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RIKO

Water Strategy

for the Republic of Macedonia

DRAFT FINAL VERSION

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Government of the Republic of Macedonia
Ministry of Environment and Physical Planning, Republic of Macedonia

CMSR
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LIST OF ABBREVIATIONS

AHMW	Administration on Hydrometeorological Works
BOD	Biological Oxygen Demand
BOT	Build-Operate-Transfer concession type
BSAP	Biodiversity Strategy and Action Plan
COD	Chemical Oxygen Demand
CIP	Competitevness and Innovation Programme
DO	Dissolved Oxygen
EC	European Commission
ERWRM	Expert Report on Water Resources Management
EU	European Union
EUR	European currency EURO
FP7	Seventh Framework Programme
IPA	Instrument of Pre-Accesssion
MKD	Macedonian currency Denar
MEPP	Ministry of Environment and Physical Planning
NEAP	National Environmental Action Plan
p.e.	Population equivalent
RIMSYS	River Monitoring System Project
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFD	Water Framework Directive

KEY TERMS RELATED TO WATER MANAGEMENT

Key terms	Act
Agglomeration means an area where the population and/or economic activities are sufficiently concentrated for urban waste water to be collected and conducted to an urban waste water treatment plant or to a final discharge point	Directive 91/271/EEC concerning urban waste water treatment
Artificial water body means a body of surface water created by human activity.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Aquifer means a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Best Available Techniques shall mean the most effective and advanced stage in the development of activities and methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, to reduce emissions and the negative impct on the environment. Thus: Techniques shall include the technology used and the way in which the installation is designed, maintained, operated, and the termination of installations. Available techniques shall mean the level of development of the techniques applied in the relevant industrial sector, under economic and technical cost effective conditions, with full account taken of the costs and benefits, irrespective of whether the techniques are used, or developed and/or produced in the Republic of Macedonia, provided that they are reasonably available to the operator. Best shall mean those techniques which are the most effective in achieving a high general level of protection of the environment as a whole.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Body of surface water means a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Key terms	Act
Body of groundwater means a distinct volume of groundwater within an aquifer or aquifers.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Change in the operation shall mean a change in the nature or functioning, or an extension of the installation, which may have an impact on the environment;	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Chemicals shall mean substances and preparations.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Coastal water: surface water on the landward side of a line every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.	Directive 2000/60/EC establishing a framework for Community action in the field of water policy
Costs, in terms of accountability for damage induced to environment, shall mean all costs required for adequate and effective provision and coverage of the overall damage, including the costs for the estimate of the damage and direct threat of damage and other activities, as well as administrative, legal and other costs related to implementation, costs for data collection, costs for the monitoring, supervision and other costs.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Cyprinid waters: waters which support or become capable of supporting fish belonging to the cyprinids or other species such as pike, perch and eel.	Directive 2006/44/EC on the quality of fresh waters needing protection or improvement in order to support fish life
Damage, in terms of accountability for damage caused to the environment, shall mean a measurable adverse change in the natural resource or direct or indirect measurable disorder in the function of that natural resource in relation to another natural resource or public interest.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Data management shall mean collection, processing, storage, use, distribution and presentation of comprehensive, accurate, accessible for the public data and information on the conditions, quality and trends in environmental media and areas.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Diffuse sources of pollution are widespread activities with no one identifiable discrete source of pollution (fertilizers, organic manure, pesticides, biocides etc.)	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Direct discharge to groundwater means discharge of pollutants into groundwater without percolation throughout the soil or subsoil.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Ecological status is an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters, classified in accordance with Annex V of WFD.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Emission limit values shall mean the mass, expressed in terms of certain specific parameters, concentration and/or level of emission, which shall not be exceeded during one or more periods of time.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Emission shall mean release or discharge (fugitive emission) of liquid, gaseous or solid substances, preparations, release of energy (noise, vibrations, radiation, heat), odour, organisms or micro-organisms, as well as release of microbiological material from any source into one or more environmental media as a result of human activity.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environment pollution shall mean emission in the air, water or soil that may be harmful to the quality of the environment, human life and health or emission that may cause damage to material property or impaire or make impact on biological and landscape diversity and other legitimate ways of use of the environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Environment protection and improvement shall mean a system of measures and activities (social, political, economic, technical, educational etc.), which provide support and create conditions for protection against pollution and degradation of and impacts on environmental areas and media (protection against depletion of the ozone layer, prevention of harmful noise and vibrations; protection against ionising and non-ionising radiation, protection against odour and use and disposal of wastes, and other types of environment protection;	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environment shall mean the space with all living organisms and natural resources, i.e. natural and man-made values, their interaction and the entire space in which people live and in which settlements, goods in general use, industrial and other facilities, including the media and the areas of the environment, are situated;	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental areas shall mean the nature, the waste, the noise, the vibrations, the ionising and non-ionising radiation, the climate, the odour and all other elements constituting integral part of the environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental cadastre shall mean quantitative and qualitative recording of polluters and sources of pollution releasing pollutants in the environmental media, including a map of polluters.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental damage shall mean any damage caused to: i) protected species and natural habitats that has substantial adverse impacts on the achievement and maintenance of the favorable preservation status of such habitats or species. The substantiality of of adverse impacts shall be estimated with regard to original state, taking into account criteria specified in accordance with the regulation referred to in Article 157 paragraph (3) and Chapter XVI of the Law On Environment. ii) waters, that has substantial adverse impacts on ecological, chemical and/or quantitative status and/or ecological potential of waters, in accor dance with the law on waters and regulations adopted on the basis thereof. iii) soil, through its contamination, that leads to substantial risk for human health as a result from direct or indirect application of substances, preparations, organisms or microorganisms in, onto or under the soil.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental impact assessment shall mean assessment of possible environmental impacts by certain planning documents, projects and planned activities.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Environmental media shall mean the water, the air and the soil.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental monitoring shall mean systematized measuring, monitoring and control of conditions, quality and changes of environmental media and areas.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental quality standard shall mean the set of requirements, with which the environment or a particular part thereof must comply, in a manner set forth in laws and other regulations of the Republic of Macedonia, and in accordance with the international agreements ratified by the Republic of Macedonia.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Environmental quality standard means the concentration of a particular pollutant or group of pollutants in water, sediment or biota which should not be exceeded in order to protect human health and the environment.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Environmentally harmful substance shall mean a biological or physical agents or phenomenon/state the presence of which in the environment may induce direct or postponed threat to or pollution of one or more environmental media or areas, as well as other irritant, inflammable and explosive matters which exhibit such properties when of certain quantity, concentration or intensity.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Eutrophication means the enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned;	Directive 91/271/EEC concerning urban waste water treatment
Existing installation shall in relation to integrated environmental permits mean an installation that has been operating before 01.07.2007.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Flood means the temporary covering by water of land not normally covered by water. This shall include floods from rivers, mountain torrents, Mediterranean ephemeral water courses, and floods from the sea in coastal areas, and may exclude floods from sewage systems.	Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks
Flood risk means the combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated	Directive 2007/60/EC of the European Parliament and of the Council on the assessment

Key terms	Act
with a flood event.	and management of flood risks
Good surface water status means the status achieved by a surface water body when both its ecological status and its chemical status are at least "good".	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Groundwater: all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.	Directive 2000/60/EC establishing a framework for Community action in the field of water policy
Groundwater status is the general expression of the status of a body of groundwater, determined by the poorer of its quantitative status and its chemical status.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Good groundwater status means the status achieved by a groundwater body when both its quantitative status and its chemical status are at least "good".	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Good ecological status is the status of a body of surface water, so classified in accordance with Annex V of WFD.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Good ecological potential is the status of a heavily modified or an artificial body of water, so classified in accordance with the relevant provisions of Annex V of WFD.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Good surface water chemical status means the chemical status required to meet the environmental objectives for surface waters, that is the chemical status achieved by a body of surface water in which concentrations of pollutants do not exceed the environmental quality standards, and under other relevant Community legislation setting environmental quality standards at Community level.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Key terms	Act
Good groundwater chemical status" is the chemical status of a body of groundwater, which meets all the conditions set out in table 2.3.2 of Annex V of WFD.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Harmful impact and activity shall mean any negative impairment of the quality of environmental media and areas.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Hazard shall mean the intrinsic property of a hazardous substance or a physical situation, with a potential to cause damage to human life and health and to environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Hazardous substances means substances which are toxic, carcinogenic, mutagenic, teratogenic or bio-accumulative, especially when they are persistent.	Council Decision 95/308/EC of 24 July 1995 on the conclusion, on behalf of the Community, of the Convention on the protection and use of trans-boundary watercourses and international lakes (the Helsinki Convention)
Heavily modified water body means a body of surface water which as a result of physical alterations by human activity is substantially changed in character, as designated by the Member State in accordance with the provisions of Annex II of WFD.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Hazardous substance: shall mean a substance or a preparation containing one or more hazardous substances the properties of which pollute the environment and are hazardous to human life and health, with proven acute, chronical, toxic and other harmful effects. with regard to industrial accidents prevention and control, hazardous substance shall mean a mixture or a preparation determined in accordance with the regulation referred to in Article 145 paragraph (2) of The Law On Environment or complying with the criteria or the properties specified in the regulation referred to in Article 145 paragraph (2) of The Law On Environment, present in a form of a raw material, product, by-product, residue or semi finished product, including those substances for which it is reasonable to assume may be generated in an event of accident.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Immission shall mean concentration of pollutants and substances in the environmental media in a specific place and at a specific time.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Industrial waste water is any waste water which is discharged from premises used for carrying on any trade or industry, other then waste water from households and run-off precipitation water.	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Inland waters: all standing or flowing water on the surface of the land, and all groundwater on the landward side of the baseline from which the breadth of territorial waters is measured.	Directive 2000/60/EC establishing a framework for Community action in the field of water policy
Installation: i) in relation to integrated environmental permits, shall mean a stationary technical unit where one or more prescribed activities or directly related activities are carried out, and which might have an effect on emissions and on pollution. ii) in relation to prevention and control of major accident which involves hazardous substances, installation shall mean a technical unit within one system in which hazardous substances are produced, used, stored or handled. It shall include all the equipment, facilities, pipelines, machinery, tools, private railway sidings, unloading quays serving the installation, warehouses or similar facilities necessary for the operation of the installation.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Investor/applicant shall mean the legal entity or natural person that applies for approval of a private project or the public authority which initiates a project.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Major accident shall in relation to accidents prevention and control mean the occurrence of such major emissions, fires or explosions resulting from uncontrolled events in the course of the operations of any system, involving one or more hazardous substances, leading to serious hazards to human life and health and environment, immediate or delayed, within or outside the system involving one or several hazardous substances.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Natural heritage shall mean parts of nature and sites composed of geological, physical geographical or biological formations or group of such formations, with outstanding values in terms of aesthetics, conservation or science. Natural heritage may be: protected area, strictly protected or protected wild species, characteristic minerals and fossils or speleological structures.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Natural person shall mean individual dealer, performer of professional activity and citizen.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Natural resource, in terms of accountability for damage induced on the environment, shall mean protected species or natural habitat, water and soil.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Natural wealth shall mean: every authentic integral part of nature like plant, fungi, animal, mineral, fossil, water, soil, etc.;	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Natural wealths management shall mean activities and works performed in accordance with this and other laws.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Operator shall mean any legal entity or natural person that performs profesional activity or performs an activity through the installation and/or controls an installation, or a person to whom economic decision making power over the activity or technical functioning of the installation has been delegated, including the holder of the permit or authorisation for such activity or person in charge of recording or alarming with regard to the activity.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Original state, in terms of accountability for damage induced on the environment, shall mean the state that would have existed in the time of the occurance of the damage on the natural resource and on its function, in case the damage on the environment has not occured. In such case, the original state shall be estimated on the basis of available information and criteria stipulated in accordance with Chapter XVI of this Law and and in accordance with the criteria stipulated in the regulation referred to in Article 157 paragraph (3).	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Permit, as regards Integrated Pollution Prevention and Control, shall mean a part, or the full decision in writing (or several such decisions) with which an authorization is granted to operate all or a part of an installation, subject to certain conditions which guarantee that the installation complies with the requirements established by this Law. The permit may cover one or more installations, or parts of installations on the same site, operated by the same operator.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Persistent organic pollutants are chemical substances that possess certain toxic properties and, unlike other pollutants, resist degradation, which makes them particularly harmful for human health and the environment. POPs accumulate in living organisms, are transported by air, water and migratory species and accumulate in terrestrial and aquatic ecosystems. They are therefore a cross-border problem on which international action is indispensable.	Council Decision 2006/507/EC of 14 October 2004 concerning the conclusion, on behalf of the European Community, of the Stockholm Convention on Persistent Organic Pollutants

Key terms	Act
Point sources of pollution are stationary location or fixed facility from which pollutants are discharged; any single identifiable source (pipe, ditch, ship, mine pit, etc.)	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Pollution means the direct or indirect introduction, as a result of human activity, of substances or heat into the air, water or land which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, which result in damage to material property, or which impair or interfere with amenities and other legitimate uses of the environment.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Pollutants and polluting substances shall mean waste, hazardous and harmful matters and substances determined by law, that by their chemical composition and by the level of their hazardness pollute the environment, and are specified in the regulation referred to in Article 41 paragraph (2) or possess the properties specified in the regulation referred to in Article 41 paragraph (2) of The Law On Environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Polluter shall mean any legal entity or natural person the activity of which directly or indirectly pollutes the environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Polluter pays principle obliges water polluters to compensate for the expenses for reverting polluted waters into their previous condition.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Population equivalent (p.e.) is a measure of pollution representing the average organic biodegradable load per person per day: it is defined in Directive 91/271/EEC as the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day.	Directive 91/271/EEC concerning urban waste water treatment
Presence of hazardous substance, in terms of industrial accidents prevention and control, shall mean existing or probable presence of hazardous substances in a system, or presence of substances posing risk that may appear during loss of control over industrial chemical process, in quantity equal too or exceeding limit values (thresholds) specified by the regulation referred to in Article 145 paragraph (2).	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Project shall mean the development document that provides an analysis and defines the final solutions in respect of the use of natural and man made values, regulates the construction of facilities and installations, as well as the performance of other activities which have an impact on the environment, landscape and human health.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Public water supply of population is water supply for more than five households, or more than 20 inhabitants from individual structures, for enterprises and other legal entities that produce and/or trade food and supply for public structures (education organizations, health organizations, legal persons in the area of tourist-catering, traffic etc.).	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Quality of the environment shall mean the state of the environment expressed by way of physical, chemical, aesthetic and other indicators;	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Quantitative status is an expression of the degree to which a body of groundwater is affected by direct and indirect abstractions.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
River basin means the area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
River basin district means the area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters, which is identified as the main unit for management of river basins.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Register of pollutants and polluting substances and their properties shall mean a catalogue in which waste, hazardous and harmful substances shall be classified according to their chemical composition and the extent of their hazardness.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Restitution including both natural and monetary restitution, in terms of accountability for damage induced to environment, shall mean: i) in terms of damage caused to waters, protected species and natural habitats, restoration of the damaged natural resource and its function into its original state; ii) in	Law on Environment, (Official Gazette, No. 53/05, 81/05)

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terms of damage caused to soil, elimination of any substantial risk that may lead to adverse impact on human health.	
Riparian Parties means the States that are signatories to the Convention that border the same trans-boundary waters.	Council Decision 95/308/EC of 24 July 1995 on the conclusion, on behalf of the Community, of the Convention on the protection and use of trans-boundary watercourses and international lakes (the Helsinki Convention)
Risk shall mean the likelihood of occurrence of a specific effect on the environment within a specified period or under specified circumstances.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Salmonid waters: waters which support or become capable of supporting fish belonging to species such as salmon, trout, grayling or whitefish.	Directive 2006/44/EC on the quality of fresh waters needing protection or improvement in order to support fish life
Sensitive areas means : • Freshwater bodies, estuaries and coastal waters which are eutrophic or which may become eutrophic if protective action is not taken; • Surface freshwaters intended for the abstraction of drinking water which contain or are likely to contain more than 50 mg/l of nitrates; • Areas where further treatment is necessary to comply with other Council Directives such as the Directives on fish waters, on bathing waters, on shellfish waters, on the conservation of wild birds and natural habitats, etc.	Directive 91/271/EEC concerning urban waste water treatment
Sludge means residual sludge, whether treated or untreated, from urban waste water treatment plants	Directive 91/271/EEC concerning urban waste water treatment
Storage shall mean the presence of a certain quantity of hazardous substances for the purpose of warehousing, depositing in safe custody or keeping in stock.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Strategies, Plans and Programmes shall mean planning documents which are subject to preparation and adoption by the Assembly of the Republic of Macedonia, the Government of the Republic of	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
Macedonia, bodies of the public administration and bodies of of municipalities and the City of Skopje and of the municipalities of the City of Skopje.	
Sub-basin means the area of land from which all surface run-off flows through a series of streams, rivers and, possibly, lakes to a particular point in a water course (normally a lake or a river confluence).	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Substantial change shall mean a change in the operation of the installation, which in the opinion of the competent authority may have significant negative impacts on human health or the environment.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
Surface water: inland waters, except groundwater, transitional waters and coastal waters, except in respect of chemical status, for which territorial waters are also included.	Directive 2000/60/EC establishing a framework for Community action in the field of water policy
Surface water status is the general expression of the status of a body of surface water, determined by the poorer of its ecological status and its chemical status.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
System, in relation to major accidents prevention and control, shall mean the entire space under operator's control, where hazardous substances are present in one or more installations, including joint or related infrastructure facilities or activities.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
The public concerned shall mean the public concerned by or having an interest in - at present or in future, the making of decisions concerning the environment, with which it has specific relation through particular procedure. The public concerned shall include the citizens' associations established for the purpose of environment protection and improvement, as well as individual with regard to whom there is a high probability to experience the effects of decision making.	Law on Environment, (Official Gazette, No. 53/05, 81/05)
The public shall mean one or more legal entities or natural persons, citizens and their organizations and associations.	Law on Environment, (Official Gazette, No. 53/05, 81/05)

Key terms	Act
"Trans-boundary impact" means any significant adverse effect on the environment resulting from a change in the conditions of trans-boundary waters caused by a human activity, the physical origin of which is situated wholly or in part within an area under the jurisdiction of another Party to the Convention (such effects include effects on human health and safety, flora, fauna, air, climate, etc.).	Council Decision 95/308/EC of 24 July 1995 on the conclusion, on behalf of the Community, of the Convention on the protection and use of trans-boundary watercourses and international lakes (the Helsinki Convention)
"Trans-boundary waters" means any surface or ground waters which mark, cross or are located on the boundaries between two or more States (where trans-boundary waters flow directly into the sea, they end at a straight line across their respective mouths between points on the low-water line of their banks).	Council Decision 95/308/EC of 24 July 1995 on the conclusion, on behalf of the Community, of the Convention on the protection and use of trans-boundary watercourses and international lakes (the Helsinki Convention)
Urban waste water means waste water from residential settlements and services which originates predominantly from the human metabolism and from household activities (domestic waste water) or a mixture of domestic waste water with waste water which is discharged from premises used for carrying on any trade or industry (industrial waste water) and/or run-off precipitation water.	Directive 91/271/EEC concerning urban waste water treatment
Water Management are the overall actions, activities and measures to achieve the objectives of the The Law on Waters, i.e. for rational and efficient water use, sustainable water recourses development, water protection and protection from adverse effects of waters.	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Water pollution is the direct or indirect introduction, as a result of human activity, of substances or heat into the water, which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems.	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Water services means all services which provide, for households, public institutions or any economic activity: (a) abstraction, impoundment, storage, treatment and distribution of surface water or groundwater, (b) waste-water collection and treatment facilities which subsequently discharge into surface water.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy

Key terms	Act
Water use means water services together with any other activity identified under Article 5 and Annex II having a significant impact on the status of water.	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
Water use is use of water covering the activities of storage, capture, abstraction, diversion of surface and ground waters.	The Law on Waters ("Official Gazette of RM" No. 4/98, 19/00, 87/08)
Waste water treatment means : • Primary treatment of urban waste water by a physical and/or chemical process involving settlement of suspended solids, or other process in which the BOD5 of the incoming waste water is reduced by at least 20% before discharge and the total suspended solids of the incoming waste water are reduced by at least 50% • Secondary treatment of urban waste water by a process generally involving biological treatment with a secondary settlement or other process in which the requirements of the Directive 91/271/EEC are respected • Appropriate treatment of urban waste water by any process and/or disposal system which after discharge allows the receiving waters to meet the relevant quality objectives and the relevant provisions of the Directive 91/271/EEC and other Community Directives	Directive 91/271/EEC concerning urban waste water treatment

1. INTRODUCTION

Water, being one of the basic media in the environment and a basic substance without which life could not exist, becomes increasingly interesting from the aspect of its quality and quantity. Water is vital for our health and wellbeing, and for agriculture, fisheries, industry, and transportation. Healthy water resources are necessary for a high-quality natural environment.

For achievement such a complex vision water strategy is needed, with defined practical steps that will be taken to ensure that good clean water will be available for people and nature. The practical long-term steps we will need to take should include sustainable development of water resources through meeting the needs of all users; rational and economical use of water, insurance of good water quality and sufficient quantity; water protection and improved measures to prevent pollution; protection and improvement of aquatic ecosystems, and protection against harmful effects of waters.

Because almost everything human being do affects water in some way, strategy looks at every aspect of water use and consequently seek for synergies between different sectors. It takes into consideration aspects of agriculture, forestry, transport and communication, local and regional development, industry, energetic, environmental protection, health, economy and others and looks ahead for a period of 30 years.

Water stratey resumes facts from the field of water legal and institutional framework. It comprehends conclusions on state of water with separately investigated general river basin characteristics, state of water use, state of river training and protection against harmful effects of water and state of water protection. Ascertainment on state of water are starting point for defining water management objectives and consequently programme of measures that is upgraded with economical issues. These segments are summarised in water vision for the future that is not care only of the state or government but is care of every individual that creates our common living space.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

Water management and the field of water policy are regulated in European and Macedonian legislation. Legislation dealing with water management defines and affects procedures and institutions in the field of water management. Important influence on law and procedures has also environmental and other horizontal legislation. This chapter covers European and Macedonian legal framework and institutions dealing with water management in the Republic of Macedonia.

