Pan American Health Organization
World Health Organization
REGIONAL OFFICE FOR THE Americas

PAHO

# Smart Health Care Facilities in the Caribbean

## Final Report


The Georgetown Smart Health Centre was completed in January 2023.

August 2023

# Content

## Executive summary[1]

The Smart Hospitals project successfully established a new paradigm that added climate change mitigation (green) to the safety of facilities to natural hazards. The project lasted from 2015 to 2023.

With this initiative, a new gold standard of A/70 has been established as the resilience goal for health facilities in the Region. 28 of the 55 health facilities retrofitted through the UK-funded project met this A/70 target, while an additional 6 facilities are between A50 and A70. The project further demonstrated the importance of embodied carbon benefits when retrofitting rather than building new facilities.

The main project outcome of "increased protection from disasters and climate change for health facilities" in seven target countries was achieved and put to test after Hurricane Elsa in Belize and the volcanic eruption in St Vincent and the Grenadines. Main achievements included:

- 1,284 people trained in the use of smart hospitals tools.
- 415 facilities assessed using the smart hospitals toolkit.
- 55 facilities made more resilient through structural, non-structural and functional improvements.
- Over 850,000 people now have access to more reliable health services in a time of disaster as proven in several events in the past two years. See annex 4.
- Check consultants, a group of experts recognized as among the best in the Region were brought in at several stages of the project and proved instrumental in ensuring that the highest standards are applied.

Selecting and bringing 55 retrofitting projects across the finish line was a complicated process but a significant accomplishment as it involved the coordination of over 100 contracts and about 40 professionals in 7 different countries.

Although the effectiveness of the concept Safe + Green is now proven, the Smart hospitals model policy is not yet fully or formally adopted by governments and donors and did not result in a significant change of attitude at individual level, as stated in the external evaluation and shown in the results of KAP analysis conducted by Florida International University.

Initially, the intent of the project was to take a limited number of health facilities in the seven project countries and bring them to A/70. However, some governments argued for a more pragmatic and health system network approach (bringing a few facilities to A/70 but also supporting a larger number of facilities to improve to around B/65). This was done in Saint Lucia and Jamaica on small facilities with nearby alternate service providers, no inpatient capacity, and providing occasional services through rotating clinics.

Frequently, facility staff argued for more attention to functional improvements such as patient flow and patient comfort. By listening to national priorities and staff preferences, the project has attempted to comply with the requests, thus generating higher levels of government ownership, staff morale and patient confidence, and thereby gained sustainability and health service benefits.

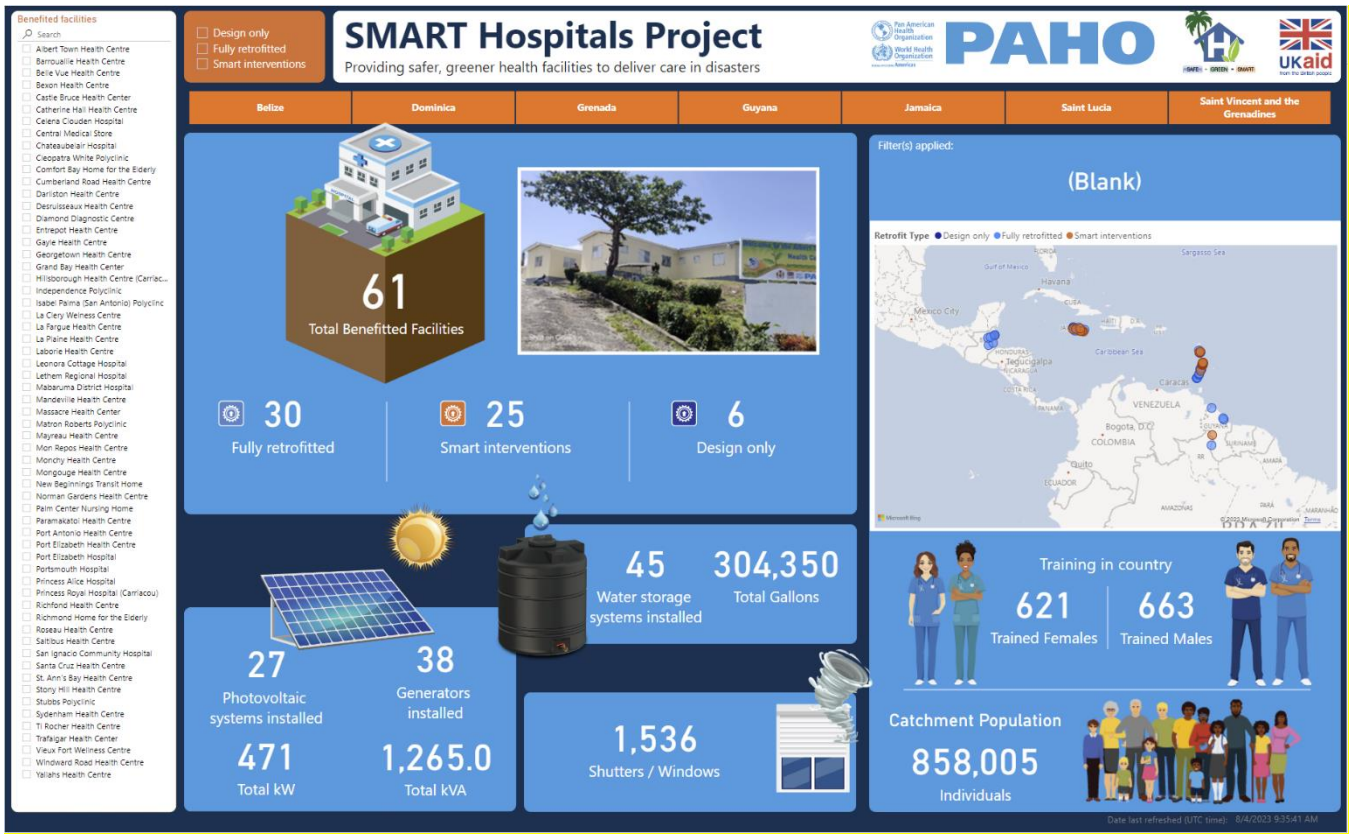
[1] This executive project summary is based on the external Smart project evaluation report 2022.

The Smart hospitals concept has been proven, and there is a higher level of awareness of Smart facilities principles among donors and in a community of officials and technical experts spread throughout the Caribbean region. There are indications that Smart facilities principles are being considered outside the Region, and in other sectors.

Building on the successful implementation of the concept in the Caribbean, PAHO is now looking at expanding the Smart hospitals initiative through the implementation of aftercare activities in the targeted countries, provision of technical assistance to countries planning new health facilities, and direct support to additional countries in Latin America and the Caribbean.

Maintenance was recognized as a risk at the outset of the project; however, it mainly came into focus as facilities started to be handed back to governments after retrofitting (1). Also, the communication strategy needed more finetuning and emphasis on the public rather than national authorities and facility staff.

