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Methodology

Measuring and projecting global health sector emissions

Health Care Without Harm and Arup had the ambition to create a global health care sector GHG emissions Road Map with the goal to frame the conversation and catalyze climate action across the sector and its community of practitioners. There are few formalized or standardized approaches for establishing such an evidence-based approach, and none currently exists in the health care sector on a global scale with detail across nations.

To help bring definition to the scope, coverage, analysis, methodology, and formatting of what this Road Map might look like, Health Care Without Harm and Arup developed a structured approach across six components to provide the health care sector with a robust method and evidence base, which includes the following features:

- Reporting GHG emissions from the health sector and its supply chain to GHG Protocol Scope 1, 2, and 3 categories
- Laying the groundwork for future scenario analysis within IPCC emission pathways
- Reporting of national perspectives
- Projections based on specific health care trends
- Incorporation of climate actions that health care actors can make
- Granularity sufficient to inform supply chain actions

A full description of the methodology and its six component parts of developing the Road Map are in the Technical Report (Annex A). For summary purposes, Figure 4 provides an overview of the chronology and relationship between each step, with each referenced number linking to a summary of each component below.

The Road Map's goal is to catalyze climate action across the sector and its community of practitioners.

Step 1. We took Green Paper One as the starting point, while adding 25 additional countries bringing the total countries covered to 68, with a "rest of the world" (RoW) category to provide a baseline emissions profile in 2014 for the global health care sector. Further analysis was conducted, using a methodology called structural path analysis (SPA) to separate and break out Scope 3 emissions (i.e., those coming from indirect sources) into usable categories from which to explore health care system emissions.

Step 2. We selected a global warming scenario aligned with keeping warming at 1.5C from which national emission budgets and health care sector pathways within these could be prescribed. This is illustrated by the dashed line and its end point in Figure 4.

Step 3. We used data from the Institute for Health Metrics Evaluation[39] to model growth in health care demand from 2014 to 2050 for each of the 68 nations and RoW. This was used to generate a forecast emissions profile based on the premise of no future climate action has been termed Business as Usual (BAU). In projecting in this manner, the assumption is made that the structure of the health system and wider economy is consistent with the 2014 baseline throughout the projected period. This assumption, its limitations, and its impact on the modelling is described in more detail in the limitations section below and in the technical report (Annex A).

Steps 4 and 5 (highlighted as the blue and gray wedge's respectively in Figure 4). We overlaid the decarbonization actions that can be taken in the health care sector, its supply chain, and the wider economy at large. The interventions that make up these decarbonization pathways and actions are pulled from third party models and published evidence, alongside more focused and new research completed by Health Care Without Harm and Arup to determine the scope, scale, and pace of feasible actions.

Step 6. We applied these actions to each nation's situation, and as an aggregate at global scale for health care, thus presenting a single emissions decarbonization profile as the global health care decarbonization Road Map.

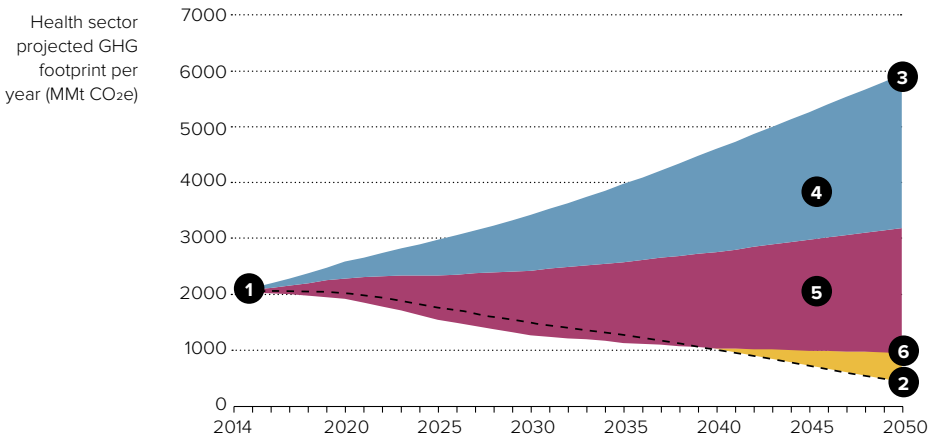

Figure 4. Workflow representation of the Health Care Without Harm and Arup global health care sector Road Map methodology. The numbers shown relate to the work step descriptions provided below.

Limitations and assumptions

The methodology incorporates assumptions and limitations that are considered appropriate for a 36-year emissions projection of a globally heterogenous sector. Please see the technical report (Annex A) for a more complete list and discussion of limitations and assumptions. A summary is provided in Table 1.

