



Flood protection Expert Group

Flood Action Programme Lower Danube Corridor

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1 Introduction

In response to the damages provoked by disastrous flood events that have occurred in the Danube River basin, the **International Commission for the Protection of the Danube River (ICPDR)** decided to establish the long-term Action Programme for Sustainable Flood Prevention in the Danube River Basin.

The overall goal of the Action Programme is to achieve a long term and sustainable approach for managing the risks of floods to protect human life and property, while encouraging conservation and improvement of water related ecosystems.

The **four major basin-wide targets** of the Action Programme are:

- Improvement of flood forecasting and early flood warning systems; interlinking national or regional Systems;
- Support for the preparation of and coordination between sub-basin-wide flood action plans;
- Creating forums for exchange of expert knowledge;
- Recommendation for a common approach in assessment of flood-prone areas and evaluation of flood risk.

At the **sub-basin level**, six targets have been identified in the Action Programme:

- To reduce the adverse impact and the likelihood of floods in each sub-basin through the development and implementation of a long-term flood protection and retention strategy based on the enhancement of natural retention as far as possible;
- To improve flood forecasting and warning suited to local and regional needs as necessary.
- To increase the capacity building and raise the level of preparedness of the organizations responsible for flood mitigation;
- To develop flood risk maps;
- To harmonize design criteria and safety regulations along and across border sections;
- To prevent and mitigate pollution of water caused by floods.

This action plan for the Lower Danube Corridor sub-basin reviews the current situation in flood protection in Romania and Bulgaria and sets the targets and the measures for reduction of damage risks and flood levels, increasing the awareness of flooding and for improvement of flood forecasting. The targets and measures are based on the regulation of land use and spatial planning, increase of retention and detention capacities, technical flood defences, preventive actions, capacity building, awareness & preparedness raising and prevention and mitigation of water pollution due to floods.

ROMANIA

The high torrentially degree of watercourses, due to the climate conditions, physical and geographical factors conduct to a frequent phenomenon of flooding on Romanian territory.

In last years the occurrence of flooding was higher. In 2005, 2006 and 2008, dangerous, atypical hydrological and meteorological phenomena took place with human lives and huge material losses.

In 2005 the total value of material damages, due to the flooding in Timiș, Olt, Siret and Ialomița hydrographical basins was app. 1.66 bn. euro, representing 0.6 % of national GDP

The registered high-flood on Romanian sector of the Danube in April 2006 was the highest since 1898. The consequences were that dikes failed on many sectors.

In July 2008, historical values of water discharge and levels have been registered in Tisa, Siret and Prut basins.

According to the Water Law, the strategy and national politics in water management field are tasks for the Ministry of Environment and for the application and control of activities is responsible “Romanian Waters” National Administration through its water directorates.

The National Plan for Prevention and Flood Protection is part of national politics and constitutes a necessary tool for national coordination and basin correlation of investments in water management domain.

The National Strategy for Flood Risk Management on short term adopted in December 2005 takes into consideration the following aspects and priorities:

- preliminary estimation;
- critical analysis of existing flood defences;
- basic principles for national strategy for flood risk management on medium and long term;
- risk reduction means both vulnerability and objective factors mitigation;
- both structural and non-structural measures are necessary;
- we should take into consideration all local and regional conditions;
- European context: directives, funds.

The existing legislative framework offer to the central authorities and public local administration the legal support for the prevention, protection and preparation activities in flood risk management (Regulations regarding flood adopted in 2005)

It is necessary a strong coordination of these activities based on regulations regarding strategies and politics for flood risk mitigation, cost-benefit analysis, economic, social and environment impact assessment, programmes and plans for spatial planning.

National Strategy for Flood Disaster Prevention and the Flood Action Plan

The short-term strategy for flood protection has the following principles:

- Sustainable development;
- Economic, social and ecological acceptability;
- Strategic assessment for a period of time;
- Simplicity and transparent aspects;
- Basin approach of the flood problem;
- Interdisciplinary approach;
- Solidarity;
- Equilibrium maintenance among preventive, response and post-factum measures, using the national territory plans, structural and non-structural measures, as intervention plans for emergency situations.

Applications of best practices proposed by EU and UN Economic Commission for Europe regarding flooding preventive measures, protection and effects mitigation are under implementation.

Flood Action Plan for the short term strategy implementation started in 2005 by integrated actions for 5 years (2010):

- development of the hydrological information system and modernization of the early warning system – DESWAT Project
- rehabilitation of the old flood defence hydraulic infrastructure and building new ones in areas of high risk,
- Flood hazard mapping and flood management plans. The first pilot basin was Siret. Nowadays, interdisciplinary studies in eight river basins are under implementation

(Siret, Mureş, Crişuri, Banat, Jiu, Olt, Someş-Tisa, Ialomiţa-Buzău) and will be finalized during 2009, beginning of 2010.

For the pilot-sub-basin Raznic, tributary of Jiu River the study was finalised, being prepared the hazard map and damages evaluation for flood risk map.

The National Plan will be finished in the frame of the River Basin Management Plans – Flood management Section first draft, till December 2009 and is planned to be adopted till mid 2010.

In mean time, during 2009 will be finalized mid and long term National Strategy for Flood Risk management, which will take into account the need for Flood Directive implementation.

BULGARIA

The adoption in 1999 of the Strategy for Integrated Water Management marked the beginning of the reforms in the water sector in Bulgaria in line with the WFD and other obligations undertaken under international instruments. Several other programs such as: Strategy for the Integrated Water Management in the Republic of Bulgaria – institutional aspects, National Strategy for Management and Development of the Water Sector until 2015, and the Operational Programme Environment 2007 - 2013 (OPE) complete the picture of ongoing efforts towards compliance and enforcement of EU legislation.

Now the legal framework for environmental management of water resources and ecosystems in Bulgaria comprises a system of decrees, laws, ordinances and regulations on different administrative levels.

In addition, a process of drafting the National Strategy for the Environment 2010-2018 and its Action Plan is in progress.

The transposition of the EU Flood Directive into national legislation is at its final stage.

Floods are basin wide phenomena which do not respect borders and often create common problems between regions and countries. It is widely recognized that effective prevention of and intervention against floods requires cross-border cooperation. Therefore, the EU Flood Directive aims at creating one single flood risk management plan for each River basin, thus promoting coordination and collaboration between authorities across borders.

