



ICTs for Herd and Pasture Management in Mountain Grasslands

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CONTENT

- Early warning system for pasture users;
- Kyrgyz Open Data Cube;
- Database on management and use of pastures, and pasture infrastructure



Livestock herding in Kyrgyzstan (pasture degradation and climate change)

- More than 93% of the territory of Kyrgyzstan is occupied by the Tien Shan and Pamir-Alai mountain ranges, which are covered with natural pastures, the total area of which is 9 million 30890 thousand hectares.
- They occupy more than 85% of the total agricultural area and are the main fodder base for animal husbandry. 5.4 million is pasture land and in actual use and 40% of hectares are degraded.
- The 64% of the population of Kyrgyzstan lives in rural areas, where the livestock sector is the most powerful component of the economy. It employs 30% of the total workforce in the agricultural economic sector.
- Various information systems are being developed for the management of pasture resources. There are Early warning system, map of visualization and database.
- From year to year, global climate change is observed, covering various areas, such as the condition and access to natural resources, food security, infrastructure of settlements etc.
- Climate change has negative consequences for agriculture, which affects crop yields and livestock deaths.





Monitoring environmental information using satellite data

- Kyrgyzstan is an agrarian country, in which the main income of the population comes from agriculture and animal husbandry, adaptation to climate change is needed.
- Satellite images are one of the sources for monitoring climate change in the world.
- Satellite imagery allows you to analyze changes in temperature, vegetation cover, land conditions, snow cover, etc.
- The visualization map provides information about the environment of Kyrgyzstan, obtained from free access satellite images.
- The main categories of information are rangeland, snow cover, drought, temperature, and optical images that provide a true color representation of the landscape as seen from satellite.



<https://kyrgyzstan.sibelius-datacube.org/>



Projects aimed at improving pasture management in the Kyrgyz Republic

Name of the project	Donor	Status	Area
Agricultural investments and services project	IFAD, WB	2008-2014	All country
Livestock and market development project-1	IFAD	2013-2018	Naryn and Issyk-Kul oblasts
Livestock and market development project-2	IFAD	2014 -2021	Osh, Batken and Jalal-Abad oblast
Improving Pasture and Livestock Management	WB	2015-2019	Talas, Chui
SIBELIUS	UK Space agency	2019-2021	Naryn and Chui district



Livestock and market development project-1,2 (funded by IFAD)

- 1) Digitization of cartographic materials of the borders of pasture committees;
- 2) Training of pasture committees on the use of GPS, Google earth Pro and mapping, the use of cartographic materials for pasture management;
- 3) Mapping of pastures in Kyrgyzstan. Carrying out work to determine the current information of pastures.





Livestock and market development project-2 (funded by IFAD)

The goal of the LMDP-2 is to continue poverty reduction and enhance economic growth in pasture communities.

The objectives of the Project are to improve livestock productivity and to enhance climate resilience of pasture communities reflected in improved and equitable returns to livestock farmers.

The Project consists of the following components:

1. Community-Based Pasture Management and Vulnerability Reduction;
2. Livestock Health and Production Services;
3. Diversification and Market/Value Chain Initiatives;
4. Project Management.