2.1 LEGAL FRAMEWORK

2.1.1 EUROPEAN LEGAL FRAMEWORK

The European Legal Framework is given in two parts, in the first part the general legal framework is given for water management. In the second part the main specific directives are briefly described for water use, surface water management and water protection.

2.1.1.1 GENERAL LEGAL FRAMEWORK FOR WATER MANAGEMENT

2.1.1.1.1 Water Framework Directive

With the "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" or, in short, the EU Water Framework Directive of 23 October 2000 establishing a framework for Community action in the field of water policy, the European Union has established a Community framework for water protection and management. The Directive provides, among other things, for the identification of European waters and their characteristics, on the basis of individual river basin districts, and the adoption of management plans and programmes of measures appropriate for each water body.

By this Directive the framework is provided for the management of inland surface waters, groundwater, transitional waters and coastal waters in order to prevent and reduce pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the effects of floods and droughts.

2.1.1.1.2 Inspire Directive

The purpose of Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) is to lay down general rules aimed at the establishment of the Infrastructure for Spatial

Information in the European Community (hereinafter referred to as Inspire), for the purposes of Community environmental policies and policies or activities which may have an impact on the environment.

According to Water Strategy crucial spatial data themes selected from Annex I and Annex III of that Directive are:

- Transport networks (Road, rail, air and water transport networks and related infrastructure. Includes links between different networks. Also includes the trans-European transport network as defined in Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community Guidelines for the development of the trans-European transport network (1) and future revisions of that Decision);
- Hydrography (Hydrographic elements, including marine areas and all other water bodies and items related to them, including river basins and sub-basins. Where appropriate, according to the definitions set out in Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (2) and in the form of networks);
- Protected sites (Area designated or managed within a framework of international, Community and Member States' legislation to achieve specific conservation objectives);
- Environmental monitoring facilities (Location and operation of environmental monitoring facilities includes observation and measurement of emissions, of the state of environmental media and of other ecosystem parameters (biodiversity, ecological conditions of vegetation etc. by or on behalf of public authorities);
- Production and industrial facilities (Industrial production sites, including installations covered by Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (1) and water abstraction facilities, mining, storage sites);
- Agricultural and aquaculture facilities (Farming equipment and production facilities (including irrigation systems, greenhouses and stables);
- Area management/restriction/regulation zones and reporting units (Areas managed, regulated or used for reporting at international, European, national, regional and local levels. Includes dumping sites, restricted areas around drinking water sources, nitrate-vulnerable zones, regulated fairways at sea or large inland waters, areas for the dumping of waste, noise restriction zones, prospecting and mining permit areas, river basin districts, relevant reporting units and coastal zone management areas);
- Natural risk zones (Vulnerable areas characterised according to natural hazards (all atmospheric, hydrologic, seismic, volcanic and wildfire phenomena that, because of their location, severity, and frequency, have the potential to seriously affect society), e.g.

floods, landslides and subsidence, avalanches, forest fires, earthquakes, volcanic eruptions) and
- Energy resources (Energy resources including hydrocarbons, hydropower, bio-energy, solar, wind, etc., where relevant including depth/height information on the extent of the resource).

2.1.1.1.3 Communication on pricing and long-term management of water

The Water Framework Directive sets out the guidelines for water policy in Europe. It promotes the use of pricing and taxation as an incentive for consumers to use water resources in a more sustainable manner and to recover the cost of water services per sector of the economy. With this in view the Commission has prepared Communication from the Commission to the Council, European Parliament and Economic and Social Committee: Pricing and sustainable management of water resources [COM(2000) 477 - Not published in the Official Journal]. The aim ot the Comminication is in enabling fruitful political debates on this matter and in informing those concerned. The communication should not be taken as solely advocating pricing in order to solve water-resource problems. However, this must be taken into due consideration and be combined with other instruments as part of drawing up of management plans for water resources at individual catchment-area level.

2.1.1.2 GENERAL LEGAL FRAMEWORK FOR WATER USE

2.1.1.2.1 Directive on the promotion of the use of energy from renewable sources

Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC came into force on 25 June 2009. It establishes a common framework for the use of energy from renewable sources.

Each Member State has a target calculated according to the share of energy from renewable sources in its gross final consumption for 2020. This target is in line with the overall goal for the Community.

The Member States are to establish national action plans which set the share of energy from renewable sources consumed in transport, as well as in the production of electricity and heating, for 2020. These action plans must take into account the effects of other energy efficiency measures on final energy consumption (the higher the reduction in energy consumption, the less energy from renewable sources will be required to meet the target). These plans will also establish procedures for the reform of planning and pricing schemes and access to electricity networks, promoting energy from renewable sources.

The Directive is part of a package of energy and climate change legislation which provides a legislative framework for Community targets for greenhouse gas emission savings. It encourages energy efficiency, energy consumption from renewable sources, the improvement of energy supply and the economic stimulation of a dynamic sector.

2.1.1.2.2 Directive on the promotion of electricity from renewable energy sources in the internal electricity market

Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity from renewable energy sources in the internal electricity market sets the promotion of electricity from renewable energy sources as a high priority for several reasons, including the security and diversification of energy supply, environmental protection and social and economic cohesion.

The Directive follows up the 1997 White Paper on renewable energy sources which set a target of 12% of gross inland energy consumption from renewables for the EU-15 by 2010, of which electricity would represent 22.1%. With the 2004 enlargement, the EU's overall objective became 21%.

The Directive concerns electricity produced from non-fossil renewable energy sources such as wind, solar, geothermal, wave, tidal, hydroelectric, biomass, landfill gas, sewage treatment gas and biogas energies (The European Comission, 2009, 2010).

2.1.1.3 GENERAL LEGAL FRAMEWORK FOR SURFACE WATER MANAGEMENT

2.1.1.3.1 Floods Directive

The purpose of Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks is to manage and reduce the risk of floods, particularly along rivers and in coastal areas. It provides framework for assessment of the risk of flooding in river basins, the mapping of flood risks in all regions where there is a serious risk of flooding and the drawing up of flood risk management plans based on cooperation and participation of Member States.

The Directive aims to establish a common framework for assessing and reducing the risk that floods within the European Union pose to human health, the environment, property and economic activity.

It covers all types of floods, both along rivers and in coastal areas. Beside that, there are also other risks, such as urban floods and sewer floods, which must also be taken into account.

In accordance with the Water Framework Directive, the proposed prevention and management measures are organised by river basin districts. The measures include the preliminary assessment of risks and the establishment of maps of areas at risk and flood management plans (The European Comission, 2009, 2010).

2.1.1.3.2 Communication on water scarcity and droughts

The document Commission Communication of 18 July 2007: "Addressing the challenge of water scarcity and droughts in the European Union" [COM(2007) 414 final – Not published in the Official Journal] represents guidelines for addressing sporadic drought and medium- or long-term water scarcity. In the guidelines the content is related to water pricing, water allocation, drought prevention and rapid response in the event of a drought, as also high-quality information and technological solutions tackling water scarcity and droughts (The European Comission, 2009, 2010)..

2.1.1.3.3 Proposal for Soil Protection Directive

Proposal for a European Parliament and Council Directive of 22 September 2006 setting out a framework for soil protection and amending Council Directive 2004/35/EC [COM(2006) 231 final - Not published in the Official Journal] gives a framework and common objectives to prevent soil degradation, to preserve soil functions and to remediate degraded soil. Under this proposal, which forms part of the strategy, there is setting up of a legislative framework for the protection and sustainable use of soil, integrating soil protection into national and EU policies, improving knowledge in this area and increasing public awareness.

The proposal for a Directive is a key component of the strategy, which enables Member States to adopt measures tailored to their local needs. It provides for measures to identify problems, prevent soil degradation and remediate polluted or degraded soil.

The proposal is not explicitly related to river erosion as it is mainly related to general erosion of soil (The European Comission, 2009, 2010).

2.1.1.4 GENERAL LEGAL FRAMEWORK FOR WATER PROTECTION

2.1.1.4.1 General framework for water protection

2.1.1.4.1.1 Groundwater Directive

Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and

deterioration represents a framework to prevent and control groundwater pollution. This includes procedures for assessing the chemical status of groundwater and measures to reduce levels of pollutants.

This Directive is designed to prevent and combat groundwater pollution. Its provisions include:

- criteria for assessing the chemical status of groundwater;
- criteria for identifying significant and sustained upward trends in groundwater pollution levels, and for defining starting points for reversing these trends and
- preventing and limiting indirect discharges (after percolation through soil or subsoil) of pollutants into groundwater.

The groundwater Directive complements the Water Framework Directive. It requires:

- groundwater quality standards to be established by the end of 2008;
- pollution trend studies to be carried out by using existing data and data which is mandatory by the Water Framework Directive (referred to as "baseline level" data obtained in 2007-2008);
- pollution trends to be reversed so that environmental objectives are achieved by 2015 by using the measures set out in the WFD;
- measures to prevent or limit inputs of pollutants into groundwater to be operational so that WFD environmental objectives can be achieved by 2015;
- reviews of technical provisions of the Directive to be carried out in 2013 and every six years thereafter;
- compliance with good chemical status criteria (based on EU standards of nitrates and pesticides and on threshold values established by Member States) (The European Comission, 2009).

2.1.1.4.1.2 Drinking Water Directive

Through the Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption the essential quality standards which water intended for human consumption must meet are defined.

The Directive is intended to protect human health by laying down healthiness and purity requirements which must be met by drinking water. It applies to all water intended for human consumption apart from natural mineral waters and waters which are medicinal products.

Directive 80/778/EEC was replaced by Directive 98/83/EC with effect from 25 December 2003 (The European Comission, 2009).

The Drinking Water Directive:

- Sets quality standards for drinking water quality at the tap (microbiological, chemical and organoleptic parameters) and the general obligation that drinking water must be wholesome and clean.
- Obliges Member States to regular monitoring of drinking water quality and to provide to consumers adequate and up-to-date information on their drinking water quality.
- Member States may exempt water supplies serving less than 50 persons or providing less than 10 m^3 of drinking water per day as an average and water in food-processing undertakings where the quality of water cannot affect the wholesomeness of the foodstuff in its finished form.

While translating the Drinking Water Directive into their own national legislation, the Member States of the European Union can include additional requirements e.g. regulate additional substances that are relevant within their territory or set higher standards. But Member States are not allowed to set lower standards as the level of protection of human health should be the same within the whole EU. Complementing the regular information to consumers, drinking water quality has in three year cycles to be reported to the European Commission; the scope of reporting is set out in Commission Decision 95/337/EEC.

2.1.1.4.1.3 Urban Waste Water Directive

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment focuses to harmonisation of measures related to the treatment of urban waste waters at the level of the European Union.

The Directive deals with the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waste waters.

Industrial waste water entering collecting sewage systems and the disposal of waste water and sewage sludge from urban waste water treatment plants are subject to regulations or specific authorisation by the competent authorities (The European Comission, 2009).

Directive 98/15/EC (Commission Directive 98/15/EC of 27 February 1998 amending Council Directive 91/271/EEC with respect to certain requirements established in Annex I) clarifies the rules relating to discharges from urban waste water treatment plants in order to put an end to differences in interpretation by the Member States (it is related to the requirements for discharges from urban waste water treatment plants

to sensitive areas and to the interpretation of measures provided in this Directive comply with the opinion of the Committee provided for Article 18 of Directive 91/271/EEC).

2.1.1.4.1.4 Nitrates Directive

In the Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (known as the "Nitrates Directive") the European Union has introduced a series of measures designed to reduce and prevent water pollution caused or induced by nitrates from agricultural sources. These measures include the requirement to identify polluted zones and zones which contribute to pollution, as well as to establish codes of good practice and action programmes.

Nitrate Directive is designed to protect the Community's waters against nitrates from agricultural sources, which are the main cause of water pollution from diffuse sources (The European Comission, 2009).

2.1.1.4.1.5 Bathing Water Directive

In the Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC (with effect from 31 December 2014) there are rules for the monitoring, assessment and management of the quality of bathing water and for the provision of information on that quality.

The Directive concerns the quality of bathing water, with the exception of water intended for therapeutic purposes and water used in swimming pools.

The review of bathing water legislation is designed to ensure consistency with the Sixth Environment Action Programme, the Sustainable Development Strategy and the Water Framework Directive. It is also intended to simplify procedures in the light of scientific developments and improve participatory processes for the actors concerned and the information given to the public (The European Comission, 2009).

2.1.1.4.1.6 Fish Water Directive

Council Directive 2006/44/EC of 6 September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life, is designed to protect fresh waters in order to safeguard the fish populations from the harmful consequences of pollutant substances discharged into water.

The Directive concerns the protection and improvement of the quality of running or standing fresh waters which support or which, if pollution were reduced or eliminated, would become adequate to support certain fish species.

The Directive doesn't include waters in natural or artificial fish ponds used for intensive fish-farming.

This Directive replaces and consolidates Directive 78/659/EEC, as amended by Directive 91/692/EEC and Regulation (EC) No 807/2003. It is restricted to formally collecting together the original Directive and its later amendments without changing the basic provisions.

The Water Framework Directive provides for the Directive to be repealed on 22 December 2013 in the field of water policy (The European Comission, 2009).

2.1.1.4.1.7 Dangerous Substances to Water Directive

In the Directive 2006/11/EC of the European Parliament and of the Council of 15 February 2006 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community the European Union lays down harmonised rules to protect the aquatic environment against the discharge of dangerous substances: it stipulates that all discharges of certain substances should be authorised, sets emission ceilings for these substances and compels the Member States to improve the quality of their water. This Directive is repealed by the Framework Directive on water as from the end of 2013.

This Directive lays down rules for protection against, and prevention of, pollution resulting from the discharge of certain substances into the aquatic environment. It applies to inland surface water, territorial waters and internal coastal waters.

Related acts:

- Directive on pollution caused by certain dangerous substances discharged into the aquatic environment and List One Substances Directive

The Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Daughter to 2006/11/EC) coveres discharges to inland surface waters, territorial waters and inland coastal waters. In 1980 the protection of groundwater was taken out of 76/464/EEC regulated under the separate Council Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances.

Council Directive 86/280/EEC of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC set limit values and quality objectives for discharges of certain substances included in List I of the Annex to Directive 76/464/EEC.

- Mercury Discharges from Chlor-Alkali Industries Directive

Council Directive 82/176/EEC of 22 March 1982 on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry covers inland surface water, territorial waters; and internal coastal waters.

Pursuant to Directive 2006/11/EC, it establishes limit values for emission standards for mercury for discharges from industrial establishments, sets quality objectives concerning mercury for the aquatic environment, establishes deadlines for compliance with the conditions set out in authorisations granted by the competent authorities in the Member States for existing discharges. The Directive also sets reference methods of measurement enabling the mercury content in discharges and in waters to be determined, establishes a monitoring procedure for discharges and invites Member States to harmonise their monitoring procedures in the event that discharges affect the waters of several Member States.

- Other Mercury Discharges Directive

Council Directive 84/156/EEC of 8 March 1984 on limit values and quality objectives for mercury discharges by sectors other than the chlor-alkali electrolysis industry sets limit values and quality objectives for mercury discharges in sectors other than the chlor-alkali electrolysis industry.

- Cadmium Discharges Directive

Council Directive 83/513/EEC of 26 September 1983 on limit values and quality objectives for cadmium discharges sets limit values and quality objectives for cadmium discharges in the aquatic environment.

- HCH Discharges Directive

Council Directive 84/491/EEC of 9 October 1984 on limit values and quality objectives for discharges of hexachlorocyclohexane sets limit values and quality objectives for discharges of hexachlorocyclohexane in the aquatic environment (The European Comission, 2009).

2.1.1.4.2 Special framework for water protection

2.1.1.4.2.1 Integrated pollution prevention and control Directive

With the Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and

control ("the IPPC Directive") the European Union defines the obligations with which industrial and agricultural activities with a high pollution potential must comply. It establishes a procedure for authorising these activities and sets minimum requirements to be included in all permits, particularly in terms of pollutants released. The aim is to prevent or reduce pollution of the atmosphere, water and soil, as well as the quantities of waste arising from industrial and agricultural installations, to ensure a high level of environmental protection.

The IPPC Directive, which replaces Directive 96/61/EC, requires industrial and agricultural activities with a high pollution potential to have a permit. This permit can only be issued if certain environmental conditions are met, so that the companies themselves bear responsibility for preventing and reducing any pollution they may cause.

The IPPC Directivecon cerns new or existing industrial and agricultural activities with a high pollution potential, as defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, livestock farming, etc.).

Directive 2008/1/EC recasts Directive 96/61/EC, which it replaces. This is a formal amendment that assembles the original instrument and its subsequent amendments in one single legislative act without altering its substantive provisions (The European Comission, 2009).

2.1.1.4.2.2 List of priority substances in the field of water policy

To establish a list of priority substances in the field of water policy, for which quality standards and measurements for the reduction of emission controls are set at Community level with Decision 2455/2001/EC of the European Parliament and of the Council of 20 November 2001, establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC [Official Journal L331 of 15.12.2001].

The Decision ranks in order of priority the substances for which quality standards and emission control measures will be set at Community level. This supplements the Water Framework Directive, and becomes Annex X.

2.1.1.4.2.3 Environmental quality standards applicable to surface water

Through the Proposal of 17 July 2006 for a Directive of the European Parliament and of the Council on environmental quality standards in the field of water policy and amending Directive 2000/60/EC the Commission proposes establishing environmental quality standards so as to limit the quantity of certain chemical substances that pose a significant risk to the environment or to health in surface water in the European Union (EU). These standards would be coupled with an inventory of discharges,

emissions and losses of these substances in order to ascertain whether the goals of reducing or eliminating such pollution have been achieved.

The purpose of this proposal is to set out environmental quality standards concerning the presence in surface water of certain pollutants and substances or groups of substances identified as priority on account of the substantial risk they pose to or via the aquatic environment.

2.1.1.4.2.4 Regulation on biodegradability and labelling of detergents

Regulation (EC) No 648/2004 of the European Parliament and of the Council of 31 March 2004 on detergents improves protection of the environment by safeguarding water systems from the harmful effects of certain substances found in detergents. It also increases consumer protection through more complete labelling which includes any substance that could cause allergies.

Regulation (EC) No 648/2004 stipulates that the Commission shall, by 8 April 2007, conduct an evaluation and submit a report and, if necessary, a legislative proposal on the use of phosphates with a view to introducing a gradual ban or restrictions on the use of such products.

2.1.1.4.2.5 Convention on elimination and minimisation of production, use and release of persistent organic pollutants (POPs)

Council Decision 2006/507/EC of 14 October 2004 concerning the conclusion, on behalf of the European Community, of the Stockholm Convention on Persistent Organic Pollutants (POPs) forms a framework, based on the precautionary principle, which seeks to guarantee the safe elimination of these substances, which are harmful to human health and the environment, as well as reductions in their production and use. The Convention covers 12 priority POPs, although the eventual long-term objective is to cover other substances.

The Convention seeks to ensure the limitation of pollution by persistent organic pollutants (POPs). It defines the substances in question, while leaving open the possibility of adding new ones, and also defines the rules governing the production, importing and exporting of those substances.

The Convention covers 12 priority POPs produced intentionally or unintentionally. These substances are formed unintentionally by a wide variety of sources, from residential combustion systems to waste incinerators.

2.1.1.4.2.6 Other substances: Directive on protection of groundwater

Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances

prohibits or limits the discharge of certain dangerous substances into groundwater and establishes systematic monitoring of the quality of such water. It will be repealed by the Water Framework Directive as of 21 December 2013.

The purpose of this Directive is to prevent the discharge of certain toxic, persistent and bioaccumulable substances into groundwater.

The following discharges are not covered in the Directive:

- discharges of domestic effluents from isolated dwellings;
- discharges containing substances listed in the Directive in very small quantities and concentrations and
- discharges of matter containing radioactive substances.

2.1.1.4.3 Regional legal framework for water protection

2.1.1.4.3.1 Environment strategy for the Mediterranean

In the Communication from the Commission of 5 September 2006 entitled: "Establishing an environment strategy for the Mediterranean" [COM(2006) 475 final - Not published in the Official Journal] there are the essential features of a coordinated strategy for the Mediterranean basin to protect the marine environment and the coastline of this region and to reduce pollution by 2020. This strategy is based on enhanced cooperation between the countries concerned in the political, financial and technical areas, and provides for the accomplishment of targeted activities, planned within a common initiative known as "Horizon 2020".

Connecting of the countries around the Mediterranean creates clear interdependence between the countries. Pollution has a direct impact on neighbouring countries, and natural resources are connected in complex ecosystems whose use and conservation are matters affecting every one of the Mediterranean countries. From this reason, the environmental actions in the Mediterranean need to be strengthened by means of a coordinated strategy between the EU and the various countries concerned.

This strategy focuses mainly on the Mediterranean countries which are covered by the European Neighbourhood Policy (Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria and Tunisia). For their part, EU Member States and the accession countries must apply EU environment legislation.

The regional cooperation strategy for the environment proposed by the Commission is aimed in particular at:

- helping partner countries to create appropriate institutions, develop an effective policy and establish a legal framework that enables environmental concerns to be integrated into other sectors of activity;
- reducing levels of pollution and the impact of uncontrolled activity;
- preparing local administrations to react to emergencies as well as to one-off and long-term issues;
- making more sustainable use of land and sea areas;
- increasing information, awareness and the participation of the public and
- encouraging regional cooperation amongst partner countries.

2.1.1.4.3.2 Helsinki Convention: trans-boundary watercourses and international lakes

Council Decision 95/308/EC of 24 July 1995 on the conclusion, on behalf of the Community, of the Convention on the protection and use of trans-boundary watercourses and international lakes (the Helsinki Convention) aims to prevent and control pollution of trans-boundary watercourses and international lakes by developing an international cooperation.

The Convention establishes a framework for cooperation between the member countries of the United Nations Economic Commission for Europe (UNECE) by ensuring rational use of water resources with a view to sustainable development.