Investment in purposeful innovations for climate change mitigation will continue to be paramount in the future as well as investment in skills and training if we want to reach a cultural shift. The FCDO-funded project helped prove the viability of the concept at large scale and champion the smart facilities standards which were presented to and are progressively being adopted by other partners, donors and sectors. As example of this is the Lancet Planetary Health commission working group on resilience, where the Smart hospitals information was shared with the working group on Disaster resilience and will be included into the framework as a practical example.



## 1.1 Summary for Output 1

### Achievements

All milestones for output 1 were already achieved or exceeded during the previous reporting periods. During this last reporting period (1 Nov. 2022 – 30 April 2023), the final preventive maintenance course was conducted in Dominica, from 28-30 November 2022, with participation of 16 males and 3 females. This brings the total number of people trained in a variety of the Smart toolkit elements to 1,284 (663 males and 621 females). In addition to the preventive maintenance manual, a maintenance course outline was developed by the PAHO MEP Consultant in March 2023, in collaboration with the BVI Community College. This course is accessible for students from the entire Caribbean region.

#### *Update from Florida International University*

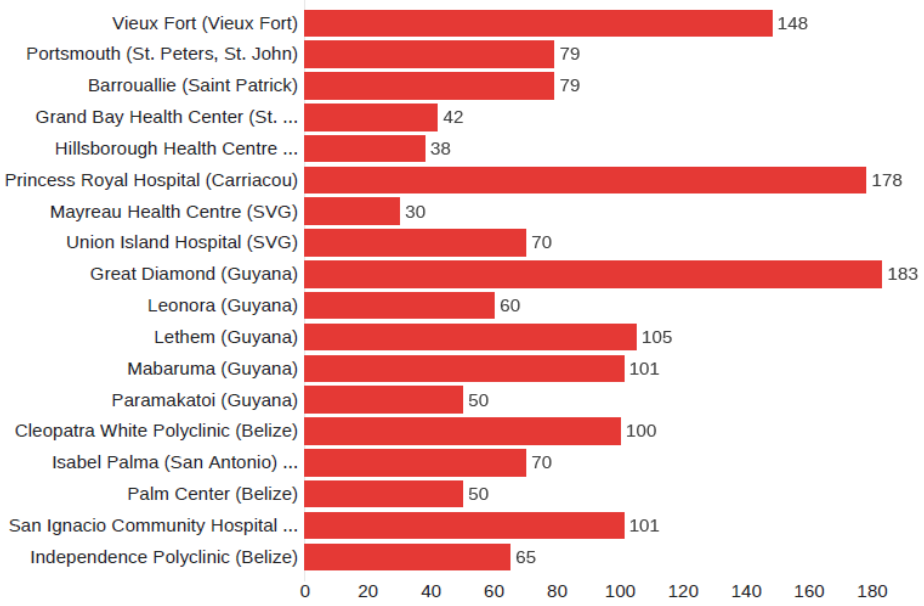
Florida International University (FIU) has been collaborating with PAHO to incorporate the Retrofitting Economic Support Tool (REST) in the Smart application. The REST is currently implemented in Excel as a stand-alone tool that users can obtain from http://hma.fiu.edu/rest and use offline. The tool allows inputting values and producing a Cost-Effectiveness Analysis report to support decision-making in retrofitting health care facilities to meet consensus Smart standards.

REST has been used by PAHO consultants in four countries. A total of 12 REST reports have been produced in Saint Lucia (Richfond Wellness Centre, Mongouge Wellness Centre, Vieux Fort Wellness Centre), Dominica (Grand Bay Health Centre, La Plaine Health Centre, Portsmouth Hospital), Jamaica (Mandeville Comprehensive Health Centre, St. Ann's Bay Health Center, Albert Town Health Center, Port Antonio Health Center), and Saint Vincent and the Grenadines (Barrouallie Health Center, Chateaubelair).

Two important messages can be obtained from the results on the economic evaluation of Smart retrofitting in the Caribbean. First, all projects are cost effective. If decisions are solely based on money, Smart projects cannot produce enough return to compensate for the investment in the immediate future; however, when health value is incorporated into the analysis through QALYs, all projects show enough value for the money. Second, energy savings are the main driver of return on investment but, in general, green investment (energy and water) are highly volatile. Results from the pre-retrofitting REST analysis showed large savings projected based on the technical specifications of energy and water invested equipment. However, actual savings are much smaller post retrofitting, because post-retrofitting investment costs were higher than initially projected, and actual water and energy consumption were higher than the projections based on technical specifications. This is also due to additional equipment installed after facilities had been retrofitted.

FIU coordinated with PAHO and country enumerators the KAP post-retrofitting survey adjustment and collection in Saint Lucia (Vieux Fort), Dominica (Portsmouth, Grand Bay), Saint Vincent and the Grenadines (Barrouallie, Union Island Hospital, Mayreau Health Centre), Carriacou (Princess Royal Hospital, Hillsborough Health Centre), Belize (Cleopatra White Polyclinic, Independence Polyclinic, Isabel Palma Polyclinc, Palm Center, San Ignacio Community Hospital), and Guyana (Great Diamond, Leonora, Lethem, Mabaruma, Paramakatoi). A total of 1,552 responses were collected, as shown in the figure below presenting the sample size for the communities served by each healthcare facility. Descriptive statistics show a better sample representation for female respondents (53% in the eighteen surveyed communities), job categories (unemployed and service sectors well represented), and education (primary and secondary education well represented). The results also show the impact of COVID-19 on day-to-day life, with 71% of respondents affirming that the COVID-19 pandemic negatively affected their lives, and 49% who avoided visiting health facilities due to the pandemic. An important result of the

KAP analysis is the existence of a disconnect between an increased knowledge about Smart facilities and an unchanged perception of safety. The fact that Smart hospitals knowledge is not changing safety perceptions seems to be associated to a misconception of the Smart facilities definition. Most people equal the Smart hospitals concept to energy efficiency and even hi-tech buildings. The safe component of Smart hospitals is not fully captured in the initial KAP survey, reducing the opportunities to improve risk perception.




### *Smart technical documents*

During this reporting period no new technical documents were produced. A consultant is working on the adaptation of the Smart green checklist to be used in Latin America. The NGO Earth Medic also showed interest to use the green checklist for bigger healthcare facilities in Trinidad.

The consolidated Smart Toolkit with all the technical documents is available online on PAHO's webpage at https://www.paho.org/en/health-emergencies/smart-hospitals; it has been shared with many other countries outside the project and was translated into Spanish.

### Lessons Identified for Output 1:

1. High turnover of health staff and trainees who participated in the project courses (HSI/Green surveys, contingency and conservation planning, BAT, maintenance) hampered the retainment of knowledge.
2. A more rigorous selection of course participants is needed, since the qualifications of course participants did not always meet the requirements (for example, structural engineers). Attempts to correct this were done in refresher courses. MoH made a serious effort to improve the selection and nomination of qualified staff.
3. The Smart facilities concept was frequently confused with IT technologies and A70 gold standard was recommended by external evaluators, however this may be less catchy for the public or national authorities.

