Space Application in Support of Land Management for SDG Implementation

Regional Expert Workshop on Land Accounting for SDG Monitoring and Reporting
26 September 2017

Space Application Section
Information and Communications Technology and Disaster Risk Reduction Division
UN ESCAP

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Economic and Social Commission for Asia and the Pacific

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Space Benefits

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What Can Space Technology Applications Offer?

From Geospatial Data to Development Paradigm Change

1. Spatial and geospatial data for decision making
2. Contribute to productivity and efficiency in socio-economic activity
3. Contribute to establishing new development paradigm transformation (3 dimensional development paradigm)

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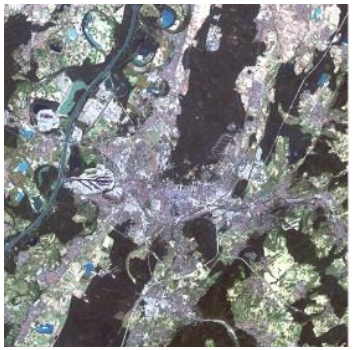
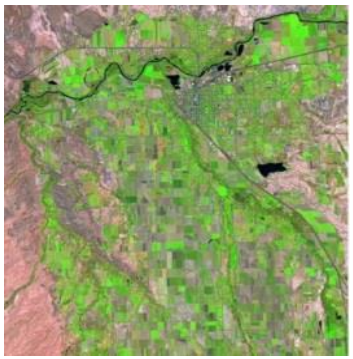
1. Spatial Data for Decision Making

Source: Commonwealth Scientific and Industrial Research Organisation (2014) Bangladesh Integrated Water Resources Assessment, Water for a Healthy Country Flagship

Obtaining Remote Sensing Data

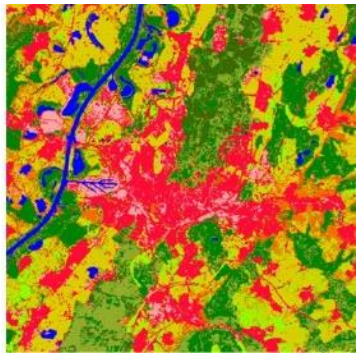
Operational Satellite





Processing Tools

- *Image into raster data for analysis*
- *Automatic categorization of land cover*



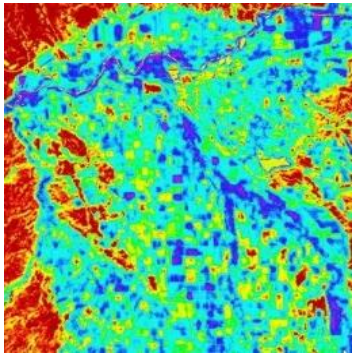


Image source: http://csterling.github.io/remoteSensing_qgis/#0
fort.usgs.gov
Icon source: https://thenounproject.com/aldricroib2

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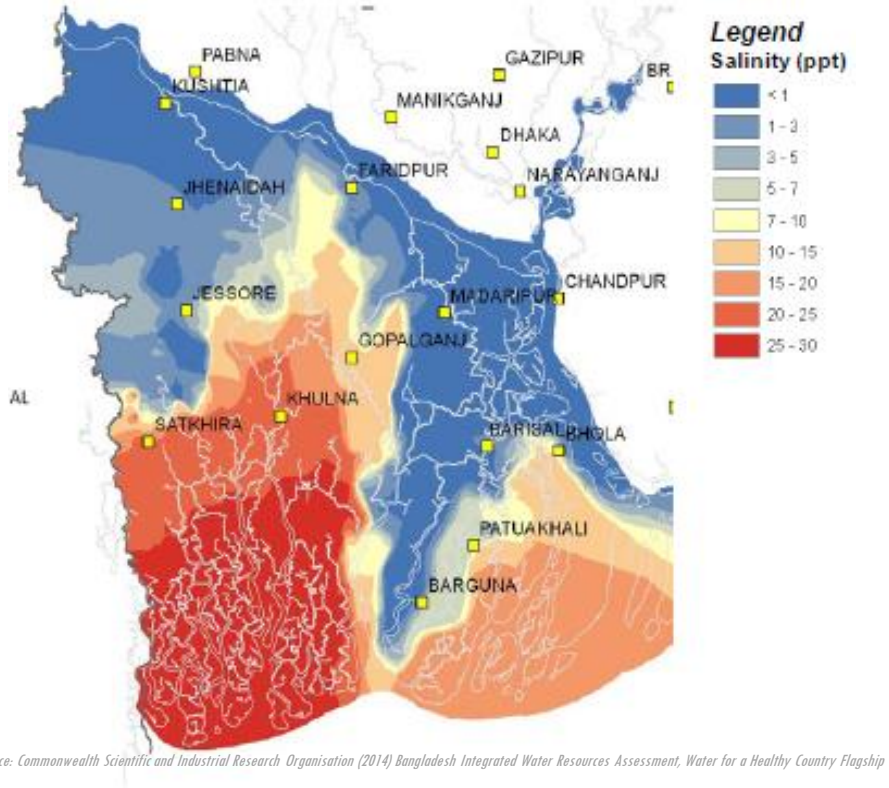
Soil salinity and Rice Production in Bangladesh

- Continuous salinization of river and arable land in southern districts of Bangladesh
- Analysis conducted to identify optimal rice fields for distributing salt-tolerant rice seed



Source: Commonwealth Scientific and Industrial Research Organisation (2014) Bangladesh Integrated Water Resources Assessment, Water for a Healthy Country Flagship

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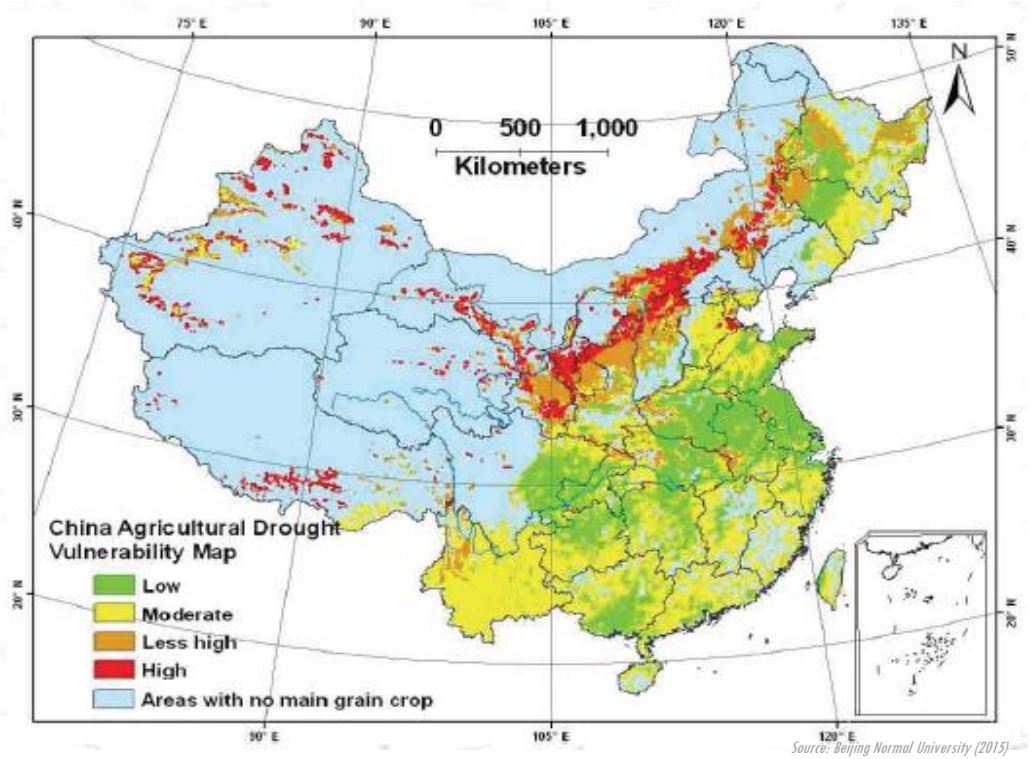
Drought monitoring and hazard maps in China

