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**METEOROLOGICAL SERVICE AS THE GOODS IN  
CONDITIONS OF MARKET ECONOMY**

In a number of the countries formed as a result of disintegration USSR, there is a change of socialist economic system on capitalist, i.e. market, and also change of the form of the properties accompanying with infringements in activity of credit and financial systems of the state, inflation and unemployment. All this has an effect for work National meteorological services (NMS), including meteorological service of Kazakhstan. From year to year cut down its financing, in result it is necessary to close of stations, to reduce terms and volumes of supervision, to turn off scientific researches, that in turn conducts to deterioration of quality of weather forecasts of different purpose, to insufficient completeness of the atmosphere, given about the regime characteristic, and hydrosphere, long-term tendencies of change of their parameters.

There is an opinion, that as the economy of the state goes to the market, NMS of Kazakhstan should aspire to self earning of money, and the state financing should accordingly be reduced. The similar situation has developed and in a number of other countries in territory former USSR. Therefore be of interest to consider the basic kinds of hydrometeorological production (or service) as goods, to find out, whether all it has properties, according to which the market would give for it the correct price. Further we shall mean market economy the mixed economy, i.e. economy, in which functioning the regulating role of the state is great. The actually pure market economy is not present in one country of the world [17].

The goods, for which market mechanism establishes the correct price, should intend for individual consumption and have property of divisibility, i.e. to consist of the large number of particles, that the separate buyers could it get. Besides such goods should fall under principle of exception: who can not or does not want to pay, that does not receive any benefits from the given goods. Accordingly, the market demand for such goods is defined as the sum of demands of the separate buyers. This total market demand enables to receive the

appropriate proceeds, and thus - and profit, i.e. to receive the general income exceeding production costs. The point of balance between the made and bought amount of the goods, i.e. ratio of a supply and demand, defines its price [17 and etc].

The described above mechanism carries out by the market only in relation to the goods intended for individual consumption - of the goods, having property of divisibility and exception, falling under a principle of exemption.

A number of the goods, however, has in a different degree the expressed external effect, i.e. such goods, let not in a complete measure, can use and those who did not participate in the bargain and did not pay for it. If spillovers - characteristic feature of the goods, then speak about the public goods. The public goods are such goods, to which the principle of exception does not distribute and which is indivisible. An example of the public goods are the roads etc. When the goods are already made, the manufacturer be not capable to prevent by the indivisible boons of the goods and the one who did not pay for it. As the potential buyers take benefit from the public goods irrespective of, they have paid for it whether or not, their original preferences do not reveal, i.e. to define the price of such goods on the basis of a ratio of a supply and demand it is not represented possible. This implies, that the parameters of market demand on the public goods or do not exist, or they are considerably underestimated. In result the market demand for such goods does not create to the manufacturer the sufficient income to cover production costs, though the public benefit can sometimes repeatedly exceed them [9, 17, 19].

At the same time theoretical definition of optimum volume of manufacture of the public goods is possible. It is achieved by the statistical account of number of the potential consumers, range of the prices for it, which they would consider acceptable. As a result of summation of amount of the goods, on which the demand in all range of the prices is presented, it is possible to receive the diagram of collective demand on the given goods and total proceeds for it [17].

Let's consider now, what properties has the meteorological service offered National meteorological service as the goods. For this purpose we list at first basic kinds of such service. All its variety agrees [3, 18, 19 etc.] it is possible to reduce to the following kinds:

- Primary data of supervision or data of supervision on the current status of an environment (including the data for the international exchange);

- Information on the dangerous phenomena of weather and forecasts of such phenomena;
- Regime hydrometeorological data;
- Forecasts of general assignment;
- Specialized weather forecasts till one years;
- Scientific and scientific - analytical production.

The majority of the listed kinds of service or has external effect, or in general is a common product. Let's consider, however, it more in detail.

The primary information has the expressed spillovers, is not indivisible and can be used at once by many consumers, first of all for the meteorological forecasts. At the same time this kind of information has also attributes of a public product, as there is no man, which would not be interested in the current weather. But primary information, have spillovers and attributes of a public product, as the majority of public products, does not fall and under a principle of exclusiveness. In the market of the goods and services for it the real price will not be offered, and, hence, in the resource market it will be impossible for the obtained money to get necessary resources, . . . manufacture of such product unprofitable.

We have not stopped separately on a network of supervision behind a level of pollution of an environment, as this problem widely and is deeply worked in the economic literature and the problem of pollution of an environment is given as a typical public problem [8, 17 etc.].

