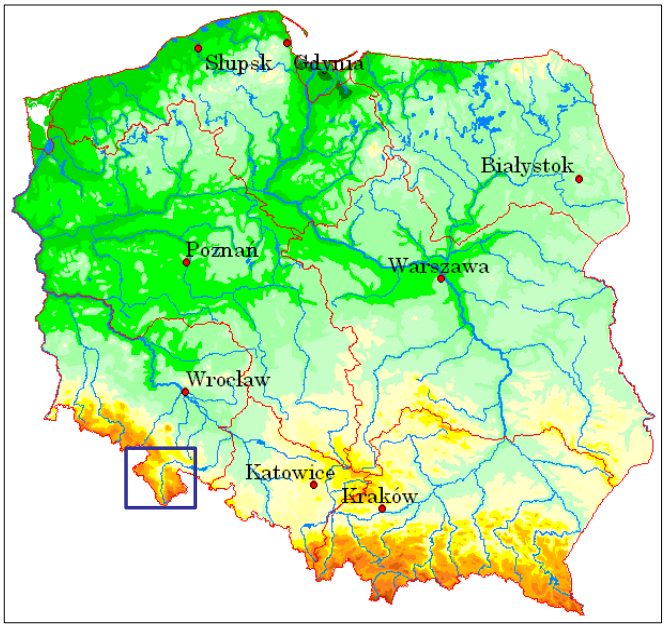
World Meteorological Organization

# FORWARD INTEGRATION OF FLOOD WARNING IN AREAS PRONE TO FLASH FLOODS

## Implementation of a Flash Flood Warning System for Inhabitants and Users of Flood Plain Areas in the Kłodzko Valley, Poland




Submitted by: Global Water Partnership—Poland

For the WMO/GWP Associated Programme on Flood Management

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# 1. Introduction

The present document represents a final report concerning work on the task "Implementation of a flash flood warning system for inhabitants and users of flood plain areas in the Klodzko Valley", being performed as part of the project "Forward Integration of Flood Warning in Areas Prone to Flash Floods" (WMO&GWP Associated Program of Flood Management Project).

## 1.1 Aim of the component of the APFM Project

The aim of this component of the APFM project, in the local dimension, is to improve the operation of the existing local flash flood warning system (known in Polish as LSOP), viewed as part of a broader flood damage mitigation plan. This work will aim both to improve and adapt elements of the LSOP (e.g. forecasts) to local needs, and to raise the level of awareness and preparation of inhabitants and crisis intervention forces, as well as to improve the efficiency of organizational solutions. In viewing the LSOP as an element of the flood damage mitigation plan, the aim is to show the role and limitations of warning systems, as well as essential links with other means of flood damage mitigation.

The overall aim is to capitalize on and disseminate experiences gained in the pilot location, concerning the possibility of building local solutions to ensure effective response to a hazard situation, and to reduce the flood sensitivity of areas prone to flash flooding.

## 1.2 The tasks of the component

The work was divided into several tasks:

- **Task 1.** To conceive, prepare and test, in IMGW practice, procedures for creation and provision of meteorological forecasts for the Klodzko Valley (regional forecast)
- **Task 2.** To set up the FLO-INFO decision-making assistance program, based on a precipitation-runoff model, for the local monitoring network already built in the Klodzko Valley
- **Task 3.** To prepare and implement procedures for warning inhabitants of the village of Gorzanow, as an element of the Local Flood Damage Mitigation Plan
- **Task 4.** To prepare a concept and test a program of education and training to improve knowledge of flood plain inhabitants and users concerning the hazard and loss mitigation methods (including the operation of the warning system)
- **Task 5.** To disseminate experiences from the project in other areas prone to flash flooding.

The first two tasks (on account of the close relationship between them) have been described together; subsequent tasks, on the other hand, have each been described in a separate chapter.

The work performed is a continuation of previous operations carried out jointly from 2000 to 2005 by IMGW Krakow and Wroclaw, as well as by the County Government in Klodzko, in cooperation with the municipalities comprising Klodzko County. In the period mentioned, the basic framework of the local warning system was built; the overall aim of this system is to notify inhabitants of an approaching flood.

As part of the APFM project, operations were also carried out which could be placed in the category of 'most difficult'. These concerned inter-institutional cooperation between:

- The Institute of Meteorology and Water Management and local government
- County-level local government and municipal-level local government
- Local government and inhabitants.

Building good relationships between these institutions and entities at risk, as well as precise division of responsibility, in many cases decides the effectiveness of warning systems operating in areas afflicted by flash floods.

The effects obtained in this area do not completely resolve existing problems—for building a good climate of cooperation is a process which takes many years and is of evolutionary character. However, a 'next step' has been taken, both in the area of utilizing operational rules focused on fulfilling a given partner's real needs, and in the area of dividing responsibility among the various partners.

### 1.3 Institutions involved in the project

**The Institute of Meteorology and Water Management**
(Krakow branch office, Wroclaw branch office)
**County Government in Klodzko**
**City and Municipal Hall in Bystrzyca Klodzka**
**Mayor and inhabitants of Gorzanow**

**Project Coordinator**
Global Water Partnership—Poland
Prof. Janusz Kindler

**Person responsible for execution**
Roman Konieczny
Institute of Meteorology and Water Management

### 1.4 Executors of project:

| | |
|---|---|
| **Jozef Adamowski** | Wroclaw University of Technology |
| **Malgorzata Barszczynska** | IMGW Krakow |
| **Renata Bogdanska-Warmuz** | IMGW Krakow |
| **Leszek Jelonek** | IMGW Wroclaw |
| **Roman Konieczny** | IMGW Krakow |
| **Aleksander Kruszewski** | IMGW Krakow |
| **Pawel Madej** | IMGW Krakow |
| **Danuta Partyka** | County Government Office in Klodzko |
| **Krzysztof Postrach** | County Government Office in Klodzko |
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| **Teresa Zawislak** | IMGW Wroclaw |

# 2. Development of tools to assist in flood warning decision-making for the Klodzko Valley

## 2.1 BASIS FOR MODIFICATION OF THE TOOL FOR WARNING ASSISTANCE IN THE KLODZKO VALLEY

### 2.1.1 Background

The nationwide meteorological and hydrological service is a basic, but not always satisfactory source of measurement and forecast information for crisis intervention forces in case of a flood hazard. In an especially difficult situation are areas located in the upper reaches of rivers. Flood waves here are of rapid character, and the nationwide hydrological and meteorological service is not always in a position to provide appropriately detailed measurement and forecasting information for such, on a nationwide scale, small areas. Thus, there is a great need to expand the scope of information available.

It is possible to enhance measurement information by building a local flood monitoring network, as was the case in the Klodzko Valley.

The local flood monitoring system for Kłodzko County was launched in 2002; and in 2004, supplemented with a telephone-based inhabitant warning system (TSOM). This is a completely automatic system comprised of 19 river gauge points and 20 precipitation measurement points. Transmission of data to 18 dispatch stations takes place via radio. The main dispatch station is located at the County Government Office; there are also three specialized stations (fire brigade, IMGW hydrological and meteorological station, emergency ambulance service) as well as 14 municipal dispatch stations. Measurement stations are powered by electricity, with backup from battery-powered generators. The cost of building the entire system was approx. 625 000 Euro, including measurement and communications equipment, measurement and dispatch station installation, system testing, dispatcher training, documentation preparation, measurement data accessing and archiving software[1]. This amount also includes the cost of the TSOM system (30 000 Euro). According to county government authorities, material losses caused by the flood in 1997 exceeded the cost of building the system by a factor of many times.
Exploitation costs for the local flood warning system in Kłodzko (on the basis of data from 2004) are approx. 15 000 Euro, including equipment maintenance, computer maintenance, electrical power, fees for usage of radio band and grounds. Up until now, the fee for usage of telephone connections needed for the TSOM system has been symbolic; the County Government Office only incurs costs for connections made, i.e. approx. 0.06 Euro per minute to land-line telephone, and approx. 0.25 Euro per minute to cellular telephone network. Exploitation costs given do not include maintenance of team at specific level of knowledge, costs of hydrometric measurements, system modernization, or funds for rebuilding of stations in case of vandalism.
[1]Unit cost for building of telemetric measurement station, based on data obtained from other counties in Poland, is approx. 5 500–10 000 Euro, while cost of staff gauge installation, together with design and geodesic work, is approx. 1 500 Euro.

A complementary way of expanding the scope of available information is to build tools for processing and analysis of available data, enabling not only forecasting of floods at the local level, but also interpretation of measurement and forecast data in terms of flood damage. Prototypes of such tools were prepared as part of the OSIRIS project and installed at the County Government Office in Klodzko. Presently, after a certain period of probationary exploitation, as well as after gathering a portion of measurement data from the local monitoring system, the possibility has arisen of modifying these tools, especially since in the meantime, the modernization of the State Hydrological and Meteorological Service (PSHM) has been finalized.

Taking into account the changes described above, actions have been proposed aiming to increase the effectiveness of the local warning system, assisted by the PSHM. The work undertaken as part of the

project had the aim of testing possibilities for expansion of IMGW's product line for the LSOP and making the associated modification of the tools to assist crisis intervention forces in Klodzko County. Below are described existing flood hazard assessment tools; and in the subsequent portion of the chapter, the concepts for their expansion prepared and realized as part of the present project.

### 2.1.2 Existing tools for assessment of flood hazards in the Klodzko Valley

**Previous IMGW practice in the area of warning**

The Institute of Meteorology and Water Management is a research and development unit supervised by the Minister of the Environment which, in accordance with the provisions of the Water Law, provides the State Hydrological and Meteorological Service. The Institute is responsible for hydrological and meteorological protection of the country. Weather forecasts, as well as warnings concerning dangerous phenomena and messages concerning the current situation are prepared by forecasting bureaus in Wroclaw, Krakow, Poznan, Warsaw, Szczecin, Gdynia and Bialystok. This information is transmitted to crisis management centers at the central and provincial levels. They are also published on the IMGW web page www.imgw.pl. Their aim is to notify the appropriate services and forces, organizations and institutions as well as communities about the predicted or actual occurrence of dangerous meteorological phenomena and the associated hazards.

For Dolnośląskie Province (Lower Silesia), in which the Klodzko Valley is located, weather forecasts, warnings and messages are prepared by the Forecasting Bureau of IMGW Wroclaw. Spatially speaking, the forecast for this area is divided into lowland areas and foothill/highland areas. The forecast for such large areas requires certain generalizations. Such a general forecast is issued for one 24-hour period, and for the next 24 hours, a so-called 'orientational forecast' is given. Meteorological parameters such as air temperature, wind, precipitation or cloud cover are specified in a descriptive manner, e.g. moderate cloud cover, light west wind; concrete values of meteorological parameters—predominantly temperature—are given in numerical ranges; and precipitation, if given at all, concerns sums of precipitation for larger areas. For the Klodzko Valley, on account of the different weather conditions occurring there, associated with the topographical features of the area - closed valley surrounded by mountains- a dedicated weather forecast is prepared for this area (product exceeding the usual standard).

Aside from the forecasts prepared and transmitted daily at a fixed hour in specific weather conditions, the bureau issues warnings concerning dangerous meteorological phenomena, among which is heavy rainfall. In the Forecasting Bureau of IMGW Wroclaw also prepared are messages about the weather situation on the basis of radar data e.g. message concerning movement of storm zones (product exceeding the usual standard).

Application assisting operational activities of the crisis management team at the county government office in Klodzko

The FLO-INFO application described here is a tool to assist the work of the crisis management center responsible for coordination of flood protection operations and 'awakening' of crisis intervention forces. Utilizing access to operational measurement data from the IMGW network and the local network, it enables analysis and forecasting of the hydrological situation. This permits identification of potential hazards defined by local crisis intervention forces. The results of analyses can be disseminated to these forces and serve the purpose of, among other things, 'awakening' them. Aside from integration of measurement data from the nationwide and local networks, the main functions of the tool being described are:

- Preparation of the local hydrological forecast
- Interpretation of measurement and forecasting information
- Dissemination of messages and warnings to crisis intervention forces.

FLO-INFO enables simulation analyses to be made for several simple hypotheses concerning precipitation distribution over time and space. Simulation analyses are based on HEC-1, a precipitation-runoff model made available by the US Army Corps of Engineers Hydrologic Engineering Center. The

aim is to prepare a local water level forecast based on the precipitation scenario selected by the operator. Precipitation scenarios are created in interactive mode by the operator on the basis of the general precipitation forecast prepared by IMGW, using predefined precipitation time distributions.

Interpretation of measurement and forecast information is based on an event database in which are defined threshold values (water levels, precipitation, etc.), as well as the associated hazards. The aforementioned threshold values are compared with the measured and forecasted amounts, which permits identification of hazards, as well as their time and place occurrence.

The software also provides support for communication with members of crisis intervention structures for transmission of information and warnings (fax, e-mail), prepared on the basis of analysis of conditions in the catchment area, as well as predicted hazards.

The application is intended for crisis management teams. It requires a user acquainted with problems in hydrological forecasting and issues in crisis response. A prototype version of the software is in the trial-run phase at the County Government Office in Klodzko.

### 2.1.3 Assumptions for modification of tools to assist warning in the Klodzko Valley

As a result of the abovementioned modernization of the PSHM, it is possible to better satisfy the needs of local areas at high risk for flooding, including flash flooding. Not only measurement data from the new, automatic stations of the nationwide network is available, but also radar information, data from the lightning detection system, and results of numerical weather forecasting models. This makes it possible to deliver to crisis intervention forces more measurement information with greater frequency than previously. It is apparently also possible to prepare, for a limited number of areas, synoptic meteorological forecasts more detailed than previously. These observations became the basis for the proposal to prepare and test, in the pilot area, new products (measurement data and forecasts) addressed to the LSOP. Proposed new IMGW products for the Klodzko Valley include:

- Delivery of measurement data from the new telemetric network
- Delivery of elements of the ‘raw’ meteorological forecast from the numerical weather prediction model, adapted to the needs of the pilot area
- Preparation and delivery of a specialized synoptic meteorological forecast for the Klodzko Valley, with increased time and spatial resolution, relative to the present state of affairs.

It was necessary to prepare both the content of the new proposals and the form and manner of obtaining and transmitting them to the LSOP, which required definition of data exchange formats, preparation of appropriate software and organizational solutions ensuring information flow within IMGW, and provision of the products prepared to the client. Since the end user of the proposal is the LSOP, which possesses software enabling analysis of measurement data and preparation of local hydrological forecasts (FLO-INFO), it was necessary to prepare and realize the concept for its modification, which would ensure the possibility of utilizing the new products.

Further on in this chapter, we describe how the assumptions presented above were realized in practice.

## 2.2 To conceive, prepare and test, in IMGW practice, procedures for preparation and provision of measuring data and meteorological forecasts for the Klodzko Valley

### 2.2.1 New tools and procedures for data conversion and transmission

**Preparation of concept and testing of ways to deliver measurement results as well as forecasts for the LSOP**

Up until now, cooperation between the County Government in Klodzko and IMGW has taken place via e-mail, but the exchange has concerned only messages containing the texts of meteorological forecasts, as well as observation results from the traditional hydro-meteorological network. Enlarging the scope of the information transmitted, as well as its frequency, made it necessary to change the means of transmitting

observation results and forecasts. Also contributing to this change was the IMGW network's internal security policy, as well as the necessity to rationalize traffic in the ICT network.

The solution finally adopted was to utilize a hosting server to which full access is possible from the IMGW network, but only reading is possible from the external user's side. Because full use is only possible from IMGW's side, the responsibility for proper operation rests on applications created as part of the task (e.g. removal of excess files). Tests of access to the server were conducted in two stages. The first revealed very uneven (and slow) file transfer. After changes in the configuration made by the ICT `department of IMGW, transfer and access to the server achieved the expected parameters. A two-month test—including one month in the target setting (Klodzko)—confirmed the correctness of the solution, but also showed a necessity for optimization of downloading.

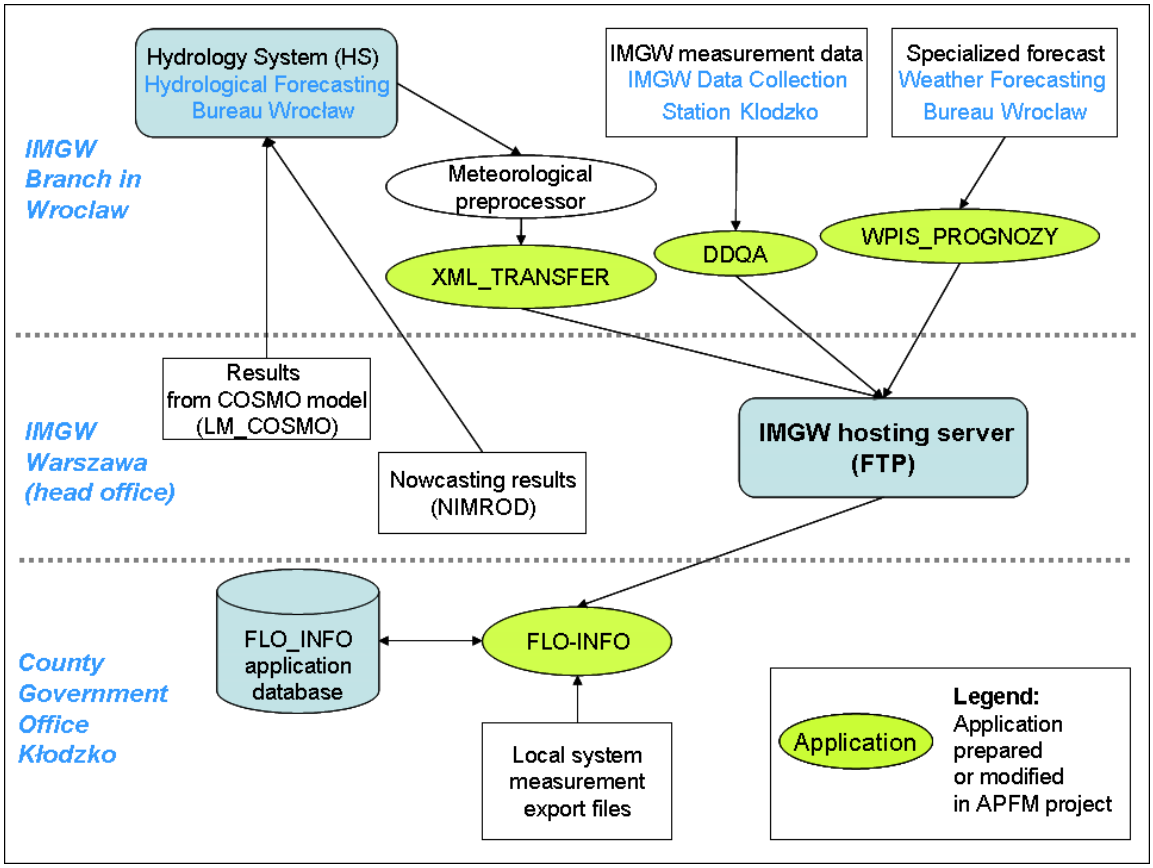



**Fig. 1 Description of data flow between Institute of Meteorology and Water management (IMGW) and local flood warning system in Klodzko County**

**Programming for generation of export and transmission of data from the DCS**

For over a year now, the telemetry system in operation at IMGW has delivered observation results once hourly for 10-minute time intervals. The proper sequence of actions in exploitation of this system does not provide for any other data delivery than via exchange initiated by the SH using the Client Service System (SOK). However, such a scheme is comprised of several steps:

- Downloading observation results for the past hour from Telemetric Measurement Stations (TPP), and saving them to the DCS database.
- Replicating data to the Regional Telemetric Center (RCT), validated according to acceptable threshold values.
- Replicating data from the RCT operational database to the SH.
- Replicating the SH database. The SH database is located at the seven Hydrological Forecasting Bureaus, and all data collected are replicated to Warsaw.

- Generating an export as well as transmitting files created to the SOK.
- Downloading products and transmitting them to the user.

In many cases, such a path for observation results is too long—in connection with which, in case of operational data, a simplified method was applied, consisting of installation at the DCS level of specialized software (DDQA application) which, at a specified minute of each hour, generates an export of observation results in the form of a file in OSIRIS XML format, and sends it to the appropriate directory, designated for the County Government Office, on the hosting server.

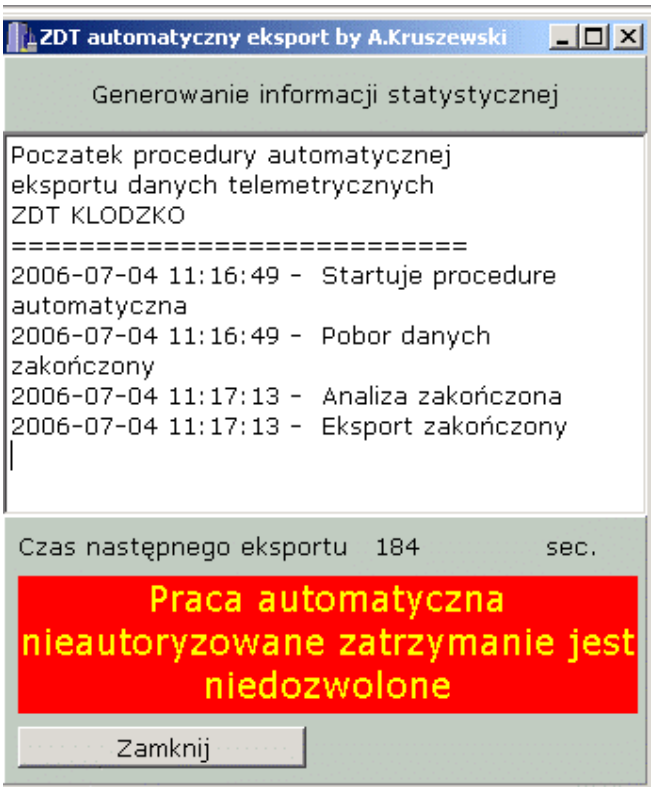



**Fig. 2 Main panel of DDQA application, responsible for sending IMGW telemetric data to the hosting server**

**Preparation, programming and implementation of export of forecasting results from LM_COSMO mesoscale model**

At IMGW, the task of storing and processing precipitation and temperature forecast results for hydrological forecast purposes has been entrusted to the Hydrology System (SH [System Hydrologii]). This system possesses specialized procedures for reading in forecasts from the mesoscale model in GRIB format, and processing them as averaged values for the so-called Hydrological Response Units (JOH [Jednorodny Obszar Hydrologiczny]). A module called the 'meteorological pre-processor', representing an element of the Hydrology System Modeling Platform, is responsible for processing of forecasts from mesoscale models, as well as from the NIMROD radar system. This module, aside from reducing matrices to one dimension (de-aggregation), as well as aggregation for any selected number of JOHs, also offers transformation to account for the topography of the given area. The results of the pre-processor's work are saved twice daily to the SH database. There also exists the possibility of making calculations hourly, using a new version of the "newscast" from the NIMROD system (radar data).