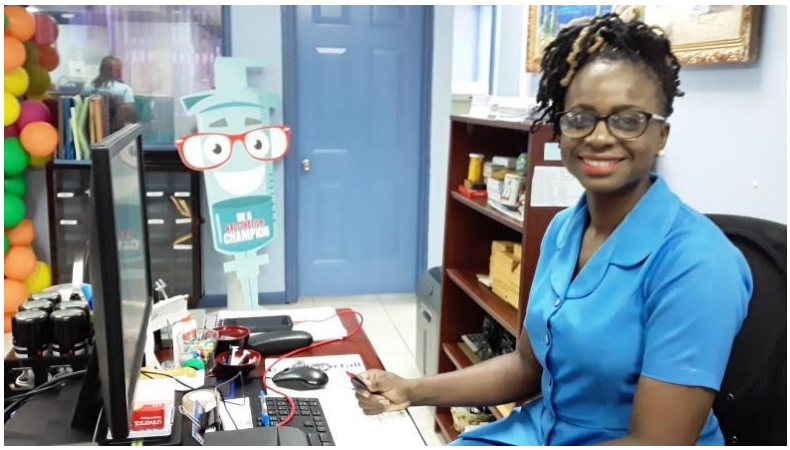
## 1.2 Summary for Output 2

As of 30 April 2023, the number of retrofitted and designed Smart health facilities is as follows:

- 55 facilities completed, out of defects liability and handed over to the Ministries of Health.
- One facility design phase 1 completed.[2]
- Five facilities full design 1 and 2 documents completed and handed over to MoH.

A total of 61 contracts were managed for design/inspection firms and contractors.

As part of the Smart 'after care' project, all the facility managers of the 55 intervened facilities received the essential technical documentation on a USB flash drive. A consolidated USB was provided to the MoH and the PAHO offices. See also letter in annex 9.



*In May 2023 Nurse Persia Adjodha Region 4 Facility Manager for the Desruisseaux and Mon Repos Wellness Centres received the USB with all the essential Smart information.*

### Dominica

#### Achievements

In Dominica three healthcare facilities were fully retrofitted according to the A70 gold standard. Two additional facilities received specific Smart interventions; one additional facility received a minor upgrade. Additionally, a full A70 design was handed over to the MoH to attract different donor funding.

[2] Design Firm MH was only able to finish design 1 documents for Stubbs Polyclinic in St. Vincent and the Grenadines, which were handed over to MOHWE.



*Table 1. Dominica HSI and Green scores before and after retrofitting + total costs*

| Dominica: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | **Portsmouth Hospital** | B47 | A73 | $ 1,211,754.35 |
| 2 | **Roseau HC** | C28 | Design only | $ 26,921,50 |
| 3 | **Grand Bay HC** | B41 | A77 | $ 1,382,600.74 |
| 4 | **La Plaine HC** | B40 | A80 | $ 656,317.48 |
| 5 | **Trafalgar HC** | B36 | B59 | $ 177,389.42 |
| 6 | **Massacre HC** | B47 | B60 | $ 167,849.11 |
| 7 | **Castle Bruce HC** | B36 | B36 | $ 5,000.00 (Small interventions only) |
| | | | **Total** | **$ 3,627,832,60** |

## Saint Lucia

### Achievements

In Saint Lucia, three healthcare facilities were fully retrofitted according to the A70 standard. Twelve other facilities received specific Smart interventions. Additionally, a full A70 design was handed over to the MoH to attract different donor funding.

Even after all the retrofitted facilities got out of their defect liability periods, the PAHO country supervisor continued to visit all the facilities on a regular basis in support of the maintenance efforts of the Ministry of Health in order to guarantee sustainability of the interventions. The PAHO country supervisor also supported the OECS project funded by the World Bank by sharing the Smart project lessons identified.



*Table 2. Saint Lucia HSI and Green scores before and after retrofitting + total costs*

| Saint Lucia HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | Comfort Bay | B53 | A86 | $ 1,354,989.93 |
| 2 | Vieux Fort | B32 | A74 | $ 1,316,803.42 |
| 3 | Transit Home | C39 | A73 | |
| 4 | La Clery HC | C24 | Design only | $ 104,698.13 |
| 5 | Bexon HC | C16 | B48 | $ 381,556.02 |
| 6 | Richfond HC | C42 | B49 | |
| 7 | Laborie HC | C36 | B57 | |
| 8 | Entrepot HC | B25 | B61 | $ 441,834.78 |
| 9 | Monchy HC | B33 | A61 | |
| 10 | Ti Rocher HC | C25 | B52 | |
| 11 | Belle Vue HC | B40 | B60 | $ 304,879.86 |
| 12 | Desruisseaux HC | C40 | B61 | |
| 13 | Mon Repos HC | C40 | B61 | |
| 14 | La Fargue HC | B31 | B56 | $ 324,539.02 |
| 15 | Saltibus HC | B16 | B63 | |
| 16 | Mongouge HC | C32 | B58 | |
| | | | Total | $ 4,336,848.64 |

## Saint Vincent and the Grenadines

### Achievements

In Saint Vincent and the Grenadines, six healthcare facilities were fully retrofitted according to the A70 standard (after the demonstration project at Georgetown Hospital during phase 1). One additional facility received limited Smart interventions. Additionally, a design 1 report was handed over to the MoH to attract alternative donor funding.

The final facility retrofitted in Saint Vincent and the Grenadines was the Georgetown Health Centre. This facility was handed over to national authorities on 20 March 2023. See also paragraph 1.3.



*Table 3. Saint Vincent and the Grenadines: HSI and Green scores before and after retrofitting + total costs*

| Saint Vincent and the Grenadines: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | **Chateaubelair Hospital** | B26 | A76 | $ 879,000.66 |
| 2 | **Barrouallie HC** | B36 | A67 | $ 1,133,192.34 |
| 3 | **Mayreau HC** | C41 | A62 | $ 441,935.08 |
| 4 | **Celena Clouden Hospital (Union Island)** | B49 | A71 | $ 906,267.22 |
| 5 | **Port Elizabeth HC** | | A83 | $ 257,437.64 |
| 6 | **Port Elizabeth Hospital** | B51 | B55 | $ 74,926.72 |
| 7 | **Georgetown HC** | B33 | A82 | $ 1,155,823.79 |
| 8 | **Stubbs HC** | B34 | Design only | $ 38,250.00 |
| | | | **Total** | **$ 4,886,833.45** |

# Grenada

## Achievements

In Grenada, five healthcare facilities were fully retrofitted according to the A70 standard. The retrofitting of the Richmond Home for the Elderly is a step forward in protecting a vulnerable group.

The retrofitting of the Central Medical Stores safeguards the strategic supply of medications and medical equipment.

In Carriacou, the Hillsborough Smart Health Centre helped decrease the patient load on Princess Royal Smart Hospital. Using different funding, PAHO was also able to provide some medical equipment to these facilities. The project was also well received by the local authorities on Carriacou because of the positive economic labour boost during a difficult COVID-19 period.



