CACIP platform

Country consultations of Central Asian Climate Information Platform: Kazakhstan

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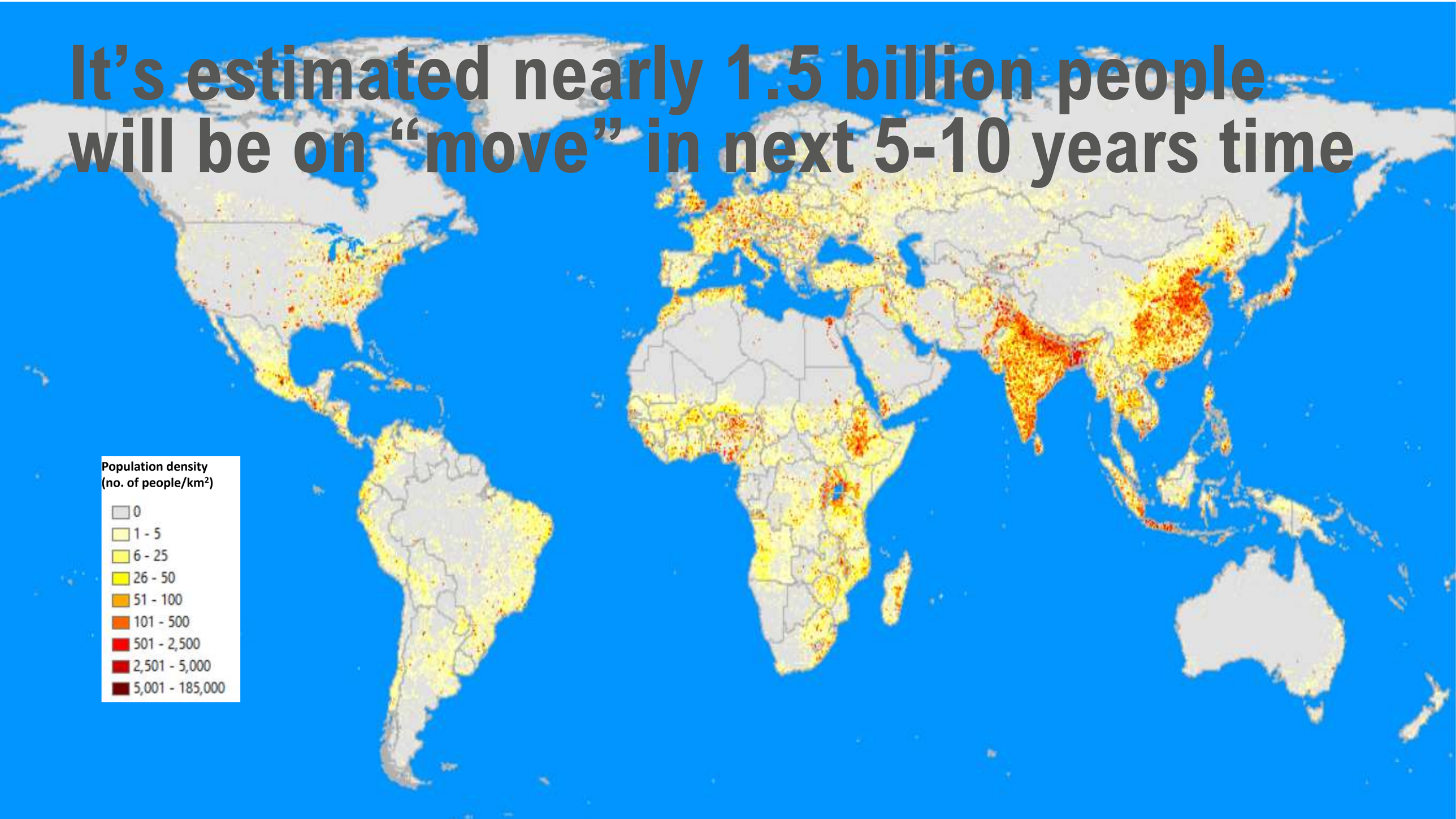
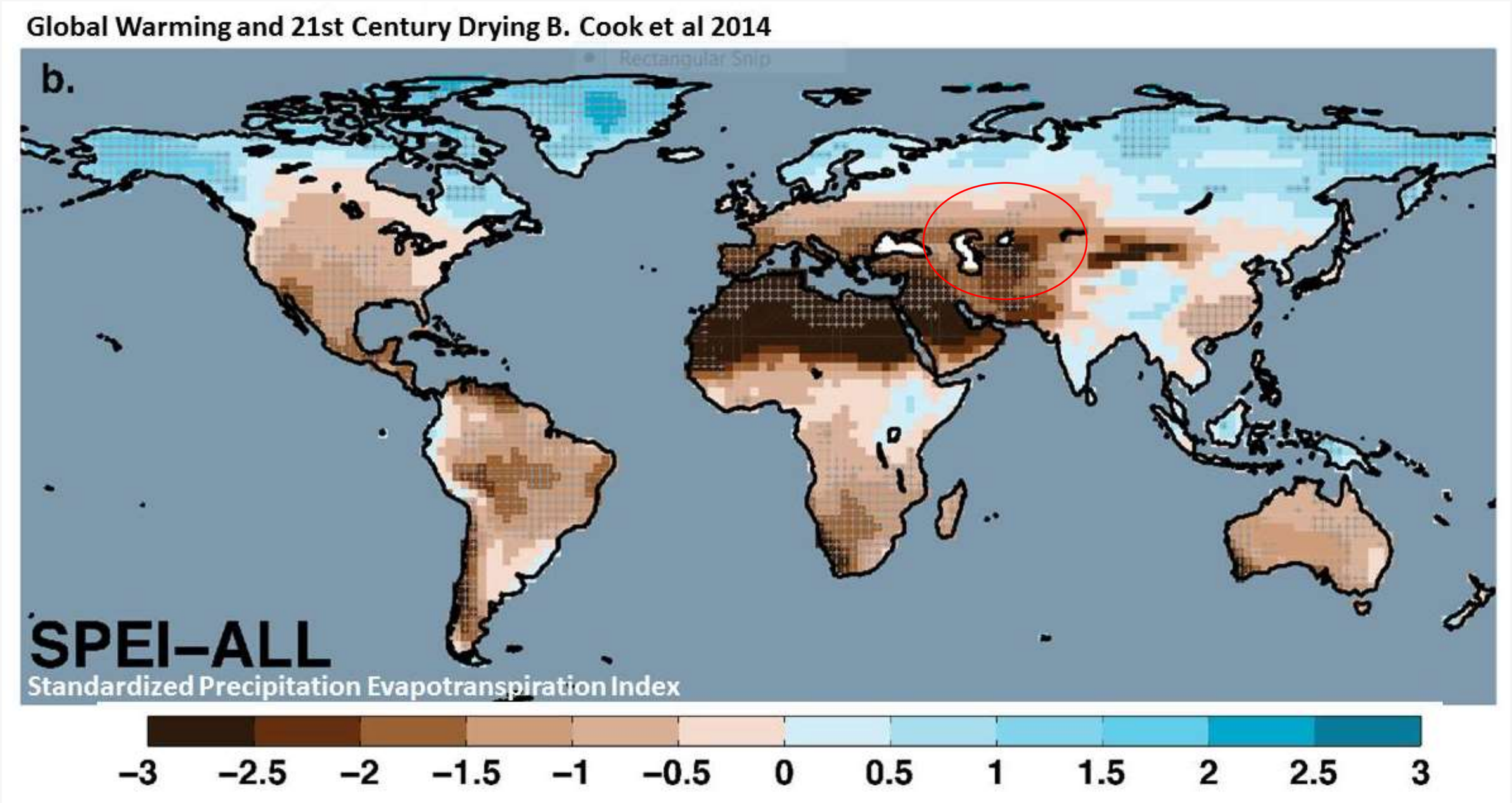
14 June 2019
Almaty, Kazakhstan

introduction

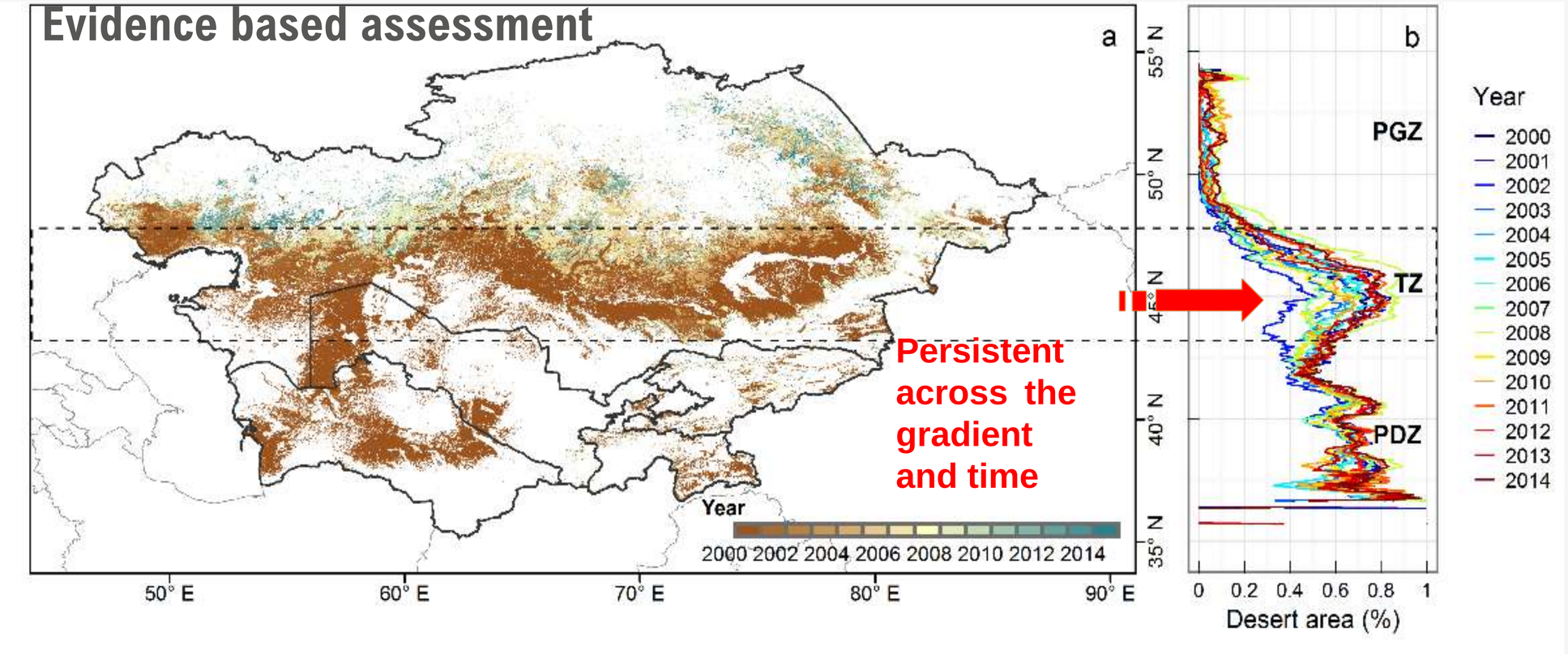
It’s estimated nearly 1.5 billion people will be on “move” in next 5-10 years time



Drought Projection by 2100



Climate Change in Central Asia

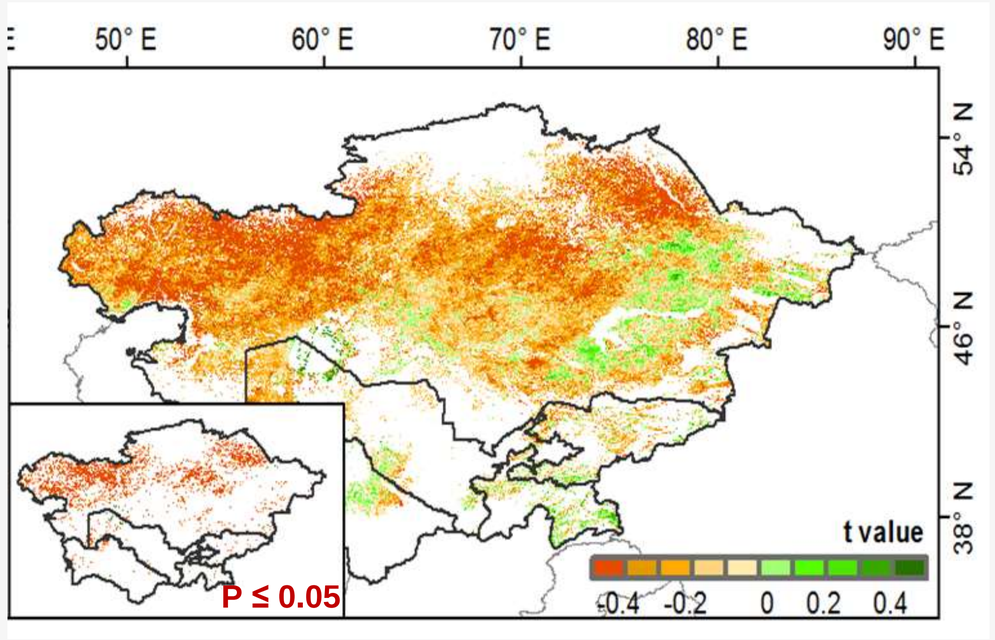


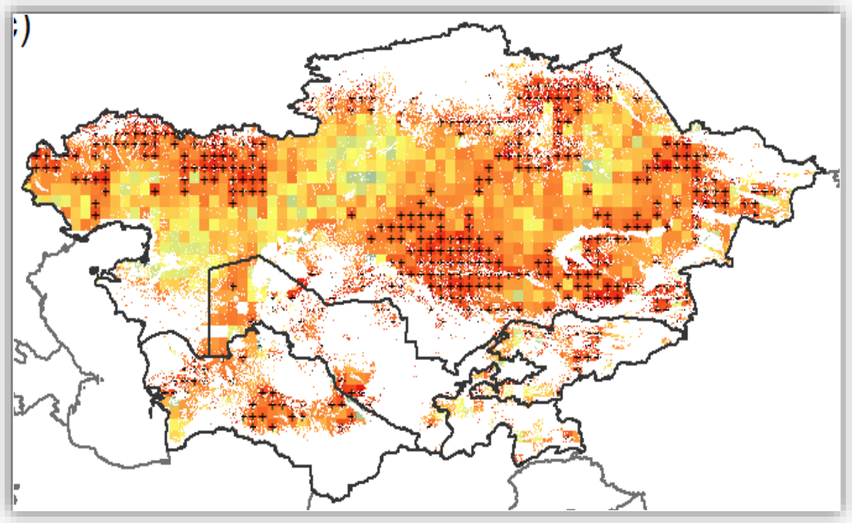
- The change analysis indicated that **grassland area** in Central Asia decreased (12.5%) in the past 15 years, especially significant within a latitude range of 43-48°N.
- Trend of gradual delay from south to north (profile), indicating the **northward extension of desertification regime**, which led to the large decrease in grasslands.

Biradar, et al., 2016; Zhang, Biradar, et al., 2017

Climate Change in Central Asia

- Spatial patterns showed an **overwhelming land degradation** across the central Asia,
- Persistent across the landscape and severe in the **northern Kazakhstan**





- Under CC, land degradation is **expected to exacerbate** in Central Asia in future.
- The identification of **sensitive and fragile regions** can help **prioritize and effectively mitigate** desertification in Central Asia.

