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House Keeping (Online)

	**	Break every 50mins. Slides will be circulated after event.
		Assessment: 20 multiple choice questions via online form One certificate per completed assessment / course participant
		Certificate of Completion issued by AEE for those who score 70%+ in the assessment Certificate of Attendance <70%
		Phone on silent please, but keep to hand for Slido polls (anonymous) & Assessment (requires full name & email for issuance of Certificate)
		Can you see the screenshare? Sound on? Turn off other apps (for bandwidth) Mute on and Camera off. Camera on when speaking and at open forum
	۲	Trainers are required to be solutions – agnostic. If you have any concerns about this course pls use chat and/or feedback form to put same on the record.
୦ଡଙ୍		Raise hand to interrupt (questions welcome). Use chat for links, files and questions. Upvote other's questions using 🖄 emoji to save typing

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AEE

Climate

About AEE aeecenter.org/certifications/certification-benefits

- AEE has tens of thousands of active certified professionals operating in 100+ countries!
- Gaining a wide-reaching and industryrecognized certification is always a personal and financial investment. Individuals report career improvements in the form of salary and responsibility increases and matching benefits for their organization.



AEE Credentials

AEE credentials are recognized worldwide by government agencies and many employers, including:

- American National Standards Institute (ANSI)
- Entidad Nacional de Acreditación (ENAC)
- U.S. Department of Energy, Better Buildings
- Saudi Energy Efficiency Center (SEEC)
- Sustainable Energy Authority of Ireland (SEAL)
- Kenya's Energy Regulatory Commission (ERC)



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AEE Certification explained

Professional Development

- Open to all
- Attend
- Pass assessment (70%)
- · Certified by AEE (central)
- If assessment not taken, certificate of attendance issues after 7 days

Certification(s) of competence

- Certified Energy Auditor (CEA)
- Certified Energy Manager (CEM)
- Certified Measurement & Verification Professional (CMVP)
- Attend courses (85% min)
- Pass the exam
- Industry experience (CEUs)
- 3 year validity (maintain CEUs)

CEU = Continuing Education Unit, 1 CEU generally = 1hr CPD

AEE Certifications – Energy Management

	Certified Energy Manager – CEM®
	Business Energy Professional – BEP®
1	Energy Efficiency Practitioner – EEP™
e	Certified Industrial Energy Professional – CIEP™
	Certified Measurement and Verification Professional – CMVP®
	Certified Lighting Efficiency Professional – CLEP™
50001 CP EnMS	Certified Practitioner in Energy Management Systems – 50001 CP EnMS
	SEP Performance Verifier – SEP PV
50001 LA	ISO 50001 Lead Auditor – ISO 50001 LA

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AEE Certifications – Energy Service and Sustainable Development

cea	Certified Energy Auditor – CEA ®
CBCP.	Certified Building Commissioning Professional – CBCP®
CBCF®	Certified Building Commissioning Firm – CBCF™
PCF	Certified Performance Contracting and Financing – PCF [™]
<u>CWEP</u>	Certified Water Efficiency Professional – CWEP™
REP	Certified Renewable Energy Professional – REP™
CISIDP	Certified Sustainable Development Professional – CSDP®
C•A•P	Carbon Auditing Professional – CAP™
GBE	Certified Green Building Engineer – GBE™
	Certified GeoExchange Designer Program – CGD™

Introductions: Trainers, Authors & Advisors

Climate Action course requested by SEAI in Jul 2022,

• developed by Sustineo and agreed with AEE in Jan 2023

Raoul Empey, BA BAI, MSc, CEng MIEI, CEM-I

- Managing director of Sustineo
 - <u>Sustainability in 3 simple steps</u> (Measure, Optimise, Restore)
- Loves nature walks, travel & culture, food

Day 1

Context

Climate Reality leader and specialises in carbon management

Conor Molloy, MSc (energy), CMVP, MCILT, CEM-I

- Helping business save energy & emissions since 2005
 Promotes the <u>ASI, model (Avoid | Shift | Improve_fuel</u>)
- Expert on Global Logistics Emissions Council (GLEC)
- · Climate Reality leader and specialises in sustainable logistics programmes

You - 20 seconds each: Name, Role, Organisation, Why you are here!



Agenda

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Learning Objectives

Participants will:

- 1. Gain an overview of Global, Regional (North America) and National (USA) emissions, policy, and legislation
 - Terminology, concepts and jargon explained
- 2. Understand the potential impacts and opportunities facing businesses

 Including carbon budgets for enterprise
- 3. Know what Climate Action means with particular regard to
 - Reducing emissions
 - Adapting to a changing climate, and
 - Raising awareness amongst suppliers, staff and customers
- 4. Learn how to prioritise opportunities for improvement
 - How to do carbon calculations
 Templates provided
 - remplates provided
- 5. Know where to find the supports to start climate action planning for your business



	Dusiness case	14.	Carbon Footprint		
2.	Science	15.	Boundary	2.	GHGs
3.	Global Policy	16.	Scope 1	3.	Energy
4.	EU Policy	17	Scope 2	4	OFI - Prioritisation
5.	Ireland's Policy	18	Scope 3		
6.	What is climate action?	19	EPDs and embodied emissions	5.	Risk Assessment
		20.	Outside of Scope (bioenergy)	6.	Scope 1 & 2 calculation
lern 7	Is / Units	21.	Presenting Results	7.	Scope 3 calculation
7.	Scale of Challenge	22.	Standards	8	Climate Action Plan
9.	Start with Energy	23.	Voluntary Carbon Markets: Carbon Offsets	0.	clinitic rector right
10.	How to Win	24.	Potential Pitfalls		
		25.	Winning approaches		
Ada	otation	Asse	ssment		
7.	Global context	Awa	reness		
8.	Ireland	26.	Solutions globally vs individual choices (for		
9.	Definitions / Standards	27.	Staff Engagement		
		28.	Innovative Approaches		
		29.	Don't Underestimate Human Success!		
		Clim	ate Action Plan Pitch		

30. Wrap Up

Day 2

Mitigation



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Polls & Exercises

1. Business case





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Companies at physical risk from Climate Change Source EC8 https://www.ecb.europa.e u/press/blog/date/2021/h tml/ecb.blog210318-3bb c68ftc5.en.html



EIB: Survey of Businesses at Risk 2021

Figure 1. Share of firms whose business activities are affected by physical climate risks, by country (%)



Note: The base is all firms (data not shown for those who said don't know/refused to answer). Question: Thinking about climate change and the related changes in weather patterns, would you say these weather events currently have a major impact, a minor impact or no impact at all on your business? Source: Elils 2020

Source: European Firms and Climate Change 2020/2021 / Evidence from the EIB Investment Survey (EIB, August 2021)

Co-Benefits from climate action

- ✓ Brand reputation
- ✓ Investor confidence
- ✓ Increased innovation
- ✓ Bottom line savings
- \checkmark Competitive edge
- ✓ Resilience against regulation

Images: https://www.dw.com/en/flooding-in-germany-beforeand-after-images-from-the-ahr-and-eifel-regions/a-58299008





"IT IS NOT AN INVESTMENT IF IT IS DESTROYING THE PLANET."