- Development of drought monitoring and hazard map based on remote sensing data
  - ➢ For appropriate crops and land uses
- Evidence-based long-term planning



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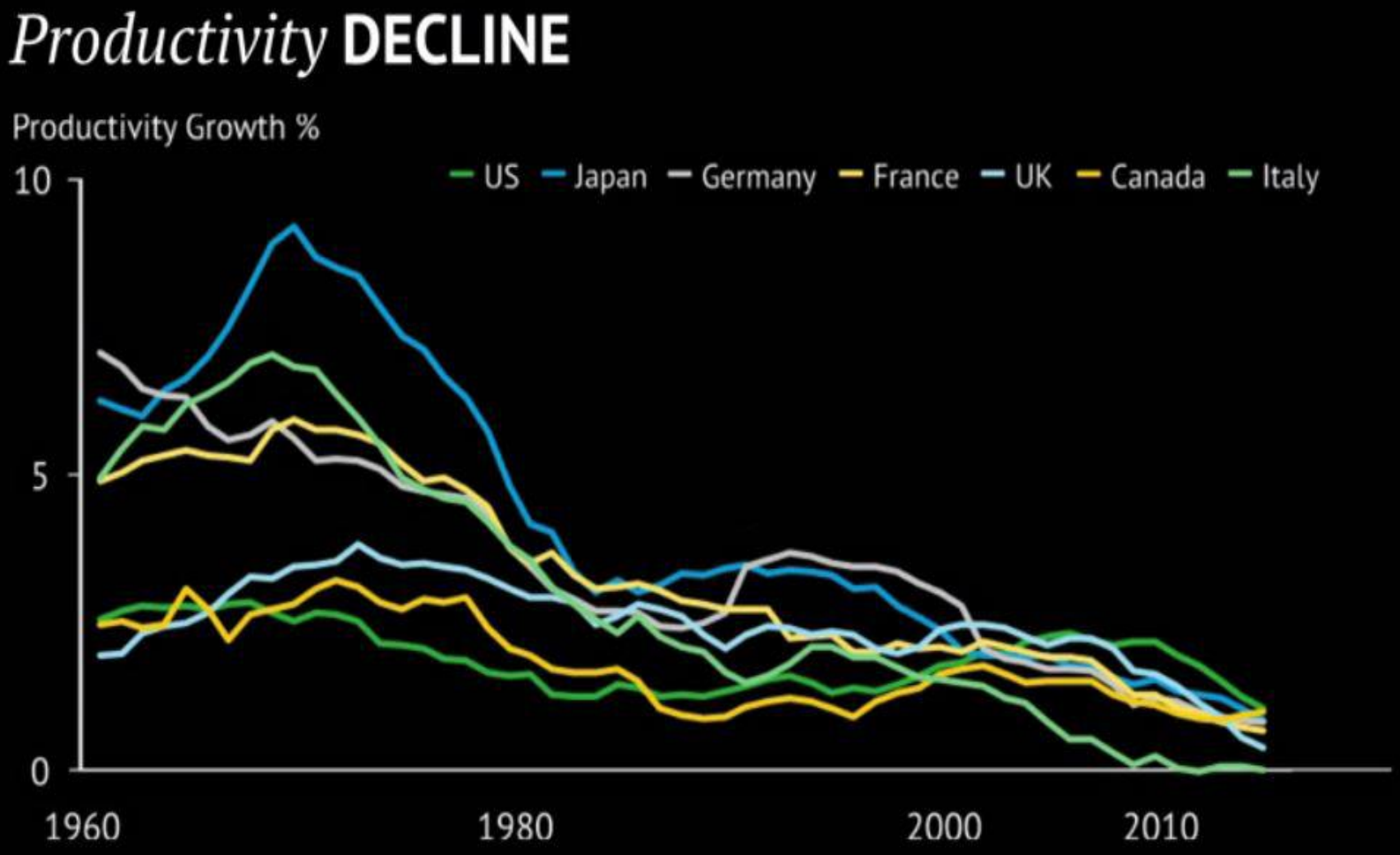
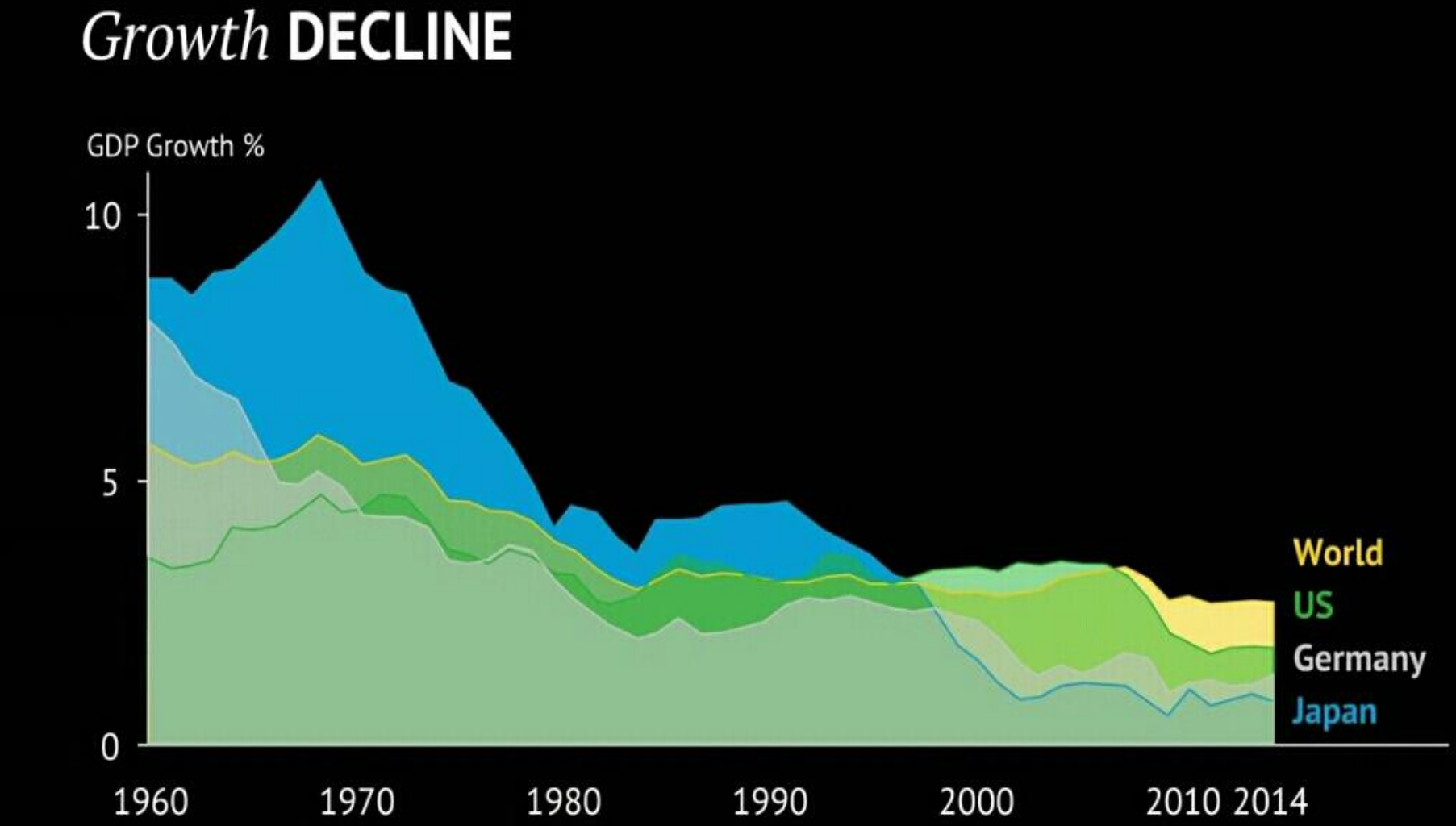
2. Contribution to Socio-Economic Growth

