



FORUM

Think Tank Basilicata

Energie per un futuro sostenibile

Matera, Palazzo Viceconte
30 gennaio 2019

PRESENTAZIONE DI
MASSIMO CLAUDIO COMPARINI



The European House
Ambrosetti

MANUFACTURING THE SPACE ECONOMY

It may seem far-fetched now, but a Space Economy is on the rise and some of the world's technology leaders are investing in

MINING, SUPPLY CHAINS, MANUFACTURING, IN SPACE

MAY 2012

IMPROVED ROCKET DESIGN
Blue Origin completes review of Moon-shaped spacecraft

JUNE 2013

SPACE CURRENCY
PayPal Galactic is created as a payment system for space tourists

2013 SPACE ACTIVITY

\$314.17 Billion TOTAL

- \$122.58 Billion Commercial Space Products & Services
- \$117.49 Billion Commercial Infrastructure & Support Industries
- \$41.26 Billion U.S. Government Space Budgets
- \$32.84 Billion Non-U.S. Government Space Budgets

2016

SPACE TOURISM
Virgin Galactic plans to launch SpaceShipTwo for tourist flights

SATELLITES

2013

SATELLITE LAUNCHES INCREASED BY OVER 60%
Microsatellite launches increase the ease of sending satellites into orbit for private companies

JUNE 2014

DIG INVESTMENT IN SATELLITES
Google announces plans to spend billions to expand the Internet by investing in SpaceX

JUNE 2014

RUSSIA JOINS NEW SPACE ECONOMY
Russia launches private satellites

JAN 2015

MOORE INTERNET SATELLITES
Virgin Galactic partners with Qualcomm to launch a fleet of 648 micro satellites

TODAY...
About 1,100 operational satellites orbit Earth:

- GPS
- TELECOMMUNICATIONS
- WEATHER FORECASTING
- DEFENSE
- AGRICULTURE

SPACE STATIONS

SATELLITES
Virgin Galactic partners with Qualcomm to launch a fleet of 648 micro satellites

SPACE STATIONS

Manned space stations can be used for manufacturing, strategic management outposts for businesses, refueling and tourism.

MANUFACTURING IN SPACE BEGINS

A 3D Printer on the International Space Station (ISS) prints its first 3D Part

BENEFITS OF MANUFACTURING IN SPACE...

- Fabricating Large, Delicate, Structures
- Weightless Environments
- Recycling Waste Resources

LUNAR BASE

An outpost on the moon will be an essential production hub with cheaper low-gravity launches and as a

OCT 2010

GROWING FOOD ON THE MOON

Collapsible greenhouses deploy in 10 minutes and grow vegetables in 30 days

JAN 2015

3D PRINTING MOON BASE TESTING

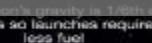
Foster + Partners teams up with the European Space Agency to test 3D Printing Moon-bases

2017

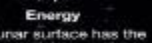
CHINA PLANS TO LAND ON THE MOON

China prepares for a soft landing to collect moon rock

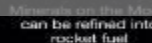
Transport
The moon's gravity is 1/6th of Earth's so launches require less fuel



Energy
The lunar surface has the raw materials to make a solar panel farm and sustain nuclear fusion



Fuel
Missions on the Moon can be refueled into rocket fuel



Life
The basic necessities for human life - air and water - can be derived from lunar soil



PROBES

Probes will be the messengers of supply chain risks and opportunities.

China prepares for a soft landing to collect moon rock

PROBES

Probes will be the messengers of supply chain risks and opportunities.

FEB 2000

SPACECRAFT ORBITS & LANDS ON ASTEROID

Rosetta's Philae probe lands on Comet 67P

NOV 2014

ROSETTA'S PHILAE PROBE LANDS ON COMET 67P

2015

ASTEROID PROSPECTING OPERATIONS BEGINS

Deep Space Industries (DSI) to search for space-mining targets near earth for sample collection

SPACE MINING

Autonomous robots aboard mining rigs will extract water, methane, and oxygen for manufacturing

2017

TARGETS IDENTIFIED

Planetary Resources hopes to identify potential asteroids

2020

ASTEROID MINING TARGETS

Based on Asteroids targeted by DSI and Planetary Resources crafts

JUNE 2013

SPACEX FIRMS FIRST SPACE OF THE WORLD'S FIRST REUSABLE ROCKET: FALCON 9

Elon Musk, CEO of Tesla and SpaceX, believes that colonizing Mars is the key to humanity's future

2020

NASA ROVER ASSESSES HABITABILITY

The Mars 2020 rover explores to assess Mars surface habitability

2025

FIRST MARS CRAWL ANDS

Nonprofit Mars One aims to land the first human crew on Mars

SPACE PROBES WILL NOT NEED...