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Business Case

(as used in large organisations to secure time/monetary resources)

Example	€
Energy & fuel spend (approx.)	€ 1,000,000*
Typical projected savings Say 10% over 3 years	€100,000
Potential annual energy saving	€ 33,000
Profit (or non-pay budget) last year? Say 3% margin of €3m t/o	€ 90,000
Energy savings as % of profit/budget per year	37%
Sales or work needed to make same profit Annual energy cost savings + margin	€ 1,100,000
*Assuming 1L = €1 for ease of calculation	



Carbon Prices





Legal & Other Requirements

Mandatory

Depends on sector/size, but one important one is the EU's **Corporate Sustainability Reporting Directive** ("CSRD" ultimately replacing the EU Non-Financial Reporting Directive or "NFRD")

- 2024 companies and public interest entities already included in NFRD > 500 employees
- 2025 > 250 employees
- 2026 listed SMEs, with potential opt out until 2028
- 2028 EU branches and subsidiaries (turnover €40 million) of non-EU companies with substantial activity in the EU market (turnover €150 million)

Voluntary

- Carbon Disclosure Project (CDP)
- Science-Based Targets initiative (STBi)
- B Corp Certification
- Origin Green
- Business in the Community Ireland Low Carbon Pledge
- etc

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 $\label{eq:source:https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en/$

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Include Carbon in our Business Case (as used in large organisations to secure time/monetary resources)

Example € tCO₂e Energy & fuel spend (approx.) € 1,000,000* 3,170* Typical projected savings Say 10% over 3 years €100,000 317 Potential annual energy saving € 33,000 105 Profit (or non-pay budget) last year? € 90,000 Say 3% margin of €3m t/ Energy savings as % of profit or budget per year 37% Sales or work needed to make same profit € 1,100,000 Annual energy cost savings ÷ 3% margin *Assuming $1L = \notin 1 = 3.17 \text{ kgCO}_2 e$ for ease of calculation Cost to Offset (a last resort) 3,170 tCO₂e energy emissions as alternative to saving fuel @ €15/tCO₂ = 3,170 tCO₂e x €15/tCO₂ = € 47,550 per yr (equivalent to 634 hectares of forest at 5tCO2/ha per year, i.e. 634ha in perpetuity) Oe -





Global warming

- We have known how the earth https://en.wikipedia.org/wiki/ traps heat since 1850's
 - John Tyndall (Carlow)1859
 - Eunice Newton Foote (USA) 1856
- CO₂ is the largest greenhouse gas by volume and **persists for** 300-1,000 years
- 93% of warming to date has been absorbed by the oceans



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Eunice Newton Foote



Measurements of CO₂ in ppm 1958-2022 Carbon dioxide concentration at Mauna Loa Observatory (u 420 u 410 400 1960 1965 10-Full record ending December 31, 2022 Concentration 390 380 370 360 350 340 ŝ 330 320 310 Source: Scripps Institution of Oceanography at UC San Diego passed 420ppm in May 2021 having started at 315ppm in 1958 Cee

Measuring Emissions, PPM (Parts Per Million)

Green House Gases (GHGs)

- Carbon Dioxide CO₂
- The largest GHG by volume
- Natural product of combustion
- Expressed as ppm
- Currently 420ppm
- Global impact
 - Deaths? None, but growing number of climate migrants; CO₂ is not fatal in low concentrations
- See also COVID viruses are jumping species due to pressure on natural habitats Clee

Air Quality emissions - EPA.ie

- Impact locally on human health [deaths estimated at 1,300+pa in Ireland - EPA]:
 - carbon monoxide (CO)
 - hydrocarbons (HC), present in fuel and as solid in asphalt
 - · oxides of nitrogen (NOx), associated with asthma
 - · particulate matter (PM), generated by the burning of fuel associated with cancer, alzheimers
- https://www.epa.ie/environment-andyou/air/



Are we Dinosaurs subsidizing meteors?

With apologies to #DontLookUp

 UN Development Programme For more information on the 'Don't Choose Extinction' campaign, visit www.dontchooseextinction .com

Temperature &

Keeling curve (ppm CO₂) and policy changes at global level.

Build your own stripes for temperature

https://showyourstripes.info/s/globe

policy

change at

This graphic



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Carbon Budget







Absolute reductions? EU -33% 1990-2020





CSRD: European Sustainability Reporting Standards (ESRS) DRAFT EUROPEAN SUSTAINABILITY **CROSS-CUTTING STANDARDS** REPORTING STANDARDS ESRS 1 ESRS 2 General requirements General disclosures ESRS E1 Climate change TOPICAL STANDARDS ENVIRONMENT ESRS E4 ESRS E5 ESRS E3 ESRS E2 ESRS E1 Biodiversity Resource use Water and marine Climate change Pollution and and circular resources ecosystems economy ESRS S1 ESRS S2 SOCIAL ESRS S3 ESRS S4 Consumers and Affected Own Workers in the workforce communities end-users value chain GOVERNANCE EFRAG ESRS G1 Business conduct

Source: https://www.efrag.org/ (first draft standards Nov 2022)





US Emissions down 3.1% vs 1990 excl LULUCE



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U.S. CO₂ emissions from energy consumption by source and sector, 2022



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A \$500 Billion Investment in a Green Economy

The federal government's average annual climate spending is poised to triple this decade.



Source: BMI Source:https://twitter.com/hankgreen/status/1559583593835352065?s=20&t=KtAzIPMUaW-VJjzH7GTxHQ and https://www.creditsuisse.com/about-us-news/en/articles/news-and-expertise/us-inflation-reduction-act-a-catalyst-for-climate-action-202211.html#:~-text=ln%20fact%2C%20Credit%20Suisse%20estimates.over%20the%20next%20the%20years accessed 06 Nov 2023 11/14/2023

(C) AEE

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fossil fuels



USA Target: 50-52% reduction vs 2005



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Source: Climate Action and Low Carbon Development (Amendment) Act 2021

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Sustainability defined / explained?



Based on the https://thenaturalstep.org/approach/ direct link to video https://youtu.be/B5NiTN0chj0











13 CLIMATE

(in the second

- 2. Decarbonisation: This happens when we <u>stop using fossil fuels</u> throughout the whole country. <u>Climate jargon buster</u>
- 3. Decarbonisation Zone: "spatial area identified by the local authority, in which a range of climate mitigation, adaptation and biodiversity measures and action owners are identified to address local low carbon energy, greenhouse gas emissions and climate needs to contribute to national climate action targets". This definition has been informed by a briefing paper prepared by CARO/CODEMA.





Acid Test for Climate Action?

- 1. Does it reduce emissions? (mitigation)
- 2. Does it help us adapt to a changing climate (adaptation / resilience)?
- 3. Does it raise awareness in either of the above?

If no to all 3, is it really climate action?

But do list co-benefits such as biodiversity!

