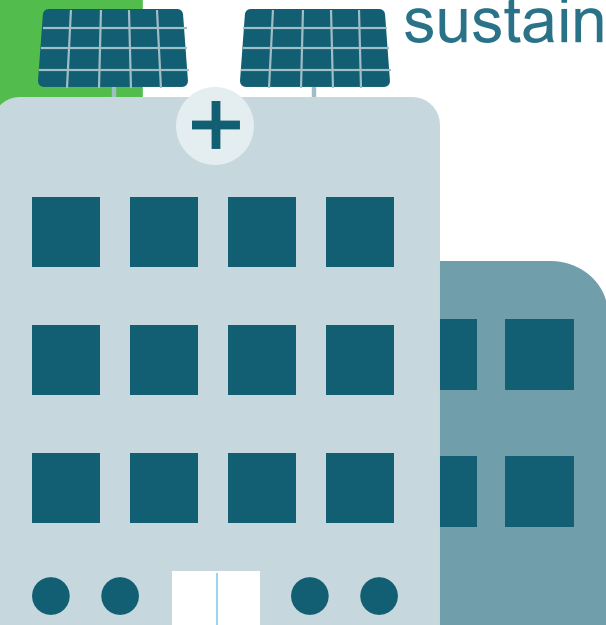


Alliance for Transformative Action on Climate and Health (ATACH)

Waste and WASH actions for low-carbon,
sustainable and resilient health care facilities

19 March 2026
9h00 – 10h30 CET



ATACH
Alliance for Transformative
Action on Climate and Health



World Health
Organization

Interpretation



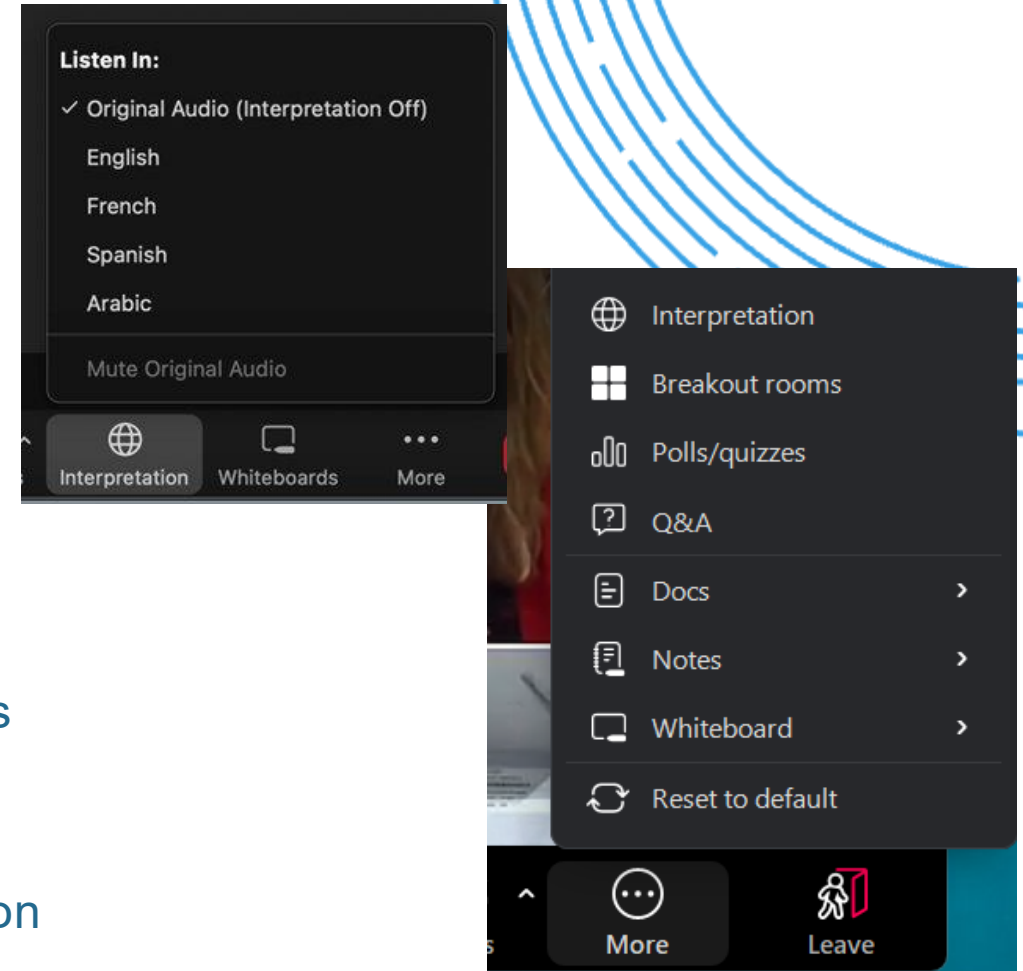
in French and Arabic

To activate interpretations (in Arabic):

1. Click on the interpretation icon (or find it in "More").
2. Select "Arabic"
3. **Optional** : mute original audio

Pour activer les interprétations (en français):

1. Cliquez sur l'icône d'interprétation (ou dans l'option "More")
2. Sélectionnez "Français"
3. **Facultatif** : couper le son d'origine



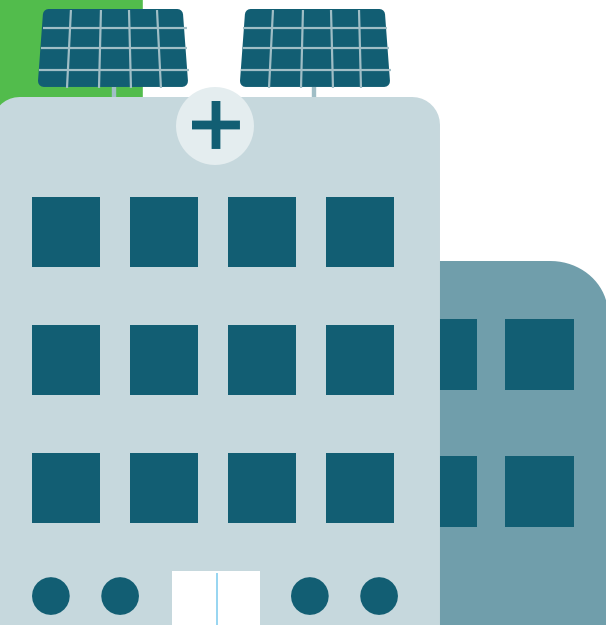
Click on "More" to see interpretation option

Meeting agenda

09:00 - 09:05	Welcoming remarks- Dr. Diarmid Campbell-Lendrum, WHO
09:05 - 09:20	<ul style="list-style-type: none">- WHO Tools on Building Climate-resilient and low carbon health care facilities - Elena Villalobos Prats, WHO- Climate resilient, sustainable and low carbon WASH in Health Care Facilities – Dr. Maggie Montgomery, WHO- Reducing carbon emissions from health care waste management interventions- Ruth Stringer, HCWH
09:20 - 10:00	Country experiences Lao PDR: Dr Viengkhan Pixay, Deputy Director General, Department of Hygiene and Health Promotion, Ministry of Health, Lao PDR And Lkhasuren Oyuntogos, WHO Lao PDR Office Ethiopia: Misganaw Tewachew, Climate and Health Focal Point, Ministry of Health Ethiopia Nepal: Dr Sudan Raj Panthi, WASH, Water Quality, Environmental Health Officer, WHO Nepal
10:00 - 10:25	Discussions, Dr. Amy Savage WHO (discussion moderation)
10:25 - 10:30	Closing Remarks

WHO tool for building climate resilient and low carbon sustainable HCFs

Elena Villalobos Prats
ATACH Secretariat Lead



ATACH
Alliance for Transformative
Action on Climate and Health



World Health
Organization

Climate change

Health risk

Vulnerability factors

- Demographic
- Geographical
- Biological factors & health status
- Sociopolitical
- Socioeconomic
- Health system capacity
- Gender & equity

Climate-related hazards

- Extreme weather events
- Heat
- Sea level rise
- Air pollution
- Vector distribution & ecology
- Water scarcity
- Reduced food production

Exposure

- People & communities
- Health workforce
- Infrastructure
- Energy systems
- Water systems
- Food systems
- Health systems

Environmental threats and GHG emissions

Health outcomes



Injury and mortality from extreme weather events



Heat-related illness



Respiratory illness



Water-borne diseases and other water-related health impacts



Zoonoses



Vector-borne diseases



Malnutrition and food-borne diseases



Noncommunicable diseases (NCDs)



Mental and psychosocial health



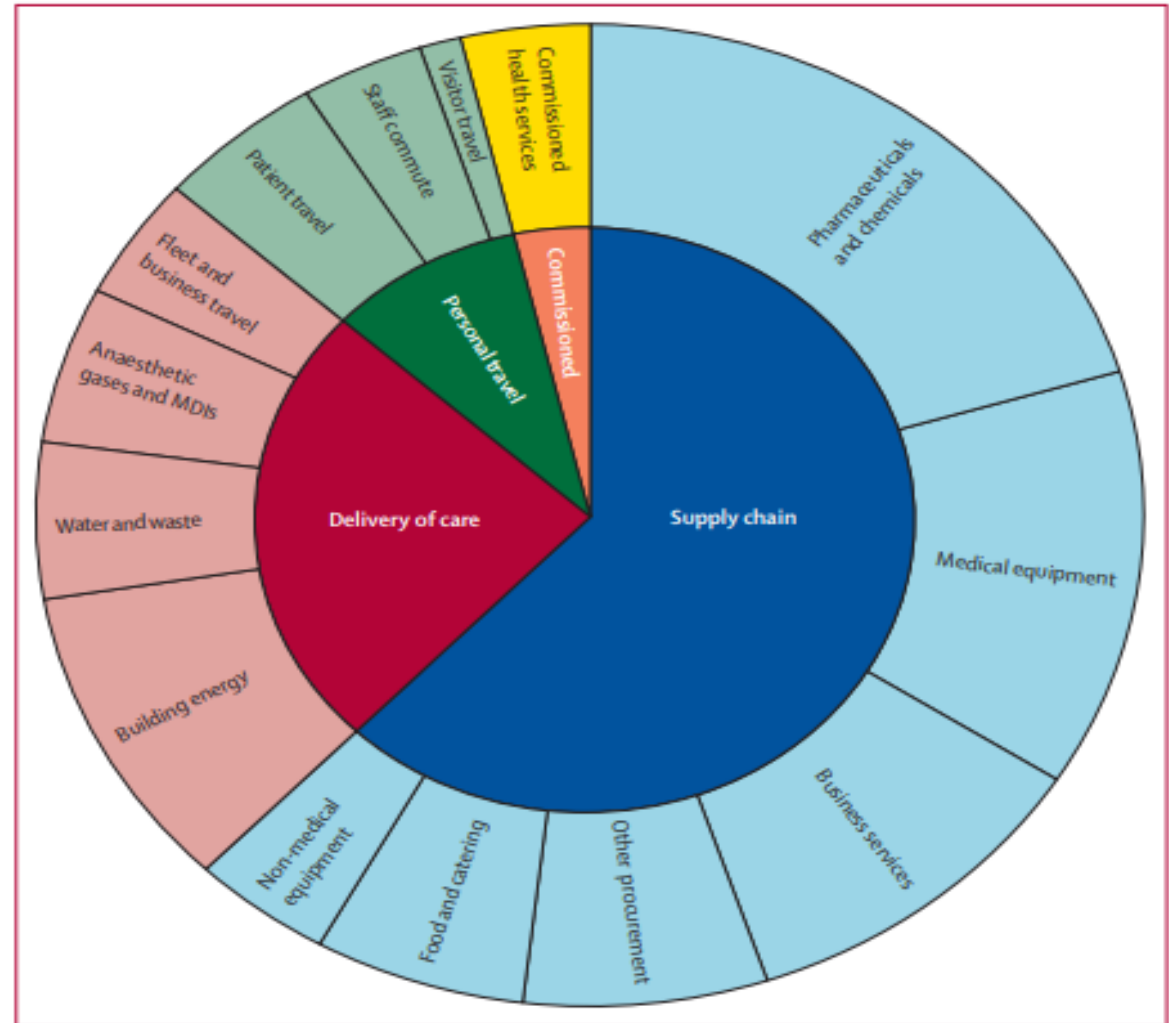
Impacts on health care facilities



Effects on health systems

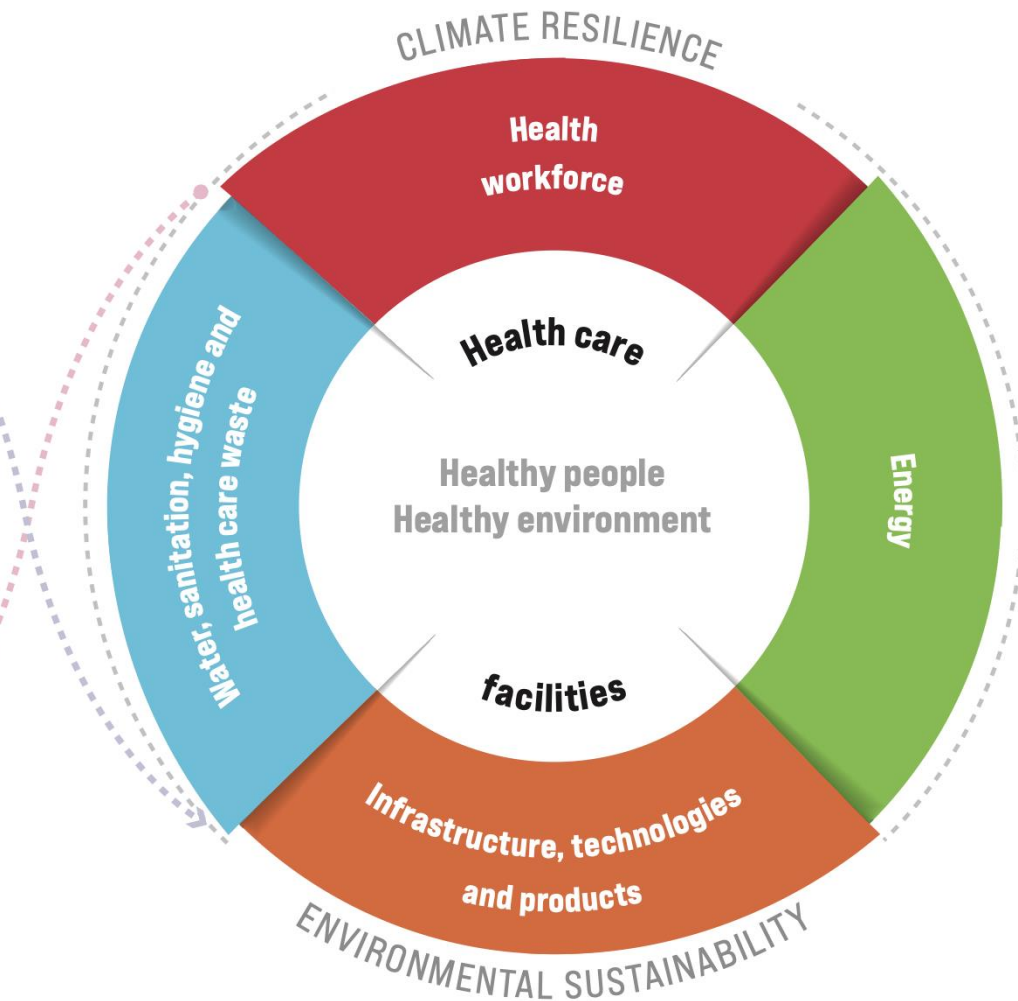
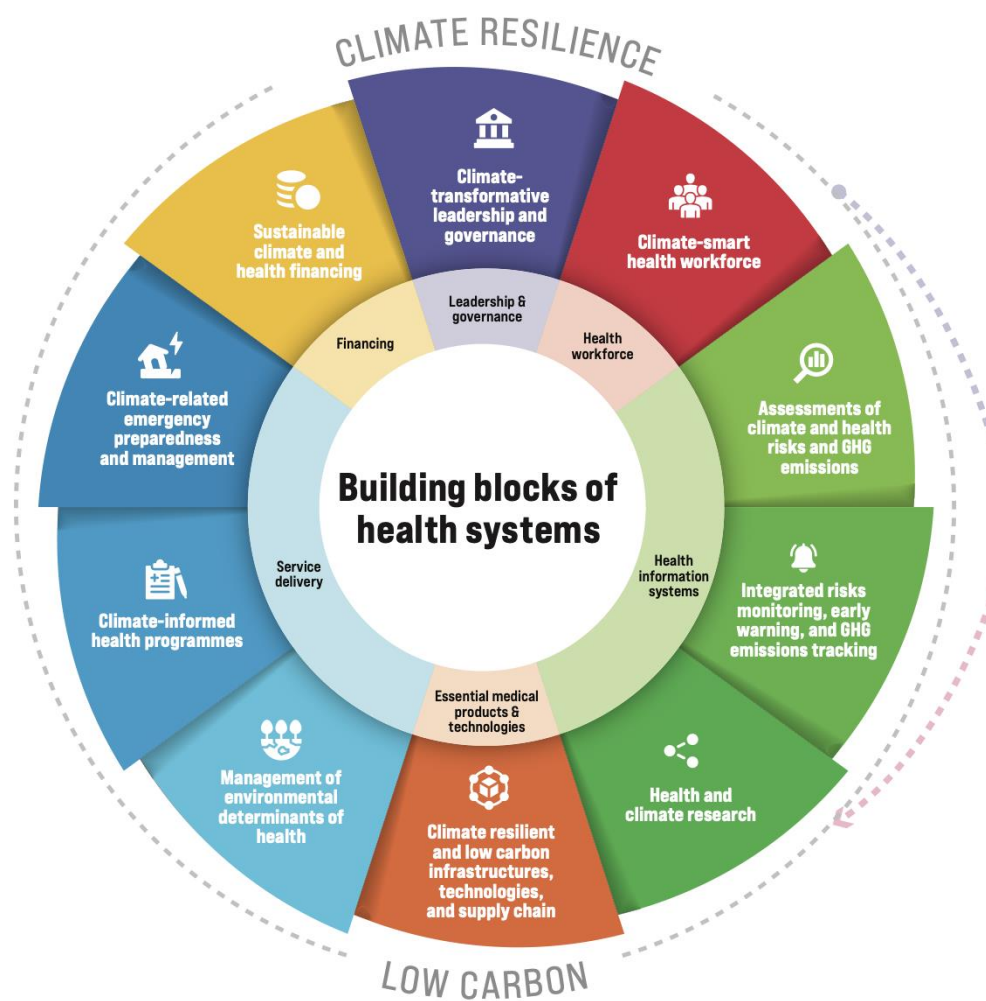
Health Care's Climate Footprint