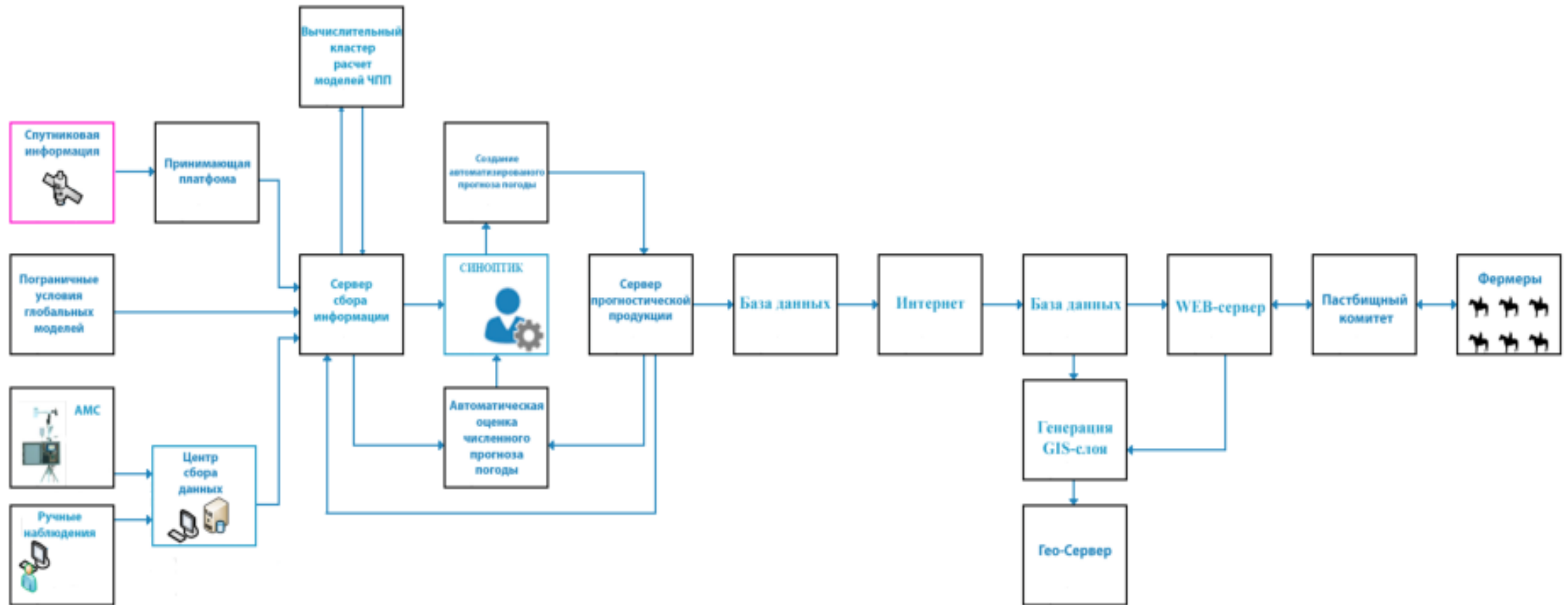


What is early warning system?

- In contrast to the mechanisms of emergency response in case of disasters, the system of early warning - one of the most important tools that contribute to the prevention of disasters and ensuring the readiness of potential hydrometeorological stations.
- This system must provide information on the dangerous and unfavorable conditions for farmers to accept the decision. That is, farmers will receive information about threats that are expected in the near future and the possibility of adopting measures to minimize the consequences of these events.
- Hydrometeorological risks and threats are storms, hurricanes, strong winds, hail, thunderstorms, snowstorms, frosts, thunderstorms, fog, famine, wounds, droughts.
- Hydrological risks and threats - floods, floods, landslides, floods.
- According to recent chronicles, we in different regions periodically lose livestock from dangerous hydrometeorological phenomena. This system will allow to reduce the number of units delivering storm warnings to farmers.

