

**MINISTRY OF EDUCATION AND SCIENCE OF GEORGIA  
GEORGIAN WATER MANAGEMENT INSTITUTE**



**Water Management Institute  
80**



საქართველოს წყალთა მუხრანეობის ინსტიტუტი  
GEORGIAN WATER MANAGEMENT INSTITUTE

1929

Tbilisi  
2009

**Ministry of Education and Science of Georgia**

**Water Management Institute**

**1929–2009**



**Water Management Institute**

**80**

**Tbilisi**

**2009**

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**Considered and endorsed for publication  
by the Scientific Council of the Institute  
Minutes of the session №10 (29)  
June 30, 2009**

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**Print run 1000**



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**DSc (Engineering), Professor**



**Tsothe Mirtskhoulava**  
**Chairman of the Scientific**  
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**Academician**



**The construction of the buildings of the Institute  
60, Chavchavadze Ave, Tbilisi  
(Former N. Marr and University street), 1935**



**Collaborators of the Institute. 12 June 2009.**

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## **1. BRIEF HISTORICAL DATA, ACHIEVEMENTS, AIMS AND TASKS**

The Georgian Water Management Institute (60, I. Chavchavadze Ave, Tbilisi) was founded in 1929, being the legal successor to the Trans-caucasian Institute of Water Management, the Scientific-research Institute of Hydraulic Engineering and Reclamation and the Institute of Water Management and Engineering Ecology of the Georgian National Academy of Sciences. For years it constituted the only institution in the entire Transcaucasus of this profile designed to carry on research work in the sphere of water management. The objects of its activity involved coastal zones of sea and rivers, erosional-mudflow phenomena, environmental protection, natural catastrophes, reclamation (drainage of excess-humidity areas, irrigation in arid zones), reservoirs, soil study, study of many hydrotechnical structures in the course of designing, construction and exploitation, their reliability and other related questions. Later on, research organizations of analogous purpose were set up in Azerbaijan and Armenia, on the basis of the cited Institute. The said organizations are functioning at present and cooperate regularly with the Institute of Water Management.

From its foundation to 1947 the Institute was directed by: K. Mikhailov, E. Gabiev, N. Sokolovski, D. Galilov, Sh Bitlazar, G. Larin and P. Solod. It is notable that between 1947 and 1968 (for 21 years) the Institute was directed by Professor Mikheil Gagoshidze who made a great contribution to its development. In 1968-2005 (for 38 years) the Institute was directed by Academician Tsoetne Mirtskhoulava, Member of the Georgian National Academy of Sciences and Member of the Russian Academy of Agricultural Sciences. At present he is chief collaborator and Chairman of the Scientific Council of the Institute. In 2006 he was awarded the title of best scientist of the year. It should be noted that his contribution to the achievements of the Institute and the creation of its international authority is considerable.



Among the scientists who study professionally the erosional processes of soil, questions of forecasting floods and mudflow phenomena and combating them a place of honour is held by the present Director of the institute professor Givi Gavardashvili, DSc (Engineering). He is a worthy continuer of the traditions of Tsoetne Mirtskhoulava.

Professor Givi Gavardashvili, Member of the Georgian Engineering Academy, Ecological Academy and the Phasis Academy, as well as of many international organizations, DSc (Engineering), on the recommendation of Mr. Tsoetne Mirtskhoulava was unanimously elected by the staff of the Institute as Director in 2005. It is the result of his boundless love of the Institute, indefatigable work and inexhaustible energy that the Institute holds first place among the research institutes of Georgia in terms of scientific-research, expert, grant, contract activity and cooperation with foreign countries. His initiative, long fruitful organizational and public activity have been the basis of the holding of an international symposium, supported by the UNESCO, dedicated to the 80<sup>th</sup> anniversary of the institute, on the theme “Floods and Modern Methods of Combating Them”, to be held in Tbilisi on 23-28 September 2009.

It should be noted that the Institute houses one of the major hydrotechnical laboratories on European scale (see Fig. 1), equipped with appropriate installations and pumping station (Fig. 2).

In 2005 the institute staff received the Swiss Diploma “Century International Quality Era Award” for numerous scientific projects, studies and the functioning of one of the best hydrotechnical laboratories of the world. The Institute has a laboratory for modeling mudflow and erosional processes (Fig. 3), laboratory of soil mechanics and technical reclamation, laboratory for the study of soils and water quality, ensuring all the scientific-research and contractual work done at the Institute.

Eminent Scientists worked for many years at the Institute: A. Voznesenski, M. Khamzaev, I. Buachidze, G. Voinich-Syanozhenski,

G. Lomidze, M. Mastkov, A. Birkaia, I. Khlebnikov, N. Danelia, M. Gagoshidze, P. Shatberashvili, G. Abelishvili, V. Buachidze, B. Kervalishvili, P. Solod, and others.



**Fig. 1. The hydrotechnical laboratory**



**Fig. 2. The pumping station**



**Fig. 3. Hydraulic chute for modeling mudflows**



**Fig. 4. The upper reservoir of the hydrotechnical laboratory**



**Fig. 5. Laser installation for the study of erosional processes**

For years the staff of the Institute participated in the implementing of major projects, such as, the diversion of part of the runoff of North Siberian rivers to Middle Asia; design and construction of water management facilities in Algeria, Syria, Cuba, Kazakhstan, Greece,; the designing of 100km coastal zone buttressing work of the Caspian Sea; determining the design parameters of the Mingeauri complex reservoir and of an earth-fill dam; reclamation of the swamped territories of Kolkheti; the Tiriponi canal and designing the facilities depending on it: the Upper and Lower Samgori irrigation systems: the Institute took direct part in the implementation of the project of the Upper Alazani main canal project. Many innovations were introduced at the implementation of this project, including the construction of earth embankments along the route of the main canal by the technology of dumping into water.

The practice obtained was used in the construction of 23 dams of land-raclamation purpose in Georgia, such as the Algeti, Zonkari, Dali mountain, etc. Apart from building dams by the technology of dumping into ground water, the project of hydraulic filling was

developed at the Institute (the dam of the manganese waste dump at Chiatura) and at construction with pin-point blasts (the dam of the zinc dump at Kvaisa). The Institute carried out the expertise in Algeria in connection with the possible deformation of five earth-fill dams, at the construction of two each new dams in Syria and Azerbaijan, to design bank protection structures on the Kodori and Alazani rivers, in order to rehabilitate the water-dividing unit on the Rioni river near Poti and the environmental protection structures in the Baku-Supsa pipeline corridor.

Over 3500 papers have been published since the foundation of the Institute, as well as over 300 methodological directives, instructions and methods, 7 professional and educational standards, up to 100 textbooks, up to 150 books and 100 monographs. More than 20 scientific-technical conferences have been held. The collected papers of the Institute are issued annually; apart from contributions of the collaborations of the Institute, papers of various scientific institutions of Georgia and of foreign specialists are printed.

