Smart Facilities for Health

Briefing deck

United Nations Development Programme
BMS-ITM, BPPS-HHD & FSH/IICPSD-COVID-19 Private Sector Global Facility

April 2021
Agenda

1. Introduction to the Smart Facility concept
2. UNDP’s track record of support to health systems
3. Deploying Smart Facilities for Health in support of COVID-19 vaccination
Introduction to the Smart Facility concept
Smart Facilities integrate 4 interdependent technology pillars into physical infrastructure

**ICT, BUSINESS INTELLIGENCE & AI**
- Atlas (ERP)
- Digital Workspace
- Cloud Computing
- OneICTbox
- Satellite Communications

**ENERGY & MOBILITY**
- Renewable Energy
- Electric Vehicles
- Vehicle-to-Grid
- Energy Storage (Li-ion)

**BIG DATA & INTERNET OF THINGS**
- Satellite Imagery
- Drones
- Energy Efficiency
- Energy Consumption & Environmental Monitoring

**SECURITY**
- Cyber Security
- Identity & Access
- Solar Street Lamps
- CCTV Cameras

"The whole is greater than the sum of its parts." - Aristotle

Interconnecting Smart Technologies and People in the pursuit of Economic and Social Development
Smart Facilities are established and sustained through a recognized, best-in-class 7-step process

**7 STEP GREEN ENERGY SOLUTION**

1. Energy Audit & Assessment Using IoT
2. Business Case
3. Procurement & Site Preparation
4. Site Survey
5. Design
6. Installation
7. Operation & Maintenance

Continuously striving to promote energy efficiency across solar implementations and enhancing user behavior

Recognized best practice by UNDG for Solar implementation
7 STEP GREEN ENERGY SOLUTION

1. Intuitive cloud-based self-assessment app and integrated data collection for business intelligence.
2. In depth technical expertise;
3. Structured document to support decision making and fundraising.
4. Publish structured and well-refined RFQ among LTA holders;
5. A Bidders Conference to ensure high quality of the received proposals;
6. Requirement of local partners creating win-win relations.
7. Ensure correct detailed design and high-standard proposals;
   Site Survey Report is required as a mandatory document to preventively identified threats and risks.
8. Technical review of the final design proposed by the vendor;
   Manufacturer endorsement certificate required as a mandatory document to sign off the final design.
9. Detailed installation plan to ensure timely installation;
   Training and capacity building for local staff and partners;
   Communication team dedicated to promoting the installation and ensure project visibility.
10. 3-years O&M plan provided by the system's vendor;
    Reporting and KPI monitoring to ensure project profitability;
    Periodic system assessment to identify further business opportunities.

WHAT'S BEHIND OUR WORK?
1. Electrical Technician Skills
2. IT Skills
3. Energy Efficiency-101 Knowledge
4. Data Analysis Skills
5. Energy Modelling Software Experience
6. Finance and Environmental Knowledge
7. Procurement and Logistics Experience
8. Energy Technical Skills
9. Finance and Legal Background
10. Construction Manager Experience
11. Project Management Experience
12. Structural Engineering Background
13. Electrical Technician Skills
14. Energy Engineering Background
15. HSE and Energy Engineering Knowledge
16. Project Management Experience
17. Communications Expertise
18. Data Analysis Skills
19. Technical Reporting Expertise
20. Monitoring/Troubleshooting Skills

SUPPORT REQUIRED FROM FOCAL POINT ON SITE
1. Provide site-specific information
2. Installation of PCM/M sensors
3. Communication with OIMT GE Team
4. Communication with OIMT GE Team
5. Provide support during Site Visit
6. Participate in the bidders’ conference
7. Provide support during detailed Site Survey
8. Communication with vendor and o&g team
9. Responsible for customs clearance
10. Oversight of installation (consulted)
11. Support UIAT and checklist with the vendor
12. Communication with vendor and GE team
13. Support in O&M visits and troubleshooting
Smart Facilities rely on a foundation of technical capacity-building of local SMEs that is central to the model’s success.

