Hydrological services and water quality information
NHMS of the Kyrgyz Republic

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PROMOTING EXPERIENCE EXCHANGE IN CENTRAL ASIAN COUNTRIES IN THE FIELD OF HYDROMETEOROLOGICAL SERVICE
Workshop-training
10-11 November 2021

The National Hydrometeorological Service of the Kyrgyz Republic - the Agency for Hydrometeorology - is an officially authorized state body entrusted by the Government of the country to carry out activities in the field of hydrometeorology. The date of formation of the National Hydrometeorological Service of Kyrgyzstan is July 16, 1926, while the beginning of systematic meteorological observations dates back to the 1880s.

Objectives of Kyrgyzhydromet

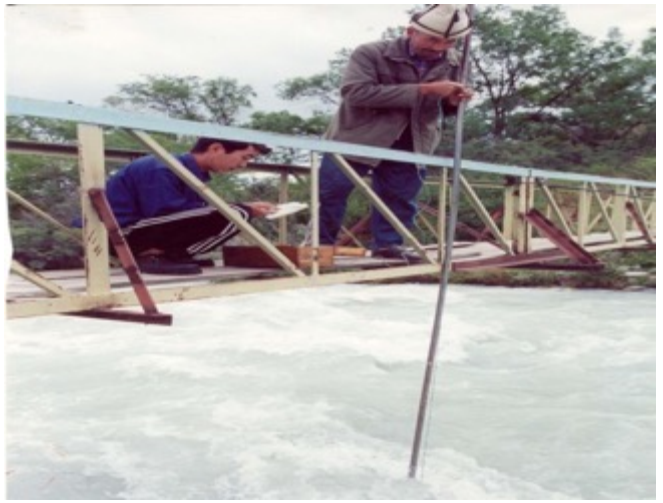
- Provide the Government of the Kyrgyz Republic, the population, various sectors of the economy with hydrometeorological information and information on environmental pollution;
- Preparation of warnings about natural and dangerous hydrometeorological phenomena, such as avalanches, mudflows, floods, storm winds, heavy precipitation, etc. and bringing them to the attention of the population, the relevant structures of the Ministry of Emergency Situations, the Government, interested ministries and departments;
- Forecasting: weather, water content of rivers, crop yield, phenological forecasts;
- Generalization and analysis of hydrometeorological conditions and information on environmental pollution, compilation and publication of scientific and applied reference books;
- Maintenance of the State Environmental Data Bank.

Observation network of Kyrgyzhydromet

- 56 automatic meteorological stations (33 of them are manual), including 4 avalanche stations, the Cholpon-Ata lake observatory with research vessels;
- 10 agrometeorological posts;
- 79 hydrological posts, 3 of them have automatic hydrological complexes, 5 lake and 23 hydrochemical posts on rivers, lakes and reservoirs;
- 20 meteorological stations that monitor the radiation situation, of which the radioactivity of atmospheric fallout is determined at 4 stations;
- 15 stations for observing atmospheric air pollution, at the 1st of them a station for observing atmospheric air was installed (Bishkek);
- 1 global station for observations of greenhouse gases (Cholpon-Ata).

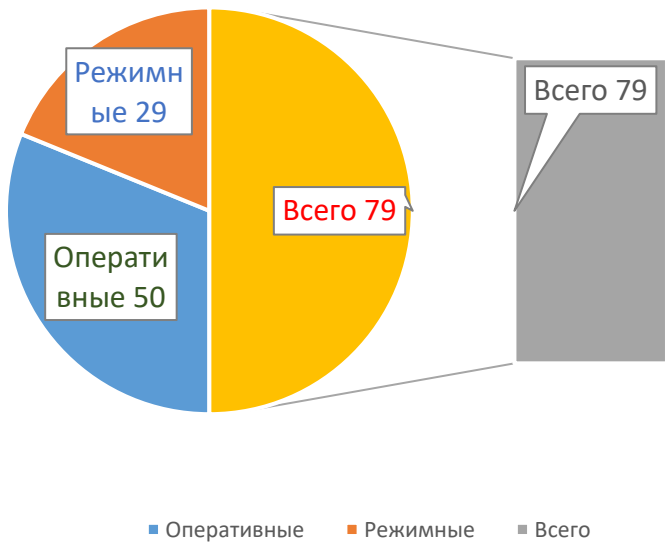
Hydrological monitoring system

The hydrological observation network in Kyrgyzstan was formed already in the first decade of the existence of the hydrometeorological service. Hydrological posts were opened on sections of mountain rivers before they reached the valleys where water was being taken for irrigation. This principle of organization of the hydrological network, the essence of which is the delimitation of the zones of formation of run-off and natural and artificial dissipation, has been maintained to this day.



Observations at the hydrological station

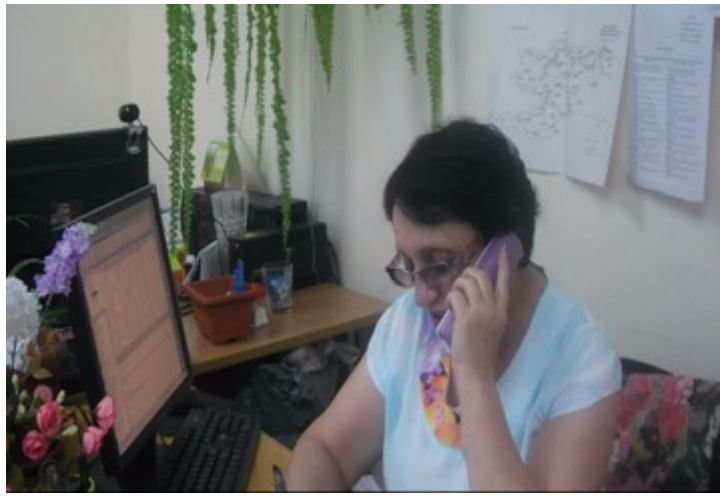
The existing hydrological network studies the regimes of water sources of the most important natural and economic areas, mainly at the boundary of the formation and dispersion of run-off