- Between 4.4% to 5.2% of World's GHG emissions are from the Health care sector
- Emissions equal to over 500 coal gas fired thermal power plants
- Over 70% of the global climate footprint is from Supply chain procurement

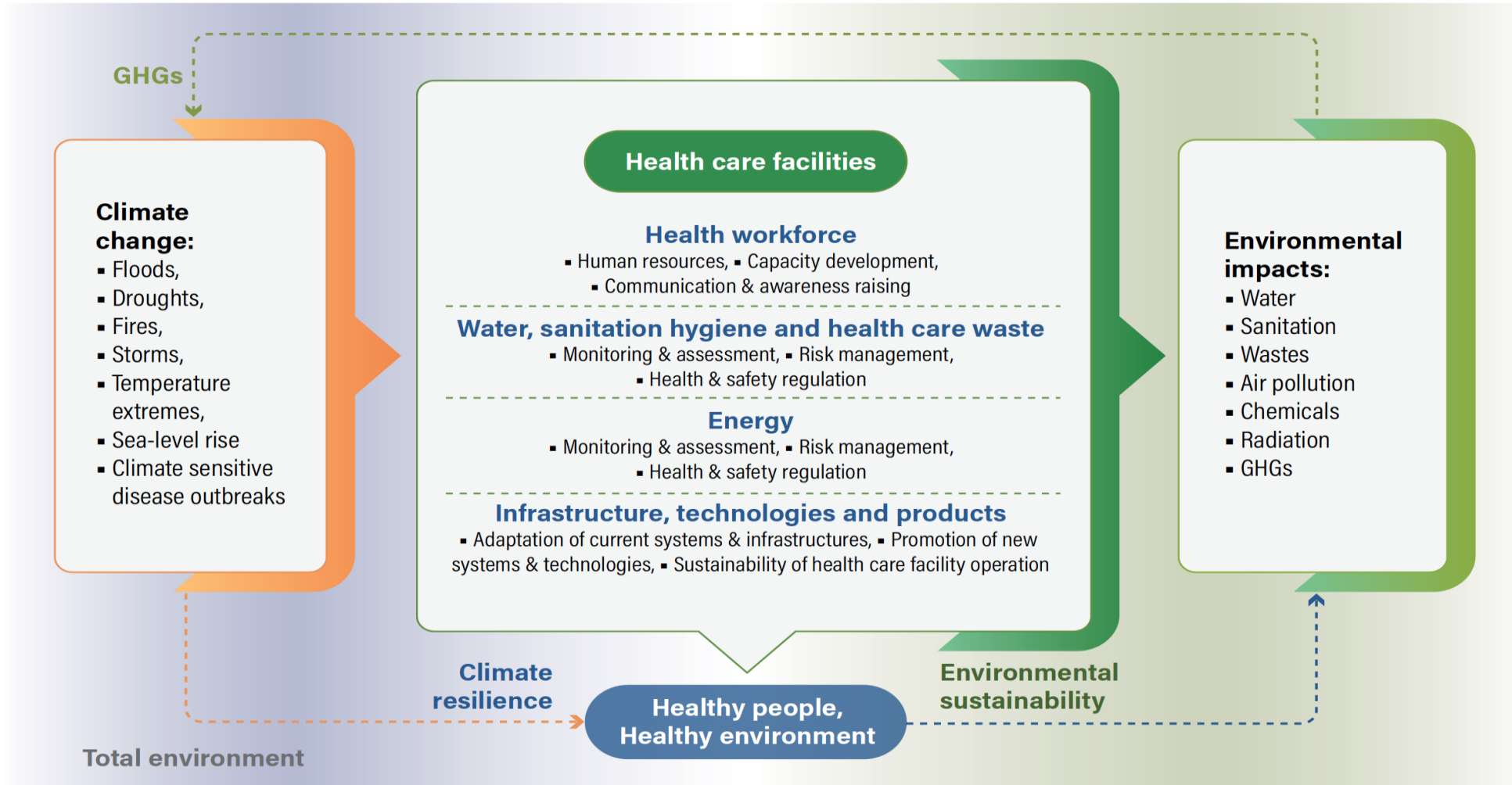


Contribution of different sectors to the greenhouse gas emissions of the NHS England, 2019

Efforts to build climate resilience and low carbon sustainability within health systems and facilities



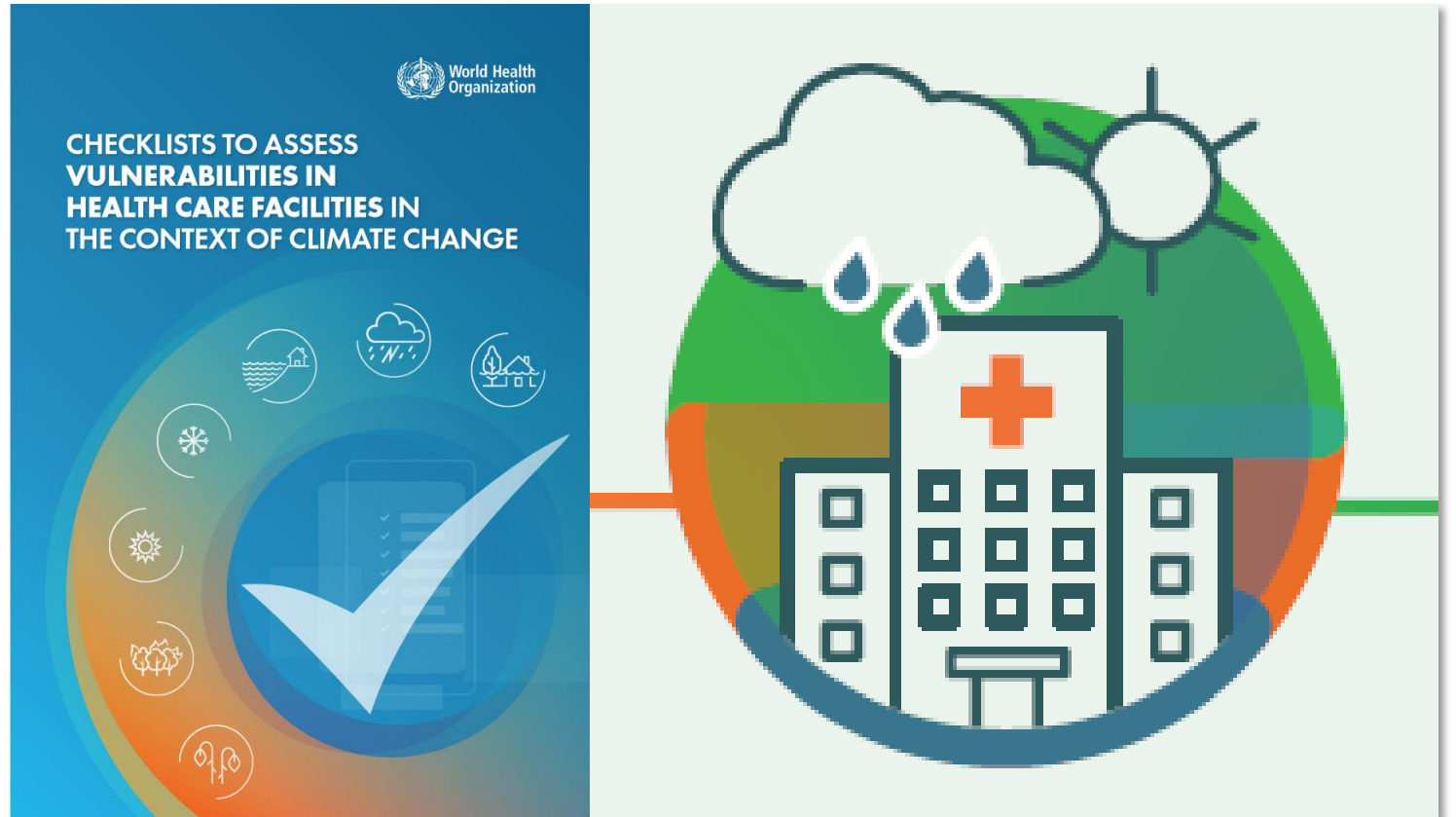
Framework for building CRESHCFs



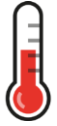
Assessing Vulnerabilities in Health Care Facilities

Steps:

1. Identify climate **hazards** of concern
2. Assess current **vulnerability** for each of the hazards, in each of the key components of health care facilities
3. Understand potential **impacts** posed by climate variability and change in each of the key components of health care facilities



3. Understand potential impacts



INCREASED TEMPERATURE

Health workforce

WASH and healthcare waste

Energy

Technologies, infrastructure, products

- Affecting workers with pre-existing conditions (respiratory and cardiovascular diseases, overweight)
- Reduced access to freshwater
- Water source contamination by pathogens and metals
- Gradual increase in the use of electricity for cooling purposes
- Additional treatment of drinking water
- Need insulation, cooling and dehumidification



DROUGHT

Health workforce

WASH and healthcare waste

Energy

Technologies, infrastructure, products

- Increased threat of noncommunicable diseases from poor air quality and higher temperatures to the health workforce
- Insufficient water availability to provide health care services
- Low water quality
- Disruption of energy-dependent water pumping and treatment
- Intermittent power delivery
- Interruption of water and food supply chains



FLOOD

- Health workers are not able to arrive at or depart from the health care facility
- Water contamination
- Lost sharps containers and hazardous waste bins
- Damage to emergency generator or other sources of energy
- Damage to building access
- Damage to medical equipment and devices



HEATWAVE

- Increased heat stress effects (heat exhaustion and heat stroke)
- Increased water demand
- Water source contamination
- Power outages
- Loss of vaccines, drugs, and other medical supplies
- Damage to medical equipment
- Increased demand for cooling and rest areas for staff



STORM

- Reduced performance capacity,
- Deaths, injuries or illness
- Disruption of water supply, wastewater and sewage systems
- Power outages (wind- and lightning-related)
- Interruption of acute medical care
- Damage to infrastructure from high winds
- Disruption to building access



WILDFIRE

- Loss of work capacity due to smoke, ash and high temperature
- Effects on mental health of staff
- Shortage of safe water
- Reduced capacity to use equipment that require potable water
- Increased demand for energy consumption from air conditioning
- Increasing indoor air contamination from smoke, threatening the health of patients and staff



SEA-LEVEL RISE

- Impacts on respiratory disease due to indoor mold growth
- Saltwater intrusion in water and wastewater containment systems
- Disruption of internal and external communication and information systems
- Damage to access systems (elevators, ramps, corridors, garage)
- Increased costs of building maintenance



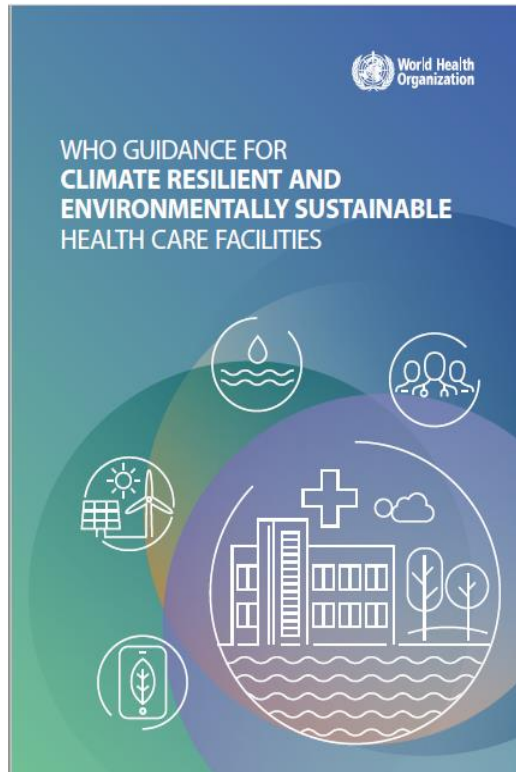
COLD WAVE

- Life-threatening risks from exposure to excessive cold
- Reduced performance capacity
- Increased likelihood of water pipes bursting and water freezing
- Loss of water pressure
- Disruption of internal heating systems
- Difficulty in providing thermal comfort
- Increased electricity demand
- Damage to water pipes from cold exposure

Interventions

- X 4 areas
- X 3 objectives each
- For climate resilience and environmental sustainability

24 tables of interventions



Climate resilience

Environmental sustainability











Interventions table 4.2.1B – Risk management: Strengthened capacity of health care facilities to manage water, sanitation, chemicals and health care waste risks to workers, patients and served communities, by including assessments of climate resilience and environmental sustainability in responding to hazards and identifying and reducing exposures and vulnerabilities.

(Water, sanitation and health care waste – climate resilience)

Interventions (level of achievement) ■ Low, unavailable, unable ■ Medium, in progress, incomplete ■ High, completed, achieved	Action level			Observations
Developed a long-term drought management plan, including the identification of available alternative safe water sources*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Health care facility conserves and manages water to reduce water usage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water services not affected by seasonality or climate change related weather extremes*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
WASH climate risk management plan implemented*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Improved training and support to health workforce on how and when to deliver water messaging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Safe water storage available, avoiding mosquito breeding sites*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water is not contaminated in the health care setting during storage, distribution and handling*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Kitchens have adequate supplies of clean potable water*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water storage tanks have appropriate covers to prevent access or contamination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Non-return valves on water supply pipes installed to prevent back flows*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Water storage in the health care facility sufficient to meet the needs of the facility in case of an extreme weather event*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Storm water safely managed (avoiding standing water near the facility or affecting nearby households)*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Health care facility drinking water treated with a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

(Water, sanitation, chemical safety and health care waste – environmental sustainability)

Interventions (level of achievement) ■ Low, unavailable, unable ■ Medium, in progress, incomplete ■ High, completed, achieved	Action level			Observations
Reinforced messaging about water use through signs and notices to promote saving	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Increased patient and visitor awareness about water conservation including signs and notices in patient rooms and visitor restrooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Plastic bottled water eliminated where drinking tap water is available*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Eating utensils are washed immediately after use (reducing water and energy)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wastewater is safely managed through use of on-site treatment (such as septic tank followed by drainage pit) or sent to a functioning sewer system*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Established recycling programme for all types of non-hazardous waste*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Established segregation collection of different types of waste according to hazards*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Phased out of incineration of medical waste: a variety of non-burn technologies are available to safely disinfect, neutralize or contain waste (such as autoclaving)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



Evolution of ATACH with growing attention on CCH

105 Countries
117 Partners



2021

COP26

UK establishes COP26 Health Programme raising ambition on Climate-Resilient and Low Carbon Sustainable Health Systems.



Nov 2022

COP27

Egypt as COP27 Presidency launches Initiative on Climate Action and Nutrition (I-CAN). I-CAN integrated into ATACH.



ATACH formed

ATACH is formed to support country-level and global delivery of climate resilient and low-carbon health systems.

June 2022



May 2024/25

WHA 77 /78

77th WHA Climate change and health resolution
78th WHA Global Action Plan on Climate and Health adopted.



COP28

COP28 UAE Declaration on Climate Change and Health endorsed by 151 Member States. ATACH referenced as a key collaboration initiative.