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Source: Sustineo 2023

COP27: Acid Test for Climate Action (if you are a Country)

- 4 Pillars
- 1. Mitigation, are you actually reducing your GHG in absolute terms
- 2. Adaptation,
- 3. Finance,
- 4. Loss & damage

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Source: https://energypost.eu/cop-27-loss-damage-can-become-the-fourth-pillar-of-climate-action-along-with-mitigation-adaptation

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Stuff our Climate Action team needs to understand. <u>https://climatejargonbuster.ie/</u> an initiative from EPA, NALA and Gov.ie may help, or look locally in the country your HQ is based.









Global Warming Potential (GWP) Factors

A measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon (100 years for carbon footprinting), relative to carbon dioxide.

	GHG	GWP – 100yr (source AR5 – IPCC)			
	Carbon dioxide (CO ₂)	1			
Methane (CH ₄)		28			
	Nitrous oxide (N ₂ O)	265			
Hydrofluorocarbons (HFCs)		Various (4 - 12,400)			
Perfluorocarbons (PFCs)		Various (6,630 – 23,500)			
	Sulphur hexafluoride (SF ₆)	23,500			
	Nitrogen trifluoride (NF ₃)	16,100			
	1 tonne methane (CH ₄) = 28 tCO ₂ e				

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One extra GHG for logistics (voluntary)





https://www.ccacoalition.org/en/resources/black-carbon-methodology-logistics-sector

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US Emissions down 3.1% vs 1990 excl LULUCF



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Carbon Visuals – 150 MtCO₂e daily (2021)

US Projected Population

338m in 2022 rising between 2% and 16% by 2050

346m (low scenario)
 375m (medium)

400m (high)

400m (high)

About 4.3% world's population (2018)

















'Sustainable Energy' is broader, and means



Energy and the cup of coffee (or tea)

• 6 ÷ 60



- Energy = Power (W or watt) x Time
- 1500W (from label on base)
 - 6 mins to boil / make coffee?
 - = 0.1 of an hour
 - 1500W x 0.1 = 150 Whr
 - 150Whr ÷ 1,000 = 0.15 kWh
 - 20c/kWh x .15 = 3c/cup of coffee
- How could you reduce cost now?



,

- Power is measured in watt [symbol W], 1,000 watts = 1 kilowatt
- Energy is measured in kilowatt hour [symbol kWh] = 1 unit of electricity
- Energy = Power x Time

REMEMBER:



- Electricity is billed in kWh (Ireland)
- Natural gas is billed in BTU / therms (USA) or kWh (Ireland)
- but we can convert all forms of energy into BTUs, kWh, etc. For example
 - 1 Litre of diesel = 10.169 kWh
 - 1 gallon diesel = 137,381 BTU (heat), 40.24 kWh (electricity) or 1.14 GGE (transport)



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Scale (prefixes – watch your zeros!)

Power in instantaneous

- W = Watt (lamp)
- kW = 1,000 W (home)
- MW = 1,000 kW (work)
- GW = 1,000 MW (windfarm)
- TW = 1,000 GW (national)

Other Units: Joule per second (J/s); Horsepower

O@@`

aneous Energy is measured hourly

- Wh = Watt-hour
- kWh = kilowatt-hour
- MWh = 1,000 kWh
- GWh = 1,000 MWh
- TWh = 1,000 GWh

Other Units: calorie, Joule (J); kilo tonnes of oil equivalent (ktoe); British Thermal Unit (BTU)

1MBTU =1,000 BTU but 1MMBTU =1,000,000 BTU



Understanding Electricity Bills





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What does success/failure look like?

- 1. Eliminate fossil fuels before 2030
 - decarbonisation
- 2. Net Zero Campus by 2040
 - balance residual GHG emissions with removals



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Strategy: Another Example - Rethink demand!

- Tackling consumption can deliver 40-70% cut in end use emissions
- Chapter 5: Demand, services and social aspects of mitigation
- "new ways of providing services can help avoid, shift, and improve final service demand."
 - "The greatest Avoid potential comes from reducing long-haul aviation and providing short-distance low-carbon urban infrastructures,
 - "The greatest Shift potential would come from switching to plant-based diets.
 - · "The greatest Improve potential comes from within the building sector, and in particular increased use of energy-efficient end-use technologies and passive housing."



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Tactics: Set targets & KPIs

EE targets are **Relative** (ratio); CO₂e targets are **Absolute**

Carbon Reduction:

- reduce by 51% by 2030 (vs 2016-18)
- Absolute = Total reduction in tCO₂e

Energy Efficiency:

- Performance improvements measured in kWh/m², MJ/m³, L/100km, kWh/seat, kWh/parcel
- Ratio = Energy ÷ activity
 - How will your organisation deliver and grow its services to a 10% greater population with 51% less carbon by 2030?
 - And net zero by 2050? €
 - Who will we need on our climate action team?

Start thinking now; book them on the next course Image: Start thinking now;

Tactics: Examples How you realise your strategy to achieve your objective

- Targets & KPIs
 - · incremental milestones set by a company to achieve larger goals that make up the strategic objectives in its business
- Opportunities for Improvement
 - Start writing down your ideas for Action
 - Think SMART (Specific, Measurable, Achievable, Relevant/Responsible & Timebound)
- Prioritise
 - · See example in Climate Action Planning toolkit
- Annual Climate Action Plan
 - · Actions is what you will do, signed by the CEO, CFO and sustainability manager
 - · Recommend annually to engage senior management on this topic
- Roadmap
 - · Direction of Travel to 2030 or 2050

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Tactics: Opportunities for Improvement (OFI) Climate Action Toolkit demo, adapted from SEAI template

- OFI output from the review and may include existing ideas
- · Combine all into one
- list/programme to aid decision:
- No cost ideas are generally completed first (simple housekeeping)
- · Ongoing (continuous) process required – not a once off following the review
- · Also arise as a result of planned (periodic) activities



- Recorded sample over
 - The importance of dates for review and for action!



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Adaptation

Does it (the action) make us more resilient to a changing climate?





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Climate Risk Assess – what degree of change?



Energy Balance

The Ocean is absorbing most of the heat:

- Temperature of Ocean is rising leading to larger storms/downpours
- It is also expanding leading to sea level rise



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Note: Primary perils: earthquake, tropical cyclone, winter storm Europe I Secondary perils: flood, severe convective storm, wildfin

Where's the Heat? Earth's Accumulated Energy

Upper Ocean 172.8

Deep Ocean 78.2

2010 ZJ*

Air, Land & Ice: 7%

Oceans:93%



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A Changing Climate

- Human activities have caused approximately 1.0°C of global warming above pre-industrial levels (UNIPCC report findings)
- Changes in climate have caused impacts on natural and human systems on all continents and across the oceans.