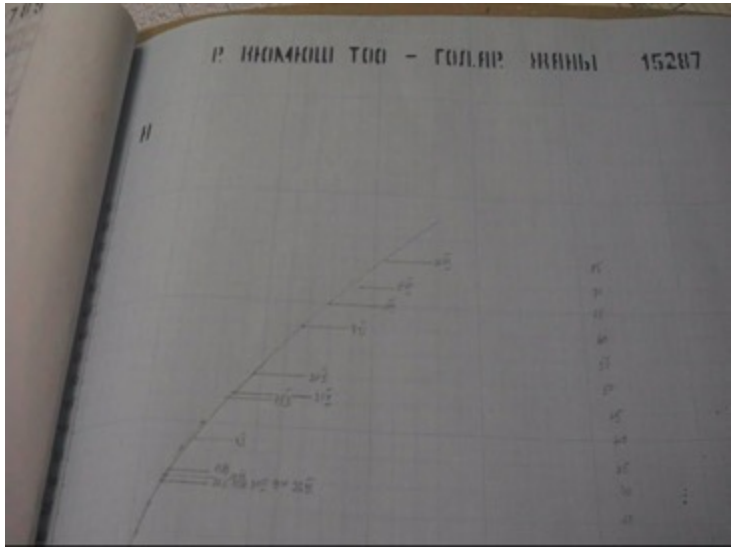


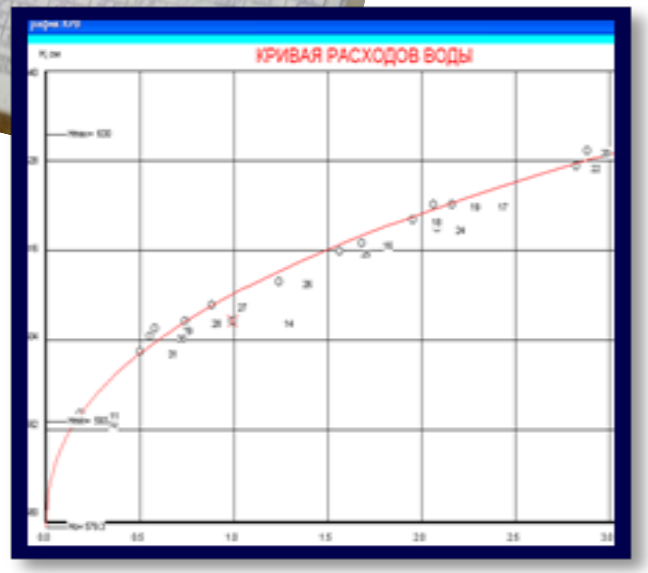
- The main task at the hydraulic station is:
  water-level observation
  water flow measurement
  water temperature measurements
  Meteo-energy measurements (air temperature, precipitation, snow cover)

Transfer of hydrological information from hydrological station to Integrated Hydrometeorological Station

Processing of hydrological information from stations







1. Completion of work on the compilation of parts of the State Water Cadastre

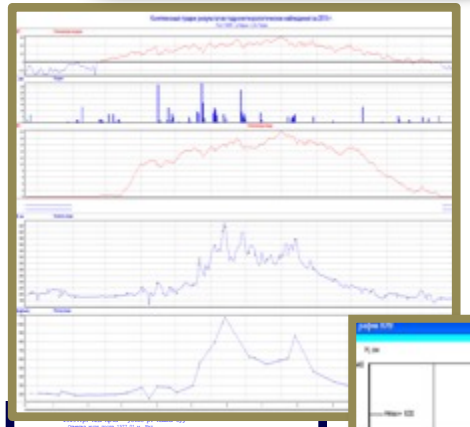
$$H = \frac{1}{2}(H_0 + H_{21}) \qquad v = c\sqrt{RI}$$

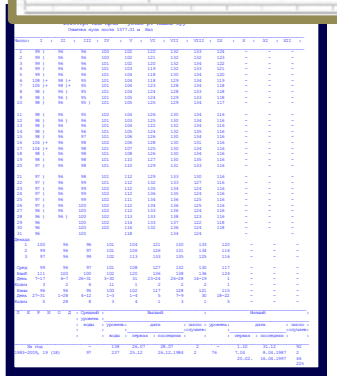
$$H_{cp} = \frac{\frac{H_1 + H_2}{2} \cdot T_{1-2} + \cdots + \frac{H_{n-1} + H_n}{2} \cdot T_{(n-1)-n}}{24}$$