Limitation or assumption	Description
Static structure	The projection is based on a static model of the economy from 2014; no changes in the structure of the economy are considered. It is therefore a projection, not a prediction, and is just one of an undeterminable number of possible emissions futures and as such provides only a guide to how the sector can decarbonize at pace.
Consistent growth	The projected growth of the health sector assumes all parts of the system grow at a consistent rate within each country.
Boundaries between the health sector, health retail, and health organizations	The model uses expenditure data which aligns with the WHO's definition of health care, which includes activities, for example, the direct sale of pharmaceuticals to individuals by pharmacies. The boundary of the sector as a whole differs therefore from that of a typical national health provider, for example, the NHS. This is not a limitation as such, rather it is an important consideration when comparing the results of this study with organizational footprints, particularly those covering Greenhouse Gas Protocol (GHGP) Scope 3 emissions.
Homogeneous product	The model assumes a single emissions intensity for the health sector. This assumption holds for considering the sector as a whole but must be acknowledged when considering the impact on emissions of redeploying expenditure from one part of the health care system to another.
Emissions trajectories	The emissions trajectories presented represent plausible emissions pathways. They are an illustration of the effort required by countries to reduce emissions and achieve the budget allocated to the global health care sector. It should be emphasised that these are not forecasts.
Decarbonization trends	The data used to project decarbonization is well-cited and respected in literature. These projections are predictions, and as such are have a degree of uncertainty; however, they represent the best, most comprehensive studies available.
Decarbonization actions	The mitigation actions modelled in this study are not exhaustive, for example, no mitigation of direct emissions from waste, water, and sanitation is modelled. The projected estimates of avoided emissions are therefore likely to be underestimated.
Rebound effects	Where behavioral changes and expenditure reductions are modelled, the emissions impact of the resultant avoided expenditure potentially being redirected to other activities is not considered because it is very complex to model. Policy action can be considered alongside actions in order to limit the scale of any rebound effect.
Emissions trajectories	The model does not account for changing health demands (for example, changed distribution of infectious diseases) or changing the health cost base (from climate shocks e.g., higher insurance, more frequent extreme weather).

Table 1. Summary of methodology limitations and assumptions

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Topography

Understanding the landscape of health care emissions

"Human health and climate change has been identified as a high priority issue for the National Academy of Medicine going forward... Decarbonization of the health sector [is] an ambitious and important goal."

Dr. Victor Dzau, President, National Academy of Medicine, United States

Health care's climate footprint: Green Paper One

In September 2019, Health Care Without Harm and Arup published Green Paper One, which found that, based on 2014 data, health care's climate footprint is equivalent to 4.4% of global net emissions (2 gigatons of carbon dioxide equivalent). The Health Care Without Harm-Arup paper built on, contributed to, and was validated by a growing body of evidence from national and international studies of health care's contribution to the climate crisis.[30]

The paper found that the top three emitters, the United States, China, and collectively the countries of the European Union, comprise more than half the world's health care climate footprint (56%). The top 10 health care emitters make up 75% of the global health care climate footprint (Figure 5). The United States health sector is the world's number one emitter in both absolute and per capita terms. It produces 57 times more emissions per person than does India.

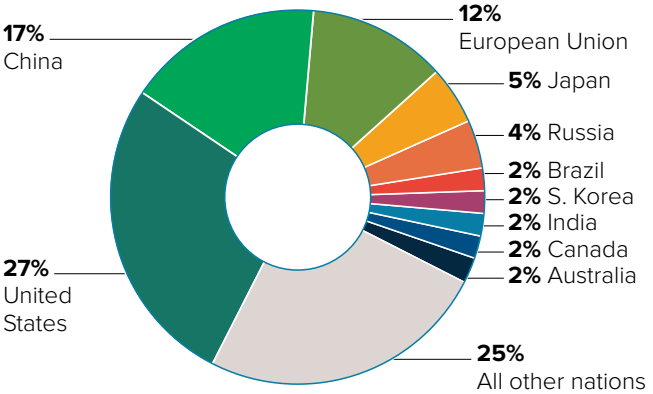

Figure 5. Top ten emitters plus all other nations and percentage of global health care footprint.

Source: Green Paper One.

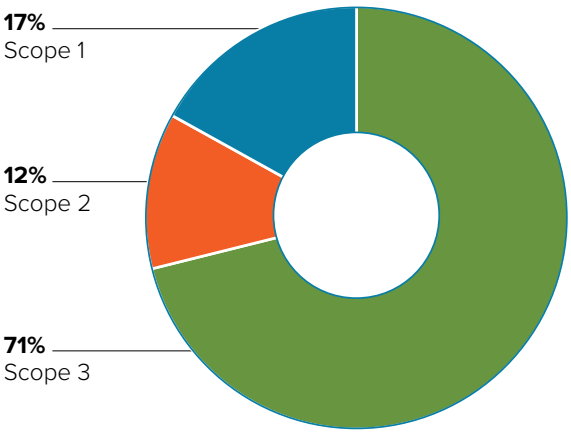

Figura 6. Global health care footprint split by GHGP Scopes.