Floods & Mudslides

- Wildfires
- Drought
- Storm Damage
- Polar Vortex
- Melting Glaciers
- Sea Level Rise
- Ocean Acidification
- Infrastructure Loss
- Climate Refugees
- Water Scarcity & Famine
- Pest outbreaks
- Species Extinction
- Infectious Diseases

Benefits of Early Adaptation, rather than Just-in-Time

- · Easier to incorporate adaptation measures into upfront capital investment than retrofit later
- Building internal capacity to deal with climate change takes time
- Reacting with one-off actions to weather or climate events can leave you exposed to longer-term shifts in climate
- Solutions need to be built over time and good to maintain flexibility to adopt future solutions to future problems



24no. Billion \$ weather / climate disaster events in 2023 to date - NOAA



Climate Central: Global Tour at 2°C and 4°C

Projected Impact on US by 2100



Global Temperatures Will Continue to Rise More Droughts and Heat Waves Longer Wildfire Season

 Changes in Precipitation Patterns • U.S. Sea Level Likely to Rise 1 to 6.6 Feet by 2100

• (already risen by 8 inches)



Arctic Is Very Likely to Become Ice -Free



Source: https://climate.nasa.gov/effects/ accessed 06 Nov 2023



Frost-Free Season (and Growing

Season) will Lengthen





Climate vs Weather

The difference between weather and climate is a measure of time.

- Weather relates to the conditions of the atmosphere over a short period of time while
- Climate refers to average weather patterns experienced over long time periods (minimum of 30 years).

When we talk about climate change, we are referring to changes in long-term averages of daily weather.

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Source: https://www.climateireland.ie/#l/aboutAdaptation/climateChange/learnClimateChange

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Adaptation and Resilience

Adaptation: Change (adapt) in response to the current or future impacts of climate change.

• Example: Improving flood protection and defence systems.

Resilience: The ability to cope with the negative impacts of climate change in a way that reduces these impacts on people and the environment and takes advantage of any positive opportunities.

• Example: Preparing our buildings for more frequent heatwaves by installing better ventilation systems

Critical Infrastructure

Critical Infrastructure represents those assets or systems which are essential for the functioning of the country and the delivery/maintenance of vital societal functions.

(https://www.climateireland.ie/#!/tools/sectors/criticalInfrastructure)

Consider cascade failure and knock-out effects

- 1. Energy
- 2. Transport
- 3. Buildings
- 4 Communications

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Risk Management Process made simple

- 1. What are we trying to achieve? (scope, context, objective setting)
- 2. What might affect us? (risk identification)
- Which of these things are most important? (risk assessment, prioritisation)
- What shall we do about the most important ones? (risk response development - mitigate negatives, exploit positives)
- 5. Did it work? (risk review)
- 6. What's changed? (risk updates, learnings)

Source: paraphrased from David Hillson, The Risk Doctor, explains https://www.youtube.com/watch?v=BLAEuVSAIVM accessed 14 Nov 2023



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Adaptation Measures

- 1. Soft Adaptation design of policies and procedures that promote behavioural shifts
 - Example: farmer planting a different crop or individuals using less water
- 2. Green Infrastructure nature-based solutions
 - Example planting to shade roadway, rather than new specification to withstand higher temperatures
- Grey Infrastructure technological or engineering solutions
 Example: engineered flood defences such as walls, barriers

Maintain **flexibility** throughout construction plans and **continually update** with latest science and information



Some measures may have a double benefit

Risk = Likelihood of Occurrence

x Magnitude of Consequence

Uncertainty can relate to the likelihood or

magnitude

Acid Test:

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1. Does it reduce emissions?

Risk = Likelihood x Severity

- 2. Does it help us adapt?
- 3. Does it raise awareness in mitigation or adaptation?

If no to all 3 questions, is it really climate action?



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ISO Adaptation Standards

- ISO 14090:2019, Adaptation to climate change Principles, requirements and guidelines
 - Framework to assess impacts, identify & manage risks, put plans in place
- ISO 14091:2021, Adaptation to climate change Guidelines on vulnerability, impacts and risk assessment

In the pipeline

- ISO/TS 14092 Adaptation to climate change —Requirements and guidance on adaptation planning for local governments and communities
- ISO 14097 Framework including principles and requirements for assessing and reporting investments and financing activities regarding climate change

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Economic assessment

Economic impacts

to19	Global GDP impact (2018: \$80tn)	-10% -13%	-23%	-45%
ß?	Stranded assets	Transition: fossil fuel assets (supply, power, transport, industry)	Mixed: some fossil fuel assets mothballed, some physical stranding	Physical: uninhabitable zones, agriculture, water- intense industry, lost tourism etc
Ĩ	Food supply	Changing diets, some yield loss in tropics	24% yield loss	60% yield loss, 60% demand increase
Ą	Insurance opportunities	New low-carbon assets and infrastructure investment (e.g. CCS)	Increasing demand to manage growing risks	Minimal: recession, tensions, high and unpredictable risks

The data used in this infographic is sourced from IPCC data and other sources as listed in the Bibliography (incl Raftery et al, Schlosser et al, Jevrejeva et al, Knuston et al, Turco et al, Huang et al, Pretis et al, and Burke, Hsiang & Miguel)

* The total number of hurricane category 1-5 tropical cyclones is predicted to decline with rising temperatures, the proportion of those that are category 4-5 will increase. The interaction of these two effects is non-linear in the models, per Knuston et al, NOA 2015.



Impacts on your assets?

Warming by 2100		<2 °C		3 °C	5 °C	
Physic	Physical impacts		2 °C			
	Sea-Level Rise (cm)	0.3-0.6 m	0.4-0.8 m	0.4-0.9 m	0.5-1.7 m	
\sim	Coastal assets to defend (\$tn)	\$10.2tn	\$11.7tn	\$14.6tn	\$27.5tn	
	Chance of ice-free Arctic summer	1 in 30	1 in 6	4 in 6 (63%)	6 in 6 (100%)	
Ò	Tropical cyclones: Fewer (#cat 1-5) Stronger (# cat 4-5) Wetter (total rain)	-1% +24%* +6%	-6% +16% +12%	-16% +28% +18%	Unknown +55% +35%	
$\langle m \rangle$	Frequency of extreme rainfall	+17%	+36%	+70%	+150%	
Ê	Increase in wildfire extent	x1.4	x1.6	x2.0	x2.6	
B	People facing extreme heatwaves	x22	x27	x80	x300	
☀	Land area hospitable to malaria	+12%	+18%	+29%	+46%	



https://www.thecroforum.org/crof-eri-2019-the-heat-is-on-insurability-and-resilience-in-a-changing-climate/

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Reprise day 1

Context

- Business case resource allocation (Ex.1)
 Mandatory vs voluntary requirements
- 2. Science
 - humankind is causing global heating; it's bad; but we can do something about it
- GHGs vs local air quality, both measured in PPM
 Global Policy: >80% fossil fuels; carbon
- budget is running out4. EU: Fit for 55 (European Green Deal)
- Energy Efficiency first;
 Many directives incl. CSRD and ESRSs
- Ireland: Climate Act & CAP2023;
- 51% GHG reduction by 2030, net zero before 2050;
 carbon budgets are max GHGs permitted
- What is climate action?
- Acid Test: Reduction, Adaption, Awareness

<u>CCC</u>

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- Terms / Units
 - tCO2e, various GWPs for different gases (Ex.2)
- 8. Scale of the Challenge vs population growth
- Net Imports add more (green procurement)
- 9. Start with Energy
 Energy (kWh) = Power (kW) x Time (h) (Ex.3)
- Electricity bills, energy conversion factors
 How to win (OST) structured approach
 - ROO exercise, SMART (Ex.4)
 - ASI, ISO50001

Adaptation

- 11. Global context
 - Climate Action failure is #1 risk to global economy
- Changing climate in Ireland
 Sea levels expected to rise by 0.6m
 - Temperatures to increase by 1-3°C by end of century
- 13. Definitions / Standards
 - Climate vs Weather, Critical infrastructure
 - Risk = Likelihood x Severity (Ex.5)





And Why Carbon Footprint?

