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**CERTIFIED DECARBONIZATION
PROFESSIONAL - CDP OVERVIEW
ONLINE TRAINING BY KRISHNAJI PAWAR**

LEED AP(BD+C), GSAS CGP, GCP, ISO 14001

KNOWLEDGE IS POWER

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MODULE
3A

Strategies for a Decarbonization-Built Environment

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CERTIFIED DECARBONIZATION PROFESSIONAL - CDP OVERVIEW

Regular inventories of GHG emissions inventory help quantify the problem's scale, identify significant sources, prioritize reduction strategies, and evaluate policies implemented by entities.

Learning Objectives

- Introduction
- Climate change and sectoral decarbonization approaches
- Strategies for a decarbonization-built environment
- Building Operational and Embodied Carbon, Kyoto Protocol, and Beyond.
- Professional certification for decarbonization audits
- Carbon, GHG, and Sustainability Accounting
- Summary and Resources
- ASHRAE CDP Practice Test V.4.1: Test Your Knowledge!



INTRODUCTION

- The need to transition from fossil fuels to low-carbon energy is a contentious topic.
- Experts agree on the necessity of a combination of technologies, but the choice of which to include and which to exclude is complex.
- Many alternative technologies face public opposition and accusations of bias.
- The chapter focuses on micro- and distributed-generation technologies currently available.
- The costs quoted for each technology are primarily from the UK and the USA, and exclude subsidies.
- Understanding the types and levels of incentives, local, national, and international legislation is crucial in selecting the most appropriate technology.
- Geography plays a significant role in the selection of renewable and low-carbon alternatives to fossil fuels.
- The viability of renewables depends on the local built environment and the reliability of the fuel supply.

