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Cities of the Future: Smart, Resilient and Sustainable

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Session 4:
Smart, Resilient, and Sustainable Cities: Cooperation and Partnerships

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Sustainable Urban Development

Cities are hubs for commerce, science, productivity, social, human and economic interactions. Urban planning, transport systems, water and sanitation, waste management, disaster risk reduction, access to information, poverty reduction, education and capacity building are interconnected with sustainable urban development.

2030 Agenda for Sustainable Development

Make cities and human settlements inclusive, safe, resilient and sustainable

- Implicit in the SDG logic is that Goals, Targets, & Indicators depend on each other
- Cities have a notable, cross-cutting role among many of the other SDGs with economic, social, energy, science, and technology outputs
- For example, there are notable linkages between Goal 11 and Goal 5, which aims to *achieve gender equality and empower all women and girls*, as well as Goal 3 on *good health and well being*

Explicit links between the 2030 Agenda for Sustainable Development & Sendai Framework for Disaster Risk Reduction

Credit: UNISDR

- Aligning these monitoring frameworks to help achieve sustainable urban development is a great accomplishment, and presents huge opportunities, as well as many challenges.
- It also highlights the importance of bringing together information producers, users, and policy makers, engaging communities, strengthening interagency activities, and enhancing national, regional, and global collaboration and partnerships.
- Earth observations can help enable such linkages by promoting equity, welfare, and shared prosperity for all levels of human settlement and fostering national urban planning.

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Sustainable Development Goals

Earth Observations in Service of the *Agenda 2030*

Target — *Contribute to progress on the Target yet not the Indicator per se*								*Goal*	*Indicator* — *Direct measure or indirect support*				
						1.4	1.5	1	1.4.2				
					2.3	2.4	2.c	2	2.4.1				
				3.3	3.4	3.9	3.d	3	3.9.1				
								4					
							5.a	5	5.a.1				
	6.1	6.3	6.4	6.5	6.6	6.a	6.b	6	6.3.1	6.3.2	6.4.2	6.5.1	6.6.1
				7.2	7.3	7.a	7.b	7	7.1.1				
							8.4	8					
				9.1	9.4	9.5	9.a	9	9.1.1	9.4.1			
					10.6	10.7	10.a	10					
11.1	11.3	11.4	11.5	11.6	11.7	11.b	11.c	11	11.1.1	11.2.1	11.3.1	11.6.2	11.7.1
			12.2	12.4	12.8	12.a	12.b	12	12.a.1				
				13.1	13.2	13.3	13.b	13	13.1.1				
	14.1	14.2	14.3	14.4	14.6	14.7	14.a	14	14.3.1	14.4.1	14.5.1		
15.1	15.2	15.3	15.4	15.5	15.7	15.8	15.9	15	15.1.1	15.2.1	15.3.1	15.4.1	15.4.2
							16.8	16					
17.2	17.3	17.6	17.7	17.8	17.9	17.16	17.17	17.18	17	17.6.1	17.18.1		

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EO4SDGs

THE GLOBAL GOALS For Sustainable Development

11 SUSTAINABLE CITIES AND COMMUNITIES

- EO can contribute to progress of eight Targets
- Five Indicators can be measured or supported by EO

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Urbanization

11 SUSTAINABLE CITIES AND COMMUNITIES

11.3 *By 2030,* ***enhance inclusive and sustainable urbanization*** *and capacity for participatory, integrated and sustainable human settlement planning and management in all countries*

- Indicator 11.3.1 *Ratio of land consumption rate to population growth rate* **(Tier II, Custodian agency: UN-Habitat, Other: UNEP, UNDP)**

- The value of satellite-based EO data to monitor land cover change is acknowledged in the stakeholder comments.

UN-HABITAT

NASA Partnerships in support of SDGs

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NASA- GEO Activities:

- **Colombia**

- ❑ On March 30, the GEO EO4SDGs Initiative (co-led by NASA-JAXA-INEGI) along with GPSDD & Colombia's National Statistical Office (DANE) co-organized a workshop, *Towards Integration of National Statistics and Earth Observations for SDG Monitoring* in Bogota, Colombia.

- ❑ Identified SDGs for focus included Goal 6 – Clean Water and Sanitation, **Goal 11** – Sustainable Cities and Communities, and Goal 15 – Life on Land.

- ❑ Colombia has already used EO to calculate Indicator 11.3.1 & to monitor forest cover extent and change, as well as soil erosion.

