The Genomics Costing Tool and the IPSN Global Investment case

South & Southeast Asia Pathogen Genomics Prioritization and Implementation Workshop

Bangkok, Thailand

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The IPSN is convening a Community of Practice (COP) focusing on Mpox to support coordination of pathogen genomics and wastewater surveillance actors

Pathogen Genomic Surveillance (PGS)

Finds solutions to challenges to the implementation, strengthening and scale-up of genomic surveillance of Mpox

- Better tools and standards
- Enhanced data and benefits sharing

Wastewater and Environmental Surveillance (WES)

Finds solutions to challenges to the implementation of wastewater surveillance of Mpox

- Sampling protocols
- Technical methods and approaches
- Data interpretation, integration and communication

For IPSN membership scan QR code

Interested in joining the COP? See Homa or Silvia or email ipsn-secretariat@who.int

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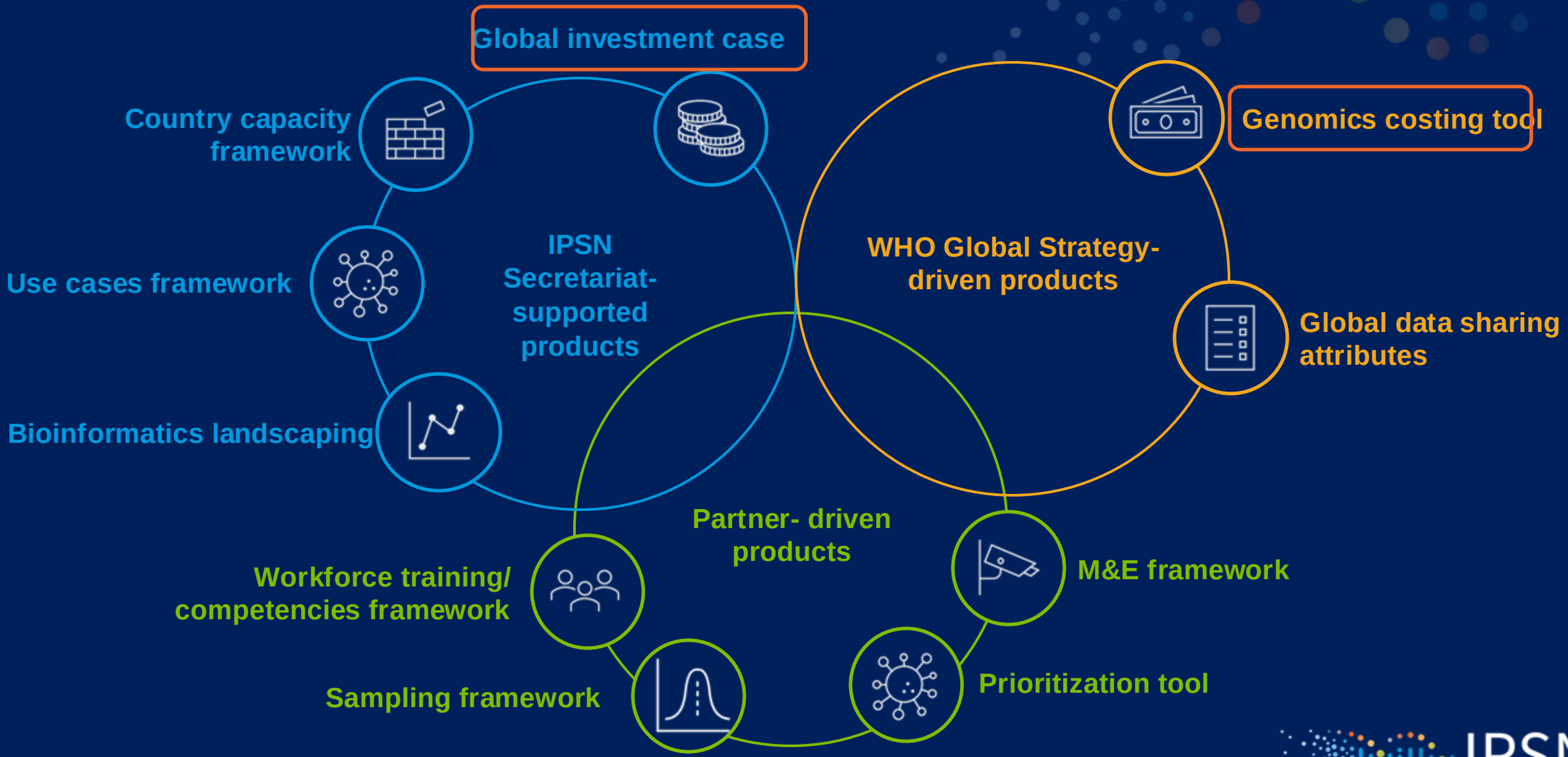
Toolkit of PGS products supported by IPSN