**The following were developed and recommended for implementation:**

- The principal hydrological and hydraulic characteristics of the processes connected with the origin of gullies and ravines on mountain slopes in the TRACECA corridor;
- Varieties of hazards at facilities of water amelioration purpose and methods of forecasting them, measures of stable development of reclamation, the risk of the onset of the hazard of desertification of arable lands: perfection of the existing methodology of predicting the hazard of failure of hydro-technical structures, allowing to take into consideration the factor of the time duration of the exploitation of facilities as one of the basic parameters in analyzing the critical state. The probability of the risk of onset of a real hazard at water management facilities;
- Methods of combating the activation of mudflow phenomena in

the mountainous region, and processes attending these phenomena; dependences for calculating wavy motion characteristic of real conditions of mudflows, allowing rational designing of antimudflow structures;

- Sensitive areas in the coastal zone of Tbilisi Reservoir, processes of chemical weathering in the soils of the foundations of structures and of the formation of a stream of mineralized ground water;
- The composition of the clay core of the Sioni reservoir dam; physical deformation with characteristics of filtration flows and stability;
- Difference between the types of surface irrigation from the viewpoint of the development of the hydraulic process, envisaging uninterrupted imitation of irrigation on computer in order to investigate different variants through assessment of their degree;
- *Kavelast*, a new, ecologically pure, multi-purpose polymineral compound based on the use of Georgia's bentonitic clays. The physico-chemical mechanism of obtaining it and the technology of its production; new loose, elastic stable and liquid highly effective, durable hydroinsulation materials made from mechanical mixtures of *Kavelast*, any soils and dispersive inert materials;
- Reclamation machines for work in over-saturated adhesive soils; principles of the work of canal-digging and rolling mechanisms; their technical data and the principles of selecting drainage-repair machines according to the character of technological operations;
- The regime of the levels of ground waters in the Kolkheti Lowland and the indices of soil humidity in drained and undrained areas;
- The variability of the Black Sea level regime owing to the global warming in recent years, water mass balance; regularities of transformation of single waves of seismic origin in the shelf zone of Kolkheti;



**Fig. 6. Basin for modeling sea waves**

- Tariff types of servicing irrigation systems, optimum scheme of tariffs for water supply;
- Classification of tasks of predicting the stable functioning of reclamation systems;
- Method of making models of furrow-cutters of various designs and possibilities of their laboratory testing;
- Hydro- and eco-chemical characteristics of water on Georgia's erosional-mudflow character watercourses, including the Tetri (White Aragvi tributaries).

In 2006-2009 contractual project work has been carried out under the direction of Prof. Givi Gavardashvili for districts hazardous from the standpoint of the development of water economy business and the impact of natural disaster phenomena:

- Measures for the protection of Shio Mghvime monastery against mudflows (financed by Bank Republic);
- Ecological assessment of the headrace of a small HPS on the river Stori (financed by the US Department of Power – "Winrock"). 2006;



**Fig. 7. Concrete antierosional barrages.  
Mountainous Tusheti. 21 November, 2007.**



**Fig. 8. Pampas grass seedlings planted on a mountain slope in  
TRACECA corridor. 22 May, 2007.**



- Ecological assessment of samples of green cover and the soils to be introduced, taken from the field of Boris Paichadze National Stadium, as well as determination of the chemical composition of the subterranean waters of the Stadium (financed by the Management of the Stadium). 2006;
- Lithological study of the town of Tsnori of the Municipality of Signaghi and the territory adjoining v. Vakiri, Signaghi district (financed by “Bagrationi – 1992”), 2007;
- Lithological study of the territory adjoining v. Giorgitsminda, Sagarejo district (financed by Bagrationi - 1882), 2007;
- Rehabilitation of a motorway section in disrepair in Erekle II street in Signaghi (financed by the local municipality), 2007;
- Project for the restoration of an eroded slope pasture adjoining v. Jvarboseli (in Mountainous Tusheti) (financed by the World Bank), 2007;
- Measures towards anti-erosional strengthening and planting of trees on a mountain slope on Gldani territory, TRACECA corridor (financed by the Road Department), 2007.

As a result of the hostilities in August 2008 in Georgia the institute of Water Management alone submitted following projects to the Parliament and Government of the country:

1. Complex assessment of the ecological-economic losses of territory as a result of the burning of forest tracts in Borjomi and Gori districts. Executed by M. Vartanov; AA
  2. First order urgent measures of protection of soil from erosion in the areas affected by fires in the region of Borjomi as a result of the military action in Georgia in August 2008 – Director of the project: G. Gavadrashvili.
- Grant-project: Rendering assistance to Lentekhi administration by implementing preventive measures against the spread of natural catastrophes (financed by the Swiss Agency of Development and Cooperation [SDC]), 2008;
  - Grant-project: Rendering assistance to Lentekhi administration

by implementing preventive measures against the spread of natural catastrophes (financed by the Swiss Agency of Development and Cooperation [SDC]), 2008;

- Carrying out comprehensive geological analysis of soil taken from the corridor of the Baku-Tbilisi-Ceyhan Pipeline (financed by EGA Ltd), 2008;
- Study of channel deformations occurring in the Aragvi bed and working out relevant recommendations with a view to ensuring the supply of Tbilisi with drinking water (financed by Tbilisi Water Ltd), 2008;
- Grant project: Rendering assistance to Lentekhi administration by implementing preventive measures in zones of spread of natural disasters – carrying out antierosional measures (design and construction) aimed at protecting the secondary school of v. Rtskhmelaura, Lentekhi district and the residents of v. Chala, Tsageri district (financed by the Swiss Agency of Development and Cooperation - SDC), 2009.



**Fig. 9 At the presentation of the Borjomi projects at the Institute. Right: Prof. A. Ghonghadze. Adviser of the President of Georgia in the field of science. 21 November 2008.E**

a)



b)



**Fig. 10. a) Antierosional “bushlags” on mountain slope  
b) Wooden antierosional barrages in a ravine. Lentekhi. 26 May 2008.**



**Fig. 11. Stone anti-flood spurs on the Tskhenistsqali river.  
Tsageri. 23 May 2009.**

## 2. THE PRINCIPAL DIRECTIONS OF ACTIVITY OF THE INSTITUTE

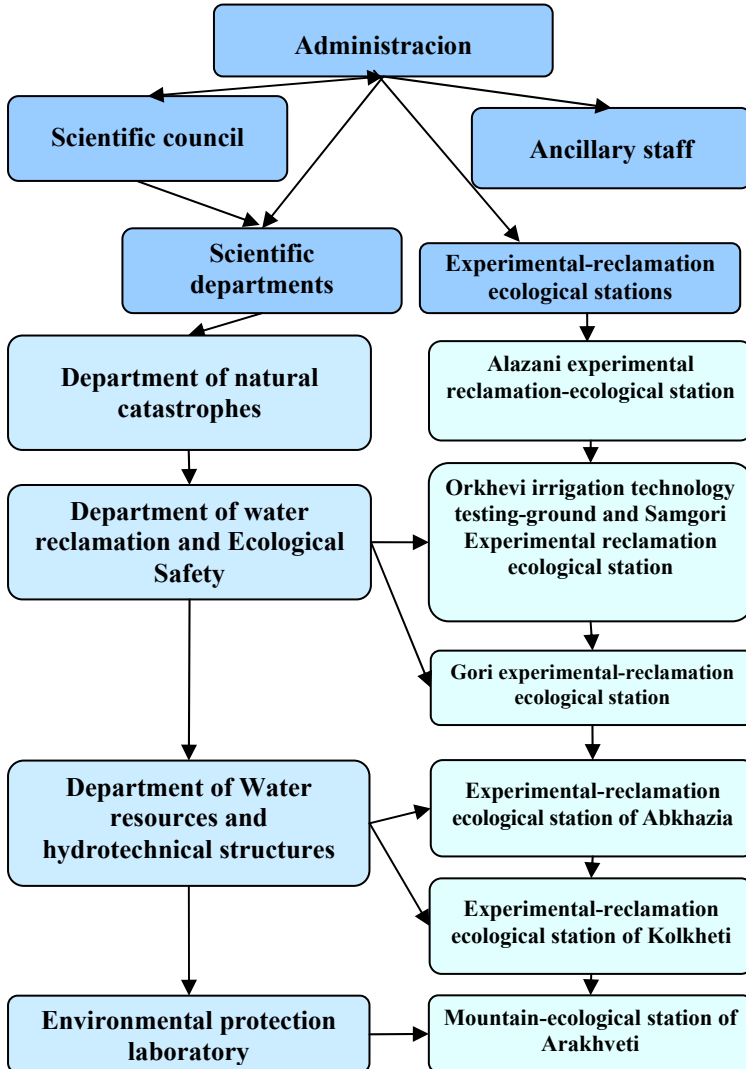
- The stability and reliability of the structures and their elements of hydro technical, water reclamation and water management systems (reservoirs, canals, etc.)
- Study of natural disastrous phenomena – floods, freshets, mudflows and erosional processes – in conditions of vertical zonation of mountain regions: prediction and methods of combating them;
- Estimation of the present status of water resources, their protection, rational use and management of critical water-ecological situation;
- The impact of technogenesis on the ecosystems of mountain regions and principles of forecasting.
- Agricultural reclamation and mechanization of reclamation work.
- Solution of problems of supplying urban territories of mountain regions with drinking water.
- Management and economics of water economy and reclamation purpose facilities;
- Studies of the ecological equilibrium of sensitive sections of the Black Sea coast (shelf and land).
- Studies of purposeful management and use of soil properties.

