The Healthcare Decarbonization Analytics Toolkit:

building the analytical foundations for net zero delivery in health systems

Discussion draft

Centre for Sustainable Medicine
NHS
ATACH Alliance for Transformative Action on Climate and Health WHO-hosted network
World Health Organization

The Healthcare Decarbonization Analytics Toolkit

The Healthcare Decarbonization Analytics Toolkit supports health systems in moving from global guidance to practical implementation. Healthcare decarbonization analytics provides the evidence health systems need to plan, implement and evaluate action to reduce emissions while supporting wider health system objectives. The Toolkit sets out expectations for high-quality, transparent and nationally owned analytical programmes.

The Toolkit is co-led by the World Health Organization (WHO), NHS England and the Centre for Sustainable Medicine at the National University of Singapore as a contribution to the Health Systems Decarbonization Thematic Community of Practice (CoP) in the Alliance for Transformative Action on Climate and Health (ATACH).

The primary audience of the Toolkit is national and subnational health authorities, particularly the technical teams responsible for developing, commissioning, governing or using healthcare decarbonization analytics. It is also intended for other ATACH members and partners, including funders, researchers and technical organizations supporting health systems to build their analytical capabilities to support decarbonization.



Two community members from Yaqeta Village assist staff from the Ministry of Health and Medical Services in installing a new solar-powered vaccine freezer at Yaqeta Nursing Station. ©WHO / Tom Vierus

1. What the Toolkit provides and where to look

Through ATACH, WHO and its partners have established a common foundation for measuring health system emissions to support decarbonization. *The Operational framework for building climate resilient and low carbon health systems (1)* was updated in 2023 to integrate guidance on reducing greenhouse gas emissions. More specific guidance has since been developed to build on the framework. Work beginning in 2022 led to the publication of *Target setting for low carbon sustainable health systems* in 2024 *(2)* and *Measuring greenhouse gas emissions in health systems* in 2025 *(3)*, developed by the ATACH Healthcare Decarbonization Analytics Task Team.