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World Health Organization

Genomics Costing Tool

Progress so far and looking forward

Slides kindly provided by Dr. Oluwatosin Akande

Genomics costing tool (GCT) – a collaborative effort

A multi agency collaboration

Purpose of the GCT

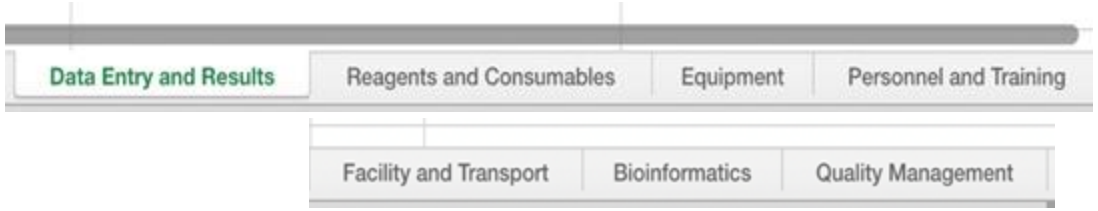
Support short- and long-term financial planning for countries who want to establish, optimize or scale up sequencing and bioinformatics activities.

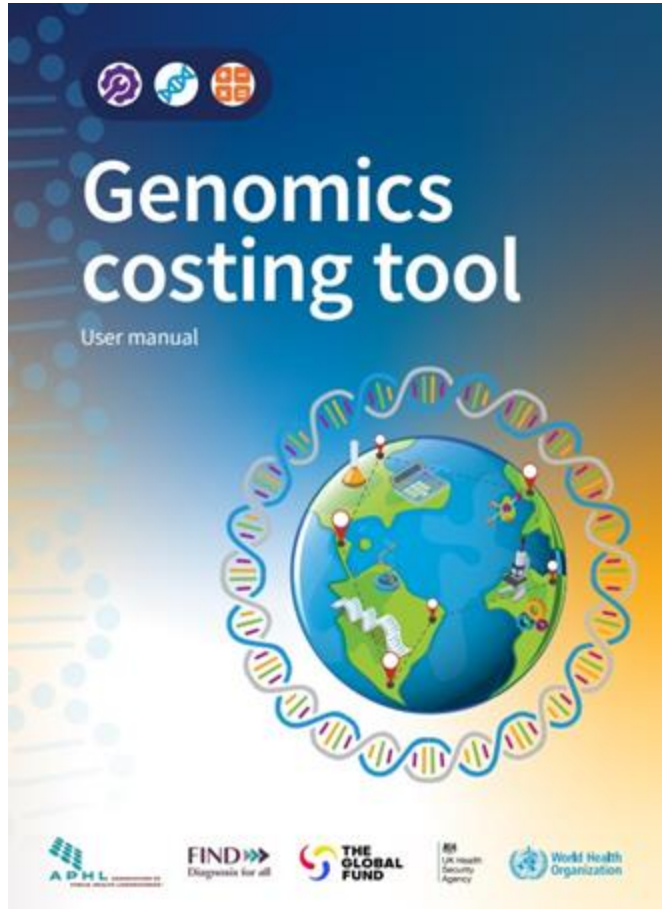
Target audience

- **Laboratories**
- **Country, regional and global policymakers**
- **Health administrators and economists**
- **International organizations including donors, philanthropic organizations, etc.**

Structure of the tool:

- **Excel-based, for SARS-CoV-2**
- **User manual available**





GCT v1 - Our journey and methodology

2022

Q3

Kick-off of the working group

2023

Q1

1st physical workshop to define scope and methodology of the tool

Q2

2nd physical workshop to advance draft tool for validation

Q2 & Q3

Validation exercises in African, East Mediterranean and European regions

Q3

3rd physical workshop to finalize tool

Q4

Country roll out in African and European regions

Official launch of the GCT v1

Landscape review

Identification and evaluation of existing tools.

Identification of country costing needs

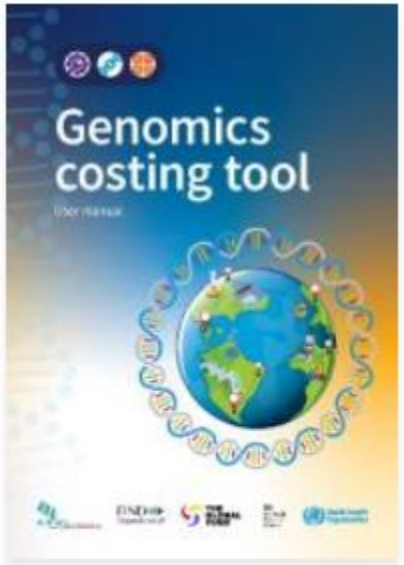
Tailored needs based on country requests.

Development of a draft tool

Built on the Laboratory Test Costing Tool developed by WHO EURO

Genomics costing tool

26 March 2024 | Technical document



Download (2.3 MB)

Overview

The first edition of the genomics costing tool (GCT) facilitates budgeting and resource mobilization for infrastructure, workforce, biosafety and quality assurance associated with SARS-CoV-2 genomic surveillance. This tool will be useful to country, regional and global policymakers, health administrators and economists, laboratory directors, quality managers, donor institutions and other stakeholders engaged in genomic surveillance for priority pathogens. The GCT is a Microsoft Excel-based tool which is accompanied by a user manual to guide its users.