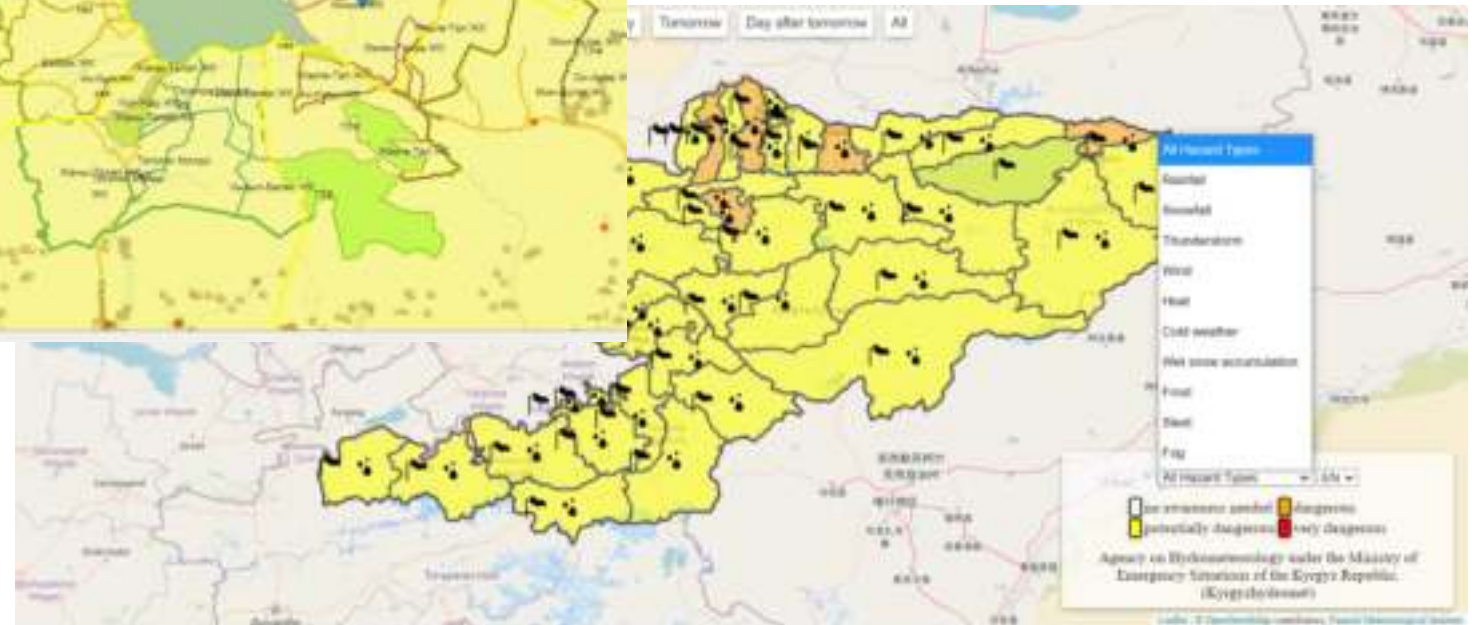
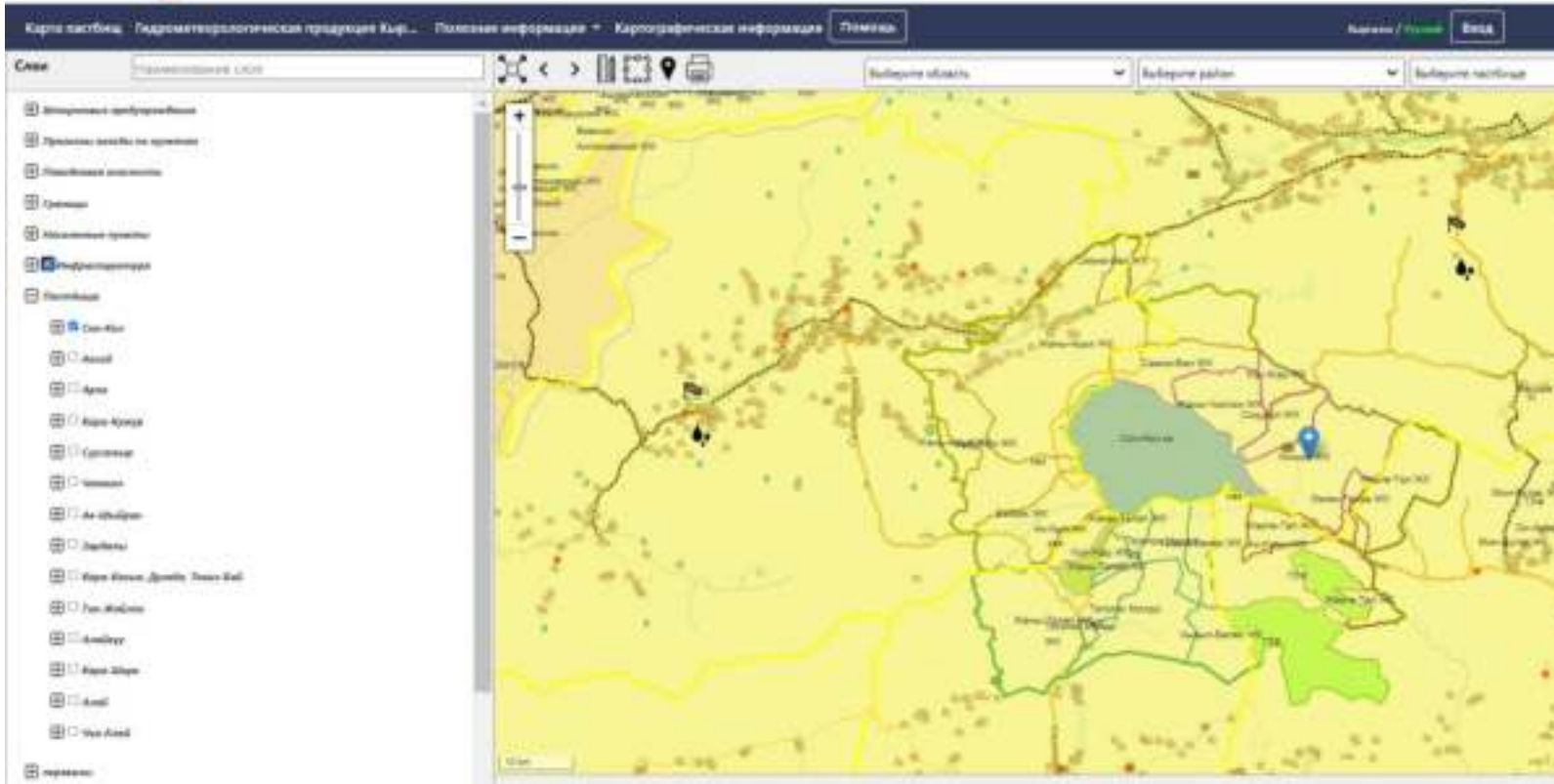