Nov 2023



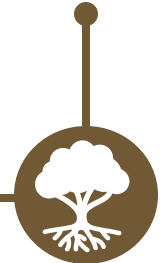
COP29

Baku COP Presidencies Continuity Coalition
COP29 Declaration on Multisectoral Action Pathways to resilient and healthy Cities

Nov 2024



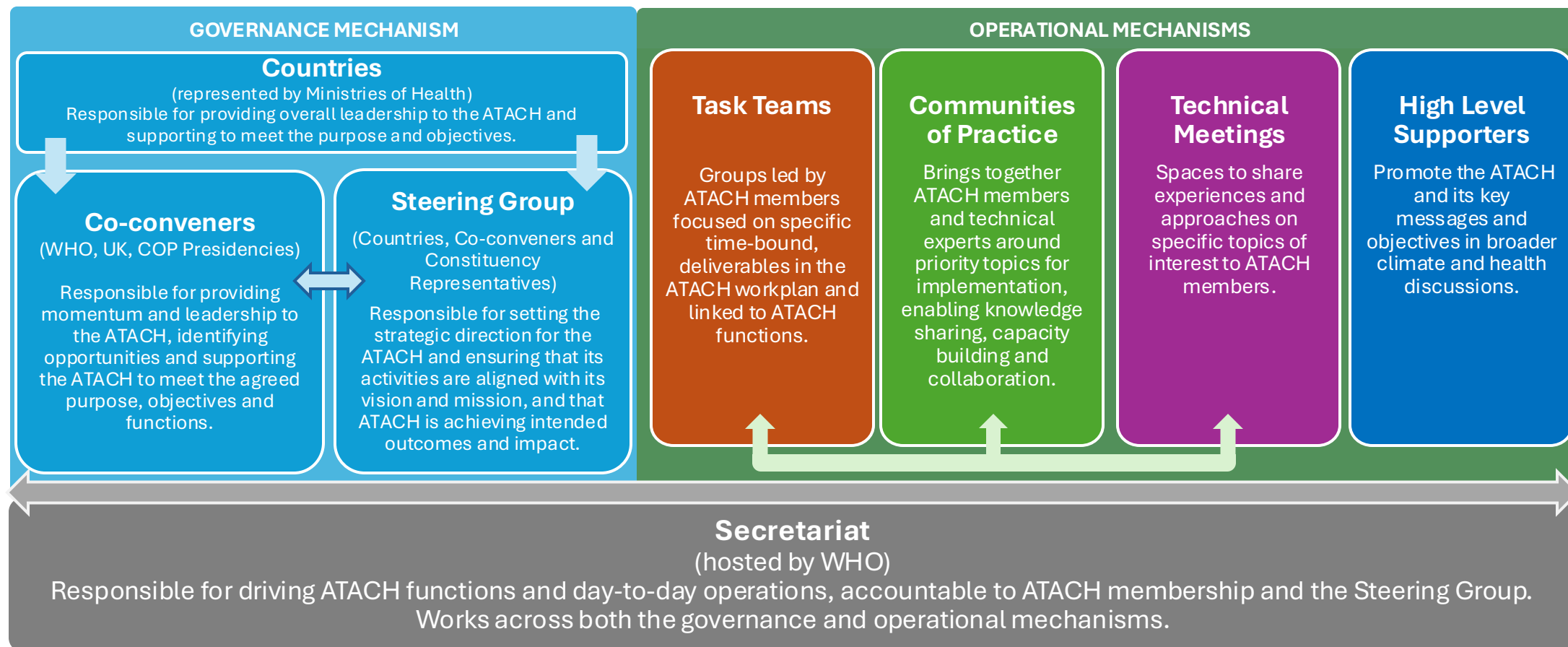
Belém Action Plan



Overview of ATACH 2.0 Structure (revised)

ATACH Membership

ATACH membership comprises countries/areas (represented by Ministries of Health), governmental technical agencies, multilateral and UN organizations, global climate-health financing mechanisms, and non-state actors.



Thank you for attending

Please direct any questions to atach@who.int

Merci d'avoir participé

Veillez adresser vos questions à atach@who.int

Gracias por atender

Por favor dirija cualquier pregunta a atach@who.int

أشكركم على مشاركتكم

يرجى إرسال أي أسئلة إلى atach@who.int



World Health
Organization

WASH
in Health Care Facilities

unicef 
for every child

Climate resilient, sustainable and low carbon WASH in Health Care Facilities



Global efforts and local actions

ATACH Technical Meeting

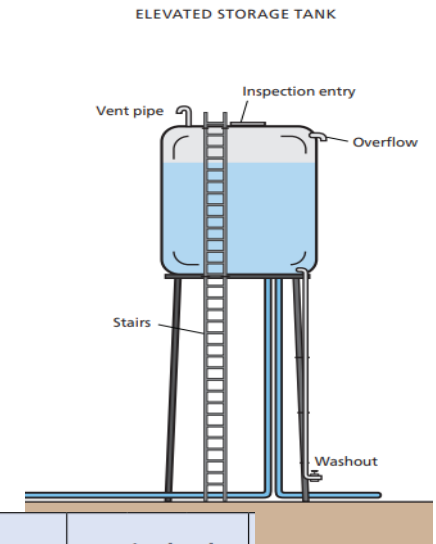
19 March 2026

Quality and safety an empty promise without the fundamentals

- **1 in 4 health care facilities, globally**, lack basic water, sanitation, hygiene, cleaning and electricity services
- Lack of basic services puts **1.8 billion people at greater risk of infection**
- **8.6 million** deaths per year in 137 LMICs are due to inadequate access to quality care.
- Maternal rates stagnant since 2015; **70% of maternal deaths** occur in sub-Saharan Africa where only **60% of health care facilities** have basic water

CRESH climate resilient, sustainable and low-carbon water interventions

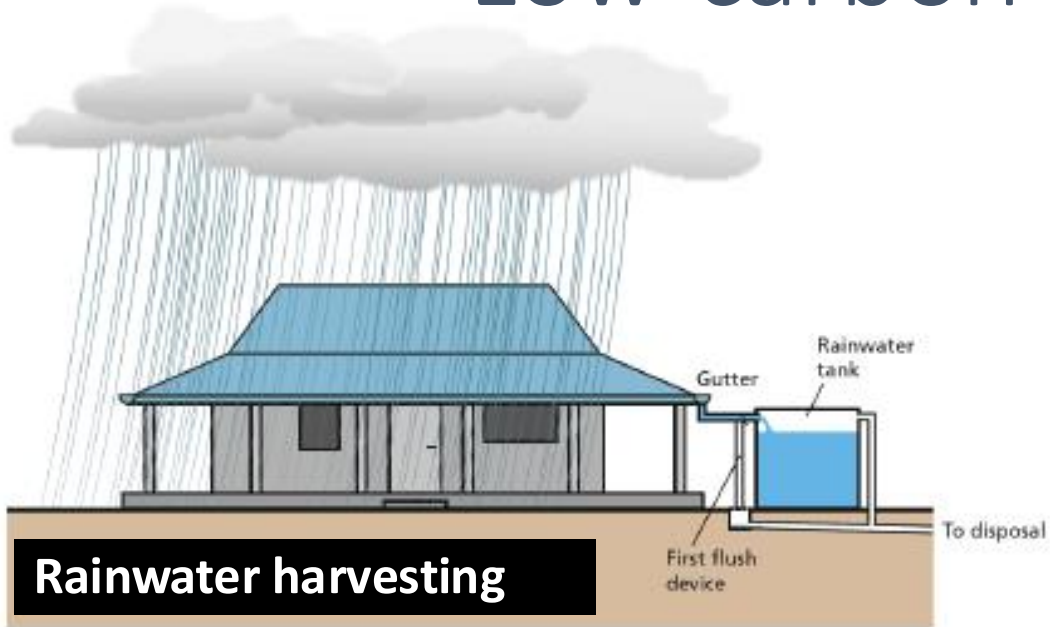
- Raise water storage tanks
- Rainwater harvesting with sufficient water storage
- Back-up water supplies
- Water reduction strategies:
 - Reuse of greywater for irrigation, flushing
 - Fix leaking taps and pipes (1 hospital can loose 5.5 million liters/year from leaks)
 - Turn off water when scrubbing hands
- Clear drainage
- Prioritize water for drinking, cleaning and other essential services



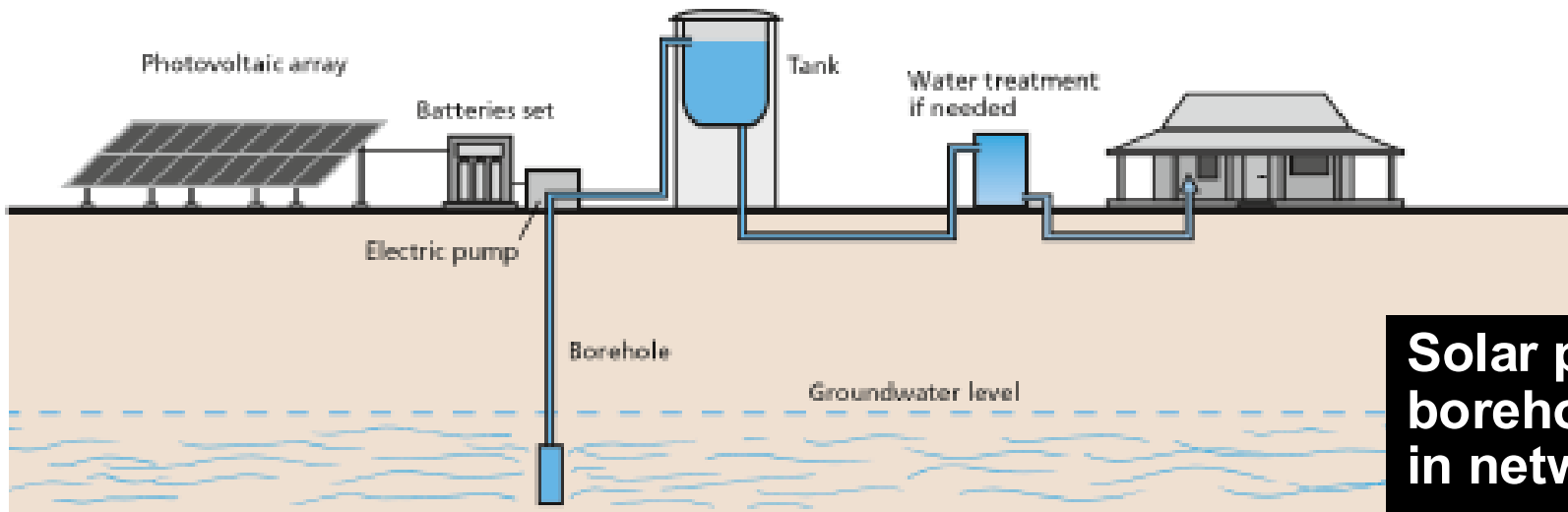
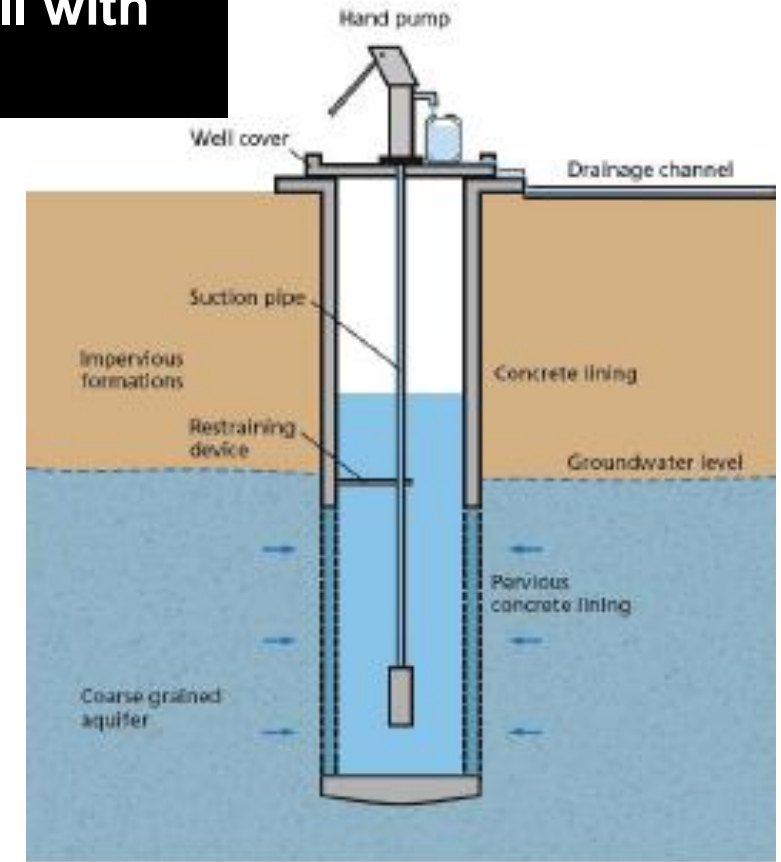
Interventions (level of achievement)	Action level		
	Low, unavailable, unable	Medium, in progress, incomplete	High, completed, achieved
Verified safety conditions and proper functioning of all elements of the water distribution system, including storage tanks, valves, pipes and connections, and water disinfection*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water pipe connections checked regularly for signs of deterioration*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developed a monitoring mechanism to verify compliance with national standards, including the operation and maintenance of water and sanitation facilities*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developed climate-resilient water safety plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water quality supply monitored regularly, including in emergencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water supply monitored regularly during emergencies to ensure adequate access throughout the duration of the event, ensuring that protocols are in place to guide rationing if required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

WASH
interventions
in CRESH
guidance

Low-carbon water supply



Protected well with handpump

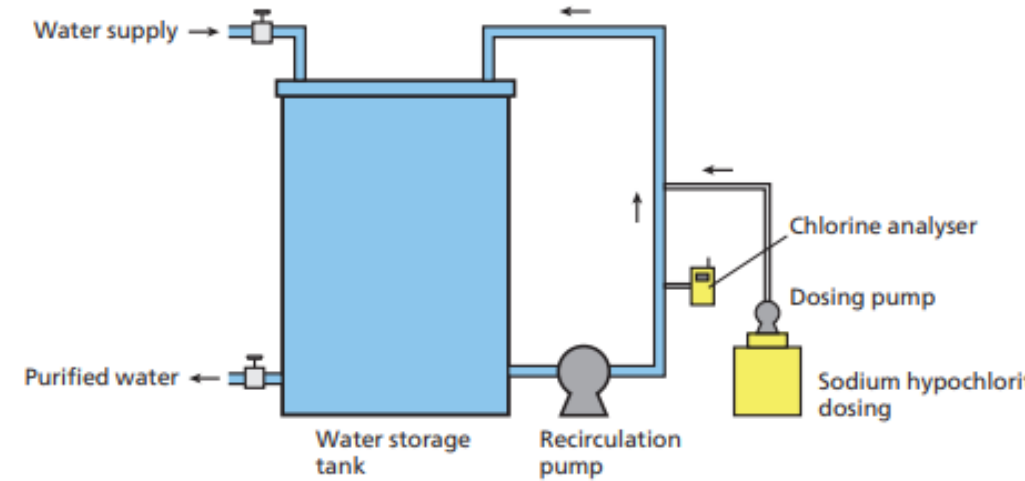


Low carbon on-site water treatment and storage

- On-site water treatment preferred to bottled water, trucked water
- Check performance against key microbiological and chemical contaminants
- Source local options and consumables
- Refer to WHO to see if product works:
<https://www.who.int/tools/international-scheme-to-evaluate-household-water-treatment-technologies/products-evaluated>



NaDCC



In-line chlorination



Membrane ultrafiltration
(no external power)



Membrane ultrafiltration
(no external power)

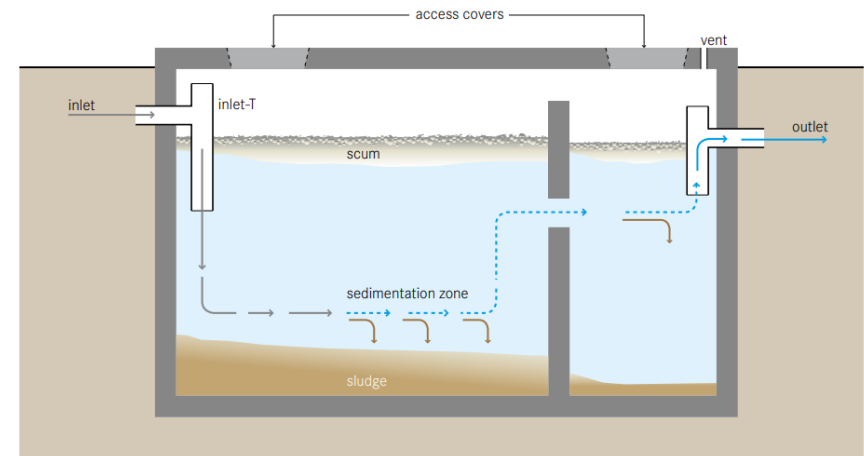
Climate resilient, sustainability and low-carbon of sanitation technology

- Locate toilets in an area of the facility which is less prone to floods, erosion, etc.
- Toilets with an open pit or soak-away should be located upgradient at least 30 m away from water sources and 1.5 m above the water table.
- Raised and/or are temporary enclosed toilets with a ramp that can be regularly emptied
- Use low or waterless toilet designs
- Where no safely managed sewerage, consider on-site treatment (e.g. septic tank, anaerobic baffle reactor) rather than trucking
- More frequent emptying of on-site sanitation during seasonal rainfall.
- All toilets should be accessible to those with limited mobility and with menstrual hygiene

Raised latrines



Septic tank



Interventions (level of achievement)	Action level			Observations
	Low, unavailable, unable	Medium, in progress, incomplete	High, completed, achieved	
Wastewater is safely managed through use of on-site treatment (such as septic tank followed by drainage pit) or sent to a functioning sewer system*	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Bringing together WASH and climate communities to support quality care for all

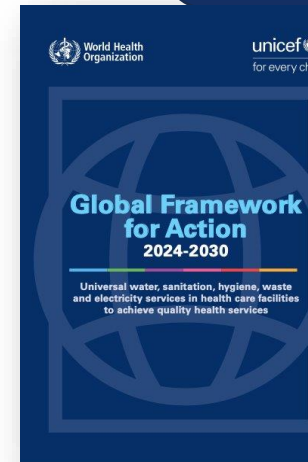
- **Country commitments**

- World Health Assembly Resolution (2019)
- UN General Assembly Resolution (2023); 2026 (forthcoming)
- Global IPC Action Plan and Monitoring Framework (2024)

- **Ways to engage**

- Join ATACH community of practice on climate resilient and sustainable health systems
- Use WHO/UNICEF WASH monitoring data to inform actions
- Join up climate, WASH and waste actors on joint training and implementation
- Download resources (training, country roadmaps, etc)
- Subscribe to newsletter and online events “meet ups”

VISION: All health care facilities have safe, sustainable, and inclusive water, sanitation, hygiene, and health care waste management and reliable electricity for quality care.



