Conference “CITES-2019”,
3 – 6 June 2019, Moscow, Russia

Development of hydrometeorological support for consumers using modern IT

Evgenii Viazilov
RIHMI-WDC
Obninsk
vjaz@meteo.ru

Problems and difficulties of GM Support

• Department of Commerce: “20% of the entire US economy is sensitive to weather conditions”: ~ $ 3 trillion per year. The potential savings due to GMOs will be 5% of the “projected damage,” that is, ~ $ 75 billion a year.

Weather and Economy of the USA (Lars Peter Riishojgaard, Director,? Joint Center for Satellite Data Assimilation)

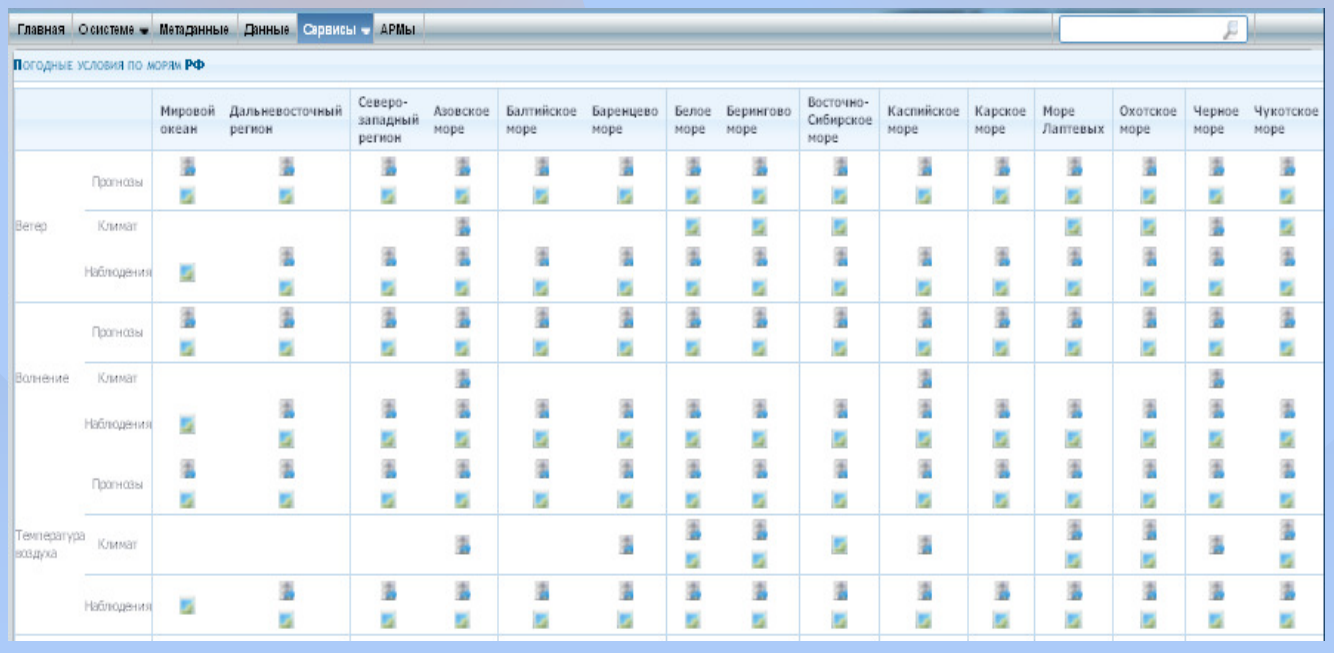
The average annual level of direct damage inflicted on the Russian economy caused by disasters reaches 80 billion rubles a year.

World Bank for Development and Reconstruction

- The information provided is designed for a wide range of users
- There is no single window of access to the whole information productions of Roshydromet
- Accounting of information products is needed
- A users needs a GMI only when the values of the disasters indicators exceed threshold values
- The amount of data provided to users is too large
- It is necessary to reduce the time between observations and the provision of information
- An automatic exchange of metadata and data with other systems is required.

