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A Net Zero Hospital: The Challenges of Establishing a Net Zero Emissions Healthcare Centre

Human health is linked to the planet, and climate change poses a serious risk. Healthcare contributes 4.4% to global CO_2 emissions. This article provides an overview of the experience of the Green Hospital project by Fundació Sanitària Mollet (Barcelona), which has successfully achieved the goal of becoming a net zero hospital in direct emissions.

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key points

- Human health is at serious risk due to climate change, affecting vulnerable groups and exacerbating global health inequalities.
- Fundació Sanitària Mollet (FSM) initiated the Green Hospital project, achieving net zero in direct emissions and committing to eliminate indirect emissions by 2050.
- Governance is the starting point for decarbonisation, focusing on institutional policies, values, and working with a vision of continuous improvement focused on tangible results.
- Defining a route to total net zero is crucial for impactful and efficient emissions reduction, with measurable goals across environmental, health, equity, governance, and education aspects.
- The Mollet University Hospital emphasises long-term vision and strategic planning for successful decarbonisation, acting as a model for sustainable healthcare.

Introduction

For a long time, it has been widely known that human health is inseparable from the health of the planet, although it is true that in recent times, much more visibility has been given to this global crisis.

The latest report, The Lancet Countdown 2023, revealed a “serious risk” to human health (Romanello 2023). With global temperatures at their highest in over 100,000 years, vulnerable groups such as the elderly and young children face increased exposure to heatwaves, droughts jeopardise water and food security, and infectious diseases spread. Economic losses and strained healthcare systems compromise our resilience and amplify global health inequalities. Projections indicate that delaying climate action will significantly worsen health outcomes, leading to increased deaths from heat-related illnesses and infectious diseases.

Similarly, at the recent COP28 held in Dubai, 123 countries signed the Climate and Health Declaration. This initiative places health at the centre of climate action and recognises the need to reduce emissions and pollution to safeguard it. The WHO Director-General, Tedros Adhanom Ghebreyesus, emphasised that it is a historic and crucial moment. The Director of the WHO Department of Environment, Climate Change, and Health, Maria Neira, stated that *“The climate crisis is a health crisis,”* and the signing of the Declaration is *“the*

realization of a dream that the global health community has been fighting for years".

Adding to all this is the fact that healthcare facilities are responsible for 4.4% of global net CO_2 emissions, highlighting that the healthcare sector is one of the major contributors to the impact of climate change.

In this context, our institution, Fundació Sanitària Mollet (FSM), a non-profit organisation providing public health and social services, managing six different centres approximately 18 km from Barcelona, acknowledges the significant environmental impact of hospitals. This led to the initiation of the Green Hospital project.

What Should be the Starting Point in Decarbonisation?

In my opinion and in line with our experience, any organisation intending to embark on a decarbonisation strategy, the starting point must be governance.

The fight against climate change must emanate from the top management of institutions and should materialise in institutional policies, values, strategic plans, and set objectives. It should not only be documented on paper but also manifested through disseminating institutional green culture, awareness and training of professionals, efficient resource management at the organisational level, and tangible results.

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The purpose of FSM is *"improving our people's lives",* in the broadest sense, encompassing not only the people we attend but also the professionals, the community, and the environment. Recognising the significant environmental impact of hospitals, Mollet University Hospital made a conscious decision to be part of the solution rather than adding to the problem. To align with this vision, the Green Hospital project was initiated during the conception phase of the hospital's construction, culminating in its opening in July 2010.

The project, active for a decade, prioritises sustainable facilities, processes, and green culture. For these reasons, in the last 12 years the Mollet University Hospital has achieved a net zero in direct emissions (scope 1 and 2). Our commitment extends beyond this milestone as we have devised a route to net zero by 2050, targeting the elimination of indirect emissions.

In this context, a results-oriented strategy and commitment to quality and continuous improvement have been key to achieving our goals.

Integrating green culture into healthcare institutions has only recently become a significant focus. However, this commitment has been evident at the University Hospital Mollet since its opening in July 2010. In 2011, it certified the safety and health management system (OSHAS 18001, currently ISO 45001). A year later, in 2012, it certified environmental management systems (ISO 14001) and energy management (ISO 50001). These management systems were followed by certifications in Social Responsibility (SR10), laboratory quality (ISO 9001), healthy company model (SIGOS), EFQM 600 seal, and Joint Commission accreditation.