Country leaders and partners

“We will work to develop *the sustainability and climate resilience* of health care facilities as part of comprehensive approach.”

Global monitoring data on WASH and waste in HCF: www.washdata.org

Global knowledge portal on WASH and waste in HCF : www.washinhcf.org



Thank you

WHO/UNICEF knowledge portal:
www.washinhcf.org

WHO/UNICEF Joint Monitoring Programme:
www.washdata.org



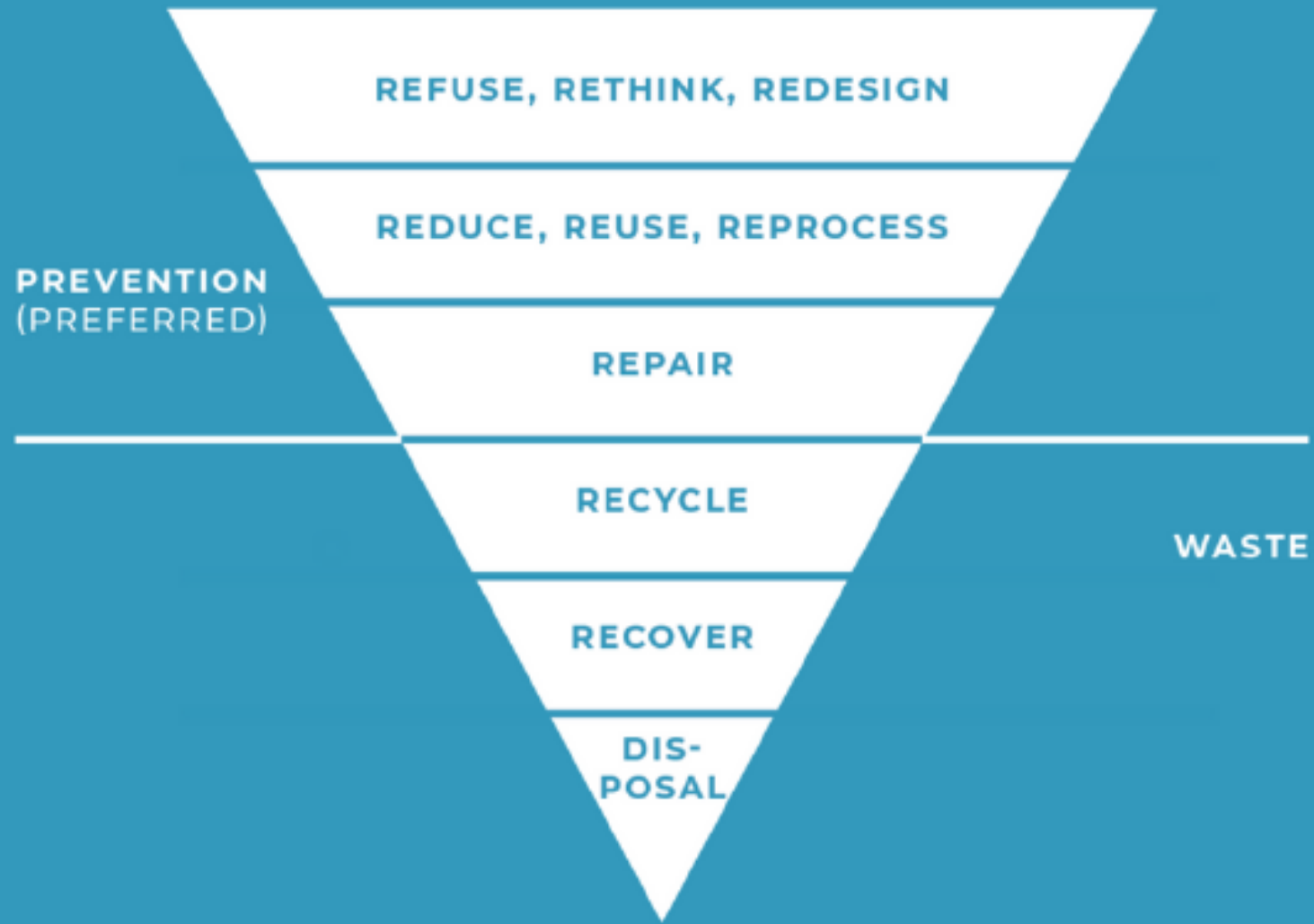
Reducing carbon emissions through healthcare waste management

Ruth Stringer, Health Care Without Harm
19th March 2026

HCWH in ATACH

- Co-organizer of the COP26 Health Programme, WHO, UNFCCC, UK (COP Presidency)
- Steering Committee Member 2023-2024
- Contributed to guidance on emissions measurement, supply chains, target setting.
- Thematic technical discussions on action planning for low-carbon health systems
- Promoting integration of adaptation and mitigation for resilient health systems
- Our Climate Impact Checkup tool -in several languages, along with an online course to guide users.

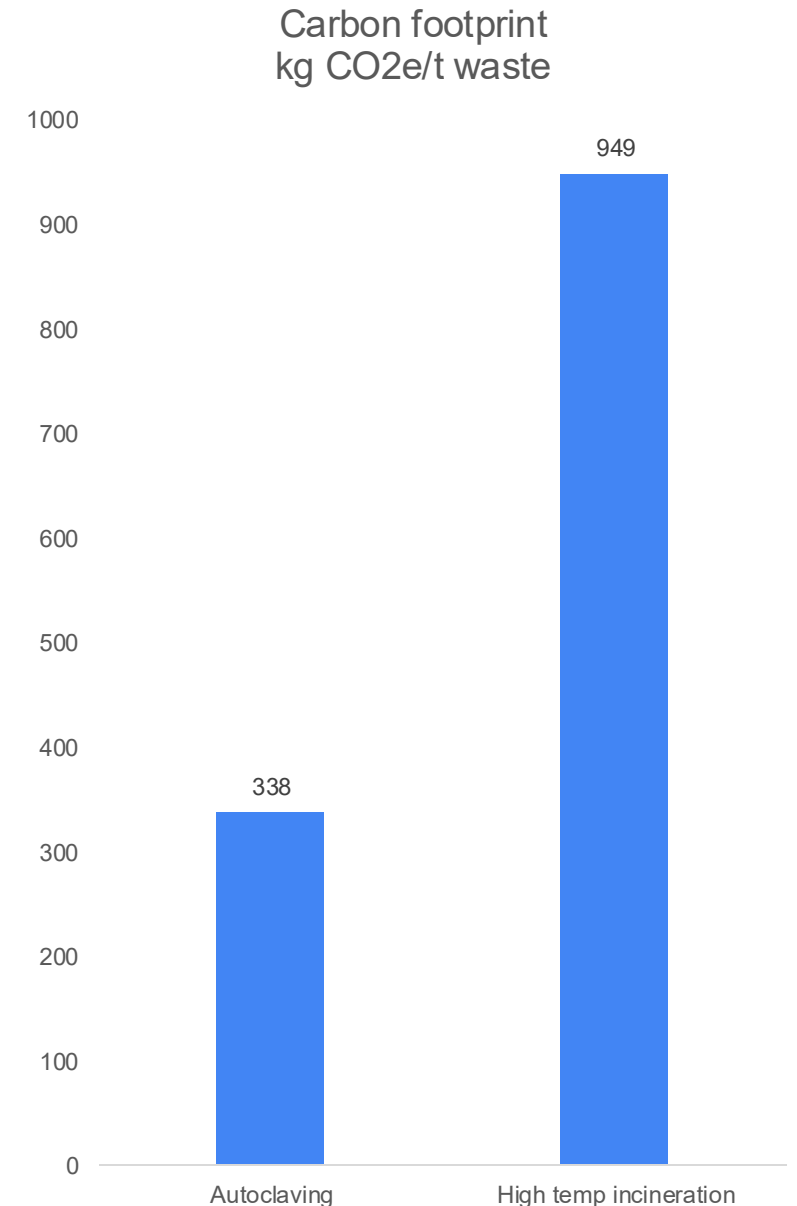
- In 2025
- Direct support to 10 countries (8 ATACH members):
 - action planning, emissions footprinting, NDCs, climate and health policies
- Indirect support to 28 countries
 - Action at national and sub-national level



The waste hierarchy

Treatment and disposal

- Incineration aims to turn all the carbon in a waste stream into CO₂
- Autoclaving has around one third of the footprint of high temperature incineration
- Waste microwaves require less energy overall and lower current than autoclaves so are better suited for remote environments
- Energy from waste is the most carbon intensive and polluting form of waste generation
- Biodigestion can treat organic waste- both food and pathological waste



Rizan *et al.* (2021)

Reduce, reuse

- Eliminate unnecessary products, and reuse the essential ones
- 15 billion medical gloves are made/year, equivalent to ~500,000 kgCO₂e.
 - Over half are unnecessary and can be eliminated
- In the USA, two thirds of the carbon footprint of surgery is linked to disposables, like drapes and gowns
- Remove little used products in surgical and other kits.
- Buy reusable textile products- reusable surgical gowns have 66% lower carbon footprint than disposables.

Reprocess, Repair, Recycle

- Sterilize or reprocess medical devices
 - In-house or at certified companies
- Repair equipment- specify generic parts, local engineers and maintenance contracts
- 85% of medical waste is similar to municipal waste, and 60% of that can be recycled
- Experience in Nepal: 30% recycled, 30% biodigested, 30% residue
- Mechanically recycled plastic has 10% of the carbon footprint of virgin plastic

Refuse, rethink, redesign

- Health facility action is essential but integrated systems are most efficient
- Up to date regulations prioritising low carbon waste management technologies and reusable products
- Reverse logistics to bring waste from remote areas to centralised treatment or hub hospitals with non-burn treatment
- Well regulated device reprocessing and medical waste recycling
- Waste management metrics in health management information systems (HMIS)

Resources

- [Climate Impact Checkup tool](#)
- [Reusable Textiles: training course and tool](#)
- [Waste trackers](#)
- [Safe Management of waste from health-care activities](#)
- [Joint Monitoring Program](#)

ATACH webinar
Waste and WASH actions for low-carbon,
sustainable and resilient health care
facilities

19 March 2026

Advancing safer, greener waste systems nationwide

Presenters:

Dr Viengkhan Pixay, Deputy Director General,
DHHP, MoH

Lkhasuren Oyuntogos, WHO Lao PDR Office



Outline

- Overview Of Health Care Waste In Lao PDR
- Needs and Opportunities
- Innovative solutions and Integrated Strategies For Sustainable Waste Management
- Conclusion and Further Strategies



Overview of HCWM



National target 100 %, progress is 45-80% in CH, PHS, DHs and HCs

Current progress

- 80% central and provincial hospitals
- 45% district hospital
- 4% of all health centers having basic waste management services with safe segregation of waste into different bins and the treatment and disposal of sharps and infectious waste (WHO MOH survey on WASH in health facilities, 2021)

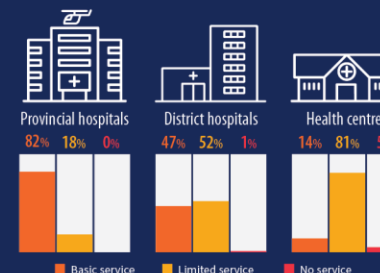
- **Main challenges:**
- Annual increase in healthcare waste volume in Lao PDR
- Facilities generate ~0.5–1.0 kg/patient/day; 15–20% is hazardous or infectious.
- Most facilities have some waste management services, but basic services remain limited.
- Gaps persist in segregation, treatment, and disposal—especially in health centres.
- Improved infrastructure and expanded basic services are essential to reduce risks.

WASTE MANAGEMENT SERVICE LEVELS*



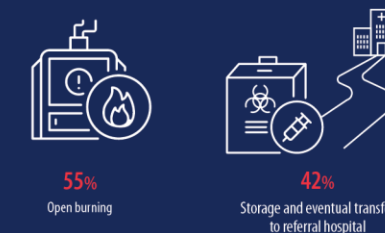
WASTE MANAGEMENT

WASTE MANAGEMENT SERVICES BY FACILITY TYPE



Health centres and district hospitals are underserved.

METHODS OF SHARPS WASTE MANAGEMENT



*WASH service levels are defined by the WHO/UNICEF Joint Monitoring Programme (see <https://apps.who.int/iris/handle/10665/275783>).

Needs and Opportunities

HCWM addressed, as part of WASH in Health facility Policy, Standards and Implementation tools

Policy and strategic directions/solutions

- Since 2014, the Ministry of Health prioritized development of WASH policies[1], strategies[2] and basic health facility environmental standards[3] and Health Care Waste Management regulations.

The National Strategy on Climate Change and HNAP:

supports climate-resilient capacity building

encourage action plans to pursue organic waste recycling through biodigestion and composting.

- In 2017, it further adopted the use of WASH FIT as the principal method to support implementation of these national WASH standards and regulations at health care facility level.
- Since July 2020, MoH has expanded the implementation of WASH FIT, combining it with a comprehensive package of interventions for “Safe, Clean and Climate Resilient Green” healthcare facilities.



Integrated approach:
Safe-Clean-Green-Climate-
Resilient Health facility Initiative

National goal:

Building Climate Resilient Health System

National strategic plan:

HNAP (Health National Adaptation Plan)

Safe-Clean-Green-Climate Resilient HCF

+ 9 components

Objective :

Safe

Clean

Green

Climate Resilient

What:

Water

Sanitation

Waste Management

Clean usable hand washing stations and showers

Cleaning and disinfection service

Environmentally sustainable energy and technologies

Infrastructure

Finance

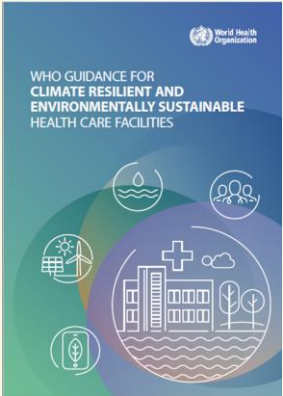
Staff training

How to :

WASH FIT



CRESHCF
(CLIMATE RESILIENT AND ENVIRONMENTALLY SUSTAINABLE HEALTH CARE FACILITIES)



Safe-Clean-Green and Climate-Resilient Health Care Facility Initiative

- The initiative implemented over 125 HCFs nationwide — covering 100% of central & provincial hospitals and ~50% of district hospitals in 2022-2025;
- Expanding nation wide in across all health centres in 2025-2026
- WHO supports: tool guide, training and monitoring
 - Upgrades WASH service (raised tanks etc)
 - HCWM supply and equipment and training
 - Provide cleaning, disinfection materials, and SOPs
 - Supported non-burn technology, such as autoclaves and
- Save the Children provides reliable energy and climate-resilient infrastructure, solar panel and waste management supplies
- Routine monitoring has been established
 - WASH in HCF assessment tool integrated with DHIS2;
 - WASH in health facility assessment is ongoing
- Peer learning via experience-sharing events: Pakson DH, Champasak showed best practice and Health Minister kindly advised to DHHP to scale up the initiative in health center
- DPs joined the events.