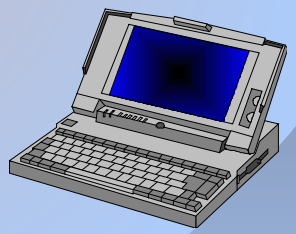
Fields of development of GM Support

- Integration of the information productions for a single portal
- Transformation of the whole information productions in digital form as structured data
- Automating the detection of disasters based on local thresholds
- Automation of transfer information about disasters to population and enterprise managers
- Automation of data delivery and use of GMI in specific business processes
- Development of an economic models to assess the damage and cost of preventive measures
- Providing enterprises heads and the public a information about impacts and recommendations
- Development of tools of interaction between users and organizations of Roshydromet - monitoring the execution of requests, subscribing to receive data, billing, monitoring the operation of the system

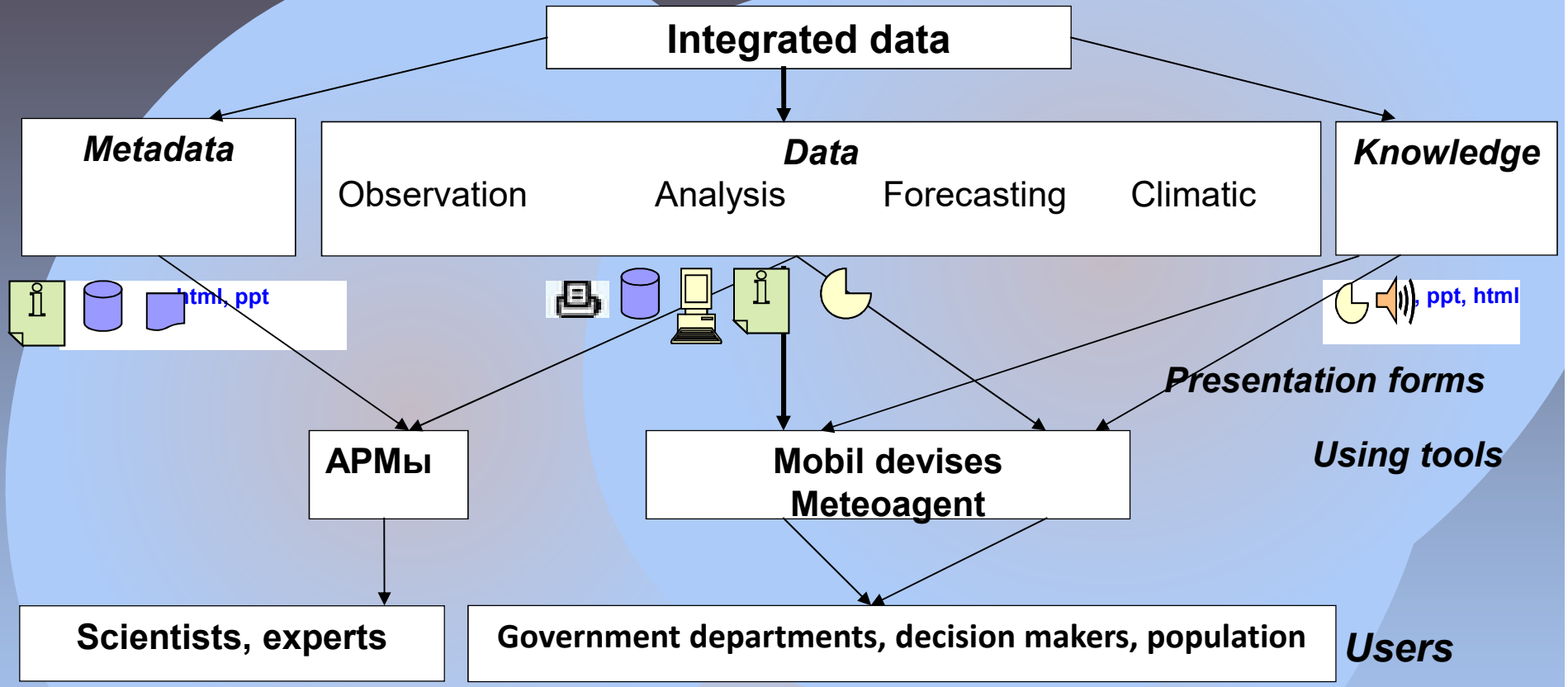


Principles of GM support development

- Personalization GM Support
- Mobility – transfer GMI to mobile Internet devices of managers of enterprises and the population
- Supporting regularity
- Delivery of GMI on the initiative of the system instead of the self-service being developed now
- The ability to receive and deliver GMI users for any geographic point
- Using GMI at all stages of the life cycle of objects
- Evaluation of possible losses and the calculation of the cost of preventive measures before the start of the disasters
- Monitoring of GM supports - relevance of data and information productions, ensuring the operability of service facilities, the calculation of indicators of GM support



The scheme of GM support development based on integrated data



- Regular electronic reports - newsletters, yearbooks ...
- Interactive maps
- Meteomonitor
- Meteoagent
- Decision support
- …….

Services

Generalized GM support scheme

Отрасли

Trade	Tourism	Enterprise	Education	Health	Transport	Agro	Fishing	Energy

Technologies

- Automatic measurement systems
- Metadata
- Data integration
- Accounting for measurement tools, information products
- Data delivery
  DBMS
  GIS
  Economic models
  Expert systems
- DSS
- .....

The use of GMI at enterprise on various stages:

- Forecasting the development of the area
- Planning the development of the area
- Selection of the construction point of enterprises and residential buildings
- Engineering design
- Construction of enterprises
