German Aerospace Center (DLR)

Capacity Building and Data Democracy – Relevant DLR Activities

WGCapD-2 Annual Meeting, Frascati, Italy

Dieter Hausamann

March 4, 2013

Outline

1. **DLR – Agency Profile 2013**

2. **DEM Data: SRTM &TanDEM**
   - Sensor & Missions
   - Data

   a. SRTM X-SAR
   b. TanDEM-X (90 m/30 m/12 m)

3. **Applications, Data Products & Services**
   - Software
   - Models
   - Applications
   - Data Products
   - Services

   c. NPP/BETHY
   d. ENERGO
   e. ENDORSE
   f. Bio Energy Atlas
   g. WASCAL/SASSCAL
   h. WISDOM

4. **Education Programs Synergies**

   i. DLR – ESA (#9)

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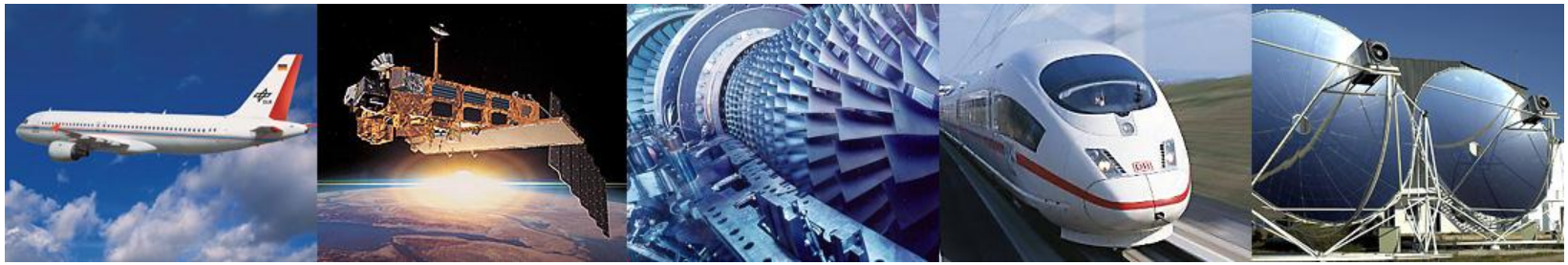
   i. DLR – ESA (#11)

DLR
German Aerospace Center

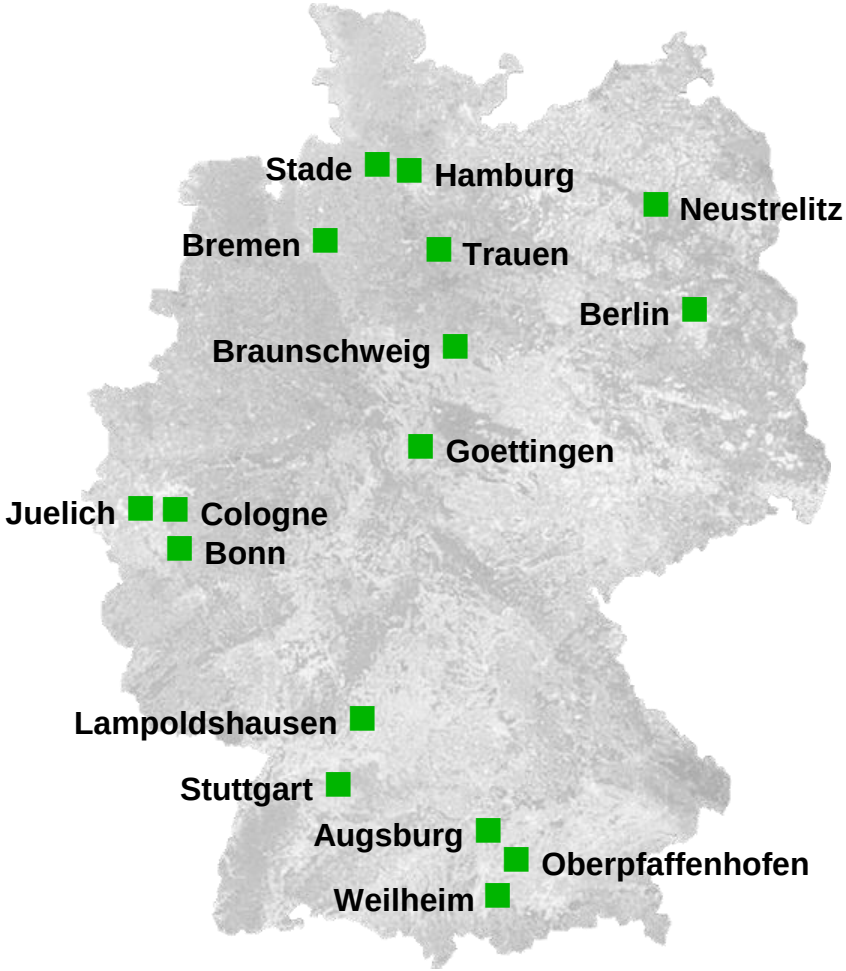


- Research Institution
- Space Agency
- Project Management Agency

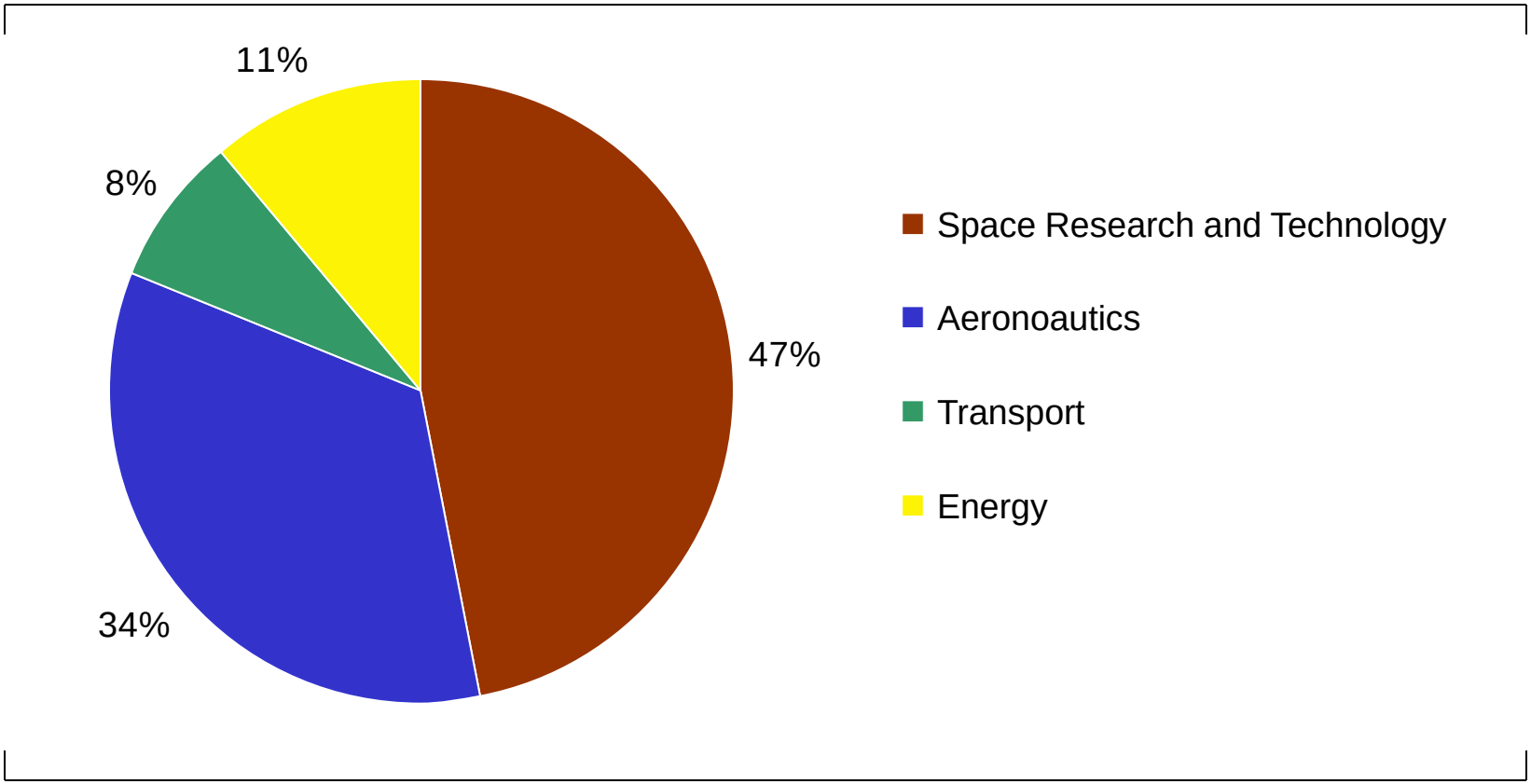
Locations and employees

7000 employees across
32 institutes and facilities at
16 sites.

