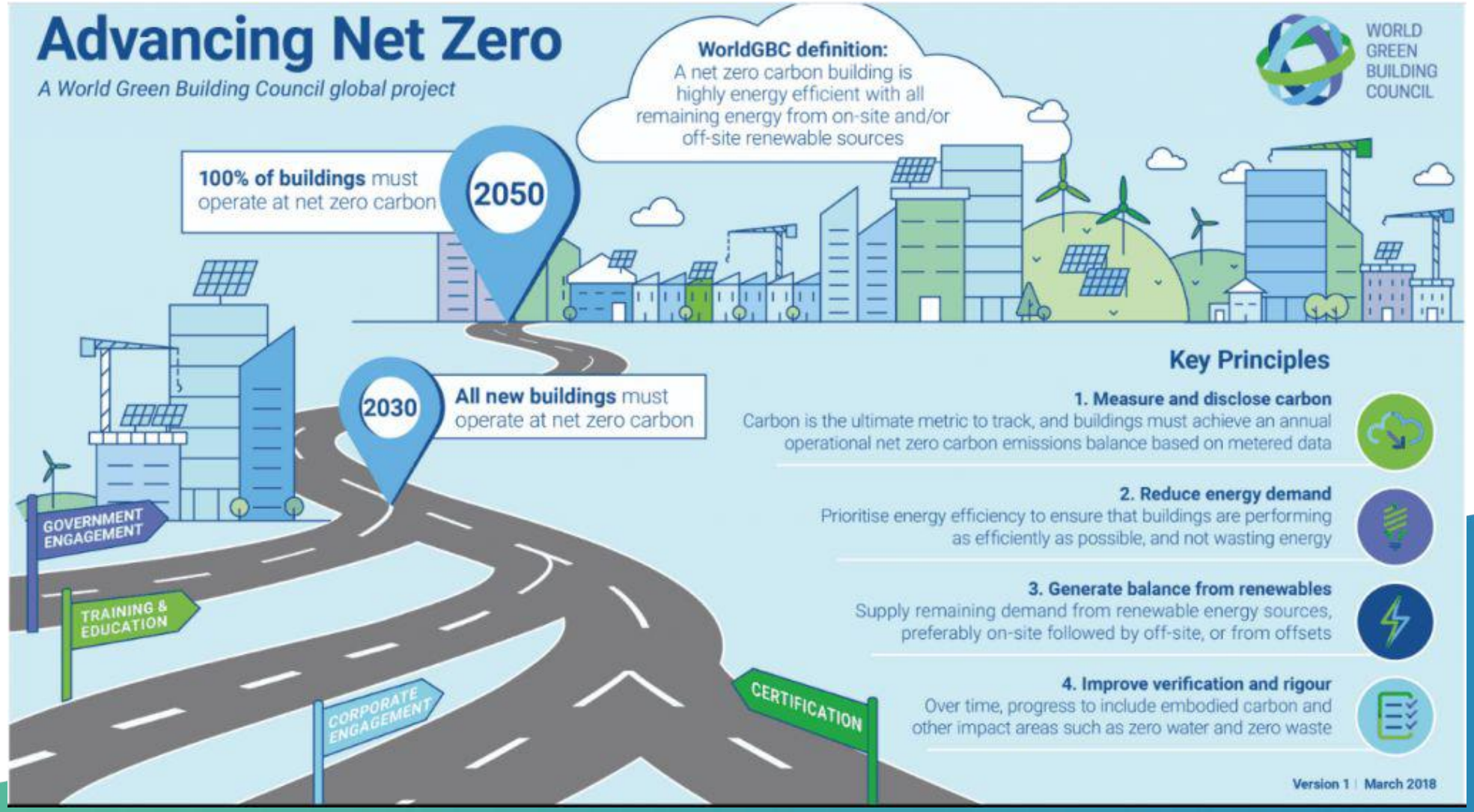
Net Zero – Buildings



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Any Questions?

