GLOBAL HEALTH

SUPPLY CHAIN SUMMIT

Application of modeling and SC optimization techniques in CCE optimal placement: DRC and Mozambique case studies

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VillageReach

Application des principes de modélisation informatique et de system design dans l'analyse du positionnement optimal des équipements de chaines de froid : Cas du Mozambique et de la RDC

Starting at the Last Mile

2018 Global Health Supply Chain Summit
Lusaka, Zambia

Agenda

The problematic

Siloed last mile interventions.

CCEOP and System Design are two SC fundamentals generally conducted independently

The Approach

Joint Analysis System Design and CCEOP.

We use supply chain modeling tool (Hermes in Moz, Llamasoft in DRC) to show the value proposition of an integrated approach

The Findings

Value of an integrated demonstrated

Upstream: Impact on CCE needs, costs and placement

Downstream: Greater flexibility and opportunities to optimize

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Reaching more children with..

Two effective last mile interventions

SYSTEM DESIGN

A structured optimization process to identify the best SC solution in constrained environments.

Costs, Resource efficiency, Inventory, Transportation Distribution.

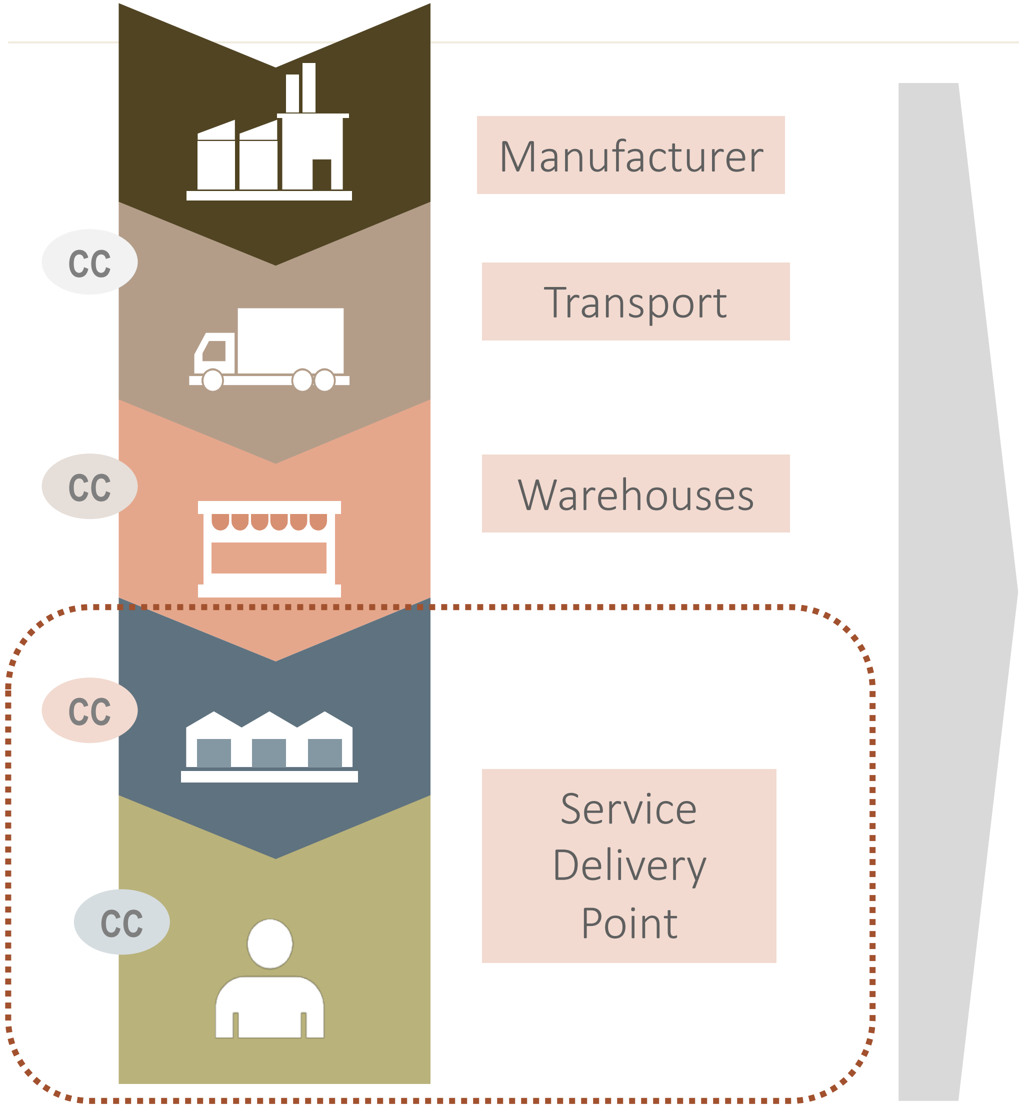
1 SYSTEM DESIGN

2 CCEOP

CCEOP

The Cold chain Optimization platform is a multimillion-dollar investment by GAVI to support countries with the selection, procurement, deployment and installation of adapted state of the art CCE

CCE, a key consideration in ISC design and performance



VACCINES POTENCY

CCE is critical for preserving the integrity, potency, and quality of through end to end supply chain.

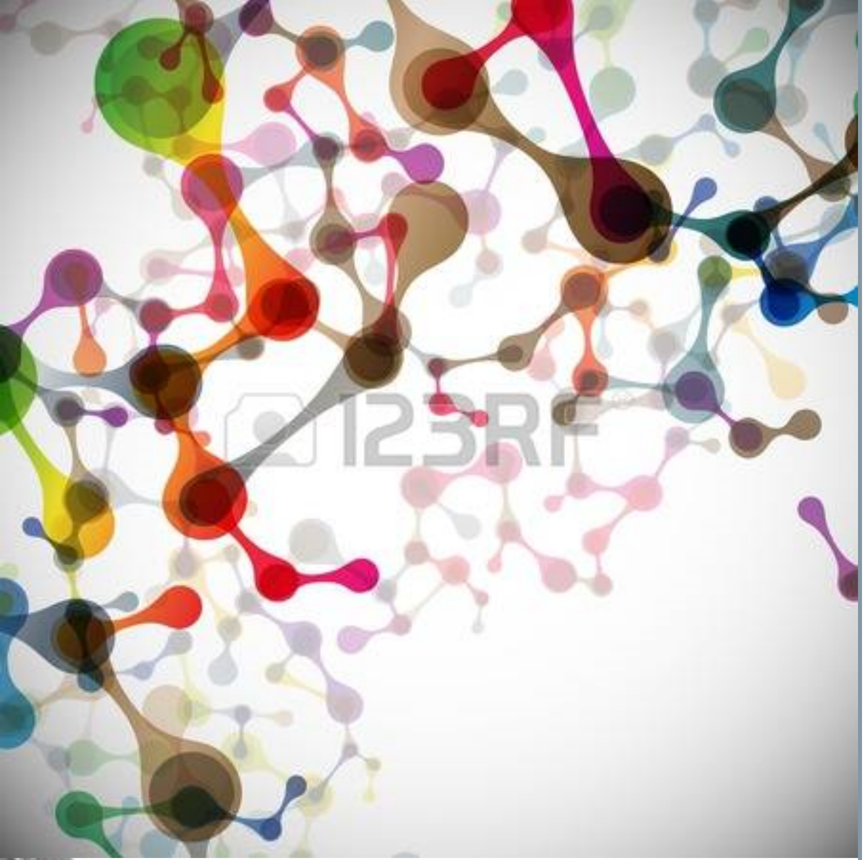
LOGISTICS FUNCTION

The absence or presence of a CCE in a health facility determines its logistics function, and impact service delivery.

INNOVATION FOR EQUITY

Solar cold chain extends immunization services to areas without electricity, impacting more children in rural areas.

