From Informing Users about Disasters to Issuing a Forecast of Possible Impacts and Recommendations

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Abstract: Increase in the number of disasters requires the development of hydrometeorological support, the use of a new paradigm - forecast the possible impacts of disasters on the population and enterprises, and the transition from the concept of informing users to a recommendatory concept. The problem of raising the awareness of enterprise heads and the public by creating a decision support system is considered. The purpose of the research is to justify the need to create the decision support system in case of disasters, determine the place of the system in hydrometeorological support of enterprises and population. In the field of hydrometeorology collected and formalized materials on the impacts of disasters on enterprises and the population, recommendations for making decisions. Database of local threshold values of disaster indicators for enterprises and their activities depending on season, geographical area, and climate zone has been prepared.

Keywords: Decision Support System, Disasters, Impacts, Hydrometeorological support
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1 Introduction

The threat to sustainable life on our planet is due to significant increase in the number and power of manifestations of various disasters, climatic changes. How to prevent or reduce the negative consequences of disasters? The prospective development of hydrometeorological support (GMS) provides for the transition from the concept of informing users about disasters to concept of recommendations delivery [1, p. 49]. For management purposes, it is necessary, to have assessments of climatic changes impacts on the state of environment - vegetation, soil, water, wildlife, population [2, 3, 4, and 5].

The main problems of adaptation to disaster are the untimeliness of communicating information about disaster to enterprises head and the public, the inadequacy of assessing the situation at enterprises on base digital hydrometeorological indicators of disasters, and the lack of systematize information about the impacts and recommendations for making decisions. Very few real systems would help decision makers (DM). Moreover, such systems are designing either for one specific object or for one disaster. They only warn enterprises heads of possible disasters. It is necessary to collect, systematize, classify, and formalize them, present information on impacts of disasters on population and enterprises, recommendations for DMs.

Currently, IT is developing both in scientific, design organizations, and in enterprises. Enterprises actively automate business processes in which it is necessary to take into account information about disasters. It is no longer enough to bring information about the disasters to the DM, it is necessary that the indicators of disasters be included directly in the implementation of business processes. It need to formalize business processes that define the organization works to increase the hydrometeorological safety of the population and enterprises, ranging from the identification of local threshold values of the parameters of the environment and to the adoption of decisions based on observed, prognostic and climatic parameters.

The aim of the article is to substantiate the need of Decision support system (DSS) creation for various disasters, determine of the place of GMS system, as well as the consideration of approaches to them creation.

2 From talk of adaptation to decision support automation

Addressing adaptation to climate change has received considerable attention, both at the international and at national levels. In 2014, the World Meteorological Congress declared "Projection of impacts of disasters on enterprises to become one of the activities of the National Hydrometeorological Services".

The principle of the comprehensive adaptation of engineering and technical solutions in the techno-sphere to natural and climatic threats should be the basis for the strategic approach of awareness mitigation natural and technological threats [6]. World Meteorological Organization (WMO) considers adaptation to disasters to be the focus of research on climate change. One of the sub-goals of the World Climate Research Program, implemented under the auspices of WMO, is the provision of products aimed at assisting in planning and decision-making on management in climate-sensitive sectors of the economy.

In France a national adaptation plan has drawn up, which includes the following characteristics: list of actions, description of the situation, main contractor, partners, tools, deadline, and indicators of the implementation [7]. In 2019 in Russia was prepared and approved by the Russian Government National Action Plan of the first phase of adaptation to climate change for the period until 2022 [8]. There are many works dealing with organizational issues of adaptation [9, 10, and 11].