- Operation of enterprises
- Decommissioning of an enterprise

Fields of data processing

- Automatic detection of disasters
- Indication of dangerous
- Risk assessment of disasters
- Comprehensive service
  Impacts
  Recommendations
  Damage calculation
- Monitoring data relevance
- Infrastructure management
- .....

Institutes

Research Inst. Regional office	Public organizations	Professional communities	…

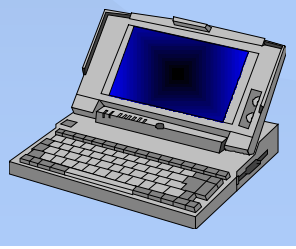
New paradigm GM Support

The recommendations of the WMO (2014): To issue not only the prediction of disasters, but also the forecast of possible impacts.
It is necessary to find all possible means to improve disaster preparedness and take response measures to them, through a synthesis of practical experience acquired during disasters.

Decision makers do not need the data themselves, not the forecast, and not climate generalizations, they need to know the level of danger and what to do in cases of disasters

It is necessary:

- To transfer GMI to the one and only that which is needed at the moment for making decisions on any Internet device of a enterprise head
- To help decision makers understand what impacts of disasters can be
- Issue recommendations for decision making to reduce or prevent these impacts
- Assess the possible damage and calculate the cost of preventive measures.



New components for GM support

An object: _____
Activities _____
Services: Delivery of messages about disasters, MeteoMonitor, MeteoAgent, Property Status Solution Support, Economic models, System performance monitoring

Hotkeys
View disasters, Data update, Thresholds, Receipt of the receipt of the message about disasters, A ticket about the state of the GM support of object. Display by sound and color

Messages delivery about disasters
(date, time, place, name, impact)

Thresholds
(indicator, geographic area, type of object, type of activity, level of danger)

MeteoMonitor
Maps of routes, the area of manifestation disasters.
Graphs of changes in the indicators of disasters and their trends.
Information on current and historical disasters.
Operational, prognostic and climatic data for any settlement

Decision support
Object, Designer knowledge base, Knowledge search, Impacts, Recommendations

Economic models
Damage assessment from impacts of disasters, Estimated cost of preventive measures

Alarm
Color,
Sound
Running line, ...

