GREEN CLIMATE FUND | Independent Evaluation Unit

Center for Evaluation and Development C4ED

Learning-Oriented Real-Time Impact Assessment

Design Workshop
Songdo, South Korea

Topic I: The importance of rigorous IE: Insights, Steps, and possibilities of involvement

Thomas Eekhout
Monitoring & Evaluation specialist at C4ED

28 August 2023

OUTLINE

1. **Introduction:**
   - Why conduct an Impact Evaluation?
   - What is an IE?

2. **How to measure impact?**

3. **Conducting an IE in practice:**
   - Overview
   - Phase I: Inception phase
   - Phase II Data collection
   - Phase III: Data analysis and dissemination

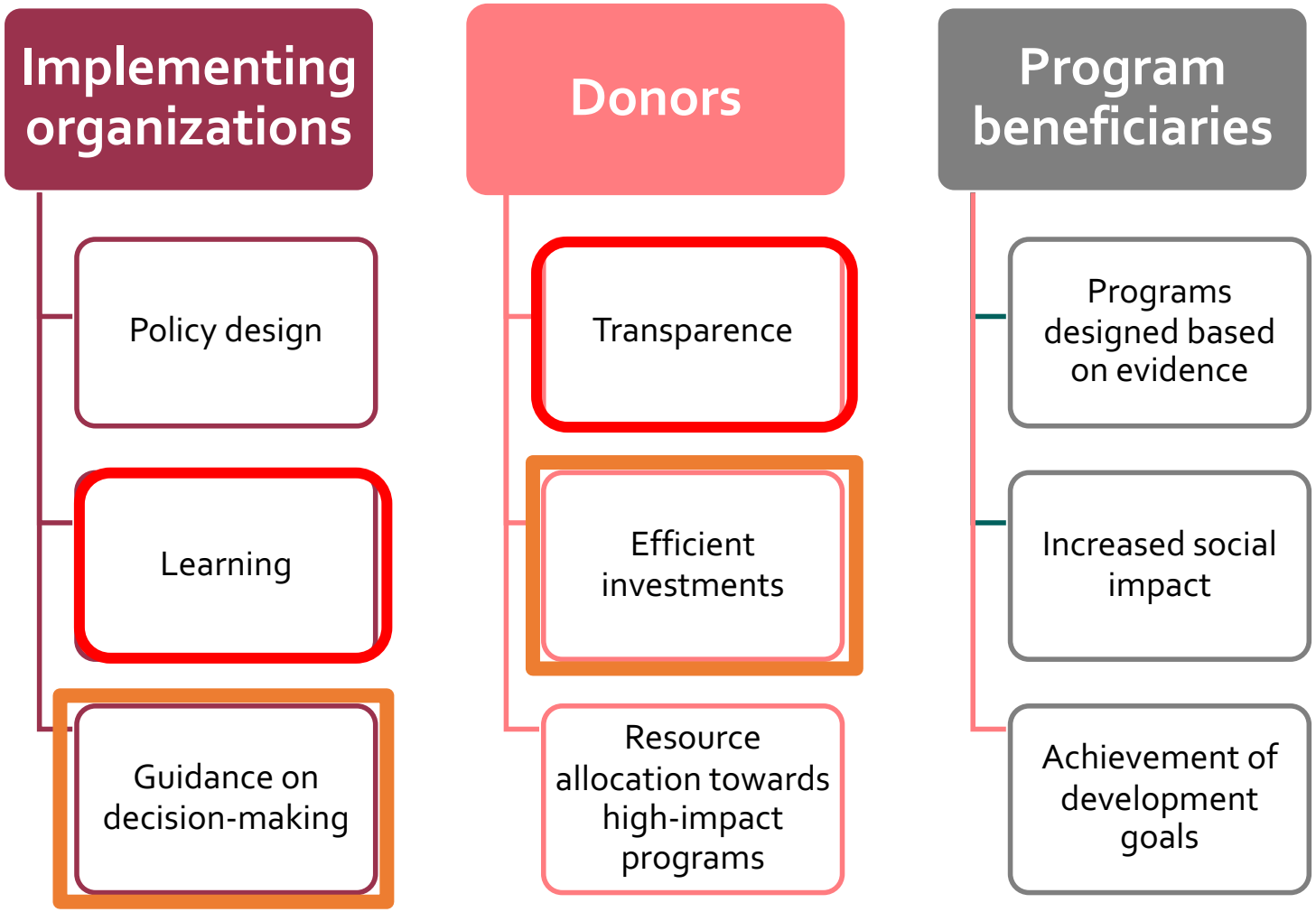
4. **Requirements to design and conduct an IE**

OBJECTIVES

- Understand what IEs are and why they are relevant.
- Understand the steps to embed an IE into a project and the potential involvement of the project team.
- Understand the implications of conducting an IE.

1. INTRODUCTION

WHY CONDUCT AN IE?



WHAT IS AN IE?

Evaluation of an intervention, a policy and/or a project

=

The measure of the difference between

outcomes with and without the intervention

IE *vs Monitoring and Evaluation?*

- Impact evaluation goes **beyond** monitoring and evaluation

- Monitoring/process evaluation is not necessarily concerned with "impact":

  - It is interested in the way money is spent → **Inputs**
  - Whether procedures are being followed → **Timing, size of the program**
  - Whether the program is delivered → **Outputs**
  - What the short-term outcomes are → **Not necessarily as a result of the program**

→ **Need for impact evaluation**

IE *vs Monitoring and Evaluation?*

Combining impact evaluation and monitoring data can be beneficial for:

- Understanding why there is an (no) impact

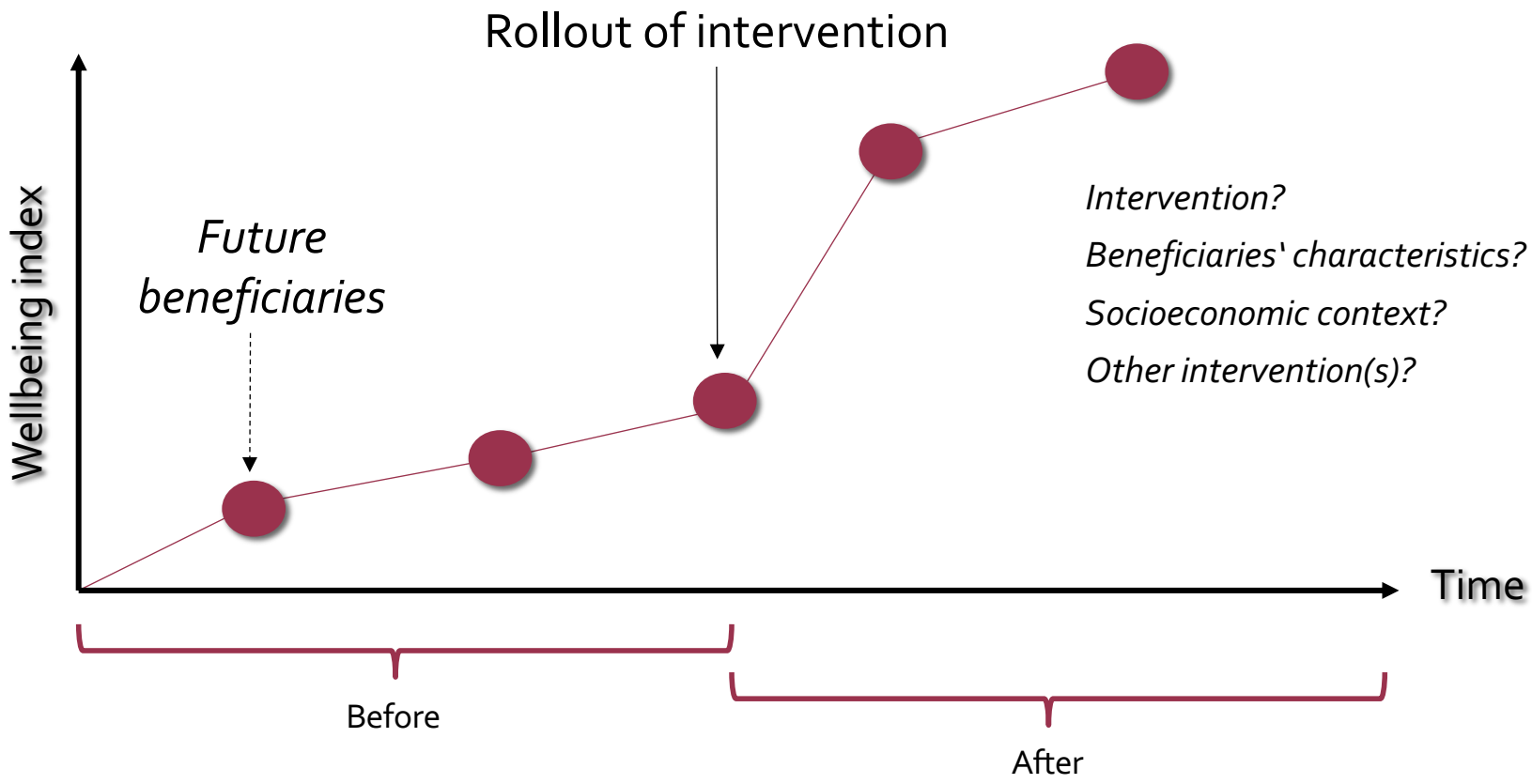
- Conducting Cost-Effectiveness Analysis (CEA):

  The amount of **cost** required to achieve a given **impact**.

  → *On average, how much did the project spend to increase income by 10% of a beneficiary?*

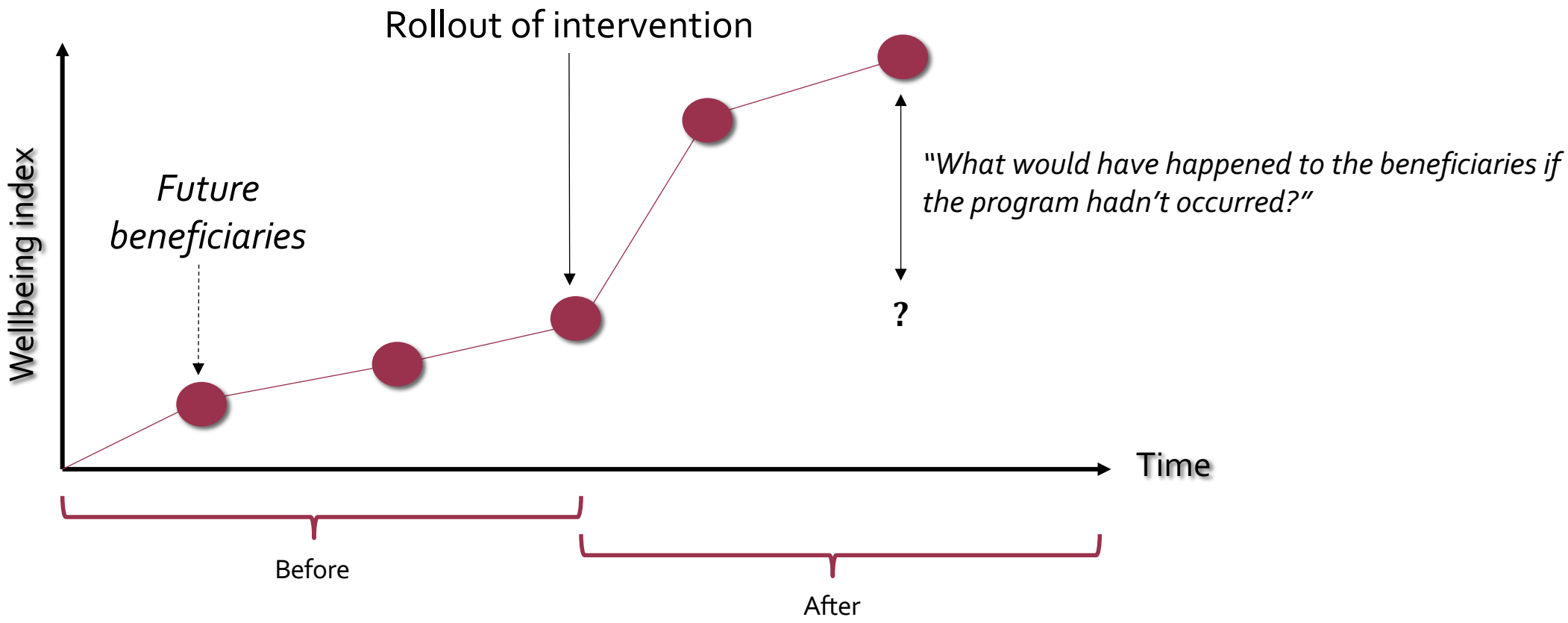
2. HOW TO MEASURE IMPACT?

HOW TO MEASURE THE IMPACT?



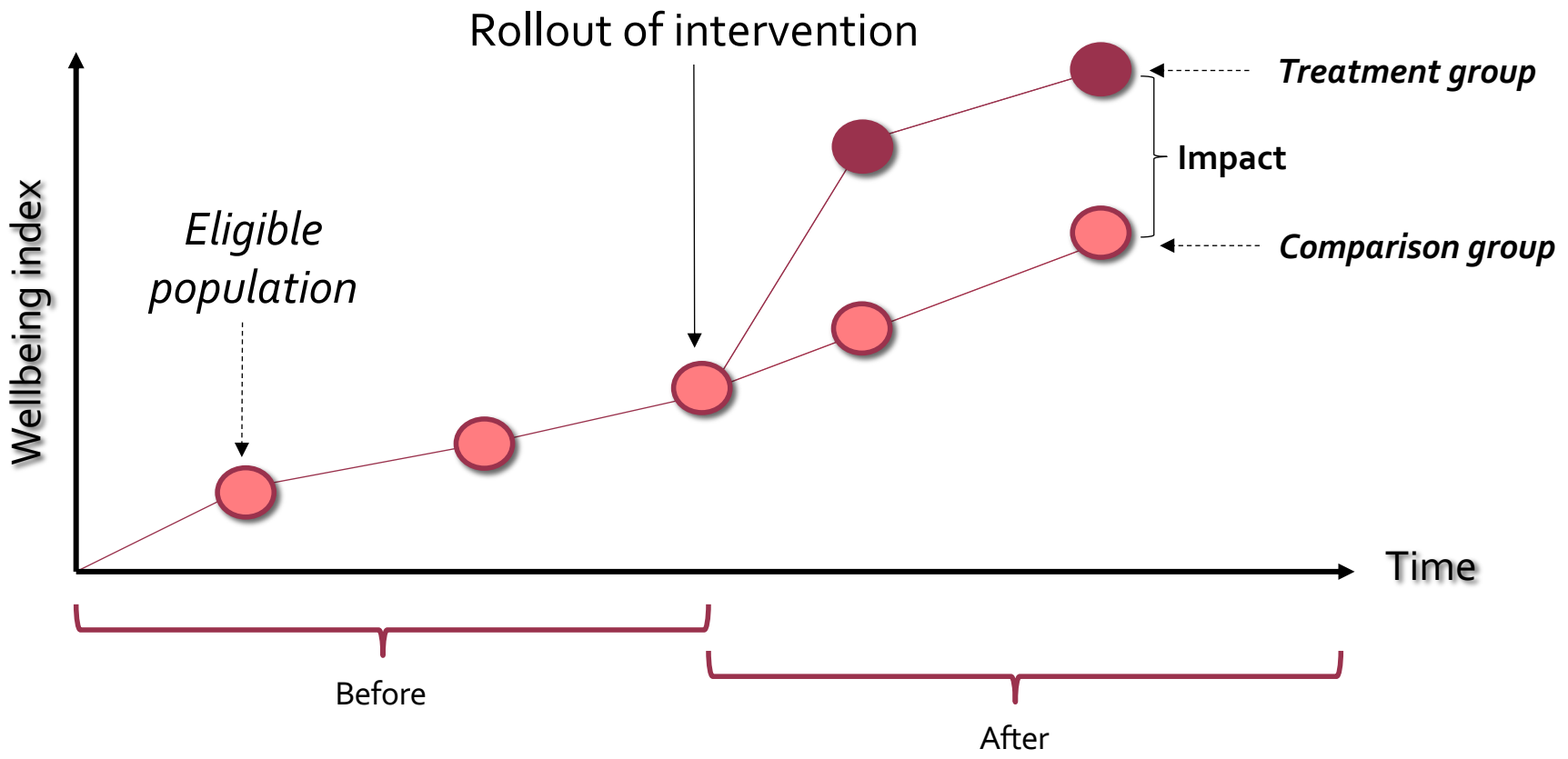
GREEN CLIMATE FUND | Independent Evaluation Unit

HOW TO MEASURE THE IMPACT?

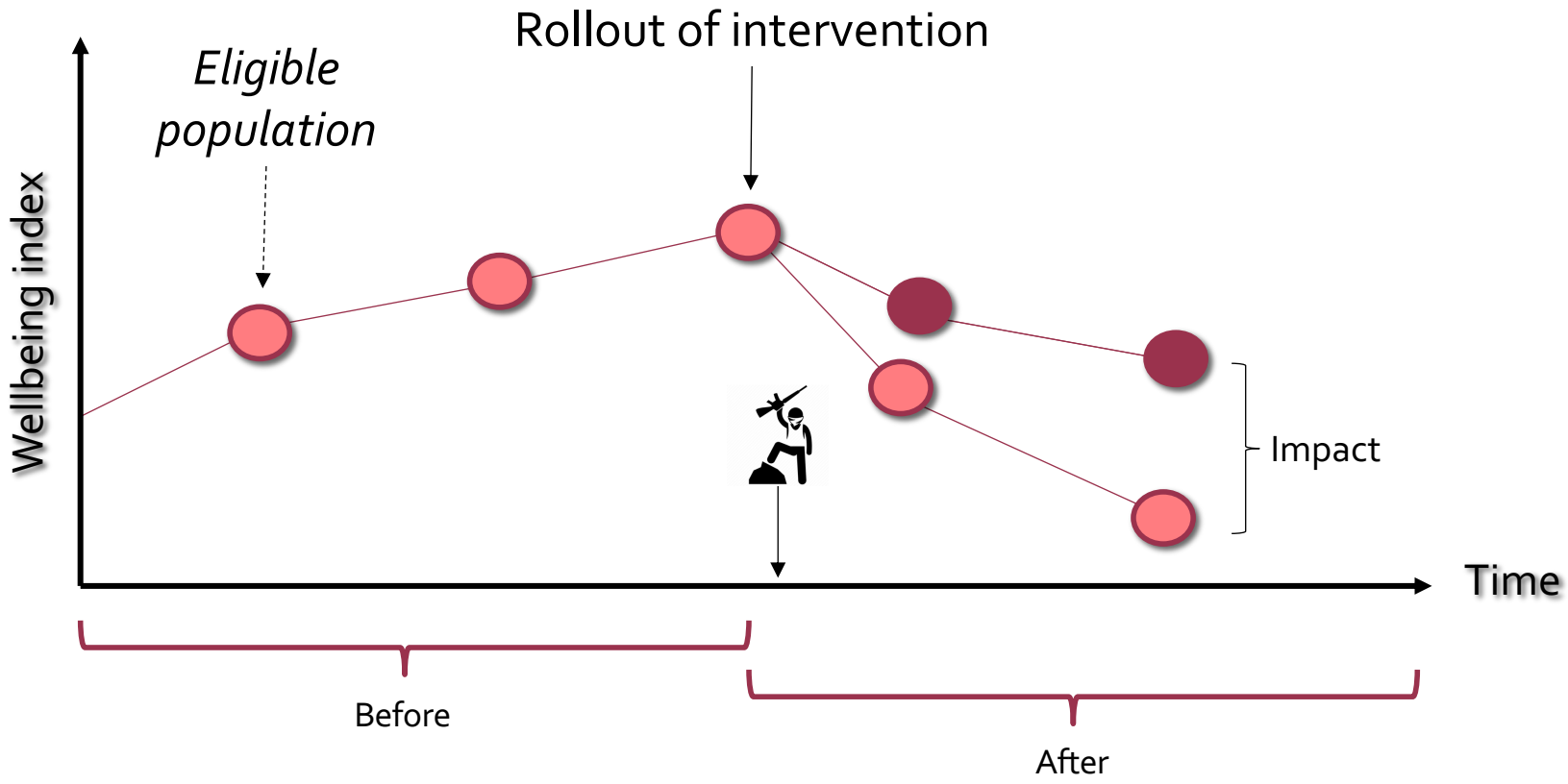


Center for Evaluation and Development

HOW TO MEASURE THE IMPACT?



HOW TO MEASURE THE IMPACT?



HOW TO MEASURE THE IMPACT?

The core challenge at the heart of any IE: …

A short test:

*Imagine GCF-IEU invites you to participate in a program to **develop leadership skills**.*

Participation in this program is expected to improve your income and career progression. The program will take place in Incheon for two weeks (full-time) and costs 200 euros.

Would you participate?

HOW TO MEASURE THE IMPACT?

Would you participate?

Yes	No
Ambition	Satisfaction with current position
Boredom	Too busy
Curiosity	Interest in developing other skills
Nearby	Far away

HOW TO FIND A GOOD COUNTERFACTUAL?

The core challenge at the heart of any RIE: **Selection bias**

1. Self-selection:

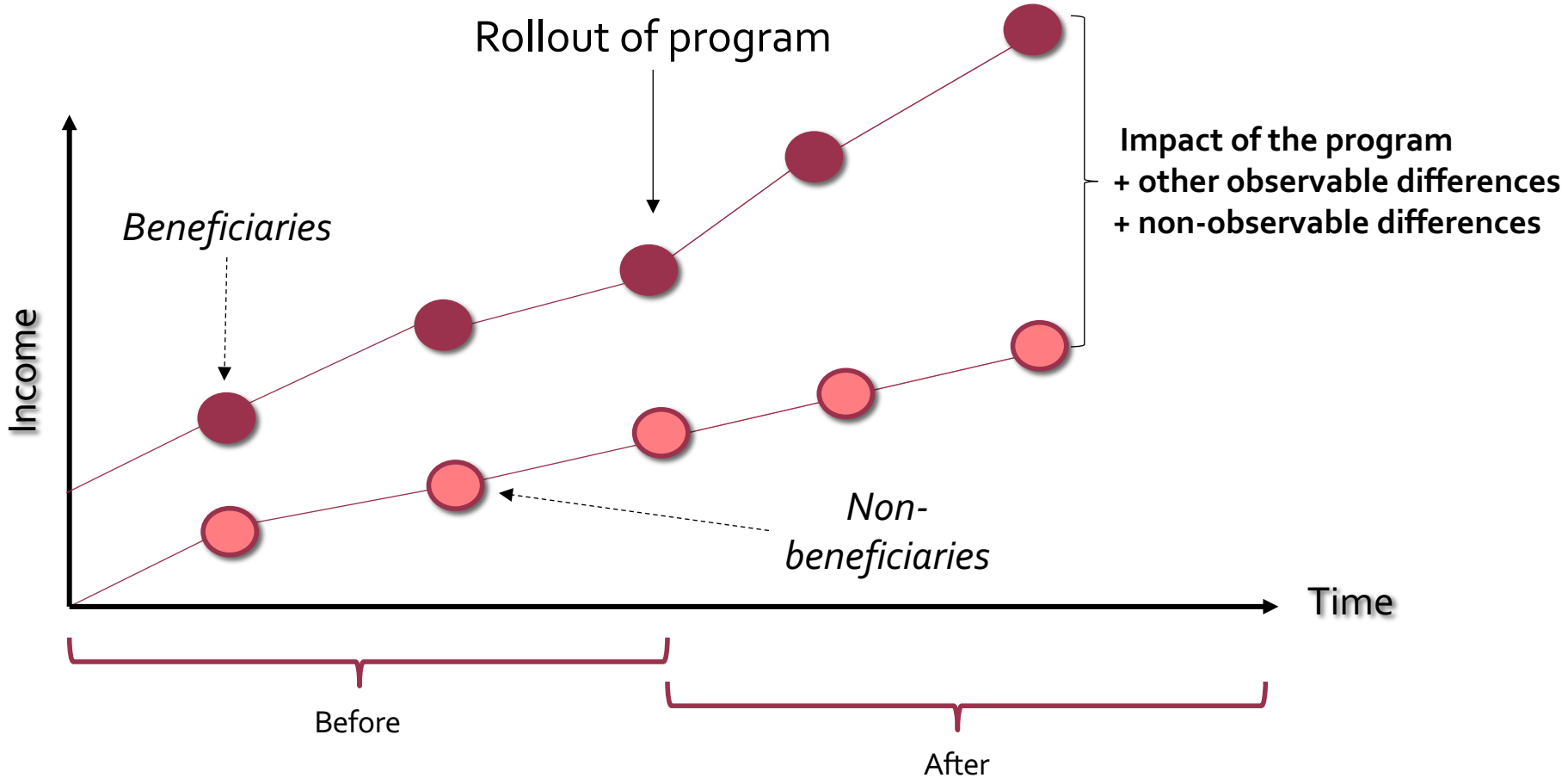
- Participation is voluntary

2. Program targeting:

- Participants are chosen *because* they are different

→ Those participating in the intervention and those not differ in observable and unobservable ways

HOW TO MEASURE THE IMPACT?



HOW TO MEASURE THE IMPACT?

HOW TO FIND A GOOD COUNTERFACTUAL …

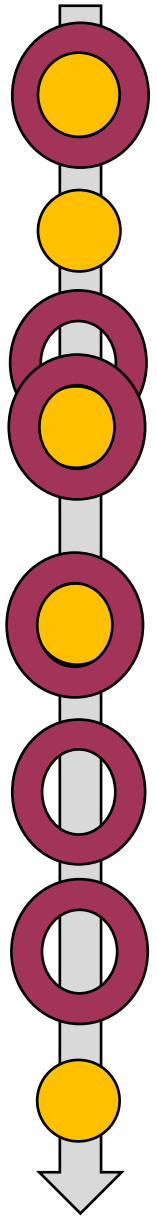
… OVERCOME THE SELECTION BIAS?

- Experimental methods / Randomized controlled trials
- Quasi-Experimental methods

→ *„Seminar III: Experimental and quasi-experimental evaluations"*

3. CONDUCTING AN IMPACT EVALUATION IN PRACTICE

OVERVIEW



Design of intervention

IE preparation & design

Identify eligible population (sensitization, application?)

Baseline data collection

Selection of participants + Selection of comparison group

Rollout of intervention + (Monitoring?)