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What is “Sustainability” in a Data Centre Context?

There is NO globally recognised definition of what a…

Sustainable Data Centre

Looks like!

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What is “Sustainability” in a Data Centre Context?

EU Code of Conduct for Data Centres (Energy Efficiency)

EN 50600 TR-99-1 Best Practices for Energy Efficiency (EUCOC)
EN 50600 TR-99-2 Best Practices for Sustainability

ISO30134 Series Data Centre KPIs (PUE etc)

iMasons Sustainability Framework

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What is “Sustainability” in a Data Centre Context?

The “Designing and Building the Next Generation of Sustainable Data Centers” document published in December 2019 issued a “call to action”

“We must rethink how we design, build, and operate next generation data centers and adopt using the sustainable cost of ownership which includes economics, resource impact, and society benefits.”

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What is “Sustainability” in a Data Centre Context?

And defines the “sustainable data center/centre” as:

The next generation data center has sustainability at its core.

It uses renewable energy 24x7x365 and achieves net zero results in carbon footprint, emissions, and waste.

It does this while maintaining 99.999% uptime and achieving optimal resource (power, water, land, network) usage effectiveness, such as PUE near 1.000, and a WUE near 0.000.

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What is “Sustainability” in a Data Centre Context?

In essence….

Sustainable data centers use renewable energy sources, reuse materials to perpetuate their life cycles, remanufacture by-products and reduce landfill impact.

Overall, the sustainable data center benefits the environment, society, and human welfare 24x7x365, thus aligning with the UNSDG goals.

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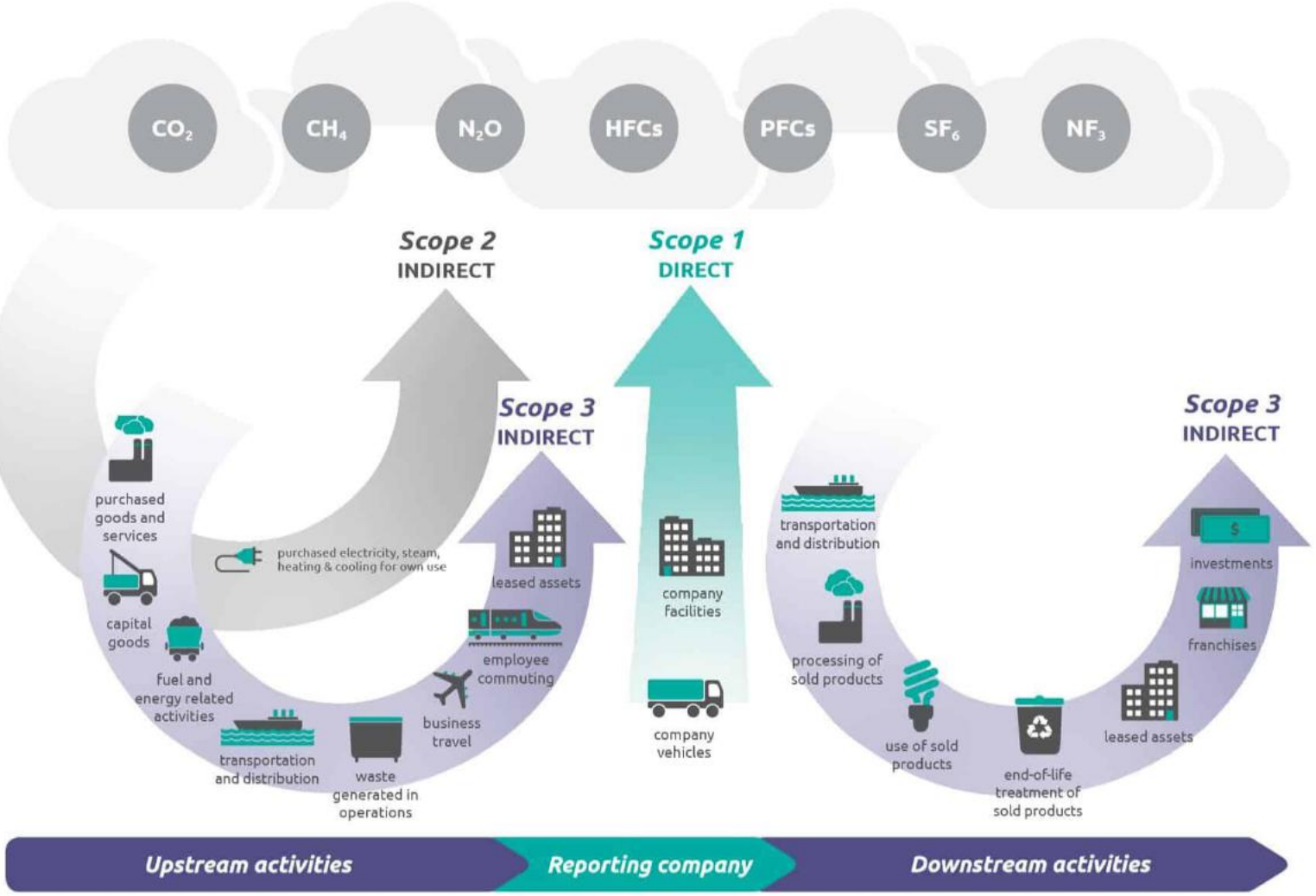
The “GHG Scopes”