National hydrometeorological services of various countries assess the damage of past disaster, the effectiveness of the use of hydrometeorological information in various sectors of the economy. They are excluding the issuing of recommendations for support decisions, considering it the prerogative of DMs. They know better what and how to do, and hydrometeorologists know what consequences these or other disasters can lead. Need is not just a numerical forecast of indicators disaster, and it need to know what can happen as a result of impacts of disasters (injury, death, disease), and what to do in the form of recommendations (evacuate population, take shelter in buildings). All that needs to done is to help DMs get information about an impending disaster and give information about possible impacts, including losses and recommendations to support decisions, the cost of preventive actions. Mankind will be able to adapt to disasters and changes in the level of the oceans only thanks to well thought out, correctly organized at all levels of government, and, most importantly, timely preventive actions for predicted consequences for each object and type of activity.

In many climatic atlases, reference books, books on GMS of various sectors of the economy, there is at least some information about the impacts of disasters on economic objects. A list of proposed impacts and recommendations is usually giving for individual sectors of the economy [12, 13, 14, 15, 16, and 17]. Emercom of Russia is prepared leaflets for the public about possible impacts and what needs to done in these situations. These leaflets are systematizing only for some disasters (earthquakes, floods, tsunamis, etc.). They do not always take into account the categories of data used (observations, forecast and climate), the types of activities and properties of specific objects, therefore they are poorly used. Moreover, they do not provide an economic justification for the recommended solutions. The disadvantages of these leaflets are also the vagueness of many recommendations; their fragmentation and incompleteness; a significant amount of information in directories due to their natural orientation to a wide range of specialists and conditions; the variety of disaster that affects various enterprises. At present, there are no classifications of impacts on enterprises, population and recommendations for decision-making.

The point is not that there is not enough knowledge about disasters and their impacts on enterprises and the population, but that the DM cannot develop a complete list of actions (decisions) based on available information about disaster. On generalization of experience affects small repeatability disasters. With some phenomena (for example, tsunamis, earthquakes), DMs sometimes meets only once during the entire period of work in his post. The accumulation of knowledge on taking into account the influence of the environment on economic objects is basing on a generalization of actions experience of enterprises in the conditions of disasters. This experience is sometimes recording in scientific publications, instructions, memos, but most often may meet only in the media. Knowledge accumulates over the years, costs considerable resources for formalization, have been turned out to be unmanageable and is not using fully. The period of gaining experience enterprises heads is quite long. Leaving the organization, the head takes away with him most of this knowledge.

With disaster, the chances of survival among the population depend on strict compliance with the requirements of local administrations, confidence in knowledge of the situation, reasonableness, initiative, discipline, a desire to survive, the ability

to apply existing knowledge, act according to plan, be able to analyze and take into account your mistakes. Unfortunately, warnings about disasters are not always taken seriously population, and DM. If warning received, then population does not always make preventive actions, because not aware of the possible consequences of disasters. Understandings of disaster risk and impact prediction go beyond the competence of National hydrometeorological services. In recent decades in Russia, the so-called "effective managers", which have been involved in the leadership of enterprises, are most often not specialists in a specific subject area, and even more so for hydrometeorology. Therefore, it can be affirm, that National hydrometeorological services are best prepared to predict impacts in partnership with DMs. Successful forecasting of impacts requires close cooperation with specialists from the Emercom of Russia, local administrations, scientific organizations, business leaders, having expert knowledge, resources, and integrated data. Services, related to impacts, cannot to provide one Roshydromet [18].

The usual methods for identifying disasters, sending and using information about disaster, taking into account the consequences of disaster are no longer sufficient to reduce or prevent them. For the organization of the adaptation and operational events, including the restoration of the infrastructure of life settlements and the economy after disaster, requires the development of a decision support system to assist DM. Studies of the possibilities of creating DSS are carried out in various industries abroad and in Russia [19, 20, 21]. Separate software packages have created. Work is underway to formalize and automate the accounting of environmental impacts, on the population and objects of the economy [22, 23].

The report of the Ad Hoc Working Group on Climate Change and Health "Protecting health in terms of climate change impacts on the environment" (2010) within the framework of the European Regional Framework for Action are proposed to consider the development of an information platform for collection of information. The information platform should contain practical tools for assessing health impacts, preparation of mitigation and adaptation actions; of impacts assessment the of climate change; of early warning of disaster and potential threats; a description of long-term trends related to climate, health impacts, and response actions applied. This proposal should be considering in a wider range of impacts assessment and adaptation to climate change - not only on human health, but also on various sectors of economic activity.