The above tasks are routine IMGW tasks as part of hydrological forecast preparation. An added value in this task was the preparation of software for conversion of precipitation and temperature forecast results to the form of a file in the XML format worked out as part of the already-mentioned OSIRIS program.

The software was ultimately installed at the Hydrological Forecasting Bureau in Wroclaw, where it is being set up after completion of the work of the 'pre-processor' (XML_TRANSFER application).

The final result of the application's operation is the sending of a file to the hosting server, to the directory designated for the County Government in Klodzko. According to the testing plan, the task is executed once daily on working days. Holidays, if there is no flood hazard in the offing, are filled in on the next working days.


**Fig. 3 Main panel of XML_TRANSFER application**

### 2.2.2 Local meteorological forecast for the Klodzko Valley

**Concept for dedicated meteorological forecasts for smaller areas**

For the needs of local warning systems, in places where a flood hazard can follow shortly after the occurrence of precipitation (and the Klodzko Valley is such an area), general meteorological forecasts are insufficient. On the other hand, delivering them at the provincial level significantly lengthens the time in which crisis intervention centers at the county and municipal levels receive warning of danger from meteorological phenomena. This is where the idea came from to prepare and send meteorological forecasts for counties, and for IMGW to sign agreements concerning closer cooperation with county crisis intervention forces. For it turns out that though meteorological forecasts for local needs should contain—just as for other users—quantitative precipitation forecasts and air temperature, as well as speed and direction of wind, they should, however, be decidedly more detailed. For a hydrological forecast for a smaller area, the basis should be a quantitative forecast of the 24-hour precipitation sum together with its time distribution, as well as, during the thawing season, a forecast of any significant warming.

Such a specialized weather forecast is a dedicated, detailed forecast for local authorities and entities responsible for flood protection, taking into account local conditions in the process of preparing the forecast, as well as the possibility of dividing the area into smaller units of similar character.

Expansion of the standard forecast prepared up until now comprises the following aspects:

- Time—division of the period of validity (time horizon) of the forecast into 6-hour periods, especially in conditions of danger from weather phenomena;
- Space—distinguishing of sub-areas with different weather conditions, and preparation of a weather forecast for them; the criterion for division could be altitude above sea level, topographic features, presence of geographic features which influence climatic conditions. An important factor for the purpose of properly selecting sub-areas is knowledge of archival data—the characteristics of floods which have occurred in the given area. This will permit definition of areas of similar type of weather conditions in terms of frequency and type of precipitation.

- Content—expansion of content with a quantitative precipitation forecast, forecasting of 24-hour sums and partial (e.g. 12-hour) sums; designation of areas in which various types of precipitation occur (rain, snow); forecasting of the altitude of occurrence of the 0º C isotherm (very important for spring thaw floods); in the future, an attempt to introduce information about the probability of occurrence of precipitation in given quantity classes. This requires appropriate preparation of both synopticians and forecast users.
- Formal—introduction of additional types of information transmitted in operational mode to users:
  - Text information published dependent on development of the flood situation: correction of forecasts or warnings during their period of validity; updating of a warning, if given for a period longer than 24 hours; messages about active storm areas;
  - Observation data from atmospheric detection systems, such as radar; data from the storm detection system with a time interval dependent on the weather situation—more often in flood hazard situations; data made available via a web client service system for authorized users (name of user and password).

It would also be necessary to check on the suitability of introduction and the usefulness, from a subsequent decision-making standpoint, of two levels of warning:

- Message about possible occurrence of an event, issued with greater lead time, but encumbered with greater uncertainty, drawing attention to a growth in probability of occurrence of heavy rainfall; it would be confirmed or called off, dependent on weather conditions
- Warning with shorter lead time, with greater certainty of occurrence of the event.

However, we should always keep in mind that this will cause a rise in the number of messages, of which a portion will be called off—in other words, in the user's assessment, inaccurate or false.

For purposes of preparing a precipitation forecast for a small catchment area, it is advisable to analyze cases of heavy precipitation which have occurred in the area being studied. This permits the catchment area to be divided into areas of greater probability of occurrence of precipitation in specific synoptic conditions, and a more detailed precipitation forecast to be made.

On this basis, four sub-areas of the Klodzko Valley have been distinguished, for which it is recommended to prepare a quantitative precipitation forecast: the Ścinawka River catchment area, the Bystrzyckie Mountains, the Snieżnik Massif, the Nysa Klodzka River Gorge.

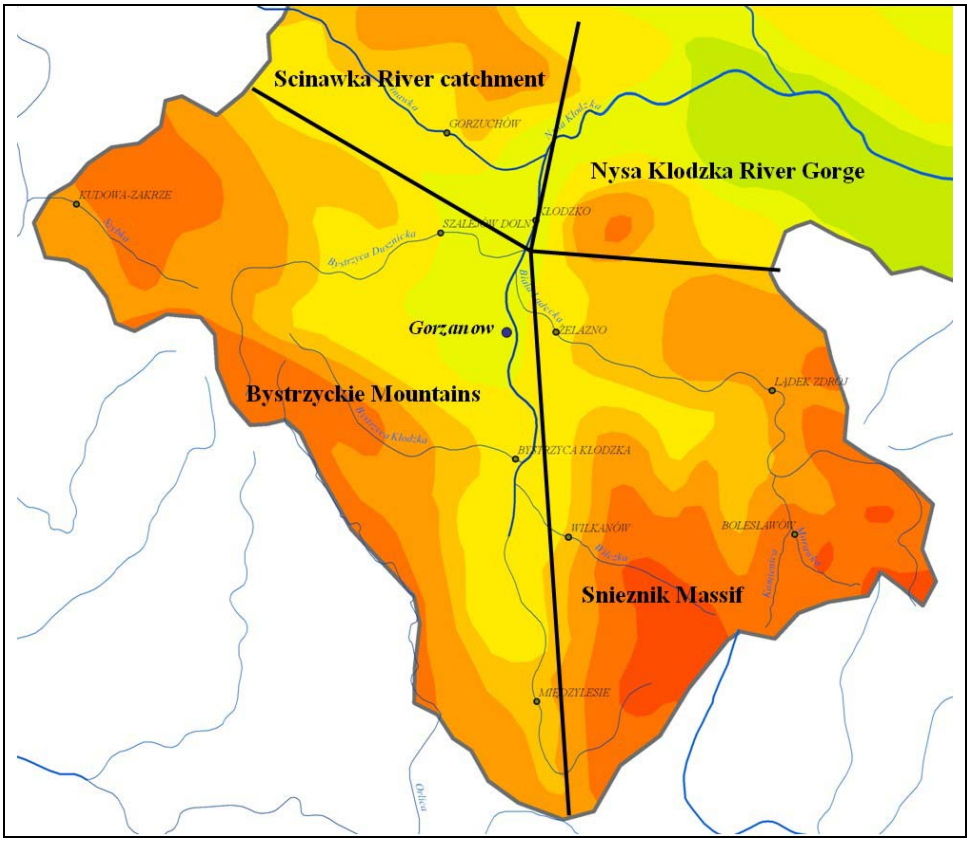



**Fig. 4 Division of the Klodzko Valley area into smaller sub-areas for which a forecasted precipitation sum is designated in the detailed forecast**

**Preparation and programming for transmission of the specialized quantitative precipitation forecast for the Klodzko Valley**

In operational work, the synoptician issues a forecast based on analysis of data from several numerical models (the Polish meteorological works on the basis of results from three models: DWD, COSMO, ALADIN). For experience shows that in conditions of stable weather, the forecasts from the different models are in agreement. However, in a situation of danger from extreme weather phenomena, the results are characterized by an enormous lack of uniformity in the time and place of occurrence, as well as the magnitude of the event. Knowledge of local conditions permits the synoptician to correct the numerical forecast. Comparisons being carried out between forecasts from models and forecasts prepared by a synoptician show that the human-authored ones are more accurate.

The specialized quantitative precipitation forecast is a proposal for the utilization of results from a synoptic meteorologist's experience with verification of forecasts from the mesoscale model. Synoptic meteorologists, using analysis of various information sources, as well as results from various available models, made an attempt to verify a quantitative rainfall forecast. This is a very difficult task, if we look at it as a process taking place in real time. Thus, it became necessary to make certain decisions in the direction of simplifying preparation as well as delivery of this forecast. It was assumed that the forecast will encompass six-hour precipitation sums for four separate areas of the Klodzko Valley, with a horizon of 48 hours (8 values for each area). Another important assumption was the adoption of the time distribution from the mesoscale model as the basis for the distribution of six-hour sums prepared by the synoptic meteorologist from IMGW Wroclaw.

To facilitate preparation of specialized forecasts, as well as their transmission to the hosting server, a simple application called WPIS_PROGNOZY was prepared.

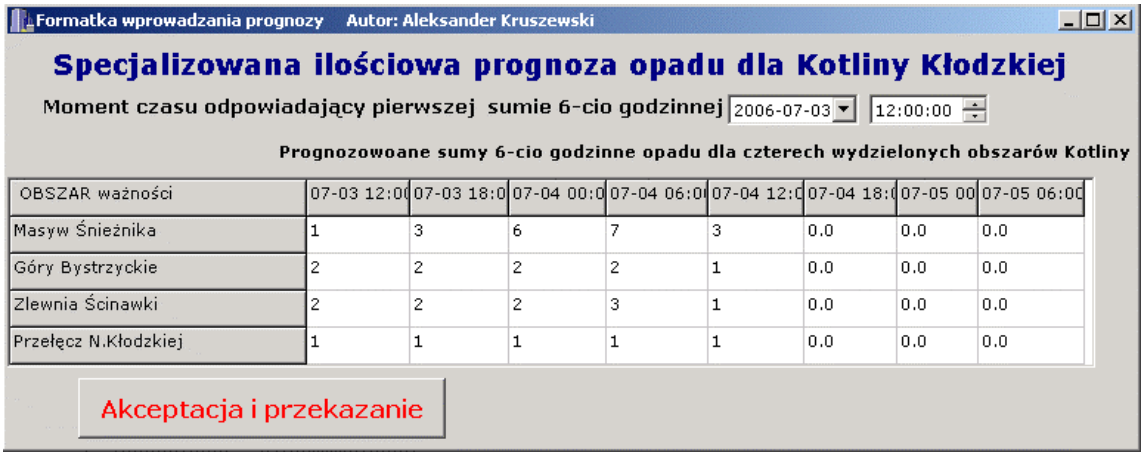



**Fig. 5 The WPIS_PROGNOZY application for recording and transmission of specialized forecasts prepared at the IMGW Wroclaw Forecasting Bureau.**

The application tested at the end of June caused no problems, and the results transmitted to the IMGW hosting server were recorded in the FLO_INFO application database in a proper manner. Still to be considered is the SH administrator's suggestion to utilize a forecast file identification which includes the moment at which the forecast was made (to enable automatic verification of the specialized forecast).

### 2.3 To set up the FLO-INFO decision-making assistance program, based on a precipitation-runoff model, for the local monitoring network already built in the Klodzko Valley

#### 2.3.1 Calibration of parameters for the precipitation-runoff model, taking into account measurement data from the local network

The precipitation-runoff model used in the FLO_INFO software was calibrated on historic data sequences from the years 1970–1997. These data came from IMGW's traditional network of hydro-meteorological stations, whose quantity was significantly less than that of the planned network of local flood monitoring system. On account of the manner of collection and storage of observation results, a 24-hour time interval was used for information about precipitation, supplemented during flood waves by 3-hour precipitation sums. Water levels (flow volumes) at the majority of stations were recorded at 06.00, 12.00 and 18.00 UTC, supplemented during flood periods with additional measurements so as to obtain observations every 3 hours.

The building of the network of local flood monitoring system permitted measurements and data transmission at shorter (15-minute) intervals. For this reason, after the initial period of exploitation, it was appropriate to carry out additional calibration of the model, taking into account the following assumptions:

- The basic time interval is 1 hour
- Differences in precipitation measurement for the network of local flood monitoring system do not diverge from the precision and resolution assumed by IMGW for these devices
- Rating curves for IMGW profiles can be applied to network of local flood monitoring system (river gauges) without any reworking whatsoever.

No changes were made in the structure of the model or in the applied methods of hydrological processes; only calibration on five episodes recorded in the network of local flood monitoring system was carried out. These concerned the years 2003, 2004 and 2005.

For this purpose, it was necessary to designate flood wave time periods and process the measurements gathered at the County Government Office in Klodzko, kept in historic collections. The next action taken was verification, consisting of visual agreement between the water level hydrographs from the network of local flood monitoring system and from IMGW's basic system.
The selected data sequences were prepared for recording in the existing database of the FLO_INFO application, which, equipped with the appropriate procedures, prepared input data for the HEC1 program.

The calibration, carried out via the trial and error method, improved the modeling results to a small degree, because the available observation results did not cover even a part of the scope of the potential variability in water levels.

Another problem was that the flood waves available for selection took place in late spring, when the increased flow volume is enlarged by melt water, and the modeling methods adopted are based on increases induced by rainfall.

While calibrating the model parameters, the need to update threshold values (water levels and precipitation), signaling a flood hazard, was considered. Since the model did not change its structure, i.e. division into sub-catchment areas and the associated cross sections for which a hydrological forecast is produced, and crisis management specialists did not signal any need to change the threshold values, the previous values were left in place. Only in connection with the installation of a staff gauge in Gorzanow, with the aim of serving the local volunteer fire brigade, could we consider establishing threshold values for this profile in the future. The possibility of utilizing them in the FLO-INFO application is, however, conditioned upon preparation of a gauge relation permitting water levels in Gorzanow to be forecasted on the basis of levels on river gauges included in the precipitation-runoff model. However, it should be remembered that the staff gauge installed in Gorzanow is not an element of either the local network or the nationwide network, which could make preparing the gauge relation difficult.

### 2.3.2 Modification of the FLO-INFO program with a tool for analysis of scenarios for distribution of forecasted precipitation other than the ones presently existing in the program

**Expansion of FLO_INFO module with a module for acquisition of additional measurement data and forecasts**

The FLO_INFO application underwent important internal changes because of the new possibility of completely changing over to a measurement time interval of 1 hour or even less. A second reason for the updating were the new information sources represented by IMGW telemetric data (previously, only local flood telemetry was supported), LM_COSMO numerical forecasts from IMGW, as well as specialized precipitation forecasts prepared by synoptic meteorologists from IMGW Wroclaw.
For proper use of the new data collected on the hosting server at IMGW, a new manual procedure for downloading of current forecast and observation results was prepared. Potential use of the automatic procedure will take place after completion of tests which will accept or reject such a course of action. This is connected to the practical utilization of the FLO_INFO application.

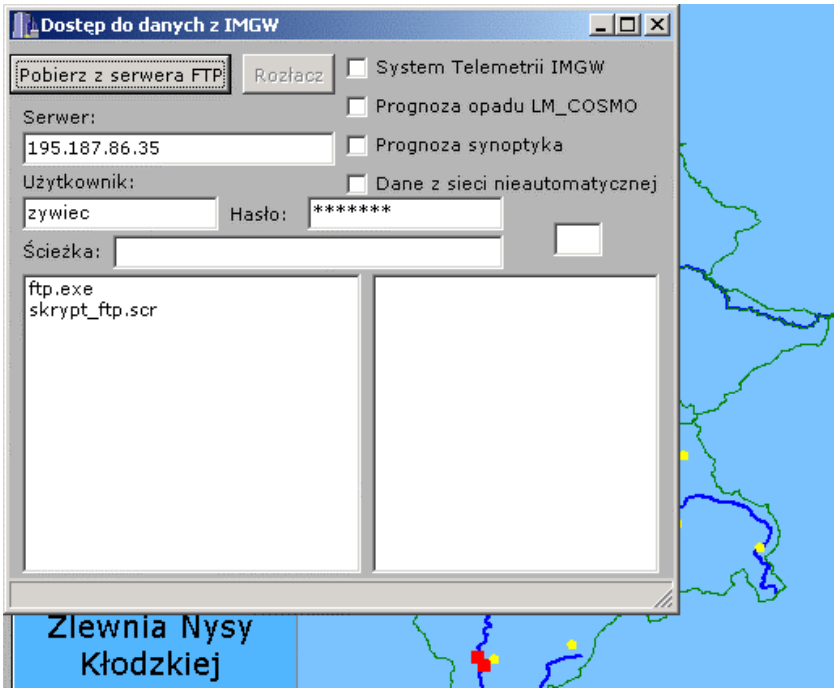



**Fig. 6 Main panel of module for access to hosting server, as well as control of recording of measurement and forecasting results from the FLO_INFO application.**

The test usage of the data acquisition module confirmed its suitability and correctness of recording, as well as of downloading of measurement and forecasting time series. Information about what kind of data, from which file in OSIRIS XML format they were accepted and recorded in the database, is stored in the daily log.

An unsolved problem for the entire FLO_INFO application is the storage time of operational data, the manner of their removal (automatic, manual), as well as the place and manner of recording of removed data.

**Addition to the FLO_INFO application of a scenario for forecasted precipitation based on verified precipitation forecasts from the mesoscale model**

As a result of the above-described tasks, there arose a natural need for an important addition to the forecasting portion of the FLO_INFO application, in the form of a precipitation forecast scenario of the verified specialized forecast obtained from the mesoscale model. For this purpose, in place of the old 'manual entry' option, the LM_COSMO scenario was introduced:

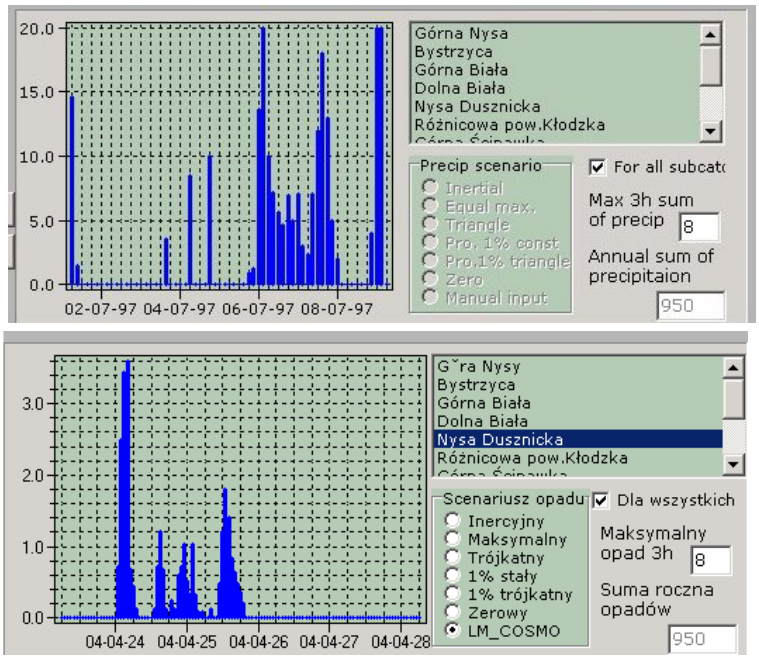
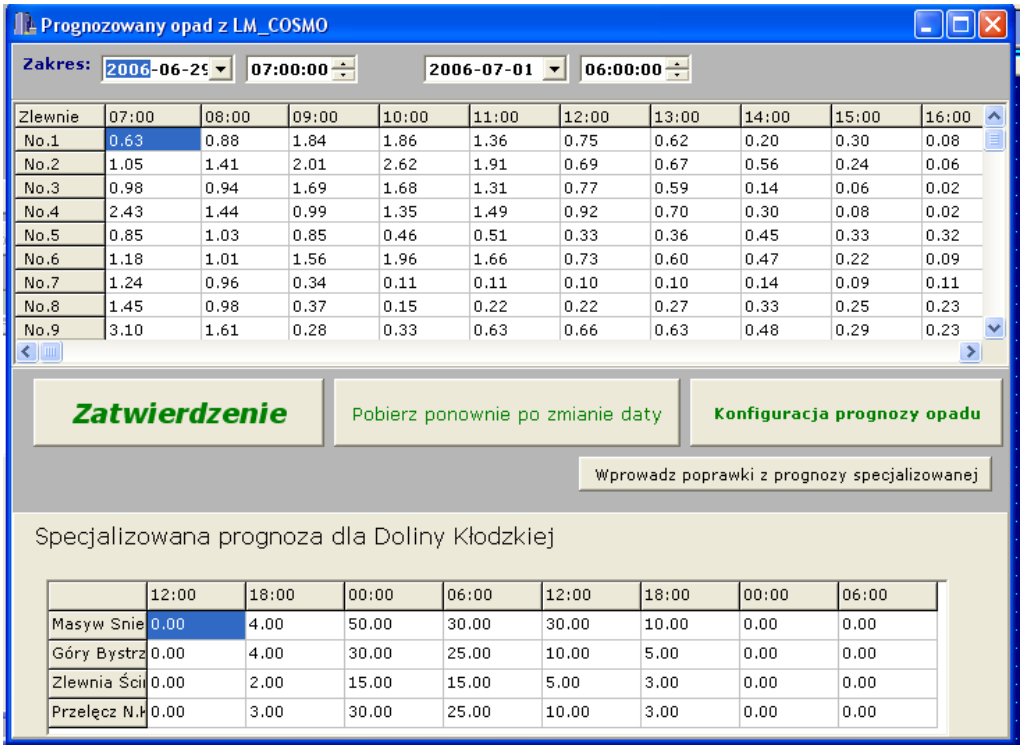