### Developing technical capabilities in local SMEs is central to the Smart Facility approach

**7 STEP GREEN ENERGY SOLUTION**

- Local SMEs are engaged in the Smart Facility process as soon as the project is deemed feasible (Step 3)
- Step 7 determines the longevity and ultimate impact of the Facility and is contingent upon the availability of local technical capacity
- There is a targeted capacity-building program for youth apprenticeship to build out the pipeline of local capacity

### Smart Facilities have the potential to transform not just health systems but local economies as well

- The ability of locally-available expertise **extends the viability and sustainability** of the solution and preserves the value of the physical capital
- Local capacity transforms short-term vertical responses to acute crises to **long-term solutions to buttress and extend health systems**, reaching underserved communities well into the future
- Investment in local technical capacity lays the foundation for a **new 4th Industrial Green Revolution**
  - Trained local enterprises can shape green, new technology-driven sectors
  - Spillover effects can nudge local economies toward the SDGs

Rapid scaling of Smart Facilities will be **contingent upon successfully offering capacity building en masse**

- The COVID-19 Private Sector Global Facility is working with strategic partner Microsoft to deploy SME-facing capacity-building (e.g., Smart Facility training) at scale
SMEs for Smart Facilities in Yemen
Scaling Smart Facilities goes hand-in-hand with scaling SME capacity

<table>
<thead>
<tr>
<th>Since 2016 the Smart Facilities Have a significant impact on communities and the environment</th>
<th>18</th>
<th>120k</th>
<th>1.2GWh</th>
<th>$289.7k</th>
<th>256T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local SME service providers</td>
<td>People served</td>
<td>Clean energy produced</td>
<td>Clean energy produced</td>
<td>Tons of CO₂ Emissions saved</td>
<td></td>
</tr>
</tbody>
</table>

Partnering with developers and content delivery experts to migrate the existing training course from hybrid (digital + on-site) to **entirely digital** will allow for the **scaling up of technical capacity and smart facilities**

<table>
<thead>
<tr>
<th>In 2021 the Smart Facilities Will increase its impact threefold leveraged by the digital solution to build capacity for local SMEs</th>
<th>36</th>
<th>360k</th>
<th>3.6GWh</th>
<th>$869.2k</th>
<th>768T</th>
</tr>
</thead>
<tbody>
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<td>Local SME service providers</td>
<td>People served</td>
<td>Clean energy produced</td>
<td>Clean energy produced</td>
<td>Tons of CO₂ Emissions saved</td>
<td></td>
</tr>
</tbody>
</table>

With potential to unlock the full pipeline of **190 Smart Facilities** across **131 countries**, **950 SMEs** would be fully trained

- **People served**
- **Clean energy produced**
- **Tons of CO₂ Emissions saved**

**In 2021**

- **1.9m**
- **$3.05m**
- **2.7KT**
The COVID-19 Private Sector Global Facility develops innovative partnerships to advance SME resilience

The Global Facility is a unique multistakeholder partnership including public sector, business networks and global private sector actors

Initiating partners

Strategic partners

Our vision is to develop innovative partnerships that support SMEs to become more resilient

1. Support sustainable economic recovery by empowering SMEs to be resilient and become the vanguard of economic growth.
2. Alleviate poverty and prevent the significant loss of livelihood and employment.
3. Form new partnerships globally and locally: creating a connective tissue to address key challenges.

Key Objectives

The partnership has co-created 5 solution areas that address the most pressing challenges threatening SME survival and focus on promoting SME resilience through public-private partnerships

1. Empowering SMEs with digital capabilities: Accelerating a holistic sustainable digital transformation for SMEs through training, mentoring, sharing best practices, and creating spaces for SMEs to connect with service providers.

2. Deploying digital solutions to advance trade and commerce: Developing sustainable e-commerce capabilities of SMEs and cross-border suppliers through programmes on upskilling and digital solutions.

3. Integrating SMEs into sustainable procurement, responsible supply chains and delivery of essential services: Integrated solutions to (1) incentivize the public sector to incorporate SMEs in public procurement systems and (2) mobilize SMEs to support access to essential goods and services (e.g., through technology-enabled delivery).

4. Boosting access to capital: Facilitating the coordination of SMEs to collectively approach lenders to negotiate access to capital, with the objective of providing easier access to liquidity for each SME and applying revenue-sensitive interest rates.

5. Strengthening SMEs through collective action and coordination: Convene SMEs by sector to support enabling dialogue and collective action with a) government and b) larger enterprises.

The role of SMEs in delivery of essential goods and services: Smart Facilities

- Smart Facilities place local SMEs at the center of the sustainability and indigenization of these leap-frogging solutions which can be applied to a wide variety of contexts (e.g., health, agriculture, customs, border and law enforcement, education)
- The ability of locally-available expertise extends the viability and sustainability of the solution and preserves the value of the physical capital
- Rapid scaling of Smart Facilities will be contingent upon successfully offering capacity building en masse. The Global Facility is working in unique partnership with DHL for technical expertise and Microsoft to deploy the SME-facing capacity-building at scale
- In the health context, local capacity transforms short-term vertical responses to acute crises to long-term solutions to buttress and extend health systems, including enabling digital health solutions and reaching underserved communities well into the future. As such, investment in local technical capacity lays the foundation for a new 4th Industrial Green Revolution (which can shape green, new technology-driven sectors and provide spillover effects that can nudge local economies towards the SDGs)
- Smart Facilities are a novel blend of local private sector actors providing integral support to essential services, supported by global private sector partnership and are a good candidate for innovative financing to expand their access and financial viability:
  - Net metering scheme
  - Power Purchasing Agreements
  - Carbon credit market scheme
  - Blended capital revolving fund
  - Outcome-based DIB leveraging private finance
  - Other results-based financing models
UNDP’s track record of support to health systems
COVID-19 vaccination actors

