Sustainability

Chapter 1

Introduction to FM Sustainability

Chapter 2

Energy Management

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Water Management

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Materials and Consumable Management

Chapter 5

Waste Management

Chapter 6

Workplace and Site Management

Chapter 1

Introduction to FM Sustainability

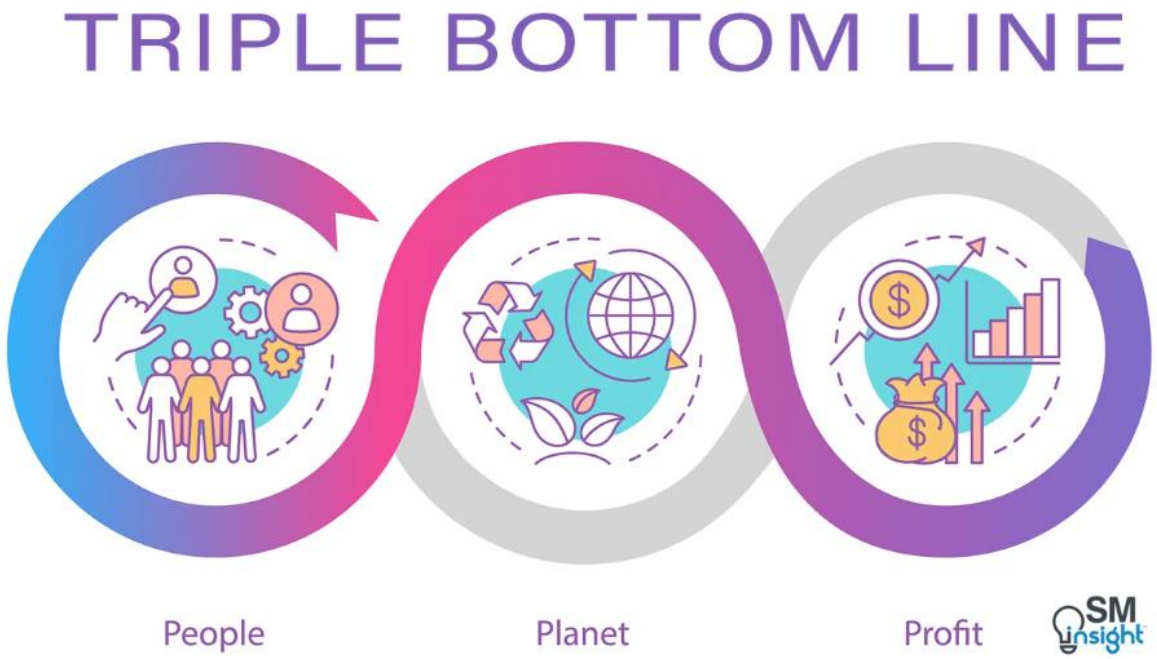
Contents:

1- Triple Bottom Line

2- Alignirig Organizational

Strategy with Sustainability

1- Triple Bottom Line



1- Social Bottom Line

1- Triple Bottom Line

2- Environmental Bottom Line

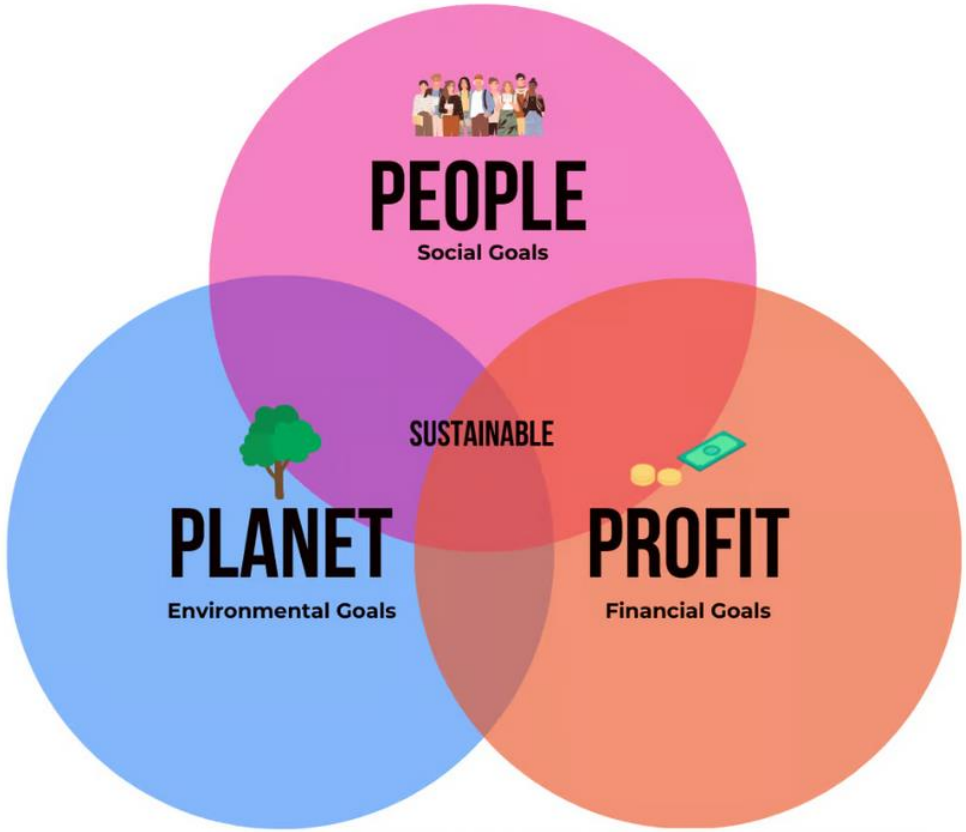
1- Triple Bottom Line

Action Balance:

1-Bearable (S&En)

2-Viable (En&Ec)

3-Equitable (S&Ec)



2- Aligning Organizational Strategy with Sustainability

Sustainability Policy

Aligned with its vision and strategy

integrate sustainable into

organizational activities

A Sustainable Leasing policy

Tenants use RFPs or RFIs for properties

Landlords include terms in the lease

Hard Benefits:

Cost-efficient reduce expenses

Money-saving measures

Profit-generating activities

Soft Benefits:

Improved employee morale

Increased health and comfort

Profit-generating activities

Ten Steps to Policy

1-Identify Stakeholders

2-Confirm Strategy

3-Gain Consensus

4-Secure Sponsor

5-Define Policy Boundaries

Ten Steps to Policy

6-Provide Resources

7-Set SMART Goals

8-Engage Staff

9-Communicate Success

5-Review and Feedback

Chapter 2

Energy Management

Contents:

Contents:

1-What Energy Management?

1-What Energy Management?

3 goals:

1-Use less

2-Use more from renewable

3-Use more socially and environmentally

Zero Net Energy Buildings

(ZNB)

net-zero emissions by 2050

Using Less Energy

1-Upgrade Building Envelope

2-Improve Systems Efficiency

3-Optimize Energy Use

4-Use Renewable Sources

Upgrade Building Envelope

1-Insulation

2-Inspection

3-Solar Gain Reduction

Improve Systems Efficiency

1-HVAC System

2-Lighting System

3-Electrical System

4-Transport System

Optimize Energy Use

1-Commissioning

2-Energy Site Audits

3-BMS or BAS System

4-Energy Performance Contracting

Use Renewable Sources

1-Solar Energy

2-Biomass

3-Geothermal Energy

4-Wind Energy

5-Micro Hydro

2-Use Energy More Efficiently

Energy Pricing Factors

Peak Pricing

Demand Charges

Management Tactics

Load Shedding

Load Shifting

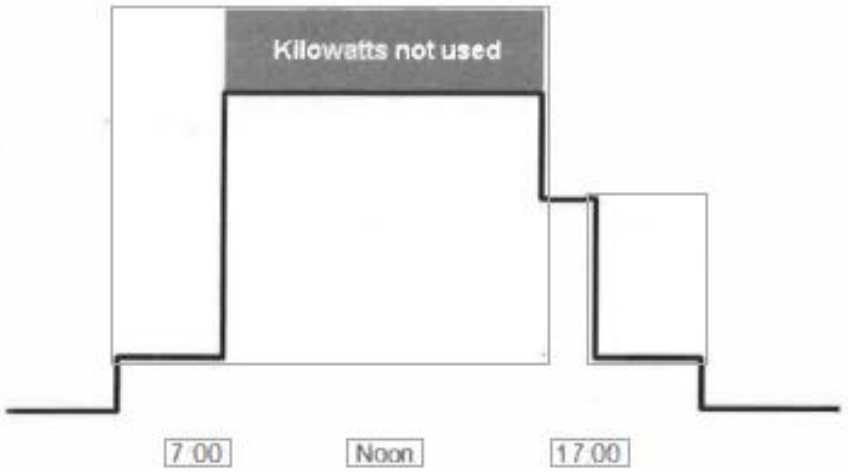


Figure 2 Load Shedding

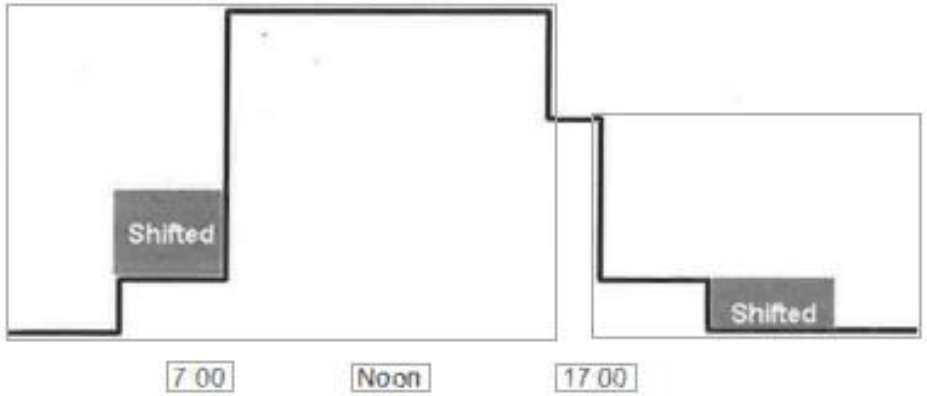


Figure 3 Load Shifting

Demand Response

Arrangement between FM and

power companies

Changing Occupant Behaviors

1-Identify and Remove Obstacles

2-Educate Occupants

3-Provide and Support Solutions

Implement a Carbon Trading Policy

1-Reducing emissions

2-Carbon Sequestration

Renewable Energy Credits (RECs)