The Action Programme for Sustainable Flood Protection in the Danube River Basin (ICPDR, 2004) also foresees preparation of the action plans for the sub-basins, which should serve as essential tools to support cooperation and harmonization between the countries in the field of flood risk management.

This Document is prepared in response to the ICPDR Flood Action Programme following the content described in chapter 5.2 of the Programme and it summarises the key actions towards preparation of the flood risk management plans.

2 Characterisation of Current Situation

2.1 Natural conditions

ROMANIA

The Danube hydrographic space is situated in Central Europe, comprises 17 countries and covers 10 % from the Europe's surface. The river crosses 8 countries and 4 capital-cities, is oriented from V-NV to E-SE and represents an essential component of the trans-European water navigation way known as "Rhein-Main-Danube System". The total surface of the

catchments basin is 805,300 km², with a length of 2,860 km, from which 1075 km on the Romanian territory.

From the total catchments area of the Danube hydrographic basin, 29 % pertains to our country, the Romanian territory being drained by 97.4 % by this river.

This hydrographic space is situated in southern Romania and goes administratively on the following counties: Caraș-Severin, Mehedinți, Dolj, Olt, Teleorman, Giurgiu, Călărași, Ialomița, Brăila, Constanța (Cernavodă and Hârșova towns) and Tulcea (Danube Delta).

The multi-annual stock of the Danube, at the entrance to Romania (Baziaș) is of 175.6 mn.m³/yr going up to 204 mn.m³/yr at the entry to the Danube Delta (Ceatal Izmail).

The maximum flow is achieved Spring-Summer. At the entrance to Romania the highest values are registered in April, because of the hydrological regime of the Drava, Sava, Tisa and Velika-Morava rivers. In Romania, at Zimnicea and Ceatal Izmail, the maximum flow is achieved in May-June, due to the hydrological regime of the Romanian tributaries.

Among the floods of big discharges, in the last 60 years, there have been: 1940, 1942, 1955, 1970, 1975, 1981 and 2006.

The highest registered values during floods on the Danube there have been at Orșova in 1940 and in 1981 and at Ceatal-Izmail in 1897.

It is to be mentioned that, for the Danube, floods regime means discharges which go higher than 8000-9000 m³/s, as it is the transport capacity of the minor streambed downstream Porțile de Fier II (Iron Gates II).

The periods of small waters on the Danube are during Winter and especially in Autumn. The daily minimum discharge values vary as it follows: the smallest values have been of 1060 m³/s at Orșova in 1985 and of 1350 m³/s at Ceatal Izmail in 1921. These are situated bellow the level of the minimum daily flows with the probability of 95%.

The Lower Danube Corridor is placed in Southern and Eastern part of Romania following the Danube River. The Corridor is formed by small basins of the small Danube tributaries from Porțile de Fier I (Iron Gates I) dam to Isaccea town.

The hydrographic basins of the Danube's main tributaries from South-Western Romania are: Bahna, Topolnița, Blahnița, Drincea, Balasan and Desnațui with a total area of 6,596.6 km² and a total river network (54 codified tributaries) length of 1078 km having a density of 0.16 km/km².

The water resources of those rivers are 261.5 mn.m³ (8.3 m³/s).

The Mostiștea (L=98 km, S=1758 km²) and Călmățui (L=152 km, S=1668 km²) basins are part of the Danube Corridor. Characteristic to these two basins is that they have a low specific flow (less than 1 l/s.km²) with drought phenomena on some of their main tributaries.

The water resources of Mostiștea and Călmățui are very modest, the multi-annual average stock of Mostiștea in the section of its discharge is 38 mn.m³ (1.2 m³/s), respectively for Călmățui 47 mn.m³ (1.5 m³/s).

On Călmățui and Mostiștea floods have been small, with small losses and damages.

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For the purposes of this document, the Lower Danube Corridor is defined as shared by Bulgaria and Romania and covering the mainstream Danube, downstream of Iron Gate II, and extending to the Prut River confluence.

The Danube River forms the northern boundary of Bulgaria with Romania. The total catchment area from the 845.5 rkm to the 375.5 rkm is 104,800 km², of which only 46,930 km² are in the Bulgarian territory. The catchment area in the Bulgarian section of the river is relatively poor in surface, as well as groundwater, and the contribution of the inflow waters from the Bulgarian territory to the river is only 3%, averaging 150 l/s.

Ecological conditions along the Bulgarian-Romanian sector are determined mainly by the construction and operation of the "Iron Gate" hydro-station, which is situated at a distance of 100 km and 17 km above the Bulgarian stretch and directly influences the hydrology of the downstream section of the Danube River.