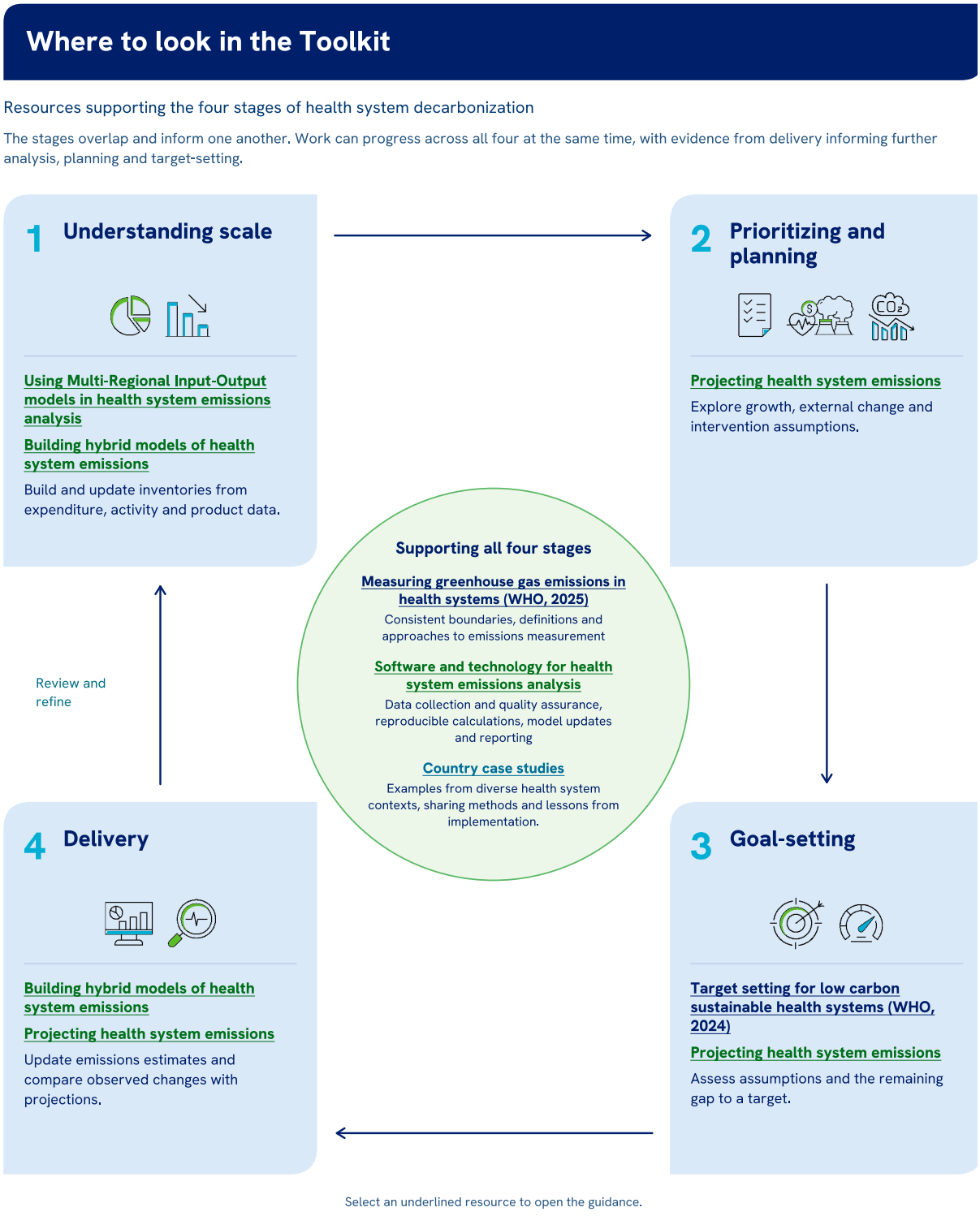
The challenge is shifting to implementation: moving beyond public commitments and one-off footprinting exercises towards high-quality, transparent, nationally owned analytics programmes. These programmes must support interventions and provide the evidence needed to judge whether implementation is delivering the emissions reductions targeted and, in many settings, required for net zero. Higher-emitting health systems with greater resources have a responsibility to decarbonize more rapidly and should take the lead in developing comprehensive analytical capabilities, advancing methods and sharing data and learning.

The Toolkit brings together several complementary types of resources to help health system analysts meet this challenge (Fig. 1):

- **Foundational guidance**, providing stable and shared principles, definitions and approaches to inform health system decarbonization programmes.
- **Decarbonization Analytics Guides**, building on foundational guidance to set out methodological requirements for specific analytical tasks. They explain key choices and limitations, supported by examples, figures and reference material.
- **National and subnational case studies**, showing how health systems have addressed common analytical challenges in different institutional, technical and resource contexts.

Fig. 1 maps resources to four connected stages of analysis to drive health system decarbonization: understanding scale, prioritizing and planning, goal-setting and delivery. Resources may support more than one stage, while some support the whole cycle.

Fig. 1. Where to find resources in the Toolkit



An evolving map of resources supporting the four stages of health system decarbonization. The linked resource titles provide access to the relevant guidance. The map will be updated as resources are added or revised.

Health system analysts should first identify the strategic decisions their analysis needs to inform, and the capabilities required to produce the necessary evidence. They can then use the five-stage maturity framework in the WHO guidance on measuring greenhouse gas emissions *(3)* to assess capabilities across different dimensions,

identify gaps and priorities, and find relevant resources in the Toolkit.

The maturity framework is designed to be applied across individual capability areas rather than used to assign a health system a single overall stage. Progress is often uneven: a system may have strong data governance and appropriate technology but significant gaps in emissions modelling, reporting or data collection. Analytical approaches and decarbonization pathways should reflect local circumstances and differentiated responsibilities, including the need to expand equitable access to high-quality care.