**Fig. 7 List of scenarios for former and most recent versions of the FLO_INFO application.**

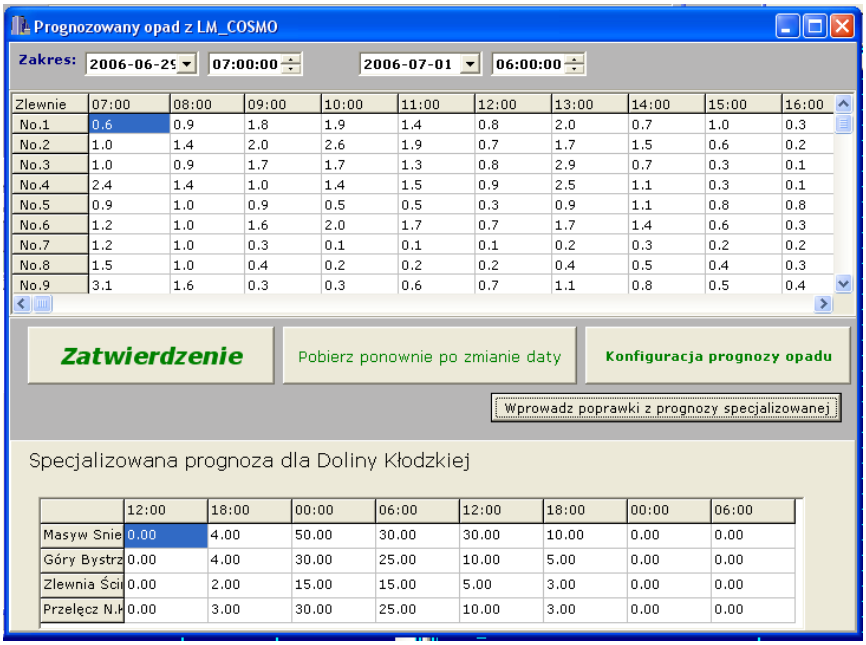
Selecting the new LM_COSMO option causes automatic downloading of forecasts results for the JOHs within the Klodzko Valley from the database, downloading of the specialized forecast, and provision of access to a form which can be utilized to enter a scenario 'by hand' if there are any gaps in data essential for the forecasting process.




| Zlewnie | 07:00 | 08:00 | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 |
|---|---|---|---|---|---|---|---|---|---|---|
| No.1 | 0.63 | 0.88 | 1.84 | 1.86 | 1.36 | 0.75 | 0.62 | 0.20 | 0.30 | 0.08 |
| No.2 | 1.05 | 1.41 | 2.01 | 2.62 | 1.91 | 0.69 | 0.67 | 0.56 | 0.24 | 0.06 |
| No.3 | 0.98 | 0.94 | 1.69 | 1.68 | 1.31 | 0.77 | 0.59 | 0.14 | 0.06 | 0.02 |
| No.4 | 2.43 | 1.44 | 0.99 | 1.35 | 1.49 | 0.92 | 0.70 | 0.30 | 0.08 | 0.02 |
| No.5 | 0.85 | 1.03 | 0.85 | 0.46 | 0.51 | 0.33 | 0.36 | 0.45 | 0.33 | 0.32 |
| No.6 | 1.18 | 1.01 | 1.56 | 1.96 | 1.66 | 0.73 | 0.60 | 0.47 | 0.22 | 0.09 |
| No.7 | 1.24 | 0.96 | 0.34 | 0.11 | 0.11 | 0.10 | 0.10 | 0.14 | 0.09 | 0.11 |
| No.8 | 1.45 | 0.98 | 0.37 | 0.15 | 0.22 | 0.22 | 0.27 | 0.33 | 0.25 | 0.23 |
| No.9 | 3.10 | 1.61 | 0.28 | 0.33 | 0.63 | 0.66 | 0.63 | 0.48 | 0.29 | 0.23 |

| | 12:00 | 18:00 | 00:00 | 06:00 | 12:00 | 18:00 | 00:00 | 06:00 |
|---|---|---|---|---|---|---|---|---|
| Masyw Snie | 0.00 | 4.00 | 50.00 | 30.00 | 30.00 | 10.00 | 0.00 | 0.00 |
| Góry Bystrz | 0.00 | 4.00 | 30.00 | 25.00 | 10.00 | 5.00 | 0.00 | 0.00 |
| Zlewnia Ści | 0.00 | 2.00 | 15.00 | 15.00 | 5.00 | 3.00 | 0.00 | 0.00 |
| Przełęcz N.K | 0.00 | 3.00 | 30.00 | 25.00 | 10.00 | 3.00 | 0.00 | 0.00 |

After selecting the button ‘Enter corrections from specialized forecast’, the hourly precipitation sums for the catchment area (upper table) are corrected on the basis of the 6-hour sums of the synoptic meteorologist forecast (lower table). The results of the correction are shown in the figure below.




| Zlewnie | 07:00 | 08:00 | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 |
|---|---|---|---|---|---|---|---|---|---|---|
| No.1 | 0.6 | 0.9 | 1.8 | 1.9 | 1.4 | 0.8 | 2.0 | 0.7 | 1.0 | 0.3 |
| No.2 | 1.0 | 1.4 | 2.0 | 2.6 | 1.9 | 0.7 | 1.7 | 1.5 | 0.6 | 0.2 |
| No.3 | 1.0 | 0.9 | 1.7 | 1.7 | 1.3 | 0.8 | 2.9 | 0.7 | 0.3 | 0.1 |
| No.4 | 2.4 | 1.4 | 1.0 | 1.4 | 1.5 | 0.9 | 2.5 | 1.1 | 0.3 | 0.1 |
| No.5 | 0.9 | 1.0 | 0.9 | 0.5 | 0.5 | 0.3 | 0.9 | 1.1 | 0.8 | 0.8 |
| No.6 | 1.2 | 1.0 | 1.6 | 2.0 | 1.7 | 0.7 | 1.7 | 1.4 | 0.6 | 0.3 |
| No.7 | 1.2 | 1.0 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 |
| No.8 | 1.5 | 1.0 | 0.4 | 0.2 | 0.2 | 0.2 | 0.4 | 0.5 | 0.4 | 0.3 |
| No.9 | 3.1 | 1.6 | 0.3 | 0.3 | 0.6 | 0.7 | 1.1 | 0.8 | 0.5 | 0.4 |

| | 12:00 | 18:00 | 00:00 | 06:00 | 12:00 | 18:00 | 00:00 | 06:00 |
|---|---|---|---|---|---|---|---|---|
| Masyw Snie | 0.00 | 4.00 | 50.00 | 30.00 | 30.00 | 10.00 | 0.00 | 0.00 |
| Góry Bystrz | 0.00 | 4.00 | 30.00 | 25.00 | 10.00 | 5.00 | 0.00 | 0.00 |
| Zlewnia Ści | 0.00 | 2.00 | 15.00 | 15.00 | 5.00 | 3.00 | 0.00 | 0.00 |
| Przełęcz N.H | 0.00 | 3.00 | 30.00 | 25.00 | 10.00 | 3.00 | 0.00 | 0.00 |

**Fig. 8 Use of forecast results from LM_COSMO, the specialized forecast of the synoptic meteorologists from the Meteorological Forecasting Bureau in Wroclaw—image before and after making of corrections. An option to make corrections entered by hand is available.**

The button ‘Zatwierdzenie’ [‘Confirm’] causes the required scenario to be prepared, and enables forecasting calculations taking it into account to be conducted. One example is shown below.

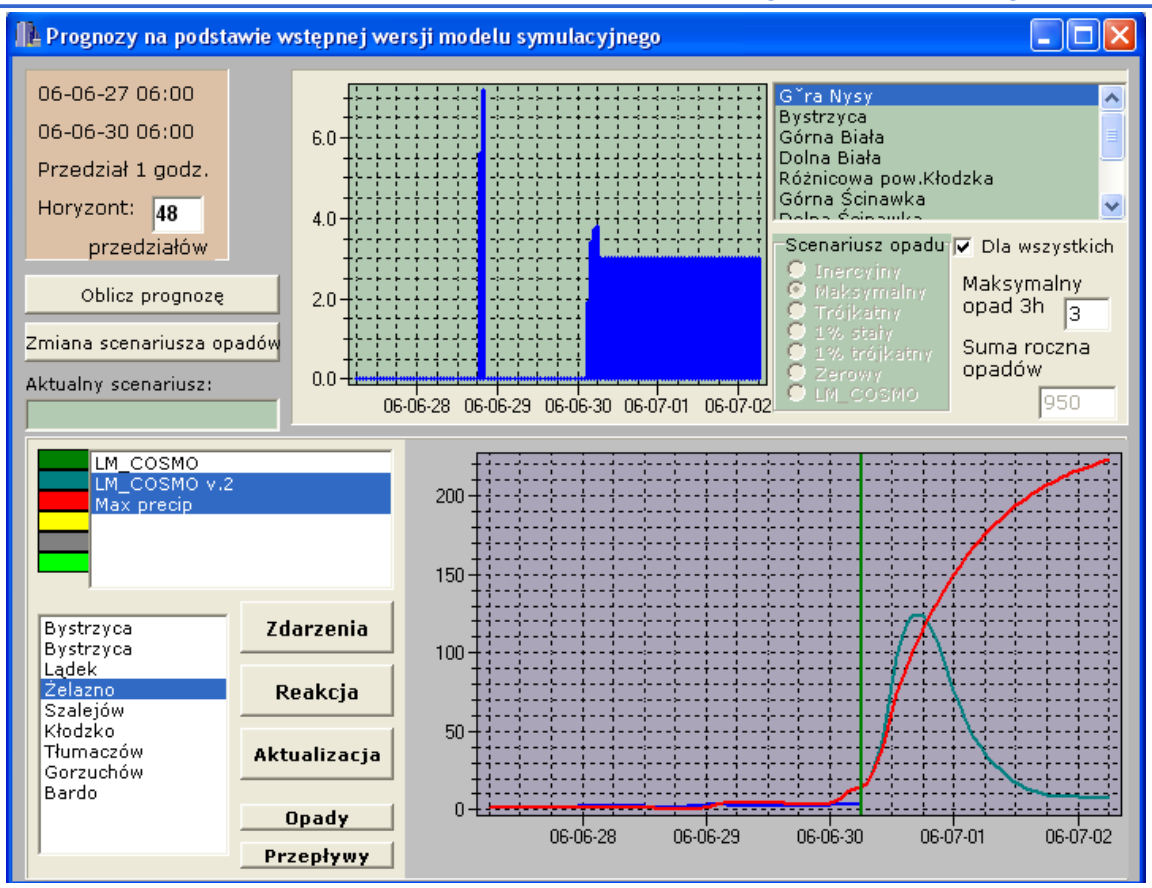



**Fig. 9 Example of calculated forecast variants.**

## 2.4 Tests of the warning assistance tool

**Testing of the FLO_INFO application, as well as ancillary applications in operation at IMGW—initial phase**

The initial phase includes tests conducted up to the moment of the project's completion. Their aim was mainly to verify the formal correctness of operation of the new or modified tools. Information about test results has been placed in the descriptions of the individual software elements. Below is a short summary of the initial phase of testing.

Testing of the FLO_INFO application was carried out in the area of those modules and procedures which underwent at least partial updating associated with taking into account the new parameters of the precipitation-runoff model, as well as with downloading IMGW telemetric system measurement results. Emphasis was placed on new procedures associated with interpretation of new data types, as well as with cooperation with the IMGW hosting server.

The application prepared for preparation of the export of IMGW telemetric system measurements was tested at DCS Krakow, Krosno and Klodzko. The longest period was in Krakow—2 months. All tests came out positively.

The application prepared for recording and transmission of the specialized forecast was tested at the IMGW Wroclaw Meteorological Forecasting Bureau; however, the application for exporting of results from the 'meteorological pre-processor' was tested first at IMGW Krakow, and then at the IMGW Wroclaw target location.
All tests came out positively, and the minor reservations in the final version of the application were removed.

**Testing and assessment scenario for after completion of the project**
As part of the APFM project, a concept was prepared for the creation of a dedicated specialized precipitation forecast for local government authorities and entities responsible for flood protection, and tools enabling its realization and utilization by the County Government in Klodzko were prepared. This work is based on IMGW experiences from cooperation with local governments, as well as being an attempt to utilize the effects of the modernization of the PSHM to prepared new products adapted to local needs. These solutions are of prototypical character, and their preparation was conducted with IMGW's own involvement. Assessment of their usefulness requires a longer period of testing. Thus, a decision was made that the solutions described above will be used in the everyday work of the meteorological and hydrological forecasting bureaus in Wroclaw during the period of July–September 2006, and forecasts will be transmitted to the County Government Office in Klodzko. A declaration of everyday utilization of these data and mobilization of FLO-INFO was also undertaken by the county crisis response center at the County Government Office in Klodzko. After this period will follow an assessment of the new products and a decision concerning their future.

Essential for success in implementing the detailed forecasts is the adoption of good practices which will contribute to improvement in forecast quality:

- Thorough analysis of each case of heavy rainfall within the catchment area, according to a specified scheme, will enable—after completion of the rain and flood season—comparative analysis and preparation of directions for utilization in forecasting;
- Creation of a catalog of experiences associated with the effect of local conditions on the process of individual meteorological elements and their deviation from conditions implied by general forecasted weather conditions (e.g. growth in wind speed from specific directions, despite a lack of gradient conditions);
- Assessment of radar data and comparison with measurements from rain gauges;
- Utilization of radar hydrological products, data from the nowcasting system (NIMROD), data from specialized applications for estimation of precipitation quantity on the basis of radar data, in order to correct precipitation forecasts in operational mode.

It is very important to receive feedback from detailed-forecast users, which will permit determination of the target level of detail and lead time for the forecast. Aside from the process of 'tuning' forecasts to local needs, it is also necessary to provide for periodic training programs for users. The reason this is so important is that proper utilization of a precipitation forecast requires preparation of users from the viewpoint of interpretation and assessment of data. It would also be necessary in the future to consider designating the degree of uncertainty in the forecast or designation of the probability of occurrence in a given area of the individual classes of precipitation amount, estimated on the basis of results from the various forecasting models and the synoptic forecast. At the present level of end-user education, this type of information may not meet with understanding and proper interpretation.

# 3. To prepare and implement procedures for warning inhabitants of the village of Gorzanow, as an element of the Local Flood Damage Mitigation Plan

## 3.1 Village of Gorzanow

Gorzanow is a large village on the Nysa Klodzka River, lying approx. 7 km from Bystrzyca Klodzka and 10 km from Klodzko. Within the village are located 214 residential buildings, inhabited by nearly 1000 persons (as of 2006). Among those who are professionally active, approx. 10–15% are farmers; 20–30 % work in small and medium-size enterprises in Gorzanow or the vicinity. A sizeable portion of the community does not work—approx. 14%.

In historic sources, the town was mentioned for the first time in 1341 as Arnoldisdorf. In 1670, it received the name Grafenort; and after 1945, Gorzanow. For many reasons, it has been and still is considered to be one of the prettiest and most interesting towns in the Klodzko area. Besides its historic buildings (castle ruins, Baroque church), another factor contributing to its popularity was the discovery of its mineral springs in the second half of the 19th century.

Within Gorzanow, a number of factories are active. There are also a few shops, a primary school, a medical center, a post office, a train station, a public library, a Volunteer Fire Brigade station, a café, a mill, a small hydroelectric generating station (under construction) and a religious convent.

For such a small town, a relatively large number of societies and associations are active. Among the most active are: the Village Council, the Village Homemakers' Circle, the Zamek Sports Club, the Society of Friends of Gorzanow.

## 3.2 Flood losses in Gorzanow

### 3.2.1 Historic floods of the Nysa Klodzka

The majority of the floods which have occurred in this area have been mentioned by Polish, German and Czech chroniclers already since the 10$^{th}$ century. The first records of a flood in the Klodzko area come from **26 July 1310**. According to chroniclers, this is what happened:

*On the second day in Klodzko, the entire suburban area of the town went under water, so that nearly two thousand people drowned. Many wild animals were seen floating on logs, here and there even entire homes with people and cradles with live children; the water did great damage and many villages and persons were submerged.*

The flood in 1310 carried off 310 homes and damaged 520 homes, as well as destroying 123 bridges. The water level took two days to return to normal.

Among the nearly seventy documented floods known today, the largest are those from 1310, 1598, 1783, 1854, 1883, 1903, 1938, 1997 and 1998.

### 3.2.2 Losses caused by the flood in 1997

The flood in 1997 was the largest one still remembered by people here, and the largest in the preceding hundred years.

**Details of flood losses and damage**

*Number of private homes inundated*: 81 residential (including one completely destroyed), 100 farm buildings (including 3 completely destroyed)

*Number of public utility buildings inundated*: House of Culture, post office, Volunteer Fire Brigade building, two residential buildings owned by the municipality.

*Other structures inundated*: mineral water bottling plant, waffle factory, mill, 2 shops

*Surface area of agricultural lands inundated*: 135.17 ha (belonging to over 70 farmers)

*Surface area damaged (destroyed)*:

- 3000 $m^2$ of County roads,
- 47 200 $m^2$ of municipal roads,
- 15 000 $m^2$ of agricultural transport roads.

*Number of washed out/damaged bridges:* 2 washed out (including one footbridge), 2 damaged.

*Number of persons evacuated*: according to the Volunteer Fire Brigade, 30 persons were evacuated during flood protection operations.

*Infrastructure elements destroyed*: telecommunications, power and gas lines; water and sewer networks; lighting.

Combined losses in Gorzanow amounted to approx. 13.2–18.6 million zloty (depending on the source—among others, the Municipal Government Office in Bystrzyca Klodzka).

*Source: Information concerning the flood in 1997 in Gorzanow was prepared on the basis of the Master's thesis written by Adam Olczyk. Information about losses in this thesis come from the City and Municipal Government Office in Bystrzyca Klodzka.*

### 3.2.3 Digital flood risk map for the village of Gorzanow

During analysis of source materials and field research, a certain set of information was gathered, picturing flood risk in the village of Gorzanow with the spatial reference of this information on analog (paper) maps. From the County Geodesic and Cartographic Documentation Center in Kłodzko, layers of a digital map coming from the cadastral map were also obtained. This made it possible to collect and standardize these materials in digital map form.

The material collected encompasses the area within the administrative boundaries of the village of Gorzanow, and contains background information encompassing outlines of land parcels, roads and buildings, rivers, administrative boundaries, information concerning the flood in 1997 as well as the 10-year and 100-year floods, and, as supplementary information, raster layers. Figure 10 below shows the scope of the area being worked up.

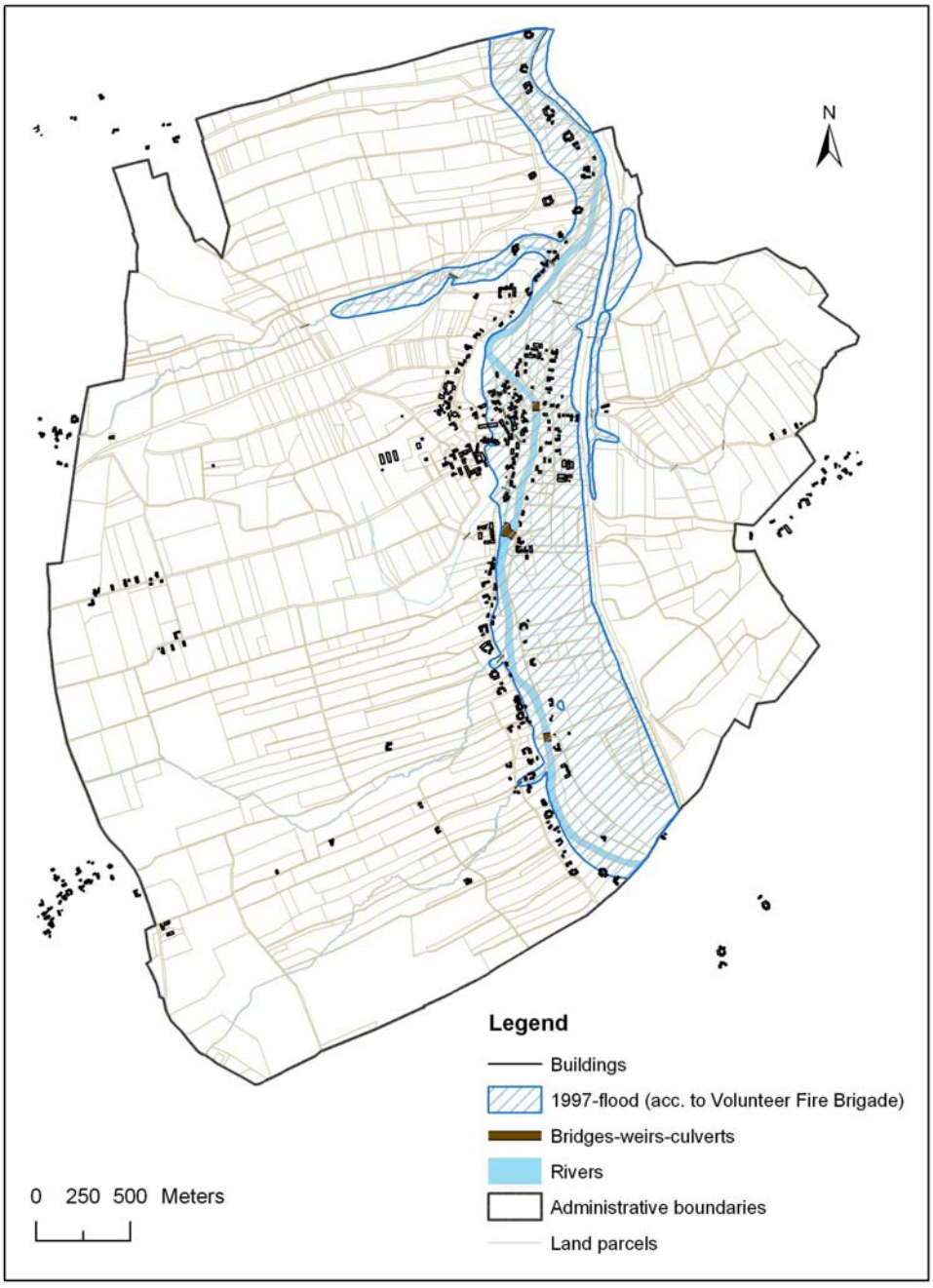



**Fig. 10 Scope of digital map for Gorzanow**

The aim of preparing the map was to create the possibility for comparative analyses of information collected from various sources, as well as for conducting analysis of flood hazards for the village of Gorzanow. It is also an information resource potentially useful in preparing and implementing the flood protection plan for Gorzanow. According to the authors' intentions, it is to serve as a means for information exchange and as material to aid in discussion and coordination within the team realizing the project. The map's informational content is not closed and, if necessary, can be supplemented.