Follow-up data collection(s) ⟶ ***Timing?***

To be adapted to the outcomes of interest

Analysis and dissemination

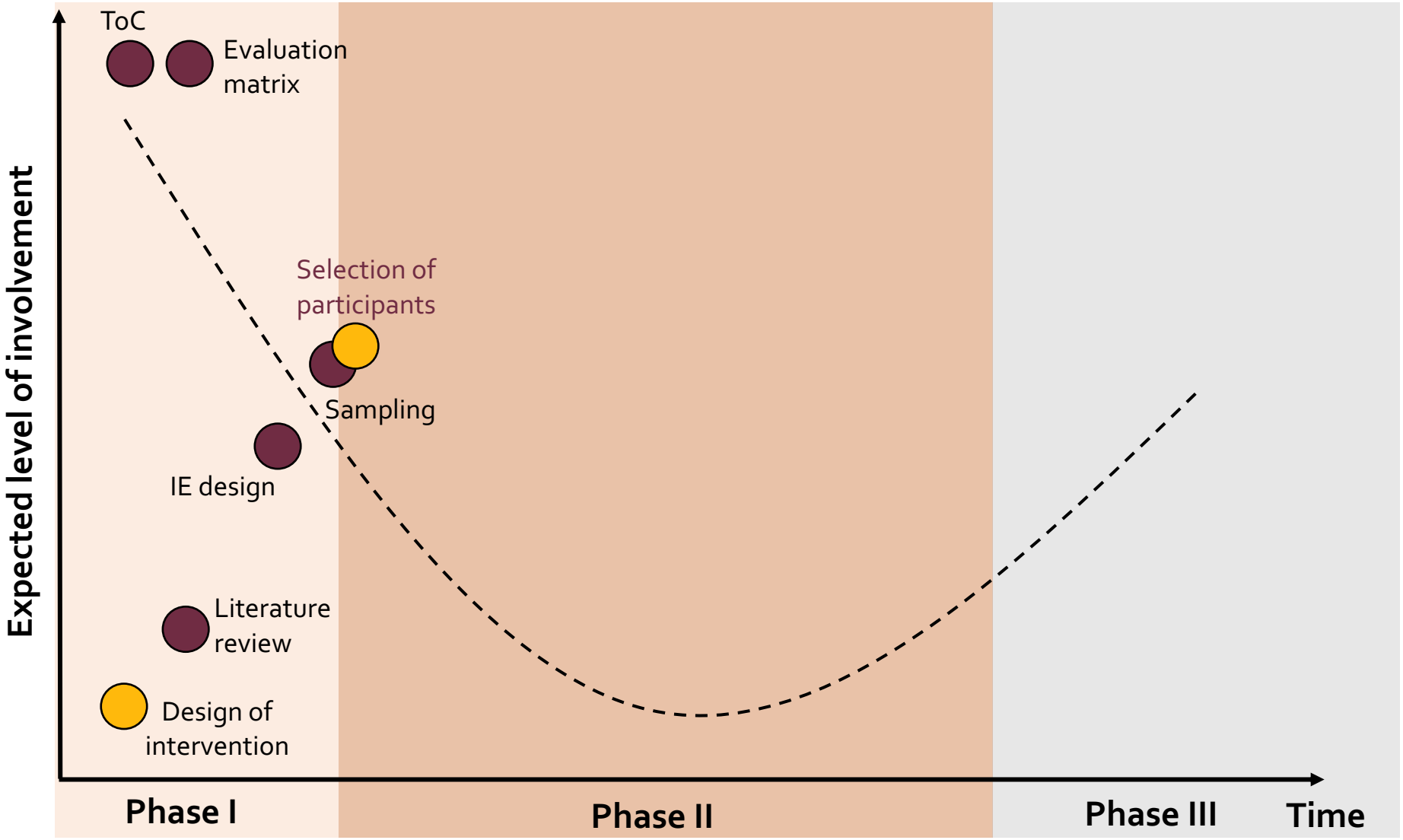
Incorporate lessons learned in next intervention

Time

Legend

- Implementation activities
- Evaluation activities

OVERVIEW (PHASE I)



Legend

- Implementation activities
- Evaluation activities

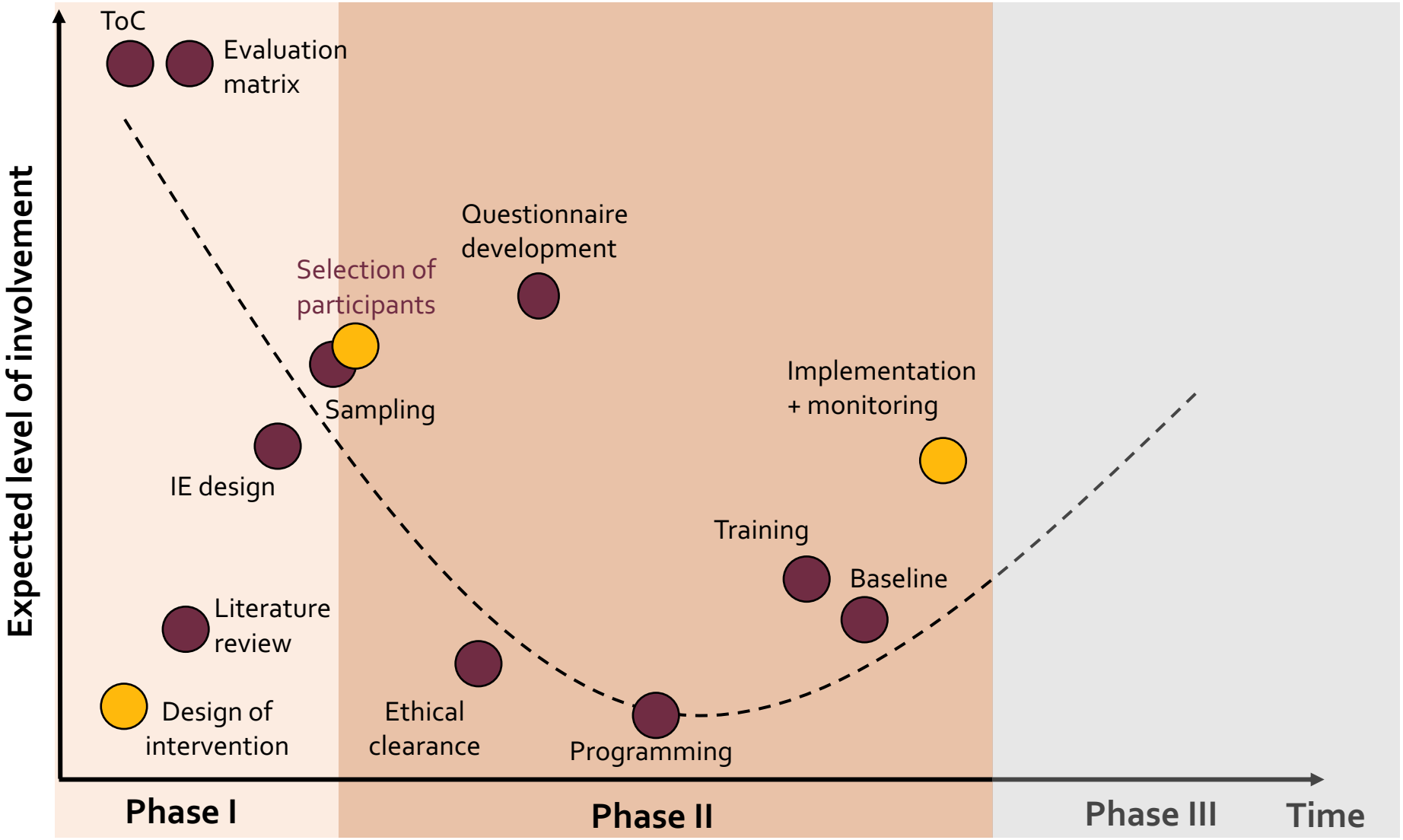
PHASE I: INCEPTION PHASE

- Literature review
- Theory of Change
- Evaluation matrix: Evaluation questions + indicators
- IE Design
- Sampling

„Seminar II: Theory of Change, Evaluation Questions, Indicators"

„Seminar III: Experimental and quasi-experimental evaluations"

OVERVIEW (PHASE II)

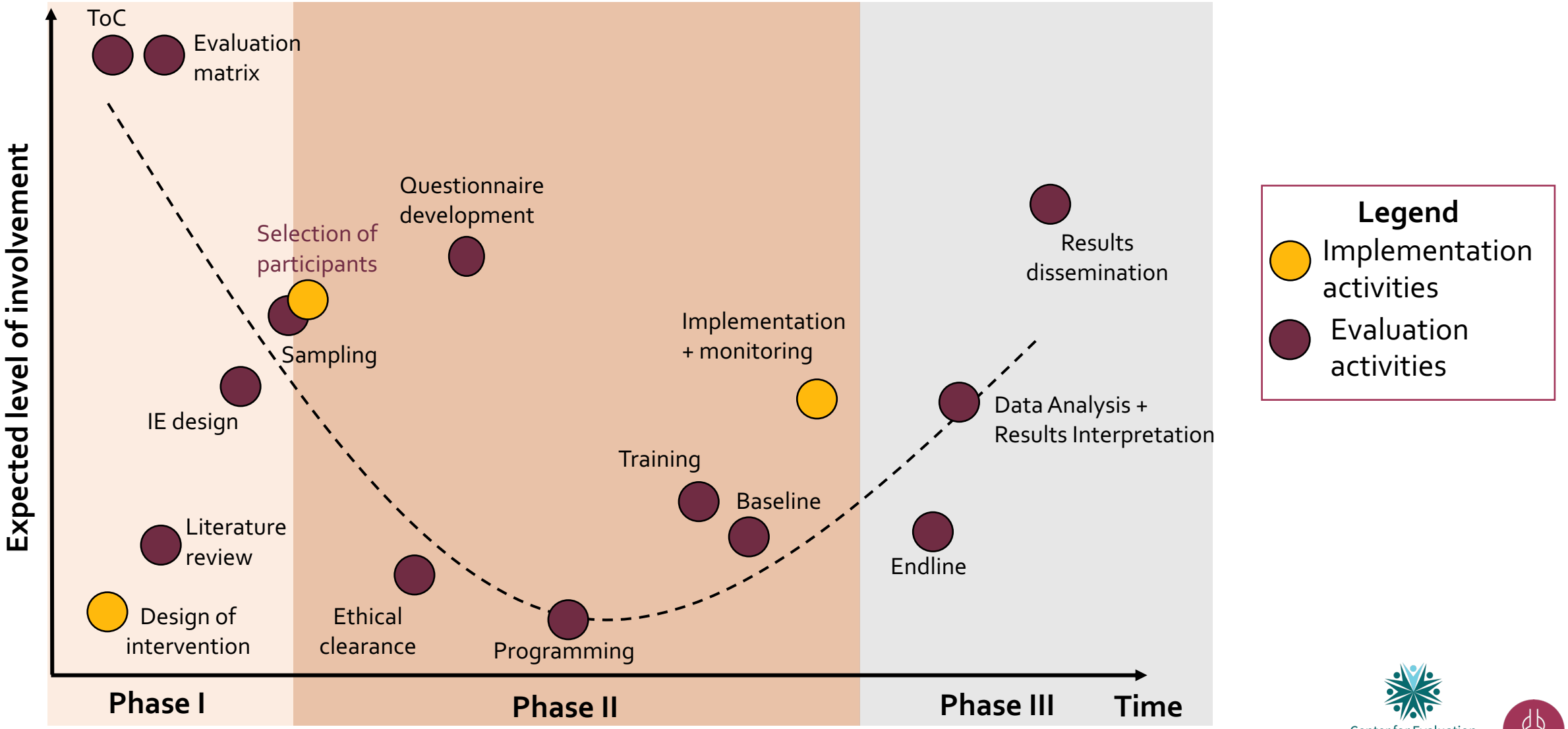


Legend

- Implementation activities
- Evaluation activities

Center for Evaluation and Development

OVERVIEW (PHASE III)

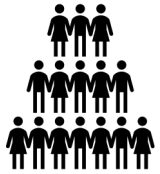


4. CONCLUSIONS

Main requirements to design an IE

Involvement of IP and evaluation team to develop a robust IE plan

Understand how the program will have an impact on the outcomes



Have sufficient **beneficiaries & non-beneficiaries** to sample

Timing (if possible, plan the IE before the start of the intervention)

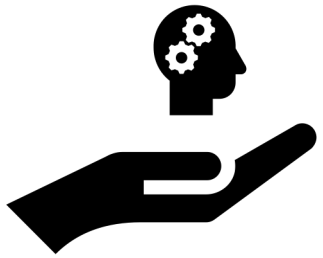
Main requirements to conduct an IE

Develop relevant **Evaluation Questions**

Identify **SMART indicators** to be measured

Budget (principally for staff and data collection)

Know-how to monitor the IE and analyze the data



Based on the project's capacities, the LORTA program provides:

- Support to undertake the IE
- Build capacity to enable the team to undertake an IE

Q & A Session

GREEN CLIMATE FUND | Independent Evaluation Unit

THANK YOU.

GREEN CLIMATE FUND | Independent Evaluation Unit

Theory of Change

LORTA Design Workshop 2023

DAY 1

Susumu Yoshida
Evaluation Specialist

28 august 2023

GREEN CLIMATE FUND | Independent Evaluation Unit

Learning Objectives

- What is a Theory of Change (TOC)?
- Why do we need a TOC?
- What are the GCF's requirements for a TOC?
- The various components of a TOC
- The difference between a Project Proposal and Impact Evaluation TOC

GREEN CLIMATE FUND | Independent Evaluation Unit

What is a Theory of Change?

It is a causal logic or a results chain of how a given project or programme will transform its inputs into its intended outcomes and impact.

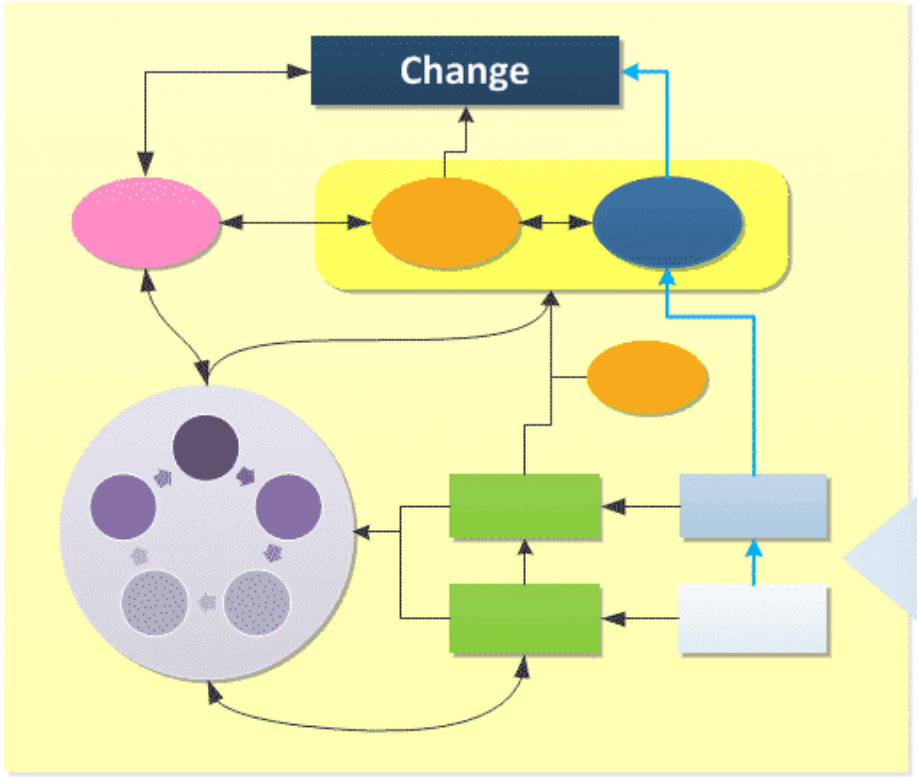
- … tells the *story* of a programme and its vision for a change
- … links the concepts of *monitoring, evaluation and impact* into a single diagram
- … *articulates* the program and its underlying assumptions and risks
- … is a *conceptual map* of a project/programme towards its goals.

GREEN CLIMATE FUND | Independent Evaluation Unit

TOC vs. LOG frame

Theory of Change

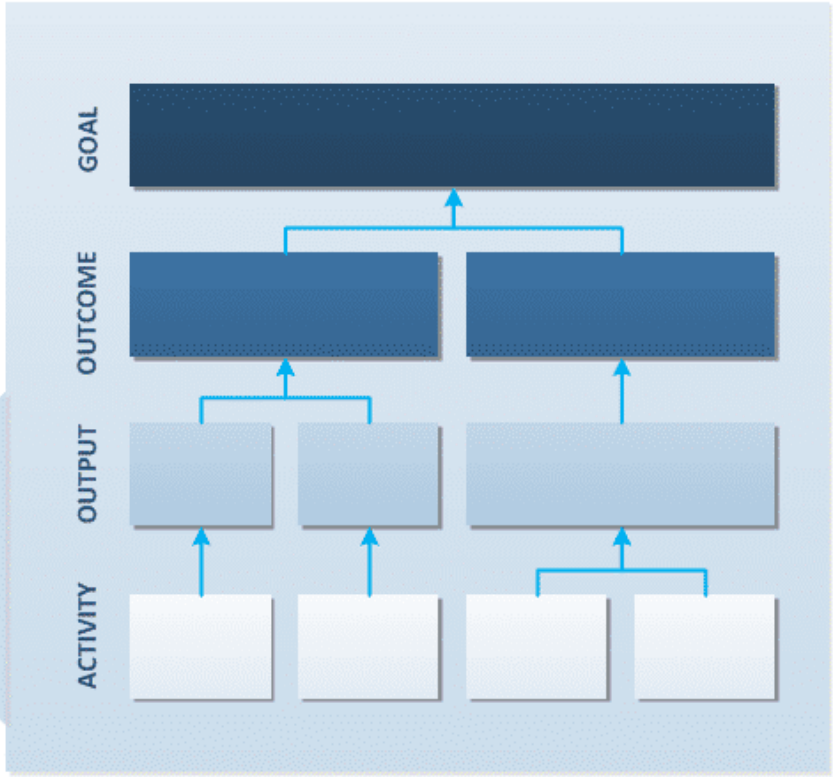
Shows the big picture with all possible pathways – messy and complex



<u>How and Why</u> the overarching goal is expected to happen.

Logical Framework

Shows just the pathway that your program deals with – neat and tidy



What the project plans <u>to do</u>.

GREEN CLIMATE FUND | Independent Evaluation Unit

Why do we need a TOC?

- A basis for evaluations
- A roadmap of the outcomes and impact - how you get where you want to go
- A framework for implementation (required interventions/actions)
- The basis of an agreement (buy-in) of all stakeholders about what needs to happen and who does it
- On-going check-ins to see if you are on track

GREEN CLIMATE FUND | Independent Evaluation Unit

GCF Secretariat Requirements: Concept Notes and Funding Proposals

Concept notes / Funding Proposals (non-SAP)

- TOC Mandatory – Section B.2 (a)
- Should be fully aligned with the IRMF
- Narrative/description of how the proposed project/programme will contribute towards the goal statement by using results chain links:

  Goal statement, Outcomes and Co-benefits (clearly label which is what)**, Outputs, Activities, Barriers, Risks, Assumptions**

SAP

- Optional/desired TOC

ALL to include LOG framework

GREEN CLIMATE FUND | Independent Evaluation Unit

GCF Secretariat Requirements: Readiness

Readiness

TOC required (Consists out of 2 parts: Diagram & Narrative)

Diagram:

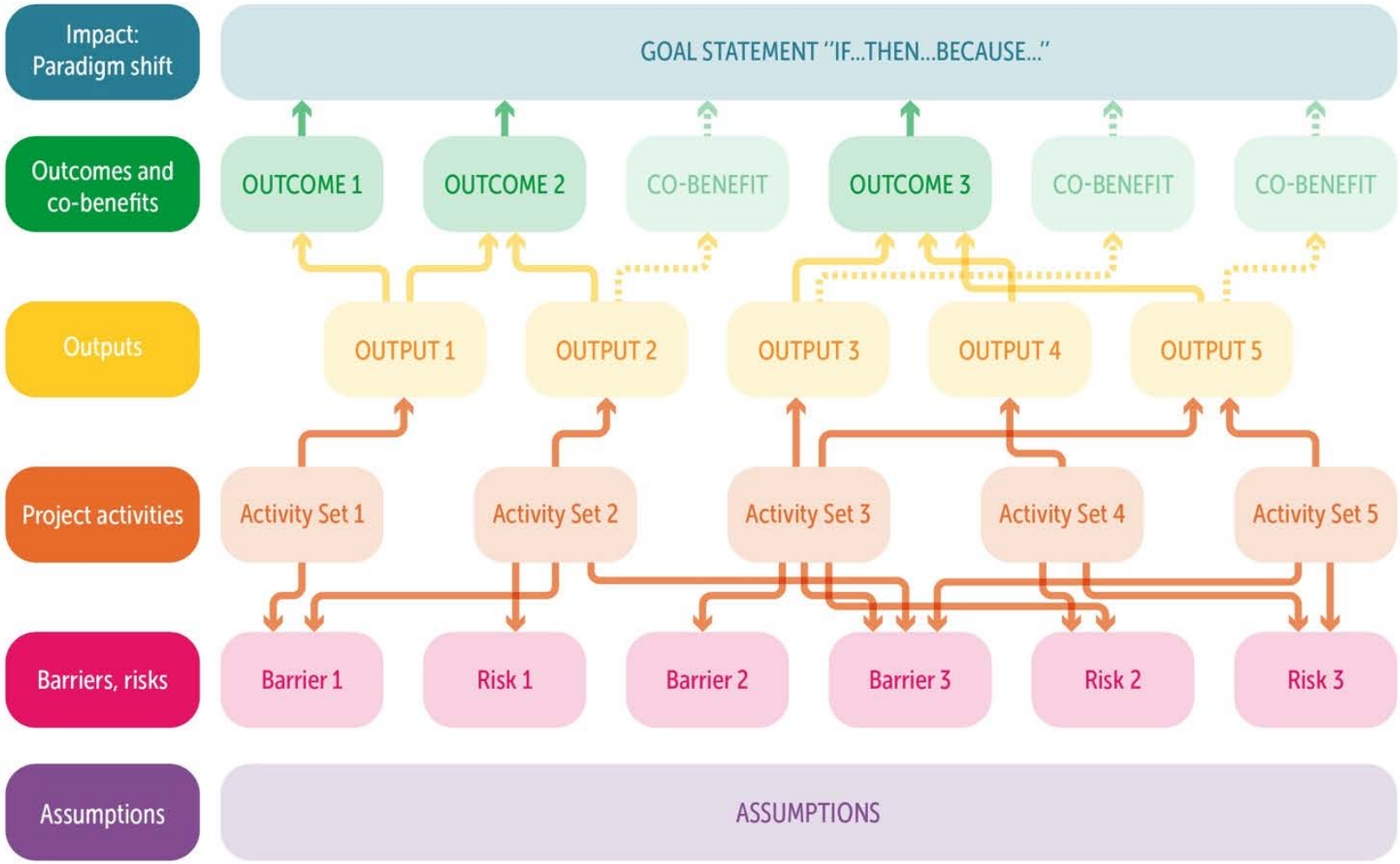
- Shows a vertical and horizontal causal relationship of the proposed interventions and results, and how they interact with the identified barriers, risks, and assumptions.

Narrative:

- Explanation on how the activities will help deliver on the country's readiness needs and build on institutions, processes or existing work already underway in the country
- Explanation on how the proposal will advance national climate priorities
  - Especially those identified nationally determined contributions (NDCs), national adaptation plans (NAPs), and other relevant national climate change strategies
- Description of how the various Outcomes, Outputs, activities and deliverables address the core Readiness challenges to reach the proposal's goal, and how barriers will be addressed.

GREEN CLIMATE FUND | Independent Evaluation Unit

Funding Proposal Theory of Change Template



GREEN CLIMATE FUND | Independent Evaluation Unit

Key definitions (I)

Node

Causal link & Assumptions

INPUTS

Resources at the disposal of the project, including staff and budget

ACTIVITIES

Activities undertaken by the project

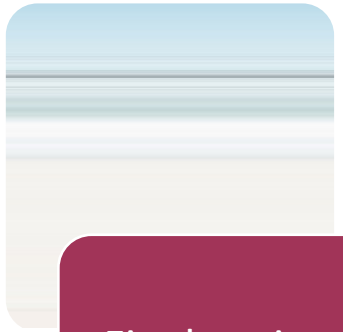
OUTPUTS

Tangible goods and services the project activities produce

OUTCOMES

Results likely achieved once beneficiary population uses outputs

IMPACT



Final project goals (long-term changes)

The essential elements of a TOC:

- **Nodes** – actions or consequences.
- **Arrows** – the direction and pathway from Node to Node.
- **Link** – the hypothesized, testable relationship between two Nodes, constituted by Assumptions.

GREEN CLIMATE FUND | Independent Evaluation Unit

TOC development

Questions to start the development process of a TOC:

1. What is the aim of the project/programme?
2. How can we measure those changes?
3. How will these changes be sustained?
4. How do we compare the existing situation with a changed situation?
5. How will the GCF funding help in achieving these changes?
6. What are the pathways to achieve these changes?
7. What are the pre-conditions of achieving the goals?

1. Place the impact/goal on one end of the TOC.
2. Include the inputs of the intervention in the first node, then fill the gaps between the inputs and goal/impact.
3. Link each component to each other.
4. Arrange your assumptions and risks below each of the nodes.
5. Identify SMART indicators for each of your outcomes.

GREEN CLIMATE FUND | Independent Evaluation Unit

Multi-component project and its TOC

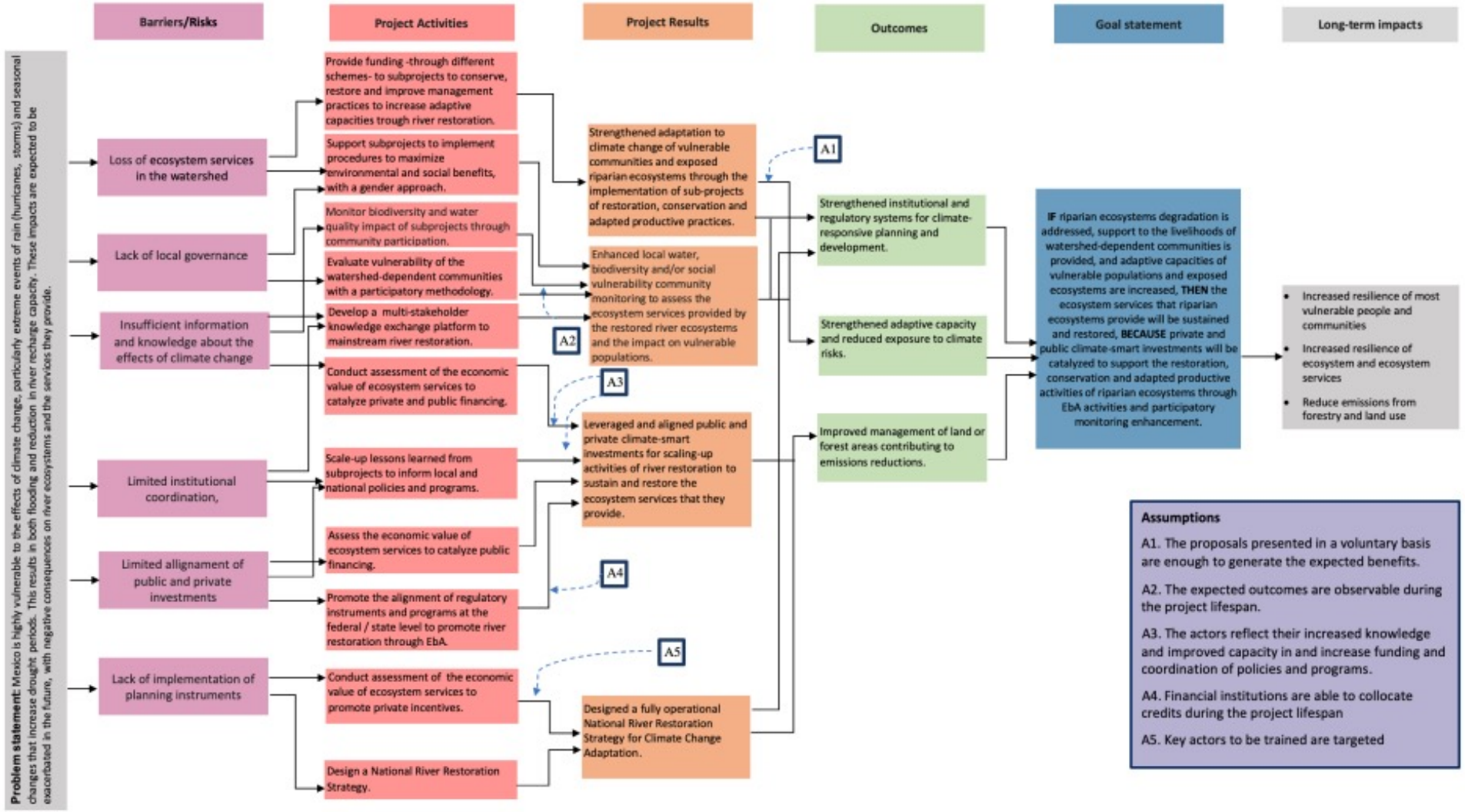


Figure 20. Theory of Change

GREEN CLIMATE FUND | Independent Evaluation Unit

Common challenges in GCF applications

- Goal statement not logically formulated
- Outputs and activities not clearly connected
- Outputs and activities grouped together without showing interlinkages
- Too many, too detailed, or not detailed enough elements
- Logic does not connect with the climate rationale of the project

GREEN CLIMATE FUND | Independent Evaluation Unit

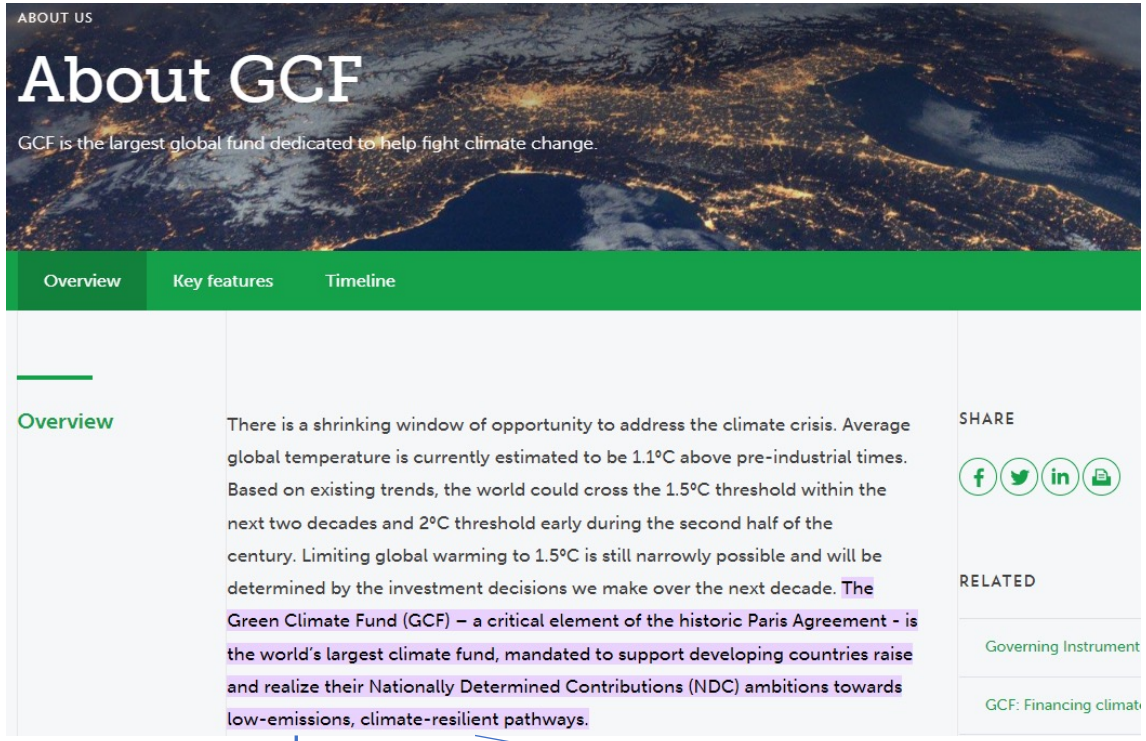
Project summary

Benin	Tanzania	Cambodia	Barbados	Timor-Leste
Cross-cutting (20/80)	Adaptation	Adaptation	Cross-cutting (7.5/92.5)	Mitigation
Scale up climate resilient agriculture and low emission agroforestry practices to improve land and water management	Unlock the climate resilience of smallholder farmers and transform the adaptive capacity of agriculture sector	Enhance climate change resilience of smallholder farmers by increasing market access	Enhance health, wellbeing, and productivity through carbon neutral and climate resilient water and energy mgmt. technology	Enhance capacity of vulnerable communities to reduce forest degradation and deforestation
Smallholder farmer / communities	Smallholder farmers / firms	Smallholder farmers / communities	Farmers/ communities	Village people
5 municipalities	National	4 provinces/ 24 districts/ 124 org	2 communities	4/14 watersheds

GREEN CLIMATE FUND | Independent Evaluation Unit

How does the secretariat measure impact?