2.1.1.4.3.3 Regional convention - Barcelona Convention for protecting the Mediterranean Sea

The Barcelona Convention of 1976, amended in 1995, and the Protocols drawn up in line with this Convention are aiming to reduce pollution in the Mediterranean Sea and protect and improve the marine environment in the area thereby contributing to its sustainable development.

In accordance to the Barcelona Convention, the Contracting Parties will individually or jointly take all appropriate measures to protect and improve the Mediterranean marine environment in order to contribute to sustainable development in the area and to prevent, abate, combat and, as far as possible, eliminate pollution in this area (The European Comission, 2009).

There is a special attention needed to four types of pollution:

- pollution caused by dumping from ships and aircraft;
- pollution from ships;
- pollution resulting from exploration and exploitation of the continental shelf and the seabed and its subsoil and
- pollution from land-based sources.

2.1.2 MACEDONIAN LEGAL FRAMEWORK

The important legislation of the Republic of Macedonia in the field of water related subjects was established in line with the transformation process of the country. A number of respective regulations still in force date back or are taken over unchanged from the years of former Yugoslavia. Apart from the legislation dealing directly with water management there are important links with environmental or other sector or horizontal legislation, which affect the institutions and procedures in the field of water management (UN, 2002; EC, 2007 Analytica, 2009).

2.1.2.1 BASIC WATER RELATED LEGISLATION

The sources of the present legal framework dealing directly or indirectly with water management or having reference to water related matters include:

- Law on Environment (Official Gazette no. 53/05, 81/05, 24/07, 159/08, 48/10, 124/10, 51/11)
- Law on Waters (Official Gazette no. 87/08, 6 / 09, 161/09, 83/10, 51/11)
- Law on Nature Protection (Official Gazette no. 67/04, 14/06, 84/07, 35/10, 47/11)
- Law on Water Management (Official Gazette no. 85/03, 95/05, 103/08)
- Law aquatic communities (Official Gazette no. 51/03, 95/05 113/07)
- Rulebook on the form and manner of keeping the register of aquatic communities (Official Gazette no. 15/04)
- Decree on classification of waters (Official Gazette no. 18/99)
- Regulation on categorization of water streams, lakes, reservoirs and groundwater (Official Gazette no. 18/99, 71/99)
- Rulebook on monitoring of sediment in reservoirs (Official Gazette no. 4 / 99)
- Rules for reporting on the state level and quantity of water accumulated in reservoirs, and the amount of water released by them (Official Gazette no. 8 / 99)
- Rulebook on the content and method of preparing management plans for river basins (Official Gazette no. 148/09)
- Regulation on methodology for assessment of river basins (Official Gazette no. 148/09)
- Rulebook on the content and method of preparing the program of measures (Official Gazette no. 148/09)

- Decision establishing the National Council for Water (Official Gazette no. 149/09)
- Law on Inland waterways (Official Gazette no. 55/07, Official Gazette no. 26/09, 22/10, 23/11, 53/11)
- Law on Fisheries and Aquaculture (Official Gazette no. 7 / 08, 67/10, 47/11, 53/11)
- Law on Protection of Ohrid, Prespa and Dojran (Official Gazette of SFRY no. 45/77 mostly valid,8 / 80 partially valid, 51/88 mostly valid, 10/90 mostly valid, 62/93 mostly valid)
- Program for Protection of Ohrid, Prespa and Dojran (Official Gazette of SFRY no. 7 / 87)
- Resolution of Dojran Lake (Official Gazette no. 45/95)
- Law on Ratification of Agreement between the Government of the Republic of Macedonia and the Council of Ministers of the Republic of Albania for the protection and sustainable development of the lake and its basin (Official Gazette no. 46/05)
- Act declaring the monument Dojran Lake Nature (Official Gazette no. 51/11)
- Regulations to implement measures to protect the strict natural reserve "Ezerani" Prespa Lake (Official Gazette no. 29/97)
- Act declaring the ornithological site "Ezerani" Prespa Lake, on a strict natural reserve (Official Gazette no. 37/96)
- Regulations to implement measures to protect the strict nature reserve in the gorge of Tikves Black River (Official Gazette no. 44/97)
- Law on Ratification of the Convention for the Protection of World Cultural Heritage (Official Gazette of SFRY no. 56/74)
- Decree on the Ratification of Convention on protection of wetlands of international importance for the protection of aquatic birds (Ramsar) (Official Gazette of SFRY no. 9 /77)
- Resolution on the impacts of climate change in the Republic of Macedonia (Official Gazette no. 31/10)
- Rules Amending the Rules for the maximum permissible amounts of radionuclides in food, water, air, land, products and raw materials of animal and plant origin and objects of general use. (Official Gazette no. 58/11)

Main stress is given to the Law on Environment, Law on Waters and Law on Nature Protection.

2.1.2.1.1 Law on environment

The Law on Environment (Official Gazette no. 53/05, 81/05, 24/07, 159/08, 48/10, 124/10, 51/11) has provided the basic legal framework of environmental protection and introduced the basic instruments of environment and nature protection and improvement, before that regulated by individual laws. The Law defines the rights and responsibilities of legal entities and natural persons in the areas of environment and nature protection and improvement; the development of planning documents in the area of environment, such as the National Environmental Action Plan (NEAP) and Local Environmental Action Plans (LEAPs); and stipulates the protection control mechanisms. For the first time the Law regulates the issues of environmental labelling, environmental monitoring as an integrated system, including environmental information system.

The Framework Law on Environment incorporates the basic principles of environmental protection, on the basis of which the relevant environmental management procedures are regulated. They are common to the principles of the laws regulating individual areas of the environment. The Law regulates the issues of access to environmental information, public participation in environmental decision-making, environmental impact assessment procedure, plans for industrial accidents controlling, as well as control mechanisms available to environmental inspectors. The Law places specific emphasis on integrated environmental permits, with regard to which it introduces the system of gradual adjustment to the required standards for integrated pollution prevention and control, through the introduction of integrated permits for compliance with operational plans, representing a condition for existing installations in the Republic of Macedonia to continue their operations.

The Law on Environment is a basic law, which treats principally all environmental media and areas, including the basic global issues. It provides a foundation for the adoption of secondary legislation for the detailed regulation of certain issues related to the protection of the environment. The Law provides a framework for the regulation of individual environmental media and areas, by the adoption of specific laws, including:

- Law on Waste Management (Official Gazette no. 68/04, 71/04);
- Law on Ambient Air Quality (Official Gazette no. 67/04) and
- Law on Waters (Official Gazette no. 87/08, 6 / 09, 161/09, 83/10, 51/11)

– Law on Nature Protection (Official Gazette no. 67/04, 14/06, 84/07, 35/10, 47/11)

The process of the new legislation development in the Republic of Macedonia is carried out in accordance with the Programme for Approximation of the National Legislation to the Legislation of the European Union, as well as in accordance with the European Partnership Action Plan, according to which the emphasis in the coming period shall be placed on the adoption of specific laws in the areas of noise, chemicals and genetically modified organisms.

2.1.2.1.2 Law on waters

In addition to the provisions of the Constitution of the Republic of Macedonia, water related legislation in the Republic of Macedonia consists of laws, international agreements and secondary legislation.

The Law on Waters (Official Gazette no. 87/08, 6 / 09, 161/09, 83/10, 51/11) provides a legal basis for water protection and management in the Republic of Macedonia. It regulates the manner of water resources use and exploitation, protection against harmful effects of water, protection of water against exhaustive water extraction and pollution, water resources management, sources for and manner of financing water management activities, concessions, transboundary water resources, and other issues of relevance with regard to the provision of a unique water use regime.

The Law on Waters from 1998 (Official Gazette no. 4/98) was the legal basis needed to address the growing water pollution problem. However, the law did not instated integrated policies and procedures for water protection and management of river basins. Actually it was never fully implemented.

Compliance to the EU Directives in the Water Quality Sector (Water Framework Directive (2000/60/EC) as the framework legislation; Urban Wastewater Treatment Directive (91/271/EEC), Nitrates Directive (91/676/EEC), Dangerous Substances to Water Discharges Directive (76/464/EEC) as emission control oriented legislation; water quality oriented directives; pollution prevention and control directives and monitoring and reporting directives has led to adoption of new Law on waters (Official Gazette, 2008). The new Law on water that will fully operate from 2010, when the secondary legislation is adopted in order to achieve full transposition, represents one initial effort to address water quality and water pollution issues within an integrated policy and legislative framework for future management of water resources. The Law

on waters incorporates the implementation provisions from the Water Framework Directive (2000/60/EC) and the Urban Wastewater Treatment Directive (91/271/EC).

The provisions of this Law refer to spring waters, running waters, stagnant waters and ground waters; impounded storm water; drinking water; wastewater; beds and banks of watercourses and torrents, lakes and accumulations; as well as thermal and mineral waters. Waters have been defined as a good of general interest and are owned by the State.

The Law on Waters has transposed the requirements of the following EU Directives in the domain of water resources management:

- Directive of the European Parliament and of the Council 2000/60/EC establishing a framework for Community action in the field of water policy;
- Directive of the European Parliament and of the Council 98/83/EEC on the quality of water intended for human consumption;
- Directive of the European Parliament and of the Council 76/160/EEC concerning the quality of bathing water;
- Directive of the European Parliament and of the Council 1991/271/EEC concerning urban waste water treatment;
- Directive of the European Parliament and of the Council 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture and
- Directive of the European Parliament and of the Council 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources.

In addition to the above mentioned, this Law establishes a basis for the transposition of the requirements contained in other relevant Directives that will remain in effect after the adoption of the Framework Water Directive (WFD) 2000/60 within the period specified for each of them.

The Law on Waters establishes legal grounds for the adoption of the relevant secondary legislation, which shall regulate in detail different conditions, procedures, standards and measures or on the basis of which the existing ones shall be revised, in order to achieve compliance with the new goals, standards and measures stipulated in the relevant EU Directives.

The Law on Waters undertakes some of the principles stipulated by the Law on Environment (which puts the protection of nature at high level), but it is also supplemented by the following principles of sustainable water resources management:

- Eco-social economic concept defines waters as a part of natural processes requiring protection as habitats of flora and fauna in the environment. Water resources management is of public interest.
- Principle of the minimization of resources use provides for careful and rational use of water during the activities that might have impact on waters.
- Principle of integration - this principle incorporates the integrated water management, from several points of view: mutual linkage between surface and ground water resources, their relationship with water dependent ecosystems and with other environmental media, the consent of directly involved institutions and users and the link with other sectors, the cooperation in matters related to transboundary water resources, as well as the integration of measures and activities for water protection into all development, strategic, planning and program documents adopted by public bodies and by the local self-government units.
- Polluter pays principle obliges water polluters to compensate for the expenses for reverting polluted waters into their previous condition.
- The principle of compensation for expenses - A water user is obliged to compensate for all expenses arising from service delivery, including expenses related to the water resources used thereby and for the expenses related to the environment, in accordance with the polluter pays principle.
- Principle of pollution prevention at the source of pollution – Pollutant emissions shall be prevented at the source of their occurrence.
- Time perspective principle – according to this principle, the terms in plans and decisions for water resources management correspond with the time perspective of expected effects.

Principle of stakeholders' participation is a principle which obliges competent bodies to take into account the interests of all stakeholders in the decision making procedure related to water resources management and protection.

2.1.2.1.3 Law on Nature Protection

One of the fundamental values of the constitutional order of the Republic of Macedonia is the space humanisation, and environment and nature protection and improvement. According to the Constitution of the Republic of Macedonia ("Official Gazette of RM" No. 52/91), everyone has the right to a healthy living environment and duty to protect and improve the environment and the nature. The State is obliged to provide conditions for the citizens' exercising the right to a healthy environment. In addition, the Constitution determines natural resources of the country, the flora and fauna, amenities in common use, as well as the objects and buildings of particular cultural and historical value determined by law, are goods of common interest enjoying specific protection. The legislation preceding

the new Law on Nature Protection (Official Gazette no. 67/04, 14/06, 84/07, 35/10, 47/11), did not regulate the protection of the nature in an integrated manner.

For the purposes of integrated nature protection, ratified international agreements implementation and transposition of the relevant EU legislation in the area of nature protection, the Assembly of the Republic of Macedonia adopted the new Law on Nature Protection (Official Gazette no. 67/04, 14/06, 84/07, 35/10, 47/11). This Law has transposed the two key legal acts of the EU concerning nature protection, as follows: Council Directive 1992/43 on the conservation of natural habitats and of wild fauna and flora and Council Directive 1979/409 on the conservation of wild birds. The Law has also taken into account the Council Regulation 338/1997 on the protection of species of wild fauna and flora by regulating trade therein, establishing grounds for further legal regulation of the subject area. In addition, regulations concerning genetically modified organisms and their use have been taken into account.

The protection of nature is carried out through biological and landscape diversity protection and natural heritage protection, in and outside protected areas.

With regard to species, the Law contains provisions that regulate the issues of introduction of non-indigenous species in nature and reintroduction of extinct indigenous species; trade in endangered and protected wild species of plants, fungi and animals; protection of species enjoying protection under international agreements; keeping and breeding of wild animal species in captivity, as well as special protection of the designated wild species included in the Red Book and Red Lists.

The Law also regulates the temporary protection of endangered wild species until their designation, by the adoption of a separate act by the Ministry of Environment and Physical Planning. The Law specifies the prohibited activities related to strictly protected wild species. The protected wild species include: indigenous wild species that are endangered or rare, but not threatened with extinction in the territory of the Republic of Macedonia; wild species that are not endangered, but could easily be confused, due to their appearance, with certain endangered species; and wild species for which the relevant manner of protection is stipulated under international agreements. The use of protected wild species may be carried out in a manner and in quantity that will not put at danger the favourable status of their preservation.

The Law also regulates the protection of habitats and ecosystems, including provisions that shall provide for the favourable status of habitats preservation, habitats monitoring, preservation of environmentally important areas and establishment of environmental network. The

protection of habitats and ecosystems is carried out through the measures and activities for nature protection, sustainable use of natural resources and space planning and development. The protection of ecosystems is provided through habitat type protection, by the determination of the status of their preservation.

2.1.2.2 SPECIFIC WATER RELATED LEGISLATION

In addition to the Law on Waters, certain water related issues are regulated by the following laws, decrees, rulebooks and related acts:

- Act for supplying drinking water and disposal of urban waste water (Official Gazette no. 68/04, mostly valid)
- Law Amending the law to supply drinking water and disposal of urban waste water (Official Gazette no. 28/06, 103/08, 17/11, 54/11)
- Methodology for determining the cost of drinking water and disposal of urban waste water (Official Gazette no. 107/05)
- Rulebook on conditions for collection, disposal and treatment, method and conditions for the design, construction and exploitation of systems and treatment plants for urban waste water, as well as technical standards, parameters, standards and emission standards for quality pre-treatment, disposal and purification of waste water, taking into account the load and the method for purification of urban waste waters discharged into sensitive areas of discharge of urban wastewater (Official Gazette no. 73/11)
- Manner and procedure for use of sludge, the maximum concentrations of heavy metals in soil where sludge is used, concentrations of heavy metals in sludge, the maximum annual quantities of heavy metals that can be incorporated into the soil (Official Gazette no. 73/11
- Rulebook on the manner and the maximum allowable concentration values and the parameters of the purified waste water for reuse them (Official Gazette no. 73/11)
- Rules on form and content of the application and permit reuse of purified wastewater, as well as the issuance of the permit (Official Gazette no. 60/11)
- Rules on form and content of the application and the license to use the sludge as well as the issuance of the permit for use of sludge (Official Gazette no. 60/11)
- Rulebook on conditions and manner of emission limit values for discharges of wastewater after their treatment, the method of their

calculation, taking into account the special requirements for protection of safety zones (Official Gazette no. 81/11)

- Rulebook on the form, content and manner of data submission and type of information using sludge from treatment of urban wastewater in line with its purpose, treatment, composition and location of its use (Official Gazette no. 60/11)
- Rules for special security requirements for natural mineral water (Official Gazette no. 32/06)
- Rulebook on determination and maintenance of protective zones around sources of drinking water (SFRY Official Gazette no. 17/83)
- Rules Amending the Rules of the manner of determination and maintenance of protective zones around sources of drinking water (SFRY Official Gazette no. 15/89)
- Rules for water safety (Official Gazette no. 46/08)
- Rulebook on the content and manner of the book Water (Official Gazette no. 2/ 99)
- Decision on determining the boundaries of the source protection zones Rasche and determination of protection measures (Official Gazette no. 36/90)
- Law on Public Utilities (Official Gazette no. 45/97, 23/99, 45/02, 16/04, 5/ 09)
- Law on ratification of the convention for assessing environmental impacts in a trans boundary context (Official Gazette no. 44/99)
- Decree on the strategies, plans and programs, including amendments to such strategies, plans and programs, mandatory procedure for assessment of their impact on the environment and human life and health (Official Gazette no. 153/07)
- Regulation Amending the Regulation on the strategies, plans and programs, including amendments to such strategies, plans and programs, mandatory procedure for assessment of their impact on the environment and human life and health (Official Gazette no. 45/11)
- Law on Hydro meteorological Activity (Official Gazette no. 5/03, 103/08, 115/08)
- Rules on the types of buildings that need to seek the opinion of Hydro regarding use meteorological and hydrological data, products and substrates (Official Gazette no. 52/10)
- Rules on procedures and method of observation and measurement of qualitative characteristics of the air, rainfall and soil in the network of meteorological stations (Official Gazette no. 39/10)

- Rules for the locations of the measuring stations and measuring points (Official Gazette no. 120/08)
- Law on mineral resources (Official Gazette no. 24/07, 88/08, 52/09, 6/10, 158/10, 53/11
- Rulebook on the form and manner of keeping the diary for extracting sand, gravel and stone (Official Gazette no. 17/99)
- Rulebook on the form, content and manner of the book for investigations conducted detailed geological surveys (Official Gazette no. 128/07)
- Law on Local Self-Government (Official Gazette no. 5 / 02)
- Spatial plan of the region of the source protection zones Rasche (Official Gazette no. 98/02)
- Spatial Plan of Republic of Macedonia (Official Gazette no. 39/04)
- Spatial Plan of the Ohrid-Prespa region 2005-2020 (Official Gazette no. 22/10)
- Spatial plan of the region of confluence of river Treska (Official Gazette no. 25/07)
- Decision on adoption of the Spatial Plan of the accumulation region Kozjak (Official Gazette no. 49/99)
- Law on Spatial and Urban Planning (consolidated text) (Official Gazette no. 60/11)
- Rules of procedure, methods of preparation, the contents of the reports on the situation and changes in space and time limits for submission (Official Gazette no. 42/05)
- Rules Amending the Rules of procedure, methods of preparation, the contents of the reports on the situation and changes in space and time limits for submission (Official Gazette no. 111/06)
- Rules Amending the Rules of procedure, methods of preparation, the contents of the reports on the situation and changes in space and time limits for submission (Official Gazette no. 17/10)
- Law on Crisis Management (Official Gazette no. 29/05, 36/11)
- Decree on the methodology for making the assessment of danger to the security of the Republic of Macedonia from all risks and dangers, its content and structure, storage and updating, as well as determination of the entities in the system of crisis management that are fully or submit a statement the assessment (Official Gazette no. 13/11)
- Law on Protection and Rescue (Official Gazette no. 36/04, 49/04, 86/08, 124/10, 18/11)
- National Strategy for Protection and Rescue (Official Gazette no. 23/09)

- Decree on implementation of the measure protection and flood rescue (Official Gazette no. 91/10)
- Rules on minimum necessary works and measures for technical monitoring of dams (Official Gazette no. 19/02)
- Determining the basic facilities of hydro systems (Official Gazette no. 11/99)
- Rulebook on the content and manner of keeping records of water facilities and plants (Official Gazette no. 17/99)
- Rules for calculating the fee for water used or used by legal entities that generate electricity (Official Gazette no. 1 / 00)
- Energy Law (Official Gazette no. 16/11)
- Law on Sanitary and Health Inspection (Official Gazette no. 71/06, 139/08, 88/10, 18/11, 53/11)
- Law on Food Safety (Official Gazette no. 157/10)
- Rules on general requirements for food safety (Official Gazette no. 118/05)
- Rules for implementing the methodology for monitoring food safety (Official Gazette no. 131/07)
- Rulebook on special requirements for safety of food produced by innovative technologies (Official Gazette no. 46/08)
- Penal Code (Official Gazette no. 37/96, 80/99, 4/02, 43/03, 19/04, 81/05, 60/06, 73/06, 7/08, 139/08, 114/09, 51/11)
- Construction Law (consolidated text)(Official Gazette no. 59/11)

2.1.3 COMPATIBILITY BETWEEN EUROPEAN AND MACEDONIAN LEGISLATION AND CAPABILITY OF REALIZATION OF WATER MANAGEMENT LEGISLATION OF EU

One of the most important goals of Republic of Macedonia is preparation for integration in EU. Such of challenge erase number of problems that comes of the differences in the policy, so preparation in the legislation of water management, environmental protection and regional development should be according EU requirements.

The most important part of legislation of the Republic of Macedonia in the field of water management is already established. At this point it is very important that legislation, which is already or will be transposed, is fulfilling the obligations from European Union and its legislation in the field of water management. Detailed description of realization how the Republic of Macedonia is dealing with this important issue is also part of this document (Chapter 7.2).

In most cases there are several institutions involved in adopting EU legislation. In the field of water management, the main competent authority ensuring the implementation and adoption of the European legislation is Ministry of Environment and Physical Planning (hereinafter called: MEPP).

2.2 INSTITUTIONAL STRUCTURE IN WATER MANAGEMENT SECTOR IN REPUBLIC OF MACEDIONIA

The current complex institutional arrangements for water management are the result of a long history and of frequent ministerial restructuring and reallocation of responsibilities over the past years (Economic Comission for Europe, 2002; MEPP, 2007).

Law on waters of the Republic of Macedonia defines water as a property of the state and thus gives the right and obligation to manage with them and to preserve them in their natural condition and even improve. These responsibilities and obligations are implemented through appropriate governmental institutions.

Competencies are divided into six ministries, Ministry of environment and physical planning, Ministry of agriculture, forestry and water-economy, Ministry of economy, Ministry of transport and communications, Ministry of education and science, Ministry of health and the Republic institute for health protection (Annex II-1; Figure 25).