The digital map prepared allowed the collected materials to be compared and verified. From comparison of the floodplain borders from the flood in July 1997, it can be seen that the extents of inundation determined on the basis of hydraulic modeling results, differ significantly from those prepared on the

basis of a field survey (conversations with inhabitants) conducted by members of the Volunteer Fire Brigade (OSP) in Gorzanow (See Fig. 11).

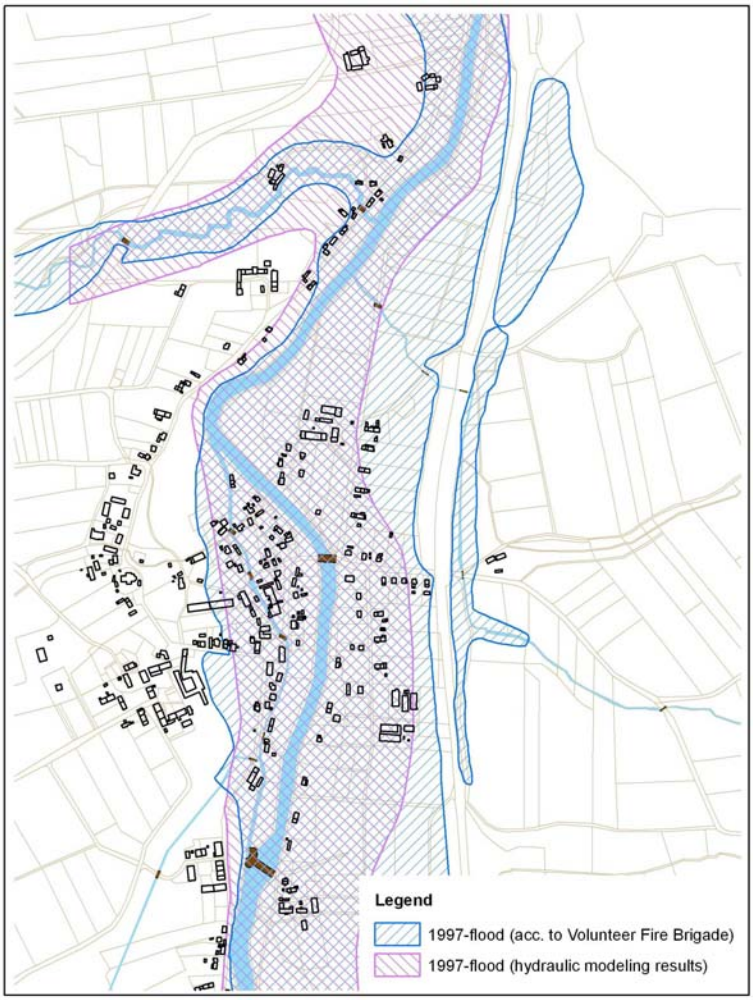



**Fig. 11 Gorzanow village center—comparison of extents of inundation for the flood in 1997**

This is not surprising. Modeling results always differ from reality—and beyond this, the degree of detail of analysis, for example, of the maps utilized in the two cases, differed to an essential degree. Beyond this, the OSP, in gathering information about the extent of inundation, did not limit itself to the effects of flood waves on the Nysa Kłodzka, but rather also took into account its small tributaries, places with no drainage, etc. The results of the comparison confirmed the mapmakers in the conviction that in micro-scale analyses, as in the case of Gorzanow, detailed interviewing in the community is key to diagnosing hazards. The extent of inundation obtained as a result of surveying inhabitants seems credible, because the amount of time that has passed since the flood is not very long. Thus, after resolving doubts, the extent of inundation determined by the OSP was adopted as the basis for work.
Utilizing the data collected, simple spatial analyses were also performed to answer the question of how many and what kind of buildings are located in the flood plain area designated by OSP officers as the extent of inundation from 1997.

The map, whether in the form of a paper printout or in digital form, accompanied by GIS tools, has become a means of communication with the local community, especially with the active portion of the community which is taking part in realization of the project. As an effect of this cooperation, new information layers have appeared on the map, associated with the local flood response plan, such as places of residence of flood wardens, evacuation points and routes. The digital data collected have also

served the purpose of preparing informational materials for the local community (flyers concerning the evacuation plan, as well as wall maps for the school and the House of Culture).

Access to the collected layers of the digital map requires utilization of an appropriate tool. This can be a GIS package; then it is possible not only to view the map, but also to carry out advanced spatial analysis. On the other hand, it is possible to utilize this information with the aid of more modest tools such as, for example, simple GIS browsers. Their capabilities are more limited, but they are free and do not require a professionally-prepared user.

### 3.3 Problems to be solved

In Gorzanow, as part of the project, many analyses were carried out, whose aim was to diagnose hazards and causes of flood losses. Among them were: analyses of documents concerning the flood in 1997, surveys conducted among those affected, conversations conducted with both inhabitants and local services/forces, field visits. The problems identified in this manner are described below.

#### 3.3.1 Insufficient maintenance of the Nysa riverbed

Reduction in riverbed depth—According to inhabitants, the riverbed was formerly more compact and deeper. The last flood definitely contributed to a reduction in its depth, but this applies only to short segments of the river, because outcroppings occurring every few hundred meters stabilize the riverbed depth in a natural manner.

Lateral erosion of riverbed—There are places in the center of the village where the riverbed has shifted to the left, as is shown by the exposure of the structure of the well on one of the farms. Failure to solve this problem will in the future cause losses on farms located near the riverbed.

#### 3.3.2 Clogging of tributary streambeds

Siltation of the mill stream—The mill stream flowing through the village represents an important element in the drainage system for the center of the town. Unfortunately, free flow of water is limited by sand clogging the streambed, as well as by trash thrown into by local inhabitants. In consequence, during the spring thaw and summer rains, it is a source of risk for homes located in the vicinity.

Culvert (Gorzelniany Stream)—The culvert built for the Gorzelniany Stream under the road is so small that every time there is any significant increase in flow volume, it is blocked by rocks and branches brought in by the water. The water then overflows onto the road and into the palace park, causing water to seep into several surrounding homes, as well as into the Volunteer Fire Brigade building.

#### 3.3.3 Bad condition of hydro-technical equipment

Limited water flow below the mill dam—Every few years, below the mill dam located in the center of the town, an island forms from rocks and gravel and limits free flow of water in the riverbed. This undoubtedly has no influence on the size of large floods; however, it could be significant for small and medium-size floods.

Missing fragment of embankment—In the center of Gorzanow, the Nysa River is only partially embanked on the left side (from kilometer 142.5 of the river and upwards). A segment of embankment several dozen meters in length was in the past either washed out, or dug out—presently only traces of it remain. In 1997, this was one of the reasons for the influx of water into the center of the town.

#### 3.3.4 Ineffective warning and response system

Lack of effective means for warning inhabitants—Quite detailed research conducted in 2002 shows that only 30% of inhabitants were warned in an official manner that a flood was approaching. Many of them were warned so late that they were not able to respond appropriately.

Lack of evacuation points—In Gorzanow, there are no designated evacuation points for persons, animals

or machinery. In 1997, evacuated persons were taken to Bystrzyca Klodzka, a few kilometers away, but they returned from there immediately for fear of their property and loved ones.
Both of the elements mentioned above could be a cause of people's unwillingness to evacuate. In 1997, only half of inhabitants evacuated together with their families (about 22% of respondents remained with their family at home). This created many situations very dangerous to human life, as well as difficult for crisis intervention forces and the fire brigade.

### 3.3.5 Little knowledge and awareness of inhabitants

Lack of knowledge that they live in a flood plain area—Surveys show that for half of the inhabitants studied, the flood in 1997 was a surprise. Only 58% knew that their homes were built in flood plain areas.

Lack of belief in the possibility of loss mitigation—Inhabitants studied consider that it is mainly the municipality which contributes to the mitigation of losses (70% of respondents). They rate their own influence very low: only 11% consider that they can, to a moderate or large extent, mitigate losses via flood preparedness.

Lack of trust in the existing system and services/forces—Nearly all inhabitants consider that the existing system does not protect them from losses. They also view the knowledge of experts in the area of flood and flood damage forecasting very skeptically. The surveys show that they rely more on their own knowledge and experience.

## 3.4 Flood damage mitigation for gorzanow—basic elements

It is easy to notice that the problems discussed in the previous chapter will not be resolved by the local community alone, for many of them lie within the sphere of responsibility of water – related institutions, as well as local or central government administration.

### 3.4.1 Agreement in the matter of realizing the plan

For this reason as well, in 2004 on the initiative of IMGW, several institutions concluded an agreement in the matter of preparing a flood damage mitigation plan for Gorzanow. These were the following institutions: the Institute of Meteorology and Water Management in Wroclaw, the Regional Water Management Board in Wroclaw, the County Government Office in Klodzko, the City and Municipal Government Office in Bystrzyca Klodzka.

The subject of the agreement is the preparation and testing of a methodology for preparing local flood damage mitigation plans for small localities, because the partners in the agreement are interested in propagation of local activity, in cooperation of many institutions, which should lead in the future to flood damage mitigation.

It has been assumed that the directions contained in the European Commission document entitled *Best practices in protection, prevention and mitigation…*, aimed at mitigating flood losses, should be included in the plan. It was established that the plan should include:

- Preparation of flood maps
- Limitation of development in flood plain areas
- Securing of structures (buildings, etc.)
- Direct, appropriately early warning of inhabitants
- Ensuring of the local community's appropriate response to warnings
- Organization of aid after a flood.

In the agreement, it was established that decision-making competencies in these operations will be given to a coordinating team comprised of persons authorized and equipped with appropriate decision-making rights by the co-signers of the agreement.

Planning work will be undertaken by a planning team comprised of representatives of individual institutions and representatives of Gorzanow's inhabitants.

Documentation and preparation of guidelines enabling the preparation of a standard plan will be undertaken by IMGW.

### 3.4.2 High-priority problems to be solved

The first stage of work completed as part of the APFM project, with a working title of 'problem diagnosis', permits us to establish which problems in Gorzanow require solving in first order of priority.

**Improvement in safety measures for rivers and streams**—this should include cleanup of the Nysa Klodzka riverbed (deepening, securing from lateral erosion), as well as hydro-technical structures such as culverts under roads; unclogging of the mill stream, etc. This task will be resolved jointly with the Regional Water Management Board in Wroclaw.

**Improvement of safety measures for buildings in flood plain areas**—this should include, above all, improvement in structure owners' knowledge in the area of small-scale safety measures which could mitigate their losses during future floods. Among such actions are: utilization of appropriate building materials, installation of backflow valves on the sewer system, securing of entrance doors and basement windows, removal of garages built below ground level, etc.

**Improvement in operation of flood warning system**—this should include precise description of competency areas of local government administration in the area of warning, methods for effectively reaching inhabitants with warnings, methods of verifying their responses to warnings.

**Improvement of inhabitant response to warnings**—this should include analysis of possible locations for evacuation points for equipment, animals and persons in Gorzanow proper, as well as ensuring that all entities at risk are reached with this information.

**Improvement of inhabitant knowledge**—this should include establishment of the scope of knowledge and information which inhabitants at risk should possess in order to respond to a hazard situation in the appropriate manner. Another important problem is finding means of education and information utilizing local capabilities, as well as adapted to the financial resources of the community.

In consideration of the APFM project, the four last tasks were considered highest in priority, although the main emphasis was laid on solving problems in warning inhabitants.

The main role in this work was played by a team comprised of inhabitants of Gorzanow (village administrator, representatives of the village council, representatives of the Village Homemakers' Circle and the Society of Friends of Gorzanow), as well as employees of the municipal response team from Bystrzyca Klodzka and of the County Government Office in Klodzko.

## 3.5 Warning as the basis for mitigating risk to life and property of gorzanow inhabitants

### 3.5.1 Description of existing warning system

Two phases can be differentiated in the development of the warning system: before the flood in 1997, and afterwards up to the present day.

The flood in 1997 showed that the warning system was completely ineffective. Only in a few places did information about the approaching hazard reach inhabitants; few people, as well, were able to evacuate their property. This is also shown by the results of surveys conducted in Gorzanow.

In practice, the warning system operated in the following manner:

- IMGW, on the basis of precipitation and water level measurements, sent warnings to provincial flood protection committees, which in turn issued a flood warning in municipalities;
- Municipal flood protection committees made decisions about further actions.

Unfortunately, a lack of precise information about the flood wave's time of arrival and its size caused committees to wait until the last minute with the decision to evacuate. In consequence, in the Klodzko Valley, only the mayor of Bystrzyca Klodzka made a decision to evacuate some of its inhabitants.

Theoretically, information should have reached inhabitants via the volunteer fire brigade, which is present in every locality; in practice, however, information reached them so late that inhabitants were not notified, or it was done at the last minute.

This situation evoked, after the flood, a wave of criticism directed at the institutions responsible for warnings and response. In consequence, the region's authorities made the decision to build a local warning system for the Klodzko Valley, independent of IMGW; in practice, however, this was a local monitoring system. The subsequent inclusion of IMGW in the process of building this system, as part of the European OSIRIS project, enabled the expansion of the monitoring system with components which were in a position to transform it into a warning system. As part of this project were built:

- A prototype for the FLO-INFO software to assist the county government office team in the area of analysis of a flood situation within Klodzko County, which enabled the making of early decisions about warning inhabitants;
- A prototype for the Telephone-based Inhabitant Warning System (TSOM), permitting inhabitants of the Klodzko Valley to be warned in a short period of time.

As part of this project, much effort was put into improved organization of cooperation among county services and forces, IMGW and municipal services and forces. IMGW also undertook to transmit forecasts for the Klodzko Valley to the County Government Office. A preliminary concept for education was also prepared.

As the effect of joint work at the County Government Office in Klodzko, many elements were prepared which permit the building of an effective warning system. However, this required:

- Preparation of procedures for mobilization of the TSOM (division of competency areas between the county administrator and the mayor);
- Provision for an alternative (to the TSOM) effective manner of transmitting warnings to inhabitants;
- Implementation of multi-stage warning, whose aim would be to transmit warnings already at an earlier stage of the catastrophe. This was to enable resolution of the problem of forecast uncertainty;
- Preparation of a procedure, rules for collection and updating of telephone numbers of inhabitants at risk for the TSOM database;
- Training programs for employees of municipal centers in the area of utilization of the TSOM system;
- Education/information of inhabitants concerning rules of operation of inhabitant warning system.

Thus, it can be said that potential capabilities existed to notify inhabitants early enough so that they could make the decision to evacuate themselves. However, many steps had to be taken to enable this to be done in practice. The APFM project has enabled resolution of some of these problems.

### 3.5.2 Solutions effectuated as part of the APFM project

**Preparation of procedure for division of competency areas concerning warning of inhabitants between county and municipality**

The County Government in Klodzko utilizes the TSOM to warn inhabitants only to a limited extent. This results from legal conditions which designate the municipality as being responsible for warning of inhabitants. The county administrator, on the other hand, does not possess competency in this area. Notification or warning of inhabitants from the county level is only possible on the basis of local agreements between the county and municipalities.

Below is described the procedure concerning rules for implementation and use of the telephone system for warning of inhabitants (TSOM) for the purpose of informing inhabitants of all hazard situations, including flood hazards, within the municipality of Bystrzyca Klodzka. These rules, together with other provisions concerning the operation of the warning system in the Klodzko Valley, were included in the Agreement signed in April 2006 (as a result of the realization of this project) between the County Administrator of Klodzko County and the Mayor of the City and Municipality of Bystrzyca Klodzka.

**Rules for warning and usage of the TSOM**

Flood signals - Four types of flood messages to be sent to inhabitants and institutions at risk for inundation have been established:

- Flood watch—warning concerning atmospheric and hydrological conditions which could lead to the occurrence of a flood in towns lying within the boundaries of the municipality—Mayor of Bystrzyca Klodzka.
- Flood warning—warning concerning an inevitable flood which is to occur in towns lying within the municipality— Mayor of Bystrzyca Klodzka, Klodzko County Administrator in cooperation with Mayor of Bystrzyca Klodzka.
- Serious flood warning—warning of inevitable catastrophic flooding, requiring immediate evacuation of flood plain inhabitants and users from towns at risk—Mayor of Bystrzyca Klodzka.
- All clear—revocation of warnings when the danger passes, or when meteorological and hydrological conditions improve.

Division of competency areas. The following division of competency areas has been established in the area of information flow concerning flood hazard situations between the County Government in Klodzko and the City and Municipal Government of Bystrzyca Klodzka:

- The County Crisis Management Center (PCZK) is responsible for analysis of situations which could lead to a flood, based on information and data received from IMGW, as well as on data from the local monitoring system.
- The County Crisis Management Center undertakes to transmit information about the possible occurrence of a flood to the Municipal Response Center immediately upon receiving such a forecast from IMGW, or upon becoming convinced of the occurrence of a flood hazard based on its own analyses.
- The Municipal Response Team is obligated to transmit information to the PCZK concerning the warning received and actions taken in connection with the warning received, as well as the content of the message sent via the TSOM.

Execution of tasks. As part of the execution of tasks associated with the functioning of the telephone warning system, the County Government in Klodzko and the City and Municipal Government in Bystrzyca Klodzka have undertaken to conduct the following operations:

- The Municipal Response Center in Bystrzyca Klodzka will prepare an updated set of telephone number data once yearly, dividing it into crisis intervention forces and persons at risk for flooding in localities lying within the municipality, in a form concurred by both sides of the agreement;
- The County Crisis Management Center in Klodzko, on the basis of the sets of telephone number data for persons at risk for flooding, will update the telephone notification system database;
- The County Crisis Management Center in Klodzko will make the access codes for independent mobilization of the telephone warning system available to the responsible persons at the City and Municipal Government Office in Bystrzyca Klodzka;
- The County Government Office in Klodzko, at the request of the Mayor of Bystrzyca Klodzka, will organize training programs for designated persons from the City and Municipal Government Office in Bystrzyca Klodzka, in the area of utilization of the flood warning system.

Additionally, rules and obligations concerning information, education and training activities were established.

**Alternative notification system—volunteer flood wardens**

**Tasks of flood wardens**

Flood wardens work in constant contact with the local Volunteer Fire Brigade unit and with the municipal government office. Their basic tasks **when there is no flood** include:

- Identifying persons at risk, who should be informed (warned) of an approaching flood;
- Identifying persons requiring special assistance during evacuation or flooding (persons who are ill, living alone, of advanced age, etc.);
- Checking regularly (once annually) whether telephone numbers of persons at risk are up-to-date;
- Promoting knowledge concerning the local warning system, individual safety measures, as well as actions to be taken during a flood (including delivery of materials providing information and education in this area).

The basic tasks of flood wardens **right before and during a flood** include:

- Warning residents in their area, after receiving warnings from the County or Municipal Government Offices, about the possibility of a flood or the necessity to evacuate;
- Transmitting information to the Volunteer Fire Brigade about actions taken by people (e.g. number of persons who have decided not to evacuate, but rather remain at home).

**Area of operation of wardens**

The area of operation of each warden should be such that they are able to discharge their obligations (in practice, they cannot have more than 10 homes under their care). It should be taken into account that these are people who also must prepare themselves for an oncoming flood.

**Legal and social-welfare powers**

- According to the plans of the municipal response center, flood wardens will be an official element of the system for warning and response during a flood.
- They will sign a letter of intent, declaring their will to carry out the obligations of a flood warden.
- They will become members of the Volunteer Fire Brigade and receive flood warden ID's containing their photo, and signed by the mayor of the municipality.

The above mentioned arrangements do not result in real legal obligation for flood wardens. There is a kind of gentlemen agreement which create a moral obligation. On the other side it allow municipality to insure flood wardens against accident during counter-flood action.

**Training programs for wardens**

- Flood wardens will be trained both in the area of warnings (what are the competency areas of individual institutions in the area of warning, how residents will be warned, where it will be possible to obtain additional information); as well as in the area of warning response (where evacuation points are located, what the evacuation routes are, whom to summon for help and how).
- Wardens will also be trained in the area of simple and effective methods for preparing one's home for a flood, as well as actions to be taken after a flood. Before the flood season (April–June), they will distribute flyers and informational materials prepared by the municipality or the county government.