Challenges of adaptation to climate change

Complex in nature, depends on environmental as well as socio-economic aspects

Environmental, for example:

- Context - drylands, high reliance on irrigated agriculture
- Drought is not sudden, ‘creeping phenomenon’
- No single indicator for monitoring, high uncertainty – and there is no single coping intervention

Socio-economical, for example:

- Impacts poorly understood - little documentation, not systematic
- Strategies not mainstreamed – decision-support tools are not tailored to policy and management decisions

Impact Assessment

CROP	COUNTRY	IRRIGATION	CHANGE OF YIELD ACROSS ALL MGMT. LEVELS AND FUTURES (%)	
			A1B	A2
WHEAT	KAZAKHSTAN	RAINFED	8	9
		SI	10	10
	KYRGYZSTAN	SI	8	8
		RAINFED	24	24
	TAJIKISTAN	SI	5	5
		RAINFED	24	29
	UZBEKISTAN	SI	14	14
		FULL IRRIG.	14	14
COTTON	KYRGYZSTAN		6	0
	KAZAKSTAN		9	9
	TAJIKISTAN		-18	-14
	UZBEKISTAN		-11	-16
POTATO	KAZAKHSTAN		-3	-5
	TAJIKISTAN		57	68
	UZBEKISTAN		19	15

Glazirina et al. 2012. Model simulations CropSyst for wheat; DSSAT for cotton and potato

Impact Assessment: Yield

Effects of climate change on crop yields 2040-2050 relative to current yields in Uzbekistan under high impact scenario

Irrigated/Rainfed	*Crop*	*Desert and Steppe East*	*Desert and Steppe West*	*Highlands South*	*Piedmont zone East*	*Piedmont zone Southwest*
Irrigated	Alfalfa	3	2	3	27	1
	Apples	–22	–14	–19	–24	–19
	Cotton	–10	–8	0	–9	–9
Rainfed	Grassland	10	–9	3	28	–5
	Potatoes	–10	–11	–13	–12	–11
	Tomatoes	–16	–12	0	–10	–15
	Winter Wheat	–8	–5	–2	19	–19
	Spring Wheat	–31	–16	–30	–12	–29

Note: Results are average changes in crop yield, assuming no adaptation and no irrigation water constraints and no effect of carbon dioxide fertilization, under high impact scenario. Declines in yield are shown in shades of orange, with darkest representing biggest declines; increases are shaded green, with darkest representing the biggest increases.

➢Effects are not always negative, positive for some crops/areas

Sutton et al. (2013) Looking beyond the horizon. World Bank.

the agenda

- **introduction** to Central Asia Climate Information Platform and Regional Framework (CAMP4ASB)
- **platform concept**, design framework and main building blocks
- **action plan, participation and suitability**

- **informative survey**, distribution of forms, filling

coffee break

- **group discussion by focus area** on available on **data / communication channels / …**
- **plenary restitution** of results of the group discussion

lunch

- **one-to-one meeting**

the context …

The project is carried under the **CAMP4ASB** program (Climate Adaptation and Mitigation Program for Aral Sea Basin) based on a partnership between **CAREC** and **World Bank**, with the funding of **IDA**.

In particular the activity is part of the Component 1 “Regional Climate Knowledge Services” of CAMP4ASB and refers to:

- Strengthening the **Information Platform** of Central Asia
- Developing **knowledge products**
- **Outreach and coalition building**

Climate Adaptation and Mitigation Program for Aral Sea Basin (CAMP4ASB) infographic. Photo credit: Saltanat Zhakenova /The Regional EnvironmentalCentre for Central Asia

the project team…

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ICARDA
Science for resilient livelihoods in dry areas

The International Center for Agricultural Research in the Dry Areas (ICARDA) is an international organization undertaking research-for-development. We provide innovative, science-based solutions for communities across the non-tropical dry areas. In partnership with research institutions, NGOs, governments, and the private sector, our work advances scientific knowledge, shapes practices, and informs policy.

iMMAP

iMMAP is an international not-for-profit organization that provides information management services to humanitarian and development organizations, enabling partners to make informed decisions that ultimately provide high-quality targeted assistance to the world's most vulnerable populations.

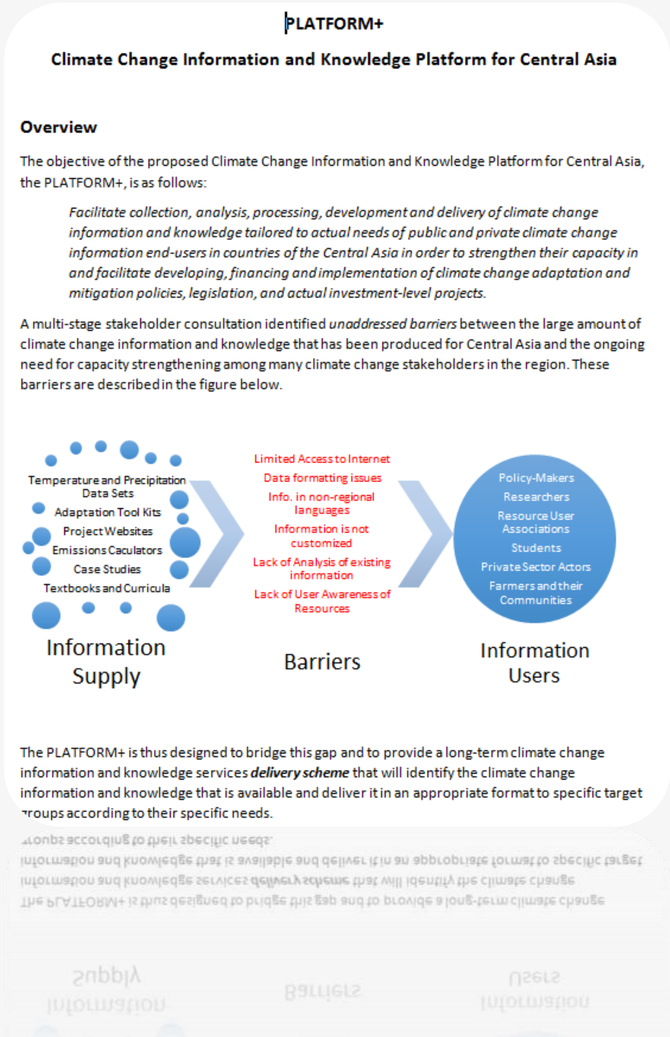
platform concept

the background …

A **previous feasibility study, carried out on behalf of CAREC**, after having analyzed the opportunities of development of a climate change platform in Central Asia, highlighted some key points.

CACIP starts from these points:

- **sustainability**, long-term duration
- **re-use** of existing information, services, knowledge, expertise, institutional infrastructure, software solutions
- **accessibility** (language, format, dissemination channels)
- **network** at country, regional, international level
- **human factor should be the core of the platform** (in the document was called PLATFORM+, where “+” is the human factor)



PLATFORM+

Climate Change Information and Knowledge Platform for Central Asia

Overview

The objective of the proposed Climate Change Information and Knowledge Platform for Central Asia, the PLATFORM+, is as follows:

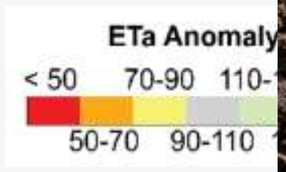
> *Facilitate collection, analysis, processing, development and delivery of climate change information and knowledge tailored to actual needs of public and private climate change information end-users in countries of the Central Asia in order to strengthen their capacity in and facilitate developing, financing and implementation of climate change adaptation and mitigation policies, legislation, and actual investment-level projects.*

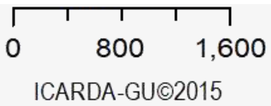
A multi-stage stakeholder consultation identified *unaddressed barriers* between the large amount of climate change information and knowledge that has been produced for Central Asia and the ongoing need for capacity strengthening among many climate change stakeholders in the region. These barriers are described in the figure below.

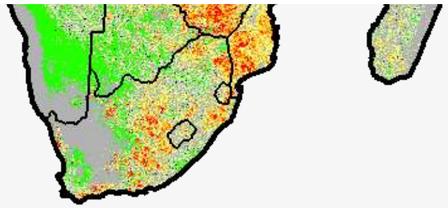
The PLATFORM+ is thus designed to bridge this gap and to provide a long-term climate change information and knowledge services ***delivery scheme*** that will identify the climate change information and knowledge that is available and deliver it in an appropriate format to specific target groups according to their specific needs.

Impact of climate on planetary health

>> land use pattern, water balance and climate

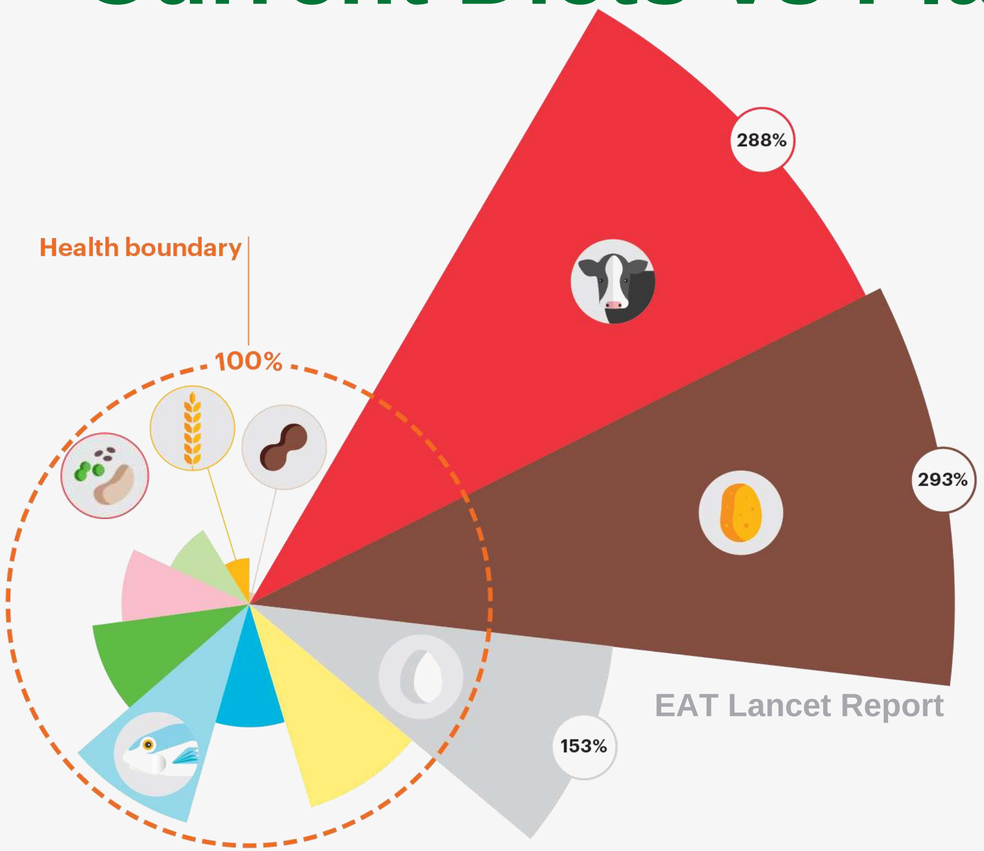




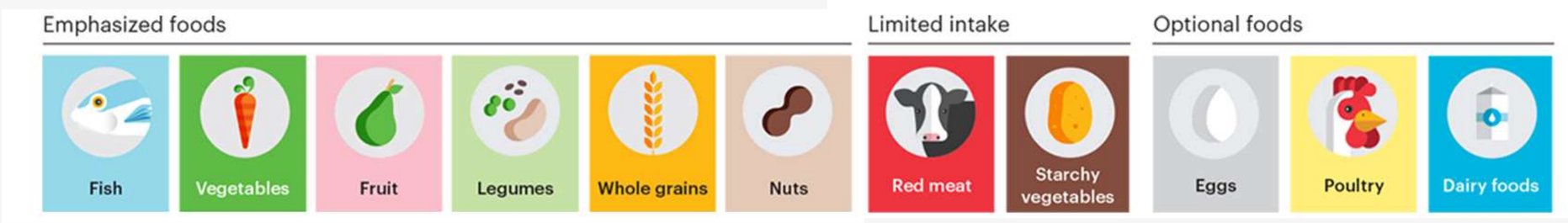


- Climate variability and extreme events
- Dominance of mono-cropping / few commodity focus
- Depleted soil organic carbon

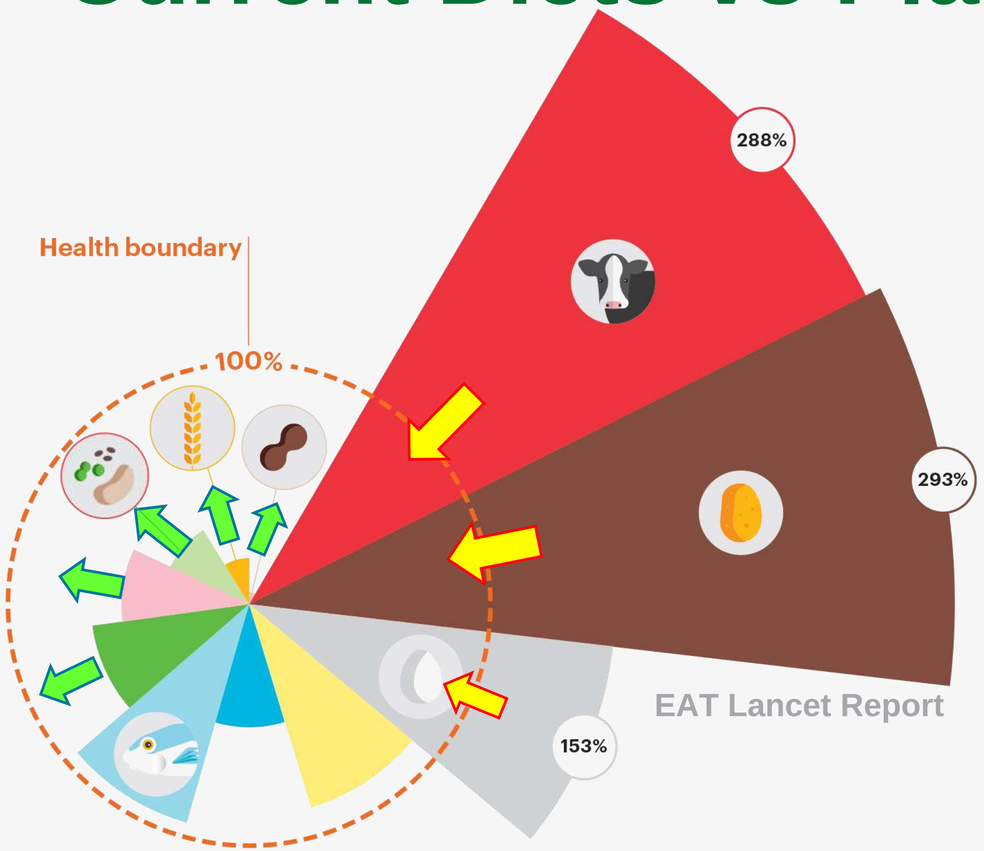
Current Diets vs Planetary Health

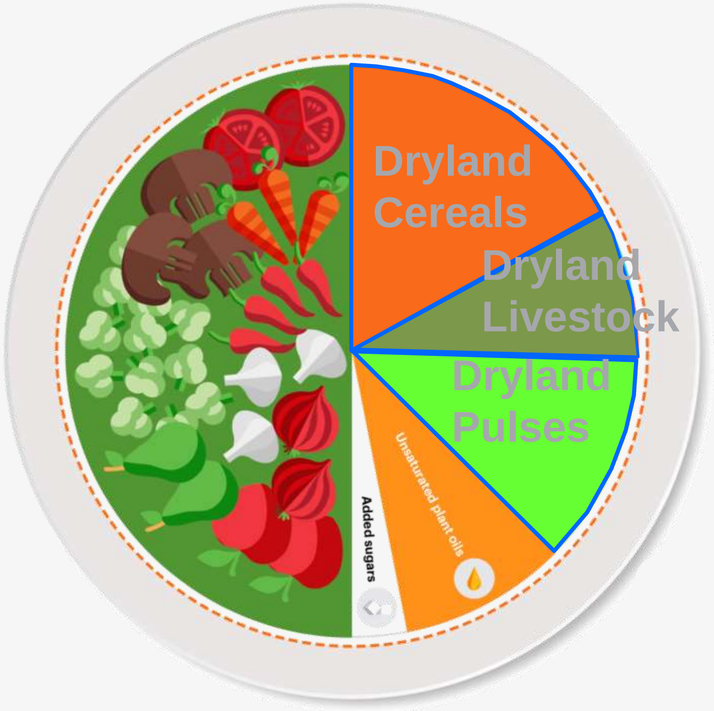


Moving from narrow sense economic benefit to a new ecologically sound functional system for well being…

