

# Making Malaysia's public healthcare system 'greener'

**Dr Khairul Azmy Kamaluddin, Ts Noor Muhammad Abd Rahman, and Dr Muhammad Syukri Imran Abdullah, discuss the advancement of sustainability programmes by the Malaysian Ministry of Health (MOH) to reduce carbon emissions within the country's public healthcare sector.**

The Malaysian public healthcare sector has aligned itself to the country's national sustainability development programme roadmap, which allows for the adoption of green technologies and practices across public services, including the public healthcare sector. The country is moving forward towards more sustainable practices and lifestyles to address issues of climate change and unsustainable consumption, as well as inefficient water resource management.

This article provides an overview and updates on the advancement of sustainability programmes by the Ministry of Health (MOH) in Malaysia to reduce carbon emissions, particularly in the public healthcare sector. Major adaptations by MOH include energy-efficient building, adopting renewable energy resources to offset power demand, and waste reduction, as well as a green building initiative programme. MOH will continue to commit towards sustainability and make planetary health and the climate agenda a priority in its actions.

## From energy efficiency to 'green' building initiatives

The year 2015 marked a new milestone in Malaysian healthcare facility management (FM) practice, when the Sustainable Energy Management Program (SEMP), Reuse, Reduce and Recycle (3R) Program, and Indoor Air Quality (IAQ) management, were first introduced. Under the new FM contract, the FM companies acted both as facility managers and Energy Service Companies (ESCOs). As ESCOs, the companies are involved in a range of energy management services, such as energy audits and energy consumption monitoring, as well as implementing renewable energy and energy efficiency projects.

The SEMP model applied in government hospitals is based on a regional certification system or ASEAN Energy Management Scheme (AEMAS), which adopts ISO 50001:2011. To further



**Figure 1. Recognition at a national level of highly energy-efficient government hospitals.**

strengthen the efficient management and conservation of energy, MOH has imposed a hospital energy policy on all government-run healthcare facilities since 2016. The introduction of the policy was a crucial step in kickstarting the green building agenda for the public healthcare sector.

There are already around 60 Energy Managers hired by the FM companies to implement the hospital SEMP with the aim of achieving the highest Energy Management Gold Standard (EMGS) rating. As of June 2022, all government hospitals and institutions under the FM contract have met the minimum certification requirement. At least 55 hospitals have managed to achieve the highest 3-Star rating offered by the energy standard. This has led to national

recognition of several hospitals by the government through the national energy award (see Fig 1).

## Carbon management hierarchy

Up to December 2021, the estimated total monetary savings achieved from the SEMP programme amounted to about RM 210 million (£35.6 m). This translates to 500 GWh in electrical energy savings, or about 360 kt in reduced carbon emissions. MOH has been adopting strategic options in the carbon management hierarchy – starting from improving working processes, being energy-efficient, and moving towards using renewable or alternative energy sources.

The Green Building Initiative is an ongoing effort by MOH to decarbonise its healthcare facilities. The 'greening' effort emphasises efficient use of building energy and water supply, the use of renewable energy, adopting waste reduction measures, enabling re-use and recycling practices, good indoor environment quality management, and consideration of the environment in the design, construction, and operation, of buildings. There are currently already 14 government hospitals in Malaysia that have registered under the US Green Building Council LEED 'green building' certification programme. The programme provides a framework for hospitals to shift from 'business as usual' towards improving efficiency, lower carbon emissions, and creating healthier places for staff and patients.



**Figure 2. One of the two Malaysian hospitals that managed to achieve 'Platinum' under the globally recognised LEED standard.**



Figure 3. The Hospital Sultanah Maliha Langkawi was Malaysia's first to achieve 'Green building' certification under the globally recognised LEED Standard.



Figure 4: A chiller retrofit at Hospital Teluk Intan involved applying variable-speed, oil-free centrifugal chillers with magnetic bearings.