Facility Manager’s Role

1-Facility Maintenance

2-Occupant Engagement

3-Equipment Optimization

4-Space Management

3-Energy Evaluation

standards

1-International (ISO 50001)

2-United Kingdom (BREEM)

3-Canada's National Energy Code

4-US (IECC - ASHRAE)

Terminology

Carbon Footprint

Carbon Intensity

Energy Use Intensity (EUI)

Greenhouse Gases

4-Energy Efficient devices

ENERGY STAR

Canada

Japan

Switzerland

Taiwan

Electric Submeters

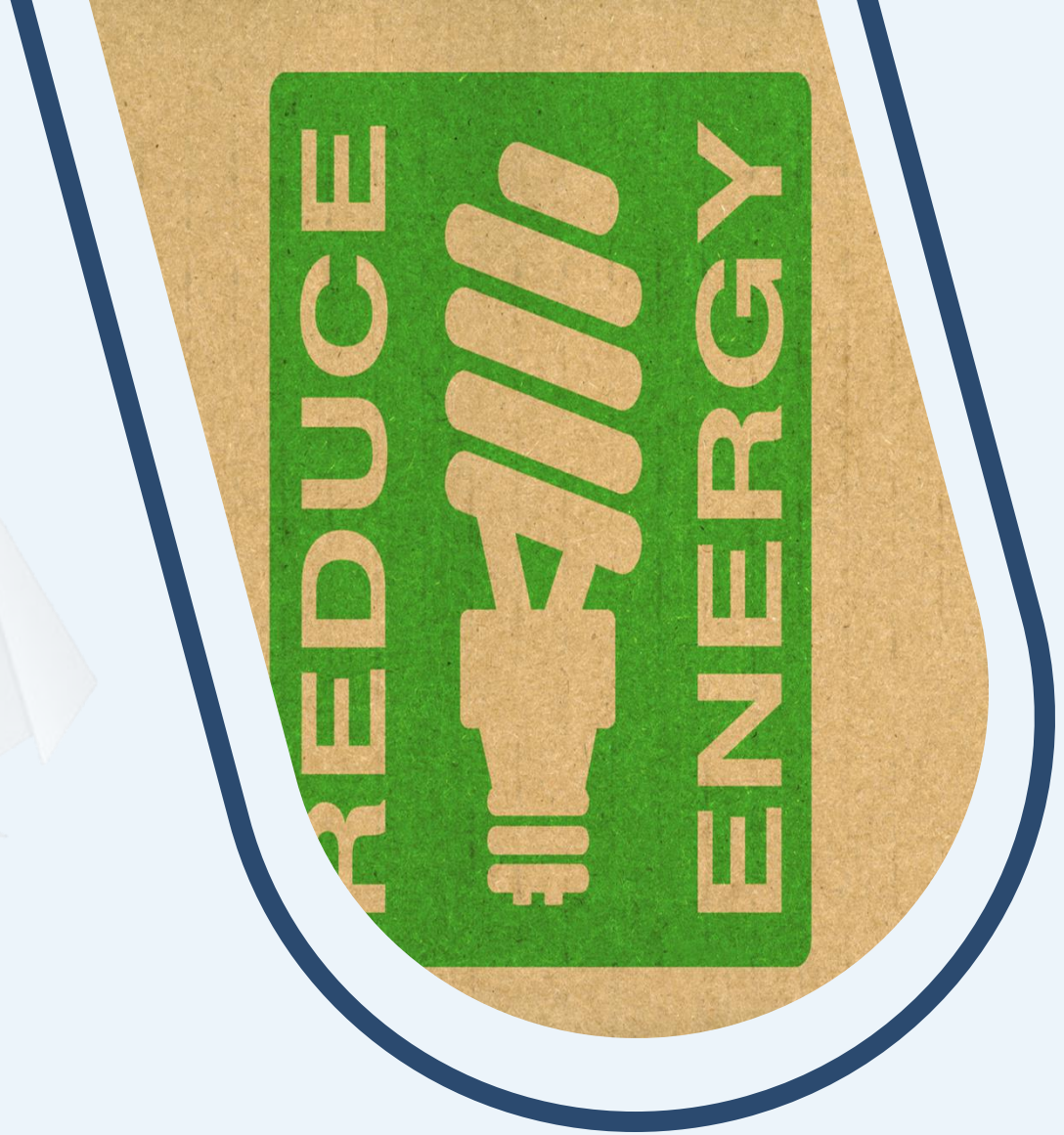
4-Energy Efficient devices

Energy Management System (EMS)

Internet of Things (IoT)