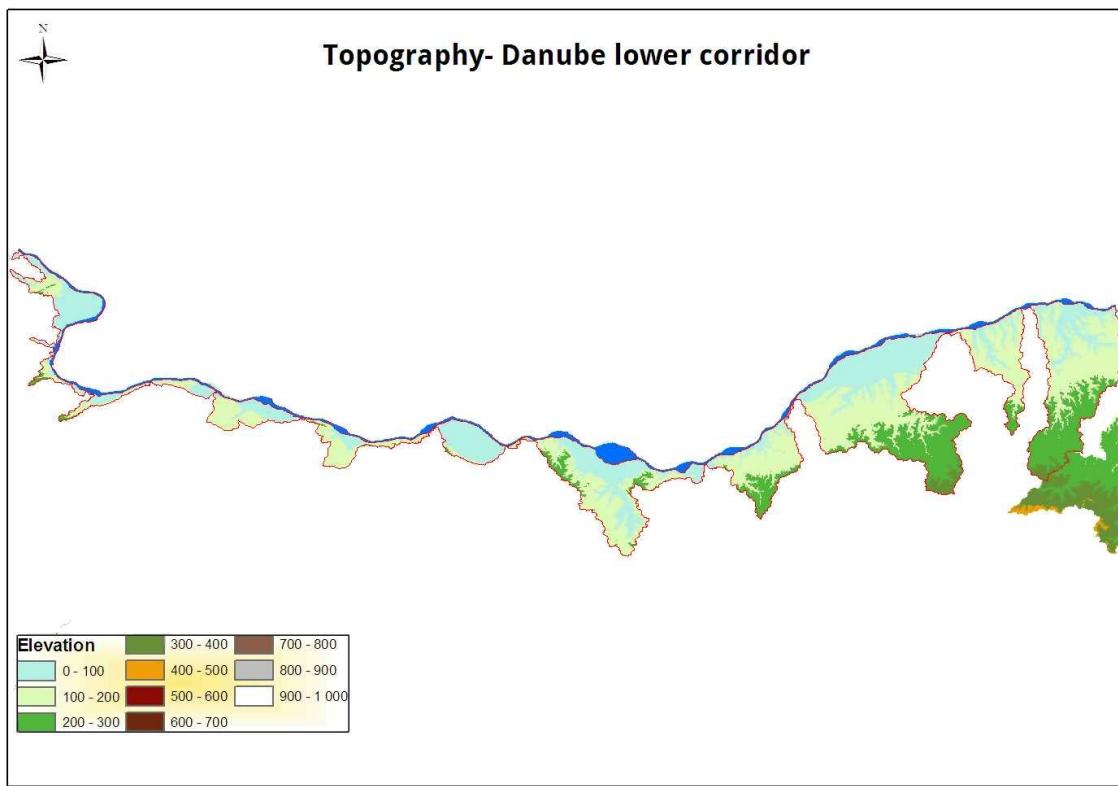
Beyond the Iron Gate the lower Danube flows across a wide plain, the river becomes shallower and broader, and its current slows down. To the right, above steep banks, stretches the the Danubian Plain of Bulgaria. To the left lies the low Romanian Plain, which is separated from the main stream by a strip of lakes and swamps.

This section of the Danube is one of the most natural stretches along the entire river. It is obstructed by a number of islands most important of which are the Bulgarian islands at Belene and the Kalimok marshes. The floodplain forests on the Bulgarian Danube islands are unique natural habitats with essential environmental functions, supporting rare and globally threatened species of fauna and flora. There is also a mosaic of protected areas including Ramsar sites, Biosphere Reserves, World Heritage Site (Srebarna Lake) and National/Nature Parks. In view of the above Bulgaria, Romania, Ukraine and Moldova signed in 2000 the Lower Danube Green Corridor Agreement to establish a corridor of protected and restored wetlands along the Danube.

As it was mentioned, the tributaries in this section are comparatively small and account for only a modest increase in the total runoff.

The flood protection dikes are built usually only 200 to 300 m away from the main stream and through this process, the formerly extended floodplains along the Danube have been reduced considerably.

Generally floods on the Bulgarian territory along the Danube River are generated under the influence of high flows with long duration which might affect the stability of the levees and cause subsequent flooding.



2.2 Anthropic influence. Flood defences

ROMANIA

The main hydraulic works affecting the flow regime of the rivers are: reservoirs, deviations and water transfers from neighbourough basin into a reservoir and levees. These types of infrastructures are in fact the most useful instruments for water management, offering possibilities in getting regulation of different volumes during the seasons and sometimes during the year, to offer flood protection or dilution in case of accidental pollution.

In order to protect goods and human lives, on Romanian territory have been realised hydraulic structures which compose the National System for Flood Defence.

The works done along its course and in the Delta there have been aimed the following main goals:

- Take off from the floods influence of the areas from the Danube floodable wetlands;
- Capitalization of the hydro-energetic potential of the river;
- Set-up some irrigation systems, with the supply source from the Danube, which totalizes circa 2.27 mn. ha;
- Cutting short of the navigable way between the Danube and the Black Sea, through the Dunăre-Marea Neagră Canal, including the possibility to catch on the cooling water for Cernavodă Nuclear Power Plant;
- The supply with potable and industrial water of the important localities situated on the Danube bank.

Reservoirs

Two reservoirs for hydropower production are along the Romanian part of the Danube. **Porțile de Fier I** (Iron Gates I), which is in the Pannonian Southern Danube and **Porțile de Fier II** (Iron Gates II) in the Lower Danube Corridor.

The maximum global volume of these accumulations is **3,900.0 mn.m³**. These two accumulations gather an utile volume of **250.0 mn.m³** and of a total attenuation volume of **670.0 mn.m³**.

The hydro-energetic potential of the river has been evaluated to 26 mn.KWh/year, from which almost 1/2 pertains to Romania. This potential is created by an average discharge of 5,550 m³/s at the entrance to Romania and of 6,500 m³/s at Ceatal Izmail, on a level difference of 63 m. The hydro-energetic potential of the Danube represents almost 32 % from the hydro-energetic potential of the country and it is concentrated in the area of the Porțile de Fier I and II reservoirs.

The Porțile de Fier II (Iron Gates II) reservoir of which dam is also located on the Danube at km 863 has the following characteristics: V_{tot}= 800 mn.m³ from which V_{utile}=100 mn.m³. The hydropower plant has P_i=216 MW and E_m=1030 GWh/year.

There also have been made 4 other important reservoirs: **Dridu** on Ialomița River, **Iezer, Frăsinet, Gurbănești** and **Fundulea** on Mostiștea valley, for irrigation purposes. All pertain to Mostiștea hydro-technical system done for securing water for irrigation in Bărăgan using the water source Ialomița basin and soon the Siret, as well as water pumped from the Danube.

Derivations and intakes

In the Lower Danube Corridor are **3** important derivations. One is for irrigation, one for water supply and one is exclusively aimed for navigation and water supply. These are:

- **Ialomița–Mostiștea** derivation, 18.5 km length, Ilfov county, which transits exceeding discharges from Ialomița River (Dridu reservoir) in Mostiștea valley (Hagiești hydraulic knot) for irrigation in Mostiștea system;
- **Slobozia** derivation, Călărași and Ialomița counties, which draws off water from Danube (Modelu and Chiciu intakes) and transfer it to Ialomița watershed for the water supply of Slobozia city;
- **Dunăre-Marea Neagră Canal** (Danube-Black Sea Canal) with a length of 64 km, Constanța county, which ensures from the Danube water for complex uses: cooling water at Cernavodă Nuclear Power Plant, irrigation in Carasu system, potable and industrial water supply for Constanța city through the Goșu intake from the Poarta Albă-Midia-Năvodari branch, cutting short of the navigation way between Black Sea and the Danube and the production of electric power.