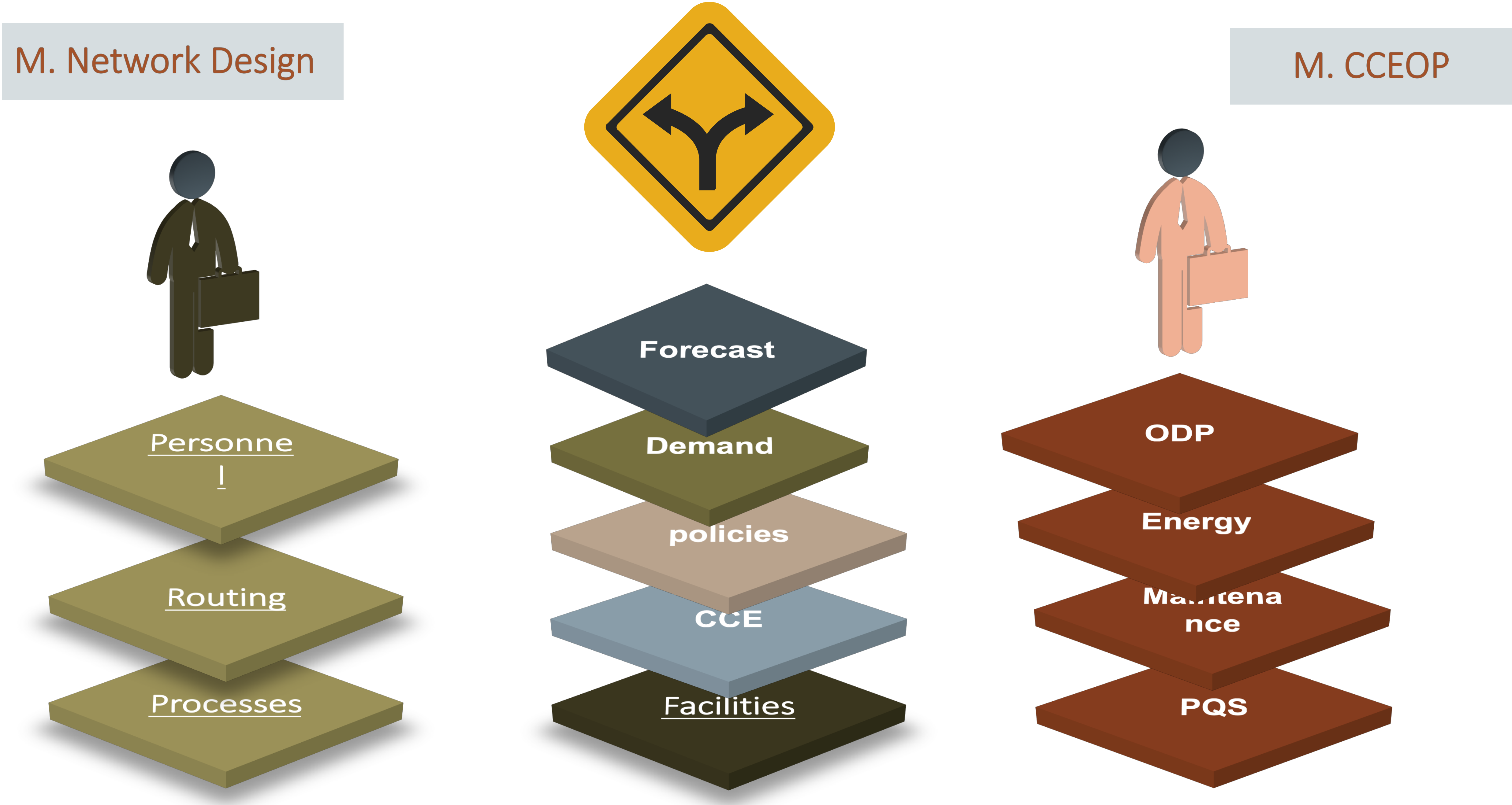
Decisions around CCE optimization and placement are rooted in data



System Design is the process of defining *the blueprint* (i.e., the architecture, components, processes, and operations) of a supply chain, how they fit together and interact to achieve the desired level of performance.

The design defines what the supply chain would be able to do or not!

SD is a data driven process


M. Network Design
M. CCEOP
Personnel
Routing
Processes
Forecast
Demand
policies
CCE
Facilities
ODP
Energy
Ma tena
nce
PQS