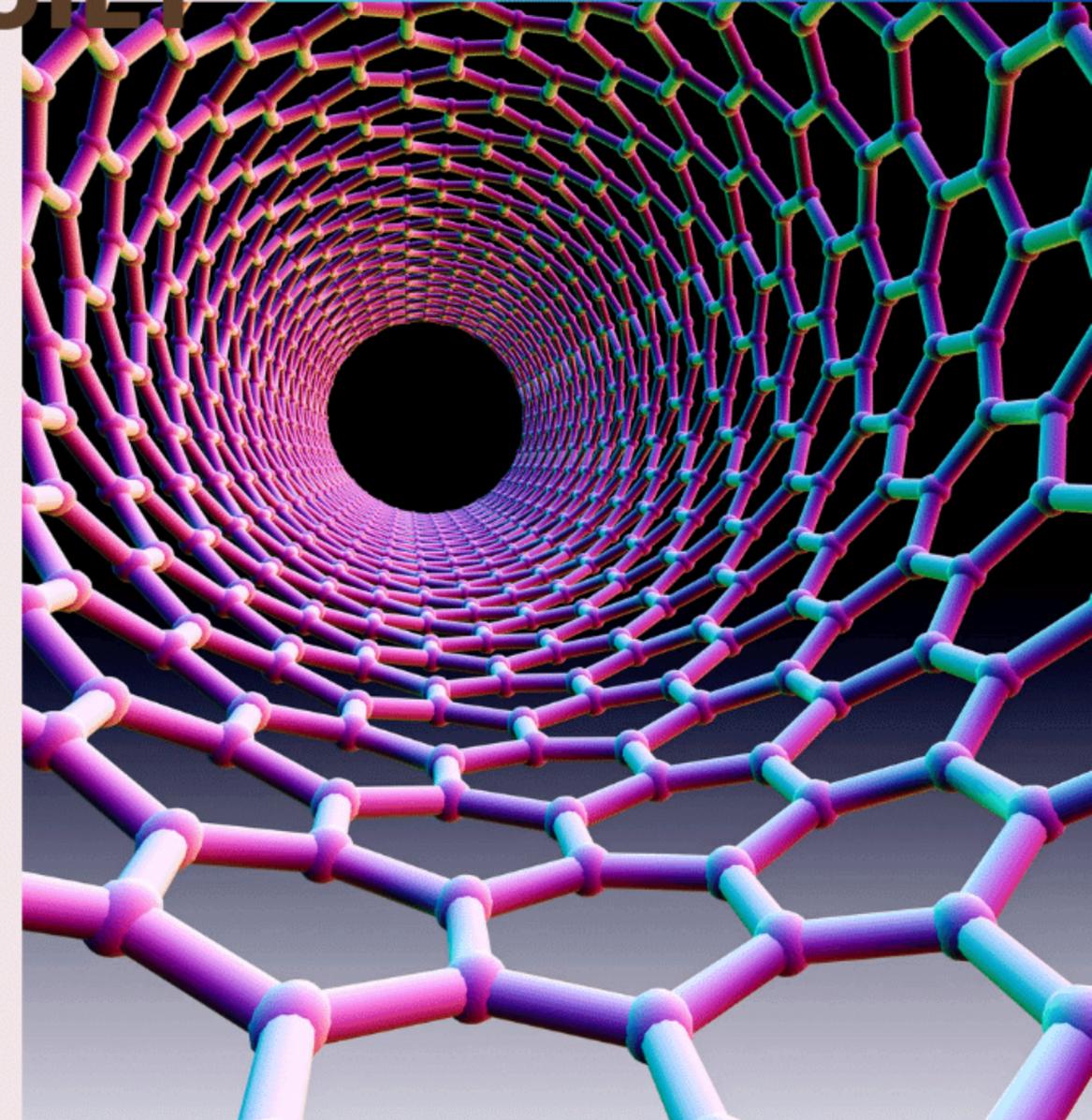
MICRO- AND DISTRIBUTED-GENERATION TECHNOLOGIES IN BUILT ENVIRONMENTS

- Micro and distributed energy generation technologies are increasingly prevalent in built environments.
- Some technologies are more visible, like rooftop wind turbines and solar panels.
- Some are more flexible, like solar, which can be used for a wide range of applications.
- Cost and 'payback period' are key factors in determining the appropriateness of each technology.
- Investors need access to subsidies and financial incentives, and long-term financial signals to ensure incentives remain consistent.
- The design of electricity infrastructure for high output, centralized, fossil fuelled generation is a barrier to greater uptake.



MICRO- AND DISTRIBUTED-GENERATION TECHNOLOGIES IN BUILT ENVIRONMENTS +

- The future of renewable and low-carbon energy generation will involve a mix of types, scales, and applications of different technologies.
- Centralized renewables and low-carbon technologies will ensure 'baseload power'.
- Microgeneration technologies can use local resources to meet energy needs, making them an important tool for lowering emissions.
- Community level applications of distributed generation technologies are expected to grow, including stand-alone wind turbines, ground-source heat pumps, and CHP.



SOLAR THERMAL



- Solar thermal panels, or solar hot water (SHW) panels, are a common building-integrated renewable technology.
- These panels hold a liquid heated by the sun and pumped to a boiler to heat water.
- They can provide hot water year-round, even in higher latitudes.
- In temperate countries like the UK, solar thermal panels can meet up to 70% of an average household's hot water needs.
- Both solar thermal and photovoltaics have significant potential to reduce carbon emissions from the built environment.

SOLAR PHOTOVOLTAICS

- Solar photovoltaic cells (PVs) convert energy from the sun directly into electricity.
- PVs can be installed on any suitable roof, integrated into roofing tiles and walls, and affix thin film designs to windows.
- Historically, PV has suffered from a lack of investment, making costs a barrier to wider installation.
- As efficiency of solar cells improves and manufacturing costs fall, PV is set to be one of the most important technologies for reducing GHG emissions from the built environment.



MICRO WIND: SOLAR PHOTOVOLTAIC CELLS



- Solar photovoltaic cells (PVs) convert sun energy into electricity.
- PVs can be installed on any roof, integrated into tiles and walls, or affix thin film designs to windows.
- Transportation infrastructure often hosts PV panels.
- Oregon, USA is conducting trials of PVs integrated into road surfaces.
- PVs have historically faced lack of investment, limiting wider installation.
- As efficiency improves and manufacturing costs decrease, PV is crucial for reducing GHG emissions in the built environment.

GROUND-SOURCE HEAT PUMPS

- Ground source heat pumps (GSHPs) utilize the ground's stable temperature to provide heating and/or cooling.
- Unlike geothermal systems, GSHPs don't rely on identifying and exploiting geothermal 'hot spots'.
- GSHPs require electricity to power the pump, resulting in 'geo-solar' systems.
- Once installed, these systems are low maintenance, have long lifespans, and offer lower payback periods compared to other renewable energy sources.



GROUND-SOURCE HEAT PUMPS AND GEOTHERMAL



- Ground-source heat pumps (GSHPs) utilize the ground's stable temperature to provide heating and/or cooling.
- They don't rely on identifying geothermal 'hot spots', enhancing efficiency.
- GSHPs pump a fluid with high thermal capacity and low freezing point around a subterranean 'loop' and through a surface heat exchanger.
- They require electricity to power the pump, solar PV can provide this, resulting in 'geo-solar' systems.
- Once installed, these systems are low maintenance, have long lifespans, and offer lower payback periods compared to other renewable energy sources.