Wherever health systems stand today, the aim is to establish a continuous cycle in which analytical capability is strengthened and embedded in routine processes to support effective decarbonization decisions (Box 1).

Box 1. How the analytical profession can drive health system decarbonization

For sustainability programmes to carry weight within ministries of health and health systems, they must be underpinned by reliable data and analysis. Healthcare decarbonization analytics should be recognized as a core professional function of a health system, subject to the same standards of governance, transparency and quality as financial, operational, workforce or clinical analysis. The depth of analysis and level of quality assurance should be proportionate to the intended use.

Delivery of health systems' decarbonization commitments requires routine and embedded analytics, integrated with existing systems and led by in-country technical teams. This requires a clear institutional mandate, defined responsibilities, sustained access to data and sufficient capacity to maintain the analysis over time *(4)*.

Health system ownership does not require every dataset, emission factor or specialist model to be developed internally, but health system teams should control the overall analytical architecture and the decisions at its heart. They should be free to scrutinize, reproduce, update and adapt any analysis to answer new questions. External partners can provide specialist knowledge, offer independent review and help overcome initial hurdles, but support must strengthen rather than substitute for local capacity. An external assessment that cannot be understood or updated by the commissioning health system has limited value. Commercial arrangements that restrict access to methods or data, prevent independent updates, or create avoidable long-term dependencies are likely to undermine implementation.

The progressive development of analytical capability must not become a justification for slow progress or inaction. Interventions with well-established benefits and suitability to local circumstances should be implemented without waiting for a comprehensive emissions assessment.

2. Decarbonization Analytics Guides

The first four guides address connected parts of an analytical programme. They apply the foundational guidance to specific tasks and set out requirements for producing credible analysis, while allowing implementation to reflect local circumstances, needs and priorities.

Software and technology for health system emissions analysis

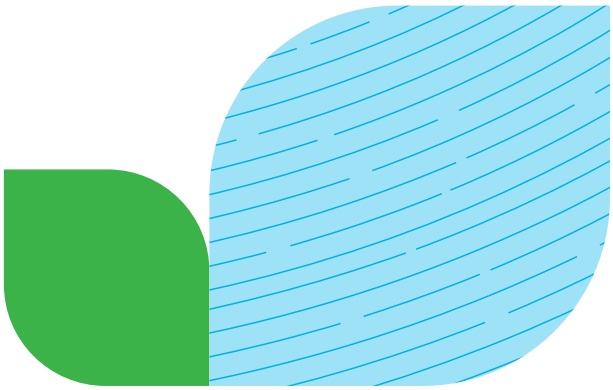
Covers the data collection, management, software and communication systems needed to support decarbonization analytics in health systems, from initial emissions assessment through to projections and monitoring. Analysts assessing emissions in health systems must:

1. **Collect data where it is most useful**, using existing data and mechanisms where possible and minimizing collection burden on the system.

2. **Use appropriate platforms and technology**, considering the analytical purpose and the granularity and complexity of the data and modelling.

3. **Move towards use of automated pipelines and version control** to manage model and data changes, reduce burden and minimize the risk of error.

4. **Present data to support decision-making**, tailoring outputs to users' needs and integrating data and insights into existing reporting platforms where possible.



Using multi-regional input-output models in health system emissions analysis

Explains how to select and apply multi-regional input-output (MRIO) emission factors to estimate supply chain emissions from health system expenditure. Health system emissions analysis that uses MRIO models must:

1. **Account for the full international supply chain.** Include domestic and international upstream emissions and account for sources outside of MRIO coverage.

2. **Select an MRIO model based on relevance and quality.** Justify the model's geographic, sectoral and GHG coverage, underlying data quality, reference years, transparency and continued access.

3. **Match expenditure datasets to factors.** Represent an appropriate mix of domestic and imported production and align currency, price year and valuation basis.