COOLING FANS
The vacuum of space will keep technology cool

FUELING STATIONS
Fuel can be mined from asteroids

LARGE BATTERIES
The sun can be used as a source of energy

THE TECHNOLOGIES FOR SPACE ACCOUNT FOR THEIR UNIQUE ENVIRONMENT

BENEFITS OF ASTEROID MINING ARE...

ABUNDANCE
An average sized asteroid is about 50 meters wide and can contain + 500 billion m of water - \$130 billion in minerals

PROFITABILITY
The global metals and mining industry is \$3 trillion - air IS asteroids - 9,000 asteroids orbit near earth that are 150+ feet in diameter

SAFETY
Asteroid mining will be conducted by autonomous robots, reducing cost and human risk

ENVIRONMENT
Space mining would reduce the negative environmental impacts of on-earth mining

MARS



EYES ON THE EARTH

Massimo c comparini
@massimoc_square

THE SPACE SECTOR ...

- ... always regarded as highly strategic, beyond what its economic and industrial dimension would allow nowadays put forward by emerging regional / global powers. First developed in the ex USSR and USA, still the dominant player(s) today, then in the main European countries (among them Italy, 3rd country in the world to put a satellite in orbit), today strong expansion in many other countries and new space powers (China, India, Korea, ...)



THE SPACE SECTOR ...

- The acquisition and development of space capabilities remains a highly **attractive strategic goal** and the number of countries and companies investing in space technologies, space systems and their **downstream applications continues to grow**. Space often has a reputation for being expensive, but national investments represent only a very small percentage relative to GDP in all G20 countries.
- The global space sector is a high-technology niche with a complex ecosystem, which employs about a million **persons around the world** including public administrations (space agencies, space departments in civil and defence-related organisations), the **space manufacturing industry** (launchers, satellites, ground systems); direct suppliers to this industry (components), and the **wider space services sector** (commercial satellite telecommunications, navigation and raising earth observation).



Space Democratization - #space4sdgs

- Decreased costs, increased capabilities and path breaking innovations
- earth observation satellites more relevant to businesses and public good
- The ability of satellites to transform businesses and quality of life today is more relevant than ever, space technologies expand at an exponential speed
- This dynamic is known as “democratization of space”,



New space race where the players, technology, and services are as diverse as it is innovative and space technologies contribute to a sustainable development of our planet

WE SCAN THE EARTH

The Space Sector – from exploration to SDGs

- The Space sector has contributed to open new technological frontiers due to the extreme and demanding nature of **operating in deep space environment** as well as today's to address new missions and innovative requirements and **new** markets (space assets themselves, “fall out” markets)



from Pixel to Information to Knowledge

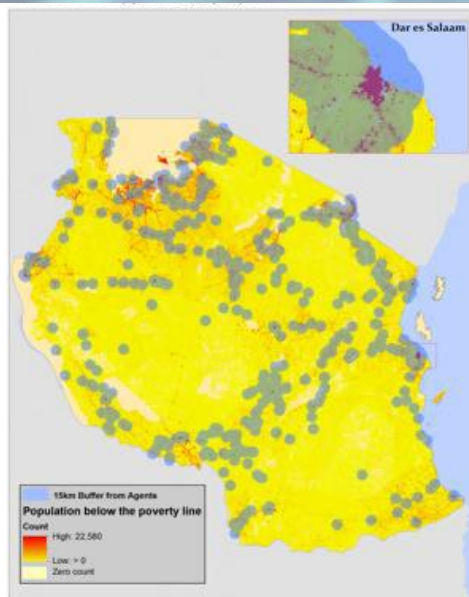


Figure 4: Spatial distribution of poor people relative to mobile money agents in Tanzania

Map of poverty

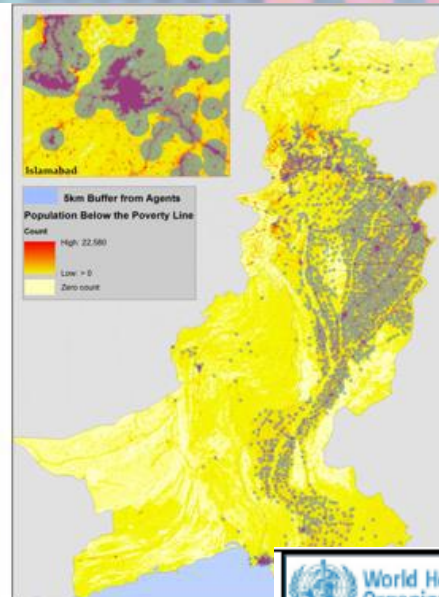


Figure 5: Spatial distribution of network of mobile money agents



Health Assessment tool

World Health Organization
INDICATOR MAPS
2012-2014
Romania
Select an indicator: Overall Malaria Risk Profile
AREA | TOTAL POP. | RISK LEVEL