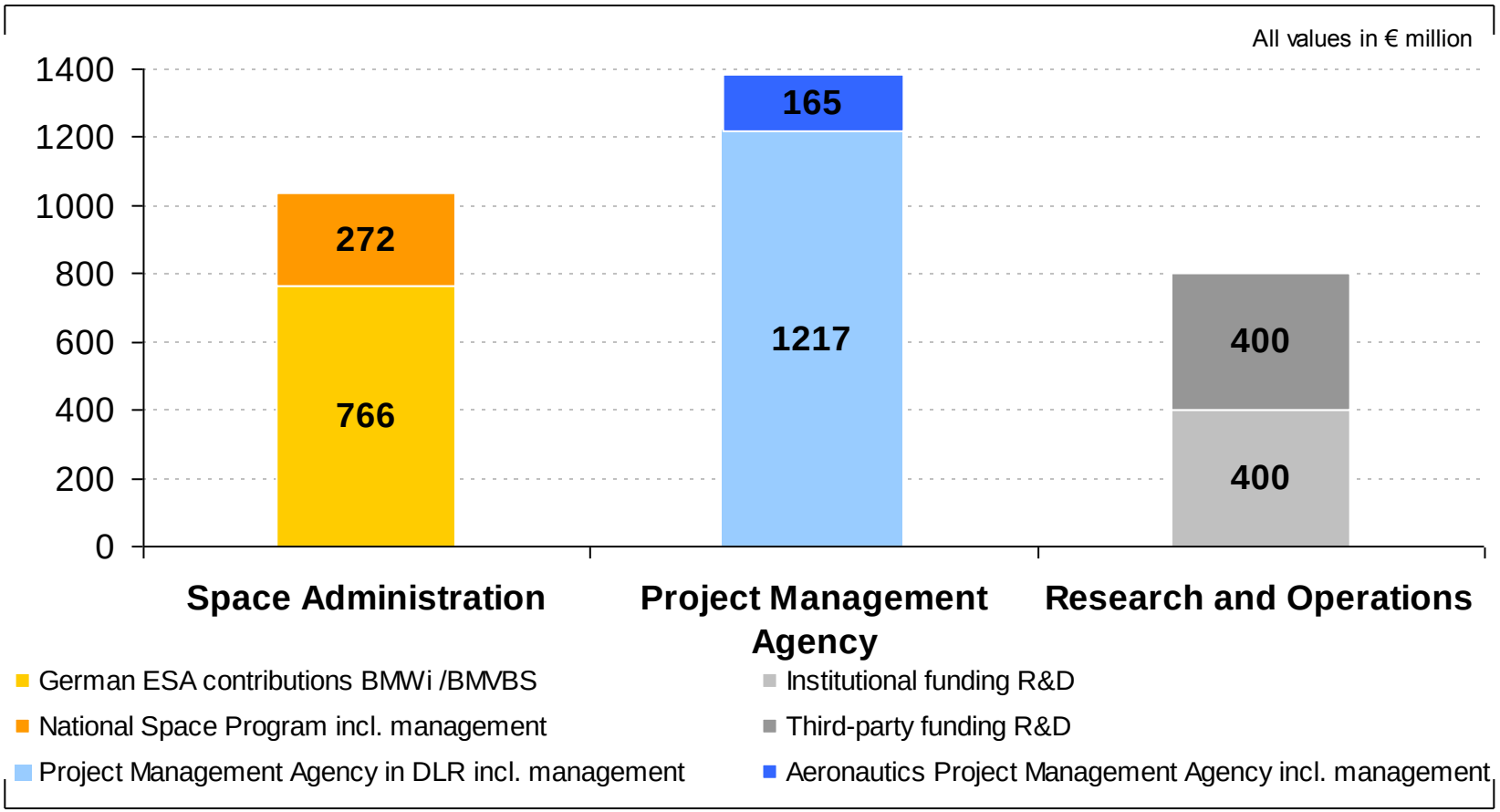
Offices in Brussels,
Paris and Washington.



Percentage of overall income from research and operations 2011



Financing of DLR and research funding 2013 (planned)



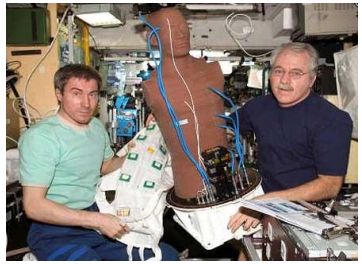
without settlement of cross-financing

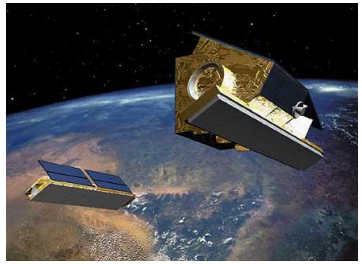
Human Resources Development and Development of Young Talents

- Further development of human resources policy instruments for employee motivation
- Systematic development and recruitment of young talent
- Communicating the fascination of research and technology to the next generation
- Representation in European organisations and promoting staff exchanges with industry and other national and international partners

DLR Space Research and Technology

- Space exploration
- Zero gravity research
- **Earth observation**
- Communication and navigation
- Space transport
- Technology of space systems



DLR Space Research and Technology – Earth Observation

Focus:
- Sensors: SAR, Lidar, IR, optical, aircraft-based sensors
- Ground segments: Satellite control, payload ground segments
- Application areas: Land, atmosphere, sea, risks/disasters

Highlights:
- TerraSAR-X: in operational use since beginning of 2008
- TanDEM-X: launch 2010
- EnMAP: phases C/D since 2008

Future:
- Optical high-resolution national satellite mission, HiROS
- GMES operational…

DLR's tasks as the National Space Agency

- Defining German space planning on behalf of the federal government
- Representing German space-related interests in the international arena, in particular in ESA
- Tendering, award and support of space projects in the context of the National Space Program

<< back

DLR Site Oberpfaffenhofen

Employees: Approx. 1600
Size of site: 245 000 m²
Research institutes and facilities:

- Microwaves and Radar Institute
- Institute of Communications and Navigation
- Institute of Atmospheric Physics
- Remote Sensing Technology Institute
- Institute of Robotics and Mechatronics
- German Remote Sensing Data Center
- Space Operations and Astronaut Training
- Galileo Control Center
- Flight Experiments

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   i. DLR – ESA (#11)

Accessing Global Digital Elevation Models SRTM X-SAR, TanDEM-X

K. Molch

German Aerospace Center DLR
German Remote Sensing Data Center DFD
Information Technology

