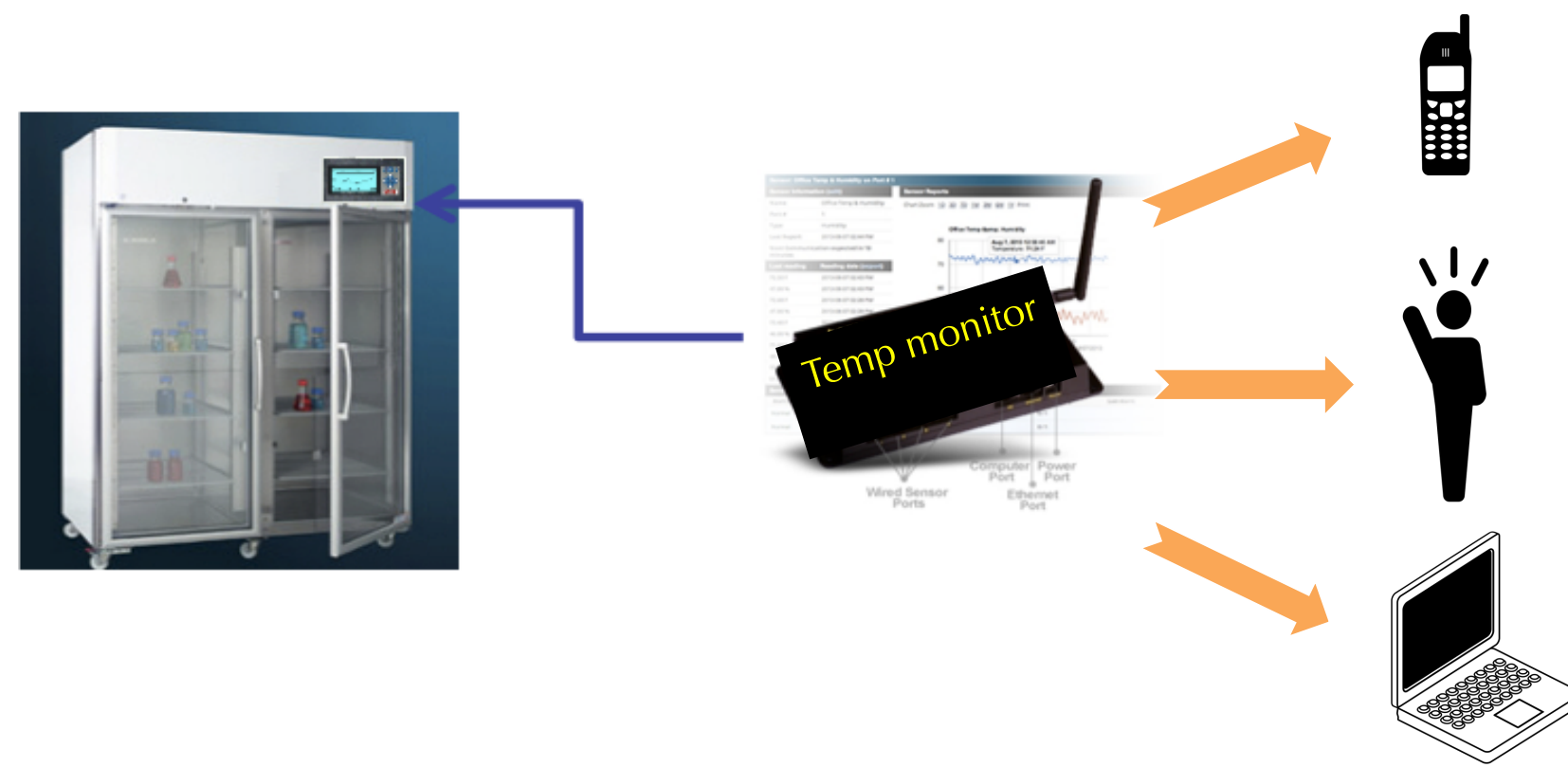


## BACKGROUND

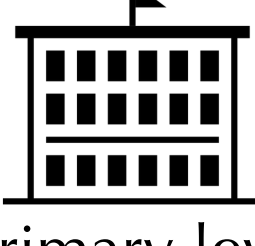



### Monitoring temperature at different levels of the supply chain

Continuous temperature monitoring systems can detect and prevent harmful temperature excursions that permit millions of compromised vaccines each year. These systems offer immediate and long-term prevention via three different mechanisms:



1. Proactive prevention of vaccine damage and wastage
2. Cold chain system visibility to better direct maintenance and repair
3. Evidence-based decision-making in future procurements of cold chain equipment

Maintaining proper temperatures for vaccines is challenging, especially in places with extreme climates, unreliable electricity, and weak transportation infrastructure. At each level of the supply chain, remote temperature monitoring (RTMs) and/or non-remote systems can be selected upon consideration of different operational, environmental, and technology parameters:

SEGMENT:	SEGMENT DESCRIPTION	CONSTRAINTS	OPERATIONAL AND ENVIRONMENTAL CONSIDERATIONS	RTM vs. NON-RTM PRODUCT CONSIDERATIONS	KEY TECHNOLOGY CONSIDERATIONS
 Primary level	National and regional stores. Cold rooms or multiple fridges per site. High volumes of vaccines.	Low	Power availability and cellular connectivity stable. Convenient access to computer likely.	Good infrastructure, connectivity & high vaccine volumes make RTMs highest potential choice.	<ul style="list-style-type: none"> <li>Multiple sensor units and different sensor types</li> <li>Flexible and actionable data management platform</li> <li>Alert escalation capabilities</li> </ul>
 Sub-national level	Provincial and large district stores. Multiple fridges per site. Fairly high volumes of vaccines.	Low-Medium	More challenging environmental conditions (e.g., interrupted power availability and cellular connectivity).	Good connectivity & fairly high vaccine volumes make RTMs high potential choice.	<ul style="list-style-type: none"> <li>Back-up battery holdover and lifetime</li> <li>Multi-sensor units</li> <li>Flexible/actionable data management platform</li> <li>Alert escalation capabilities</li> </ul>
 Lowest delivery level	Stores that supply health facilities directly. Single fridge per site. Low volumes of vaccines.	Medium-High	Challenging environmental conditions and lower human availability to respond to alerts than Segments 1 and 2. Convenient access to computer unlikely.	Challenging conditions and low vaccine volumes make RTMs and non-RTMs both viable considerations.	<ul style="list-style-type: none"> <li>Battery holdover and device lifetime</li> <li>Internal memory capacity</li> </ul>
 Service point	Health facilities with refrigerators, cold boxes, or carriers. Low volumes of vaccines.	High	Unlikely access to power for charging or monitoring equipment. Limited cellular connectivity. No access to computer.	With limited connectivity and very low vaccine volumes, non-RTMs likely highest potential choice.	<ul style="list-style-type: none"> <li>Device lifetime</li> <li>Internal memory capacity</li> <li>Multiple use capabilities</li> <li>Enclosure robustness</li> </ul>