The information on the dangerous phenomena of weather partially acts from the same observant network, and also from a special network, network meteorological radars, as the information from the meteorological satellites etc. Known economists C.McConnell and S.Brue, the authors of the widely known tutorial on economy [17], result in it meteorological system of the warning as an example of the manufacturer of a certainly public product, as it is directed on preservation of material assets and life of the citizens of the state. As the private business is engaged in this or that branch until then while there is an opportunity to receive of normal profit [4, 9, 13, 17, 20], it is clear also, that the system of the warnings and its production should belong to the state. The forecasts of the phenomena of weather are based on the given system of supervision behind them and directed on the decision of the same task and too regard to the public goods. Is clear also, that data of supervision for the dangerous

phenomena, their forecasts, as the public goods, not in a status to receive in the market the real price.

The regime hydrometeorological materials are widely used in various spheres of activity, it is usual as the climatic reference books, water reference books and others given, received on the basis of the control, generalization and special processing of the primary information for the long period of supervision, usually approximately for 20 years. Than more period of averaging within the limits of these 20 years, the high is trust to the data, the above their consumer cost. Increase of the period of averaging more than 20 years for the different reasons of geophysical character does not practise. It is accepted to repeat the fundamental regime editions on new by the data for the new period of time [1,2].

The generalized regime materials have the especially strongly expressed spillovers, as the separate copy can be used repeatedly and many users, including and not paying for the goods. For example, the Research-and-Production Association of Applied Ecology "Mechanobr" within one year carries out works, in which rather widely uses the data of the climatic directory on Kazakhstan, for the sum about 100 thousand reference of dollars and more. At the same time NMS of Kazakhstan has not received cent, as the necessary data are taken from a copy Climatic book [2], available in library of "Mechanobr".

From time to time regime generalizations should be updated. The edition of the subsequent variant, say, of same climatic reference book, bypasses more expensively, than previous that all kinds of resources in due course rise in price [17, 19]. At the same time consumer is not declined to get the new editions, as their consumer cost for it changes a little. So, new edition of the climatic reference book [1], despite of a number of apparent advantages (first of all data are received for last 20 years of supervision), the success at the consumer had no, since it accepts the first edition [2].

At the same time climatic directories, water reference books and other fundamental generalizations contain important for the state the strategic information on its climatic, water resources etc. On its basis the important decisions, are accepted on prospect, about development of regions, separate branches. Accordingly, edition of such fundamental generalizations is necessary for the state and probably only at its financial support.

However lot of the specialized generalizations for maintenance of construction within the framework of performance evaluation of

ecological impact and other quite can be profitable, as on them there is a concrete customer ready to pay specialized generalizations, executed on his order. Such generalizations have property of divisibility and in a significant degree fall under a principle of exception.

The forecasts of general purpose, according to many researchers, are the public goods [14, 15, 18, 19, 20, 22]. They do not fall under a principle of divisibility also do not fall under a principle of exception, if the forecast has bought and one man knows, it is known by everyone, with whom it communicates, without damage to him. Accordingly, manufacture of such forecasts can not be profitable.

The specialized forecasts appreciably fall under a principle of exception and have no property of divisibility. For example, air weather forecast on a route Almaty-Moscow is applicable only to the given route, to concrete height of flight and is valid during the limited interval of time. Accordingly, market for production of such type already in a status to give the real price and proceeds, which can pay back the charges on their drawing up.

Scientific and scientific - analytical production differs by that the potential consumer to the moment of its manufacture can not know at all, what benefits he will receive from its application and therefore will be hardly declined to its financing. Besides the economic benefit can be received only after the expiration of time. The majority of kinds of scientific production have property of the public goods. For example, the data on expected changes of a climate are extremely important for the state and its people as a whole, but hardly who except for the state is ready to buy or to finance such work. Similar properties of the public goods have the results of researches of ozon-layer, problem of change of a level of the Caspian sea, problem of shrinking of Aral see, development and perfection of the forecasts of general purpose, including long-term, rating of a level and potential of pollution of an environment etc. At the same time development and perfection of methods of some specialized forecasts can partial be carried out at the expense of means earned NMS on sale of such forecasts. The appreciable share in financing science of less developed countries can be made by means of the International funds.

In the table the Kazakhstans, coordinated with the consumers, of the price on some kinds of hydrometeorological of service are given, i.e. price, which the consumer is on the average ready to pay for a commodity unit. The collective price is approximately equal a range

of the prices to the average price, which are ready to give the buyers multiplied on number of the potential buyers.