The Ministry of environment and physical planning with current restructuring should take responsibilities related to the protection, improvement and planning in water management.

The Ministry of economy has jurisdiction over abstraction of water needed for the industry and energy production (production of electricity and heat). Their responsibilities, the Ministry achieves through its energy sector and relevant units in the sector.

The Ministry of transport and communications has responsibilities related to supply drinking water, collection and drainage of urban waste water and responsibilities related by internal navigation

The Ministry of education and science through the Hydrobiological institute-Ohrid are cared for physical and chemical composition of the water in natural and artificial lakes and the state of flora and fauna of aquatic life in them.

The Ministry of agriculture, forestry and water economy manages with the water for agricultural purposes as well as infrastructural facilities such as dams, reservoirs, irrigation systems. The hydrometeorological service is part of ministry, and he is responsibility for monitoring the quantity and quality of surface water and groundwater.

The Ministry of health implements control of the state of the water in terms of potential epidemics that can spread through water and control of the water as a kind of food. Responsibilities are implemented through two bodies in own composition- **state sanitary and health inspectorate** and **food directorate**.

Republic institute for health protection has obligations in relation to communal hygienic in public facilities, quality control and hygienic-bacteriological correctness of the waters.

Within these institutions there are departments, units, inspectorates and directorates with defined responsibilities in the relation to water. There are four river basins in Macedonia and currently there are four departments in establishment at the MEPP.

These departments are responsible for:

- carrying out the basic analysis of river basin characteristics;
- preparation and implementation of the river basin management plans (RBMP);
- preparation the Programme of measures;
- collecting the monitoring data, controlling the operators (drinking water supply utilities, irrigation operators, industry water suppliers, etc.);
- protection from the adverse effects of the water;
- protection of the water from pollution, preparation and updating of polluters cadastre;
- establishing and updating of register of protected areas and
- international cooperation regarding the preparation of international river basins management plans, performing scientific research in water field, etc.

3. SURFACE WATER AND GROUNDWATER STATE

State of water analysis is necessary for definition of important water management issues, setting water management objectives and programme of measures. Therefore different aspects of state are carried out in this chapter, including results of water balance and water quality; state of water use, surface water management and water protection.

3.1 GENERAL CHARACTERIZATION OF RIVER BASINS

The Republic of Macedonia has a total area of 25.713 km^2. It has 748 km of boundaries, shared with Serbia, Kosovo, Bulgaria, Greece and Albania. It is a landlocked country that is geographically clearly defined by a central valley formed by the Vardar River and framed along its borders by mountain ranges.

In the Republic of Macedonia surface waters cover 477 km^2, that represent 1,88 % of the territory (188 m^2/ha). There are about 35 rivers, 53 natural and artificial lakes. In the Republic of Macedonia there are 1.100 larger sources of water. In relations to quantities of water resources, Macedonia belongs to areas that have sufficient water resources. However, their distribution is quite unequal.

The rivers flow into three different river basin districts: the Aegean, the Adriatic and that Black Sea basin district (Annex 1, Map 1). The Aegean basin district is the largest. It covers 87 % of the territory or 22.075 km^2. It is divided on Vardar River Basin and Strumica River Basin.

- AEGEAN (CENTRAL MACEDONIA) RIVER BASIN DISTRICT – VARDAR RIVER BASIN

Vardar, the largest river in this basin district, drains 80 % of the territory or 20.661 km^2 (Figure 1). It consists of Vardar River Basin with its tributaries on the territory of the Republic of Macedonia up to the Macedonian-Greek state border, and Lake Dojran Basin on the territory of the Republic of Macedonia. Most important tributaries of River Vardar are: Treska, Lepenec, Pcinja, Bregalnica, Crna Reka, Bosava and Dosnica. In Vardar River Basin there is the smallest natural lake in the state, Dojran Lake, which the Republic of Macedonia shares with Greece.

- AEGEAN (WEST MACEDONIA) RIVER BASIN DISTRICT – STRUMICA RIVER BASIN

The Strumica River Basin includes Strumica, Cironska and Lebnica River Basin up to the Macedonian-Bulgarian state border. It covers 1.649 km^2 or 6,4 % of the territory of the Republic of Macedonia. The major part of the total river basin (75 %) is situated in the Republic of Macedonia and the remaining part in Bulgaria and Greece. The main tributaries to River Strumica are Vodoca, Turija, Radoviska and Podareska. This area presents the poorest part in water resources of the whole state. The river has a total length of 114 km, of which 81 km in the Republic of Macedonia and 33 km in Bulgaria. It is the Struma's largest tributary.

- ADRIATIC RIVER BASIN DISTRICT - CRN DRIM RIVER BASIN

Adriatic basin district is the second largest. The main river is Crn Drim. Adriatic basin district covers an area of about 3.359 km^2 or 13 % of the territory. It receives water from Lakes Prespa and Ohrid. This region is the richest with water resources. It also includes tributaries on the territory of the Republic of Macedonia up to the Macedonian-Albanian state border. The River Crn Drim, whose length in amounts to 44,5 km^2, springs out from the Ohrid Lake, at the town of Struga. Its main tributary is the Radika River. The Crn Drim River Basin includes two biggest natural lakes in Macedonia – Ohrid Lake and Prespa Lake.

- DANUBE RIVER BASIN DISTRICT – JUZNA MORAVA RIVER BASIN

The Danube River basin district is the smallest with only 44 km^2 or 0,14 % of the territory. It covers the northern side of Mount Skopska Crna Gora. This is the source of the river Binachka Morava which, joining the Morava, and later, the Danube which flows into the Black Sea. The Binachka Morava River Basin includes the Binachka Morava River Basin on the territory of the Republic of Macedonia up to the Macedonian-Serbian state border. It has not significant impact on the availability of the water resource in the Republic of Macedonia.

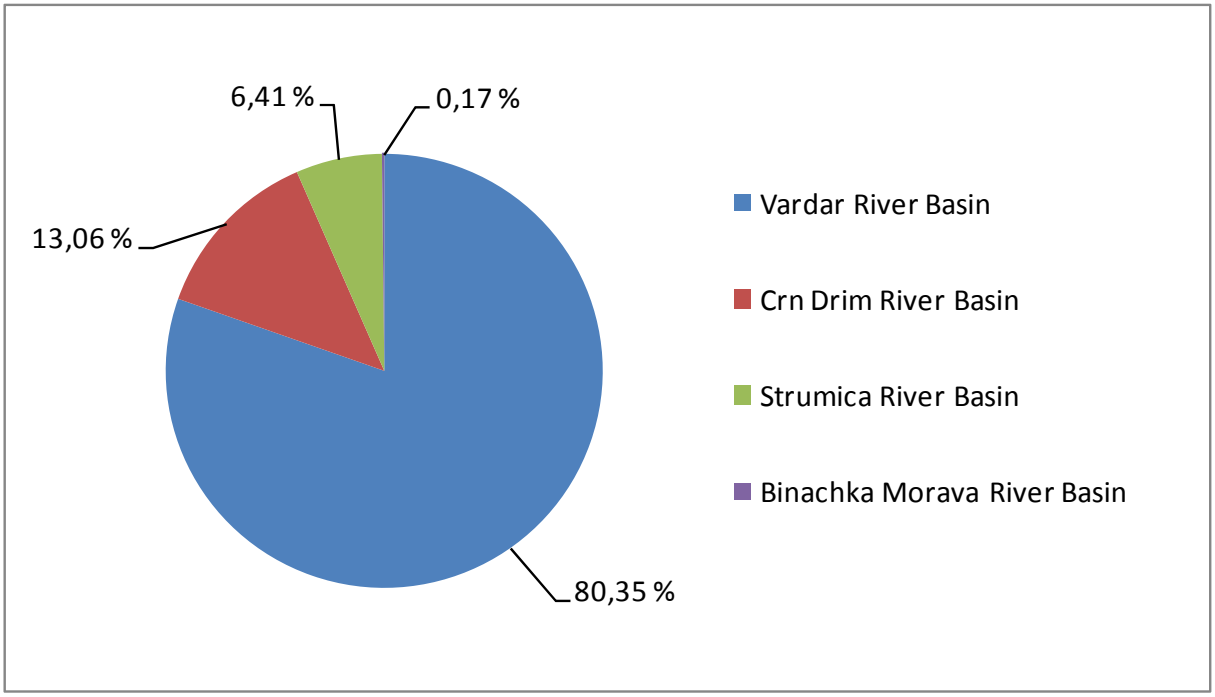


Figure 1: Percentage of particular river basin in the Republic of Macedonia

About 98 percent of the territory of the Republic of Macedonia is in international basins shared with all neighbouring countries: Serbia and Montenegro, Greece, Albania and Bulgaria. According to recognized national and international river basin district under Article 3 of the Water Framework Directive there are 4 international river basin district (RBD) in the Republic of Macedonia:

- Danube RBD;
- Adriatic RBD;
- Central Macedonia RBD and
- West Aegean RBD.

3.1.1 WATER MANAGEMENT DIVISIONS

The Republic of Macedonia is divided on 16 water management divisions (Table 1; Annex I, Map 2). The largest division is Sredna and Dolna Bregalnica that covers 12,48 % of the total area and the smallest is Dojran that covers only 0,45 % of the area. There are 11 water management divisions in the Vardar River basin, 4 in the Crn Drim River Basin and 1 in Strumica River Basin. Small area of Binachka Morava River Basin is included in water divisions Pcinja and Skopsko.

Table 1: Water management divisions in the Republic of Macedonia

Water Management Division	River Basin	River Basin District	Area (km^2)	Percentage (%)
Polog-Debarsko	Crn Drim	Adriatic	265,26	1,03
Debarsko	Crn Drim	Adriatic	775,67	3,02
Ohridsko-Strusko	Crn Drim	Adriatic	1.489,44	5,79
Prespa	Crn Drim	Adriatic	765,31	2,98
Polog	Vardar	Central Macedonia	1.443,99	5,62
Treska	Vardar	Central Macedonia	2.028,65	7,89
Pelagonija	Vardar	Central Macedonia	3.068,29	11,93
Skopsko	Vardar	Central Macedonia	1.605,11	6,24
Sreden Vardar	Vardar	Central Macedonia	2.624,75	10,21
Srednja and Dolna Crna Reka	Vardar	Central Macedonia	1.940,65	7,55
Dolen Vardar	Vardar	Central Macedonia	1.088,02	4,23
Pcinja	Vardar	Central Macedonia	2.317,96	9,01
Gorna Bregalnica	Vardar	Central Macedonia	1.068,82	4,16
Sredna and Dolna Bregalnica	Vardar	Central Macedonia	3.208,37	12,48
Dojran	Vardar	Central Macedonia	116,05	0,45
Strumica	Strumica	West Macedonia	1.526,64	5,94

- WATER MANAGEMENT DIVISION DEBARSKO

This region is located at west side of the Republic of Macedonia, along middle run of rivers Crn Drim and Radika. It encompasses Debarska valley and part of mountains Korab, Debar and others. Main urban centre is Debar. Main left tributaries of Crna Reka are Modriska, and right tributaries are Selacka Reka, Dolgas and Radika. Main tributaries of Radika are Mavrovica, Mala Reka and Rabnica.

- WATER MANAGEMENT DIVISION OHRIDSKO-STRUSKO

This area is located at west side of the Republic of Macedonia and encompasses Ohridsko-Struska valley and fringe of mountains Jablanice, Galicica, Karaorman and others. Main urban centres are Ohrid and Struga. Main recipients for surface waters are Ohrid Lake and Crn Drim River. Important are also rivers Koselska and Sateska that has outflow into Ohrid Lake.

- WATER MANAGEMENT DIVISION PRESPA

This area is located in southern part of the country and encompasses Resenska valley and fringe of mountains Baba, Galicica, Paklenska Gora. The main urban centre is Resen. This area encompasses Prespa Lake and rivers with outflow to Presla Lake. Main tributaries are Brajcinska River, Pretorska River and Golema.

- WATER MANAGEMENT DIVISION POLOG

This region is located at northeast part of the Republic. It comprehends Poloska valley, Sharplaninski massif, karst terrain Bukovic and Krasta, Suva Gora mountain range, and others.

- WATER MANAGEMENT DIVISION TRESKA

This region is located along river Treska and comprehends Kicevska valley, east slopes of massif Bistra, Suha Gora and west border of Jakupica and Karađice. Main urban centres are Kicevo and Makedonski Brod. Beside river Treska important are also its tributaries Kicevska Reka and Mala Reka.

- WATER MANAGEMENT DIVISION SKOPSKO

This region is located at the northern part of the Republic and comprehend Skopje valley, mountain ranges in Skopska Crna Gora, Zeden, Karađica etc. Main urban centre is Skopje. Vardar's main tributaries are Lepenec and Treska.

- WATER MANAGEMENT DIVISION PELAGONIJA AND SREDNA AND SPODNA CRNA REKA

This area encompasses Pelagonijska valley, Bitolsko and Prilepsko pole along the Crna Reka and fringe of Selecka Gora, Babuna, Plekenska Gora, Ilinska Gora and others. Major urban centres are Bitola, Prilep, Krusevo, Demir Hisar and others. In Pelagonija main Crna Reka's right tributaries are Cerska, Semnica, Dragor, Elaska, and left tributaries Blato and Suvudolska. Greater part of Elaska basin is located in Greece.

- WATER MANAGEMENT DIVISION SREDEN VARDAR

This area is located along middle run of the Vardar River from confluence with Pcinja River to settlement Demir Kapija and encompasses Valeska and Kavadarecko-Negotinska valley and part of massif Babuna, Jakupica, Karađica, Kozuv, etc. Larger urban centres are Veles, Kavadarci and Negotino. River Vardar has many small left tributaries; larger tributaries are on the right side, i.e. Topolka, Babuna, Luda Mara and Bosava.

- WATER MANAGEMENT DIVISION DOLEN VARDAR

This area is located along lower Vardar and encompasses Valandovska, Gevgelijska and Bogdanska valley, and east fringe of Kozuv Gora. It is extended form Demir Kapija to Greek border. Main left tributary is Anska Reka and right one is Konska Reka.

- WATER MANAGEMENT DIVISION PCINJA

This region is located at the northeast of the Republic of Macedonia, along rivers Pcinja and Kriva Reka. Larger urban centres are Kumanovo, Kriva Palanka and Skopje. Pcinja River spring in Serbia and enter to Republic of Macodnia at settlement Pahor Pcinjski. It is right tributary is Kumanovska Reka and left tributary is Kriva Reka.

- WATER MANAGEMENT DIVISION GORNA BREGALNICA

This region is located at eastern part of the Republic of Macedonia and encompass upper run of river Bregalnica, from source to accumulation Kalimanci. Major urban centres are Delcevo, Berovo and Pehcevo. Major Bregalnica's tributaries are on the right bankside - Rateska and Saska Reka.

- WATER MANAGEMENT DIVISION SREDNA AND DOLNA BREGALNICA

This region is extended form middle run of river Bregalnica (accumulation Kalimanci) to confluence with river Vardar. It encompasses Kocanski and Kratovsko-Zletovski basen, Ovcepolska valley, as well as mountains

Osogovska gora, Pljackovia and others. Main urban centres are Kocani, Vinica, Stipe, Probistip and Sveti Nikole. Bregalnica's right tributaries are Orizarska, Kocanska, Zletoviaca and Sveti Nikolska Reka and left are Zrenovska Reka and Kriva Lakavica.

- WATER MANAGEMENT DIVISION STRUMICA

This area is located in the southeast part of the Republic and encompass basins Strumica and Radovis and fringe of massif Pljackovica, Malesevska gora, Ograzden, Belasica and others. Main urban centre are Strumica and Radovis. Main Strumica tributaries are rivers Podares, Vodaca and Turija.

- WATER MANAGEMENT DIVISION DOJRAN

This small area is located at Dojran Lake. Large urban centre is Dojran.

3.1.2 GENERAL REVIEW OF SURFACE WATERS

General review is prepared separately for rivers and lakes according to Water Frame Directive. Because the Republic of Macedonia is landlocked country, there are no transitional or coastal waters.

3.1.2.1 RIVERS

According to the hydrochartic division, on the territory of the Republic of Macedonia there are four river basins: Vardar, Strumica, Crn Drim and Binachka Morava. The surface inflowing waters are the rivers: Lepenac, Pcinja and Elaska and the out flowing waters are rivers Vardar, Strumica, Crn Drim, Cironska, and Lebnica. Characteristics of main rivers are represented in Table 2. Data on flow, water level, suspended disposal and temperature are measurable at surface water monitoring stations. There are 97 stations - 20 stations in the Crn Drim River Basin, 5 Strumica River Basin and 82 stations in Vardar River Basin (Map 3).

Table 2: Characteristics of main rivers in the Republic of Macedonia (Protection and utilization of water and water economy infrastructure, 1998; EC, 2002)

River	River basin	Catchment area	River length	Average annual flow
		(km^2)	(km)	(m^3/s)
Vardar	Vardar	20.661	301	63-145 [(a)]

River	River basin	Catchment area	River length	Average annual flow
		(km^2)	(km)	(m^3/s)
Treska	Vardar	2.068	139	24,2[(b)]
Lepenac	Vardar	770	75	8.7
Pcinja	Vardar	2.841	137	12,6[(c)]
Bregalnica	Vardar	4.344	..	12,2[(d)]
Crna Reka	Vardar	4.985	228	29,3
Bosava	Vardar	468	52	23,4[(e)]
Crn Drim	Crn Drim	3.359	45	52,0[(f)]
Radika	Crn Drim	..	..	19,3
Strumica	Strumica	1.649	..	4,2[(g)]
Binachka Morava	Binachka Morava	44	..	..

Legend: [(a)] 63 in Skopje; 145 in Gergelija; [(b)]at its confluence with the River Vardar; [(c)]at Katlanovska Banja; [(d)]in Shtip, [(e)]at Rasimbegov Most; [(f)]at Shpilje hydro power station; [(g)]at Novo Selo

Total drainage length is 7.637 km and drainage density is 0,30 km/km^2. Drainage density in Vardar, Crn Drim and Strumica River Basin are almost identical. Minor deviations are noticeable in drainage density comparison between water management divisions (Table 3, Figure 2). The largest drainage density is in water management division Gorna Bregalnica while null drainage density is in Dojran water management division, where is no (river) surface water.

Table 3: River length and drainage density in water management divisions

Water Management Division	River Basin	Length (km)	Drainage density (km/km^2)
Polog-Debarsko	Crn Drim	82,92	0,31
Debarsko	Crn Drim	326,32	0,42
Ohridsko-Strusko	Crn Drim	400,17	0,27
Prespa	Crn Drim	150,31	0,20
Polog	Vardar	473,15	0,33
Treska	Vardar	550,46	0,27
Pelagonija	Vardar	872,83	0,28
Skopsko	Vardar	288,52	0,18

Water Management Division	River Basin	Length (km)	Drainage density (km/km^2)
Sreden Vardar	Vardar	854,98	0,33
Srednja and Dolna Crna Reka	Vardar	795,93	0,41
Dolen Vardar	Vardar	394,07	0,36
Pcinja	Vardar	574,85	0,25
Gorna Bregalnica	Vardar	508,36	0,48
Sredna and Dolna Bregalnica	Vardar	847,02	0,26
Dojran	Vardar	0,00	0,00
Strumica	Strumica	451,17	0,30

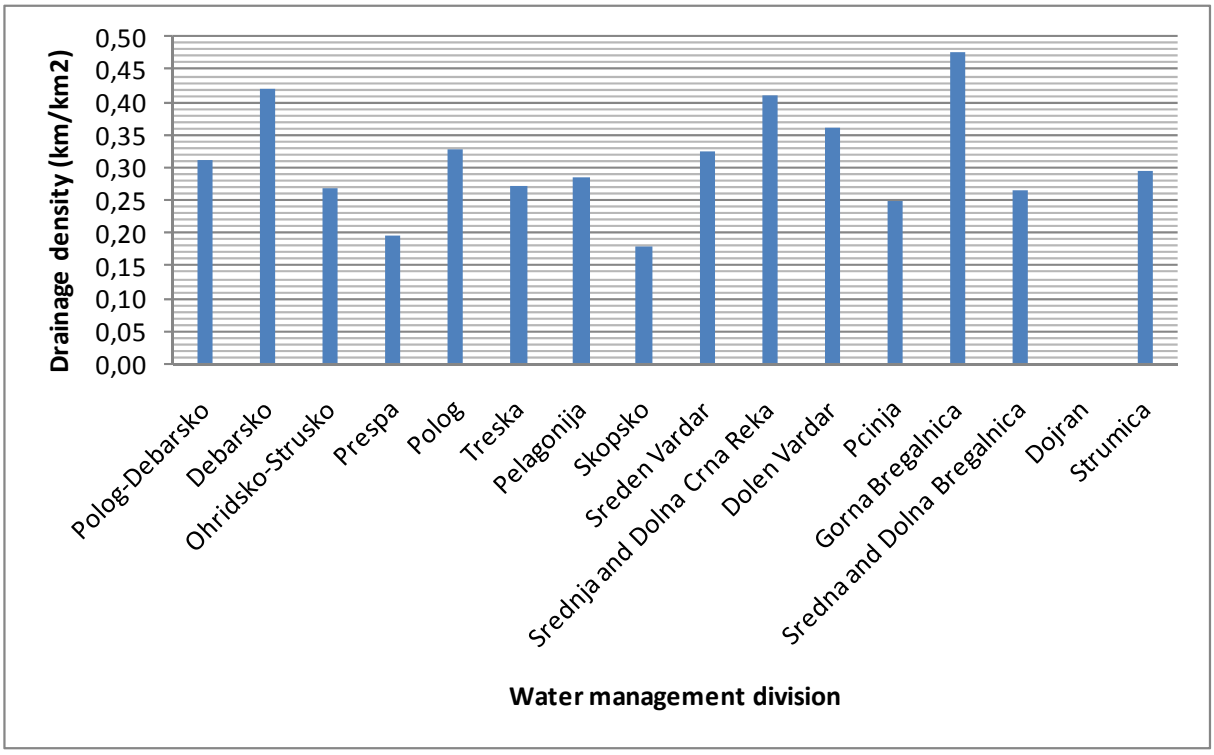


Figure 2: Water management divisions in the Republic of Macedonia

3.1.2.2 LAKES

In the Republic of Macedonia there are several natural and artificial lakes (Table 4). Of the natural ones, the most attractive are the tectonic lakes Ohrid, Prespa and Dojran. All of them are shared with the neighbouring countries. Lake Ohrid is the largest one with an area of 359 km^2; of which 230 km^2 belong to Macedonia and the remainder to Albania. The lake has a hydrological connection with the upper lake Prespa, with the total area of 274 km^2, shared with Greece and Albania. The smallest, Lake Dojran, has a total area of 43 km^2 (the Macedonian part amounts

27km^2) and is shared with Greece. Characteristics of main lakes are represented in Table 5.