Global Support and Coordination

COVAX

- Speeding up the development of safe and effective vaccines against COVID-19,
- Supporting the building of manufacturing capabilities, and
- Working with governments and manufacturers to ensure fair and equitable allocation of the vaccines for all countries

UNDP’s COVID-19 Vaccination Support revolves around three key thematic areas focused on health systems:

1) Digital solutions for vaccine delivery
2) Data Futures – Global Dashboard for vaccine equity
3) Greening COVID vaccination

National Level Architecture

unicef

- Procurement of vaccines
- Procurement of Cold Chain Equipment (CCE) as needed

World Health Organization

- Information and advocacy
- Standards for equipment and medical use
- Training health workers

National Logistics Working Group

- Mandate to improve immunization logistics and supply chain

COVAX Technical Working Group / COVAX National Coordinating Committee

- Have the responsible for developing and monitoring the key activities of vaccine distribution
  - Coordination and monitoring
  - Logistics structure / Transport
  - Cold chain
  - HR / Training

(UNDP, UN Global Compact, ICC, DHL, Microsoft, PwC)

- Public-private partnerships
- Role of SMEs
UNDP’s track record of support to health systems

**Sustainable Procurement**

UNDP is taking a lead globally to support countries in the procurement of health products and to strengthen national supply chains in some of the most challenging operating environments in close collaboration with other partners. The expertise built through 15 years of supporting the PSM implementation of donor grants in such contexts is being used to support ongoing reforms in national procurement systems and to strengthen national supply chain systems. In collaboration with UNICEF, UNFPA, and GDF/UNOPS, UNDP’s total volume of health procurement is $310 million annually.

**Global Fund**

UNDP is one of the largest implementers of the Global Fund, working closely with governments and civil society organizations to implement projects for health. To date, the partnership has saved 3.1 million lives since its inception in 2003 and treated 880,000 cases of TB and 67 million cases of malaria. Currently, 2.2 million people are receiving HIV treatment through UNDP-managed programmes.

**LMIS**

UNDP has successfully digitized vaccine stocks and storage temperatures across 10,500 vaccine cold chain points in 12 states of India. This has been coupled with capacity-building of more than 17,000 government staff, including vaccine storekeepers, data entry operators and cold chain managers through more than 550 sessions of training programmes using the eVIN application.

**Solar for Health**

UNDP’s Solar for Health initiative supports governments to increase access to quality health services through the installation of solar energy photovoltaic systems (PV), ensuring constant and cost-effective access to electricity, while reducing carbon emissions.
UNDP’s Solar for Health (S4H) has existing infrastructure in partnership with the Global Fund

UNDP’s Solar for Health initiative, installed in **652 facilities to date**, supports governments to **increase access to quality health services through the installation of solar energy photovoltaic systems (PV)**, ensuring **constant and cost-effective access to electricity**, while reducing carbon emissions.

### Countries and Total Facilities

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe</td>
<td>405</td>
</tr>
<tr>
<td>Nepal</td>
<td>145</td>
</tr>
<tr>
<td>Sudan</td>
<td>62</td>
</tr>
<tr>
<td>Zambia</td>
<td>19</td>
</tr>
<tr>
<td>Namibia</td>
<td>11</td>
</tr>
<tr>
<td>South Sudan</td>
<td>10</td>
</tr>
<tr>
<td>Libya</td>
<td>5</td>
</tr>
<tr>
<td>Angola</td>
<td>1</td>
</tr>
</tbody>
</table>

**Case study 1: Health facility**

Health facilities in rural areas of Zimbabwe installed with solar panels ensure the necessary source of energy to provide health services to local communities while reducing the electricity bills by up to 60%.

**Case study 2: Effective warehousing**

UNDP has supported the set up of so-called Medical Store Limited (MSL), to install 300 kWh solar energy systems in central medical warehouses in Zambia.