Plug Load Controlling

5-Reducing Energy Use



Controlling Devices

Smart Thermostats

Energy Misers

Smart Charging Stations

Smart Power Strips:

Data Center Management

Virtual Servers

Cooling Systems

Temperature Adjustments

6-Energy-efficient Systems

6-Energy-efficient Systems

1-BAS or BMS

2-Efficient HVAC systems

3-Renewable power sources

4-Computer Power Management

7- Energy-efficient Operational Processes

Commissioning (Cx)

Retro Commissioning (RCx)

Measurement and Verification

Initial Verification

Ongoing Checks

ASHRAE Levels for Audit

1-ASHRAE Level 1: Walk-through Audit

2- ASHRAE Level 2: Energy Survey and Analysis

3-ASHRAE Level 3: Detailed Analysis of Capital-Intensive Modifications

Reducing Power Usage

1-Lighting (LED Technology)

2-Light Sensors

Chapter 3

Water Management

Contents:

1-Introduction to Water Management

Water flow

1-Occupants

2-Facility Processes

3-Core Building Systems

4-Site Maintenance

1-Introduction to Water Management

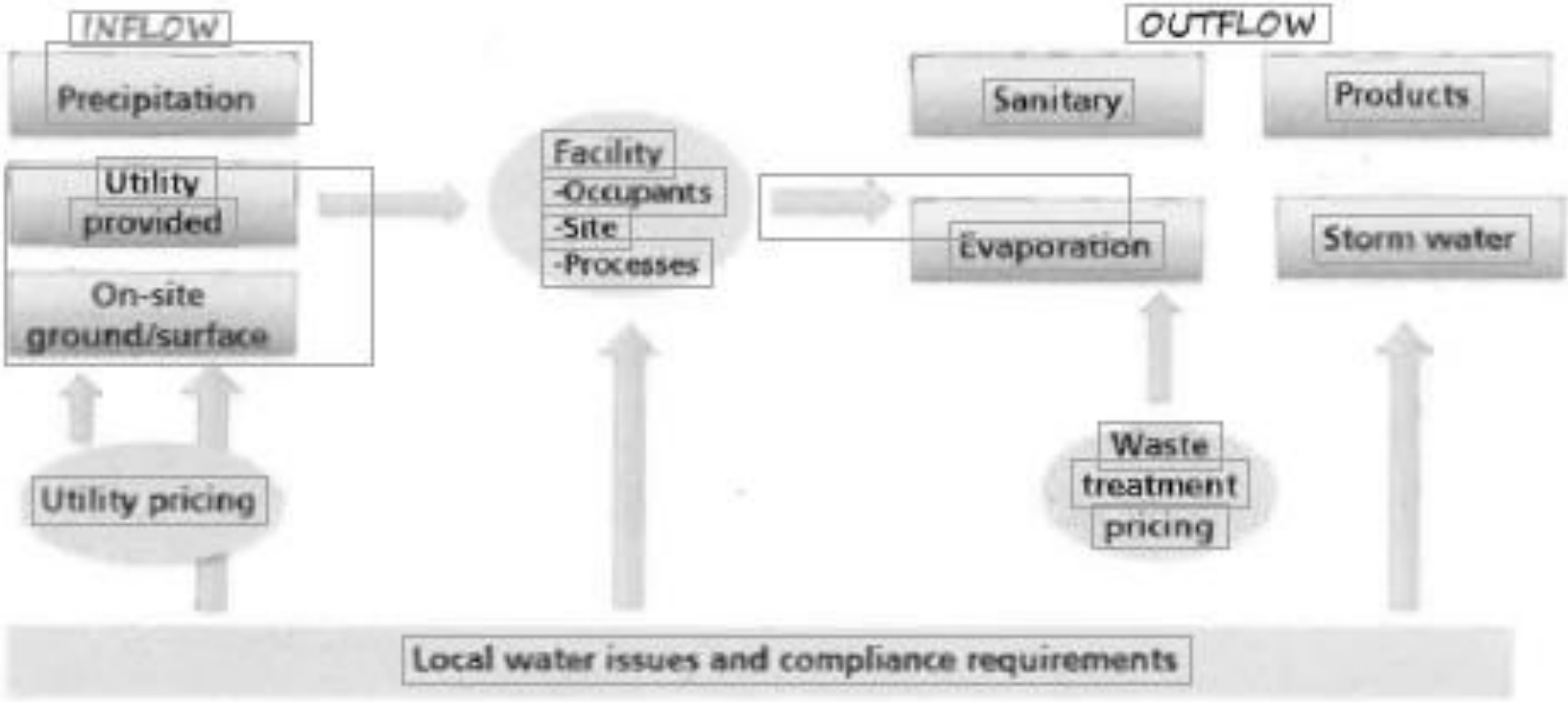


Figure 5 Water Flow

