Food and Agriculture Organization of the United Nations

UNEP United Nations Environment Programme

NL UNSDI

ITC

UNIVERSITY OF TWENTE.
Faculty of Geo-Information Science and Earth Observation

PBL Netherlands Environmental Assessment Agency

Establishment of a Spatial Data Infrastructure (SDI) For Food and Agriculture

Supporting comprehensive assessment of environmental conditions and monitoring food security

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Food and Agriculture Organization of the United Nations

FAO are proposing to the Dutch government jointly with UNEP, Dutch industry and local partners to engage in a joint venture to develop and innovate a cross-UN Spatial Data Infrastructure (SDI) specifically designed to address integrated food security.

The AFSDI will provide methods and infrastructure for hosting geospatial data coming from data sources, methods and workflows for analysis, standardization that allows data integration, and a pervasive data dissemination and outreach through WebGIS technology.

Food security monitoring/forecasting within the many subdomains of agriculture, natural resources, and economics will raise a high volume of dedicated online applications to address individual use cases. FAO & UNEP have initiated this process with joint MOU, FAO restructured, but needs both Dutch industry and govt. to catalyse and realise this quickly in light of the compelling issue of the SDG and monitoring of the indicators.

Integrate req. of UNSDI, improved timely access to the range Sentinel 2 value added products) crop masks, Agric./non Agric , NDVI etc. and establish and Agric. thematic data portal / GDW.

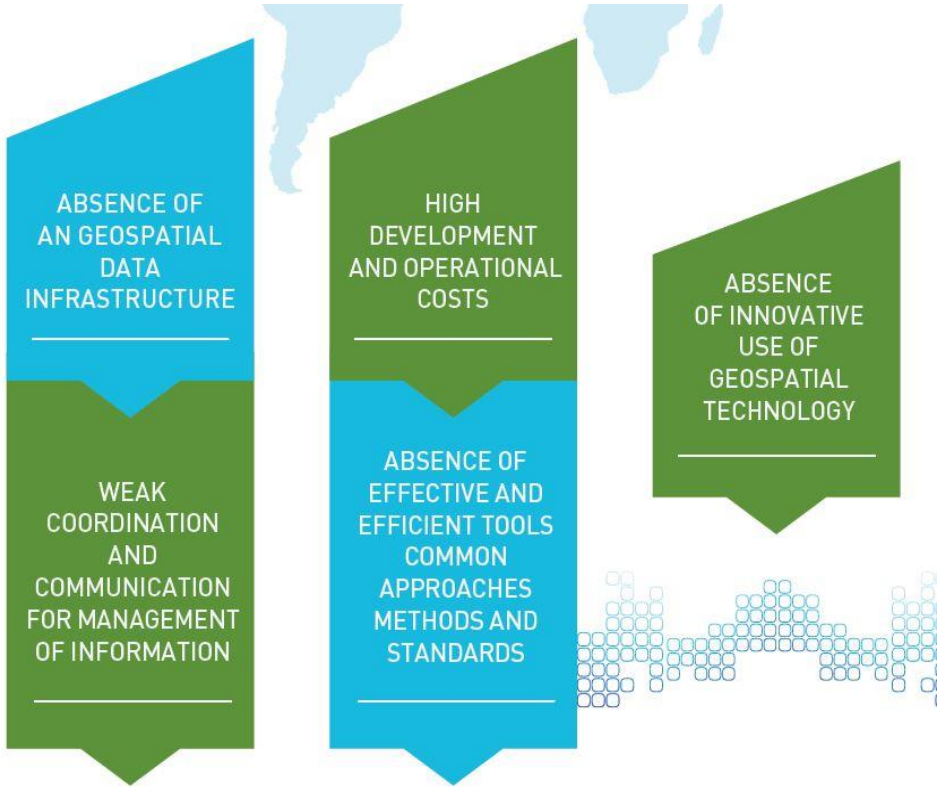
Need, Urgency and Added Value

AFSDI's overall Goals

- Support comprehensive assessment and monitoring of food security and environmental sustainability in the selected countries through the establishment of Agri-Food Spatial Data Infrastructure (AFSDI)
- Support Country Governments and Organisations on the attainment of the Sustainable Development Goals (SDGs) through development of mechanism for increasing system coherence in the use and exchange of Agri-food and geospatial data in a changing climate.