It is possible to see from the given table, that widely popular in the population

The table

The coordinated price-list of the prices for some kinds of hydrometeorological production in national currency (tenge) and US dollars.

Kind of hydrometeorological production	Unit of measurements	The price for Unit	
		tenge	dollar
The short-term forecast for day on territory of Kazakhstan	1 forecast	5200	35,0
The forecast for day on area	1 forecast	670	4,4
The forecast for day on item	1 forecast	1010	6,6
The forecast for the second and third day on territory of Kazakhstan	1 forecast	10850	70,9
The forecast for one week (period, decade) on territory of Kazakhstan	1 forecast	11700	76,5
The forecast for second, third day on area	1 forecast	1260	8,9
The forecast for one month on territory of Kazakhstan	1 forecast	11700	76,5
The storm warnings of the dangerous phenomena on territory of Kazakhstan	The warning of one phenomenon	3050	19,9
The storm warnings of sharp changes of weather and spontaneous	The warning of one phenomenon	4050	26,5
The hydrometeorological phenomena	phenomenon		
The daily bulletin of weather on republic (meteorological part)	The bulletin	12700	83,3
The monthly bulletin of weather on territory of Kazakhstan	The bulletin	11850	77,4
The decade agrometeorological bulletin on territory of Kazakhstan		4000	26,0
The forecast, middle in region of productivity and total tax grain and bean of cultures on territory of Kazakhstan	The forecast	32050	209,5
The forecast of stocks of a moisture in ground to the beginning of spring-field works on territory of Kazakhstan	The forecast	31650	206,9
The long-term forecast of maximum levels, charges of water of a spring high water on the rivers of Western Kazakhstan	The forecast	378300	2472,2
The daily hydrological bulletin on the rivers of Kazakhstan	The bulletin	155480	1016,2
The daily bulletin about a status of a snow cover and avalanche conditions in mountain areas of Kazakhstan	The bulletin	11480	75,0

the forecast of general assignment - forecast on area - is necessary about 5 dollar. At the same time price for the air forecast - about 5 thousand dollars, the prices for other kinds of service are in an interval between named. As the prices, given in the table, result of interrogation of the consumers, it is possible to consider that they reflect size of a by-effect or are a measure of a public of each product: if the by-effect is higher, then the price is lower. Really, the forecast of general purpose use everything, but this service is indivisible also nobody wants to buy it for the present price. At the same time collective price for this product higher. Having assumed, that in area the forecast interests only 20% of the population (50 thousand the man), which ready to pay for it only till 20 cents (cost of the newspaper), we shall receive the collective price 10 thousand dollars on area and 150 - 200 thousand dollars on Kazakhstan a day. The similar results received in [6, 7, 10, 17, 19 etc.] for Australia and other countries. As the standard of living there appreciably is higher, than in the Kazakhstan, percent wishing to get the forecast at the price of the newspaper according to interrogations exceeded 80 % of the population. Accordingly collective cost of the forecast of general usage has exceeded 1,5 million dollars. At the same time expenses for manufacture of such forecasts, as we know, 1,5 - 2 order is lower.

The air forecasts the consumer pays for enough complete cost, owing to, which is explained earlier.

Who pays and finances manufacture of the public goods, as his manufacture is unprofitable? The state. For this purpose at first carry out the analysis of costs and benefits, define optimum volume of financing, and then, it is usual through parliament, i.e. political methods, accept the appropriate decision [17].

The essence of the analysis of costs and benefits concludes that any decision to enclose money in state sector (where public goods more often are made) or to finance its manufacture in private sector attracts behind itself both benefit, and costs. The benefit consists in additional satisfaction of the consumers, as the release of the public goods is increased, and costs that the satisfaction of other consumers reduces(decrease) in connection with reduction of manufacture of the goods for the individual consumer. Business that means for the public goods the state takes from private sector as the taxes, reduce thus its opportunities on manufacture of other goods. It name as moving of means from private sector in state.

Whether it is necessary to move means to public sector, i.e. on an manufacture of the public goods? If you exceed years from

additional manufacture of the public goods costs from reduction of amount of the goods for individual usage, that is necessary. However analysis of costs and profits in a status not only to specify on expediency or in expediency of investments in creation of the concrete public goods, but also allows to specify optimum volumes of such investments. The authors [17] demonstrate these opportunities on a hydrological example - realization of the program flood of the control in different variants with various volumes of investments. The examples with a comparative rating of collective cost of the forecasts of common usage and charges on their manufacture in Kazakhstan, Australia and other countries specify unconditional necessity of their financing on the part of the state.