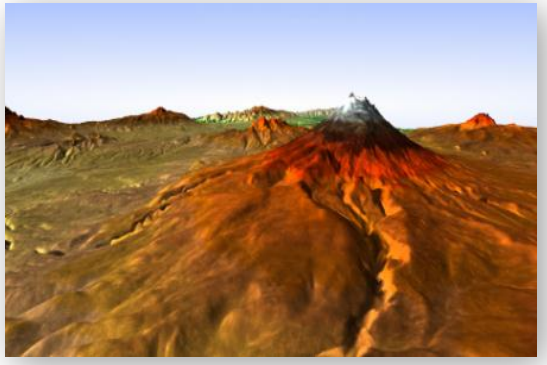
NOAA Visit to DLR

DLR - Oberpfaffenhofen
27 September 2012

DLR SRTM X-SAR DEM - Overview

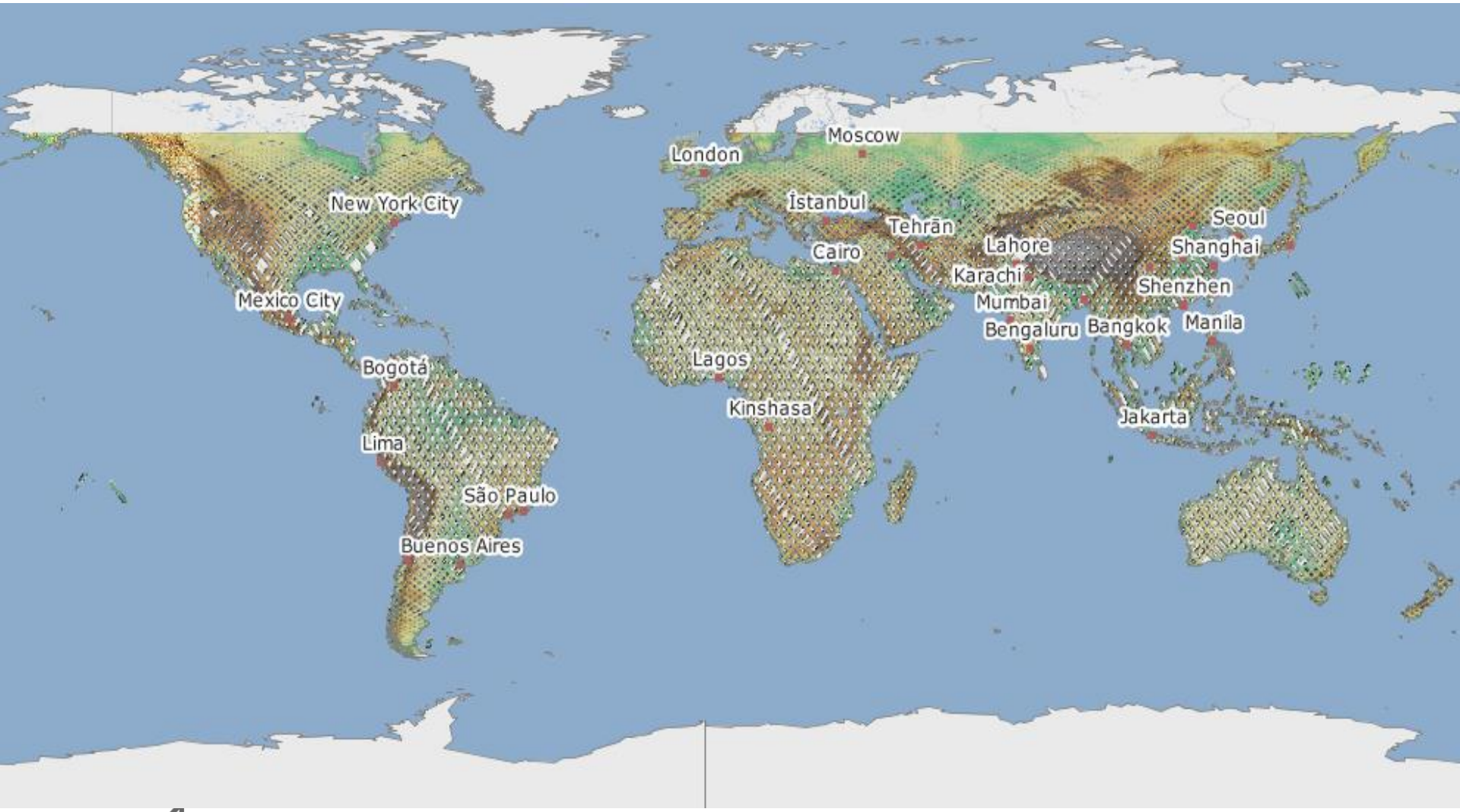
- 'Global' Digital Elevation Model (DEM) generated from radar (SAR) interferometry
- Collaborative mission - NASA/JPL (C-Band), DLR & ASI (X-SAR)
- Acquired within 11 days in 02/2000
- Coverage: 'global' between 60 deg. north & south
- Posting: 25 m; vertical accuracy: ±16 m (abs.) / ±6 m (rel.)
- Discontinuous coverage due to narrow swath width of the higher resolution X-SAR sensor (SRTM C-Band coverage continuous)
- Info: http://www.dlr.de/caf/en/desktopdefault.aspx/tabid-5515/9214_read-17716/