The warehouse guarantees the quality of vaccines and medicines.
**UNDP’s COVID-19 vaccine support offer: enhancing equity, resilience and sustainability of COVID-19 vaccination efforts**

**Digital solutions for vaccine delivery**
- Develop and deploy digital solutions (include open-source digital tools such as software, platforms, apps, etc.) for vaccine delivery and health systems strengthening more broadly, adapted to country-contexts in order to ensure that approved vaccines are distributed rapidly, efficiently, equitably and safely.

**Data Futures: Global Dashboard for vaccine equity**
- **A. Multidimensional vaccine data (type, regulatory/policy, price, supplies, logistics etc.)**
  - A one-stop-shop that combines existing data with insights
    - Our World Data
    - The London School of Hygiene & Tropical Medicine
    - WHO Vaccine Tracker
    - The Milken Institute
    - Etc.

- **B. Hyperlocal vaccine analytics (exposure risk, health, prior vaccinations, health facilities, communication risk and affordability)**
  - Actionable And Informative Insights For National And Community-level Decision Making.
  - Through the application of Artificial Intelligence (AI) and Machine Learning (ML) algorithms, produce spatially continuous information at a scale greater than 1km cell size for different elements of risk and vulnerability to COVID-19.

**Greening COVID-19 vaccination**
- Support COVID-19 vaccine waste management and multisectoral coordination mechanism based on WHO and UNICEF guidelines to ensure environmentally and socially sustainable disposal of immunization waste.

- Track the chain of custody of the vaccination waste using digital solutions
  - A digitization roll out will be applied to pre-existing systems as needed to help minimize the amount of waste generated through appropriate recycling of materials used during the vaccination.

- For reliable access to electricity for health facilities, scale reliable energy solutions for vaccination
  - which allows the transport and last mile distribution of vaccines in optimal conditions; and solar-power fridges and freezer to store the vaccines at immunization points.

Leveraging UNDP’s experience in India and Indonesia and the global fund partnership, UNDP has already initiated the implementation of digital solutions for vaccine delivery in 30 countries.
Deploying Smart Facilities for Health in support of COVID-19 vaccination
There are a number of UNDP LMIS and Smart Facility solutions that can support vaccine distribution efforts.

Vaccine distribution chain (simplified; based on UNICEF Supply Division model):

- **Port of entry**
- **Transport**
- **Central or regional cold chain storage**
- **Transport**
- **Point of use**

### Requirements

- **Mobile management**
  - Stable mobile cold storage

- **Stationary management**
  - Stable stationary cold storage
  - **Connectivity to enable remote monitoring**
  - **Reliable energy source to support cold storage and monitoring systems**

### Available solutions

- Accompanies the vaccines (provided by UNICEF, vaccine manufacturer or another party)
- Independently acquired (e.g., Africa CDC strategy to procure ultracold storage freezers
- Install base
- **Supporting Smart Facility solution: vehicle grid integration**
- Smart Facility OnelICTBox, Satellite communications
- Smart Facility renewable energy and energy storage
- **UNDP LMIS mobile app**
- **Supporting Smart Facility solution: mobility tracking**
- Temperature loggers
- Third-party solutions (e.g., DHL SmartSensor)
- **Supporting Smart Facility solution: IoT sensors and gateway**
- Smart Facility physical and cybersecurity solutions

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Large building by Loren Klein; Van by Fahmi Studio from the Noun Project.
Smart Facilities for Health (SFHs) are focused on providing essential solutions for fixed infrastructure throughout health systems

Discrete design elements (based on input from Global Facility Partner DHL)