*Table 4. Grenada: HSI and Green scores before and after retrofitting + total costs*

| Grenada: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | **Princess Alice Hospital** | B44 | A81 | $ 926,167.88 |
| 2 | **CMS** | B29 | A71 | $ 557,406.26 |
| 3 | **Princess Royal Hospital** | C50 | A77 | $ 2,140,282.95 |
| 4 | **Hillsborough HC** | C30 | A71 | |
| 5 | **Richmond Home** | C61 | A83 | $ 2,281,508.89 |
| 6 | | | **Total** | **$ 5,905,365.98** |

# Belize

## Achievements

In Belize, five healthcare facilities were fully retrofitted according to the A70 standard. Additionally, a full A70 design was handed over to the MoH to attract different donor funding. The retrofitting of the Palm Centre facility addressed an urgent need for healthcare services to a specific vulnerable group.

Additional funding from the EU was secured based upon the Smart Toolkit and FCDO funded activities, which ensured that all health regions in Belize now have a Smart facility to provide care in disasters.



*Table 5. Belize: HSI and Green scores before and after retrofitting + total costs*

| Belize: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting[3] | Total cost for design, inspection, and retrofitting (USD) |
| 1 | **Cleopatra White PC** | C17 | A76 | $ 1,400,437.10 |
| 2 | **San Ignacio Community Hospital** | B34 | A81 | $ 1,867,380.48 |
| 3 | **Palm Centre Nursing Home** | C33 | A72 | $ 794,138.05 |
| 4 | **Matron Roberts PC** | B45 | Design only | $ 9,360.00 |
| 5 | **Independence PC** | C23 | A76 | $ 1,349,301.62 |
| 6 | **Isabel Palma PC** | B25 | A68 | $ 526,544.74 |
| | | | **Total** | **$ 5,947,161.99** |

[3] The PAHO team in Belize has reviewed the HSI checklist assessments based on feedback from the external evaluators and PAHO principals consultants. The Green checklist assessments were also reviewed and the health staff was advised on how to evaluate the score. Note: application of HSI and Green checklist have an aspect of judgement, therefore limited technical knowledge of the evaluators can result in a degree of bias and had to be reviewed.

## Guyana

### Achievements

The retrofitting of Paramakatoi Health Centre started in February 2022 and was finished in March 2023. The handover took place on 8 April 2023. Works were delayed due to the damaged Guyana Defence Force (GDF) plane and torrential rains that hampered the road transport of supplies. As discussed between GDF, PAHO and FCDO, the GDF used local workers to ensure the direct community engagement in this initiative and positive economic outcome for the local Patamona population.

Smarting of facilities in interior locations like Paramakatoi, Lethem and Mabaruma provided increased access to healthcare services for the Amerindian groups as well as refugees and migrants from Venezuela.

The Smart concept was acknowledged at the highest political level and will be promoted in projects funded by other donors or financial institutions. The President of Guyana himself participated in some of the handovers showing the commitment and ownership of the government at the highest levels. The Inter-American Development Bank also recognized the importance that the Government has given to the smart concept and standards.


*Table 6. Guyana: HSI and Green scores before and after retrofitting + total costs*

| Guyana: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | **Diamond Diagnostic Centre** | C27 | A73 | $ 1,145,459.28 |
| 2 | **Leonora Cottage Hospital** | C24 | A87 | $ 1,390,571.16 |
| 3 | **Mabaruma Hospital** | C31 | A87 | $ 949,061.05 |
| 4 | **Lethem Hospital** | C42 | A75 | $ 884,833.81 |
| 5 | **Paramakatoi Health Centre** | C18 | A79 | $ 298,049.48 |
| | | | **Total** | **$ 4,667,974.78** |

## Jamaica

### Achievements

In Jamaica, four healthcare facilities were fully retrofitted according to the A70 gold standard. Eight additional facilities received specific Smart interventions only. Additionally, two full A70 designs were handed over to the MoHW to attract alternative funding.

The retrofitting of the Santa Cruz and Mandeville Health Centres were completed in February 2023.

As in Saint Lucia, the concept of small Smart interventions was adopted to improve the safety and resilience of more facilities during and after disasters. The adoption of Smart model policy is envisaged by MoHW.


*Table 7. Jamaica: HSI and Green scores before and after retrofitting + total costs*

| Jamaica: HSI and Green scores before and after retrofitting + total costs. | | | | |
|---|---|---|---|---|
| # | Facility name | HSI and Green score before retrofitting | HSI and Green score after retrofitting | Total cost for design, inspection, and retrofitting (USD) |
| 1 | Port Antonio HC | B44 | A71 | $ 1,608,745.06 |
| 2 | St. Ann's Bay HC | B29 | A70 | $ 909,907.29 |
| 3 | Mandeville HC | B27 | A70 | $ 1,704,873.03 |
| 4 | Santa Cruz HC | B22 | A71 | $ 1,312,138.02 |
| 5 | Catherine Hall | B22 | Design only | $ 1,042,434.34 |
| 6 | Albert Town HC | B24 | A53 | |
| 7 | Darliston HC | B12 | B33 | |
| 8 | Gayle HC | B31 | A51 | |
| 9 | Yallah's HC | B19 | B19 | $ 162,776.60 |
| 10 | Windward Road HC | B36 | B36 | |
| 11 | Norman Gardens HC | C14 | C14 | |
| 12 | Sydenham HC | C11 | C11 | |
| 13 | Cumberland Road HC | B16 | B16 | |
| 14 | Stony Hill HC | C21 | Design only | $ 26,145.90 |
| | | | **Total** | **$ 6,926,739.98** |

## Lessons Identified for Output 2:

***Design and construction***

1. Ensure a quality design process: genuine two-way facility consultations on design preferences are needed, ensuring the government is fully engaged in Design stage 1 (multi-stakeholder site visits to confirm key design parameters), as well as managing a procurement process that focuses on quality rather than on cheap designers.
2. Use check consultants to ensure the quality of design and construction: even the best work benefits from an expert second opinion, and some safe or green components are not immediately visible. To be certified A/70 an independent expert verification is needed.[4]
3. Support from structural, MEP, QS check consultants was essential during the entire project. Lack of understanding of structural calculations and specific MEP designs required their support throughout.
4. Frequent requests of changes in the scope of works by the MoH after designs were already approved resulted in an increase of costs and time.
5. As built drawings were unavailable for any of the selected facilities, the design firms had to do a floorplan, and MEP drawings were not available, causing surprises after small demolition works which resulted in delays and cost increases.
6. Benefits from the installation of PV systems and batteries are dependent on local regulations.
7. On-island/in-country design and inspection firms should be used. Inspection should be done on a regular basis and must not be hampered by travel restrictions. Using designers from another island resulted in limited local knowledge of material prices/construction business.
8. Use of joint ventures (example Keechanona-Sonrise JV retrofitting Richmond Home for the Elderly, and CMS in Grenada) resulted in mutual benefit for contractors and stakeholders and improved local capacity through on-the-job training.

[4] First two lessons are from the external evaluators report.