What are GCF investments?



GCF instruments

- Grants
- Loans
- Equity
- Results-based payments
- Guarantees

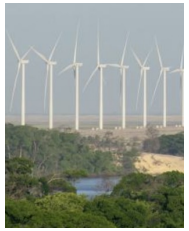
4 transitions

Built environment

Energy & industry

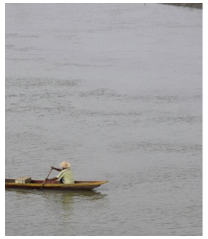
Human security, livelihoods and wellbeing

Land-use, forests and ecosystems



Mitigation:

GHG emissions reductions



Adaptation:

Effective adaptive response to the risks or impact of a specific climate change hazard

GREEN CLIMATE FUND | Independent Evaluation Unit

How does the secretariat measure impact?

Adaptation: Overarching goal from the *Article 7.1 of the Paris Agreement*

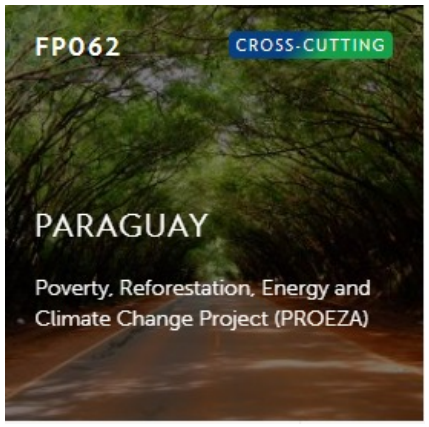
1. Enhancing adaptive capacity
2. Strengthening resilience
3. Reducing vulnerability to climate change

Article 7
1. Parties hereby establish the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal referred to in Article 2.

【Example of GCF Adaptation projects】

Wetland

Reforestation



Early Warning System (EWS)

Climate Smart Agriculture

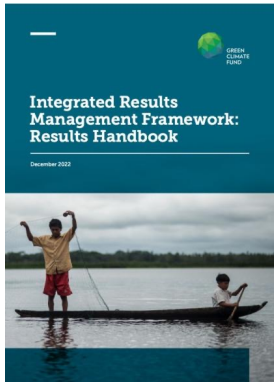
What is the impact of these projects? How do we measure it?

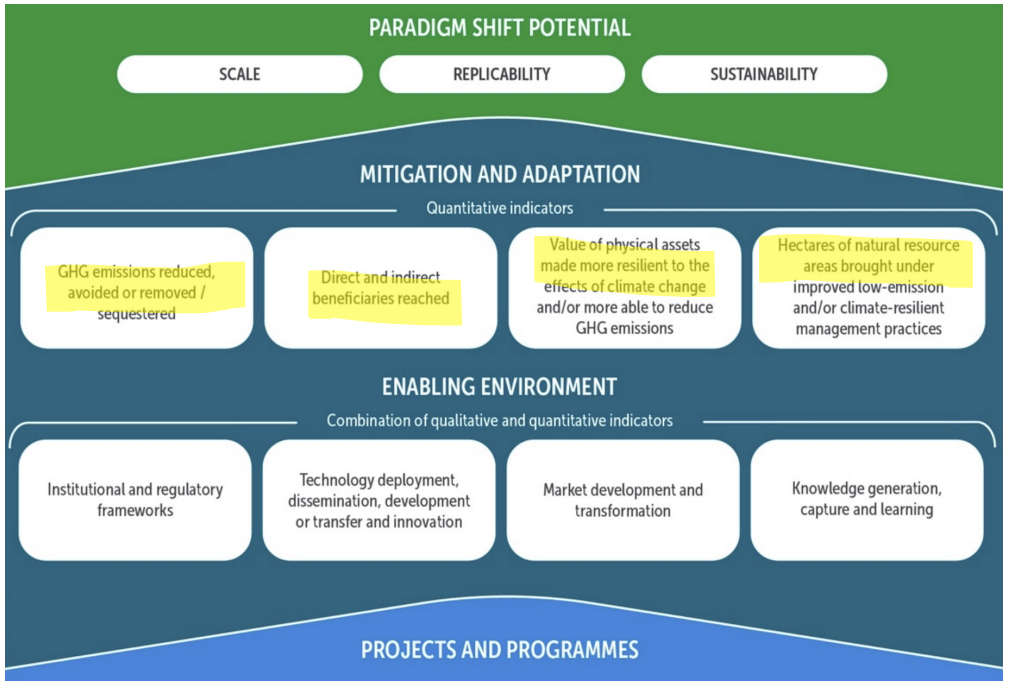
GREEN CLIMATE FUND | Independent Evaluation Unit

How does the secretariat measure impact?

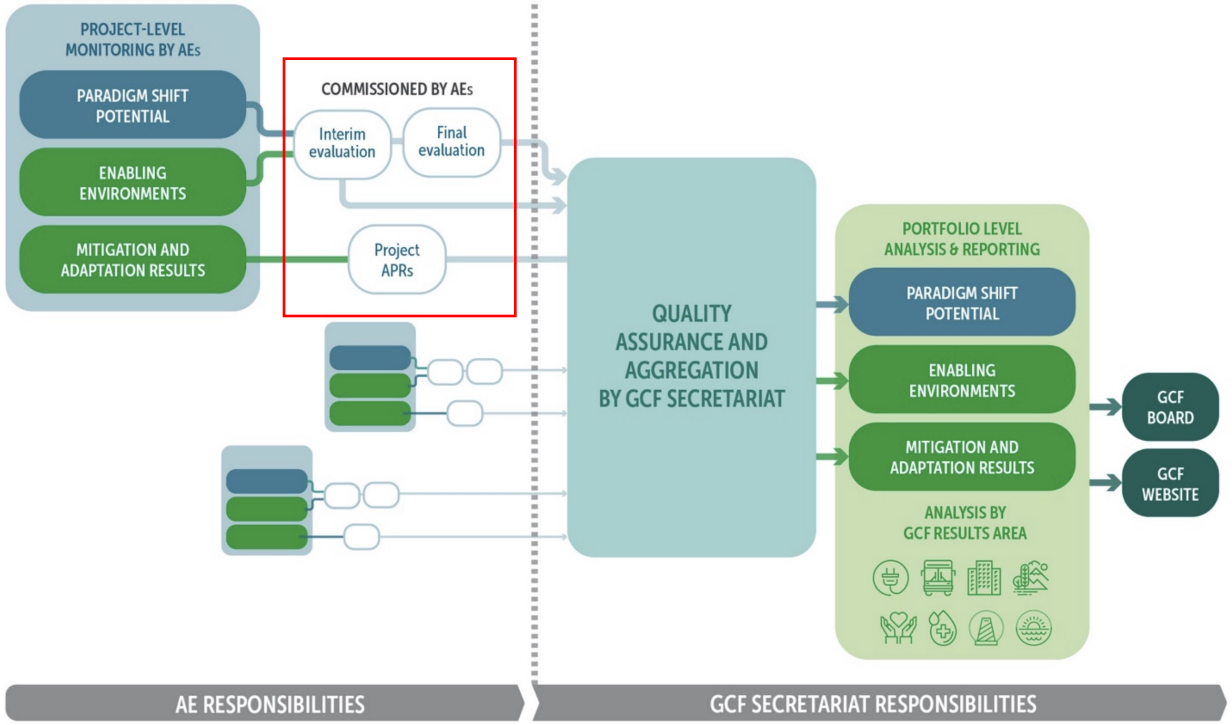
Impact: Integrated Results Management Framework (IRMF)

RESULT LEVEL	GCF DEFINITION
Impacts	Positive and negative, primary and secondary long-term effects produced by an intervention, directly or indirectly, intended or unintended.



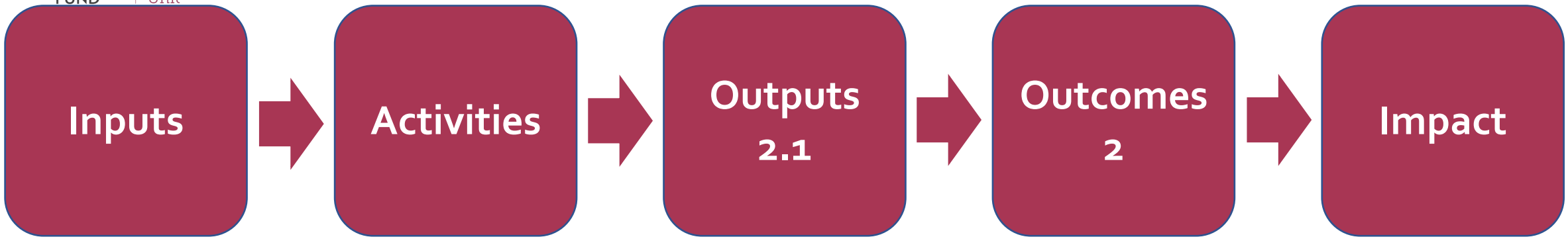


IRMF results architecture



GREEN CLIMATE FUND | Independent Evaluation Unit

Example 1



- Fund
- Infrastructures
- Training
- Capacity building
- Climate smart agriculture technologies

- Increase income of 5,000 farmers through training on business and marketing techniques and equipment
- Improve access to micro-credit and investments for agriculture
- Train facilitators on the use of assessment and/or monitoring Instruments for Resilience (FarmTree App)

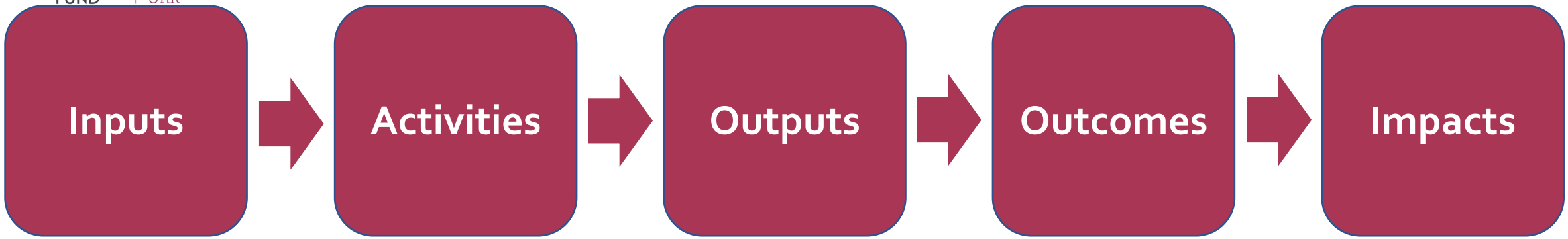
Farmers and cooperatives' income stream diversified, enhanced, and secured in the face of climate change

Climate-resilient and gender-sensitive value chains, supporting farmers' livelihoods in the Upper and Middle Oueme

Oueme basin communities resilience toward climate chocks is increased

GREEN CLIMATE FUND | Independent Evaluation Unit

Example 2



- Adaptation credits
- Guarantee
- Parametric weather insurance
- Grant
- Policy intervention

- Establishment of dedicated credit line
- Establish and implement Adaptation Resilience Agriculture (ARA) guarantee facility
- Establishment weather insurance product
- Training and capacity building on ARA technologies

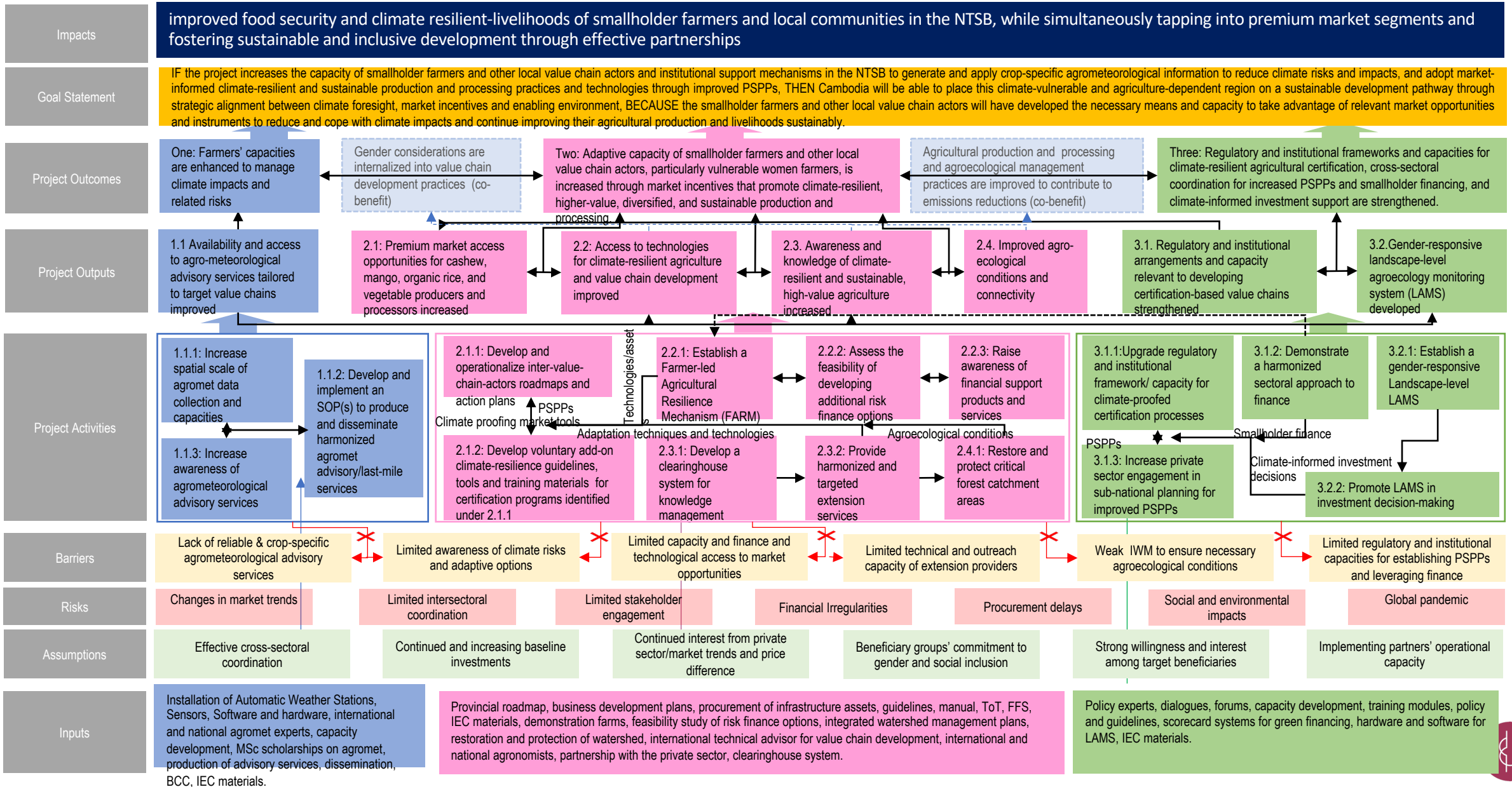
- Increased access to ARA loans
- Risk in agriculture reduced and hence investment rised
- Knowledge, capacity and awareness to farmers strengthened on adoption and use of ARA technologies
- Adaptive capacity strengthened
- Increased private sectors leverage
- Innovative business models and technological agri practices increased

- Increased resilience and enhanced livelihood of the most vulnerable people and community
- Increased resilience of health and well being of food and water security

- The ability and capability to adapt to adverse climate change impacts increased
- Incorporation and consideration of climate risks into credit lending operations is adhered to
- Improved food security health and well being of the most vulnerable communities

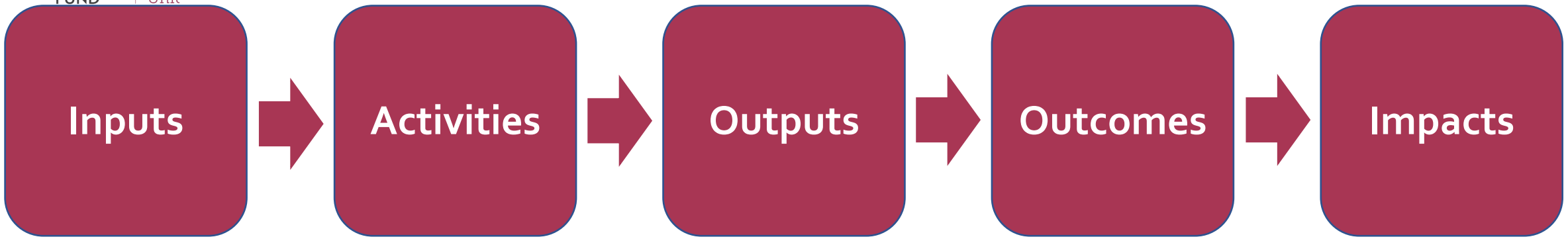
GREEN CLIMATE FUND | Independent Evaluation Unit

Example 3



GREEN CLIMATE FUND | Independent Evaluation Unit

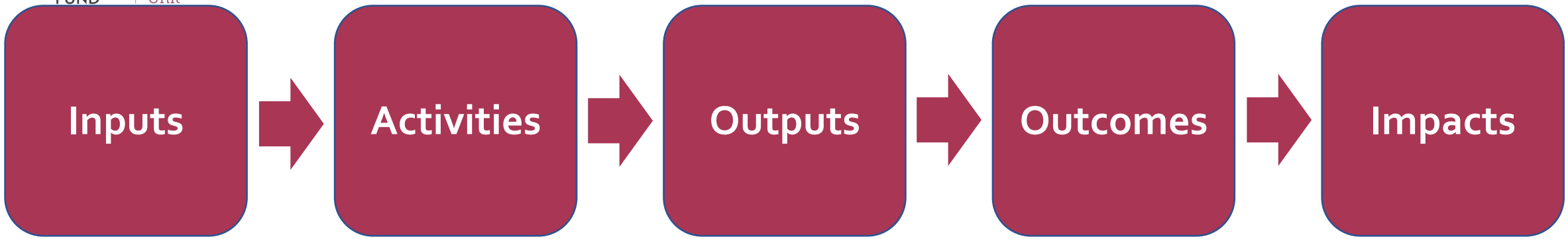
Example 4



Inputs	Activities	Outputs	Outcomes	Impacts
Funds PMU Office Space Facilitation of approvals from relevant ministries and agencies.	1.1.1 Install CAS Biological treatment process. 1.2.1 Install RO membrane filtration system. 1.2.2 Construct 9km pipeline & 6 injection wells. 1.3.1 Implement sewer monitoring programme. 1.3.2 Establish on-site laboratory. 1.3.3 Implement CMMS 1.4.1 Construct 2 decentralized treatment facility in Zone A – Belle Vue and Belle Tenantry	1.1 BSTP Upgrade 1.2 Wastewater Reuse 1.3 Mitigate climate risk. 1.4 Decentralized treatment facilities	1 Enhanced availability, management, and use of treated wastewater	▪ General population through increased food availability and security, ▪ 155 farmers on 235 Hectares through increased and assured availability of water for irrigation, enabling the expansion of irrigated agriculture for new entrants. ▪ Laboratory to ensure that end users are receiving safe water for reuse. ▪ Increase health and sanitation for 225 households from the 2 communities benefiting from reclaimed water and utilizing decentralized wastewater systems.

GREEN CLIMATE FUND | Independent Evaluation Unit

Example 5



- expert
- supporting staff
- equipment
- training

- workshop for land use planning
- implementation of micro program

- improved management and protection for forests
- enhanced food security and livelihood diversification

- institutional and individual capacities are enhanced
- government and non-government organization are enhanced

- sustainable forest management and appropriate farmland management

GREEN CLIMATE FUND | Independent Evaluation Unit

Evaluation questions

	Evaluation Questions
Benin	What is the impact of OCRI intervention (infrastructure, training and Climate smart agriculture technologies) on crop yields and farmers' income in the upper and middle Oueme ?
Tanzania	
Cambodia	To what extent the project intervention has resulted in improving the climate-resilient livelihood and food security of the target communities? To what extent the agrometeorological advisory services has resulted in improved farm management practices and crop outputs?
Barbados	How do you feel about reclaimed wastewater being used for agriculture irrigation (scale 1-5)? Sentiment of targeted population (residents, farmers) Is there a more reliable water supply during the "dry" season (verification – BWS water supply to the agriculture area)
Timor-Leste	the status of forest cover during project implementation period Reduced GHG emissions from forest degradation by the implementation of the project household economy in relation to agricultural production

GREEN CLIMATE FUND | Independent Evaluation Unit

Thank you!

Contact IEU:

✉ ieu@gcfund.org

@GCF_Eval

ieu.greenclimate.fund

GREEN CLIMATE FUND | Independent Evaluation Unit

Center for Evaluation and Development C4ED

Learning-Oriented Real-Time Impact Assessment

Design Workshop
Songdo, South Korea

Seminar III: Experimental and Quasi-Experimental Evaluation Methods

Johanna Gather, Atika Pasha
M&E Specialists at C4ED

29 August 2023

Agenda:

- Introduction
- Experimental Evaluation Methods
  - Randomization
  - Types of RCTs
- Quasi-Experimental Evaluation Methods
  - When to use
  - Types of quasi-experimental methods

Introduction

Impact Evaluation – Recap

Purpose

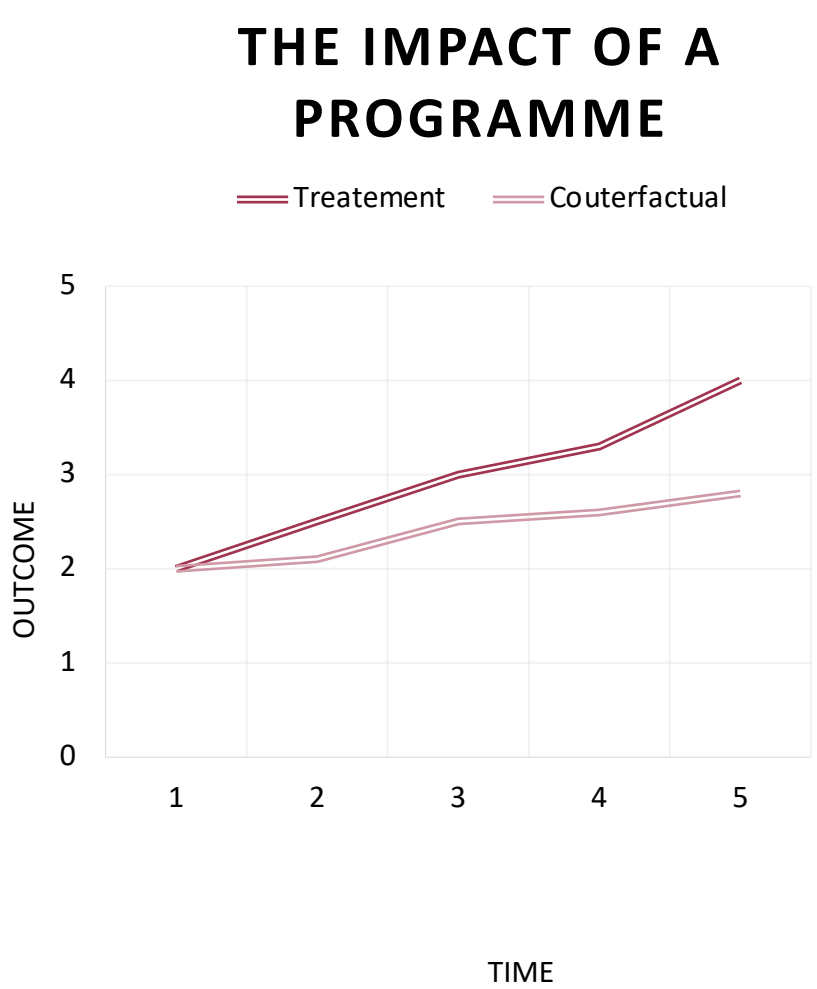
- To measure the difference between outcomes with and without the intervention

How?

- **Counterfactual:** what would the outcome have been for beneficiaries if they had not participated in the project/programme

Problems, problems, problems…

- Self-selection & programme targeting



Constructing a control group

Experimental vs quasi-experimental designs

- Experimental evaluations: ***R***andomized ***C***ontrolled ***T***rials (RCTs),
  - Beneficiaries randomly assigned to control or treatment group

- ***Quasi-experimental evaluations:***
  - When full randomization impractical, unethical, or not feasible
  - Use of existing groups or naturally occurring circumstances

GREEN CLIMATE FUND | Independent Evaluation Unit

Experimental Evaluation Methods

Randomization

Why Randomize?