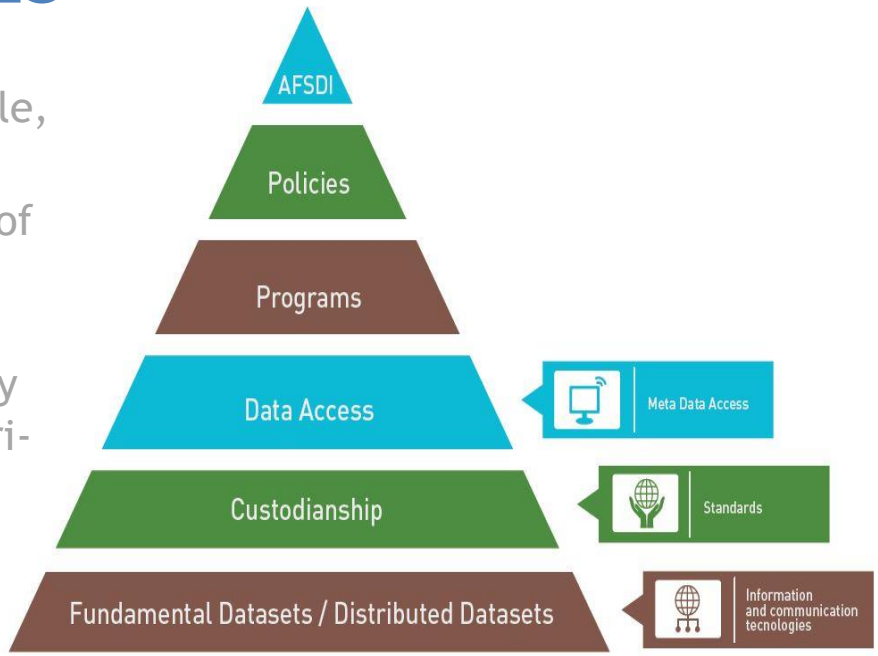
Problem Statements

No world-wide common platform that stores and provides core data and information related to the assessment, monitoring and mapping of agri-food, environmental and water resources through indicators derived by the combination of remote sensing, geospatial analysis, in-situ measurement and country reporting.



Specific OBJECTIVES

1. Make spatial data commonly available, based on international standards
2. Support monitoring and assessment of agriculture and environmental conditions in target countries
3. Enhance selected countries' capacity on the use of geospatial data for agri-food monitoring and analysis
4. Develop technology, services and related policies for collection, updating, sharing, and analysis of datasets

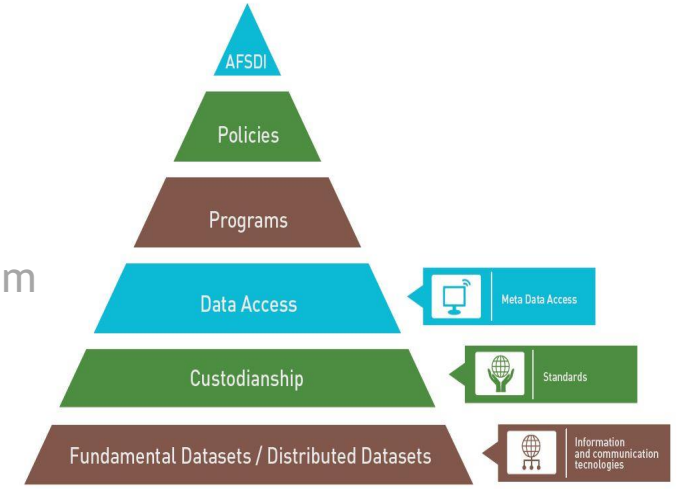


Specific OBJECTIVES

5. Create a user-friendly environment which facilitates agri-food and geospatial data management
6. Strengthen key data, reduce duplication, improve reliability and quality and promote data custodianship
7. Provide timely information products for data driven to decision makers.

Strategic OBJECTIVES

1. Climate Smart Agriculture
2. Ecosystem service assessment and ecosystem based planning
3. SDG monitoring
4. Role of the private sector: design, delivery
5. Long term advantages of access to the services.