Space Shuttle Endeavor

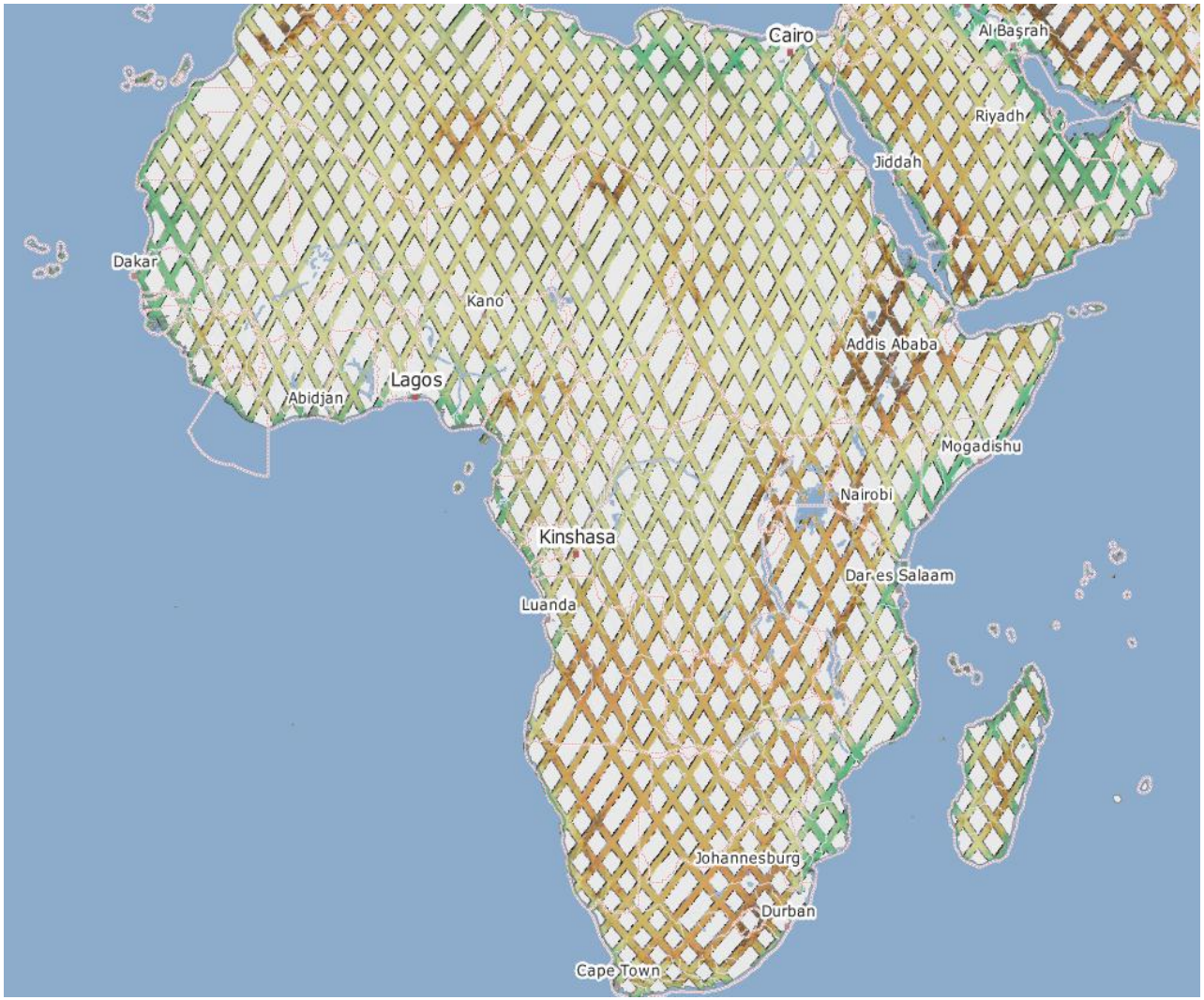


Cotopaxi, Ecuador

SRTM X-SAR Coverage - Global

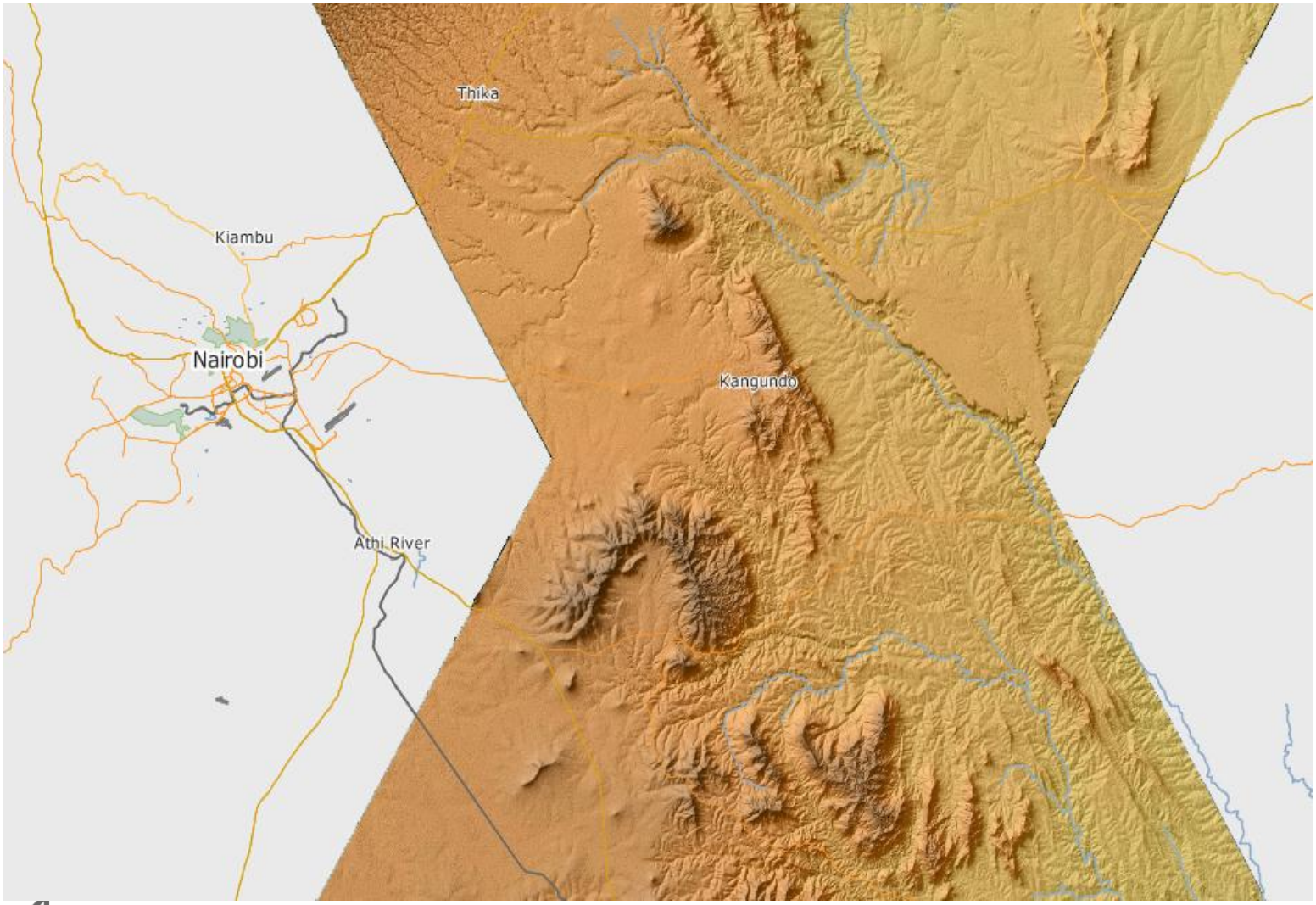


SRTM X-SAR Coverage - Africa

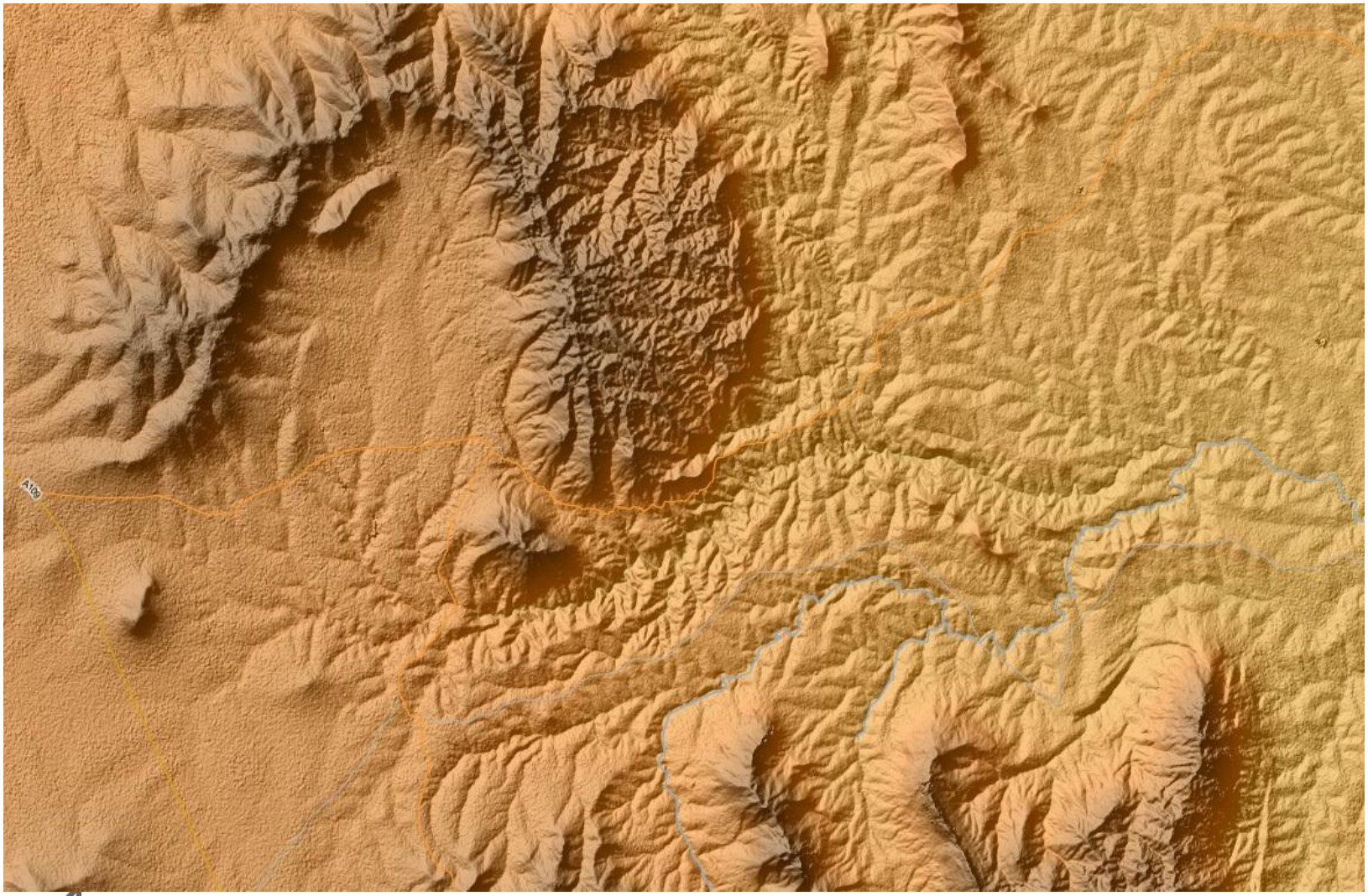


SRTM X-SAR Coverage - East Africa / Kenya

SRTM X-SAR Coverage - Detail

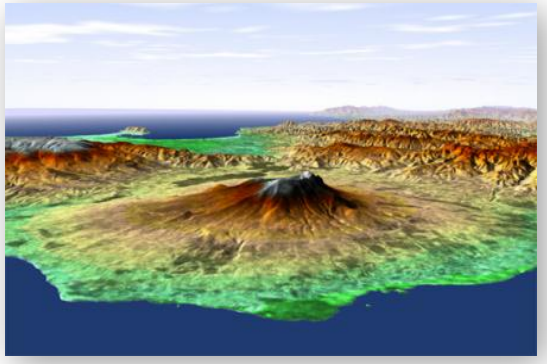


SRTM X-SAR Coverage - Detail

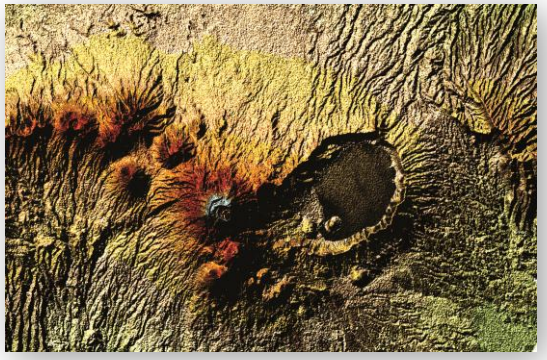


DLR SRTM X-SAR DEM - Access

- Available free of charge
- Use constraints - no redistribution of original data
- Info: https://centaurus.caf.dlr.de:8443/eoweb-ng/licenseAgreements/DLR_SRTM_Readme.pdf
- Three access options
  - EOWEB-NG - data search & order of individual tiles