AREA	TOTAL POP.	RISK LEVEL
Bucovina	65	VERY
Buzu	25	VERY
Arad	24	VERY
Bene	AVAIL.	AVAIL.
Bihar	37	VERY
Bistrita-Nasaud	42	VERY
Botosani	34	VERY
Braşov	40	VERY
Braşov	37	VERY
Bucarest	AVAIL.	AVAIL.
Buzau	31	VERY
Cluj	40	VERY
Constanta	41	VERY
Covasna	10	VERY
Dejulesti	10	VERY
Galati	47	VERY
Giurgiu	10	VERY
Giurgiu	AVAIL.	AVAIL.
Iasi	38	VERY
Marghita	10	VERY
Mehadia	26	VERY
Motru	AVAIL.	AVAIL.
Sibiu	37	VERY
Sibiu	30	VERY
Sibiu	10	VERY
Suceava	10	VERY
Targoviste	38	VERY

from Pixel to Information to Knowledge



THE GLOBAL GOALS
For Sustainable Development

2 NO HUNGER



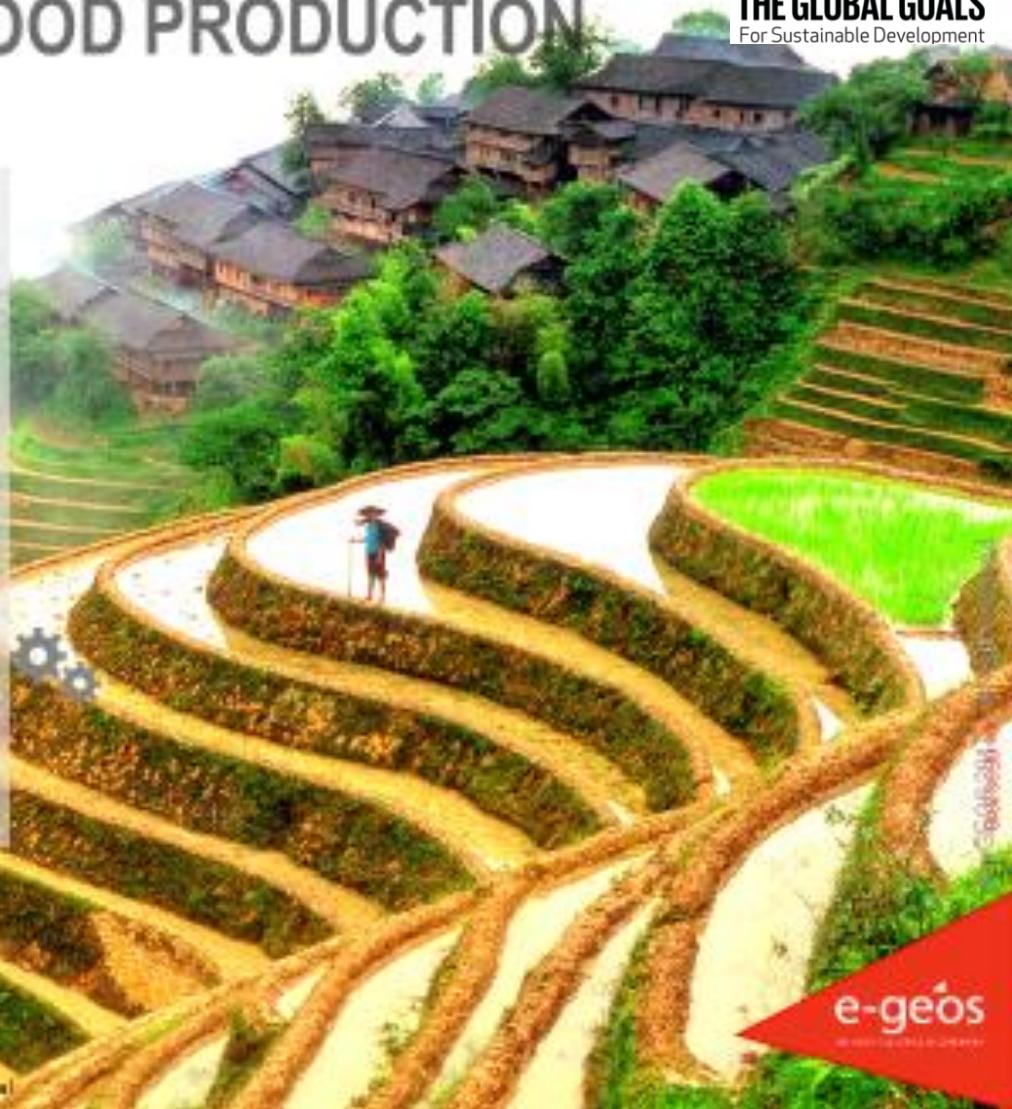
*sustainable
and
productive
agriculture*