Questions

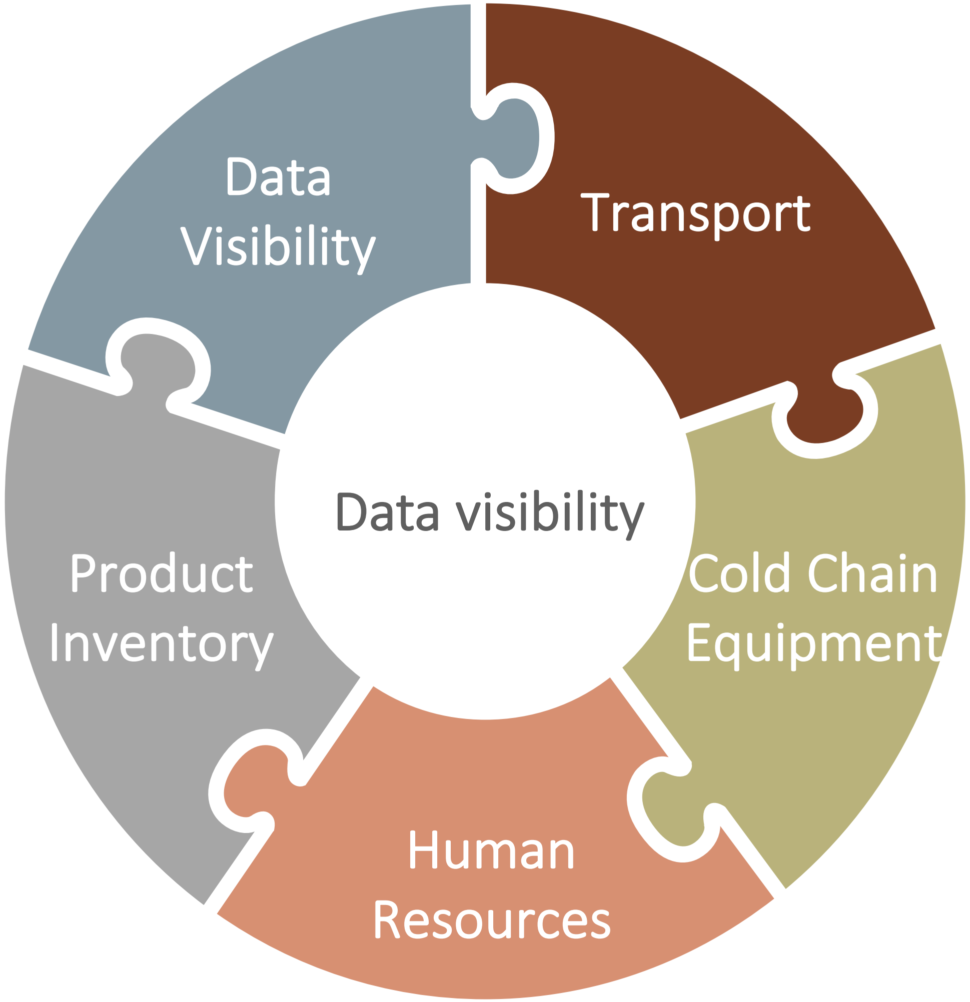
QUESTION 1#

How can ***system design*** add value to CCE placement optimization?

QUESTION# 2

How can ***CCE placement*** inform system design?

What is the **value proposition** of combining these two analysis that currently conducted independently?



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Approach

- **Modelling** - tool to create a virtual representation of a country's existing supply chain and test potential changes. It was used to drive system design and CCE placement in two cases:

Case 1: Mozambique

Determine how the immunization supply chain design and structure should inform allocation of CCE, ***upstream*** of country's application for support through GAVI's Cold Chain Equipment Optimization Platform (CCEOP)

Case 2: Dem. Republic of Congo

Determine how operational deployment of equipment obtained through GAVI's Cold Chain Equipment Optimization Platform (CCEOP), affected the design of the SC, ***downstream***

Case 1: Mozambique

Objectives	Assess how system design impacts CCE placement needs (in support of CCEOP application)
Methodology	1. Measure the **impact of the existing CCE on vaccine supply chain performance** *(storage capacity utilization rate and vaccine availability)* 2. Estimate the delivery costs with the current allocation of CCE 3. Assess the **impact of a redesigned supply chain (direct delivery system) over CCE capacity** requirements

Case 2: Democratic Republic of Congo

Objectives	**Leveraging on CCEOP deployment to design a more equitable and performant supply chain**
Methodolog y	1. Supply Chain Modeling to assess the potential of the Supply Chain in place to flow the products that are required to meet the population needs 2. Baseline analysis to validate modeling results, validate capacity assumptions and assess and verify applicability of the opportunity in real settings 3. Solution design including equity parameters 4. Small scale implementation

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Results	▪ Provinces with **high peak storage utilization and high Vx availability** – indicated need to **address CCE capacity** in the short-term ▪ In a direct delivery system, cold storage capacity required at the district level is lower, since the district only houses 25% of buffer vaccine stock – can help **realize cost savings**

Case 1: Mozambique

CCE capacity savings realized due to direct distribution

Results (contd.)