9. Do not bundle facilities into a single contract. Most of the design firms and contractors do not have the capacity to handle more than two facilities simultaneously. Contractors tend to tender for more facilities once they understand PAHO procurement expectations.
10. Provide direct assistance to designers in light of shortage of QS consultants, structural, and MEP engineers.
11. Guidelines and templates for design firms and contractors have been developed per country. These were essential to increase awareness of the design standards that the project expects but also of what the project can do or not do.
12. Include the aspect of maintenance from the start of the design and prepare facility specific maintenance checklists.
13. Communication and information on scope of works should be shared with all stakeholders. This should prevent ad hoc requests for change in scope of works during the retrofitting stage.
14. Awareness of significant savings in electricity and water consumption need to be shared.
15. By using the retrofitting concept, the project did not increase embodied carbon associated with new buildings. This is an unintended benefit; however, it is quite significant.

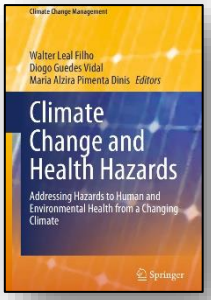
***Project management***

1. Review content RFPs (for design firms) and ITBs (for contractors) and specifically adjust to Smart retrofitting requirements as well as to what the contractors are familiar with.
2. Bulk procurement was being attempted in Saint Lucia, but local companies are quite small and do not have enough items to make it worthwhile. Previous attempts at bulk procurement resulted in delays after hurricanes Irma and Maria. In Saint Lucia, local companies do not have the number of generators required and Florida companies will not provide warranty if they do not do the installation.
3. Every line item in the BoQ is currently in USD, which could lead to increased costs. Line items should be in local currency and final contract amount should be converted into USD.
4. PAHO internal administrative and procurement processes were negatively impacted by the extraordinary demand placed on the organization due to the COVID-19 pandemic which required an organization-wide response, resulting in longer approval processes.
5. Some of PAHO procurement regulations are regarded as unorthodox and unfamiliar to the construction industry, such as the absence of a contingency sum in the bill of quantities or provisional lump sums.
6. PAHO selection process of design firms need to be upgraded to attract higher quality of designers. This can be done by including additional evaluation criteria and a penalty clause. Requirement for pre-qualification process design firms and contractors will shorten the tender selection and ensure a pool of fully qualified designers or contractors.

The project took a flexible approach trying to accommodate specific requests by the governments and PAHO requirements. Upon advice from FCDO, M&E, data collection and reporting was strengthened to better document this innovative initiative.

## 1.3 Summary for Output 3

### Achievements




The Smart hospital concept contributed to shape the climate change resilience and disaster risk reduction landscape throughout the Region of the Americas and beyond. An article on "*Increasing Healthcare Facilities Resilience to Hazards Resulting from Climate Change"* was published by Springer in April 2023 and written by a PAHO country supervisor with support of the project team as part of the book on *Climate Change and Health Hazards*.

The following final eight Smart healthcare facilities were officially handed over to the Ministries of Health. All these handovers attracted significant media coverage in local newspapers and MoH social media sites:

#### *Jamaica*

1. Port Antonio Health Centre (17 February 2023)
2. Mandeville Health Centre (5 May 2023)
3. Santa Cruz Health Centre (5 May 2023)



#### *Guyana*

4. Mabaruma District Hospital (16 December 2022)
5. Paramakatoi Health Centre (8 April 2023)



During the handover of the Paramakatoi Health Centre, medical equipment including wheelchairs and stretchers were also provided as requested by MoH Guyana to cover for their disaster management needs.

***Saint Vincent and the Grenadines***

6. Georgetown Health Centre (20 March 2023) (see picture in the cover page of this report)


*From left to right: Mr. Seon Samuel, Political and Projects Officer, British High Commission, Hon Dr Ralph E Gonsalves, Prime Minister, St. Vincent and the Grenadines, Dr. Amalia Del Riego, PAHO/WHO Representative for Barbados and the Eastern Caribbean Countries and Hon. Mr. Jimmy Prince, Minister of Health, Wellness and the Environment during the ceremonial handover of the Georgetown Smart Health Centre on Monday 20th March 2023.*

### *Grenada*

7. Hillsborough Health Centre (24 March 2023)
8. Princess Royal Hospital (24 March 2023)

See also: https://bit.ly/42Q7vOr


- The Smart video produced by PAHO Guyana in close collaboration with the MoH and FCDO was finalized and includes footage of the completed Smart facilities. Additionally, PAHO Guyana completed a separate video on the retrofitting of the Paramakatoi Health Centre, including the participation of the local community. It can be found here: https://youtu.be/v6LB26HIFUs.
- All the Smart project video's can be found here: https://www.youtube.com/@PAHOTV/search?query=smart
- The World Bank is implementing a similar project in the four OECS countries, covering about 27 health care facilities, using the Smart Hospitals concept. The Health Emergency Operations Centre in Saint Vincent and the Grenadines (funded by NGO) will also be constructed according to the Smart facilities standards. Our check and technical consultants were asked to also support their project for quality assurance.
- The Inter-American Development Bank (IADB) expressed interest in receiving all information on smart standards and pursuing the issue with Caribbean Governments currently receiving loans for health facilities.
- In addition to the seven project countries cover by the FCDO contribution, 12 countries and territories have benefitted from this project, including Antigua and Barbuda, Bahamas, Barbados, Saint Kitts and Nevis, Suriname, Trinidad and Tobago, Turks and Caicos, and Anguilla. These activities were also implemented by PAHO and funded by Global Affairs Canada.
- On 11 January 2023 a high-level UK delegation conducted a visit to the Georgetown Health Centre in Saint Vincent and the Grenadines.


- Besides Facebook (Smart Health Care Facilities), Instagram (smarthealthcare.facility), and Twitter (@PAHOemergencies), the project was also promoted via the PAHO Procurement LinkedIn account in support of the outreach and advocacy efforts of the project: https://bit.ly/3oajffD.
    - For all the available data see: https://drive.google.com/drive/folders/10gNsBCEecgFDrfOVY_gm0P6Qj2G7KTAw

- As requested by FCDO, the project team produced and installed several labels to promote behavioural change and safety. The labels are installed in Saint Lucia and are provided to all the seven project countries facility mangers and Ministries of Health on their USB flash drives. See some examples below:




- The Prime Minister and Minister of Health joined several senior health officials in Saint Kitts and Nevis and other stakeholders at the Saint Kitts Marriott Resort Wednesday on 8 March 2023 for a meeting with representatives from the Pan American Health Organization (PAHO), including the PAHO/World Health Organization's Representative (PWR) for the Eastern Caribbean Countries and Barbados. Among the topics discussed were Universal Health Insurance and the building of the new smart hospital.
  The Prime Minister and Minister of Health of Saint Kitts and Nevis informed the attendees that "in 2023, we will be embarking on one of the biggest capital projects ever undertaken in the health sector – the erection of a brand new, Smart Hospital, one in which structural and operational safety are linked along

with the relevant green interventions to ensure disaster resilience."
https://www.sknvibes.com/news/newsdetails.cfm/121420

(L/R: Dr. Amalia Del Riego, PAHO/World Health Organization's Representative (PWR); the Honourable Dr. Terrance Drew; Permanent Secretary (Ag) in MoH, Dr. Sharon Archibald; Chief Medical Officer (CMO), Dr. Hazel Laws)...