Mechanism of the early warning system for pasture users





СИСТЕМА РАННЕГО ОПОВЕЩЕНИЯ



<https://sropasture.kg/>, <http://alert.kgm.kg/>



Kyrgyz Open Data Cube

The following tasks are considered within the framework of the project:

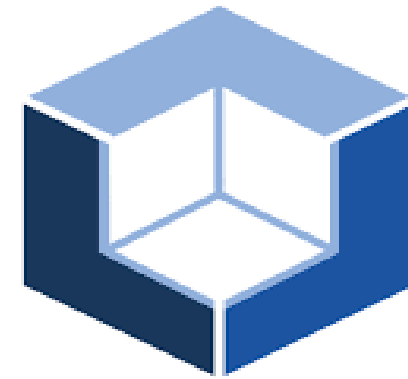
- a baseline study that aims to better understand the problems faced by livestock breeders and assist the project in developing solutions to these problems. The pilot regions were selected Zhayilskiy (Ak-Bashat and Zhayil PC) and At-Bashinskiy region (Ak-Muz and Kazybek PC);
- development of the Kyrgyz Open Data Cube (KDC) and the web visualization map;
- training in the application of the KDC for carrying out various analyzes of satellite images.



Developed tools

Visualization map

Kyrgyzstan Open Data Cube



**OPEN
DATA
CUBE**

<https://kyrgyzstan.sibelius-datacube.org/map/ru>



The Kyrgyz Data Cube

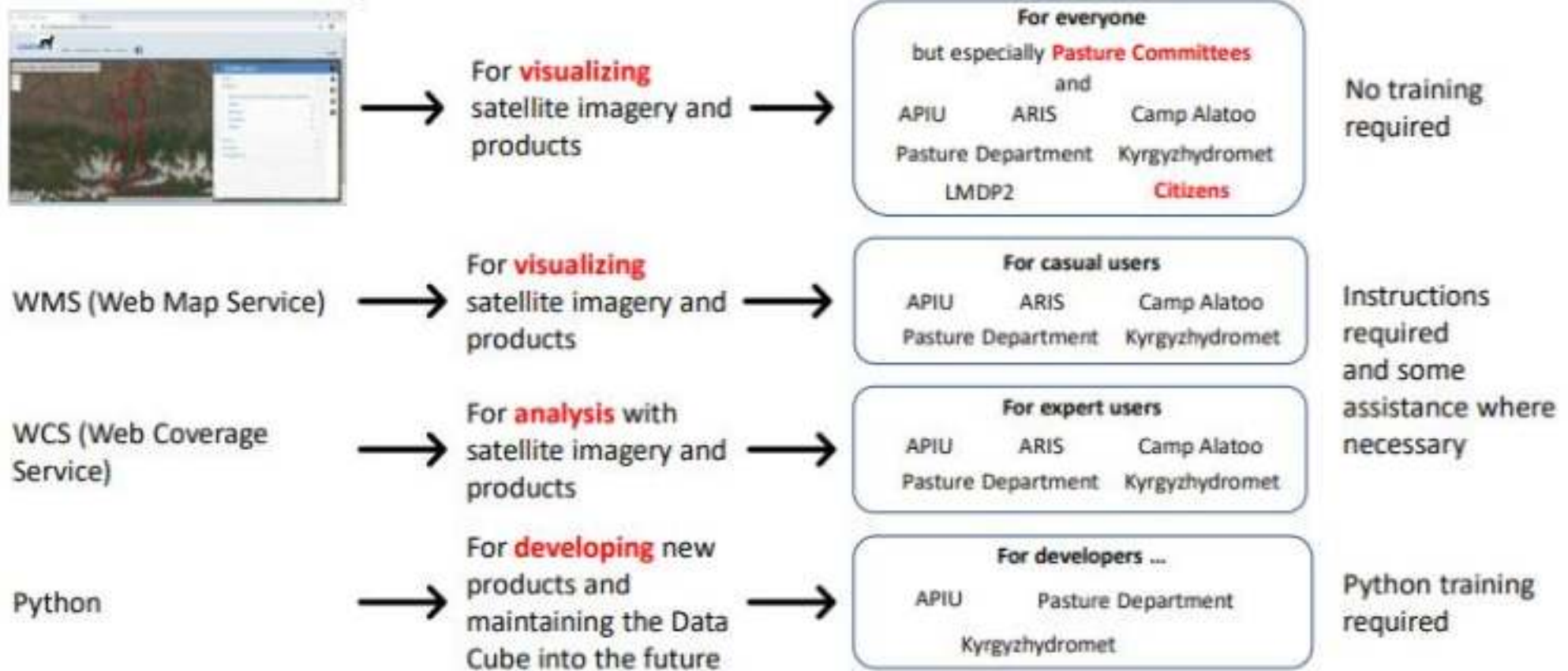
- Total Size of Data Cube – **13.1 TB (Terabytes)**
- Data from:
 - Sentinel-2 (going back to 2015)
 - Landsat 8 (going back to 2015)
 - MODIS (going back to 2003)
 - VIIRS (going back to 2012)
- All MODIS/VIIRS products go back to 2003.
- All high-resolution indices (NDVI, NDSI, NDWI, NDDI) go back to 2015