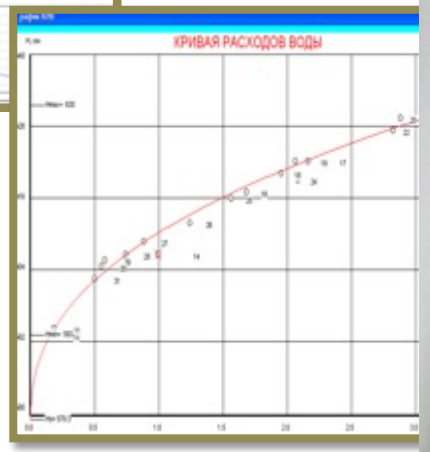
$$q = mb\sqrt{2g}H^{3/2}$$

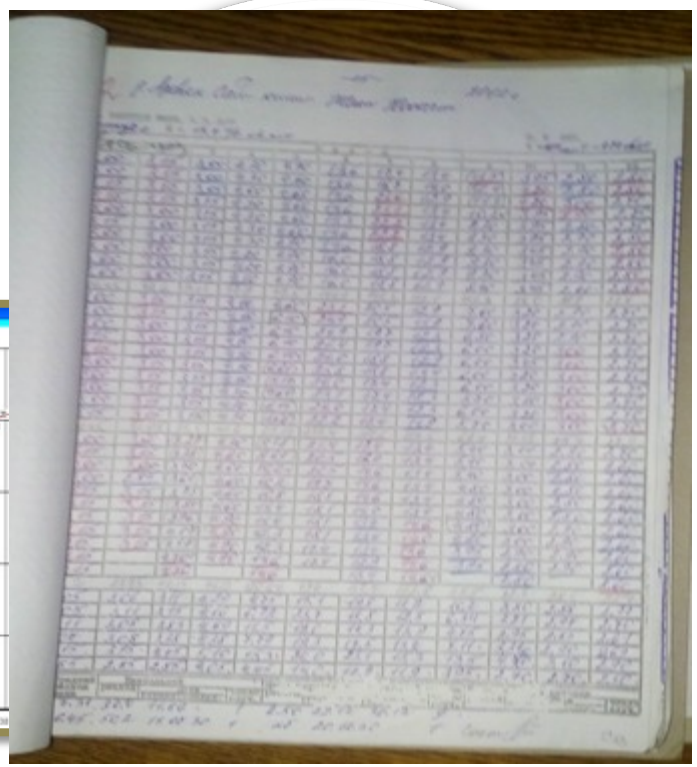
$$H = f(Q)$$

$$\sigma \leq \mp 10\,\%$$





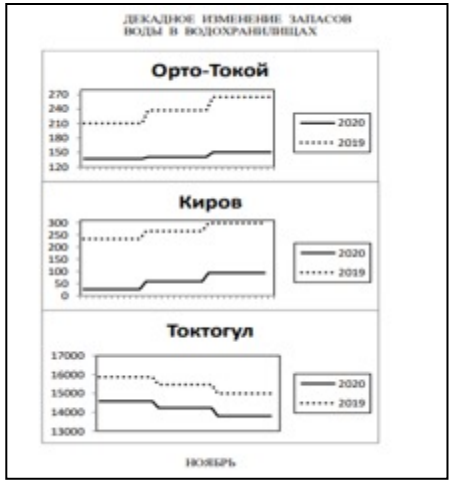




2. Production of a monthly operational water balance for three reservoirs of the Kyrgyz Republic

Ортотокойское водохранилище

Бюллетень водного баланса



Декадное изменение запасов воды в водохранилищах

Токтогульское водохранилище

Потребители: органы гос.управления, лица, принимающие решения, водный и энергетический секторы.

Кировское водохранилище

3. Issue of the annual water balance for Issyk-Kul

Водный баланс оз.Иссык-Куль млн.м^3 2019г

	Составляющие баланса	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	год
1	Приточность по г/п Киргизгидромета	134	109	116	191	297	460	673	624	337	212	158	144	3455
2	Приточность по г/п ММиВХ (многолетняя)	27,9	25,2	30,8	42,7	71,3	90,9	93,5	82,8	59,6	44,0	33,7	30,6	633
3	Суммарная приточность	162	134	147	234	368	551	767	707	397	256	192	175	4088
4	Возвратные воды 55% от водозаборов	0,64	0,64	4,43	3,18	8,14	19,7	20,1	6,05	0,80	10,5	0,31	0,64	75,1
	Сумма	163	135	151	237	376	571	787	713	398	267	192	176	4166
5	Водозабор	1,16	1,16	8,06	5,70	14,0	35,8	36,6	11,0	1,46	19,0	0,57	1,17	137
	Итого	162	134	143	231	361	535	750	702	397	248	191	175	4029
	Осадки	42,0	109	36,3	216	97,3	238	144	456	208	155	64,3	64,3	1830
	Испарение	330	261	208	196	286	356	527	544	543	711	559	479	5000
	Аккумуляция	-187	-62,4	62,4	374	0	125	-125	312	-62,4	-312	-312	-312	-499

Водный баланс оз.Иссык-Куль млн.м^3 2019г

Составляющие баланса		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	год
Приход		оз. Иссык-Куль												
Поверхностный приток в озеро		162	134	143	231	361	535	750	702	397	248	191	175	4029
Подрусловой приток		11,1	10,0	11,1	10,7	11,1	10,7	11,1	11,1	10,7	11,1	10,7	11,1	131
Осадки		42,0	109	36,3	216	97,3	238	144	456	208	155	64,3	64,3	1830
Итого:		215	253	190	458	469	784	905	1169	616	414	266	250	5990
Расход: Испарение с зеркала озера		330	261	208	196	286	356	527	544	543	711	559	479	5000
Изменение запасов воды		-187	-62,4	62,4	374	0	125	-125	312	-62,4	-312	-312	-312	-499
Невязка баланса	Объем	72,0	54,4	-80,4	-112	183	303	503	313	135	15,0	19,0	83,0	1489
	% проценты	22	21	39	24	39	39	56	27	22	2	3	17	25