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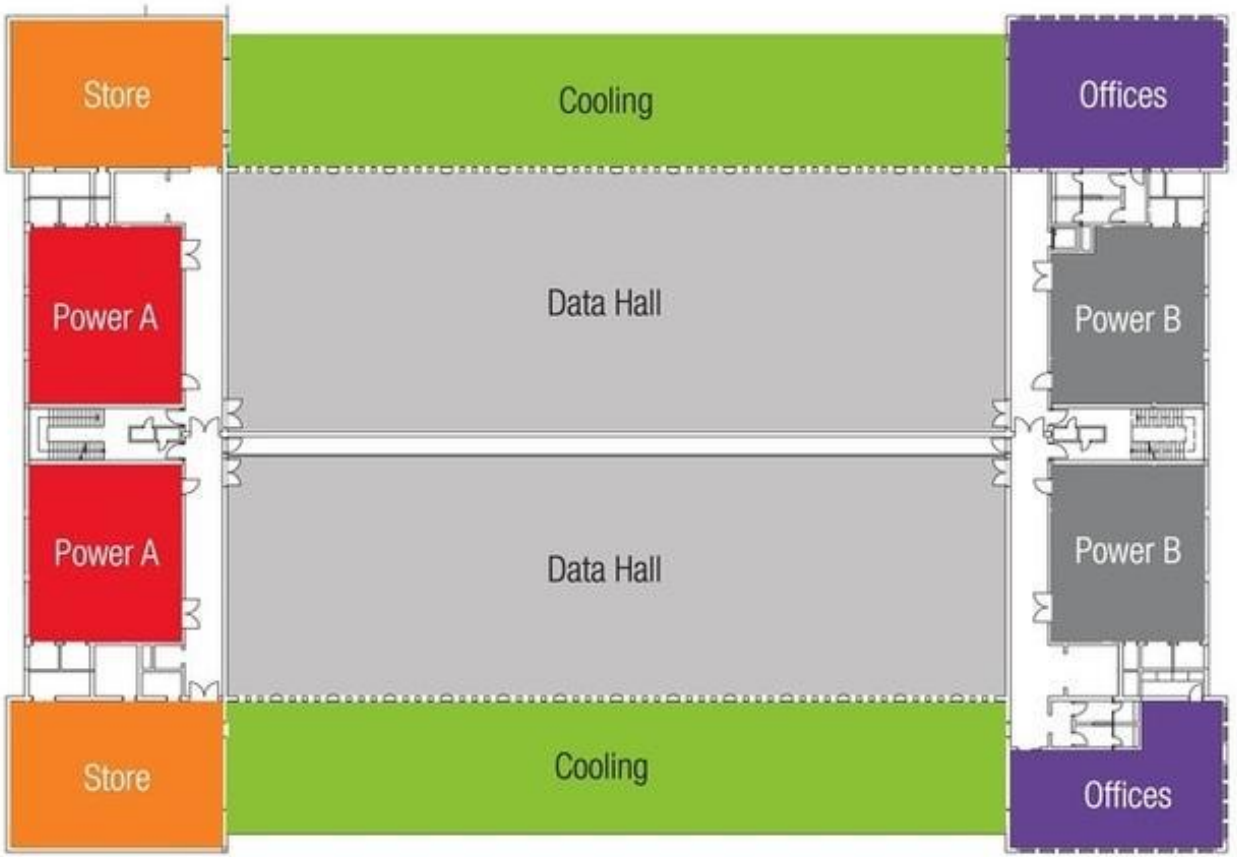
Current Designs