With a view to training students (baccalaureate) and young scientists (masters, doctors), the Institute has signed memoranda of understanding with:

- Javakhishvili Tbilisi State University;
- Georgian State Agricultural University;
- Georgian Technical University;
- Georgian Research and Industrial-technological Complex Institute of Roads (*Sakgametsniereba*).

### 3. THE COMPOSITION AND STRUCTURE OF THE INSTITUTE. THE STAFF OF THE INSTITUTE NUMBERS

**The Structure of the Institute**



72 collaborators. Of these 35 are scientific collaborators, including 1 academician of the Georgian National Academy of Sciences, of New York Academy and of the Russian Agricultural Academy, 1 Academician-Secretary of the Georgian National Academy and Academician-secretary of the Department of Agriculture of the same Academy, 1 Corresponding Member of the Georgian Agricultural Academy, 3 of the Engineering Academy, 1 of the International Engineering Academy, 4 of the Ecology Academy, 9 doctors of science, 15 holding the degree of doctor/scientific collaborator, 5 working on doctor's thesis, 3 masters.

#### 4. ADMINISTRATION

1. **Givi Gavardashvili** – Director of the Institute, DSc (Engineering), Professor, Academician of the Georgian Engineering Academy and Academy of Ecological Sciences (Hydraulic engineer);
2. **Inga Iremashvili**, Deputy Director, academic doctor of engineering (building-technologist);
3. **Zurab Gogvadze**, Chief Engineer (engineer-economist);
4. **Gulnazi Iagorashvili**, Chief Accountant (financier);
5. **Nino Tsimakuridze**, Assistant Chief Accountant (specialist in budgetary accounting);
6. **Nino Nibladze**, Head-Clerk (specialist in land reclamation);
7. **Khatuna Mikautadze**, Lawyer (Jurist);
8. **Shorena Robakidze**, Chief of Human Resources Management (specialist in the German Language);
9. **Lali Bilanishvili**, Librarian-interpreter (specialist in the English language).

## 5. THE SCIENTIFIC COUNCIL OF THE INSTITUTE

The scientific-research processes at the Institute, their methodological guidance, summing up the results, relations with related foreign scientific organizations and evaluation of the quality of the papers devolve on the Scientific Council, which is comprised of:

1. **Tsotne Mirtskhoulava**, Chairmen of the Scientific Council, senior scientific collaborator of the Department of Natural Catastrophes, Academician of the Georgian National Academy of Sciences, the New York Academy and of the Russian Agricultural Academy; DSc (Engineering), Professor;
2. **Vakhtang Tevzadze**, Deputy Chairman of the Scientific Council, Director of the Department of Natural Catastrophes, Corresponding-Member of the Georgian Academy of Agricultural Sciences, DSc (Engineering), Professor;
3. **Otar Natishvili**, Chief Scientific collaborator of the Department of Natural Catastrophes, Academician Secretary of the Georgian National Academy of Sciences and academician-secretary of the Department of Agriculture of the same academy, DSc (Engineering), Professor;
4. **Shorena Kupreishvili**, Scientific Secretary of the Scientific Council, Scientific collaborator of the Department of Natural Catastrophes, Academic Doctor of Engineering;
5. **Tarkhan Tevzadze**, Senior Scientific collaborator of the Department of Water Resources and Hydrotechnical Structures, DSc (Geol.-Mineral.);
6. **Irine Iordanishvili**, Head of the Department of Water Resources and Hydrotechnical Structures, DSc (Engineering);
7. **Levan Itriashvili**, Head of the Department of Water Resources and Hydrotechnical Structures, Academician of the Georgian and International Engineering Academics, Academic Doctor of Engineering;
8. **Otar Nanitashvili**, Head of the Department of Water Reclamation and Ecological Safety; DSc (Engineering), Professor;
9. **Goga Chakhaia**, Head of the Laboratory for Environmental Protection, Academic Doctor of Engineering.

## 6. SUBDIVISIONS OF THE INSTITUTE

Three departments and one laboratory, equipped with modern computer hardware, function at the Institute.

1. Department of the natural catastrophes;
2. Department of Water Resources and Hydrotechnical Structures;
3. Department of Water Reclamation and Ecological Safety;
4. Laboratory Environmental Protection.

### 6.1. Department of Natural Catastrophes

#### 1. Collaborators of the Department



**Vakhtang Tevzadze**

- 1.1. **Vakhtang Tevzadze**, Head of the Department, DSc (Engineering), Professor, Corresponding Member of the Georgian Agricultural Academy;
- 1.2. **Tsotne Mirtskhoulava**, Senior Scientist, Academician of the Georgian National Academy of Sciences and of the Russian Agricultural Academy of Sciences, DSc (Engineering), Professor;
- 1.3. **Otar Natishvili**, Academician-Secretary of the Georgian National Academy of Sciences and Academician-Secretary of the Department of Agriculture of the same Academy; DSc (Engineering), Professor;
- 1.4. **Gamarli Dokhnadze**, Senior Scientific Collaborator, Academic Doctor of Engineering;
- 1.5. **Levan Tsulukidze**, Senior Scientific Collaborator, Academic Doctor of Engineering;
- 1.6. **Shorena Kupreishvili**, Scientific worker, DSc (Engineering);
- 1.7. **Zempira Charbadze**, Scientific worker;



- 1.8. **Ketevan Dadiani**, Scientific worker;
- 1.9. **Irakli Pirtskhalaishvili**, Scientific worker, Master;
- 1.10. **Zurab Bostashvili**, Engineer, master.

## **2. Brief History of the Department**

The Department has been functioning almost since the day of the foundation of the Institute, its initial name being Department of Mountain Reclamation. It involved mainly the study of erosional-mudflow phenomena in mountainous regions, development of engineering them agrophytoreclamation methods for combating through the use of field, laboratory and theoretical studies. In recent years the Department has become appreciably stronger, including the lines connected with environmental protection, ecological safety, reliability of hydrostructures. In solving problems connected with the topics of the Department modern methods of studies are used, with account of computer technologies and inert materials (Google, GIS, GPS).