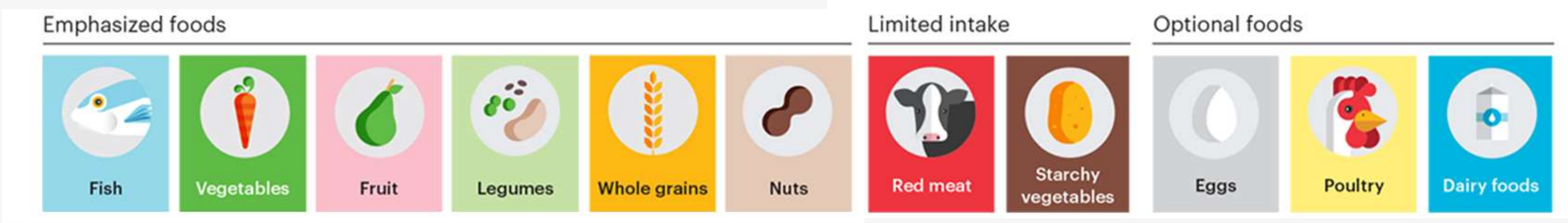


Current Diets vs Planetary Health





…with diversified cropping systems, conservation, rotation, nutrition focus >> **“more health per acre”**



Integrated systems combining component research & systems research

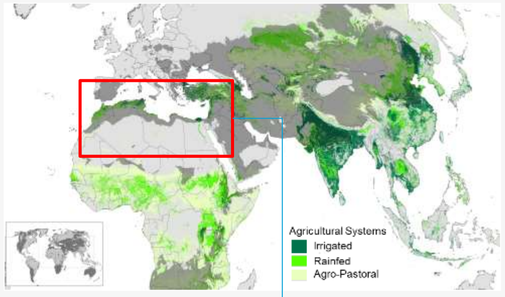
Global

Country

Region

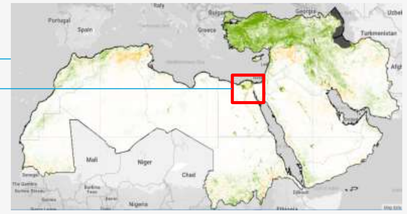
Landscape

Farm/Field

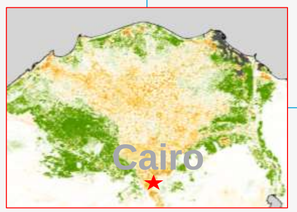


Climate (Variability and Change)

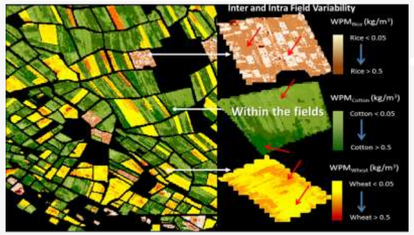
Nutrition Security and Sovereignty



Un-employment
Poverty



NRMs



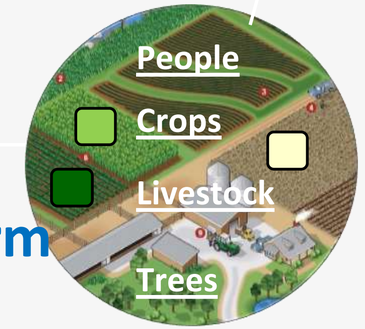
Functional
Productivity

Supply Chain

Down

Out

Up



Farm

Agricultural Systems
Irrigated
Rainfed
Agro-Pastoral

Data growing exponentially

>> it demands new technical and strategic approaches untap its huge potential

GEOAGRO

44 zettabytes

unstructured data

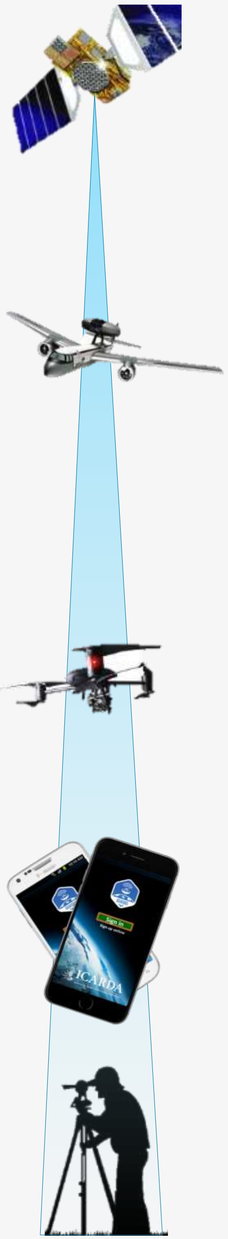
You are here

structured data

2010

2018/2019

2020



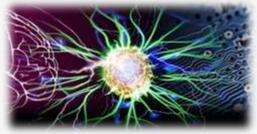
icarda.org

New era of analytics

Conscious Systems Era

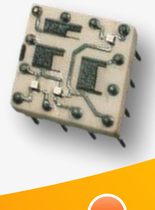
Local intelligence

Cognitive Systems Era



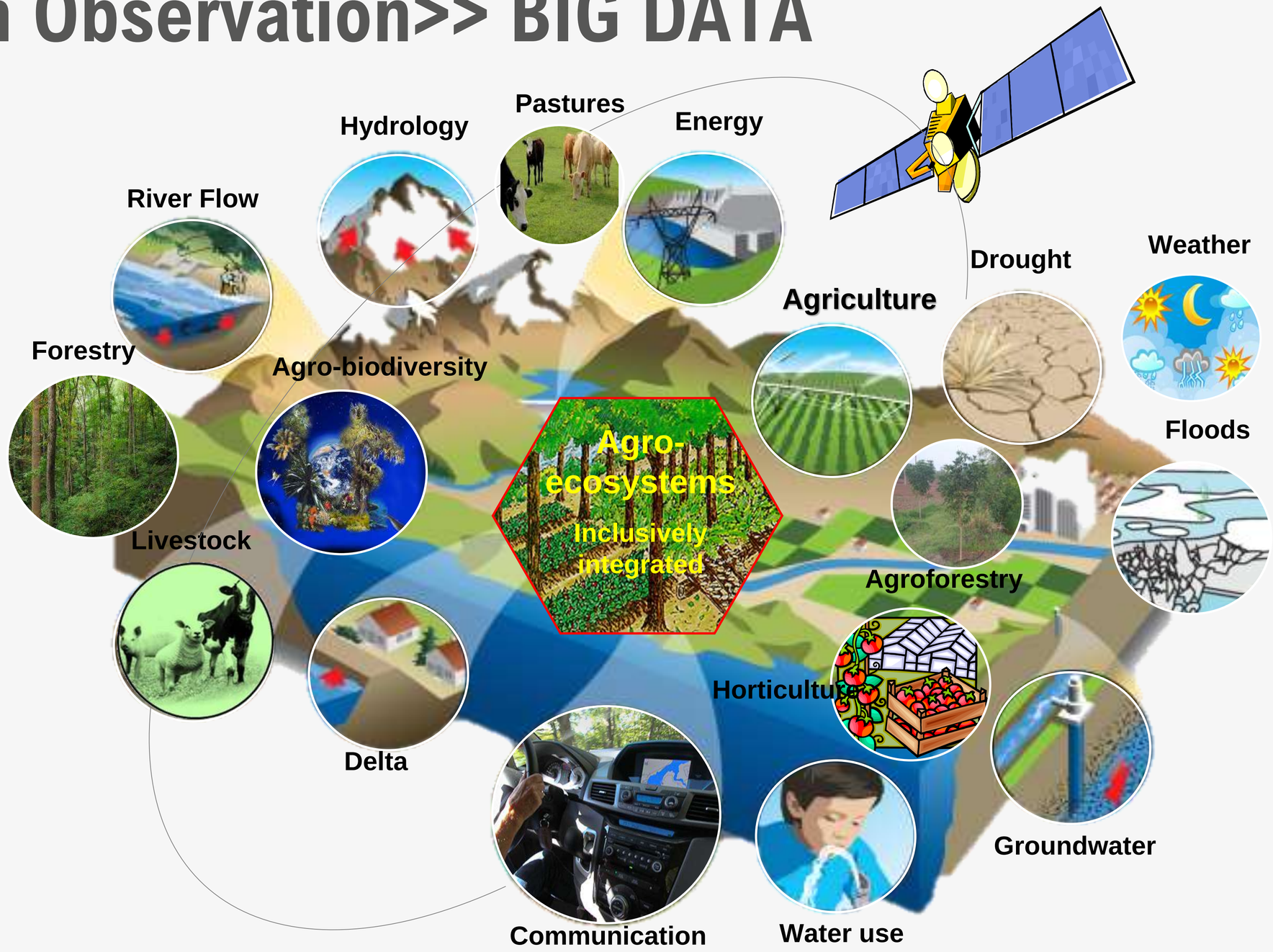
Data driven

Programmable Systems Era

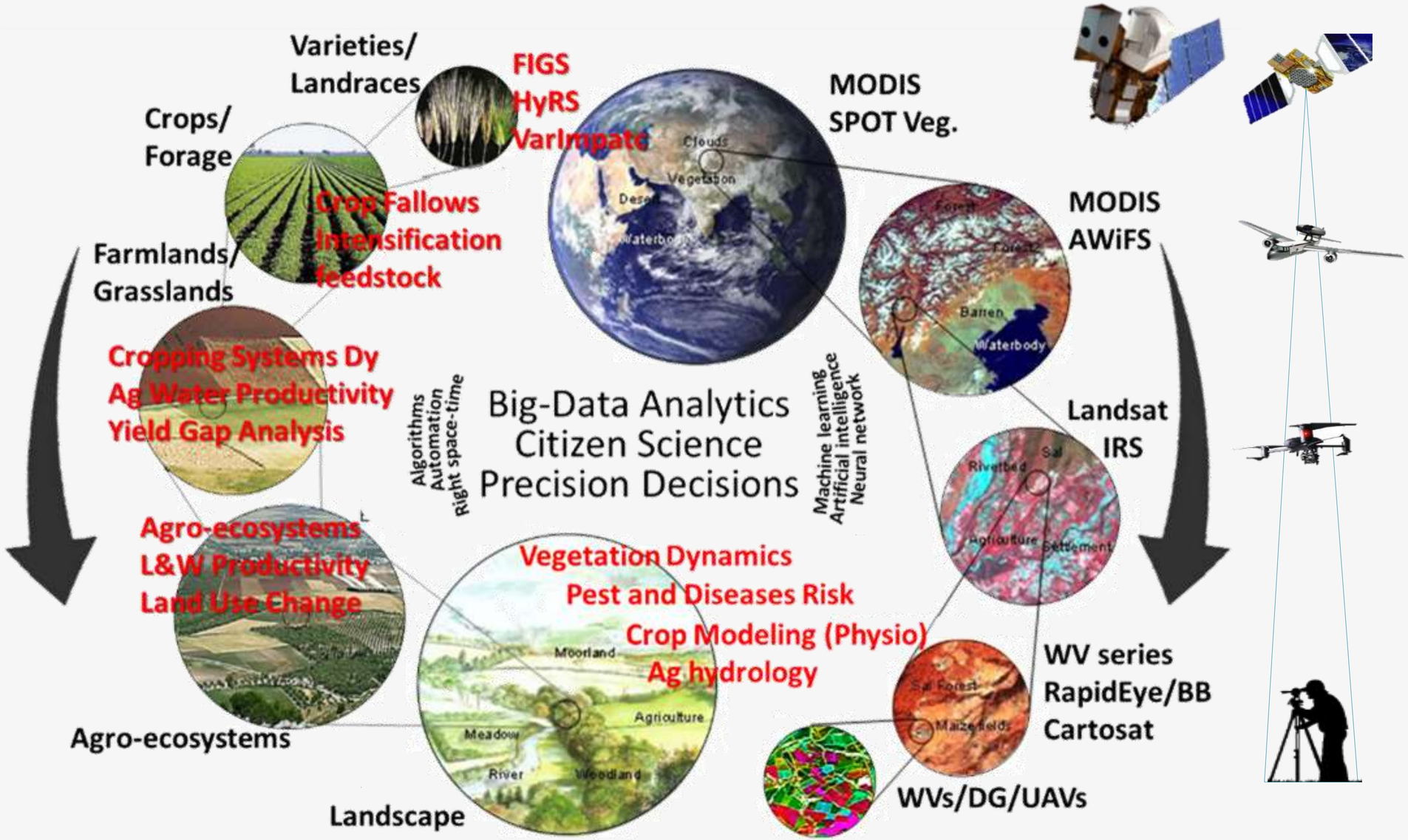


Tabulating Systems Era

Earth Observation>> BIG DATA



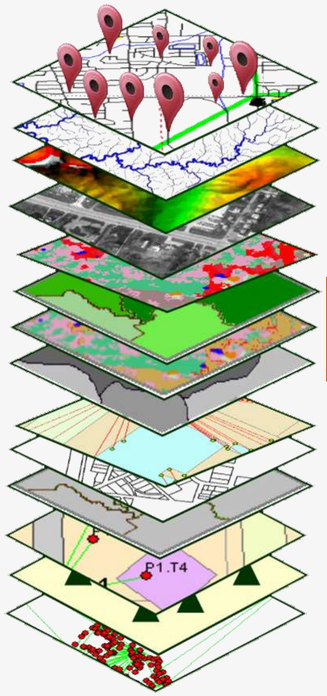
Disciplines, Scales and Trade offs



Digital (data and knowledge) Augmentation

Geotagging
Satellite data
Crop data
Climate data
Soil data
Water data
Topography
Demography
Ecological data
…

Data Layers



Computation

Algorithms

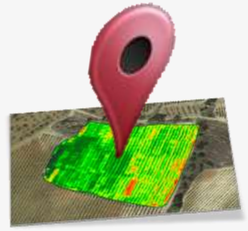
Biggest drivers

Applications

Scalability

Mapping
Monitoring
Targeting
Estimating
Forecasting
Warning
Lending
Insurance
Value chains
Carbon-Credits

location based services



Technologies are mature to make better decisions

>> but need strong, committed and collective actions to see the results

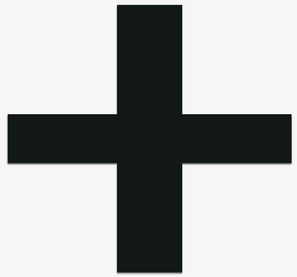
- Thousands of research and outreach data points in each season across the disciplines
- Open source near real-time earth observation data at field, farm and landscape scales
- Enormous power of cloud computing, open access, algorithms and analytics to process data on time
- Smart phone enabled apps and cloud web-GIS for decision making at point, farm and administrative units

AWS Google Earth Engine

the human factor …

To be effective, CACIP (=PLATFORM+) must **last over time** …
and to last over time, the **human factor is decisive and crucial**

- in the **back-end** skilled Experts should supervise PLATFORM+
- In the **dissemination phase** local “subjects” should help disseminating information
- at the **front-end** users/stakeholders should contribute with their contents
  users should keep used=alive the PLATFORM+



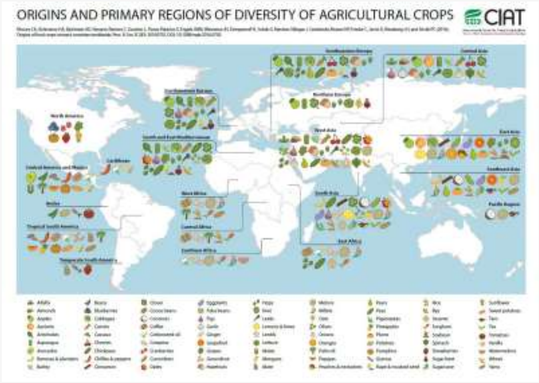
the objectives …

Based on the previous results, the mandate of CACIP project asks us to

- make available **comprehensive and up-to-date relevant data and information** (relevant to the issues related to climate change), linked to high-quality datasets (including time series and spatial information)

- provide **analytical tools and interfaces for the visualization and interpretation** of data and information