Data access and training

The SIBELIUS Visualization system





Satellite Earth Observation



Satellite images are used:

- Land monitoring;
- Vegetation;
- Soil moisture;
- Water coating;
- Snow cover;
- Agriculture;
- Forest fires;
- Emergency services.



Training



Multiple polygons

In the following cells we will use MODIS data to show how the data is processed.

```

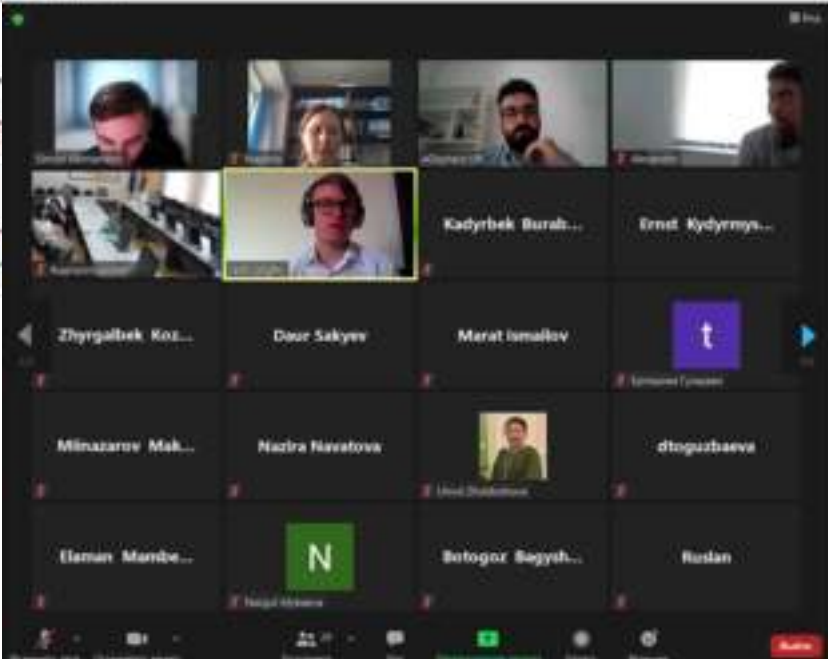
In [14]: # Load the shapefile and find the bounds
sf = geopandas.read_file("data/kg_subdivs_sdb2_
wink, wink = sf.bounds["xmin"], sf.bounds["
maxx, maxx = sf.bounds["xmax"], sf.bounds["