Dikes and river regulations

In the Lower Danube Corridor Danube hydrographic space there exist 101 dikes and regulations of the river beds with a total length of 1300 km along the Danube.

These works protect against floods: 172 localities from which 13 towns and municipalities, 20,000 houses from rural and urban areas, 440,000 ha in Lunca Dunării (Danube Floodplain), railways, roads, ports and other objectives.

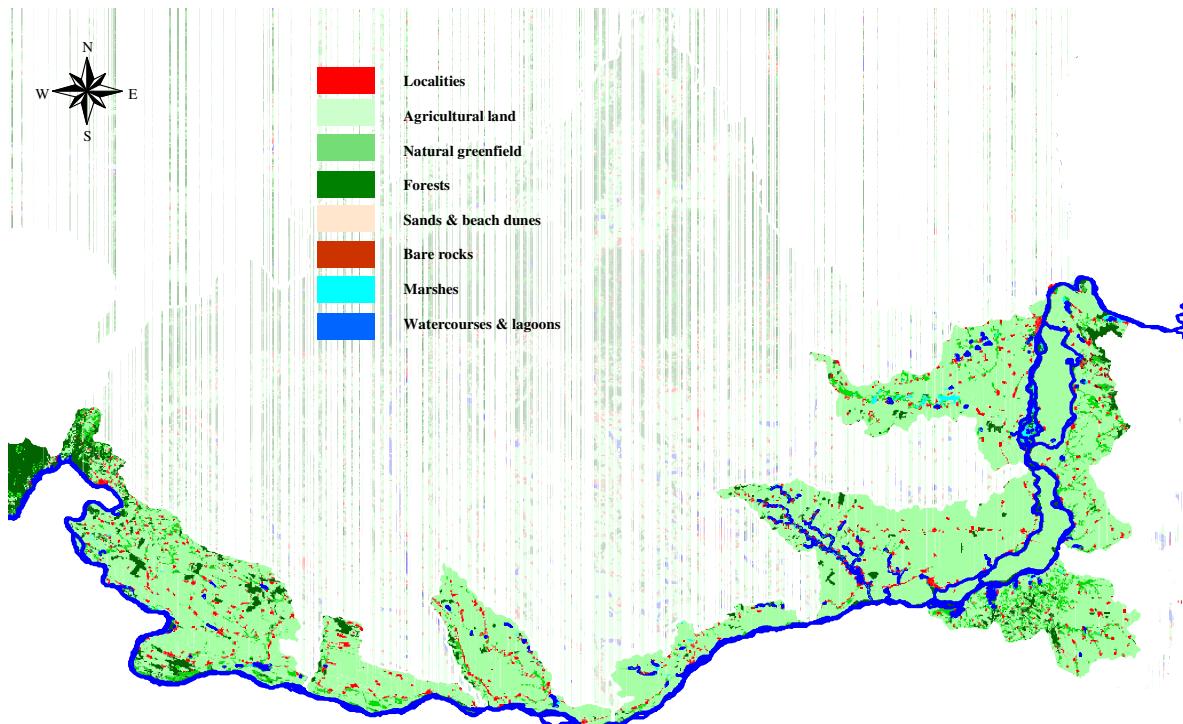
From the regulation and dike works of the Danube hydrographic space, there have been retained as most important the following:

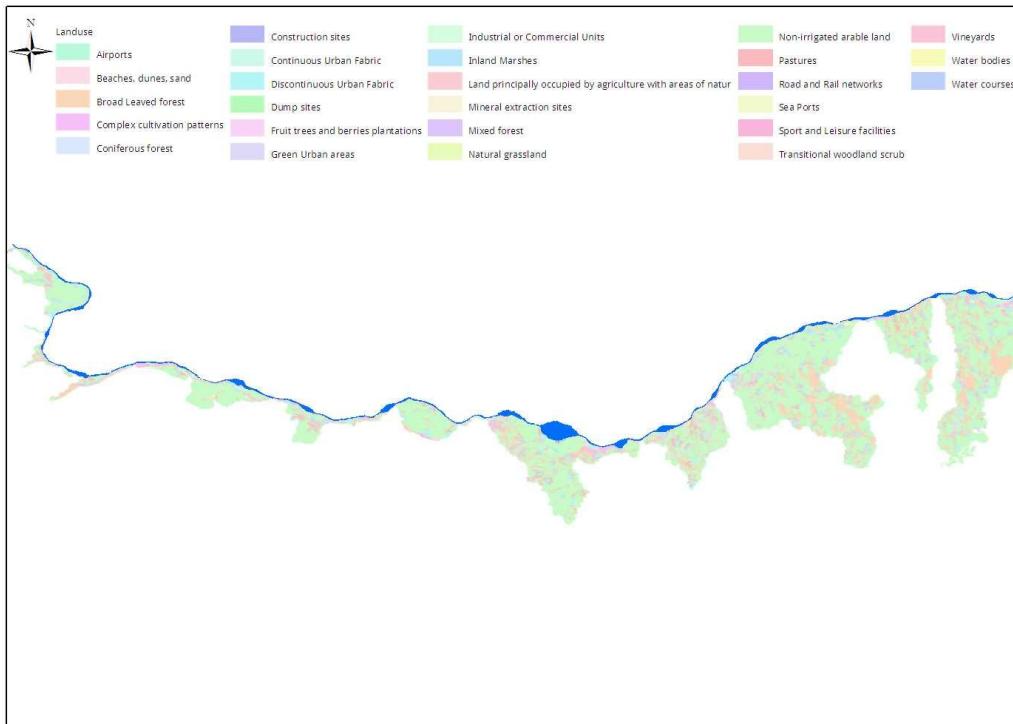
- Regulation of Călmățui River, Buzău county ($L_{reg} = 81.7$ km);
- Dike on Călmățui River, Buzău county ($L_{dike} = 168.4$ km);
- Regularizations and dikes on Blahnița, Bahnița and Baboia brooks, direct tributaries of the Danube in Mehedinți and Dolj counties, with regulation lengths up to 41 km and dikes up to 78 km;
- Dikes for the protection of 30 big agricultural areas along the Danube, with lengths of more than 30 km, up to 174 km (Insula Mare a Brăilei - Brăila's Big Island), and dikes for the protection of some important agricultural and fishery units

2.3 Landuse

ROMANIA

The land in the Lower Danube Corridor has as main use the agriculture, irrigated and non-irrigated. The forests have a very poor representation in the floodplain due to the climate and of the soil composition.