Furthermore, the hospital joined the voluntary agreements to reduce CO_2 emissions of the Catalan Office of Climate Change (OCCC) in 2013. This

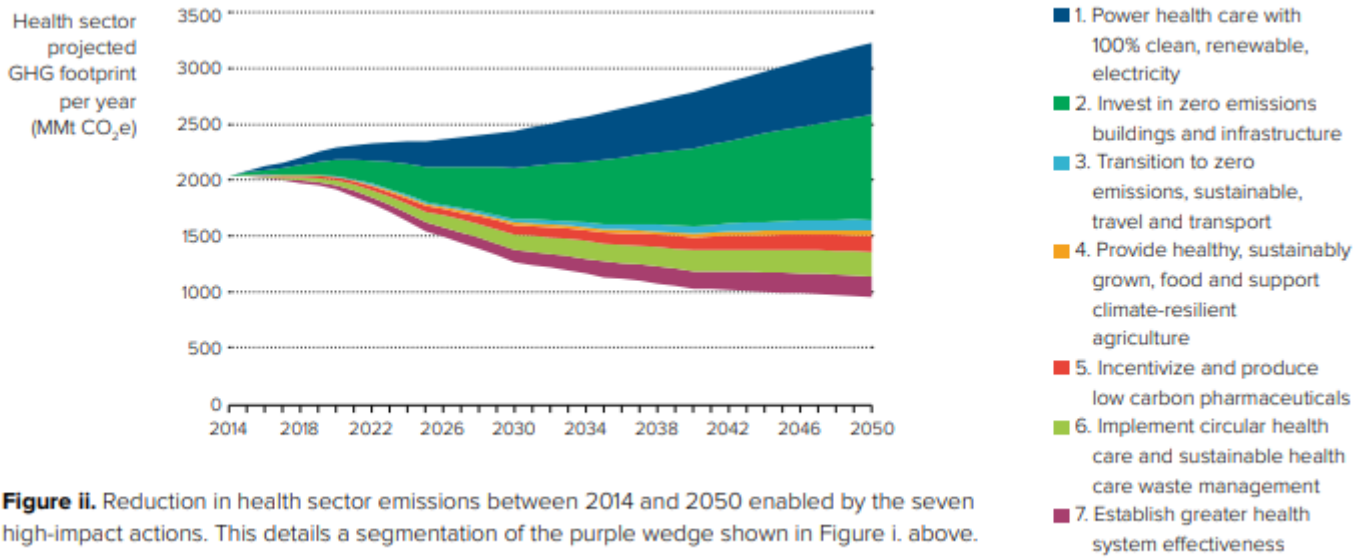

Figure ii. Reduction in health sector emissions between 2014 and 2050 enabled by the seven high-impact actions. This details a segmentation of the purple wedge shown in Figure i. above.

Source: Global Road Map for Health Care Decarbonisation - HCWH

commitment mandates the annual calculation of the hospital's carbon footprint and the development of an action plan to mitigate environmental emissions, allowing for the implementation of high-impact actions over the years to reduce the carbon footprint effectively.

As a healthcare centre providing public services, precision in implementing actions and correctly and efficiently using budgetary resources is crucial. Having implemented management systems and focusing on continuous improvement, from results analysis and indicator tracking, allows us to carry out actions that will have a significant impact, as in the Green Hospital project's decarbonisation of our activities. It also enables the proper and efficient use of the economic resources available. Thanks to this, we have become more sustainable in all environmental, healthcare, and economic aspects, demonstrating that environmental sustainability impacts healthcare and economic sustainability, even if results are sometimes seen in the medium term.

How to Accelerate Decarbonisation

According to the Health Care Without Harm - Global Road Map for Health Care Decarbonization report, there are seven high-impact actions to decarbonise the healthcare sector: 1. Power health care with 100% clean, renewable, electricity 2. Invest in zero emissions buildings and infrastructure 3. Transition to zero emissions, sustainable travel and transport 4. Provide healthy, sustainably grown food and support climate-resilient agriculture 5. Incentivise and produce low-carbon pharmaceuticals 6. Implement circular health care and sustainable health care waste management 7. Establish greater health system effectiveness.