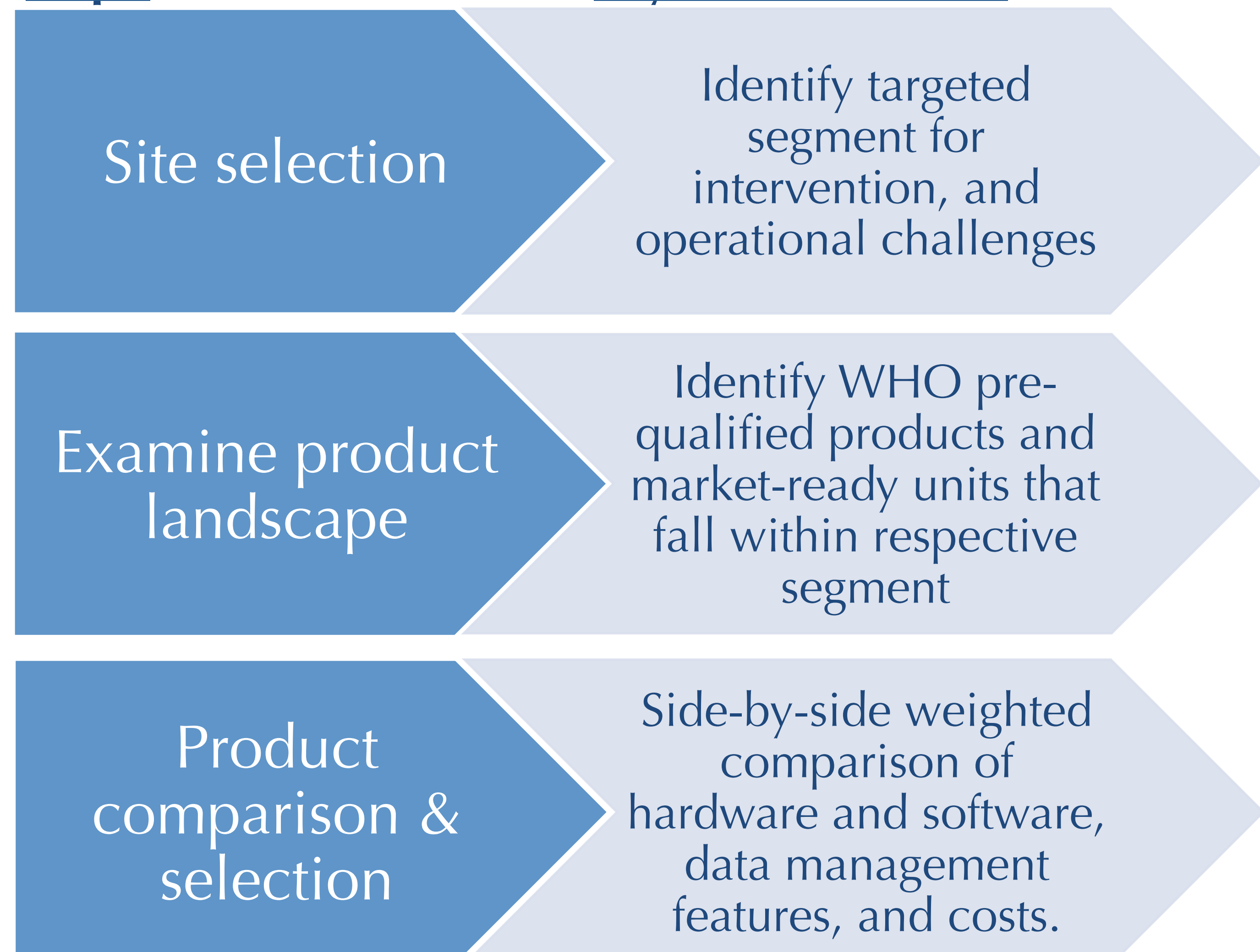
## METHODS

### Step-wise procedure for product selection

We have leveraged pilot experience to develop tools that can help users to identify high-potential products for continuous temperature monitoring at different levels of the supply chain:

#### Steps:

#### Key considerations:



## PRODUCT COMPARISON & SELECTION

### Key features used for comparison

#### Hardware

- Power source(s)
- Battery/device lifetime
- Ease of maintenance/replacement
- Sensors per device
- Visual display
- Local alarm

#### Software & Dashboard

- Ease of software configuration and customizability
- SMS/Call/Email on alarm
- Dashboard design
- Device & sensor grouping
- Periodic report customizability
- Alarm layers and escalations
- Data and user access tiers

#### Costs & Fees

- Unit and sensor costs
- Installation and training costs
- Recurring costs (replacement or software fees)