Leveraging Space Technology for Climate Risk Finance

Thursday, June 24, 2021

10:00 AM – 12:00 PM EDT / 4:00 PM – 6:00 PM CET

Implemented by

Disaster Risk Financing & Insurance Program

SUPPORTED BY WORLD BANK GROUP

In partnership with

esa

With support from

Global Risk Financing Facility

Supporting Early Action to Climate Shocks, Disasters, and Crises

Structure of Webinar & Housekeeping

Welcome and Opening Remarks

Ignite Presentations

Technical Presentations & Live Panel Discussion

Q&A: Please share your questions via chat

Post-event Resources will be shared

Please Mute your Microphone unless speaking

Opening Remarks

Jean Pesme

Global Director
Finance, Competitiveness & Innovation (FCI) Global Practice
World Bank Group

Global Risk Financing Facility
Supporting Early Action to Climate Shocks, Disasters, and Crises

Disaster Risk Financing & Insurance Program
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Opening Remarks

Susanne Mecklenburg

Head of the ESA Climate Office

Global Risk Financing Facility
Supporting Early Action to Climate Shocks, Disasters, and Crises

Disaster Risk Financing & Insurance Program
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WHAT SPACE CAN DO FOR CLIMATE RISK

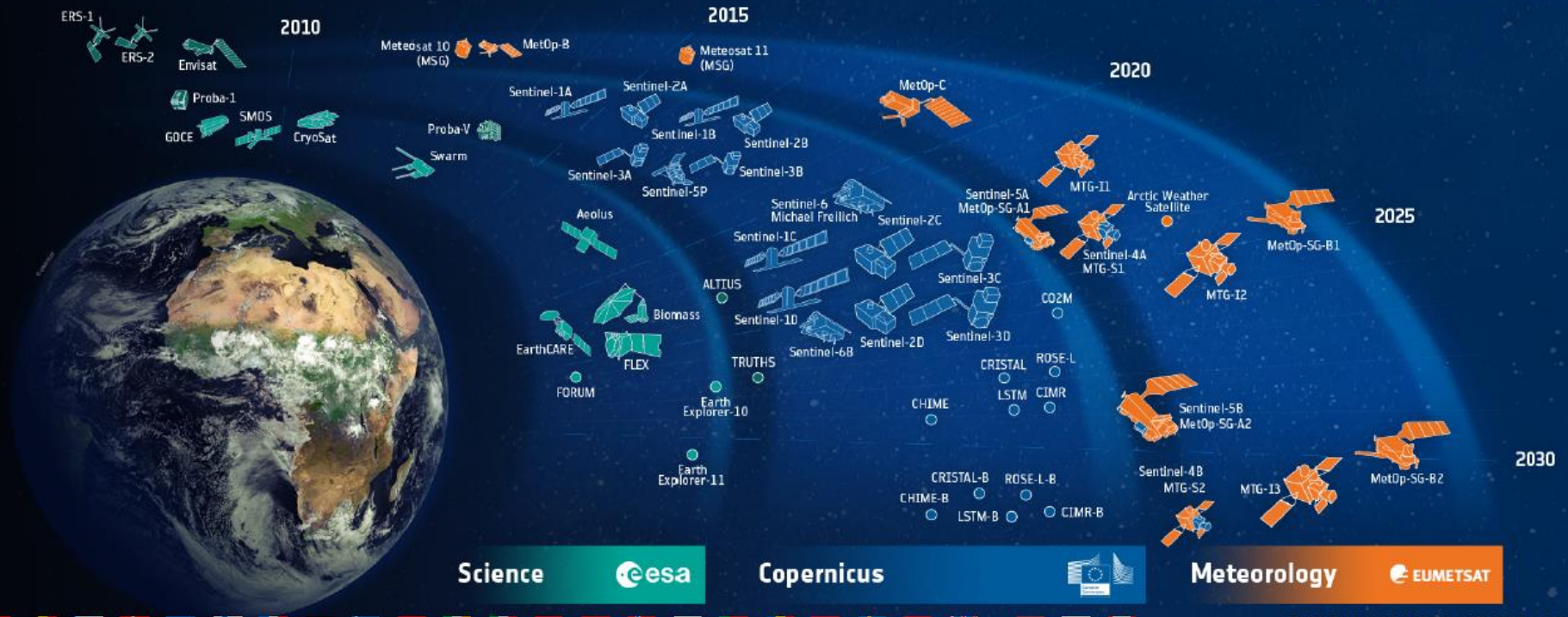
Susanne Mecklenburg
Head of ESA Climate Office, ECSAT, Harwell Campus, UK

Satellite data for Climate Risk Finance Event
24 June 2021

www.climate.esa.int

ESA-Developed Earth Observation Satellites

16 in operation
38 under development
14 under preparation



→ THE EUROPEAN SPACE AGENCY

ESA's Climate Change Initiative

WMO defined **54** Essential Climate Variables
36 benefit from space observations
21 generated by ESA Climate Change Initiative

climate change initiative

Oceanic | Terrestrial | Atmospheric

climate modelling user group cci

sea level budget closure cci

reccap-2 cci

www.climate.esa.int

Ignite Presentations

Hazard modelling (Marie-Kristina Thomson, Remote Sensing and Photogrammetry Society/Willis Re)

Mapping Financial Exposure (Georgiana Esquivias, ImageCat)

Investments and Footprint/Emissions monitoring (Arjen Vrielink, Satelligence)

Satellite Services, Insurance & Finance (Hannah McNally, Airbus Defense & Space)

Ignite Presentation #1

Hazard modelling & insurance
(Marie-Kristina Thomson, Remote Sensing and Photogrammetry Society/Willis Re)

Earth observation for pricing and innovative climate risk financing

A re/insurance perspective

Dr Tina Thomson

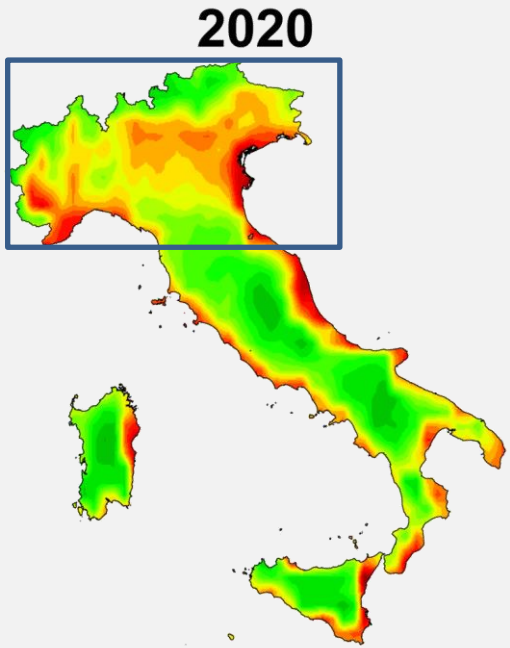
24th June 2021

Willis Re

Severe Convective Storm risk in Italy

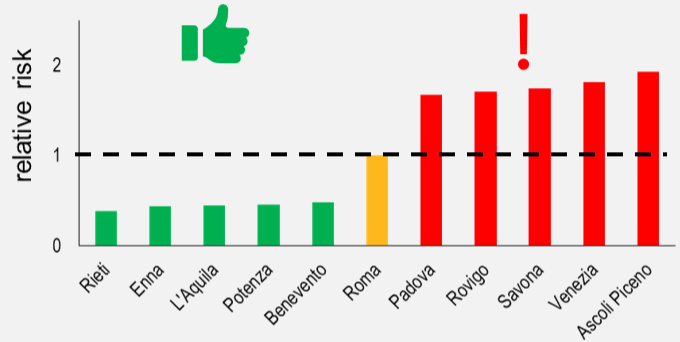
Designing hazard maps for underwriting using satellite & radar data

Dynamic hazard layers

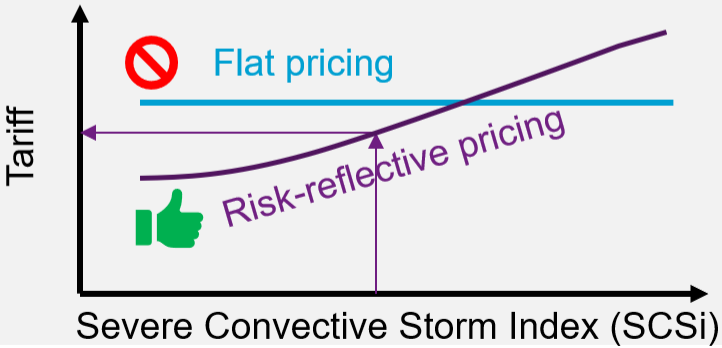


100 year return period SCSi hazard layer

Risk selection



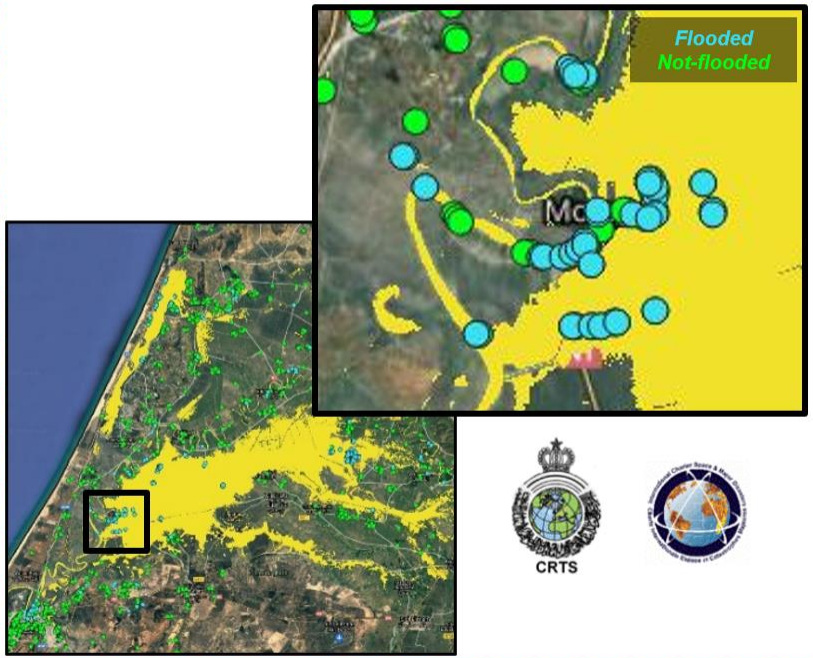
Pricing model



Flood risk in Morocco

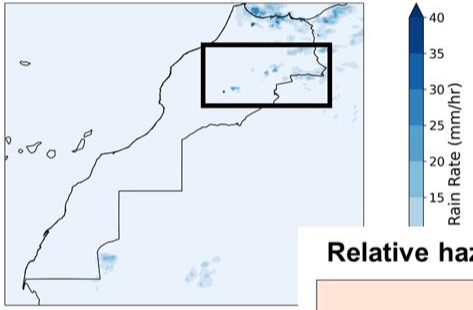
Combining two metrics to quantify flood risk for a parametric trigger