**Supervision of warden network**

Supervision of flood wardens will be carried out by the local Volunteer Fire Brigade, or by the person responsible for safety in the municipality. The supervision will consist of keeping a register of wardens (names, addresses, contact information), and organizing meetings (at least once a year) in order to discuss together what is needed, as well as problems, suggestions for changing the rules of operation, etc.

**Updating of telephone number database**
**Structure of TSOM database**
The database of the Telephone System for Warning of Inhabitants is an alphabetical list of subscribers—flood plain area inhabitants and users (institutions and businesses with a variety of activity profiles), obtained from municipalities on the basis of voluntary declaration of inhabitants who wish to be warned and notified of hazard situations.

Currently, the TSOM contains 1200 telephone numbers. These are telephone numbers of inhabitants, users of risk areas, services and forces, institutions, members of the county crisis response team, as well as members of county council.

The structure of the TSOM database has been grouped by locality; within each locality, various groups and sub-groups have been distinguished. These are, for example, inhabitants at risk, institutions at risk, village administrators, Volunteer Fire Brigades; or groups have been created which contain the telephone numbers of all persons in the groups mentioned.

**Table. 1 Structure of telephone and address database, on the example of Bystrzyca Klodzka municipality**

| Name of group | Description of group |
|---|---|
| Bystrzyca Klodzka | All who are at risk |
| Wilkanow | Inhabitants at risk |
| Dlugopole Zdroj | Inhabitants at risk |
| Dlugopole Dolne | Inhabitants at risk |
| Gorzanow | Inhabitants at risk |
| Zablocie | Inhabitants at risk |
| Bystrzyca Klodzka | Inhabitants at risk |
| Dlugopole Gorne | Inhabitants at risk |

In the TSOM database, there exists a separate group named ‘Gorzanow’. Within this group, the following sub-groups have been distinguished:

- Flood wardens—14 telephone numbers (10 persons)
- Inhabitants/institutions/businesses at risk—77 telephone numbers (inhabitants of the following streets: Polna, Nadrzeczna, Mlynska, Ludowa, Klodzka, Bystrzycka).

**Previous manner of updating TSOM database**
Up until now, data were updated according to the following algorithm:

- An employee of the County Crisis Management Center (PCZK) sends to the Municipal Response Center (GCR)—twice yearly, in the spring and the fall—a list of inhabitants of the municipality included in the TSOM (first name, last name, name of business, address, telephone number), with a request for updating, designating a time for this task to be carried out (approx. one month);
- An employee of the Municipal Response Center (or designated person) updates the data according to whatever manner the municipality has adopted: surveys prepared in the municipality and sent out to inhabitants, verification according to telephone books, verification according to census data, field verification according to conversations with inhabitants;
- An employee of the GCR sends to the PCZK either an updated list, or information to the effect that there have been no changes;
- An authorized employee of the PCZK updates the data in the TSOM database.

The procedure described turns out not to be completely effective, chiefly because of the municipality’s exceeding the time limit for carrying out the data updating, and because of incompleteness of the lists provided.

**Concept for updating of the TSOM database**
The concept for the updating of the TSOM database was based on the above system; details were added by the municipality to the proposal for updating the database (p. 2). According to the proposal of the Municipal Response Team in Gorzanow and in other localities within the municipality of Bystrzyca Klodzka, updating of the TSOM database will be conducted by flood wardens.

Such a system, upon agreement with representatives of other municipalities, could also be implemented in other localities in Klodzko County.

For purposes of updating the TSOM database, it is essential to prepare a standard form for all municipalities, as well as obtain written consent from inhabitants for their telephone numbers to be added to the TSOM, and for them to be warned via the system.

Additionally, the possibility exists of updating the TSOM database by placing a form on the Klodzko County web page, to download or send via e-mail to the County Crisis Management Center.

In order to increase inhabitants' awareness concerning the operational rules of the system for warning inhabitants about a flood, as well as the necessity of updating data in the TSOM database, education and information operations addressed to inhabitants are necessary.

Information on this subject can be conveyed, for example, at meetings with inhabitants, in classes at school, via municipalities' web pages, or cooperation with local press—placement of informational inserts in newspapers, etc.

**Building the response plan**
The building of the flood response plan for the inhabitants of Gorzanow encompassed preparation and implementation of operational rules for the inhabitant flood warning system, as well as preparation of rules for flood response, including an evacuation plan. The building of this plan required an array of matters to be settled between the County Government Office in Klodzko and the City and Municipal Government Office in Bystrzyca Klodzka, as well as the village administrator, the Volunteer Fire Brigade unit and the inhabitants of Gorzanow, as well as neighboring localities. As a result, it was established that the inhabitant warning and response system for Gorzanow is based on:

- Telephone System for Warning of Inhabitants (TSOM), via which the mayor of the City and Municipality of Bystrzyca Klodzka warns inhabitants of flood hazard situations, the necessity to evacuate, etc.;
- Flood wardens, who are an additional source of warnings for inhabitants, as well as
- Volunteer Fire Brigade (OSP), which warns inhabitants in a situation where a flood is inevitable and it is necessary to evacuate inhabitants.

In a flood hazard situation, the OSP and flood wardens work closely with the chief of the Municipal Response Center of the City and Municipal Government Office in Bystrzyca Klodzka, which transmits information to them concerning the hazard, as well as actions which they are to take (warning, evacuation of inhabitants, etc.). An additional source of information for inhabitants and forces (OSP) concerning the magnitude of the hazard is the staff gauge installed on the bridge in Gorzanow by IMGW. It is not an element of the local monitoring system, nor of the nationwide system; however, it does enable the local community to directly observe the water level and its tempo of growth. In a situation where evacuation is necessary, on the basis of information from the Municipal Response Center of the City and Municipal Government Office in Bystrzyca Klodzka, as well as additional observation of water levels on the staff gauge in Gorzanów, the OSP transmits warnings to inhabitants at risk concerning the magnitude of the hazard and rules for responding, and conducts the evacuation of inhabitants.

As a result of discussions between the team representing the community of Gorzanow and the chief of the Municipal Response Center of the City and Municipal Government Office in Bystrzyca Klodzka, rules for warning response were established for inhabitants of Gorzanow.

As a first step, evacuation routes and points were established for inhabitants as well as farm animals and vehicles (automobiles, farm machinery). In designating the evacuation points, an essential question was for them to be near the homes of inhabitants at risk, so that they can check whether their property is safe.

Up until now, inhabitants had been unwilling to evacuate from homes at risk, and the reason for this was, among other things, the fact that the evacuation point for inhabitants was located in Bystrzyca Klodzka, over a dozen kilometers away. Thus, inhabitants were far from their homes and didn't know whether their property was safe.

The Primary School in Gorzanow was designated as the evacuation point for inhabitants whose homes are located on the left side of the river (the western, left-bank portion of the village)[1]. On the other hand, the former State Agricultural Commune (PGR) building (now privately-owned) was designated as the evacuation point for farm animals and vehicles.

Inhabitants of the right-bank portion of the village cannot evacuate to the primary school in Gorzanow and the former PGR Building because in a flood hazard situation, the only road to these structures—the bridge in Gorzanow—could be washed out and inhabitants of the left-bank portion would be cut off from inhabitants of the right-bank portion of the village. So, for inhabitants of the right-bank portion of the village, it was established that the evacuation point would be Mielnik—a neighboring locality to the east of Gorzanow.

Next, the village administrator of Gorzanow and the chief of the Municipal Response Center of the City and Municipal Government Office in Bystrzyca Klodzka conducted conversations with the owners of the structures designated as evacuation points, in order to obtain their consent to the utilization of these structures for evacuation purposes in a flood hazard situation.

An agreement was also reached with the village administrator of Mielnik concerning the possibility of evacuating inhabitants of Gorzanow to homes and farms located in Mielnik. As a consequence of the conversations conducted with the village administrator of Mielnik, it was established that in a flood hazard situation, inhabitants of Gorzanow will evacuate to Mielnik, where they will be taken in by its inhabitants. It was planned to have a meeting of inhabitants of both villages, in order to determine the details associated with evacuation. The meeting did not eventuate, however, because only inhabitants of Mielnik came to the meeting.

After determining the evacuation points and routes, as well as obtaining consent for the evacuation of inhabitants as well as animals and vehicles to the designated structures, a flyer was prepared for the inhabitants of Gorzanow concerning the operational rules of the inhabitant flood warning system for Gorzanow, together with the evacuation plan. The evacuation plan (cf. appendix 1) was presented on a map prepared in the earlier stages of the project, and presents the state of development of Gorzanow, the extent of inundation for the flood from 1997, as well as evacuation points and routes. This flyer was distributed to Gorzanow by flood wardens during the inhabitant warning system test on 30 June 2006.

**Test of inhabitant warning system**
To test the concept described, an operational trial of the warning system for Gorzanow was planned and carried out. Its aim was to verify in practice those operational sequences of the warning system which are addressed to inhabitants (Telephone System for Warning of Inhabitants—flood wardens—inhabitants), and gather their opinions in this matter.

**Testing plan**
Planned sequence of operations within the test:

Stage I Dissemination by the TSOM of information about the possible occurrence of a flood.

[1] For formal reasons, it was established that the primary school would be a 'temporary' evacuation point.

*Message recipients*: inhabitants of Gorzanow, businesses, institutions, flood wardens

Stage II Short training program for flood wardens

- Operational rules of local system for monitoring water levels and precipitation within the Klodzko Valley.
- Operational rules of the Telephone System for Warning of Inhabitants.
- Instruction in the tasks of flood wardens during the test.

Stage III Dissemination of message (TSOM) about inevitable flooding and need to evacuate
*Message Recipients*: a) flood wardens, b) inhabitants, owners of businesses and institutions in Gorzanow. Each of these groups was to receive a message with different content.

Stage IV Visits of flood wardens to structures at risk and transmission of:

- Information about the operation of the inhabitant warning system and the role of flood wardens
- Flyers containing a description of the inhabitant warning system and evacuation plan (for text of flyer, see appendix).

During the visits to homes of inhabitants at risk, wardens were to conduct with some of them a short survey concerning their assessment of the proposed warning system.

**Message content**
Planned test messages:
*Message 1 (Inhabitants and flood wardens)*

> 'Attention! This is a test of the warning system.
> The mayor of Bystrzyca Klodzka warns of the possibility of flood hazards occurring in towns located along the Nysa Klodzka: Gorzanow and Zablocie. Additional information at the following telephone number: (074) 811 76 58.
> Attention! This was a test of the warning system.'

*Message 2 (Flood wardens)*

> 'Attention! This is a test of the warning system.
> Information for flood wardens
> The mayor of Bystrzyca Klodzka warns that a flood is inevitable. I order evacuation of inhabitants of Gorzanow and Zablocie to the designated places. The water level in the Nysa Klodzka, measured at Bystrzyca Klodzka has exceeded flood warning level by 40 cm—the river is overflowing its banks. Please warn your neighbors of the necessity to evacuate. Additional information at the following telephone number: (074) 811 76 58.
> Attention! This was a test of the warning system.'

*Message 3 (Inhabitants)*

> 'Attention! This is a test of the warning system.
> The mayor of Bystrzyca Klodzka warns that an inevitable flood is approaching Gorzanow. I order evacuation of inhabitants of Gorzanow and Zablocie to the designated places: to the elementary school in Gorzanow and to Mielnik. Please obey the instructions of flood wardens as well as uniformed services and forces. Additional information at the following telephone number: (074) 811 76 58.
> Attention! This was a test of the warning system.'

**Conducting of the test**
On the day preceding the test (29 June 2006), IMGW Wroclaw transmitted to the County Government in Klodzko a warning of predicted precipitation within the Klodzko Valley of 50–80 mm/12 hours. The next morning, IMGW corrected the warning, predicting lesser precipitation in the amount of 5–15 mm and only in some places 40–50 mm. In the network of the local monitoring system, a rise in water levels for rivers in the Klodzko Valley was noted. But no exceeding of flood watch or flood warning levels was noted.

Because of this, it was decided that a test of the inhabitant warning system would be conducted. However, its procedure, number of messages and the content of these messages were changed, so as not to unnecessarily scare or threaten inhabitants. Only two messages were emitted (one to wardens, the other to inhabitants), which, aside from information that a test of the warning system was being conducted, provided information about the current flood hazard status.

The test was conducted with the involvement of the County Crisis Response Center team, the Municipal Response Team, the flood wardens, the IMGW team and the village administrator of Gorzanow. The system was mobilized from a cellular telephone by the chief of the Municipal Crisis Response Center in Bystrzyca Klodzka.

**Test results**

*Flood wardens.*

The TSOM system report shows that the first message was received and confirmed by seven of the ten flood wardens, of whom six appeared at the meeting point. During visits to the homes of inhabitants at risk, they carried out 18 interviews assessing the system.

*Inhabitants*

The report from after the completion of notification shows that the second message was received and confirmed by about 50% of Gorzanow residents notified (the system called 70 numbers).

The survey conducted by wardens shows that only 3 among the 18 persons surveyed received a warning. This confirms that it makes sense to build a supplementary warning dissemination system, because it means that in the summer period, many people may not be within reach of a land-line telephone.

The survey shows that almost all (16 of the 18 surveyed) consider a telephone system to be a good solution. All, on the other hand, considered the system of neighbor notification—i.e. the flood warden network—to be a good idea.

The subsequent portion of the survey contained questions concerning the manner of response to a warning of inevitable flooding. Seventeen persons declared that they would evacuate with their whole family (one person did not answer this question). Fourteen of these people wrote were they would evacuate to; twelve indicated the new evacuation points established as part of the APFM project, i.e. the school, the former State Agricultural Commune, or the neighboring village of Mielnik.

Conclusion

The test of the notification system, though it took place in rather difficult conditions, provided much interesting information which will be useful in further fine-tuning of the system.

1. The test showed that even such a precisely-addressed and exact system of inhabitant notification as the TSOM may not reach all of them. There are such months, there are days in the week and times of day when many people are not home. This survey result underlines the significance of supplementary notification systems such as the flood warden network.

2. The training program for the wardens conducted during the test, and a short discussion afterwards, showed that the system requires further fine-tuning. This applies in particular to precise designation of the operational areas of the wardens, so that they will each have a similar number of homes to take care of.

3. People's knowledge that there exist new evacuation points in Gorzanow shows that it is possible in a relatively short time, without expending a lot of energy and finances, to obtain quite a good informational effect. During the test, 12 persons, when asked where they will evacuate to, indicated the points planned in.

# 4. Elements of a program for local education aimed at improving awareness and knowledge of inhabitants at risk for flooding

## 4.1 introduction

The effectiveness of modern flood damage mitigation systems is decided in large measure by the awareness and knowledge of entities involved in its building and exploitation. For present trends in this area assume that obtaining a good effect from these actions, in particular from preparation for a flood, depends on the involvement of all communities which could influence the magnitude of losses, thus: state and local government administration, commercial businesses, public institutions and ordinary people. The majority of these, however, are not specialists in this area and, as studies show, do not know basic methods of coping with a flood hazard situation.

However, affecting these entities, especially individual people, is not easy. While we do observe great activity on the part of local authorities and persons at risk right after a flood, as time goes on, interest in securing oneself in case of another flood grows weaker and weaker. As emphasized by psychologists, this results from people's unwillingness to invest in safety measures for hazards which occur infrequently. Education, as well, which right after a flood is considered an essential element of the operations of crisis intervention forces, begins to slowly recede into the background and reduce itself to purely formal, not very effective actions.

Thus, the question arises: How to cope with building education at the local level? What elements are important? How to use different forms and tools for education? Who can and should be involved in education?

During this project, an attempt was made to answer several of these questions based on work conducted in Gorzanow in cooperation with the County Government Office in Kłodzko. There was too little time for the effects of this work to become a full-fledge example for others to follow, but these effects could be a good basis for summing up and drawing conclusions for the future, for the proposals being tested are a continuation of IMGW's many years of work in the area of flood education.

## 4.2 basic concepts of education

### 4.2.1 Aims and content of education

So, what operational aims should be fulfilled by the concept for education and improvement of knowledge and awareness of inhabitants? To simplify matters a bit, we can assume, taking into account the hindrances mentioned earlier, that education should:

- Make people aware that a flood is inevitable and that it can occur at any moment (Key point: 'You are at risk')
- Make people aware that the safety of each person depends in large measure on that person (Key point: 'You have an influence on the size of losses')
- Build an awareness that individual activity is supported by local services and forces responsible for flood protection (Key point: 'You are not alone')
- Provide accurate knowledge of the local risk and means of reducing susceptibility to flood losses (Key point: 'Find out how to prepare yourself')
- Show examples of hazards and means of resolving them (key phrase: 'See how other people are doing it').

### 4.2.2 Recipients of education

In the case of Gorzanow, the group at risk for flooding includes mainly owners and occupants of residential homes. There are only a few businesses and public structures in these areas.

From the viewpoint of possibilities for reaching this group of recipients with information and educational activities, we can distinguish two groups:

- Children and school-age youth (in Gorzanow, there exists a primary school)—this is a group which it is relatively easy to reach: their education is organized, and teachers are usually willing to conduct additional lessons, especially ones aimed at activating students—teaching them creative action.
- Adults—reaching this group is not simple for various reasons. Surveys show that they do not trust the knowledge of experts involved with flood issues; they also do not trust representatives of the local government in this area. Some adult inhabitants can be reached via their children who are attending the primary school, as well as via NGOs active within the village (e.g. the Society of Friends of Gorzanow), as well as via the Volunteer Fire Brigade (OSP) and the Village Council.

Consequently, it has been assumed that the key partners in the process of transmitting knowledge and information to inhabitants will be the school, the Society of Friends of Gorzanow, and the team involved in preparing the flood damage mitigation plan for Gorzanow (comprised of local leaders, among others representatives of the OSP, the Village Council, the local parish priest).

### 4.2.3 Forms of education and information

Selection of proper forms of education is an important element of the plan to improve people's knowledge and awareness level in the area of flood damage mitigation. The standard way of transmitting knowledge to adults is via various forms of training programs and courses. However, it should be remembered that these types of actions are effective if adult inhabitants are interested in acquiring such knowledge or are in some obligated to do so. In the case of a flood, in the context of the fact that after a few years, it is forgotten, such a form is not very effective. Consequently, it should be assumed that in the local community, all occasions should be utilized for education and information which enable contact with different groups of people.

In the project, the following forms of action have been adopted:

- Cooperation with the school in Gorzanow in the area of introducing lessons on flood issues to the curriculum, as well as joint organization of a competition concerning the Family Flood Plan (evacuation plan)
  (Recipients: Children and their parents)
- Engagement of a team involved in preparing a local flood damage mitigation plan for Gorzanow
  (Recipients: Local leaders)
- Utilization of local events bringing together inhabitants of Gorzanow; in this case St. Florian's Day (holiday named after the patron saint of the fire brigade)
  (Recipients: All inhabitants)
- Utilization of the newly-created structure of the volunteer **flood warden** network to transmit information about the operational rules of the warning system, methods of securing homes and responding to warnings
  (Recipients: All inhabitants at risk).

For the educational and informational activities to be effective, it was necessary to prepare various informational media concerning the risk and methods of flood damage mitigation. With this aim, the following were prepared as part of the project:

- Informational flyer about the system for warning inhabitants of Gorzanow and about the evacuation plan.
- Informational flyer about methods of securing one's home from flooding
- Map of flood plain areas in Gorzanow and evacuation plan
- Information packet intended for presentation on web pages on the Internet.

It was also decided that use would be made of existing information channels in Gorzanow:

- Web pages of the Society of Friends of Gorzanow (containing a broad range of information concerning Gorzanow)
- Cultural club in Gorzanow (for which a large wall display with the flood map and evacuation plan was prepared)

The creation of this concept, as well as the realization of its educational and informational elements, was possible thanks to involvement on the part of both people from Gorzanow (village administrator, president of Society of Friends of Gorzanow, president of OSP), teachers at the primary school in Gorzanow, as well as persons from the crisis response teams in Bystrzyca Kłodzka and at the County Government Office in Kłodzko.

### 4.3 description of actions taken

#### 4.3.1 Education of children and parents via the school

The program implemented by the school in Gorzanow (53 pupils in attendance) was comprised of the following elements:

- Lessons for all classes at the school in the area of flood risk. Teachers used various lesson formats, utilizing a handbook prepared by IMGW for teachers (*Jak sobie radzic z powodzia—materialy dydaktyczne dla nauczycieli* [*How to Cope with a Flood—Didactic Materials for Teachers*]), such as: lectures, quizzes, therapeutic games (younger classes), art workshops, interviews with inhabitants about the flood in 1997. A meeting with parents was also organized.
- A competition for preparation of a Family Flood Plan (evacuation plan). The task consisted of preparation by children in older classes, together with their parents, of a family evacuation plan containing a description of actions to be taken by the family after receiving a warning of an oncoming flood (contact addresses, important telephone numbers, evacuation points, lists of objects which need to be taken from home when evacuating, division of actions among family members, etc.)