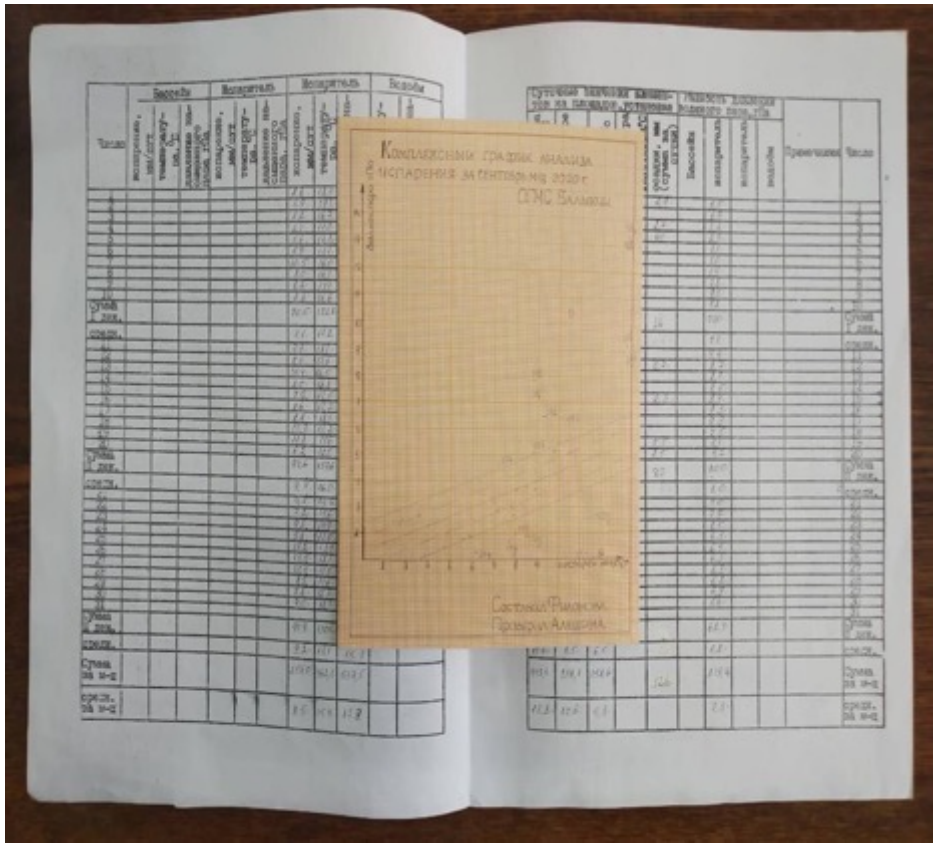
Водный баланс оз.Иссык-Куль 2019г

Форма Б

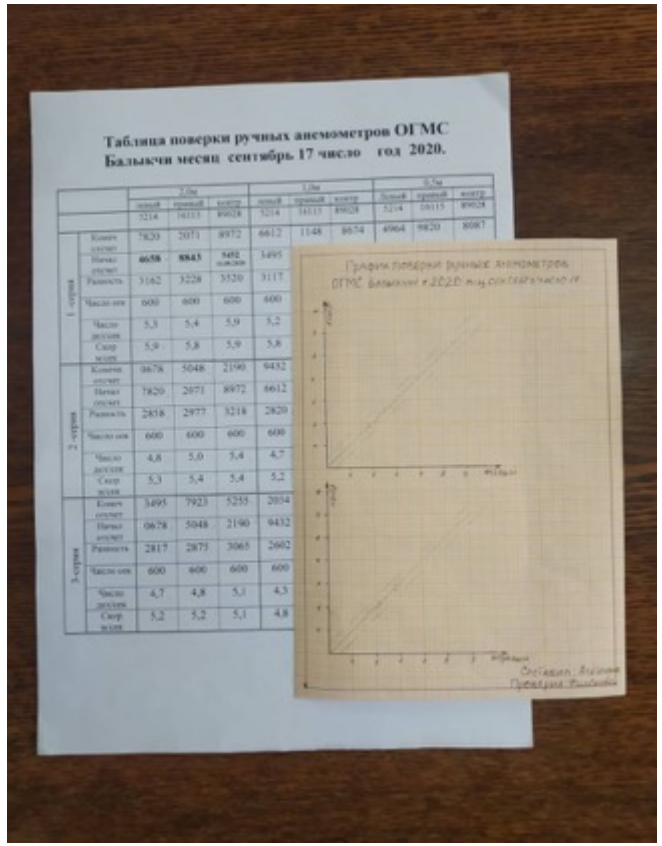
Год период	Приход										Расход		Изменение объема		Невязка баланса	
	Поверхностный приток		Подземный приток		Подрусловой приток		Осадки		Сумма		Испарение					
	куб.км	мм	куб.км	мм	куб.км	мм	куб.км	мм	куб.км	мм	куб.км	мм	куб.км	мм	куб.км	%
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
2019 год	4,03	646	2,01	322	0,13	20,8	1,83	293	8,00	1282	5,00	801	-0,50	-80,1	3,50	44