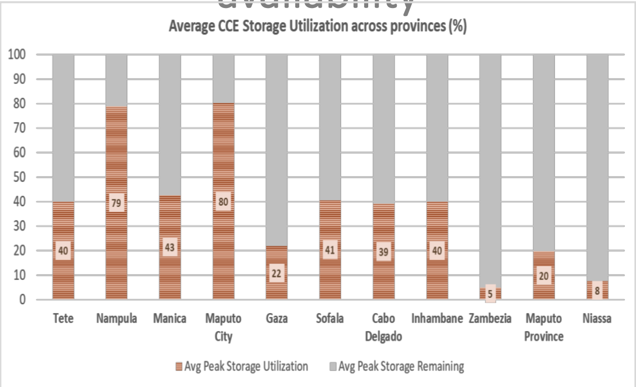
KPI 5: CCE capacity savings associated with direct delivery (# of fridges)

	Tete	Nampula	Zam-bezia	Manica	Maputo City	Gaza	Sofala	Cabo Delgado	Inham-bane	Maputo Province
Direct Delivery System										
Monthly Vx volume delivered (liters)	231	248	314	138	84	116	196	166	156	137
Cold storage capacity required (liters)	1,446	2,165	1,962	864	526	727	1,178	1,037	281	856
Cold storage capacity (# of fridges*)	26	39	35	15	9	13	21	19	5	15
Multi-Tier Delivery System										
Monthly Vx volume delivered (liters)	1157	1732	1569	691	422	581	982	829	781	685
Cold storage capacity required (liters)	2603	3897	3536	1555	947	1308	2209	1866	506	1541
Cold storage capacity (# of fridges*)	46	70	63	28	17	23	39	33	9	28
Direct Delivery System vs Multi-tier Delivery System										
SAVINGS - # of CCE at District Level	21	31	28	12	8	10	18	15	4	12

Case 1: Mozambique

Results (contd.)

Province prioritization based on CCE needs & Vx availability



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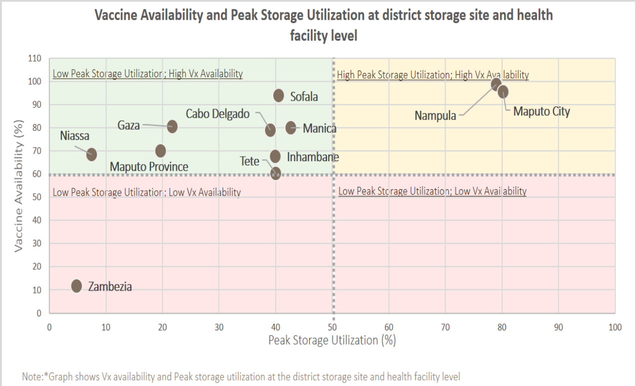

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Impact

- Provided roadmap for **strategic placement on CCE** - where storage capacity was low
- Allowed for increasing CCE placement in most **isolated areas**
- Strategic placement of CCE help **improve vaccine availability**
- Reduced focus on district level storage sites to reflect direct delivery distribution model - leading to **cost savings**

Case 2: Democratic Republic of Congo

Objectives

1. Leveraging on CCEOP deployment to design a more equitable and performant supply chain

Methodology

1. Supply Chain Modeling to assess the potential of the Supply Chain in place to flow the products that are required to meet the population needs
2. Baseline analysis to validate modeling results, validate capacity assumptions and assess and verify applicability of the opportunity in real settings
3. Solution design including equity parameters
4. Small scale implementation

Results

- CCEOP deployment increase CCE coverage from 10 to 40%
- From 30 Stocking sites (HF with CCE) to 115
- Reduced time average between health facilities and the nearest vaccine storage center
- Key takeaway:
- With more stocking sites, fewer vaccination sites depend on the Zone central office for replenishment (60)
- Shorter journeys and lower costs (+8% sites accessible within 1h; reduced time 45 min)