- Download the genomics costing tool here
- Download the genomics costing tool user manual here

WHO TEAM

Global Genomic Surveillance

NUMBER OF PAGES

46

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https://www.who.int/publications/i/item/9789240090866

SCAN ME

GCT v1: Overview in MS Excel

1- Data entry and results

2- Reagents and consumables

3- Equipment

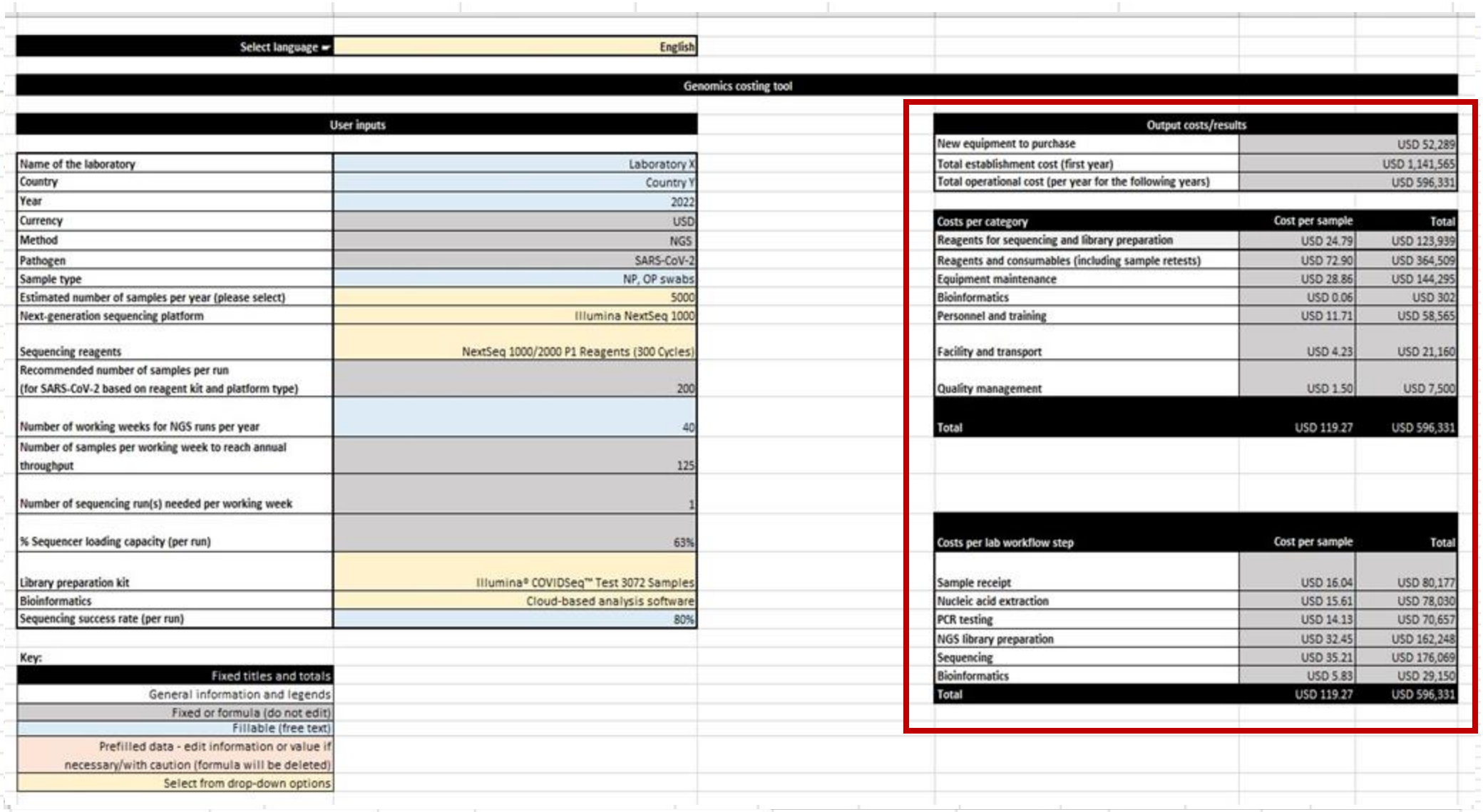
4 - Personnel and training

5- Facility and transport

6- Bioinformatics

7- Quality management

1- Data entry and results



Select language	English

Genomics costing tool

User inputs

Name of the laboratory	Laboratory X
Country	Country Y
Year	2022
Currency	USD
Method	NGS
Pathogen	SARS-CoV-2
Sample type	NP, OP swabs
Estimated number of samples per year (please select)	5000
Next-generation sequencing platform	Illumina NextSeq 1000
Sequencing reagents	NextSeq 1000/2000 P1 Reagents (300 Cycles)
Recommended number of samples per run (for SARS-CoV-2 based on reagent kit and platform type)	200
Number of working weeks for NGS runs per year	40
Number of samples per working week to reach annual throughput	125
Number of sequencing run(s) needed per working week	1
% Sequencer loading capacity (per run)	63%
Library preparation kit	Illumina® COVIDSeq™ Test 3072 Samples
Bioinformatics	Cloud-based analysis software
Sequencing success rate (per run)	80%

Key:

Fixed titles and totals
General information and legends
Fixed or formula (do not edit)
Fillable (free text)
Prefilled data - edit information or value if necessary/with caution (formula will be deleted)
Select from drop-down options

Output costs/results

New equipment to purchase	USD 52,289
Total establishment cost (first year)	USD 1,141,565
Total operational cost (per year for the following years)	USD 596,331

Costs per category	Cost per sample	Total
Reagents for sequencing and library preparation	USD 24.79	USD 123,939
Reagents and consumables (including sample retests)	USD 72.90	USD 364,509
Equipment maintenance	USD 28.86	USD 144,295
Bioinformatics	USD 0.06	USD 302
Personnel and training	USD 11.71	USD 58,565
Facility and transport	USD 4.23	USD 21,160
Quality management	USD 1.50	USD 7,500
Total	USD 119.27	USD 596,331

Costs per lab workflow step	Cost per sample	Total
Sample receipt	USD 16.04	USD 80,177
Nucleic acid extraction	USD 15.61	USD 78,030
PCR testing	USD 14.13	USD 70,657
NGS library preparation	USD 32.45	USD 162,248
Sequencing	USD 35.21	USD 176,069
Bioinformatics	USD 5.83	USD 29,150
Total	USD 119.27	USD 596,331

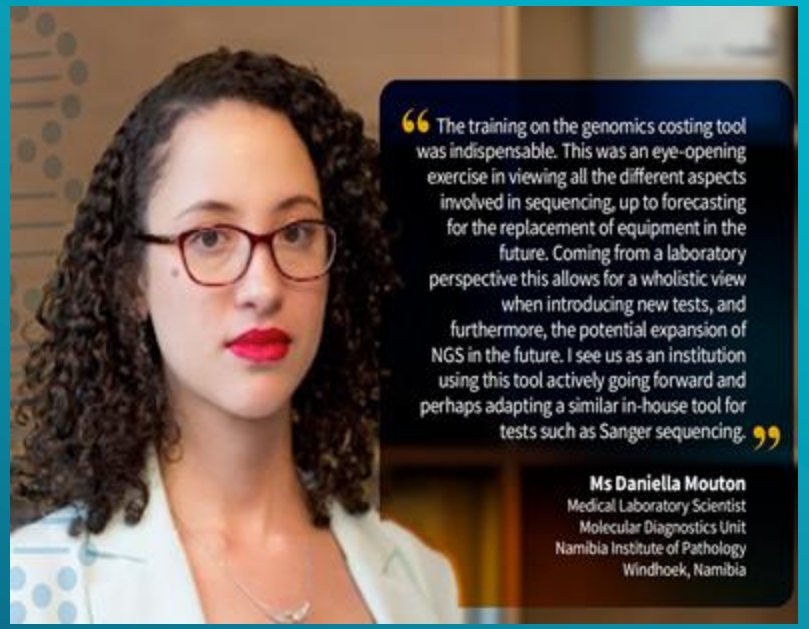
Reflections from the validation exercises

"During the training in Oman, the value of bringing together key stakeholders with expertise in a wide range of areas, for open discussion about the principles, goals and challenges associated with implementing genomics was clear."

Dr. Luke W. Meredith
Sequencing Consultant,
WHO Regional Office for the Eastern Mediterranean

12-14 June 2023: Kyrgyzstan
31 July - 2 August 2023: Ghana
7-8 August 2023: Oman

Early experiences in rolling out the tool: Namibia and Georgia



10-11 October 2023: Namibia

28-29 November 2023: Georgia

GCT v2 - Our journey and methodology

2023

Q4

Country roll out in African and European regions

Official launch of the GCT v1

2024

Q1/Q2

Collection and collation of GCT v1 feedback

Q2

Physical workshop to define scope and methodology of the tool

Q2/Q3

Bootcamp to develop first draft of GCT v2

Internal review and refinement of draft

Q3/Q4

Bootcamp to advance draft tool for validation exercise

Validation exercises and finalization of the tool and its user manual

Collection and collation of GCT v1 feedback

★★☆

Demand from countries and partners to expand scope to more pathogens, expand throughputs and platforms, etc.

Prioritization and feasibility assessment of features for GCT v2

Review of feedback to prioritize and assess feasibility of incorporating suggestions into GCT v2.

Looking ahead….

Develop and publish GCT v2 by Q4 2024:

- Reiterate based on country and partner needs

What's new? Capability of the tool to cost **viral and bacterial pathogens**

Continue to develop and publish derivative knowledge products:

- 1 manuscript published and 1 is being finalized
- 3 abstracts presented in 2023

Investing in health preparedness, response and resilience: a genomics costing tool focused on next generation sequencing

Learn more: https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1404243/full

Thank you….