Table 4: Number and surface area of lakes in the Republic of Macedonia (The State Statistical Office, 2009)

Types of lakes	Number of lakes	Surface area (km^2)
Natural techtonic lakes	3	434
Natural glacial lakes	25	0,22
Artificial lakes	14	53,59
Total	42	487,81

Table 5: Characteristics of main lakes in the Republic of Macedonia (The State Statistical Office, 2009)

Lake	Surface area (km^2)		Altitude (m)	Maximum depth (m)
Ohrid	349	1)	693	286
Prespa	274	2)	853	54
Dojran	43	3)	148	10
Tikves	14	4)	260	95
Debar-Globocica	13	4)	580	92
Mavrovo	12	4)	1197	48
Glacial	0,22	5)	1330-2470	

Legend: (1) 118,9 km^2 belongs to Albania, (2) 49,4 km^2 belongs to Albania and 47,8 km^2 to Greece, (3) 15,6 km^2 belongs to Greece, (4) Artifical lakes, (5) 25 small lakes

3.1.2.3 RIVERS

In the Republic of Macedonia there are 44 wetlands. These wetlands are grouped as follows: 19 artificial lakes (reservoirs), 8 marshes, 6 glacial lakes, 3 fish ponds, 3 natural lakes, 1 temporary water, 2 rivers, one aquatic bed and one spring. Total area that is covered by wetlands is 57.422 ha or 2,23 % of the total area of Macedonia.

The largest percentage belongs to natural lakes (82,5 %), reservoirs (11,3 %) and marshes (5,54 %). The largest number of wetlands (10) belongs to Vardar River Basin (direct basin) and Crna Reka River Basin, while in Bregalnica River Basin there are 6 wetlands.

The most important wetlands are: Lake Prespa, Lake Ohrid and Lake Dojran, reservoirs: Tikves, Mladost, Matka, Glaznja, Lipkovo, Mavrovica, Kalimanci, Gradce, Ratevo, Paljurci, Prilep, Strezevo, Suvodol, Globocica, Spilje, Mavrovo, Turija, Vodoca and Mantovo and marshes: Katlanovko Blato, Belcisko Blato and Monosptiovsko Blato. Site Ezerani at Prespa Lake is promoted as a strictly protected ornithological reserve and it is on the world RAMSAR list.

Water quality in these wetlands is mostly endangered by the wastewater which is discharged untreated in the water bodies, uncontrolled abstraction of the water, uncontrolled visits of the tourists and unfavourable weather conditions.

3.1.3 GENERAL REVIEW OF GROUNDWATERS

Groundwater on the territory of the Republic of Macedonia is generally divided in two kinds of lithological formations – Quaternary and Neogene formations with characteristic intergranular porosity and carbonate formations with karst porosity. Karst formations with porosity have minor importance for water distribution (Map 4).

Aquifers formed in Quaternary and Neogene formations are separated into three hydrogeological classes - 11, 12 and 13. Extent and basic characteristics are shown on Map 4. This type of aquifers is dispersed through the whole county and cover about 5000 km^2 (19,5 % of total area). In terms of the representation of the underground water reserves that can be interesting to organized commercial exploitation, classes 12 and 13 are appropriate. The most important are formations in alluvial sediments of major rivers Vardar, Crna Reka and Bregalnica, that are spread in areas Poloshka, Skopska, Gevgelijsko-Valandovska, Pelagoniska, Kochanska, Strumicka depression, which are classified in class 13. Aquifer capacity in class 12 is less than 15 l/s and capacity in class 13 is 20-40 l/s. The most important is region Valandovo-Gevgelijsko in the southern part of Macedonia, where aquifer capacity reaches 100 l/s. In these parts hydraulic connection with surface water bodies is especially important.

Carbonate aquifers in karst area are classified in class 32 and 33, where aquifer capacity is 10-100 l/s. For class 33 karst springs are characteristic, that have capacity more than 100 l/s, even more than 1000 l/s. There is registered about 40 springs with capacity more than 100 l/s. The total area of this kind of aquifers is about 2620 km^2 (10,2 % of total area). About 2520 km^2 are spread in western Macedonia, and only 100 km^2 in the territory of Eastern Macedonia. The total average capacity of the sources of this type of groundwater is about 25 m^3/s. This type is spread very asymmetrical – almost totally absent in the eastern part of county. These aquifers are characterized by a module on the expiry of underground (q) most often within 6 and 12 $l/s/km^2$, rainfall infiltration between 20 and 40 % and effective porosity between 3 and 5 %.

Aquifers formed from different types of formations with middle permeability are classified in classes 41 and 42. This type covers small area – about 900 km^2 (3,5 % of total area). Aquifer capacity is normally

between 2 and 10 l/s. Module on the expiry of underground most is between 1 to 1,5 l/s/km^2. Total capacity is estimated at 1,0 to 1,3 m^3/s.

Low water permeability is characteristic of class 60. It covers the greatest part of county. Aquifers are formed from different types of intrusive and metamorphic rocks, which are characterized by a developed porosity only at the shallow surface. This type covers about 16000 km^2 (62 % of total county area). Source capacity is less than 2 l/s and the total capacity is estimated at 2,5 to 3,0 m^3/s. These aquifers are characterized by a module on the expiry of most underground (q) between 0,1 and 0,2 l/s/km^2. Characteristic rainfall infiltrations is between 0,8 and 1,2 % and effective porosity less than 0,5 %.

Classes of very low water permeability or even anhydrous courts are class 70 and 80. These classes cover about 1200 km^2 (or about 4,6 % of total area). In these classes are mainly formations as clay, marl, Eocene sediments and some kind of slate. The sources are rare (or completely absent) with poor capacity.

According to data from the cadastre of the source which date in '70s, there are 4400 sources registered on the whole territory of the Republic of Macedonia. Total capacity is 992 x 106 m^3/year or 31,5 m^3/s. Data on water level and water temperature are gauged at groundwater monitoring stations (Map 5).

Data on number of sources is underestimated, but estimation of total capacity is quite good. New updated, detailed and accurate information about hydrogeological characteristics shall be provided with the drafting of the basic hydrogeological map. For the present only 30 % of total area the Republic of Macedonia is covered with that kind of map (Map 6).

3.1.3.1 GROUNDWATER IN PARTICULAR WATER MANAGEMENT DIVISION

Groundwater on the territory of the Republic of Macedonia represents a basic resource for water supply. For public water supply groundwater participate approximately 70 %, while the percentage for individual water supply is higher. Despite the high percentage of utilization of underground water their potential has not been enough researched, used and protected. Reasons for such a situation are building a multipurpose accumulations and consequently neglected research of groundwater; inconsistency in the existing legislation and insufficiently clearly defined obligations and rights in the domain of research and using of groundwater; imbalances in the competence in the domain of water supply; deficient hydrometeorological network; lack of hydrogeological detail survey, etc.

In further text presence of particular aquifer type, level of exposure to research and exploitation for particular water management division is presented. In the next phase of the development and implementation of this strategy analysis will be prepared for particular hydrogeological region and/or municipality.

- WATER MANAGEMENT DIVISION POLOG

Larger urban centres are Tetovo and Gostivar. The main hydrogeological type is compact formations with free water level in the alluvial deposits of the Vardar and Sarska Reka, where thickness of alluvium is less than 20 m. In this type are included also fluvio-glacial deposits in the foothills of mountain Sara, Pliocene-Quaternary sediments in Poloska Valley and local formations released with the water level under pressure in Spodnji Polog.

Exploitation of water is made by number of wells. Water is used mainly for local water supply, for the needs of the industry as well as additional water supply for Tetovo. Well capacity is more than 10 l/s, locally about 40 l/s. The total well capacity in Poloska valley is estimated at 600-800 l/s.

Karst type formations are present in carbonate massifs of Sara, karst massifs Bukovic, Krasta and Suva gora. Aquifer is dried up by a number of sources, from which important sources are located at contact of karst region and Suva gora and Neogene sediments (source Gergane, Forino, Volkovija with q between 0,1 to 1,0 m^3/s, source Vrutok-karst range Krasta with q between 0,.5-5 m^3/s. Data for a total average capacity (of all sources in this water management division) does not exist, but it is estimated at 3,0 m^3/s. Fissured formations are present in parts with larger parties slates in mountain Sara.

- WATER MANAGEMENT DIVISION SKOPJE

The main hydrogeological type are compact formation with free water level in the alluvium of the river Vardar (thickness up to 25 m); Pliocene-Quaternary sediments in Skopje Pole (thickness of alluvial sediments up to 160 m) and compact formations with the level under pressure in the southern part of the Skopje Pole.

Groundwater is drained through a number of wells and is mainly used for industry. Capacity is greater than 10 l/s, locally even more than 100 l/s. There is no accurate data on total capacity, but it is at 1500-2000 l/s.

Karst formations are present at mountainous range Zeden. It is mainly drained through the source Rasce, with the capacity between 0,8 and 6 m^3/s. This source is used for water supply in Skopje. Karst-fissured

formations are present at massifs of Skopska Crna Gora. This area drains through a number of sources with the capacity between 0,1 and 10 l/s.

- WATER MANAGEMENT DIVISION TRESKA

The main hydrogeological type is karstic carbonate type that is presented along river Treskka and on mountain Bistra. Aquifer is drained through a number of karst springs. Main source is Studencica, which is located at southeast side of mountain Bistra at contact between different formations. This source is the main source for water supply in Kicevo, Makedonski Brod, Krusevo, Prilep and other suburbs. Source capacity is 0,905 to 2,77 m^3/s. Along the Studencica river there are also numerous smaller sources.

Other karst springs are: the source of river Treska (0,283-5,5 m^3/s, average monthly value is 1,396 m^3/s), Pitran (0,2 to 0,7 m^3/s), Popolzani, Belicki viri, Tajmiste, Belica (0,32- 2,1 m^3/s), Pesna, Devicki viri and others. Total average capacity is estimated at 12,0 m^3/s. This area presents the largest aquifer within the carbonate karst-fissured formations.

In the Kicevska dolina there are locally present also compact formations with free water level. Wells capacity is between 1 and 3 l/s. At river Treska and other smaller rivers thickness of sediments is up to 10 m that are characterized with a good infiltration characteristics – capacity of particular well is more than 20 l/s.

Compact formations with the water level under pressure are present at Oslomej area, where well capacity is between 0,5 and 1 l/s. Compact and karst formations at the area of river Treska are hydraulically connected and are important groundwater storage.

- WATER MANAGEMENT DIVISION PCINJA

In this area compact formations with free water level are present. Quaternary alluvial sediments along the river Pcinja and Kriva Reka have thickness between 10 and 17 m. Well capacity is between 2 and 9 l/s. Locally are present also compact formations with water level under pressure, with well capacity up to 1 l/s (Slavisko Pole). Karst formations (Eocene carbonate) are present locally at Krivopalanecka regija and Kumanovo (Đetirce, Dobrosane, Nikustak). Groundwater storage of those formations is not as important other in this region. Karst formations are important just for local water supply.

- WATER MANAGEMENT DIVISION SREDEN VARDAR

The most extensive is compact formation type with free water level. The Quaternary alluvial sediments have small thickness - up to 10 m in the

valley of river Vardar, Topolka and others, and up to 15 m in the region of Negotino. Well capacity is between 2 and 10 l/s. This source is also important for water supply for urban centre Veles.

Karst formations (Mesozoic carbonate) are present at mountain Kozuv. Groundwater is drained through a number of karst sources. Main karst sources are Lukar with capacity 400 l/s and sources Konjska and Babuna with capacity between 10 and 90 l/s.

- WATER MANAGEMENT DIVISION GORNA BREGALNICA

The main type is compact formations with free water level. Alluvium at the river Bregalnica has good infiltration characteristics and has thickness between 5 and 15 m. This type is present also at Gabrovska Reka, Grasnica and others, as well as at Pliocene-Quaternary sediments at Delcevski-Pehcevski-Berovski basen. Capacity is from 10 l/s up to 30-40 l/s. From location "Samakot" also water for water supply of the Delcevo is taken.

Formations with the water level under pressure are present in the nearness of Zvegore-Pancarevo. Karst formations (Triassic carbonate) are present in the nearness of Zvegor, Grad, Planica and is drained by several smaller sources.

- Water management division Srednja and Dolna Bregalnica

The main hydrogeological type is compact formations with free water in the river alluvium of rivers Bregalnica, Lakavica, Otisa, Svetinikolska, Orizarska, Zletovska etc. These aquifers are drained through a number of wells. Water is used for water supply for centres Vinica, Kocani, Stipe, Probistip, Skopje and others. Capacity of particular well is between 10 to 60 l/s. Evident is also individual groundwater exploitation for irrigation, especially in vegetation period. In the near future also HS system will become operative and problem of water supply in urban centres Stip, Probistip, Kratovo, Sveti Nikole and in number of smaller settlements will be solved.

Compact type (Pliocene sediments) with water level under pressure is located at Ovcepolska dolina. Well capacity is up to 10 l/sec (villages as Krupa, Durfulija, Lozovo, Erhelija and others). Locally also carbonate-karst type is present in massif Plackovica and karst-fissure type in massif Osogoska Gora, where numerous sources with smaller capacity are placed.

- WATER MANAGEMENT DIVISION PELAGONIJA AND DOLNA CRNA REKA

The main hydrogeological type is compact type with free water level at alluvial deposits along the Crna Reka and Semnica. Sediment has good infiltration characteristics and has thickness between 10 and 30 m. Well capacity is between 15 and 40 l/s. Considering hydrogeological characteristics, this aquifer has important potential storage. This source was used for water supply of urban centre Bitola (120 l/s). Not it is used a reserve source for urban centre Demir Hisar (at alluvium Crna Reka 48 l/s) and Prilep (120 l/s). These sediments originate to Quaternary-Pliocene period.

Prilep area is characterised by compact formation (Neogene sediments) with water level under pressure. Well capacity is up to 10 l/s. At Bitola area also mineral water with CO2 is important. Well capacity is up to 60 l/s and 3 t/hour CO_2.

Karst-fissured (carbonate) formation is present at fringe of Prilepsko pole, eastern part of Crna Reka, Debre and other. Area is drained by number of sources – the main are Zeleznec (Q_{cp} ≈ 2 m^3/s, Babino ≈ 0,04 m^3/s, Debriste ≈ 0,05 m^3/s, Zrze ≈ 0,03 m^3/s).

- WATER MANAGEMENT DIVISION DOLEN VARDAR

The main hydrogeological type is compact formation with free water level in the alluvial deposits on the terrace at river Vardar. Thickness is between 10 and 20 m in Valandovskiot region and up to 100m in Gevgelijska region. Terrain has very good infiltration characteristics. In this area groundwater is used for irrigation of agricultural areas, water supply and industry: Gevgelija (120 l/s), Bogdanci (40 l/s), well system Dojransko lake 1000 l/s, well system Paljurci 700 l/s, well system Miravci 350 l/s, well system Limbs-Marvinci 350 l/s, well system Predejci 400 l/s etc. Together with the Skopje region, this area presents the largest storage of groundwater within non-agglutinate alluvial sediments.

Karst-fissured formations are present at Plaus, Tatarli and Memesli at the northwest of Valandovo. This area is drained through a number of sources with variable capacity, 1-20 l/s. Sources together with groundwater from karst (capacity 40 l/s) are partially delivered for water supply to Valandovo (≈ 20l/s).

- WATER MANAGEMENT DIVISION DOJRAN

The quaternary sediments with thickness up to 10 m form compact formation with free water level. Well capacity is 1-5 l/s. Pliocene sediments form compact formation with water level under pressure

(Acikot). Well capacity is 10-15 l/s. Groundwater is used for public and individual water supply, irrigation and industry.

Karst formations (Palaeozoic sediments) are located at Star Dojran, Nov Dojran and others. Groundwater is drained by numerous sources, important source Deribas with capacity 5-25 l/s. Groundwater is used for water pupply of Dojran (well capacity is 10-20 l/s) and for industry. Water is used uncontrolled and also negative trends of water level is noted.

- WATER MANAGEMENT DIVISION STRUMICA

There is compact formation (Quaternary-Pliocene sediments) with free water level along rivers Stara Reka, Strumica, Turija, Stuka and others. Groundwater is used for water supply for Radovis (105 l/s) and industry. Well capacity is up to 15 l/s.

In the Pliocene-Quaternary sediments in the central part of the Struma valley (villages Sofilari, Murtino, Dabile, Bosilevo, etc.) compact type with water level under pressure is present (artesian well at depth 180-160 m). Well capacity is 10-20 l/s. Groundwater is used for water supply, irrigation, industry and other purposes.

Karst-fissure formation is located at the fringe of Radoviska-Strumicka depression. It is drained by numerous wells with capacity 1-10 l/s, rarely 30 l/s. Groundwater is used for water supply of centre Radovis (30 l/s).

- WATER MANAGEMENT DIVISION PRESPA

In this area compact formation with free water level is present. Quaternary sediments have thickness 10-30 m. Well capacity is 1-5 l/s. At Quaternary-Pliocene sediments in Resenska dolina capacity is 10-20 l/s. From these sources water supply for Resen is enable (50 l/s).

Compact formation with water level under pressure is present at settlements Lavci and Krusje. Watre is located at depth 15-200 m. Well capacity is 5 l/s.

Karst-fissured type (Trias carbonate) is located at mountain Bigla, at settlements Krusje and east slope of Galicica. Area is drained by numerous wells with capacity over 25 l/s.

- WATER MANAGEMENT DIVISION OHRIDSKO-STRUSKO

In valley compact formation (Quaternary and Pliocene sediments) with free water level are present. Sediments along Crn Drim, Koselska Reka and Sateska Reka have thickness between 10 and 40 m.

In the central part of Struska valley compact formation (Pliocene sediments) with water level under pressure is present. Wells have variable capacity.

Karst formation (Triase carbonate) is present at mountains Galicica and Jablanica. Terrain is drained by numerous sources, the main are: Sv. Naum (5-10m^3/s), Biljanini izvori (0.2–1 m^3/s), Bej Bunar (40-100 l/s), Vevcani (1,5 m^3/s), Sum (1 m^3/s), Beli Vodi (300 l/s). Graundwater is used for public water supply in Ohrid and Struga and individual water supply.

- WATER MANAGEMENT DIVISION DEBAR

In this area compact type with free water level is present. Quaternary sediments have thickness up to 15 m. This terrain is drained by number of wells. Groundwater is used also for water supply of Debar. Well capacity us 4-20 l/s.

Karst type is present at west slope of mountain Bistra and is drained by number of sources with capacity 0,1-2 m^3/s. Source Rosoki is the main source for water supply of Debar. Other important sources are also Tresonecka, Jadovska and others along the river Radika.

3.1.3.2 INVESTIGATIONS OF GROUNDWATER BODIES

In the past numerous hydrogeological studies were prepared for different purposes. Studies results are not systematically gathered and updated. Studies are in property of different institutions, some of them are mislaid. At present, investigations of groundwater are not systematic, insufficient and unorganised. Investigations are not continued and updated and sometimes more investigations are made for the same location. Detailed investigations are prepared for area, where special interest is placed (water supply, hydro-technical objects and others).

As general information about groundwater, hydrogeological map exists from 1977, but without appropriate definition. It has to be updated.

Organized and planned investigations are made for OHGK 1:100.000. These researches are of regional character and are performed according to instructions for the preparation of a hydrogeological map. Investigations provide data on hydrogeological characteristics of the terrain, balance and reserves of groundwater, detailed cadastre of the springs, wells and water supply systems, flows on the surface waters, data on the water quality, state of protection of groundwater and surface water from pollution, solutions for strengthening of the groundwater needs, etc.

Such investigations have been completed at area 7763 km^2 that represents 30% of the territory of the Republic of Macedonia. At area 1575 km^2, investigations are only partially completed (Map 5). Such investigations started in 1985, have very slow dynamics and have to be finished till 2010. The main problem is not continuous investigations in the past.

3.1.4 SURFACE AND GROUNDWATER BALANCE

3.1.4.1 SURFACE WATER BALANCE

Total annual available surface water resources in the Republic of Macedonia are assessed as 6.372 billion m^3 (Table 6). The yearly average water availability from surface resources for a medium dry year accessed as 4,5 billion m^3. Most of these resources are found in Vardar River Basin (72 %) and, to a lesser extent, in Crn Drim River Basin (26 %) and Strumica River Basin (2 %) (Economic Commission for Europe, 2002).

Table 6: Surface water resources (Dodeva, 1999)

River Basin	Surface water resources (10^6 m^3/year)
Vardar	4.600
Strumica	132
Crn Drim	1.640
Total	6.372

The volume linked to springs amounts from 0,4 to 0,6 billion m^3. The yearly volume of groundwater is about 0,3 to 0,5 billion m^3, an estimate that is considered to be low. According to 1995-1996 data, 1,5 to 1,7 billion m^3 are used per year, 84 % from surface water and 16 % from groundwater and natural springs. Therefore, about one third of the water resources are used, which is indicative of a country with rather scarce water resources.

Characteristics for main river are presented in Table 7. The average Vardar annual flow for the period 1960-1991, measured at the gauging station in Skopje is 63,0 m^3/s, and at the gauging station in Gevgelija 144,90 m3/s, while the specific run off at the same profile is 6,5 l/s/km^2. The average annual volume of discharged water at Gevgelija is approximately 4,6 billion m^3.

River Radika has annual average flow for the period 1961-1990 at the gauging station of Boskov Most 19,63 m^3/s. The annual average flow for the above mentioned period of the Crn Drim at the HPP Spilje is 52 m^3/s, respectively its specific run offis 12,3 l/s/km^2. The average water volume discharging from the river Crn Drim is approximately 1,64 billion m^3.