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The Fiesta!

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IT'S TIME FOR A RADICAL RETHINK

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EU Code of Conduct for Data Centres (Energy Efficiency)

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CLC/TR EN 50600 TR-99-2

The impact from manufacturing the mechanical and electrical systems and IT equipment dominate the embodied environmental impact of data centres – being two to three orders of magnitude greater than the construction phase.

As a result, environmental assessment methods for buildings (such as BREEAM and LEED), which consider the embodied impact of only the construction materials, are of limited use, even though they have data centre specific schemes, because these components are omitted from consideration.

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CLC/TR EN 50600 TR-99-2

Users of this document are not required to undertake an LCA. This sub-clause provides a background to the method, and guidance based on the findings of previous LCA studies.

However, users who wish to undertake an LCA to gain a more detailed understanding of the areas of impact of a specific facility are referred to in EN 15643-1, EN ISO 14040, ITU-T L.1410 and the ILCD Handbook.

EUCOC 3.2.4 Lifecycle Assessment, Mandatory for "New Build/Retrofit from 2022

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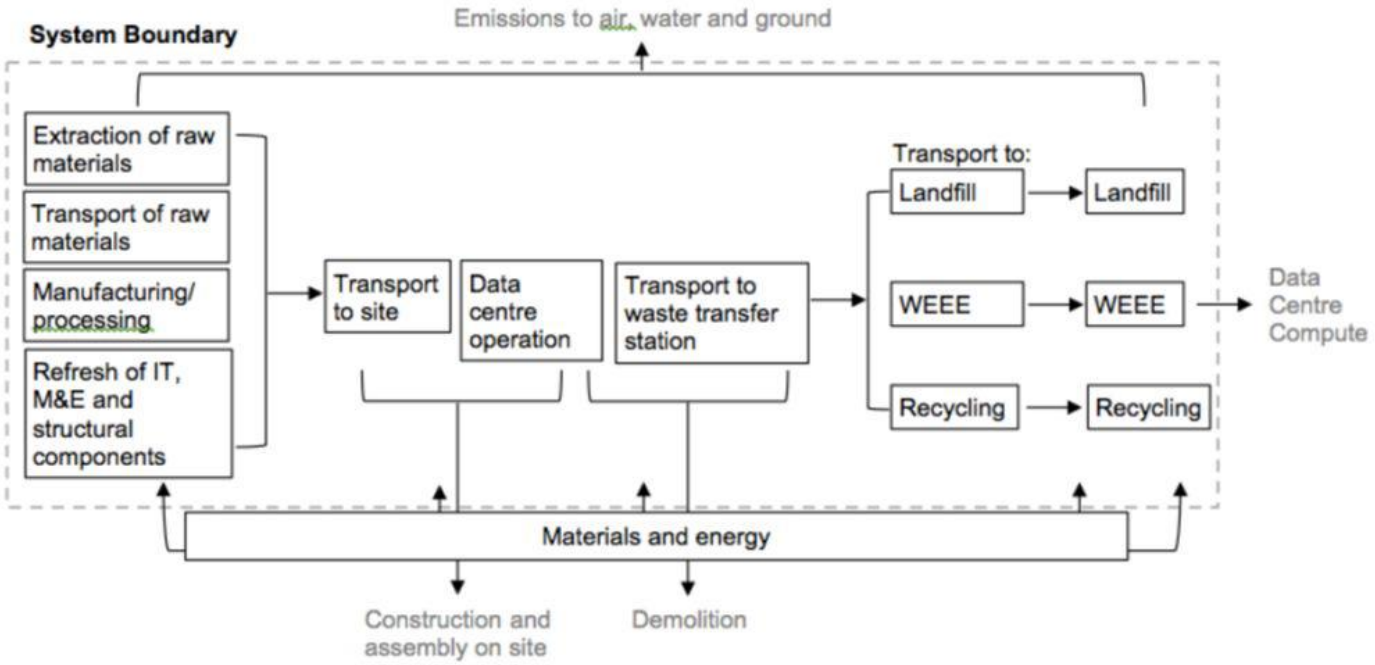
CLC/TR EN 50600 TR-99-2