Launch of GCT v1 in December 2023, Istanbul, Turkiye

Some members of the GCT working group

Acknowledging our partners:

- Central Public Health Laboratories, Ministry of Health, Muscat, Oman
- National Public Health and Reference Laboratory Ghana Health Service, Accra, Ghana
- National TB Reference Laboratory, Bishkek, Kyrgyzstan
- Noguchi Memorial Institute for Medical Research, Accra, Ghana
- World Health Organization Country Office Ghana, Accra, Ghana
- World Health Organization Country Office Kyrgyzstan, Bishkek, Kyrgyzstan
- World Health Organization Regional Office for Africa, Brazzaville, Republic of the Congo
- World Health Organization Regional Office for the Eastern Mediterranean, Cairo, Egypt

APHL Association of Public Health Laboratories
FIND Diagnosis for all
THE GLOBAL FUND
UK Health Security Agency
World Health Organization

The IPSN Global Investment Case

Developed by SEEK Development consulting group

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The global investment case creates an advocacy narrative for financing of pathogen genomic surveillance (PGS)

Key financing challenges

- Current funding levels for PGS are insufficient and under threat
- Investments in PGS are not appropriately prioritized
- Cost effectiveness is not well understood

Intended impact of a global investment case

- Develop a $ figure around which a global call for investment can be made
- Articulate the benefit of these investments to build the narrative for funders

Target audience for the investment case

- The investment case targets a global audience, while emphasizing country needs
- International donors are the main audience, plus Ministries of Finance

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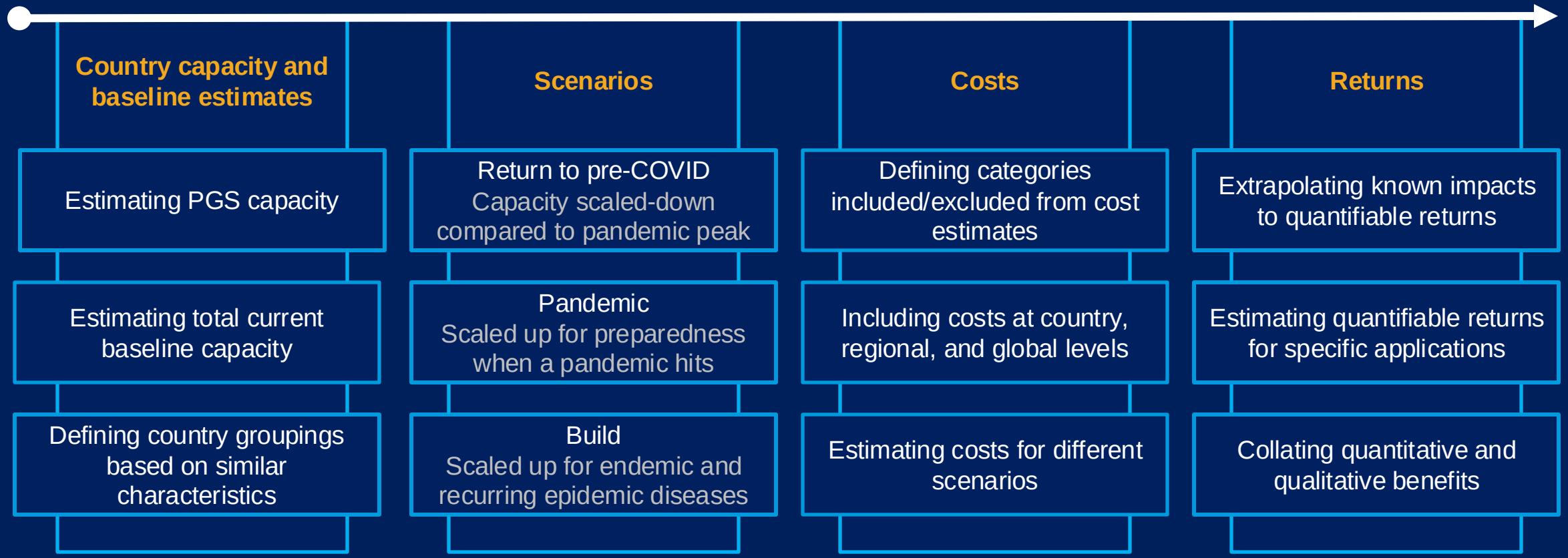
Analytical framework – 4 main components



Genome Unit: Ratio from which estimates of viral sequencing capacity could be converted into other pathogen types, based on the size of the genome and the throughput of the sequencing technology