Condition of the object
The mnemonic scheme of the object and the existing equipment, reflecting the impact of disasters on them

Regulatory legal guidance documents
Instructions,
Manuals,
Governing documents

Identification of dangerous situations

Integrated data

Messages and warnings for disasters

DB "Threshold values of indicators" (general, regional, local)

Results of observations from the GTS (SYNOP, SHIP, BUOY, SEA, HYDRO, etc.)

Disasters detection

Disasters DB

Web-service

MeteoAgent

Forecasting

Climate

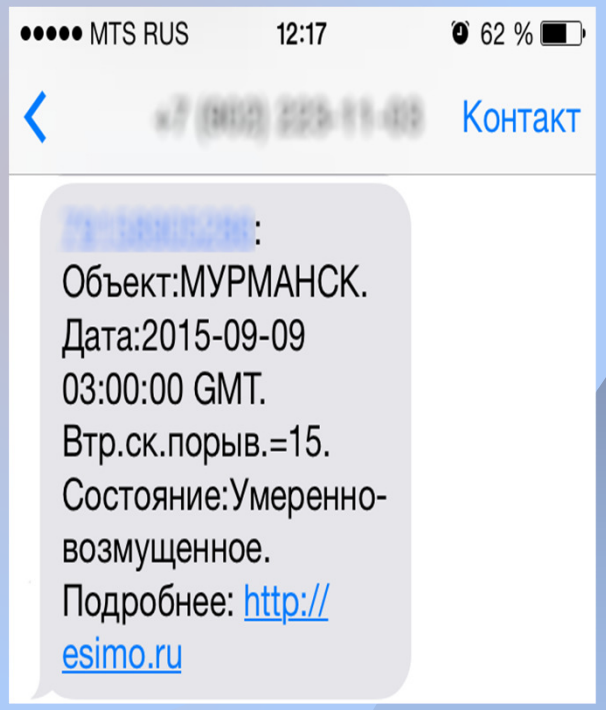
The application must:

- select objects, areas with a certain level of danger or along the track of the object
- create a table with information about the dangerous situations for objects that are currently being serviced
- transfer information about the dangerous situation to specific objects

Transfer GMI

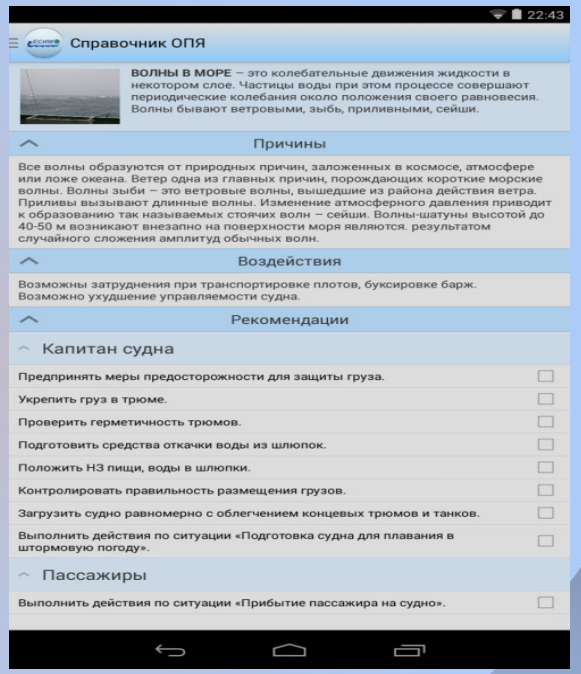
- Each object must have its own composition of indicators and its own threshold values of indicators of the situation.
- Transfer of information about the disaster to potential users in case of exceeding the threshold values of indicators by e-mail, mobile phone, MeteoAgent
- Decision makers and population should receive not only the values of indicators of disasters and the forecast in electronic form, but also:

- Dangerous level for a particular enterprise and activity type
- Link to a more detailed description of the situation - Meteomonitor
- Information about the possible impacts of disasters
- Recommendations for preventive actions
- Damage assessment, calculation of the cost of preventive measures, optimization solutions