Source: Commonwealth Scientific and Industrial Research Organisation (2014) Bangladesh Integrated Water Resources Assessment, Water for a Healthy Country Flagship

Productivity Decline



Growth Decline



Source: Olivier Scalabre

Change of Economic Structure

Decentralized production and consumptions

CLOSE TO CONSUMER MARKET
SMALLER
MULTI PRODUCT
MADE TO ORDER

Source: Olivier Scalabre

3. Contribution to Development Paradigm Change and the 4th Industrial Revolution

Source: Commonwealth Scientific and Industrial Research Organisation (2014) Bangladesh Integrated Water Resources Assessment, Water for a Healthy Country Flagship

Examples: City

Examples: Urban Transport

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Drone Transport

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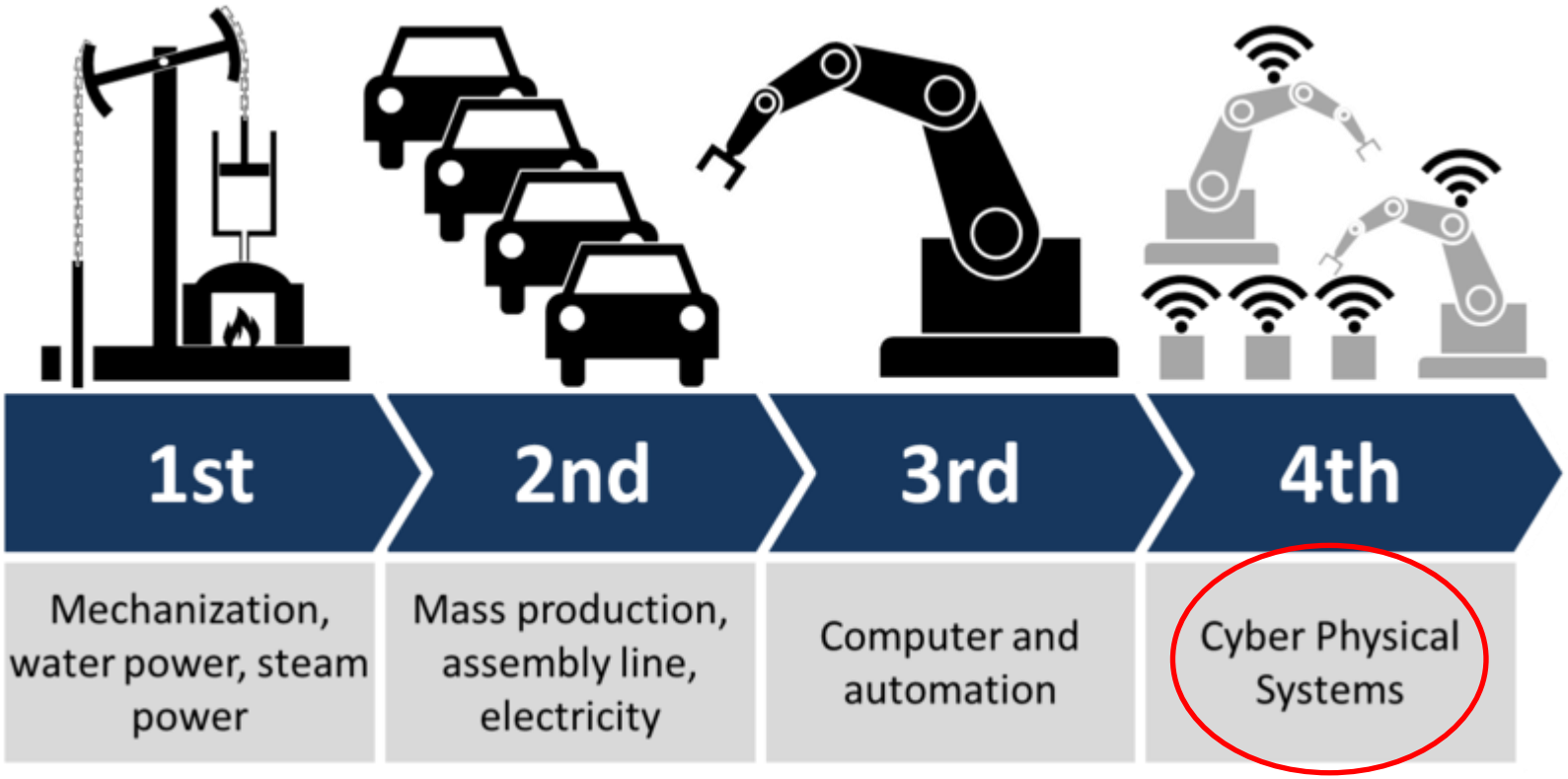
Space Tech for 4th Industrial Revolution



Source: Forbes (http://www.forbes.com/sites/bernardmarr/2016/04/05/why-everyone-must-get-ready-for-4th-industrial-revolution/#a5dabca79c98)

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Space Technology Applications for Land Planning and Management

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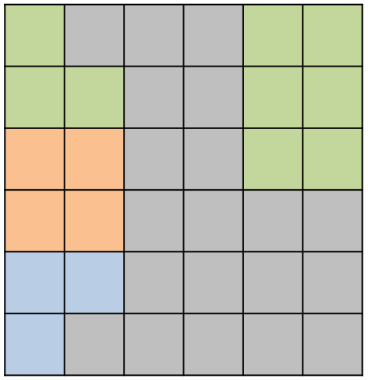
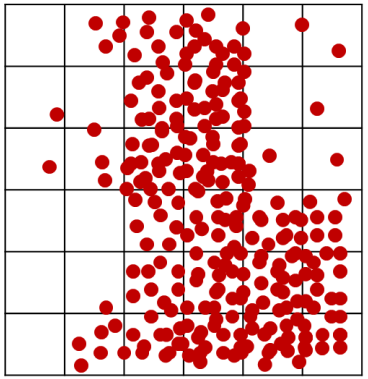
Case 1: Damage Assessment (1)

Land Account



Population Density/ Infrastructure



Pre- and Post-Disaster EO/Remote Sensing Data

Better damage assessment with information from land account and remote sensing data:

- ***Land area & value***
- ***Population and land development***
- ***Land use***
- ***Land cover***

Source: CEOS (2015) Satellite Earth Observations in Support of Disaster Risk Reduction