The program encompassed all of the children at the school, although the teachers adapted the lesson format to the age of the children. After finishing implementation, they indicated a need to supplement the didactic materials in *Jak sobie radzic z powodzia—materialy dydaktyczne dla nauczycieli* [*How to Cope with a Flood—Didactic Materials for Teachers*] with additional scripts for children from the lowest classes (e.g. guessing games, crossword puzzles, coloring books, etc.) Teachers also proposed simplification of the tasks for the family evacuation plan competition because, according to them, some of the parents have trouble expressing themselves in writing (they proposed preparing the plan in the form of a survey to fill out). Generally, however, teachers' assessment of the program was very positive. The changes proposed by them will make it possible to fine-tune the didactic materials. The competition have been preceded by special lesson based on scenario contained in the handbook *How to Cope with a Flood—Didactic Materials for Teachers*[2]

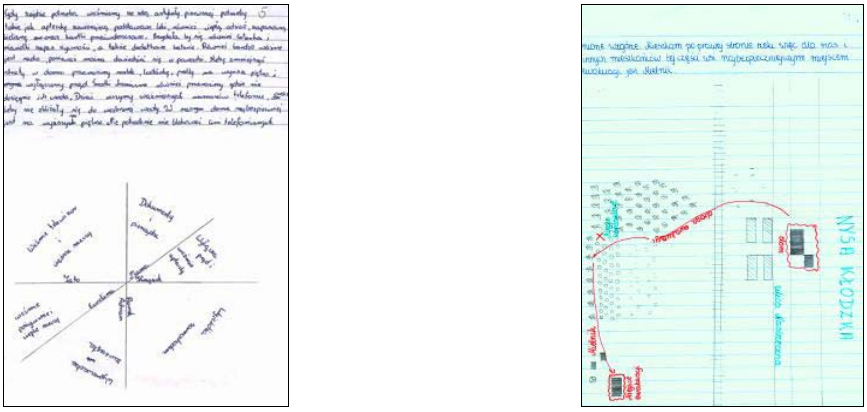


**Fig. 12 Pages of evacuation plan prepared by children at school in Gorzanow**

[2] . see http://powodz.info/downloads/How_to_prepare.pdf


**Fig. 13 Drawings made by children after hearing a therapeutic story**

### 4.3.2 Actions of the team preparing the flood damage mitigation plan

Before the beginning of the APFM project, a group of local leaders began to meet in Gorzanow, whose task was to assess flood risk. The team was initiated by IMGW and during the entire period of work, a total of 20 people took part in it. These were fire brigade officers, village council members, representatives of the Society of Friends of Gorzanow, the municipal council representative, the parish priest, and inhabitants. Presentations concerning possible solutions to local flood problems; examples from other places in Poland, especially concerning warning systems; and group discussions concerning causes of flood hazards improved the knowledge of team members. It is difficult to measure the educational value of these actions, but members of this team definitely did become 'mini-centers' for the promotion of the solutions proposed in the plan among the local community.

During the project, 5 meetings of this team took place, with participation of representatives from IMGW, as well as smaller group meetings including, among others, one comprised of flood wardens only.

**Fig. 14 Meetings of the committee preparing the flood damage mitigation plan**

### 4.3.3 Utilizing local events for education

For purposes of education and transmission of information, a festival organized on St. Florian's Day—the day of the patron saint of fire brigade members—was utilized. The program of the event, to which all inhabitants of Gorzanow were invited, and which took place on 3 May 2006, encompassed:

- Consecration by the parish priest and installation on the fire brigade building of a figure of St. Florian
- Presentation by children from the school in Gorzanow concerning environmental protection (water pollution)
- Performance of amateur choir from Gorzanow

- Games and contests in the castle park.

During the meeting, a diagnosis of sources of flood risk in Gorzanow and proposed solutions for local problems in this area were presented to inhabitants. During the open-air games, IMGW organized games for younger children (painting, solving of crossword puzzles on meteorological topics) as well as a family evacuation plan contest with prizes funded by the Mayor of Bystrzyca Kłodzka. During the festival, flyers were also distributed concerning the operational rules of the warning system for Gorzanow, as well as methods of securing buildings.

The assessment of the utilization of local events for educational and promotional purposes came out positively, although it was stated that both the lectures and the materials propagated on such an occasion should be as simple and easy to understand as possible for all members of the local community.

**Fig. 15 Pictures of the St. Florian's Day festival (Left: Families which won prizes in the contest; Right: Children's games)**

### 4.3.4 Education conducted by flood wardens

The **flood warden** network was set up on the initiative of the team working on the flood damage mitigation plan for Gorzanow. It is a natural means of reaching inhabitants with information about the risk and about methods of flood damage mitigation. Each of the wardens, who has under his/her care several neighboring homes, will receive training every year in the area of notification and warning; thus, it is possible to expand the scope of their activity with transmission of information to inhabitants on other subjects besides just warning. It is planned in the future to conduct training programs for wardens in the area of simple means of securing buildings and home furnishings from destruction during a flood. Wardens will also take care of distributing printed materials (informational flyers) and promoting utilization of information placed on the Internet. Just like members of the planning team, they will be natural promoters of the proposed solutions for Gorzanow; they will also be able to gather opinions of inhabitants on various matters.

### 4.3.5 Flyer on the local flood warning system (for Gorzanow)

The aim of the flyer is to inform inhabitants how they will be warned, who will warn them, and how to proceed after receiving a warning. An integral part of the flyer is the evacuation plan for the locality. The flyer was distributed among inhabitants of Gorzanow during a local festival, as well as via flood wardens.

### 4.3.6 Flyer on methods for securing buildings from flooding (general)

The aim of this flyer is to transmit knowledge about how to prepare a building for a flood with the aid of various techniques. The flyer encompasses information about what can be done during the building of a home (location, building materials) or in a situation where a home already exists in the flood plain area. This flyer was distributed among inhabitants of Gorzanow during a local festival.

### 4.3.7 Information packet on Society of Friends of Gorzanow web pages

The Internet, though it is not yet very popular in rural areas of Poland, by virtue of its rapid expansion demands that we treat it as one of the more important information sources. In Gorzanow, the Society of Friends of Gorzanow has been very active for years. On their web pages, information has been placed concerning the flood damage mitigation plan for Gorzanow, including in particular the operation of the local flood warning and hazard response system (www.tmg.gorzanow.prv.pl). The structure of the information placed there is as follows:

- History of floods in Gorzanow (flood losses in 1997)
- What we are at risk for (flood risk)?
- Flood protection plan for Gorzanow
- Advice for inhabitants:
  - How to prepare your home for a flood
  - How to prepare for evacuation
  - How to respond to warnings, how to proceed during a flood
  - How to recover after a flood.
  - Institutions which can help
- Education at the school in Gorzanow (examples of family flood plans).

Information has been supplemented with pictures from the flood, as well as a film.

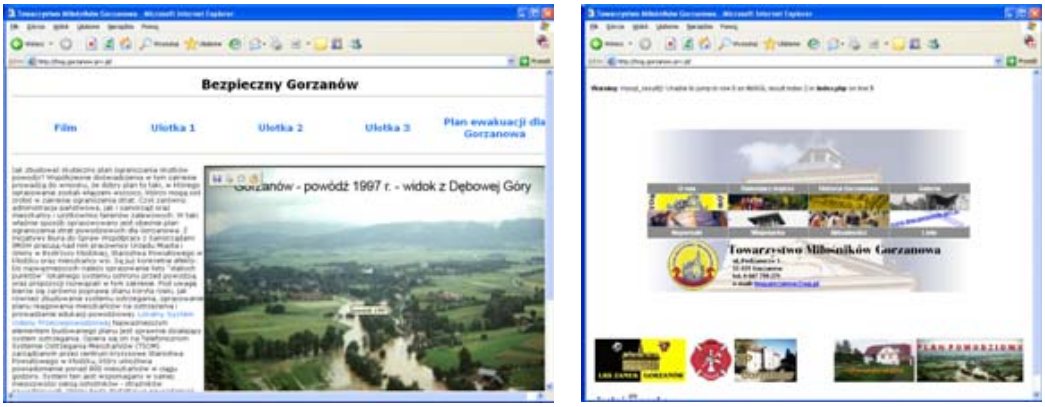



**Fig. 16 Society of Friends of Gorzanow web pages concerning flood issues**

### 4.3.8 Map of flood hazards as well as evacuation routes and points

Among the most important flood-related information which enables the taking of any kind of action is a risk map, on which are drawn lines showing the possible extent of inundation in the future, or the extent of inundation during the historic flood in 1997. Equally important is to indicate on the map evacuation points for persons, equipment, machinery and farm animals, as well as safe evacuation routes:
As part of the project were prepared and printed such maps in A0 format for two purposes:

- School education (map on cloth, easy to transport from room to room)
- Map on rigid backing, covered with protective lacquer, intended for the culture club in Gorzanow.

## 4.4 TRAINING PROGRAMS FOR CRISIS INTERVENTION FORCES

Apart from educational operations addressed to flood plain inhabitants and users, training programs should be conducted for decision-makers and crisis intervention forces in the area of non-structural methods of flood protection. Training programs currently being conducted in Poland for crisis intervention forces are focused mainly on response during a crisis.

The subject matter of training programs for crisis intervention forces should concern, in particular: building and exploitation of local flood monitoring and warning systems, uncertainty of hydrological and meteorological forecasts, utilization in practice of new tools to assist in decision-making, individual loss mitigation methods, and the role of flood information and education for flood plain users. Knowledge and

understanding of these issues by crisis intervention forces is a condition decisive in the effectiveness of loss mitigation systems on a local scale.

Training programs should also be subject to decision-makers (local authorities) who completely accept the solutions which have been adopted in a given area. Training programs for them should, however, concern only rather general trends in the area of flood loss mitigation (including planning of flood plain development, warning and education of inhabitants) and decision-making in conditions of uncertainty – and not detailed technical solutions.

Within the project, the issues of cyclical training programs for crisis intervention forces were not taken up in any broad manner; however, as part of propagation of its effects, several meetings and seminars were organized for crisis intervention forces and decision-makers from various regions of Poland.

## 5. To disseminate experiences from the project in other areas prone to flash flooding

Realization of the APFM project was an impulse for dissemination of information about local flood problems, possible solutions and the effects of work carried out in the Klodzko Valley. This is all the more important in that in Poland, there is no tradition, and consequently no means or forms, for disseminating information or sharing experiences concerning methods, successes and failures associated with their resolution.

As part of the project, two ways of disseminating information were adopted:

- Meetings with local leaders, as well as employees of local government crisis response centers
- Preparation of publications concerning local flood problems and their resolution.

### 5.1 Organization of meetings

It was assumed that experiences gained in the Klodzko Valley will be disseminated in the community of those local governments which are trying on their own initiative to resolve local flood problems. For this purpose, meetings organized by county centers were utilized, or such meetings were arranged.

#### 5.1.1 Workshops for local governments, devoted to the issue of building a local flood damage mitigation plan (Zieleniec, 31-2 may 2006)

The most important place for dissemination of experiences from the project was a training program organized by the County Government Office in Klodzko and the Dolnoslaskie (Lower Silesian) Provincial Government Office. A special four-hour session was organized, and guests were invited from southwestern Poland. The program encompassed the following problems related to the project:

- The notification system in the Klodzko Valley
- The flood damage mitigation plan for Gorzanow
- Education as the basis for effective action
- Flood maps.

About one hundred people (employees of provincial, county and municipal crisis intervention centers, representatives of the State Fire Brigade, *et al.*) associated with crisis management, mainly from southwestern Poland, took part in the meeting. These meetings of a group which is expanding from year to year are the effect of IMGW's cooperation with the County Government Office in Klodzko.

#### 5.1.2 Meeting with representatives of county and municipal services and forces in Krakow County (Krakow, 31 May 2006)

During the meeting with the Krakow County Council, as well as with the municipalities of this county, methods for resolution of flood problems on a local scale, the assumptions and tasks of the APFM program in Poland, as well as collected experiences, were presented (in a 40-minute talk).

Participants in the meeting included representatives of the county, municipalities, fire brigade and invited guests from water-related institutions in Krakow.

#### 5.1.3 Meeting with representatives of county and municipal services and forces in Zywiec County (Zywiec, 9 June 2006)

Zywiec County is located in an area prone to flash flooding. It is the second county, aside from Klodzko County, to have built its own rather complex precipitation and water level monitoring system. A 5-hour session was organized, at which experiences gained in the Klodzko Valley were presented in detail.

Participants in the meeting included representatives of provincial, county and municipal crisis intervention forces. The honorary patron of the meeting was the County Administrator.

### 5.1.4 Meeting with representatives of county and municipal services and forces in Staszow County (Staszow, 14 June 2006)

Staszow is one of the counties which are presently building a local system for monitoring and warning the population. During a 3-hour meeting, presented were methods for flood damage mitigation, basics for building local warning systems, and methods of education utilizing, among other things, experiences gained as part of APFM.

Participants in the meeting included representatives of county and municipal crisis intervention forces.

## 5.2 Publications

Publications represent an important element of the system for dissemination of knowledge and experiences. The Office for Local Government Collaboration, whose employees were involved in the project, has been trying for several years now to publish materials associated with methods of mitigating flood damage, which are addressed to local governments or communities. Up until now, handbooks concerning the following subjects have been published: cooperation with the media (for crisis intervention forces and journalists), methods of educating children and youth in the schools concerning how to cope with a flood (for teachers), as well as rules for building local flood warning systems (for local governments).

The APFM project permitted the preparation of more materials which can be utilized as-is in other places besides the Klodzko Valley, or they can represent a standard for how to prepare such materials. The examples of flyers have been described in the previous chapter. A description of more extensive publication is given below.

Additionally, in the appendix III, articles from the local magazines (*Euroregio Glacensis, Gazeta Prowincjonalna, Biuletyn Bystrzycki*) concerning activities taken during the project are placed.

**Brochure on the local warning system for the Klodzko Valley (on the example of Gorzanow)**
The aim of the brochure is to disseminate information and experiences concerning the building and exploitation of the local flood warning system in the Klodzko Valley. An integral element of this brochure are experiences in the area of building cooperation among the various partners (IMGW, county government, local government, local community), as well as examples of detailed problems requiring resolution at the locality level. The basic elements of the table of contents are as follows:

- The integrated warning system—between theory and practice
- Monitoring and forecasting—independent system, or system integrated with IMGW
- Preparation of warnings—the problem of scale
- Warning and response—a local solution
- Education—declarations and no action

All of these publications have been printed, but at the same time, a digital version (PDF format) of them was created (and made available on the Internet), enabling reprinting and copying of these materials.

## Appendix I Flyer on the local flood warning system (for Gorzanow)

**Flyer on the local flood warning system (for Gorzanow)**

W razie konieczności ewakuacji udaj się
do wyznaczonych miejsc, zgodnie z załączoną mapą

Na mapie, na odwrocie strony, zaznaczone są punkty ewakuacji dla mieszkańców, zwierząt i maszyn oraz drogi i kierunki ewakuacji. Dla mieszkańców lewobrzeżnej części miejscowości wyznaczono punkt ewakuacji w budynku Szkoły Podstawowej, a dla zwierząt i maszyn na terenie dawnego PGR-u w Gorzanowie, natomiast mieszkańcy części prawobrzeżnej powinni ewakuować się do Mielnika.

TELEFONY ALARMOWE

Urząd Miasta i Gminy w Bystrzycy Kłodzkiej, Gminne Centrum Zarządzania
074 811 13 92, 074 811 76 58
(czynny całą dobę w czasie kryzysu)

Starostwo Powiatowe w Kłodzku,
Wydział Spraw Obywatelskich i Zarządzania Kryzysowego
074 867 20 35, 074 865 75 19
(czynny całą dobę w czasie kryzysu)

OSP w Gorzanowie
074 812 10 38

Straż pożarna – 998
Policja – 997
Pogotowie ratunkowe – 999

Telefony informacyjne
Pogotowie energetyczne – 991
Pogotowie wodociągowe – 074 811 19 46
Ośrodek Pomocy Społecznej – 074 811 02 66

SPRAWDŹ, CZY NUMER TWOJEGO TELEFONU
ZNAJDUJE SIĘ W BAZIE TELEFONICZNEGO SYSYTEMU OSTRZEGANIA!

Możesz podać kilka numerów telefonicznych,
pod którymi można się z Tobą skontaktować!

Zadzwoń do pod numer: 074 811 76 58 lub 074 811 13 92 i sprawdź!

SYSTEM OSTRZEGANIA
MIESZKAŃCÓW GORZANOWA
PRZED POWODZIĄ

Po powodzi w 1997 roku w powiecie kłodzkim uruchomiono Telefoniczny System Ostrzegania Mieszkańców (TSOM), który działa również w Gorzanowie. Celem tego systemu jest bezpośrednie ostrzeganie mieszkańców o zagrożeniu powodziowym.

Jak będziesz ostrzegany

**Zadzwoni do Ciebie telefon**
W przypadku niebezpieczeństwa powodzi, niezależnie od pory dnia, każda zagrożona rodzina i firma otrzyma przez telefon automatyczny komunikat, że dzieje się coś niedobrego. Najpierw otrzymasz informację, że taka sytuacja może wystąpić, a jeśli będzie to konieczne – kolejny komunikat (ostrzeżenie), że powódź faktycznie nadchodzi i że trzeba się ewakuować. Otrzymasz również informację o tym, że zagrożenie minęło.

**Powiadomi Cię strażnik powodziowy**
Dodatkowo, aby zwiększyć pewność, że informacja o niebezpieczeństwie z pewnością dotarła do wszystkich, ostrzeżenie o zagrożeniu przekażą Ci bezpośrednio tzw. strażnicy powodziowi. To Twoi sąsiedzi, którzy zechcieli pełnić taką funkcję. Będą oni także udzielali dodatkowych informacji dotyczących zasad postępowania w razie zagrożenia.

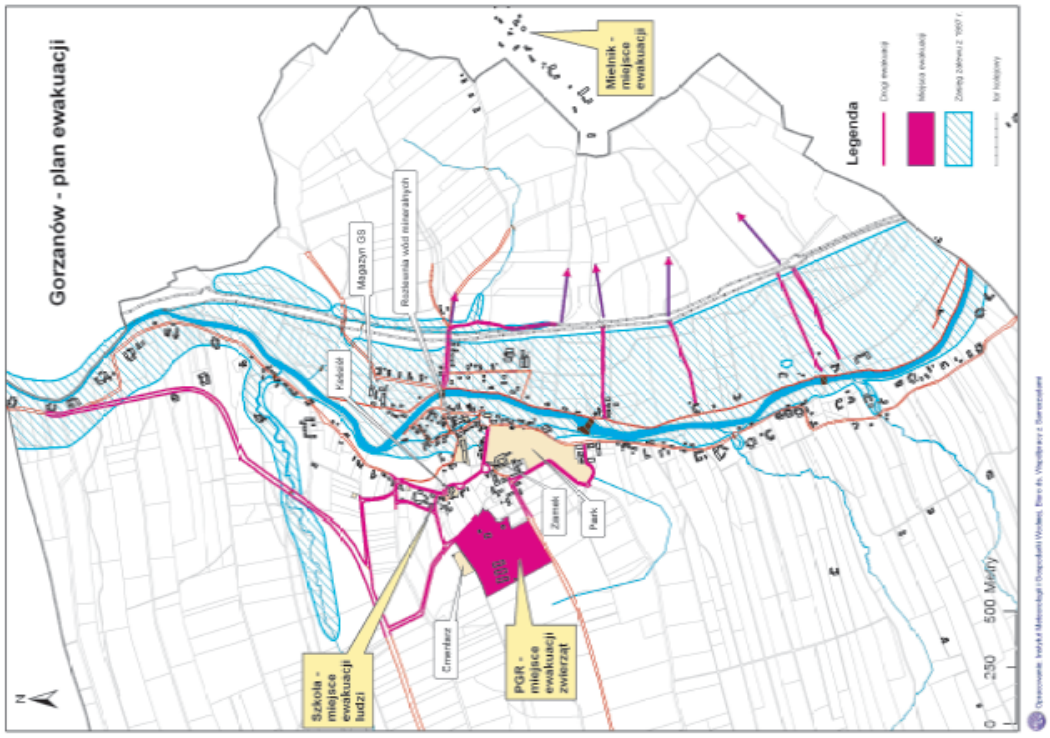
**Inne sygnały alarmowe**
Niezależnie od bezpośredniego powiadamiania, wszyscy mieszkańcy Gorzanowa będą ostrzegani przed zagrożeniem za pośrednictwem syren Ochotniczej Straży Pożarnej.

Jak masz postępować po otrzymaniu ostrzeżenia

Jeśli otrzymałeś ostrzeżenie o powodzi, nie czekaj! Ewakuuj rodzinę, zwierzęta i maszyny. Zabezpiecz dobytek i dom. Zapakuj ważne przedmioty i przygotuj niezbędny ekwipunek.

Jeśli jeszcze zdążysz, to:
- załóż osłony na okna i drzwi lub zabezpiecz je workami z piaskiem
- wyłącz prąd, gaz, wodę oraz zabezpiecz kanalizację przed cofaniem się ścieków
- przenieś na wyższe kondygnacje najcenniejsze przedmioty
- zabezpiecz farby, rozpuszczalniki, oleje, środki ochrony roślin, nawozy itp.

**Flyer on the local flood warning system (for Gorzanow) (1 and 4 page)**




**Map of flood response plan for Gorzanow (2 and 3 page)**

**(translation of the content of 1 and 4 page)**

## FLOOD WARNING SYSTEM FOR RESIDENTS OF GORZANOW

After the flood in 1997, a Telephone Warning System for Residents (TSOM) was set up in Kłodzko County, which also operates in Gorzanow. The aim of this system is to warn residents directly concerning flood hazard situations.

**How you will be warned**

The telephone will ring

In case of a flood hazard situation, regardless of the time of day, every family and business at risk will receive an automated telephone message that something bad is going on. First, you will receive information that such a situation may occur; and if necessary, another message that a flood is definitely approaching and that you need to evacuate. You will also receive information when the dangerous situation passes.

You will be notified by a flood warden

Additionally, to increase the certainty that information about the danger has definitely reached everyone, a warning about the hazard situation will be conveyed to you directly by so-called **flood wardens**. These will be your neighbors, who have decided they want to take on such a function. They will also give you additional information about what actions to take in case of a hazard situation.

Other alarm signals

Independent of direct notification, all residents of Gorzanow will also be warned of a hazard situation via Volunteer Fire Brigade sirens.