4.Issue of the Yearbook on Evaporation

Book KG-46 and Table TG-46

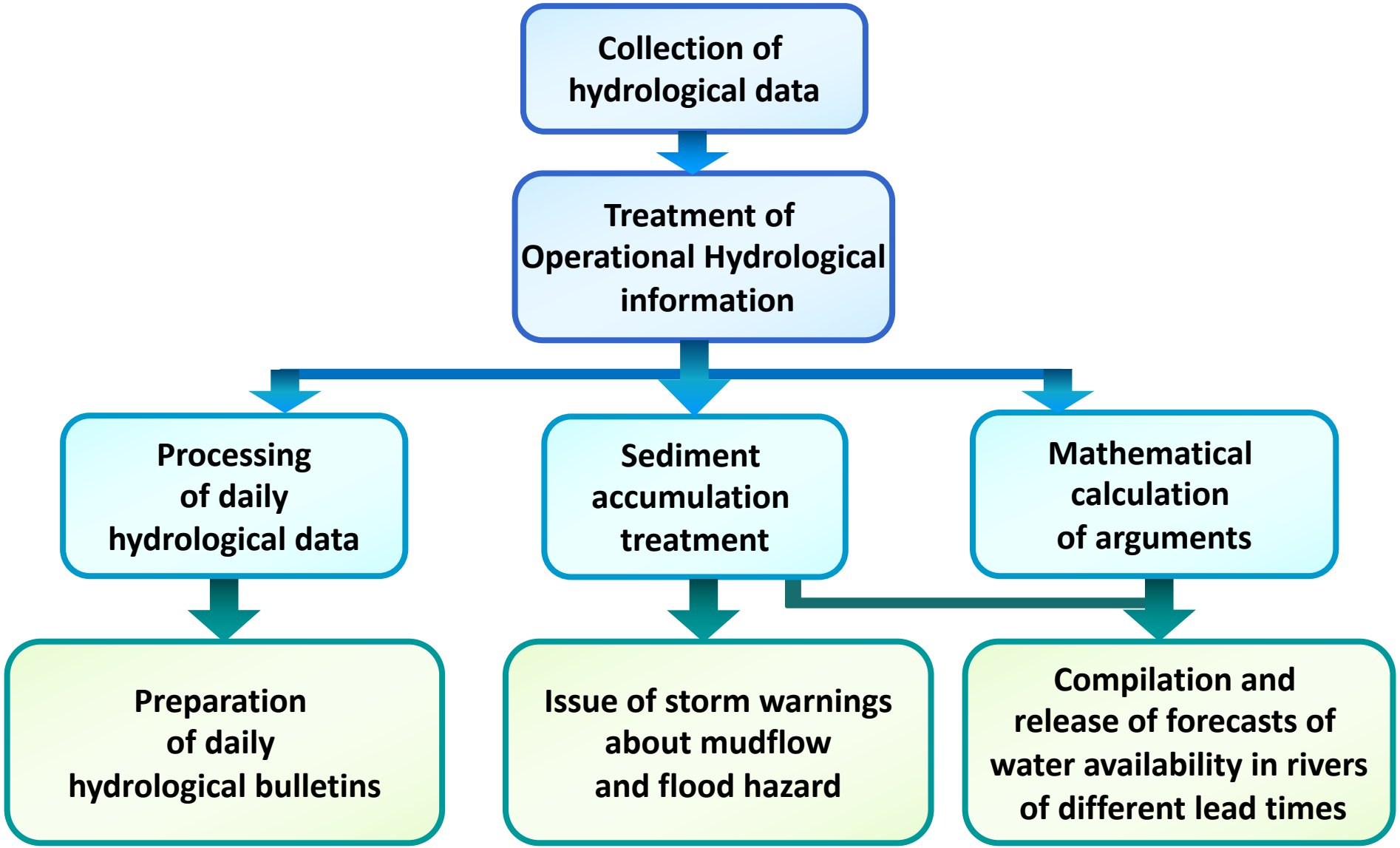


Comprehensive Evaporation Analysis Graph

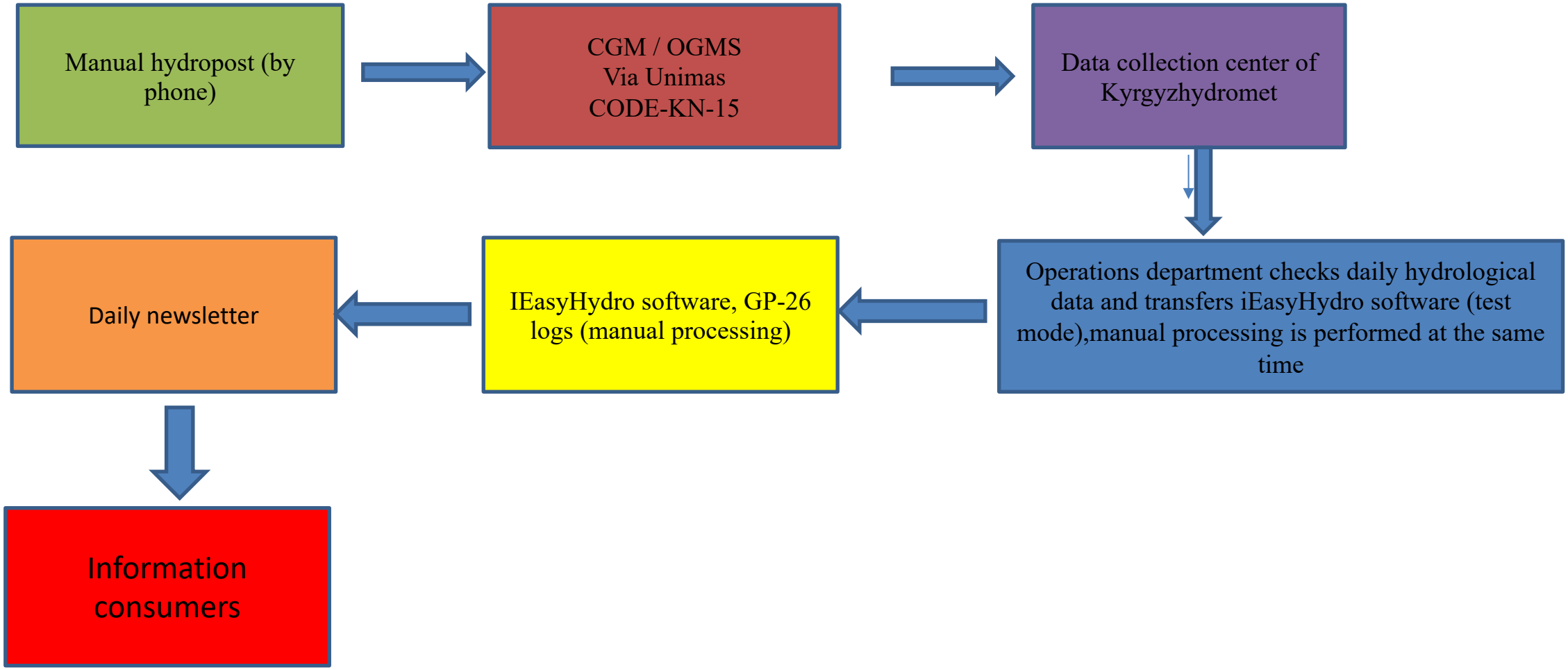