- Obtain control group that is as similar as possible to treatment group
  - Randomized assignment of treatment
  - ***Law of large numbers***
    - If you draw a large number of individuals from a population, any two groups will become similar ***on average***
    - Any differences between the two groups → caused by the project
  - ***But is it ethical?***
    - Randomization gives everyone the same chance to be treated
    - Fair, transparent and ethical way to assign treatment to equally deserving people

Types of RCT's

Simple Lottery Design/ Classical RCT

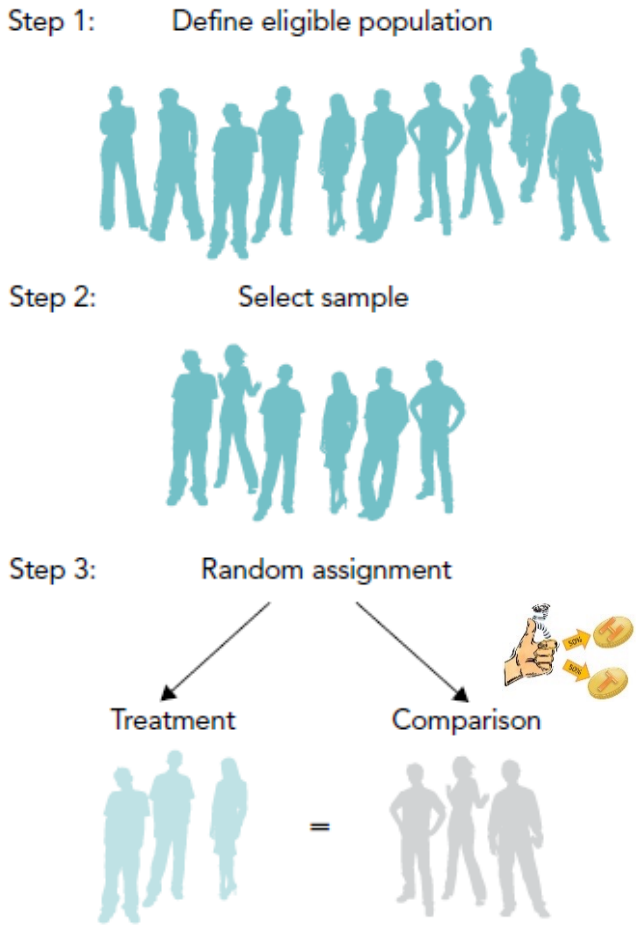
Phased-in RCT

Randomized controlled trials

Random encouragement design

Cluster randomization design

Classical RCT



Source: Hempel & Fiala (2011)

! Not all participants have to be included in the RCT

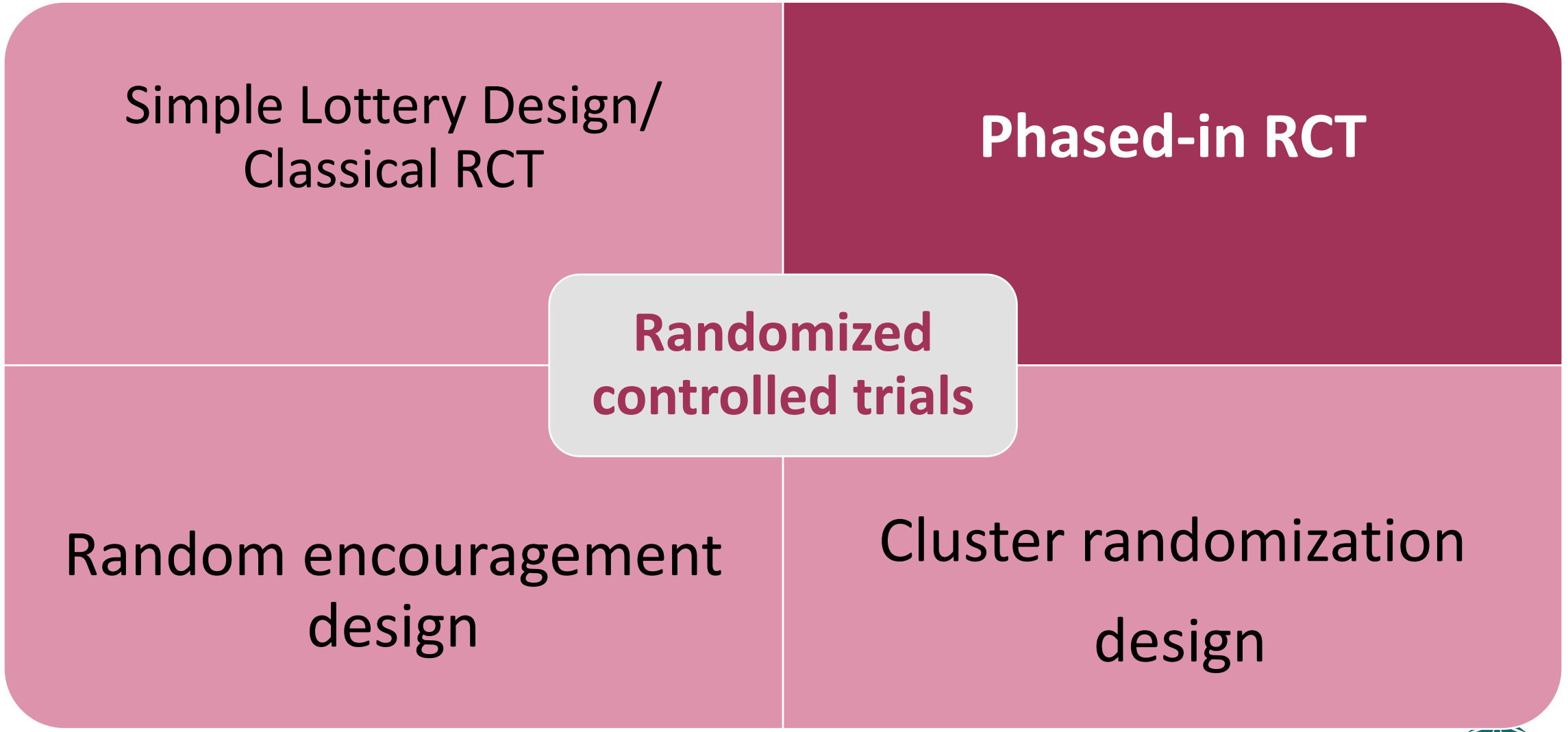
Select a **random sample** from the eligible population

Randomize the treatment within the random sample

! Data on treatment and control group is needed

Center for Evaluation and Development

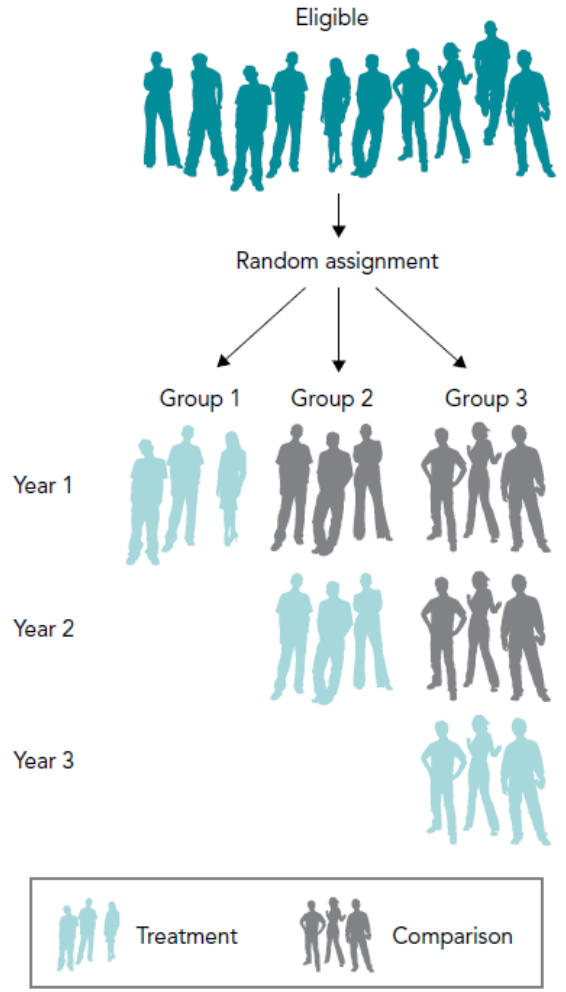
Types of RCTs



Phased-In RCT

- If random assignment is unethical/not possible
- Not all beneficiaries will be covered immediately, but eventually over two or more phases

→ **Randomize** the order of program implementation



Source: Hempel & Fiala (2011)

Advantages:

- Feasibility
- Learning Opportunities & Evaluation of challenges
- Ethical Considerations

Disadvantages

- Delayed Access
- Contamination

Center for Evaluation and Development

Types of RCTs

Simple Lottery Design/ Classical RCT

Phased-in RCT

Randomized controlled trials

Random encouragement design

Cluster randomization design

GREEN CLIMATE FUND | Independent Evaluation Unit

Center for Evaluation and Development

Random Encouragement Design

- Encouragement design can be used for programs and policies that are universally available but not universally adpoted

- Instead of randomizing "treatment", randomize your **mobilization activities!**

- An example of a suitable encouragement is an information campaign for an ongoing program

  →Randomly generate variation in take-up between the two, otherwise equal, groups

- These motivational actions are also called **nudges!**

Types of RCTs

Simple Lottery Design/ Classical RCT

Phased-in RCT

Randomized controlled trials

Random encouragement design

Cluster randomization design

Clustered RCT

- In case, individual treatment is not possible or large spill-overs are expected
- Randomize at a higher level, even when we collect data on a lower level
- Feasible: Randomly assign with shared community infrastructure, such as cooking stove solution or water supply at a community level, rather than at a household level
- Has implications for **sample size calculations**

Household level randomization

Village/community level randomization

GREEN CLIMATE FUND | Independent Evaluation Unit

Quasi-Experimental Evaluation Methods

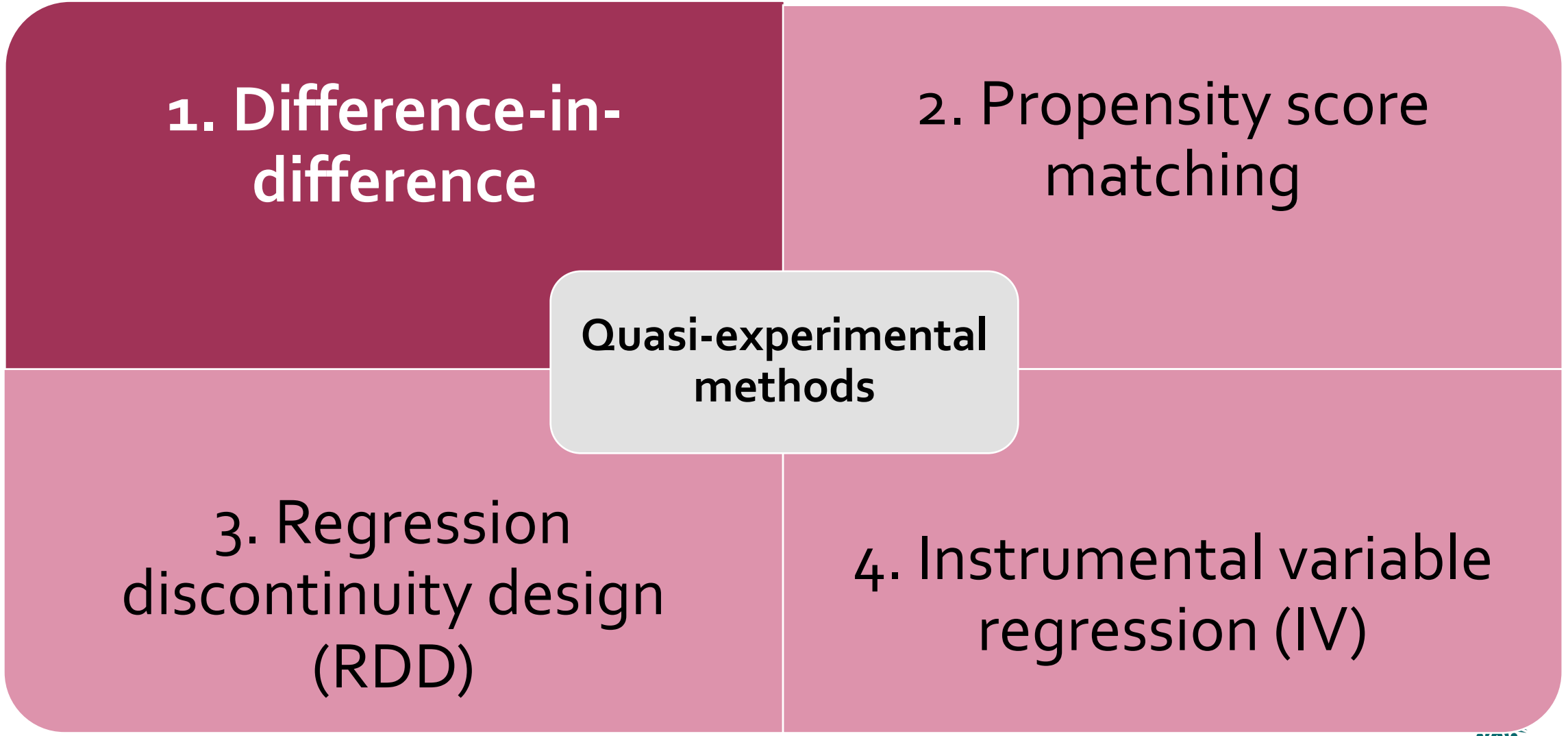
Quasi-Experimental Methods

- When randomisation is not possible

  1. **Ethical Constraints:** unethical to randomly assign subjects to a control group that does not receive a potentially beneficial intervention
  2. **Logistical Constraints:** RCT may be challenging, e.g., due to limited budgets, or time constraints.
  3. **Complex Interventions:** Some interventions, such as community-level interventions or policy changes, are inherently difficult to randomize.
  4. **Voluntary project participation:** The project is available to everyone, and only few people choose to participate

- Quasi-experimental designs → use statistical methods to construct a control group as similar to the treatment group as possible

Quasi-Experimental Methods



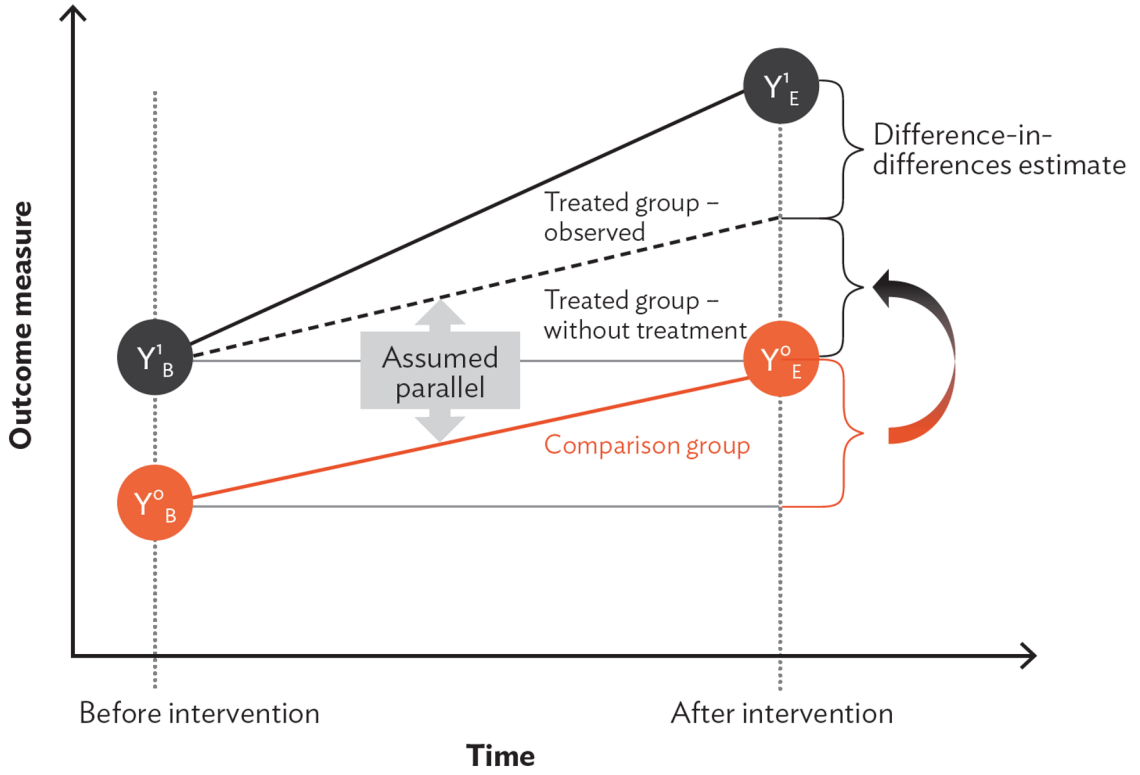
Difference-in-Differences

- Compares changes in outcomes over time between a treatment group and a control group.
- **Key assumption**: in the absence of treatment, both groups would have similar outcomes
- **Parallel Trend Assumption:** both groups exposed to the same external development (policy changes, shocks)

White and Raitzer (2017)

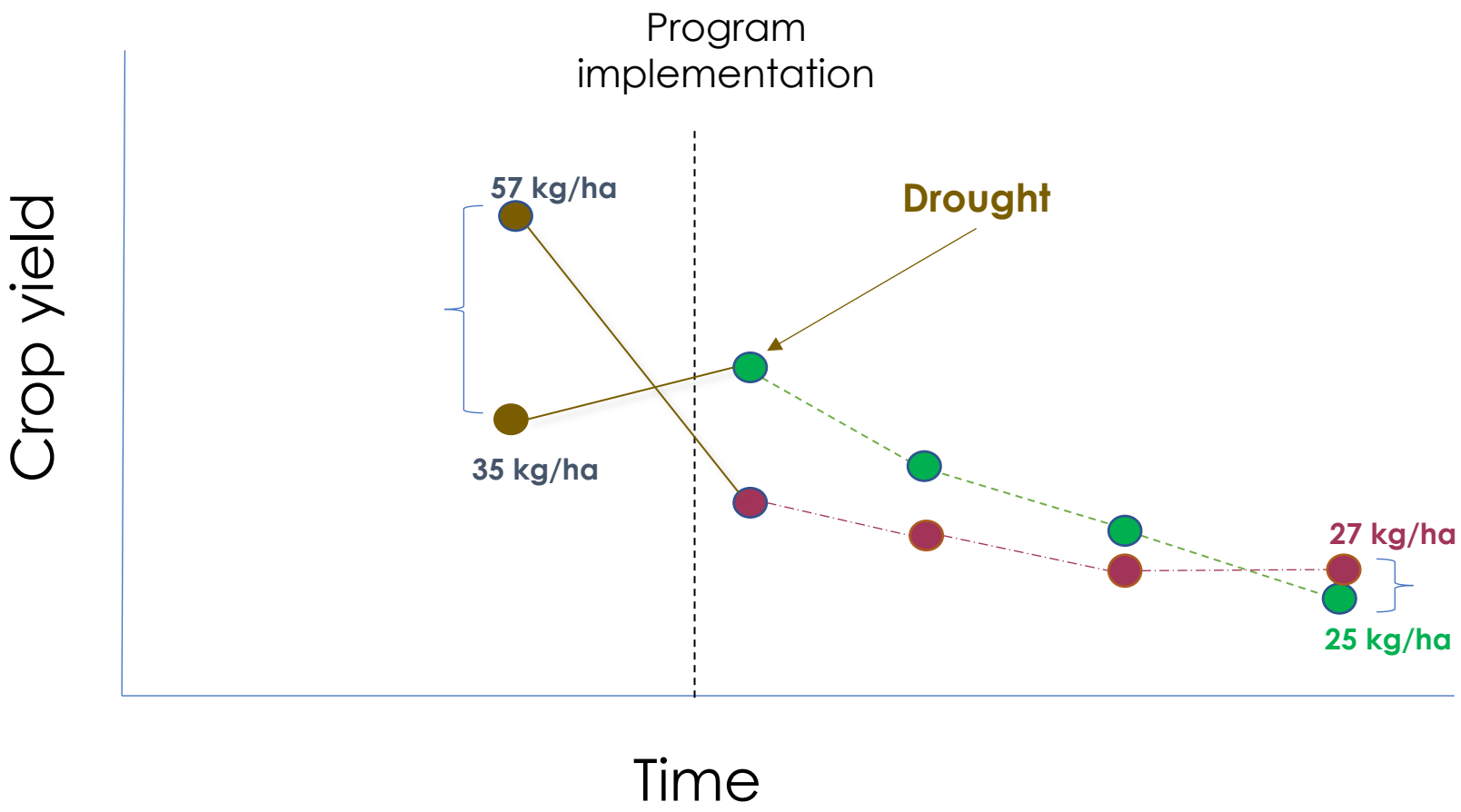
Difference-in-Differences

- Program impact → difference between the Treatment group and the (artificial) comparison group over time
- **Baseline data** before the intervention affects beneficiaries **needed**
- The parallel trend assumption can be tested if there are multiple data points before the intervention
- Let's talk about a climate adaptation program now!



White and Raitzer (2017)

Difference-in-Differences



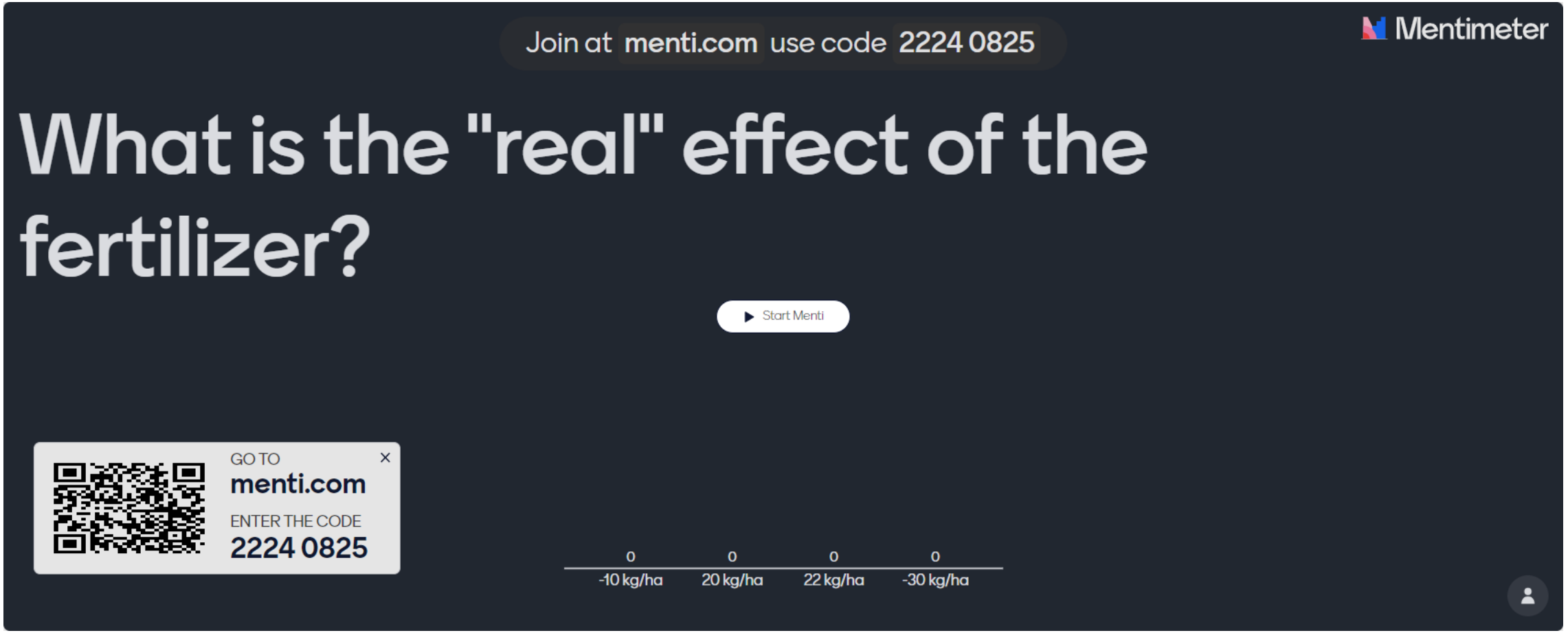
- A government provides fertilizer to a region, targeting poor areas in 2016
- Yields in 2019, at the end of the program, were 25 kg/ha

Difference-in-Differences

- What is the "real" effect of the fertilizer?

	Intervention (I)	Comparison (C)	C-I
Pre (Baseline- 0)	35	57	-22
Post (Endline- 1)	25	27	-2
$(D_1 - D_0)$	-10	-30	

Difference-in-Differences



	Intervention (I)	Comparison (C)
Pre (Baseline- 0)	35	57
Post (Endline- 1)	25	27

Difference-in-Differences

- What is the "real" effect of the fertilizer?

	Intervention (I)	Comparison (C)
Pre (Baseline- 0)	35	57
Post (Endline- 1)	25	27
$(D_1 - D_0)$	-10	-30

- **Pre-post = $(D_1 - D_0)$**
- Double difference= $(I_1 - I_0)$- $(C_1 - C_0)$

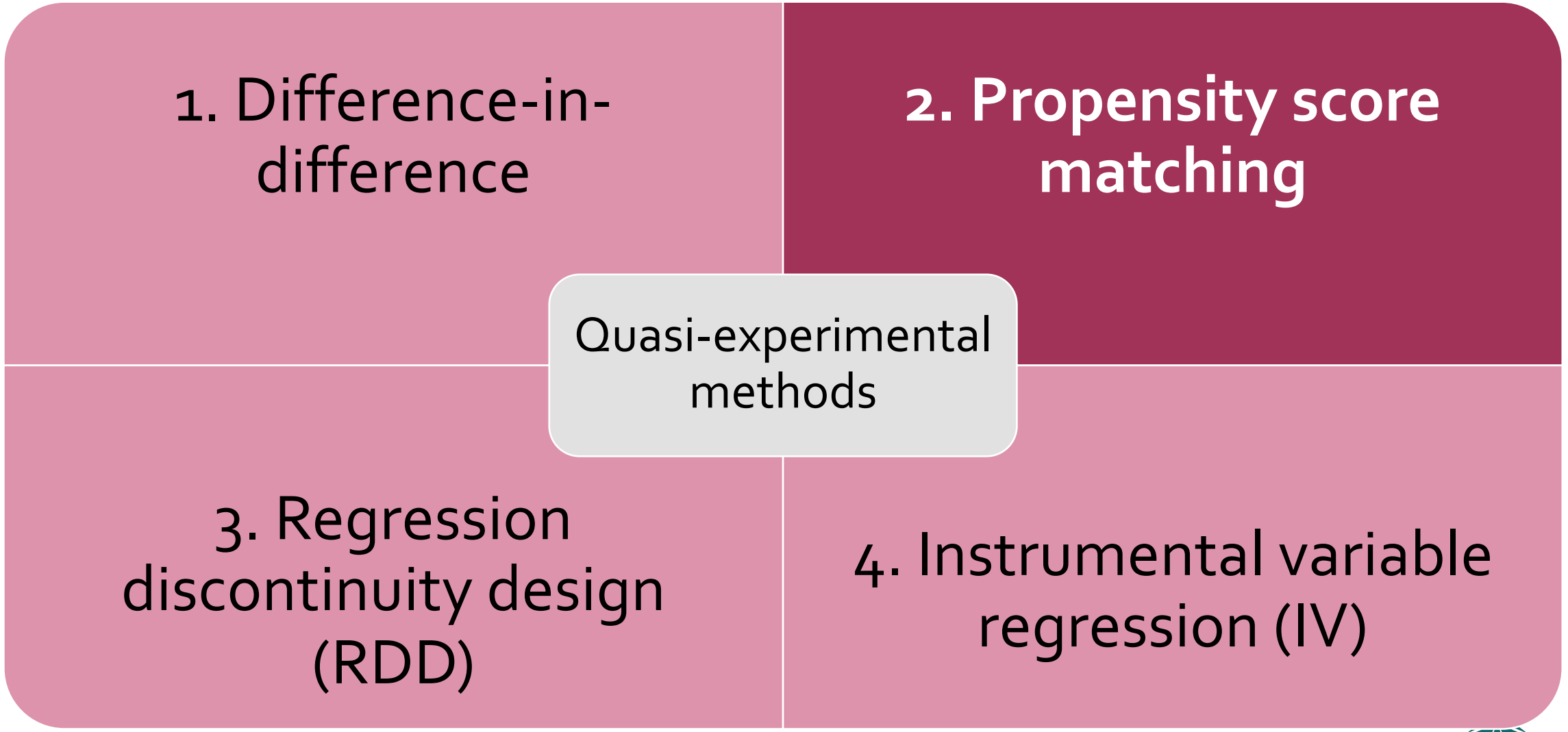
Difference-in-Differences

- What is the "real" effect of the fertilizer?