4. **Interpret results within their analytical limits.** Account for uncertainty, sector averages and data limitations when drawing conclusions, comparing results or assessing changes over time.

Building hybrid models of health system emissions

Explains how to combine expenditure, activity and process-based data into a consistent health system emissions assessment, improving its coverage and specificity as more detailed information becomes available. Health system emissions analysis that uses hybrid models must:

1. **Establish a complete and reconciled expenditure framework.** Cover the agreed health system boundary and reconcile contributing financial datasets against a common reference total.

2. **Account for every line of expenditure.** Document exclusions, direct mappings to economic sectors and allocations of aggregated expenditure to multiple sectors.

3. **Use representative activity data and emission factors.** Prioritize suitable activity data already available, address coverage gaps and analytical needs and justify the applicability of data, factors and extrapolations.

4. **Combine estimates without gaps or double counting.** Replace overlapping emissions, add sources not previously captured and retain a traceable account of the combined calculation.

5. **Enable disaggregated estimates consistent with the whole-system model.** Incorporate local records progressively, reconcile organizational and system totals and distinguish local evidence from proxy allocations.

Projecting health system emissions

Explains how to project future health system emissions by representing health care growth, accounting for external changes and quantifying and combining health system interventions. Health system emissions projections aligned with net zero must:

1. **Support a transition to net zero by 2050.** Modelling and strategy should be developed together. High-emitting and high-ambition health systems should identify quantified routes to achieve net zero by 2050 or earlier.

2. **Start from a complete health system inventory.** Projections must reconcile to an emissions assessment with a defined boundary, reporting year and documented methods.

3. **Represent future health care needs.** Growth assumptions must account for changes in health care needs and planned improvements in access, quality and resilience.

4. **Establish a reference scenario.** The reference scenario must describe future emissions before the interventions being assessed, using explicit assumptions about external changes.

5. **Quantify interventions and their combined effects.** For each intervention, specify the proposed change, quantify its expected effect and account for interactions with other interventions. Calculate changes in absolute emissions over time and any remaining gaps to interim and final targets.

6. **Support monitoring and allow for alternative pathways.** Modelling should explore different routes towards net zero, assess uncertainty and support monitoring and revision as evidence and implementation develop.

3. How the Toolkit will evolve and how to contribute

The ATACH website will remain the live platform for new and updated Toolkit resources. Priorities will be informed by country priorities and needs; questions, feedback and experience from Toolkit users; content and lessons from Technical Meetings and Implementation Clinics; gaps identified through the maturity framework; and significant developments in analytical methods and practice.

The Decarbonization Analytics Guides support the analytical components of planning and delivery. Further guidance on low-carbon transition planning and intervention appraisal will address the additional work needed to translate analysis into actionable plans, including policy development, implementation prioritization and financing.

Where a body of technical material becomes sufficiently established, it may be consolidated into a formal WHO publication.

These resources will be complemented by knowledge exchange and implementation support through the wider CoP, including Technical Meetings, Implementation Clinics, training, technical assistance and peer matching.

Fig. 2 places this development within the wider planned activities of the CoP.

Countries and technical partners within and beyond ATACH membership are invited to contribute tools, methods, worked examples, case studies and lessons from implementation. Contributions should address a defined analytical challenge or help other health systems strengthen a particular capability.

Case studies should explain what was done and why the approach was appropriate to the health system context and decision needs. They should describe the methods and assumptions used, adaptations made, challenges encountered, limitations and priorities for improvement. This context helps other health systems judge whether and how the approach could be applied in their own settings.

Within ATACH, the Healthcare Decarbonization Analytics Toolkit will support a growing professional network of healthcare decarbonization analysts through shared frameworks, evidence and experience. Emissions can be quantified in models, but reductions are delivered through changes in policy and practice. By generating evidence and communicating it effectively, the healthcare decarbonization analytics profession will play a key role in the transition to net zero health care.