AGRICULTURE AND FOOD PRODUCTION

AgriGeo

For supporting governments and farmers in the management of the agricultural and food activities, as well as the crop lifecycle

- Precision farming analysis
- Crop monitoring reports, acreage and crop yield assessment, for early estimation, analytics monitoring services
- Agro-Environment Geo-Information Products
- Services of crop monitoring for claim management, funding/subsidies management, production processes

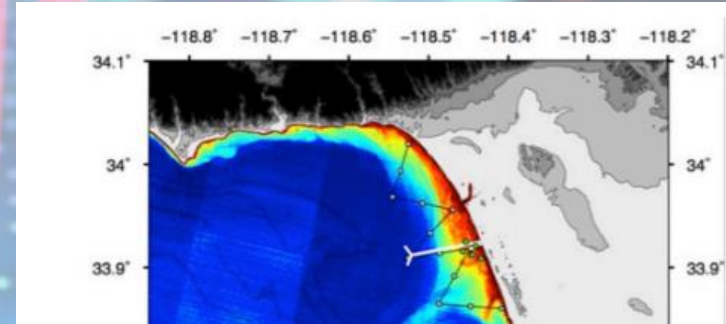
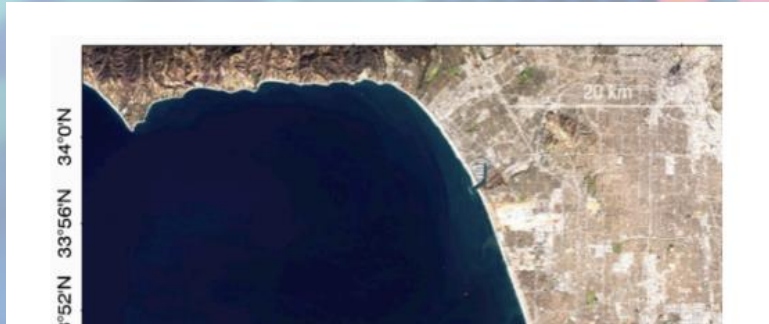


e-geos

from Pixel to Information to Knowledge



6 CLEAN WATER AND SANITATION



Water quality assessment

Water Leakage map

The product for water leaks detection for aqueduct infrastructure based on satellite analysis using L Band radar

The technique

- “Oh semi-empirical model” using L-band SAR Quad Pol data (ALOS-2 $\lambda \approx 24cm$)
- The detection is based on the contrast between the dielectric properties of liquid water ($\epsilon \approx 80$) and dry soil ($\epsilon \approx 6$)
- Quality controls using optical VHR data

What?

A WL map is generated associating areas with higher moisture level to the aqueduct network.