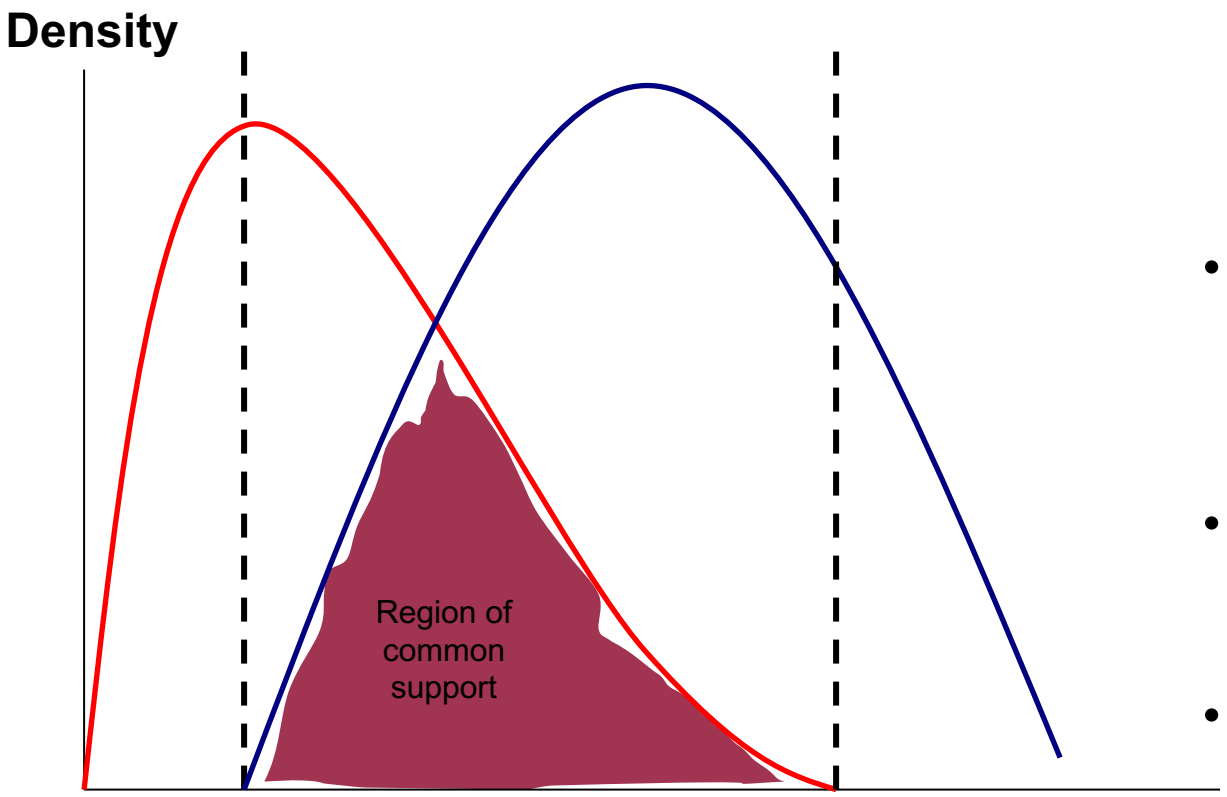
	Intervention (I)	Comparison (C)	C-I
Pre (Baseline- 0)	35	57	-22
Post (Endline- 1)	25	27	-2
$(D_1 - D_0)$	-10	-30	20

- **Pre-post = $(D_1 - D_0)$**
- Double difference= $(I_1 - I_0)$- $(C_1 - C_0)$ = 20 kgs/hectare

Quasi-Experimental Methods



Propensity Score Matching



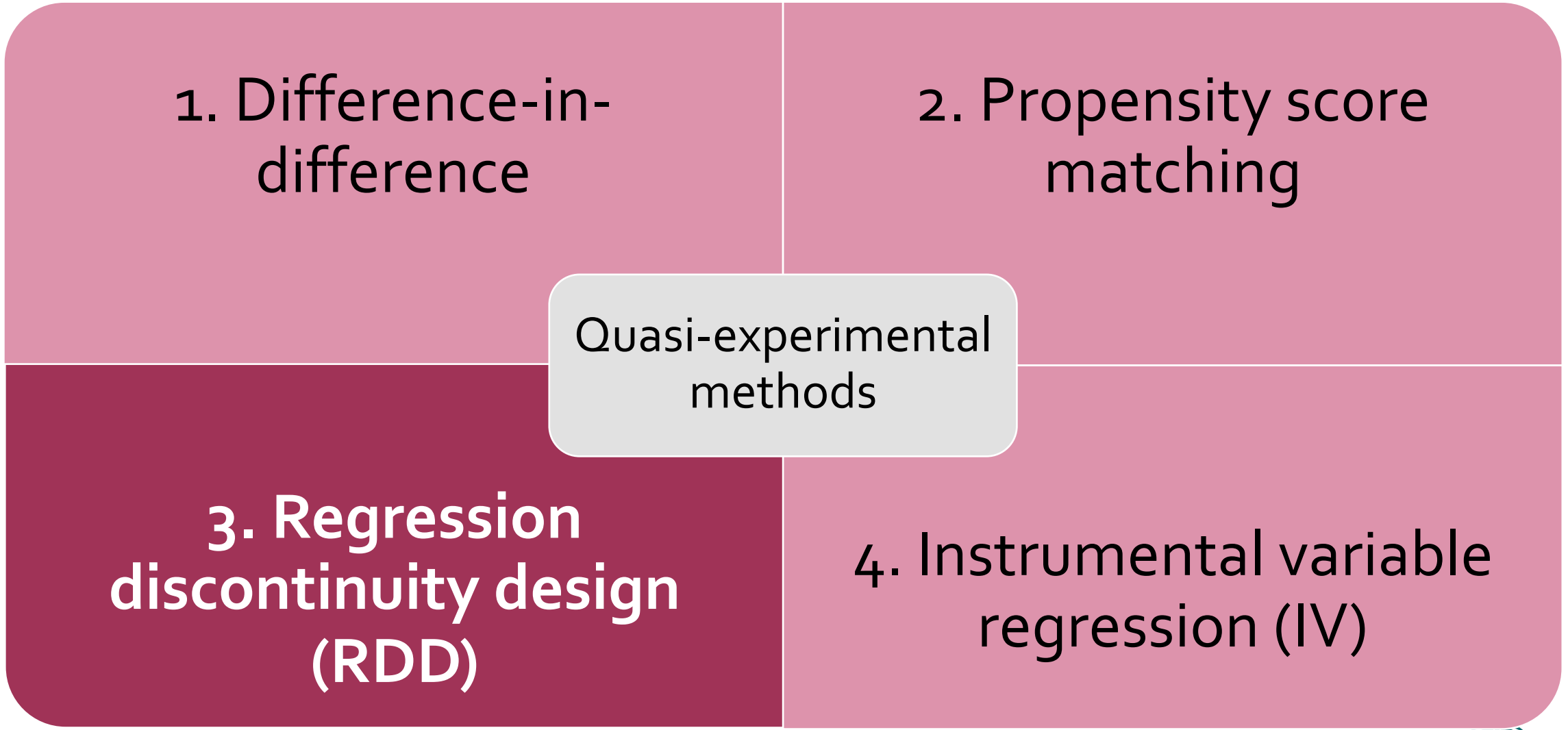
White and Raitzer (2017)

- Matching of project beneficiaries with individuals from control group having a similar probability of participating in the programme based on observable characteristics
- **Common support**: ensures that there are individuals in both groups who have propensity scores in the same range
- The larger the sample, the better the matching will be
- Let's get back to our climate adaptation program now!

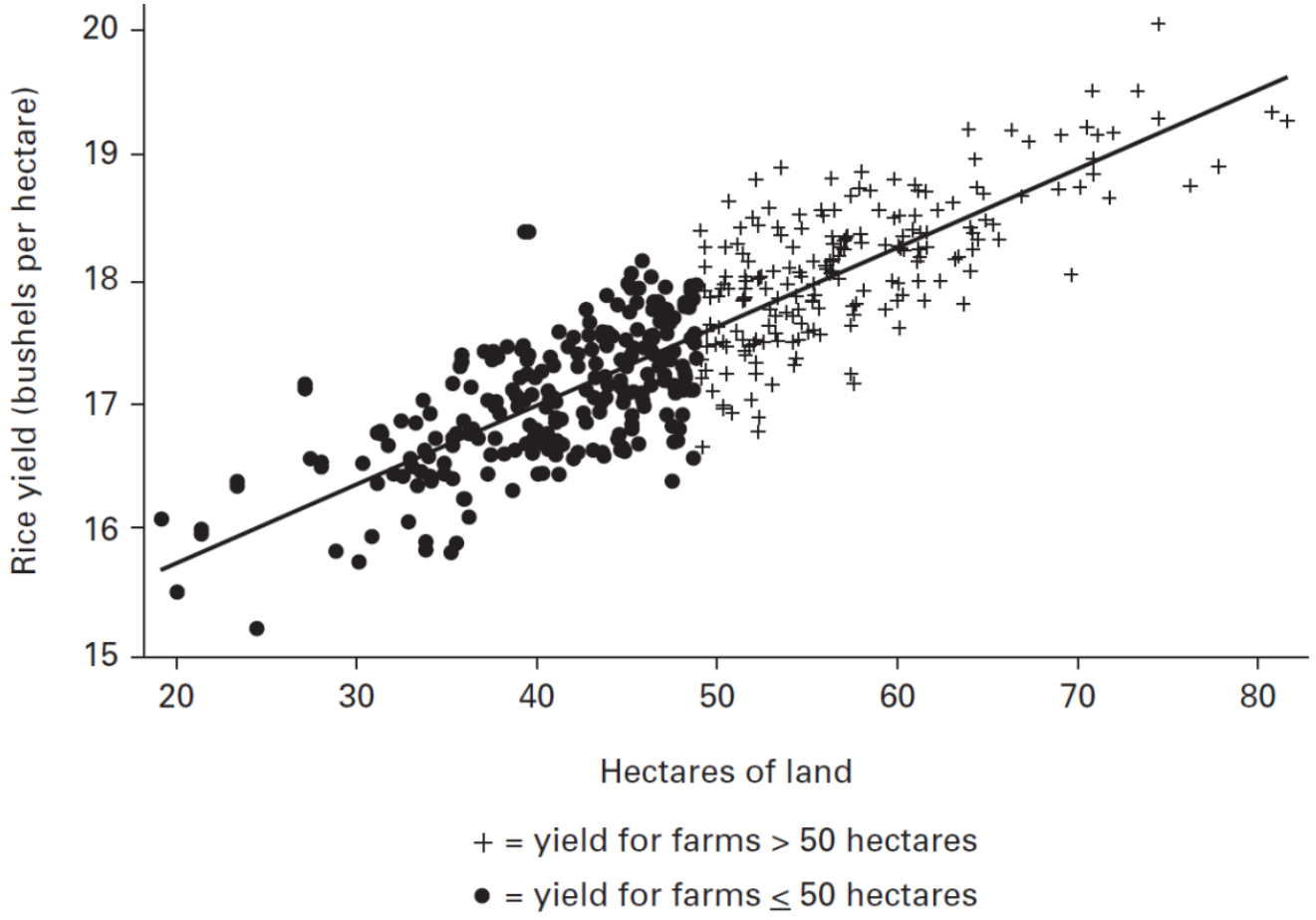
Propensity Score Matching

Center for Evaluation and Development

Quasi-Experimental Methods

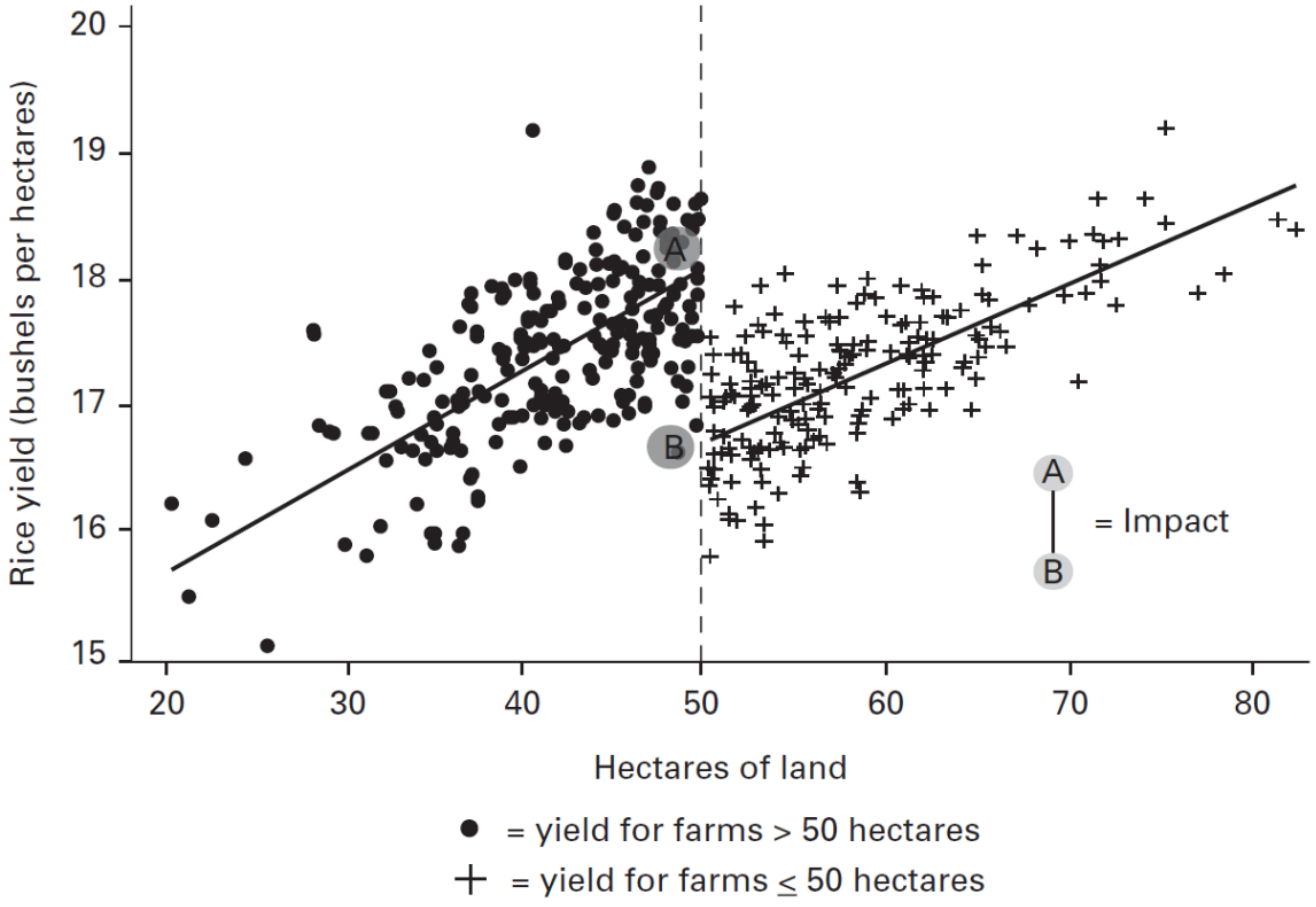


Regression Discontinuity Design



- Use of **threshold** for eligibility when continuous index (such as a vulnerability score, credit rating score, test score) determines eligibility
- Assumption: units very close to the threshold are similar
- Farmers with 49 hectares and 51 hectares are, **on average**, very similar

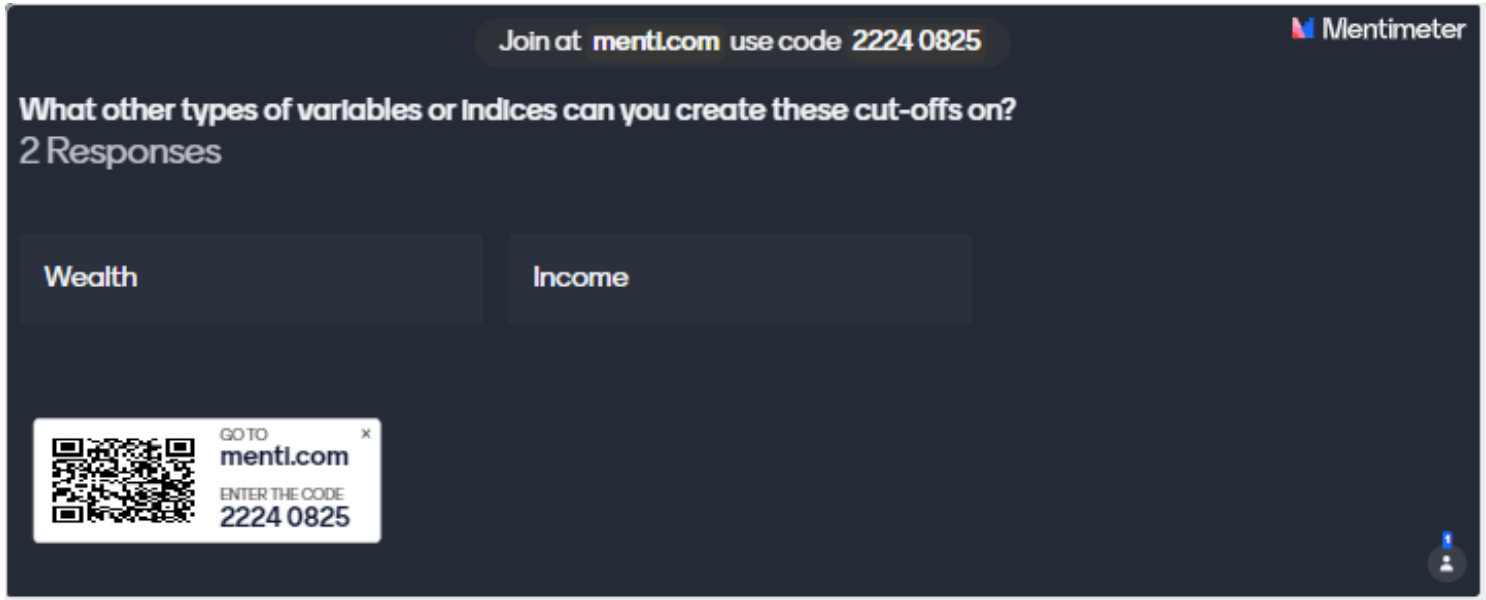
Regression Discontinuity Design



Gertler et al (2016)

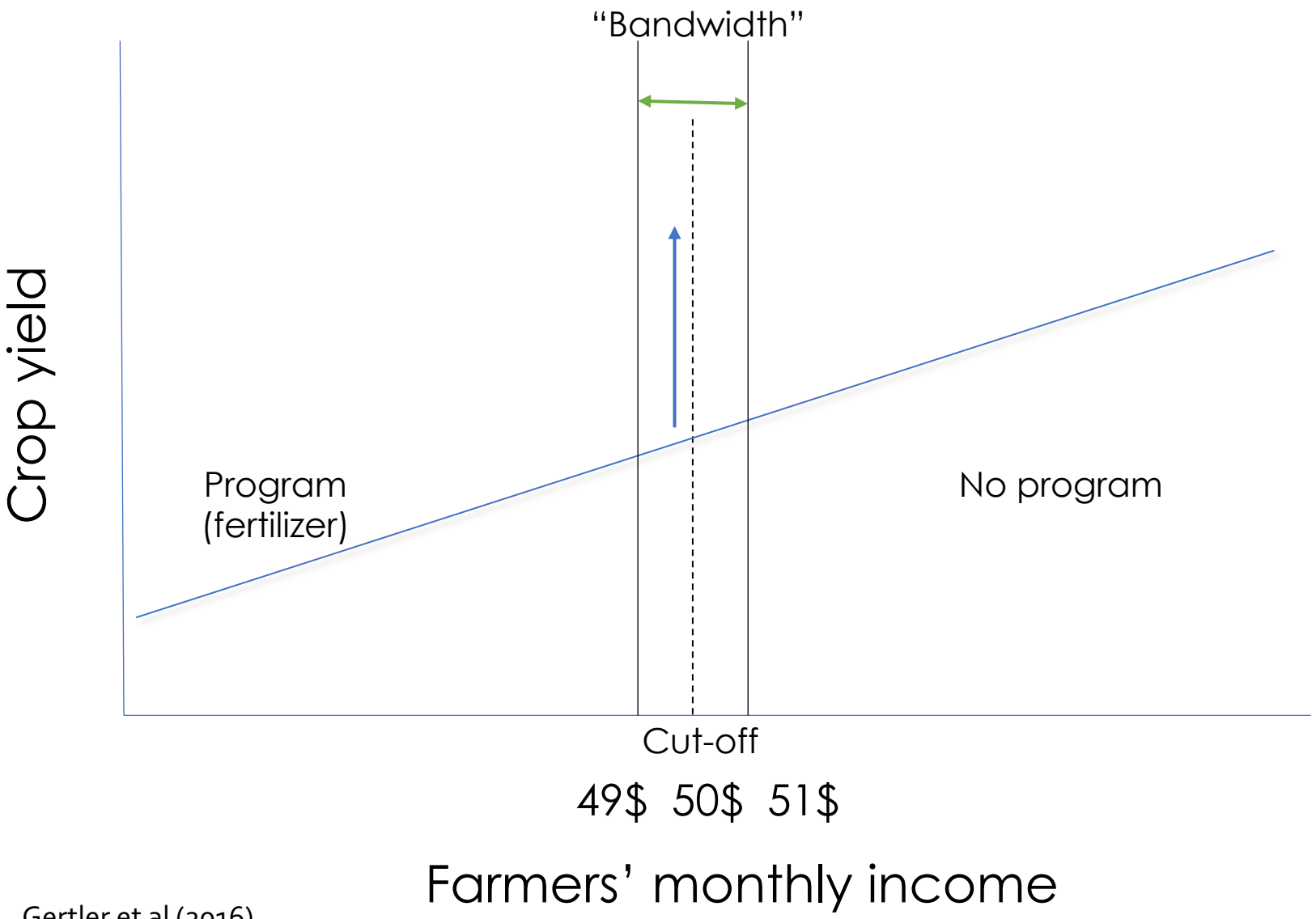
- Program impact: outcome directly above and below the threshold
- Different bandwidths can be used for sensitivity analysis
- RDD controls for both observables and unobservables
- Different types of thresholds can be used (spatial, time sensitive)

Regression Discontinuity Design



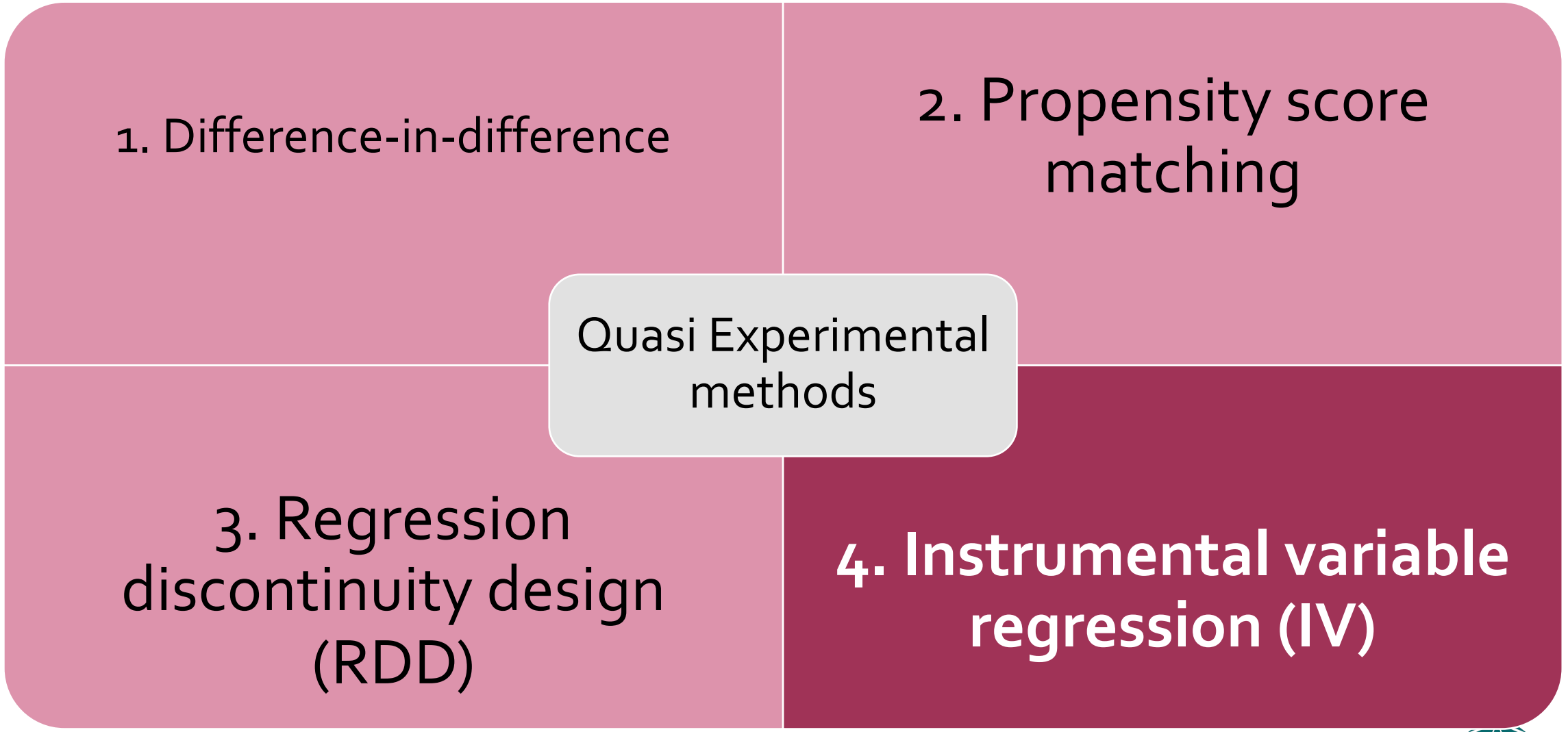
Center for Evaluation and Development

Regression Discontinuity Design



Gertler et al (2016)

Quasi-Experimental Methods



Instrumental Variable

- IV doesn't create control group → uses a **regression framework** to estimate the impact of an intervention
- IV counteracts selection bias, especially how **unobservable characteristics can bias impact estimates**
- If project participation is not random, e.g., because only certain people want to participate → correlation between treatment and (un)observable characteristics affecting outcome

Gertler et al (2016)

Instrumental Variable

- **Additional variable (the IV)** used
  - **IV → highly correlated with program participation**, but **not correlated with unobservable characteristics** affecting outcomes
  - IV **'cleans'** treatment variable

- How to find a relevant Instrument?
  - Needs to influence project take-up → *relevant instrument*
  - Does not affect outcomes through any channel except through the project → *valid instrument*)

- It can be hard to find a valid instrument!
  - **Randomised treatment variable** in RCT, if there is non-compliance in treatment and control group

Q & A Session

GREEN CLIMATE FUND | Independent Evaluation Unit

THANK YOU.

GREEN CLIMATE FUND | Independent Evaluation Unit

USE OF SPATIAL DATA, MACHINE LEARNING AND GEOSPATIAL IMPACT EVALUATIONS

Ana Paula de la O Campos – Agrifood Economics Division (ESA)
Food and Agriculture Organization of the United Nations (FAO)

GREEN CLIMATE FUND | Independent Evaluation Unit

LEVERAGING GEOGRAPHICAL INFORMATION SYSTEM DATA

- Surveys and administrative data tell us about **people and institutions,** their characteristics and their outcomes
- Remote sensing and more broadly GIS datasets report on a wide variety on **environmental characteristics** that affect and are affected by humans
- **GIS datasets provide more precise targeting of climate actions and understanding of context conditions, and new opportunities for strengthening impact evaluation design (more on this later)**
- Survey data in this context can often be limited:
  - Challenging to conduct surveys in conflict or disaster affected areas
  - Reaching certain areas due to lack of roads, infrastructure or when access is restricted (COVID-19)
  - Biophysical aspects limited to the domain or unit of analysis (e.g., the household, the parcel)
- Available budget for survey data collection may only cover a part of the overall intervention
  - not telling how different aspects of the project interact with each other
- GIS Data can be used to address some of these limitations:
  - offering key advantages for identifying assumptions, which can be especially transparently tested and arguments be visibly supported
  - provides more data points across space and time (historical data)
  - little effect of political borders and hard for one government to manipulate the information

GREEN CLIMATE FUND | Independent Evaluation Unit

KEY CONCEPTS AND GIS DATA GATHERING MECHANISMS

KEY DEFINITIONS

- **Remote sensing (RS)** is the analysis of data acquired using a device that is not in contact with the object, area or phenomenon under investigation (Lillesand *et al.*, 2015)

- **Earth observation (EO)** is the study of the earth's surface using remote sensing technologies (mostly satellite or air borne acquired) to monitor land, water (seas, rivers, lakes) and atmosphere

- A **geographic information system (GIS)** is a system that creates, manages, analyzes, and maps all types of data (ESRI, 2023)

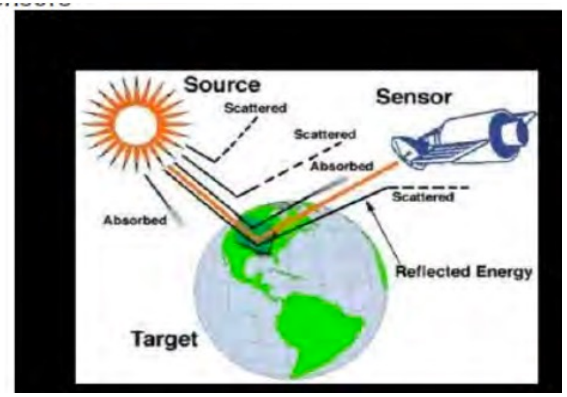
- **Spatial data** is information about the locations and shapes of geographic features and the relationships between them, usually stored as coordinates and topology

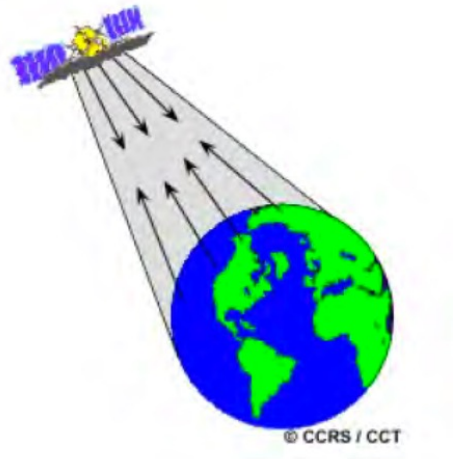
Shrinking lakes of the Kashmir Valley, NASA

GREEN CLIMATE FUND | Independent Evaluation Unit

WHAT IS SATELLITE DATA?