The DSS will allow evaluating the possible impacts of disasters. Impacts are the basis for planning proactive preventive actions, the timely implementation of which can reduce the number of accidents, unscheduled repairs, minimize downtime, increase safety, and minimize negative impacts on the environment, insurance costs and other. DSS can give out the impacts for various disasters - river spills, droughts, floods, and contribute to the adaptation of population to them.

Information about in impacts and recommendations should be using in the development of global, regional and sectoral development plans and preparations for disasters. The timely adoption of specific strategies, plans, actions to mitigate the impacts of climate change is an important condition for the sustainable development of regions in a changing climate. They can not only reduce the negative impacts of the manifestations of climate variability, but also bring additional benefits for economic development.

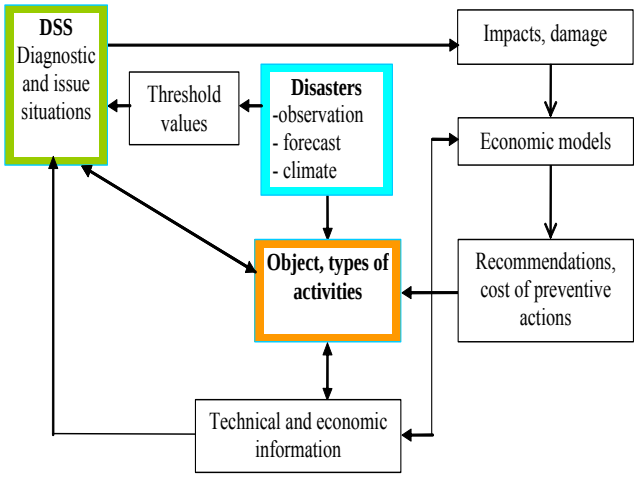
In regulatory documents must be provide actions related to the prevention of the impacts of disasters on the work of transport, agriculture and other sectors of the economy, as well as the activities of state bodies with the aim of ensuring the safety of the population during the period of disasters. There are detailed documents only for the individual disaster, for example, in Russia for the case of fishing from ice developed a document on cooperation of several ministries organizations [24].

The main questions, which arises in these situations, are the mandatory (or not) use of the system in the case of a disaster, and who will be responsible for the consequences of decision-making in case of losses at the enterprise? That is, all the rules of conduct for disasters introduced in the DSS should maximize the use of existing regulatory and methodological documents; recommendations must checked by experts.

3 Where and how to use DSS?

For the functioning of the monitoring system of disasters is necessary to obtain information about the status of hydrometeorological conditions on a single information platform and interfacing with all existing and prospects measuring systems of collection, transfer, processing and storage of environment data. Before issuing a forecast of possible impacts, it is necessary to define disaster indicators based on local threshold values for a particular enterprise and type of activity, and then,

depending on the danger level identified, issue information on the impacts and recommendations



for making decisions, Fig. 1.

Fig.1. The schema of DSS work

Knowing of values of indicators characterizing the disasters, can get information about the possible impacts, knowing the goals, standing before the DMs (the safety of persons or property) may issue a set of recommendations for decision-making in order to reduce or prevent of possible impacts. Decision support tools must be following:

- Servicing enterprises at all stages of its life cycle (development forecast, planning, design, operation, decommissioning);
- Infrastructure management of regions, taking into account climate change and the forecast of disasters based on spatial planning of enterprises location;
- Control of technological modes of equipment during the period of disaster (prediction of deviations of performance indicators of equipment);
- Reduction of unplanned downtime of enterprises, equipment, in connection with disasters;
- Solving problems of optimizing energy consumption, technological processes, various types of activities, taking into account climate change and weather forecasts;
- Preventive diagnostics of various activities that are impacted by disasters;
- Planning and carrying out maintenance work of the equipment, taking into account the impact of disasters on it;
- Estimates of production losses, including working time during the period of disaster;
- Obtaining information on possible impacts and recommendations for making decisions.