## **3. Scientific Activity**

- Study of erosional phenomena in conditions of mountainous relief and proposing relevant calculation dependences;
- Environmental protection measures, determination of their reliability and risk factors;
- Reliability of hydrostructures and determination of their quantitative indices;
- With a view to verifying the calculation dependences obtained as a result of the scientific studies carried out regular field observations are conducted, with appropriate processing of the data obtained at hot points of the spread of mudflow phenomena;
- Laboratory experiments are carried on in order to determine the rheological characteristics of mudflows;
- As a result of the investigations carried out the nature of mudflows is described, with account of its properties differing from streams of ordinary water.

#### **4. The Results of Scientific Activity**

- The results of the scientific activity of the Department mainly covers investigation of ecological disturbances in mountainous regions, study of the safety of the facilities built their in relation to erosional-mudflow phenomena, reliability of hydrostructures and questions of channel processes;
- Permissible non-scouring rates have been determined for cohesive and non-cohesive soils, with account of determining factors which were used as a normative document on the scale of the former Soviet union;
- A theory of the reliability of water reclamation structures has been developed and acknowledged world wide; later it was issued in the form of a monograph and translated from the Russian into English;
- For water and other facilities a method is proposed for determining the amount of their hazard and risk, in papers and monographs;
- For the excessive humidity lands of Kolkheti methods are developed for the mastery of swamped areas and for determining the reliability of the existing drainage systems;
- Significant information is obtained on the hazards existing in nature, with assessment of related risk situations in conditions of geographical systems;
- Methods are proposed for quantitative estimation of permissible limiting loads on landscapes, including for soils of diverse structure formed in mountain regions;
- The risk connected with ecological breakdowns in river-beds is assessed, with account of the safety of civilian and economic facilities built there;
- A strategy is chosen for ensuring reliable functioning of individual facilities in the ecosystem, including water facilities and nearby economic ones;
- Dependences are proposed for calculating the prediction of

- floods and mudflows of catastrophic character, with indication of time space parameters;
- Methods are developed for calculating the depth of scour of water-beds at the sections and placement of oil pipelines in river channels, with a view to ensuring the safety of these facilities;
  - A mathematical model is worked out of terms of sound exploitation of soils of economic purpose, with account of probabilistic factors and of soil fertility;
  - Information is obtained and a method is worked out related to an urgent question of modern times - dealing with terrorism and mob psychology;
  - With reference to distinct and concrete data among varieties of mudflows occurring in natural conditions, the so-called structure type of mudflows has been described, standing out for sudden origin, short duration and great destructive force, due their high value of compactness:  $p = 1.8-23 \text{ kg/m}^3$ ;
  - The geographic locations of especially hazardous water courses of mudflow character have been determined and risk of their negative impact on the environment has been assessed;
  - Proceeding from the nature of cohesive (high concentration mudflows), and on the basis of multi-year observations and laboratory experiments, the so-called “method of dilution” is proposed for neutralizing such flows, by means of which qualitative change of mudflow mass is effected and the destructive movement of the flow ceases;
  - The basic characteristics of the debris cones of water courses have been studied quantitatively and qualitatively in order to ensure the safety of adjacent areas;
  - As a result of modeling on the unique mudflow experimental installation of the Institute the character of impact of the mudflow on the antimudflow frontal structure, was determined exceeding 4-5 times the action of ordinary water wave flow of analogous dimensions;
  - The conditions of mudflows passing through mudflow chutes without causing damage in order to ensure safe functioning of

communication structures (railway, motorway, irrigation and derivation canals, etc.) have been studied in natural laboratory conditions, proposing a method for their hydraulic calculation;

- The fundamentals of mudflow hydraulics are created for the different conditions of the channels of water courses and mudflow conducting structures in conditions, of movement of their even, unsettled and undular character;
- Calculation models are proposed for the interaction of mudflows with mudflows, with account of the principles of the dynamics of these flows;
- Monographs have been prepared and published on environmental safety and reliability of water structures and drainage systems (23 monographs) for hydraulic calculation of the dynamics of mudflow phenomena and antimudflow structures;
- Recommendations, methodological directives, instructions and other normative documents are proposed with a view to hydraulic calculation of mudflows and antimudflow structures.

## **5. Themes Funded from the Budget**

- Prediction of breakdown of hydrostructures and development of measures for the prevention or postponement of these incidents (2009-2011). Director: Acad. Ts. Mirtskhoulava;
- Working out measures for management of mudflow processes in agroecosystems with a view to stable development (2005-2010). Directed by Acad. O. Nanitashvili and Prof. V. Tevzadze.

## **6. Grant Projects**

### **Of the Georgia National Science Foundation:**

- Measures towards prolonging the functioning of obsolescent hydrostructures (2008-2010). Director. Acad. Ts. Mirtskhoulava;
- Measures towards reducing accidents at hydrotechnical structures and mitigating the losses inflicted (2008-2010). Director. Acad. Ts. Mirtskhoulava.

## **International:**

- The US International Development Agency – “Study of antierosional measures through vetiver and other soil-trapping grass barriers” (TA-MOU. 01-CA-15-011). Funded by the U S National Academy, co-implemented by the Israel Volkan Centre Institute of Water, Soil and Protection of Environment, 2002-2007. Director. Acad. Ts. Mirtskhoulava.

## **6.2. Department of Water Resources and Hydrotechnical Structures**

### **1. Collaborators of the Department**



**Irine Jordanishvili**

- 1.1. **Irine Jordanishvili**, Head of Department, Senior research-worker, DSc (Engineering);
- 1.2. **Tarkhan Tevzadze**, Senior research-worker, DSc (Geol. Mineral);
- 1.3. **Levan Itriashvili**, Senior research-worker, Acad. Doctor Tech. Sc. Full Member of the Georgian International Engineering Academy;
- 1.4. **Martin Vartanov**, Senior research-worker, DSc (Econ);
- 1.5. **Teimuraz Akhvlediani**, Scientific worker, DSc (Biol.);
- 1.6. **David Potskhveria**, scientific worker;
- 1.7. **Elene Khosroshvili**, scientific worker;
- 1.8. **Iagor Makharadze**, engineer.

### **2. Brief History of the Department**

The Department (former "Laboratory for the Use and Protection of water Resources") is one of the oldest at the Institute. It has been functioning since the 1950s. The Kolkheti Experimental-reclamation Ecological Station is subordinated to the Department.

The results of the theoretical and laboratory studies conducted at the Laboratory are implemented at the Institute's experimental base by the use of hydraulic chutes and basins of various sizes, and are verified by field observations.

The department is equipped with relevant devices and apparatus. echo-soundingt, GPS, radio-transmitter, apparatus for measuring wind-undular regime, equipment-installation for complex study of the water-physical and physico-mechanical properties of soils.

### **3. Scientific Activity**

- Study of the engineering-ecological reliability of the functioning of water reclamation and water economy facilities;
- Study and prediction of the ecological stability of the Black Sea shelf and coastel zone;
- Economic substantiation of rational use of water resources and price formation.