Source: Green Paper One.

The paper also aligned its findings with GHGP categories, establishing that 17% of health care emissions were produced onsite (Scope 1), 12% were from purchased energy (Scope 2), and 71% came from indirect emissions (Scope 3) including the global supply chain (Figure 6.). Overall, and across all countries, the paper found that fossil fuel consumption is at the heart of health care's emissions because it inherently fuels the energy, manufacture, and transport of health care operations and products.

A further perspective of this is summarized in Figure 7 where the product sectors of the Scope 3 component are set out.

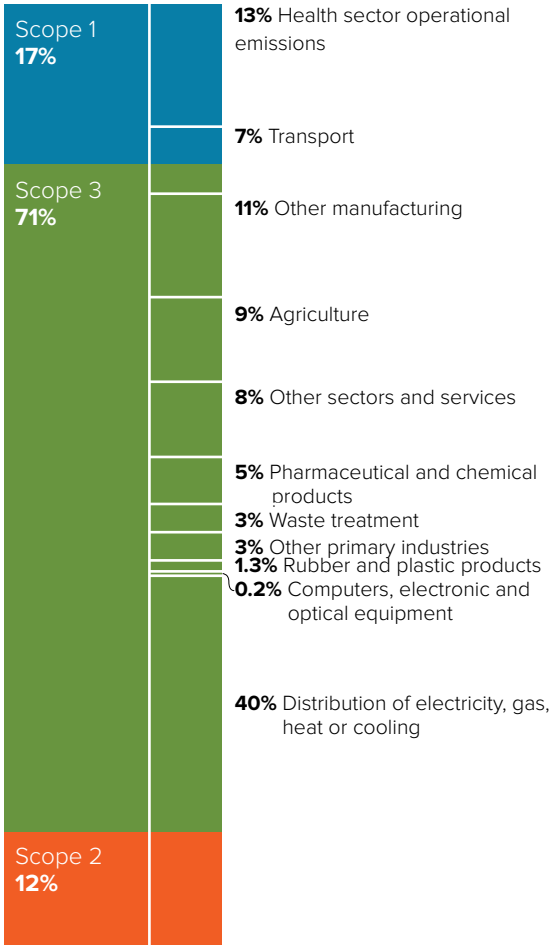

Figure 7. Global health care emissions as presented in the Green Paper One are split by production sector and by scope category.

Structural path analysis findings

Green Paper One presented Scope 3 data with limited granularity and descriptions of the sectorial categories shown in Figure 7 which did not match well with the categorizations more familiar to health care decision makers.

This Road Map addresses this issue by using a technique called Structural Path Analysis (SPA) to present the data in a more impactful and usable form. SPA is an advanced input-output modelling approach[ii] and a full description of the method and findings can be found in Annex A.

Green Paper One findings were modelled through an SPA. This generated outputs more familiar to, and actionable for, those engaged in health care policy, procurement, and supply chain management. Figure 8 shows a perspective of the SPA output, the significance of supply chain Scope 3 emissions, and the variation of distribution across many different categories. Business services, the food sector, construction, and pharmaceuticals stand out, with each making up between 5% and 12% of health care's climate footprint. Figure 9 shows the same emissions through the lens of Greenhouse Gas Protocol categories.

Implementing the SPA has enabled these results to be applied to the Road Map to inform future pathways and high-level actions essential for health care sector decarbonization. The findings of Green Paper One, together with the SPA, form the foundational analysis, or the topography upon which the Road Map is based.