1. Primary index: water depth

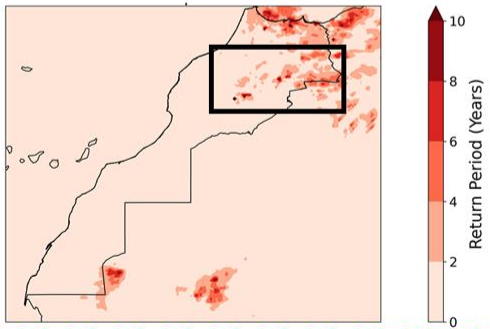


2. Secondary index: rainfall intensity

Daily maximum "60-min average" rain rate, 8 Sep 2019



Relative hazard map for 8 Sep 2019



Flood risk in Rwanda

Parametric solution based on flood extents – Kigali Floods December 2019

Trigger

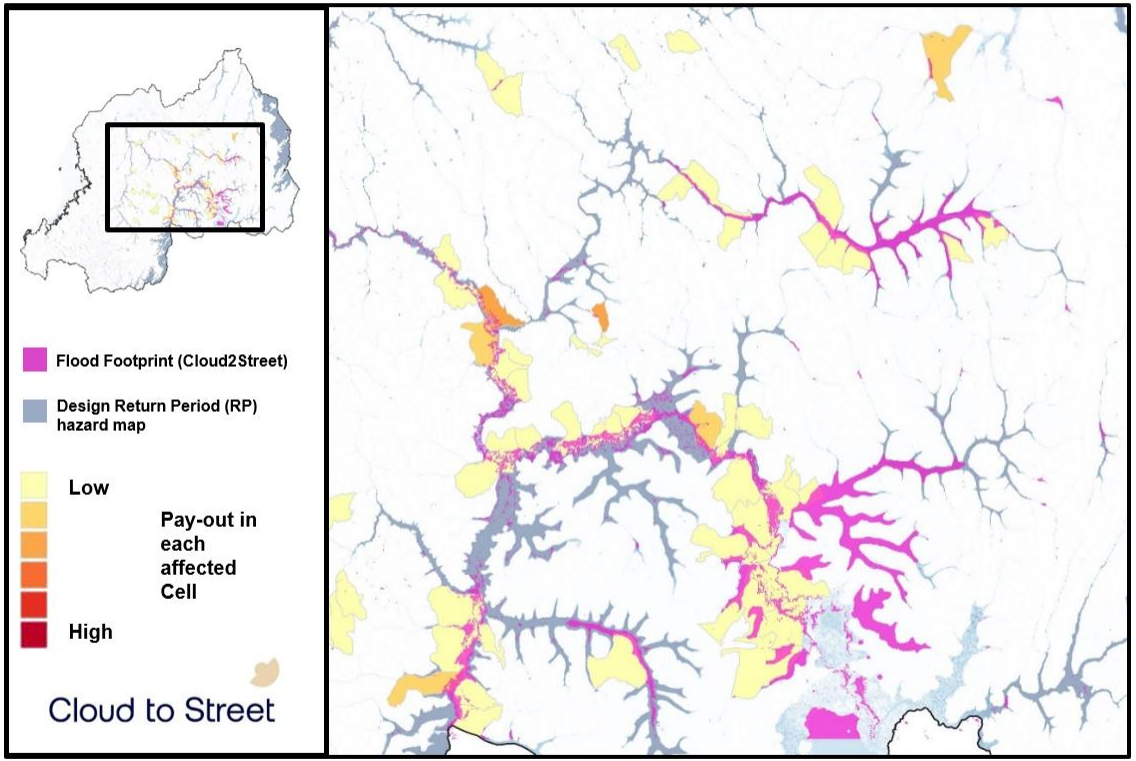
Threshold of households in flood extent in an administrative unit

Index

Combination of flood extent & design RP maps to identify impact

Payout

Based on a certain RP exceeded in an administrative unit



Ignite Presentation #2

Mapping Financial Exposure
(Georgiana Esquivias, ImageCat)

Mapping Financial Exposure

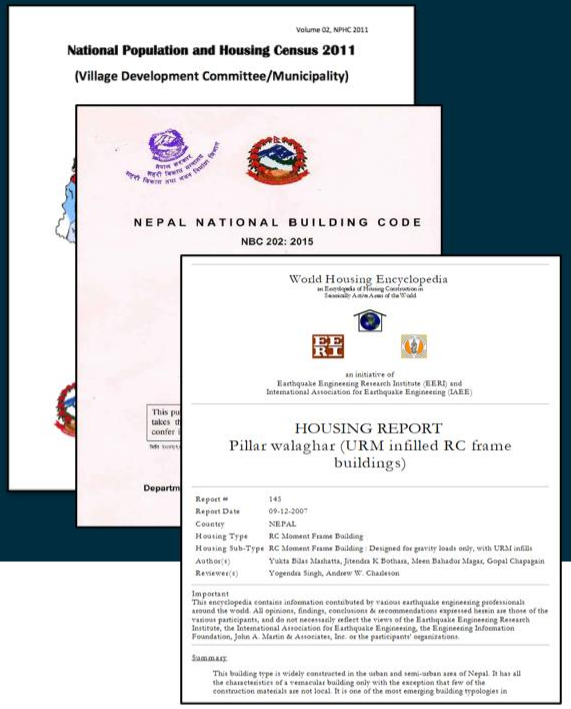
Georgiana Esquivias Ramirez

Senior Project Analyst

ImageCat, Inc.

gre@imagecatinc.com

ImageCat



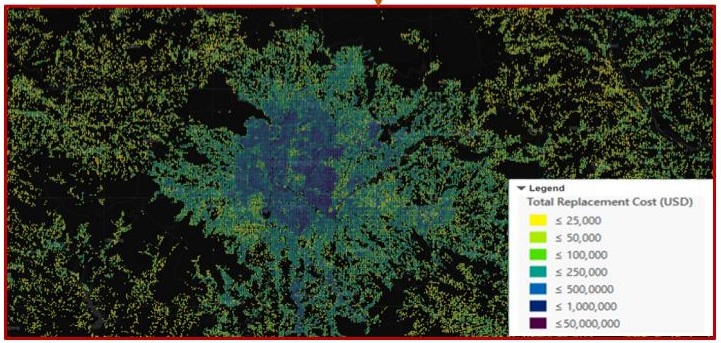
Collect Census & Building data

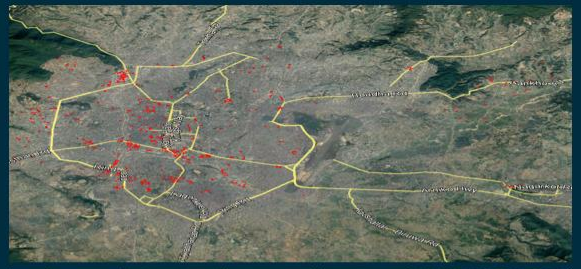
Develop Structural Distribution

Estimate number of buildings, building area and height

Estimate replacement value

Dasymetric Mapping with EO Data



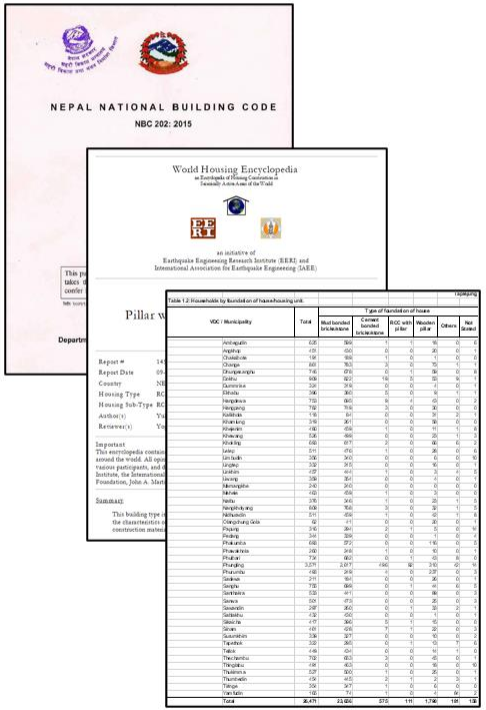


GEM Class	1	2	3	4	5	6	7
MUR+ADO/HBET:1,3	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MUR+ADO/HBET:4,7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CR/LFINF+DNO/HBET:1,3	49.4%	36.5%	13.7%	28.2%	7.7%	17.0%	18.9%
CR/LFINF+DNO/HBET:4,7	22.1%	35.3%	55.9%	23.2%	4.4%	44.8%	22.2%
CR/LFINF+DNO/HBET:8,20	0.0%	0.6%	3.3%	0.0%	0.0%	7.7%	1.1%
MATO/LN	0.0%	0.3%	0.0%	1.7%	23.1%	0.0%	0.0%
S/LFM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
S/LFBR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
S/LO	2.2%	1.2%	0.4%	8.7%	0.0%	0.0%	1.1%
S/LFINF	2.2%	0.4%	0.2%	2.9%	0.0%	2.6%	1.1%
MUR+CL99/HBET:1,2	15.6%	12.6%	5.2%	29.9%	53.8%	14.4%	32.2%

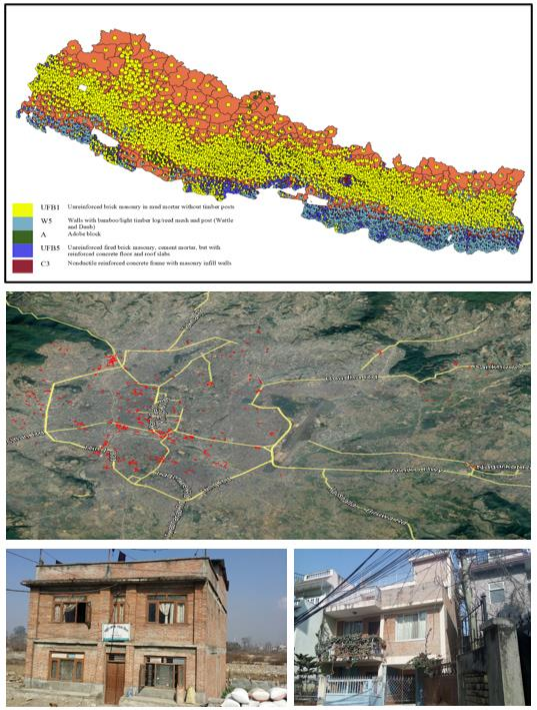
ImageCat

DEVELOP STRUCTURAL DISTRIBUTION MAPPING SCHEME

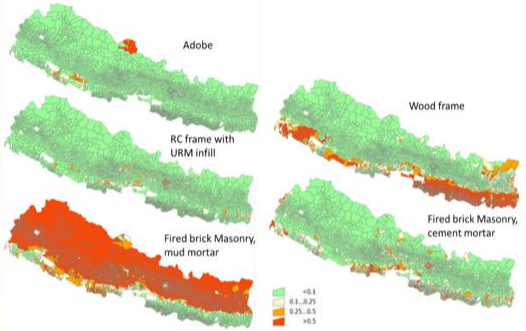
Identify Construction Types



Gather/Organize Census Data



Construct Mapping Schemes Per Built-up Environment



GEM Class	1	2	3	4	5	6	7
MUR+ADO/HBET:1,3	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MUR+ADO/HBET:4,7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
CR/LFINF+DNO/HBET:1,3	49.4%	36.5%	13.7%	28.2%	7.7%	17.0%	18.9%
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CR/LFINF+DNO/HBET:8,20	0.0%	0.6%	3.3%	0.0%	0.0%	7.7%	1.1%
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S/LFM	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
S/LFBR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
S/LO	2.2%	1.2%	0.4%	8.7%	0.0%	0.0%	1.1%
S/LFINF	2.2%	0.4%	0.2%	2.9%	0.0%	2.6%	1.1%
MUR+CL99/HBET:1,2	15.6%	12.6%	5.2%	29.9%	53.8%	14.4%	32.2%
MUR+CL99/HBET:3,5	6.5%	13.1%	21.2%	5.4%	0.0%	13.4%	22.2%
W	0.0%	0.0%	0.0%	0.0%	5.5%	0.0%	1.1%
W+WWD	1.0%	0.0%	0.0%	0.0%	5.5%	0.0%	0.0%