- Win Business: Knowing your number in conjunction with a credible carbon reduction plan is becoming a social license to do business
- **Track Progress:** A carbon footprint can be used to baseline your operations and quantify progress on your journey towards zero emissions
- **Compare:** Carbon footprints, if calculated in a similar way, allow comparison between options



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We face choices every day



A carbon footprint is

A calculation

Not a measurement



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ity x Emission Factor = Carbon footprint				tonnes?
[A] Summary	[B] Activity / Qty	[C] Unit	[D] kgCO₂e/unit	[E = B x D/1000 tCO ₂ e
Kerosene	950	litres	2.524	2.40
Electricity	3,312	kWh	0.437	1.45
Diesel	1,581	litres	2.684	4.24
Petrol	610	litres	2.355	1.44
Flights	47,650	p.km	0.173	8.23
Waste	0.28	tonnes	395.694	0.11
Totals				17.87

Carbon Footprint

The **best estimate** that we can get of the full climate change impact of something.

- *'Carbon'* shorthand for all the different global warming greenhouse gases
- *'Footprint'* metaphor for the total impact that something has, be it an activity, an item, a lifestyle, a company, a country or even the whole world

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For GHG emissions which is higher – a cow or a car?

Source: How Bad Are Bananas? The Carbon Footprint of Everything, Mike Berners-Lee (Revised 2020 edition) - sits on IPCC

• Annually...

- 1 cow = 70-120 kgCH4 x 28 (GWP)
- = 1,960-3,360 kgCO₂e / cow
- If 1 cow = 274kg meat,
- 1kg beef = 1,960-3,360 kgCO₂e / 274 kg
- = 7.15-12.2 kgCO₂e / kg
- Sense check: 11.58 kgCO₂e/kg [Origin Green 2016]
 14 lb beef = 0.8 1.38 kgCO₂e / burger excluding b
- 1/4 lb beef = $0.8 1.38 \text{ kgCO}_2\text{e}$ / burger excluding bread, cheese, etc
- Compared to running a car
 - 5 L/100 km x 20,000 km per annum = 1,000 litre petrol
 - 1,000 litres petrol x 2.198 kgCO₂e/litre = 2,198 kgCO₂e



2+t CO₂e per year x 2.1 million cars

• In carbon reporting they are about the same c.2 tCO₂e per

CCCC^{annum}



What to inc	lude, where to put them
What is the g	ioal?
	The end use / audience may drive the calculations and/or factors
Boundaries	= physical or organisational limits
	Normally defined using one of two consolidation approaches
	Financial / operational control or on an equity share basis
Who owns th	e goods?
	As long as you own the goods you own the CO ₂ e/GHG
Scopes	= means of classifying an organisation's GHG emissions from its activities
	GHG Protocol classifies emissions under Scopes 1, 2 and 3
	ISO 14064-1 classifies emissions under Categories 1 to 6
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Scopes categorise GHGs to **prevent double counting** and to **assign responsibility**

- Scope 1 direct emissions
- Scope 2 indirect purchased energy emissions
- (you control consumption, but not how it is generated)
- Scope 3 indirect emissions for everything else
- Outside of Scope 'carbon neutral' bioenergy

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Scopes 1-3+

A Tale of 2 Boundaries NHS Carbon Footprint (under control) NHS Carbon Footprint Plus (under



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Boundary setting

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Example Business

Company A owns a factory that bakes cakes.

- The factory uses grid electricity and natural gas
- Fleet of 10 trucks to deliver cakes to retailers within a 100km radius
- Uses a logistics provider, Company B, to deliver its cakes to other retailers nationwide
- Objective: calculated Farm-to-Store carbon footprint



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Example Business



GHG Protocol, p.25

Scope 1: Direct GHG emissions

Direct GHG emissions occur from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; emissions from chemical production in owned or controlled process equipment.

Direct CO₂ emissions from the combustion of biomass shall not be included in scope 1 but reported separately (see chapter 9).

GHG emissions not covered by the Kyoto Protocol, e.g. CFCs, NOx, etc. shall not be included in scope 1 but may be reported separately (see chapter 9).

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"stop burning fossil fuels"

 Scope 1 can also include
 process emissions (e.g. CO₂ from cement manufacture) and
 fugitive emissions (e.g. refrigerant leaks from cooling equipment / 'F' gases)

Direct Emissions – Annual Quantities

	Activity	Qty	Unit
Factory	Natural Gas	5,000,000	kWh GCV
Factory	Refrigerant top ups	1	kg R404A
Logistics	Owned fleet, Company A	50,000	litres
Totals			

Activity x Emissions Factor = Carbon Footprint 5,000,000 kWh natural gas x 0.1846 kgCO₂/kWh / 1000 kg/tonne = 923 tCO₂



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GHG Protocol, p.25

Scope 2: Electricity indirect GHG emissions

Scope 2 accounts for GHG emissions from the generation of purchased electricity² consumed by the company. Purchased electricity is defined as electricity that is purchased or otherwise brought into the organizational boundary of the company. Scope 2 emissions physically occur at the facility where electricity is generated.

Where you create demand = Scope 2 i.e. generally grid electricity

Scope 2 indirect emissions from purchased energy can also include distributed heat, steam, compressed air, i.e. you control how much you use, but not how it is generated

Indirect Emissions, Purchased Energy

	Activity	Qty	Unit
	Electricity	1,000,000	kWh
Factory	Natural Gas	5,000,000	kWh GCV
	Refrigerant top ups	1	kg R404A
Logistics	Owned fleet, Company A	50,000	litres
Totals			

There are two ways to calculate electricity emissions:

- Use the annual average carbon intensity of the electricity grid (known as the Location-Based Method). This is published by the SEAI in Ireland
- Use the carbon intensity as published by the supplier (known as the Market-Based Method). Suppliers can purchase wholesale electricity with Guarantees of Origin (GOs) that demonstrate it is from renewable sources, but electricity may be from another country, e.g. Norwegian hydropower





Sourcing Electricity: Hierarchy of Credibility

- 1. On Site Renewables reduce your grid electricity consumption
- 2. Power Purchase Agreements (PPA) help to fund wind power by providing a guaranteed market or income to the project; they are NOT a carbon offset
- Green Tariffs: Guarantees of Origin (GO) aka 'green electricity certificate' guarantee that one MWh of electricity has been produced from renewable energy sources. Electricity suppliers buy GOs. A GO is a "green label".
 - Public Service Obligation (PSO) funds the Renewable Energy Feed in Tariff (REFIT) which
 is paid for by all electricity consumers and excluded from GO
 - Fuel Mix / Supplier carbon intensities published by the Commission for Regulation of Utilities (CRU)

Sources: https://www.cru.ie/professional/energy/energy-market/renewables/

Sourcing Electricity: Hierarchy of Credibility (More Advanced)