- ❑ Since 2015, Colombia has established an inter-agency coordination mechanism on data needs for the SDGs, comprised of 7 national government entities

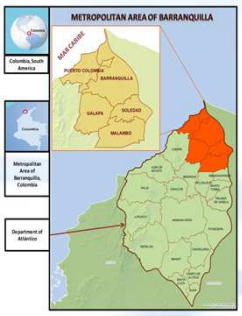
Integration of EO & Statistics in Colombia

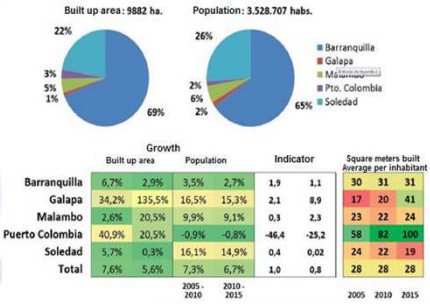
$$\textit{Indicator}\ 11.3.1 = \frac{Urban\ land\ \ consumption\ \ rate}{Population\ \ growth\ rate}$$

- Used Landsat data for the years 2000, 2005, and 2015, and Google Earth Engine platform to optimize processing and classification of images.
- Calculated 11.3.1 across six metropolitan, and 151 urban, areas

What follows:

- Expand 11.3.1 calculation in other urban agglomerations to meet the 'leave no one behind' commitment
- Algorithm development access to tools, such as the CEOS data cube, for DANE
- Enhance access to quality images, storage and processing of large volumes of data





	Growth Built up area		Growth Population		Indicator		Square meters built Average per inhabitant		
	2005 - 2010	2010 - 2015	2005 - 2010	2010 - 2015	2005 - 2010	2010 - 2015	2005	2010	2015
Barranquilla	6,7%	2,9%	3,5%	2,7%	1,9	1,1	30	31	31
Galapa	34,2%	135,5%	16,5%	15,3%	2,1	8,9	17	20	41
Malambo	2,6%	20,5%	9,9%	9,1%	0,3	2,3	23	22	24
Puerto Colombia	40,9%	20,5%	-0,9%	-0,8%	-46,4	-25,2	58	82	100
Soledad	5,7%	0,3%	16,1%	14,9%	0,4	0,02	24	22	19
Total	7,6%	5,6%	7,3%	6,7%	1,0	0,8	28	28	28

- Overcome limitations due to presence of clouds
- Useability of global datasets in mapping urbanization (GUF+, GHSL)
- Other Indicators (e.g., 11.7.1)

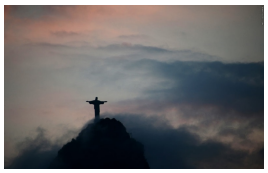
Credit: DANE, Colombia

NASA-Rio de Janeiro Partnership

Goals of Collaboration:

- NASA's Earth Science Division & the Rio de Janeiro mayor's office signed an agreement in December 2015, to support innovative efforts to better understand, anticipate, and monitor natural hazards and climate change impacts around the city.
- Leverage unique and complimentary attributes of NASA's satellite data systems and Rio de Janeiro's monitoring and crisis management capabilities
- Collaborate on joint activities that:
  - ✓Advance capabilities for improved situational awareness of hazards within the Mayor's Office in Rio de Janeiro
  - ✓Advance the use & application of NASA Earth Science data
  - ✓Communicate about the use of Earth Science data within Rio de Janeiro with the public and educators/students in Brazil

Rainfall/Landslides



Climate change impacts

Thematic Areas

Air/Water Pollution

Education/Outreach

Rainfall and Mass Movements

Goals and status of partnership

- Collaborate on improving Rio's landslide alert capabilities
- Enhance online alert system http://alertario.rio.rj.gov.br/
- Improve the landslide inventory and mapping in the Rio area
- Evaluate and validate NASA precipitation estimates over the greater Rio area
- Evaluate regional susceptibility maps developed by NASA

Rainfall and Mass Movements: available data and resources

NASA data and resources

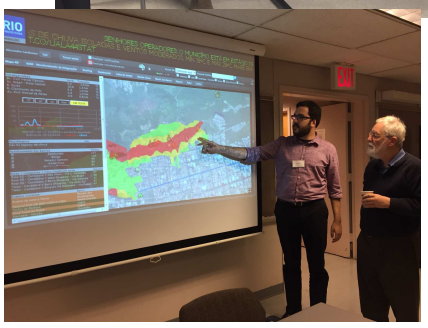
- Satellite precipitation data from the TRMM and GPM satellites is available at 0.1 degree resolution globally
- Global Landslide Catalog with over 130 landslides reported in the greater Rio area
- Global susceptibility map at 1km
- Open source threshold-based landslide "nowcasting" system that can be shared with Rio or customized for this region
- Expertise in rainfall analysis and regional landslide modeling

Rio data and resources

- 33 Rain gauges throughout the city that operate at 15 min. intervals
- Landslide inventory
- Regional landslide susceptibility map
- High resolution elevation from LIDAR
- Local expertise in geological and climatic setting of the region, mass movement issues throughout the city, hotspot areas for landslide activity

NASA-Rio Workshop on Climate Change Impacts

As part of the NASA-Rio agreement, 10 representatives from offices across the Rio City Government participated in a 3-day interactive training workshop with NASA GISS, GSFC and Columbia University scientists on the topics of Sea Level Rise, Urban Heat Islands, and Water Quality. There was a science policy discussion with the NYC Mayor's office, C40 initiative, Rio, and NASA (right), science presentations for the three thematic areas (bottom), and a demonstration of the advanced City Operations Center in Rio (bottom, right).