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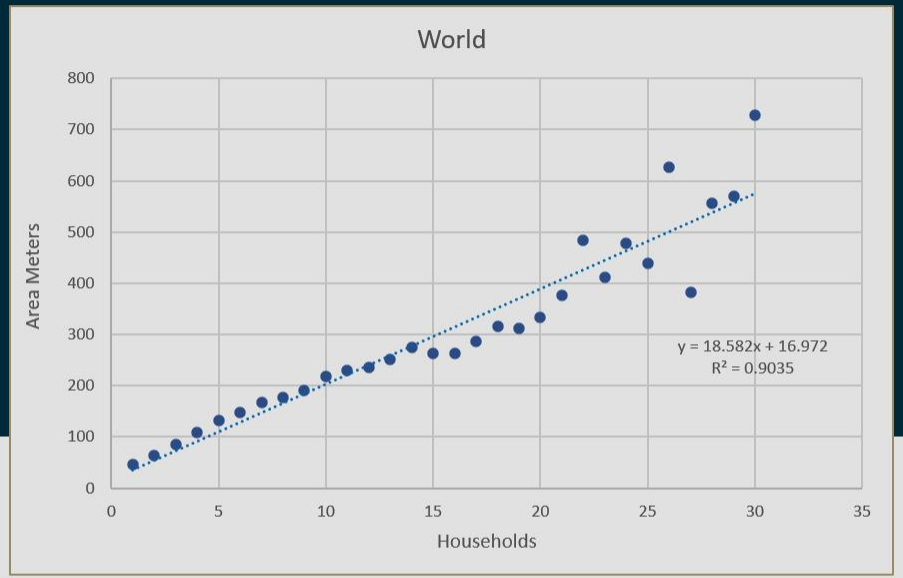
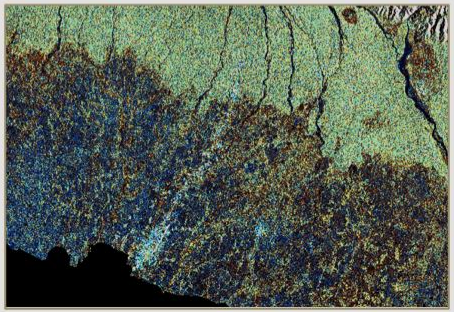
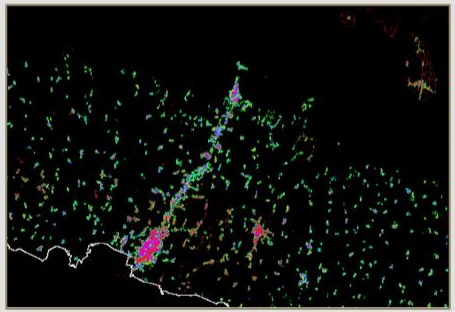
ESTIMATE NUMBER OF BUILDINGS & BUILDING AREA AND HEIGHT







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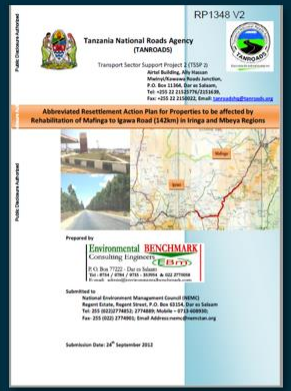
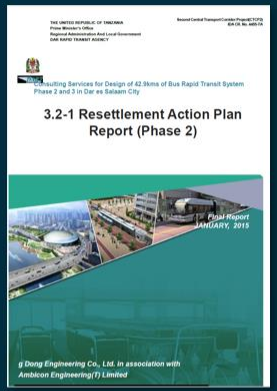
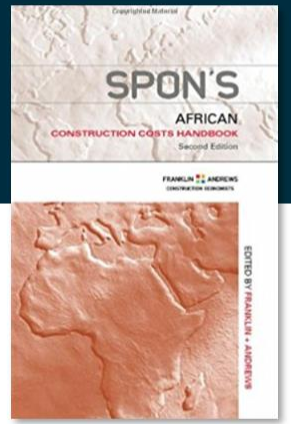
ESTIMATE REPLACEMENT COST VALUES

- Estimate square footage per building
- Building value per meter by building type or occupancy
- Use building construction manuals
- Expert opinion
- Scale by building durability
- Use GDP/median income
- Difficult to estimate “replacement cost” in some developing countries







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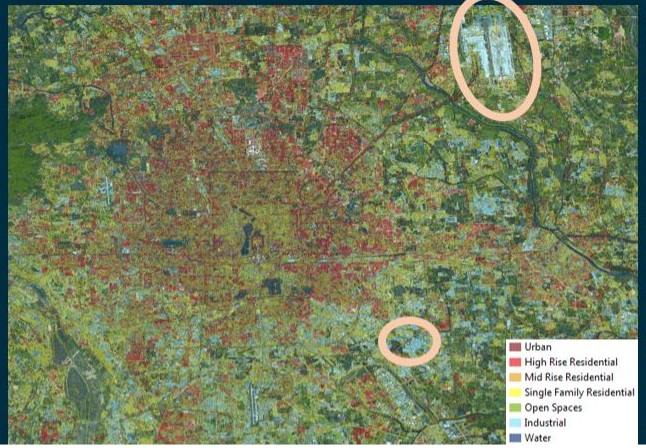
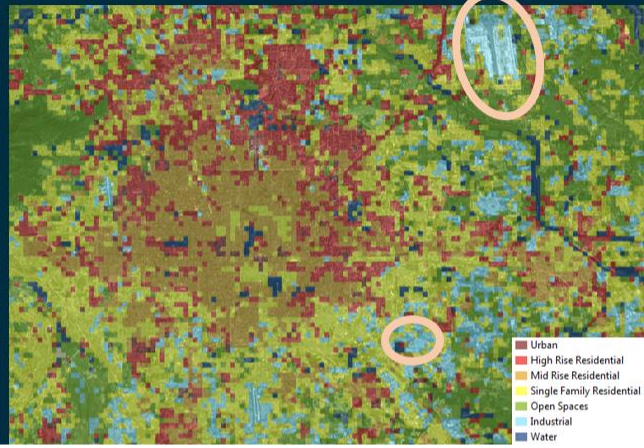
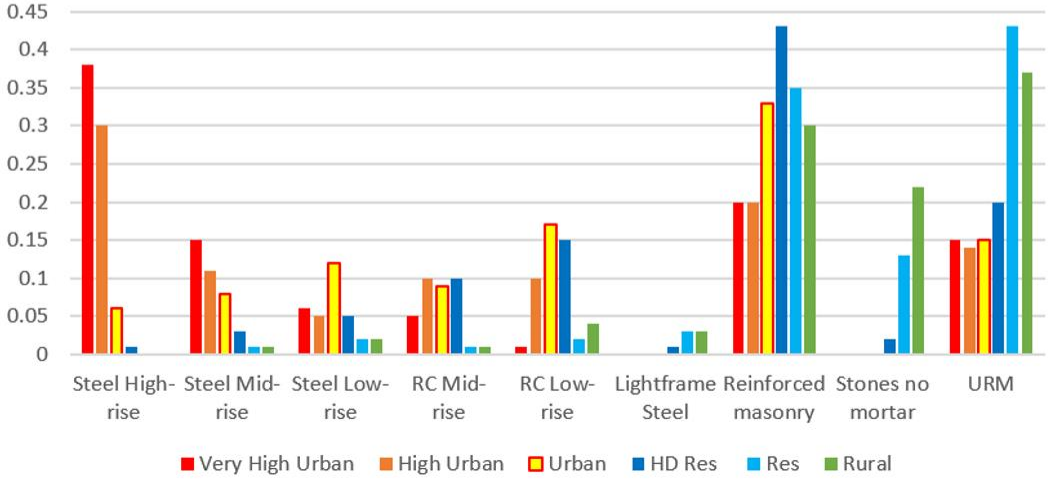
DASYMETRIC MAPPING & MODELING WITH EO DATA







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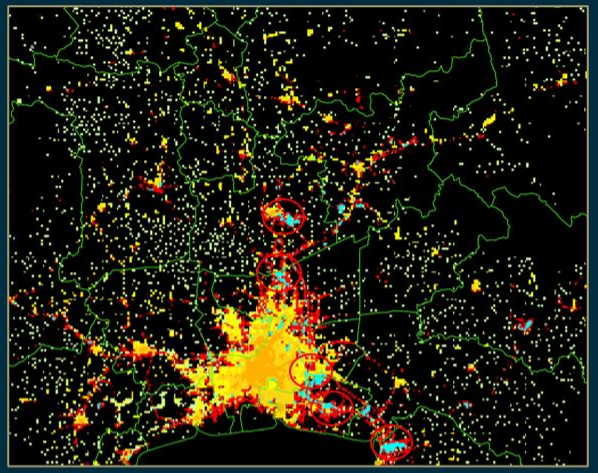
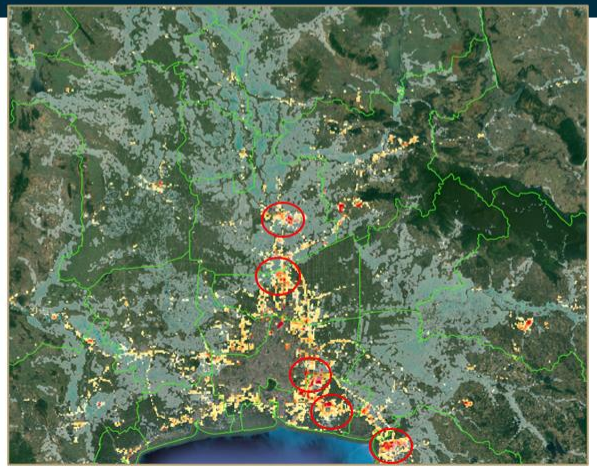
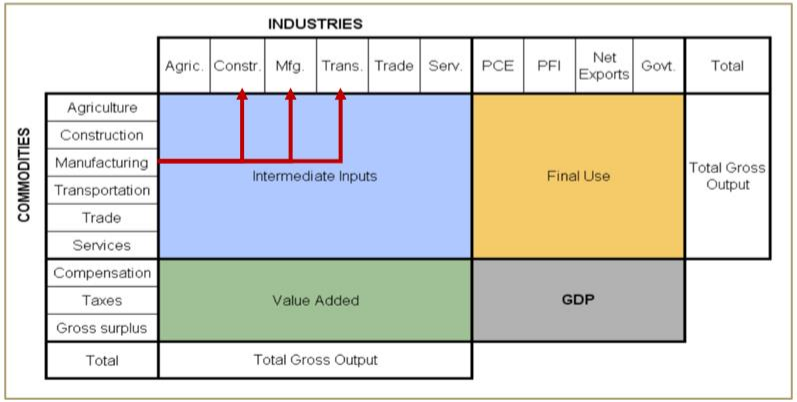
Regions of production