### **4. The Results of Scientific Activity**

Worked out and assessed:

- Negative processes on the slopes and hollows of Georgia's mountain reservoirs, their prediction and determination of critical (limit) state, using the newest methods of field studies and probability theory;
- The processes of the dynamics of the Blasck Sea coastal and shelf zones (between the Enguri and Chorokhi basins).
- Methods of calculating the construction of earth structures by dumping soil into water and the parameters of their technology;
- Method of accumulating drinking water in alluvial deposits.
- Methods of calculating the depth of scour in alluvial soils for bridge piers and protective walls;
- Methods of predicting the development of water reclamation systems;
- Complex methods of fighting slope erosion and technologies of their implementation;

- Methods of improving the agroreclamation state of the heavy soils of Kolkheti and of an aggregate structure, and technologies of their application;
- Methods of enhancing the water accumulating and water-trapping capacity of soils and technologies of their use;
- Readily implementable technologies of preparation and use of new, non-standard, multifunctional antifiltration and hydro-insulation materials from local soils and wastes of dispersive inert materials;
- A simple express-method of assessing the engineering-reclamation condition of arable lands and of the effectiveness of measures carried out and selection of such methods;
- Technologies of insulation, conservation and utilization of noxious and toxic materials and wastes;
- New highly-effective methods of extinguishing fires and arranging fire-proof covers and technologies of their implementation;
- New non-standard technologies of water insulation of reservoirs, dams canals, tunnels, dykes, and basins with the use of local materials;
- New energy classification of water forms in soils and methods of practical determination;
- Methods of ecological-economic assessment of regulated water resources;
- Methods of estimating the damage inflicted by rivers overflowing the banks during floods;
- Method of assessing the economic efficiency of protecting economic facilities from floods and other natural disasters;
- Working out energy-saving technologies in constructing earth structures from local soil (dam, dyke, embankment);
- Three theses were prepared and defended to obtain the DSc degree in technical sciences;
- An album of Georgian water “stock” and “resources” has been compiled and published;
- 30 patents have been obtained on facilities of diverse purpose from Georgia, Armenia, Turkmenistan, Ukraine, Russia, Greece, Germany and Israel, 2 Georgian patents and 1 from abroad.

## 5. Themes Funded from the Budget

- Determination of the basic characteristics of Georgia's water stock (2007-2010). Directed by I. Iordanishvili;
- Ecological-economic estimation of regulated water resources (2007-2009), directed by M. Vartanov;
- Development of alternative energy-saving technology (AET) for supplying the urbanized territories of Georgia's mountain regions with drinking water (2009-2011), directed by T. Tevzadze;
- Development of a unified method of engineering-reclamation assessment of the state of soils and of the efficiency of agroreclamation measures (2009-2011), directed by L. Itriashvili;
- Geo-ecological studies of the sensitive sections of the Black Sea coastal zone (2007-20110), directed by I. Iordanishvili.

## 6. Grant Projects

- Assessment of the ecological reliability of Georgia's reclamation systems (2008-2010), directed by I. Iordanishvili.

### 6.3. Department of water Amelioration and Ecological Safety

#### 1. Collaborators of the Department



**Otar Nanitashvili**

- 1.1. **Otar Nanitashvili**, Head of the Department, DSc (Engineering), Professor;
- 1.2. **Revaz Kiladze**, Senior research worker, DSc (Engineering);
- 1.3. **Vakhtang Samkharadze**, Senior research worker, Academic Doctor of Engineering;
- 1.4. **Guram Chitishvili**, Senior research-worker, DSc (Engineering);
- 1.5. **Liana Purtseladze**, Research-worker, Academic Doctor of Engineering;
- 1.6. **Ivane Zakaidze**, Research-worker, Academic Doctor of Engineering;



- 1.7. **Vladimer Shurgaia**, research-worker, Academic Doctor of Engineering;
- 1.8. **Konstantine Iordanishvili**, Research-worker, Academic Doctor of Engineering;
- 1.9. **Lena Kekelishvili**, engineer.

## **2. Brief History of the Department**

The department was set up in 2006 on the basis of the following sub-departments;

- Department of irrigation and drainage;
- Laboratory of sprinkling mechanization;
- Department of ecological, technical-economic and mathematical studies;
- Laboratory of reclamation of salinized lands;
- Scientific-methodological and patent sectors.

Subordinated to the Department are the experimental-amelioration ecological stations of Gori, Orkhevi and Gamarjveba.

During the existence of the sub-departments (which comprised the present Department) significant achievements were gained both in scientific-research work and implementation practice.

The Department of Water Reclamation and Ecological Safety, using the available scientific potential, laboratory and field bases, modern equipment and computer hardware, carries on scientific research work on problems of amelioration, environmental protection and ecology.

## **3. Scientific Activity**

- Development of methods for draining the soils of Kolkheti region with its excessive humidity, improvement of agro-reclamation situation and mastery;
- Development of modern ecological methods techniques and technologies;
- Offering technologies of mechanization of reclamation work and

new hardware;

- Mathematical modeling of drainage and irrigation processes, establishment of optimum regimes, working out methods of computer imitation and calculation.

#### **4. The Results of Scientific Activity**

Created and worked out:

- The basic principles of arranging sprinkling irrigation systems on slopes;
- High-productivity sprinkling aggregates and apparatuses of circular and sprinkling action; a sprinkling plant of special design for irrigation of tea plantations and agricultural crops;
- Train-type sprinkling plant of simple design with small intensity of rain for micro and modular individual and farmer households;
- Furrow-cutter equipment with six conical coupling elements drainage and irrigation means for arranging an inner irrigation network;
- Computer simulation of hydroecological processes (gravity irrigation, surface runoff, flood, infiltration, etc) with use of complete theoretical base and numerical methods, allowing in place of costly experiments in the field (with limited number) to simulate on computer at any volume;
- Designs of aggregates for clean canals of sediments and herbs, for machines leveling and smoothing irrigation areas, tools for cutting the drainage network; a new furrow-cutter that digs furrows by cutting and ramming. The innovation is protected by a patent of 2007.
- Drainage areas of Khorga, Abasha and Gali and combined drainage were arranged;
- Scheme of the filtration coefficient of the soils of the Kolkheti Lowland;
- Calculation of the surface runoff of the irrigation canals, bilateral embankment of rivers and their hydrological calculation;
- Work towards solving problems of mathematical modeling of rainfall and erosional processes and elaborating special computer programs.

## 5. Themes Funded from the Budget

- Development of ecological safe sprinkling technique oriented to low intensity (2005-2009), directed by O. Nanitashvili.
- Study of technologies of cutting irrigation furrows, mechanisms and antierosional measures (2005-2009), directed by V. Samkharadze;
- Development of new resource-saving, gravity irrigation technologies, mathematical modeling, computer simulation and creation of calculation methods (2009-2012), directed by R. Kiladze;
- Development of methods of predicting stable, balanced functioning of reclamation systems (2007-2009), directed by L. Purtseladze;
- Measures towards regulating the water regime in Kolkheti Lowlands, with account of the demands of farming economies (2009-2012), directed by I. Zakaidze and V. Shurghaia.
- Development of methods and computer programs for calculating rainfall and erosion intensity (2009-2012), directed by G. Chitishvili.

## 6.4. Laboratory of Environmental Protection

### 1. Collaborators of the Department



**Goga Chakhaia**

- 1.1. **Goga Chakhaia**, Head of Laboratory, senior research-worker, academic doctor of engineering;
- 1.2. **Robert Diakonidze**, senior research-worker, academic doctor of geography;
- 1.3. **Konstantine Bziava**, senior research-worker, academic doctor of engineering;
- 1.4. **Vakhtang Balamtsarashvili**, research-worker;
- 1.5. **Khatuna Kiknadze**, research-worker;

- 1.6. **Latavra Javakhishvili**, research-worker, academic doctor of engineering;
- 1.7. **Irina Khubulava**, engineer;
- 1.8. **Marine Shavlakadze**, engineer, working on doctoral thesis;
- 1.9. **Tamriko Supatashvili**, senior laboratory assistant, working on doctoral thesis;
- 1.10. **Peride Lortkipanidze**, senior laboratory assistant;
- 1.11. **Giorgi Omsarashvili**, laboratory assistant, working on Master's degree.

## **2. Brief History of the Department**

The Laboratory for Environmental Protection was set up on the decision of 14 February 2007 taken by the Ministry of Education and Science. The Arakhveti Experimental Ecological Station is within its jurisdiction.