Hierarchy	Business' Scope 2 Emissions Reduction Additionality	Business' Electricity Decarbonisation Approach			
1		e e	Onsite or private wire renewable electricty generation (e.g. rooftop solar or wind turbine)		
2	Credible and Clear	ach	CPPA with new renewable projects, including advanced supply/demand matching strategy		
3	Additionality	cy to re nd shou	CPPA with new renewable projects		
4			Demand Flexibility/Response to utilise high % RES-E electricity (e.g. load shifting, heat electrification, storage)		
5		ana	Demand Flexibility/Response to support renewable integration (DS3, DSU)		
6	Limited Additionality	y de I to	CPPA with existing/legacy renewable projects		
7		gy l rict	Green Electricity Purchasing (GoO) from sites within juristiction		
8		ection	Green Electricity Purchasing (GoO) from sites outside juristiction		
9	No Additionality	ш Т	Normal Electricty Purchasing		
RR	Sources: https 1Lyn?utm_sou	://www.linke rce=share&	clin.com/posts/fsharkey_lot-of-companies-seeking-to-reduce-electricity-activity-6946121608042344448- utm.medium=member_desidop		

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https://www.electricitymap.org/



GHG Protocol, p.25

Scope 3: Other indirect GHG emissions

Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.

Everything else = Scope 3 Calculations get trickier under Scope 3, and this is where the carbon footprint becomes a "best estimate" as to your contribution to global warming, unless you have a really transparent supply chain.

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Scope 3 Categories

Upstream

- 1. purchased goods and services
- 2. capital goods
- 3. fuel- and energy-related activities
- 4. transportation and distribution
- 5. waste generated in operations
- 6. business travel
- 7. employee commuting
- 8. leased assets

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Downstream

- 9. transportation and distribution
- 10. processing of sold products
- 11. use of sold products
- 12. end of life treatment of sold products
- 13. leased assets
- 14. franchises
- 15. investments

Procurement Add an extra +11?% for net imports (+48% in 2006)?



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Indirect Emissions, Other Purchases

	Activity	Qty	Unit
	Electricity	1,000,000	kWh
Factory	Natural Gas	5,000,000	kWh GCV
	Refrigerant top ups	1	kg R404A
Logistics	Owned fleet, Company A	50,000	litres
LOBISTICS	Outsourced fleet, Company B	800,000	tonne.km
	Flour, wheat	5,000,000	kg
	Eggs	1,000,000	kg
	Water	500	m3
Materials	Yeast	300,000	kg
	Chocolate	750,000	kg
	Deliveries, unrefrigerated ave artic	700,000	tonne.km
	Deliveries, refrigerated ave artic	100,000	tonne.km



Well to ... WTT + TTW = WTW



Category 1 Example: Cloud reporting



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Environmental Product Declarations

Environmental Product Declarations (EPD) are a standardised way of providing data about the environmental impacts of a product through the product life cycle.

An EPD does not mean a product is the best from an emissions point of view, rather that the manufacture has gone to the trouble to commission one to better demonstrate its environmental credentials.

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Example EPD: Organic Soft Wheat Flour



Look for CO₂e or CO₂eq And the "declared unit" which in this case is 1kg of product



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Updating with EPDs if we have them



Changing the EF from 1.04 (generic) to 0.19 (EPD upstream + core components) reduced this part of the Scope 3 carbon footprint from 5,186 to 950 tCO₂e.



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Message: take care to disclose assumptions so they can easily be updated if required

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Example EPD: Organic Soft Wheat Flour



You may have noticed that this product contains biogenic emissions, so too does the use of biofuels in the forecourt blend Adding in Biogenic "Outside of Scope" Emissions

											\frown	
		EF (kgCO2e/unit)					tCO2e	tCO2e	tCO2e	tCO2e		
	Activity		Unit	Scope 1	Scope 2	Scope 3	Outside o		Scope 2	Scope 3	Outside o	otals
	Electricity	1,000,000	kWh		0.33	0.07			333	73		406
Factory	Natural Gas	5,000,000	kWh GCV	0.18		0.02		923	-	120	-	1,043
	Refrigerant top ups	1	kg R404A	3,922				4		1.1		4
Logistics	Owned fleet, Company A	50,000	litres	2.68		0.61		134		31		165
	Outsourced fleet, Company B	800,000	tonne.km			0.09				74		74
	Flour, wheat	5,000,000	kg			0.19	0.01			950	28	950
	Eggs	1,000,000	kg			2.20				2,200		2,200
	Water	500	m3			0.15		-		c	-	0
Materials	Yeast	300,000	kg			2.94		-	-	882	-	882
	Chocolate	750,000	kg			5.40				4,050		4,050
	Deliveries, unrefrigerated ave artic	700,000	tonne.km			0.09		-		64		64
	Deliveries, refrigerated ave artic	100,000	tonne.km			0.09				9		9
Totals								1,061	333	8,452	28	9,847
											-	,

You can also add the Outside of Scope biogenic emissions from the biofuels if you know the % biofuel blend. Use annual average values.



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Presenting Results

				EF (kgCO2e/unit)					tCO2e	tCO2e	tCO2e	tCO2e	tCO2e	tCO2e
	Activity	Qty	Unit	Scope 1	Scope 2	Scope 3	Outside o	Source	Scope 1	Scope 2	Scope 3	Outside o	Totals	%
	S2 Electricity	1,000,000	kWh		0.33	0.07		SEAI 2021 / DEFRA 2021	1.1	333	73	1.1	406	4%
Factory	S1 Natural Gas	5,000,000	kWh GCV	0.18		0.02		SEAI	923	1.1	120		1,043	11%
	S1 Refrigerant top ups	1	kg R404A	3,922				DEFRA 2021	4	-	-	-	4	0%
Lonistics	S1 Owned fleet, Company A	50,000	litres	2.68		0.61		SEAI / DEFRA 2021	134	1.1	31	1.1	165	2%
Logistics	S3 Outsourced fleet, Company B	800,000	tonne.km			0.09		GLEC WTW	1.1	1.1	74	1.1	74	1%
	S3 Flour, wheat	5,000,000	kg			0.19	0.01	EPD (Farina Bio Molino G	1.1	1.1	950	28	950	10%
	S3 Eggs	1,000,000	kg			2.20		CarbonCloud, SE			2,200		2,200	22%
	S3 Water	500	m3			0.15		DEFRA 2021		-	0		0	0%
Materials	S3 Yeast	300,000	kg			2.94		Ecolovent v3.8	1.1	1.1	882	1.1	882	9%
	S3 Chocolate	750,000	kg			5.40		CarbonCloud, SE		1.1	4,050	1.1	4,050	41%
	S3 Deliveries, unrefrigerated ave art	700,000	tonne.km			0.09		GLEC WTW		1.1	64	1.1	64	1%
	S3 Deliveries, refrigerated ave artic	100,000	tonne.km			0.09		GLEC WTW			9		9	0%
Totals									1,061	333	8,452	28	9,847	100%

Assumptions above are highlighted in yellow, with the sources of each emission factor stated and hyperlinked if necessary $% \left({{{\mathbf{x}}_{i}} \right)$

%s on right hand side highlight significant sources of emissions Now that we know our carbon hotspots, what will we do in our carbon reduction planning?