The analysis of costs and benefits disperse a myth that economy on the state charges and reduction of the state charges - identical concepts. The economy is connected to efficiency of use of resources. If the limiting benefits from an investment in the public goods are less than limiting costs to carry out such program does not follow. But if there is a return situation - if the benefits exceed costs, would be not economic and it is prodigal to not enclose money in such program [17].

It is underlined efficiency of investments in meteorological service in a number of works [3-12,14-16, 18, 19, 22]. It follows and from above mentioned examples about collective cost of the forecasts of general purpose in Australia and Kazakhstan. Was at the same time above shown, that some kinds of service for example special forecasts, can bring even profit. What in this case share of the state in financing NMS?

Agrees [7, 12, 14, 16, 21, 23 etc.] some national NMS earn up to 30 % of required means, others - only 2-5 %. Such wide dispersion has an explanation. Meteorological service and its use in manufacture - reserve of the second order. It is effective only then, when manufacture works highly effectively and all reserves of the first order are used. If, say, on autotransport undertaking works with faults because of shortage of fuel and spare parts, the working and technological discipline not at height, benefits from the meteorological forecasts will not be. In this sense the research is interesting [5], where the authors show, that in Devon county it is possible to save on motorways about 120 pounds of an item for a winter season if to use the meteorological forecasts and if technology of road - transport and cleaning works will not break. Compulsion of last condition they emphasize.



Also becomes understandable wide disperse of efficiency of market activity National meteorological services. In the countries, where the economy works stably, where the advanced technologies are applied at high organization of work, the profit can reach 30 %, and in less developed countries - only 2-5 % from required amount. The share of the state, thus, makes in financing NMS 70 % and more.

It is necessary to note, that the significant share (on some data up to 30 %) leaves these 70 % on scientifically technical progress and perfection of a product. The large share of the state in financing NMS, in the first turn financing of the contents of all kinds of an observant network, on the one hand, provides of availability primary given supervision to any establishment, high school or separate citizens, as their reception is financed from pockets of the tax bearers. This availability enables private business to begin the activity in sphere of hydrometeorological service. From other party, large investments in scientific - technical progress and the perfection of quality of a product guarantees NMS a leading rule in this area and effective performance by it of state tasks on the international information interchange, effective work of systems of the warning about the dangerous phenomena and their forecast, preparation of fundamental regime materials, research works and of scientific-analytical generalizations.

Indicative in this plan is Meteorological service of England. On maintenance of flights of aircraft (basically in Asia) it earns 2,1 million Pounds of an item per one year, from which 1million Pounds spends for perfection of system of the tax and analysis of the information, and 1,1 million. Pounds - on perfection of quality of a product. It is natural, that it can not be afraid of the competitors, since initial the investment of the capital on the part of the competitor should be too high to reach such level. It is interesting, that the efficiency from meteorological service is estimated by them not above than 3 %, than proves to be true, that the meteorological service and economy from it is all the same reserve of the second order [3, 18, 19 etc.].

There is a set of examples of successful cooperation national Meteorological services and private capital promoting the best satisfaction of searches of the consumers [8, 12, 18, etc.]. It confirms the thesis, that at NMS and private business different market niches and the presence last does not interfere with work NMS, but makes more floppy and complete meteorological service as a whole.

In summary it is possible to make some conclusions.

1. The meteorological service on the nature has the expressed spillovers or is the public goods. For this reason the market be not capable to offer for it an all-round price, so NMS not in a status to exist on the proceeds for it.

2. As the majority hydrometeorological of service is the public goods having the high collective price, the financing NMS is carried out by the state, that provides except for existence NMS and its service availability of the primary hydrometeorological information to any department, establishment, citizen, and also gives an opportunity of development of private business in this sphere.

3. The efficiency of hydrometeorological service is high in the countries with effectively working economy and allows to earn up to 30 % of required means. In less developed countries this share is reduced up to 5-3 %.

4. The scientific and technical progress finances in the basic state, providing NMS, on the one hand, efficiency both high level service and performance by it of some tasks state, and with another - competition. The private business near to effectively working NMS too works more effectively, as with it closely cooperates.

5. Priority of state financing NMS do not exclude application of highly effective methods of payment of work of the workers with maximal use of a principle of personal interest and realization of a lot of other measures directed on increase to efficiency of use of financing of other tasks.

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