4 Principles of Water Management

1-Reducing Water Wasteccupants

2-Increasing Efficiency

3-User Education

4-Reusing Water

Implementing a Programme

1-Establish a Baseline

Sub metering

Utility Bills

Inventory

Implementing a Programme

2-Evaluate Opportunities

Educating occupants

Installing faucet aerators

Reprogramming irrigation systems

Implementing a Programme

3-Set Goals and Secure Commitment

2-Minimizing Utilization of Potable Water

2-Minimizing Utilization of Potable Water

Reducing Water Loss and Educating Users

Monitoring and Measuring

ENERGY STAR Portfolio Manager

2-Minimizing Utilization of Potable Water

Water Efficient Equipment

1-Restroom Equipment

2-Kitchen and Break Rooms

3-Irrigation Efficiency

4-HVAC Equipment Efficiency

3-Methods to Reduce Water Waste

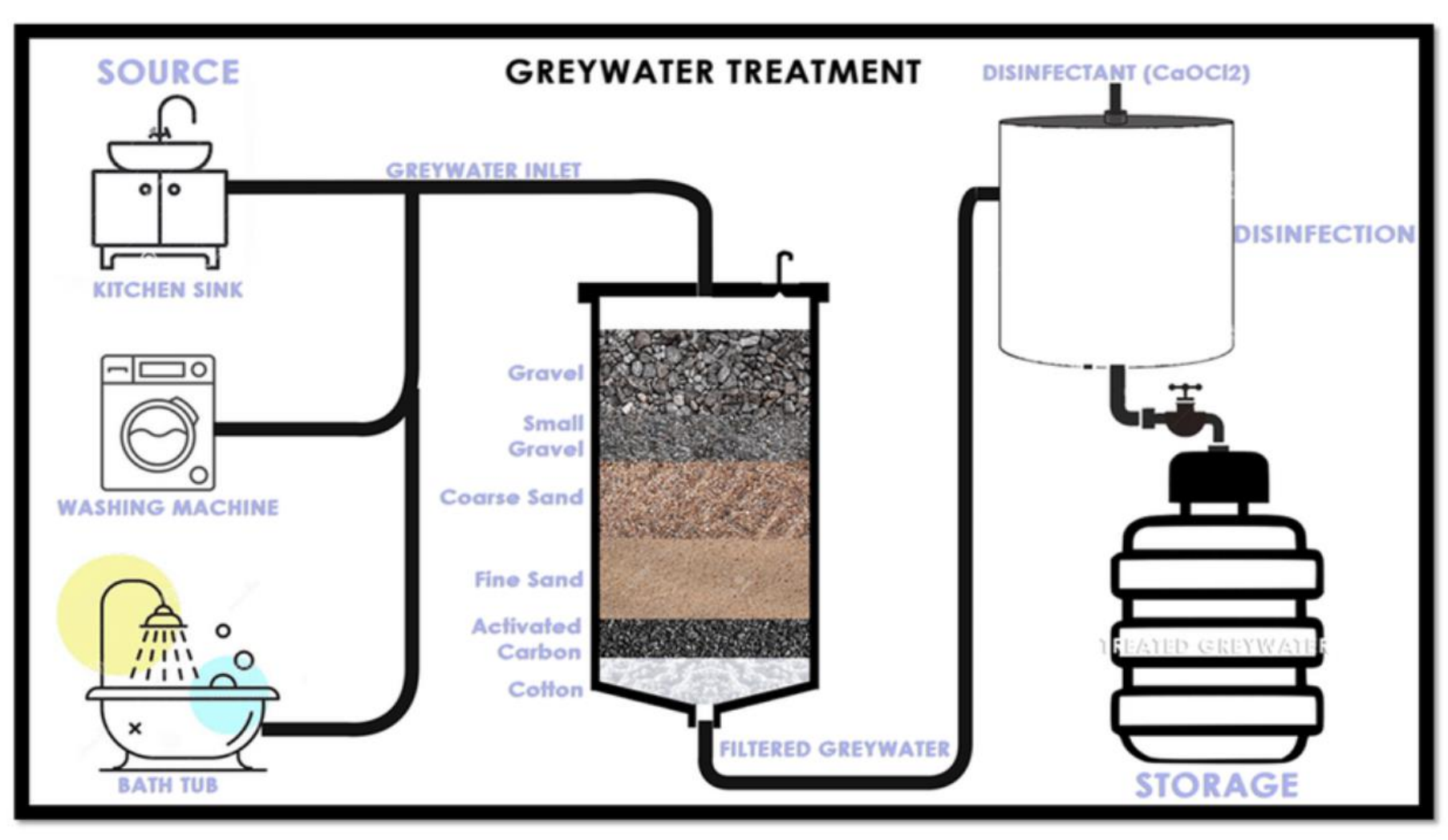
3-Methods to Reduce Water Waste

Rainwater Harvesting

Reverse Osmosis Deionized (RODI)Units

Rainwater Collection

3-Methods to Reduce Water Waste



Greywater

3-Methods to Reduce Water Waste

Potable Water

Clean and safe for human consumption.