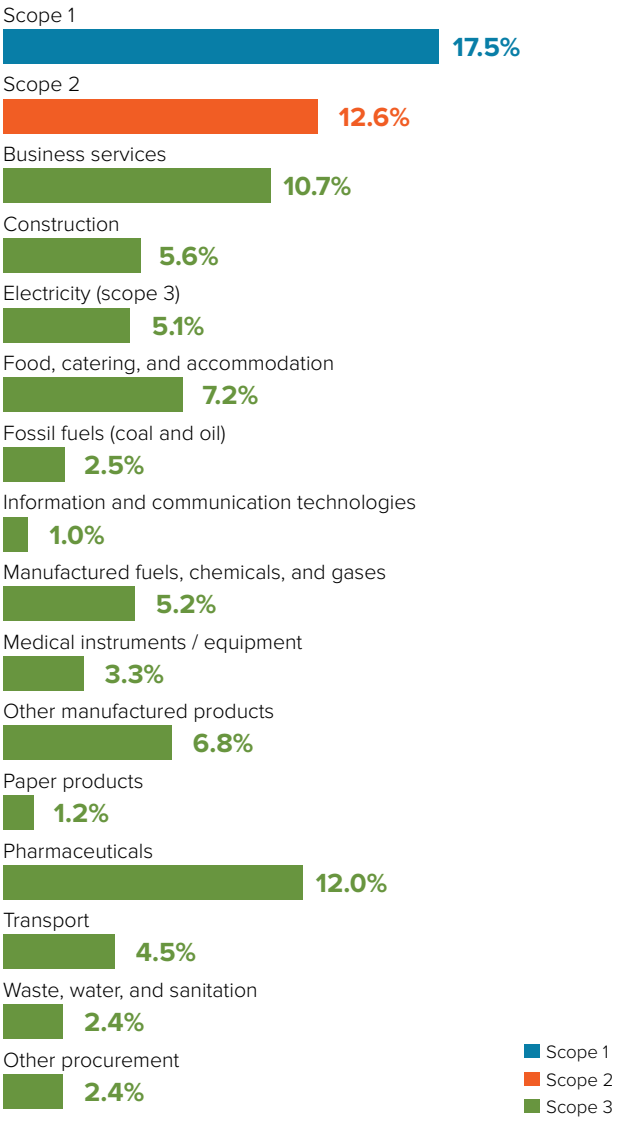

Figure 8. Health care's global emissions footprint by supply chain categories

ii Input-output analysis predicts emissions through coupling expenditure data with the emissions intensity per unit spend for sectors in the economy. To predict future growth in emissions, predicted changes in health expenditure have been used as this data is directly compatible with the IO methodology, which is introduced in the following paper: Kitzes J. An Introduction to Environmentally-Extended Input-Output Analysis. Resources. 2013; 2(4):489-503. https://doi.org/10.3390/resources2040489

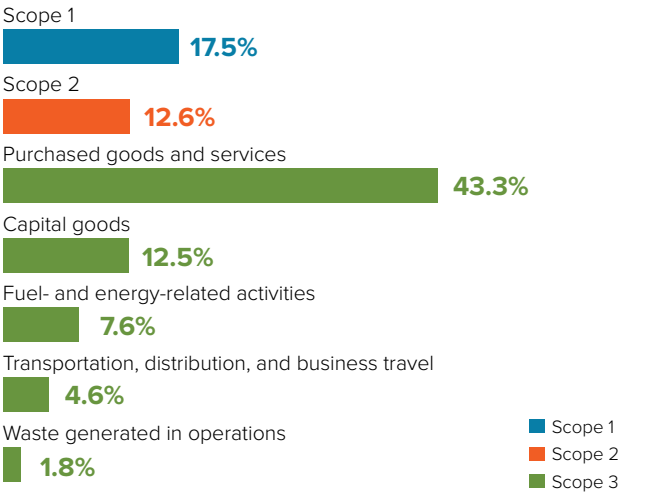

Figure 9. Health care's global emissions footprint by GHGP supply chain categories and sub-categories

Broadening individual country coverage

The 43 nations covered in detail in the WIOD input-output model have a skew toward higher income nations. Other studies, making use of differing data sources and methodologies, have provided estimates for other nations. One such study, from Lenzen et al.[31], has produced a global health sector footprint based on Eora, a different input-output model, and provides the health sector footprint with a complementary set of nations to those in WIOD.

From Lenzen et al.'s work, 25 additional national footprints have been included in this study, thus expanding the number of low- and middle-income nations profiled. The additional nations are shown in Table 3, and all profiles are included in the country factsheets in Annex C. Integrating these published footprints for an additional 25 nations has allowed the Road Map to be more expansive than Green Paper One.

Because these footprints have been derived through a different methodology (Eora), using a different source of health sector expenditure, the sector definitions and activities covered differ from those in the WIOD based model. Target projections and anticipated growth in expenditure helped establish the reference case scenario (BAU) and target trajectories for the additional national footprints. However, the structure of the health care sector footprint for these nations was not available. The potential scale of emissions reduction for these nations is instead estimated using the global mean reductions derived from the WIOD model. These estimates are shown to highlight the potential savings if these health systems decarbonize in line with the global average, and therefore do not capture the expected variability associated with the national context. It is recommended that these nations further investigate their national health system footprint and potential to decarbonize to capture the national context in greater detail.

To hold climate change to 1.5 degrees and achieve the ambition of the Paris Agreement, the nations of the world have agreed that all countries must take action.