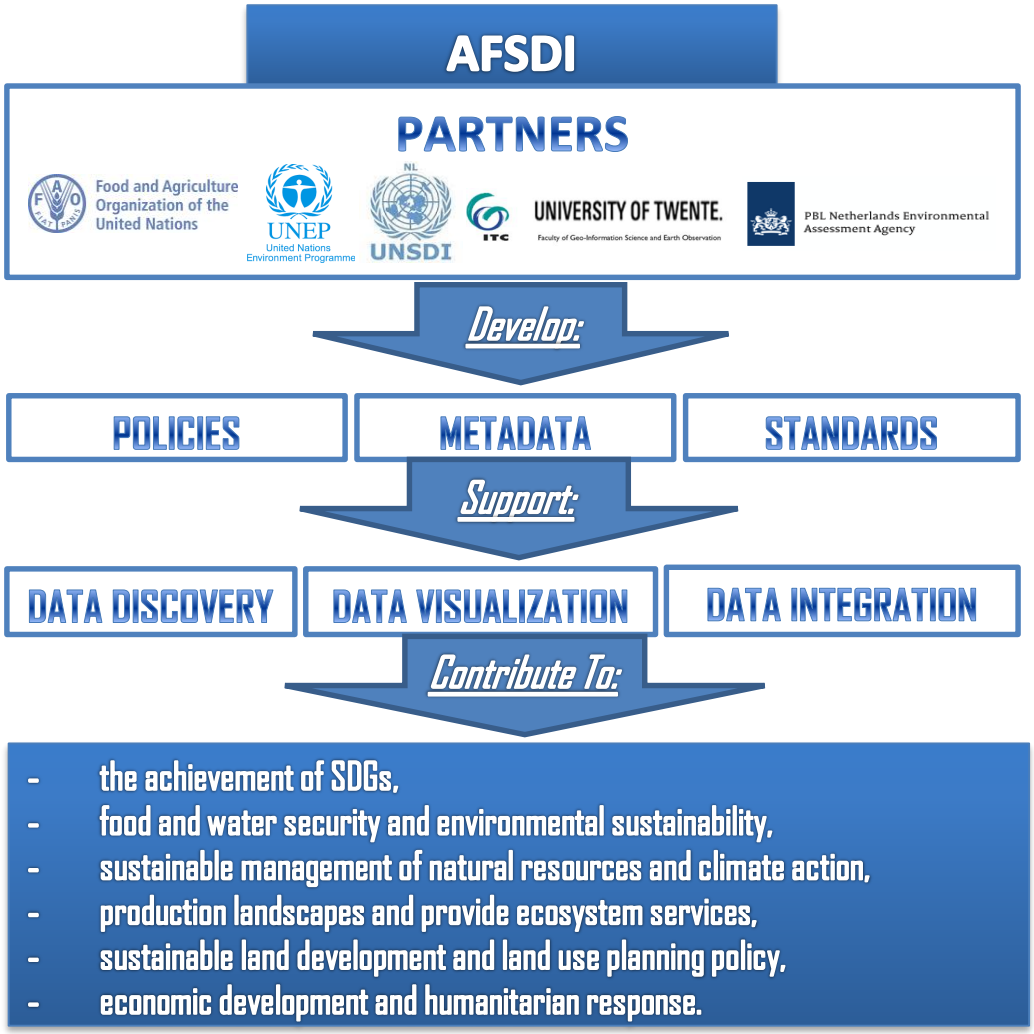


Core Partners and Role

PARTNERS	ROLE
1. Food and Agriculture Organisation (FAO).	Project Coordination, Portals, Methods, Capacity development, Data/layer provider, Applications, Advocacy, Dissemination and Communication, Partnership and cooperation development.
2. United Nations Environment Programme (UNEP)	Portals, Methods, Data/layer provider, Applications, Advocacy, Communication and Dissemination, Partnership and cooperation development.
3. University of Twente	Technology transfer and Capacity Development, Methods, Portals, Modelling, Dissemination via web, Develop learning and research material, Develop partnership and cooperation, Applications, Data/layer provider.
4. UNSDI-NCO	Advocacy, Communications, Dissemination and Coordination, Portal/web-site development/maintenance, Partnership and cooperation development.
5. PBL Netherlands Environmental Assessment Agency	Enclosing and disseminating the GRIP World Road Database and derived datasets. Supporting the user perspective in toolkit development and knowledge transfer on data/methods/modelling in support of use cases and case studies, focusing on global and regional and landscape applications.

Approach

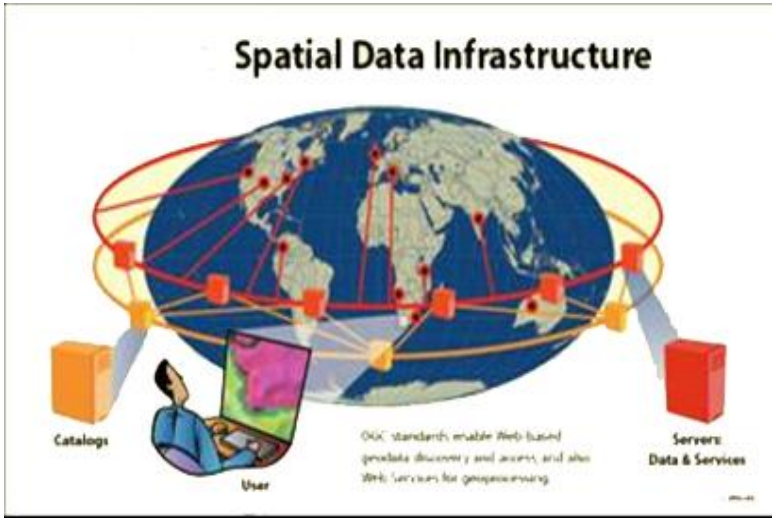
- Under UNSDI umbrella
- Link to existing SDIs and inititatives like:
  - *INSPIRE*
  - *UNEP-Live*
  - *OGC & ISO*
  - *CAPRA*
- AFSDI Applications:
  - *Agriculture monitoring and statistics*
  - *CSA*
  - *NAEZ*
  - *production landscapes analysis to provide ecosystem services*
  - *SDG monitoring*

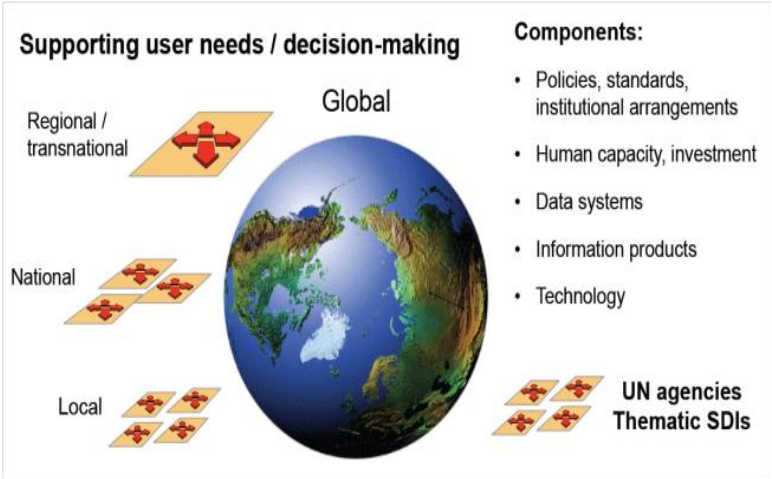


Project Structure

OUTCOMES:

- I - Established dedicated agri-food geospatial information, infrastructure and institutional arrangements (SDI/GDW) under UNSDI umbrella and, settled Agri-Food Spatial Data Infrastructure governance to agreed standards, protocols and best practices.
- II - Enhanced selected countries capacity on the use of geospatial data for agri-food monitoring and analysis. Contribution of AFSDI for agriculture monitoring in the selected countries (application cases and linkage to selected agri-food & Water projects).

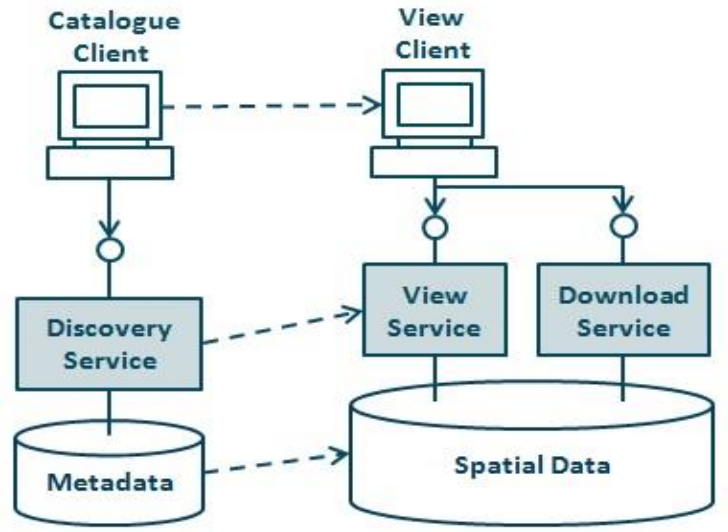


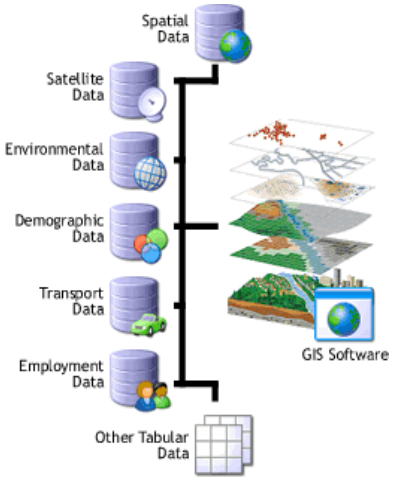


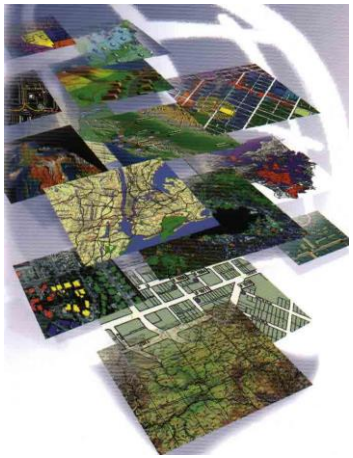
OUTCOME I

APPROACH:

- Establish strategy to achieve common interoperability standards, protocols and interfaces that support real-time integration
- Build an open source GDW and toolkit
- Develop dedicated geospatial information, data models, and supporting information needed for the data content of the AFSDI
- Filling the Geospatial Data Warehouse (GDW) with information layers from projects/agencies
- Communication and dissemination of the AFSDI results.