<table>
<thead>
<tr>
<th>Logistics and distribution systems-based elements</th>
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</thead>
<tbody>
<tr>
<td>• A number of transport, logistics and multilateral entities are actively engaged in the mobile components of distribution</td>
<td></td>
</tr>
<tr>
<td>• <strong>Out-of-scope</strong>: For the time being, Smart Facilities for Health treat these elements as peripheral to their core design which is focused on fixed infrastructure-based solutions</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Fixed infrastructure elements – Smart Facilities plug-and-play model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>• Bandwidth requirements to enable active, realtime IoT solutions and integrated remote monitoring (e.g., integrated with eLMIS solution on a national dashboard across multiple sites)</td>
</tr>
<tr>
<td>• Power to support fixed CCE e.g., 220/240 V/3/50Hz (E001 for segments 1&amp;2); 12-30V DC (E003 for segments 2&amp;3)</td>
<td>• Bandwidth requirements to enable digitally-enabled health solutions (e.g., telemedicine at 50-100 Mbps)</td>
</tr>
<tr>
<td>• Energy to support diagnostics instruments (e.g., 200-240 VAC 50/60 Hz, 120w, single phase with ground, 20A peak current)</td>
<td>• Bandwidth requirements to enable remote support for diagnostics hardware</td>
</tr>
<tr>
<td><strong>ICT</strong></td>
<td></td>
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<tr>
<td>• Comprehensive IoT solution for energy optimisation</td>
<td>• WHO PQS-standard devices and appliances across all health system segments – i.e., Higher levels of cold chain (Primary and Sub-national), Middle levels of cold chain (lowest delivery), Lower level of the cold chain (Service point):</td>
</tr>
<tr>
<td>• IoT Gateway with compatible protocol to support E006 sensors</td>
<td>• Fixed CCE (E001, E003) – e.g., cold rooms, walk-in freezers, refrigerators, freezers</td>
</tr>
<tr>
<td>• Non-TTSPP-related monitoring for healthcare delivery environments (e.g., air quality, pest control)</td>
<td>• TTTP monitoring and cold chain accessories (E006, E007) – e.g., active and passive temperature monitoring devices, voltage stabilisers</td>
</tr>
<tr>
<td>• IoT solutions for diagnostics inventory management</td>
<td>• Diagnostics hardware and software according to manufacturer requirements and CLIA standards for laboratories</td>
</tr>
<tr>
<td>• Natural hazard response mechanisms where applicable (e.g., emergency protocols for floods, tropical cyclones)</td>
<td></td>
</tr>
<tr>
<td><strong>IoT</strong></td>
<td>• Comprehensive physical security components (e.g., CCTV, motion detection)</td>
</tr>
<tr>
<td>• Comprehensive IoT solution for energy, Connectivity, IoT and Security</td>
<td>• Comprehensive cybersecurity solutions (e.g., data encryption)</td>
</tr>
<tr>
<td><strong>Security</strong></td>
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<td></td>
<td></td>
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<tr>
<td>4. CCE and Stationary Condition Monitoring</td>
<td></td>
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<tr>
<td>5. Diagnostics hardware and software solutions</td>
<td></td>
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</tbody>
</table>
Smart Facilities compared to the prevailing standard of care

Relevance to COVID-19 vaccination support

- Providing electricity to CCE (cold chain equipment)
- Providing electricity to monitoring and vaccine intelligence solutions (e.g., eLMIS)

Current state(s)

- No access to reliable electric grid, requiring costly standalone CCE (e.g., solar-powered refrigeration appliances)
- No access to green energy

Smart Facility solutions

- Total green energy independence
- Robust tracking of generation and consumption dynamics (i.e., using IoT sensors) to ensure viability
- Supported by local technical capacity (i.e. SMEs) to ensure reliability and sustainability

Potential additional support: mobile energy solutions (e.g., electric vehicles, vehicle-to-grid integration)

- Built-in connectivity (via terrestrial networks or satellite where necessary)

Potential additional support: mobile ICT solutions (e.g., mobile IoT gateway)

- Sensors are applied to track a variety of conditions relevant for stable infrastructure management

Potential additional support: vaccine and cold chain integrity support (e.g., humidity, temperature, CCE status) at stationary points (e.g., medical warehouses, points of use); redundant IoT data that is broadcast to enable proactive management (e.g., mobile GPS, temperature data)

- Comprehensive cybersecurity solutions to protect the integrity of data collection

Potential additional support: physical security solutions (e.g., identity & access, solar street lamps, CCTV cameras)

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Energy

- Enables automated collection (e.g., to the cloud) of critical data
- Enables LMIS and vaccine intelligence solutions to be integrated and monitored remotely
- Enables automated, remote, centralized monitoring of critical parameters (e.g., energy generation and consumption)

ICT

- Lack of connectivity at multiple health system nodes limits visibility into critical dynamics and failure points
- If LMIS solutions are in place, they are disperse and management is decentralized

IoT Sensors

- No tracking of parameters, increasing volatility of the system
- If critical parameters are tracked, it is passive and must be directly manually monitored (e.g., cold chain manager retrieves and observes temperature probes and records the data manually)

- Sensors are applied to track a variety of conditions relevant for stable infrastructure management

Potential additional support: vaccine and cold chain integrity support (e.g., humidity, temperature, CCE status) at stationary points (e.g., medical warehouses, points of use); redundant IoT data that is broadcast to enable proactive management (e.g., mobile GPS, temperature data)

Security

- Protection of critical data
- Security of physical premises

- Weak or absent cybersecurity
- Weak or absent monitoring of premises

All elements have been field-tested since 2016 and are currently operational across 18 sites; the integrated system is in the process of being field-tested as a plug-and-play solution to enable digital solutions for health (e.g., stationary condition monitoring for COVID vaccination support)