- Satellite-based EO relies on the use of **satellite-mounted payloads** to gather imaging data about the Earth's characteristics
- It provides **detaile**d and **objective** information about the earths surface (vegetation, water, agriculture, urbanization, infrastructure, etc.)
- Two types of data, depending on how it is recorded:
  - **Passive:** sensors use energy from another source of radiation (e.g, the sun) reflected by the object of interest
  - **Active:** sensors create own electromagnetic energy sent to, and backscattered by, the object
- Not only satellites: remote sensing uses **drones**, **air crafts** as well
- Information collected is then processed and interpreted to generate information about the surface of the earth or atmospheric conditions
- We use '**pre-processed' data** (deforestation, fire places, rainfall, temperature, nighttime lights dataset etc.) and **'raw' data** images that could be processed for certain indicators (e.g. NDVI)

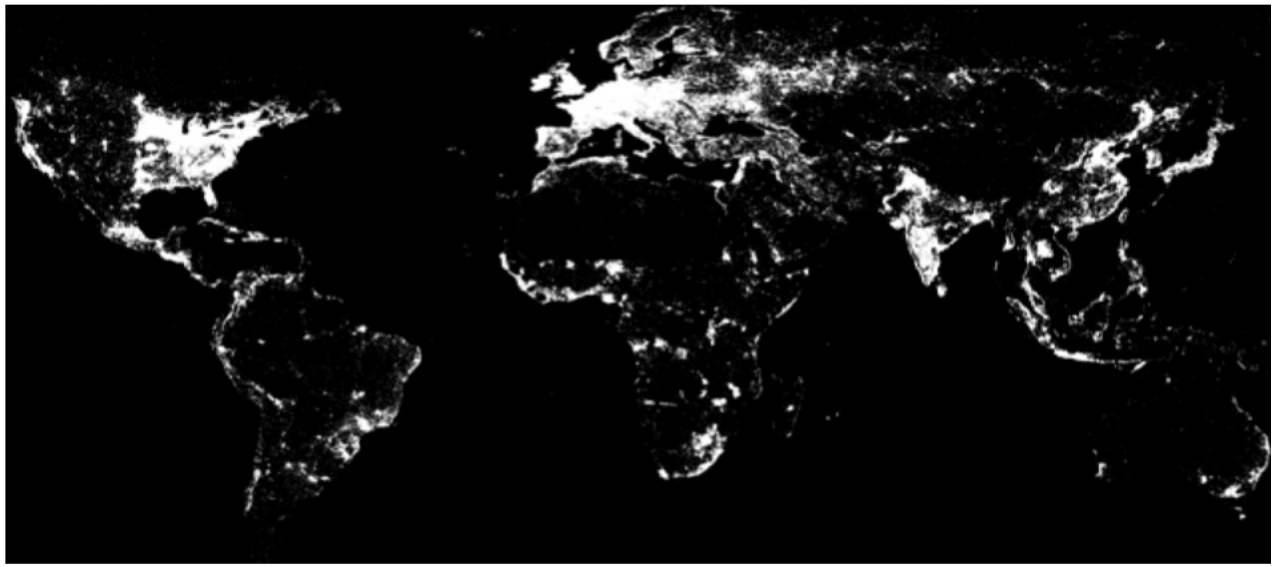




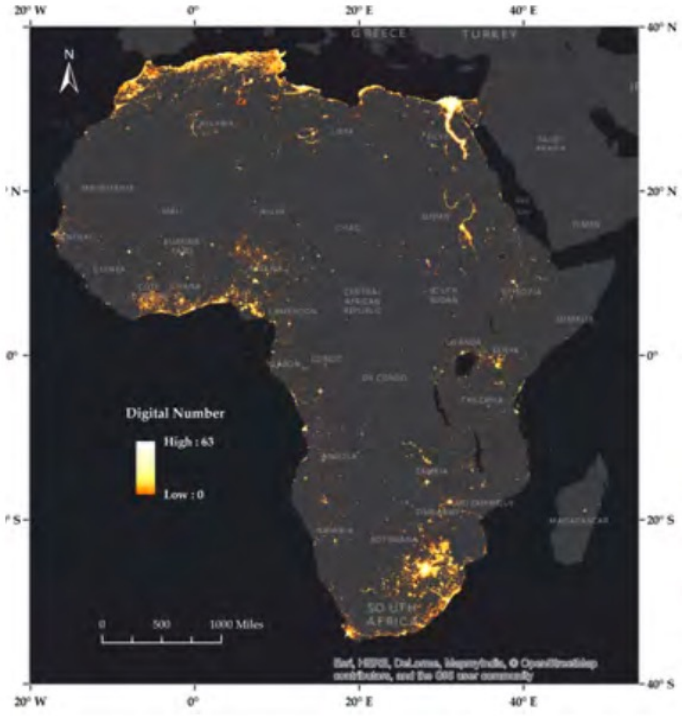
Passive vs. active remote sensors

GEOGRAPHIC INFORMATION SYSTEMS

- GIS data often have two components:
  - Spatial information: report the coordinates of spatial features
  - Attribute data: characteristics of the geographical features
- There are two primary types of spatial information:
  - Rasters made up of pixels with discrete or continuous values



Nighttime light throughout the World in 2001
Source: Maatta and Lessman, 2019

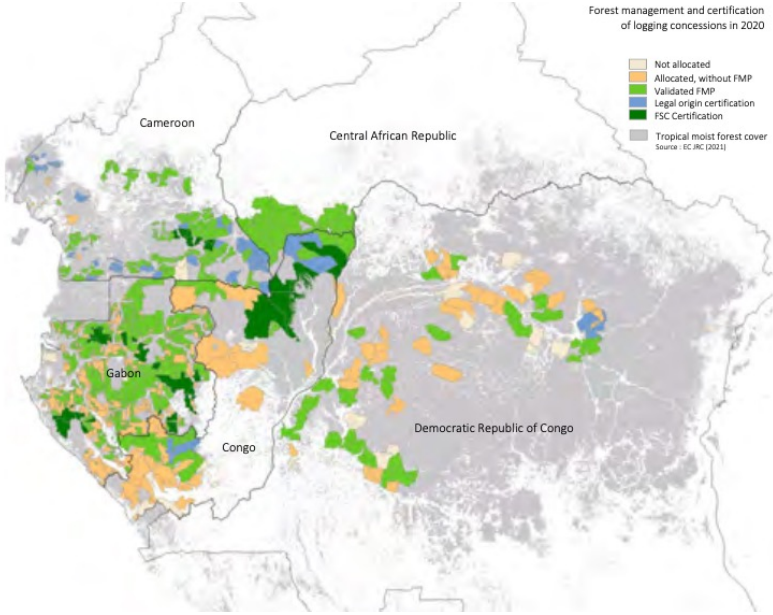


Intercalibrated 2013 nigttime imaregy for Africa (Savory et al,m 2017)

GEOGRAPHIC INFORMATION SYSTEMS

- GIS data often have two components:
  - Spatial information: report the coordinates of spatial features
  - Attribute data: characteristics of the geographical features
- There are two primary types of spatial information:
  - Rasters made up of pixels with discrete or continuous values
  - Vectors represented as points, lines and polygons

Ancient African cities (before 500 ad) (Folkers and van Buiten, 2019)

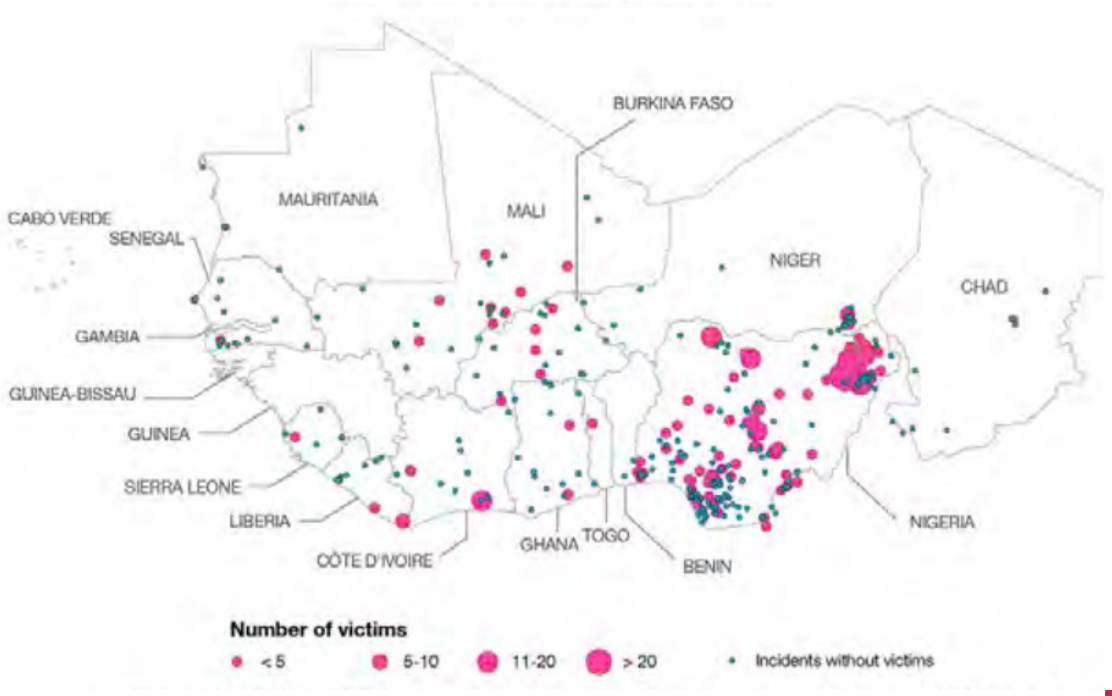


Logging concessions in the Congo Basin in 2020 (EC-JRC, 2021)

GEOGRAPHIC INFORMATION SYSTEMS

- GIS data often have two components:
  - Spatial information: report the coordinates of spatial features
  - Attribute data: characteristics of the geographical features
- There are two primary types of spatial information:
  - Rasters made up of pixels with discrete or continuous values
  - Vectors represented as points, lines and polygons
- A map is made up of layers of GIS Data

Victims of political violence affecting women, 2009-19 (SWAC/OECD) from ACLED data



GREEN CLIMATE FUND | Independent Evaluation Unit

Examples of satellite (remote sensing) data different resolutions

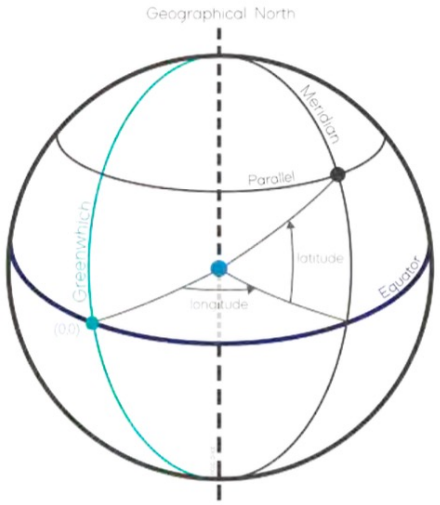
- Satellites gather different resolutions, and are classified by **high resolution** (HR) and **very high resolution** (VHR)
- For example:
  - **Landsat 8** images (at 30m level, optical satellite, new images every 15-16 days, since year 2000) from the National Aeronautics and Space Administration
  - **Sentinel 2** images (at 10m level, optical satellite, new images every 4-5 days since year 2014) from European Space Agency
- VHR is needed with dealing with socioeconomic calibration or for machine learning
- HR is sufficient when dealing with agricultural evaluations or for environmental purposes

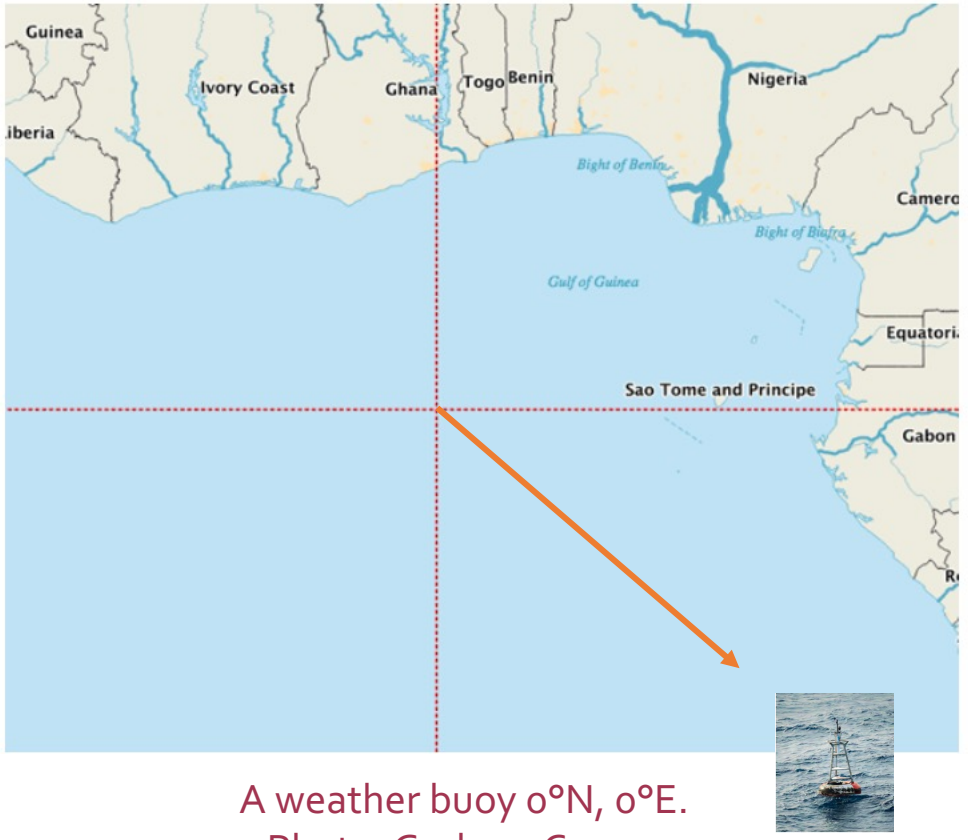
High-resolution and very high resolution images

	VHR1	VHR2	HR1	HR2
Resolution	<= 1 m	1 m < 4 m	4 m < 10 m	10 m < 30 m

GEOGRAPHIC COORDINATION SYSTEMS (GCS)

- GCS helps represent **the position of any point** located on Earth, based on its latitude, longitude and elevation
  - The **latitude** represents the position on the North-South axis or parallel
  - The **longitude** represents the position on the East-West axis or meridians
- The **elevation** represents the vertical position with z-axis pointing upward
- The **World Geodetic System** (1984) – WGS1984 – is the most common geographic coordinate system

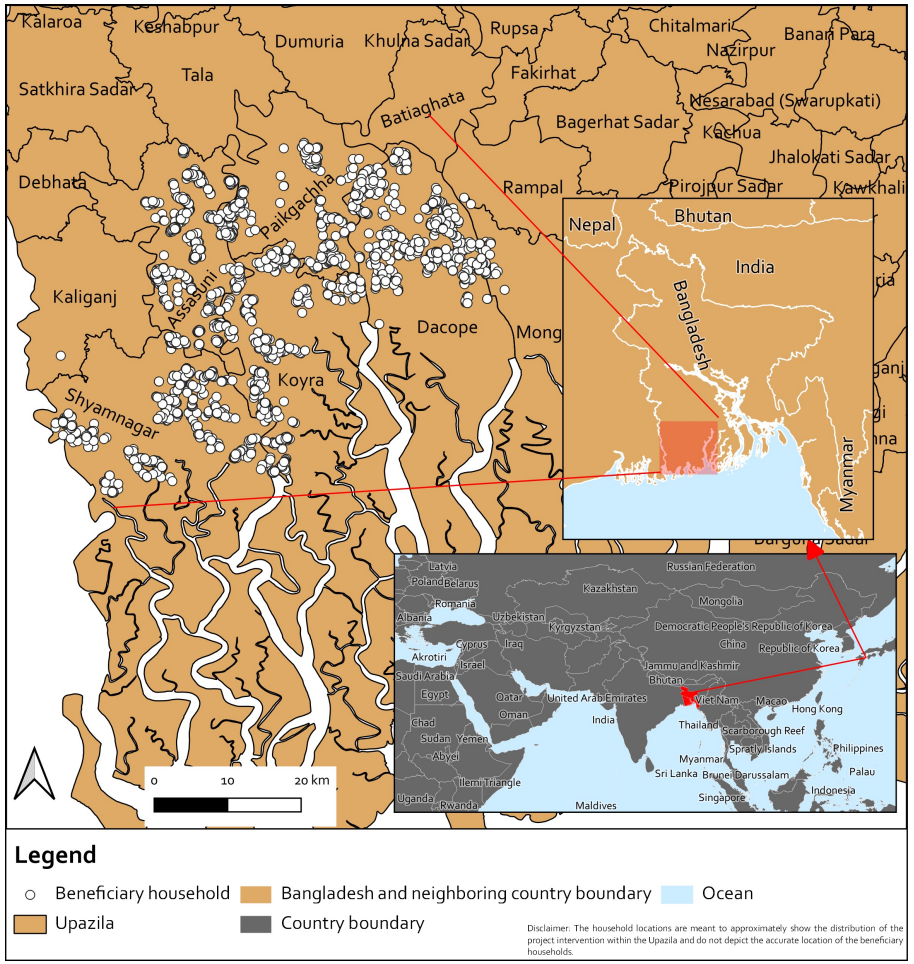




A weather buoy 0°N, 0°E.
Photo: Graham Curran

INTEGRATING SATELLITE WITH OTHER SPATIAL DATA

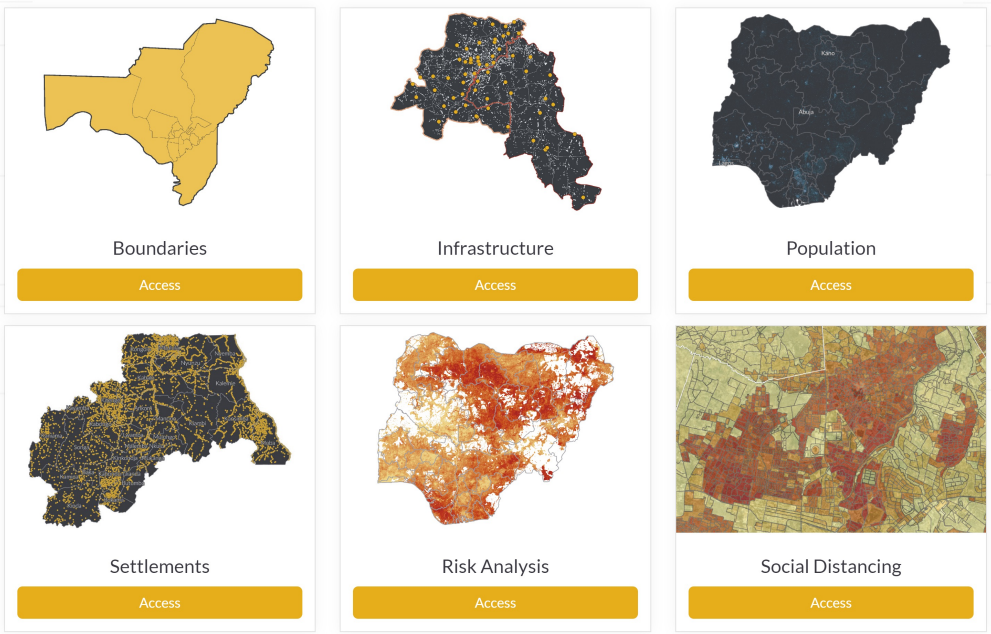
- Now that you know the different data and how these are collected…
- GIS, satellite data can be **integrated** with spatial data about beneficiaries, households or interventions
  - This helps to understand the geographic context of the beneficiaries and our project area
- By continuously updating our spatial database we can utilize GIS data to track our implementation and monitor impacts
- Visualize impact evaluation results in form of maps to aid the understanding of the project and communicate impacts
- Maps can effectively depict program coverage, reach, and distribution of outcomes, providing clear insights



GREEN CLIMATE FUND | Independent Evaluation Unit

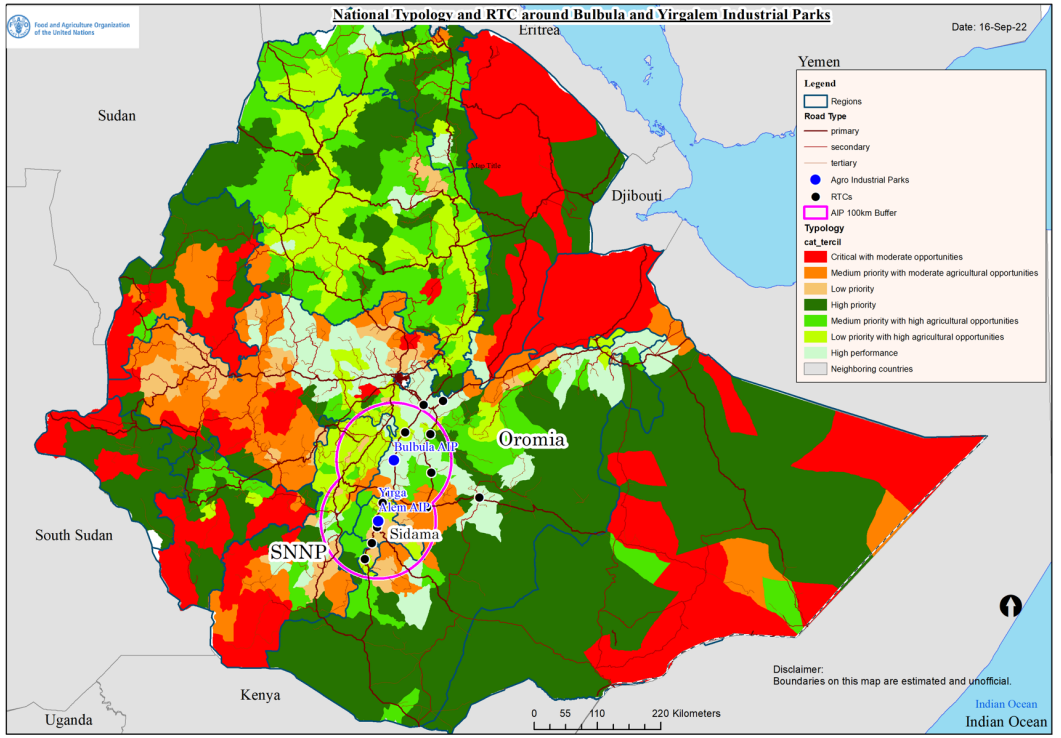
INTEGRATING SATELLITE WITH OTHER SOURCES OF DATA

- Satellite data can be integrated with other data sources:
  - administrative, socioeconomic, demographic, population and data from the impact evaluation survey
- The data can be collected specifically for the project or from other sources such as citizen science, multi-agency partnership and public data



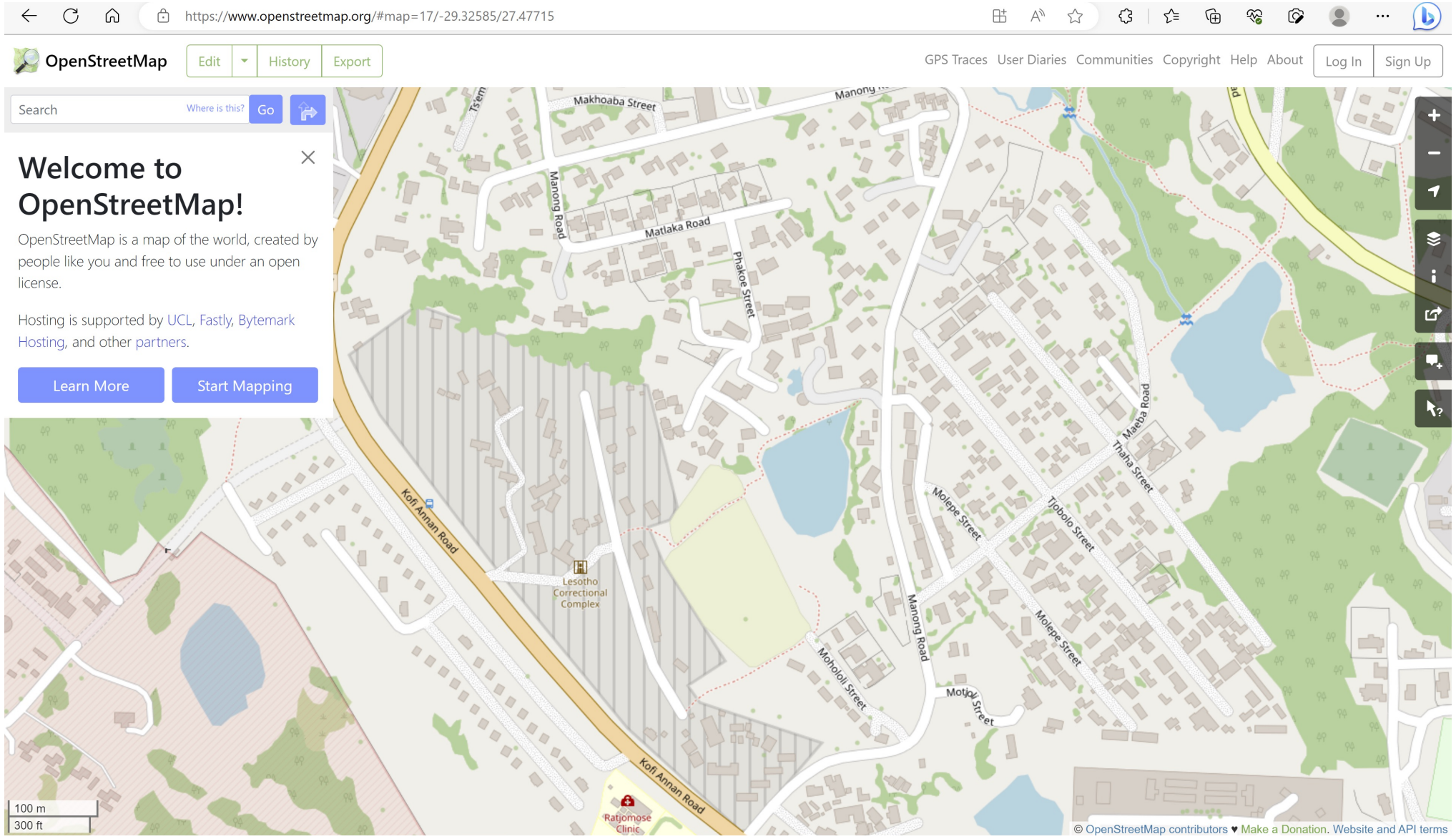
https://data.grid3.org

FAO Hand in Hand Typology of Microregions



GREEN CLIMATE FUND | Independent Evaluation Unit

CITIZEN SCIENCE, OPENSTREETMAP INITIATIVE

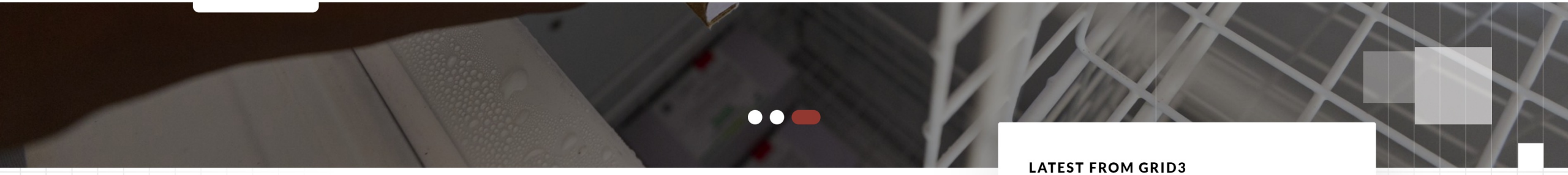


GREEN CLIMATE FUND | Independent Evaluation Unit

MULTI AGENCY PARTNERSHIP INITIATIVES

GRID3

ABOUT US SOLUTIONS NEWS DATA RESOURCES



DATA-DRIVEN DECISION MAKING

Enabling more effective humanitarian and development decisions

When maps fail to account for every person, progress can't be achieved. Too many people still remain invisible to the governments and humanitarian and development organisations that can provide the public with vital resources. Communities that are absent from maps often miss out on much needed support. And when other map-based data, such as infrastructure and boundaries, are missing or incorrect, development efforts are also impeded.