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2.4 Flood forecasting and warning

ROMANIA

The National Institute for Hydrology and Water Management (NIHWM) has the responsibility in order to issue warnings regarding watercourses (including Danube) levels increase.

The methodology and procedures used in warning elaboration are based on well known hydrology law (precipitation transformation in base run-off, concentration, creating high flood waves and downstream attenuation).

For improving the information-decision flow and for the raising population awareness concerning the risk of flooding and the possibilities of decrease the damages and causalities, a new type of hydro meteorological warnings which is based on colour codes was approved in 2006, through a joint order of the Ministry of Interior and the Ministry of Environment.

The colours code (green, yellow, orange and red) depend of the intensity of the meteorological or hydrological phenomena which are forecasted.

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The Executive Agency for Exploration and Maintenance of the Danube River, a legal body under the Ministry of Transport, takes the measurements and maintains the Danube River gauging stations at *Novo Selo, Lom, Oriahovo, Svishtov, Ruse and Silistra* and conducts complex hydromorphological and hydrological surveys. The Agency also publishes navigational maps, hydrological reference books and other navigational aids, two or seven-day river level forecasts and daily weather forecasts.

The National Institute of Meteorology and Hydrology at BAS (Bulgarian Academy of Science) is the main body carrying out scientific research and operational activities in the field of meteorology and agrometeorology. The guiding principles of these activities, especially the operational ones, are the Technical Regulations of the World Meteorological Organization, where NIMH is the official representative of Bulgaria.

In September 2005 NIMH started to receive the European Flood Alert System (EFAS) bulletins with indicative hydrological forecasts.

The operational issues of flood monitoring, forecasting and warning are based on:

- Operational observations of river levels and provisional rating curves for real time conversion of levels into discharges;
- Operational synoptic meteorological forecasts of precipitation and air temperature;
- Operational forecasts of precipitation and air temperature coming from the High Resolution Limited Area meteorological forecasting model (ALADIN).

Under the umbrella of the World Meteorological Organization an Agreement between Bulgaria and Romania for real time data and flood forecasts/warnings exchange was signed in 2001. The stations and the frequency of data which is made available to the parties is given in the tables below.

Operational data used for flood forecasting services and received operationally from the Romanian side.

River	Cross-section	Frequency	Data type
Danube	Corabia	Daily	levels/discharges
Danube	Tr. Măgurele	Daily	levels/discharges
Danube	Giurgiu	Daily	levels/discharges
Danube	Oltenița	Daily	levels/discharges
Iron Gate 1	Orșova	Daily	Levels
Iron Gates 1 & 2	n/a	daily evacuated	discharges
Iron Gates 1 & 2	n/a	3 days forecast of daily evacuated	disch.
Iron Gates 1 & 2	n/a	3 days forecast of daily incoming	disch.
Jiu	Podari	Daily	levels/discharges
Arges	Budesti	Daily	levels/discharges

Operational data used for flood forecasting services and transmitted operationally to the Romanian side.

Station No.	River	Cross-section	Data collection
42070	r. Danube	Novo selo	daily
42073	r. Danube	Lom	daily
42075	r. Danube	Oryahovo	daily
42078	r. Danube	Svishtov	daily
42080	r. Danube	Rousse	daily
42083	r. Danube	Silistra	daily
16850	r. Ogosta	Misia	daily
18850	r. Iskar	Orehovitza	daily
21800	r. Vit	Tarnene	weekly
22800	r. Osam	Izgrev	weekly
23850	r. Yantra	Karantzi	daily
31830	r. Rusenski Lom	Bojichen	weekly

2.5 Institutional and legal framework

ROMANIA

It has been issued or updated important regulations as follows:

- The National Strategy for Flood Risk Management on short term (Governmental Decision 1854 from 2005), which establish prevention and protection measures for flood effects mitigation for each of involved structures from central to local level;
- National Plan for Prevention and Flood Protection at Hydrographic Basin level (Governmental Decision 1309 from 2005);
- The Water Law 107 from 1996 modified and completed according tot the National Strategy;
- Emergency Order regarding safety operation of the reservoirs for pisciculture, recreation or local importance, establishing operating conditions;
- Regulations for management of emergency situations generated by flooding, dangerous meteorological phenomena and accidents at hydraulic structures adopted in May 2005.

Based on these regulations, taking into account the 2005 and 2006 floods, new flood protection plans at basin, county and local level have been approved in 2006. These plans comprise maps with level curves that bordered flooded zones by watercourses overflow and versant run-off corresponding to the maximum known discharges. In 2009 all flood protection plans will be updated.

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Water Act regulates the ownership and management of water within the territory of the Republic of Bulgaria as a national indivisible natural resource and the ownership of the water development systems and facilities.

Water management at the national level is implemented by the Minister of Environment and Water.

Under the Ministry, as its regional structure, the Danube River Basin Directorate (DRBD) is responsible for integrated water management at river basin level aiming to achieve good ecological status and to ensure sustainable water use.

The state policy related to activities involving operation, construction, remodelling and modernization of water development systems and facilities is implemented by:

- the Minister of Regional Development and Public Works: in respect to protection against water-related damage and loss within the boundaries of settlements;
- the Minister of Agriculture and Food: in respect to protection against water-related damage and loss beyond the boundaries of settlements;
- the Minister of Economy and Energy: in respect to hydro-power systems and projects;

The policy related to activities involving operation, construction, remodelling and modernization of water development systems and facilities constituting municipal property shall be implemented by the competent municipality mayor.

Protection against water-related damage and loss covered herein shall be operational and permanent.

Operational protection is implemented against flooding, ice accumulation and ice action, and water-related natural disasters, and shall be directed by Ministry of Interior - the Civil Protection.

Operational protection shall be implemented in accordance with an emergency response

plan. Emergency plans shall be drafted by the owners or users of water development systems and hydraulic-engineering facilities.