Greywater

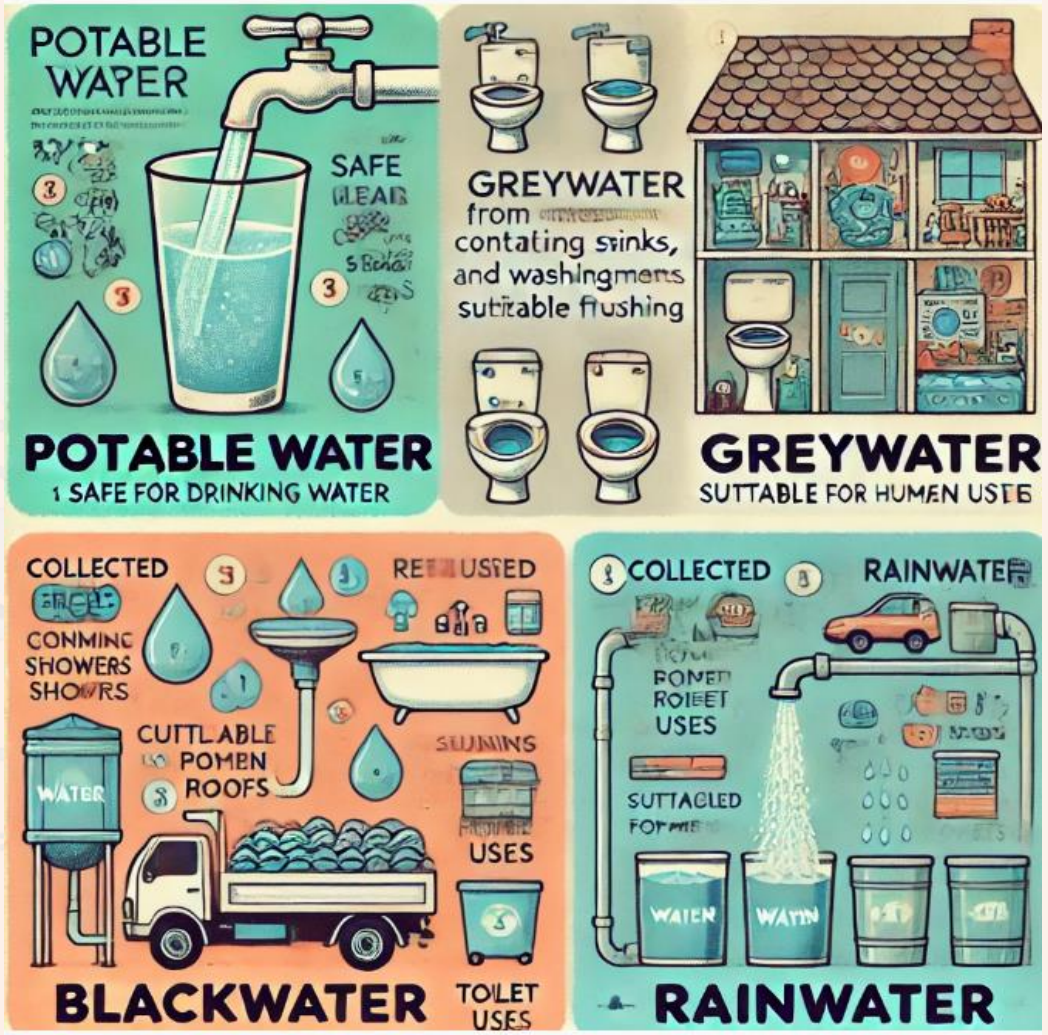
Reused water from sinks, showers, and laundry.

Blackwater

Contaminated water from toilets and industrial waste.

Rainwater

Collected water from rainfall, typically from rooftops.



Chapter 4

Materials and Consumable Management

Contents:

1-Introduction to Materials and Consumables Management

Product Life Cycle

1-Extraction

2-Production

3-Distribution and Delivery

Product Life Cycle

4-Usage

5-End-of-Life Management

Benefits of Sustainable procurement

1-improves internal and external standards

2-Manages the organization's risk and reputation

3-Builds a sustainable supply chain for the future

Barriers of Sustainable procurement

1-Focus Beyond Price

2-Leadership Support

3-Clear Priorities

4-Verification of Claims

Steps to Build a Sustainable Supply Chain

1-Organizational Commitment

2-Strong Supplier Relationships

3-Measure Impact

4-Monitor and Audit Compliance

2-Renewable Resources

Recycled materials

Sustainability certification

Forest Stewardship Council (FSC)

Challenges of renewable materials

1- consumption during production

2- Use of chemicals or toxins in manufacturing

3- Energy and resources required

to turn raw materials into products.