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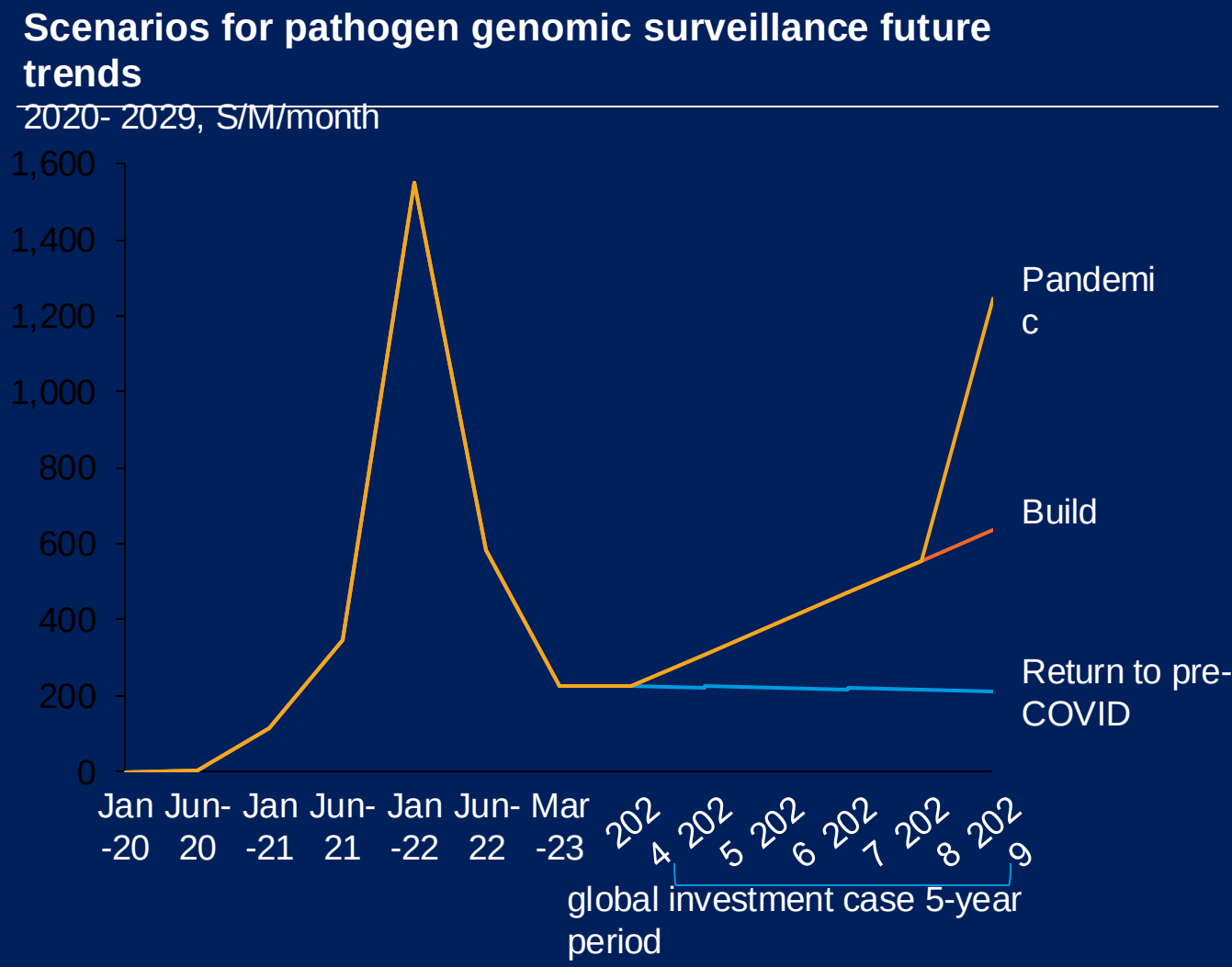
To understand the likely evolution of capacity levels, countries were sorted to four groups based on a composite score of sequencing capacity, strength of the surveillance system, and income

Country group	1	2	3	4
Description	No sequencing capacity or very low capacity (incl. access). Low surveillance system capabilities. Mainly low-income countries.	Low to moderate sequencing capacity. Low to moderate surveillance system strength. Low to lower middle-income countries.	Moderate sequencing capacity. Moderate to high surveillance system strength. Lower medium and higher middle-income countries.	High sequencing capacity including sequencing for others. High surveillance system strength. High and upper-middle income countries.

Each group is represented by approximately 40 countries

Source: SEEK Development analysis. The composite score is constructed out of three normalized indicators, cumulative sequences reported across the pandemic derived from FIIND, SARS-COV-2 genomic surveillance global capacity mapping, 2023, the GHSI early detection score, from: Global Health Security (GHS) Index, 2023, and World Bank GDP data derived from World Bank country and lending groups. Indicators are normalized to a scale from 0 to 1. Countries are sorted into four groups by composite score quartile. Countries with a population below 500,000 are excluded.

Scenarios – Projections of PGS capacity



*Source: SEEK Development analysis, based on data from FIND, World Bank, GHSI, and AsiaPGI; FIND daily sequences are converted into daily rolling average, aggregated by month; sequences are population adjusted globally

Pandemic scenario

- Equivalent to pandemic peak sequencing volume of each country, calculated as the maximum value of monthly SC2 sequencing +/- 6 months
- Countries below 9/M/m scale up to that target, countries above that target remain at their peak sequencing levels

Build scenario

- Equivalent to the average peace-time utilization rate of PGS (51%, Asia PGI's capacity mapping), applied to the pandemic peak of each country

Return to pre-COVID scenario

- Estimated based on SC2 shared between Dec 2020 and May 2021, multiplied by the average peace-time utilization rate (51%, AsiaPGI's capacity mapping)

Baseline sequencing capacity

- Estimated based on SC2 sequences shared in 2023

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Costs estimation

- Country costs
  - Total facility costs (lab costing tool components)
  - Sharing and decision-making costs
- Regional costs
  - Regional reference labs
  - Regional networks
- Global costs
  - Networks providing coordination, capacity building support and sequencing for multiple geographies

Returns estimation

Benefits model calculated using the ‘Cost-of-Illness’ (COI) approach

- Treatment costs saved (medications, diagnostic costs, and facility/provider fees
- Total productivity saved (reduced labour force participation due to disability and death)