Four stages of automate the development of GMS of enterprises, public authorities and the public are selected. These are informational stage; informational and advising stage; stage of semi-automatic and stage of automatic management with use hydrometeorological information.

At present, GMS of enterprises, government bodies and the public are at the informational stage of their development, i.e., the Roshydromet observational units measure (observation) the environmental parameters, identify disaster and bring information about them DMs by all available means. The heads on enterprises himself makes all decisions on conducting preventive actions or improving the efficiency of business processes using hydrometeorological information.

The informational and advisory stage of providing of information to heads is in its infancy. At this stage the heads not only receive hydrometeorological data and information for disasters, but and from of DSS receive information on the possible impacts of disasters on activities of enterprises and recommendations to prevent or minimize their impacts, in form in a convenient for its perception. On this stage, heads should not initiate the start of work with the system; the system should automatically notify heads of the occurrence of a disaster.

Now it is already necessary to develop the tools of semi-automatic control, when DSSs not only provides information about the impacts and recommendations, but also partially gives out commands on executive mechanisms. For example, if air temperature of outside is dropping then temperature of hot water in the heating system must be increasing automatic; increasing the power of refrigerator units to maintain a certain temperature in the refrigerator when transporting fruit and vegetables from the south to the north. The heads, using his experience and intuition, corrects (confirms) the implementation of the control functions of the system. So, if the heat supply system of buildings is outdated, then during a period of severe cooling of air temperature, do not increase the pressure in the system, because this can lead to a breakthrough, and then freezing of pipes and cessation of heat supply.

The automatic control stage provides for the receipt of all information by the system in an automatic regime. The head monitors the progress of the process, he has the opportunity to intervene in the process in order to verify the correctness of the decision or cancel the automatic control mode.

This control method should be use in autopilots of aircraft, cars, drones, ship autopilots, and robots - wherever an automatic recording of the hydrometeorological parameters may organize.

Below are presenting directions of DSS use at various stages of the life cycle of enterprises:

1) *Prediction of the development of the region taking into account the risk of disasters*. For the development of production in a certain region, it is necessary to take into account the prevailing climatic conditions. Each region has its own list of disasters, which eventually can affect both the further development of production and the infrastructure of region, as well as people's livelihoods. At this stage, it is important to have climatic assessments of natural conditions, the likelihood of disaster, as well as risks from certain disasters for several options for the development of a region. Using DSS, estimates of possible impacts taking into account climate change may obtain.

2) *Planning*. Based on forecasts for the development of the region, taking into account the risk of disasters, available resources, an appropriate development option is selecting. At this stage, DSS allows quickly and efficiently to assess possible impacts of disasters on enterprises and the population with an assessment of the damage for each development option, as well as recommendations for mitigating these impacts taking into account their cost.

3) *Engineering designing*. Designers, using DSS, to determine possible impacts on specific projected enterprises, for examples, where to lay the pipeline taking into account possible flooding of the territory, at what height to build a pier, where to put warehouses for storing goods, at what height to install Internet-communicators, so that if the level rises water a cable is not exposed to water.

4) *Designing of construction*. At this stage, it is important to take into account the relationship between enterprises under construction and possible disasters. For example, a road running along the river can serve as a dam, but at a certain water level exceeding the critical mark, can take place overflow of water across the road, its erosion, which, in turn, could lead to new flooding. When building design, it is also important to consider the wind rose, the amount of precipitation, etc. All this can formalize by DSS.

5) *Construction*. This step consists in providing data of observations and prognostic information of construction and installation work on constructed enterprises and installations. Here using DSS it is necessary to take into account the impacts of disasters occurring at the time of construction and affecting the enterprise under construction, construction materials and equipment.