Calibration schedule for hand-held anemometers

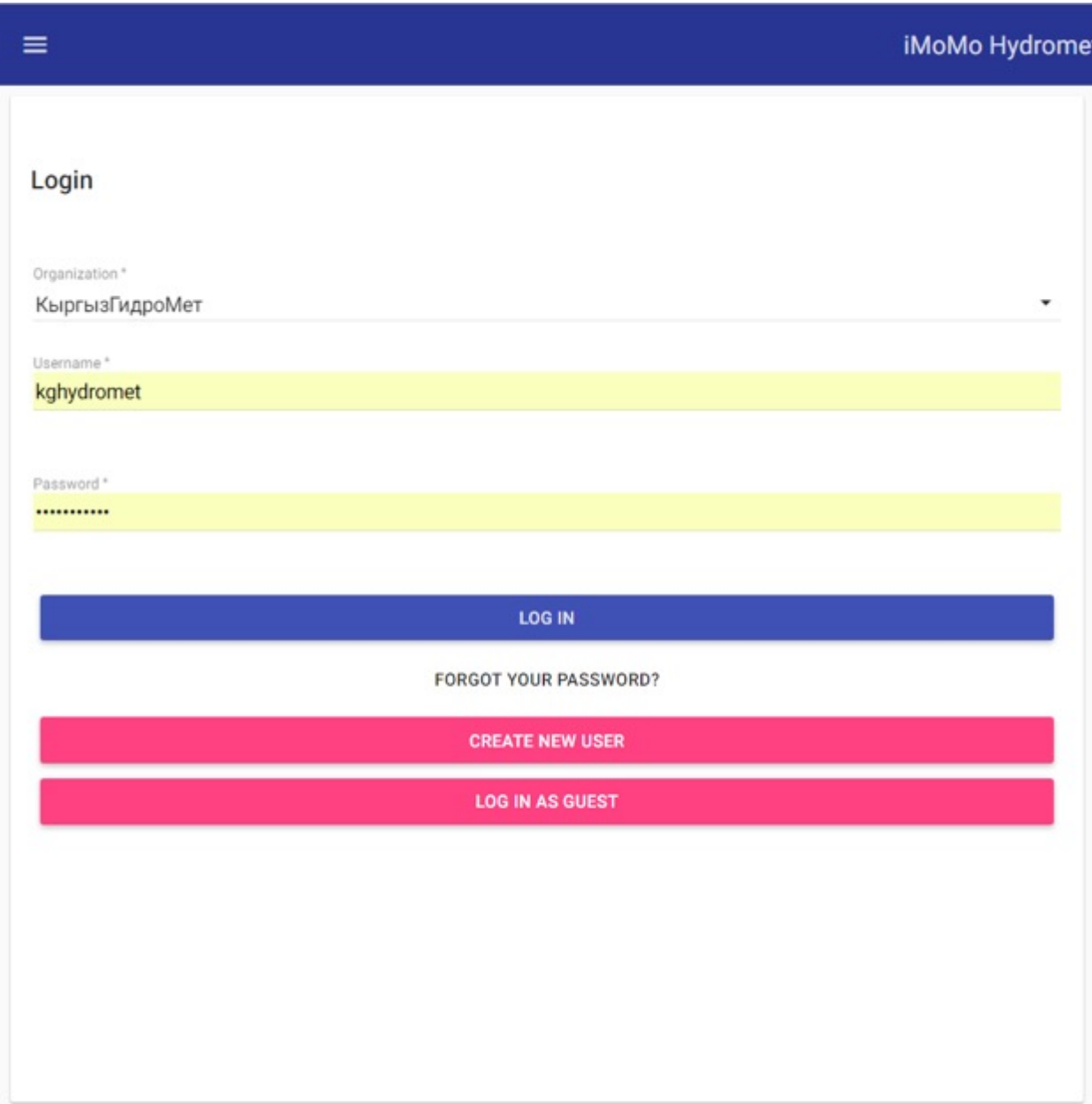
Organization of work on the collection, processing and analysis of operational hydrological information