Water leakage

from Pixel to Information to Knowledge



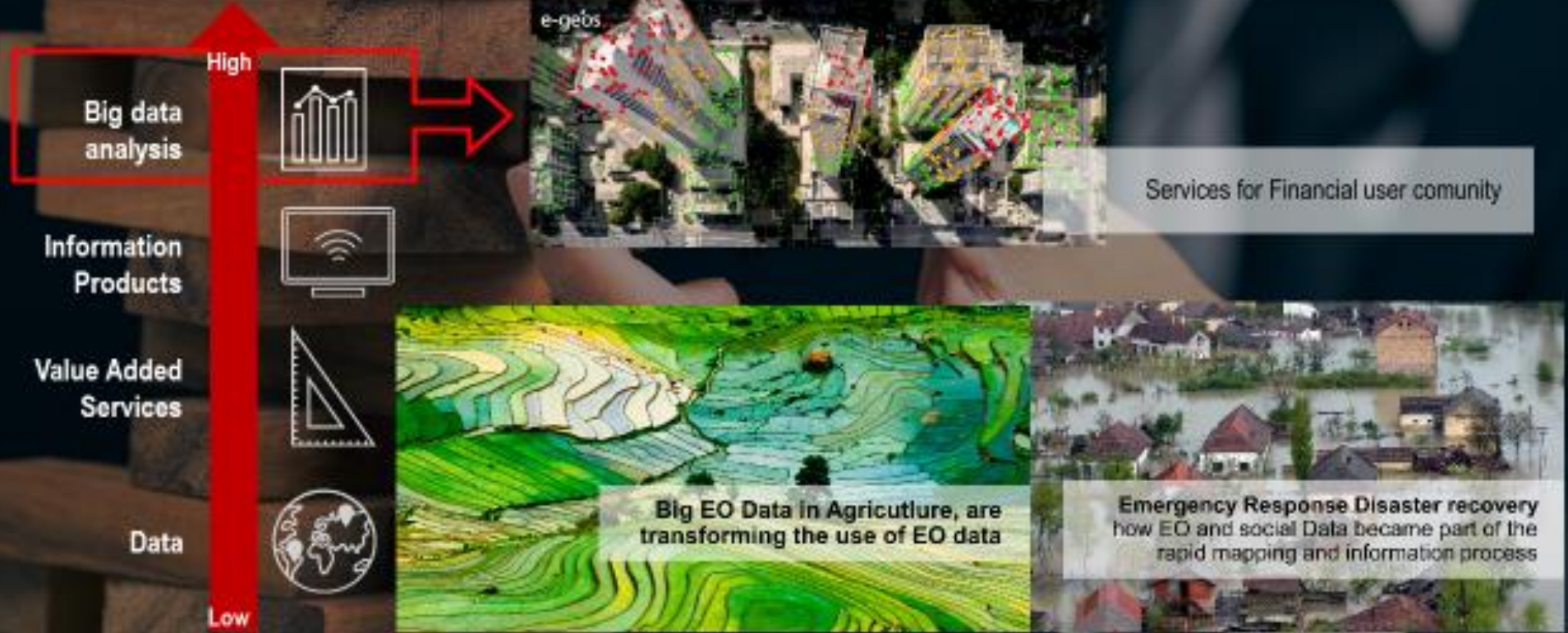
8 GOOD JOBS AND ECONOMIC GROWTH

9 INNOVATION AND INFRASTRUCTURE

THE VALUE CHAIN FOR THE NEW VALUE ADDED SERVICES

More value addition/processing to the raw data

EO innovative services to address downstream space economy

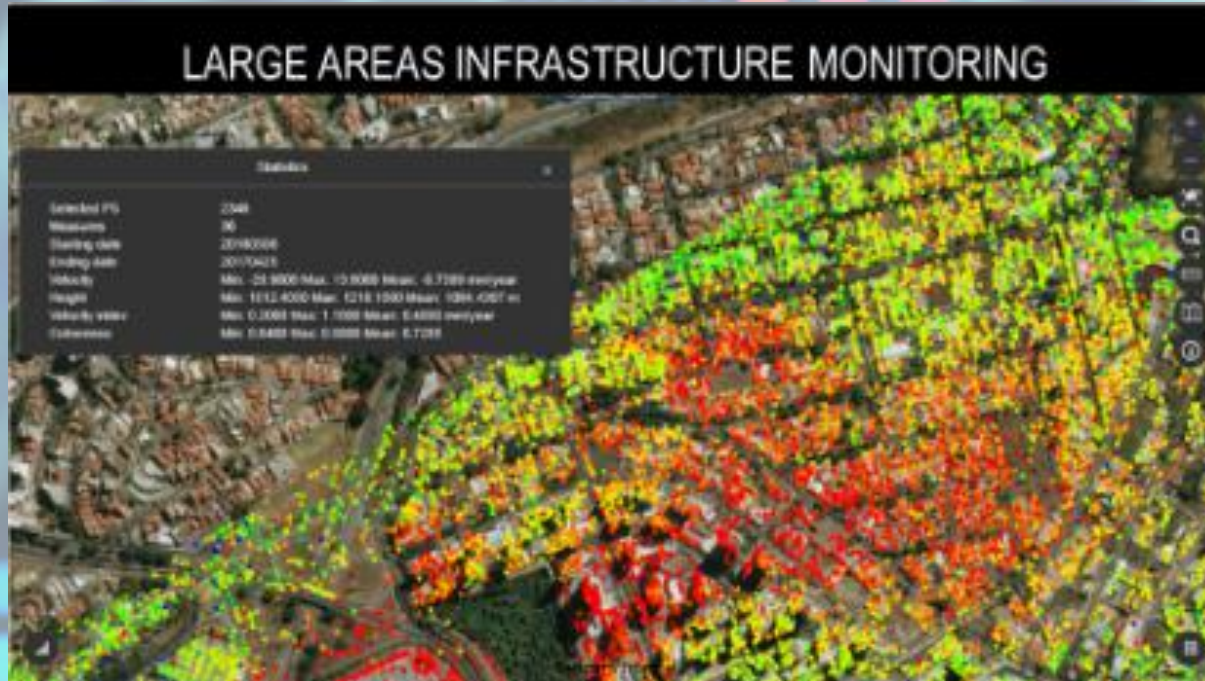


Massimo C Comparini – Ground Services for Constellations Telespazio Workshop June 2018