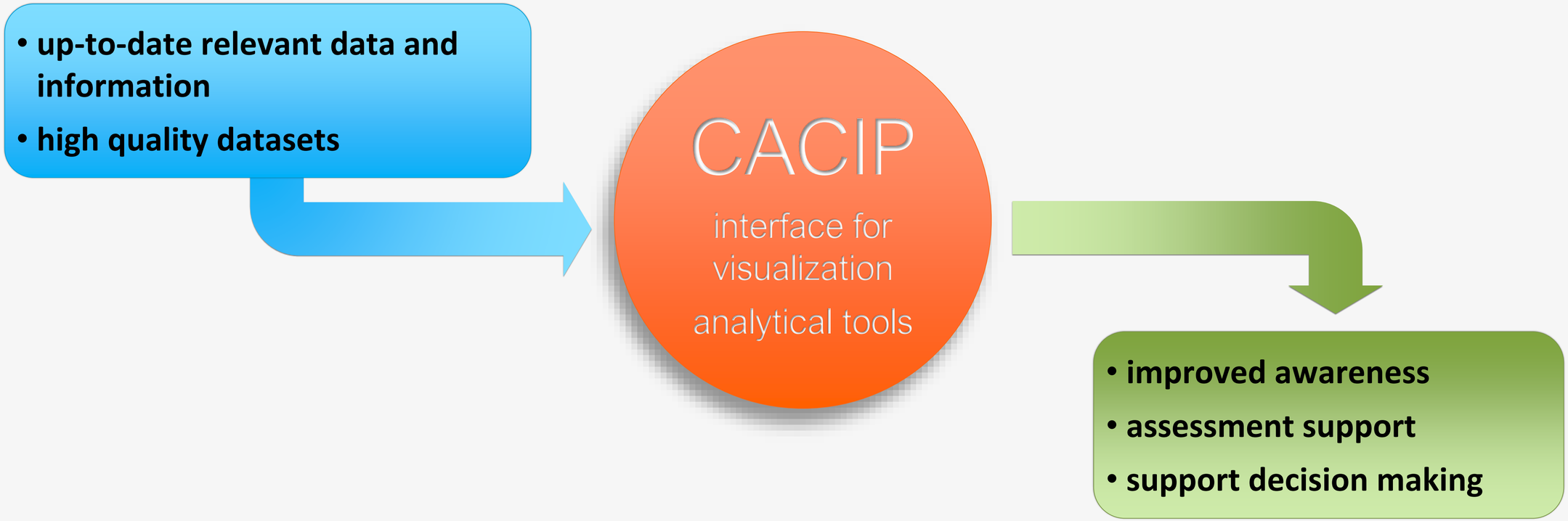
https://towardsdatascience.com



https://blog.ciat.cgiar.org

the platform …

CACIP (Central Asia Climate Information Platform) is a platform which will help stakeholders to access, analyze and visualize public-domain data to support improved awareness, assessment and decision support.



starting from the name …

CENTRAL ASIA

CLIMATE INFORMATION

CENTRAL ASIA

PLATFORM

summary

- PLATFORM vs WEBSITE
- DESIGN PRINCIPLES
- LOGICAL ARCHITECTURE
- CLIMATE INFORMATION
- CENTRAL ASIA
- PARTICIPATION PLAN
- SUSTAINABILITY PLAN

platform

PLATFORM
CLIMATE INFORMATION
CENTRAL ASIA

platform … the social meaning

website

a website is a collection of resources able to provide information to **USERS**

platform

a platform supports **COMMUNITIES** sharing contents and services

WEBSITE

Platform

platform … making community

HAVING A PLACE	the platform CACIP will be this place
HAVING COMMON INTERESTS	for all subjects interested in **climate change** (policy makers, environmental agencies, research and training institutions, entities implementing and financing CC mitigation and adaptation projects, regional organizations, donors, experts, individuals)
FINDING WHAT WE NEED and **SHARING WHAT WE HAVE**	information, data, publications, best practices, maps, interactive tools, media, case studies, news, expertise, reports

platform … design principles 1/2

SUSTAINABILITY, LONG-TERM SERVICES

- long–term provision of free, public-domain climate information
- minimize cost of O&M

RE-USE

- max use of existing information, knowledge, expertise
- max use of existing infrastructure

NETWORK

- facilitation of in-country, regional, international cooperation and information sharing

PLATFORM vs WEBSITE
DESIGN PRINCIPLES
LOGICAL ARCHITECTURE
CLIMATE INFORMATION
CENTRAL ASIA
PARTICIPATION PLAN
SUSTAINABILITY PLAN

platform … design principles 2/2

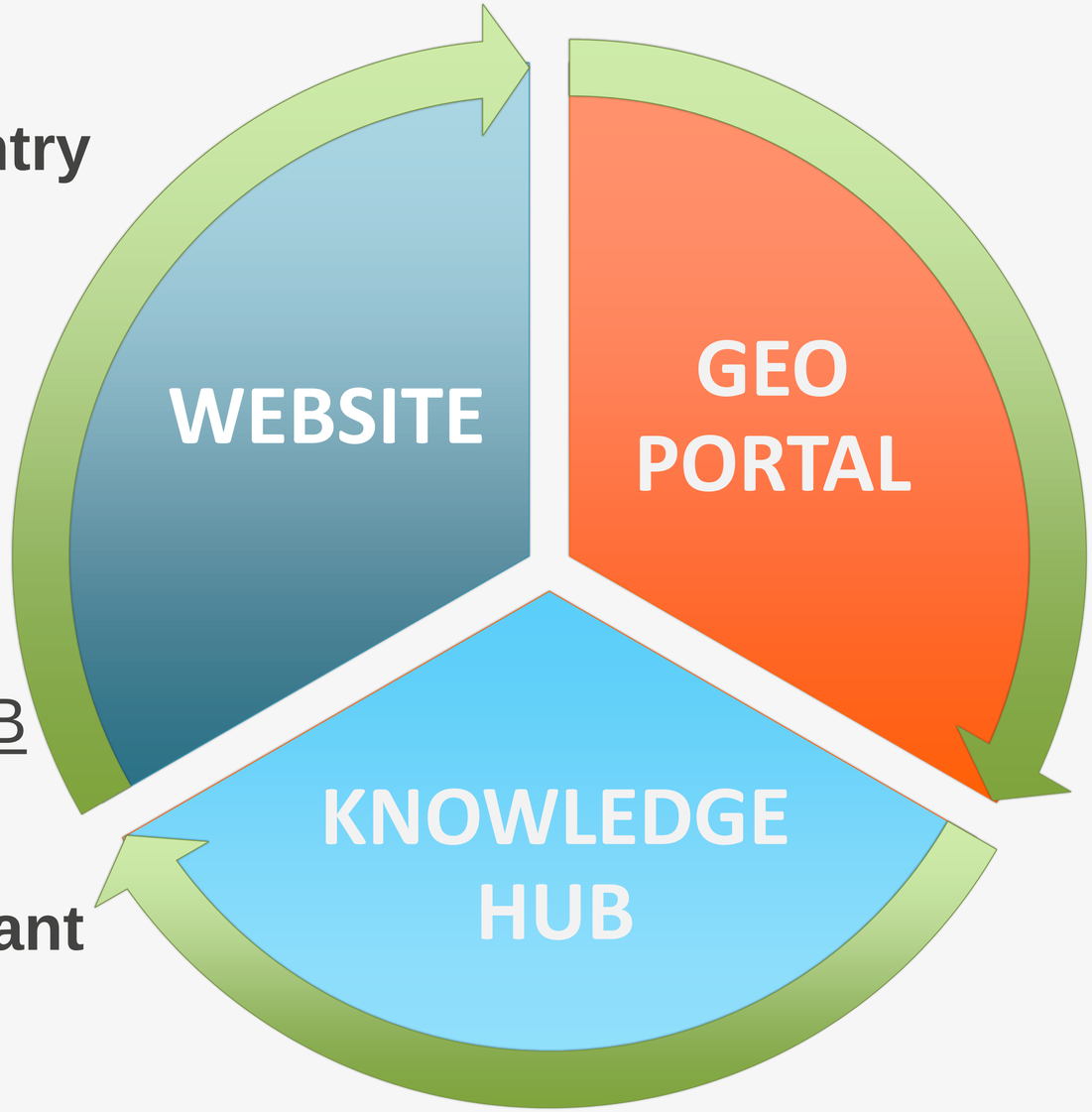
ACCESSIBILITY

- the main language is **Russian**, with key components in English
- accessible in all digital platforms (computers, tablets, smartphones)
- facilitate the **linkage to modern decision support systems**

- delivery of information in **analysis-ready** format
- support for **off-line knowledge products** (by including in the platform contents easy-printable)

platform … logical architecture

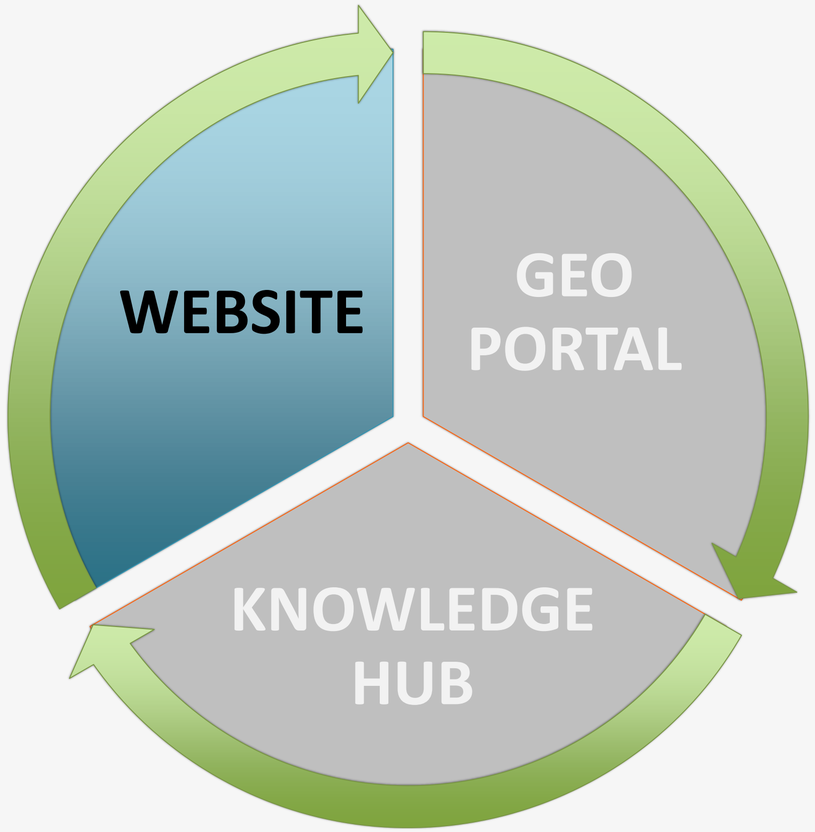
the WEBSITE is the **entry point** of the platform



the GEO PORTAL collects manages and displays **geographical data** and includes **analysis tools**

the KNOWLEDGE HUB collects, store and provides docs, ideas, contacts, and **all relevant information**

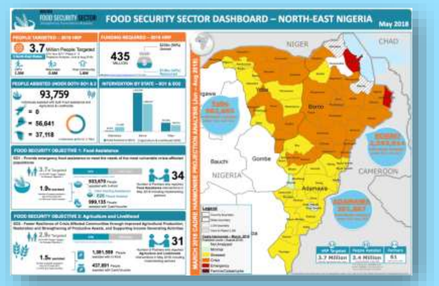
logical architecture … website 1



WEBSITE

- is the main entry point of the platform
- set the language (Russian, English)
- lets the user access to all sections
- provides a full text search
- shows news, tweets, updates, …
- manages user registration, forum
- includes dashboard style information