```

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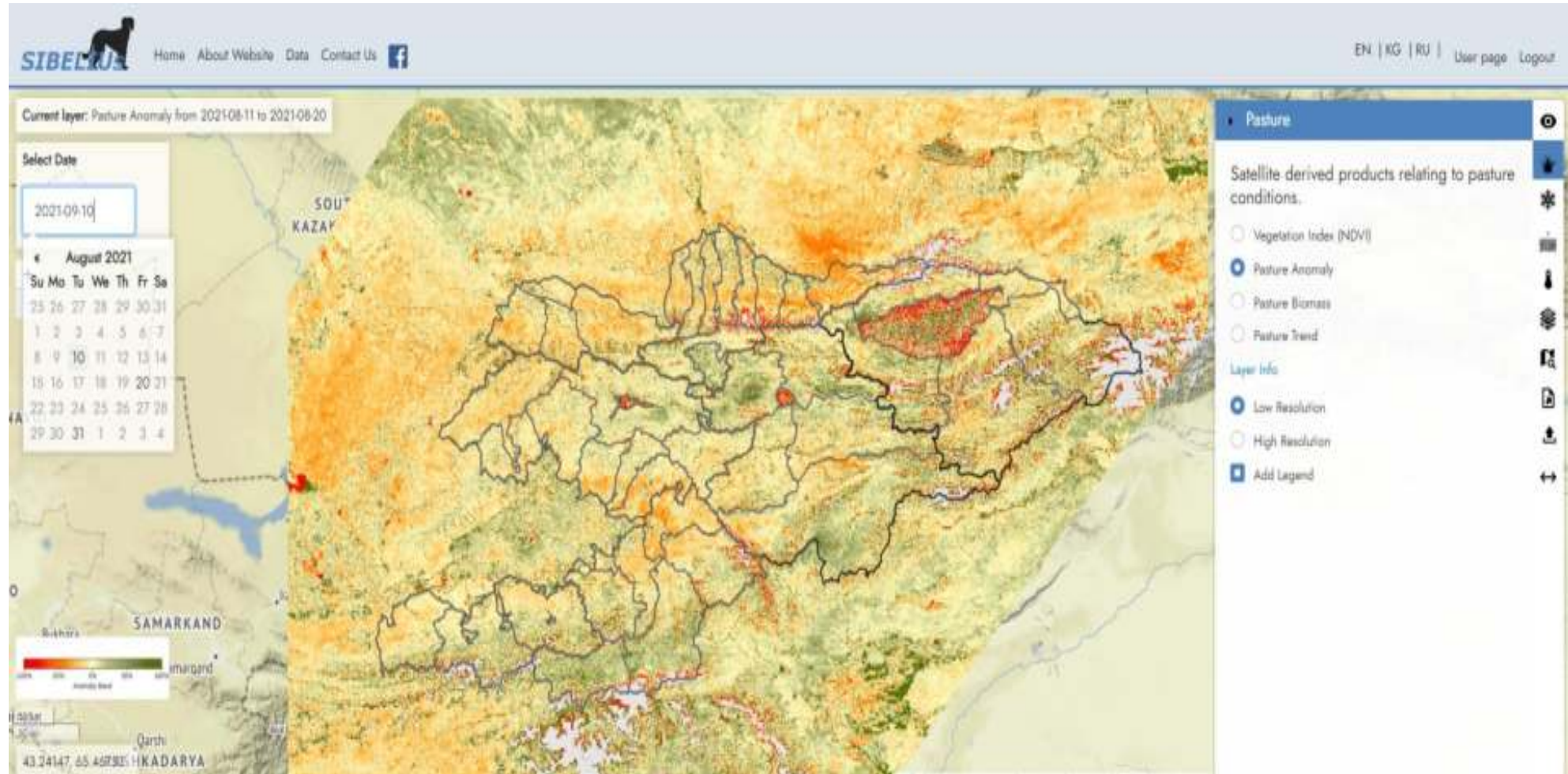
In [17]: # Query to load MODIS data
start_date, end_date = "2019-06-01", "2019-06-01"
query = """
SELECT * FROM MODIS
WHERE (time >= '{start_date}' AND time <= '{end_date}'
AND (wink = '{wink}' OR wink = '{wink2}'))
AND (wink = '{wink}' OR wink = '{wink2}')
AND (maxx >= '{maxx}' AND maxx <= '{maxx2}')
AND (minx <= '{minx}' AND minx >= '{minx2}')
"""