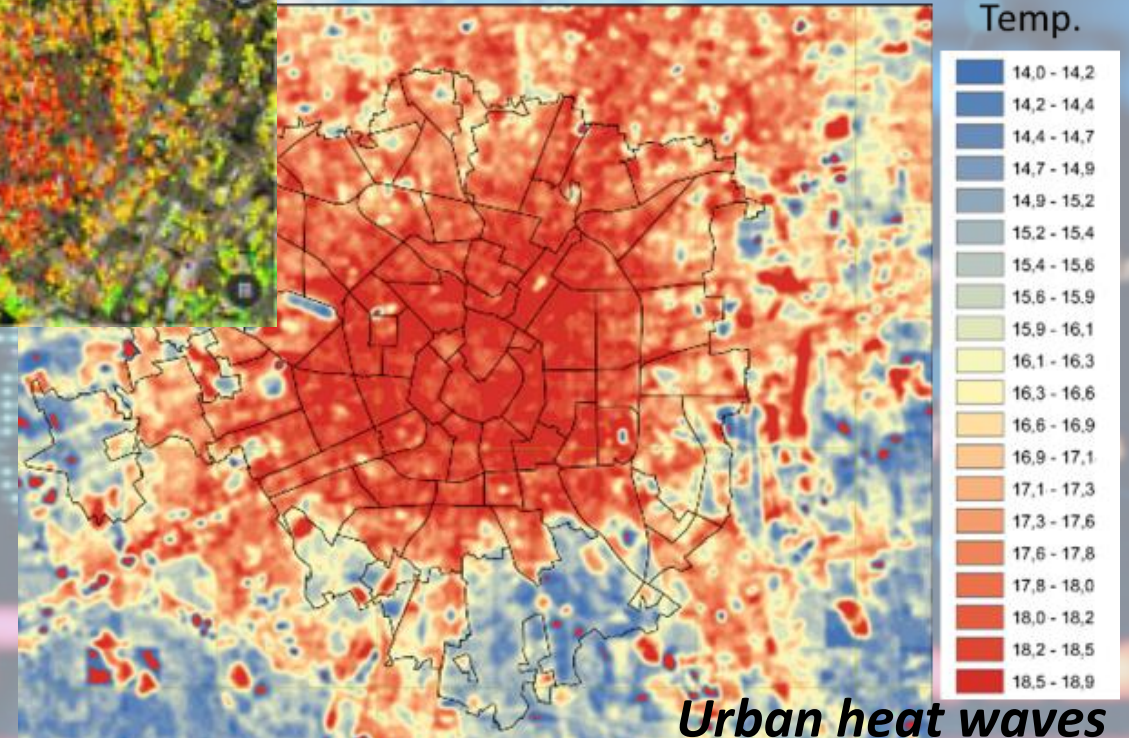
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11 SUSTAINABLE CITIES AND COMMUNITIES