  - EOWEB-NG - bulk download via FTP
  - Geoservice - direct access - viewing & download via standardized, OGC-compliant geodata services
- Experimental dataset
  - provided as is on best effort basis



Hokkaido, Japan



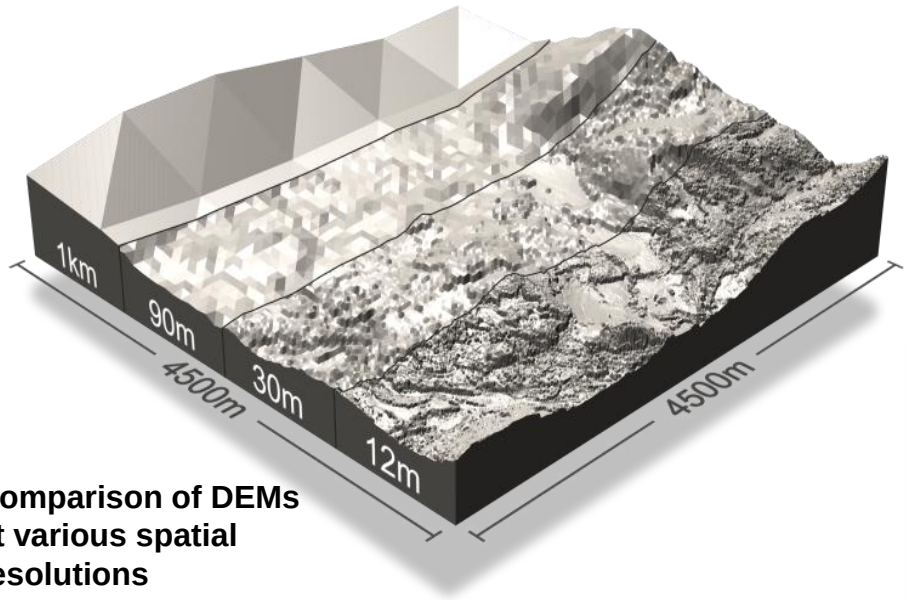
Coatepeque Caldera, El Salvador

TanDEM-X Overview

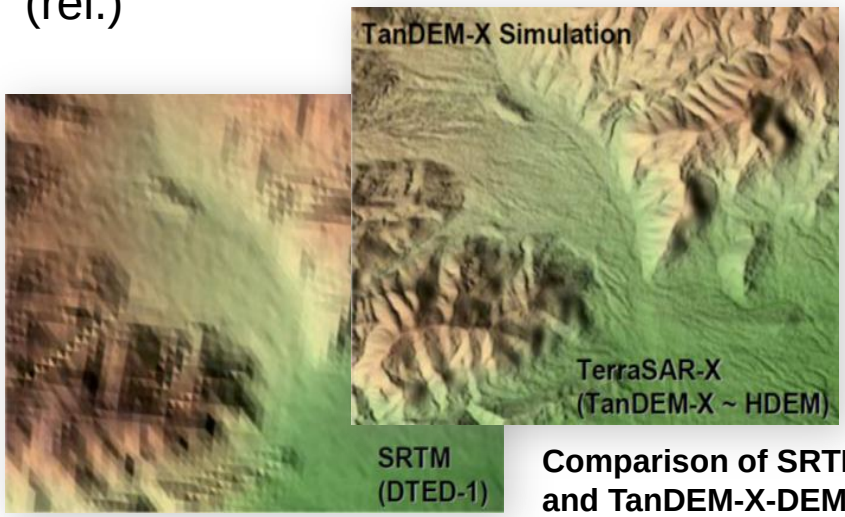
- Global Digital Elevation Model (DEM) generated from radar (SAR) interferometry
- Entire landmass of the Earth acquired by a single system within 2.5 years
- Posting: 12 m; vertical accuracy: ±10 m (abs.) / ±2 m (rel.)
- Available 2014

TanDEM-X DEM Quality

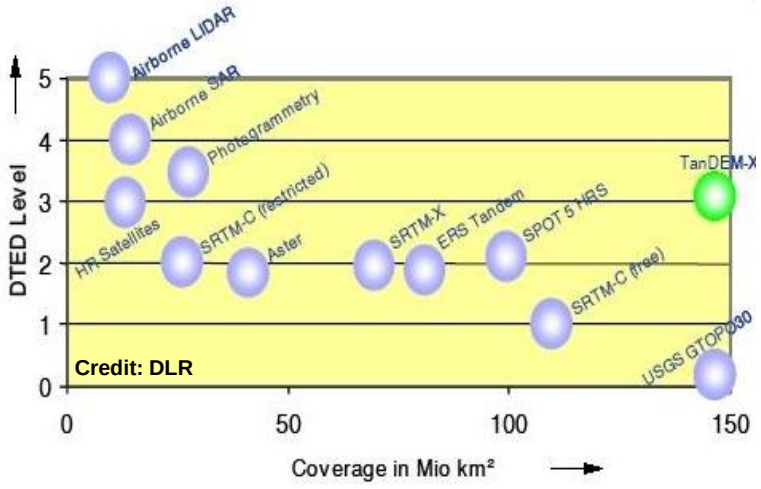
- Posting: 12 m
- Vertical accuracy: ±10 m (abs.) / ±2 m (rel.)