In our Green Hospital project, the starting point was to invest in a zero-emission building and infrastructure. Since 2017, 100% of the electricity consumed comes from certified 100% renewable sources. As seen in the image, these two actions have the most significant impact on reducing CO_2 emissions in a healthcare facility.

Likewise, we have implemented actions related to the other five high-impact actions and have many more planned on our journey toward total net zero.

Currently, with the majority of actions related to infrastructure and facilities already implemented, we are conducting a process-by-process analysis, which we believe is necessary to ensure that all our activities are as sustainable as possible.

The Importance of a Climate-Smart Building

In addressing the emerging challenges posed by climate change, it is imperative to adopt a climate-smart approach in designing healthcare facilities. A climate-smart hospital building not only needs to be sustainable and low-emission but also resilient, capable of confronting the evolving challenges of climate change, such as heat waves and emerging tropical diseases,

and ensuring uninterrupted operations in the face of meteorological phenomena like droughts and floods.

Key elements of a climate-smart building encompass energy-efficient systems with low consumption, complemented by the integration of renewable energy sources. Sustainable infrastructure components, including landscaped roofs, rainwater collection systems, and vegetation to enhance biodiversity, play a crucial role.

Efficient water consumption systems, incorporating low flow, recirculation, or reuse mechanisms, are equally vital. Leveraging natural ventilation and light reduces consumption and enhances overall environmental efficiency. Constructing with sustainable materials, preferably sourced from local companies, contributes to the building's eco-friendly profile.

Moreover, in terms of resilience, the building should be adaptable to the dynamic challenges posed by climate change. Employing durable materials that can be modified according to evolving needs without generating waste is crucial. An illustrative example is the rapid adaptation of hospitals during the pandemic, where many facilities had to modify their structures within 24-48 hours to accommodate a surge in patients.

utilising over 20km of subterranean pipelines, this system taps into underground energy, resulting in an impressive 30% reduction in air conditioning energy consumption on average.

Incorporating natural courtyards and sustainable architecture is a hallmark of our hospital. Internal and natural courtyards and green light wells optimising natural light in workspaces have led to a significant 40% reduction in average light consumption. Gravel and plant rooftops enhance thermal insulation and acoustic comfort. According to the Gallecs Natural Park, our green courtyards serve as resting and nesting spots for various bird species, contributing to the well-being of healthcare professionals.

The building was designed with radiant ceilings featuring a circular plumbing system circulating hot water on the roof at a controlled temperature. This reduces daily energy consumption, promoting efficiency and providing patients with a serene, quiet environment.

Rainwater collection posed a significant challenge, and over the past decade, we have achieved a remarkable 36% reduction in water consumption on average despite increased normal activity. An 80m3 cistern collects rainwater for the courtyards.

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The Mollet University Hospital Climate-Smart Building

Situated adjacent to the protected natural and rural area of Gallecs, encompassed within the Plan of Areas of Natural Interest of Catalonia, our hospital was purposefully designed to minimise visual impact and seamlessly integrate into the natural surroundings.