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Data Centre Lifecycle TCO Emissions

Phase	GHG Emissions	Timescale	GHG Scope	Comments
Design/Construction	1-4%	1-2 Years	3	
M&E Fit Out	4%	20-25 Years	3	
IT Fit Out	12%	3-5 Years	3	
Operations	80%	25+	1 or 2 and 3	Depends on Power Source
Decommissioning	Marginal	1-2 Years	3	

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Construction Materials – EPD

Life Cycle Stages	Product			Construction		Use/Operational Stage							End of Life				Benefits and Loads beyond the System Boundary
						Related to Building Fabric					Related to Building Operation						
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw Material Supply	Transport	Manufacturing	Transport	Construction/Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Demolition	Transport	Waste Processing	Disposal	Reuse/Recovery/ Recycling Potential
EPD - Cradle to Gate																	Optional
EPD - Cradle to Grave																	Optional

Mandatory	
Optional	

CODE OF CONDUCT DATA CENTRES

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Construction Materials – EPD

ENVIRONMENTAL INDICATOR	UNITS
Global Warming Potential (GWP)	kg CO2e/Kg or product unit
Ozone Depletion	kg CFC11e/Kg or product unit
Acidification of Soils and Waters	kg SO2e/Kg or product unit
Eutrophication	kg (PO4)3-e/Kg or product unit
Photochemical Ozone Formation	Ethene e /Kg or product unit
Exhaustion of Abiotic Resources (elements)	kg Sb e/Kg or product unit
Exhaustion of Abiotic Resources (fossil fuels)	MJ/Kg or product unit
Water Depletion	m3/Kg or product unit
Water Pollution	m3/Kg or product unit
Air Pollution	m3/Kg or product unit

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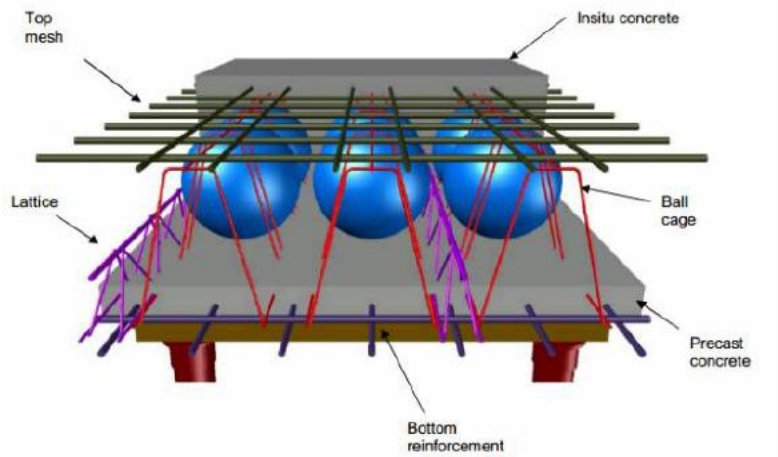
Construction Materials – Concrete