Safe, Clean, Green and Climate-Resilient Hospital/Health center team



1. The National guide and training program was developed

- WHO WASH FIT and CRESHCF tools used for developing the guidance and training modules
- **63 indicators for assessment and improvement, and monitoring Health centre: 29 indicators**
- HCWM indicators under green – environmentally sustainable indicators

2. National refresher training and simplified training modules for health center

3. Team building and training at health facility levels

- District hospital team: Deputy director, IPC nurse, WASH staff of provincial health department
- HC: team includes head of center, DHO trainer, WASH staff of the DHO and village head or community representative/health volunteer

4. WASH FIT Assessment and improvement planning

5. Provision of necessary basic supplies and equipment

6. Development of infrastructure in 8 provinces, 26 district hospitals and 80 health centers

- Solar panel and energy-efficient lamps

7. External (trainers) and internal monitoring checklist and monitoring plan

8. Documentation, annual review and experience sharing events

A Feasibility study conducted for the expansion of ongoing and further implementation of the low-carbon and environmentally sustainable technologies



The regulation requires all central and provincial hospitals to treat infectious and sharp waste on-site by using non-incineration technology

- Pros: stopped over 1200 incinerator uses, protected staff from infection/sharp injury
- Cons: High initial investment, staff, and training



3Rs: plastic-free/reduce use of the bottled water by ensuring water quality

- Pros: separation of plastic and recyclable items is segregated.
- Reduce plastic use, green meeting,
- Cons: no buyers in district and health centers



A feasibility study for food waste management

Pros: reduce waste, recover energy

Cons: staff cost, sustainability of daily operation

Summary of achievements and Further Strategies

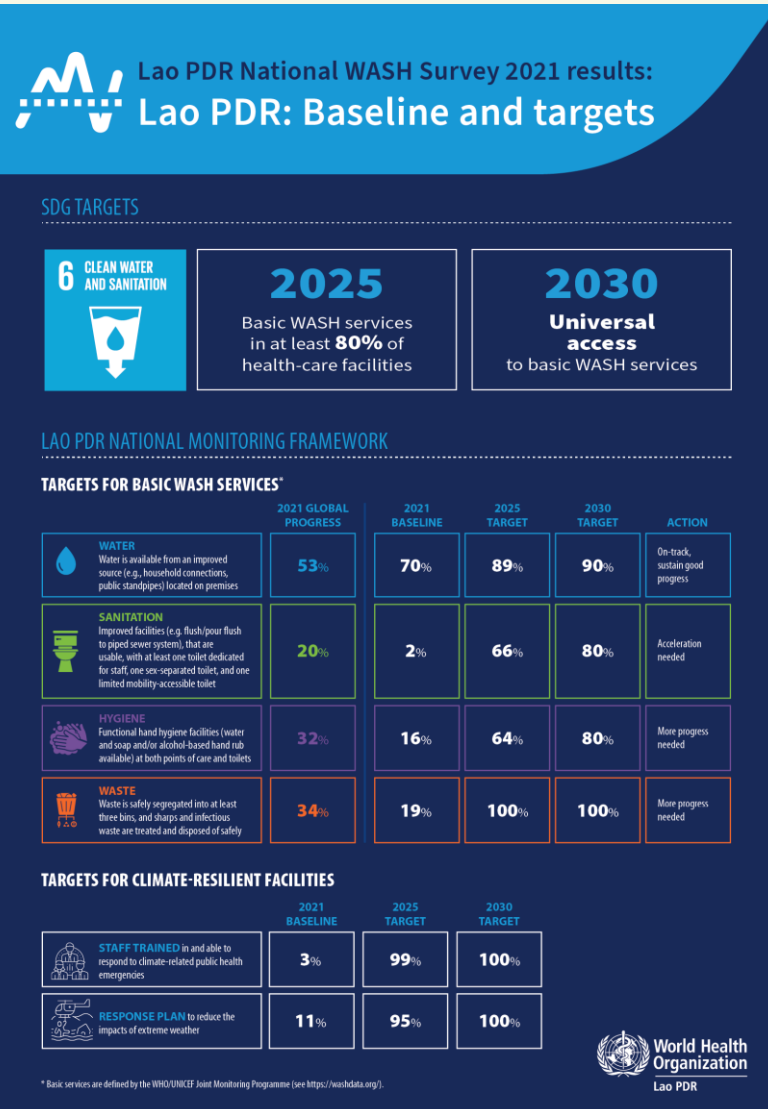
In summary, the Lao MoH has made significant progress

Practical 8 steps	2000-21	2022-23	2024-25
1. Situation analysis and assessment: Baseline assessment and GLASS survey	1	3	3
2. National roadmap and targets: included in the HNAP 2025-2030 and NDC 2.0, NDC 3.0	1	3	3
3. Standard: National ENH standards, WASH Facility design, HCWM Regulation, WASH FIT	1	3	3
4. Improve infrastructure and maintenance: 70% DHs, scale up in all health centers in 2025	2	2	3
5. Monitor and review data: HMIS, Safe Clean Green CR HCF indicators (26)	2	2	3
6. Develop health workforce: tool guide, training modules for a Safe Clean, Green and CR Health center, upscaling	1	2	3
7. Community engagement: Safe Clean Green CR HCF team	2	2	2
8. Operational research:	2	2	2

WHA Resolution approved 8 practical steps for safe WASH in HCFs

Label: **Red** - starting (1), **Orange** - Ongoing progress (2), **Green** - good progress/scaled up (3)

Strategic directions guide the next steps



1. National regulation, ENH standards and WASH FIT and CRESHCF tool:

- In collaboration with other DPs, provide the support to MOH DHHP in updating policy regulatory documents, costing analysis, O&M guide/generic plans

2. Expansion of Safe Clean Green CR HCF: target 20 HCFs every year

- Staff capacity building: ToTs, subnational and health care facility level teams, WASH IPC teams,
- Provision of autoclave, supply and equipment and on-the-job training
- Establish pre-service training to prepare autoclave operators

3. Promote 3Rs policy and implementation (zero-carbon/green hospital):

- **Waste Reduction** – SMART procurement policy and promoting degradable/non-plastic materials
- **Recycling policy and promoting best practice**
- **Feasibility study for recycling and support circular economy**
- **Establish sustainable fund for safe waste management of health care facility**

4. Assess co-health benefit from mitigation actions for further CC Mitigation Planning

5. M&E: Finalize M&E framework for health care waste management and set up system to assess progress annually through DHIS2



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MINISTRY OF HEALTH-ETHIOPIA

የዚያ ጤና ለሃገር ብልጽግና!
HEALTHIER CITIZENS FOR PROSPEROUS NATION!



**World Health
Organization**

Ethiopia

WHO ATACH webinar on WASH and waste in health care facilities Ethiopia's Experience in Low-Carbon Health Care Waste Management

Misganaw Tewachew, Climate Change and Health Focal, MOH Ethiopia

Beza Kibret, WASH in HCFs Focal, MOH, Ethiopia

Waltaji Terfa KUTANE, Health and Environment Focal Person, WHO Ethiopia

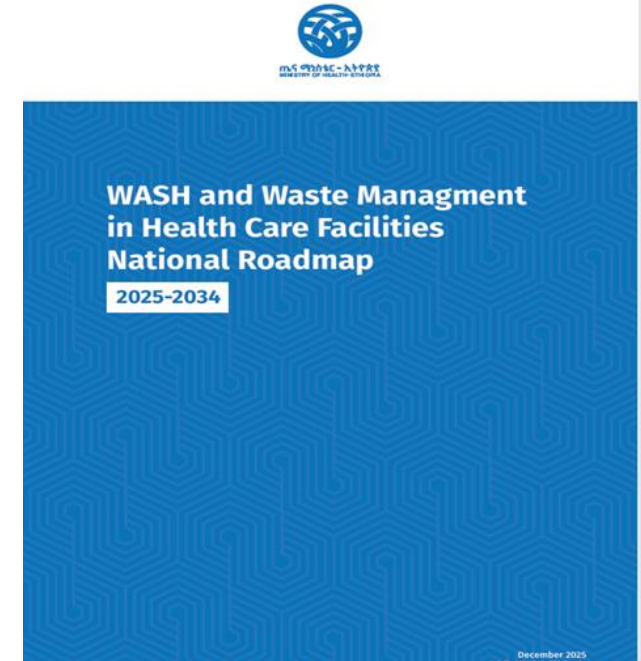
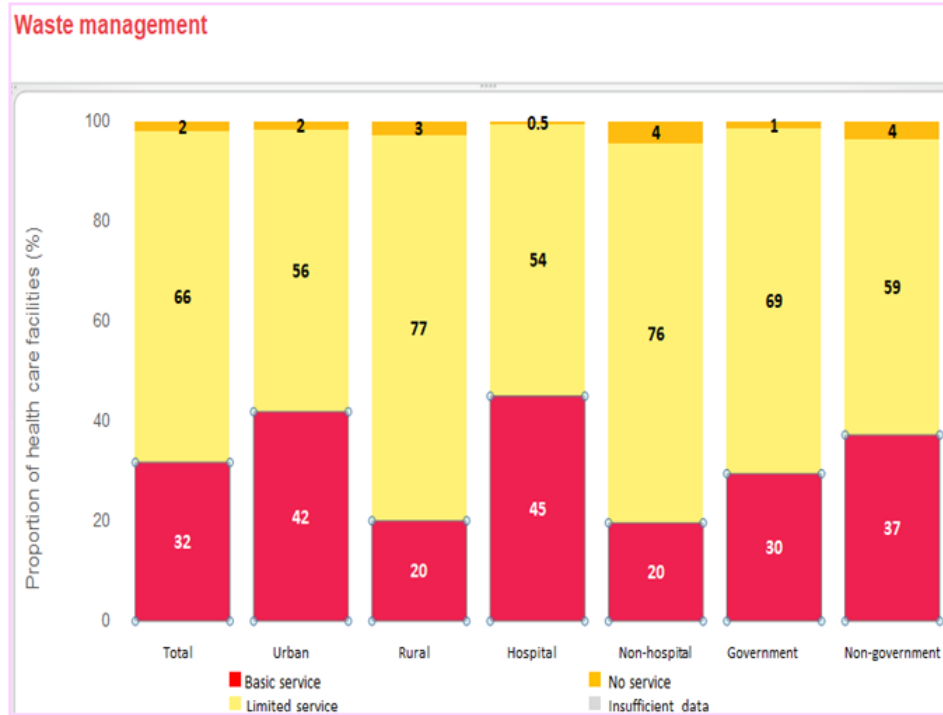
19 March 2026

Addis Ababa

Outlines

- Introduction
 - The National WASH and waste management in healthcare facilities costed roadmap 2025–2034
- Ethiopia health care waste management manual (Second Edition, 2021)
- The World Bank–funded health facility projects in Ethiopia
- Key challenges
- Actions required
- Strategic direction

Introduction



WASH in health care facilities (JMP_2024 Report)

- The government of Ethiopia is diligently addressing this gap including the development and implementation of the National WASH and Waste Management in Health Care Facilities Roadmap 2025–2034 explicitly targets reducing the carbon footprint of Ethiopia’s health facilities.
 - It promotes climate-resilient infrastructure, energy efficiency and renewable energy integration alongside safer waste treatment.
 - Shifting toward non-burn technologies and enforcing emission controls on incinerators, the roadmap aims to cut greenhouse gas emissions while safeguarding public health.

Introduction cont'd...

- Ethiopia's National WASH and Waste Management in Health Care Facilities Costed Roadmap 2025–2034

Strategic Objectives

1. Universal WASH coverage in healthcare facilities

- Ensure all healthcare facilities have reliable and inclusive water supply, sanitation, hygiene services and **waste management systems** by 2034.

2. Safe and sustainable health care waste management

- Introduce standardized practices for reduction, segregation, collection, treatment and disposal across all facilities.
- **Promote non-burn technologies** (autoclaves, chemical disinfection) while regulating incinerator use.

3. Climate resilient and green infrastructure

- **Retrofit facilities with energy-efficient, water-saving and low-emission technologies including WASH facilities, health infrastructure and supply chain**
- Integrate renewable energy (solar, biogas) into healthcare facility operations

4. Strengthened policy, regulation and governance

- Establish clear institutional mandates between MOH, EPA and regional authorities.
- **Develop independent regulatory oversight for emissions and waste disposal.**

Introduction cont'd...

5. Capacity building and workforce development

- Train health workers, waste handlers and technicians in WASH and waste management.
- Create certification systems for incinerator operators and waste managers.

6. Monitoring, evaluation and accountability

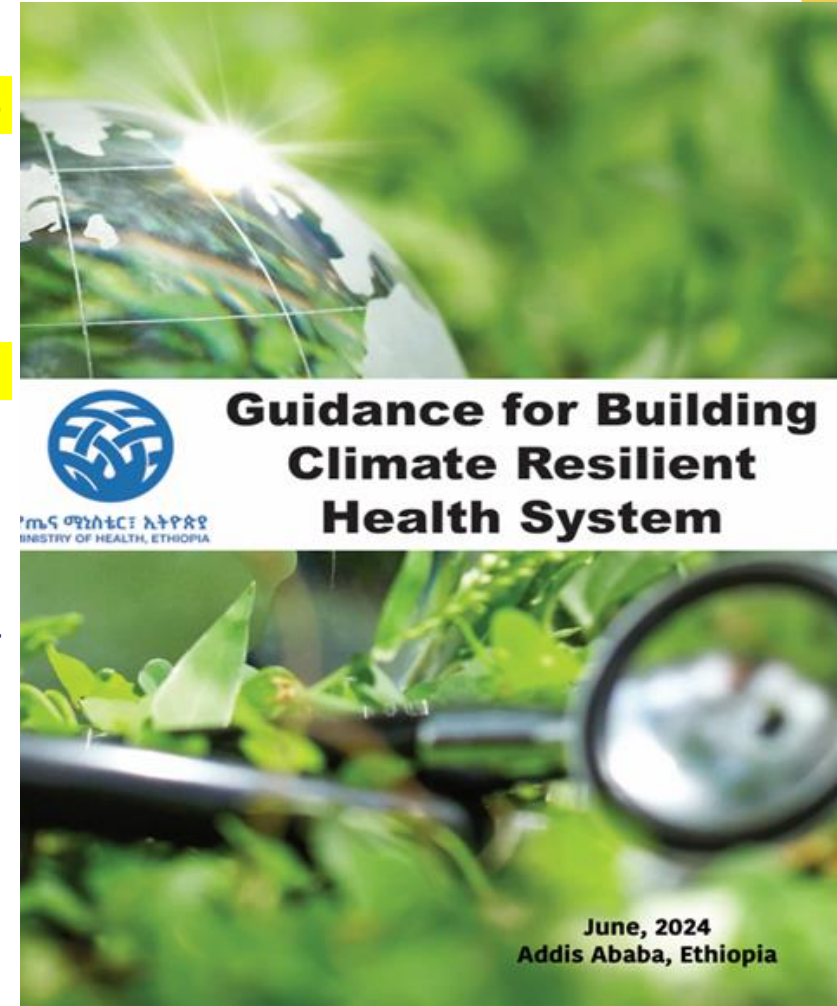
- Implement digital systems to track WASH service levels, waste volumes and emissions using MRV systems
- Regular audits and public reporting to ensure transparency.

7. Financing and partnerships

- Mobilize from World Bank, climate funds and private sector investment for sustainable WASH and waste systems.
- Encourage cost-sharing models and PPPs for infrastructure upgrades.

8. Community engagement and risk communication

- Raise awareness on safe waste handling and environmental health.
- Involve communities in monitoring facility performance and emissions.



These objectives position Ethiopia to close the WASH gap in health facilities, modernize waste treatment, and align with WHO and World Bank EHS guidelines. The roadmap balances immediate biosafety needs (incinerators for infectious waste) with long-term sustainability (non-burn technologies and climate-resilient infrastructure)



Ethiopia Health Care Waste Management Manual (Second Edition, 2021),

■ Ethiopia MoH Guidelines on Health Care Waste Management (2021)

Area	Key Provisions	Implications for Incinerators
Waste Segregation	Clear color-coded system for infectious, sharps, pharmaceutical, chemical, and general waste	Only infectious/pathological waste should be incinerated; plastics, heavy metals, and pressurized containers are prohibited
Treatment Options	Autoclaving, chemical disinfection, microwaving, and incineration	Non-burn technologies are prioritized where feasible; incineration is allowed but regulated
Incinerator Standards	Must include dual-chamber design, operate at $\geq 850^{\circ}\text{C}$, and have emission control systems	Designed to minimize dioxins, furans, and particulate matter
Environmental Safeguards	Facilities must comply with Ethiopian EPA standards and WHO/World Bank EHS guidelines	Regular monitoring of emissions and ash disposal required
Capacity Building	Training for health workers on waste segregation, handling, and safe operation of treatment technologies	Reduces misuse of incinerators and ensures sustainability

🌐 How Guidelines Address Challenges

- **Air Pollution Concerns:** By requiring dual-chamber incinerators and prohibiting burning of plastics, the manual reduces toxic emissions.
- **Operational Sustainability:** Emphasizes training and maintenance, recognizing that poorly operated incinerators are a major risk.
- **Greening Facilities:** Encourages adoption of autoclaves and other non-burn technologies, aligning with climate-resilient health care.
- **Integration with Global Standards:** Harmonized with WHO and World Bank safeguards, ensuring Ethiopia's projects meet international benchmarks.