**Update on other Smart projects funded by donors**

**European Union (EU) Smart healthcare facilities in Belize**

- Retrofitting works in three health facilities (Punta Gorda Community Hospital, Southern Regional Hospital and Corozal Community Hospital) are ongoing under the EU funded Smart Hospitals project component of the Health Sector Support Programme Belize.
- Design stage 2 reports for Western and Northern Regional Hospitals, and Central Medical Laboratory have been finalized. However, following reprioritization exercise and series of reviews, the MOHW indicated that remaining funds for retrofitting works are to be allocated to the improvement of the Central Medical Laboratory (CML).

**European Union Smart Shelters in the British Virgin Islands**

- Between 4 September 2019 and 16 March 2022, and with the financial support of the EU, this project successfully retrofitted four emergency shelters in the British Virgin Islands (BVI) according to safe, environmental-friendly and more sustainable standards and built capacities of local communities and national authorities in shelter management and climate-change adaptation concepts to increase community resilience to future emergencies. Also, a Smart maintenance course was conducted. As a result of this Action, the BVI became the first country in the Region of the Americas to adopt the Smart concept in their policy and develop a system of Smart accreditation for schools, which provides a viable model that could be replicated in the education and health sectors throughout the Caribbean region.

**European Union Smart Shelters in Sint Maarten**

- The contribution agreement between PAHO and the EU to construct two new Smart shelters (multipurpose community centres) in Sint Maarten was signed in December 2020 between PAHO and the EU. The project was officially launched on 26 March 2021 and the design inception reports

were finalized and approved in December 2021. The design and inspection firm is currently working on the design of two reports.

- In view of excessive rise in construction prices, it was recognized that only one smart shelter will be built with the available funding.

**Smart Healthcare Facilities in Haiti**

- The construction of a new A&E facility in Haiti according to the Smart standards was finalized with funding from the Inter-American Development Bank: SMART Hospital Initiative: Inauguration of a new ambulatory emergency room at the Hôpital Universitaire de la Paix - PAHO/WHO | Pan American Health Organization
- The Government of Haiti has already requested PAHO's assistance to replicate this successful initiative and support the construction of a new Smart emergency service in Cap Haitien in the North department, one of the most earthquake-prone area of the country.


## Lessons Identified for Output 3:

1. The UK-funded initiative evolved from a Smart concept into a Smart movement as illustrated by its adoption by other sectors (Education BVI), donors (EU, IADB) and countries (Sint Maarten, Haiti, BVI).
2. To leverage and amplify the innovative approach of these new climate resilience standards, a PR/Communications specialist was needed from the start to draft and implement a powerful Smart PR Campaign and increase public awareness of the project in the Region. Unfortunately, the project was not able to find a suitable person to support the Smart project team in Barbados to design and implement the communication strategy which resulted in insufficient Public Relations and awareness of stakeholders.
3. Timing of PR activities is essential. PR activities should have been increased when things were happening on the ground, like during the construction period.

4. Communication materials must focus on the improvements of the Smart interventions at the retrofitted healthcare facility (before and after).

## 1.4 Summary for Output 4 (Finance)

Table 8. Final Budget Implementation as of 31 August 2023

STATEMENT OF BUDGET AND DISBURSEMENTS
FOR THE PERIOD 1 NOVEMBER 2022 TO 25 AUGUST 2023
(Expressed in US Dollars)

| GRANT DETAIL | EXPENDITURE CATEGORY | BUDGETED AMOUNT | DISBURSEMENTS PRIOR | DISBURSEMENTS THIS PERIOD | DISBURSEMENTS TOTAL | UNLIQUIDATED OBLIGATIONS | BUDGET BALANCE |
|---|---|---|---|---|---|---|---|
| 01 | OUTPUT 1 | 1,637,176.43 | 1,612,460.55 | 24,715.88 | 1,637,176.43 | 0.00 | 0.00 |
| 02 | OUTPUT 2 | 40,057,691.71 | 36,580,758.93 | 3,476,932.78 | 40,057,691.71 | 0.00 | 0.00 |
| 03 | OUTPUT 3 | 673,077.57 | 612,348.09 | 60,729.48 | 673,077.57 | 0.00 | 0.00 |
| 04 | PERSONNEL | 11,801,230.35 | 11,055,372.56 | 745,857.79 | 11,801,230.35 | 0.00 | 0.00 |
| 05 | MONITORING AND EVALUATION | 1,160,344.27 | 944,030.05 | 216,314.22 | 1,160,344.27 | 0.00 | 0.00 |
| 98 | PROGRAM SUPPORT COST = 7.5% | 4,149,714.02 | 3,810,372.76 | 339,341.26 | 4,149,714.02 | 0.00 | 0.00 |
| | TOTAL | 59,479,234.35 | 54,615,342.94 | 4,863,891.41 | 59,479,234.35 | 0.00 | 0.00 |

Table 8 shows the overall financial implementation of the UK-funded Smart Hospitals project from inception to closure. The total approved commitment amount for this project was £46.3m. The final contribution amount requested to and received from FCDO totaled £46,121,862, equivalent to US$ 59,479,234. 100% of the FCDO contribution to PAHO was implemented, as reflected in the financial report table above.

Financial implementation by project component is presented below:

| Type | Final Expenditures (USD) | |
|---|---|---|
| 105 - Capital (retrofitting) work cost | $ | 39,608,702.03 |
| 104 - Non-capital Fixed Core Cost | $ | 15,748,018.62 |
| 104 - Non-capital Variable Cost | $ | 4,122,513.70 |
| GRAND TOTAL | $ | 59,479,234.35 |

For more details on budget implementation for this reporting period and overall project implementation period, please refer to Annexes 2 & 3.

### Lessons Identified for Output 4:

The external evaluation team was confident that the project represented good value for money. The project was however impacted by a decrease in available project funds due to changes in the exchange rate between USD and GBP. Additionally, the inflation caused by the war in Ukraine and the COVID-19 pandemic had a serious impact on construction costs. As a reference, the Federal Reserve Economic Data reported an increase for

Architectural and engineering services from last year of about 6.8%[5]; while the US Bureau of Labor Statistics reports an inflation of 6.4 %[6].