Detectable through segmentation

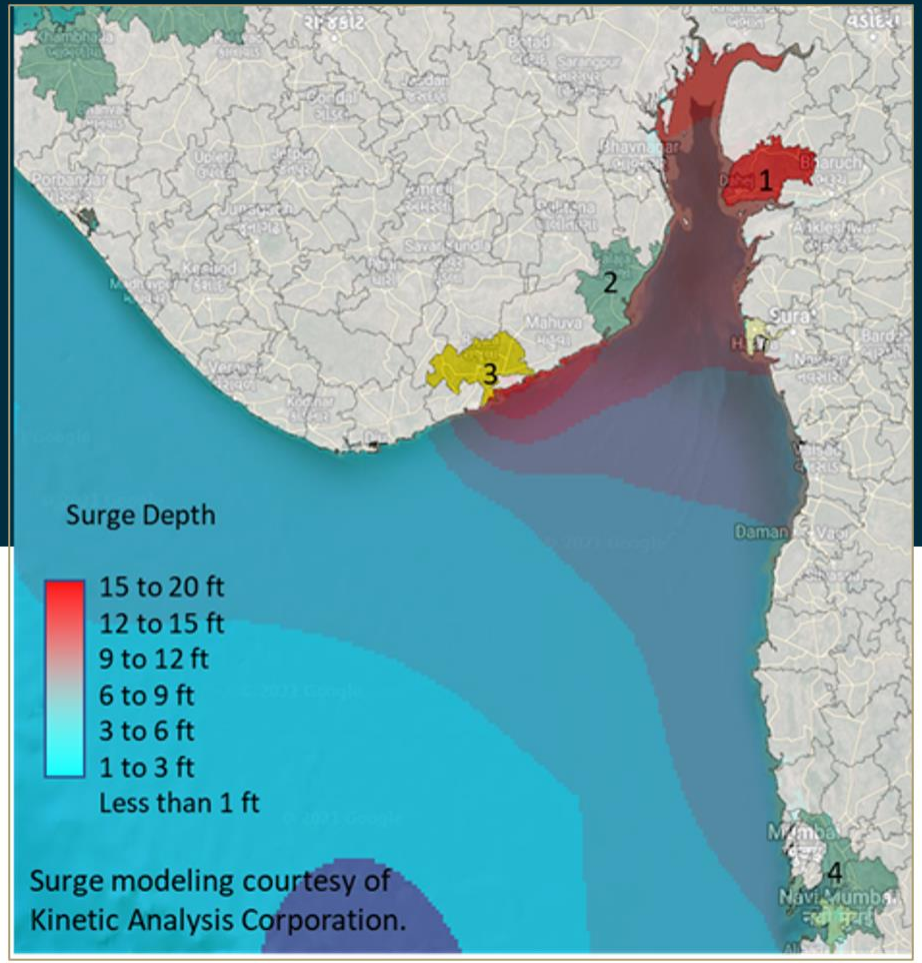




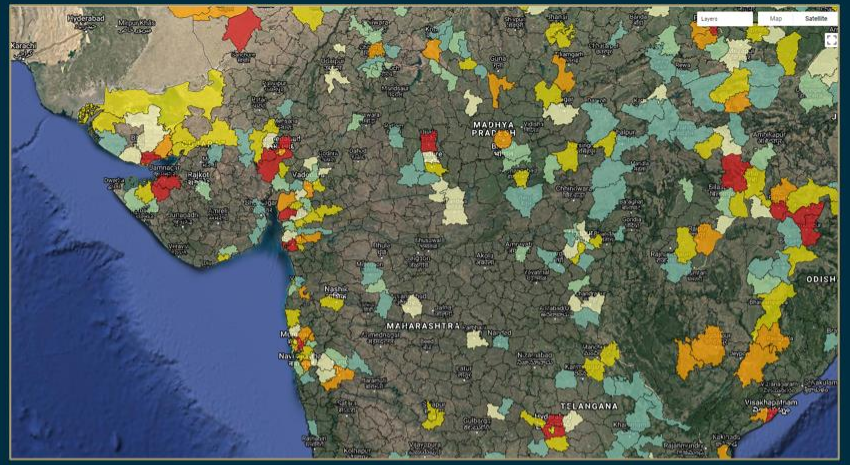
Disaggregate/allocate production with overlayed hazard data



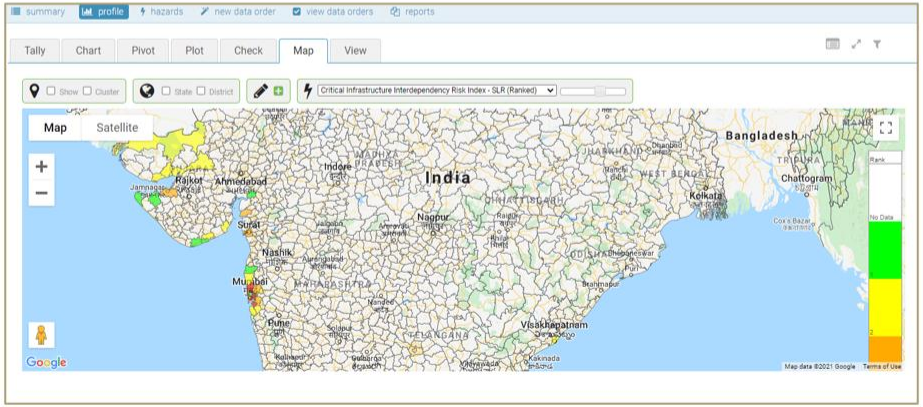
… and modeling via input-output economic models



Where active events, such as typhoons, are likely to cause disruption



Where 1% annual chance of flooding could cause cascading effects



County-level regions where nuisance flooding and sea level rise stand to disrupt industry and economies

Thank you for your time

Georgiana Esquivias Ramirez

Senior Project Analyst

ImageCat, Inc.

gre@imagecatinc.com

ImageCat

Ignite Presentation #3

Investments and Footprint/Deforestation Monitoring (Arjen Vrielink, Satelligence)


Space for Climate
Leveraging space technology for climate risk finance
SATELLIGENCE


365
Peanut Butter
crunchy
365
ORGANIC
Peanut Butter
CREAMY
UNSWEETENED & NO SALT
365
ORGANIC
Peanut Butter
CREAMY
UNSWEETENED & NO SALT
365
ORGANIC
Peanut Butter
CREAMY
UNSWEETENED
NON GMO Project
VERIFIED
$4.99
MaraNatha
ORGANIC
NO STIR
PEANUT
BUTTER
CRUNCHY
MaraNatha
ORGANIC
NO STIR
PEANUT
BUTTER
CRUNCHY
SANTA CRUZ
organic
Crunchy
DARK ROASTED
PEANUT BUTTER
SALE!

TOWARDS ZERO DEFORESTATION

Monitor deforestation risk and **progress** towards a **zero deforestation** commodity supply chain

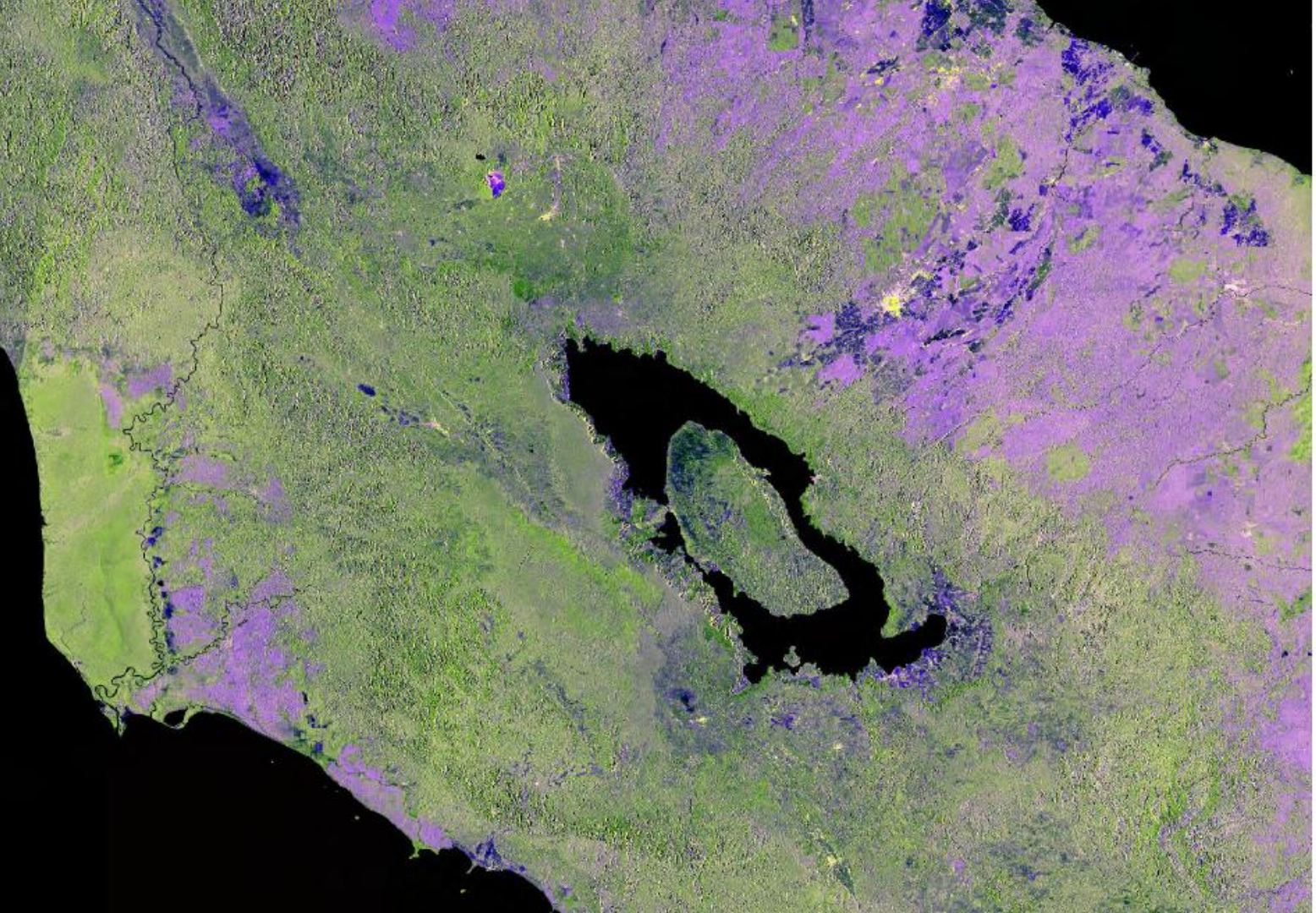


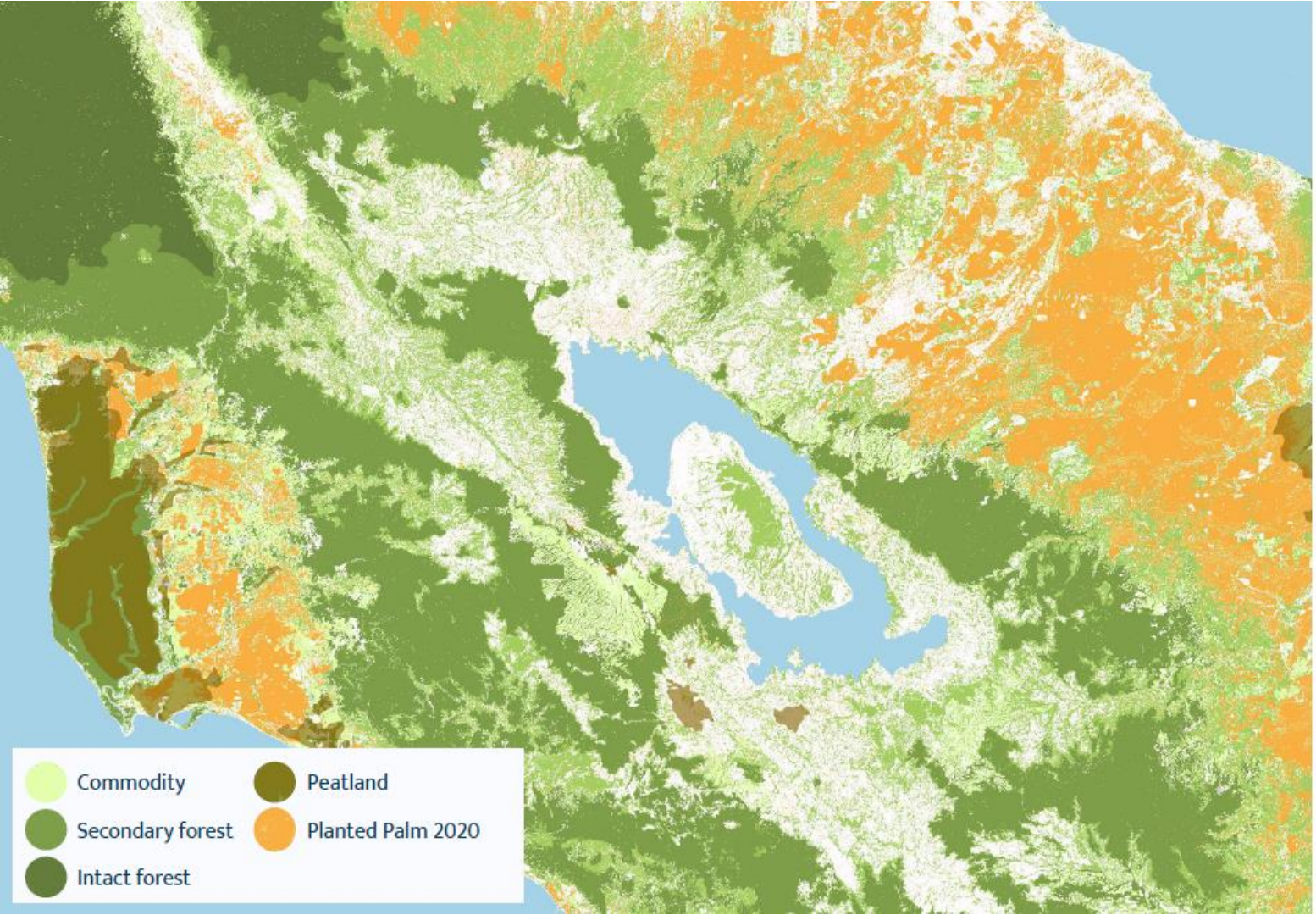
IMAGE PROCESSING ENGINE

Radar Satellite Image

PUTTING IT IN CONTEXT

Global layers we use:

Baseline 2015



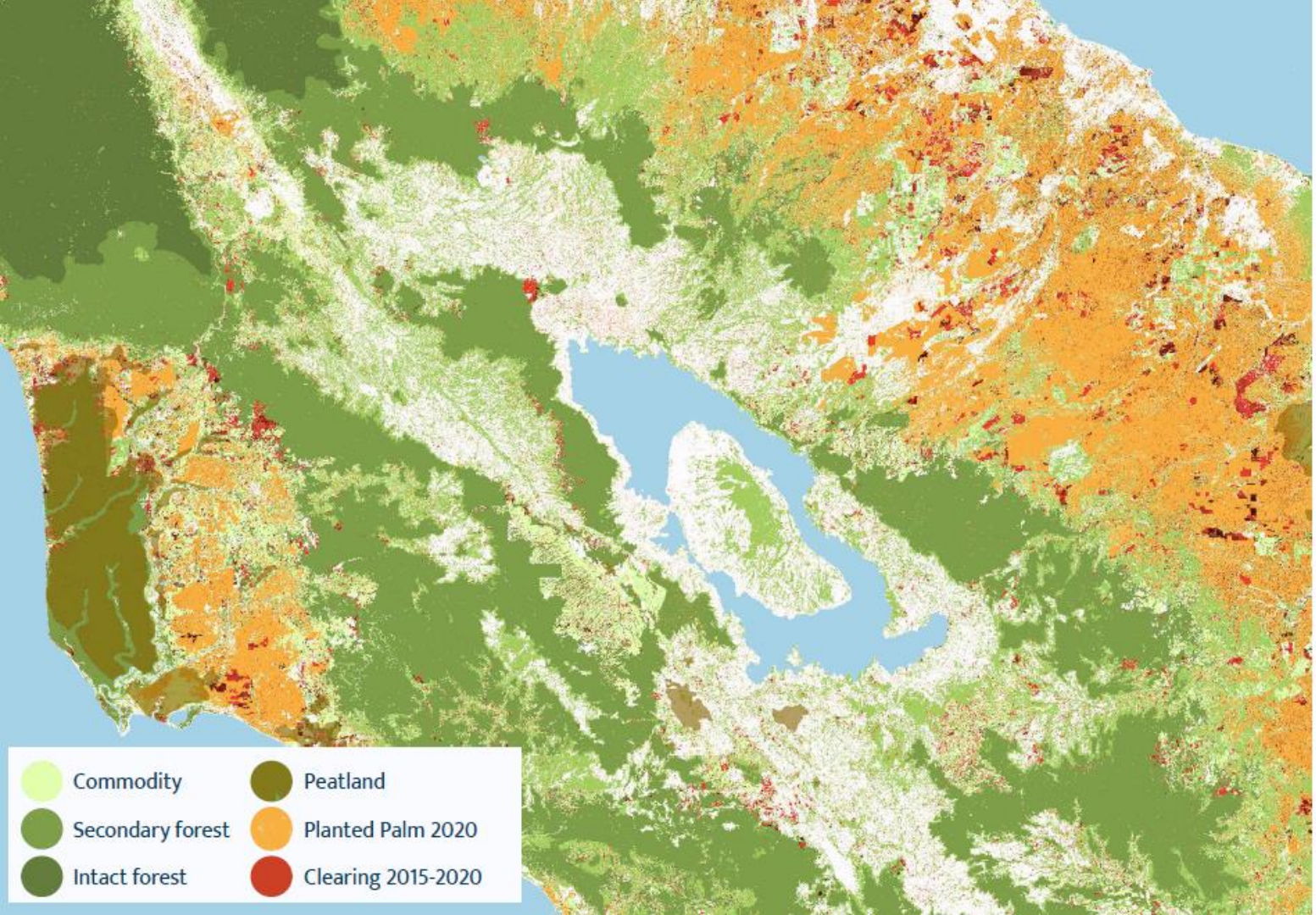
PUTTING IT IN CONTEXT

Global layers we use:

Baseline 2015

Peatlands

Planted Palm 2020



PUTTING IT IN CONTEXT

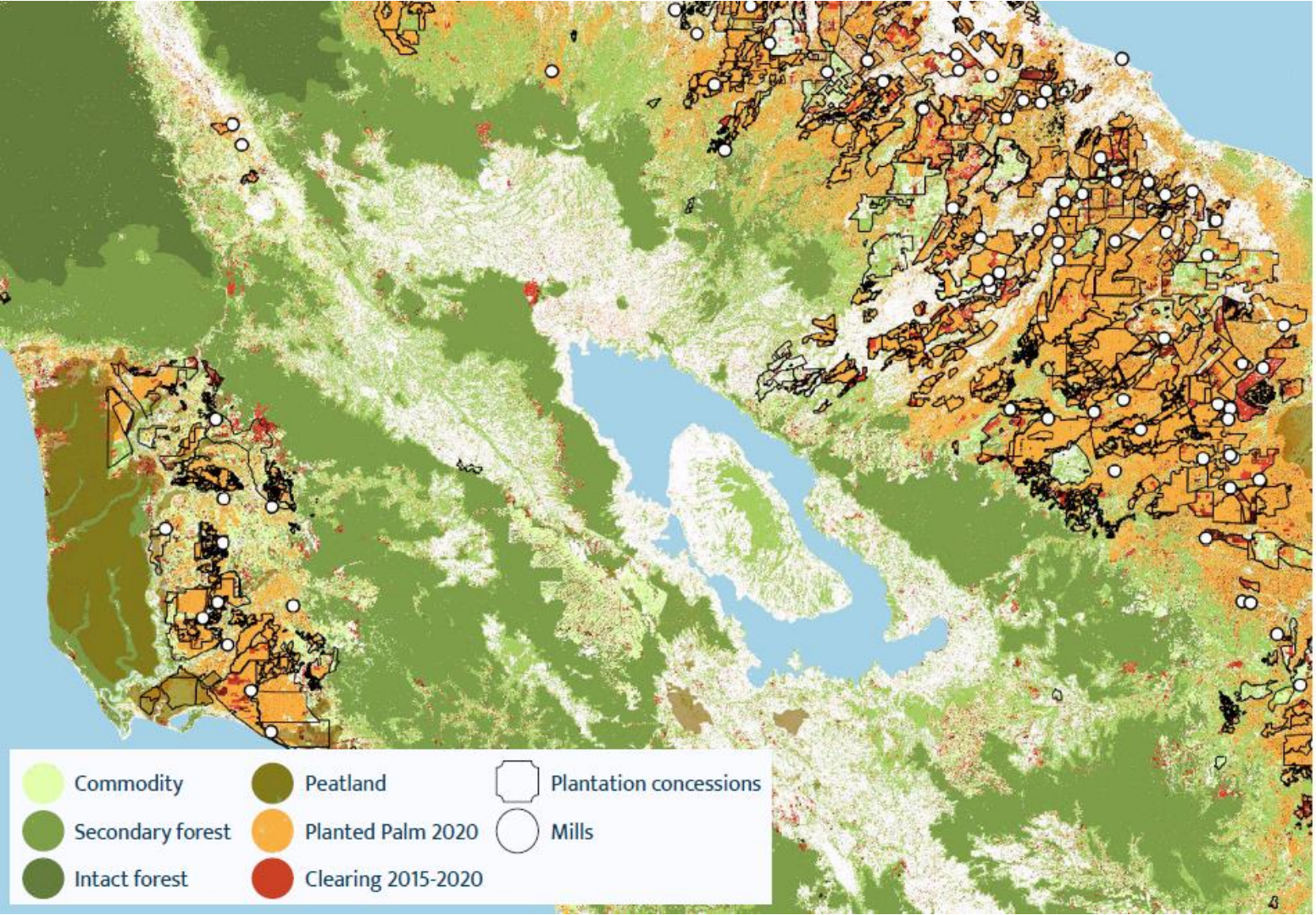
Global layers we use:

Baseline 2015

Peatlands

Planted Palm 2020

Clearing 2015-2020



PUTTING IT IN CONTEXT

Global layers we use:

Baseline 2015

Peatlands

Planted Palm 2020

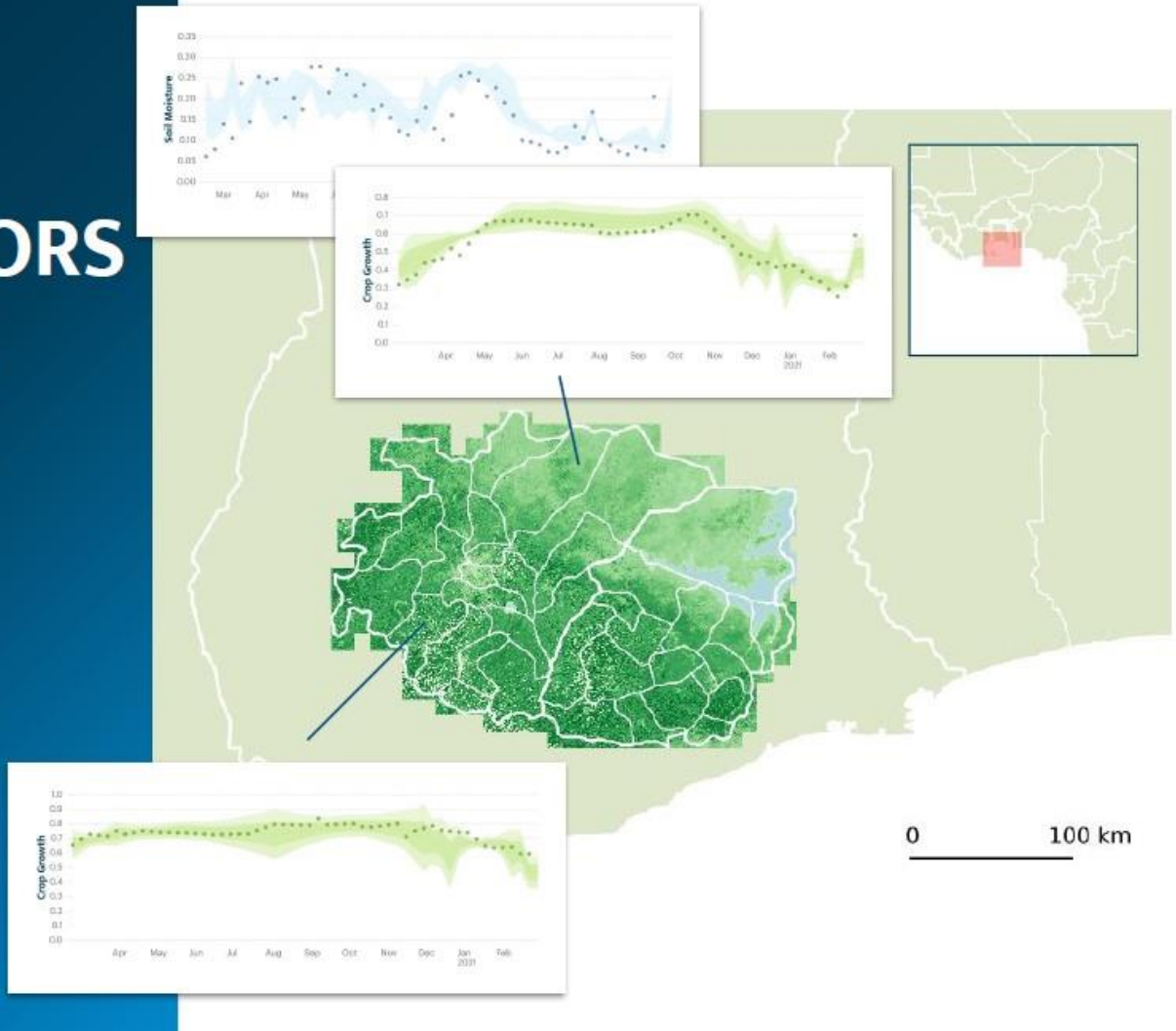
Clearing 2015-2020

Plantation Concession

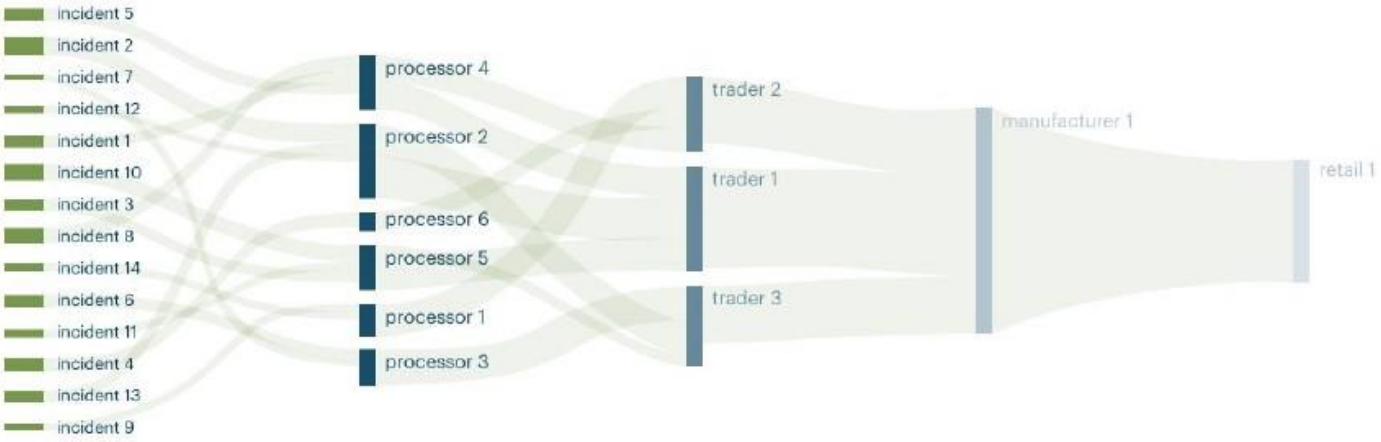
Mills

ENV INDICATORS

crop growth &
soil moisture

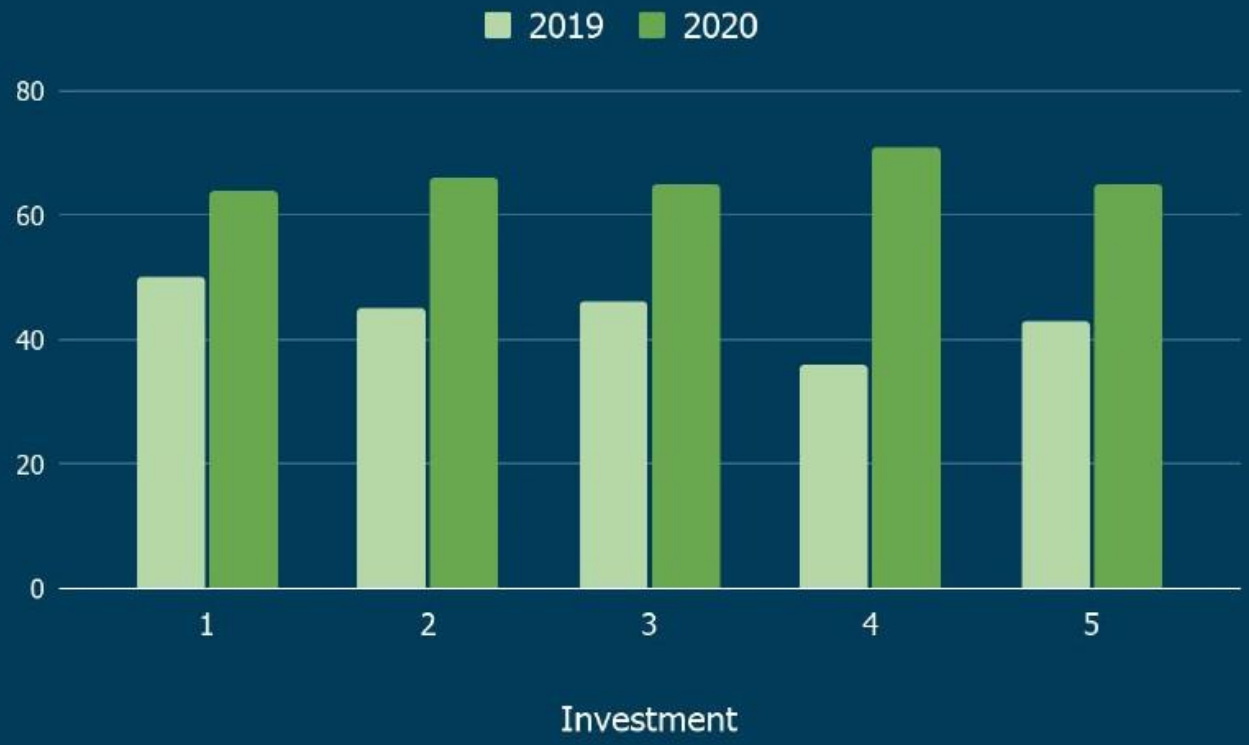


natural forest & plantations | processor | traders | manufacturer | retail



Portfolio insights - top 5 highest risk

% deforestation free



% Deforestation Free
the higher the better

Arjen Vrielink

director

vrielink@satelligence.com

/arjenvrielink

/arjenvrielink

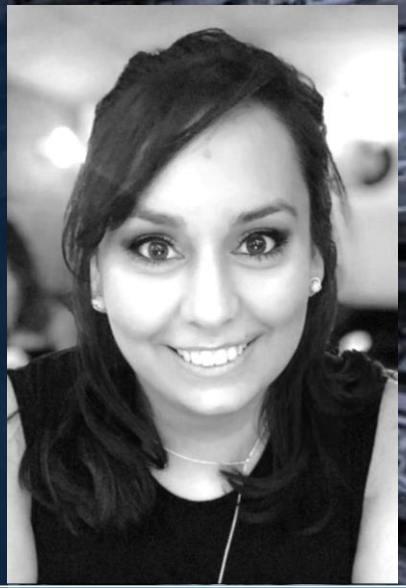
SATELLIGENCE

Ignite Presentation #4

Satellite Services, Insurance & Finance (Hannah McNally, Airbus Defense & Space)

Satellite Services and Insurance & Finance

How can geospatial technology support the Insurance & Finance market with assessing climate risk?



Hannah McNally

Product Development Manager

esa

Disaster Risk Financing & Insurance Program

SUPPORTED BY WORLD BANK GROUP

Global Risk Financing Facility

Supporting Early Action to Climate Shocks, Disasters, and Crises

AIRBUS

Intelligence Has an **Unrivalled** Operational **Constellation**

NEXT

OPTICAL CONSTELLATION

Pléiades Neo (4)
Pléiades (2)
SPOT (2)
DMC Constellation (4)
Vision 1
KazEOSat (partner, 2)

RADAR CONSTELLATION

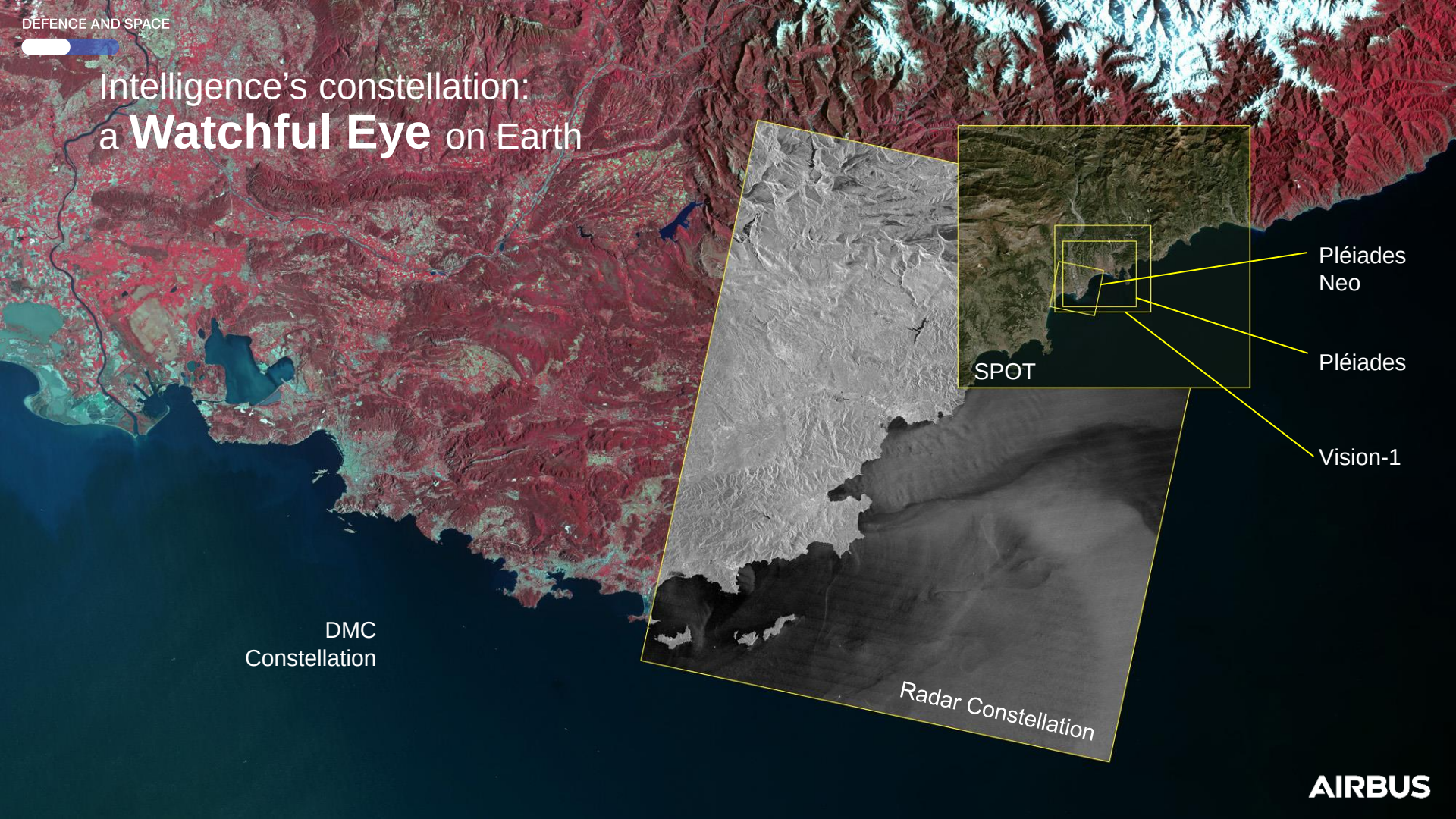
TerraSAR-X
TanDem-X
PAZ (partner)
NovaSAR