The annual average discharges of river Strumica for the period 1961-1990 at the gauging station Smiljanci is 0,74 m^3/s, at gauging station Susevo 1,79 m^3/s and at gauging station Novo Selo is 4,2 m^3/s, while its specific run off is 3,1 $l/s/km^2$. This area presents the poorest part in water resources of the whole state. The annual average of total available water in this river basin is approximately 132 million m^3.

Table 7: Characteristics of main rivers in the Republic of Macedonia (Protection and utilization of water and water economy infrastructure, 1998; Economic Commission for Europe, 2002)

River	River Catchment	Average annual volume	Specific run-off
		(billion m^3)	($l/s/km^2$)
Vardar	Vardar	4,600	7,0
Treska	Vardar	0,764	12,9
Lepenac	Vardar	0,271	11,2
Pcinja	Vardar	0,400	4,6
Bregalnica	Vardar	..	4,1
Crna Reka	Vardar	..	5,1
Bosava	Vardar	..	..
Crn Drim	Crn Drim	1,640	12,3
Radika	Crn Drim	..	..
Strumica	Strumica	0,132	3,1
Binachka Morava	Juzna Morava	..	..

3.1.4.2 GROUNDWATER BALANCE

Data on groundwater reserves are insufficient, that is the reason for presenting just data on exploitation of reserves that are important for communication aspect of planning and development in this sphere (Annex II-3; Table 43).

The total quantity of exploitation is estimated at 50,15 m^3/s or $1.579,72x10^6$ m^3/year. Quantity of water corresponds to about 8 % of the total precipitations on the territory of the Republic of Macedonia or well as 25 % of the total available annual surface water.

Total annual surface water quantity is estimated at $6.372x10^6$ m^3 or 202 m^3/s (NEAP-2, PPRM). 23,8 m^3/s are provided from the spring water - this presents 80 % of the total sources in Macedonia (static reserves that can be exploitive are not included). Groundwater through construction of wells

is defined by the quantity of the exploitation of reserves of 26,35 m^3/s. That is the quantity of water which corresponds to approximately 15 % of the total available quantity of surface water. With wells located in alluvial sediments of the larger rivers could also surface water can be used.

Water in the Republic of Macedonia is asymmetrical distributed. Part of the estimated exploitation of reserves is not balance, and their exploitation is not economically feasible, depended on location necessary investments in relation to the final effect.

3.1.5 SURFACE AND GROUNDWATER QUALITY

Water resources, i.e. ground and surface waters, are relatively clean in their upper course, and rapidly worsen along their middle and lower courses. This situation is the result of unpurified waste water discharged chiefly by human settlements, but also by industry and agriculture. Often, the water bodies do not comply with the quality class objectives set for them (Economic Comission for Europe, 2002).

3.1.5.1 SURFACE WATER QUALITY

According to the Law on Waters the categorization and classification of the waters is done in line with international standards. The corresponding "Book of Regulations" (ordinance) classifies the waters from "purity" to "pollution" in five classes and defines the permitted use criteria of the respective water class. The categorization enumerates the country's waters by river basins, lakes and groundwater and defines which quality class applies in which water course district (MEPP, 2008, 2009, 2010; Stojkov and Gelzer; Cvetovska and Dika).

In accordance to monitoring data on the quality of rivers in the Republic of Macedonia obtained from the RIMSYS program in 2009 water quality in rivers in terms of oxygen indicators is shown through analysis of dissolved oxygen, BOD_5 concentrations and COD concentrations with comparison to prescribed values in Classification of Waters (Decree on classification of waters Official Gazette br.18/99).

3.1.5.1.1 Surface water monitoring

Surface water monitoring of rivers in Macedonia is performed by the Republic Institute for Health Protection (RIHP)/ Chemicals Hazard Information & Packaging (CIHPs) and the Hydro Meteorological Administration (HMA). While the RIHP/CIHPs focus more on parameters of sanitary importance, namely microbiological parameters, the HMA focuses on hydrological as well as water quality parameters.

The River Monitoring System Project in Macedonia (RIMSYS) is a collaborative project undertaken by Switzerland and Macedonia. The objectives of RIMSYS includes the long-term assessment of water quality and discharges as well as the establishment of an effective forecasting and alarm system.

The specific objective is to document long-term changes at 18 locations in the most important rivers in Macedonia. In addition to RIMSYS, the PHARE Cross Border Cooperation Programme has already provided two automatic monitoring stations which are scheduled to become part of the RIMSYS monitoring network, thereby yielding a total of 20 automatic monitoring stations which are located on rivers, lakes and reservoirs.

In the in the map of RIMSYS monitoring stations in the Republic of Macedonia (Map 7) these measuring points are presented. Analyses are performed 12 (8) times per a year (on monthly base).

Indicators, which are included in the measurement and analysis activities of the RIMSYS project, are presented in the Table 8.

Table 8: Indicators included in the measurement and analysis activities of the RIMSYS project (Cvetovska and Dika)

Indicators included in the measurement and analysis activities of the RIMSYS Project	
a1. Hydrological Parameters	Water Level, Water Discharge - Flow, Suspended materials, Width cross-section,
a2. Appearance, Organoleptic and Physical Parameters	Water and Air Temperature, Odour, Colour, Oil and other flying liquids, pH -value, Redox potential, Specific Electroconductivity, Turbidity
a3. Mineralization - residues on evaporation	Total Residue / Fixed and Volatile / , Filterable Residue - Dissolved Matters / Fixed - mineral and Volatile - organic / , Nonfilterable residue-Suspended Matters / Fixed - mineral and Volatile - organic /
a4. Parameters -Oxygen Regime and Nutrients /Eutrophication /	Oxygen regime Parameters: Dissolved oxygen - now, Water oxygen saturation (saturation - supersaturation), Biochemical Oxygen Demand for 5 days, Chemical Oxygen Demand - Permanganate or dichromate; Eutrofication Parameters:Ammonia ion, Nitrates and Nitrites ion, Phosphate (ortopfospfates ion); Future planning: Total Nitrogen and Total Phosphorus
a5. Anions and Cations	Bicarbonate, Carbonate, Hydroxide, (Calculed on Alkalinity - p and m), Chloride, Sulphate, Calcium, Magnesium, Sodium, Potassium, Hardness (total, carbonate and noncarbonate);
a6. Harmful Substances - Heavy Metals	Total Iron, Manganese, Lead, Zinc, Cadmium, Chromium, Copper, Nickel, Cobalt, Aluminium, Future planning: Arsenic, Mercury and another hydride metals, Cyanides, Phenols, Sulfides ,
a7. Harmful Substances - Organic Micropollutants	Aldrin, Dieldrin, DDT, DDE, DDD, Endrin, Endosulfan 1, Endosulfan 2, Heptachlor, α-BHC, β-BHC, γ-BHC /

Indicators included in the measurement and analysis activities of the RIMSYS Project	
	lindan / , δ.BHC, Metoxichlor, Malation, Paration, Methomyl, Atrazine, Alachlor, Folpet and other
a8. Saprobiological Parameters	Saprobity Index of Pantel and Buck, Saprobiological rank of Liebman
a9. Microbiological Parameters	Microbiological Pollution MPN No/100 ml , Thermo-tolerant coliforms, Faecal streptococci
a10. Radioactivity	Total β-activity

3.1.5.1.2 State of surface waters in accordance to biological quality elements

Biological monitoring is an integral part of systematic monitoring of water quality. Biological monitoring in the Republic of Macedonia is performed in 9 rivers in 18 monitoring stations. For quality assessment the following biological elements are used:

- structure and abundance of aquatic flora and

- structure and abundance of benthos invertebrate fauna.

The state of a given biotope is defined with the use of bioindicator organisms and determination of the state of biocenosis.

Collection of biological material is carried out 5 times a year (in February, April, June, August and October) with the inclusion of four seasons and with the selection of the most appropriate index period for sampling of the material.

Index period is determined on the basis of findings from the longer periods observations, with more frequent frequency of sampling (10 times per year) in four seasons.

Analysis carried out in 2009 places samples in three quality classes (first class has the best and third the worst quality). Results show that 85,5% of samples can be placed in the second quality class, 7,2% in the third class and 7,2% in first class (Figure 3).

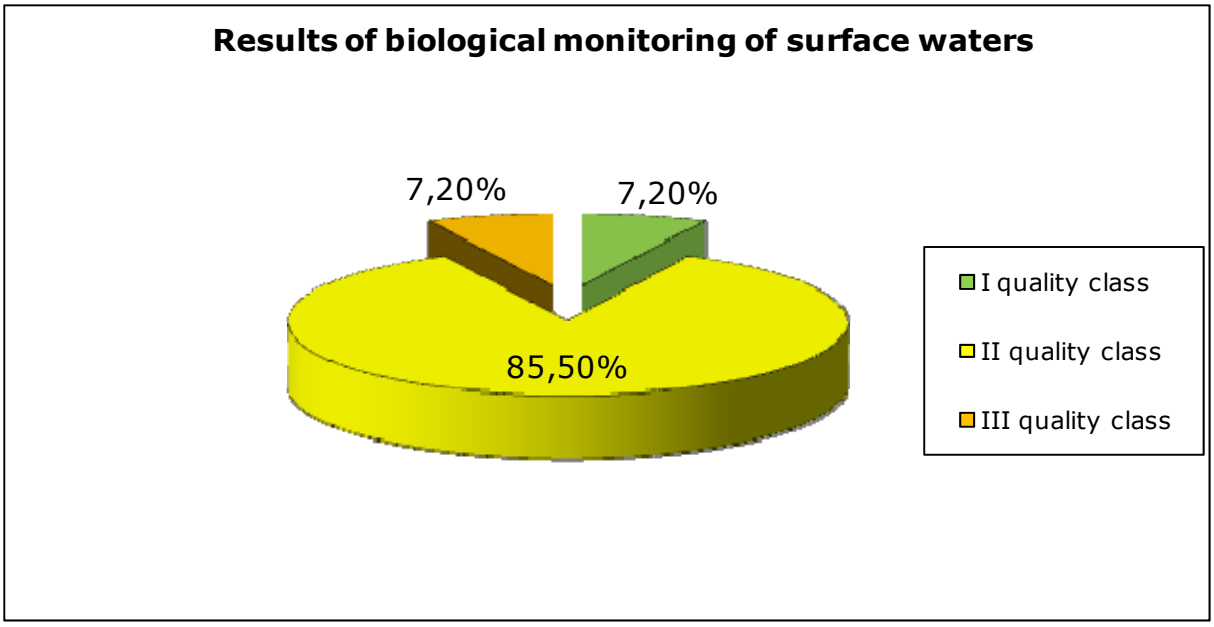


Figure 3: Results of the biological monitoring of surface waters showing water quality based on saprobe index expressed in % for 2009 (MEEP, 2010)

Monitoring results of the year 2009 show the worst water quality for Crna Reka in Skocivir, where two analyses show quality of third class, and other analysis show the quality of the second class. Poor quality was estimated for waters of River Eleska-Brod and River Vardar in Taor, Basino Selo and Demir Kapija, where 80% of the analysis show quality of the second class, and 20% of the analysis show quality of third class. Analysis for River Strumica in Novo Selo has shown second class quality for 100% of samples.

The maximum values of saprobe index which indicate worsening of water quality in the rivers have been identified in October and August, and the lowest values of the index in April. From April to October, in almost all measuring points the value of saprobe index has increased, so the water quality has deteriorated. The most drastic deterioration of water quality has been identified in rives with permanent heavy pollution: Crna Reka in Skocivir, River Vardar in Taor, Basino Selo and Demir Kapija, River Eleska in Makedonski Brod and River Strumica in Novo Selo.

Rivers with measuring points where most of the year there is the best water quality are River Kriva in Trnovec, River Pcinja in Pelince, Vardar River in Radusa and River Treska in Saraj.

3.1.5.1.3 State of surface waters in accordance to oxygen consuming substances

During the assessed period from 1988 to 2006, no reduction in BOD_5 and concentrations of ammonium in rivers was tracked in the Republic

of Macedonia (Figure 4). In the year 2008 at some monitoring stations, located on the rivers Crna Reka and Vardar, eutrophic water status with high BOD value was recorded. The results of the analysis show that monitored concentrations of dissolved oxygen in 2009 are within the prescribed limit values for the classification of waters. Water quality in the Republic of Macedonia in accordance to oxygen consuming substances in rivers is shown in the map (Map 8).

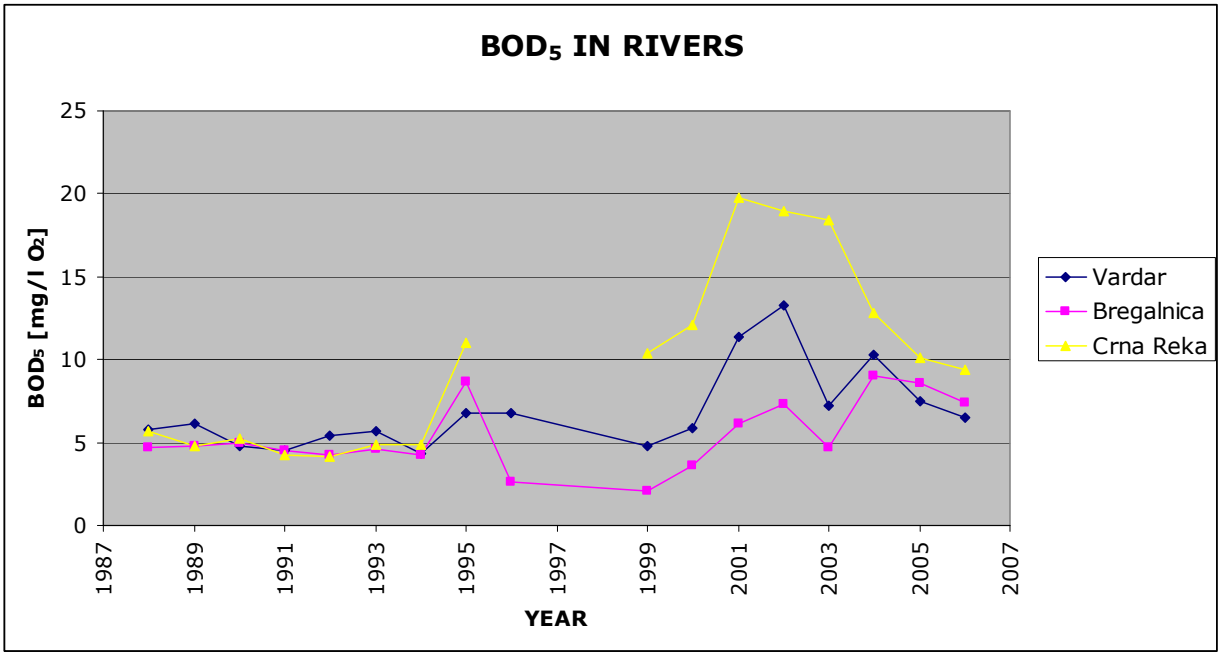


Figure 4: Concentrations of BOD_5 in rivers for years 1988 to 2006 (MEPP, 2009)

The Figure 5 and Figure 6 shows average monthly concentrations of dissolved oxygen in Lake Ohrid and Lake Prespa for the year 2008. The analysis has identified annual average concentration from 9,08 O_2 mg/l in the Lake Ohrid and 7,56 O_2 mg/l Lake Prespa.

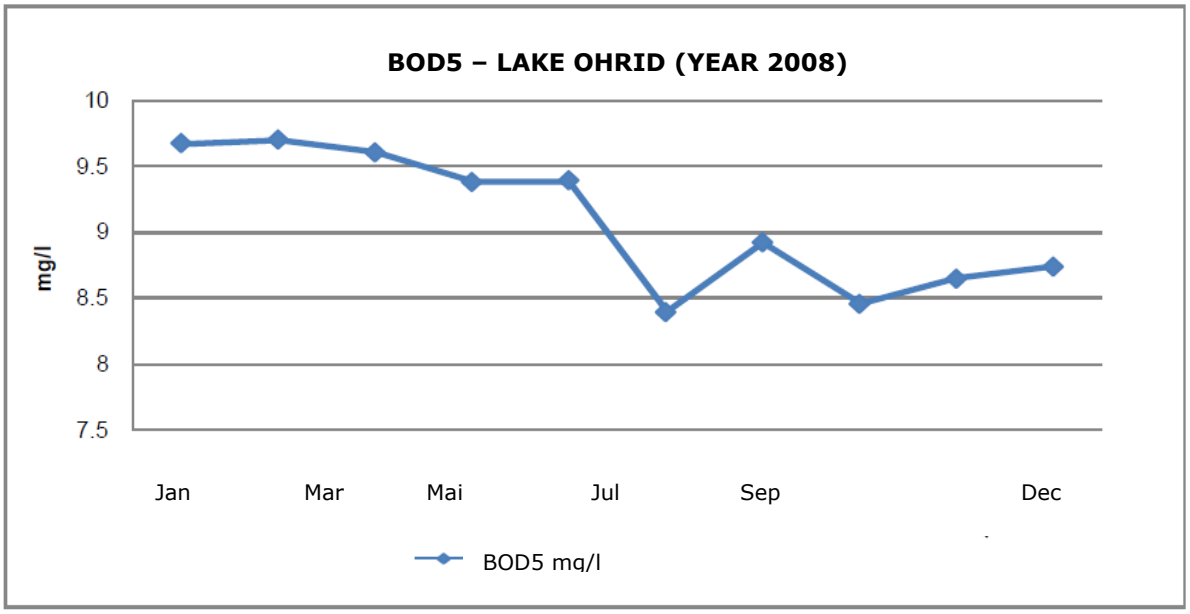


Figure 5: Concentrations of BOD_5 in Lake Ohrid for year 2008 (MEPP, 2010)

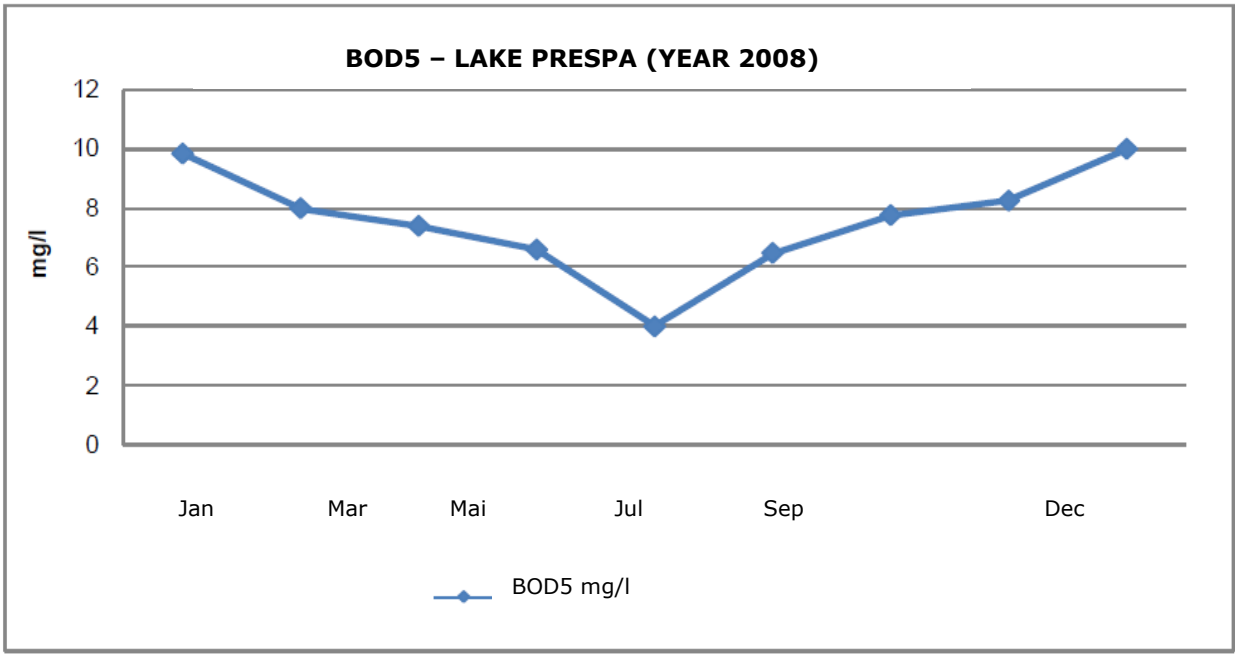


Figure 6: Concentrations of BOD_5 in Lake Prespa for year 2008 (MEPP, 2010)

3.1.5.1.4 State of surface waters in accordance to nutrients in surface waters

For water quality in rivers in terms of nutrients, the annual average concentrations of ammonia, nitrites and nitrates in rivers are analyzed.

During the assessed period from 1988 to 2006, no reduction in concentrations of ammonium in rivers was tracked in the Republic of Macedonia.

Annual mean concentrations of nitrates and orthophosphates have remained relatively stable since the beginning of 1990's (Figures 7-10). It has been found out that the concentration of these parameters is higher at certain measuring points of river Vardar.

Analysis of the results from the measurements in the pelagial parts of Ohrid Lake throughout the period has confirmed the oligotrophic nature with relatively stable concentrations of phosphorus (below 0,015 mg/l) and nitrates (mean annual concentrations below 0,55 mg/l). Concentrations are significantly higher in Prespa Lake, where organic compounds are found at high levels, thus increasing the risk of lake's water eutrophication. Analysis of certain parameters in the waters of Ohrid and Prespa Lakes region in 2008 show that there are no significant changes from the values of 2007.