Scheme for obtaining operational hydrological information



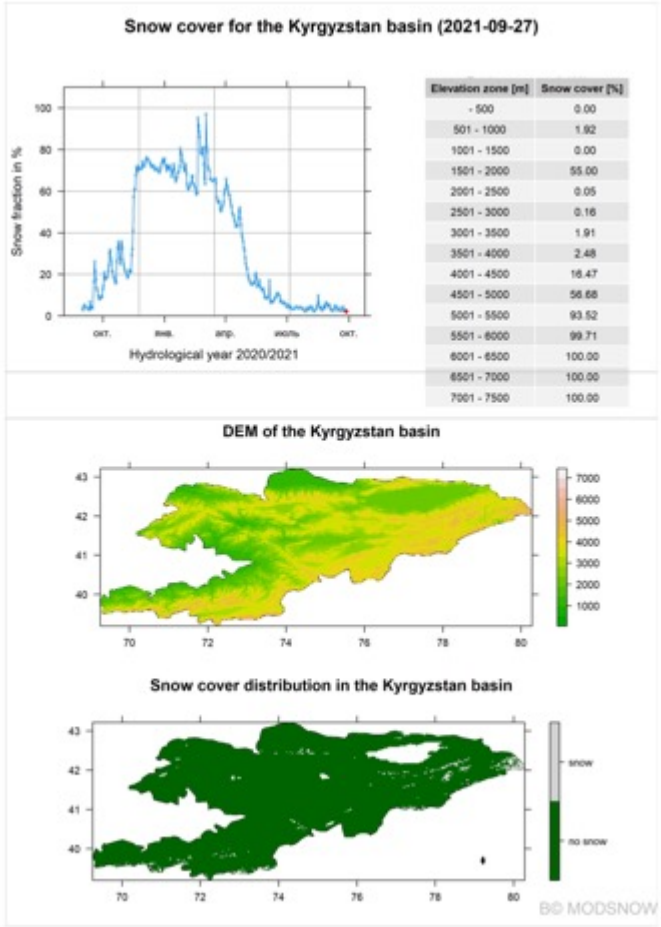
IEasyHYDRO Software

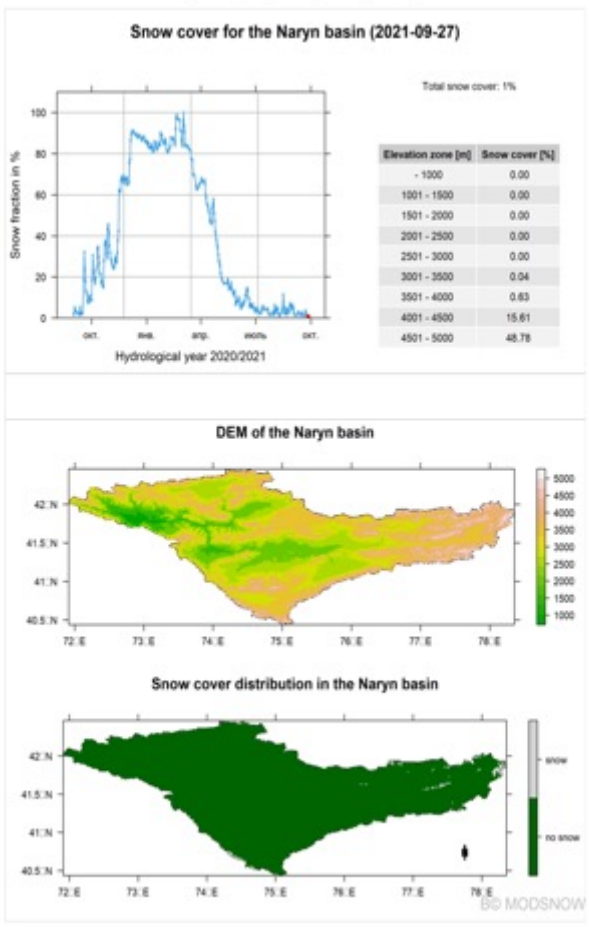


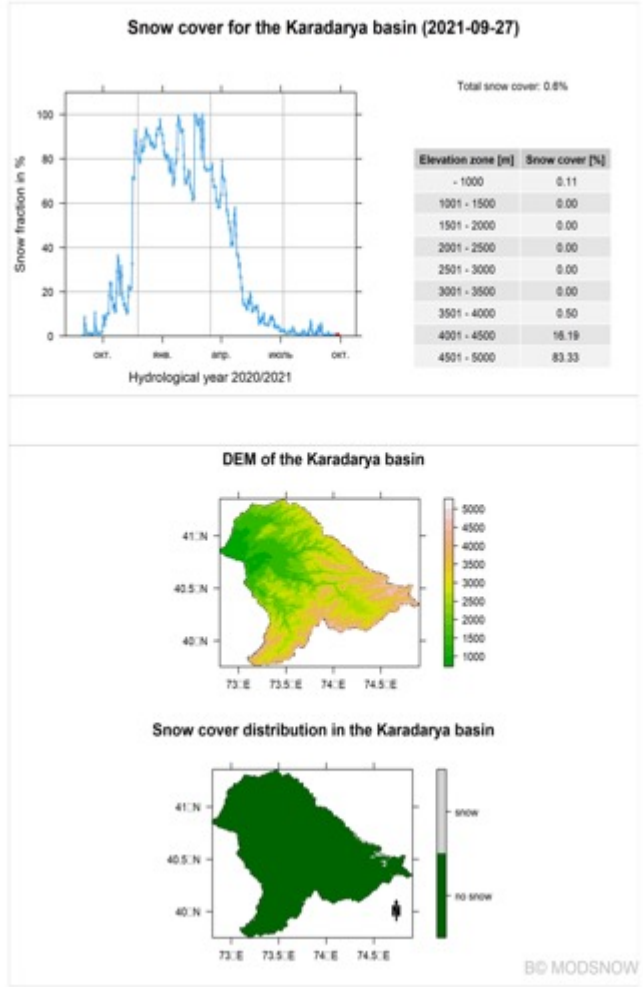
Announcements

The processing of operational hydrological information is carried out in the iEasyHydro software - a software tool that automatically processes daily hydrological information by decoding telegrams encoded with the KN-15 code. Specially designed for mountain hydrological posts. At present, the software is used in test mode. its further improvement is being carried out and measures are planned to integrate operational data with AGK (automated hydrological complexes) into the software, in this regard, along with automatic processing, manual processing is also carried out. The tool was developed jointly with experts from Central Asia and hydrosolutions Ltd (www.hydrosolutions.ch) and encode d.o.o. (www.encode.hr).

MODSNOW software for forecasting the water availability of river basins in Kyrgyzstan







With the help of MODIS satellite images, in the MODSNOW software, which calculates the area of snow cover by altitude zones, forecasts of the water content of rivers of different lead times are issued

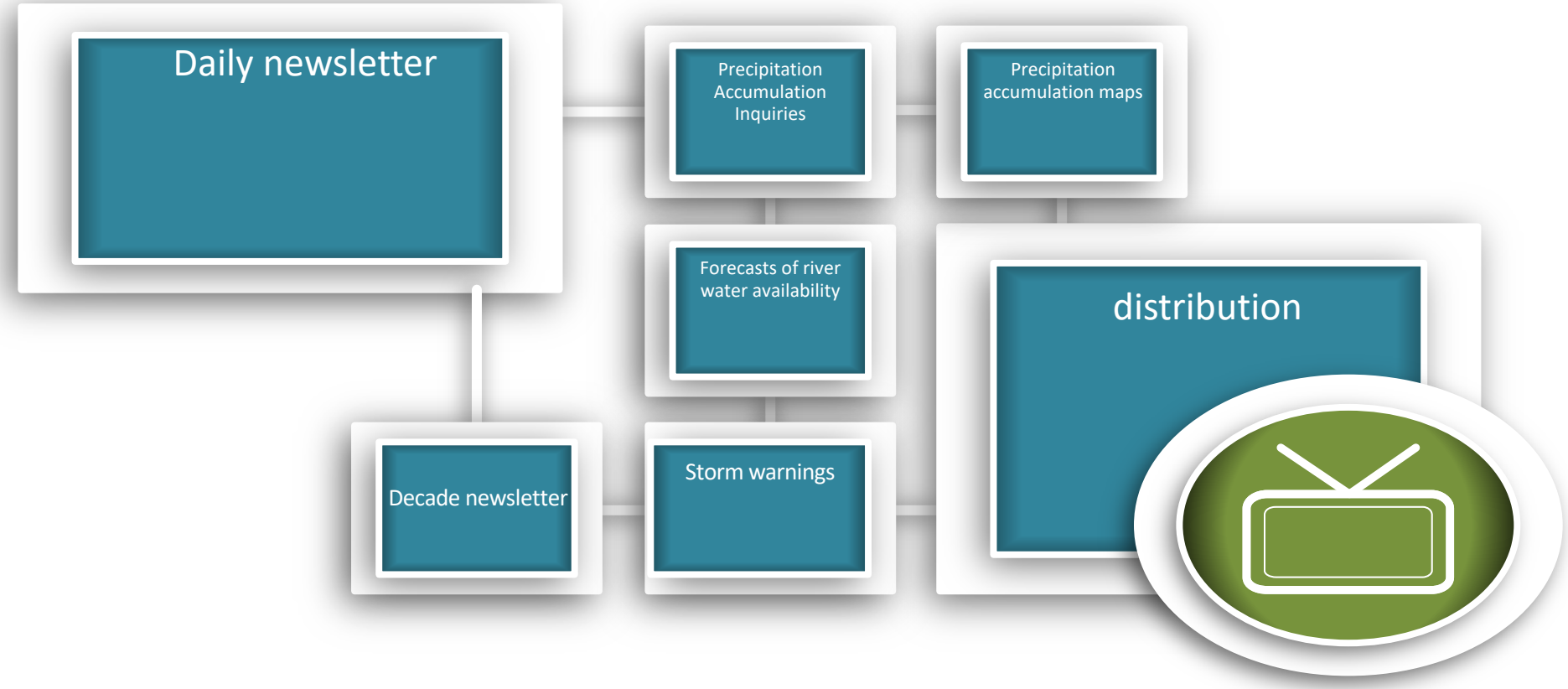
Types of hydrological forecasts

Short-term forecasts are issued with a lead time of 5 and 10 days

Long-term forecasts are issued for the growing season (April-September), for the growing season, quarters, low-water period (October-March)