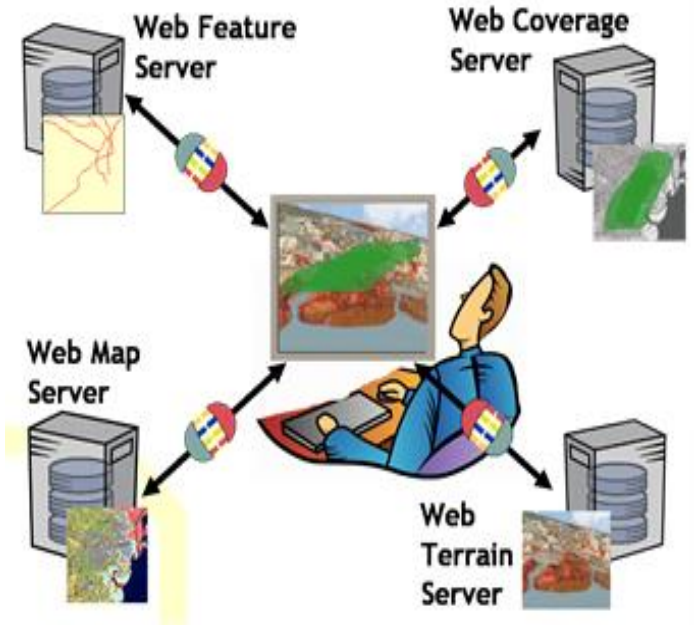




OUTCOME I – Building AFSDI

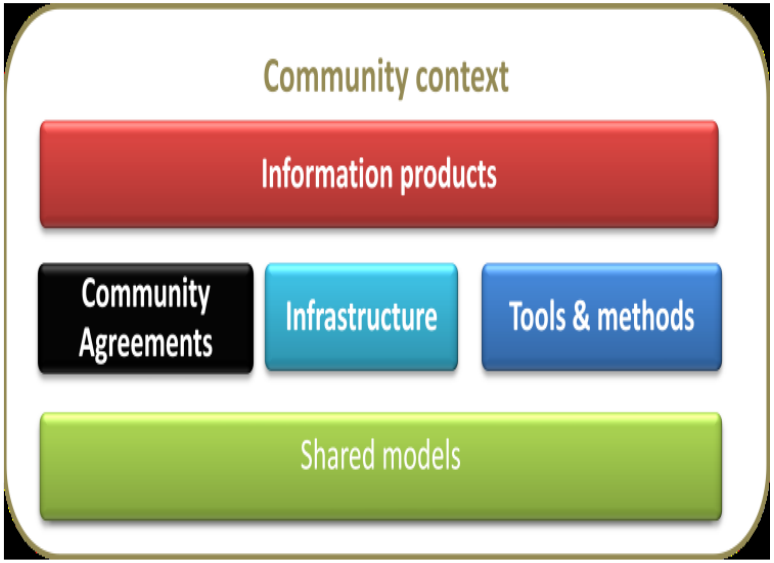
OUTPUTS:

- Establish the use cases for an Agri-Food SDI and the required data and technology
- Develop the necessary community agreements, data models, and supporting information, and software systems needed to implement the SDI. Establish open source Geospatial Data Warehouse (GDW) information services
- Develop interoperability tests that exercise the AFSDI and illustrate its broader use, and
- Design and build a stable production version, transition to stable operational environment and community-building. Communication and dissemination of the AFSDI results.



AFSDI main components

- **Community agreements** – community engagement and governance to enable the establishment of a shared information platform
- **Infrastructure** - infrastructure to support publication of and access to shared resources
- **Tools and methods** - tools and associated methods to enable the creation, management and use of shared information



- **Shared models** – the creation and management of shared content models, data models for data exchange, and agreed numerical models that underpins and enables the entire process
- **Information products** – the creation and maintenance of shared information products

Relevant Standards

OGC & ISO

- Open, well-accepted and proven geospatial standards and best practices

INSPIRE

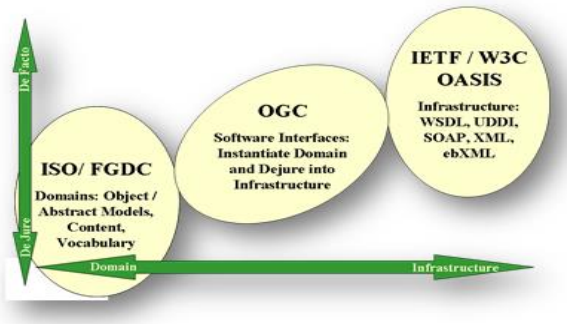
- Based on OGC & ISO standards
- Technical Guidelines for real world implementation of interoperable SDI

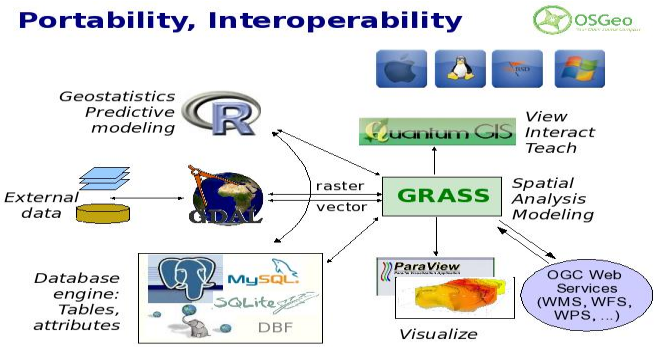
OSGEO

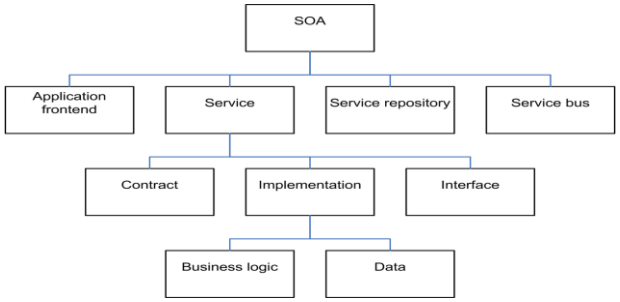
- Vibrant Community born around GeoSpatial Open Source Software
- Unparalleled source of real-world experience
- Source of de-facto and bottom-up standard (e.g. tiling, crowdsourcing)

'SOA World'