Fig. 2. The Healthcare Decarbonization Analytics Toolkit and its contribution to the Health Systems Decarbonization Thematic Community of Practice

Health Systems Decarbonization Community of Practice — Resources and planned activities

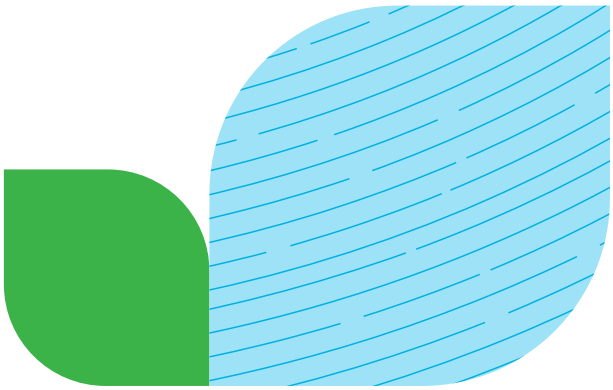
	The Healthcare Decarbonization Analytics Toolkit			Wider CoP activities	
	Guidance and evidence support implementation, policy and action →			← Country priorities and experience shape the Toolkit	
	Foundational guidance documents Stable guidance supporting high-quality implementation across health system contexts, maintained through regular review	**Decarbonization Analytics Guides** A live set of analytical guidance and worked examples supporting specific analytical tasks across health system decarbonization	**Country case studies** A shared library of country experience, reflecting diverse health systems and supporting learning across ATACH	**Capability and implementation support** Strengthen national teams and institutions through training, technical assistance, ATACH Implementation Clinics, and peer matching	**Policy, review and collaboration** Connect country priorities with collective action, transparent reporting, expert review and international collaboration
2024–2025	Target setting for low carbon sustainable health systems (WHO, 2024) Measuring greenhouse gas emissions in health systems (WHO, 2025)		Five country case studies developed in 2025		
2026		Using Multi-Regional Input-Output models in health system emissions analysis Building hybrid models of health system emissions Projecting health system emissions Software and technology for health system emissions analysis	Additional country case studies published	Technical Meeting: Measuring GHG emissions in health systems	
2027	**Future contributions to the Toolkit** Low-carbon transition planning and appraisal of decarbonization interventions	**2027–2030** **Future contributions to the Toolkit** Five additional guides per year, shaped by country priorities and needs. Topics to include: • Uncertainty, validation and assurance • Clinical and care pathway analysis • Linking national, subnational and facility assessments • Progress reporting using emissions and implementation indicators	**2027–2030** **Future contributions to the toolkit** Further examples aligned with the analytical programme and country implementation experience. National and subnational examples from diverse health systems. Sharing methods, adaptations, challenges and lessons learned.	Implementation Clinics launched Technical Meetings: Decarbonization and sustainability planning; Conducting GHG assessments	**2027–2030** **Planned activities** **Policy coherence and collective solutions** Align climate and health policy, planning, financing and procurement. Address shared barriers across ATACH CoPs. **Demonstrating delivery** Support transparent reporting and expert peer review of emissions assessments, targets and plans at countries' request. **International leadership and collaboration** Technical Meetings and an annual in-person meeting to agree priorities, coordinate action and review progress.
2028	Monitoring, reporting and verifying decarbonization progress			**2028–2030** **Planned activities** Quarterly Implementation Clinics. At least two Technical Meetings per year. Further training, technical assistance and peer matching.	
2029	Synthesis of guidance and case studies, where appropriate				
2030	Review of measurement and target-setting guidance				

Existing resources and the indicative programme of future contributions, alongside wider CoP activities. Planned topics, activities, frequencies and timing are subject to agreement through the CoP.

Acknowledgements

The Healthcare Decarbonization Analytics Toolkit was co-developed by WHO, NHS England and the Centre for Sustainable Medicine (CoSM) at the National University of Singapore as a contribution to the Health Systems Decarbonization Thematic Community of Practice.

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