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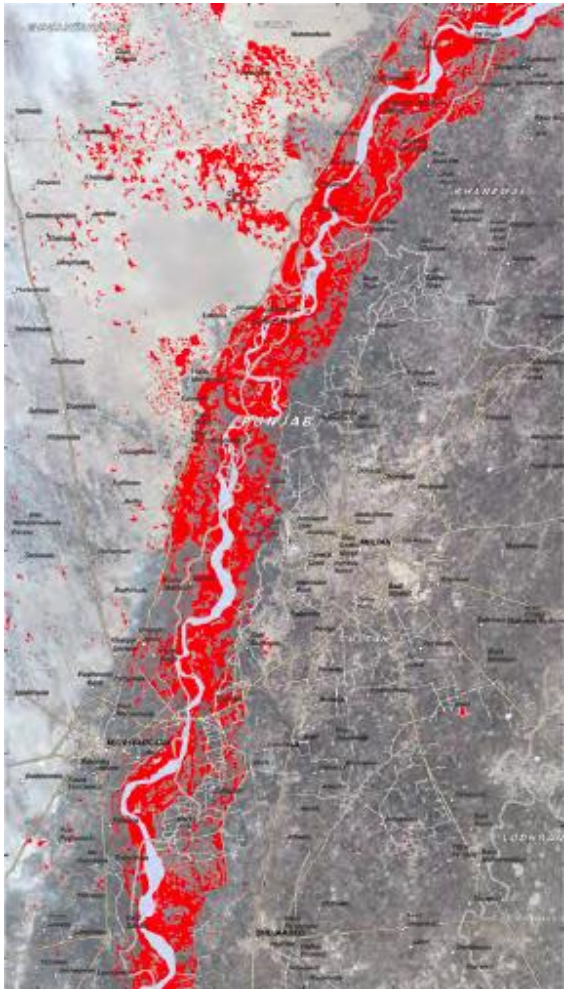
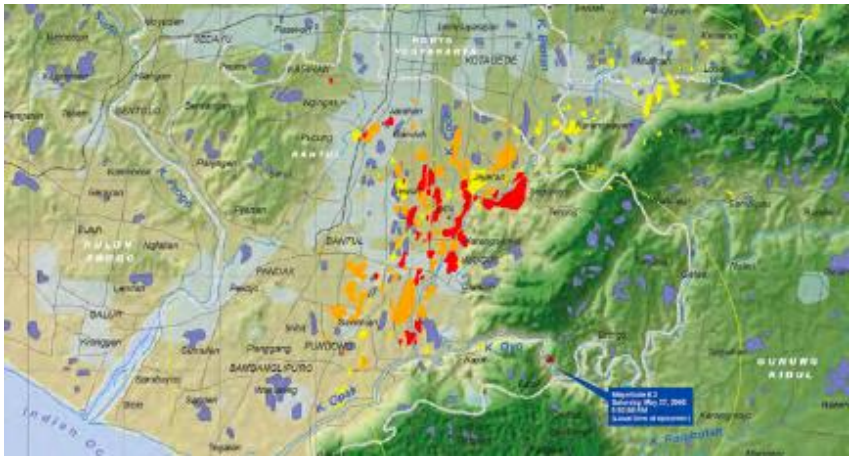
Case 1: Damage Assessment (2)





Source: CEOS (2015) Satellite Earth Observations in Support of Disaster Risk Reduction

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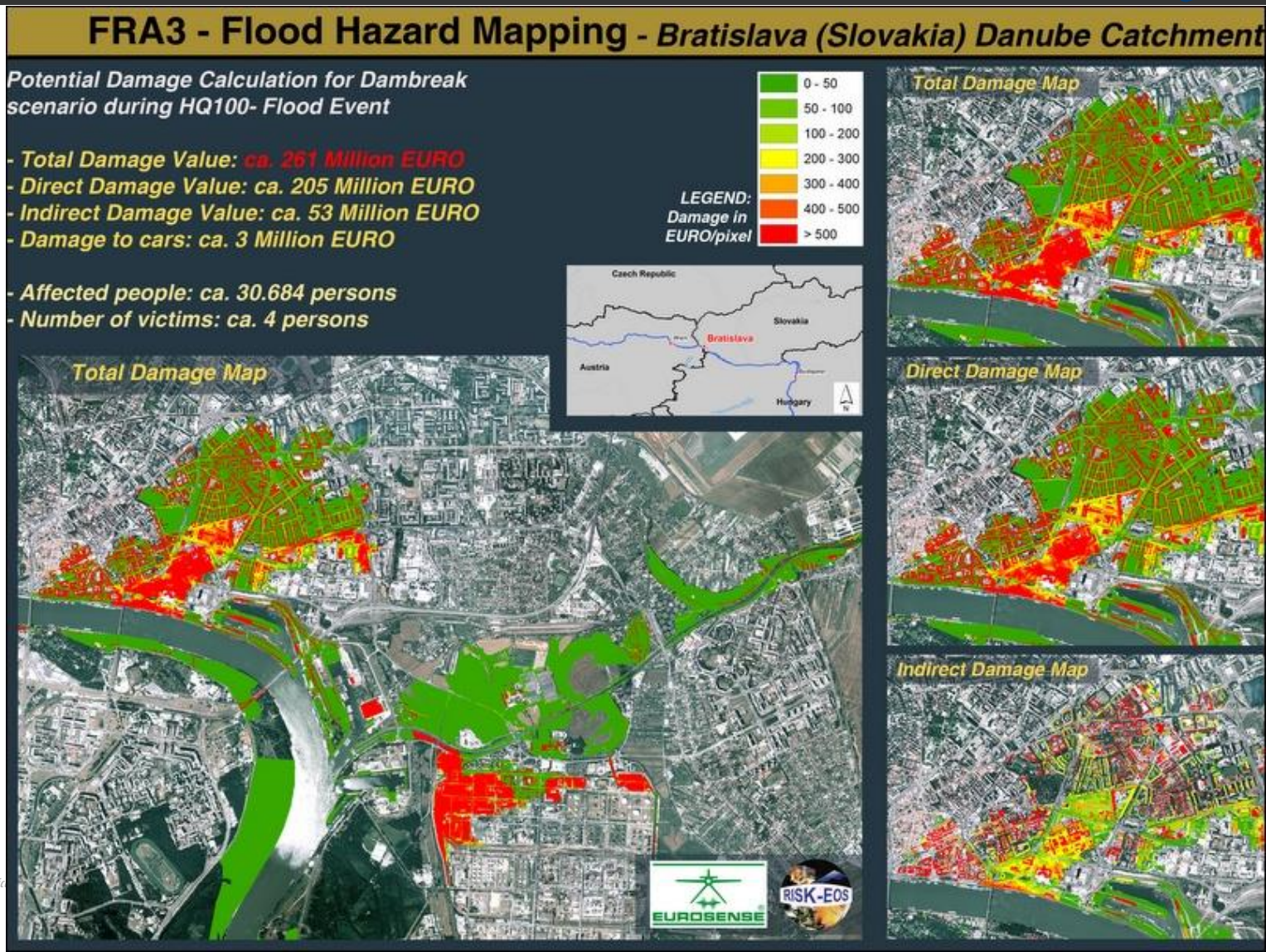
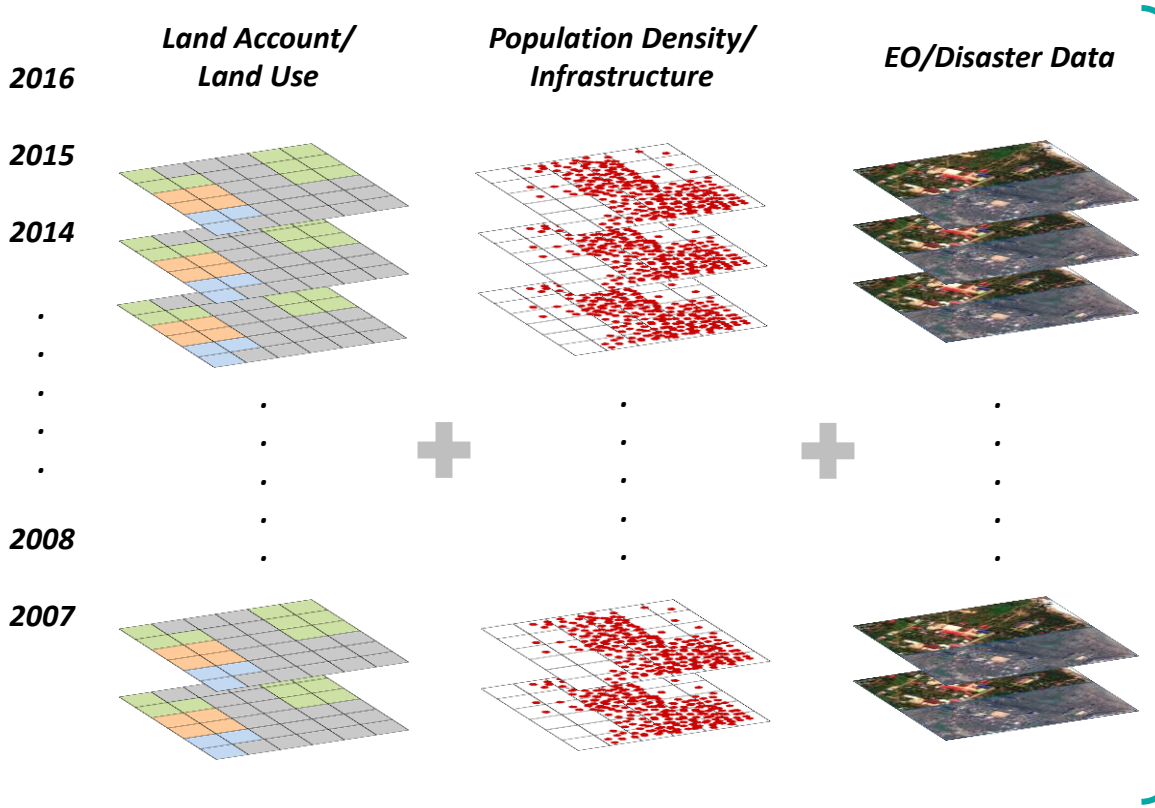
Case 1: Damage Assessment (3)



