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SUSTAINABLE CONSTRUCTION

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Introduction

- As economies across the world recover from COVID-19, construction volumes are expected to increase globally by an average of 3.2 percent a year.
- Building construction and operations, however, account for about 40 percent of global energy-related greenhouse gas emissions.
- This number is expected to reach 70 percent by 2050, mainly due to an increase in electricity and water demand.
- With this said, there is significant investment and attention being directed towards sustainable construction.
- However, the pace of this change needs to accelerate with the many options that are now available to businesses.
- This presentation provides a checklist for embedding sustainability within construction.

Outline

1. Energy efficiency in construction site offices: Lighting, HVAC, Insulation
2. Power generators
3. Water efficiency
4. Construction materials
5. Waste management
6. Food waste
7. Sustainable temporary roadways
8. Modern Methods of Construction
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Energy efficiency in construction site offices

- Over the last few years, there has been an increased focus on the energy efficiency of both existing and new buildings.
- However, the energy efficiency and environmental impacts of the temporary buildings/structures that are used during the duration of the construction of these projects are often overlooked.
- Optimising these temporary buildings' energy efficiency and reducing electricity consumption, especially in hot climates such as that in the Middle East, offers huge cost savings in addition to environmental and even social benefits.
- The next few slides looks at various areas around energy efficiency that can be implemented in temporary construction site offices.

Energy efficiency in construction site offices: Lighting

Lighting can consume a lot of power and is also one of the easiest and more affordable items to replace.

Solutions	Benefits	Solution Provider
Switching to LED Lighting	70-90% less energy consumption than a standard incandescent or CFL bulb; Longer lifespan; Long-run cost savings; Lower carbon footprint.	Signify
Lighting control systems: eg. Sensors, timers, daylight, etc.	Reduces energy-use and creates cost-savings by ensuring that the indoor lighting system operates only when necessary; improves overall staff well-being.	Signify

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Energy efficiency in construction site offices: HVAC

Solutions	Benefits	Solution Provider
Smart control systems	Reduces energy-use and creates cost-savings by ensuring most efficient use of HVAC.	Signify (for FCU) or Schneider Electric
Upgrading to modern split HVAC with dual inverter	Energy savings of up to 53%, faster cooling & lower vibration.	
Choose HVACs with high SEER ratings	The higher the SEER (Seasonal Energy Efficiency ratio), the less energy it will use.	

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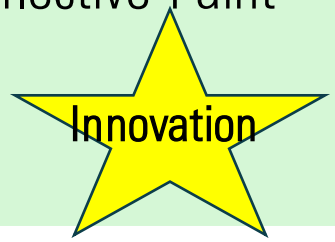
Energy efficiency in construction site offices: Insulation

Site offices that are not insulated can overheat during summer and lose heat during winter. This consumes more energy as the demand from heating or cooling systems are much higher.

Solutions	Benefits	Solution Provider
Double/triple glazed windows with 48% visibility	Creates an insulating barrier to slow heat transfer, promoting energy & cost-saving.	
Wall, roof & floor insulation	Multiplex found that complete insulation can generate a very significant annual energy reduction of 52%.	
Set air leakage target to maximum allowance	Decreases infiltration of hot/cold outdoor air and promotes energy and cost savings	
Reflective Paint 	Decreases internal temperature by up to 10*C and cuts energy demand, generating real savings.	COOL-R

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Power generators

On-site generation tends to be the choice of power for construction sites as they are often not connected to the grid electricity. Unfortunately, most of this power still comes from diesel generators which are neither the most efficient nor an environmentally friendly source of power generation.

There are, however, ways to make your diesel generation more efficient, such as:

- Changing generators according to the season (40% energy savings)
- Not oversizing your generators

There are also alternative cleaner sources of energy that your business can use on its construction sites such as:

- Solar-diesel and solar-battery hybrid generator systems
  → Solution Provider: Enerwhere (Middle East & Africa)
- Bio-diesel in generators
  → Solution Providers: Neutral Fuels (UAE, Bahrain, India, Singapore and South Africa.

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Efficient water-use

- Invest in water-efficient fixtures such as dual flush toilets, faucet aerators, and timed/sensored fixtures in site offices and on-site labour accomodations.
  → Solution Provider for aerators: **Earth Fokus**

- Recycle greywater from bathrooms and re-use it for other purposes :
  → Solution Providers: **Bionest**

- Engage staff in water conservation efforts by raising awareness on SDG 6 (Clean Water and Sanitation) or creating social involvement opportunities like celebrating World Water Day (March 22 every year).

- Capturing water condensate from HVAC units to use for different on-site activities.

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Construction materials: concrete

Using a cradle-to-cradle concept in building design/materials is another way to make construction sites greener. Developed in the 1990s, the concept's goal is to reduce damage to the environment by selecting reusable construction materials.

Unfortunately, today, concrete is still one of the most widely used construction materials in the world and is the source of about 8% of the world's carbon dioxide emissions.

While replacing concrete might be difficult in many projects, there are ways to make it more sustainable, such as:

- Adjusting additives in the mix.
- Employing naturally occurring bacteria (instead of clinker) as a binder (bioMASON).
- Using byproducts from other industrial processes to create "geopolymers" to replace clinker in making cement (Zeobond).
- Extending the curing time to reduce the amount of cement (the main carbon culprit).
- Exploring technology that allows carbon absorption from the air by the concrete structure.
- Curing the concrete using waste CO2 from industrial plants and steam (ARAMCO)
- Pumping liquefied carbon dioxide into wet concrete as its being mixed, reducing the need for cement without compromising the concrete's strength or price (CarbonCure)

Sustainable construction materials

- **Reclaimed wood**: Using reclaimed wood reduces the amount of lumber in landfill and saves new trees from being cut down. → Solution Provider: Steel Wood Industries

- **Recycled steel** : Steel is a permanent material that can be infinitely recycled and is 100% recyclable without loss of quality. Look for the Responsible Steel certification for responsibly sourced and produced steel.