LEARN MORE

LATEST FROM GRID3

News

Innovative online course attracts learners from across the globe

News

Sierra Leone tackles HPV in its latest nationwide vaccination campaign

News

Supporting vaccination microplanning in Mozambique

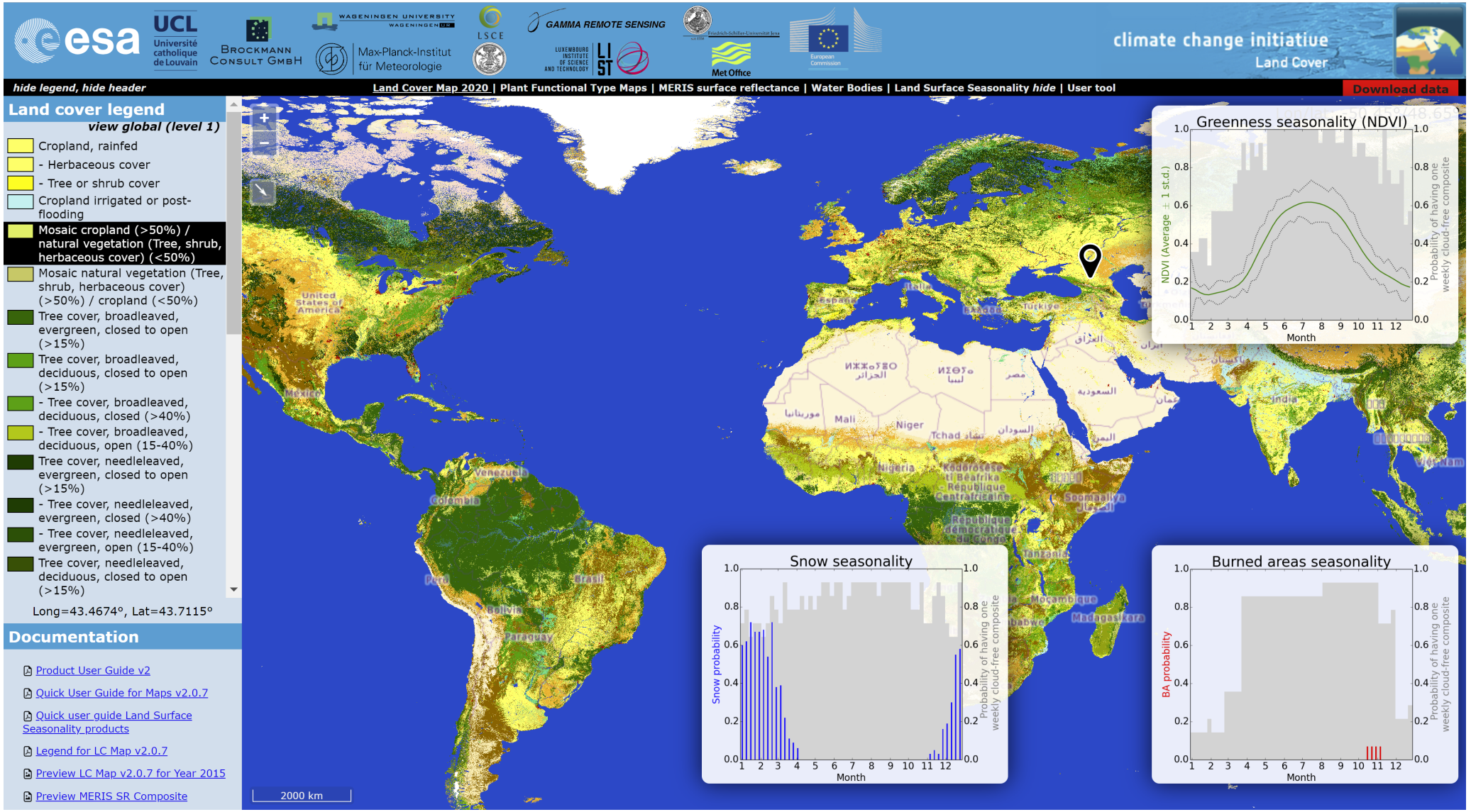
News

Planners in Zambia continue to draw on geospatial solutions to make sure no one is left behind

VIEW MORE

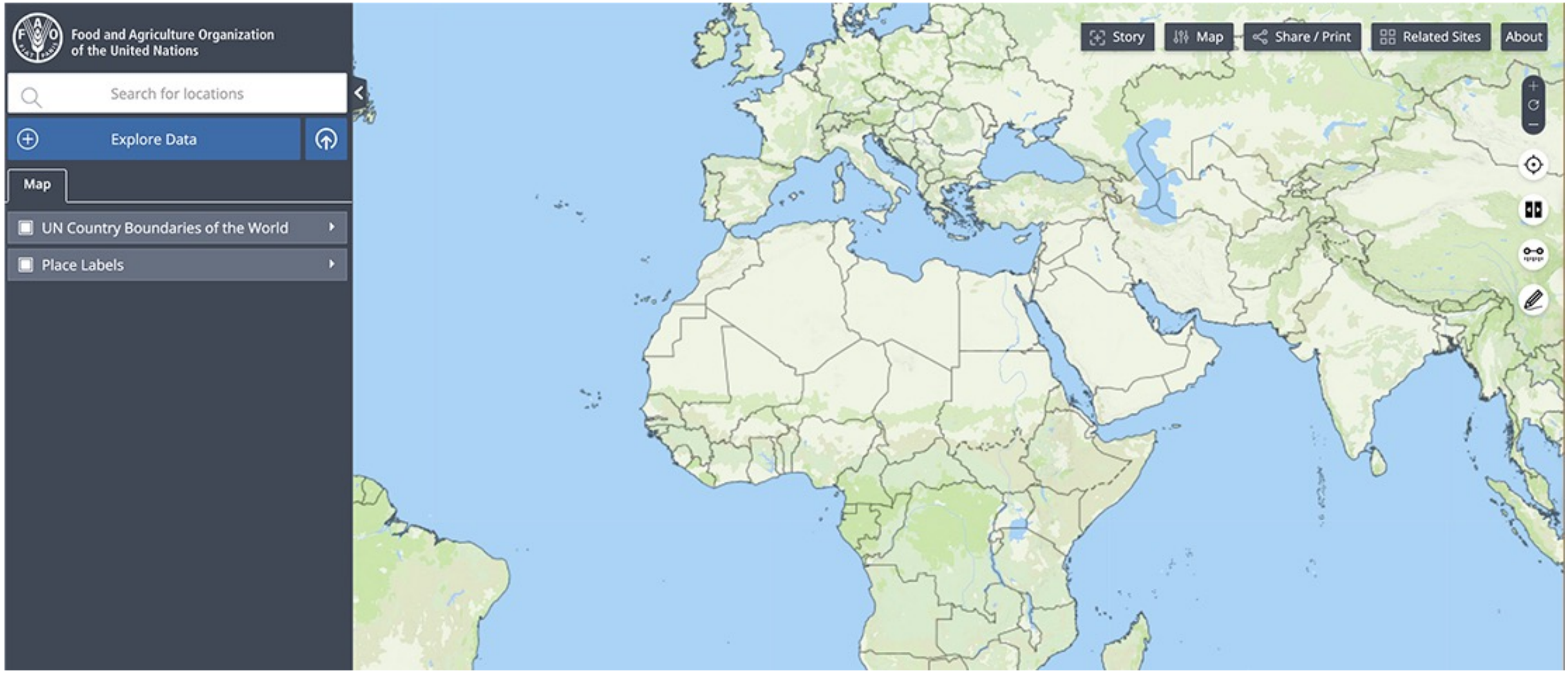
GREEN CLIMATE FUND | Independent Evaluation Unit

ESA CLIMATE CHANGE INITIATIVE



GREEN CLIMATE FUND | Independent Evaluation Unit

FAO HAND IN HAND GEOSPATIAL PLATFORM



GREEN CLIMATE FUND | Independent Evaluation Unit

USING SATELLITE DATA FOR MONITORING AND MEASURING PROJECT OUTCOMES

GREEN CLIMATE FUND | Independent Evaluation Unit

USE OF SATELLITE DATA IN IMPACT EVALUATIONS

- Satellite data can be used to **inform the targeting st**rategy of the intervention(s), helping identify potential targeting criteria

- **During the project implementation**, it can directly record the activities being studied or through use proxies for the indicators we are studying

  - Directly study and monitor cropping patterns, intensity of agricultural activities, extent of restored ecosystem, status of infrastructure etc.

  - Modelling variables generated from satellite data to estimate crop yields, urban developments or deforestation

  - Assessing the impact of infrastructure projects by measuring changes in road networks, urban development and land cover

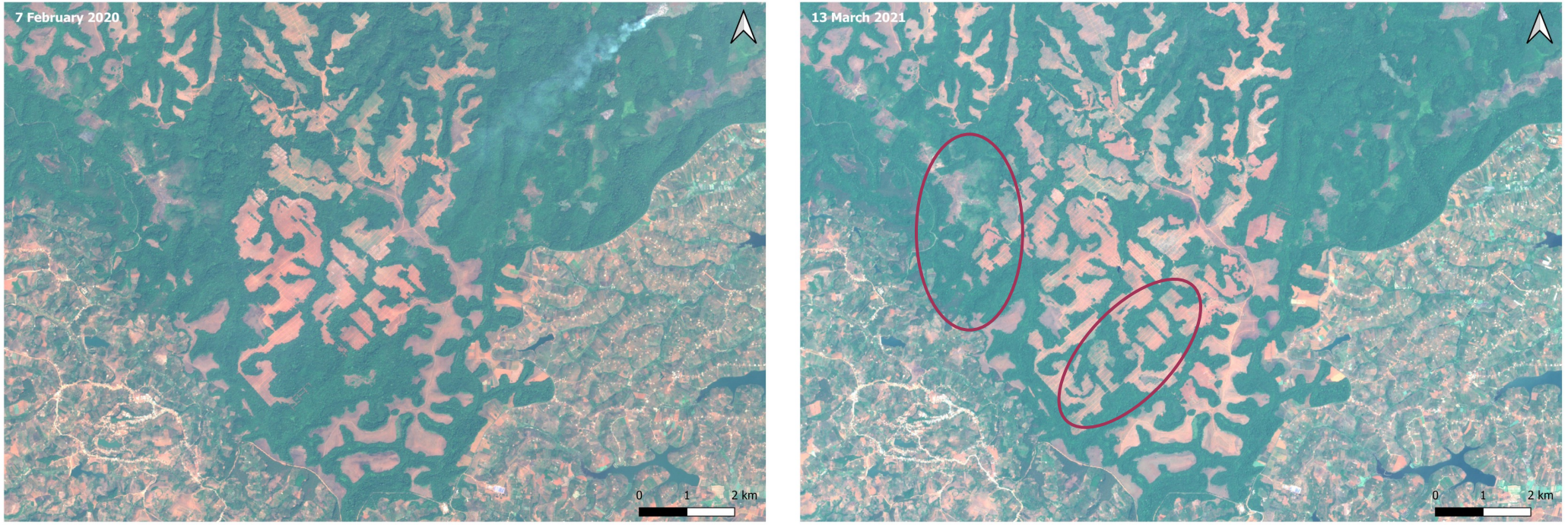
  - Evaluating ecosystem restoration projects by tracking deforestation, air and water quality, and climate change impacts

  - Analyzing disaster response and recovery efforts by assessing damage and changes in affected areas

- It can also provide ideas for the **choice of a suitable counterfactual** (e.g. using ML) and enhance our **econometric approaches** when using quasi-experimental techniques

GREEN CLIMATE FUND | Independent Evaluation Unit

MONITORING AGRICULTURAL INTENSIFICATION AND DEFORESTATION



Agricultural intensification and loss of forest vegetation in Phumi Lumpek, Cambodia (Source: Sentinel 2 accessed from https://glovis.usgs.gov)

GREEN CLIMATE FUND | Independent Evaluation Unit

PHOTOVOLTAIC CELLS IN VANUATU

Source: UN Development Programme (2020). Satellite data and climate change. https://undp.medium.com/satellite-data-and-climate-change-e5c91ad42877

Investment in other renewable energy sources, such as solar power, are also easy to detect like solar photovoltaic cells are generally large enough to be visible from satellites

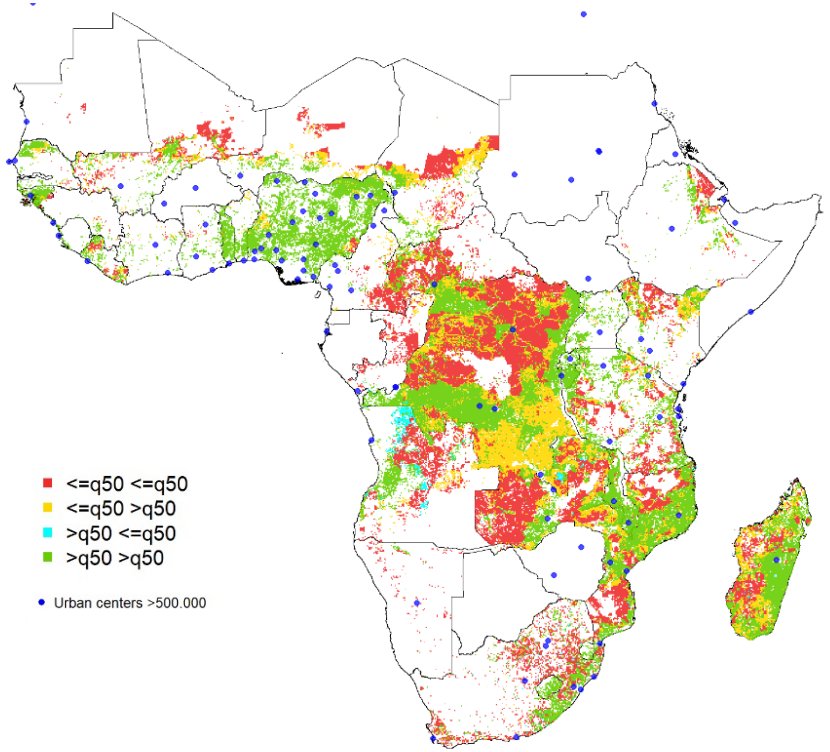
GREEN CLIMATE FUND | Independent Evaluation Unit

ASSESSING SOCIO-ECONOMIC IMPACTS

- Night-time light is correlated with urbanization, population density, GDP, poverty
- Night time light data based on DMSP (1992 to 2013) have been controversial and ViiRS preferred (2013-now)

Night lights in Africa - credits: NASA

- Or trained data (ATLAS-AI asset index or consumption)



Changes in extreme poverty in SSA from 2003 to 2021)
(Becerra, De la O Campos, Sitko, Davis, & Vielanovska, forthcoming)

GREEN CLIMATE FUND | Independent Evaluation Unit

GENERAL LIMITATIONS OF SATELLITE DATA

- Quality is relatively constant over time and space, but:
  - The best conditions is homogeneously covered on a cloud free day
  - Heterogeneity in land use, terrain slopes, and clouds tend to degrade the quality of data
  - There could be sensor limitations or malfunctioning of the equipment (and thus, data gaps)
  - Remote sensors with high frequency tend to have lower precision
  - VHR sensors tend to cover smaller parts of the Earth - and thus have smaller frequency over the same point
- Some data may be limited by temporal resolution:
  - Data coverage gets worse, both in terms of frequency and of resolution as we go back in time
  - Data quality improves a lot over the years
- Some data may involve complex methods - strong technical expertise to process and analyze it
- The higher the resolution, the larger the memory and computational requirements.
- **There is no one size fits all solution: think about these trade-offs and about your research questions: what is the best way to answer it?**

GREEN CLIMATE FUND | Independent Evaluation Unit

LIMITATIONS SPECIFIC TO IMPACT EVALUATIONS

- It is not applicable to all types of projects and interventions
- Does not capture some indicators
  - Attitudes
  - Behaviour
  - Nutrition and food security
  - Health
  - Access to clean and safe water
- Difficult when aiming at capturing heterogeneity of outcomes at household level (e.g, gender) or through ethnic groups if populations not geographically determined
- Adherence ethical practices and considerations (e.g., use of drones)

GREEN CLIMATE FUND | Independent Evaluation Unit

GEOSPATIAL IMPACT EVALUATION

GREEN CLIMATE FUND | Independent Evaluation Unit

WHAT IS GEOSPATIAL IMPACT EVALUATION?

- Embeds the use of GIS data in the design of experimental/quasi-experimental impact evaluation
  - Satellite data in experimental designs supports processes of randomization
  - Quasi-experimental where satellite data can support both the building of a counterfactual and the strengthening of econometric approaches/estimates
- It is not simply monitoring of outcome changes over time
- There are different types of GIE, depending on how the data is used:
  - Applied to standard quasi-experimental techniques frameworks using data spatial data to assess outcome indicators
  - OR both, the above + using spatial data to identify the counterfactual
- Examples of GIE designs:
  - Randomized Control Trial (RCT) - GIS used in targeting and outcome meassurement
  - Geographic Regression Discontinuity Design (GRDD)
  - Geospatial Difference-in-Difference
  - Geospatial Matching
  - Their comibinations: e.g. Difference-in-discontinuities

GREEN CLIMATE FUND | Independent Evaluation Unit

Eperimental evaluation with Biophysical outcomes

Example:

PES in Uganda randomized Diff-in-Diff

- Randomized evaluation of PES in 121 villages to measure **causal impacts** on forest cover
- Annual payments of 70,000 Ugandan shillings per hectare if conserved their forest
- Used Landsat satellite images to identify villages in the study districts with forest and then conducted a census of private forest owners (PFOs) in these villages
- Analyased QuickBird satellite images to measure tree cover using object-based image analysis and a change-detection technique

Example: Payments For Environmental Services in Hoima, Uganda (J-PAL) - Cash for Carbon

Source: Jayachandran et al. ,Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation. Science357,267-273(2017).DOI:10.1126/science.aan0568

Geographic RDD

- Similar to RDD, but leverages a spatial discontinuity
- Uses both satellite data and survey data

Example: irrigation scheme in Rwanda

- A main canal was constructred along contour of the hillside
- Plots under the command area have access to irrigation
- Impact on outcomes of interest (measured by plot survey) comparing above and below the threshold

Example of spatial discontinuity in plot-level access to irrigation

Source: Jones, M., Kondylis, F., Loeser, J. & Magruder, J. 2020. *Factor market failures and the adoption of irrigation in Rwanda.*

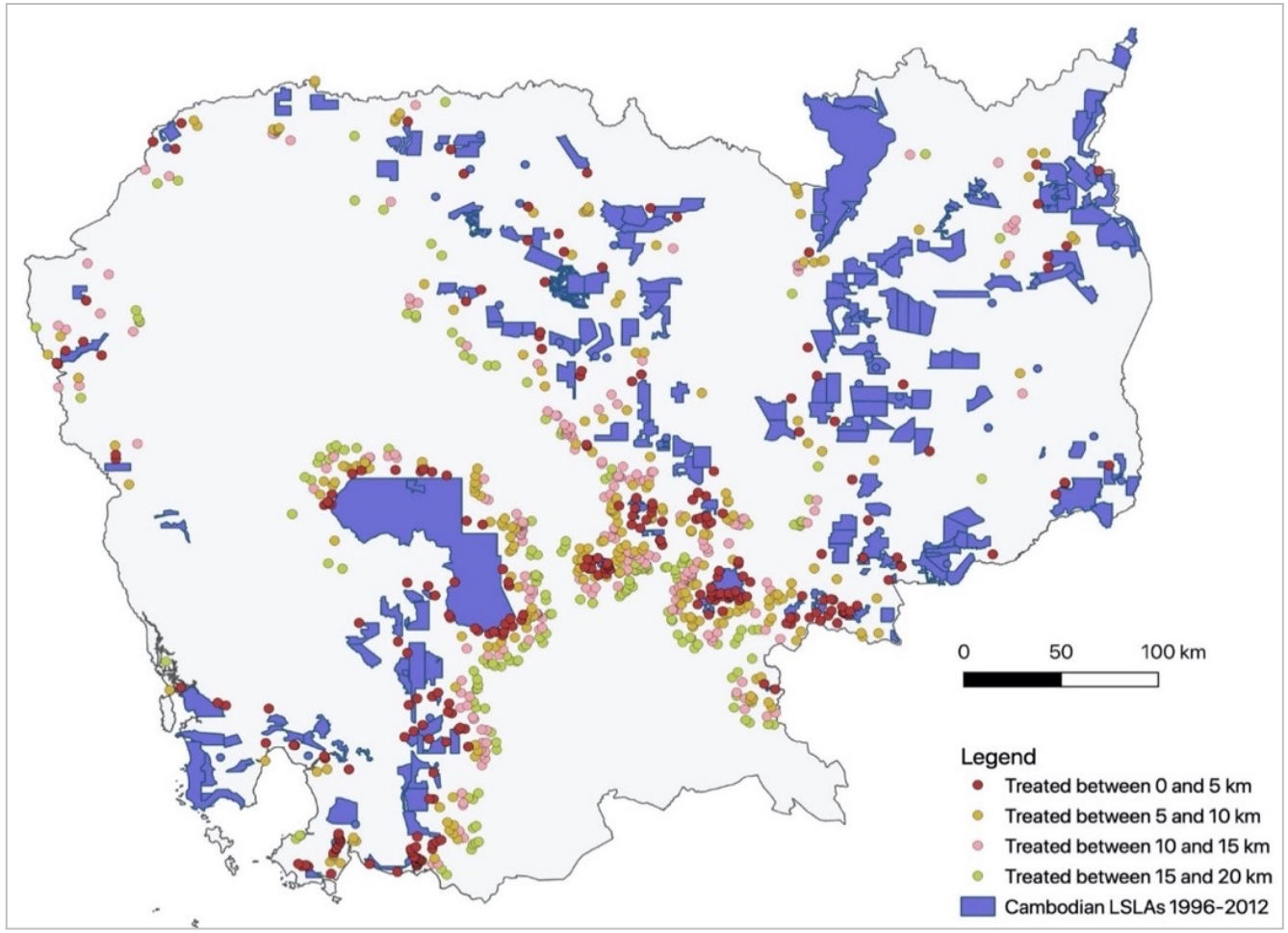
Geospatial Diff-in-Diff

Application to Diff-in-Diff

Example: Large-scale land aquisitions in Cambodia

- Uses spatial data of LSLAs and CSEC (socio-economic survey) covering years 1999-2016
- Impact on employment and expenditures
- Impact estimated with $LSLA_{v,k} \times After_{vt}$
- where After refers to binary variable equial to one if individual is in village within k km of an LSMA (Figure)

Large Scale Land Acquisitions established between 1996 and 2016.



Source: Anti, S. 2021. Land grabs and labour in Cambodia. *Journal of Development Economics*, 149: 102616

GREEN CLIMATE FUND | Independent Evaluation Unit

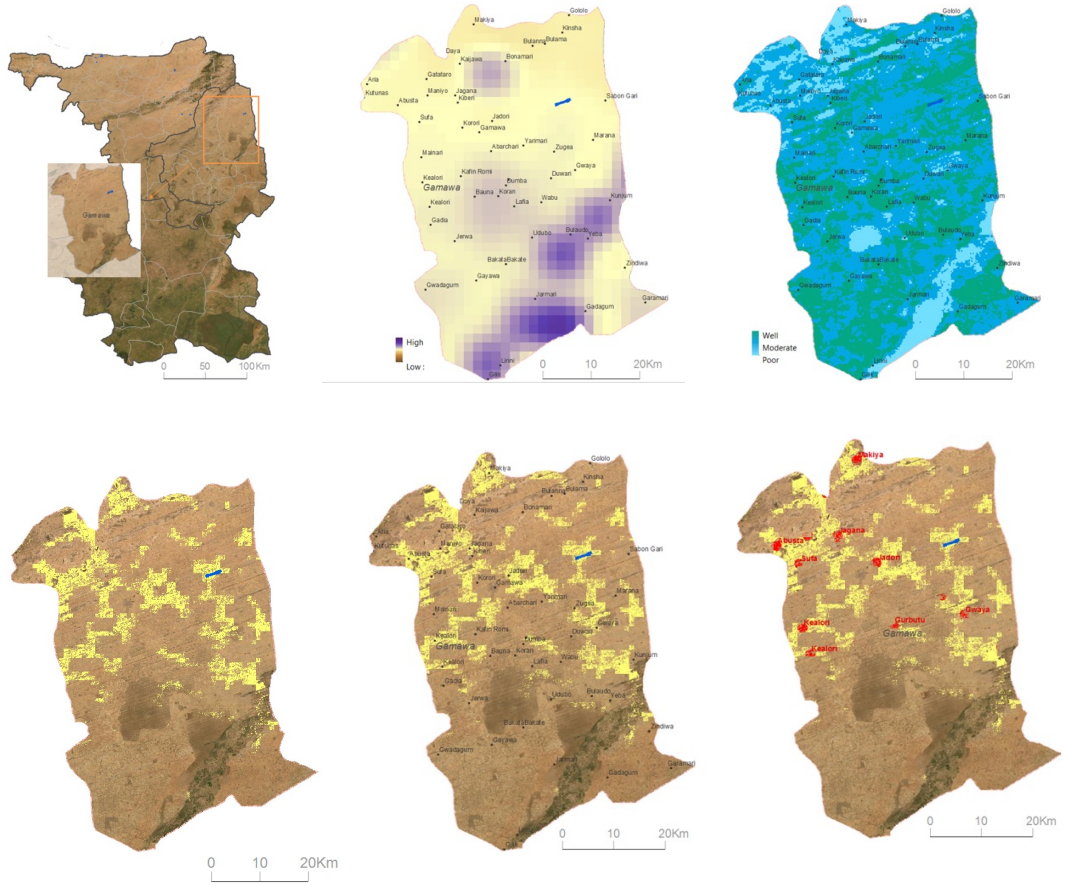
Geospatial Matching

Application to both identification of counterfactual and Inverse Probability Weighting regression in an ex-post setting

Example: Land restoration in Northern Nigeria

- Super Vector Machine (SVM) used about 15 sources of biophysical and socio-economic spatial data to locate similar plots of land eligible for restoration
- These locations determined the survey implementation (together with treated communities)
- Spatial data estimates also used in the propensity scores needed for IPWRA method (SPEI –based climate risk measure, ATLAS-AI wealth indicator, NDVI)

Super Vector Machine (SVM) - visual inspection for identifying sites similar to AAD locations (Gamawa, Bauchi state).



Source: De La O Campos, A.P., Petracco, C.K., Valli, E., Sitko, N. & D'Aietti, L. 2023. *Greening for the greater good – The case of Action Against Desertification in Northern Nigeria.* FAO Agricultural Development Economics Working Paper 23-06. Rome, FAO. https://doi.org/10.4060/cc7307en

GREEN CLIMATE FUND | Independent Evaluation Unit

Summary and final considerations

To learn more, join virtual the gathering of GeoField faciliated by Aid Data on Geospatial Impact Evaluations (Community of Practice)

https://www.geofield.org/events/autumn-2023-geofield-convening-leveraging-earth-observation-for-impact-evaluations-of-climate-sensitive-agriculture

- Support **targeting** and IE **design options** (randomization, selection of control areas using SVM or random forest
- Supports monitoring and collection of additional data for understanding **mechanisms** and **means of verification**
- Quasi-experimental: Econometric techniques enhanced when integrating quantitative data extracted from spatial estimates of satellite/remote sensing data
- **Remember**: the definition of polygons and pixels used will influence the validity of estimates used
- **Remember**: the extraction of such estimates requires drawing assumptions about indicators and their time frames (average, median? Monthly, annually, peak periods?)
- The debate on the **validity of some measures** (NDVI, nighttlights, non-widely validated trained data) is still ongoing…
- We are in an experimental phase of all this: our evaluations are an opportunity to expand the evidence!

GREEN CLIMATE FUND | Independent Evaluation Unit

Thank you!

Contact IEU:

✉ anapaula.delaocampos@fao.org

@anapauladelao

https://www.fao.org/agrifood-economics/areas-of-work/smart/inclusivity-agrifood-systems-transformation/en/

GREEN CLIMATE FUND | Independent Evaluation Unit

Timeline and Budget

Joint session between IEU and FAO

LORTA In-person Impact Evaluation Workshop 2023

Dr Anastasia Aladysheva
Impact Evaluation Specialist, a.i.
Independent Evaluation Unit

August 2023

GREEN CLIMATE FUND | Independent Evaluation Unit

General remarks

- Impact evaluation and project implementation are ***intertwined***
- For rigorous impact evaluation, it is important to plan the IE design at the beginning of the project, ***before the start of implementation***
- 2-5% of the project budget are to be used for the evaluations ***(IEU Evaluation Policy)***

GREEN CLIMATE FUND | Independent Evaluation Unit

Cost of an Impact Evaluation

Type of Evaluation	Cost	Factors Influencing Cost
Performance Evaluation	$10,000–$30,000	Scope of the evaluation and salary of the evaluator
Process Evaluation	$10,000–$60,000	Same as performance evaluation, but often uses more data collection tools so evaluation can take longer
Impact Evaluation	$15,000–$1 million+	Cost varies widely depending on methodology used: the more data collected, the more expensive the evaluation becomes (see notes 6 and 7 for more details)
Cost-Effectiveness and Cost-Benefit Analyses	$10,000–$30,000	Depends on whether benefits have previously been measured and whether data are readily available

Source: International Labor Organization

GREEN CLIMATE FUND | Independent Evaluation Unit

Example 1: Asian Development Bank

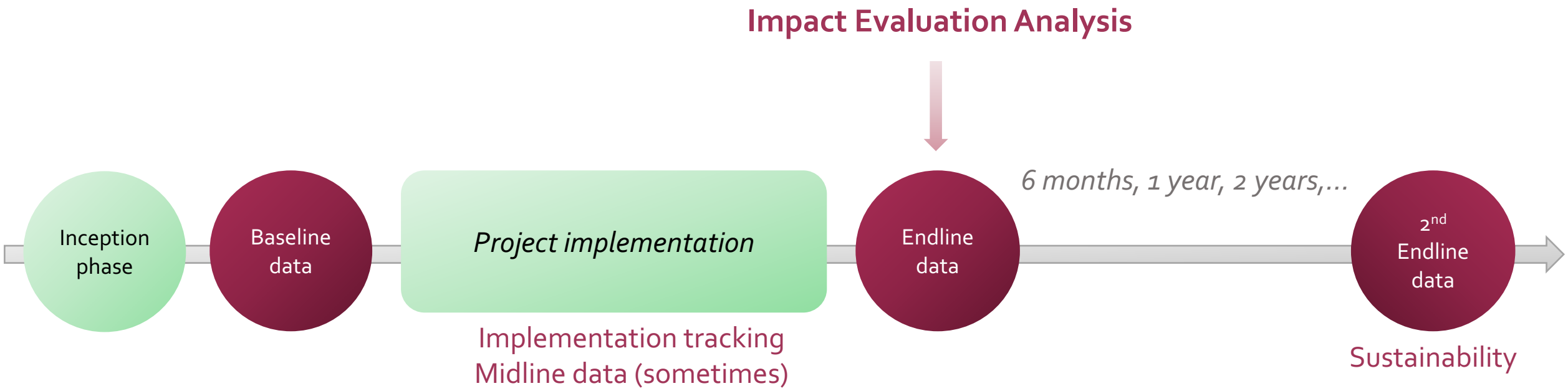
Table 8.3: Budgets of Selected ADB-Supported Impact Evaluations, ($)

Item	JobStart (Philippines)	Metro Extension (Georgia)	Medicard and Food Stamp (Mongolia)	Climate Change and Women (Viet Nam)	Labor-Based Road Work (Pacific)	Small and Medium Farmers (Nepal)
Design	Simple RCT	DiD	RDD	DiD	DiD	DiD
International staff	130,000	120,000	121,000	104,000	80,000	102,304
National staff	96,000	70,000	–	–	–	–
Survey	160,000	44,000	87,000	71,000	60,000	110,700
Workshops and travel	10,000	44,000	–	–	35,000	19,000
Other	–	22,000	19,700	–	–	18,560
Total	396,000	300,000	227,700	175,000	175,000	250,564

– = not applicable, ADB = Asian Development Bank, DiD = difference-in-differences, RCT = randomized controlled trial, RDD = regression discontinuity design.
Source: Authors.