GEO THERMAL

- Geothermal technologies harness the heat from geothermal 'hot spots' in the earth's crust to produce heat and electricity.
- Advanced designs recycle the heat to minimize resource consumption and nearly eliminate operational emissions.
- Geothermal plants remain a fringe technology on a small scale, but are highly cost-effective once in operation.
- They can provide an almost limitless output of cheap low-carbon energy.





MICRO AND COMMUNITY BIOMASS AND CHP



- All combined heat and power technologies involve burning a fuel to generate electricity while simultaneously capturing and utilizing the heat that would otherwise go to waste.
- Public or commercial buildings can house power plants for community-scale systems, also known as district heating.

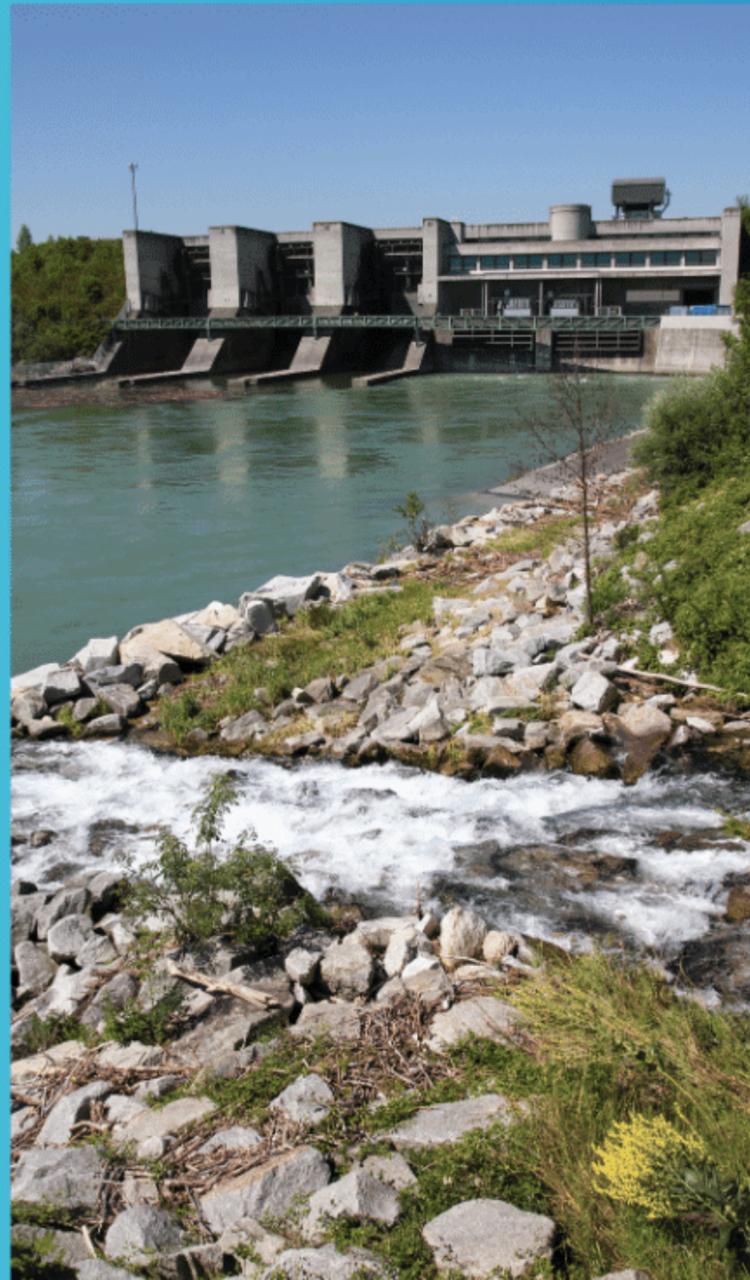
ANAEROBIC DIGESTION (AD)

- AD is the process whereby bacteria break down organic material in the absence of air, yielding biogas containing methane, which can be burned to generate electricity and heat.
- Despite high costs, AD plants offer significant system and cost-efficiency benefits.



MICRO-HYDRO

- Despite its rural origins, many major cities still contain waterways that may be ideally suited to micro-hydro installations.



GHG EMISSIONS INVENTORY OVERVIEW

- CO₂, the primary greenhouse gas, is imperceptible to humans.
- Regular inventories are necessary to quantify the scale of the problem and determine necessary actions to limit anthropogenic influence on the atmosphere and climate.
- A GHG emissions inventory lists and quantifies emissions for an entity or product over a given period.
- This inventory helps identify significant emissions sources and prioritize them.
- It also provides third parties with a better understanding of the context for reduction strategies and enables evaluation of the policies and measures implemented by the entities publishing an inventory.



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