## **3. Scientific Activity**

- Study of natural disastrous phenomena: floods, mudflows, as well as of erosional processes: working out effective measures for combating them;
- Forecasting the erosional-mudflow processes in the river Duruji basin and working out new engineer-ecology measures to combat them;
- Assessment of the ecological balance of mudflow-type water-courses along the Georgian Military Road, using the theory of reliability and risk;
- Assessment of the reliability of Georgia's mountain slopes in the Baku-Supsa corridor;
- The typology of Georgia's principal mudflow-type river basins and their assessment;
- Analysis of the breakdown of arch-step shape antimudflow structures, using the theory of catastrophes;

- Working out a scheme of arrangement of antimudflow structures on mountain rivers;
- Assessment of the reliability of mudflow-type river-beds in the Georgian transport corridor;
- Assessment of erosional processes in mountain landscapes in oil- and gas - pipeline corridors;
- Forecasting erosional-mudflow processes, with account of solar radiation;
- Laboratory hydrotechnical modeling of new designs of environmental protection structures;
- Determination of the chemical characteristics of water and soils.

#### **4. The Results of Scientific Activity**

- Since 2007 to the present day the collaborators of the laboratory of environmental protection have taken part in the preparation of 3 contract-themes;
- Systematic determination is under way in the Laboratory of the basic chemical composition of water and soil with a view to implementing the questions detailed in the budget-funded theme as well as grant topics;
- In order to protect the population of the town of Qvareli from mudflows formed in the Duruji bed, the critical points are identified where a mudflow may leave the river-bed;
- A dependence is obtained with which the maximum discharges of a mudflow of diverse provision are calculated, allowing to design anti-mudflow structures.
- Using the mathematical theory of catastrophes, the critical values of the movement of the mudflow mass accumulated in erosional gullies, commencement of the movement of small-power landslide, and the breakdown of spring-board type anti-mudflow structures are determined, allowing to forecast the cited processes;

- Applying the theory of reliability and risk, the reliability of spring-board-type new design and the risk of failure are assessed in the case of the separate, as well as synchronous action of the dynamic impact and mudflow mass on the structure;
- A number of new designs of spring-board type antimudflow structures are developed, the priority of whose material-technical novelty is confirmed by 10 author's certificates (of the former Soviet Union) and 15 patent certificates of Georgia; their implementation in practice allows effective protection of the country's population and mudflow-type river-beds and adjacent areas from mudflows.

### **5. Themes Funded from the Budget**

- Study of the hydro- and ecochemical characteristics of Georgia's erosional-mudflow rivers (2007-2009), directed by G. Chakhaia and R. Diakonidze;
- The ecocide carried out in the region of Borjomi and Gori during the hostilities in Georgia in August 2008 and measures of improving the scorched territories (2009-2011), directed by G. Gavardashvili;
- Working out measures of combating floods, freshets and erosional-mudflow phenomena in mountain landscapes (2005-2010), directed by G. Gavardashvili.

### **6. Grant Projects**

#### **Of the Georgian Scientific National Fund:**

- Measures towards assessing and ensuring the stability of mountain slopes in the TRACECA corridor (2007-2009), directed by G. Chakaia;
- Measures towards the assessment and ensuring the ecological safety of the Baku-Tbilisi-Erzurum transport and energy corridors, alternative to Russia, crossing Georgian territory

(2009-2011), directed by G. Chakaia;

- Assessment of the ecological problems of the Black Sea against the background of global warming and prediction of the erosional-mudflow phenomena and sediment in the river basins with a view to protecting Georgia's Black Sea shore from abrasive processes (2009-2011), directed by R. Diakonidze;
- Protection of the ecological safety of the Poti industrial zone through uninterrupted functioning of the water dividing unit existing on the Rioni river (2009-2010), directed by R. Diakonidze.

### **International:**

- Project FP-7 of the grant of the European Union – The Black Sea Scientific Network (2008-2010), directed by G. Gavardashvili;
- The NATO grant project: “Risk-based analysis of the safety of the hydraulic systems in the river network of the South Caucasus region” (2009-2010), directed by G. Gavardashvili.

## **7. EXPERIMENTAL-RECLAMATION ECOLOGICAL STATIONS**

Six experimental-reclamation stations come under the Institute.

### **1. The Alazani experimental-reclamation ecological station**

(v. *Khornabuji, Sighnaghi district*),

directed by **David Mosulishvili**, scientific collaborator,  
working on doctoral thesis.

The station is one of the oldest scientific organizations, set up in 1948, and situated 20 km east of Tsnori, Sighnaghi district.

At present 75 ha of land area has been transferred to the station in perpetual use.

The basic line of scientific-research work of the station is reclamation of Georgia's salinized and salt soils, carrying on

experimental studies for putting them to agricultural use, testing and working out practical recommendations.

## **2. The Gori Experimental-reclamation Ecological Station**

(v. *Karaleti, Gori district*),

directed by **Guram Muradashvili**, agronomist.

The station is situated in v. Karaleti, to the right of the Gori-Tskhinvali motorway. It was set up in 1962 to study the agricultural crops characteristic of the Kartli region and to work out recommendations for agricultural organization, in particular to determine the requirement of water for agricultural crops and the irrigation regime. Recommendations, worked out on the basis of the studies conducted and experimented data, are sent to the agricultural organizations of the region, experiments are carried out with the purpose of selecting the elements of the techniques of irrigation and its varieties.

The total area of the station is 5 ha, of which buildings and facilities hold 900m<sup>2</sup>, inner roads: 2250 m<sup>2</sup>; the remaining area is occupied by perennial plants (apple, pear, cherry, walnut) and annual (maize, cabbage, tomatoes, wheat) crops.

## **3. The Kholkheti (Poti) Experimental-reclamation Ecological Station named after Prof. Pridon Shatberashvili**

(4400,10, D. *Tavdadebuli, Poti*),

directed by **Otar Gagua**, agronomist.

The station was founded in 1932 in connection with the launching of measures for draining the swamped area of Kolkheti, and it functions to the present day; since then it has conducted important studies, which preceded the scientific-research work of stages I and II of the development of Kolkheti and the drawing up of the field-design documentation (the physico-mechanical composition of the soils and identification and assessment of the filtration coefficients and other characteristic parameters). The station was housed in the administrative building of *Kolkhidmsheni*. In 1982 it moved to the territory of Maltaqva hamlet of Poti, to a well-appointed single-



storey building, with 315m<sup>2</sup> work area and a 0.5 ha yard; the station boasts work-rooms, a hotel, warehouse facilities, car parkings, etc.

#### **4. Orkhevi Irrigation Testing-ground and Samgori Experimental-reclamation Ecological Station**

*(Gardabani, Orkhxevi Settlement, Tbilisi;*

*v. Gamarjveba, Samgori Experimentsl-reclamation Ecological Station,*

directed by **Giorgi Jachvadze**, agronomist.

The station is situated near the route of the Zemo Samgori irrigation system, within 15 km of Tbilisi. It is built on the territory of the Tetrichevi HPS complex. In the east it is bounded by the pressure pipeline of the complex and chute in the south by the main canal.

The Orkhevi base was built in the 1960s, on the initiative of the late Professor Jamlet Kervalishvili. The area of the plot totals 4.5 ha; it is oriented from north to south, with an inclination 0.15; both perennial and annual plants grow here.

The relief conditions rendered difficult irrigation processes; hence the irrigation system designed here is characteristic of such irrigation facilities whose areas are situated on slopes

#### **5. Arakhveti Mountain-reclamation Ecological Station**

*(v. Aarakhveti, Dusheti district),*

directed by **Guram Burduli**, engineer.