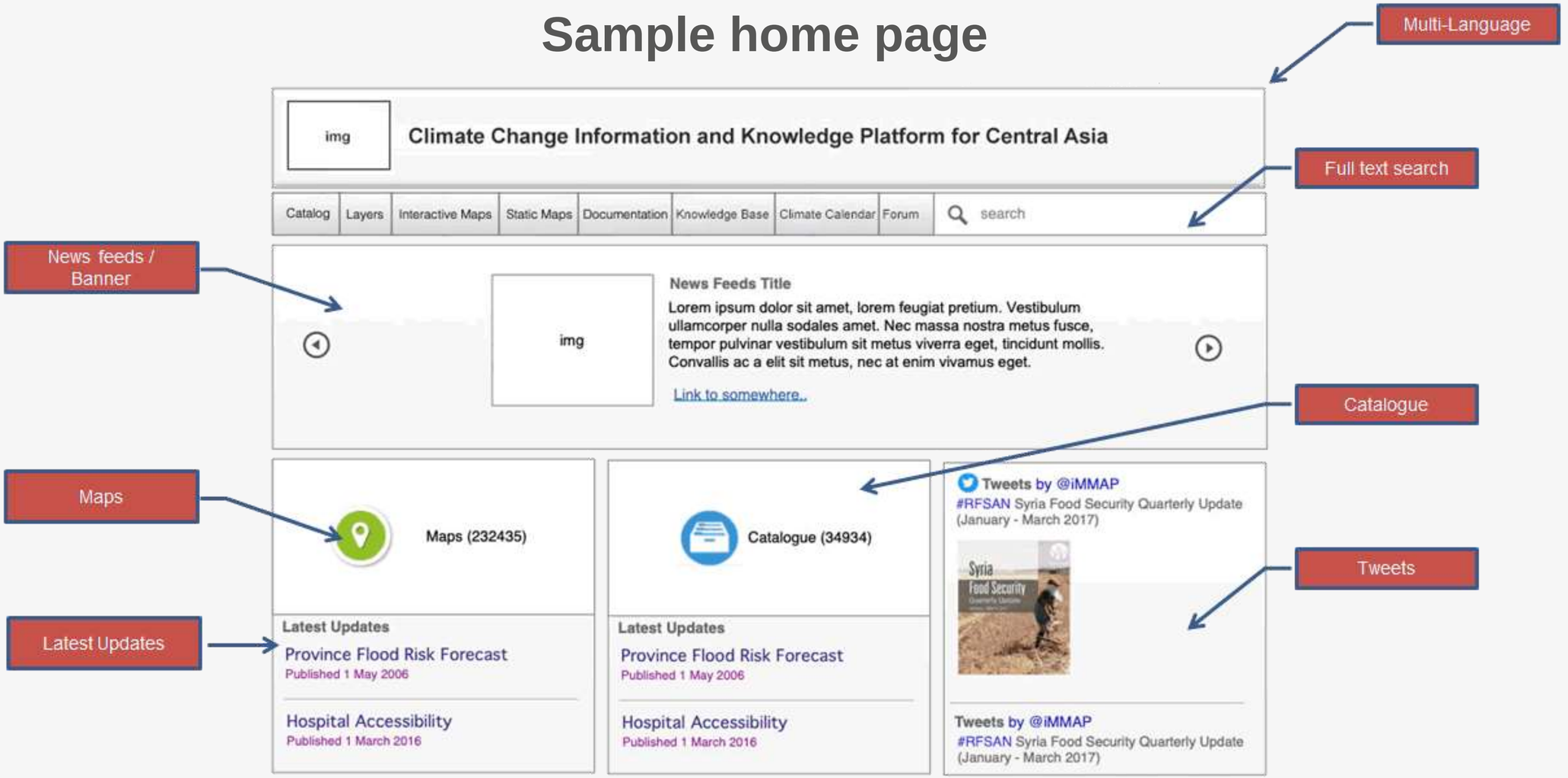
https://www.icarda.org/



https://immap.org/products/

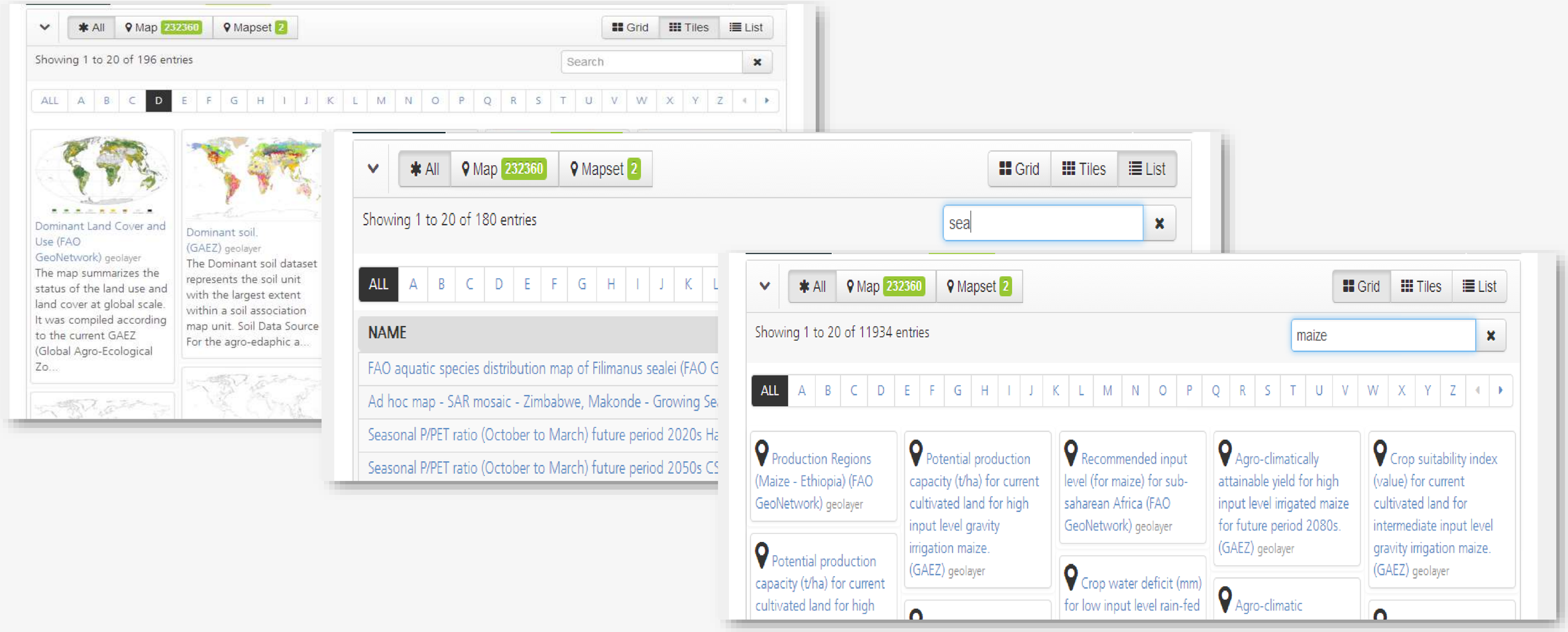
logical architecture … website 2

Sample home page

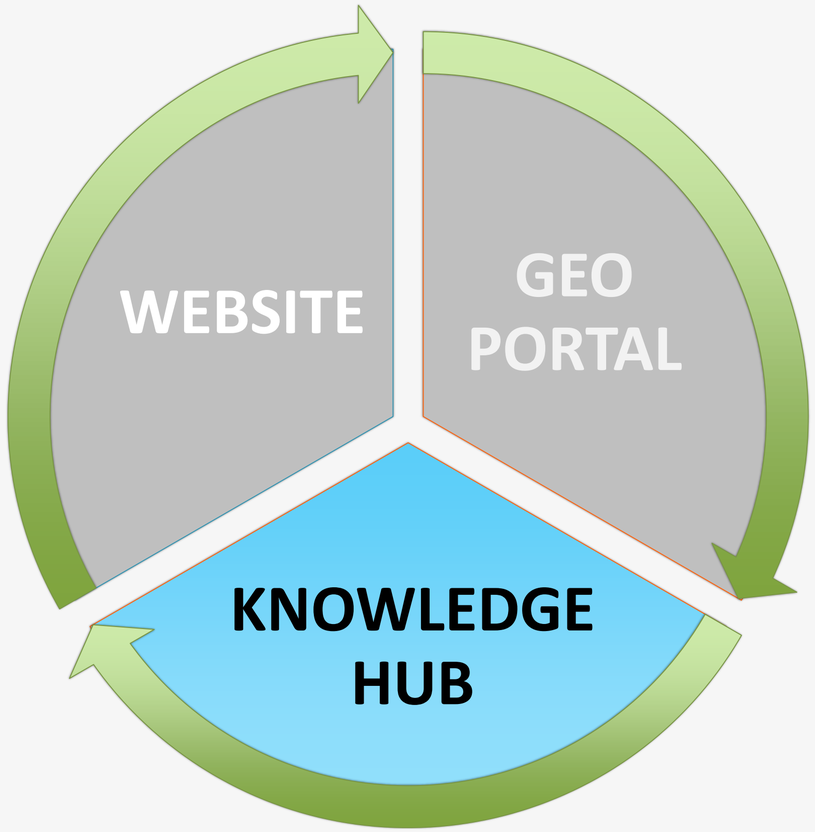


logical architecture … website 3

Sample search result with multiple card views



logical architecture … knowledge 1



KNOWLEDGE HUB

- publications (reports, webinars, atlases, posters, infographics, conference proceedings, studies)
- best practices, methodologies
- projects reviews
- news, tweets
- …

logical architecture … knowledge 2

The KNOWLEDGE HUB manages both **static** and **dynamic** knowledge

STATIC KNOWLEDGE

Comprehensive inventory of databases and web resources available for consultation and **tagged by user profiles/use cases**

Series of Publications, Maps, Infographics and Posters **replicated from original sources** (not interoperable) using standardized knowledge software (DSPACE-DATAVERSE-FLICK-YOUTUBE, depending on the type of knowledge)

DSPACE	DATAVERSE	FLICKR	YOUTUBE
Open source web application used to create repositories of scientific publications	Open source web application to share, preserve, cite, explore, and analyze research data	To manage and share photos	To manage and share videos
https://duraspace.org/dspace/about/	https://dataverse.org/	https://www.flickr.com/	https://www.youtube.com

logical architecture … knowledge 3

The KNOWLEDGE HUB manages both **static** and **dynamic** knowledge

DYNAMIC KNOWLEDGE

Knowledge repositories **harvested via API** for rapid consultation and **matched with users profiles** base on standardized software (DSPACE/DATAVERSE)

Dynamic infographics from knowledge harvested

RSS Feeds and Social Media real-time integration

DSPACE

Open source web application
used to create repositories of
scientific publications

https://duraspace.org/dspace/about/

DATAVERSE

Open source web application
to share, preserve, cite, explore,
and analyze research data

https://dataverse.org/

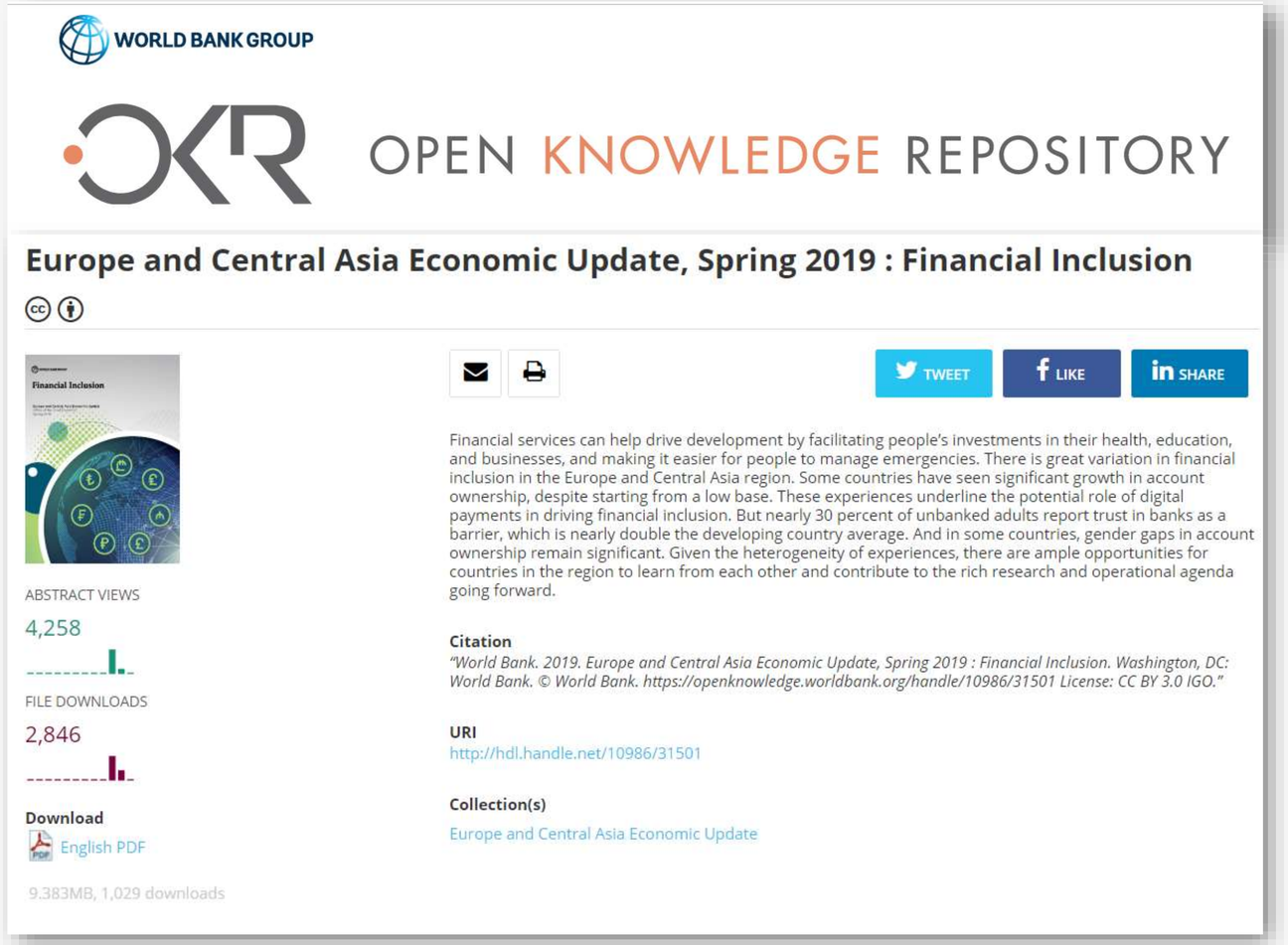
logical architecture … knowledge 4

Dynamic knowledge harvested via API
sample of query and visualization from OKR of the World Bank

1. **Visualization of the abstract and of the general information**

2. Visualization of metadata
   (in this case there is a mix of OKR specific tags and Dublin Core tags (Dublin Core Metadata Initiative DCMI has developed these interoperable online metadata standards: dc…)

3. Specifics to “harvest” the repository
   It is a good practice to inform users about harvesting procedures



logical architecture … knowledge 5

Dynamic knowledge harvested via API
sample of query and visualization from OKR of the World Bank

1. Visualization of the abstract and of the general information

2. **Visualization of metadata**
   (in this case there is a mix of OKR specific tags and Dublin Core tags (Dublin Core Metadata Initiative DCMI has developed these interoperable online metadata standards: dc…)

3. Specifics to “harvest” the repository
   It is a good practice to inform users about harvesting procedures

logical architecture … knowledge 6

Dynamic knowledge harvested via API
sample of query and visualization from OKR of the World Bank

1. Visualization of the abstract and of the general information

2. Visualization of metadata
(in this case there is a mix of OKR specific tags and Dublin Core tags (Dublin Core Metadata Initiative DCMI has developed these interoperable online metadata standards: dc…)

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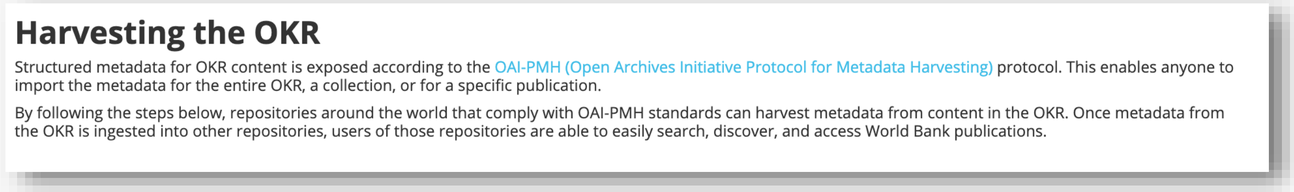
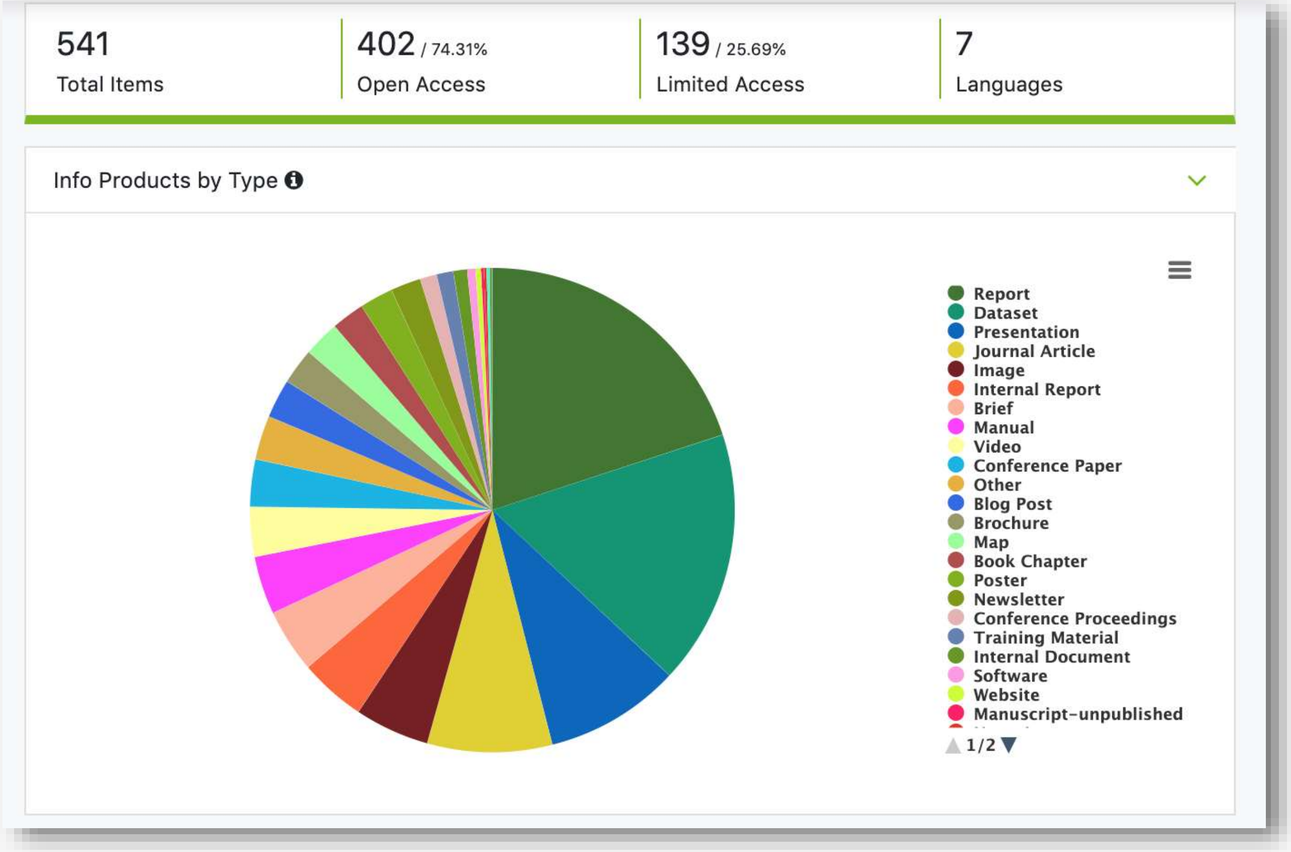


logical architecture … knowledge 8

Dynamic knowledge harvested via API
sample of query and visualization from AReS of the CGIAR