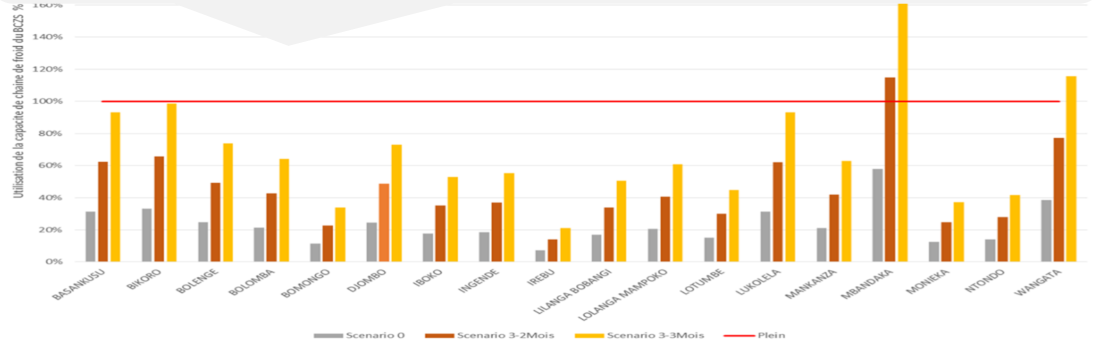
Case 2: Democratic Republic of Congo

Results (contd.)

Impact of CCE deployment on key metrics

Service Metric (Cumulative)	CCE available Volume		Vaccination Sites (sites with CCE)	
	BEFORE	AFTER	BEFORE	AFTER
1-Hour Reach	45%	66%	42%	64%
Half-Day (5 Hours)	86%	94%	85%	94%
1-Day	97%	99%	97%	98%
1+ Day	100%	100%	100%	100%
Wt. Avg Service Time	2.90 hr	1.52 hr		

Impact of CCE capacity utilization under different delivery intervals



Impact

- Increased flexibility
- Increase capacity,
- Frequency change: which allowed to implement a two month frequency
- Hub locations/ facilities with highest coverage were used as hub
- Reduced distance between facilities and vaccine warehouse
- Boost in performance in Equateur
- Reduction in distribution costs
- The optimization of CCE placement revealed opportunities for more vaccination sites to collect their immunization products from a local stocking site

Case 2: Democratic Republic of Congo (Deep Dive)

i. Impact on Key Metrics

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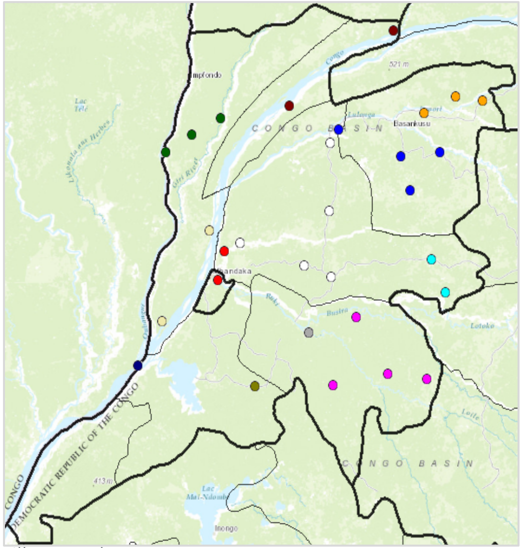
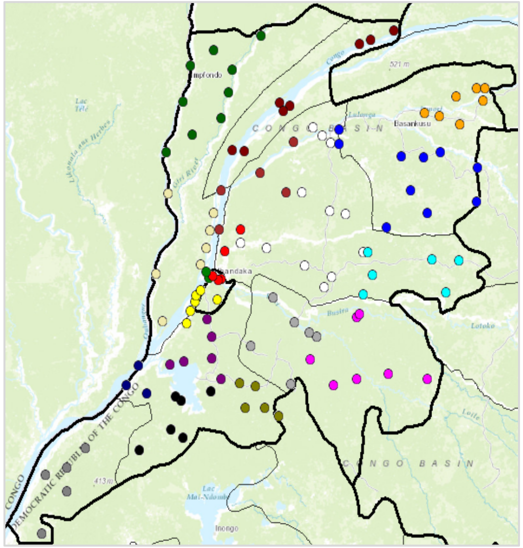
Case 2: Democratic Republic of Congo (Deep Dive)