⚖️ Trade-Offs in Ethiopia's Context

- **Pros of Incinerators:** Effective for infectious waste, especially in rural or high-volume facilities.
- **Cons:** High cost, technical maintenance, and risk of emissions if standards are not enforced.
- **Policy Direction:** Ethiopia's MoH is pushing toward greener alternatives but still permits incinerators under strict regulation.

🔗 Implications for Health Facility Greening

- Ethiopia's MoH guidelines provide a **balanced framework**: incinerators are not banned, but their use is tightly controlled and alternatives are encouraged.
- For World Bank-funded projects, compliance with these national guidelines plus international EHS standards is mandatory.
- This creates an opportunity for **advocacy toward scaling non-burn technologies**, especially in urban hospitals where resources are available.

- Ethiopia's Ministry of Health has issued the Health Care Waste Management Manual which directly addresses challenges of greening health facilities and managing incinerators. It emphasizes waste segregation, safe treatment and strict emission controls, while encouraging non-burn alternatives where feasible.



The World Bank–funded health facility projects in Ethiopia

- World Bank–funded health facility projects in Ethiopia include the Roha Medical Campus and the National Reference Laboratory, both requiring strict Environmental and Social Impact Assessments (ESIAs). These projects mandate emission controls, waste segregation, and compliance with World Bank Group Environmental, Health, and Safety (EHS) Guidelines to ensure incinerators meet international air quality standards.

Examples of World Bank–Supported Health Facility Projects in Ethiopia

Project	Location	Focus	Safeguards & Environmental Standards
Roha Medical Campus (RMC)	Addis Ababa	\$130M multi-specialty hospital	ESIA approved by Ethiopian EPA; IFC-EDGE “green hospital” accreditation; requires waste segregation, safe disposal systems, and compliance with EHS guidelines afdb.org
BSL-3 National Reference Laboratory (EPI)	Addis Ababa	Advanced pathogen diagnostics	Environmental and Social Management Plan (ESMP) prepared with World Bank support; includes hazardous waste treatment and incineration safeguards The World Bank
Africa CDC Regional Investment Program (P167916)	Ethiopia (EPI)	Multi-purpose building (bio-bank, warehouse, equipment maintenance)	ESMP requires safe waste handling, emissions monitoring, and alignment with World Bank EHS guidelines The World Bank

🏛️ World Bank Safeguards for Incinerators

According to the **World Bank Group Environmental, Health, and Safety Guidelines for Health Care Facilities (2025 draft)**:

- Emission Controls:** Incinerators must include secondary combustion chambers and pollution control devices to minimize dioxins, furans, and particulate matter.
- Waste Segregation:** Only infectious and pathological waste should be incinerated; plastics, heavy metals, and pressurized containers are prohibited.
- Monitoring:** Facilities must track emissions and report compliance with WHO and World Bank standards.
- Alternatives Encouraged:** Autoclaves, microwaving, and chemical disinfection are recommended where feasible to reduce environmental impact ifc.org.

🔗 Implications for Ethiopia

- Green Health Facilities:** Ethiopia’s projects show a shift toward climate-resilient infrastructure, but incinerators remain part of biosafety protocols.
- Balance Needed:** While incinerators are effective for infectious waste, Ethiopia must invest in **non-burn technologies** to align with global “greening” principles.
- Regulatory Reform:** Stronger enforcement of emission standards and independent monitoring will be critical to ensure incinerators do not undermine Ethiopia’s climate-health agenda.

Key Challenges

1. Air pollution and emissions

- Many existing incinerators are single-chamber, low-temperature units that release dioxins, furans and particulates.
- Weak enforcement of emission standards by regulatory authorities.

2. Operational and maintenance gaps

- Facilities often lack trained technicians to operate and maintain incinerators properly.
- Spare parts and fuel supply chains are unreliable, leading to unsafe operation.

3. Financial constraints

- High upfront and recurrent costs for modern dual-chamber incinerators with emission controls.
- Limited budget allocation for non-burn alternatives (autoclaves, microwaves).

4. Regulatory and institutional Weakness

- Fragmented responsibilities between MOH, EPA and sub-national levels.
- Lack of independent monitoring and enforcement mechanisms.

5. Waste segregation failures

- Poor segregation at source means plastics, heavy metals, and pharmaceuticals often end up in incinerators.
- Increases toxic emissions and ash contamination.

6. Community and environmental concerns

- Health facilities near residential areas face community resistance due to smoke and odor.
- Ash disposal sites are often unmanaged, creating secondary contamination risks.

Actions Required

1. Strengthen regulatory framework

- Establish an independent water and waste regulatory authority with clear enforcement powers.
- Align national standards with WHO and World Bank EHS guidelines.

2. Invest in non-burn technologies

- Scale up autoclaves, microwaving and chemical disinfection in urban hospitals.
- Reserve incineration only for pathological waste where alternatives are not feasible.

3. Capacity building

- Train health workers and technicians in waste segregation, safe handling, and operation of treatment technologies.
- Develop certification programs for incinerator operators.

4. Infrastructure upgrades

- Replace outdated single-chamber incinerators with dual-chamber, high-temperature units fitted with emission controls.
- Ensure proper ash disposal systems.

5. Financing and sustainability

- Mobilize climate financing and World Bank green health facility funds for sustainable waste management.
- Introduce cost-sharing models with private sector hospitals.

6. Community engagement

- Conduct awareness campaigns on safe waste management and environmental health.
- Involve local communities in monitoring emissions and facility performance.

Strategic Direction

Ethiopia's path forward for low carbon waste management is hybrid:

1. **Short-term:** Upgrade incinerators where urgently needed for biosafety and pollution control devices.
2. **Medium-term:** Scale non-burn technologies in urban and referral hospitals.
3. **Long-term:** Institutionalize independent regulation, monitoring and financing mechanisms to fully align with green health care principles.

THANK YOU

Advancing Climate-Resilient Health Systems through Zero-Waste and Non-Burn Health-Care Waste Management: Experience from Nepal



19th Mar, 2026

Sudan Raj Panthi, PhD

Outline of Presentation

- **Background (Problem)**
- **Chronological Progress on HCWM (Solution)**
- **Strategic Approach (SOP Framework)**
- **Case Studies and Lesson Learnt**
 - **Success Stories**
 - **Challenges**
 - **Conclusion and recommendations**

Problems

Different Scenarios (was and exists)



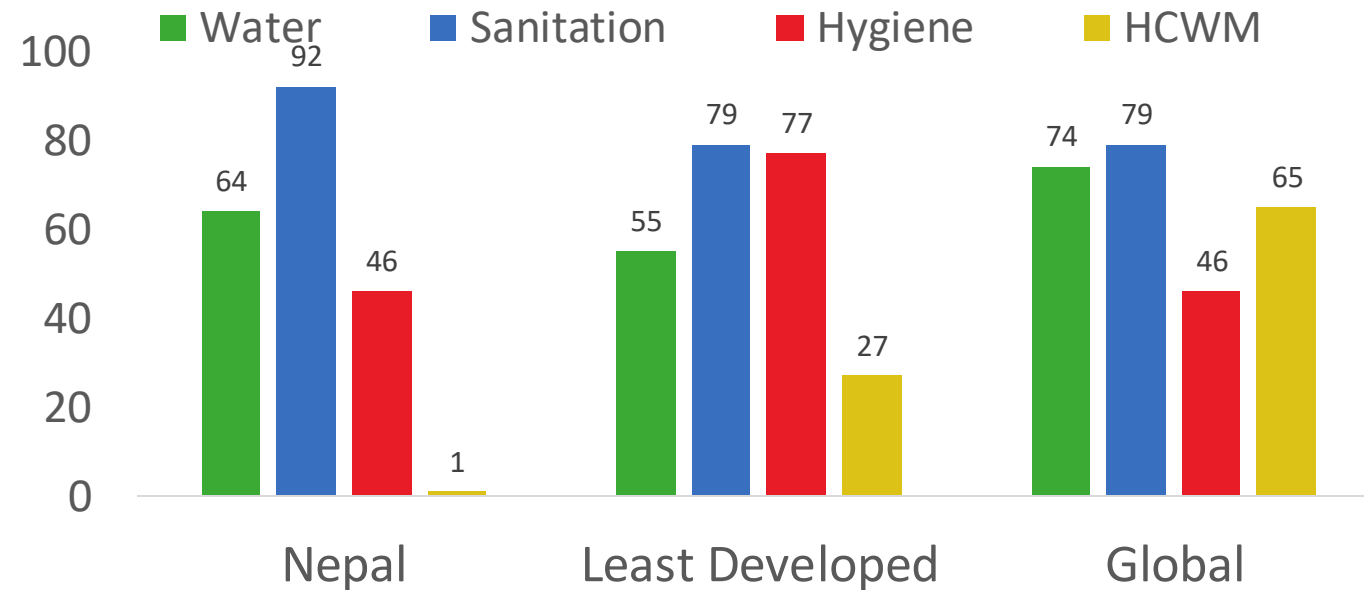








Basic and Limited WASH Services in HCFs (Global (JMP) Baseline Report 2019)





WHO/UNICEF JMP 2019

Parameters	Per cent (2016)
Improved water	93
Improved water in premise	64
Improved sanitation	92
Improved sanitation that is usable	92
Hospitals has sewer connections	18
HW materials at point of care	46
Basic waste management	1
Limited waste management	62
Waste segregated	5
Waste treated	21

Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely



Case Study #1

Handicrafts from plastic waste – Burn patients that require physiotherapy are trained to make handicrafts from various types of plastics that are collected from the hospital.



Safe Injection Practice – Nurses have been trained on WHO's safe injection criteria focusing on safe handling of sharps and on safe disposal.



Impact if expanded

The impact of this project can be seen in several aspects: experiential accounts show that hospital infection; prevention of needle stick injuries among waste handlers, prevention of reuse of syringes, cleaner rooms and surroundings, reduced waste that goes to landfilling, income for the hospital from the sale of recyclable waste, and, as a whole, the carbon footprint for hospital operations is reduced. There are plans to expand this health-care waste management approach to other hospitals.

Managing Health care waste – the Bir hospital experience

Year 2009/2011

Health-care activities such as immunization, diagnostic tests, medical treatment, and laboratory examinations protect and restore health and save lives. On the other hand, unsafe management and improper disposal of the wastes and by-products of these activities pose a number of life-threatening risks. Often due to inefficient systems, these infectious and hazardous wastes are mixed with general waste and thrown in landfill sites, thereby converting them into hazardous places. To address the solid waste problems in Bir hospital, a system was designed using a zero waste programme so that the

waste disposed into Kathmandu's municipal waste stream is negligible.

The health care waste management system at Bir hospital is based on three pillars that support each other—**waste management, injection safety, and mercury elimination**. The following are its specific components:

Ease of waste segregation – for convenience a trolley fitted with various colour-coded bins for risk and non-risk waste are used, accompanying visual messages are also placed in all wards to promote proper use.





Ease for transportation of waste – trolleys made from recycled materials designed to protect the waste handler are used to transport waste.

Treatment and storage of waste – Segregated waste is stored and sold from this place. Infectious waste is stored separately, treated and disposed.




Biological treatment of infected cotton and gauze – these are autoclaved and with this as the base material the hospital is testing vermicomposting i.e. composting of these materials with the use of a particular type of earthworms.



Biological treatment of food waste – a bio-digester plant where food waste is fed produces biogas for cooking and slurry for fertilizer. It generates about 6 cubic meters of biogas per day.

Mercury collection house – Discarded mercury-containing equipment and supplies (eg thermometers and sphygmomanometers) are collected, sealed and stored in a designated collection house. Until disposal options are developed, the safe storage of mercury is the best option for avoiding mercury spills and exposure.



A photograph of a recycling facility. In the foreground, several large, light-colored bags of waste are visible. In the background, a person is working at a table, and the facility has a corrugated metal roof and various equipment. The text is overlaid on the image.

79% of total waste is recycled
of which 29% is biodegradable
generating revenues of
30,000 Rupees/month



**World Health
Organization**

Regional Office for South-East Asia

2011 Recommendations to SEARO - progress



Regional workshop on healthcare waste management A Report

Yak and Yeti Hotel, Kathmandu, Nepal
21-24 November 2016

2nd Regional Workshop on HCWM, 21-24 Nov 2016, Kathmandu



Recommendations	Status
Provide technical support in developing policy, guidelines and piloting innovative, sustainable and appropriate HCWM approaches.	Green
Support research and assessment at local level on mercury poisoning to support evidence-based decision-making.	Red
Technical evaluation of claimed best practices in different countries.	Yellow
Local capacity-building to adopt appropriate HCWM, including training of key country stakeholders in global best practices.	Green
Recommendations	Status
Identify appropriate technologies for HCWM for developing and resource-poor countries.	Green
Organize workshops and invite experts from relevant organizations to be resource persons.	Green
Technical and financial support for the development of policy/guidelines for HCWM, including mercury control and implementation programme.	Green
Establish a Regional network on HCWM and facilitate sharing of best practices.	Yellow



World Health
Organization

Regional Office for South-East Asia

Central Treatment Facility in Pokhara, Nepalgunj and many other places (Non-burn Technology)



Development and updates of Health Care Waste Management Guidelines in Nepal

This document
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Mr. Salil Devk
Mr. Sharad Ar
© Nepal Health
Assisted by:
Mr. Chandra Bh
Financial assista

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सम्बन्धी

National Healthcare Waste Management Standards and Operating Procedures - 2020

This document is developed based on the "Health Care Waste Management Guideline 2071 (2014)", "The Public Health Service Act, 2075 (2018)" and "National Health Policy, 2076 (2019)"

Government of Nepal
Ministry of Health and Population 2020

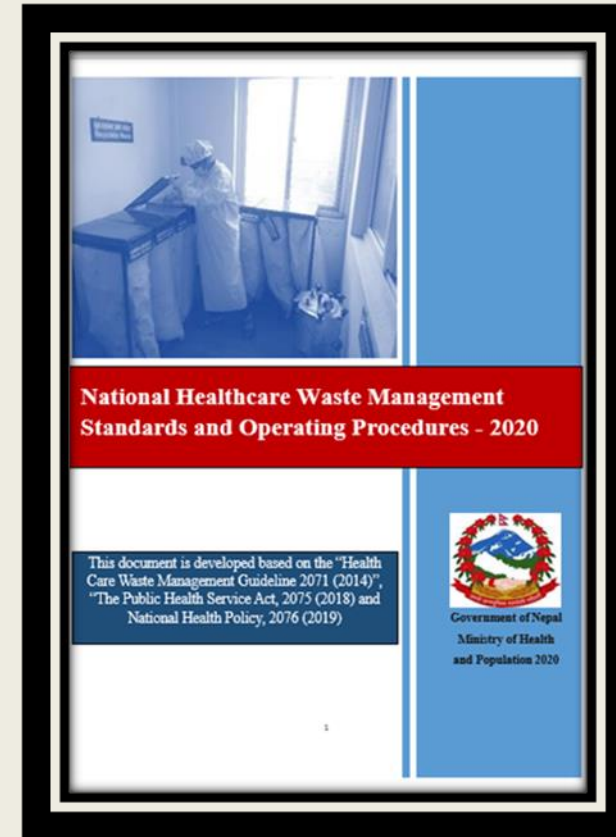
Government of Nepal
MINISTRY OF HEALTH AND POPULATION



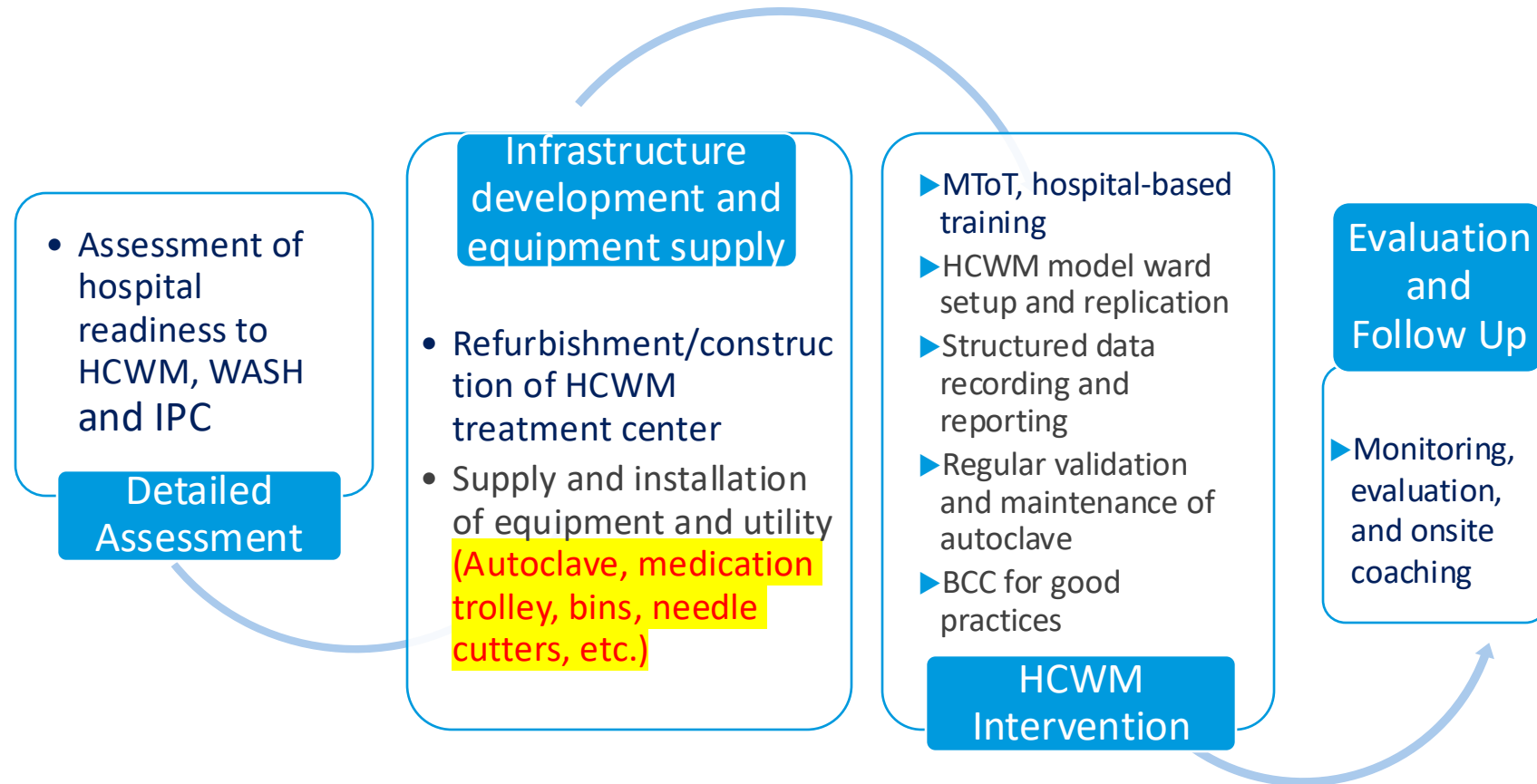
References: WHO and UNEP HCWM Guidelines