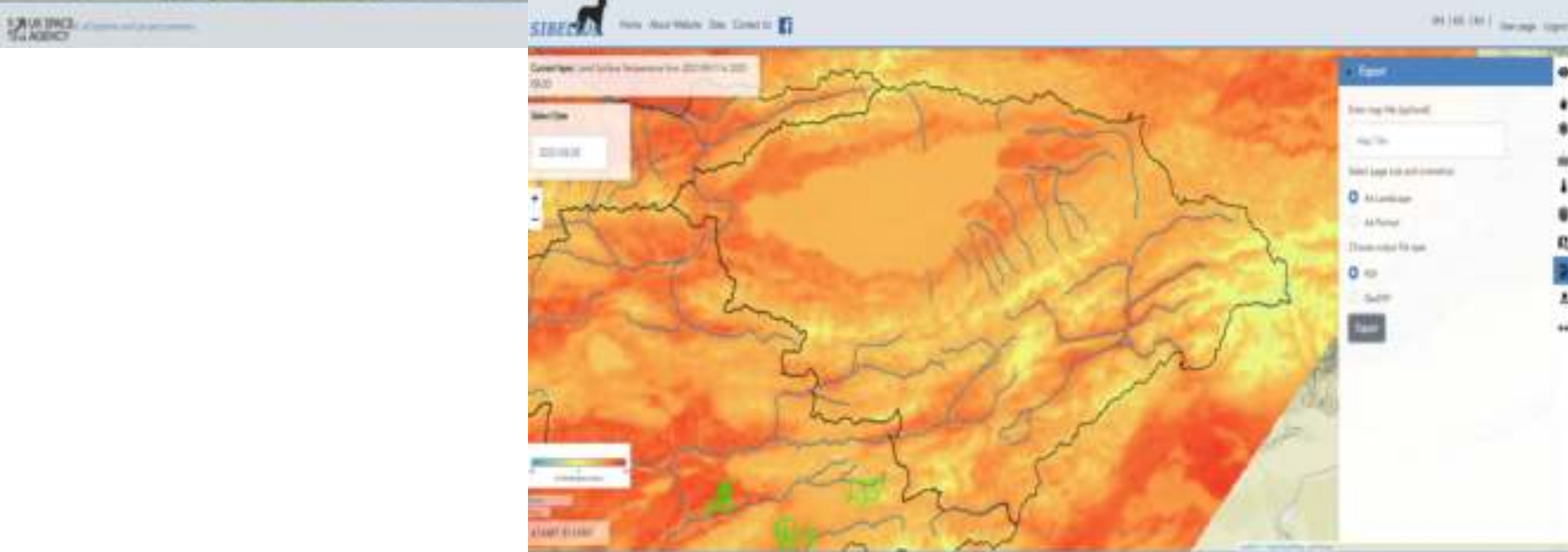
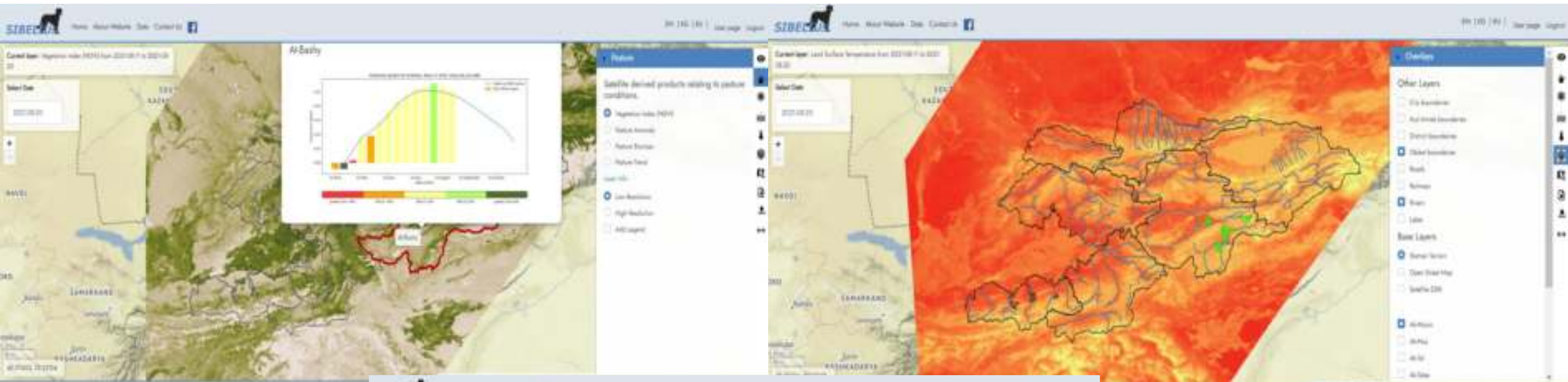
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<https://kyrgyzstan.sibelius-datacube.org/>







The Kyrgyz National Determined Contribution (NDC) for climate change

- Karagana is an inedible bush that is spreading in many parts of Kyrgyzstan, reducing the pasture available to livestock
- The Suusamyр Valley is an important pasture region in Kyrgyzstan
- We created an updated karagana map of the Suusamyр Valley, based on Sentinel-2 data acquired in 2020
- Shows where this has increased since the last map that was made, which was based on data from 2014
- Overall there is an increase from 6.3% to 7.1%
- This work was done by Megan, a summer internship physics student from Southampton University