Country estimation of incidence reduction due to PGS estimated from published studies

- ‘cost-benefit’, ‘cost-effectiveness’, ‘cost-utility’, ‘impact analysis’, and ‘impact assessment’ of PGS (mainly foodborne and HAI)
- adjusted by health system strength and sequencing capacity

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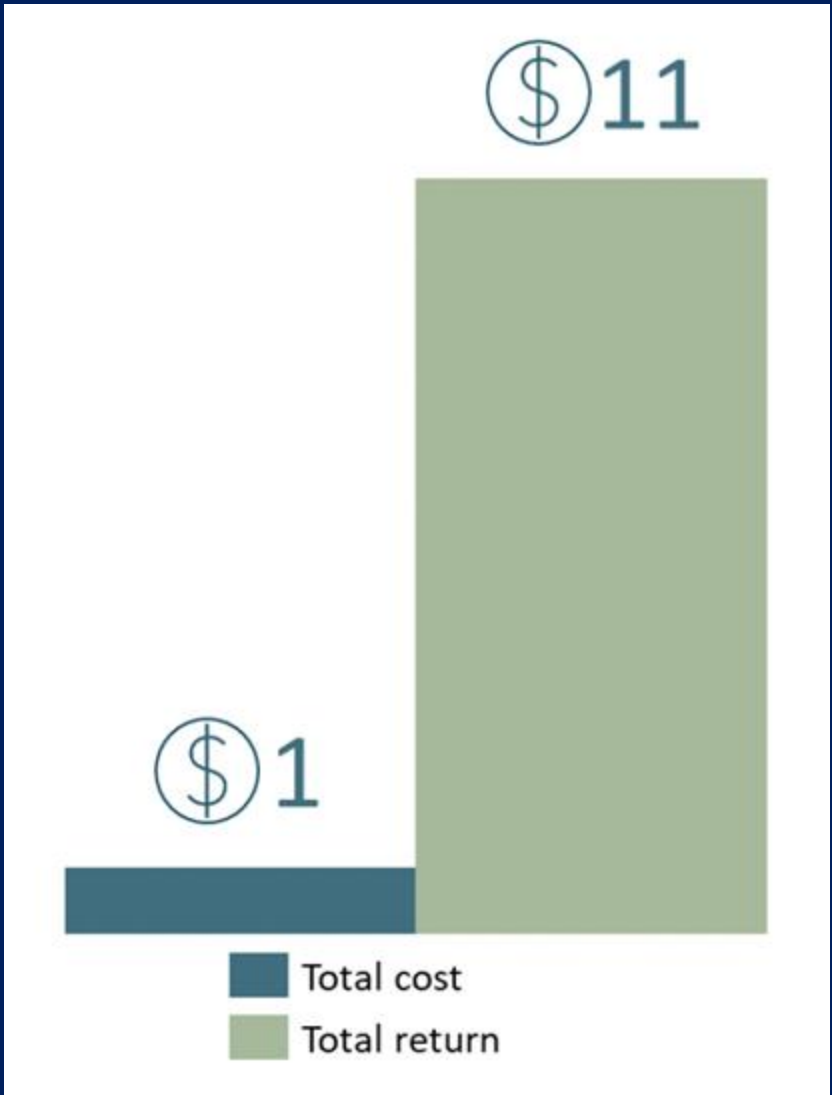
Each dollar invested will bring at least $11 in health and economic benefits



Estimate based on foodborne diseases

The return on investment can be as large as $121 for every dollar invested for PGS of drug-resistant hospital-acquired infections

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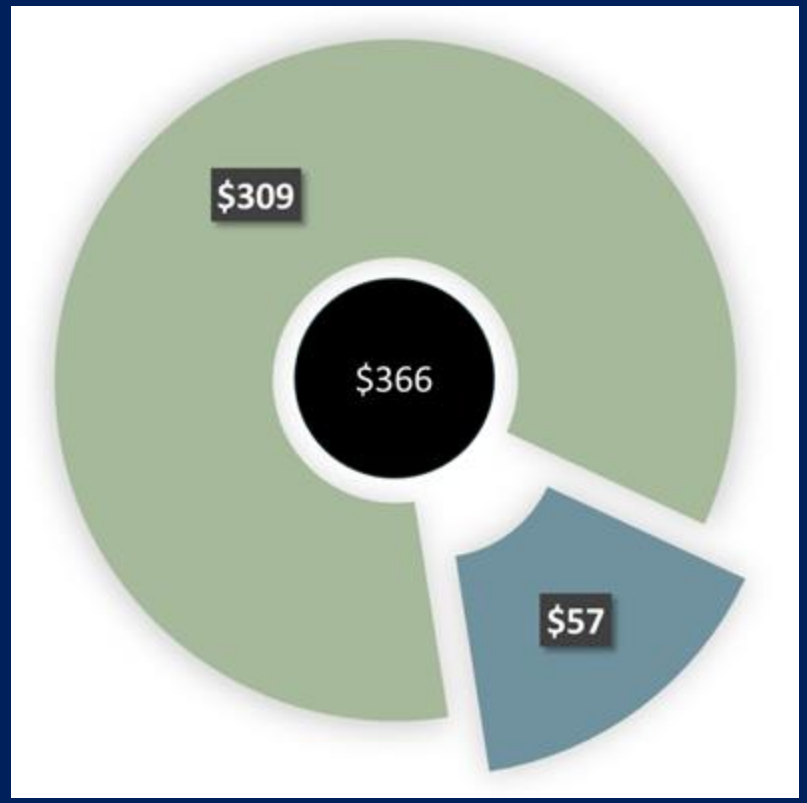
Investments of $366 million per year are needed to build equity and ensure sustainability



$309 million - Equity investments

- ## $212 million - Country-level investments

To build equitable access to genomics capacity in all low-income, low-capacity countries

Domestic budgets would continue to cover capacity in higher income, higher capacity countries.