Impact and Recommendation Description Scheme

1. Title of disaster
2. Definition of a disaster
3. Causes
4. Photos with examples of manifestation of disaster
5. Objects of impact (government departments, ports, ships, agricultural, population, ...)
5.1. Name of the object that can be affected by the disaster
5.2. Type of information (climate, forecast, at the moment, after the disaster)
5.3. Impact indicators and their values
5.4. Danger level
6. Impacts (name, type of activity impact by the disaster, priority, author, possible potential damage)
7. Recommendations (name, level of management to which the recommendation is intended, priority, author, cost of preventive actions, references to standard recommendations)
8. References to the accompanying phenomena's
9. Sources of information



Formalized more 3000 situations, including:

108 disasters for 30 types objects, 100 type activities, 3 dangerous level, 4 information type (observation, forecasting, climatic, past disaster), general volume >10 000 impacts and recommendations

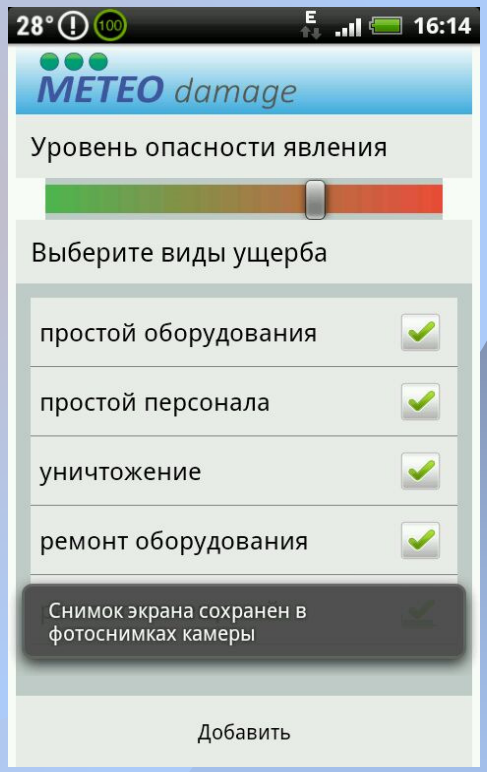
Damage assessments and cost of preventive actions

Possible damage:

- Salary loss at downtime
- Losses due to a decrease in output productions
- Losses at destruction of the prepared products
- Losses from product damage due to exposure to disaster
- The cost of emergency recovery actions
- ……..