Useful/nice graphical visualizations

4. **Distribution for type** of the results of a query, and **aggregated statistics**
5. **Word cloud** based on the results of the query
6. **Geographical distribution** of the results and **histograms**



logical architecture … knowledge 9

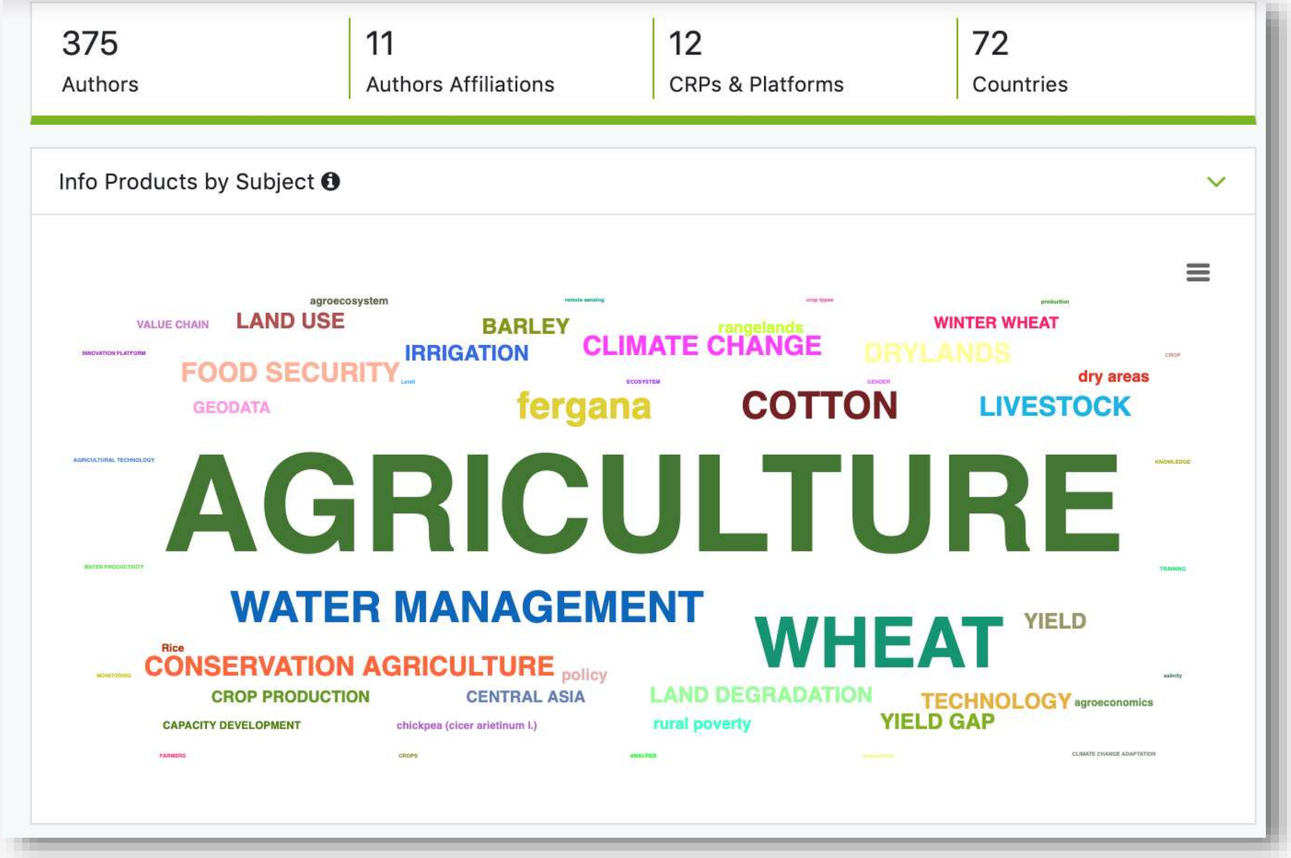
Dynamic knowledge harvested via API
sample of query and visualization from AReS of the CGIAR

Useful/nice graphical visualizations

4. **Distribution for type** of the results of a query, and **aggregated statistics**

5. **Word cloud** based on the results of the query

6. **Geographical distribution** of the results and **histograms**



logical architecture … knowledge 10

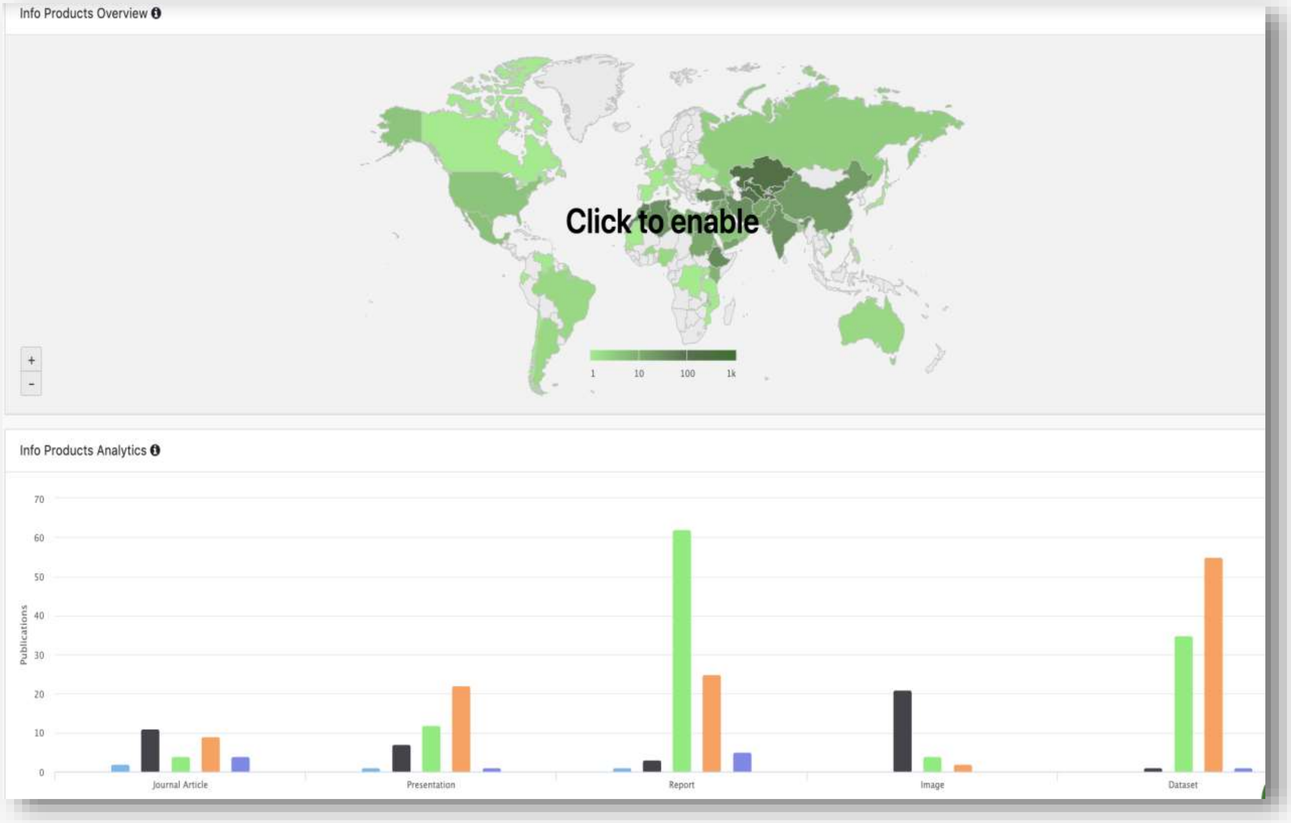
Dynamic knowledge harvested via API
sample of query and visualization from AReS of the CGIAR

Useful/nice graphical visualizations

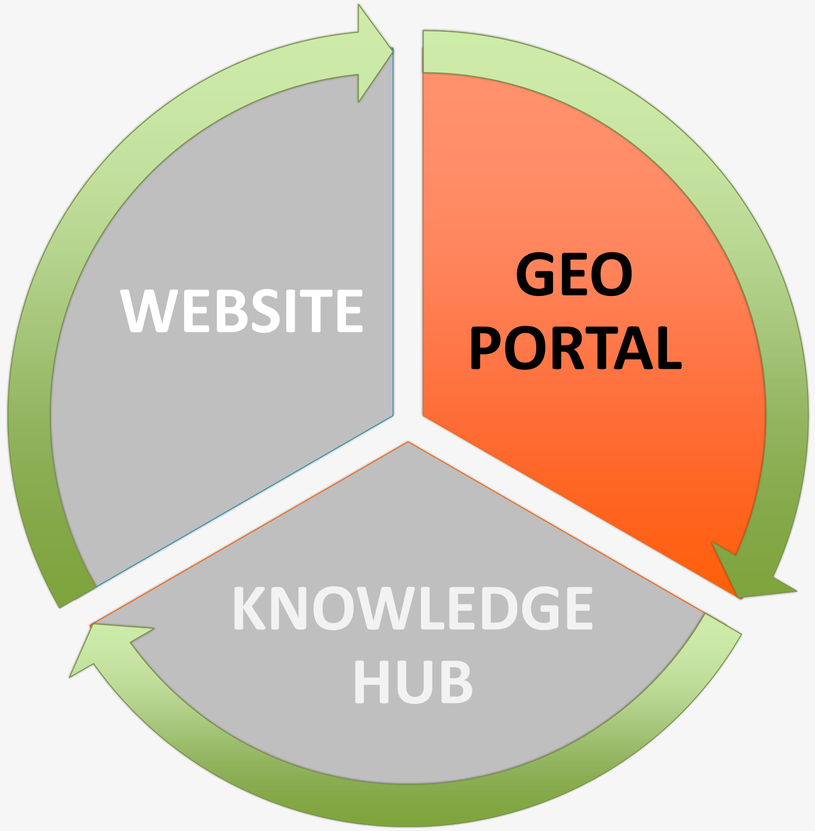
4. **Distribution for type** of the results of a query, and **aggregated statistics**

5. **Word cloud** based on the results of the query

6. **Geographical distribution** of the results and **histograms**

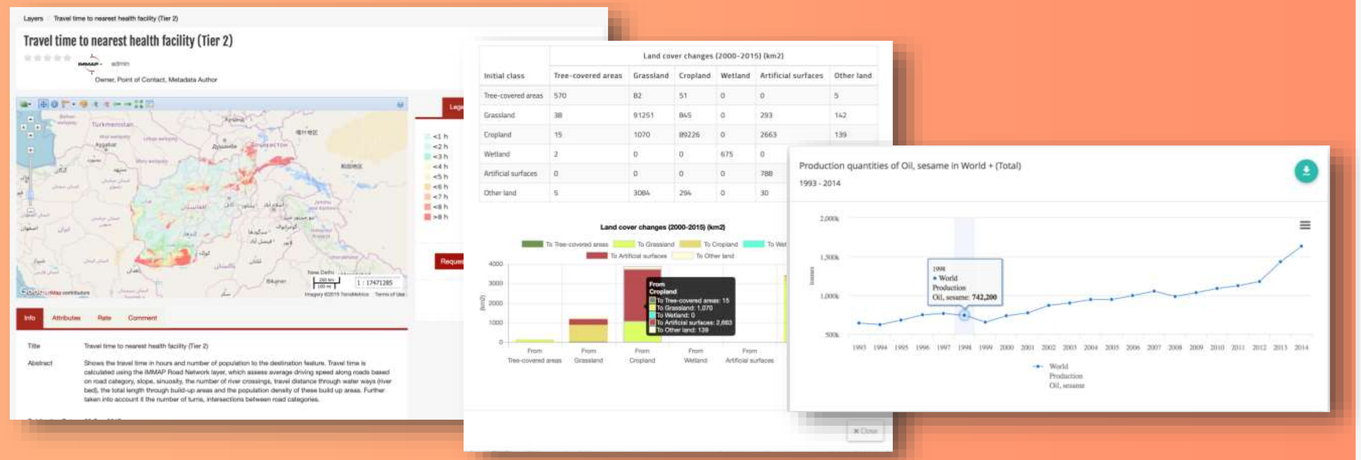


logical architecture … geo portal 1



GEO PORTAL

- collects data from external sources
- combines data with local sources
- displays interactive maps
- displays interactive data tables
- allows the access to data (WMS, WFS, API)



logical architecture … geo portal 2

The GEO PORTAL manages **static** and **dynamic** data and provide **analysis tools**

As the knowledge base, the GEO PORTAL combine dynamic harvested data with local static data, but **dynamic data are the first priority**.

PostGIS Spatial database is used to store local data

GeoServer is used to publish geographical data using open standards

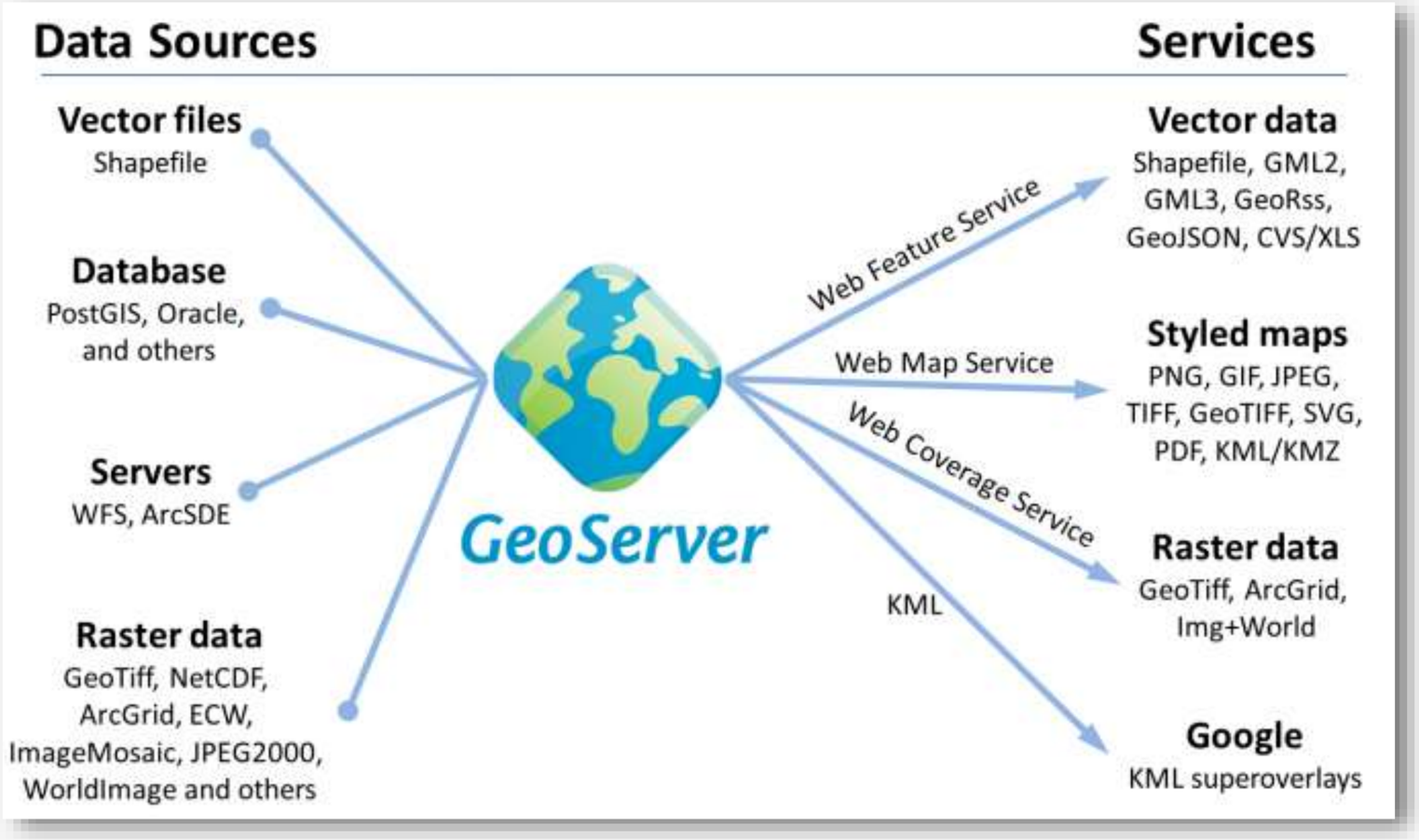
A **content management system** (GeoNode, other) manages the repository and provides the interface to the data.