6) *Operation of an enterprise*. In the process of operating enterprises, the key task is to build an effective process for taking into account the impacts of current and predicted indicators. At this stage, the DM should receive information about the hydrometeorological situation automatically as they are used.in the business processes of enterprises. DSS here will help DM in time to take preventive actions to prevent or mitigate the consequences of disasters, as well as increase the efficiency of the business processes that depend on the hydrometeorological situation.

7) *Conservation of the enterprise*. So far, very little attention has been paying to the last stage of enterprises life cycle. This is clearly seeing in the example of nuclear power plants. There are few effective technologies that make it possible in a planned manner not only to decommission an object, preserve it, but also to provide a safe long-term conservation regime or even free up space for another object. In addition to monitoring the state of the conserved enterprise, it is necessary to take into account the passage of disasters, which can affect the safety his of conservation.

The tasks of the GMS of national, regional and local administrations, heads of government and enterprises should be:

- Preparation of information, regulated in terms of composition, danger criteria, timing of updating and transmission for automated systems of federal executive bodies and enterprises;
- Awareness raising among the public and enterprises leaders to identify and predict disasters;
- Choice of means and methods of informing of the public about disaster;
- Informing the public about disaster, danger level, potential impacts and recommendations;
- Identification of individual objects subjected to disasters with complex social or technical conditions;
- Identification of the danger level for enterprises on the basis of assessments of impact indicators (at what values a negative impact occurs) in the form of a “traffic light” (green, yellow, orange, red);
- Indication of disasters nature, causes, indicators of severity and scale impacts;
- Determination of the list of possible objects, on which impact the disaster;
- For each type of enterprise and type of production activity automatic detection of disasters must be organize on local threshold values with the

provision of information on possible impacts and recommendations;

- Compiling a list of all the expected impacts for each enterprise, type of activity and of the population;
- Distribution of information about the disaster received from Regional offices of Roshydromet, according to the list, including mass media, population by e-mail, SMS;
- Loss assessment for the most significant impacts;
- Defining a list of recommendations to reduce or prevent the impact of disaster;
- Assessment of the cost of preventive actions;
- Evaluations of alternatives decisions;
- Adoption of final decision.

Here it is important to give the DM the information about what can happen, and what needs to be making before, during and after the disaster. To reduce the time for preparation for disaster, it is necessary automatically to deliver information about disaster to each DM on mobile Internet devices (smartphone, tablet, or laptop) in real time. DM must visible state disaster indicators to monitor the situation, which automatically are reflecting on the "traffic light".

In the coming years, a transition will be making from the one-time provision of hydrometeorological services to the constant support of DMs with information about the hydrometeorological situation. In practice, this means that Regional offices of Roshydromet should be organizations that carry out continuous comprehensive monitoring of the hydrometeorological situation throughout the entire life cycle of enterprises activity, and must contribute to improving their efficiency and reducing losses from disasters.

Using DSS can take into account all possible protection options in disaster; calculate the costs of preventive actions with various protection options for a specific disasters and enterprise; compare them with possible damage, including possible emergency rescue and restoration work; get the most complete information about all the factors of the impact of disasters on enterprises and the population. Prompt delivery of the required information in connection with natural disasters will create conditions for reducing the costs of eliminating the consequences of disasters, restoring destroyed territories and social support for the population.

DSS development indicators for situations associated with disaster are increasing the information content of DM when making decisions in the case of disaster; acceleration of delivering of information (increasing the efficiency of informing) to DM about the forecast and the fact of occurrence of disaster; decrease in the volume of information presented by DM for decision making.