The station serves the study in natural conditions of the hydromorphological and geological processes occurring in Georgia's mountainous regions, of scientific and engineering questions of nature protection, and of solution of the problems of damage of the Georgian Military Road and adjacent areas, characterized by catastrophic phenomena.

The station has a building (area: 250 m<sup>2</sup>), workshop (area: 64 m<sup>2</sup>), an auxiliary facility (area: 36 m<sup>2</sup>) and testing-ground (area: 0.5 ha) for anti-erosional measures.

#### **4. Experimental-reclamation Ecological Station of Abkhazia**

Directed by **Paata Sichinava**, scientific collaborator, engineer-hydraulic engineer.

Until 1993 the Station was situated in the Abkhazian Autonomous Republic.

Experimental-industrial studies were conducted on the drainage of soil through rational exploitation of new reclamation devices and drainage systems; measures to combat erosion; study of the hydrological regimes of rivers; designing devices for strengthening the banks of the Kodori river.

### **8. GRANTS RECEIVED**

Following the introduction of the grant system, the Institute received and utilized grants, in various years, from national and international organizations:

- **Georgian National Academy of Sciences:**

- Working out recommendations for enhancing the efficiency of the use of land and water resources, with account of erosional processes, 1997;
- Development of methods of regulating mudflows, with account of preservation of the ecological stability of the environment, 1999.
- Development of ecologically safe reclamation measures for Kolkheti lands in conditions of market infrastructure, 1990;
- Development of measures for ensuring ecological equilibrium of the environment in the zone of exploitation of hydro-reclamation systems, 2000;
- Development of measures for preserving ecological stability of Georgia's irrigation lands, 2001;
- Working out measures towards stable development of reclamation in Georgia, 2003.
- Working out ecological methods for enhancing the efficiency of irrigation in conditions of farmer economy, 2003.



**Fig. 12. presentation at the Georgian National Academy of Sciences. Right: President of the Academy, Academician Th. Gamkrelidze and G. Gavardashvili. 17 March 2005.**

- Assessment of the vulnerability of hydroecological and water management facilities and of the onset of risk, 2004.
- Development of highly-productive technologies for construction of reclamation systems and their exploitation, with preservation of the ecological stability of the environment, 2004.
- Raising the yield of agricultural crops, with account of ecological-reclamation conditions, 2004.
- Study of ecological disturbances caused by anthropogenic loads in mudflow basins, 2005.
- Assessment of the vulnerability of hydroecological and water management facilities and of its onset, 2005.
- **The US International Agency of Development**
  - “Study of antierosional measures in the form of vetiver and other soil-trapping grass barriers” (TAMOU-01-CA15-011), financed by the US National Academy, coimplemented by Israel’s Institute for the Protection of Water, Soils and Environment of Volkan Centre, 2002-2007.



**Fig. 13. Experimental stand of vetiver, a soil antierosional plant at the Institute**

- **International Engineering Academy:**

- Development of new safe technologies for enhancing raw material of agricultural production, 2001-2002;
- Development of methods of engineering-reclamation assessment of agricultural arable lands, 2003-2004.

**Grants received at present and under implementation:**

- **International**

- Grant of the European Union, Project FP-7 – The Black Sea Scientific Network, 2008-2010;
- Project of a NATO grant – “Risk-based safety analysis of the hydraulic systems on the network of rivers of the south Caucasus region”, 2009-2011.

- **Georgia National Science Foundation (GNSF)**

- Measures towards prolonging the functioning of obsolescent hydrostructures, 2008-2010.

- Measures towards the assessment and ensuring of the stability of mountain slopes in the TRACECA corridor, 2008-2009.
- Assessment of the ecological reliability of Georgia's reclamation systems, 2008-2010.
- Measures towards preventing accidents at hydrotechnical structures and mitigation of the damage inflicted, 2008-2010.
- Protection of the ecological safety of the Poti Industrial Zone through uninterrupted functioning of the water dividing unit on the river Rioni, 2009-2010.
- Assessment of the ecological problems of the Black Sea against the background of global warming and prediction of the erosional-mudflow phenomena and sedimentation of river basins in order to protect the Georgian seashore from abrasive processes, 2009-2011;
- Measures towards the assessment and ensuring of the ecological safety of the Baku-Tbilisi-Erzurum transport and energy corridors, crossing Georgia, alternative to Russia, 2009-2010.

## **9. INTERNATIONAL SCIENTIFIC RELATIONS AND COOPERATION**

Throughout its existence the Institute has carried on diverse scientific contacts and joint studies with various scientific, design, construction organizations and educational institutes of the USA, Czechia, Hungary, Poland, China, Israel, Germany, Greece, Japan, Romania, Syria, Cuba, Iraq, and Bulgaria.

The scientific organizations of the following countries closely cooperate with the Institute:

- Giessen University of Germany;
- Moscow Lomonosov State University
- Central Normal University of China;
- Prague Institute of Hydrodynamics;

- Polish Agrarian University of Wroclaw;
- Institute (Volcan Centre) of Protection of Soil, Water and Environment of Israel's Organization of Agricultural Research
- Us Agrarian Department;
- Swiss Agency of Development Cooperation (SDC);
- Azerbaijan Research Institute of Hydraulic Engineering and Reclamation;
- Acad. I. Egiazarov Armenian Institute of Problems of Water and Hydraulic Engineering;
- Institute of problems of Water and Hydraulic Engineering of the Kyrgyz National Academy of Sciences;
- Ukrainian Institute of Hydraulic Engineering and Reclamation;
- Ukrainian Institute of Colloidal Chemistry and Water Chemistry;
- Armenian University of Architecture and Construction.



**Fig. 14. While working on an international grant.  
Left: Prof. G. King (Germany) and Prof. G. Gavardashvili.  
20 April 2006.**



**Fig. 15. Signing an agreement on international cooperation. Right: Prof. I. Wu (China) and Prof. G. Gavardashvili, 22 August 2007.**



**Fig. 16. A Chinese delegation at the Institute. Right: Prof. V. Tevzadze, Acad. Ts. Mirtskhoulava, Acad. O. Natishvili, Prof. I. Wu. Ts. Yulon, Adviser of the Ambassador to Georgia, I. Shen, First Secretary of the Chinese Embassy to Georgia, Prof. G. Gavardashvili, 24 August 2007.**



**Fig. 17. On a visit to the Georgian Ministry of Education and Science. Left: Acad. A. Didebulidze, First Deputy Minister, Prof. I. Wu (China) and Prof. G. Gavardashvili, 25 August 2007.**



**Fig. 18. European Scientists on a visit to the Institute. Right: G. Szapy, Acad. P. Vlasak (Vice-President of the Czechian National Academy of Sciences), Prof. E. Sobota (Dean of the Faculty of Environmental Protection of Vroclaw Agrarian University), Prof. G. Gavardashvili, Ts. Mirtskhoulava.**





**Fig. 19. An Israeli delegation at the Institute. Prof. G. Gavardashvili: Prof: D. Dudai, Acad. Ts. Mirtskhoulava, Prof. V. Tevzadze, Prof. M. Ben. Hur, G. Live, 30 June 2006.**



**Fig. 20. In the bed of Dusheties-khevi. Left: L. Kuchevski, Specialist on International Training of the US Agrarian Department, and Prof. G. Gavardashvili, 23 February 2006.**



**Fig. 21. St. Petersburg (Russia). Together with the participants of the 14th World International Conference. 23-27 June 2007.**