SS before/ after CCEOP 1st deployment batch

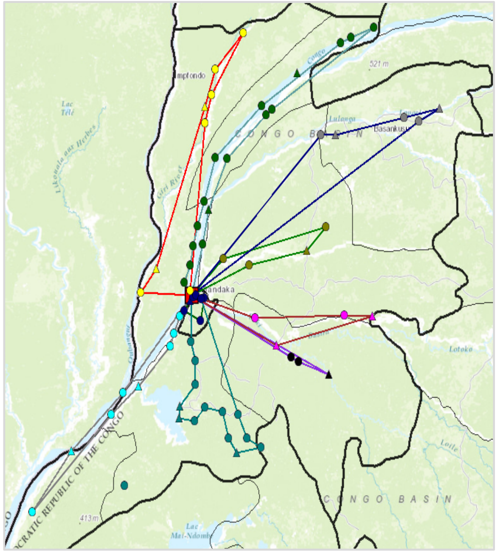
- **Results:** New cold chain equipment should **release opportunities to improve service within the province (Weighted Average Service time reduced by 50%),** facilitating product accessibility and availability to the health agents at vaccination sites.





Impact on Direct Delivery Potential

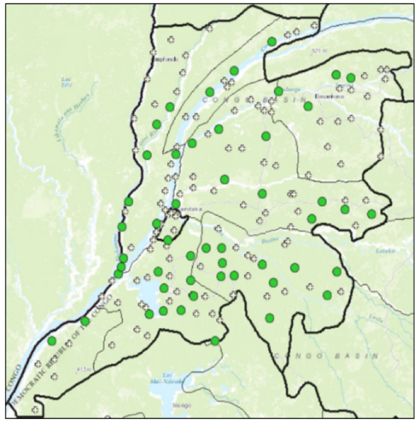
- **Results**: 52 stocking sites could potentially be delivered directly from the DPS if a push delivery system to the BCZS were to be set up using 9 different axes. **Direct delivery would not have been possible without the adding of new SS.. This volume shift can leverage available space allowing longer replenishment cycles therefore bigger drop sizes to be managed**.

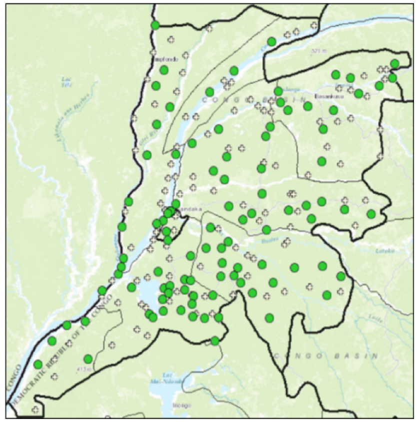


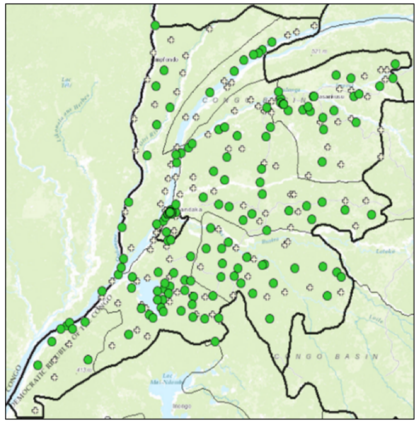
Case 2: Democratic Republic of Congo (Deep Dive)

v. Modelling future CCE Deployment (2/2)

- **Results**:
- Should the deployment occur in smaller batches (50 CCE as a next step), equipping the zones that currently have the highest cost per dose and longest service times are the best candidates to receive the new equipment.
- **Beyond 100 additional CCE deployed, there is not a significant improvement in cost metrics. However, increasing CCE coverage does continue to improve the level of service for vaccination sites**.
- Other key findings:
  - CCE deployment can improve the operation cost per dose but this improvement potential is limited and would be reached with a deployment of between 120 and 130 additional CCE.
  - More CCE brings products stock closer to consumption point enhancing accessibility of the products