logical architecture … geo portal 3

GeoServer input data

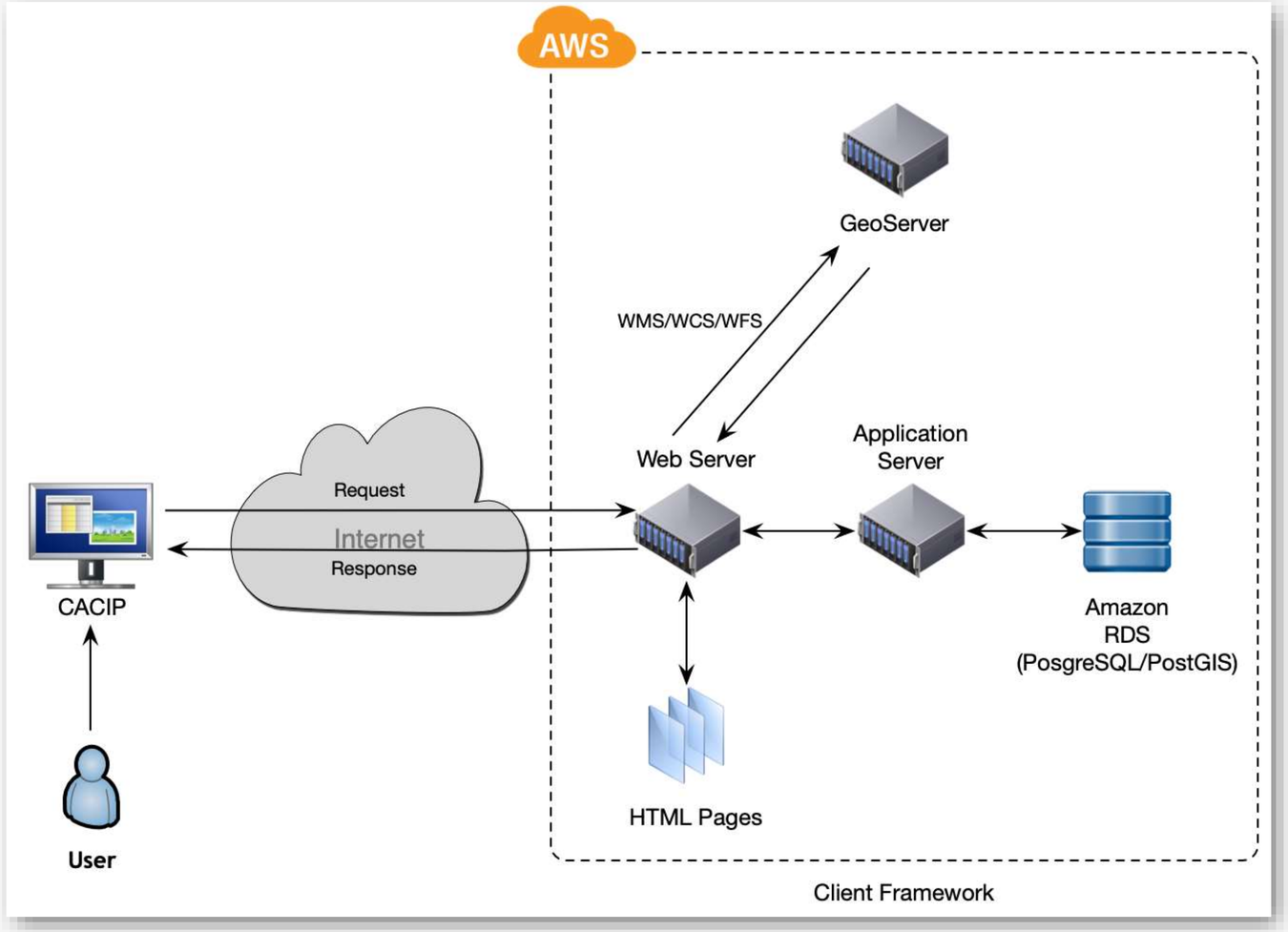
GeoServer is able to access geographical data from different sources (local and remote)

Vector files	shapefile
Database	PostGIS Oracle …
Servers	WFS ArcSDE
Raster data	GeoTiff ArcGrid ECW JPEG2000 …



logical architecture … geo portal 4

CACIP system architecture



GeoServer is able to publish local and remote data using open international interoperability standards

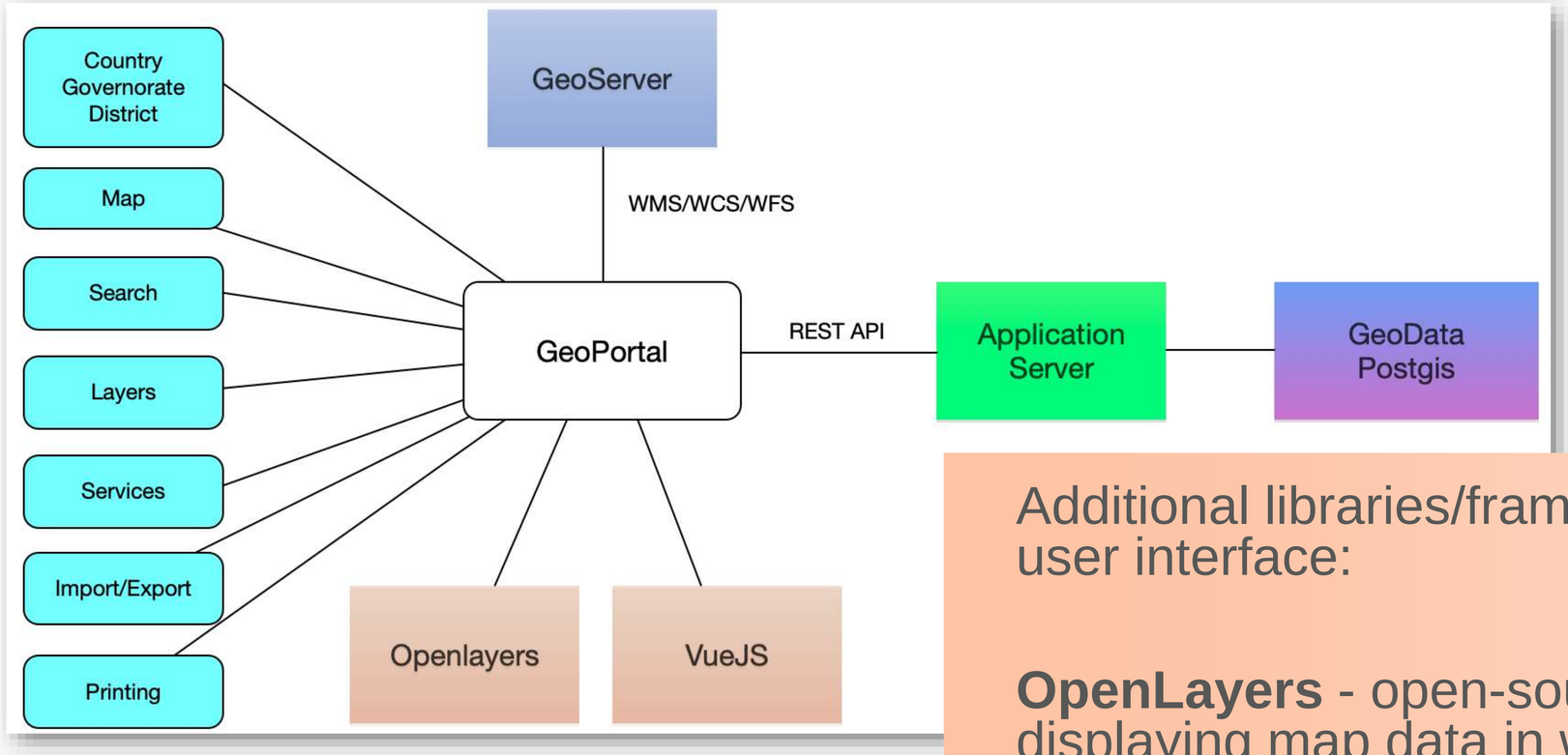
WMS - Web Map Service

WCS - Web Coverage Service

WFS - Web Feature Service

logical architecture … geo portal 5

CACIP components architecture



Additional libraries/frameworks are used to build the user interface:

OpenLayers - open-source JavaScript library for displaying map data in web browsers

VueJS - open-source JavaScript framework for building user interfaces and single-page applications

climate information

climate information … geographical data

(tentative list)

Historical climate variability

- **Temperature**
  (https://modis.gsfc.nasa.gov/data/)
- **Precipitation**
  (https://pmm.nasa.gov/GPM)
- **Evapotranspiration**
  (https://modis.gsfc.nasa.gov/data/)
- **Glaciers**
  (https://nsidc.org/)
- **NDVI, EVI**
  (https://modis.gsfc.nasa.gov/data/)
- **Burned areas**
  (https://modis.gsfc.nasa.gov/data/)
- **Fire**
  (https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data/viirs-nrt , https://firms.modaps.eosdis.nasa.gov/)
- **Soil moisture**
  (https://smap.jpl.nasa.gov/)

Climate characterization

- **Monthly temperature (avg, min, max)>**
  (http://worldclim.org/)
- **Precipitation**
  (http://worldclim.org/)
- **Bioclimatic variables**
  (http://worldclim.org/)

Current data

- **Surface temperature**
  (https://modis.gsfc.nasa.gov/data/)
- **Precipitation**
  (https://pmm.nasa.gov/GPM)

Land cover

- **Cover type**
  (https://www.esa-landcover-cci.org/ , https://modis.gsfc.nasa.gov/data/)
- **Glaciers/snow cover**
  (https://nsidc.org/)
- **Cropland**
  (https://modis.gsfc.nasa.gov/data/)
- **Irrigated areas**
  (http://www.fao.org/land-water/land/land-governance/land-resources-planning-toolbox/category/details/en/c/1029519/)
- **Tree cover change**
  (http://earthenginepartners.appspot.com/science-2013-global-forest)

Physical characteristics

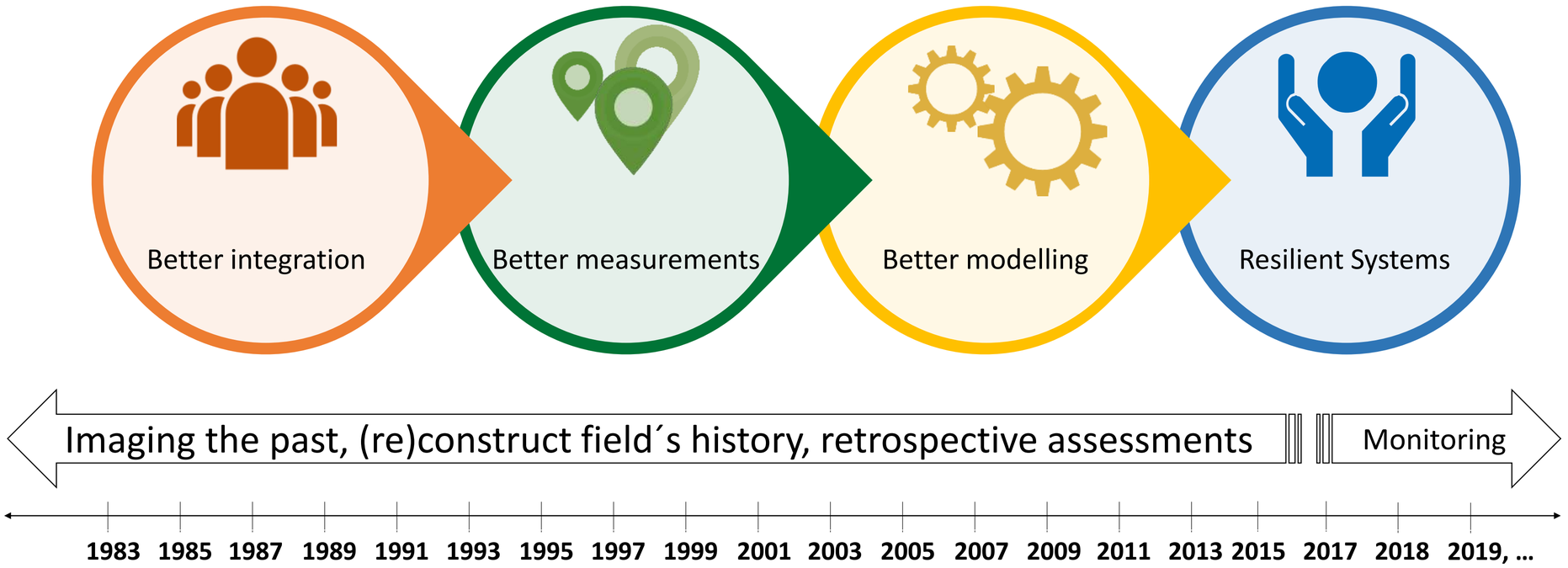
- **Soil carbon density**
  (https://www.isric.org/explore/soilgrids)
- **Global aridity index**
  (https://cgiarcsi.community/2019/01/24/global-aridity-index-and-potential-evapotranspiration-climate-database-v2/)
- **Potential Evapotranspiration**
  (https://cgiarcsi.community/2019/01/24/global-aridity-index-and-potential-evapotranspiration-climate-database-v2/)

Other relevant data

- **Agricultural productions**
  (http://www.earthstat.org/)
- **Spatial production allocation mode 2000, 2005, 2010 (SPAM)**
  (https://cgiarcsi.community/2019/01/04/global-spatially-disaggregated-crop-production-statistics-data-for-2010/)
- **Land degradation and desertification**
  (http://geoagro.icarda.org/cldd/)

PLATFORM vs WEBSITE
DESIGN PRINCIPLES
LOGICAL ARCHITECTURE
CLIMATE INFORMATION
CENTRAL ASIA
PARTICIPATION PLAN
SUSTAINABILITY PLAN

Shift in paradigm towards ecologically sound climate adaptation



Rebuilding functional system is the key to exponential efficiency and growth

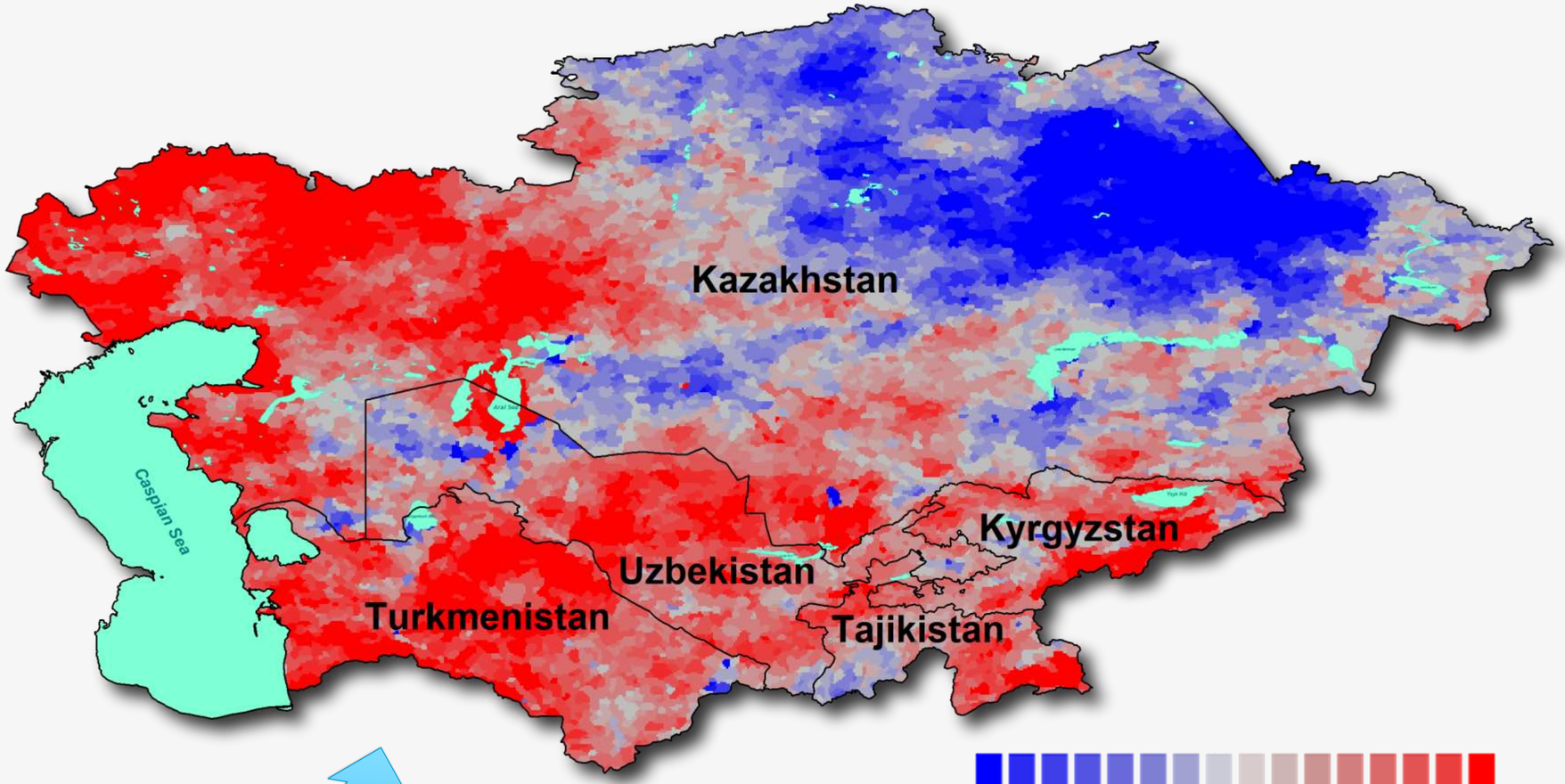
central asia

central asia …

The contents of the platform focuses on the Central Asia region.