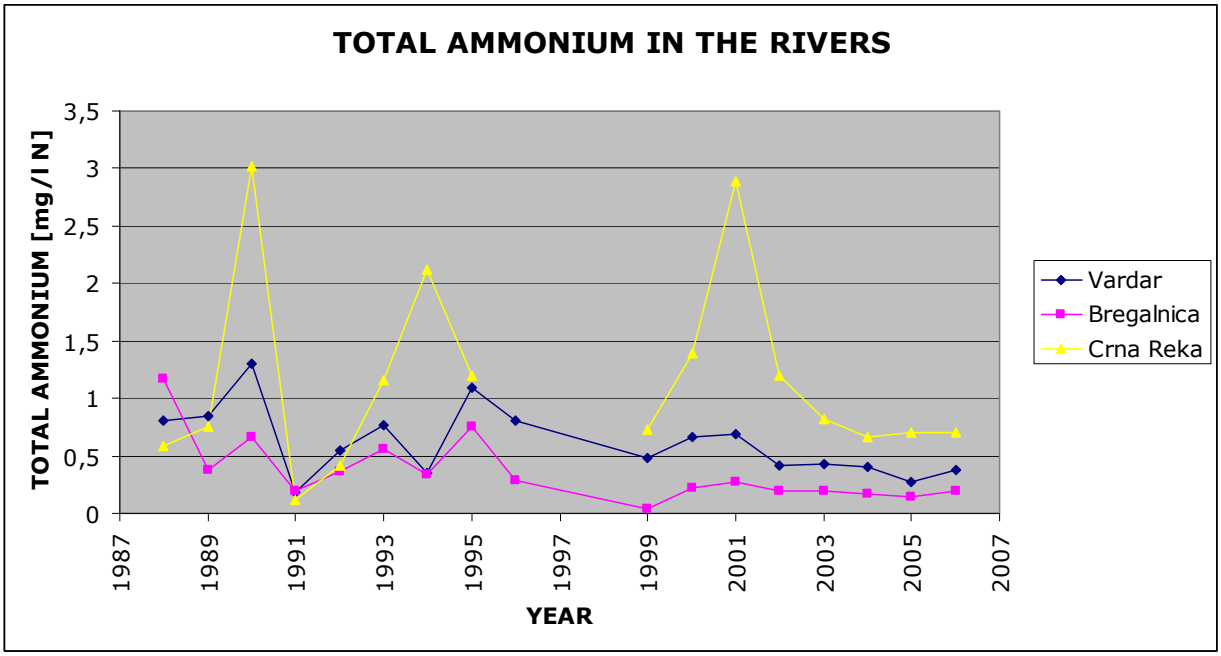


Figure 7: Concentrations of total ammonium in rivers for years 1988 to 2006 (MEPP, 2009)

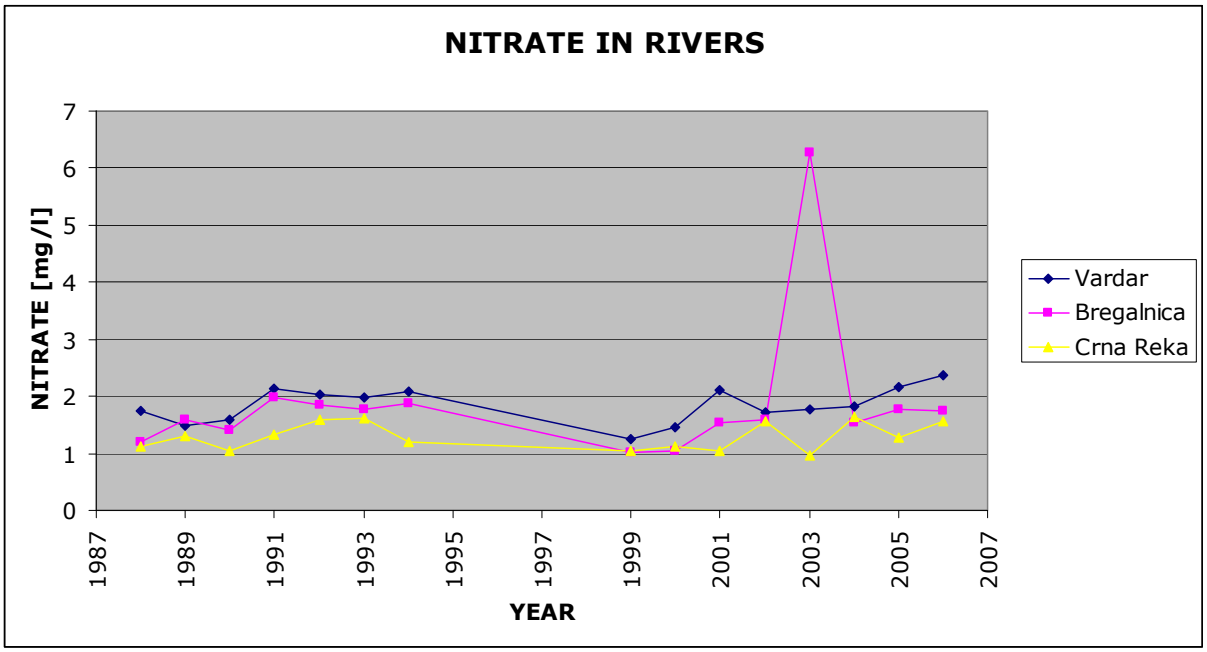


Figure 8: Concentrations of nitrates in rivers for years 1988 to 2006 (MEPP, 2009)

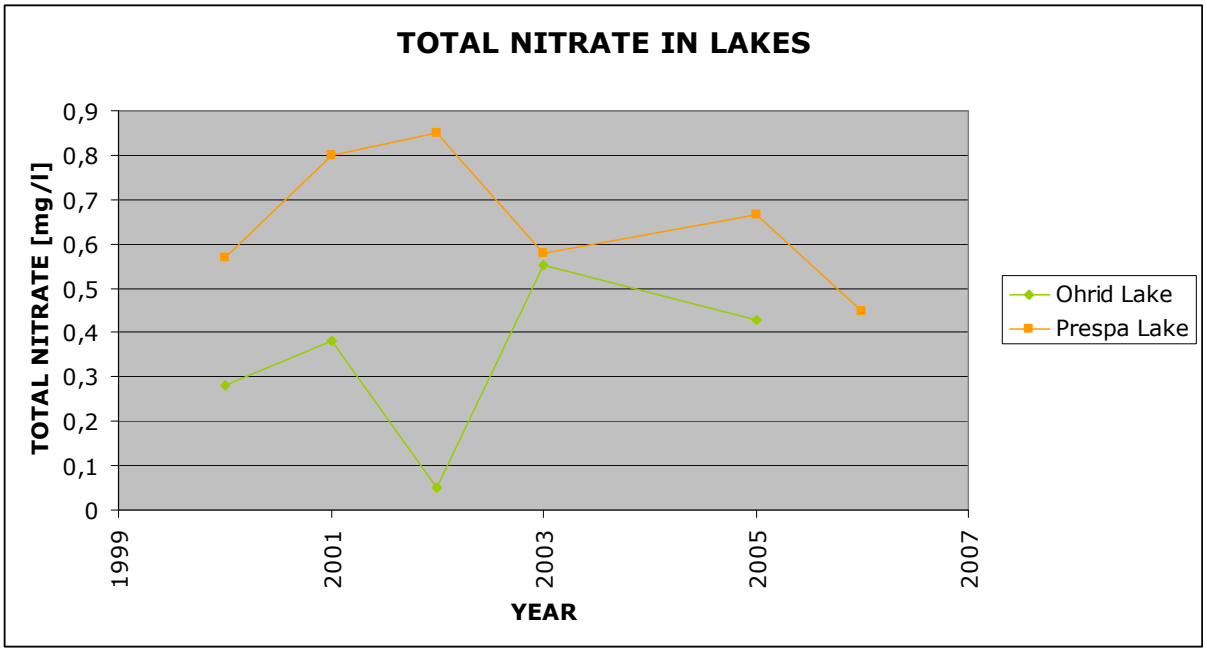


Figure 9: Concentrations of total nitrates in lakes for years 2000 to 2006 (MEPP, 2009)

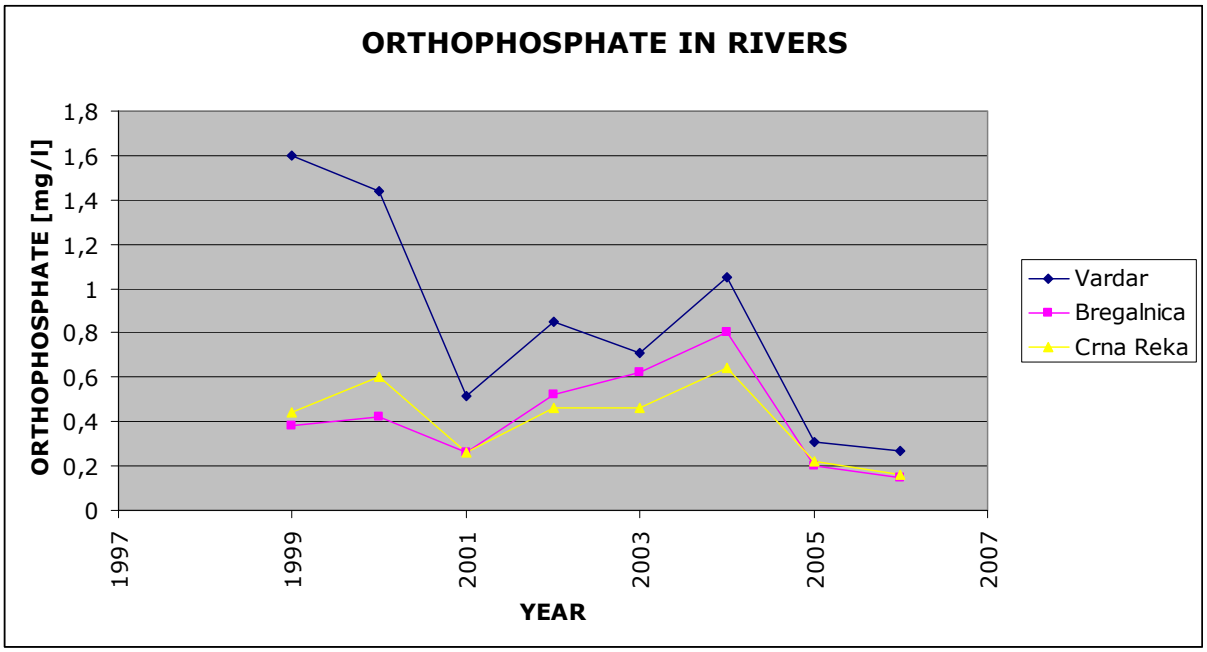


Figure 10: Concentrations of orthophosphates in rivers for years 1999 to 2006 (MEPP, 2009)

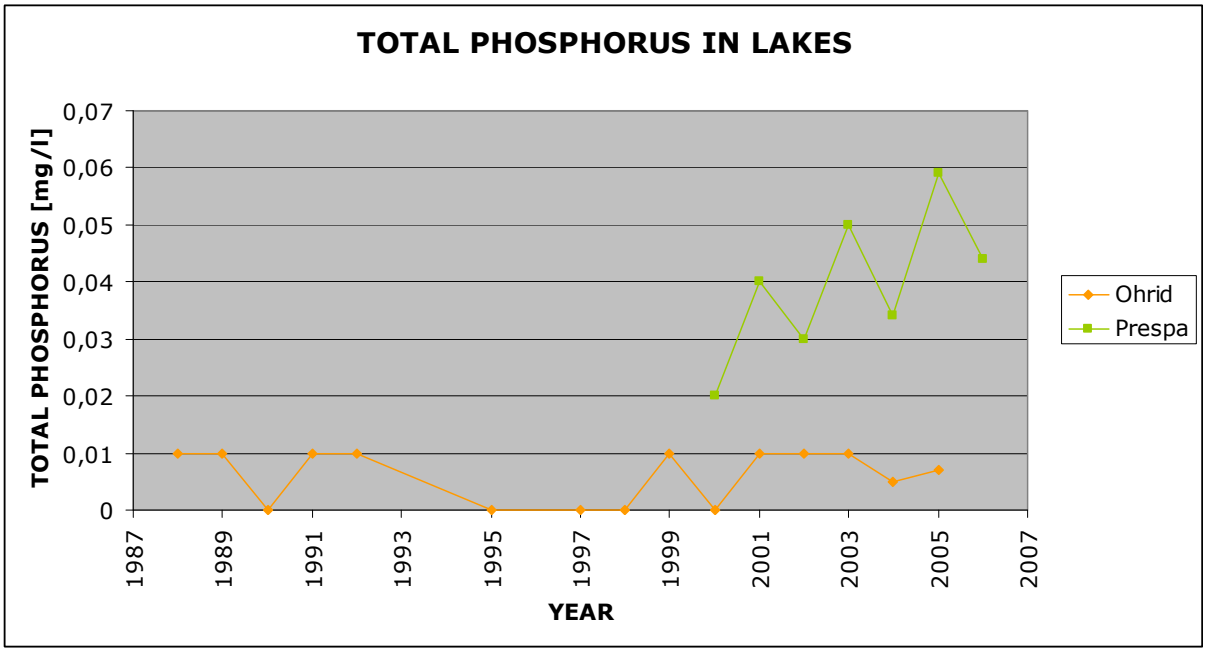


Figure 11: Concentrations of total phosphorous in lakes for years 1988 to 2006 (MEPP, 2009)

The results of the analysis of the monitoring results of the year 2009 for rivers show that the concentration the nutrients in monitoring stations are within the prescribed limit for the classification of waters. The monitoring results are shown in the map of Water quality in the Republic of Macedonia – Nitrite and nitrate concentrations in 2009 (Map 9). The

measured nutrient concentrations not deviate from values of the monitoring which was done in the past year.

3.1.5.1.5 State of surface waters in accordance to hazardous and dangerous substances

The concentrations of hazardous and dangerous substances in the year 2009 (iron, cadmium, zinc, lead, copper, nickel, chromium and manganese) show no major deviations in comparison to measurements in 2007 and in 2008 and are also within the prescribed concentrations for classification of waters.

3.1.5.1.6 Bathing water quality

Natural and some of the artificial lakes comply with the relevant standards for bathing waters quality and thus the quality of lake water is at constantly satisfactory level (there is a difference between national and international standards for bathing water and they need to be harmonized with the EU Bathing Water Directive 76/160/EC).

In the graph there is information on share of samples of improper bathing water quality in lakes for years 1997 to 2005 for microbiological and psysico-chemical parameters (Figure 11). It has been noted that the water in the biggest natural lake – Ohrid Lake – has been improving as a result of the construction of sewage system for protection of the Ohrid Lake (more detailed information in chapter 3.4.1.1.1). However, there are still parts at which rivers entering the lake contribute to deterioration of the status of water quality of the lake. The percentage of samples with inadequate quality is still high (especially for physicochemical parameters). Settlements around the three natural lakes are among the rare ones with wastewater treatment plants available in the country.

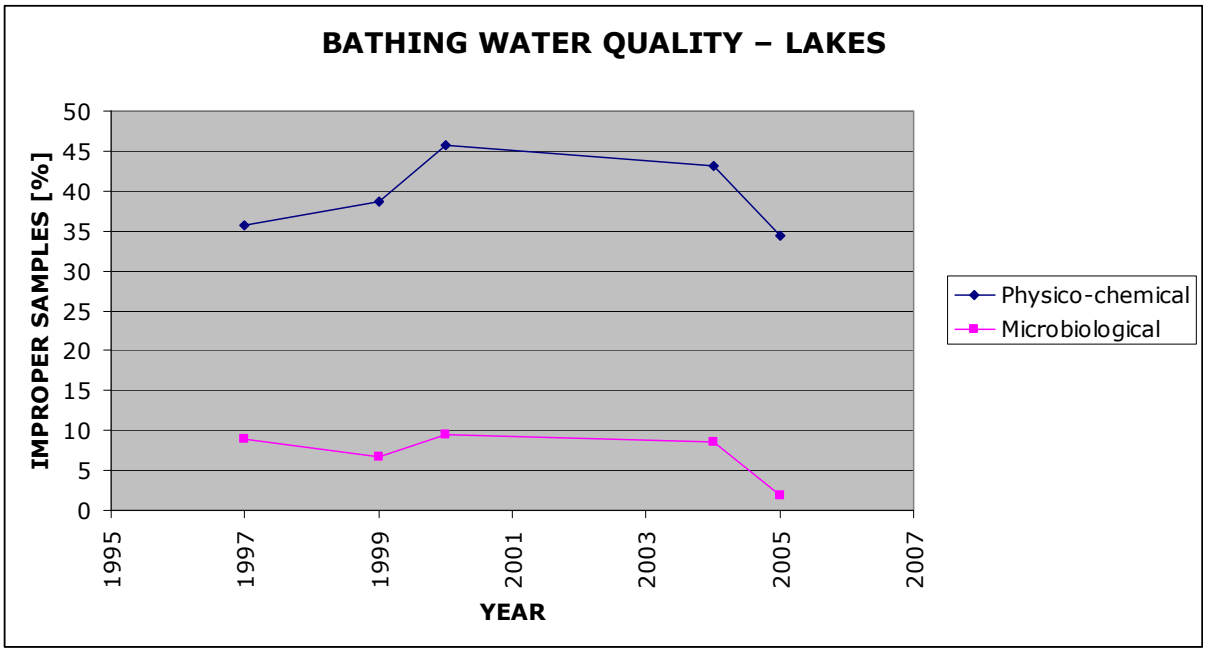


Figure 12: Share of improper samples for bathing water quality in lakes for years 1997 to 2005 (MEPP, 2009)

3.1.5.2 GROUNDWATER QUALITY

In the Republic of Macedonia currently there are problems in terms of rational use rational use and groundwater protection in frame of sustainable resources and environmental management. The management is often lacking appropriate researches and up to now there was no national Strategy for management of groundwater. Generally there is no consideration of threat due to potential excessive extractions or pollution, etc. Although in today's living conditions in all spheres of social life enormous efforts were made in retaining and creating a healthy environment, nevertheless, in view of the protection of ground waters the Republic of Macedonia still falls behind developed countries.

Goundwater monitoring in the Republic of Macedonia is made in subsurface monitoring stations which are shown in the map (Map 5). On the basis of the results of groundwater monitoring generally in the Republic of Macedonia the groundwater quality is at relatively high level. Nevertheless that should not be the ground not to create an inert condition with respect to the question of the groundwater protection.

In the annex there is a map, showing vulnerability of groundwater resources in the Republic of Macedonia (Map 10). The map, which is elaborated in scale M = 1:200 000, is based on expert knowledge and analysis of hydrogeological conditions in the Republic of Macedonia and of the state of groundwater.

3.1.5.2.1 Preparation of the map of vulnerability of groundwater for pressures form pollution of the Republic of Macedonia

The map of vulnerability of groundwater resources in the Republic of Macedonia (Map 10) is a "first approximation" of study of vulnerability of groundwater for pressures of existing or potential pollution from surface.

The map does not show the state of pollution but, hydrogeological aspect of danger. This map should reflect the hydrogeological properties of the formations and hydrogeological conditions on the surface that affect the three basic hydrogeological factors:

- the possibility of penetration of contaminated water or substances from the surface in aquifer;
- speed of spreading of contaminated substances in aquifer and
- ability of self-cleansing of contaminated substances in aquifer.

During the preparation of this map orientation responses to the first two factors could be given, while the third - ability of self-cleansing - requires profound study. In fact, qualitatively assessed, it can be said self-cleansing potential is lower in case of higher speed of the spread of contaminated liquid in aquifer.

The possibility of penetration of contaminated substances in aquifer, that is the first factor which depends on aquifer danger, is tied more to permeability than to transmissibility.

As it can be indicated from name of the map the subject of vulnerability is the aquifer, not formations. If below the formation there is the abundant aquifer which is exploited or may be exploited for water supply, the area is classified in a class of vulnerability that is required for lower-laid aquifer. Four classes of threat were defined: non-vulnerable, partly vulnerable, vulnerable and highly vulnerable.

Generally, as non-vulnerable could be considered the following stonewares:

- clay- marl deposits and stonewares of low-metamorph class, 80 and
- intrusive and stonewares of high-metamorph class, 60.

As partly vulnerable the following stonewares can be considered:

- mostly impermeable stonewares, class 70;
- impermeable quaternary deposits, but only if they do not lie below the formations with exploited aquifers for water supply with good or very good transmissibility, class 50;
- other solid stonewares of classes 41 and 42;
- carbonate deposits, class 31;
- permeable quaternary deposits of the class 11 and
- other non-aligned stonewares of class 21.

Due to the pollution the following stonewares can be considered as vulnerable:

- impermeable quaternary deposits, if they lie below the formations with exploited aquifers for water supply with good or very good transmissibility, class 50;
- other non-aligned stonewares of class 22 and
- permeable quaternary deposits of the class 12 and class 13 and 14 if they have a thick impermeable roof.

In the class of very vulnerable by pollution the following stonewares can be classified:

- carbonate deposits of the classes 32 and 33 and
- permeable quaternary deposits from classes 13 and 14 if there is no impermeable roof or if it is thin.

In karstic terrains the danger of pollution is affected by the specific phenomenon of sinking of the waters that flow on the surface. During the preparation of the map special attention should be given to the specific of the karstic terrains which requires good knowledge of the hydrogeological conditions. Namely, if within such areas are less vulnerable stonewares such as dolomites that did would constitute non-vulnerable or perhaps partly vulnerable stonewares, the difference appears where the stonewares are drained at the surface.

These rocks do not change their class of vulnerability of contamination if the water that flows at their surface, flowing directly into surface water that does not lose water or at least not any major quantities. The surface water can lose substantial amounts of water but in an area that is no longer relevant for the water supply of groundwater sources.

If the surface water of such stoneware flows over carbonate deposits and soaks into the ground and reaches sweet and exploited karstic aquifers, it significantly increases the degree of endangerment of such aquifers. These areas are treated as "catchment areas of karstic aquifers" and are marked in the map with additional pattern.

3.1.5.2.2 Usage of the map of vulnerability of groundwater resources in the Republic of Macedonia

The map should be used for:

- Evaluation of the degree of vulnerability of aquifers of regional character and possible consequence of existing infrastructure installed for water supply (pumping stations and wells);

- Establishment of a detailed systematic monitoring in specific zones for observing the movements of contaminated substances and leads to the source;
- Designing and establishing preventive measures to protect water sources, based on forecasts that will arise from monitoring;
- Design and installation of special protection measures for specific locations and liquidation of polluted "hot-spots" areas;
- Research the requirements for establishing the zones of sanitary protection around water supply sources;
- Preparation of water management documentation on national and regional level;
- Spatial planning in terms of the location of water supply sources and storage of waste from industry, mining, agriculture, municipal landfills, etc. and
- Timely detection and assessment of possible predicted appear technical processes in the zones of exploitation of water sources.