- Best practices and standard for infrastructures
- After mutated from the Finance IT infrastructures

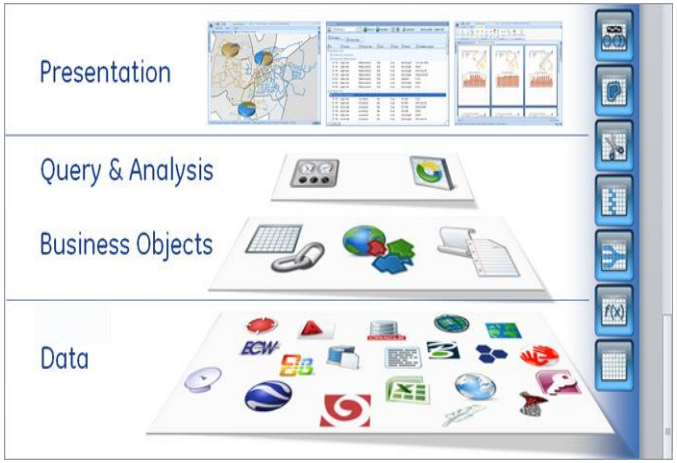




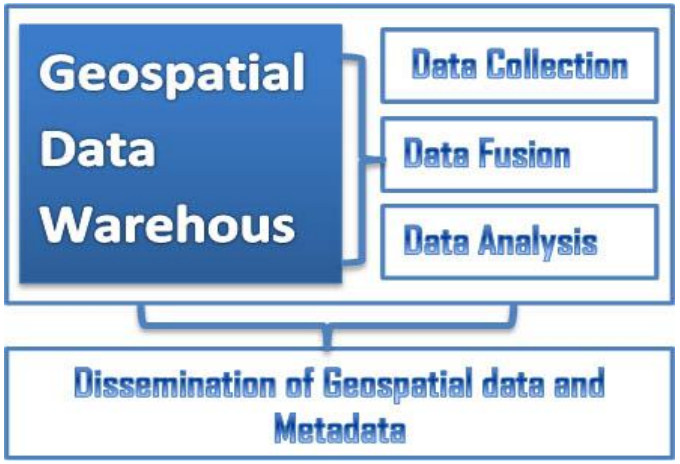


GDW

- The **Geospatial Data Warehouse** will result from the dynamic composition of different software components grouped into a few functional areas.
- **Geospatial Data Warehouse (GDW)** provide support to the four fundamental functions:
  - *data collection*
  - *data fusion*
  - *data analysis and*
  - *dissemination of geospatial data and metadata*
  - *built on Open Data*

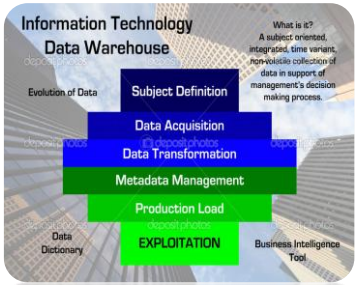


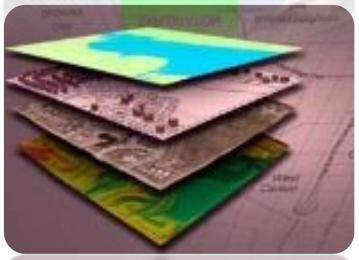
Geospatial Data Warehouse (GDW) components



Performance Indicators – OUTCOME I

- Geospatial Data Warehouse of standardized spatial data-sharing practices and a common software platform based on open standards providing the hosting foundation for the visualization facility as well as a centrally accessible data repository for procured agri-food, water, environmental and geospatial content implemented
- A core agri-food, environment and geospatial information (c.a. 200.000-300.000 geospatial layers) organised according to international standards, compatible with similar data produced by other SDIs or initiatives and widely accepted layers and scales to be integrated in the GDW
- Online AFSDI training course(s) will be completed by at least 100 – 150 experts from the selected countries; absorptive capacity dependent and countries selected
- GAEZ- NAEZ- NAEEZ; through FFS to farmers.

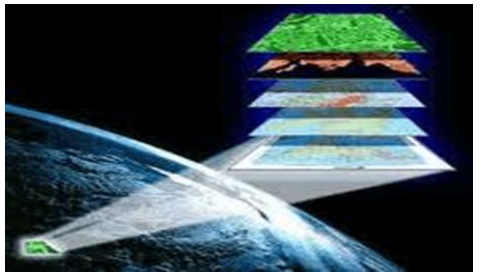


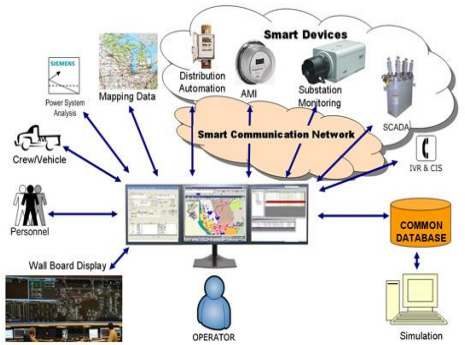


OUTCOME II

OUTPUTS:

- Enhanced selected countries' capacity on the use of geospatial data for Agro-Food monitoring and analysis
- Enhanced the geospatial information framework at FAO, UNEP within Dutch Ind. and within Country to improve the collection, aggregation and dissemination of geospatial information and services
- Contribution of AFSDI for agri-food monitoring in the selected countries (agri-food cases and linkage to selected Agro-Food & Water projects). Enhanced information quality, policy development and data collection and management in the target countries.