Value proposition of an integrated SD+CCEOP approach

Before CCE deployment

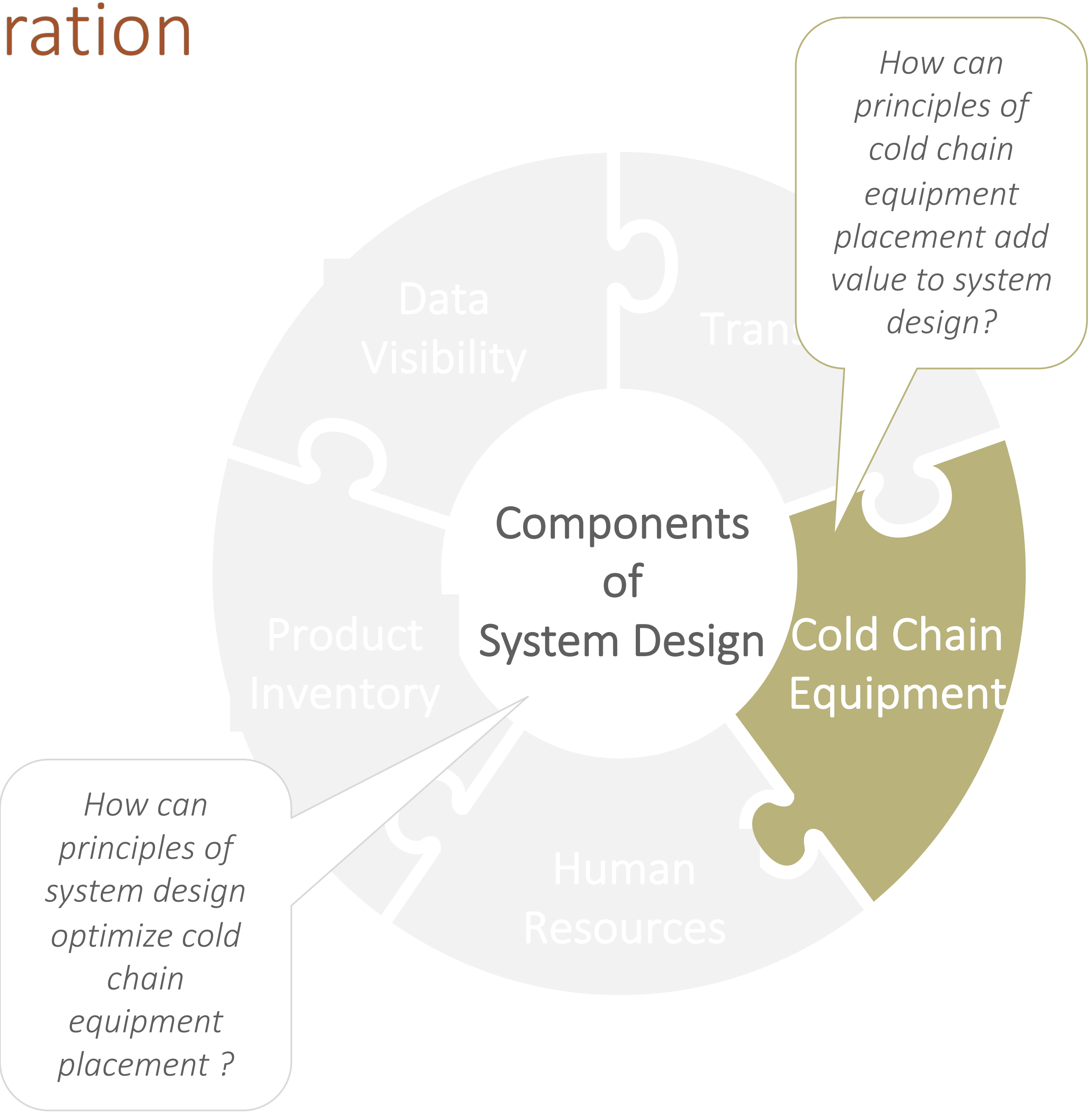
- CCE **capacity savings**
- Informed the roadmap for **strategic placement**
- **Equity:** considering most **isolated areas by cross analysis with transportation network**
- Possibility to measure deployment impact in terms of **vaccine availability**
- Possibility to get costing information to measure the impact of the deployment at the operational level
- **cost savings**

After CCE deployment

- Increased **opportunities to optimize**
- Increased SC **flexibility** and CCE **capacity**
- Possibility of increasing **delivery frequency**
- Possibility of changing resupply policy
- Reduced distance between facilities and vaccine picking sites
- Boost in performance in Equateur
- Reduction in distribution costs

Learnings and further consideration

- **Application of SD tool** to inform cold chain equipment placement decisions **to obtain a holistic view of the SC in addition to the conventional CCEOP elements**
- SC is further optimized when it takes into account CCE placement in regards to the **distribution model**
- **Possibility to optimize data collection processes, and costs**
- **Possibility to increase resource efficiency**



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