GREEN CLIMATE FUND | Independent Evaluation Unit

Impact Evaluation Timeline



Data collection:

Staff cost	Field coordinator, supervisor, enumerator, moderator (qualitative), translator.
Training cost	Training venue, catering, training stipend for participants, accommodation.
Transport	Car hire, fuel, driver, bus fare, motorcycle during training and data collection
Other	Tablets, incentives, printing of training material, communication/internet cost, venue for focus group discussions (qualitative)

GREEN CLIMATE FUND | Independent Evaluation Unit

Cost by region

Table 4 Average cost of closed 3ie IE grants by research method and region, unit: USD'000

	Research method		
	RCT	**Quasi-experiment**	**Total**
East Asia	304.9 (n=4)	315.6 (n=3)	309.4 (n=7)
Latin America	332.8 (n=4)	253.0 (n=2)	306.2 (n=6)
South Asia	482.3 (n=11)	159.2 (n=1)	455.4 (n=12)
Africa	320.0 (n=14)	167.0 (n=3)	293.0 (n=17)
Total	373.8 (n=33)	234.7 (n=9)	344.0 (n=42)

GREEN CLIMATE FUND | Independent Evaluation Unit

Timeline – Example

Baseline -Year 2023 - Months												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Preparation of Scoping Mission												
Scoping mission												
Desk review												
Writing of Pre-Analysis Plan												
Preparation of survey tools												
Preparation data collection												
Pre-test and training												
Data collection												
Project Implementation to start (earliest)												
Data cleaning												
Data analysis												
Writing of IE Baseline report												
Dissemination of findings												

GREEN CLIMATE FUND | Independent Evaluation Unit

Timeline

- Evaluation phases:
  I. **Baseline** (if needed): **BEFORE or AT THE START OF** project implementation
  II. **Midline** (optional)
  III. **Endline**: After project ends
- Decision for baseline and midline depends on the ***selected evaluation design*** as well as project interests and resources
  - RCT → baseline data collection is highly desirable but not strictly necessary
  - DiD → baseline and endline mandatory
- Should be determined ***together*** with an IE specialist

GREEN CLIMATE FUND | Independent Evaluation Unit

Possible hitches and glitches

1. Foreseeable challenges

- Ethical clearance and local research permissions
- Procurement takes time
- Holiday/festivals/elections
- Missing/incomplete data

2. Unforeseeable challenges

- Natural disasters, pandemics, local conflict
- Delays in project implementation
- Change in project team/contact person of local partner

GREEN CLIMATE FUND | Independent Evaluation Unit

Q&A

- **FAO/C4ED**: What are your experiences in setting a budget for IE? Any failures/success stories?

- **Project teams**: What is your experience in conducting surveys for your projects?

GREEN CLIMATE FUND | Independent Evaluation Unit

Thank you!

Contact IEU:

✉ ieu@gcfund.org

@GCF_Eval

ieu.greenclimate.fund

GREEN CLIMATE FUND | Independent Evaluation Unit

Data and Power Analysis

LORTA In-person Impact Evaluation Workshop 2023

Dr Anastasia Aladysheva
Impact Evaluation Specialist, a.i.
Independent Evaluation Unit

August 2023

GREEN CLIMATE FUND | Independent Evaluation Unit

Data

- Data are key to Impact Evaluation
- Data may come from various sources and survey instruments
- Data needs must be driven by the Theory of Change

GREEN CLIMATE FUND | Independent Evaluation Unit

Data sources

- Census:
  - *data collected from the whole population*
- Surveys:
  - *data collected from a sample of the population of interest*
- Geographic Information Systems (GIS):
  - *data relating to geographic characteristics of an area*
- Administrative data:
  - *information collected routinely (ex. utility bills, school attendance)*
- Other sources:
  - *(ex. observational data, data from mobile phones)*

GREEN CLIMATE FUND | Independent Evaluation Unit

Multiple survey instruments

- Household survey
  - *data are collected by a visit to the household*
- Community survey
  - *data are collected at the level of the community (a village or administrative district in urban areas such as the "barangay" in the Philippines)*
- Facility survey
  - *data are collected at the level of the facility (such as a school or a health clinic)*

Health facility in Burkina Faso

GREEN CLIMATE FUND | Independent Evaluation Unit

Data needs

Impact evaluation method

Evaluation method	Data required
Randomized control trial	Outcome data for comparison and treatment groups. Baseline data and background variables are desirable
Differences-in-differences	Before and after data for participants and non-participants
Propensity score matching	Outcomes as well as “variables for matching” for both participants and non-participants
Regression discontinuity design	Outcomes as well as data of ranking criteria (e.g., age, index, etc.). Socioeconomic background variables highly desirable.
Before-and-after	Before-and-after data for programme participants
Comparing participants to non-participants	After-programme data for participants and non-participants

GREEN CLIMATE FUND | Independent Evaluation Unit

The role of qualitative data

- At the formative stage to help *inform evaluation and survey design*;
- Can *capture sensitive or less well-understood issues* relating to intervention implementation, such as barriers to participation, implementation problems, and so on; and
- Can help to *interpret study findings* and to generalize conclusions.

GREEN CLIMATE FUND | Independent Evaluation Unit

Modules in household questionnaire

- Roster/listing of the household members (age, level of education, relationship to the HH head)
- Socio-economic characteristics (household assets, expenditures)
- Intervention-related outcomes (quantity & quality of water, food intake)
- Awareness of climate change risks
- Agricultural practices and outputs
- Health indicators

GREEN CLIMATE FUND | Independent Evaluation Unit

Household resilience to climate change shocks

- Income and access to food;
- Assets such as land and livestock;
- Social safety nets such as food assistance and social security;
- Access to basic services such as water, health care, electricity, etc.;
- Households' adaptive capacity which is linked to education and diversity of income sources; and
- Stability of all these factors over time.

GREEN CLIMATE FUND | Independent Evaluation Unit

Power analysis

- Statistical power is the probability that the evaluation will find a significant impact when there is one.
- An underpowered study may incorrectly conclude that an intervention is not having a detectable effect.

GREEN CLIMATE FUND | Independent Evaluation Unit

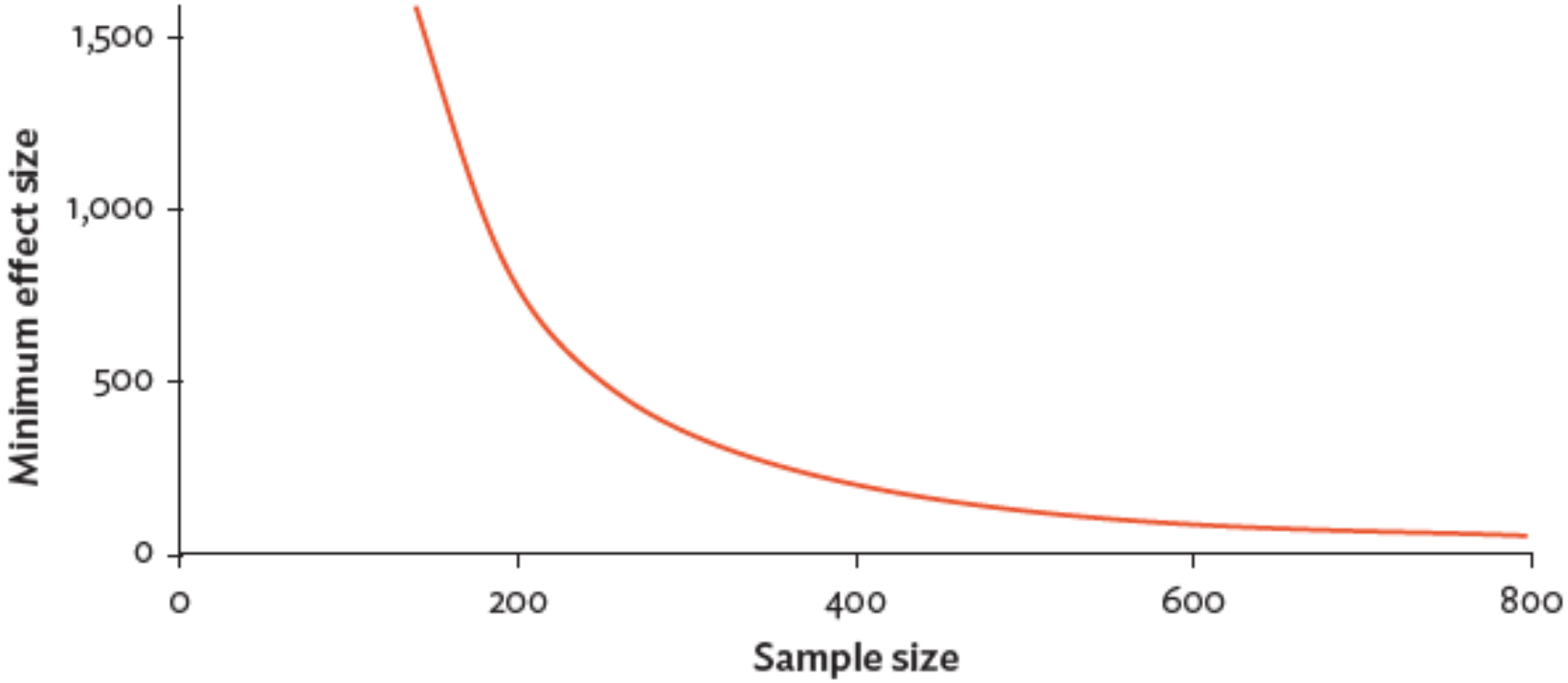
Type I and Type II errors

- **Statistical significance**: results from the data are because of the project and not any random factor/noise in the data

	Find no Significant Impact	Find a Significant Impact
Intervention has no impact	No error (Correct conclusion)	Type I error (False Positive)
Intervention has an impact	Type II error (False Negative)	No error (Correct conclusion)

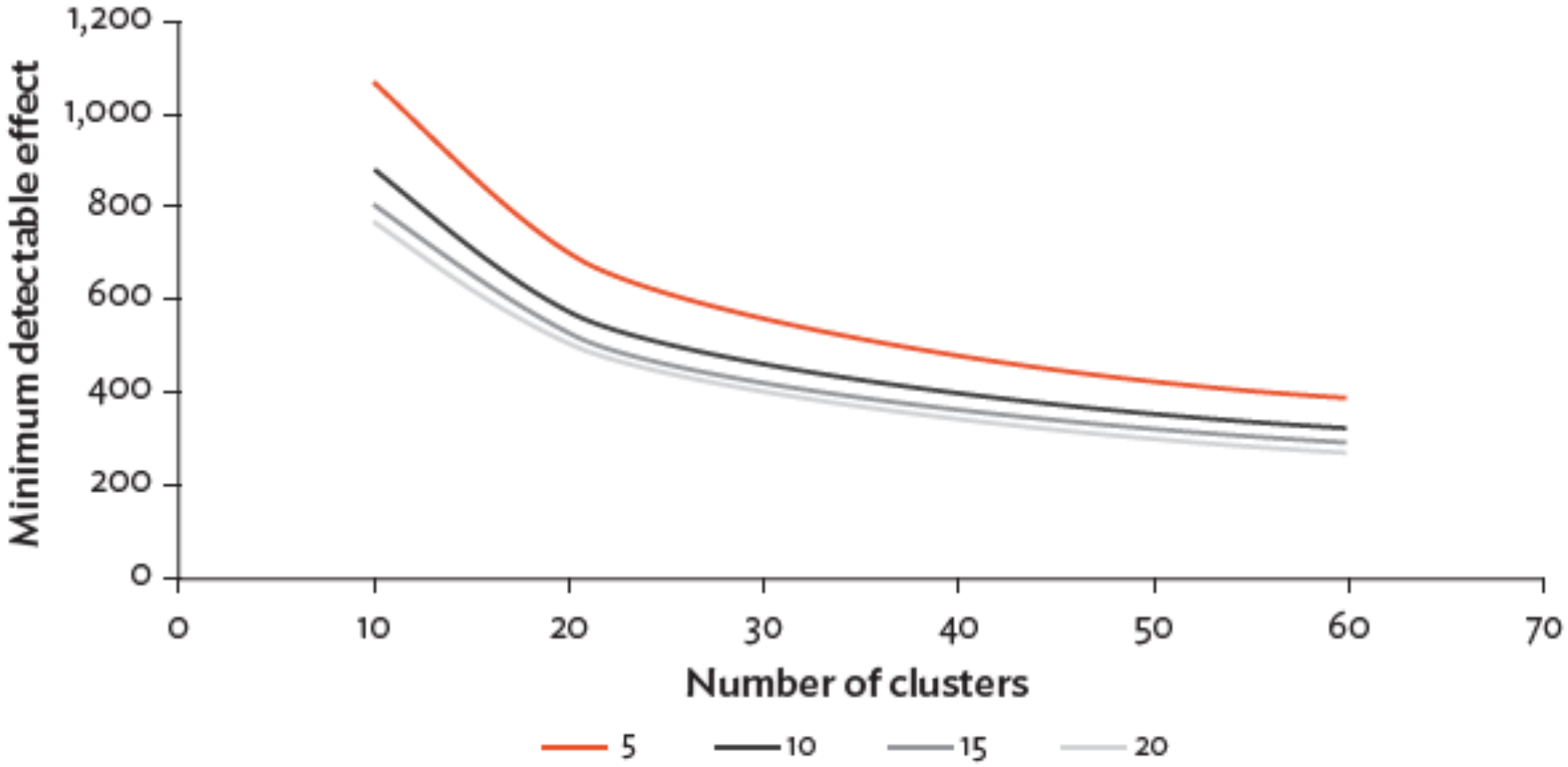
GREEN CLIMATE FUND | Independent Evaluation Unit

The smaller effect you want to capture, the larger the sample size you need



GREEN CLIMATE FUND | Independent Evaluation Unit

In cluster studies, what matters more is the number of clusters than the number of units within a cluster



GREEN CLIMATE FUND | Independent Evaluation Unit

Q&A

Any questions or feedback?

GREEN CLIMATE FUND | Independent Evaluation Unit

Thank you!

Contact IEU:

✉ ieu@gcfund.org

@GCF_Eval

ieu.greenclimate.fund

GREEN CLIMATE FUND | Independent Evaluation Unit

Center for Evaluation and Development C4ED

Learning-Oriented Real-Time Impact Assessment

Design Workshop
Songdo, South Korea

Seminar VII: Consistency between evaluation and implementation, Data collection steps and challenges

Maria Bucciarelli
Team Leader and Head of Project Coordination at C4ED

17 August 2023

Agenda:

- Consistency between evaluation and implementation:
  - Coordination between evaluation and project teams
  - Implications of lack of compliance with identified evaluation design

- Data collection steps:
  - Ethical clearance
  - Contracting data collection firm
  - Data quality monitoring

0. Consistency between evaluation and implementation

- Consistency between evaluation and implementation:
- Evaluation team and Project team objectives:
  - Evaluation team wants to generate robust evidence by using rigorous methods to improve project designs
  - Project team wants to implement a project that is logistically feasible and well received by targeted communities

- Research and project teams need to align their objectives through:
  - Constant coordination and collaboration
  - Thorough understanding of project implementation design and evaluation design by both parties
  - Joint drafting and revision, if necessary, of the Impact Evaluation plan
  - Timely planning and regular monitoring of activities

0. Consistency between evaluation and implementation

- Possible challenges at design stage:
  - Ethical dilemma: evaluation design requires a few villages to be left out of the program to have more sound results
  - Program take-up: evaluation design requires number of farmers to be higher than number of farmers interested in the program
  - Weak ToC: broken linkages between stages → impossibility to address evaluation questions
- Possible data-related challenges:
  - M&E systems: set up only after the project implementation has rolled up (→ evaluation team cannot use this data for analysis)
  - Data cleaning and analysis: Data is manipulated in excel without following any protocol

0. Consistency between evaluation and implementation

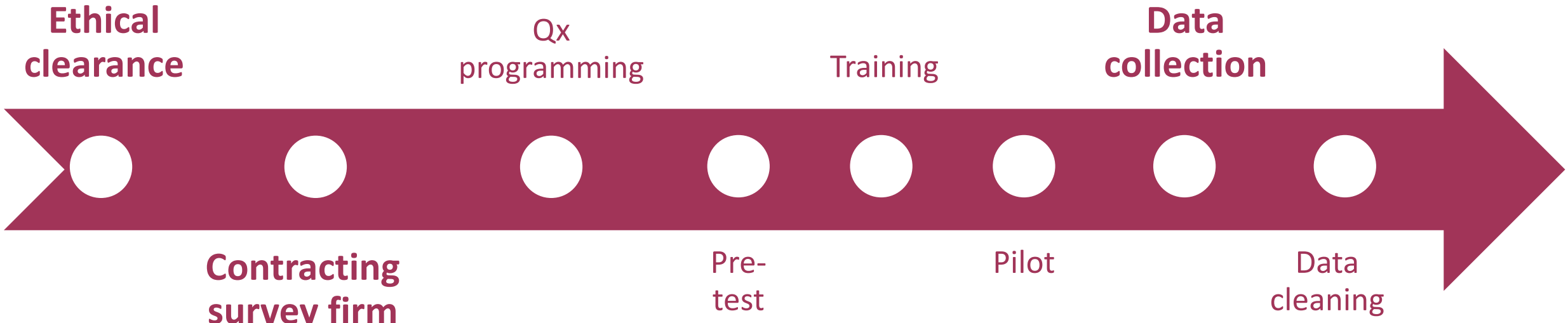
- Possible challenges at implementation stage:
  - Timing: evaluation design requires data collection to be conducted before implementation but latter can't be delayed (e.g. crop season).
  - Contamination: No compliance with design (control receiving treatment) (mitigation strategies, e.g. planning, control and treatment in different villages, different service providers in control and treatment villages)
  - Target population: Farmers in village C receive program but baseline data is collected in village A (treatment) and village B (control)
  - Target population 2: Incorrect target population identified at preliminary stage → need to identify new target population (feasibility assessment to identify real needs)
  - ToRs: incorrect/ incomplete not specifying evaluation design, target population, control & treatment

0. Consistency between evaluation and implementation

- Without coordination…

- Evaluation team will need to draft a new design <u>after the project has been implemented</u>, leading to weaker results
- Implementation team will roll out a project ill-suited for the specific context at hand leading to weaker results
- Implementation team will roll out a project without the favour of the communities leading to lower take up

0. Data collection steps – Ethical clearance



- Data collection steps – Ethical clearance:

- Institutional review board (IRB)

- The IRB is a committee designated to **review, approve, and monitor research involving human subjects**.
- The IRB reviews the research protocols and related materials **before the study starts and during its implementation**.
- IRB checks whether:
  - the **participants are capable of making the choice to participate in the data collection** activities
  - their choice will be fully **informed and voluntary**.
  - there is any reason to believe that the **safety of participants could be at risk**.

-Data collection steps – Ethical clearance:

- Tips when applying for ethical clearance:

- Plan well in advance!
  - Find out which institutions have an IRB (most universities do!) and their:
    - **meeting dates (usually once a month)**
    - **reviewing timing (from 2 to 4 weeks)**
    - **and costs**
  - Check if they have **expedited review** – this takes less time but might cost a bit more
  - **Adjust data collection timeline based on IRB reviewing timing**

0. Data collection steps – Contracting data collection firm

-Data collection steps – Contracting survey firm:

- **Terms of reference:** Make sure to be as comprehensive as possible; this is a binding document. Below are the most important items to be provided by local firm and to be included in the ToR:
  - **Evaluation design and target population:** purpose of the data collection and evaluation design, treatment group & control group
  - **Data collection preparation:** translation services, pre-test, equipment, CVs of enumerators & supervisors
  - **Training and pilot:** transportation and accommodation for team, adequate training venue and catering, number of enumerators required to attend; duration of training and pilot, equipment

0. Data collection steps – Contracting data collection firm

-Data collection steps – Contracting survey firm:

- **Terms of reference:** Make sure to be as comprehensive as possible; this is a binding document. Below are the most important items to be provided by local firm and to be included in the ToR:
  - **Data collection:** number of **completed interviews** to be submitted, **team size**, **incentives** for respondents, data collection expected **duration**, **areas** where data collection takes place, teams' **transportation and accommodation**, constant **communication** to clarify any doubt and rectify any mistakes in submitted surveys, **revisits** of respondents in case of incomplete interviews or poor data quality
  - **Data cleaning and analysis:** detailed explanation of data analysis required in the context of the evaluation design
  - **Contract duration:** expected dates for each deliverable.

- Data collection steps – Data quality

- Types of data quality

- **Survey programming checks:** checks are included in the programming of the questionnaire to ensure answers are **consistent** throughout the survey (e.g. at the beginning of the survey farmer reported to be widowed but later reports his wife is currently helping him in the farm) and **unreasonable values** are flagged (e.g. someone is 150 years old, or coffee yield falls outside a reasonable range given the number of coffee trees)
- **Field monitoring:** spot checks (random checks) and accompaniments (assisting to interviews) done by Field Coordinator

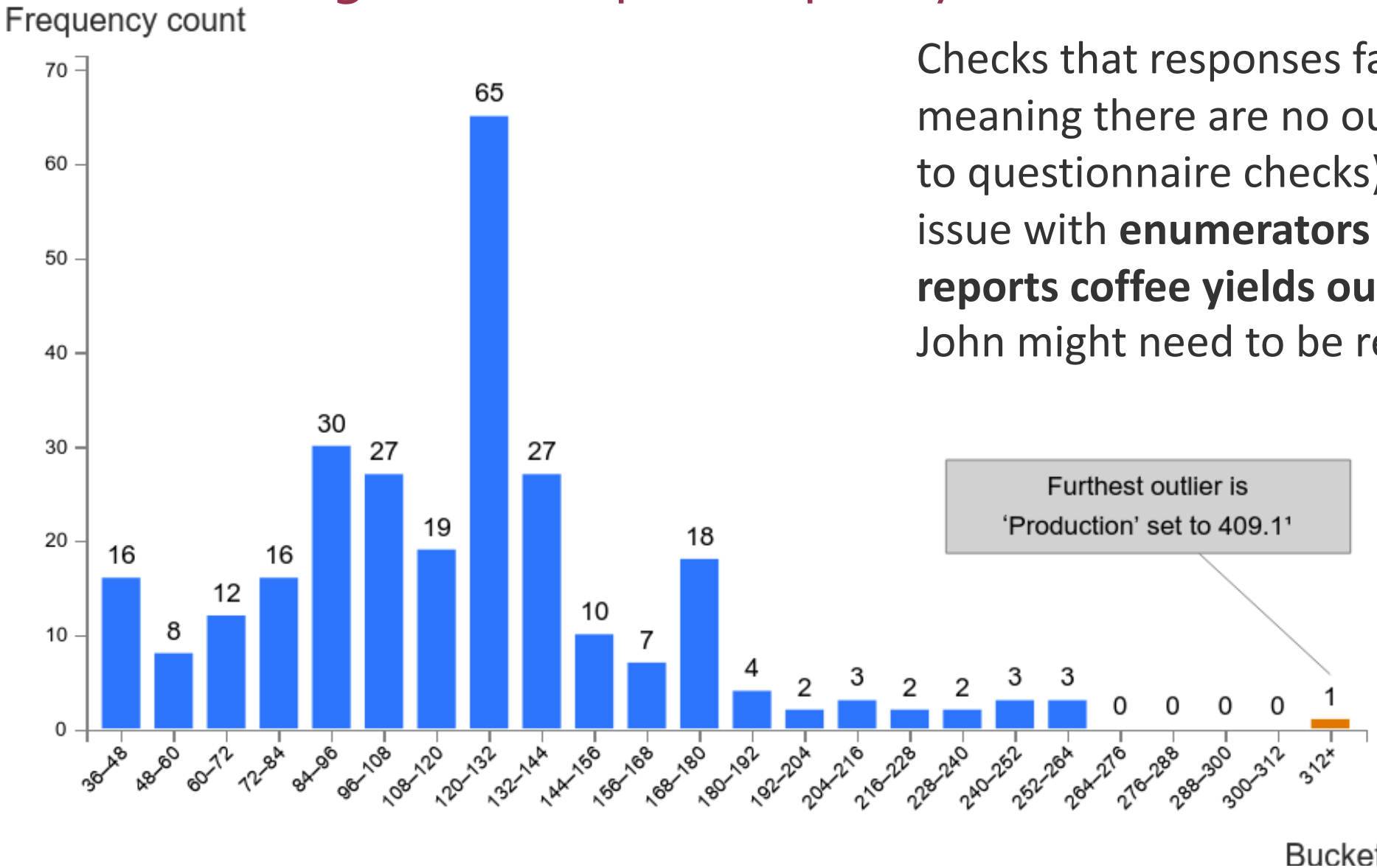
- Data collection steps – Data quality

- Types of data quality

- **Remote data quality checks:** Evaluation team designs and code data quality checks aka **High Frequency Checks (HFCs)** to monitor data received in real-time.
  - HFCs categories
    - Response quality checks (outliers)
    - Enumerator checks
    - Programming checks
    - Duplicate, survey log and project-related checks
  - HFCs Tips

0. Data collection steps – Data quality

- HFCs categories: Response quality checks



Checks that responses fall within a range, meaning there are no outliers (in addition to questionnaire checks). Check if it is an issue with **enumerators (e.g. John always reports coffee yields outliers)**. In this case John might need to be retrained.

-HFCs categories: Enumerator checks

- These are designed to check if data shared by any particular enumerator is significantly different from the data shared by other enumerators. Some parameters to check enumerator performance include:
  - **Percentage of "Don't know" responses**. However, if most enumerators report DKN to a certain question, then question might need to be rephrased (e.g. sensitive financial information is asked or a key word is not translated correctly)
  - **Average interview duration**: if an enumerator consistently submit shorted surveys
  - **Patterns in enumerators' surveys**: some enumerators mito the respondght always select the same answers to certain questions. This might be due to them involuntarily suggesting the answer ents.

-HFCs categories: Programming checks

- **Programming checks:** Programming should be thoroughly checked during pre-test and pilot. However, not all mistakes might be spotted. These checks therefore test for issues in logic or **skip patterns** that were not spotted during questionnaire programming. For example:
  - A question that should be skipped is instead asked.
  - Data that is missing because the **programmed version** of the instrument skips certain questions. In this case, you need to program the instrument again, and double-check for errors.

0. Data collection steps – Data quality

- HFCs categories: Duplicates, survey log and project related checks

- **Duplicates checks:** . In case of duplicate IDs, identify the source of the error and reach out to the field team in case of need for clarifications, then rectify the error.
- **Survey log checks:** In case some data is missing, or the survey forms are incomplete, share a report with the field team and identify the reasons for low completion rate.
- **Other checks related to the project:** These include:
  - Ensuring that there is at least one variable that has a **unique ID**.
  - Daily checks to check and compare data with **previous records** (e.g. baseline survey)
  - Check number of completed interview is **consistent between treatment and control groups**
  - Check for **systematic differences** in responses between control and treatment groups due to cultural norms, etc.

0. Data collection steps – Data quality

- Data collection steps
- HFCs Tips

- **Run daily:** Monitoring and reporting errors to field teams on a daily basis → Importance of receiving new surveys daily
- **One-click process:** Coding should produce data quality checks results with one click only.
- **Prioritize.** It might not always be possible to perform all checks. So prioritize the ones that are most likely to affect data quality.
- **Communication with survey team**: This is crucial to identify and correct the mistakes as soon as possible

Q & A Session

GREEN CLIMATE FUND | Independent Evaluation Unit

THANK YOU.