Accounting for Uncertainty

Math

- Fuel pump or meter is ±1% (99% accurate)
- 1,000,000L x 1% = ±10,000L
- 100,000L per month ±1,000L
- 10,000L per month ±100L

Insert Function			?	×
Search for a function:				
roundup			9	o
Or select a <u>c</u> ategory:	Recommended	~		
Select a function:				
ROUNDOP				
ROUNDUP(number,r	um_digits)			
Rounds a number up	, away from zero.			
Help on this function		ОК	Ca	ncel



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Significant Sources of Emissions





Template Provided

CSRD Requirement: ESRS E1 Climate Change

9 disclosure requirements E1-1 to E1-9

- E1-5 breakdown of energy sources (MWh fossil vs renewable + intensity MWh/activity)
- E1-6 Breakdown of emissions (absolute tCO₂e Scope 1, 2 and 3, optional intensity tCO₂e/activity)
- E1-7 removals, credits (within vs outside value chain)
- E1-8 Internal carbon pricing
- E1-9 Potential financial effects from risks & opportunities

Round Room – think of an activity and let's categorise it!



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Now that we know our number, what next?

- Carbon Reduction Plan should address all Scopes
- Scope 1 direct emissions take priority
- Scope 2 we can also do something about
- Scope 3 is it possible to collaborate with our suppliers and influence the supply chain?
- You may also wish to set targets aligned with the science (see https://sciencebasedtargets.org/)
- Normally one target for Scopes 1 & 2 and a separate target for Scope $\overset{3}{3}$

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Sourcing Appropriate Emission Factors

- SEAI, Ireland's National Energy Authority
- Global Logistics Emissions Framework (GLEC), for freight
- DEFRA, UK useful for business travel
- EPDs for materials, need to search a variety of platforms. EPDs may be product specific, but there are also industry published ones for particular sectors/geographical areas
- Ecolnvent (paid license for data base)
- Other online sources can be used, but always source assumptions!

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Association of Energy Engineers

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ISO 1406x Standards



- 14064-1 Organisations
- 14064-2 Projects
- 14067 Products
- 14064-3 Validation & Verification
- 14065 Verification Bodies
- 14064 Competence of verification teams

https://www.iso.org/ClimateAction.html

GHG Accounting & Reporting Principles



Beware the toeprint / truncation error

• "Better to be roughly right than exactly wrong"

(British economist John Maynard Keynes)

 Completeness beats accuracy: invest your time including all aspects, rather than getting some figures exactly correct.



These kinds of carbon footprint are actually prints' - they don't give the full picture flying stuff other electricity exhaust pipe

The footprint of a lifestyle is bigger than its toe-print

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What is an Offset

A reduction, avoidance or removal of emissions of CO₂ or GHGs made by a project elsewhere in order to compensate for, or to offset an emission made by an organisation, product, event or activity.



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Voluntary Carbon Market (VCM) Globally: \$2bn in 2021 up from \$280m in 2019

		2020		2021
	VOLUME (MtCO2e)	PRICE (USD)	VALUE (USD)	VOLUME PRICE VALUE (MtCO2e) (USD) (USD)
FORESTRY AND LAND USE	57.8M	\$5.40	\$315.4M	227.7M \$5.80 \$1,327.5M
RENEWABLE ENERGY	93.8M	\$1.08	\$101.5M	211.4M \$2.26 \$479.1M
CHEMICAL PROCESSES / INDUSTRIAL MANUFACTURING	1.8M	\$2.15	\$3.9M	17.3M \$3.12 \$53.9M
WASTE DISPOSAL	8.5M	\$2.69	\$22.8M	11.4M \$3.62 \$41.2M
ENERGY EFFICIENCY / FUEL SWTICHING	30.9M	\$0.98	\$30.4M	10.9M \$1.99 \$21.9M
HOUSEHOLD / COMMUNITY DEVICES	8.3M	\$4.34	\$36.2M	8.0M \$5.36 \$43.3M
TRANSPORTATION	1.1M	\$0.64	\$0.7M	5.4M \$1.16 \$6.3M
AGRICULTURE	0.5M	\$10.38	\$4.7M	1.0M \$8.81 \$8.7M



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Source: Ecosystem Marketplace State of the Voluntary Carbon Markets 2021, a Forest Trends Initiative

Which Project would you invest in?



Brazil hydropower: \$1.00 per tonne



India biogas power: \$4.95 per tonne



Uganda cookstoves: \$8.00 per tonne



Uganda tree planting: Carbon Offsets That Alleviate Poverty (COTAP) - Uganda \$15.00 per tonne



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Best Practice Principles (Voluntary)

- UNIQUE: Exclusive claim to credits by means of a registry which clearly records projects and issuance of offsets
- REAL
- **PERMANENT**: Can be problematic forest fires, pests , windthrow, etc
- ADDITIONAL: If the woodland would have been planted anyway in the absence of a market for offset credits, then this is not additional
- **INDEPENDENTLY VERIFIED** to avoid over-estimation (conservative calculation)
- MEASUREABLE
- Cee
- Source: ICROA, Code of Best Practice v2.0 cl 1.1.13 (Mar 2023)

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Two Broad Types of Carbon Offsets

Compensation Measures

Removals

- Avoided emissions offsets can come from projects such as replacing kerosene cook-stoves with solar stoves, as it avoids emissions that would have taken place if the cookstoves had not been replaced.
- Emissions reduction offsets can come from projects such as avoided deforestation and carbon capture and storage on industrial processes, where the project stops emissions being released into the atmosphere.

 Greenhouse gas removal offsets can come from projects such as afforestation and direct air carbon capture and storage, where emissions are physically removed from the atmosphere.

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Key Terms

Decarbonisation

• Stop burning fossil fuels

Carbon Neutral

· can buy verified carbon credits to offset residual emissions

Net Zero

• emissions reduction pathway must be aligned with the science / Paris Agreement with residual emissions balanced by removals using "negative emissions technologies" (NETs), for example by restoring forests or through direct air capture and storage (DACS) technology

Sources: various including IPCC SR15, carbon neutral and net zero standards, and https://climatejargonbuster.ie/

Climate Neutral

• Climate Jargon Buster interprets this as effectively same as Net Zero, but scientists define as "no net effect on the climate system" to include all effects of human activities, such as surface albedo

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Greenwashing Claims

Carbon offsetting is not warding off environmental collapse - it's accelerating it George Monbiot



- [Offsets]... are being widely used as an alternative for effective action. Rather than committing to leave fossil fuels in the ground, oil and gas firms continue to prospect for new reserves while claiming that the credits they buy have turned them "carbon neutral".
- As big corporations and financiers pile into this market, land prices are rising so fast that local people, some of whom would like to run their own rewilding and reforestation projects, are being shut out.

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https://www.theguardian.com/commentisfree/2022/jan/26/carbon-offsetting-environmental-collapse-carbon-land-grab





Offsets: paying for the right to do wrong?



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'Offsetting' is a Seductive Concept but...