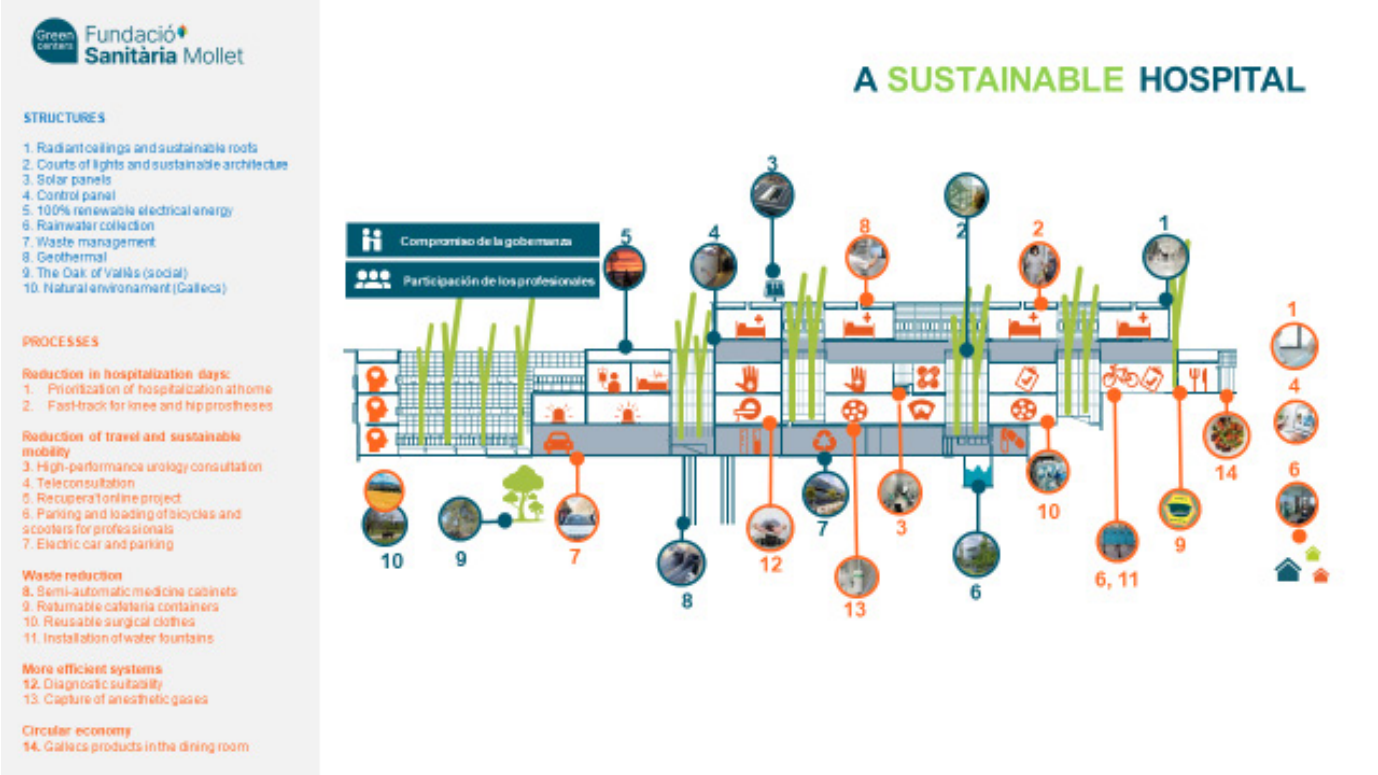
In the designated building area, a Centennial Oak Tree stood. This tree became an integral part of the project design, with the building being meticulously adapted to the terrain's volume to preserve its natural state.

The hospital also has a Geothermal System, which at the time was the fourth-largest project in Europe. Comprising 148 wells, each 146 meters deep, and

Four years ago, a major installation was completed: the photovoltaic plant. Designed with horizontal architecture, 80% of the roof was designated for solar panel installation. In 2023, energy production represented over 13% of the total, substantially reducing approximately 120 annual tons of carbon emissions, equivalent to planting 240 trees per year.