- ## $97 million - Regional investments

To consolidate regional capacity in lower income regions

$57 million - Sustainability investments

Global investments

To ensure sustainability (coordination, capacity building, global goods)

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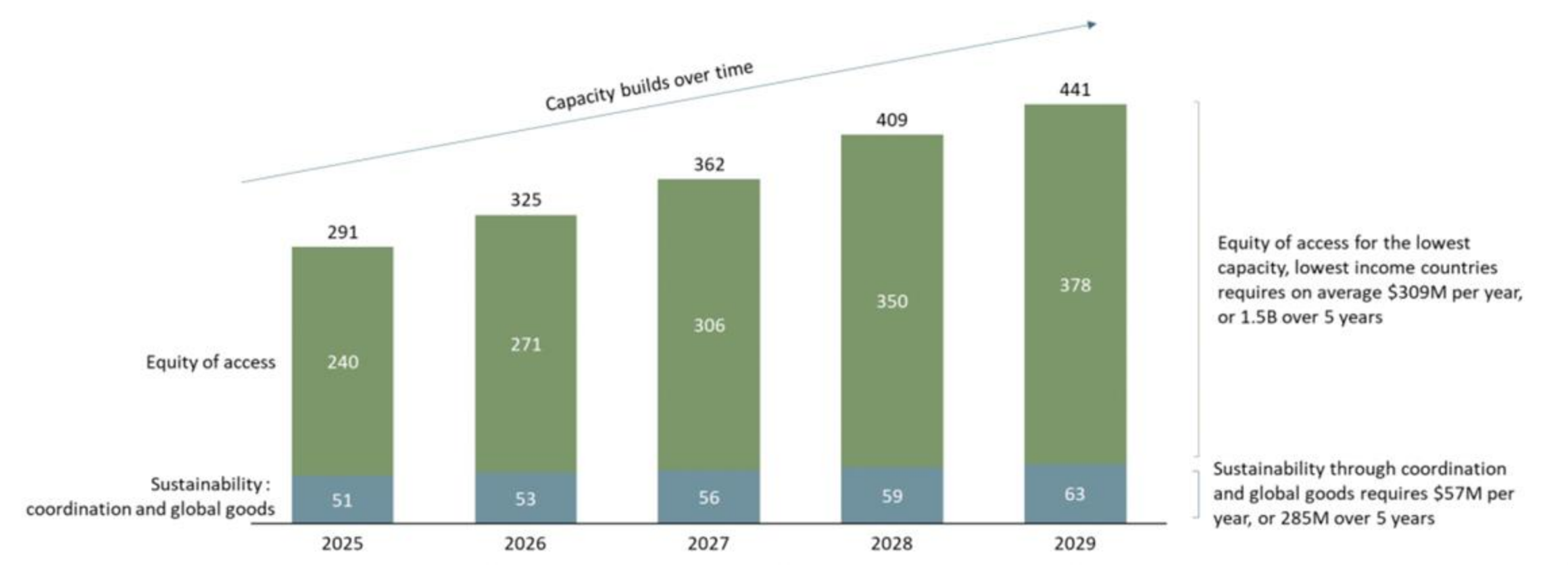
Total Cost per Year, 2025-2029

Costs would scale up over time as additional capacity is built to a total of $441 Million in 2029.



Key Messages

- Pathogen genomics is impactful and cost-effective. Investing $1 now will yield a return of at least $11 in health and economic benefits in five years. Once capacity is built, additional value will be unlocked for different applications, including for AMR surveillance, clinical care, or vaccine development.
- Building more equitable, and sustainable pathogen genomic surveillance systems requires additional investments of $366 million per year until 2029. This includes creating minimum effective capacity in low-income, low-capacity countries, strengthening regional support capacity, as well as investing in global infrastructure.
- The IPSN calls on donors to support required additional investments, in particular through supporting multilateral funding vehicles.

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Overview of next steps

Refine results based on broader consultation

- Test results based on consultations with partners, including countries and regions
- Test final messaging of narrative with key audiences, including countries and donors
- Refine final results and messaging based on feedback received

Publish full investment case

- Define roadmap to publication and launch, including identification of launch date, location and potential partner organizations
- Draft full investment case publication
- Define engagement and communications plan in preparation for launch

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Acknowledgements

The IPSN Secretariat team

SEEK Development

External technical advisors from WHO and partner organizations

PGS experts consulted for the development of the global investment case

Internal WHO

External

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