ITEM	Kg/m3	VALUE, Kg CO2e / t	Kg CO2e/m3
CEMENT			
CEM I 42.5 R	330	881	308
VICANT - Naturat CEM II/A-M (LL-P) 42,5 R CE NF (-30%)	330	617	221
CEMEX - Vertua Classic (Max -50%)	330	441	163
LAFARGE-HOLCIM - EcoPact (-60%)	330	352	133
AGGREGATES			
Sand 0-4	752.1	10	8
Coarse 4-8	583	10	6
Coarse6-12	332.9	10	3
		SUM AGGREGATES	17



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Construction Materials - Steel

https://www.steelconstruction.info/Sustainability#Life_cycle_assessment_.28LCA.29

Current recovery rates from demolition sites in the UK are 99% for structural steelwork and 96% (on average) for all steel construction products – figures that far exceed those for any other construction material

The amount of energy used in steel manufacture has fallen by some 61% since the 1960s, according to World Steel Association data (2020), and further improvements are being sought from steel sector research and development investments.

It means that steel components have the potential to be perpetually reused in a continuous loop, and never sent to landfill; a truly circular economic model.

Capital Plant Environmental Product Declaration

EUCOC 3.2.4 Lifecycle Assessment

All DC Supply Chain either have or are in the process of producing EPDs for their products.

https://www.environdec.com/all-about-epds

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Operations

Follow the EUCOC

Management

Procurement (EPDs)