Process Improvement in Healthcare Sustainability

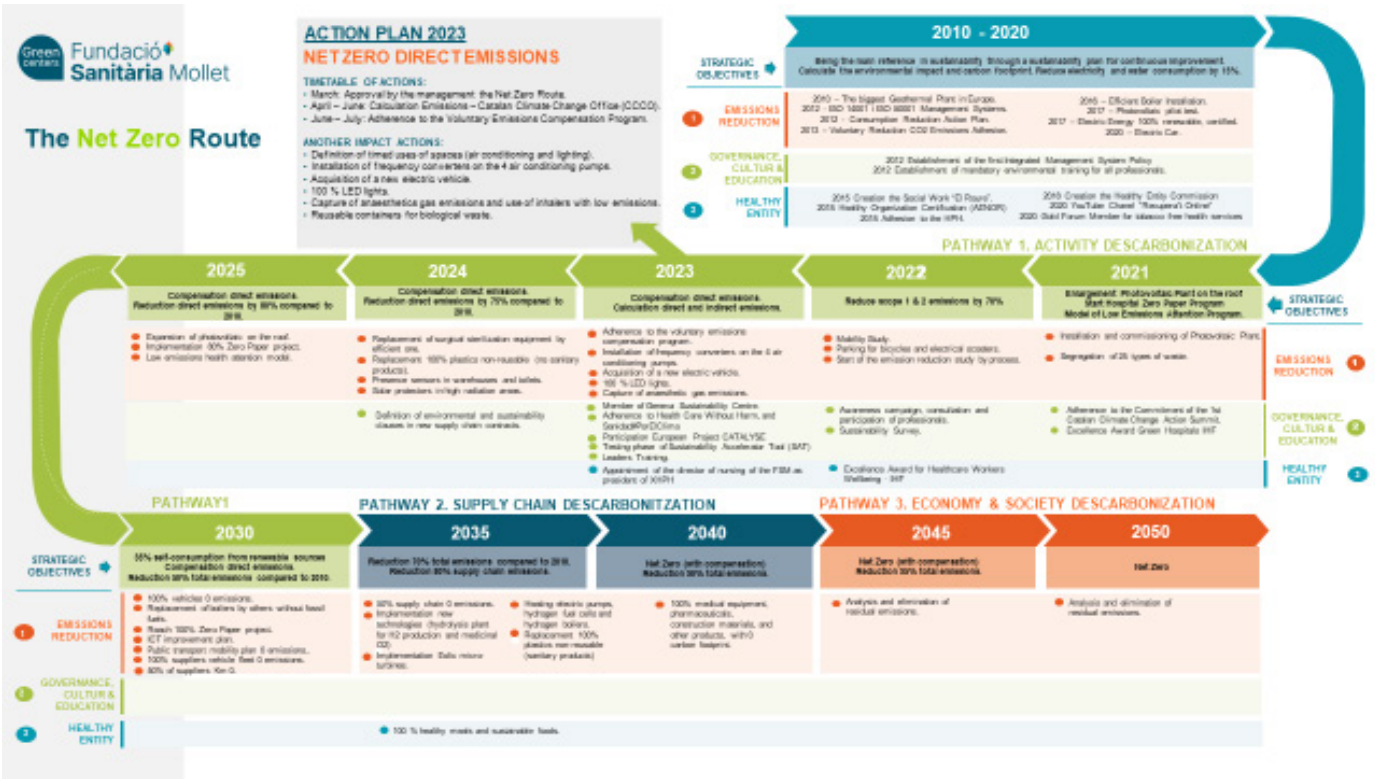
Process analysis is a critical element in diminishing the environmental impact within a healthcare institution. A meticulous examination of each area and activity is indispensable to optimize efficiency. This is imperative because, for example, the environmental impact



varies significantly between the surgical area and the hospitalisation process, with distinctions in factors such as energy consumption, consumable material usage, and waste generation.

Outlined below are key points and actions integral to our consideration in each of the processes:

- Recycling and Waste Management Enhancement: Over the past 11 years, a comprehensive revision of recycling and waste management has elevated the number of waste segregation types from 9 to 29, showcasing a commitment to more sustainable practices. The ongoing focus remains on refining recycling and waste management strategies.
- Reduction of Inpatient Stay Duration: Addressing the length of stay in inpatient units is a crucial action since each day of hospitalisation generates 7kg of waste. By minimising unnecessary stays, both the environmental impact and waste generation are curtailed. Prioritising home hospitalisation and implementing streamlined processes such as the Fast Track for knee and hip replacement effectively reduce hospital stays.
- Avoidance of Unnecessary Travel and Mobility: Acknowledging that 7% of indirect emissions result from transportation, we are actively working on process improvements to minimise hospital visits. The adoption of online consultations has surged by 24%. Additionally, introducing a high-performance urology outpatient visit and a Rehabilitation Service YouTube channel enhances treatment follow-up from the comfort of patients' homes.
- Preventing Unnecessary Duplication of Diagnostic Tests: The high environmental impact of diagnostic tests on energy consumption and waste generation underscores the need to scrutinise processes to avoid unnecessary tests. This not only benefits patients but also contributes to environmental and economic sustainability.
- Implementing More Efficient Systems: Considering new, more efficient systems is crucial in decision-making. In our case, we have implemented different projects focus on sustainable initiatives such as the recovery and treatment of anaesthetic gases harmful to the ozone layer, improvements in sterilisation circuits for water conservation, the utilisation of recyclable materials in the surgical block, and the treatment of dialysis plant waters. Additionally, implementing a new Semi-automated drug-dispensing system has reduced medication waste by 29%, concurrently enhancing patient safety and process efficiency.