- At €3 per tonne CO₂e, "... the whole climate crisis could be solved for a trivial 0.2 per cent of world GDP"
- Mike Berners-Lee, How Bad Are Bananas? (2nd edition 2020)
- *Indicative costs to reduce carbon footprints by 1 tCO₂e

If Buying Offsets...

- · Offset as last resort, but consider double gifting too
 - Comply with standards (which are evolving) and
 - Do something local
- There are options to get involved with tree planting in Ireland, but verifiable offsets will cost extra
 (requirement to design, certify and register)
 - A domestic VCM like the one in the UK may still emerge in Ireland
- · Carbon Neutral requires verified carbon offsets
- · Net Zero requires verified carbon removal offsets
- · Plenty of choice for international offsets, but remember ICROA principles
 - · Independently Verified
 - Unique
 - Real
 - Measureable
 - Permanent
 - Additional









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Carbon Neutral vs Net Zero

	Carbon Neutral	Net Zero
Boundary	Product, Service or Organisation	Organisation
Scope (Activities)	Requires Scope 1 and 2 emissions (Scope 3 not mandatory)	Scope 1, 2 and 3 emissions
Reduction Required	Level of emissions reduction not specified	Targets must align to 1.5°C science-based target. 90% reduction before carbon removals counted.
Residual Emissions	Verified Carbon Offsets accepted	Verified Carbon Removals for residual emissions



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Standards



Common elements



Beware the toeprint

 Completeness beats accuracy (don't just focus what's measurable)

• Guard against 'greenwash' and omissions



Successful approaches include

Demand reduction (or energy efficiency first)
Shift to less intensive goods and services
Improve the technologies you must use
Offsets / removals as a last resort

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Exam

20 Qus, open book, 70% pass rate



Awareness

Does it (the action) raise awareness on Climate Action?





Atmospheric CO₂ Reduction by Sector



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Leading by Example, personal vs system







CO₂ emissions from passenger Transport





Identify, Measure, Check

- Make a list of energy using equipment, and when it should be running
- Walk around at different times of the day, checking where energy is used/wasted.





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Procedures - Check Time Clocks Regularly

- List your time clocks with a location plan
- Write down correct on-off times
- Check
 - periodically
 - day light saving
 - after power cuts





Home Energy Saving Kits, Dublin Libraries



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Staff Training - Awareness

- Label kitchen equipment with warm up times
- Always use saucepan lids (7% saving)
- Right sized hob / right positioning
- Appropriate equipment for task
- Switch off equipment and lights immediately after use



CRE

50001:2018 Awareness

- Persons doing work under the organization's control shall be aware of:
 - a) the energy policy (see 5.2)
 - b) their contribution to the effectiveness of the EnMS, including achievement of objectives and energy targets (see 6.2), and the benefits of improved energy performance
 - c) the impact of their activities or behaviour with respect to energy performance
 - d) the implications of not conforming with the EnMS requirements

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A successful approach

- Everyone's favourite radio station: WIIFM
 - What's In It For Me
 - Good book "Nudge"
- Plan for 12-18 months
- Be realistic; planet vs me and my family

- A good campaign will be:
 - Reflective of people's real needs
 - Give them ownership
 - Adapted to suit situations
 - · Addresses the current level of awareness
 - Results in action something you can measure



Start with energy efficiency i.e. less energy per unit of output.

Don't conflate with Politics

Air Ouality

Job losses

EnPl contributes to GHG/CO_{2e} reduction, but may not reduce absolute emissions.



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YOUR BICYCLE

TOD



Innovative Approaches to communication?

Art for "Hearts & Minds", Science & Technology for Credibility, Behavioural Change, the Energy Pyschologist





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Mark Coreth and Duncan Hamilton Copenhagen

• "When the skeleton begins to appear, it's going to become terrifying. When the bronze appears, it is going to take warmth through the skeleton and melt that ice even more."

• Mark Coreth, British Artist















Pulling it altogether into an Elevator Pitch







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Learning Objectives

Participants will:

1. Gain an overview of Global, Regional (EU) and National (Ireland) emissions, policy, and legislation

Terminology, concepts and jargon explained

- 2. Understand the potential impacts and opportunities facing businesses

 Including carbon budgets for enterprise
- 3. Know what Climate Action means with particular regard to
 - Reducing emissions
 - Adapting to a changing climate, and
 - Raising awareness amongst suppliers, staff and customers
- 4. Learn how to prioritise opportunities for improvement
 - How to do carbon calculations
 - Templates provided
- 5. Know where to find the supports to start climate action planning for your business

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Reprise day 2

Mitigation

- 14. Carbon Footprint = Activity x EF Best estimate, calculation
- 15. Boundary
- · Consolidation approach: Financial, Operational, Equity
- Life Cycle terms
- 16. Scope 1 direct combustion, fugitive, process Cannot be double counted
- 17. Scope 2 indirect emissions from purchased energy Hierarchy of credibility: I BM and MBM Cannot be double counted (Ex.6)
- 18. Scope 3 indirect emissions from everything else
- · direct emissions of another entity, shared influence means double counting may occur • 15 categories for value chain emissions, WTW (Ex.7)
- 19. EPDs and embodied emissions
- 20. Outside of Scope (bioenergy)

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Mitigation (contd.)

- 21. Presenting Results
- 22. Standards / Principles (TRACC) source emission factors and assumptions
 - · Beware the toe print / truncation error
- 23. Voluntary Carbon Markets: Carbon Offsets Carbon Neutral vs Net Zero vs Climate Neutral
- 24 Potential Pitfalls
 - ICROA Best Practice / The Integrity Council
 - · Short-lived vs Long-lived; Avoidance vs removal offsets
- 25. Winning approaches Microsoft, Brewdog, Inland Fisheries Ireland
- Assessment

Awareness

- 26. Solutions globally vs individual choices (food, travel)
- · Beware of putting climate anxiety on individuals 27. Staff Engagement
- Empower individuals (meanies, greenies, tekkies) 28. Innovative Approaches
- 29. Don't Underestimate Human Success!
- **Climate Action Plan Pitch** Ouick draft and pitch (Ex.8)
- 30. Wrap Up

Thank You

2-minute feedback: https://forms.office.com/e/RSebVxF41b



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Climate Action

Acid Test:

- 1. Does it reduce emissions?
- 2. Does it help us adapt?
- 3. Does it raise awareness in mitigation or adaptation?
- If no to all 3 questions, is it really climate action?

Some actions offer a double benefit

OCC

Reprise on your Climate Action Journey

Winning Approach?

- Objective
 - · Define drivers for change
- Strategy
 - What suits your business?
- Tactics
 - · Opportunities, Action Plans, Targets, KPIs
 - · Impacts & boundaries
 - Significance
- Demonstrating leadership
- Transparency & measured reductions

- 1. Business Case
- 2. Global Warming Potential
- 3. Energy Calculation
- 4. ROO & Prioritisation for annual Climate Action Plan
- 5. Risk Assessment
- Scope 1 & 2 calculation 6.
- 7. Scope 3 calculation
- 8. Climate Action Plan Pitch





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- Certifications in
 - Energy Management
 - Energy Service & Commissioning
 - Sustainable Development
 - Utility Services
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