#### Four hospitals achieve LEED Gold

Four Malaysian hospitals have been awarded LEED Gold certification, while another two have managed to achieve Platinum level under the globally recognised LEED standard (Fig 2). Hospital Langkawi, on Langkawi Island in Kedah, was the first government hospital to register itself under the LEED green building certification programme (existing building operation and maintenance category, EBOM), and received Gold certification in 2020 (Fig 3). The hospital has set the pace and precedent for other government hospitals to pursue the green building pathway, which is part of a 2030 MOH masterplan to decarbonise government healthcare facilities. Prior to this, two private healthcare establishments had been certified 'green' to the regional Green Building Index (GBI) Malaysian green building certification system.

#### Energy projects

Malaysia's Ministry of Health (MOH) has implemented a significant number of energy projects to further decarbonise and reduce the health service's carbon footprint. Major key energy projects include upgrading inefficient and ageing chillers to magnetic bearing chillers or solar chillers, switching to LED lighting, installing solar thermal hot water systems, and small-scale solar PV, as well as solar tube chimneys for daylight harvesting. These energy schemes were either undertaken via conventional methods, or through the Energy Performance Contracting (EPC) process. Figure 4 shows the first EPC project, which was implemented at the Teluk Intan Hospital in 2017. To date 11 energy projects and 32 EPC-based projects have been completed, while another 12 projects are still ongoing. Figure 5 shows part of a solar thermal hot water system that was commissioned at Miri Hospital in Sarawak in 2020.

In addition to these schemes, other mechanisms have also been deployed to implement energy projects in healthcare facilities, utilising both internal and external funds. An example of external

funding was the energy efficiency funding provided by the Malaysian Energy Ministry (MESTECC). MESTECC has been actively implementing energy efficiency projects in the country involving retrofit work at 50 government-owned buildings, including hospitals, with energy efficiency technology worth RM 200 (£36.6 m). It has been widely accepted that hospital buildings have been identified as one of the highest energy users in the country, which explains and justifies the scale of effort at a national level to retrofit energy efficiency technology in such buildings. Another approach to make available and expand the use of renewable energy in the healthcare sector is to allow independent energy providers (IPPs) to build and operate facilities to generate electricity - particularly solar PV systems (SPS) - within hospital property boundaries, and sell it to the hospital concerned at a competitive rate. Such arrangements are enabled via a solar power purchase agreement guide that provides a framework and structured renewable

energy agreement to enable solar PV installation programmes in healthcare facilities. Such developments will not only help the transition towards renewable energy sources, but will also be crucial in helping Malaysia achieve its goal of being 'carbon neutral' by 2050.

#### The 'next generation' of maintenance staff and managers

The ever-changing healthcare environment requires focused training for the next generation of facilities management staff in healthcare facilities. A Certified Healthcare Facility Manager (CHFM) training programme has therefore been introduced into the Malaysian healthcare facility management sector through collaboration with local universities. The training programme was designed to ensure that FM companies in the healthcare sector - both public and private sector - have the knowledge, skills, and professionalism, to carry out FM activities efficiently. The modules and training content were designed and



Figure 5: The solar thermal hot water supply system at Hospital Miri Sarawak.



Figures 6A and 6B: The hydrogen fuel cell system (left) linked to a solar PV system to generate 'green' electrical energy in a rural healthcare clinic in Borneo Sarawak.

endorsed by the Advisory Council for Certified Healthcare Facility Management (IAC-CHFM), and recognised by MOH in 2015. The content also includes modules on sustainable facility and energy management, in line with the sustainability goals of MOH. Subsequently, the training programme is now being regulated by the Construction Industry Development Board (CIDB) Act (Act 520) as part of the Contractors Registration requirement under healthcare FM (F02) group (CIDB, 2017). Currently, over 150 professionals – primarily employees of the FM companies, as well as another 100 MOH engineers – have successfully completed the CHFM course.

### Hydrogen-based power solutions – the next step?

A more recent sustainability initiative for healthcare facilities in Malaysia is the application of a hydrogen gas electrification system for a rural healthcare clinic. There are a significant number of rural clinics isolated from the national power grid that rely on generators for power, resulting in a limited ability to provide healthcare services to rural communities using modern technology. However, 2022 marked another milestone for Malaysian healthcare facilities, when a hydrogen fuel cell system was successfully commissioned and tested in a Borneo Sarawak rural clinic – providing a 'green and clean' uninterrupted power supply. The system is linked to a solar PV system where access power from the solar PV passes through the electrolyser during the day to generate and store hydrogen gas, as shown in Figure 6. The hydrogen will power the fuel cell during the night to give the clinic the power it needs.