A Sustainable Hospital

As a result of the actions and policies implemented by governance, the improvement of structures and facilities, and the analysis of processes to make them more sustainable, we have a sustainable hospital today. In any of its areas, actions can be observed, as depicted in the following infographic, where actions related to structures are represented in blue, and those related to processes are represented in orange.

The Green Culture

Establishing a green culture within an institution is another key element in advancing healthcare decarbonisation. The active engagement of professionals is crucial, as they play a central role in the battle against climate change, contributing improvement proposals to enhance the sustainability of their work processes.

The decisive involvement of all professionals played a crucial role in identifying the most viable actions with the greatest impact on reducing the carbon footprint. Effectively communicating senior management's commitment to sustainability posed a notable challenge. Consequently, in 2012, it was mandated that environmental training become mandatory for all professionals, ensuring the organisation's dedication to environmental stewardship resonates throughout the entire staff.

Moreover, organisations need to assess professionals' perceptions of climate change, their training, and the implementation of best practices. In our specific case, this information is validated through periodic surveys, providing insights into the high level of engagement among our employees.

The Need to Define a Route to Total Net Zero

Some might wonder if defining a route to net zero is truly necessary. In response to that question, my answer would be affirmative. Defining a net zero roadmap is necessary to identify the key aspects that will have the greatest impact on both health and the environment. Likewise, establishing coherent planning of the actions with the greatest impact will allow the reduction of emissions more efficiently.

In our case, as an entity providing a public service and operating within a public budget, we cannot implement all the actions or measures we would like due to a lack

of incentives from the authorities. For this reason, having a route to net zero allows us to establish a realistic and purposeful action plan, prioritising those that will have a greater impact on emissions reduction. It ensures that we do not overlook or forget important actions that cannot be materialised at the present moment.

Our strategy relies on three pillars: Governance, Culture, and Education; Environmental Impact Reduction; and Healthy Entity Project. We actively engage professionals and stakeholders and share knowledge on our path to net zero.

Similarly, three paths have been defined. Pathway 1 is the decarbonisation of our activity; pathway 2 is the decarbonisation of our supply chain, where we are already taking actions with the goal of becoming a total net zero Hospital by 2040 (including indirect emissions), pathway 3 involves eliminating any residual emissions through the decarbonisation of the economy and society. Our plan includes measurable goals for environmental impact, health, equity, governance, and education.

Conclusion

The climate crisis is also a health crisis for people. Considering that healthcare centres are one of the activities with the greatest environmental impact, we cannot stand idly by; we must act quickly to reduce our emissions.

To meet the challenge of zero emissions in healthcare centres, the starting point should be governance. This challenge should be reflected in the policies, objectives, and strategic plans of the organisation.

Furthermore, although not mandatory, having implemented management systems and focusing on continuous improvement, analysing results, and monitoring indicators will enable us to carry out actions with a greater impact on decarbonising our activity. This approach ensures the correct and efficient use of the economic resources at our disposal. As a result, we can be more sustainable in all environmental, healthcare, and economic aspects, demonstrating that environmental sustainability affects healthcare and economic sustainability, even if results are sometimes seen in the medium term.

Regarding the implementation of actions, transforming centres into climate-smart buildings, using energy from renewable sources, and conducting a thorough analysis of each process (sustainable and zero-emission mobility, healthy and sustainable nutrition, low-carbon pharmaceuticals, circular economy, system efficiency) is crucial.

Similarly, for a decarbonisation project to be successful, as in the case of our Green Hospital project, implementing a green culture among all stakeholders involved, including professionals, patients, suppliers, the community, etc., should be considered.

Without all the aspects above, the Mollet University Hospital could not have achieved the challenge of being a net zero centre in direct emissions.

On the other hand, any viable strategy must include a long-term vision, which is why we have outlined a route to total net zero, including indirect emissions, by the year 2050. We have planned future actions and strategic objectives based on the three key pillars mentioned above.

Conflict of Interest

None.

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