Source: http://www.eurosense.com/documents/your-applic
gb&template=/system/templates/site/print.html

Case 2: Risk resilient land-use planning (1)



Risk resilient land-use planning based on historical data for mid- to long-term implementation

Source: CEOS (2015) Satellite Earth Observations in Support of Disaster Risk Reduction

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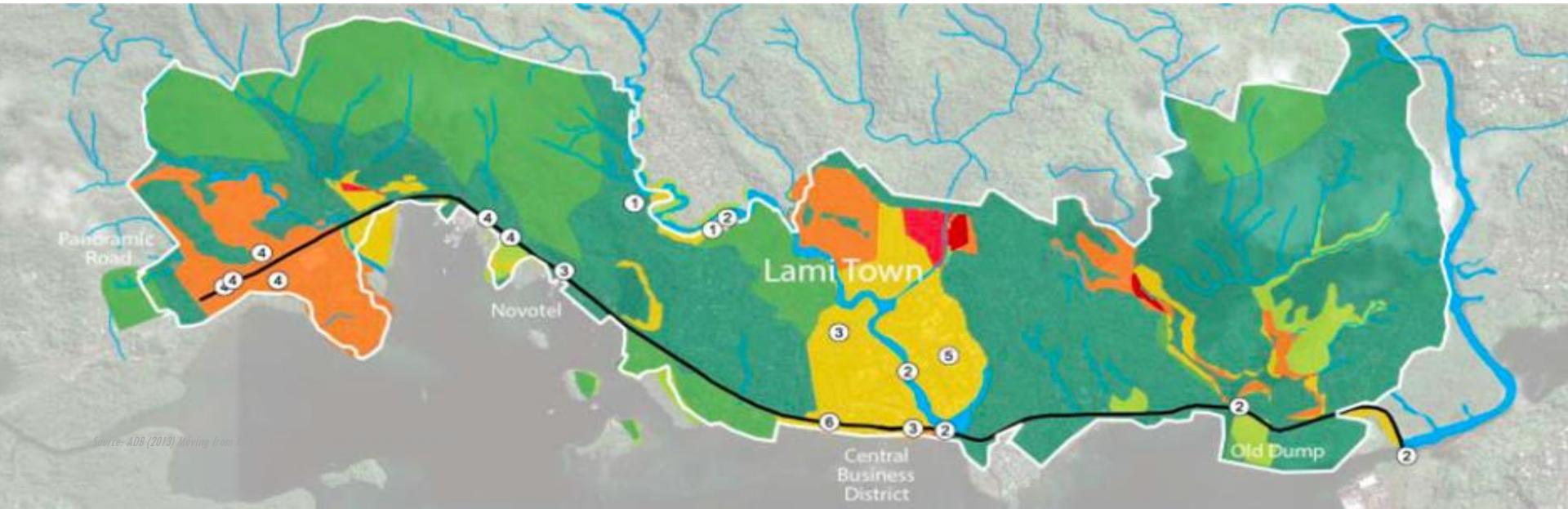
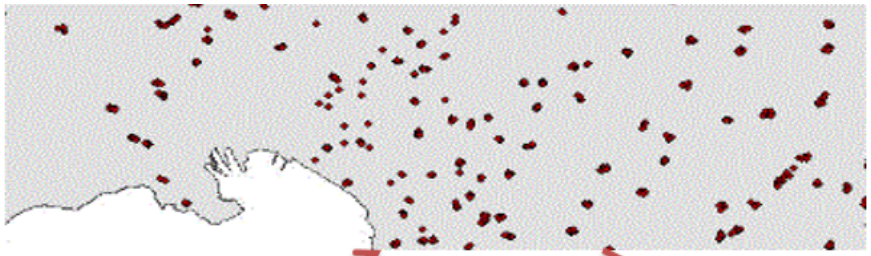
Case 2: Risk resilient land-use planning (2)

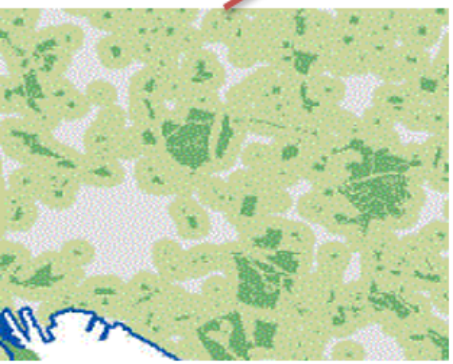
Policy options based on analysis result:

- Keeping inappropriate land use/development out of hazard zone
- Applying building controls and reinforcing building structures
- Minimizing property damage by identifying areas for low density use