Protecting Endangered Species

1-harmful chemical use in outdoor areas

2-Preventing new developments

3-reduce the need for raw material

3-Minimizing the Use of Substances that Harm Health and the Environment

Common and abundant Hazard

Chemicals in food packaging

Agricultural chemicals

Hazardous cleaning chemicals

Use of

Biodegradable Materials

Agriculture Materials

Cork

Finite

Linoleum

Use of Natural Resources

Bamboo and corn-based serving dishes

Cornstarch& mushroom

Organic fabrics

4-Purchasing Materials
&
Resources that Promote Ethical

4-Purchasing Materials & Resources that Promote Ethical

Social Responsibilities and Ethical Behavior

Balancing Responsibility and Finances

Chapter 5

Waste Management

Contents

1-Introduction to Waste Management

FM Take the Lead

Waste education

Environmental protection

Cost and efficiency

Collection Methods

1-Pick-up method

2-Drop-off method

Main Disposal Methods

1-Landfills

2-Incineration

Main Disposal Methods

3-Resource Recovery:

Recycling

Composting

Thermal Treatment

2-Procurement Activities that Promote Consumption of Materials

Construction and Renovation Projects

large waste stream

Waste Separation

Metal Recycling

Material Reuse

Donations

3-Recycling

and

Waste Diversion

Recycling

Decline in Recycling

Markets

Market Shift

Recycling's Importance

Recycling Guideline

1-Gain Management Support

2-Conduct a Waste Assessment

3-Design the Program

Recycling Guideline

4-Implement the Program

5- Monitor and Track

6-Continuous Improvement

Waste Diversion

1-Generate Less Waste

2- Reduce Packaging Waste

3-Repurpose Materials

4-Manufacturer Recycling Programs

Waste Diversion

4-Manufacturer Recycling Programs

5-Alternative Waste Disposal Methods

6-Salvage Walkthroughs

4-Waste Disposal Techniques that do not Harm the Natural

Disposal of Organic Waste

1-Biogas Generation

2-Composting

Chapter 6

Workplace and Site Management

Contents

1-Indoor Environmental Quality (IEQ)

2-Standards and Guidelines

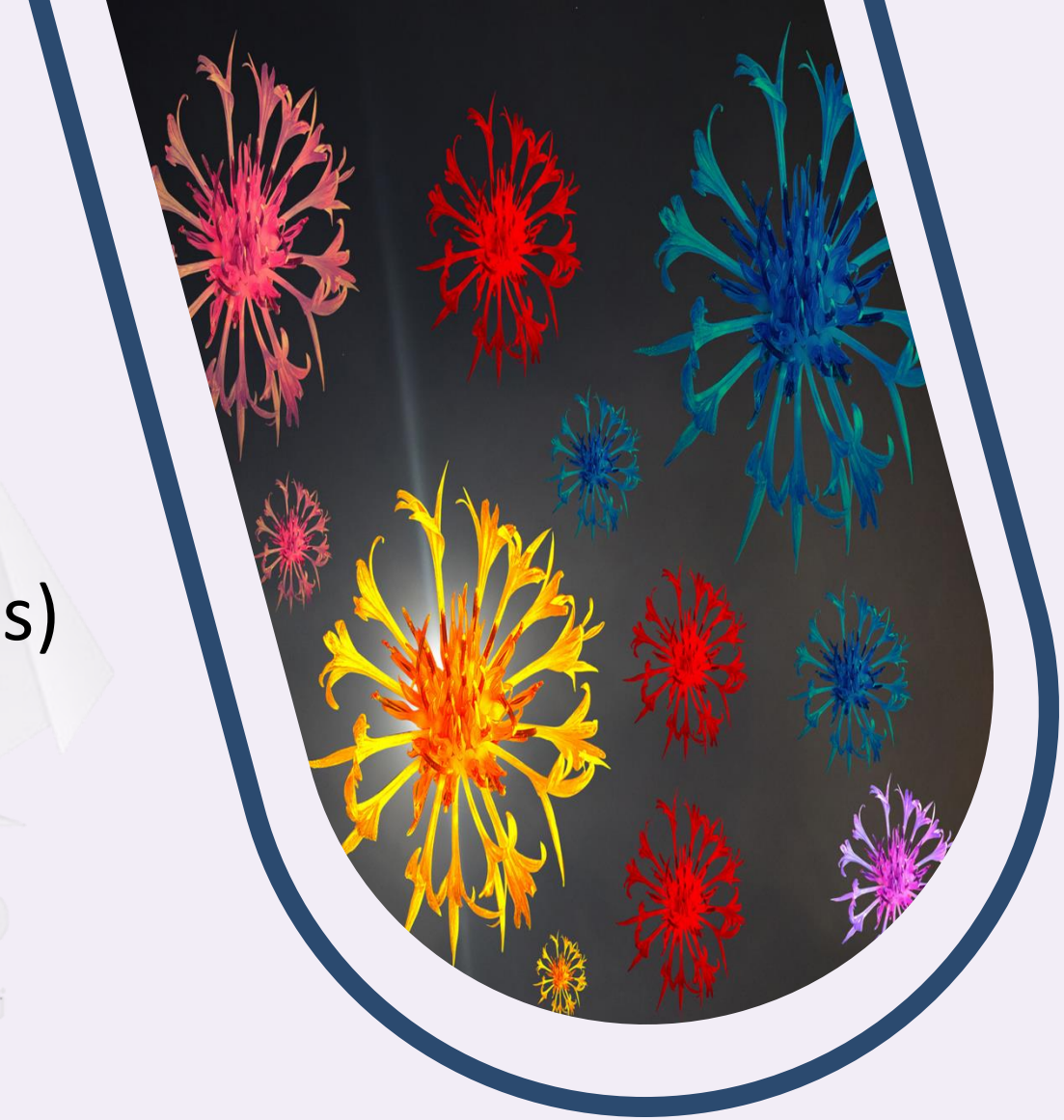
1-Indoor Environmental Quality (IEQ)