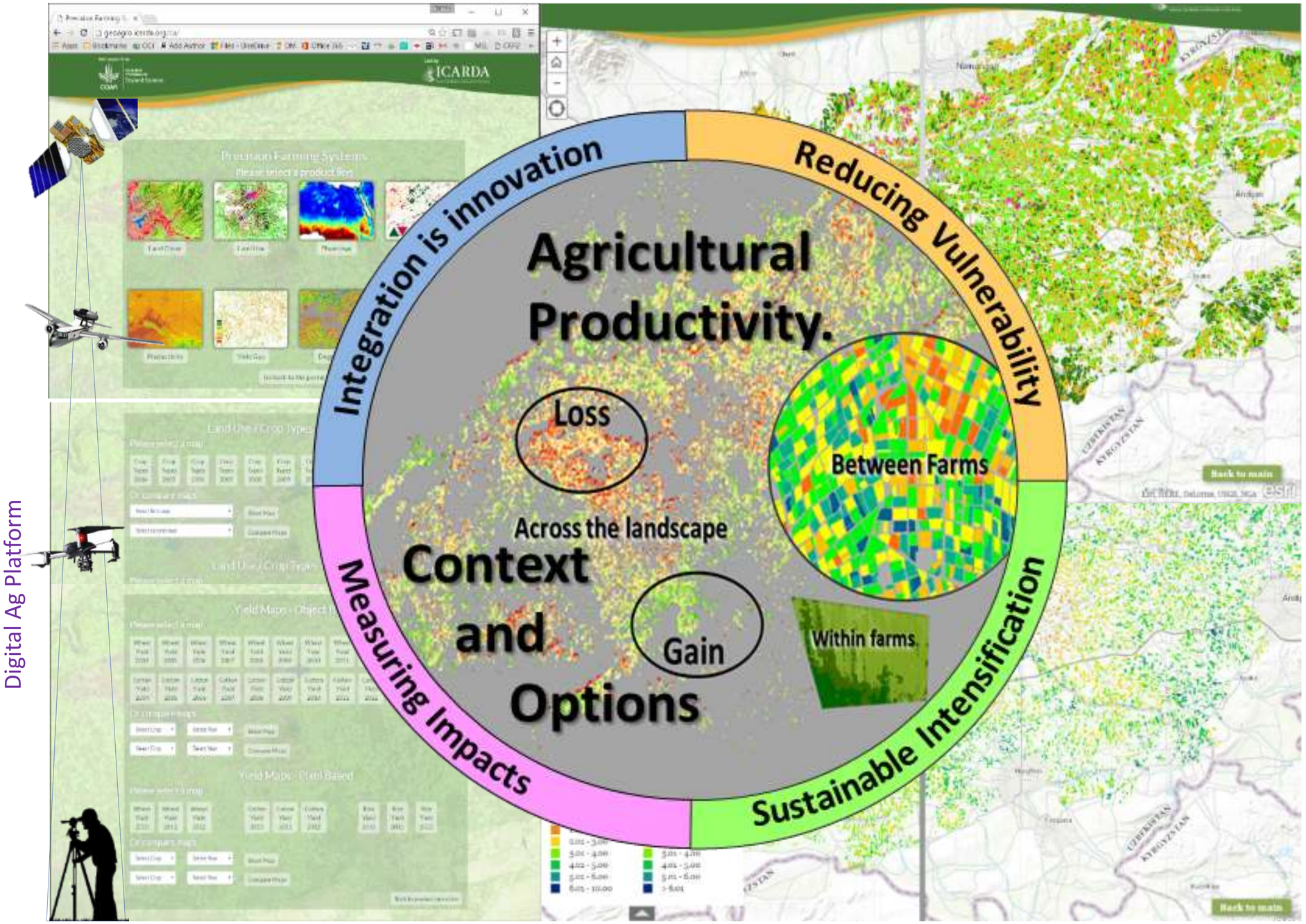
A comprehensive view of the all region facilitates the understanding of climate change phenomena and improves the usefulness of the platform.

On the right the **global trend of surface daily temperature** derived from MODIS data since 2000



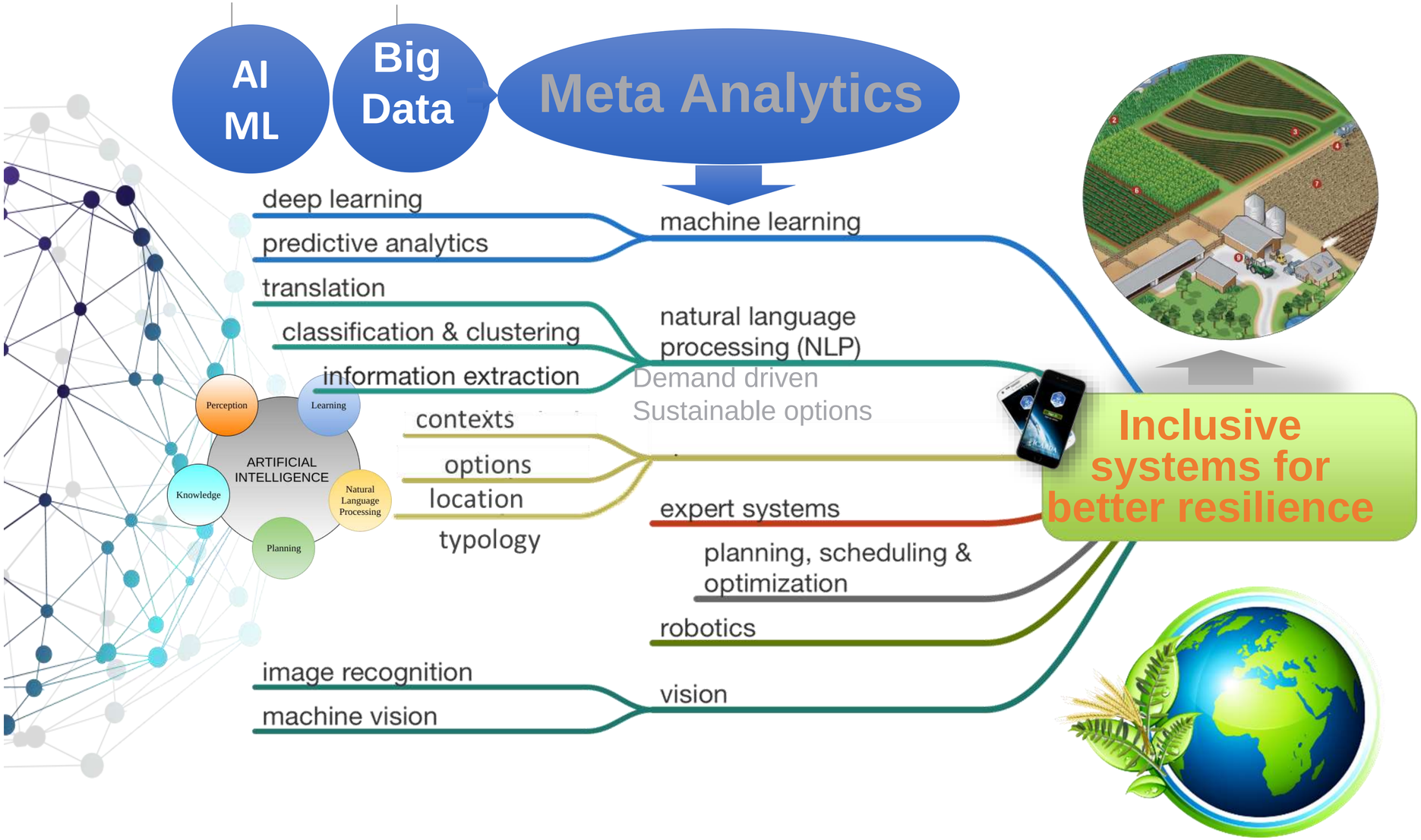
Negative/Positive trend of the variation of the land surface temperature in the long term

Digital Ag Platform

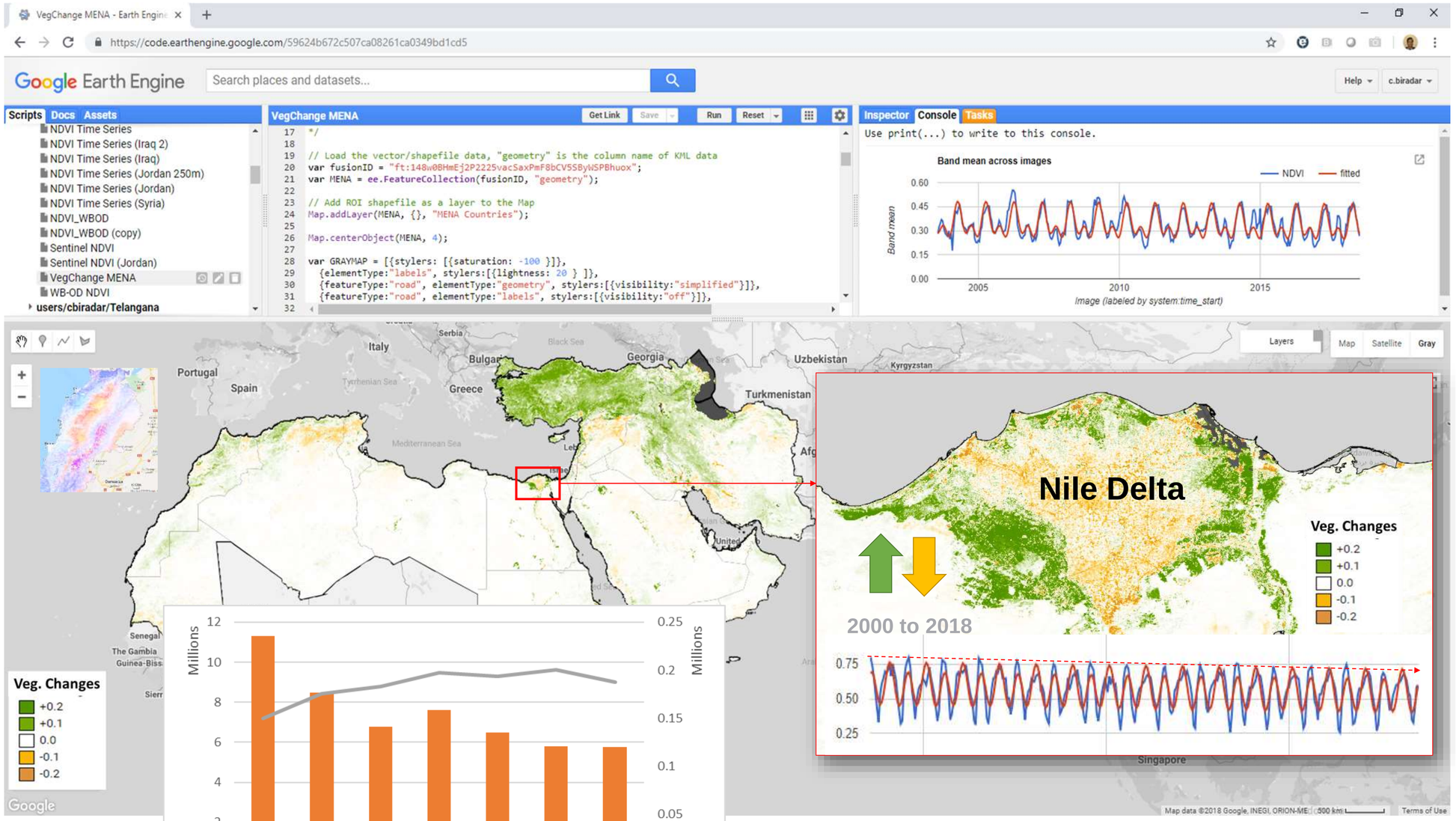


Data is in everything and everywhere

Climate, weather, genetics, chemistry, agronomy, trade…



Tracing the changes to target interventions



participation plan

participation plan

the PARTICIPATION plan of CACIP is based on the following steps:

1. identification of the **stakeholders**
   - on site investigations
   - internet searches

2. identification of **available data**
   - specific one-to-one meetings
   - national consultations
   - analysis of global databases, …

3. **participatory process**, involvement of stakeholders on the development of the concept
   - brainstorming during official meetings
   - **regional meeting** (end of August)

4. analysis of **feedback** from stakeholders

5. **refinement of the concept** on the basis of stakeholders' suggestions

6. **development of portal**

7. **test, evaluation of the portal** with selected stakeholders before the final release

PLATFORM vs WEBSITE
DESIGN PRINCIPLES
LOGICAL ARCHITECTURE
CLIMATE INFORMATION
CENTRAL ASIA
PARTICIPATION PLAN
SUSTAINABILITY PLAN

sustainability plan

sustainability plan

the PARTICIPATION plan of CACIP is based on the following steps:

1. identification of the **regional organization** responsible of the management and maintenance of the platform: directives will be provided by the project team to help the identification of the suitable subject
2. definition of a **management governance**: with the participation of the stakeholders
3. O&M **cost analysis**
4. staff training, about the use and the maintenance of the system
5. formalization of a **management protocol**

PLATFORM vs WEBSITE
DESIGN PRINCIPLES
LOGICAL ARCHITECTURE
CLIMATE INFORMATION
CENTRAL ASIA
PARTICIPATION PLAN
SUSTAINABILITY PLAN

group discussion

group discussion …

- focus area 1: **food and nutritional security**
- focus area 2: **sustainable agroecosystems / mitigation**
- focus area 3: **risk assessment and mapping**
- focus area 4: **land degradation / desertification**
- focus area 6: **reforestation / forest protection**
- focus area 7: **climate changes / long term forecast**
- focus area 8: **socio-economic impact** (*)
- focus area 9: **smartphone services to end users**

(*) it includes migration, health, economic performance, livelihoods, etc.

group discussion …

– Workgroup “Partners’ Requirements and Data contribution”

Partners are organized by the focus areas resulting from the previous sessions.

group discussion about:

1) “What do we know, and what scientific information **have to be available via information Platform** for usage in policy making processes at national level and/or in decision making at local level”
2) Main **formats/channels to share** knowledge (e.g. SMS, MobApp, Telegram, mobile version of web-site)
3) should knowledge be free or paid? Do you have existing examples?

COFFEE BREAK

plenary discussion

action plan

group discussion ...

To be done

LUNCH TIME

Notes

Uzbekistan, Tashkent: 11 June 2019 – Venue: City Palace hotel https://citypalace.uz/
Kazakhstan, Almaty: 14 June 2019 - Venue: Kazzhol Almaty Hotel www.hotelkazzhol.kz
Turkmenistan, Ashgabat: 21 June 2019 – Venue: to be clarified
Kyrgyzstan, Bishkek: 25 June 2019 – Venue: Grand Hotel http://grandhotel.kg/en/
Tajikistan, Dushanbe: 10 July 2019 - Venue: to be clarified