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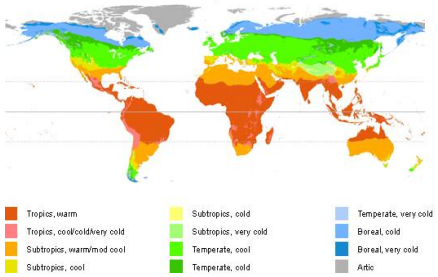
OUTCOME II – Capacity Development

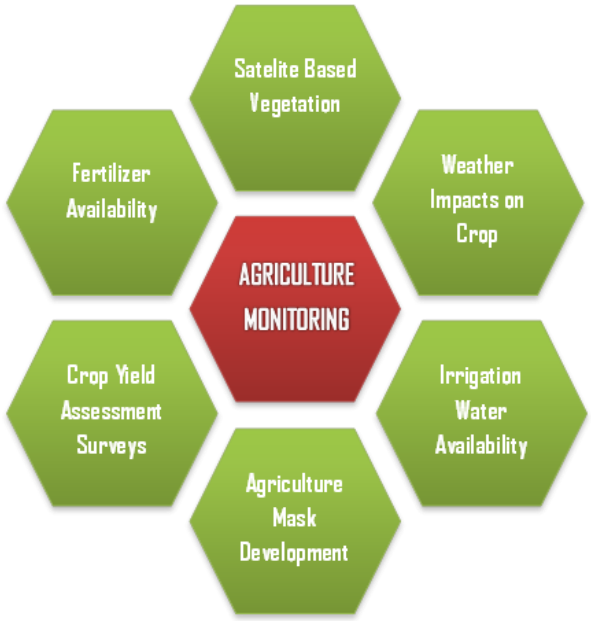
- Target countries improve their capacities to better manage natural resources and improve agriculture monitoring and food security through agri-food and geospatial information (AFSDI)
- Main training topics
- Link with ongoing initiatives
- produce reliable and timely information for NAEZ assessment
- land cover and agriculture statistics, remote sensing, GIS and mobile computing technology
- monitoring of major crops globally and within-season production forecasts, making contributions to AMIS
- use spatial and meteorological data for developing sustainable agriculture landscape and livelihoods through application of climate smart agriculture
- “Training of trainers” to act as leaders in their respective communities of practice



OUTCOME II – AFSDI applications

AFSDI Applications in target countries:

1. Agriculture monitoring and statistics / Area Frame application for estimation of acreage and yield for agricultural statistics. Implementation of an improved agriculture statistical approach based on GSAS
2. CSA application: of advance geospatial technology for data collection, dissemination and information flow and reciprocal data verification and validation to to enhance smallholder livelihoods
3. Ecosystem service assessments
4. SDG monitoring
5. Land Resources Inventory for land and water resources evaluation and NAEZ assessment
6. GRIP World Road Database updates/developed



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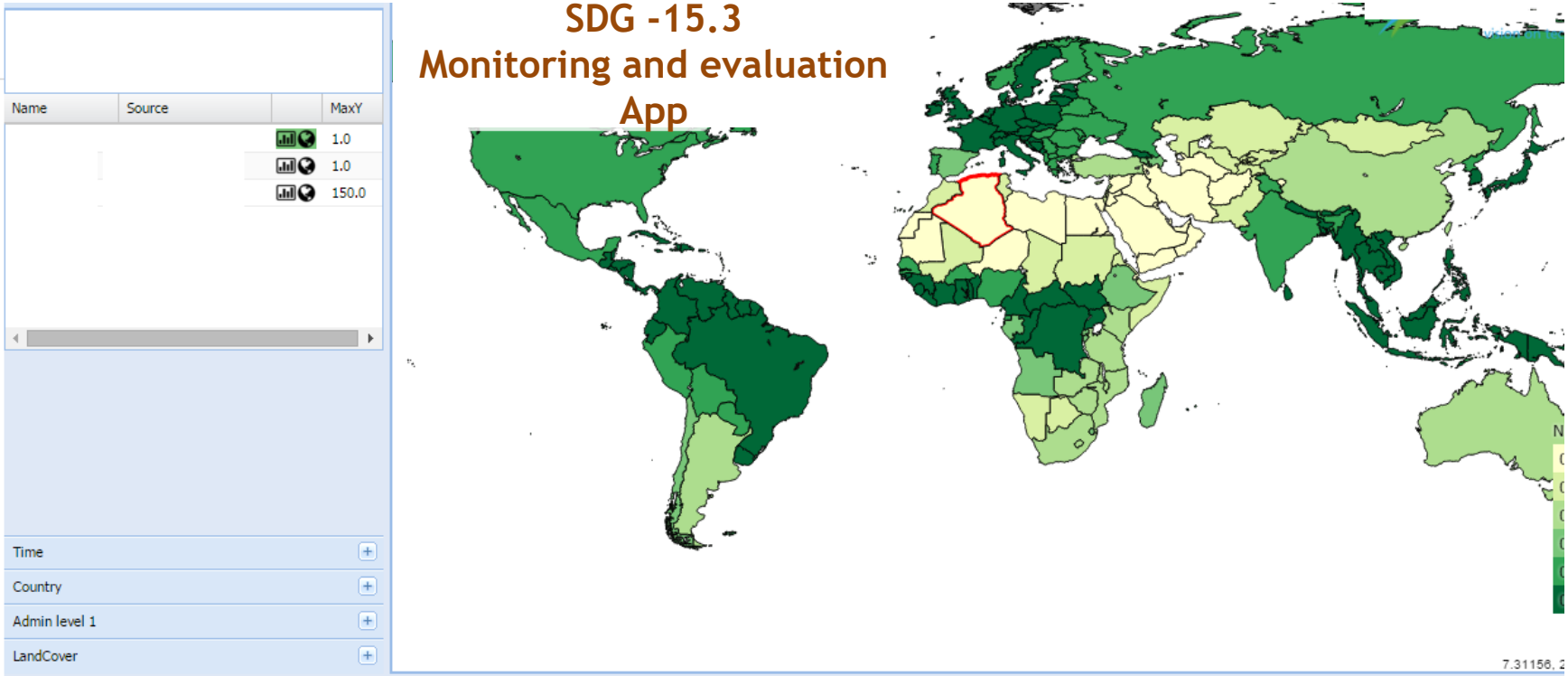
SDG -15.3 Monitoring and evaluation App