4 New tasks for the development hydrometeorological support

The new tasks of GMS when using DSS should be:

- Automatic delivery of data and information for DMs to mobile devices;
- Automatic delivery of observed and prognostic values of indicators, that the head of the administration of a constituent entity of the Russian Federation or municipality identified as dangerous;
- Automatic notification of the population about impending disaster and the issuance of information on possible impacts and recommendations for preventive actions;
- Automatic transmission of observed and prognostic information about disaster to drivers;
- Inclusion of hydrometeorological information in the ship's navigation system for the combination of the ship's route of movement and the area of the passage of the disaster based on current and forecast data;
- Automatic accounting of threshold values of disasters indicators when some objects are located in the area of disaster;
- Energy saving, optimal calculation of energy consumption at the enterprise, predictive monitoring of fuel supply depending on the season, weather conditions.

With the help of such means, the DMs will be able to get operational access to current, prognostic and climate information, evaluate disaster, and quickly make managerial decisions based on these data. The necessary data will automatically update, loaded from an integrated information system, for example, from the Unified State System for Information on the Situation in the World Ocean (ESIMO) [25]. When working with the system, the DM pre-determines the type of object, type of activity, area of interest or a fixed point, for which hydrometeorological information needs. For each district or point, indicator values will be available that the DM has identified as danger for his enterprise, presented in the form of observed, predictive and climatic values.

Using personalized services for GMS provide a focus on receiving better economic results. It need personalized maintenance methods for enterprises such as airplanes, helicopters, trains, mining trucks, turbines of power plants and others taking into

account hydrometeorological information, can provide profit growth, reduced downtime of basic equipment, and increased workers safety.

DSS provides enterprises with a clearer picture of potential impacts of disasters, based on climatic, prognostic information, and the impacts that occur during the passage of disasters, which will help reduce production downtime and damage. An important moment is also the possibility of changing the economic model of interaction between Roshydromet and consumers, i.e. a change in the GMS paradigm - from the formal delivery of information on the current and prognostic state of the environment by all possible means, before her automatic using in business models of enterprises. The DSS is necessary for solving the following business tasks:

- Ensuring the safety of the population in the event of disaster, timely informing and delivery of warning of the disasters to emergency rescue, fire, supervisory services, municipal services, Emercom of Russia;
- Decrease of losses by reducing the time to delivering information about disaster, forecasting potential impacts and conducting appropriate and timely preventive actions;
- Increasing of the efficiency of transport operation and ensure its safety due to the automatic use of hydrometeorological information;
- Optimization of fuel consumption (coal, gas, electricity) depending on the year season;
- Ensuring the sustainability of the operation of the enterprise infrastructure.

The sequence of actions for the implementation of business processes using hydrometeorological information includes:

- Identification of interaction participants involved in the implementation of business processes;
- Determination of the composition of regulatory documents on the basis of which the business process is carried out;
- Assessment of time, cost of work and other characteristics of the business process;
- Description of the business process passport;
- Formation of plan for hydrometeorological support of the business process;
- Description of the situations associated with the impacts of disasters.

5 Results

Materials on the impacts collected for108 disasters, formalized in the form of 3000 situations (30 typical enterprises, 100 types of activity, 3 danger levels – yellow, orange, red, for climatic and forecasting information, in moment disaster, after of disaster). The total volume are >10 thousand impacts and recommendations, which are presented in database (DB).

A demo version of DSS was created to delivering information about disaster to the population by a mobile Internet device with the ability to provide information about the impacts of disasters and recommendations to reduce or prevent these impacts. To obtain recommendations, the following implementation option is used. The user independently received from any official source (radio, TV, Emercom of Russia, Roshydromet organizations) or even from an unofficial foreign sources and information about a possible disaster, enters the application, selects the corresponding disaster and receives information for impacts and recommendations. In the future, a search will be organized for situations related to the type of object and types of activities; with the danger level of the disaster, data used (observed, forecast, climatic), the level of decision-making. An example of impacts and recommendations for the situation “Thawing permafrost” is presenting below.