Advanced cities smart monitoring

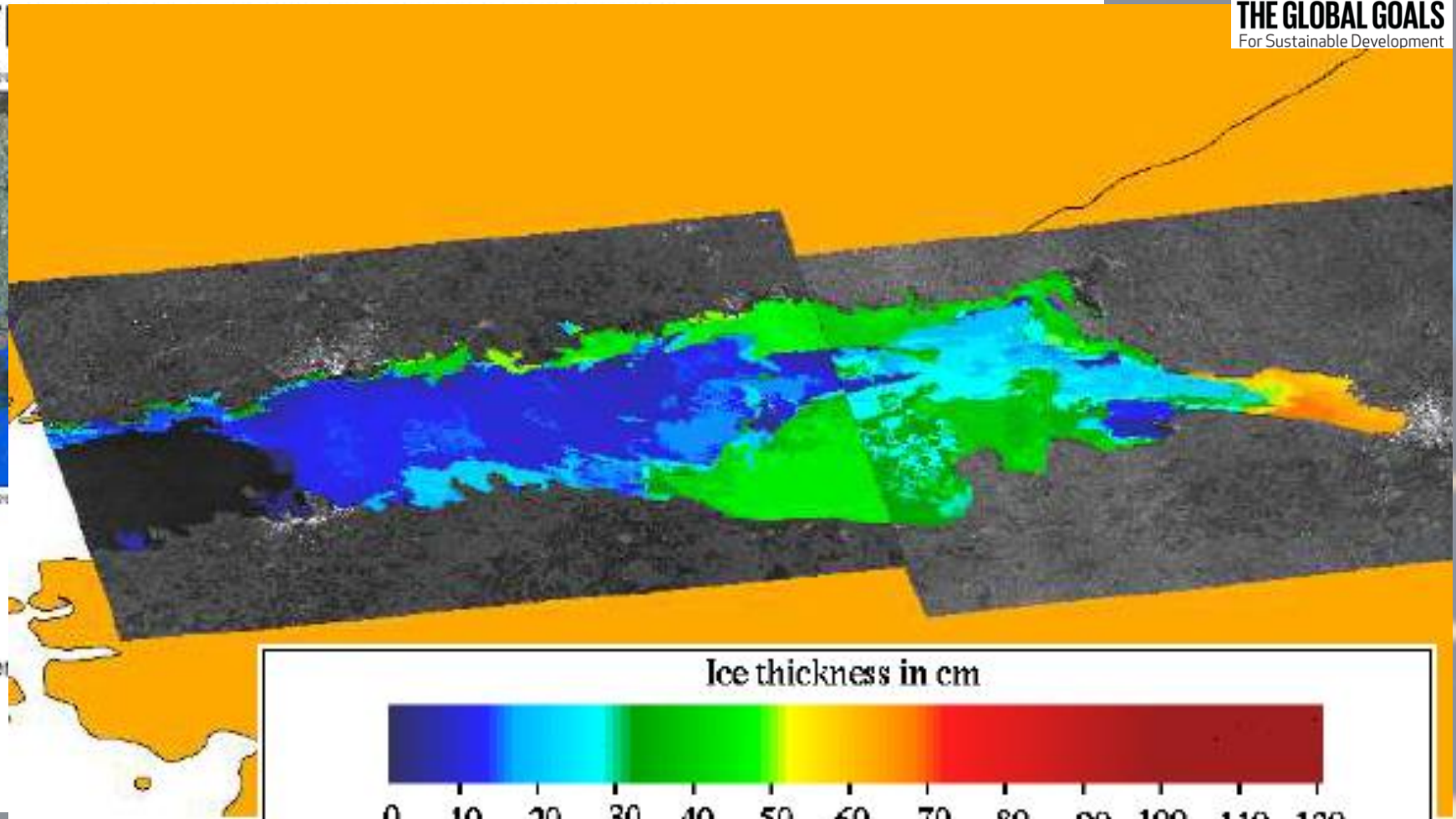


from Pixel to Information to Knowledge



THE GLOBAL GOALS
For Sustainable Development

13 CLIMATE ACTION

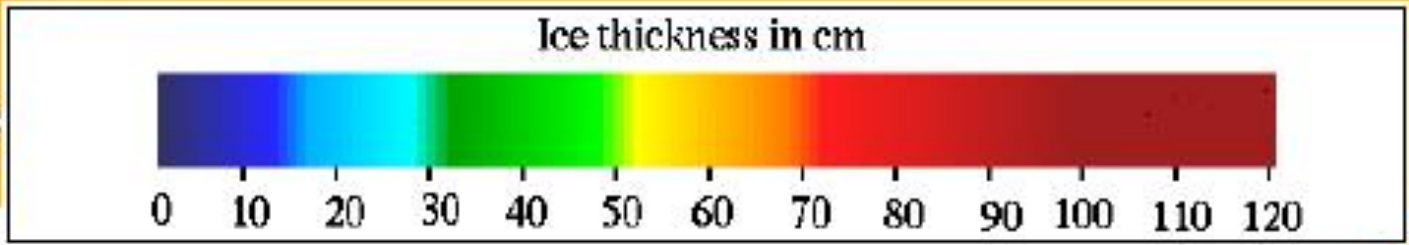


200+

Images Acquired

70+

Products generated
delivered



EO for understanding climate change dynamic and to counteract the effects

from Pixel to Information to Knowledge



Environment and Climate Change

EO for understading climate change dynamic and to counteract the effects

e-geos

WE SCAN THE EARTH

WE MONITOR THE CHANGES

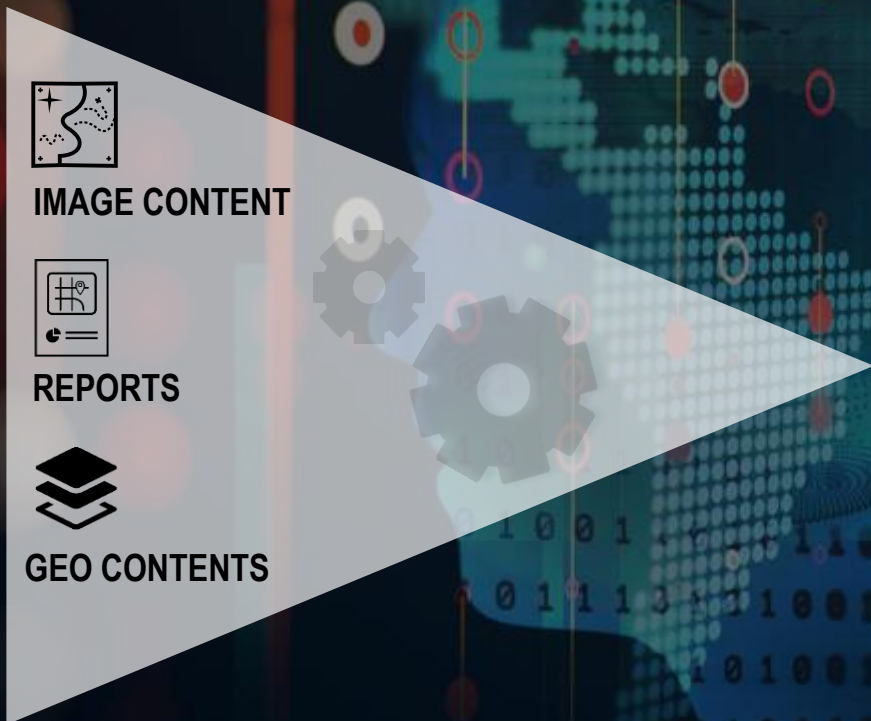
WE GIVE MAPS & REPORTS

Space and Democratization

From data 

Generating information 

To customized platforms 



LAND

DEFENCE

MARITIME

AGRICULTURE

EMERGENCY

ENVIRONMENT

Space and Democratization

From data



Generating information



To customized Information Products and BDA



Orbital Insight

Orbital Insight Data Now Available on the Bloomberg Terminal

Bloomberg Terminal

July 18, 2018 07:00 ET | Source: Or

PALO ALTO, Calif., July 1 U.S. Consumer Retail pro 80 U.S. retailers. Year-ove

"The financial services ind source that brings addition integration, we can better

Subscribers can download traditional investment met

REPORT ON REFINERY OIL TANKS STORAGE - WEEK 51/1

REPORT ID: 004010-10017
 MEASURE DATE: December 19, 2018
 MEASURING TIME: 01:55 UTC
 SITE ID: 013
 N° TANKS: 17
 RELEASED: December 21, 2018

REFINERY: SIMES (P)

Orbital Insight @orbital_insight · 29 Jun

Ahead of last week's #OPEC meeting, Orbital Insight launched the first ever Global Geospatial Crude Index (GCI), a single number reporting global #crudeoil inventory

Product: Tweet

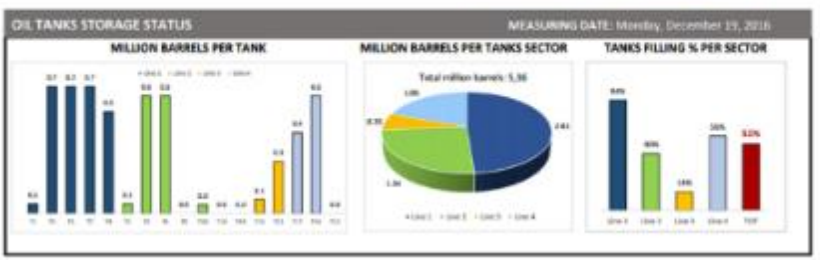
The New World of Tracking Oil Inventories After OPEC's June 2018 M...