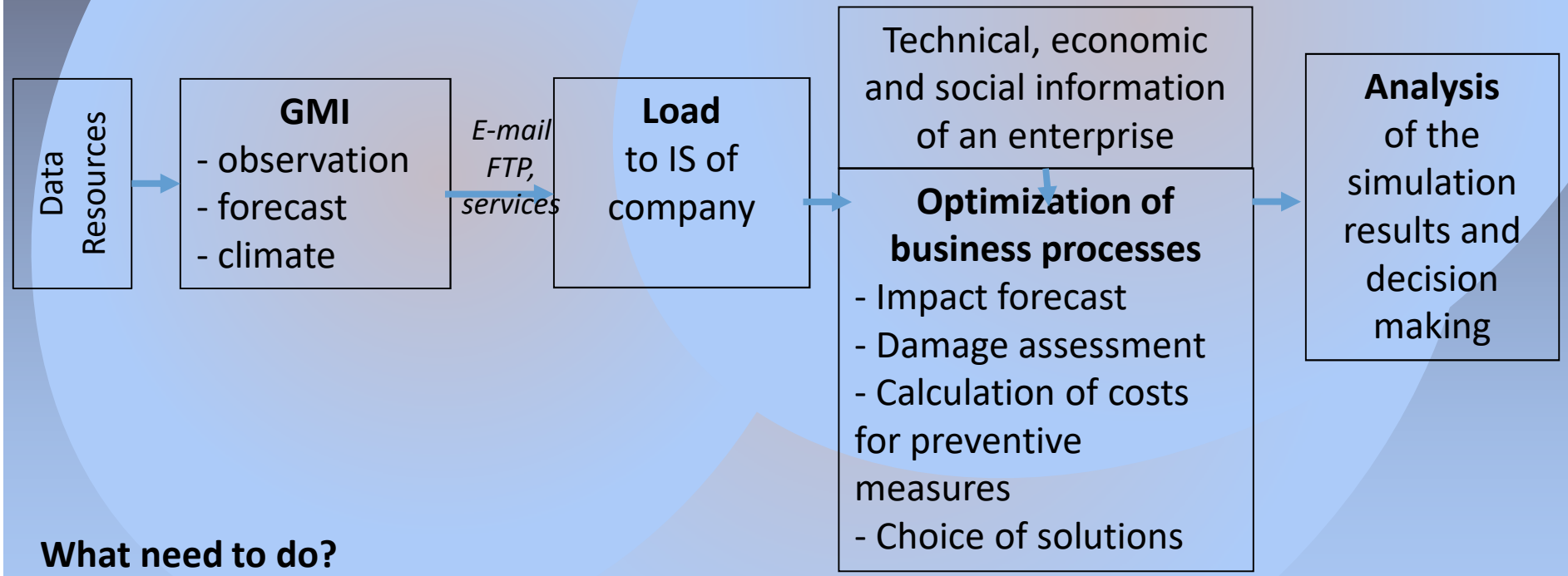
Cost of preventive actions:

- Cost of consumables
- Shelter costs
- Evacuation costs
- The cost of construction of protective structures
- … … …



The use of GMI in business processes of enterprises

Transportation: Planning Northern Delivery, ...
Agro: Assessment of export-import of agricultural products, depending on the forecast yield on different continents or regions; laying the optimal transportation route ...
Logistics: Accounting for precipitation during unloading, storage and transportation of goods that are afraid of moisture; air temperature - when transporting perishable goods; humidity - when transporting goods by sea with electronic elements ...



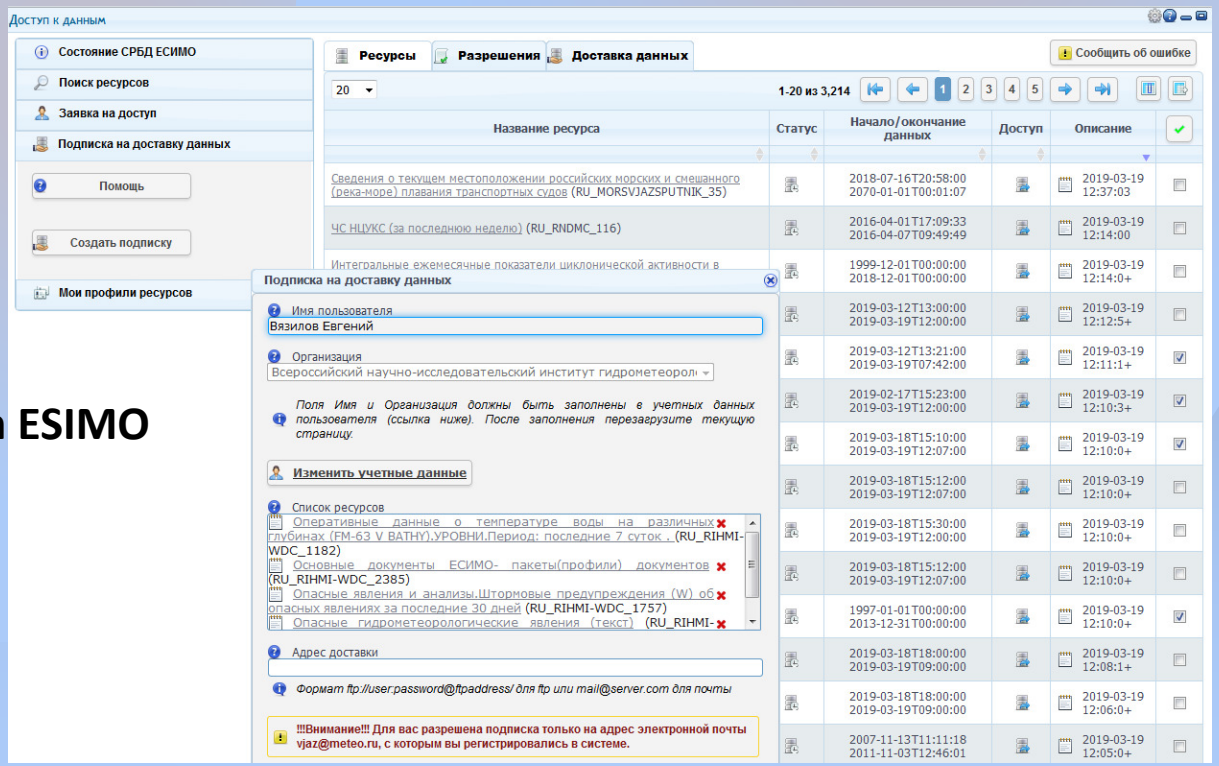
What need to do?