The cost to deliver and provide such infrastructure to rural healthcare facilities

is still high, but expected to become competitive over a long-term energy supply scenario. Hydrogen fuel cell technology is an emerging technology in the Malaysian healthcare sector, and perhaps one day it will become widely available in both rural and urban healthcare facilities, given the positive development of the technology both locally and abroad.

### Challenges and the way forward

Around the world, many government mandates for sustainability already exist, as governments stipulate that buildings need to be more energy-efficient and sustainable. However, financial and time constraints, as well as lack of knowledge and awareness, are barriers that need to be continually addressed. Future retrofitting projects for government healthcare buildings require substantial funding to achieve energy efficiency and green building goals. Building technology systems for smart buildings, electric ambulances, waste to energy generation, and passive building retrofits, are among a number of future initiatives set to be implemented. Business models such as Energy Performance Contracting will continue to be an attractive choice for the MOH to decarbonise its healthcare facilities, and will continue to be expanded. Complementing this is the Replacement Through Maintenance programme (RTM), which allows FM companies to replace ageing medical equipment without going through the normal procurement hassle.

### Human resource challenges

There are also ongoing challenges in terms of human capital development, as there is increasing demand for experienced Facilities managers and technical / engineering personnel. The CHFM training programme will continue to play its role in upskilling both the existing and emerging workforce with the right skills and competencies. Sustainability workshops, roadshows, and user engagement from MOH at ground level – particularly with

clinical and other hospital staff and administrators – will need to be conducted to gain support for the sustainability practices.

The energy consumption of a hospital building can be better managed and monitored via comparison with a target or benchmark, or that of another similar-sized building. MOH has been looking into this challenge by conducting important hospital energy benchmark studies. The initial study by MOH has shown that the government hospital building energy index is 172 kWh /m<sup>2</sup> / year. However, recent energy research collaboration led by the Engineering Services Division at the MOH has established an energy benchmarking model based on multiple linear regression. This enables hospital buildings to assess their energy consumption against a predicted value. The study has also indicated that energy consumption in Malaysian hospitals is largely influenced by parameters such as air-conditioned floor area, the number of operating theatres available, the quantity of high energy-consuming medical equipment, and the energy consumed by lighting. The obvious conclusion, therefore, is that that energy efficiency initiatives and sustainable practices should focus on these areas to further reduce hospital carbon footprints.

### The carbon accounting 'challenge'

Another element that remains a challenge to the MOH is carbon accounting of its hospital facilities. However, efforts are ongoing to apply GHG protocols, collect data, and submit this to data to top management personnel, as soon as possible. A carbon neutral healthcare facility (2021-2050) blueprint is in development that will outline steps for carbon neutral facility planning, and an optimal carbon reduction strategy, without compromising the quality / availability of healthcare services. In parallel, there is ongoing work to reduce GHG emissions through energy efficiency measures, reducing demand for energy, switching

to 'greener' fuels, and outsourcing to a greater degree to more efficiently run services. Additionally, MOH is looking to increase its collaboration with industry, universities, and local and international experts, on key strategic areas – namely green practice awareness, skills, knowledge, and research, and reducing emissions by enhancing energy efficiency.

**Conclusions**

Government healthcare facilities in Malaysia have experienced significant transformation since 2015, when MOH integrated sustainability programmes into the hospital FM contract. Efforts to decarbonise the healthcare sector are still ongoing, and it remains a monumental task – but many advancements and progress have been made. However, much catching up is still needed, particularly in expanding the current initiatives and pushing for more green, low carbon, and alternative energy source projects. Benchmarking of all GHG scopes is still ongoing to identify emission 'hotspots' in the healthcare system. Only then can a meaningful transition pathway towards decarbonising and Net Zero emissions be developed for Malaysia's healthcare facilities.



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