Updated HCWM Guidelines

Global – National



Approaches: Step-wise plan (SOP Framework)



Waste Composition Data:

Waste Type	Percentage
Paper	15%
Plastic	15%
Glass	10%
Metal	10%
Textiles	10%
Kitchen waste	10%
Other waste	45%



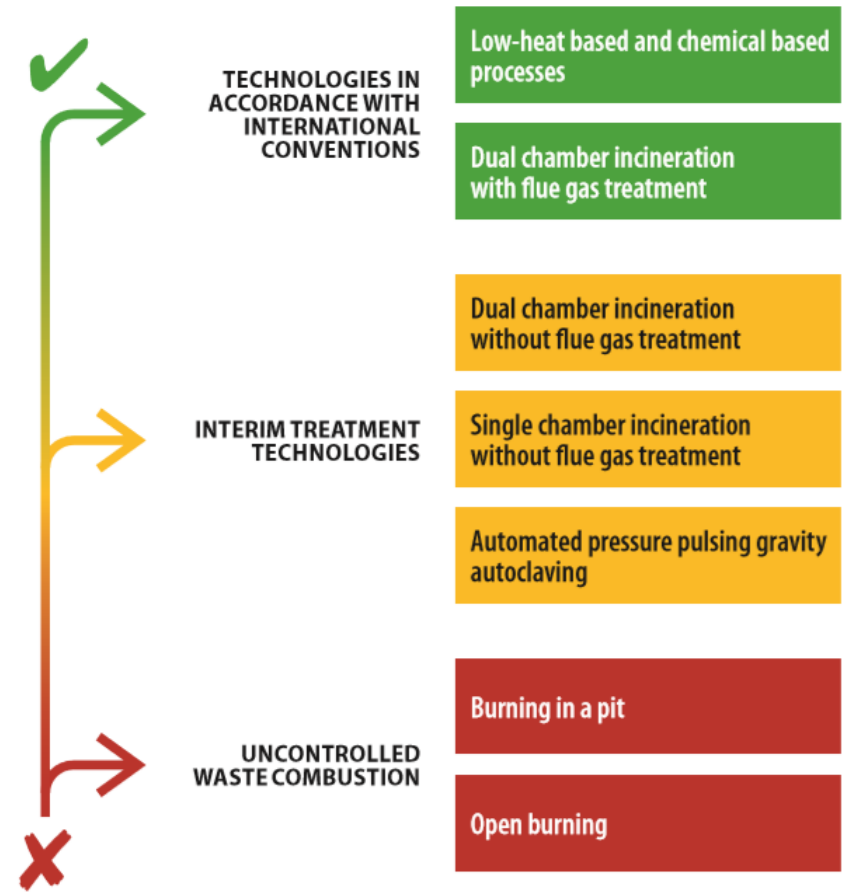
Table 1. Comparison of infectious and sharp waste treatment technologies which comply with the Stockholm and Basel Conventions

Type of technology	Capacity (kg/h)	Environmental impact	Capital costs	Operating costs
Vacuum autoclave	5–3000	●	●	●
Autoclave with integrated shredding	5–3000	●	●●	●●
Batch wise microwave	1–210	●	●	●●
Continuous microwave	100–600	●	●●	●●
Frictional heat treatment	10–500	●	●●	●●
Sodium hypochlorite treatment	600–3000	●●	●●●	●●
Ozone treatment	45–1000	●	●●●	●
Incineration including flue gas treatment	50–3000+	●●	●●●●	●●●●

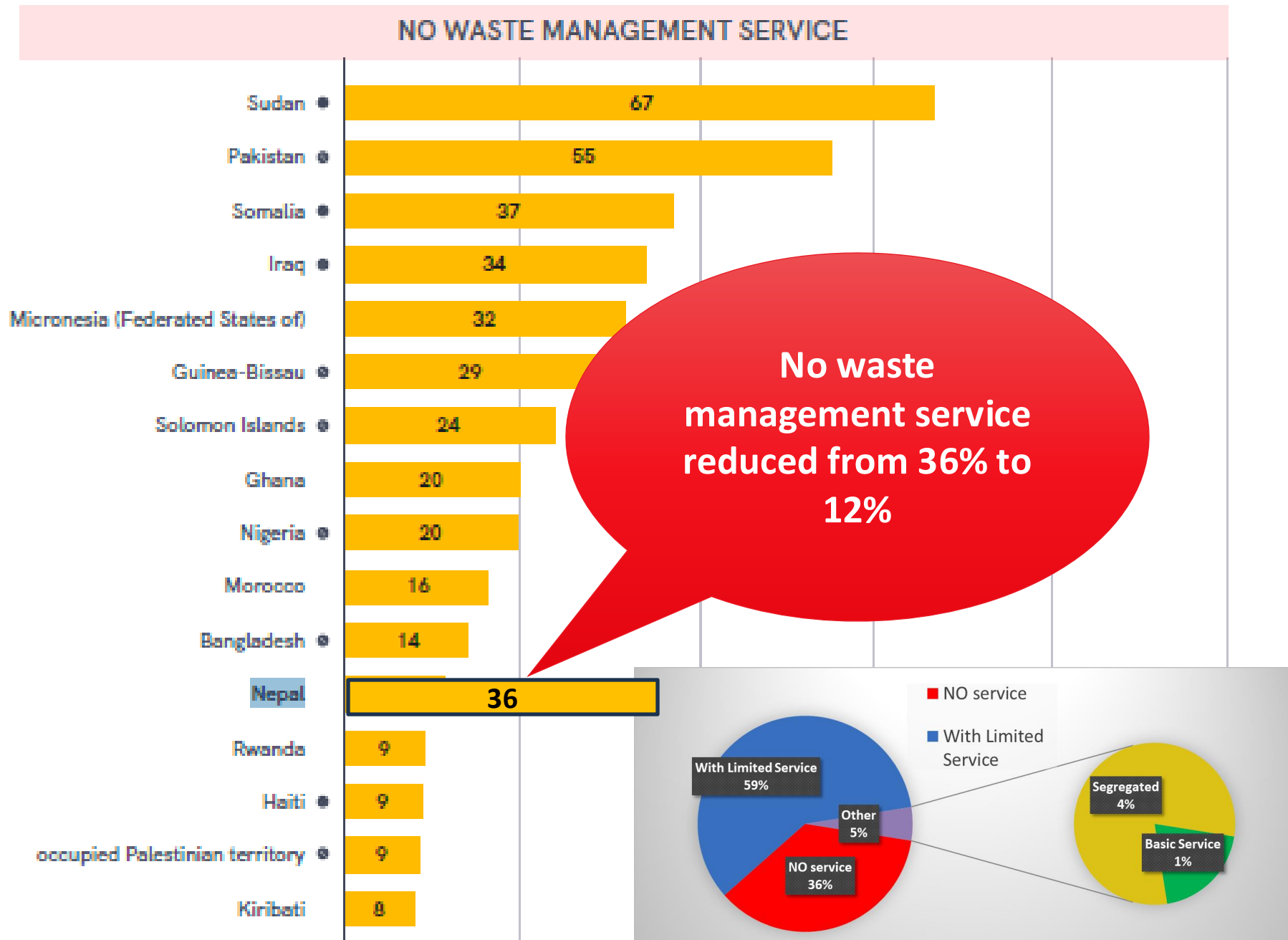
Table 2. Comparison of interim waste treatment technologies used in low-resource settings

Type of technology	Capacity (kg/h)	Environmental impact	Capital costs	Operating costs
Automated pressure pulsing autoclave	5–50	●	●	●
Dual chamber incinerator	5–500	●●	●●	●●
Single chamber incinerator	5–500	●●●	●	●
Open burning	N/A	●●●●	N/A	N/A

Figure 1. Treatment technologies ladder

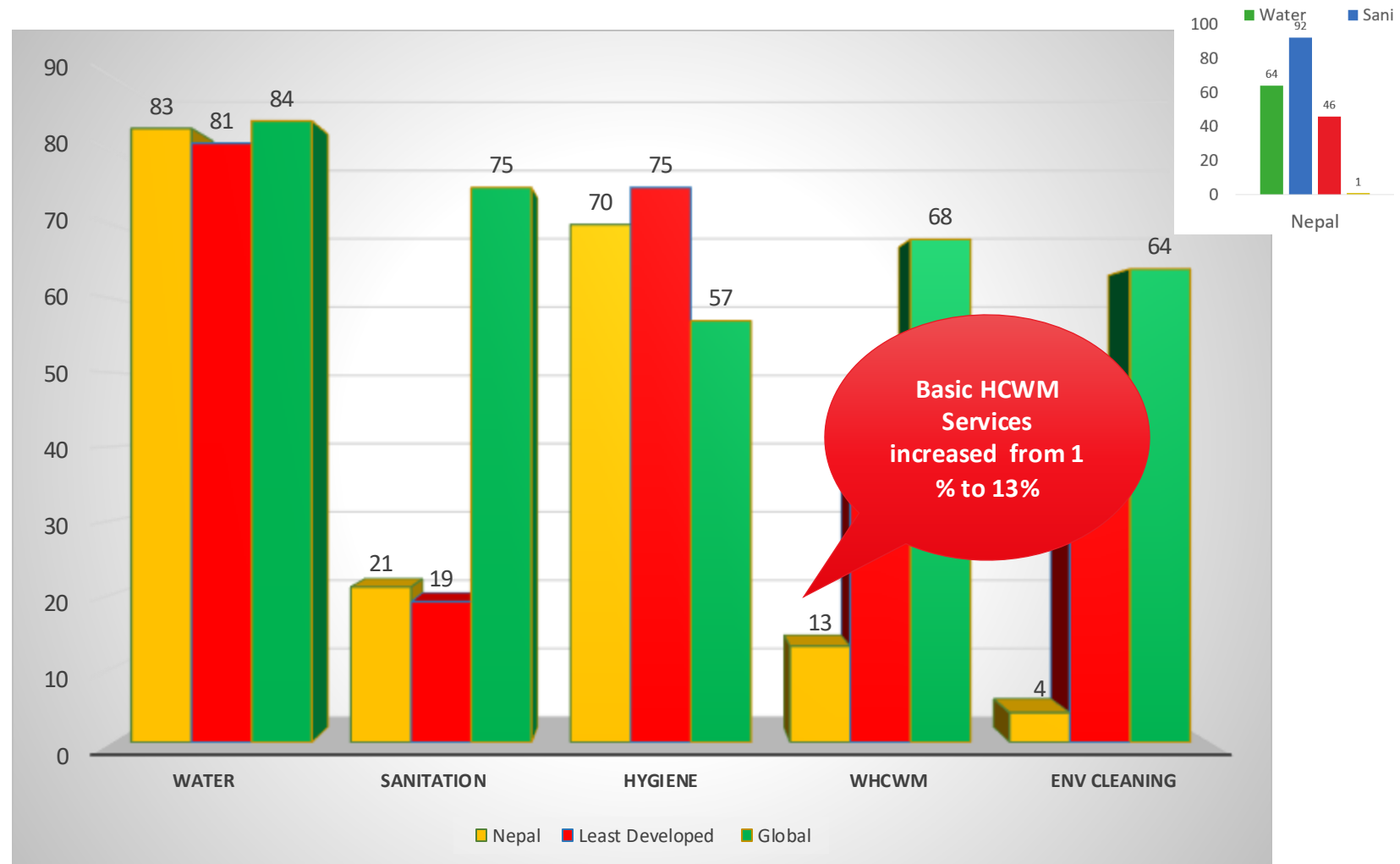


In 18 countries, at least 1 in 20 health care facilities had no waste management service in 2023



Basic and Limited WASH Services in HCFs 2023

Data Update WHO/ UNICEF 2024



Case Studies / Published



HEALTH CARE WASTE MANAGEMENT TOWARDS THE CIRCULAR ECONOMY A CASE STUDY AT TRIBHUVAN UNIVERSITY TEACHING HOSPITAL IN NEPAL

November 2021



This case study reports on the development of a healthcare waste management (HCWM) system at Tribhuvan University Teaching Hospital (TUTH) in Nepal where the intervention began in 2014 with support from HECAF 360, a local NGO, and Health Care Without Harm (HCWH), an international NGO, and WHO Nepal. It describes the approach and path followed by TUTH in the area of HCWM and the circular economy. It also describes factors that acted as barriers to or assisted in the changes by analysing the past data and information collected as well as interview with the key stakeholders. By enhancing waste separation at source and needle cutters in the hospital, installing a biogas digester to treat organic waste and autoclaves to treat infectious waste, levels of hygiene have risen and risk of exposure to infectious disease and injuries associated with waste handling have been reduced. In addition, the risk of emission of air pollutants and greenhouse gases caused by the use of incinerators without air pollution control has been minimized through non-burning treatment technology. The hospital offsets some of the costs of the system by selling recyclables from general waste and treated infectious waste.

Several recommendations for future activities and scale-up can be drawn from this case study, as follows:

- ▶ National and regional governments should: follow the National Health Care Waste Management Standards and Operating Procedures 2020; facilitate the implementation of HCWM to meet the standards of the Standard Operating Procedures set under the policy and strategy by allocating sufficient budget and personnel; perform monitoring and evaluation with data collection and analysis; disseminate relevant information; provide training and develop a curriculum to enable ongoing improvements in the skills and knowledge of individuals responsible for HCWM.
- ▶ Healthcare facilities (HCFs) must have a HCWM plan with sufficient budget and human resources for implementation. For tasks outsourced, contracts should include conditions ensuring appropriate handling and treatment of all waste generated at HCFs based on the HCWM plan. As well as expenses associated with waste management, hygiene conditions at HCFs and working environments for the staff should be carefully monitored for future improvements. Above all, determined leadership from top management is vital to implement of waste management plan.

the project partners who contributed to the project implementation at Tribhuvan University Teaching Hospital.

Tribhuvan University Teaching Hospital (TUTH)

Tribhuvan University Teaching Hospital (TUTH) (Figure 2) is located in the northern part of the capital city of Nepal, Kathmandu and is the site and instigator requesting the project covered in this report. TUTH was established in 1982 and currently has 15 outpatient departments, 30 indoor units and 22 laboratory units, which conduct research and education as well as provide medical services. Japan International Cooperation Agency (JICA) supported in the construction of TUTH, nursing college and dormitory between 1980's and 90's, and improved medical equipment. It has 700 patient beds and treats 2,000 outpatients per day. The hospital set the broad parameters for the project, allocated the necessary human and financial resources, led the construction of the necessary infrastructure and procured the required

equipment. Its senior management worked closely with WHO Nepal and HECAF 360 to create an appropriate plan and ensure that the steps needed to implement it were carried out as smoothly as possible.

WHO Nepal

At the request of the Executive Director of TUTH, WHO Nepal agreed to provide technical assistance in implementation of safe HCWM and assigned Dr. Sudan Panthi, National Program Officer and senior WASH expert as their representative. WHO's role was to provide professional technical input to the project and evaluate the progress of the waste management system through active participation in committee meetings and other activities.