Private –Public Partnerships

NASA + Microsoft

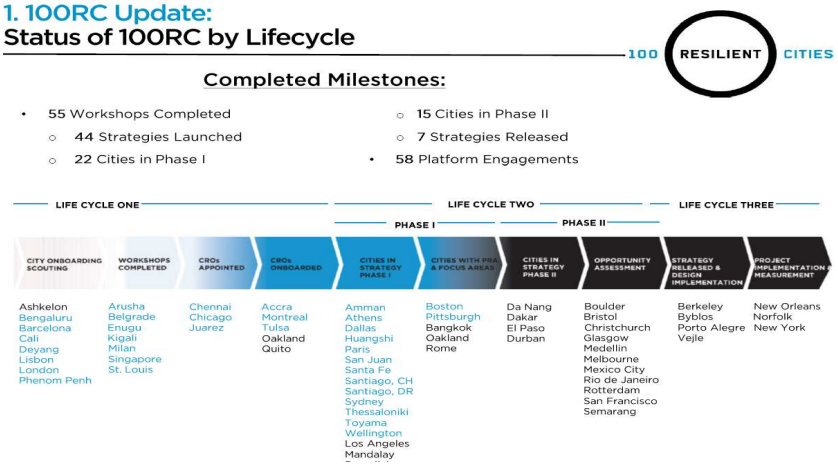
- NASA + Microsoft partnership (agreement pending) will focus in-part on urban resiliency
- Motivation: Explore the integration of technology (e.g., cloud-based services, Internet of Things) and Big Data (e.g., NASA Earth observations and model output) advances to support data-based approaches to inform and enhance decisions on long-term planning around infrastructure and resiliency investments

NASA + Microsoft workshop on urban resiliency

Objective
Utilize partnerships (1) as an amplifier of NASA Earth Science Division's work and (2) to create new understanding of the Earth system and societal benefits that essential leverage the resources and expertise of both NASA and the partner to achieve what neither group could alone

Additional Initiatives

100 Resilient Cities (100RC), pioneered by the Rockefeller Foundation is dedicated to helping cities around the world become more resilient to the physical, social and economic challenges that are a growing part of the 21st century.



Goal 17, *Strengthen the means of implementation and revitalize the global partnership for sustainable development*

- Achieving sustainable urbanization requires revitalized and enhanced partnerships from local to national, regional, and global levels, which aim to bring together governments, civil society, the private sector, the United Nations system and other actors, and mobilize all available resources.

Thank you!

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EO4SDGs

THE GLOBAL GOALS For Sustainable Development

Extra Slides

NASA and Rio de Janeiro work together to address climate impacts and extreme events at the city level

NASA's Earth Science Division and the Rio de Janeiro mayor's office signed an agreement in December 2015, to support innovative efforts to better understand, anticipate, and monitor natural hazards and climate change impacts around the city.

Through this partnership, NASA scientists and representatives from the Rio de Janeiro city government met at NASA GISS for a 3-day technical exchange and workshop on the topics of sea level rise, urban heat islands, and water quality from Nov. 14-16th.

As part of this workshop, Dalia Kirschbaum (NASA GSFC), Cynthia Rosenzweig (NASA GISS), Dan Bader (Columbia University), Felipe Mandariano (Rio City Government) and Susanne DesRoches (New York City Mayor's office) participated in a Facebook Live event in southern Manhattan that has been viewed by 88k people. A feature story and short video were also released the same day, Nov. 16th. 2016

NASA-Rio Outreach Webinars

As part of a NASA-Rio agreement signed in December 2015, NASA GSFC conducted three outreach webinars in partnership with the Rio de Janeiro city government, led by the city's planetarium. A series of three webinars featured science talks on the main focus areas of this partnership: climate impacts, extreme events, water and air quality, and education/outreach.

The three webinars were conducted in Portuguese and were recorded. In addition, several NASA videos and educational material were translated into Portuguese and shared with a broad network of schools within Rio. All information and materials on the partnership can be found in English and Portuguese at: http://science.gsfc.nasa.gov/610/applied-sciences/nasa_rio_partnership.html

https://svs.gsfc.nasa.gov/11877