Comparison of DEMs at various spatial resolutions



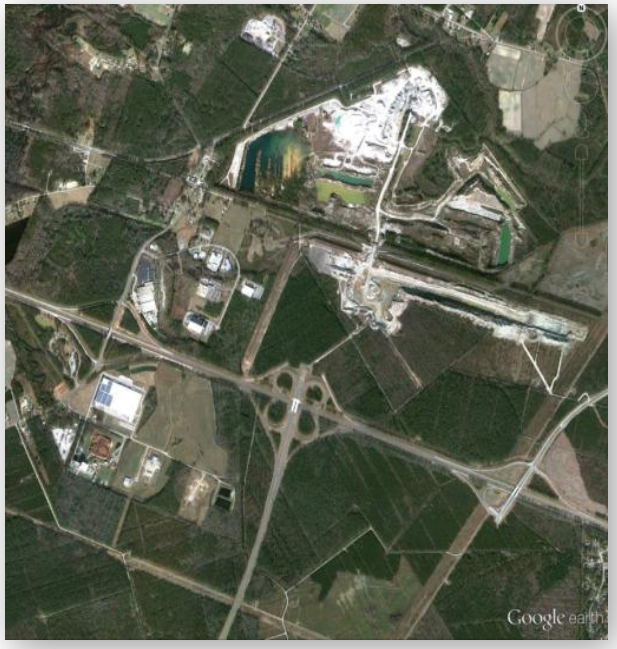
Comparison of SRTM and TanDEM-X-DEM



Parameter	Specification	HRTI-3 definition	DTED-2
Relative vertical accuracy	90% linear point-to-point error over a 1º x 1º cell	2 m (slope ≤ 20%) 4 m (slope ≥ 20%)	12 m (slope < 20%) 15 m (slope > 20%)
Absolute vertical accuracy	90% linear error	10 m	18 m
Relative horizontal accuracy	90% circular error	3 m	15 m
Horizontal accuracy	90% circular error	10 m	23 m
Spatial resolution	Independent pixels	12 m (1 arcsec)	30 m (1 arcsec)

DLR

TanDEM-X DEM Example



Google Earth

TanDEM-X

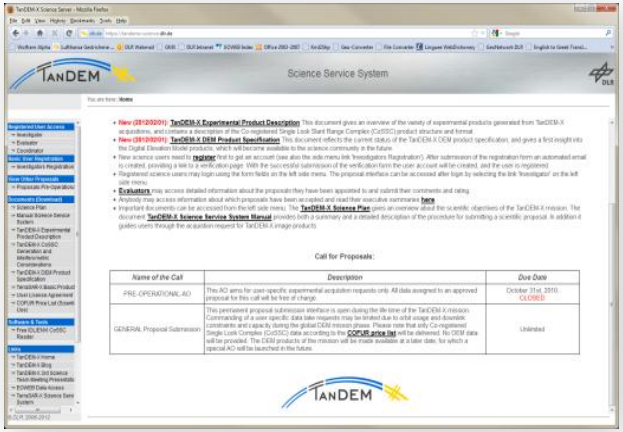
TanDEM-X DEM Access

Scientific users

- via DLR
- Proposal submission through 'TanDEM-X Science Service System'
- DEM products at COFUR prices
  - 60-100€ (~75-130$) /product
  - Tiling: 1 deg. x 1(-4) deg.

Commercial users

- via Astrium Geoinformation Services
- Link: http://www.astrium-geo.com/en/168-tandem-x-global-dem



DLR

User License for the Utilisation of TerraSAR-X / TanDEM-X Data and Products for Scientific Use

between

DLR

and

the Principal Investigator

_____

Proposal ID: _____ **issued on** _____

As the duly empowered representative of _____,
I hereby declare to have read and approved the terms and conditions and unconditionally accept that any activity related to the project be governed by them.

Date: _____

Name: _____

Signature: _____

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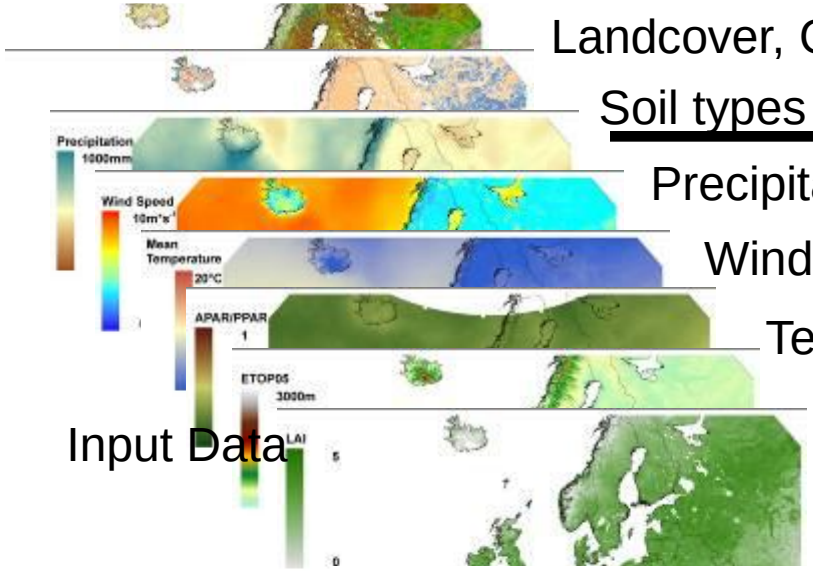
Net Primary Productivity (NPP), Biomass & Bio-energy

M. Tum
German Aerospace Center (DLR) – German Remote Sensing Data Center (DFD)

BETHY/DLR

(Biosphere Energy Transfer Hydrology Model,
extended at Deutsches Zentrum für Luft- und Raumfahrt)

***Knorr**, 1997;*
***Wißkirchen**, 2005*



Input Data

Landcover, GLC2000 (1 km)

Soil types FAO/IIASA (1 km)

BETHY/DLR

Precipitation ECMWF (25 km)

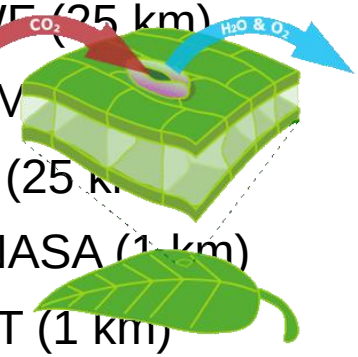
Wind Speed, ECMWF (25 km)

Temperature, ECM

PAR, ECMWF (25 k

Elevation, NASA (1 km)

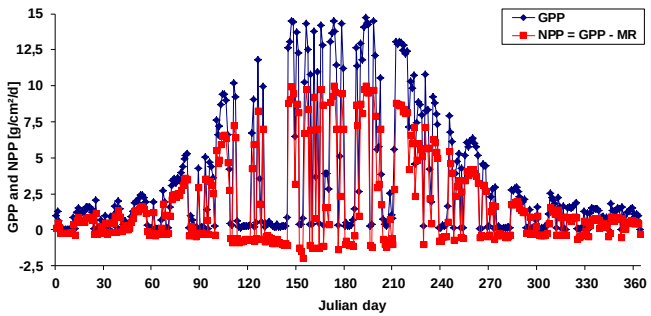
LAI, SPOT (1 km)