The most **accurate** & **extensive** imagery solutions based on strong **partnerships** and continues to **grow**

AIRBUS

DEFENCE AND SPACE

Intelligence's constellation: a **Watchful Eye** on Earth



AIRBUS

Smart Report

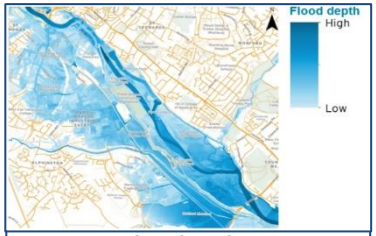
Reliable reports for insurers to carry out **natural damage assessment**

AIRBUS

Geospatial Financial Hub

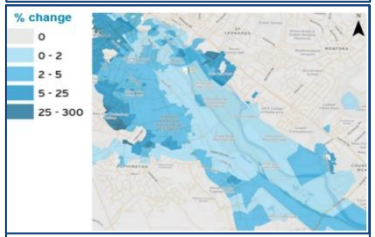
Providing future flood and subsidence risk adjusted **under climate change scenarios** in a visualisation platform

Flood risk modelled against climate change



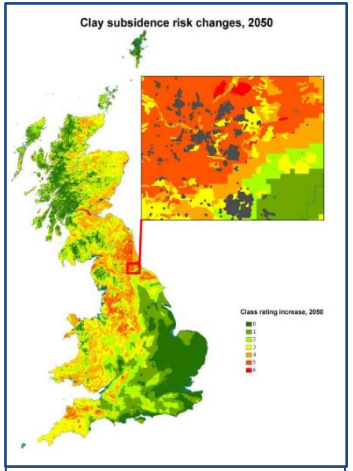
JBA's Flood Map

Provided by
JBA Risk Management



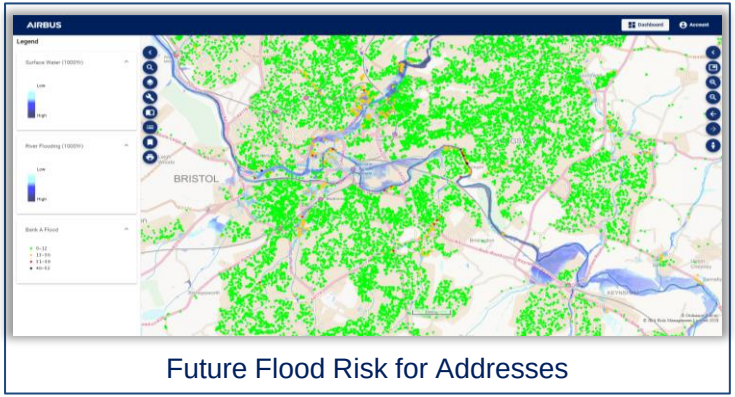
Climate change index represented at postcode level

Subsidence risk modelled against climate change

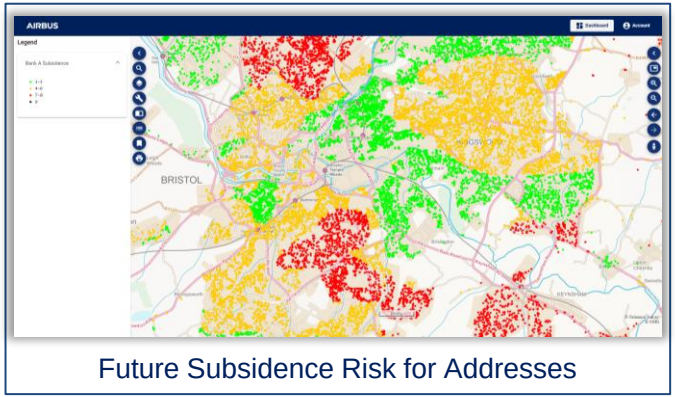


Clay Subsidence Risk Changes map

Provided by
Cranfield University



Future Flood Risk for Addresses



Future Subsidence Risk for Addresses

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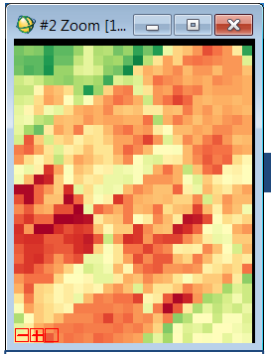
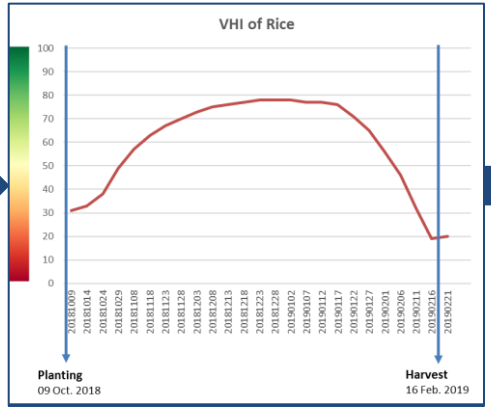
Pléiades (0.5m) Satellite image without field boundaries

Pléiades (0.5m) Satellite image with field boundaries – FieldFinder



Rice field
Kenya



Vegetation Health Index Matrix

Delivered via a visualisation tool

Crop Analytics

Understanding of agricultural production for insurers to **support food security risks**

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Thank You

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Join the Conversation

Disaster Risk Finance – Community of Practice

- Participate in discussions and build valuable relationships through the world's largest community of disaster risk financing practitioners and professionals.
- Sign up today by scanning the QR code to receive our monthly Community of Practice newsletter, which provides relevant research, impact stories, and information on upcoming events and programs.

Experts Panel

#1 Understanding the demand

Emerging needs and priorities in Emerging Markets and Developing Economies

- **Unnikrishnan Nair**, Head of Climate Change (Commonwealth Secretariat, Economic, Youth & Sustainable Development Directorate)
- **Martijn Regelink**, Senior Financial Sector Specialist (WBG/FCI, Financial Stability)
- **David Carlin**, TCFD Program Lead (United Nations Environment Programme Finance Initiative)

Questions & Answers - Panel #1

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Experts Panel

#2 Bridging the gap with space technology and analytics

Existing climate risk mapping and modeling tools and how to leverage new space technologies

- **Fabio Natalucci**, Deputy Director (IMF, Co-chair of NGFS Workstream on Bridging the Data Gaps)
- **Nicola Ranger**, Deputy Director (UK Centre for Greening Finance and Investment at Oxford Sustainable Finance Programme)
- **Matthew Foote**, Senior Director of Science & Analytics (WTW/Coalition for Climate Resilient Investment)

Presentation #1

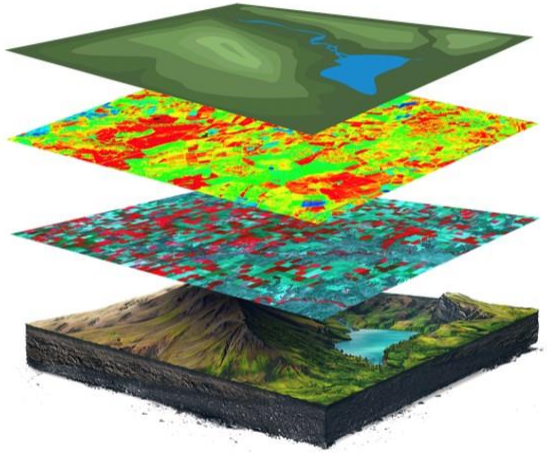
- **Nicola Ranger**, Deputy Director (UK Centre for Greening Finance and Investment at Oxford Sustainable Finance Programme)

Spatial Finance

'Spatial finance' is the integration of geospatial data and analysis into financial theory and practice.

Increasing availability and quality of spatial information will profoundly change how climate and environmental **risks, opportunities, and impacts** are measured and managed by financial institutions.

In tandem: reliable, consistent **asset-level datasets** tying physical & natural assets to ownership structures can deliver a step change in **accountability and transparency**



Geospatial data and analysis

Information markets

Financial products

Risk management

CGFI

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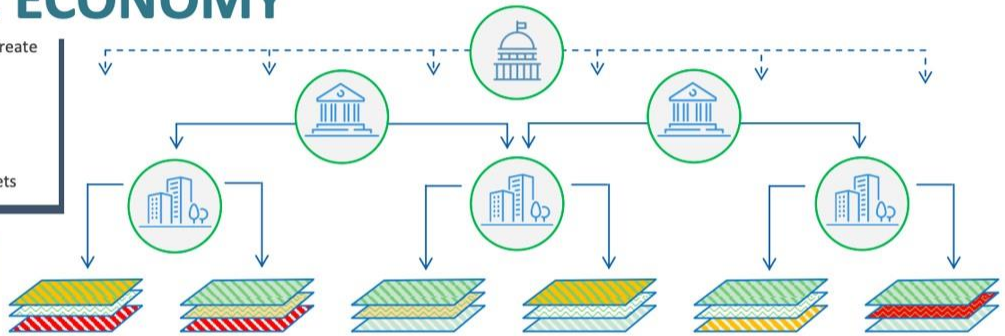
GEOASSET PROJECT: DIGITAL FOOTPRINT OF GLOBAL ECONOMY

Governments regulate and create policies across all sectors

Investors own companies

Companies own exposed assets

Assets, both built and natural, are exposed to different climate risks, impacts and opportunities



Observational data
E.g. GHG emissions, climate hazard, air pollution

GeoAsset

Foundational asset-level data including location, ownership, production type, capacity, age etc. will radically increase transparency in sectors with significant climate impact and risk exposure. Foundational data enables the full suite of observational data to become more actionable by key actors tackling climate change.

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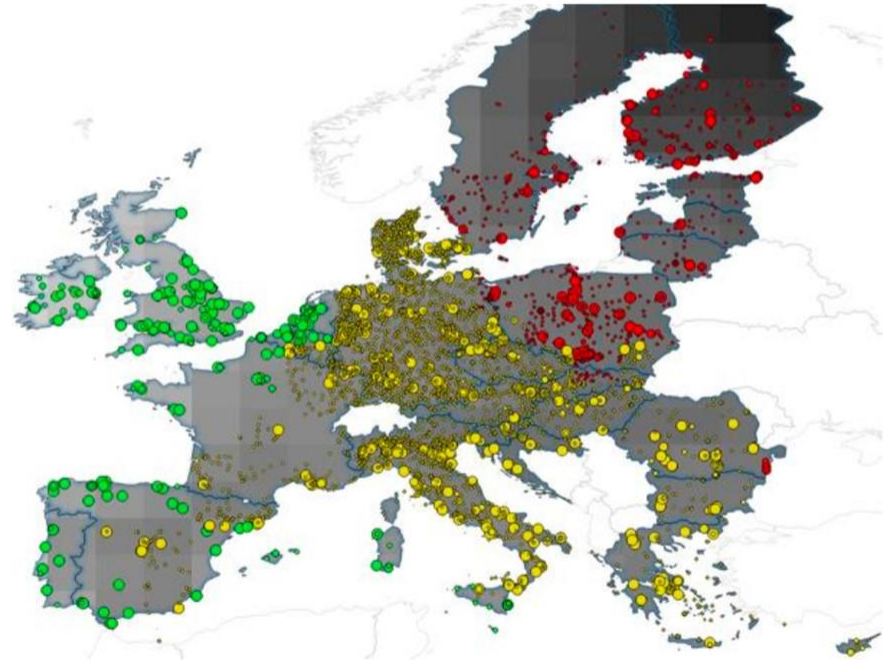
BOTTOM-UP RISK AND IMPACT ASSESSMENT EXAMPLE: CHRONIC HEAT STRESS FOR POWER STATIONS



Credit: Oxford Sustainable Finance Programme

Chronic heat stress risk analysis for power stations in Europe under a 1.5 degree global warming scenario by 2030.