**Fig. 22. Minsk (Belarus). At an international meeting of the International Association of Academies of Sciences (IAAS).  
Right: Acad. A. Naumtsev (Vice-President of the Ukrainian National Academy of Sciences), Acad. P. Vityaz (First Deputy Chairman of the Presidium of the Belarusian Academy of Sciences),  
Prof. G. Gavardashvili, 10-13 July 2008.**



**Fig. 23. While working on a NATO project at the Institute.  
Right: Prof. B. Ayub of Maryland University (USA) and Prof. G.  
Gavaradshvili. 22 April 2009.**



**Fig. 24. At an international training at the US Agrarian Department,  
Washington, 15 May 2009.**



**Fig. 25. Signing of an agreement on international cooperation between the Institute of Water Management and the Kyrgyz Institute of Problems of Water and Energy. Left: Director of the Institute D. Mamatkanov, Prof. G. Gavardashvili, Bishkek, 2 October 2008.**



**Fig. 26. Signing of an agreement of cooperation between the Institute of Water Management and the Azerbaijanian Research Institute of Hydraulic Engineering and Reclamation. Right: Director of the Institute, Professor A. Gashimov. Baku, 4 October 2008.**



**Fig. 27. Signing of an agreement on cooperation between the Institute of Water Management and the Armenian University of Architecture and Construction. Left: Rector of the University, Prof. O. Tokmajyan and Prof. G Gvaradshvili, Yerevan, 25 March 2009.**

## **10. INVENTION AND PATENT ACTIVITY**

In the period of the former Soviet Union the Institute received 90 author's certification on inventions, and following the gaining of independence by Georgia (since 1992), 36 patents. Through its existence the Institute has carried out 216 major implementations, and has participated in 17 international exhibitions.

## **11. EXPERT ACTIVITY**

On the orders of Georgian government department ecological expertise was carried out at the Institute on several important projects:

### **Carried out by Prof. G. Gavardashvili:**

- In v. Kakhareti, Adigeni district, assessment of the impact on the environment of the Kakhareti small HPS. Chairman of the State Expert Commission, expert on environmental protection (2007).

- Rehabilitation of a small HPS in v. Misaktsieli, Mtskheta district. Expert on environmental protection (2007).
- Ecological expertise of the detailed project of the rehabilitation of the headwork and main canal of the Imirasan (Bolnisi) irrigation system. Expert on environmental protection (2007).
- Hydrological documentation of the rehabilitation of the areal crossing of the 500 mm diameter main gas pipeline over the river Mtkvari at Karadag-Tbilisi 417.8-473.3 km . Expert on environmental protection (2007).
- Impact on the environment of the rehabilitation of the Aghaiani-Igoeti section of the E-60 east-west motorway. Expert on environmental protection (2007).
- Assessment of the impact on environment of the reconstruction-modernization of the Igoeti-Sveneti 56-80 km section of the E-60 motorway. Expert on environmental protection (2007).
- Report on the Assessment of the impact on environment of the reconstruction-modernization of the Sveneti-Ruisi 80-95 km section of the Tbilisi-Senaki-Leselidze motorway (2007);
- Building and reconstruction work on the Sveneti-Ruisi 80-95 km section of the Tbilisi-Senaki-Leselidze motorway. Expert on environmental protection (2007);
- Hydrotechnocal (design) part based on a single assignment at crossings of the secondary oil-trapping structure of the Baku-Tbilisi-Ceyhan (BTC) oil pipeline project. Expert on environmental protection (2007)
- Hydrological calculations of free beds in the part connected with crossing of the secondary oil-trapping structure of the Baku-Tbilisi-Ceyhan (BTC) oil-pipeline (vol-I, Prospecting work).Expert on environmental protection (2007);
- Expertise of the design of the crossing of the beds of the Lekhura and Cholobauri rivers by the Baku-Supsa oil pipeline. Expert on environmental protection (2007);
- Ecological expertise of the report on the impact of the rehabilitation work of the Ajaristqali HPS on the environment. Expert on environmental protection (2007);

- Ecological expertise of the report on the assessment of impact on the environment of the rehabilitation and exploitation of the Gumati HPS chain (Gumati HPS) owned by Energo Pro Georgia LTd. Expert on environmental protection (2007).
- Assessment of the Rioni HPS on the environment. Expert on environmental protection (2008);
- Assessment of the impact of the Shaori HPS on the environment. Chairman of the State Expert Commission and Expert (2008);
- Assessment of the impact of the Lajanuri HPS on the environment. Expert on environmental protection (2008);
- Assessment of the impact of the Kakhareti HPS on the environment. Chairman of State Expert Commission and Expert (2008);
- Ecological expertise of the report on the assessment of the impact of the Lajanuri HPS on the environment. Expert on environmental protection (2009);
- Ecological expertise of the report on the assessment of the Rioni HPS on the environment. Expert on environmental protection (2009);
- Expertise of the report on the assessment of the impact of high voltage aerial power line “Chorokhi” on the environment. Expert (2009);
- Number of the State Expert commission on the “Report on the assessment of the impact on the environment of the rehabilitation of the road crossing the village of Koda”, presented by the Fund “Millennial Challenge to Georgia” (2009).

**Carried out by Prof. V.Tevzadze:**

- Assessment of the impact of Ajar HPS on the environment. Expert on environmental protection (2008);
- Assessment of the Gumati HPS on the environment. Expert on environmental protection (2008);
- Assessment of the Dzevrula HPS on the environment. Expert on environmental protection (2008);

- Ecological expertise of the report on the assessment of the impact of the activity connected with the rehabilitation work on the Ajaristsqali HPS on the environment. Expert on environmental protection (2009).
- Ecological expertise of the report on the assessment of the impact on the environment of the rehabilitation and exploitation of the Gumati HPS chain (Gumati HPS), owned by Energo Pro Georgia Ltd. Expert on environmental protection (2009)

## **12. INTERNATIONAL SYMPOSIUM DEDICATED TO THE 80<sup>TH</sup> ANNIVERSARY OF THE INSTITUTE (1929-2009)**

The management and scientific workers of the Institute express their thanks to the Georgian Ministry of Education and Science, the Georgian Ministry of Foreign Affairs, the National Commission on UNESCO Affairs, the UN Organization of Education, Science and Culture (UNESCO) for their support in marking the 80<sup>th</sup> anniversary of the Institute of Water Management on an international scale.

Taking into consideration the experience and international standing of the Institute, the UN Commission signed a contract, on 30 May 2008, between the Institute and UNESCO on holding an international symposium: “Floods and Modern Methods of Combating Them” (23-28 September 2009, Tbilisi), dedicated to the 80<sup>th</sup> anniversary of the foundation of the Institute. Scientists of over 20 countries agreed to take part in the event: Britain, Germany, Poland, Bulgaria, the USA, Czechia, Ukraine, Russia, Israel, the Netherlands, Austria, Switzerland, Italy, Belarus, Ethiopia, Kyrgyzstan, Armenia, Azerbaijan, China, Iran, and others.

It should be noted also that, since the foundation of the Institute, this is the third symposium to be held under the aegis of the United Nations:

- 1969 – “Anti-flood Measures”



- 1995 – “Man and the Sea”.
- 2009 – “Floods and Modern Methods of Combating Them.

We hope that the international symposium: “Floods and Modern Methods of Combating Them” will contribute to the implementation of the international strategy (Hugo framework document) on ensuring the environmental protection and the safety of stability of our planet – the Earth, close cooperation of world scientists and researcher-specialists, exchange of information and the solution of the urgent world problem – floods – using the modern scientific achievements and nano-technologies.

The management of the Institute, its Scientific Council, and the collaborators of the entire Institute will do their best towards creating normal working conditions for Georgian and foreign scientists and specialists throughout the course of the symposium.