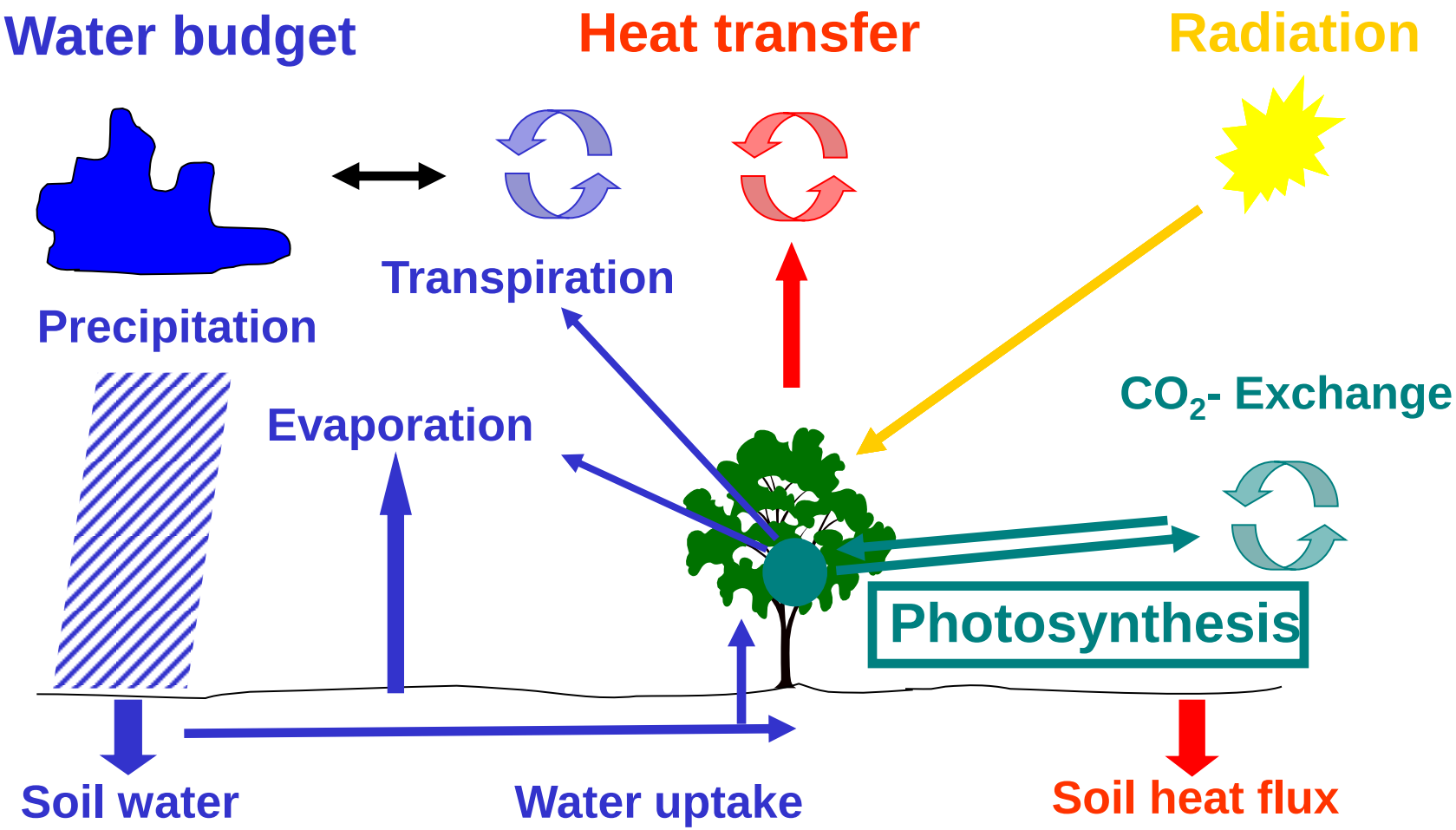
Gross- and Net-
Primary Productivity

Maintenance
Respiration

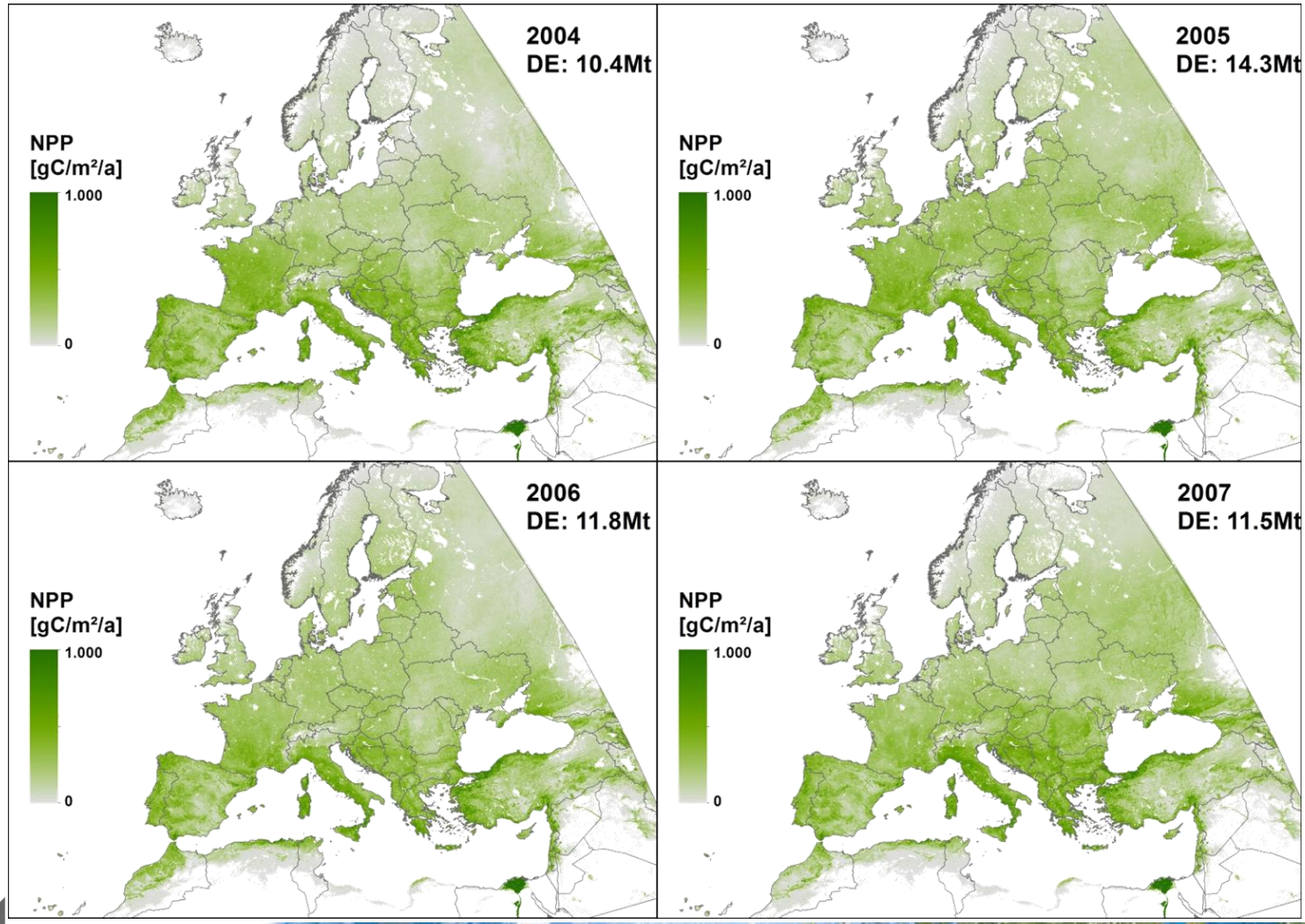
NPP = GPP - MR



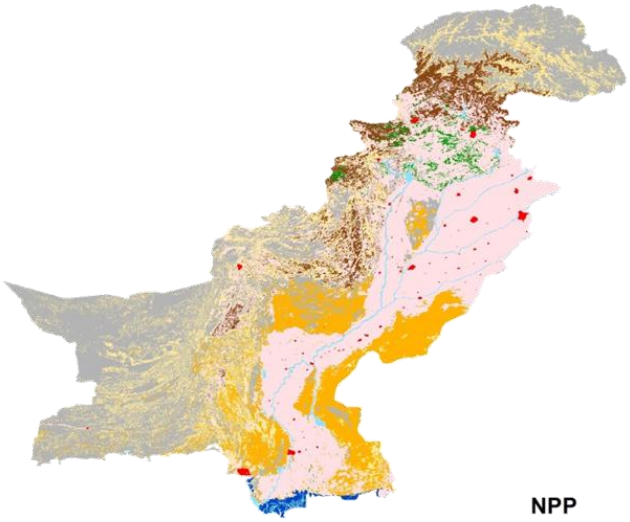
Processes depicted in BETHY/DLR

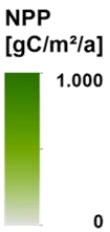


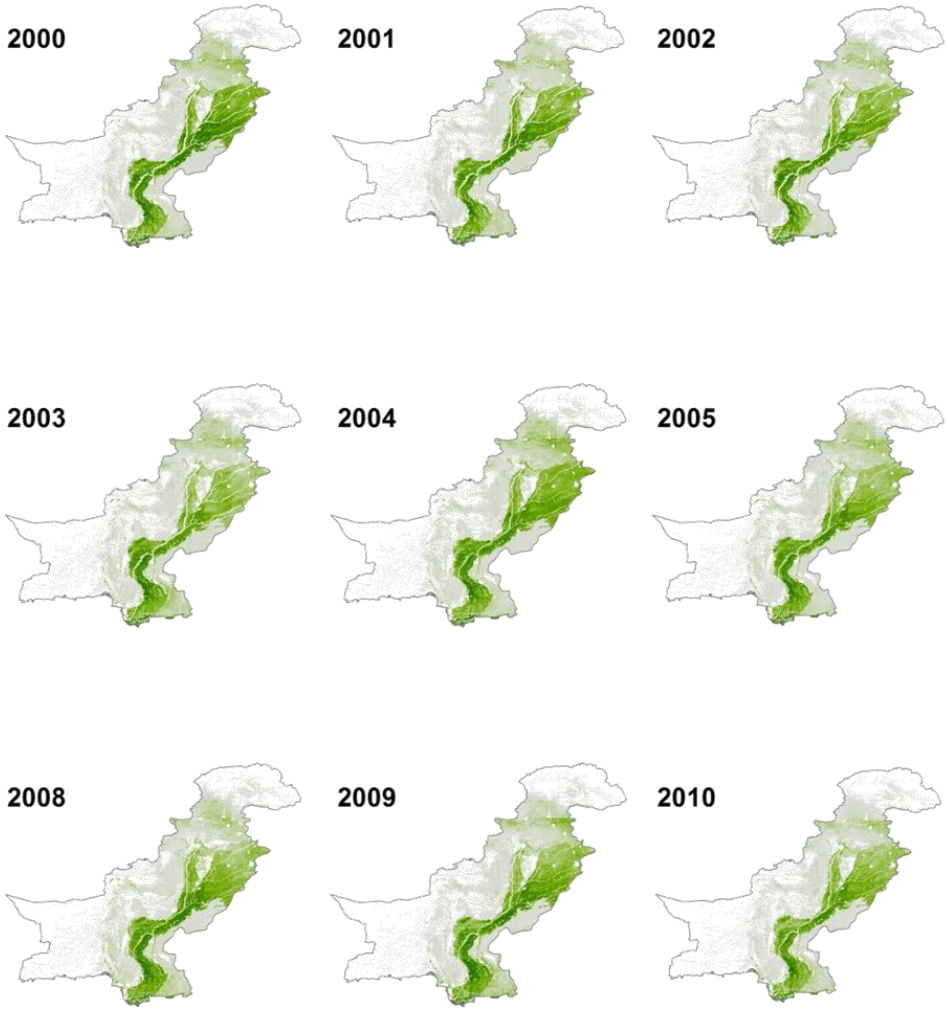
Net-Primary-Productivity – Europe



Net-Primary-Productivity – Pakistan







From NPP to biomass increase

NPP