HECAF 360

The Health, Environment and Climate Action Foundation (HECAF 360), a Nepali NGO, was built on Health Care Foundation Nepal (HECAF) which was founded in 1994 with a mission to create a non-profit



Figure 2: Tribhuvan University Teaching Hospital
(Source: https://www.flickr.com/photos/usaid_images/17910340946)



Figure 13: The waste treatment centre (top) and Storage for recyclable wastes (bottom) (Source: HECAF 360)

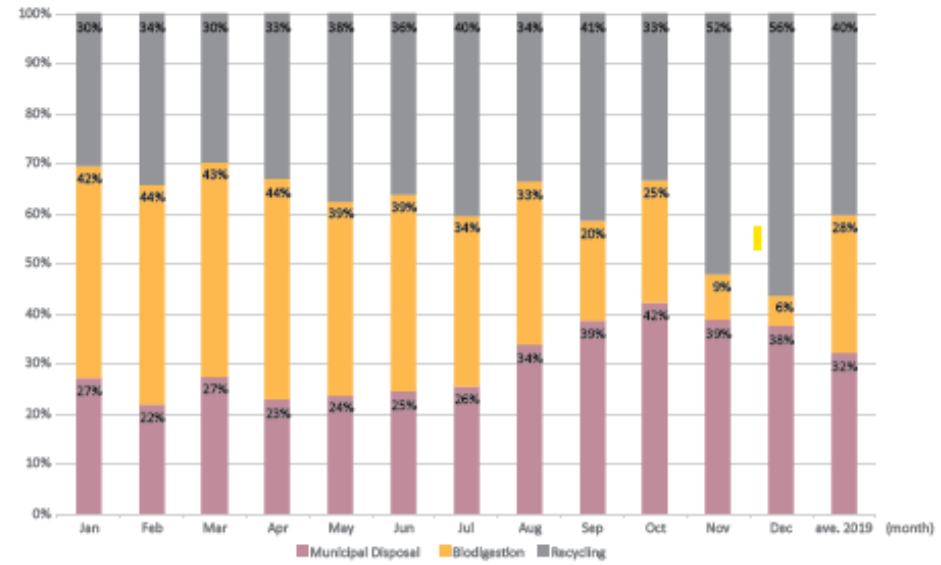


Figure 20: Percentage of waste recycled, biodigested or sent for municipal disposal in 2019

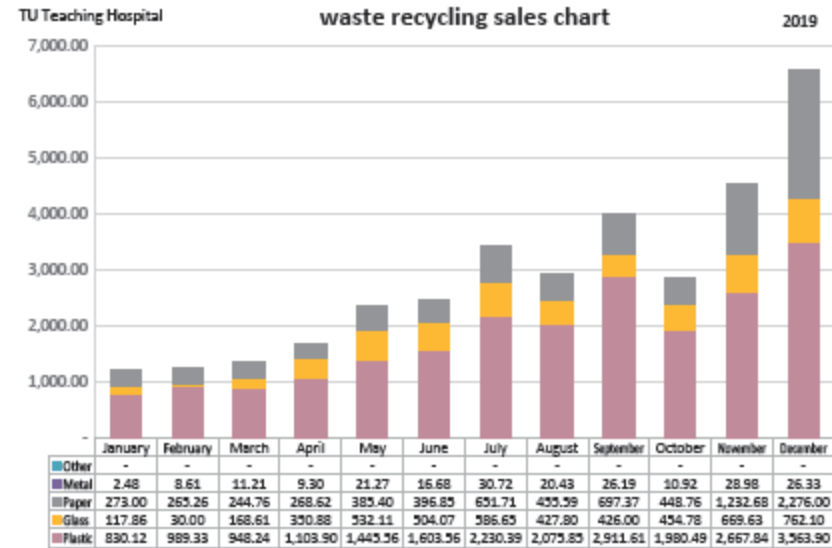
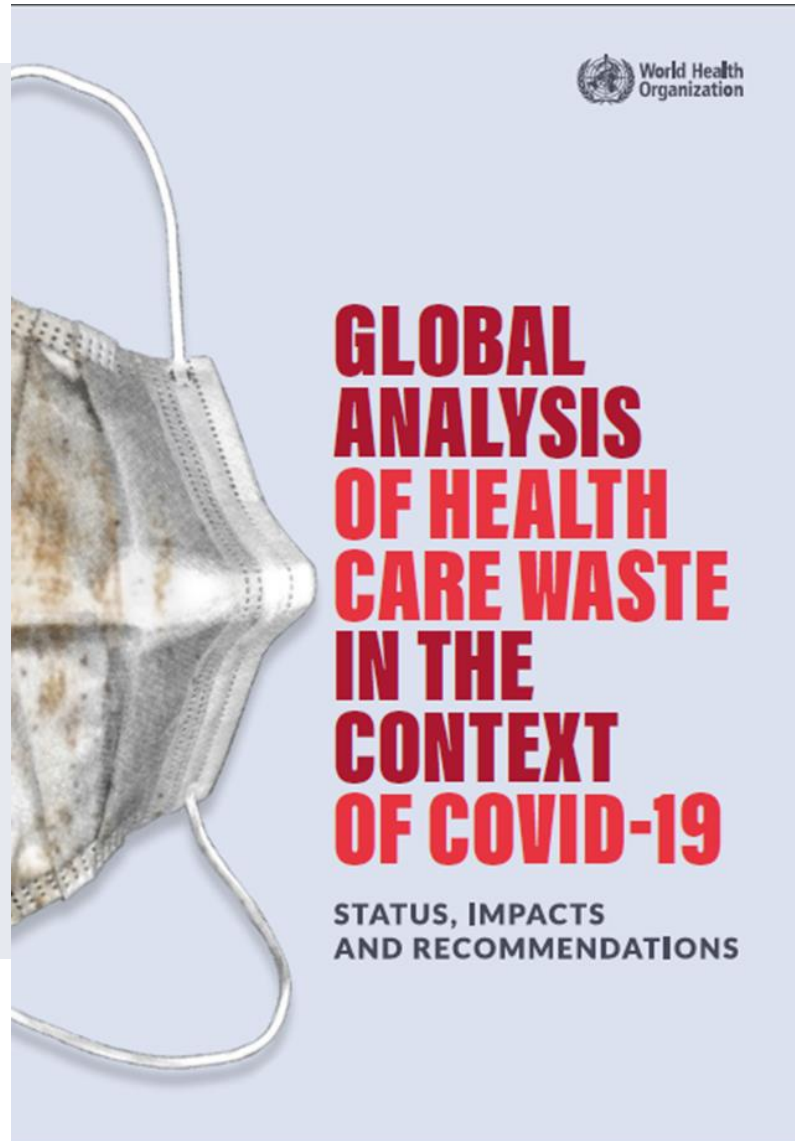


Figure 21: Weight of waste recycled per month in 2019 (kg)

Case Studies / Published



NEPAL Use of alternative waste treatment technologies and recycling of vaccination waste



Remote, rural facilities, including those in Nepal, often struggle with safe management and treatment of vaccine waste. Facilities from the periphery of Kathmandu Valley regularly request help to manage safety boxes, which frequently pile up around vaccination sites and health posts. Open burning of safety boxes is still the main treatment option in many places, posing health and environmental risks. Data on the quantity of waste generated are rarely collected, which makes planning for waste management more difficult. A partner organization, Terre des hommes, has piloted a method for measuring waste in three rural healthcare facilities. Waste produced from the delivery room, from the outpatient department and by facility staff was segregated and collected in plastic bags. Waste generated over a 24-hour period was transferred for digital weighing, and a new plastic bag was replaced at the point of collection to collect the waste for the next 24 hours. The number of people who produced the waste each day was also recorded. This continued for 7 consecutive days. This tracking effort allowed facilities to identify where segregation could be improved, thereby reducing the amount of waste that needs to be treated.

To address poor vaccine waste management in Kathmandu Valley, the Ministry of Health asked WHO Nepal to support safe management and treatment of vaccine waste. The waste management strategy involved the safe collection, storage, treatment and disposal of safety containers, as well as use of two non-burn technologies: microwaving and autoclaving. The estimated cost for the packaging, collection, safe storage and treatment of 1500 sharps boxes included in the effort was about US\$ 15 000 (about US\$ 10 per sharps box). Of the 1500 safety boxes collected, 613 were taken to a nearby hospital and treated using a microwave with an inbuilt shredder (Fig. A6). Decontamination and shredding rendered the waste unrecognizable, allowing it to be sent directly to the landfill site as normal nonhazardous waste. This option had fast treatment cycles and was easy to implement, but the waste could not be recycled. The remaining boxes were sent to a local maternity and women's hospital, and treated in a 227-litre pre-vacuum autoclave (Fig. A6). This method had longer treatment cycles and slightly higher operational costs, but had the benefit of producing decontaminated plastic waste that could be recycled – syringes were cut with needle cutters, leaving the plastic part for recycling (about 95% of the decontaminated waste).

FIG. A 6 — (a) Collection of safety boxes in drums. b) Shredded waste after microwaving. c) Loading of the autoclave.



30 One safety box contains approximately 100 used syringes and corresponding empty vials.

Success Factors

Enabling Policies, Standards, and Legal Frameworks /Alignment with Global Guidance and Standards

Establishment and enforcement of clear national guidelines, standards, and regulatory mechanisms created a strong foundation for systematic health care waste management.

Integration of Climate and Health Agendas and Leveraging Climate Co-benefits

Positioning health care waste management within climate resilience efforts highlighted co-benefits such as reduced emissions, improved environmental health, and strengthened system sustainability.

Catalytic Impact of the COVID-19 Pandemic

The disruptions and increased waste generation during COVID-19 accelerated attention, investment, and innovation in health care waste management systems.

Strong Government Leadership and Strategic Partnerships

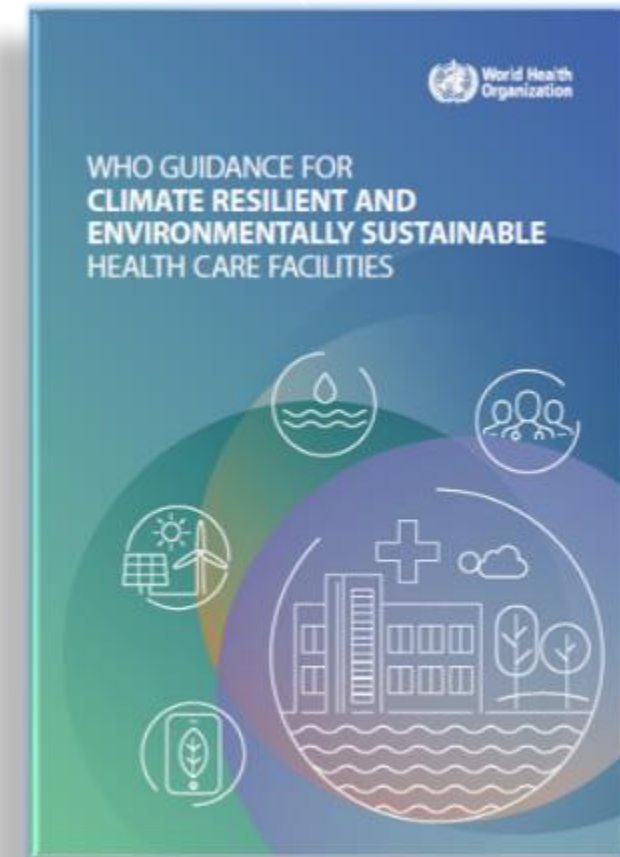
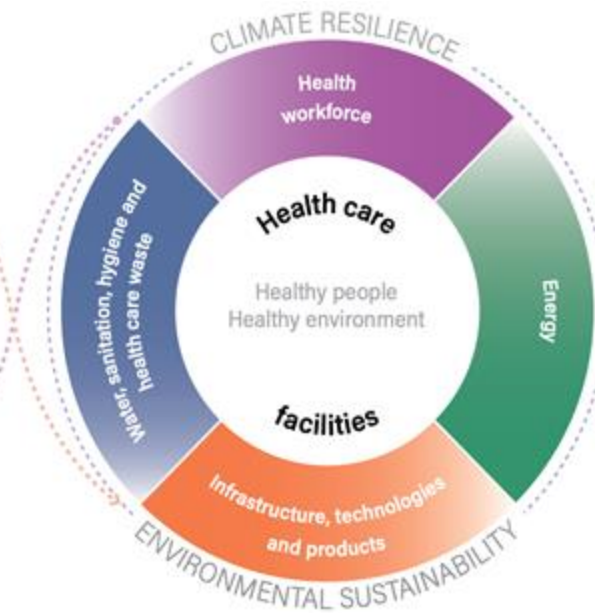
Leadership from the Ministry of Health and Population (MoHP), combined with effective collaboration with development partners and stakeholders, ensured coordinated planning and implementation.

Capacity Building and Technical Support for evidence-based planning

Continuous strengthening of technical and institutional capacity among heal

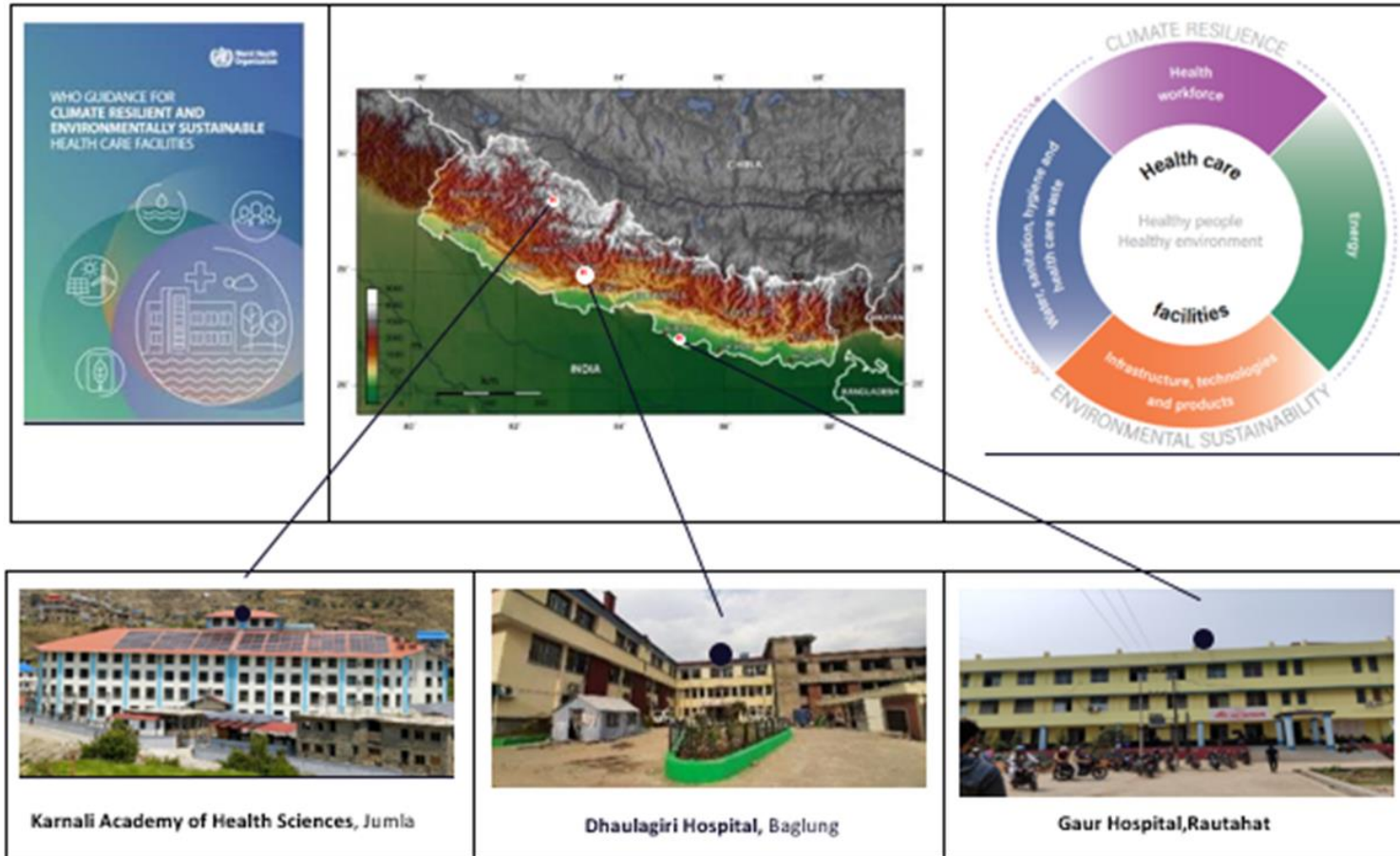


WHO Guidance for Climate Resilient and Environmentally Sustainable Health Care Facilities



Non-burn Technologies/ Zero Waste Concept

Implementation of Climate Resilience and Environmental Sustainability of Healthcare facilities in three ecological regions of Nepal



Systematic Implementation of the CRESH Project in Nepal

Phase 1: CRESH Assessment

- Surveys and site observations
- Quantification of 1-day waste
- Pollution Level Tests

Phase 2: Improvement work

Phase 3: Capacity building and public awareness

Communication materials

Phase 3: Way forward and Scaleup

Based on the experience, Revised HNAP and NDC3.0 targets to scale up similar activities / GCF Project



Thank you