Calculate all the ISO 30134 KPIs

Calculate Operational GHG Scope 3's

Enterprise - Use Accredited Colo's

Colo's – Consider Accreditation

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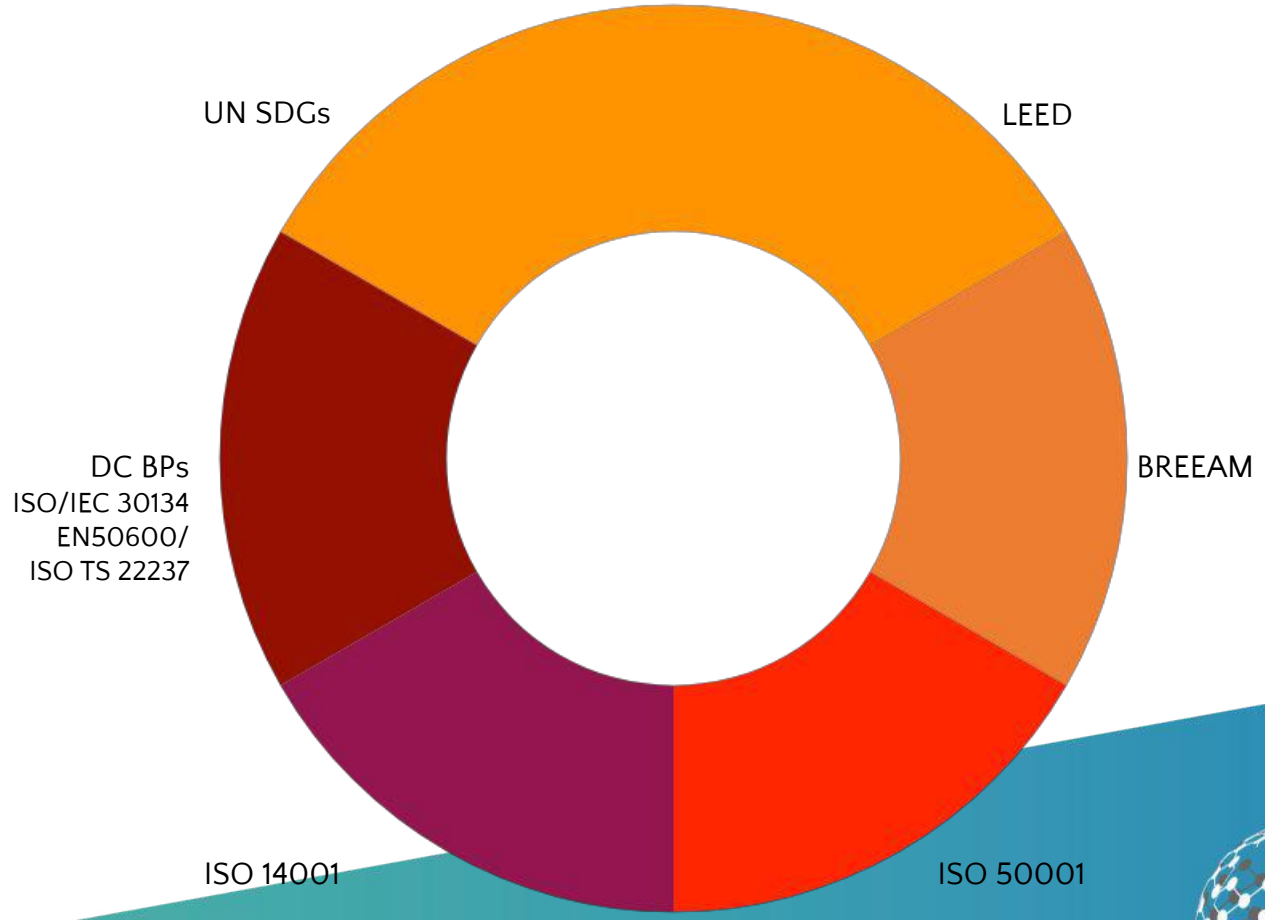
Data Center Sustainability Wheel*: Certifications + Compliance



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*TM JBNM 2020/21

Any Questions?

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EU – Data Centre Policy

CE

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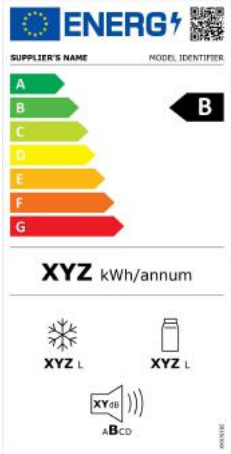
European Commission

HORIZON 2020



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EU – Climate Neutral Data Centre Pact

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CNDCP Reporting Reqs (TBC) Mapping to ISO/IEC DC KPIs – 1

Energy Efficiency

ISO/IEC 30134-2 Data Centre Key Performance Indicators, Power Usage effectiveness (PUE) [30134-2] - PUE

Clean Energy

ISO/IEC 30134-3 Data Centre Key Performance Indicators, Renewable energy factor (REF) [30134-3] - REF

ISO/IEC 30134-4 Data Centre Key Performance Indicators, IT Equipment Energy Efficiency for servers [30134-4]

ISO/IEC 30134-5 Data Centre Key Performance Indicators, IT Equipment Utilization for servers (ITEUsv) [30134-5]

CLIMATE NEUTRAL DATA CENTER

CODE OF CONDUCT DATA CENTRES

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CNDCP Reporting Reqs (TBC) Mapping to ISO/IEC DC KPIs – 2

Circular Energy System

BS ISO/IEC 30134-6 Data Centre Key Performance Indicators, Energy Reuse Factor (ERF)– [30134-6]

Clean Energy??