Adding Geospatial Data to Statistics





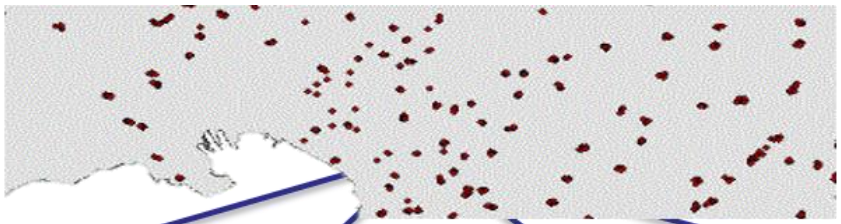
Access to Greenspace

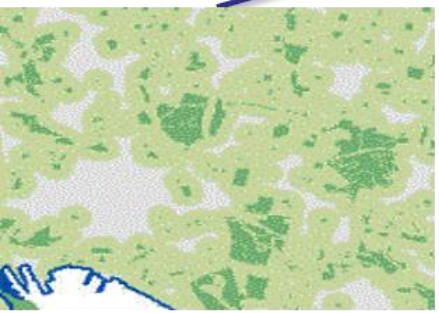
Statistics

Geo-statistics

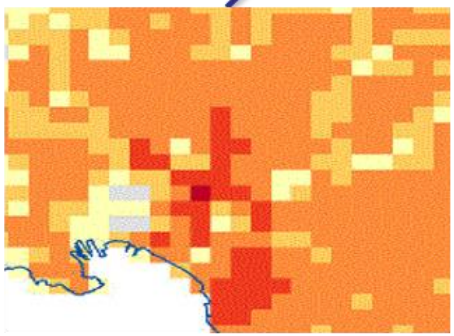
Person	Age	Sex	Body Mass Index	Distance to Greenspace
1	F	30	19	0.25
2	F	28	32	2.01
3	M	42	27	0.36

Adding Geospatial Data to Statistics



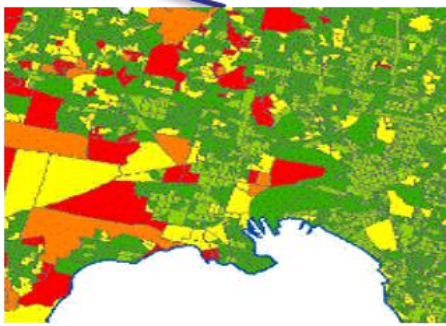


Access to Greenspace



Population Density

Commuting Distance



Access to Health Services

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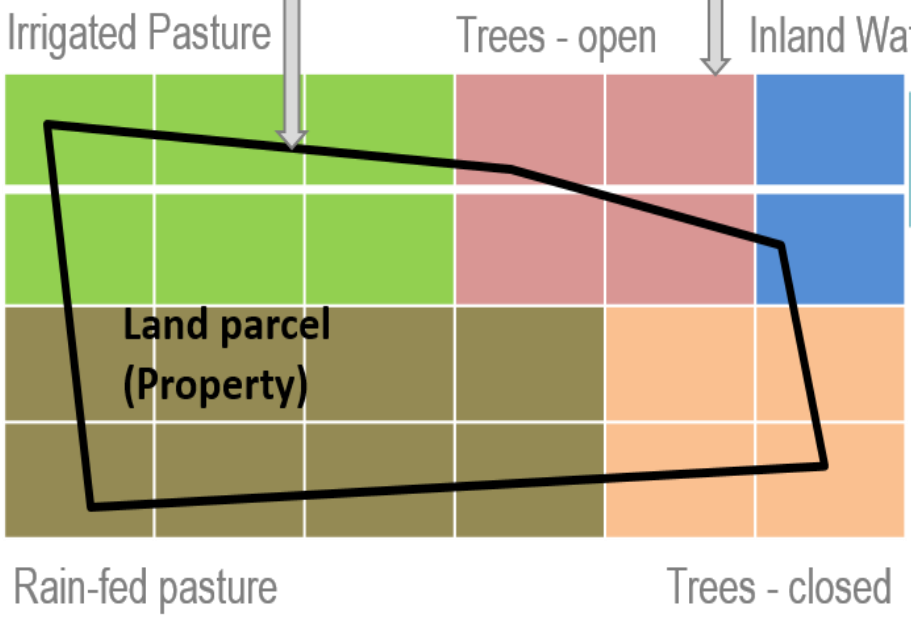
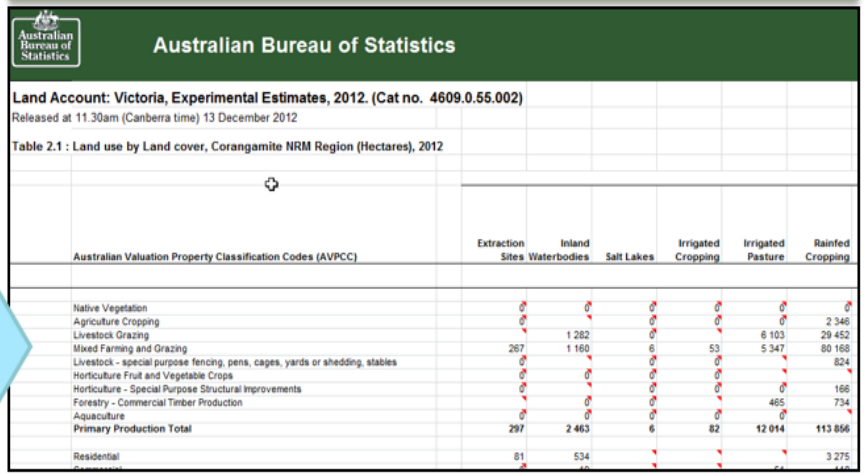
Adding Geospatial Data to Statistics

State Valuations:
- Land use
- Land value

Geoscience Australia's Dynamic Land Cover grid



Detailed Land Account tables:
Land cover by land use, area and value



Australian Bureau of Statistics

Land Account: Victoria, Experimental Estimates, 2012. (Cat no. 4609.0.55.002)

Released at 11.30am (Canberra time) 13 December 2012

Table 2.1 : Land use by Land cover, Corangamite NRM Region (Hectares), 2012

Australian Valuation Property Classification Codes (AVPCC)	Extraction Sites	Inland Waterbodies	Salt Lakes	Irrigated Cropping	Irrigated Pasture	Rainfed Cropping
Native Vegetation	0	0	0	0	0	0
Agriculture Cropping	0	0	0	0	0	2 346
Livestock Grazing		1 282	0		6 103	29 452
Mixed Farming and Grazing	267	1 160	6	53	5 347	80 168
Livestock - special purpose fencing, pens, cages, yards or shedding, stables	0		0	0		824
Horticulture Fruit and Vegetable Crops	0	0	0	0		
Horticulture - Special Purpose Structural Improvements	0		0	0	0	166
Forestry - Commercial Timber Production		0	0		465	734
Aquaculture	0	0	0	0	0	
Primary Production Total	**297**	**2 463**	**6**	**82**	**12 014**	**113 856**
Residential	81	534				3 275

Small area land account summary data:

- Land value
- Land use
- Land cover
- Cadastral change

Integrated with other small area data:

+ Population
+ Building approvals

Statistical Geospatial Framework

Statistical Community

Socio-Economic Datasets

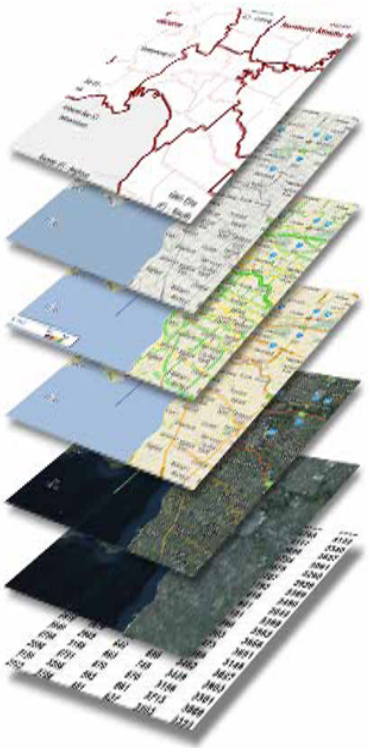
- **Core Statistical** — Census, Demographics, Agriculture, Building, Labour Force, etc.
- **Tax** — Income and Business Tax
- **Immigration**
- **Health** — Medicare, Pharmaceuticals, Workforce
- **Land** — Valuation and Use
- **Social Welfare** — Unemployment, Disability, Family Support
- **Others ...**

SSF bridge

Spatial Community

Foundation Spatial Data Framework – Fundamental Elements

- Admin. & statistical boundaries
- Addressing, Place Names
- Transport, Water
- Land and Property
- Elevation and Depth
- Imagery
- Positioning



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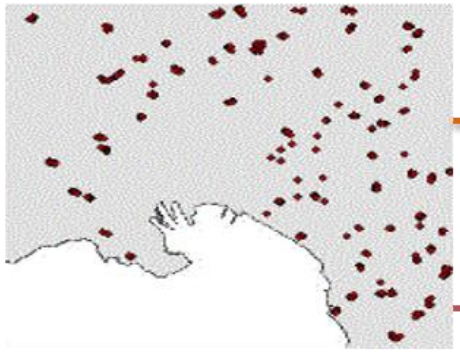
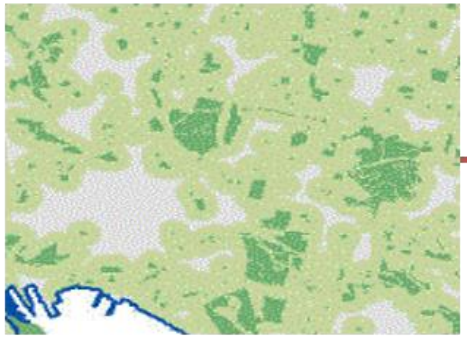
Statistical Geospatial Framework



Address Register

Sample selection or geocoded admin. addresses

Statistical dataset



Greenspace

Web Service compares address points and greenspace

Dataset of address point identifiers with attribute of walking distance to greenspace

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Operational Land-Monitoring Data/Service

- **ESA Sentinel-2**: https://sentinel.esa.int/web/sentinel/missions/sentinel-2
- **Copernicus**: http://copernicus.eu
- **Copernicus Land-Monitoring Service**: http://copernicus.eu/main/land-monitoring
- **Landsat Missions**: https://landsat.usgs.gov
- **USGS Landsat Archive**: https://landsatlook.usgs.gov

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Regional Space Applications Programme for Sustainable Development (RESAP)

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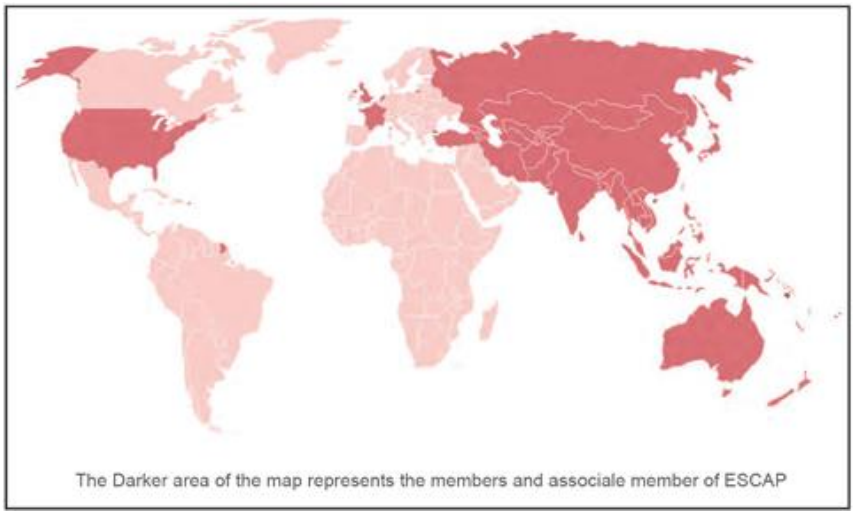
ESCAP and RESAP

- Has been operating for around 22 years since 1991
- 25 member States
- Asia-Pacific Plan of Action for Space Applications and GIS for Sustainable Development (2012-2017)



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Changing Global Development Frameworks

Key Global frameworks:

- Sustainable Development Goals
- Sendai Framework for DRR
- SAMOA Pathway
- Paris Agreement on Climate Change

Space technology applications and geospatial data as essential implementation tools for SDGs

- Data; Productivity; and Change of development paradigms

Opportunities for RESAP:

- Existing Asia-Pacific Plan of Action for Space Applications and GIS for Sustainable Development (2012-2017) is coming to an end
- Need for ***a new Asia-Pacific Plan of Action for Space Applications (2018-2030)***
- 3rd Ministerial Conference on Space Applications in 2018

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Draft Asia-Pacific Plan of Action 2018-2030

RESAP strategy covering 2018-2030

- Initial work/implementation plan covering 2018-2022

Contribute to

(1) Global development framework such as SDGs;

(2) ESCAP Regional Road Map for Implementing 2030 Agenda for Sustainable Development in Asia and the Pacific; and

(3) member States.

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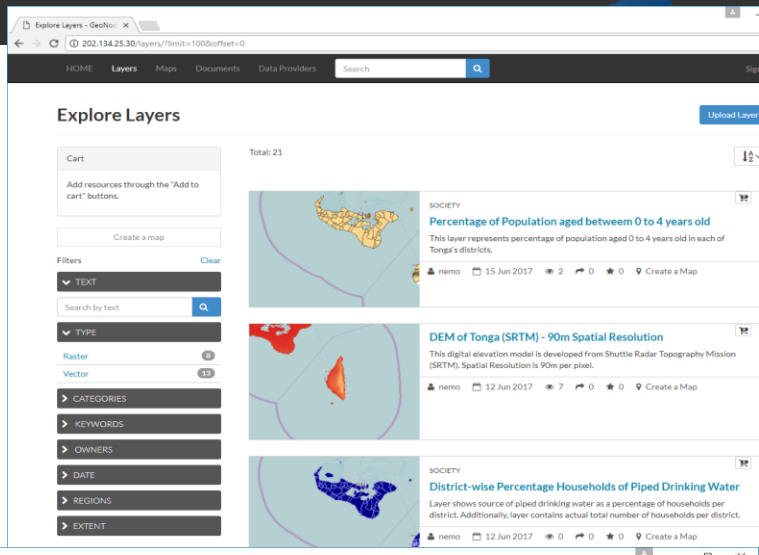
Geo Data for Early Warning System in the Pacific