The visualization map makes it possible to achieve the following results

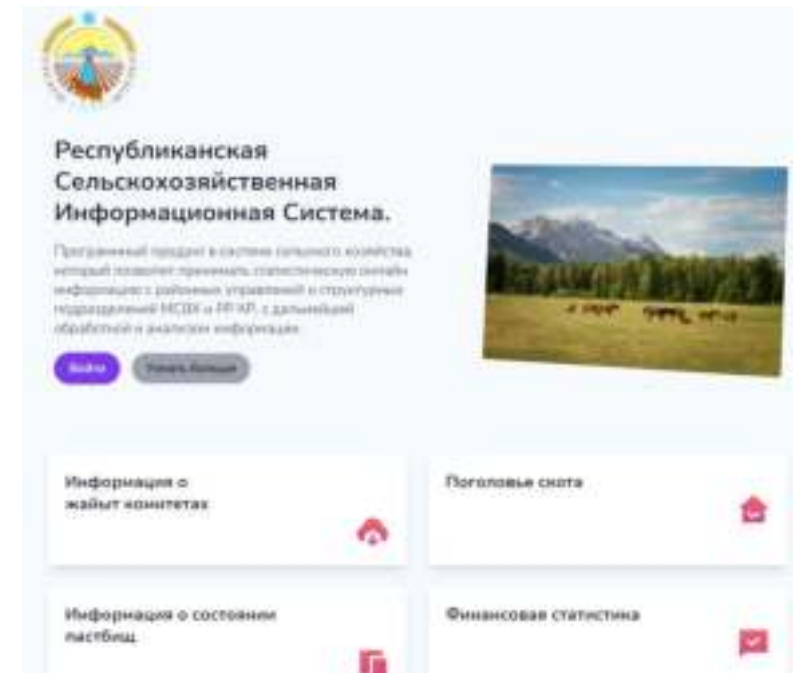
- to improve the accuracy of assessing the extent and area of distribution of droughts, assessing vegetation cover and land temperature and the tendency of the impact of climate change;
- associations of pasture users independently carry out monitoring and rational use of pasture lands in accordance with the legislation;
- taking into account climate change in the Community Plans for Pasture Management and Improvement;
- identifying plants that are becoming widespread in many rangelands (such as karagana) which livestock are unable to eat;
- information provision of scientific research information for pasture users, employees of the Ministry of agriculture, forestry and water resources of the Kyrgyz Republic and other interested parties will be improved.



Database on management and use of pastures and pasture infrastructure

The database on the management and use of pastures and pasture infrastructure is an operational tool that is created to:

- streamlining the existing and the formation of systematized, complete and up-to-date data on the management and use of pastures;
- implementation of operational accounting, analysis, control of management and use of pastures;
- automation of the activities of the Pasture committees to ensure sustainable development of pastures and pasture infrastructure;
- providing all interested parties with reliable, complete and up-to-date information;
- providing the possibility of control by local self-government bodies, state bodies over the activities of the PC in the management and use of pasture lands;
- Mapping of the Pasture committees.

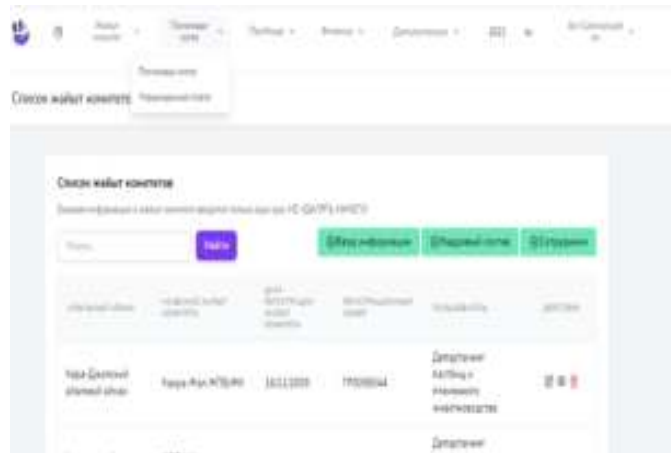




Database on management and use of pastures and pasture infrastructure



Thank you for attention!



social networks:

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<https://www.facebook.com/SIBELIUsKyrgyzstan>