Permanent protection shall include:

1. construction and maintenance of dikes and other hydraulic-engineering facilities and protective structures;
2. establishment and maintenance of monitoring, forecasting and warning systems;
3. regulation of the groundwater level in the event of a hazardous raising or lowering thereof;
4. activities for protection of drainage basins against water erosion;
5. maintenance of the hydraulic conductivity of river beds.

The hydraulic-engineering facilities and protective herein shall be maintained by the owner or user thereof.

The Executive Environment Agency (ExEA) is another body of the Ministry of Environment and Water which carries out monitoring functions on the territory of the whole country and develops and maintains of the National Monitoring System of Environment and information about state of environmental components. The Agency also is a national referent center in the frame of the European Environment Agency and in this respect it deals with collecting, processing and reporting information as well as makes analyses and assessments.

Civil Protection Service Directorate is a structure under the Ministry of Interior and implements the state policy in this frame. The main activities of Civil Protection Service are directed towards protection of the population, the national economy, the material and cultural values. The Service organizes and conducts life-saving and urgent emergency-reconstruction activities in case of disasters occurring and also has the responsibility to collect data about disasters and accidents, including floods, to advise on prevention activities and to solve resulting consequences for the human life and environment.

The Executive Agency for Exploration and Maintenance of the Danube River is specialized organization in Bulgaria which carries out the entire range of supporting activities for the maintenance of the waterway, aquatory of the ports and the winter camps for providing a secure ship sailing in the Bulgarian section of the river Danube. In its responsibility is to coordinate all the projects and works, related to the complex utilization of the Danube, as to notify for taking precautionary measures when threats of flooding, icing, bank corrosion, etc.

The Convention between the Government of the Republic of Bulgaria and the Government of Romania on Environmental Cooperation (1992) is a bilateral agreement of immediate relevance to transboundary cooperation requirements of the WFD.

2.6. Recent awareness of flooding

The flood events in 2006 were mostly driven by snowmelt causing long-lasting high discharges in the Danube. Due to these high discharges, large floods affected the whole lower Danube and the high water levels lasted for over six weeks.

In mid-April along the Danube River were recorded highest water levels with return intervals of peak discharges more than 100 years. From 21 of April the peak of the wave was slowly moving towards the East, so that it led to stabilisation of water levels followed by a decline.

ROMANIA

Water levels on the Romanian part of the Danube River

Cross-section	Water level registered before 2006 (cm)/year	Water level in 2006 (cm)	Difference (cm)
Gruia	862/1981	899	37
Calafat	802/1981	861	59
Bechet	787/1981	845	58
Corabia	756/1981	801	45
Giurgiu	795/1981	822	27
Oltenița	772/1981	809	37
Călărași	703/1970	737	34
Cernavodă	708/1970	736	28
Hârșova	727/1970	764	37
Brăila	639/1970	699	60
Tulcea	435/1970	438	3

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Water levels on the Bulgarian part of the Danube River in April 2006

CROSS-SECTION		Novo selo	Vidin	Lom	Oriahovo	Nikopol	Svishtov	Ruse	Silistra
Km		833,6	790,2	743,3	678,0	597,5	554,3	495,6	375,5
Level limits for	State of alert	690-790	750-850	680-750	800-900	до 700	680-780	680-750	680-750
	State of danger	791-890	851-950	751-815	901-1020	701-875	781-827	751-800	751-800
	State of emergency	890	950	815	1020	875	827	800	800
Level	Date	см.	см.	см.	см.	см.	см.	см.	см.
06.04		754	814	816	684	730	710	745	732
07.04		768	820	819	688	736	718	753	734
08.04		777	838	833	698	744	724	761	740
09.04		800	856	853	712	750	734	769	744
10.04		814	870	868	726	763	744	779	751
11.04		834	890	884	738	772	754	790	759
12.04		856	905	900	753	784	765	800	767
13.04		890	939	926	774	800	781	812	777
14.04		900	952	946	799	837	810	838	788
15.04		918	965	944	798	851	837	865	812
16.04		918	966	944	789	856	840	878	825
17.04		917	963	952	790	856	839	879	838
18.04		917	971	965	803	859	840	880	838
19.04		917	973	971	813	868	848	886	836
20.04		922	977	978	814	878	857	890	836
23.04		916	979	985	825	894	874	911	851
24.04		913	975	979	822	896	876	912	853
25.04		901	962	956	802	873	861	906	849
26.04		892	950	936	785	849	838	887	849
27.04		882	937	927	784	840	821	869	842

Although for almost two months the dikes we subjected to extreme pressure, there were no huge levee overtoppings or breaches, but high water levels caused a rise of groundwater levels which occurred in the entire region along the river and cased damages to this territory. Overall, urban areas and agricultural lands in Danube's lowlands were flooded, partial failure

of protection dykes at 69 places along the river was observed, as well as damaged banks and flood defences, broken bridges and other structures.

3 Target Settings

ROMANIA

The Action Plan for flood protection on medium-term (2009-2012) launched and comprises new hydraulic structures in frequently affected zones, higher safety degree of existing works and finalization of ongoing ones.

The National Action Plan foresees 1850 km river regulation 976 km of dikes, 810 km riverbank consolidation, DESWAT and WATMAN Projects finalisation.

The prioritisation criteria for promoting investments for flood protection have been made following:

- Inclusion of the proposed works in the Strategy of Ministry of Environment;
- Actual safety degree of the flood protection structures;
- Amplitude of avoided damages as result of the projects;
- The elaboration status of technical and economic documents;
- Financing possibility
- Occupied field status.

3.1 Regulation on Land Use and Spatial Planning

ROMANIA

The existing local urban plans for development should contain maps with actually flooded areas, based on historic and studies data.

These maps are from the Local Flood Protection Plans and are updated every 4 years.

BULGARIA

Target 1: Landscape development plans and spatial plans respect flood hazard maps and flood risk maps.

3.2 Reactivation of former, or creation of new, retention and detention capacities

ROMANIA

The Ecologic and Economic Resizing Lower Danube Floodplain Programme

During the last century, almost entire Danube floodplain was embanked (53 enclosures with a total area of 430,000 ha and 1200 km of dikes), which affected the hydro morphologic and local-regional climate.

In Spring 2006, Romania faced to biggest Danube's flows. Some dikes collapsed on 50-100 m length, flooded the riparian localities, over 15,000 people being evacuated.