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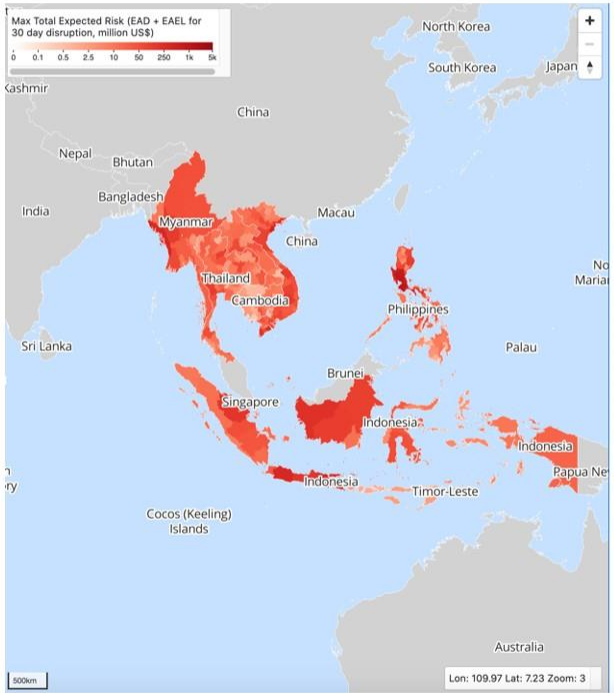
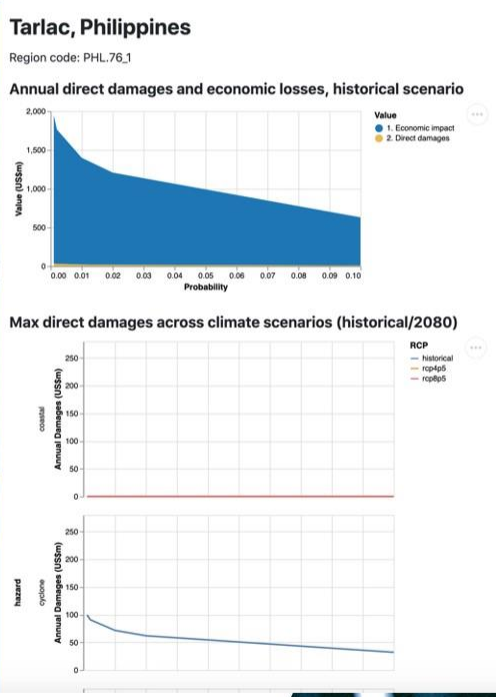
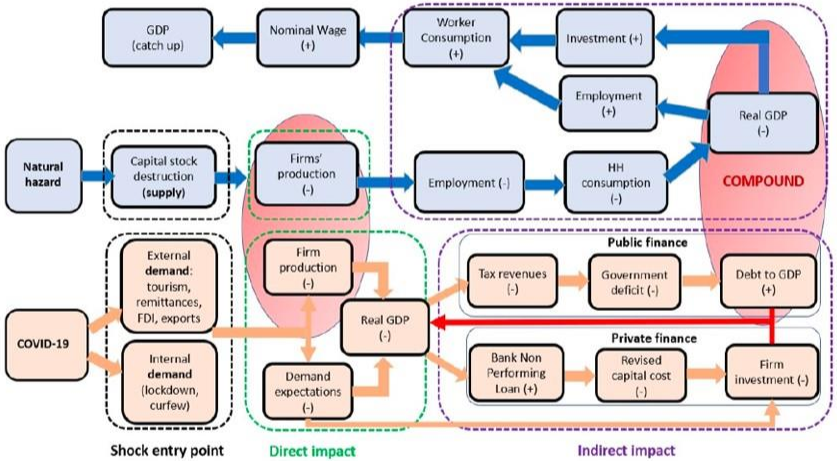
ASSESSING SYSTEMS LEVEL RISKS

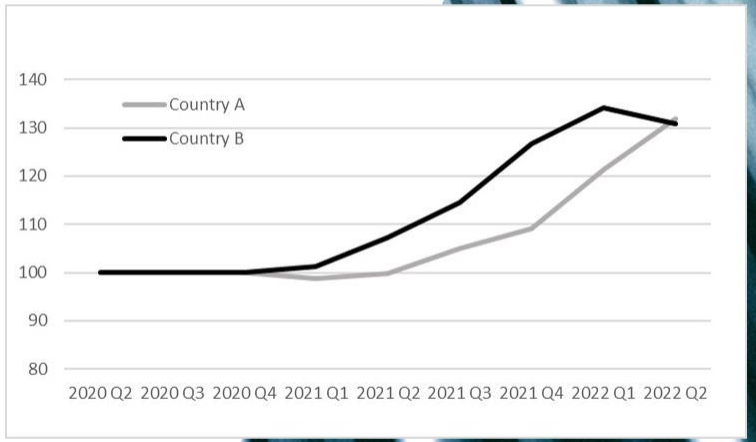




Source: Oxford & World Bank (2021)

ASSESSING SYSTEMS LEVEL RISKS





Source: *"Learning from COVID-19 and climate change: Managing the financial risks of compound shocks"* Olivier Mahul, Irene Monasterolo and Nicola Ranger

Presentation #2

- **Matthew Foote**, Senior Director of Science & Analytics (WTW/Coalition for Climate Resilient Investment)


Coalition for
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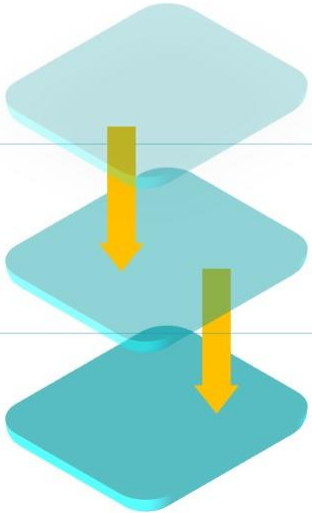
IN PARTNERSHIP WITH ITALY
Willis Towers Watson

Areas of Work and Deliverables

Coalition for Climate Resilient Investment

CCRI aims to address the different levels (systems, asset and financing) in which the mispricing of physical climate risks in investment decision-making manifests, recognising both their interdependence and as well as their specific needs

Working Group	*Deliverable/s*	*Status*
1. Systemic Resilience	a. A national **investment prioritisation tool** b. **A metric for systemic resilience**	• Deliverables underway in Jamaica • Discussions with 5 other countries
2. Asset Design & Structuring	a. **A Cash Flow Modelling Framework** for Physical Climate Risks b. **Related case studies**	• 9 real projects being analysed • first case study a hydro plant in Uganda
3. Financial Innovation	a. **A financial instrument for resilience investment**	• 3 candidate transactions identified



Participating Institutions

Coalition for Climate Resilient Investment

Institutional Investors

Aberdeen Standard Investments, Aviva Investors, AustralianSuper, B Capital Partners, CalSTRS, CBRE Global Investors, Climate Fund Managers, DWS, Environment Agency Pension Fund, Fidelity International, IMPAX Asset Management, Invesco, Lion's Head Global Partners, Legal & General Investment Management, The Lightsmith Group, Macquarie Green Investment Group, meridiam infrastructure, Nephila, Schroders, Willis Towers Watson

Financial data

REFINITIV, OCTOBRE, AGVESTO

Lending Institutions

HSBC, Lloyds Banking Group, Standard Chartered, Wells Fargo

Insurance

Zurich, Prudential, Munich RE

Climate Risk Data

AIR Worldwide, lobelia., one concern, JUPITER, XDI Cross Dependency Initiative, TRUCOST

Engineering and Construction

AECOM, ARUP, High Speed, Mott MacDonald, VINCI Resallience, wsp, anglianwater

Consulting/Auditing

accenture, ACCESS, cambridge econometrics, KPMG, McKinsey & Company, GOIMPACT Capital Partners

Standards

Climate Bonds Initiative, GRESB

Governments

Multilateral Institutions

ADB, European Bank for Reconstruction and Development, Green Climate Fund, European Investment Bank, Global Infrastructure Facility, IDB Inter-American Development Bank

Legal

Clyde&Co

Advocacy/Think Tank

Climate Policy Initiative, Global Center on Adaptation, #NSFM NextGen, SYSTEMIQ, TCFD Task Force on Climate-Related Financial Disclosures, World Resources Institute

Public Institutions

A4S Accounting for Sustainability, Department for Business, Energy & Industrial Strategy, Foreign, Commonwealth & Development Office, GARI, Green Finance Institute, Investor Group on Climate Change, IIGCC

Academic

Imperial College London, University of Oxford, Toulouse School of Economics

Credit rating

Trucost ESG Analysis, S&P Global

International Organisations

UNEP Finance Initiative, Food and Agriculture Organization of the United Nations, UNDP

Convening Partners

World Economic Forum, Global Commission on Adaptation, UN Climate Change Conference UK 2021

Global Resilience Index Structure

Physical peril models and risk metrics to support global resilience and risk reduction

RACE TO RESILIENCE

UN CLIMATE CHANGE CONFERENCE UK 2021

IN PARTNERSHIP WITH ITALY

Key Stakeholder Groups

Humanitarian | Risk Financing | Infrastructure | Green Finance

Curation / Delivery

Methodology / Evaluation

Climate Conditioning

Core modelling development

Insurance Development Forum

CDRI Coalition for Disaster Resilient Infrastructure

Coalition for Climate Resilient Investment

CGFI UK Centre for Greening Finance & Investment

UNDRR UN Office for Disaster Risk Reduction

UNDP

Open Access Platform

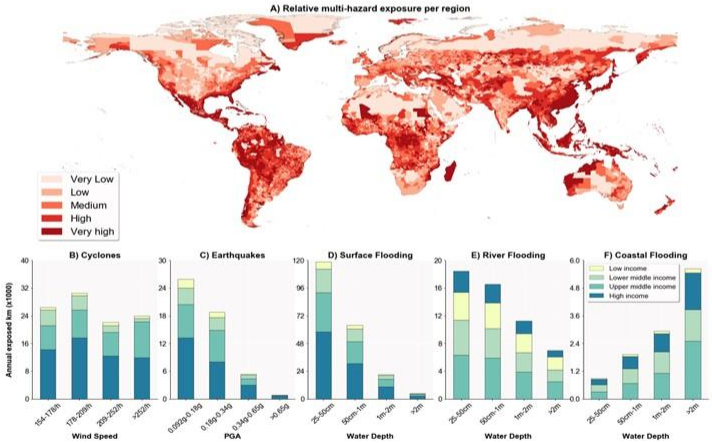
Resilience Indices & metrics

Probabilistic modelling

Climate scenarios

Reference standards

Exposure | Vulnerability | Hazard | Climate



Questions & Answers - Panel #2

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Closing Remarks

Benjamin Koetz

Head of Sustainable Initiatives Office
ESA/ESRIN

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Closing Remarks

Olivier Mahul

Practice Manager
FCI Global Practice
Crisis and Disaster Risk Finance
World Bank Group

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