BS ISO/IEC 30134-8 Data Centre Key Performance Indicators, Carbon Usage Effectiveness (CUE) –[30134-8]

Water

BS ISO/IEC 30134-9 Data Centre Key Performance Indicators, Water Usage Effectiveness (WUE) – [30134-9]

CLIMATE NEUTRAL DATA CENTER

CODE OF CONDUCT DATA CENTRES

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iMasons Sustainability Framework

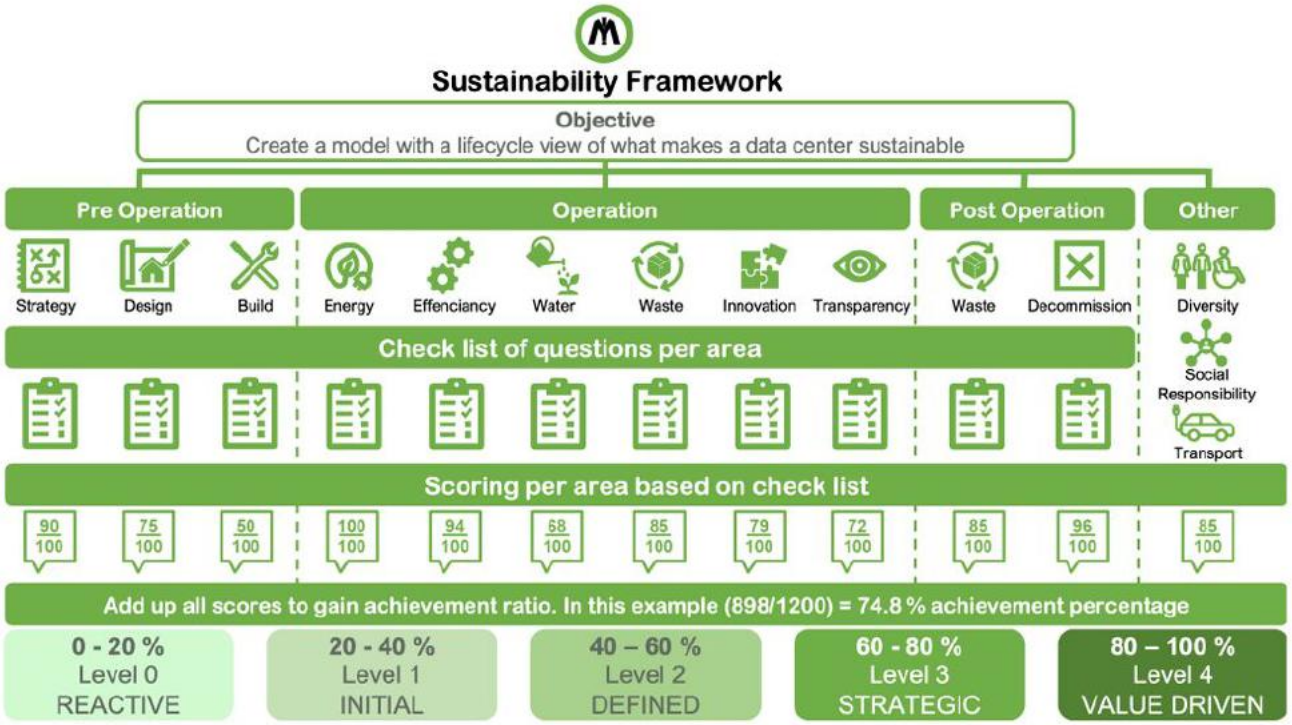

Figure 1 - iMasons Sustainability Framework

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Tips

Use and formally participate in the EU Code of Conduct for Data Centres (Energy Efficiency)

Undertake some DC Energy Efficiency & Sustainability Assessments

Consider using/certifying to ISO 50001

Get an External Review perhaps some Sustainability Benchmarking

Undertake some Training

Consider CEEDA/DCA Certification

Sign up to Climate Neutral Data Centre Pact

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Q&A's

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Thank You

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Extra title