In the following years this kind of event could be repeated and the need for a strategic and adequate approach for flood risk management on the Romanian sector of the Danube appeared.

A real analysis is more and more necessary for some alternate measures to remake wetlands, initially existing, in comparison with the classic defences.

The study regarding ecological and economic resizing on the Romanian sector of the Danube River will be a vital instrument for a strategic co-ordination on all Romanian Danube's sector of the investments for flood prevention and for the future economic development measures. Elements and principles that we are taking account in the Danube's improvement are:

- changing of the hydrologic regime characteristics;
- realising of an adequate habitat in order to preserve the aquatic natural biodiversity;
- the improvement variants for the Danube take into account the following: riparian localities should be defended, proposed ecologic restored zones in various studies of the "National Institute for Research and Development Danube Delta" and World Wild Fund, controlled flooded zones and areas which the Danube created breaches in the longitudinal dikes.

Public debates have been realized in Bucharest, Giurgiu and Galati with this subject.

BULGARIA

Target 1: Restoration of wetland areas along the Danub river

3.3 Technical Flood Defences

ROMANIA

The structural flood defences are realized in order to make an effective protection for populated areas, to avoid human and material losses.

The Action Plan (2009-2012) foresees 1850 km river regulation, 976 km of dikes and 810 km riverbank consolidation.

For all investments works are realized feasibility studies.

BULGARIA

Target 1. Reconstruction and rehabilitation of flood protection structures in the towns and municipalities

3.4 Preventive Actions

ROMANIA

These actions are concentrated towards prevention/mitigation of potential damages generated by floods through:

- a) avoiding houses, social and cultural or/and economic objectives constructions in potentially flooded area;
- b) realisation of structural and non-structural measures for protection;
- c) geographical delimitation of natural flood risk zones and noting these in the general urban planning studies;
- d) modern forecast, warning and alarming systems implementation in case of floods;
- e) existing infrastructure for flood protection and riverbed maintenance;
- f) effective communication and people education regarding flood risk and the action ways in emergency situations.

A good system for people warning and preparation could save many lives. For this reason, in the last years was and are in development three projects: SIMIN (National Meteorological Integrated System), DESWAT (Destructive Water) and WATMAN (Water Management).

SIMIN integrates the provided data from existent systems in Romania with a high technology in meteorological radars field, stations with surface hydrologic sensors, data processing systems and forecast decision based on satellite transmission. System was released in September 2003.

The DESWAT project has in its first stage as objective, the modernisation of informational hydrological system, beginning with data acquisition through 600 automatic stations placed on rivers, 250 automatic gauging stations and 64 automatic quality stations, continuing with transmission support which will comprise the actual classic radio system, the GSM and satellite systems.

The programme package for hydrological forecast will be modernised, enlarged and will include semi-automatic procedures for elaboration of warnings, forecasts and information products for various decision makers, media and population.

WATMAN is a project through that the National Strategy for water management in case of disaster will be applied. It will integrate the output data from SIMIN and DESWAT, finally being carrying-out the Information-Decisional Integrated System. Those two projects, through modernised hydrologic and meteorological information systems will provide data and forecast in real-time, which represents input data for WATMAN infrastructure, optimising the integrated water management system.

Financial insurance for flood risk

In 1 January 2010, a law referring to the obligatory insurance for houses against natural disasters such earthquakes, landslides and flooding will come into force.

BULGARIA

- Target 1. Enhancing flood forecast service
- Target 2. Introduce principles of EU Flood Directive

3.5 Raising Awareness and Preparedness of General Public

ROMANIA

- Improvement reaction capacity, response and intervention;
- Information and awareness of the population regarding floods and its effects;
- Eco-centres setting-up in frequently affected zones;
- Public meeting presenting the local flood protection plans and the warning procedures based on colours code;
- Exercises for flood simulation at basin and county level with the participation of population.

BULGARIA

- Target 1 Inform the public about the causes of floods and improving awareness and preparedness to avoid detrimental effects

3.6 Capacity building of professionals

ROMANIA

It was planned an intensive programme for raising personnel capacity from the water management units of Romanian Waters responsible with flood defences maintenance and with means and equipments for interventions in case of flooding.

It is developing the training action of new elected mayors and public local administration.

BULGARIA

- Target 1 Build capacity of professionals and institutions responsible for flood management
Target 2 Improving international cooperation

3.7 Prevention and Mitigation of Water Pollution Due to Floods**ROMANIA**

The Law 466 (regarding dam safety) covers the safety problems of dams and dikes of the mining waste deposits.

Now, according to the EU Directive 1999/31/CE and Governmental Decision 349 from 2005 the major part of the mining ponds with high risk stopped the activity.
The actual legislation foresees the continuity monitoring of the closed ponds.

4 Measures to Achieve Targets

4.1 Regulation on Land Use and Spatial Planning

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Implementation of the medium- and long-term flood risk management strategy - Land-use control Relocation, land purchasing & cultural changes	Technical Administrative	Ministry of Environment Ministry of Agriculture Ministry of Administration and Interior Romanian Waters		2020	
Strategy of the territory arrangements in the border zone (RO-BG)	Administrative			2012	
Including the results of the study “Identification and delimitation of the natural hazards (earthquakes, landslides and floods). Hazards maps at county level” into local and regional developing plans	Administrative	Public Administration	120	2009	
Including the maps from Local Flood Protection Plan (Contingency Plans) into the Urban Development Plans	Administrative	Public Administration	20/year	continuous	This actions include flood risk evaluation (flooded areas maps and estimation of damages)

BULGARIA

Measures	Type of intervention	Responsibility	Costs	Deadlines	Remarks
Regulation of land use and spatial planning					
Target 1: Landscape development plans and spatial plans respect flood hazard maps and flood risk maps.					
M 1: Landscape development plans respect flood-hazard maps and flood-risk maps	Technical	Ministry of regional development and public works (MRDPW), Ministry of Agriculture and Food (MAF), Executive Agency of Forestry (EAF)		Continuous	
M 2: Introduction of flood maps into development and spatial plans of municipalities	Administrative	MRDPW		Continuous	

4.2 Reactivation of former, or creation of new, retention and detention capacities

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Implementation of the study “Ecologic and economic resizing of the Lower Danube floodplain”	Administrative and technical	Ministry of Environment	2.5	2010	Including contributions for Romania in the Danube Floodrisk Project