- **Ferrock**: Ferrock is created from waste steel dust which is normally discarded from industrial processes. It is a viable alternative to cement and some believe it may even be more resilient to weather than concrete.

- **Acetylated wood:** Acetylation boosts the concentration of 'acetyl groups' in the wood, reducing how much water the cells in the wood can absorb, making it less susceptible to decay or insect attack. → Solution Provider: Accsys technologies

- **Bamboo flooring**: Bamboo is a fast-growing and sustainable timber that regenerates itself with minimal water. Look for the Forest Stewardship Council Certification on bamboo products to ensure the wood is free from toxic chemicals.

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Construction waste management

Reduce

- Practice source reduction by pre-planning how much of each material your project needs
- Reduce on-site errors by employing modern planning and surveillance technologies eg. FEDS and Aerodyne Group for drone surveillance technologies
- Plan to use construction materials that come with minimal cardboard and plastic packaging.

Reuse

- Use best design practices to enable materials reuse in the future or send their components on for reuse.
- Use surplus concrete for lower quality products such as curbstones.

Recycle

- Identify the recyclable materials in your construction processes and the construction waste recycling methods available to you.
- Some materials you can recycle are concrete, wood, drywall, asphalt, glass, metal, plastic.

Dispose

- Partner with a reliable waste disposal company, ideally one with significant experience in handling construction waste.

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Off-site waste recycling

- Provide recycling bins to segregate waste into a minimum of paper, plastic, cans and glass. Educate staff on how to segregate waste and use signage.
  - ➡ Solution Provider: Imdaad; Recycling Services Oman; Outgreens Egypt
  - ➡ E-waste Solution Provider: Efate E-waste Management Company

- Reduce single-use items such as kitchen supplies and water bottles by providing company reusable water bottles, mugs, cutlery and containers.

- Go #OffTheBottle and reduce drinking water costs by investing in water filtration systems for drinking water in labour accommodations.
  - Solution Providers: Liquid of life; Water Club

- Make double-sided printing the default on printers to reduce waste & save costs.

- Use green cleaning products that have compostable/recyclable/refillable packaging & can increase employee well-being due to lack of chemicals/toxins.
  - ➡ Solution Provider: Green Touches

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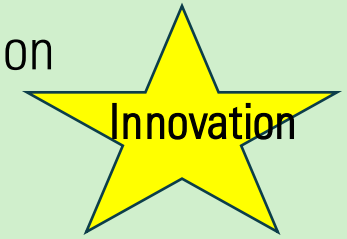
Food waste

Some construction sites have canteens where food waste can become an expensive problem over time. Moreover, food waste that ends up in landfill can contribute to climate change through the production of CO2.

Solutions	Benefits	Solution Provider
LFC Biodigester 	Transform food waste into gray water that is safe to send to water treatment facilities. This reduces food disposal management costs and diverts food waste from landfill.	Power Knot
AI food waste tracker: Winnow Vision 	Helps cut down food waste by automatically tracking food waste through an AI-enabled tool.	Winnow

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Temporary sustainable pathways/roadways

During the final stages of construction, some finished surfaces will need to be protected from vehicle movements or other equipment. Similarly, some landscapes may need to be protected from crane traffic and delivery vehicles.

Trident trackway offers temporary sustainable pathways/roadways that are made from recycled post-industrial and post-consumer plastic. They can protect your finished surfaces and landscapes from the heaviest of equipment such as trucks and cranes.

TRIDENT TRACKWAY

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Modern Methods of Construction (MMC)

There has been a growing interest in MMC, a term used to refer to a range of offsite manufacturing alternatives to traditional construction methods. These methods can help in reducing construction time, cost, & can result in more sustainable maintainability of the structure. Below are some MMC examples:

- **Modular construction:** The process in which a building is constructed off-site, under controlled plant conditions, using the same materials and designing to the same codes and standards as conventionally built facilities – but in about half the time.

- **Design for Manufacture & Assembly (DfMA):** This approach focuses on ease of manufacture and efficiency of assembly of parts at another location, and enables the elimination of waste.

- **3D printing:** 3D printing similarly produces complex shapes offsite and reduces construction waste. Dubai's 3D Printing Strategy states that every new building needs to be 25 percent 3D-printed by 2030

- **Insulated Concrete Forms (ICF):** ICF consists of cast-in-place concrete walls sandwiched between 2 panels of foam, allowing for strong and energy efficient systems, built in a shorter time. Solution Provider: Mutrah Insofoam (Oman and UAE)

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Green building certifications

To improve the environmental, social and economic performance of buildings, various sustainability rating systems and green building regulations have been created:

LEED (Leadership in Energy & Environmental Design): A certification system that makes it mandatory for the project owner to implement a C&D waste management plan.

BREEAM (Building Research Establishment Environmental Assessment Method): A certification system that takes the whole construction life cycle into account, including adjusted weighting of the environmental effects.

GSAS (Global Sustainability Assessment System): GSAS combines 140 building sustainability assessment mechanisms and is divided into eight categories including urban connectivity, site, energy, water, materials, indoor environment, cultural and economic value and management and operations

PEARL (Abu Dhabi): A rating system that requires you to divert a minimum of 30% of C&D wastes through recycling/ salvaging.

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THANK YOU!

ANY QUESTIONS? CONTACT US:

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