Above Ground biomass (increase)

AGB_i = NPP / F / (1 + R)

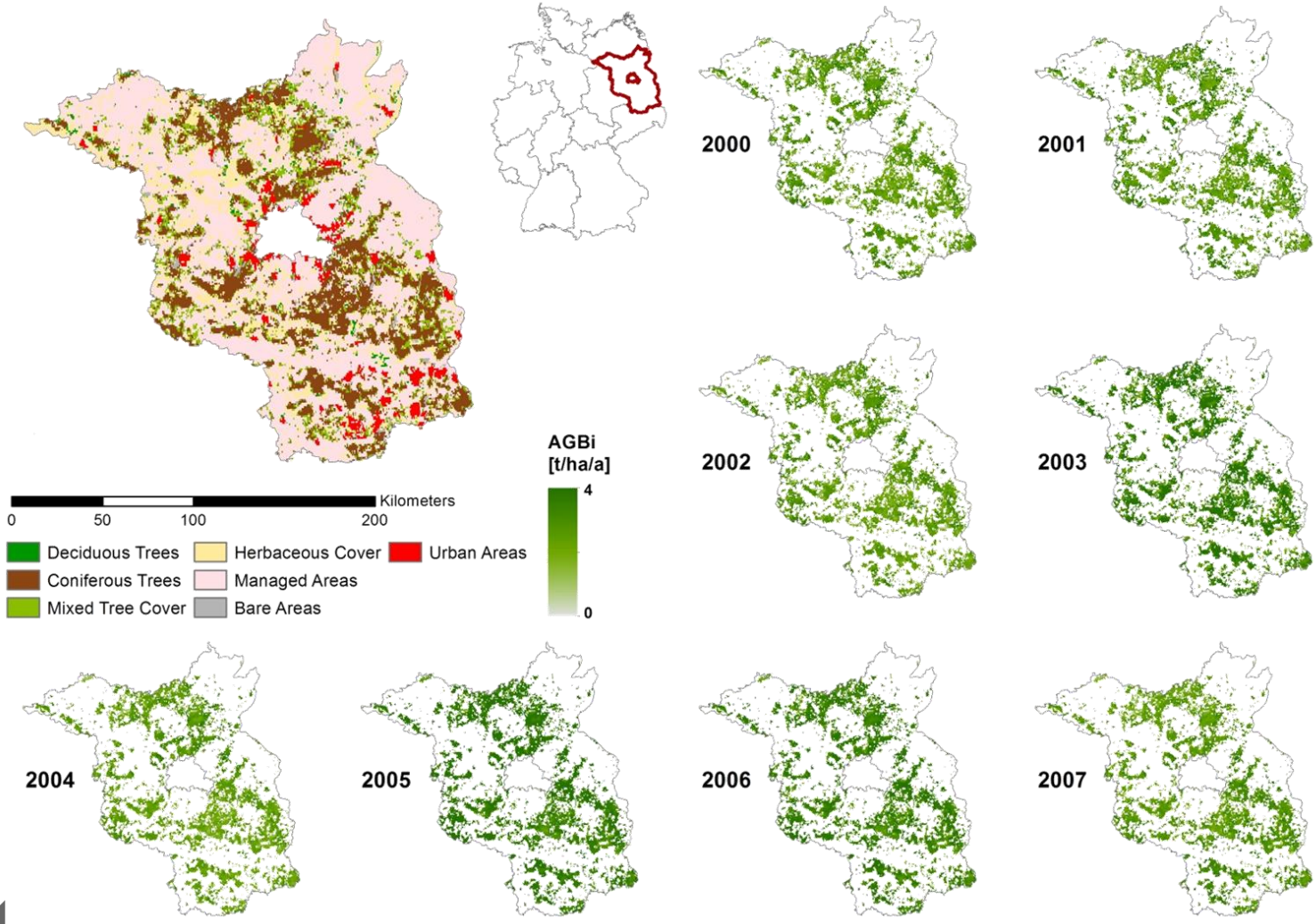
AGB_i = Above Ground Biomass increase

NPP = Net Primary Productivity

F = Conversion Factor

R = Ratio: below to above ground biomass

Above ground biomass increase (AGBi) for Brandenburgs forests



From NPP to straw-energy

NPP

Tuber
Forage plants

Roots

Grain

\+

Water
Nitrogen etc.

Straw

Energy

Energy potential of straw