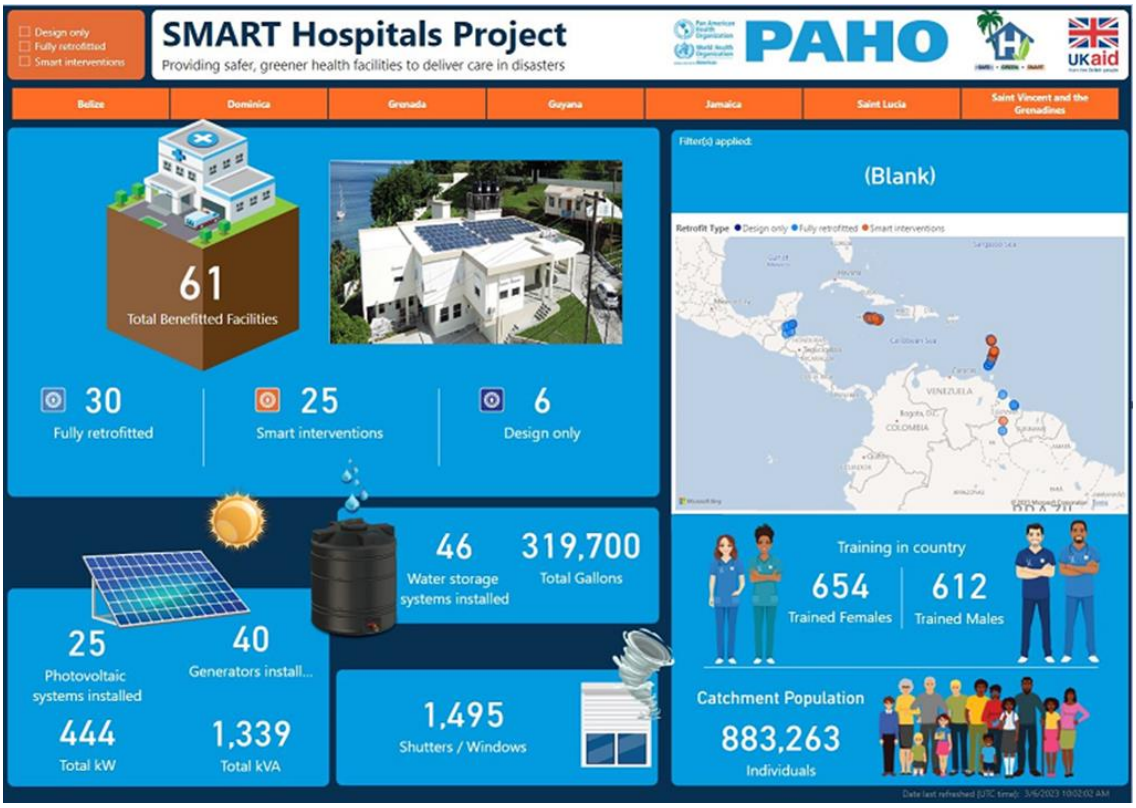
## 1.5 Update for Output 5 (project management and M&E)

### Achievements

The following project management and M&E activities/events were held over the last reporting period:

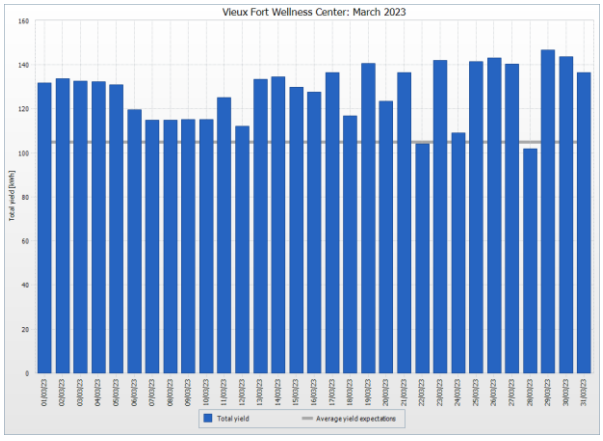
- The External evaluation of the project was finalized in December 2022, including the following lessons learnt and recommendations:
  - The vulnerability of the target health facilities was substantially reduced through the implemented interventions.
  - The key innovation of the Smart Hospitals initiative is to add green to safe, providing multi-dimensional resilience, and opening up access to climate change funding for the countries.
  - The benefits of the non-core and carefully-negotiated improvements related to staff well-being or function were very high and were so natural in a retrofitting context and at such low additional cost, that the evaluation team believes they should be part of any future retrofitting project.
  - Operating efficiencies were achieved, including energy and water conservation enhancements.
  - BVI's system of Smart accreditation for schools provides a viable model that could be replicated in the education and health sectors throughout the Caribbean region.
  - Maintenance remains a risk factor for sustainability.
- A few of the recommendations are mentioned below:
  - Consolidate the gains at facility level.
  - Scale up – using A/70 as the goal.
  - Pay attention to maintenance: prevention is cheaper than cure.
  - Adopt Smart facilities principles into national policies and standards.
  - Consolidate the institutional gains (PAHO).
  - Break down the silos between sectors (Donors, Banks).
- For the full report and a short video on the report see under the technical guidelines tab of the Smart Hospitals website: Smart Hospitals - PAHO/WHO | Pan American Health Organization.
- The M&E framework was updated monthly and used to finalize the 7 country infographics and the PAHO Smart Dashboard below. See also database in Annex 5.

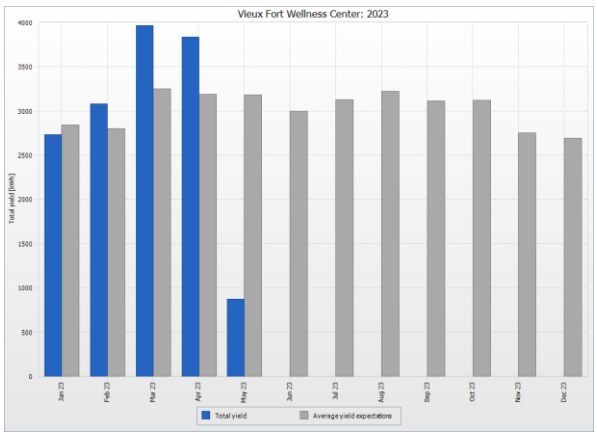
[5] https://fred.stlouisfed.org/series/PCU54135413
[6] https://www.bls.gov/news.release/cpi.nr0.htm

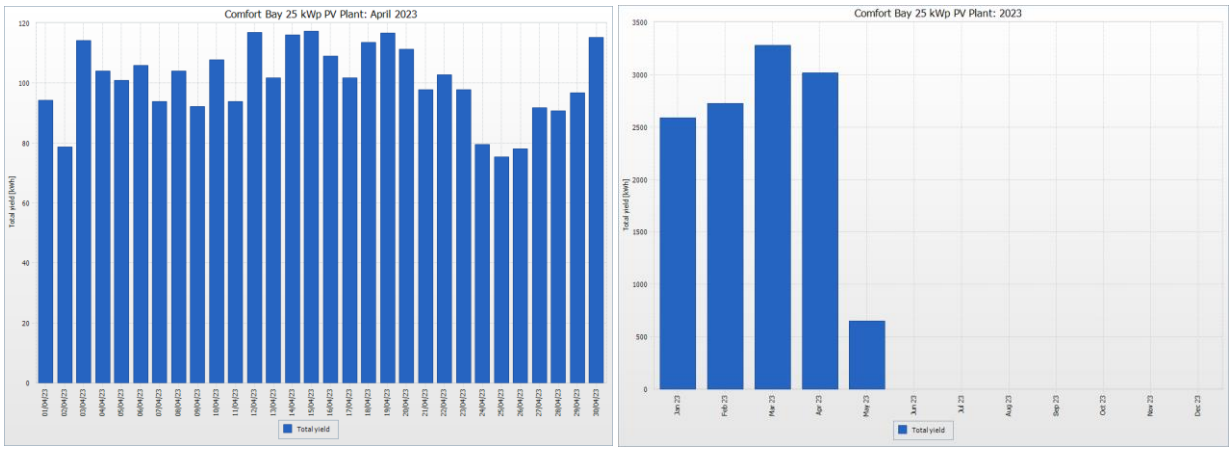



Dashboard Smart Hospitals Initiative: [Smart Hospitals - PAHO/WHO | Pan American Health Organization]

- Country supervisors and MoH focal points monitored water and electricity consumption to estimate savings. It proved to be difficult to get access to the consumption data and utility bills which are paid by the Ministry of Finance. Some of the PV systems installed by the project have an online monitoring device for MoH to review the production and calculate the savings. See examples electricity production from installed PV-panels at Vieux Fort Wellness Center and Comfort Bay in Saint Lucia, which show a minimal total monthly production of 3000 kWh. Before retrofitting, Comfort Bay consumed 5498 kWh and Vieux Fort 10580 kWh, which results in an average 37% reduction (excluding reduction because of installation of LED and efficient ACs). This is in line with the estimates the project made for all the project facilities (see Annex 10). This exceeds the requirement of 15% as stated in the project logframe.