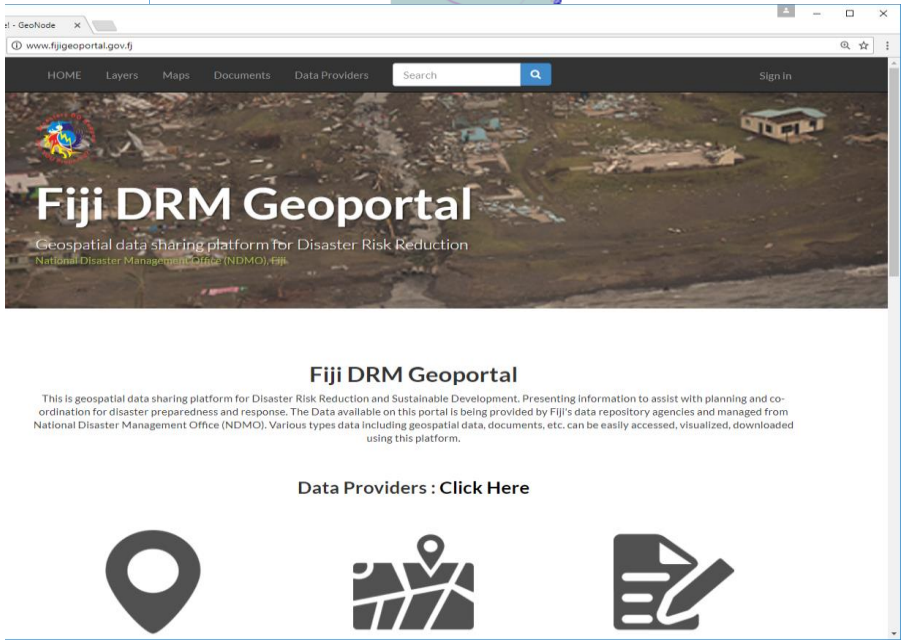
Goals:

- **Strengthen use of geospatial data for EWS**
- **Contribution to SDGs and SAMOA Pathway**

Key Activities:

- **Gaps and needs**
- **Training for 9 Pacific island countries**
- **Country pilot projects**
- **Pacific strategy for knowledge hub on early warning system**
- **E-learning platform for disaster and GIS**





Statistical Geospatial Indicators for Disaster-related SDG monitoring

In line with Global Statistical Geospatial Framework of UNGGIM.

Key Activities:

- 1st EGM in Bangkok on 10 October 2017
- 2nd EGM in Kazakhstan in January 2018 (Tentatively)
- 3rd and 4th EGM in 2018
- Central Asia as a pilot

Source: Martin Brady, "Towards a Global Statistical Geospatial Framework", Australian Bureau of Statistics, November 2015

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Difference from Existing Indicators

Existing Disaster Indicators	Statistical Geospatial Indicators
Measure after disasters	Measure risk reduction before disasters
Measure death, economic loss	Measure required actions to reduce risks
Measure on a specific date	Measure the progress for a period
Use statistical data	Combine statistical and geospatial data
Negative message (death, loss)	Positive - encouraging message
	: Regardless size of disasters and loss , government should keep investing to address disaster risks

Structure of Statistical Geospatial Indicators

1. **Economic dimension**
   - Budget for disaster prevention, Investment ratio
2. **Social dimension**
   - Demographics, Education-level, Poverty
3. **Infrastructure dimension**
   - Resilience
4. **Science and Technology dimension**
   - Modern early warning systems, predictive models
5. **Institutional dimension**
   - awareness, evacuation training, protections, shelters

Source: Martin Brady, "Towards a Global Statistical Geospatial Framework", Australian Bureau of Statistics, November 2015

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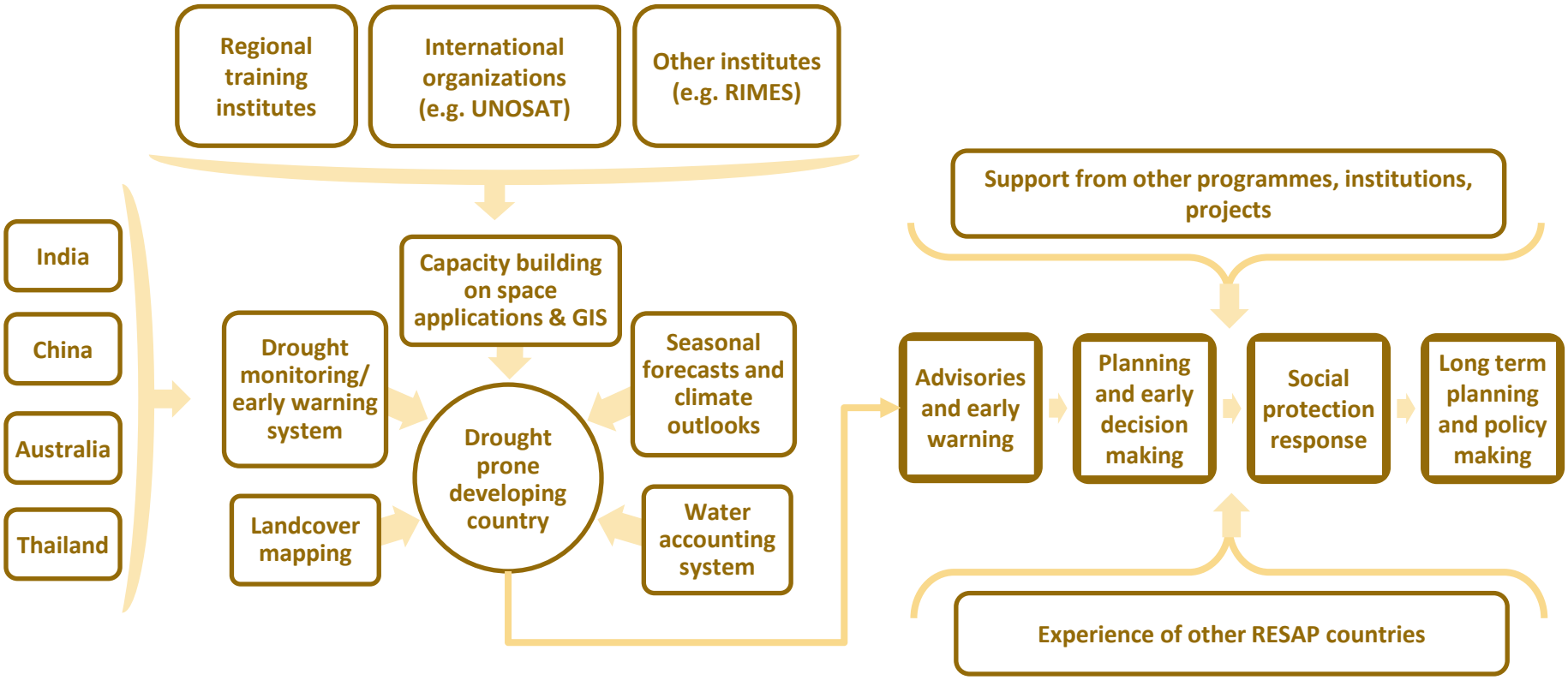
Regional Drought Mechanism

For effective decision making on drought management in the spirit of regional cooperation



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Other Useful Sources

- http://ceos.org
- http://www.eohandbook.com
- http://www.earthobservations.org/index.php
- http://www.geoglam.org/index.php/en/
- http://www.gfoi.org

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THANK YOU

Tae Hyung KIM

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ICT and Disaster Risk Reduction Division

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