4.3 Technical Flood Defences

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Implementation of the medium- and long-term flood risk management strategy- Improvement & maintenance of defence structures	Technical Administrative	Ministry of Environment Ministry of Agriculture Ministry of Administration and Interior Romanian Waters		2020	
River left bank protection of Borcea arm in Borcea locality zone, Călărași county	Technical	Romanian Waters	1.92	2009	External funds
River left bank protection of Borcea arm, in Bordușani locality, Ialomița county	Technical	Romanian Waters	6.79	2010	External funds
224 objectives (polders, riverbank regularizations, dams) at national level	Technical	Romanian Waters	2000	2013	9 dams, 4 polders, 211 regularizations works

Measures	Type of intervention	Institution in charge	Costs (mn.USD)	Deadline	Comment
Flood defences rehabilitation Bentu, Borcea arm, Danube river	Technical	Romanian Waters	5.462	2010	Hazard Risk Mitigation & Emergency Preparedness Project – World Bank
Flood defences rehabilitation Bordușani, Borcea arm, Danube river	Technical	Romanian Waters	0.885	2010	Hazard Risk Mitigation & Emergency Preparedness Project – World Bank
Flood defences rehabilitation Făcăieni, Borcea arm, Danube river	Technical	Romanian Waters	0.406	2010	Hazard Risk Mitigation & Emergency Preparedness Project – World Bank

BULGARIA

Measures	Type of intervention	Responsibility	Costs	Deadlines	Remarks
Technical flood protection					
Target 1. Improvement of Structural Flood protection of municipalities					
M 1: Building and reconstruction of flood protection structures in towns and villages	Technical	MRDPW, Municipalities,		Continuous	
M 2: Maintenance of the existing flood protection structures and sustainable river-bed	Technical	MRDPW, MAF, Municipalities		Continuous	

4.4 Preventive Actions

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Implementation of the medium- and long-term flood risk management strategy - Elaboration & implementation of Flood Risk Management Plans - Forecasting, monitoring & warning - Emergency plan & management - Flood Risk Assessment - Run-off control - Improvement of flow conditions in river beds - Improvement of the flood defence capacity	Administrative Technical	Ministry of Environment Ministry of Agriculture Ministry of Administration and Interior Romanian Waters		2020	

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
- Reduction of flood vulnerability of infrastructures and agriculture - Reduction of flood vulnerability of the environment - Social vulnerability to floods - Individual vulnerability mitigation - Funding & compensation - International Cooperation					
DESWAT – Carrying of a hydrologic information-decisional system for the management of emergency situations (12 automatic stations along the Danube)	Technical	Romanian Waters	45	2011	
WIMS – Investment supporting the information system and database for water management (PHARE project) at national level	Technical	Romanian Waters	2.4	2009	
Contributions to the development of the flood risk management strategy	Technical	Romanian Waters	1.7	2009	
Information system for integrated water management (WATMAN)	Technical	Romanian Waters	138.4	2015	
DANUBE FLOODRISK - flood risk reduction: risk assessment, risk mapping, involvement of stakeholders, risk reduction by adequate spatial planning.	Administrative Public	Romanian Waters	6.38	2012	
MONDAN, Integrated Monitoring of the Danube	Technical	Ministry of Environment	6.5	2010	
High-flood forecasting and flood management in Romania – feasibility study - the analysis for implementing of the decision support system	Administrative Technical	Romanian Waters	0.1	2009	

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Ostrov-Silistra: common water, common riverbanks, common problems – cross-border cooperation for risk management improvement	Administrative Technical	Romanian Waters	0.14	2009	
Update the Water Law	Administrative	Ministry of Environment			
Update the Flood Protection Plans at basin, county and local level	Administrative	Romanian Waters		Every 4 years	
Update the Plan for warning-alarming for downstream localities in case of accidents at dams	Administrative	Romanian Waters		Every 10 years	

BULGARIA

Measures	Type of intervention	Responsibility	Costs	Deadlines	Remarks
Preventive actions					
Target 1. Enhancing flood forecast service					
M 1: Improving flood forecasts and gauging stations	Technical			Continuous	
M 2: Information service	Administrative			Continuous	
Target 2. Introduce principles of EU Flood Directive					
M 1: Preparation and adoption of new or amendment of the existing Water law	Legal / Administrative	State	2009		
M 2: Flood-risk management planning	Administrative	MoEW, Basin Directorates			
M 2.1. Preliminary flood risk assessment	Scientific/ Technical		2010		
M 2.2. Preparation of flood hazard maps	Scientific/ Technical		2013		
M 2.3. Preparation of flood risk maps	Scientific/ Technical		2013		

4.5 Raising Awareness and Preparedness of General Public

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Implementation of the medium- and long-term flood risk management strategy - Population preparedness & feedback Individual vulnerability mitigation	Technical Administrative	Ministry of Environment Ministry of Agriculture Ministry of Administration and Interior Romanian Waters		2020	
Exercises for general public preparedness for flood simulation	Public participation	Romanian Waters, General Inspectorate for Emergency Operations	0.50	Continuous	
Flood Protection leaflets	Public participation	Ministry of Environment	0.01	Continuous	
Setting-up New Eco-centres	Administrative	Ministry of Environment	0.02	Continuous	

BULGARIA

Measures	Type of intervention	Responsibility	Costs	Deadlines	Remarks
Raising awareness and preparedness of general public					
Target 1 Inform the public about the causes of floods and improving awareness and preparedness to avoid detrimental effects					
M 1: Presentation of flood risk management plans to the public	Information	MoEW, Basin Directorates		2015	

Measures	Type of intervention	Responsibility	Costs	Deadlines	Remarks
M 2: Training activities, publishing informational brochures etc.	Administrative	MoEW, Basin Directorates, Municipalities, CPSD		Continuous	

4.6 Prevention and Mitigation of Water Pollution Due to Floods

ROMANIA

Measures	Type of intervention	Institution in charge	Costs (mn.€)	Deadline	Comment
Monitoring the closed ponds and waste deposits	Administrative, Technical	Ministry of Industry	5.00	2012	USTDA estimation of the minimum needed equipment for monitoring and communication