- Identify which GMI is needed for each business process
- Identify the sources of the necessary data to account for the GM conditions
- Develop economic and optimization models
- Develop GM support regulations for each company

Subscribe to receive data

It need to specify:
- Geography (coordinates of a point or area)
- Composition of parameters
- Type of information (observations, forecast, climate)
- Threshold values of parameters at which distribution is necessary
- Address (e-mail or mobile phone number, or ftp server)

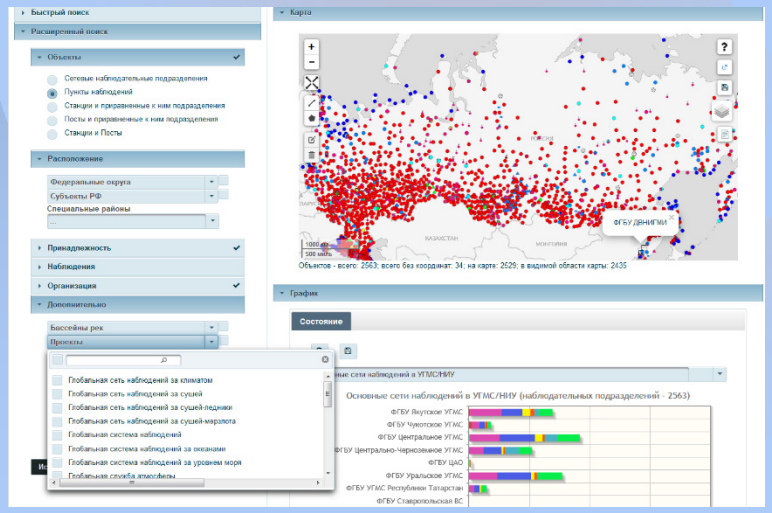
Subscribe in ESIMO

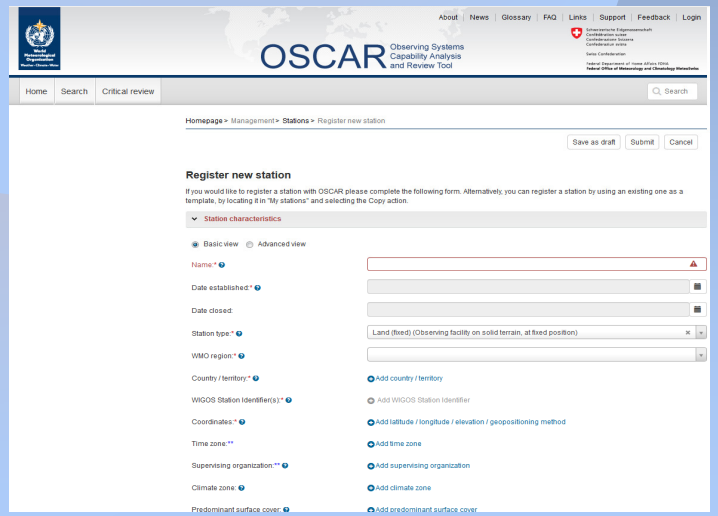


Automatic exchange of information with other systems

- Machine-to-machine (M2M) interaction of existing IS is required
- The main interaction tools are web services, or rest services, or the development of standardized application interfaces (APIs)
- The following data exchange technologies are currently implemented:

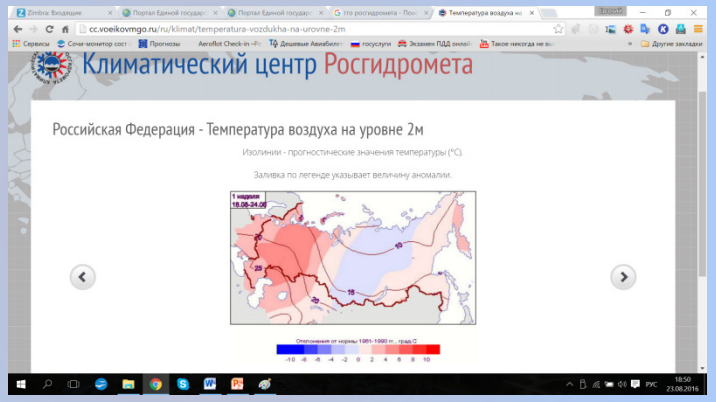
  - Provision of information on observation points from ASUNP (http://asunp.meteo.ru/portal/asunp/) to the Territorial Planning System of the Ministry of Economic Development of the Russian Federation - web-service, in JSON format
  - The interaction of ASUNP with the international system OSCAR (WMO)
  - Providing information on hydrometeorological stations when visualizing operational data from the GTS (station name, owner, year, etc.)

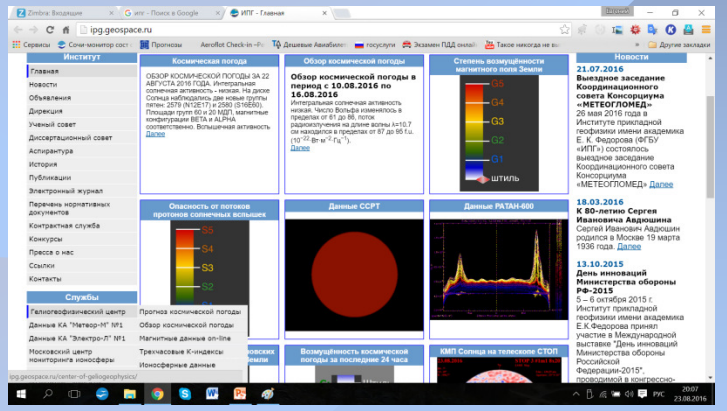




Accounting for information products for GM support

- Information production of Roshydromet - bulletins, monthly, yearbooks, analyzes, forecasts, generalizations, reference books, atlases
- "The main information resources and products of Rosgidromet", http://www.meteorf.ru/product/info/, 41 link, presented on the websites of Research Institute and regional office
- No metadata that would allow to organize their search
- Reflects only a very small part of the information productions, which is prepared in Roshydromet
- Accounting information production allows you to control its relevance, reduce duplication in the preparation of similar products





It need to account the information production by integration

The development of automation in the field of GM support will allow

- To deliver at any time, for any place, by any parameter, taking into account local threshold values, type of object, type of activity, danger level, level of data generalization (observation, forecast, climate, after an disaster) necessary information to increase the efficiency of industrial enterprises business processes

- Head of enterprise:

- will receive a message about a disaster that the object is in danger
- will have extra time to justify decision making
- will see the impacts of disaster and recommendations to reduce damage
- assess the potential damage and calculate the cost of preventive measures

Thank you for your attention !