*Pictures 25-28: Monthly electricity production from installed PV-panels at Vieux Fort Wellness Center and Comfort Bay in St Lucia, which show a minimal total monthly production of 3000 kWh, which resulted in significant savings that exceeded the Smart project logframe requirements.*

- PAHO also calculated potential savings based on the BAT assessments before retrofitting and the installation of LED-lightning, Inverter AC units and PV panels. These calculations were checked with available data from the utility bills to confirm accuracy. See also Annex 10.

## 2 Risk Management

Risk management was important to protect the reputation of the organization and to ensure the project team was proactive in assessing challenges that could impact or slow down the project.

There are now new improved policies in place for the management of construction and retrofitting projects as well as risk assessment and monitoring of voluntary contribution (VC) projects within PAHO. The institutionalization of specific risk management matrix for large and/or complex VC projects within PAHO is based in part on the Smart Hospitals project learning and introduction.

MoH in some countries started construction projects on the same Smart sites and discussions were held with national authorities related to the application of the Smart standards in Government funded works.

As previously reported, construction prices raised due to international supply chain issues and transport challenges related to COVID-19 and other international crisis at global level. Delays in designs and PAHO internal approvals resulted in increased prices by the time the tender process was complete.

All challenges in this project have one thing in common: Information at the right time and to the right people.

# 3 Practical Lessons (M&E)

1. PAHO mandatory contract breaks for essential consultants during design and retrofitting were delaying the project and the necessary quality assurance visits.
2. The project was unable to implement the savings-maintenance mechanism and experienced great difficulty to get access to the water and electricity consumption data before and after retrofitting, since this is not being monitored by health staff and MoH. The payment of the utility bills is done from the consolidated funds which are controlled by the Ministry of Finance. Although FCDO assisted during their 'final tour', further discussions need to be held with financial experts within MoH and Ministries of Finance to increase the sustainability of the project.
3. MoH and PAHO need to ensure that duty free import concession procedures do not delay the project. During the kick off meeting for retrofitting the practical procedure to apply for duty free import concessions need to be clarified to the contractor and MOH endorsement obtained in time.
4. The Smart hospital initiative plays an important role in capacity building of the construction sector by conducting training and mentorship by PAHO technical and check consultants (Structural, MEP, QS, tender processes). Other donors like the World Bank and IADB also realize the importance of check consultants and are looking at possible mechanisms to implement it or request it from Governments when providing loans. "Government units should be equipped with the capacity to monitor progress and evaluate performance, and to obtain specialised (check consultant) technical support when necessary (MoH)."[7]
5. Check consultants (PAHO) – The check consultants are a community not an organisation – they are the best experts in the Region in all the technical areas required to plan and implement retrofitting of health facilities (or other types of facilities).
6. Small islands are vulnerable not only to climate change but to the shock created by international events such as COVID and the war in Ukraine that have direct impact on the supply chain and cost of fuel.
7. Elections, change of governments, Ministers, and Permanent Secretaries of Health can cause a shift in priorities and potentially increase the risk to the execution of the project.
8. Limited internal communication in the retrofitted facilities. Due to rotation of personnel, new staff is not aware of what the scope of works was supposed to address and areas that were not part of the scope of works. PAHO Country supervisors and MoH Smart focal points were requested to inform facility staff. Information packages were prepared for health staff to keep in file (drawings, manuals, contingency plans, scope of works, HSI, and Green assessments, etc.).

COVID-19 impacted the project in the following ways:

1. (In-country) travel restrictions delayed contractors to start retrofitting. In Guyana the truck drivers had to go in quarantine before travelling to Lethem.
2. Travel restrictions prevented off-island inspection firms and check consultants to visit the sites.
3. Reduced staff in general. Sometimes because of curfew or lockdown to areas where staff reside.
4. Reduced working hours because of curfews.
5. Fear and anxiety among staff, because of not knowing what might happen and risk of exposure to the virus - this affects work output and morale of staff.
6. Working from home even further delayed design firms to finalize four of the outstanding designs.
7. Travel restrictions and supply chain issues increased the cost of retrofitting facilities as products are difficult to procure. There are currently cement and timber shortages.

[7] From Smart external evaluators report, December 2022.

8. Currency fluctuations in countries dependent on tourism and US foreign exchange affects pricing and increases the cost of construction especially in the Caribbean region.
9. COVID-19 sanitary safety measures increased overall construction costs.
10. Health facilities repurposed as respiratory clinics means greater coordination efforts between contractors and MoH's to ensure retrofitting works are completed on time.
11. Delayed site inspections from Check Consultants increased risks associated with quality assurance.
12. Change of focus of MoH in all countries because of COVID-19 and therefore delays in approvals from MoH.

# 4 Conclusions

This project could not seek to address all elements of a health facility building, so it focused particularly on those safety and green aspects that have frequently been found to be defective and carry a high-risk to building users and its function.

One of the main lessons from this project is: "Don't cherry-pick convenient or lower-cost components of the A/70 package if you intend to be Smart. Smart is the whole package and branding of the concept as well as possible certification of facilities has been requested by various countries.

The way current quality assurance processes are implemented in the industry has frequently been shown to be unreliable and there is an urgent need for the construction industry and national authorities to invest in the development, and industry-wide application, of effective standardised safety and quality focused installation, supervision, inspection and sign-off protocols. This is a significant step in restoring public confidence in the health facilities able to function when they are most needed.

It is hoped that the national agencies will make use of the smart toolkit, in applying it as an immediate priority to address the need for safe and green compliant construction.

The excellent partnership between the PAHO team and the responsible FCDO team contributed significantly to the success of the activities. The Smart project was able to make a difference and we can all justifiably be proud to have been part of it.



# 5 Annexes

Below is the list of documents provided in annex:

1. Log frame update as of 30 April 2023
2. Final Certified Financial Report (PAHO format)
3. Final Budget Implementation (Project format)
4. Smart project highlights reporting period 1 November 2022 – 30 April 2023
5. Smart project M&E database
6. FIU final report
7. Example end of Smart project letter (SVG)
8. Justification retrofitting financial variation spreadsheet
9. Example cover letter USB flash drives for MoH and facility managers with essential documentation
10. Overview potential electricity and carbon footprint reduction
11. Summary findings Smart project external evaluation