What actions you should take after receiving a warning

If you receive a flood warning, do not wait! Evacuate your family, animals and machinery. Secure your property and your home. Pack important objects and prepare necessary equipment.

**If there is still time:**

Install protective panels on windows and doors, or secure them with sandbags
Turn off electricity, gas and water, and secure your sewer system from backflow
Take your most valuable items up to higher floors
Secure paints, solvents, oils, plant protection materials, fertilizers, etc.

**If there is a need to evacuate, proceed to the designated places, in accordance with the attached map**

On the map on the reverse of this page, evacuation points for residents, animals and machinery are designated, along with evacuation routes and directions. For residents of the left-bank portion of the village, the evacuation point is in the Primary School building; and for animals and machinery, on the premises of the former PGR (State Agricultural Commune) in Gorzanow. Residents of the right-bank portion of the village, on the other hand, should evacuate to Melnik.

## EMERGENCY TELEPHONE NUMBERS

City and Municipal Government Office in Bystrzyca Kłodzka
Municipal Crisis Management Center
(074) 8111392, (074) 8117658
(open 24 hours/day during a crisis)

County Government Office in Kłodzko, Division of Citizen Affairs and Crisis Management
(074) 8672035, (074) 8657519
(open 24 hours/day during a crisis)

Volunteer Fire Brigade in Gorzanow—(074) 8121038
Fire Brigade—998
Police—997
Ambulance—999

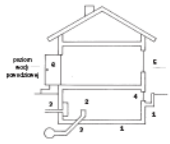
Telephone information numbers
Power emergency services—991
Waterworks emergency services—(074) 8111946
Social-Welfare Aid Center—(074) 8110266

**CHECK WHETHER YOUR TELEPHONE NUMBER**
**IS IN THE DATABASE OF THE TELEPHONE WARNING SYSTEM!**
**You can give several telephone numbers where it will be possible to contact you!**

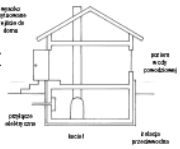
**Call this number: (074) 8117658 or (074) 8111392 and check!**
I

## Appendix II Flyer on methods for securing buildings from flooding

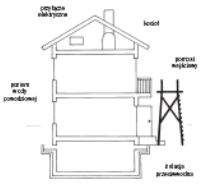
### Flyer on methods for securing buildings from flooding



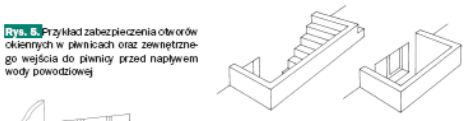
**Rys. 2.** Miejsca, przez które wody powodziowe mogą przedostawać się do budynku: 1 – ściany i podłoga piwnic, 2 – kanalizacja sanitarna, burzowa, 3 – nieszczelności wokół przyłączy (gaz, woda, c.o., sieć elektryczna i telefoniczna), 4 – okna piwniczne, 5 – ściany parteru, 6 – otwory drzwiowe i okienne parteru



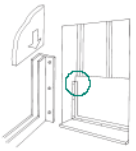
**Rys. 3.** Uszczelnienie dolnej (piwnicznej) części budynku. Wodoszczelne izolacje i uszczelnienia przyłączy i otworów uniemożliwiają przeniknięcie wody do wnętrza budynku



**Rys. 4.** Budynek przygotowany do zalania podczas powodzi. Woda powodziowa może bez przeszkód przenikać do wnętrza budynku



**Rys. 5.** Przykład zabezpieczenia otworów okiennych w piwnicach oraz zewnętrznego wejścia do piwnicy przed napływem wody powodziowej



**Rys. 7.** Przykład dodatkowego zabezpieczenia wejść, bram na posesję drzwi i okien przez zamontowanie na czas powodzi wodoodpornych paneli (płyt) z ramkami i taśmami uszczelniającymi

# SPOSOBY ZABEZPIECZANIA BUDYNKÓW PRZED POWODZIĄ

Najskuteczniejszym zabezpieczeniem budynków przed skutkami powodzi jest budowanie ich poza terenami zagrożonymi. Jeżeli jednak sprawy własnościowe, ekonomiczne lub atrakcyjność terenu (np. bliskość rzeki) wpłyną na podjęcie decyzji o budowie nowego obiektu na zagrożonych terenach, należy podjąć działania, które pozwolą zminimalizować ewentualne negatywne skutki powodzi. Można zrobić to na kilka sposobów, niektóre z nich opisujemy poniżej. **rys. 1**

## Uszczelnienie budynku

Jeśli decydujemy się na budowę domu na terenach zalewowych, najlepiej zrezygnować z podpiwniczenia i budowy garażu poniżej poziomu terenu. Jeśli budynek już stoi, to można, a nawet należy go uszczelnić. Warto pamiętać w tym przypadku, że woda może się dostać do wnętrza budynku różnymi drogami: przez ściany, podłogi, piwnice, przyłącza instalacji, otwory okienne i drzwiowe. **rys. 2-3 i 5-6**

W takim przypadku muszą być spełnione następujące warunki:

- masa budynku musi być na tyle duża, by dom nie został uniesiony przez wodę
- podziemna część budynku musi mieć bardzo dobrą (skuteczną) izolację przeciwwodną oraz uszczelnienie wszystkich przyłączy (instalacji sanitarnych, elektrycznych itp.)
- podziemna część budynku musi mieć izolację przeciwwodną do najwyższego spodziewanego poziomu wody powodziowej
- wejście do budynku powinno być usytuowane powyżej spodziewanego poziomu wody powodziowej
- na czas powodzi powinny być zabezpieczone (wodoodpornymi panelami) wszystkie otwory drzwiowe, okienne, bramy w ogrodzeniu.

## Ulokowanie części mieszkalnej ponad poziomem powodzi

Jeśli myślimy o nowym domu, można go zaprojektować tak, aby powierzchnia mieszkalna znajdowała się ponad najwyższym poziomem zagrożonym zalaniem. Natomiast kondygnacja przyziemia powinna mieć formę szkieletu żelbetowego, którego ściany powinny być tak wykonane, aby pozwalały na swobodny przepływ wody (nie hamowały jej), a więc powinny mieć odpowiednio usytuowane otwory okienne i drzwiowe (bramy). Podłoże pod posadzkę przyziemia powinno być wykonane z płyty żelbetowej odpowiednio zbrojonej. Tak zaprojektowane pomieszczenia przyziemia mogą być przeznaczane na cele gospodarcze, garaż, parking lub na letnie, nie ogrzewane mieszkanie.

Oczywiście, na konstrukcji żelbetowej szkieletu przyziemia mogą być wykonane dowolne konstrukcje nośne budynków, w tym także drewniane lub stalowe.

### Flyer on methods for securing buildings from flooding (1 and 4 page)

Jeśli budynek już istnieje, można urządzić dom w taki sposób, by parterowe pomieszczenia stanowiły część gospodarczą, tak jak opisane poprzednio, zaś część mieszkalną przenieść na wyższą kondygnację. Należy wtedy zastanowić się, jak w przypadku zalania tej części ułatwić wodzie przepływ przez dolną kondygnację.

## Ochrona budynku przed naporem wody

Napływająca woda może z tak dużą siłą oddziaływać na budynek, że spowoduje jego uszkodzenie lub zniszczenie. Zagrożenie można zmniejszyć przewidując w trakcie projektowania nowego domu odpowiedni jego kształt (np. zaokrąglona ściana od strony napływającej wody) lub usytuowanie na działce (pod kątem lub krótszymi krawędziami w kierunku spodziewanej fali powodziowej).

Jeśli budynek już istnieje, można od strony napływającej wody wykonać małe obwałowanie lub posadzić drzewa i krzewy o mocnych korzeniach.

## Zastosowanie materiałów budowlanych odpornych na wodę

W tabeli zestawiono wybrane materiały budowlane odporne i nieodporne na wodę

| materiały odporne na wodę | zakres zastosowania | materiały nieodporne na wodę |
|---|---|---|
| tynki mineralne na bazie cementu i wapna hydraulicznego, tynki z żywic syntetycznych, płyty włóknocementowe | wykończenie ścian zewnętrznych | płyty drewniane, tynki gliniane, tynki wapienne, wełna mineralna, suprema |
| beton zwykły, beton lekki z kruszywem mineralnym, cegły (wapienno-piaskowe, ceramiczne) pustaki szklane, styropian | ściany | płyty gipsowe, ściany drewniane, bloczki i pustaki gipsowe, pustaki żużlobetonowe |
| drewno (zabezpieczone), tworzywa sztuczne, np. PCV, aluminium | okna i drzwi | drewno (niezabezpieczone) |
| tynki mineralne cementowo-wapienne z wapna hydraulicznego, płytki ścienne (glazura), klinkier | wykończenie ścian wewnętrznych | tynki gipsowe, tynki wapienne, płyty gipsowo-kartonowe, tapety, okładziny drewniane, okładziny korkowe, farby wapienne |
| beton, jastrych cementowy, terakota, asfalt | posadzki | parkiet, wykładziny dywanowe, linoleum, korek, podłogi drewniane |

W przypadku zabezpieczenia przed powodzią już istniejących budynków murowanych z cegły należy stosować materiały odporne na wodę przedstawione w tabeli, a zwłaszcza mineralne wyprawy (tynki) uszczelniające, porowate tynki renowacyjne, opaski żwirowe wokół budynku ze żwiru do głębokości i szerokości około 50 cm.

## „Otwarcie budynku" dla wody

W przypadku istniejących obiektów trudno będzie czasem uszczelnić je tak, by woda nie dostała się do wnętrza. Lepiej wtedy przygotować wnętrze na przyjęcie wody w taki sposób, aby straty były jak najmniejsze, a późniejszy remont oraz osuszanie było jak najłatwiejsze. **rys. 4**

W takim przypadku powinny być spełnione następujące warunki:

- okna piwniczne oraz drzwi wejściowe powinny umożliwiać kontrolowane zalewanie budynku
- przyłącza elektryczne, telefoniczne, gazowe oraz kocioł instalacji grzewczej powinny być umieszczone powyżej spodziewanego najwyższego poziomu wody powodziowej (np. na strychu)
- w piwnicy powinna być zainstalowana pompa zatapialna (tzw. błotna) wraz ze studzienką zbiorczą
- wszystkie instalacje powinny być zabezpieczone przed zamoczeniem, a do budowy dolnej (zatapianej) części budynku należy użyć wodoodpornych materiałów budowlanych
- ściany i posadzki piwnic powinny być izolowane oraz wzmocnione konstrukcyjnie tak, aby było możliwe odwodnienie piwnic przy podwyższonym poziomie wód gruntowych
- w części budynku, która może być zalana, powinny znajdować się jedynie lekkie meble i urządzenia, które można łatwo przenieść na wyższe kondygnacje
- do budynku (w czasie powodzi) powinno być możliwe wejście na piętro poprzez schody zewnętrzne lub zewnętrzny pomost wejściowy.

**Rys. 1** Różne sposoby ochrony budynków przed powodzią

### Flyer on methods for securing buildings from flooding (2 and 3 page)

**(translation of the content of the flyer)**

**MEANS OF SECURING BUILDINGS FROM FLOODING**

The most effective way of securing buildings from flood damage is to build them outside of risk areas. However, if matters of ownership, economics or the attractiveness of the area (e.g. location close to a river) contribute to a decision to build a new structure in a flood plain area, actions must be taken which will permit any flood damage to be minimized. This can be done in several ways, some of which we describe below (fig. 1).

**Sealing a building**
If we decide to build a home in a flood plain area, it is best to refrain from constructing a basement or building a garage below ground level. If the building is already standing, we can and even must seal it. In this case, it is worth remembering that water can get into the interior of a building via various routes: walls, floors, basements, utility connections, window and door openings (figs. 2–3 and 5–7).

In such a case, the following conditions must be met:
The mass of the building must be sufficient for the building not to float on water;
The underground portion of the building must have very good (effective) waterproof insulation, and all utility connections (sanitary, electrical, etc.) must be sealed;
The above-ground portion of the building must have waterproof insulation to the highest expected flood water level;
The entrance to the building should be situated above the expected flood water level;
During a flood, all door, window and gate openings should be secured (with waterproof panels).

**Locating the living space above flood level**
If we are thinking of a new home, it can be designed such that the living space is located above the highest level at risk for inundation. On the other hand, the ground flood should take the form of a reinforced concrete skeleton, whose walls should be executed in such a way that they permit water to flow freely (without hindrance); thus, they should have appropriately-situated window and door (including garage) openings. The foundation under the flooring on the ground floor should be constructed as an appropriately-shielded reinforced concrete plate. Ground-floor spaces designed in this manner can be designated for storage, garage or parking purposes, or for a summertime, unheated apartment.

Obviously, any kind of bearing structures, including wood or steel, can be executed on top of the reinforced concrete construction of the skeleton.

If the building already exists, we can arrange our home so that the ground-floor spaces represent a storage portion, as described earlier, while the living space can be transferred to a higher floor. Then we need to think about how to facilitate free flow of water through the ground floor level, in case this part of the house is inundated.

**Protecting a building from water pressure**
Incoming water can affect a building with such force as to damage or destroy it. During the design of a new home, the risk can be reduced by providing an appropriate building shape (e.g. a round wall on the side facing the incoming water), or location on the land parcel (at an angle, or with shorter sides facing in the direction of the expected flood wave).

If the building already exists, you can make a small embankment on the side facing the incoming water, or plant trees and bushes with strong roots.

**Utilization of waterproof building materials**
The table below is a compilation of selected waterproof and non-waterproof building materials.

| Waterproof materials | Scope of application | Non-waterproof materials |
|---|---|---|
| Mineral plasters on cement and hydraulic lime base, plasters made of synthetic resins, fiber-cement siding | Exterior wall finish | Wood paneling, clay plasters, lime plasters, mineral wool, insulation board |
| Ordinary concrete, lightweight concrete with mineral aggregate, bricks (lime-sand, ceramic), glass air bricks, styrofoam | Walls | Gypsum plates, wood, gypsum blocks and air bricks, cinder-concrete air bricks |
| Wood (coated), artificial resins (e.g. PVC), aluminum | Windows and doors | Wood (uncoated) |
| Cement-lime mineral plasters made with hydraulic lime, glazed wall tiles, clinker | Finishing of interior walls | Gypsum plasters, lime plasters, gypsum-cardboard plates, wallpapers, wood paneling, cork paneling, lime paints. |
| Concrete, cement jointless flooring, terracotta, asphalt | Flooring | Parquet flooring, wall-to-wall carpeting, linoleum, cork, wood flooring. |

In the case of flood protection for already-existing buildings with brick masonry, we must use waterproof materials presented in the table, especially mineral sealing plasters, porous renovation plasters, gravel bands around the building made of gravel to a depth and width of approx. 50 cm.

**“Opening a building” to water**
In the case of existing structures, it will sometimes be difficult to seal them so that water will not get into the interior. Then it is better to prepare the interior to receive water in such a way that losses will be as small as possible, and later renovation and drying out will be as easy as possible (fig. 4).

In such a case, the following conditions should be fulfilled:

Basement windows and entrance doors should enable controlled inundation of the building;

Electrical, telephone and gas utility connections, as well as the furnace, should be placed above the expected highest flood water level (e.g. in the attic);
In the basement, a submersible pump (so-called ‘mud pump’) should be installed, together with a reservoir;

All utility installations should be secured from wetting, and waterproof building materials must be used to construct the building’s lower portion (i.e. the part that will be under water during a flood);

Basement walls and floors should be insulated and reinforced structurally so that it will be possible to drain the basement in conditions where the ground water level is elevated;

Only light furniture and devices which can be easily transferred to higher floors should be located in the portion of the building which could be inundated;

During a flood, it should be possible to enter the second floor via exterior steps, or an exterior entrance bridge.

**Figures description**

- Fig. 1. Various ways of protecting a building from flooding
- Fig. 2. Places through which flood waters can gain entry to a building:
- 1 – Basement walls and floor; 2 – Plumbing, sanitary and storm sewers; 3 – leaks at utility connection points (gas, water, central heating, power and telephone networks); 4 – Basement windows; 5 – Ground floor walls; 6 – Ground floor door and window openings
- Fig. 3. Sealing of lower (basement) portion of building. Waterproof insulation materials and sealing of connections and openings prevent water from seeping into the interior of a building.
- Fig. 4. Example of how to secure basement window openings from flood water inflow
- Fig. 5. Example of how to secure the external entrance to a basement from flood water inflow
- Fig. 6. Example of additional security for entrances and gates by installing waterproof panels with sealing frames and tape, for the duration of a flood
- Fig. 7. Building prepared for inundation during a flood. Flood water can enter the interior of the building without hindrance.

**Appendix III Press review**

# Edukować i monitorować powódź w górach

**GORZANÓW**

Ochrona mieszkańców przed powodzią to jedno z ważniejszych zadań realizowanych przez władze powiatowe. Nie należy ono do łatwych, bowiem na ziemi kłodzkiej trudno jest przewidzieć wielkość opadów i skutki, jakie one mogą wyrządzić. Jedynym wyjściem dla zagrożonych ludzi jest szybkie ich ostrzeżenie przed zagrożeniem, np. poprzez rozwój specjalnego systemu alarmowania i monitorowania. Ważna jest też edukacja społeczna. Tą ostatnią z powodzeniem prowadzi się m.in. w Gorzanowie, gdzie w działania włączyła się Szkoła Podstawowa, Towarzystwo Miłośników Gorzanowa, rada sołecka. Wypracowano już efekty, z którymi zapoznano w minioną sobotę dyrektora Wydziału Hydrologii i Gospodarki Wodnej Światowej Organizacji Meteorologicznej - **Avinasha Tyagi'a** z Indii, szefa projektu APFM - **Joachima Saalmuellera**, prezesa Polskiego Komitetu Globalnego Partnerstwa dla Wody - prof. **Janusza Kindlera**. W roli gospodarzy wystąpili starosta **Adam Łącki** i burmistrz **Bogdan Krynicki**.

**(bień)**

***Dyrektor Avinash Tyagi w towarzystwie gospodarzy powiatu i gminy.***

**Euroregio Glacensis**

Biuletyn Bystrzycki
Informator Samorządowy • nr 2/56/06 • kwiecień 2006

# Gorzanów – mała miejscowość która buduje plan

Współczesne doświadczenia związane z ograniczaniem skutków powodzi prowadzą do wniosku, że jedyną skuteczną drogą do sukcesu jest włączenie w ten proces wszystkich, którzy mogą wpłynąć na ograniczenie strat.
Dotyczy to głównie instytucji państwowych odpowiedzialnych za planowanie, reagowanie kryzysowe, czy pomoc po powodzi, jednak najwięcej zależy od aktywności tych, których powódź dotyka, czyli od mieszkańców i administracji samorządowej.

Takie wnioski można wyciągnąć z analizy przyczyn rosnących strat powodziowych na świecie. Podkreślają to również publikowane i opracowywane dokumenty Unii Europejskiej, takie jak „Best practices in mitigation.... czy opracowywana właśnie dyrektywa powodziowa Unii Europejskiej.

Jednym z ciekawych przykładów aktywności lokalnej jest opracowywany w miejscowości Gorzanów plan ograniczania skutków powodzi.

Plan zainicjowany został przez Instytut Meteorologii i Gospodarki

*Burmistrz Bogdan Krynicki i Starosta Adam Łącki podpisują porozumienie*

## Dziś w Biuletynie:

# Gorzanów – mała miejscowość, która buduje plan c.d.

Wodnej (IMGW) w Krakowie i rozwijany jest w ramach zarządzanego przez WMO programu Associated Program on Flood Management APFM).

W krakowskim oddziale IMGW od kilku lat działa zespół ukierunkowany na kontakty z lokalnymi samorządami.

W końcu 2004 roku on został formalnie przekształcony w Biuro ds. Współpracy z Samorządami.

W Gorzanowie, tej niewielkiej miejscowości, która liczy 1000 mieszkańców, w katastrofalnej powodzi w 1997 roku zalanych zostało około 100 budynków mieszkalnych i równie wiele gospodarczych.

Zagrożenie dla życia stwarza szybkość przebiegu zjawiska – czas koncentracji fali wynosi w tej miejscowości około 3-4 godzin.

Wspomagana przez Institute of Meteorology and Water Management, aktywność władz lokalnych (County Government in Klodzko and City and Municipal Hall in Bystrzyca Kłodzka) oraz mieszkańców wsi doprowadziła już obecnie do konkretnych rezultatów.

Do najważniejszych należy opracowanie listy „słabych punktów" lokalnego systemu ochrony przed powodzią oraz propozycji rozwiązań w tym zakresie.

Pod uwagę bierze się zarówno poprawę stanu koryta rzeki, jak również zbudowanie systemu ostrzegania, opracowanie planu reagowania mieszkańców na ostrzeżenia i rozwijanie edukacji powodziowej.

Najważniejszym elementem budowanego planu jest sprawnie działający system ostrzegania. Opiera się on na Telefonicznym Systemie Ostrzegania Mieszkańców (TSOM) zarządzanym przez centrum kryzysowe starostwa powiatowego w Kłodzku, który umożliwia powiadomienie ponad 800 mieszkańców w ciągu godziny.

System ten jest wspomagany w Gorzanowie siecią ochotników – strażników powodziowych, którzy będą powiadamiać sąsiadów i dodatkowo sprawdzać ich reakcję.

22 kwietnia br. w szkole podstawowej w Gorzanowie odbyło się spotkanie, na którym przedstawiono elementy planu ograniczania skutków powodzi.

Jego założenia oraz system ostrzegania przedstawili przedstawiciele: Ochotniczej Straży Pożarnej, Centrum Kryzysowego w Bystrzycy Kłodzkiej, Towarzystwa Miłośników Gorzanowa (lokalny NGO) oraz nauczyciele, którzy już obecnie wprowadzają do programu nauczania elementy związane z powodziami i sposobami prawidłowych zachowań w fazie prewencji i reagowania powodziowego.