Air Quality

1-Heating and Cooling

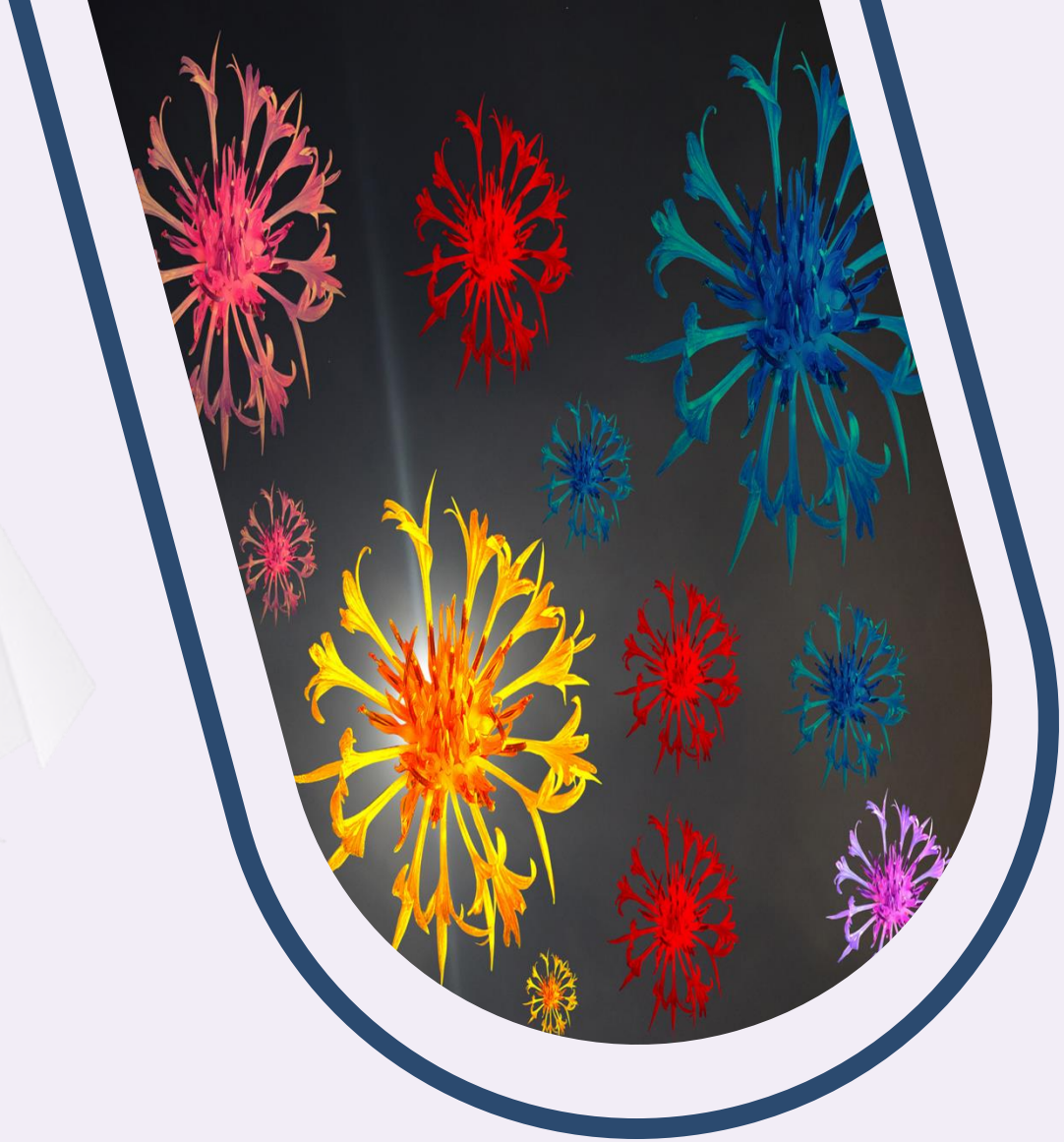
2-Mold and Mildew Control

3-Humidity Management



Air Quality

1-Volatile Organic Compounds (VOCs)



Air Quality

6-Occupant-Generated Sources

7-Outdoor Air Quality

Thermal Comfort

1-Air Movement

2-Humidity Control

3-Manage Perceptions

4-Occupant Education

Lighting

1-Color Temperature

2-Lighting Levels

3-Light Level Maintenance

4-Color Finishes

Views and Access to Daylight

1-Dimmable Solar Tubes

2-Skylights

3-Light Shelves

4-Natural Light Simulation:

Sound and Acoustics

Sound Masking

2-Standards and Guidelines

Standards

1- ASHRAE

2-Association of Physical Plant Administrators (APPA)

3- International Sanitary Supply Association (ISSA)

certifications

4-Green Globes

5-WELL Certification

6- OSHA Europe

7-IFMA SFP® Certification