Storm warning - emergency information about a hazardous hydrological phenomenon during the growing season

Hydrological information provision



Water quality monitoring system

Kyrgyzhydromet carries out systematic observations of the state of surface water pollution in the Kyrgyz Republic.
According to the work plan, the water quality of the transboundary river Chu is being monitored, as well as its tributaries that flow into the Chu River in the territory that forms the state border with Kazakhstan.O
bservation points on the rivers of the Chui oblast belong to the 3rd and 4th categories. Observations are carried out according to a compulsory program. Taking into account the characteristic features of the water body and the importance of the water quality of the transboundary Chu river, water sampling is carried out monthly (12 times a year).
On the tributaries of the Chu River, the monitoring program is carried out 4 times a year during the main hydrological phases.

At present, monitoring of the quality of surface waters is carried out at 10 water bodies of the Chui region, at 23 points according to 34 indicators of the physical and chemical composition of water.
In water samples, the following are determined:

- physical and chemical properties of water, gas composition, main ions;
- organic substances, including pollutants (BOD, oil products, synthetic surfactants);
- biogenic components and pollutants of inorganic origin (ammonium, nitrite, nitrate nitrogen, phosphorus, iron, silicon, chromium, heavy metals).

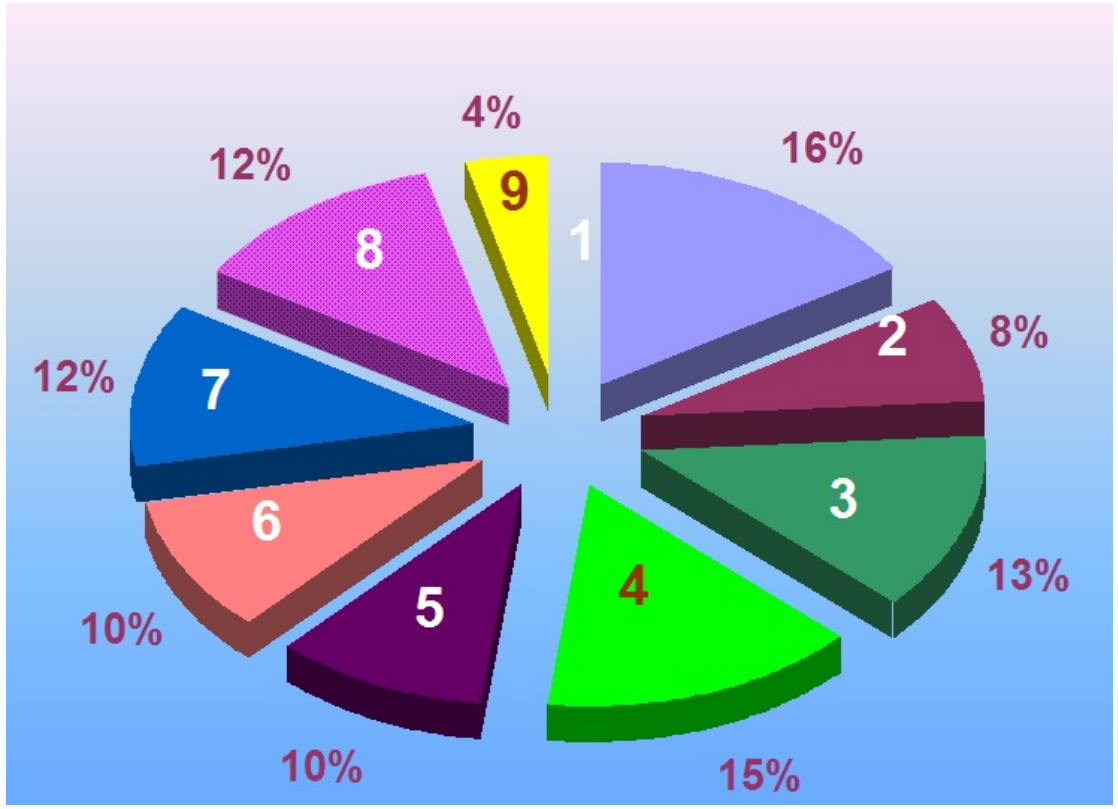
Water Quality Assessment Methods

To assess the degree of pollution of surface waters, a complex relative indicator of pollution is used - the water pollution index (WPI), which conventionally estimates, in the form of a dimensionless number, the share of the polluting effect introduced into the total degree of water pollution. When assessing the degree of pollution of surface waters, water quality standards (MPC) are used for water bodies of fishery importance and established in the "Rules for the Protection of Surface Waters of the Kyrgyz Republic" (PP No. 128 of March 14, 2016).

At the regional level, the users of hydrometeorological information are the NMHSs of Central Asia - Uzhydromet, Kazhydromet. Kyrgyzhydromet and the Central Asian NMHS have bilateral agreements on scientific and technical cooperation and cooperation programs in the field of operational and production activities.

The type, time, regularity and method of presenting information are prescribed in cooperation programs. The exchange of actual meteorological, hydrological, agrometeorological information and information products is carried out: weather forecasts, water content of rivers and water inflows into reservoirs of different lead times, storm warnings about natural hydrometeorological phenomena, bulletins, reviews, etc.

Main users of hydrometeorological information at the national level



1. MCHS
2. design and construction
3. Energy
4. water industry
5. Transport
6. mass media
7. government agencies
8. a.
9. other industries

Thanks for your attention!