Najważniejszym punktem spotkania było podpisanie porozumienia pomiędzy urzędem powiatowym i gminnym w sprawie podziału kompetencji i odpowiedzialności w zakresie ostrzegania mieszkańców przy wykorzystaniu TSOM oraz w zakresie edukacji.

Podpisali je Burmistrz Bystrzycy Kłodzkiej **Bogdan Krynicki i** Starosta Kłodzki **Adam Łącki.**

Dotyczy ono nie tylko miejscowości Gorzanów ale wielu innych leżących na terenie gminy.

W spotkaniu, które przygotowali nauczyciele i uczniowie Szkoły Podstawowej w Gorzanowie, brali m.in. udział przedstawiciele World Meteorological Organization (ONZ), Global Water Partnership z Polski, Rumunii i Słowacji oraz Instytutu Meteorologii i Gospodarki Wodnej – instytucji odpowiedzialnej za realizację prowadzonych działań.

Goście obecni na spotkaniu:

1/ **Joachim Saalmuller** - Jednostka Wspomagania Realizacji Projektów Światowej Organizacji Meteorologicznej (agencja ONZ)

2/ **Awinash Tiagi** - Dyrektor Wydziału Hydrologii i Zasobów Wodnych Światowej Organizacji Meteorologicznej (Agencja ONZ)

3/ **Bogdan Ozga-Zielinski** - Kierownik Zakładu Hydrologii Stosowanej Instytut Meteorologii i Gospodarki Wodnej

4/ **Janusz Kindler** - Kierownik Polskiego Komitetu Globalnego Partnerstwa dla Wody

5/ **Liviu N. Popescu** - Przewodniczący Rady Programowej Globalnego Partnerstwa dla Wody dla Krajów Środkowej i Wschodniej Europy

6/ **Katarina Hajtasova** - Dyrektor Wydziału Zintegrowanego Zarządzania Słowackiego Instytutu Hydrologiczno Meteorologicznego

7/ **Boris Minarik** - Słowacki Instytut Hydrologiczno Meteorologiczny

8/ **Jana Poorova** - Dyrektor Wydziału Hydrologii Słowackiego Instytutu Hydrologiczno Meteorologicznego

9/ **Milan Matuska** - Regionalny Koordynator Globalnego Partnerstwa dla Wody dla krajów Środkowej i Wschodniej Europy.

*Zbigniew Woźniak*

6 Gazeta Prowincjonalna • nr 18 (740) • 5.05.- 11.05.2006

Gazeta Prowincjonalna, to **ekskluzywny, prywatny tygodnik**, na łamach którego możesz zaprezentować swoje poglądy i podzielić się zainteresowaniami z mieszkańcami całej Ziemi Kłodzkiej

MIĘDZYLESIE

### Absolutorium udzielone

25.04.2006 r. odbyła się "absolutoryjna" sesja Rady Miejskiej. Po pozytywnej opinii RIO oraz sprawozdania z wyk. budżetu za 2005 r. podjęto uchwałę o udzieleniu absolutorium Burmistrzowi za 2005 r.

### Nowe stawki za wodę i ścieki

Na tej sesji zatwierdzono również przedstawione przez ZGKiM nowe taryfy za wodę i odbiór ścieków. Od 1. lipca stawki będą wynosić:

WODA: dla bud. jednorodzinnych - 1,44 zł/m3, dla bud. wielorodzinnych - 1,58 zł/m3, dla pozostałych odbiorców - 1,37 zł/m3. Opłata stała nie została zmieniona i już od 3. lat wynosi 3,50 zł/ mies. za umowę.

ŚCIEKI: dla kanalizacji miejskiej - 1,32 zł/m3, dla ścieków dowożonych - 1,23 zł/m3. Opłaty za ścieki dowożone nie obejmują kosztów transportu. Opłaty za wodę i ścieki są opłatami brutto.

### Informacja dla dzierżawców gruntów gminnych

Informujemy, że do końca czerwca 2006 r. nastąpi kontrola przez prac. Urzędu MiG Międzylesie dzierżawionych gruntów pod względem zagospodarowania rolniczego zgodnie z ustaleniami zawartymi w umowie dzierżawy.

### Czas inwestycji rozpoczęty

Rozpoczęły się prace nad przebudową parkingu i placu targowego za bud. Urzędu Miejskiego. Rozstrzygnięto przetarg na wyłonienie wykonawcy. Obecnie trwają prace nad podłączeniem bud. Urzędu do miejskiej sieci ogólnospławnej. Zadanie przebudowy współfinansowane jest ze środków Unii Europejskiej pozyskanych ze środków ZPORR.

**(inf. na podst. Infrormatora Gminnego nr 94/4/2006)**

## Gorzanów – mała miejscowość, która buduje plan ograniczania skutków powodzi

Współczesne doświadczenia związane z ograniczaniem skutków powodzi prowadzą do wniosku, że jedyną skuteczną drogą do sukcesu jest włączenie w ten proces wszystkich, którzy mogą wpłynąć na ograniczenie strat. Dotyczy to głównie instytucji państwowych odpowiedzialnych za planowanie, reagowanie kryzysowe, czy pomoc po powodzi, jednak najwięcej zależy od aktywności tych, których powódź dotyka, czyli od mieszkańców i administracji samorządowej. Takie można wyciągnąć wnioski po analizie przyczyn rosnących strat powodziowych na świecie. Podkreślają to w efekcie publikowane i opracowywane dokumenty Unii Europejskiej, takie jak „Best practices on flood prevention protection and mitigation" czy opracowywana właśnie dyrektywa powodziowa Unii Europejskiej.

Jednym z ciekawych przykładów aktywności lokalnej jest opracowywany w małej miejscowości Gorzanów w Polsce plan ograniczania skutków powodzi. Plan zainicjowany został przez Instytut Meteorologii i Gospodarki Wodnej (IMGW) w Krakowie i rozwijany jest w ramach zarządzanego przez World Meteorological Organization (agencja ONZ) programu Associated Program on Flood Management APFM. W tej niewielkiej miejscowości, która liczy 1000 mieszkańców, w katastrofalnej powodzi w 1997 roku zalanych zostało około 100 budynków mieszkalnych i równie wiele gospodarczych. Zagrożenie dla życia stwarza szybkość przebiegu zjawiska – czas koncentracji fali wynosi w tej miejscowości około 3-4 godzin. Wspomagana przez Instytut Meteorologii i Gospodarki Wodnej, aktywność władz lokalnych (Starostwo Powiatowe w Kłodzku i Urząd Miasta i Gminy Bystrzyca Kłodzka) oraz mieszkańców wsi doprowadziła już obecnie do konkretnych rezultatów. Do najważniejszych należy opracowanie listy „słabych punktów" lokalnego systemu ochrony przed powodzią oraz propozycji rozwiązań w tym zakresie. Pod uwagę bierze się zarówno poprawę stanu koryta rzeki, jak również zbudowanie systemu ostrzegania, opracowanie planu reagowania mieszkańców na ostrzeżenia i rozwijanie edukację powodziowej.

Najważniejszym elementem budowanego planu jest sprawnie działający system ostrzegania. Opiera się on na Telefonicznym Systemie Ostrzegania Mieszkańców (TSOM) zarządzanym przez centrum kryzysowe starostwa powiatowego w Kłodzku, który umożliwia powiadomienie ponad 800 mieszkańców w ciągu godziny. System ten jest wspomagany w samej miejscowości siecią ochotników – strażników powodziowych, którzy będą powiadamiać sąsiadów i dodatkowo sprawdzać ich reakcję.

W kwietniu 2006 r. w szkole podstawowej w Gorzanowie odbyło się spotkanie, na którym przedstawiono elementy planu ograniczania skutków powodzi. Jego założenia oraz system ostrzegania przedstawili przedstawiciele: Ochotniczej Straży Pożarnej, Centrum Kryzysowego w Bystrzycy Kłodzkiej, Towarzystwa Miłośników Gorzanowa (lokalny NGO) oraz nauczyciele, którzy już obecnie wprowadzają do programu nauczania elementy związane z powodziami i sposobami prawidłowych zachowań w fazie prewencji i reagowania powodziowego.

Najważniejszym punktem spotkania było podpisanie porozumienia pomiędzy urzędem powiatowym i gminnym w sprawie podziału kompetencji i odpowiedzialności w zakresie ostrzegania mieszkańców przy wykorzystaniu TSOM oraz w zakresie edukacji. Podpisali je starosta powiatu Kłodzkiego i burmistrz gminy Bystrzyca Kłodzka. Dotyczy ono nie tylko miejscowości Gorzanów ale wielu innych leżących na terenie gminy.

W spotkaniu brali udział przedstawiciele World Meteorological Organization, Global Water Partnership z Polski, Rumunii i Słowacji oraz Instytutu Meteorologii i Gospodarki Wodnej – instytucji odpowiedzialnej za realizację prowadzonych działań.

**Biuro ds. Współpracy z Samorządami, Instytut Meteorologii i Gospodarki Wodnej Kraków**

## LIDERZY SAMORZĄDNOŚCI - „GMINY FAIR PLAY"!

Już po raz piąty samorządy z całej Polski poddają się weryfikacji przystępując do ogólnopolskiego konkursu i programu certyfikacyjnego dla samorządów „Gmina Fair Play" – Certyfikowana Lokalizacja Inwestycji. Z roku na rok obserwujemy coraz większe zainteresowanie konkursem i certyfikacją. Coraz więcej gmin chce zweryfikowania i potwierdzenia swej rzetelności i fachowości w zakresie obsługi inwestycji.

W tym roku do konkursu zgłosiła się rekordowa liczba gmin – 183 samorządy! W województwie dolnośląskim do weryfikacji przystąpiło 18 gmin są to: Gmina Mieroszów, **Gmina Miejska Duszniki-Zdrój**, Miasto Pieszyce, Gmina Żarów, Gmina Wałbrzych, **Gmina Lądek Zdrój**, Gmina Miejska Zawidów, Gmina Kobierzyce, Gmina Zgorzelec, Gmina i Miasto Lwówek Śląski, Gmina Ścinawa, Gmina Bogatynia, Miasto i Gmina Chocianów, Gmina Góra, **Gmina Stronie Śląskie**, Miasto Kowary, **Gmina Polanica-Zdrój**, Gmina Miejska Zgorzelec.

Podstawowym celem konkursu „Gmina Fair Play" jest popularyzowanie etyki w biznesie, przejrzystości procedur oraz postaw godnych naśladowania, sprzyjających podejmowaniu przedsięwzięć inwestycyjnych. Dlatego zależy nam głównie na tym, aby gminy w pełni zaangażowane w tworzenie jak najlepszych warunków dla prowadzenia działalności gospodarczej i inwestowania zostały wyróżnione i uzyskały wsparcie w swych wysiłkach na rzecz przyciągania nowych inwestorów. Gminy, które przystąpiły do programu zostaną poddane dwuetapowej weryfikacji. Pierwszy etap to ocena ankiet, zawierających prezentacje gminy (aby zakwalifikować się do II etapu gmina musi uzyskać minimum 72 punkty na 100 możliwych). Drugi etap to audyty we wszystkich gminach zakwalifikowanych do tego etapu oraz badania losowo wybranych inwestorów.

***Gmina Fair Play:*** *dąży do wypracowania jak najlepszych standardów dla prowadzenia zarówno małych jak i dużych przedsięwzięć gospodarczych i inwestycyjnych; zapewnia szybką i sprawną obsługę inwestorów; pracownicy urzędu są dobrze przygotowani merytorycznie a zarząd gminy podejmuje prawidłowe i korzystne dla gminy decyzje; dotrzymuje podjętych zobowiązań; umiejętnie promuje zarówno samą gminę, jak i inwestycje podejmowane na jej terenie (niewiele gmin zdaje sobie sprawę, jak ważną promocją jest chociażby udostępnianie oferty inwestycyjnej w Internecie). utrzymuje wysokie standardy obsługi inwestorów w gminie - przyjazne podejście, rzetelność, sprawność obsługi, bardzo dobre przygotowanie urzędników gminy do negocjacji z nowymi inwestorami; promuje inwestycje przyjazne dla środowiska i promuje współpracę pomiędzy biznesem i gminami; stwarza pozytywny wizerunek skutecznych władz samorządowych; podnosi swą konkurencyjność (dzięki rozpoznaniu potrzeb inwestorów).*

Organizatorem konkursu jest Fundacja Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym. Konkurs afiliowany jest przy Krajowej Izbie Gospodarczej. Obie instytucje od ponad 10 lat prowadzą szeroko zakrojoną akcję promowania rzetelności i uczciwości w działalności gospodarczej a konkurs „Gmina Fair Play" jest kontynuacją tych działań.

**Paulina Bednarz - Warszawa**

## Appendix IV INITIAL OBSERVATIONS CONCERNING OPERATION OF THE WARNING system AFTER THE FLOOD WAVE WHICH OCCURRED IN KłodzkO VALLEY IN AUGUST 2006

### INITIAL OBSERVATIONS CONCERNING OPERATION OF THE WARNING system AFTER THE FLOOD WAVE WHICH OCCURRED IN KłodzkO VALLEY IN AUGUST 2006

The description below was written on the basis of initial[3] conversations and materials received from employees of the Institute of Meteorology and Water Management (IMGW) in Wroclaw, the County Crisis Management Center (PCZK) in Kłodzko, the Municipal Response Team in Bystrzyca Kłodzka, and the village administrator of Gorzanów.
In assessing warning system operation, we have focused on those elements which have been implemented in Kłodzko County in recent years, and expanded as part of the APFM project.

### DESCRIPTION OF THE AUGUST 2006 FLOOD IN SOUTHWESTERN POLAND

**Characterization of meteorological situation and IMGW operations in first half of August 2006**
In the first half of August, heavy rainfall was noted in the area of southwestern Poland. They occurred in an expansive low-pressure area in which two centers were formed, linked by a frontal zone. Associated with this system was the first wave of precipitation in the Kłodzko Valley, which began on 3 August in the afternoon and lasted, with varying intensity, for two days. The total precipitation noted for this period amounted from 45 to 90 mm.

On 5 August, precipitation slacked off; fleeting showers were noted. However, another low-pressure center was forming over Ukraine, which grew deeper and encompassed eastern and central Poland. In the Kłodzko Valley, a second wave of precipitation began, lasting until the morning hours of 9 August. The heaviest rainfall occurred during the second hydrological day (7/8 August). For the entire period, the total precipitation was greater in the eastern part of the Valley, where over 100 mm were noted, with a maximum of 140 mm. In the western half, precipitation amounted to 60–90 mm (locally, up to 140 mm).

All told, in the first half of August, in the Kłodzko Valley, over 130 mm of precipitation were noted; and in places in the south and east, even 220–250 mm. Most of this was constant rainfall (from stratus clouds); though during the second precipitation wave, showers also occurred. With such a large total precipitation, the scale of the flood was influenced by very low river water levels at the beginning of the month, as well as distribution of precipitation over time.

The first precipitation warning was given at IMGW Wroclaw a little before noon on 3 August (in weather forecasts for orientation purposes made the preceding day, information was given about predicted heavy rainfall). Warnings and forecasts were updated daily. Local authorities were warned of conditions for occurrence of rainfall which could cause elevated water levels – initially to flood watch level and then, in subsequent days, to flood warning level, so that there was an actual flood hazard situation in progress. In weather messages transmitted daily, information was given about anticipated time of occurrence of precipitation; and for purposes of the model implemented at the County Government Office, a detailed quantitative precipitation distribution was forecasted for separate areas of the Kłodzko Valley.

**Operation of local government administration and crisis intervention forces in the Kłodzko Valley**
Weather and hydrological warnings and messages disseminated to municipalities by PCZK:

- 5 August 2006 – warning of heavy rainfall transmitted via SMS to mayors and crisis intervention forces
- 7 August 2006, 12:40 PM – IMGW Wrocław heavy rainfall warning transmitted to municipalities
- 7 August 2006, 1:15 PM – IMGW Wrocław hydrological warning transmitted to municipalities
- 7 August 2006, 2:36 PM – weather forecast for orientation purposes transmitted to municipalities.

[3] A more detailed analysis is planned in the immediate future.

All crisis intervention forces monitored the flood situation via the local monitoring system. The PCZK was in close contact with the Regional Water Management Board Inspectorate in Kłodzko, which monitors water levels on dams in Stronie Slaskie and Miedzygorze.

Declaration of flood warning and preparedness status and inhabitant warning:

- Mayor of Radkow municipality instituted flood watch on 7 August 2006 at 2:00 PM and notified inhabitants of the hazard situation via Telephone-based Inhabitant Warning System (TSOM).
- Mayor of Bystrzyca Kłodzka instituted flood watch on 7 August 2006; and on 8 August 2006 at 5:00 AM, issued flood warning and informed municipality inhabitants of hazard situation via TSOM.
- Administrator of Kłodzko Municipality issued flood warning on 7 August 2006 at 3:00 PM.
- Mayor of City of Kłodzko issued flood warning on 7 August 2006 at 3:20 PM
- Kłodzko County Administrator issued flood warning on 8 August 2006 at 7:00 AM; and at 10:30 AM, notified county inhabitants of the hazard situation via TSOM.

**COMMENTS ON FLOOD WARNING system OPERATION**

**Actions at IMGW Wrocław level**

Elements built as part of APFM project

Tools to prepare, on an ongoing basis, precipitation forecasts from a numerical model, as well as synoptic precipitation forecast (a specialized product being prepared experimentally as part of the project) for the Kłodzko Valley.

Activity during flood

The aforementioned forecasting products were prepared and assembled on an FTP server available to the County Government Office in Kłodzko.

Conclusions and suggestions

The practical possibility was tested of preparing specialized products on an ongoing basis for small areas; however, assessment of their quality and usefulness to local crisis intervention forces has not yet been made. Lack of interaction between crisis intervention forces and synopticians could indicate that the assessment will be difficult to carry out.

**Operations at level of County Crisis Management Center in Kłodzko**

Elements built as part of APFM project

Modernization of software assisting in the work of the crisis intervention team, via adaptation to the locally-operating monitoring system and to receipt of specialized forecasts from IMGW. More detail was added to rules for utilization of TSOM.

Operations during flood

The telephone-based inhabitant warning system was launched for at-risk areas of the Kłodzko Valley (with the exception of Gorzanów and Radków, which were warned previously by municipal authorities).

The Flo-Info application was not utilized. A few factors contributed to this: illness of the center employee responsible for utilization of the program, as well as changes in the County Government Office's computer network settings, which caused problems with access to data and difficulties in use of the new version of the application.

Conclusions and reflections

Training of PCZK employees in use of Flo-Info turned out to be insufficient. Further training programs are necessary, as well as – particularly important – everyday, routine exploitation of the application.

Problems are also generated by changes in configuration of elements of the computer network utilized by the County Government Office[4].

**Operations at level of Municipal Response Team in Bystrzyca Kłodzka**

Elements built as part of APFM project

Division of competency areas in warning of inhabitants between the county administrator and the mayor, training of municipal forces in the area of launching the TSOM.

Operations during flood

The mayor of the municipality of Bystrzyca Kłodzka launched the TSOM (for the first time since the system has existed) 4–5 hours before the flood. This was in accordance with the agreement signed by the mayor of the municipality and the county administrator in May 2006. However, the new structure created in Gorzanów – flood wardens whose assumed task is to reinforce the effectiveness of telephone warnings – was not utilized. During conversations, it was determined that the reason for this was a fear that the knowledge level of flood wardens is still too low for them to be able to perform their tasks to good effect.

Conclusions and suggestions

It is necessary to fine-tune the plan for utilization of flood wardens, determine the scope of their competency areas and responsibilities, principles for expert support on the part of the municipality, as well as train the wardens.

**Operations in village of Gorzanów**

Elements built as part of APFM project

Implementation of the TSOM (updating of database and system operation test), establishment of (volunteer) flood warden network, building of a staff gauge permitting inhabitants to observe water levels, education and information operations oriented towards the warning system and flood preparedness.

Operations during flood

Some inhabitants, upon receiving the warning, moved property from the ground floors of homes to an upper floor; some property was also evacuated. Inhabitants used the staff gauge built during the project to observe rises and falls in water levels. The village administrator made use of measurement information from the local monitoring system at the County Government Office, publicly available over the Internet. Flood wardens made themselves available and attempted to help people whose homes were at risk.

Conclusions and suggestions

Inhabitants, at least some of them, responded properly to the warning. Likewise flood wardens, who made themselves available to the Volunteer Fire Brigade (OSP). A negative is the lack of skill in utilizing them, revealed during the flood. It is necessary, with the OSP, to establish principles of cooperation with flood wardens, as well as joint training programs.

**General comments**

The TSOM, so far, has not been very well-utilized by the municipalities. Up until now, two of them have used it; in the case of Bystrzyca Kłodzka, this was most probably influenced by the warning test using the TSOM, conducted in Gorzanów shortly before the flood in August 2006. This indicates a need to organize drills in launching of the TSOM for municipal centers which, by showing the operation of the system in practice, would encourage its use.

The above-described utilization of measurement information from the local monitoring system by the village administrator of Gorzanów took place as a result of information and suggestions from IMGW transmitted already during the flood wave. This shows that the measurement system in operation for the past several years in the Kłodzko Valley, and the possibilities for its utilization, have not been sufficiently popularized.

[4] Changes in configuration (e.g. of mail server) are not signaled, and independent configuration of the Flo-Info application at the County Government Office in Kłodzko is a problem.

Information concerning perceptions of Gorzanów inhabitants shows that at least some of them believe that only structural means of flood protection are effective, which causes passivity in taking individual safety actions. In other towns, the case is no doubt the same. This indicates a need to reinforce education for inhabitants.

To sum up, it seems that it is possible to increase effectiveness in utilization of flood warning system elements; and key to this are information, education and training programs.