 The energy world looks to Vienna this week as OPEC and non-OPEC oil producers gather on June 22 for the 174th OPEC Meeting. The keynote...
 medium.com

URSA Ursa Space @UrsaSpace · 3 Jul

Post #OPEC+ #crudeoil inventory insights, now up on the blog. [hubs.ly/1DcWslc0](#)
 #OPEC #GEONINT #OCTI

Track: Tweet

Total OPEC Inventory (mmbbls)



Space Democratization

first space wave

Space as Political
Power
Cold War



moon
landing
1969

JFK Speech
1962

2nd space wave

Science and
Exploration
Early
Communications



1979

Navstar 1
1978

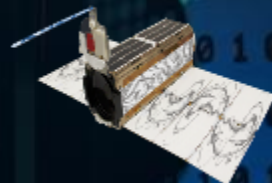


3rd space wave

DAB DBS
HTS
Comms LEO/MEO
Earth Observation
Navigation
Systems

mid 90's

mid 2010's



4th space wave

Democratization
Sharing Economy
In Space

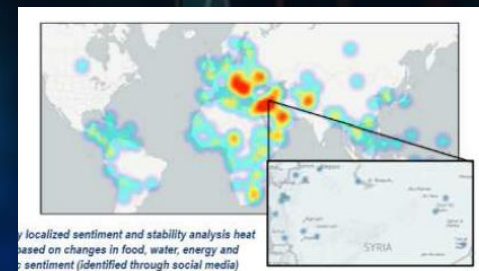
2007-
2010



Earth Digital Twin



Pattern of life



@massimoc_square

The Economist

Data, data everywhere


A special report on managing information
February 27th 2010

ics ▾ Current edition More ▾

Regulating the internet giants

The world's most valuable resource is no longer oil, but data

The data economy demands a new approach to antitrust rules



Digital Transformation Monitor

Big Data in Earth Observation

DEFENSE & INTELLIGENCE

An aerial photograph of a satellite ground station facility in a vast, arid desert landscape. The facility consists of several large, rectangular buildings, a central parking lot with several cars, and several large satellite dish antennas. The terrain is flat and brown, with some sparse vegetation. In the background, there are low hills and a clear sky. The text 'e-geos' is overlaid on the image, with the 'e' and 'geos' in white and the 'o' in red.

e-geos

IS A GLOBAL LEADER
IN GEOINFORMATION
APPLICATIONS AND SERVICES

e-geos

EYES ON THE EARTH