Disaster: Thawing permafrost.
Type of information: climate.
Indicators: intensive thawing of frozen rocks >4 cm/year.
Danger level: red.
Impacts*:*
Operation of enterprise:
Accidents of oil and gas pipelines occur.
There is a loss of stability of the foundations.
There is a loss of deformation of supports.
Destructs the walls of underground storages.
Threatens infrastructure.
Environmental impact:
The permafrost zone boundary shift to the north >50 km, and on the islands - >200 km.
An increase in average annual air temperature >2 degrees, the bearing capacity of pile foundations reduced >50%.
A small forest appears - larch in the open areas on the border of continuous permafrost.
The runoff of the northern rivers is increase.
Danger processes thermokarst, thermoerosion develops.
The number of mudflows, landslide formations increases.
Coastal erosion increases, coasts destroys.
The intensity of slope processes increase.
Planar, linear erosion arises, ravines erosion is increasing.
Karst processes are amplifies.
Thawing permafrost at the bottom of the seas arises.
The earth, devoid of natural protection, begins to heat up.
Craters form appear.
Houses go underground.
Ice in soil is melting and a completely new landscape is being forming.
Accompanied by the release of methane into the atmosphere.
Recommendations:
National, regional and local administrations:

To allocate a financial resources to prevent the harmful impacts of disaster.
To update the development plans of region.
No cut down a forest in permafrost areas.
To develop new "Building regulations", and legal and by-laws, taking into account the forecast of climate change.
Introduce restrictive actions for the construction of multi-story buildings in permafrost areas.
To change the environmental behavior of the population.

Enterprises:

To organize freezing in platforms in the form of the “Chinese wall”.
To reconstruct a homes to people living in the permafrost zone.
To remove designed structures from the risk zone.

A DSS more promising implementation option is associated with the automatic detection of disaster by indicators, based on threshold values DB, using integrated ESIMO data [26]. This system integrates the observed operational data coming in from the global telecommunication system of the WMO; prognostic grid data of regular points coming from the Hydrometeorological Center of Russia and other organizations; climatic data obtained based on a synthesis of historical data from RIHMI-WDC. The ESIMO tools are identified a danger situation for an every object separately based on threshold values of disasters and is delivered directly to the MeteoAgent application. This application after receiving the SMS message about the disaster is initializing on the mobile Internet device. If necessary, the user will receive information about the possible impacts of the identified disaster and recommendations for DM. It is possible to connect economic models to assess the possible damage and calculate the cost of preventive actions before the onset of the disaster. More details about the existing demonstration implementation option and prospects for the development of DSS can found in articles [22, 27].

6 Conclusions

The first time in the field of hydrometeorology collected and formalized materials on impacts of various disasters on enterprises and the population, recommendations for making decisions; prepared experimental DB of threshold values of environment parameters, taking into account of the enterprise type, the time of year, climatic zone.

At any time, no matter where the DM is, it will be possible to obtain any information about the environment state, including recommendations for making decisions. In the case of the disaster, the computer itself will remind DMs that the enterprise is in the zone of disaster. SMS will represent the DMs an information available about forecast of time and place of disaster manifestations; possible impacts; recommendations that need to be evaluated, selected and implemented. DMs must only set or correct the mode of operation of the technological process.

Using DSS, one can streamline the decision-making process, generalize the experience of using information, standardize the list of activities, determine the significance of certain decisions, and facilitate the work DM on enterprise in determining the list of necessary activities. This will make it possible to bring information to the consumer not in the form of numbers, but in the form of information on impacts, recommendations, and damage and cost assessments for preventive actions. DSS only recommends, the decision is always make by the DM, who may not agree with the information presented by the system.

With the help of DSS, it is possible to set and solve tasks of increasing efficiency by automating the delivery of data, detailing data and forecasts to the level of settlements, indicating the danger level, providing of information about impacts and recommendations. That is, the question should not be improving the efficiency of IT implementation and operation, but about improving the management of efficiency GMS of DMs, an IT-based. The transition to automated DMs service is impossible without modernization of legislation and the regulatory environment, removal of administrative barriers between Roshydromet and departments related both to the obligatory use of hydrometeorological information when making decisions and to the responsibility of managers of enterprises for not using of information.

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