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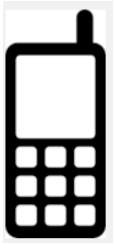
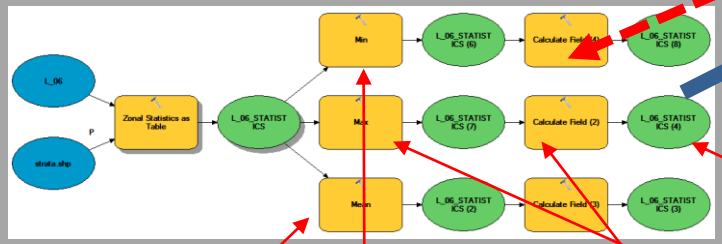
CSA Application Example

1) Crop suitability model (NAEZ, local)
2) Spatial model (Geoprocessing tool)
3) Seamless computation with inputs from SDI and Farmers
4) Farm management advice message reaches farmer



Advisory text on crop suitability; /irrigation/etc.

X,Y; temperature; field picture



SDI

Farming management variables:
1) Temperature
2) Precipitation
3) Soils
4) Crop yield gap

Water

NAEZ

Temperature

In situ data

NDVI

Projects (e.g. Info4Water)

UN Ag

NL Ind

Sentinel 2 products

RS/Meteo

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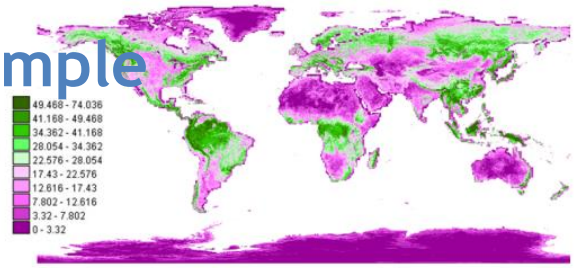
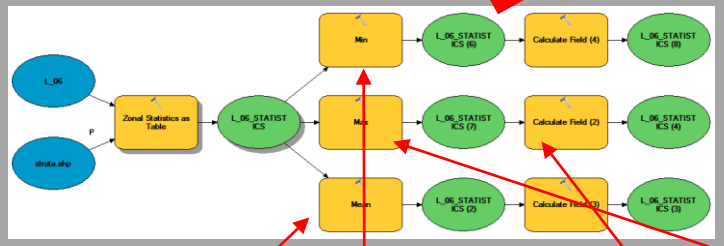
Ecosystem service Application Example



1) Ecosystem service definition (prod./reg./cult.)
2) Spatial model (Geoprocessing tool)
3) Seamless computation
4) Ecosystem assessment and mapping disseminated

Ecosystem functionality map (credit Society for Conservation Biology)



GLC share

Forests

Precipitation

NDVI Composite

SDI

Service definitions
1. Water Yield
2. Hydropower
3. Water Purification
4. Sediment Retention
5. Carbon Storage and Sequestration
6. Timber Harvest
7. Habitat Quality and Rarity

UN Ag

NL Ind

Sentinel 2 products

RS/Meteo

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Performance Indicators- OUTCOME II

- Training courses on the application of the agri-food and geospatial information and technology for agriculture monitoring and analysis will be completed in the selected countries
- NAEZ / NAEEZ assessments and Land Resources Inventory database developed in selected countries
- Agriculture statistics and analysis database for some pilot areas of the target countries
- Newsletters will be produced at regular intervals.