The map should be used as basis for expert assessments when planning groundwater utilization by separating areas where potential pollution can occure, with proposed preventive measures. These estimations are in the competences of the relevant ministries which are defined by legal regulations in the field of water and environmental protection.

3.1.6 PROTECTED AND OTHER AREAS OF IMPORTANCE RELATED TO WATER

3.1.6.1 NATURAL SITES OF IMPORTANCE

In the Republic of Macedonia there are several natural sites of importance, which are allocated in three groups, strict nature reserve, national parks and sites of natural significance. The natural sites are presented in Annex II-2 (Micevski, 2002; MEPP, 2005a; State Statistical Office, 2009).

In accordance to 3th AEWA report, there are several sites of international importance in the Republic of Macedonia:

- **Lake Ohrid:** UNESCO World Heritage site (1980); Ramsar Shedow List (1B/1987); Nature Monument (1977), CORINE Site (P-003/2000); Wellands (Site code MKWS002/ Sub-Site Codes: MKWS0001A, MKWS0001B, MKWS0001C), BSPSM/02; Balkan Green Belt/1999; European Green Belt/2004;

- **Lake Prespa:** Ramsar site (1995); Nature Monument (1977) Strict Natural Reserve Ezerani (1996); CORINE Site (P-001/2000); Wetlands (Site code MKWS001/ Sib-Site Codes MKWS001A, MKWS001B), BSPSM/02; Balkan Green Belt/1999; European Green Belt/2004;

- **Lake Dojran:** Ramsar Shedow List (1B/1987); Nature Monument (1977), CORINE Site (P-002/2000); Wellands (Site code MKWS003), BSPSM/02; Balkan Green Belt/1999; European Green Belt/2004;

- **Vardar River Basin:** CORINE Site (GV: LE, PC, TR; SV: BR, CR; DV:DE/ BSPSM/02; **Basin of the River Vardar- Axios River:** Balkan Green Belt/1999; European Green Belt/2004;

- **Crn Drim River Basin:** CORINE Site (CD: RA, OE, PE/ BSPSM/02; Balkan Green Belt/1999; European Green Belt/2004;

- **Strumica River Basin:** CORINE Site (ST), Site code MKWS0016BSPSM/02); Balkan Green Belt/1999; European Green Belt/2004;

- **Katlanovsko Blato:** CORINE Site P-004/2000; Wetlands (Site code MKWS0004), BSPSM/02;

- **Belchisko Blato:** CORINE Site P-005/2000; Wetlands (Site code MKWS0005), BSPSM/02 and

- **Monospitovsko Blato:** CORINE Site P-006/2000; Wetlands (Site code MKWS0006), BSPSM/02.

3.1.6.2 AREAS OF EMERALD NETWORK (NATURA 2000 AREAS)

Emerald Network is a network of areas of special conservation interest (ASCI - Areas of Special Conservation Interest) which establishes the territory of the Contracting Parties of the Bern Convention (Convention on the conservation of wildlife and their natural habitats in Europe, 1979). Bern Convention was ratified by 42 countries in Europe and four African countries. The European Community has ratified the Berne Convention in 1982 and the Republic of Macedonia in 1997 with the Law on Ratification (Official Gazette no. 49/97) which entered into force in April 1999 (Brajanoska, 2009).

According to Resolution no. 5 (1998) for Contracting Parties to the Bern Convention, Emerald network areas are actually areas of the Natura 2000 identified and protected under Birds Directive and Directive habitats.

In the Republic of Macedonia there are 35 areas indentified with conservation interest. The total area of areas is 752.223 ha or about 29 % of the territory of the Republic of Macedonia. The smallest area (625 ha) represents Marsh Negorski Banji and largest area Jakupica with 76.740 ha. The areas are presented in map of Emerald network in the Republic of Macedonia (Annex I, Map 11).

For compatibility of Emerald network and Natura 2000 areas, the 35 areas of Emerald network are classified into three types:

- Type A - areas important for the protection of wild Birds (corresponding to the specific protected areas Natura 2000)

  It includes four areas (Tikvesh, Ovce Pole, Gorna Pelagonija and gorge of the river Bregalnica);

- Type B - areas important for other wild species and / or habitats (corresponding to Specific areas for conservation of Natura 2000)

  It includes five areas.

- Type C - significant areas for wild birds, other species and / or habitats

  It includes 26 areas.

3.1.6.3 BATHING WATERS

The Bathing Water Directive (76/160/EEC) was designed to protect the public from accidental and chronic pollution incidents, which could cause illness from recreational water use. In the Republic of Macedonia the Law on Waters defines bathing waters with Atricle 101.

The Directive requires the countries to designate water bodies intended for bathing and carry out monitoring of their quality during the bathing period. Water bodies designated for bathing are those water bodies designated by the competent authorities and those where bathing has been practiced traditionally by high number of swimmers. The bathing period is determined in accordance with the period during which the highest number of swimmers is present. Qualitative monitoring, which is set in the Law on Waters (Article 149), takes place on daily basis during the bathing season, as well as two weeks before the commencement of the bathing season.

3.1.6.4 DRINKING WATER PROTECTED AREAS

The drinking water protected areas are regulated by Articles 98 to 100 of the Law on Waters, which envisages narrow protected areas of stricter provisions and wider protection areas. For those areas measures are foreseen in Article 100 of the Law on Waters (increasing level of waste water treatment, restrictions and prohibitions of constructions, etc.).

At the moment the protected areas are only defined in relation to several bigger springs (Studencica, Rasce, Lukar).

Because of that, it is necessary to define protected areas to protect all wells used for water supply.

3.1.6.5 EUTROPHICATION SENSITIVE AREAS DUE TO THE DISCHARGE OF URBAN WASTE WATER AND NITRATE SENSITIVE AREAS

Sensitive areas in respect to wastewater, as well as the areas vulnerable to nitrate pollution and protected zones as defined in the Water Framework Directive have not been identified and proclaimed officially.

In the Law on Waters nitrate sensitive areas are defined with Atricle 102 and eutrophication sensitive areas with Article 103.

3.1.6.6 AREAS FOR PROTECTING PLANT AND ANIMAL SPECIES THAT LIVE DEPEND ON WATER AND ARE ECONOMICALLY IMPORTANT

In the Republic of Macedonia areas for protecting plant and animal species that live depend on water and are economically important as defined in the Water Framework Directive have not been identified and proclaimed officially.

3.2 WATER USE

Law on Waters clearly provides in Article 13 the definition of water use.

Water use is use of water covering the activities of storage, capture, abstraction, diversion of surface and ground waters:

- consumption by humans, irrigation, industrial, technological, economic needs and for other purposes;
- to produce electricity and other power purposes;
- breeding of fish;
- shipping-navigation;

- for sport, recreation, bathing, tourism and
- accumulation, capture, extraction, use, transfer and other purposes.

In this part mainly consumption by humans (drinking water supply and waste water treatment)), irrigation, industrial, technological, economic needs and for other purposes is adressed. Water use for energy production, fish breeding and other purposes has also been analized and presented. The data on water, given in tables, is part of the surveys on water conducted by the State Statistical Office.

3.2.1 DRINKING WATER SUPPLY

Supplying the population with drinking water is an important priority for every country. With the Census of population, households and dwellings, as a statistical survey which scopes the whole population, data on the way in which the households are supplied with drinking water, as well as on the equipment of the dwelling units with appropriate instalations for drinking water supply are collected regularly.

Even though the data that 88,9 % of the total number of individual households are supplied with drinking water from public water pipeline represent statistically high indicator, the mere fact that at the beginning of the 21 century, in the heart of Europe, still a part of the households drink water which is neither biologically nor chemically examined, represents a worrying indicator. Neither the fact that the bigger number of the households that are not supplied with drinking water from a public water pipeline are concentrated mostly in low populated rural settlements can not be an excuse for the insufficient care of the country, in every dwelling, in every household to bring quality drinking water (Figure 13).

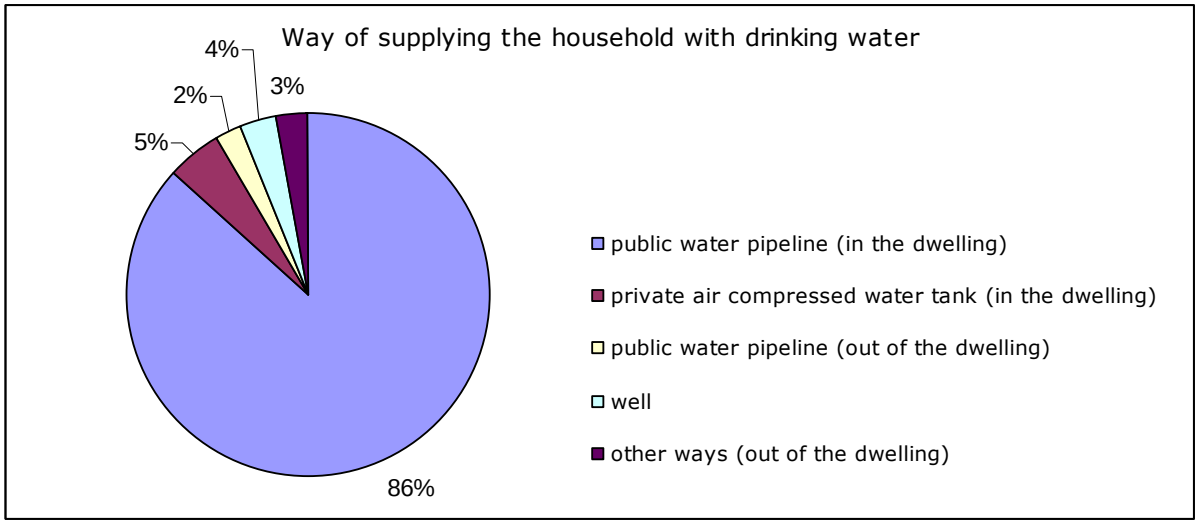


Figure 13: Way of supplying the households with drinking water, Census 2002 (State Statistical Office, 2009)

In the Republic of Macedonia, there are mainly local water supply systems for cities, towns and villages. Many of them, originally constructed for the city or town, are extended in order to meet the water demands of the local rural areas. There are also regional water supply systems:

- "Studencica" for Kicevo, Prilep, Makedonski Brod and Krusevo;
- "Lukar" for Kavadarci,Negotino and 13 villages and
- "Debar" for town Debar and several close villages.

According to the Census 2002, the number of dwellings connected to public water supply system is 597.014, which presents 86 % of all dwellings, while 7 % of dwellings are connected to air compressed water tank or other resource. The percentage of connections to public water supply systems in the municipalities-urban areas is much higher then the average, it varies from 82 % (Berovo, Kumanovo) to 100 % Skopje-Center municipality. Total number of population connected to public water supply systems is 1.200.000 inhabitants (Map 15).

Regarding the rural areas the percentage of the connected dwellings to the public water supply systems is very different, from 10 % up to 100 %. According to the available data, average percentage is about 70, while total number of population connected to public water supply is 250.000 inhabitants.

For drinking water supply springs, groundwater and surface water or combined resource are used. Larger cities, which are supplied with spring water, are: Skopje, Prilep, Kicevo, Makedonski Brod, Krusevo, Struga, Debar, Gostivar, Tetovo and Kriva Planka. Groundwater is used for supplying the cities: Skopje, Stip (with pretreatment), Veles, Kocani, Probistip, Gevgelija, Ohrid, Demir Hisar, Delcevo, and Radovis. Surface water is used after treatment of the raw water for the cities: Bitola, Kumanovo, Strumica, Veles, Berovo, Vinica, Sv. Nikole and Kratovo. Combined water supply with spring and surface water is used for Ohrid, Kavadarci and Negotino, while groundwater and surface water is used for Delcevo and Vinica. Rural water supply systems are mainly supplied from springs and groundwater, but lately, very often they use surface water.

3.2.2 WASTE WATER TREATMENT

With the Census of population, households and dwellings, 2002, data on the equipment of dwellings with sewage system for waste waters are collected as well. The data that as many as 40,1 % (Table 9) of the total number of dwellings are not equipped with instalations which conduct the waste waters from the households to public sewage show that little care for the protection of the living environment from the waste waters from households is taken in the Republic of Macedonia. Bigger part of the

constructed sewage network does not lead to modern system of drains. In this case the competent institutions and the local self-government units must provide some possibilities how to deal with this important issue**.**

Table 9: Dwellings according to sewage facilities, Census 2002 (State Official Office, 2009)

	Sewage facilities				
	Total number of dwelings	Public sewage	Septic tank	Free waste water pipeline	No instalations
Absolute numbers	697.520	417.653	143.353	85.007	51.516
In %	100.00	59.88	20.55	12.19	7.39

3.2.3 INDUSTRY WATER USE AND WATER USED FOR PRODUCTION PURPOSES

3.2.3.1 INDUSTRY WATER USE

Water supply in industry and mining includes all water quantities intaken and supplied by the businesses no matter if they are for own needs or transfered or sold to other users. The water quantities are determined by measuring with water meter or assessed according to the norms for the specified activity (on the basis of the working time and the capacities of the pumping facilities). According to the statistical data, the water quantities for the needs of the industry and the mining mostly are provided by surface waters (water courses, reservoirs, lakes).

In 2008, to surface waters belong approximately 92 % of the total intaken waters for supplying the industry and the mining, and the rest belong to public sewage, springs and ground waters (Figure 14).

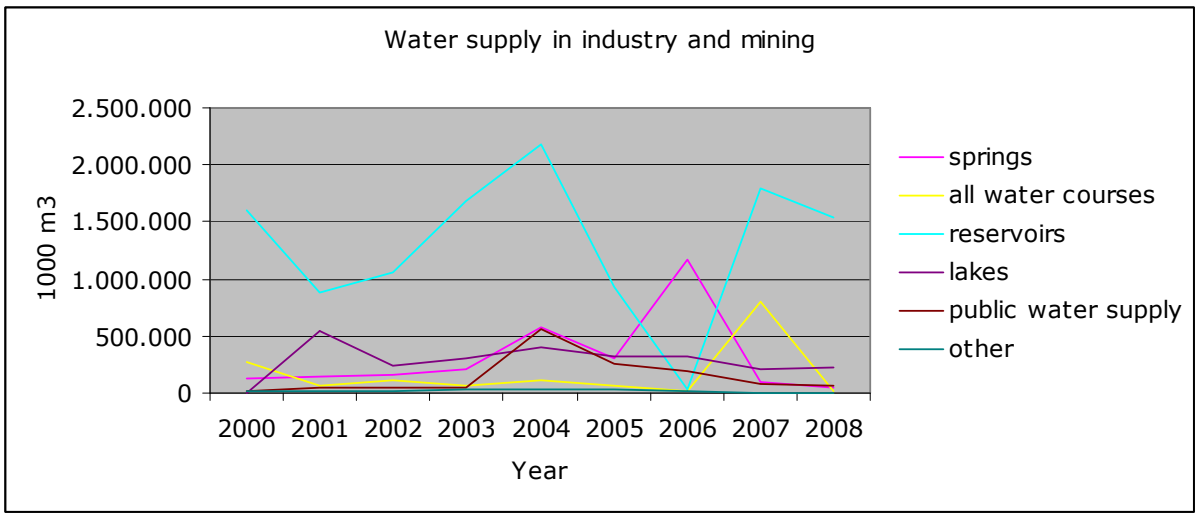


Figure 14: Water supply in industry and mining (2000-2008) (State Statistical Office, 2009)

3.2.3.2 WATER USED FOR PRODUCTION PUPROSES

The waters used for production purposes represent used or consumed water quantities in production purposes (production, cooling). In the period 2000-2008, for production purposes, fresh water for technical purposes (approximately 99 %) was mostly used. In 2008, from total 1.9 mil. m^3 of used fresh water in industry and mining, 1,85 mil. m^3 were industrial water (Table 10).

Table 10: Water used for production purposes (in 1000 m^3) (State Statistical Office, 2009)

	Total	Fresh water		Recycled water		Water used repeatedly	
		for all technical purposes	drinking water	all	fresh water added	after purfying	after cooling
2000	2.018.772	2.015.861	206	2.286	116	0	535
2001	1.645.595	1.626.993	15.024	3.391	166	0	353
2002	1.554.614	1.552.174	566	1.889	82	67	0
2003	2.350.453	2.338.222	10.398	38.226	36.658	210	55
2004	3.669.675	3.534.037	132.891	2.421	50	278	98
2005	1.622.325	1.609.866	12.459	0	0	0	0
2006	1.599.739	1.593.879	5.791	-	-	68	38
2007	2.960.540	2.854.975	97.095	8.572	1.210	1.078	30
2008	1.906.480	1.859.781	11.358	5.470	1.347	14.555	30.998

3.2.4 AGRICULTURE WATER USE

The favourable climate and pedological conditions in the Republic of Macedonia create the basis for intensive agricultural production of specific highly cost effective crops. These crops would not otherwise grow under conditions where the water is limiting factor in space and time. Due to uneven distribution of precipitation in time and space, irrigation in the Republic of Macedonia is necessary condition for successful agricultural production.

The arable agricultural area in the Republic of Macedonia accounts for approximately 667.000 ha. If fully constructed, irrigation schemes could irrigate around 400.000 ha, or 60% of the total arable land. So far, 106 smaller and larger irrigation schemes have been built covering an area of 163.693 ha of fertile arable land, i.e. 49,9% of the area that may be irrigated (Ministry of environment and physical planning, 2005). Actual possible area for irrigation is about 126.600 ha. The irrigation schemes are mainly constructed in the period between 1958 and 1980, which means that some of them are under operation for more then 40 years. Out of the total area under irrigation 61% are irrigated by sprinkling, while 39% by other type of surface irrigation.

Irrigation water demands are defined for assumed irrigation area of 126.617 ha and average irrigation norm for certain areas (depending of type of crop irrigated, climate and soil conditions). Total irrigation water demands and divided demands by river basin base are presented in the Table 11.

Table 11: Irrigation water demands in Republic of Macedonia (MEPP, 2005 a)

No.	River basin	Area (ha)	Irrigation water demands (m^3/year)
1.	Vardar	99.918	731.732.000
2.	Strumica	18.432	117.941.000
3.	Crn Drim	8.267	49.662.000
	TOTAL	126.617	899.335.000

3.2.5 WATER USE FOR ENERGY PRODUCTION

Territory of Republic of Macedonia mainly is characterized by mountains and lowland areas, which generally gravitate around major watercourses. Such configuration contributes for significant energy potential in the rivers, but also for their quick leaking. That means, the space is ideal for the construction of dams and creation of small and large reservoirs which allowing regulation on rivers and multipurpose optimal utilization of waters (eg. energy production). The Republic of Macedonia has a great potential

for energy production from renewable resources and also to achieve the objectives regarding the Directive on Electricity Production from Renewable Energy Sources (Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, published 2001-10-27 in the Official Journal of the European Communities: L 283/33). The directive, which took effect in October 2001, sets national indicative targets for renewable energy production.

In the Table 12 are given data for hydro power potential on rivers in the territory of the Republic of Macedonia and the current situation with its use. Currently, only 26,6 % of technically useful potential it is used.

Table 12: Technical and used potential of HPPs (Strategija za razvoj na energetikata vo Republika Makedonija za period 2008-2020 sa vizija do 2030)

River basin	Theoretical potencial [GWh]	Technical potencial [GWh]	Used potencial [GWh]
Vardar	6.660	4.559,3	1.150,0
Crn Drim	2.203	964,9	583,0
Total	8.863	5.524,2	1.471,7

Review of existing hydroelectric power plants (Map 16):

- HPS Mavrovo is located between River Mavrovska and River Gorna Radika. It is consisting from reservoir Mavrovo and three HPPs-derivation HPP Vrutok, run-of-river HPP Raven, run-of-river HPP Vrben. In future is in plan to be built reservoir Lukovo Pole and HPP Crn Kamen that will become part of HPS. Primary purpose of reservoir Mavrovo is providing water for the production of electricity, water for irrigation of the agricultural areas in Polog and Skopje and regulation of waters in upper courses of river Vardar.

- HPS Treska is located on the River Treska. It is consisting from three HPP with reservoir-HPP Kozjak (existing), HPP Sveta Petka (in the final phase of construction) and HPP Matka (existing). The reservoir of HPP Kozjak is multipurpose, primarily provides flood protection, water for irrigation of agricultural areas around Skopje, technical water and water for electricity production. Reservoirs of HPP Sveta Petka and HPP Matka, depending on the mode of discharge of water from the HPP

Kozjak, are used to optimize the production of electricity in their HPP and regulating of waters in the lower course of River Treska.

- HPS Crn Drim, located on the River Crn Drim and the River Radika, consist of the following HPP with reservoir-HPP Globocica (existing), HPP Spilje (existing) and HPP Boskov Most (planed for construction). Reservoirs of HPP Globocica, HPP Spilje and HPP Boskov Most primarily provided water to produce electricity in their HPP.

3.2.6 NAVIGATION WATER USE

The main advantages of river and canal transport over rail and road traffic are in considerably low transport costs, in big capacities, in reduced number of employee, in big advantages in loading and discharging, storage and maintenance of various types of goods and their safety in transit.

The idea of connecting the river Danube with the Aegean Sea by a navigable route via the rivers Morava and Vardar dates back to the last century. It is based on the geographical-topographical characteristics and suitability of the terrain.

Natural location of the Morava and Vardar river beds and possibility of connecting them on a short section between the rivers Juzna Morava and Pcinja affords extraordinary possibilities to materialize a navigable route from the Danube up to the Thessalonike in the Aegean Sea.

The navigable route Morava-Vardar by the canal Rhine-Main-Danube is foreseen to connect and fit into the European network of magisterial canals. The concept is to qualify the route Morava-Vardar as the navigable route and the perspective idee to realize its connection by canal through Presevo and Pcinja are the shortest way to join European navigable network with the Mediterranean (International Scientific Forum "Danube - River of Cooperation", 1993).

3.2.7 FISH-FARMING WATER USE AND FISHING

Fishing is allowed on all natural lakes, reservoirs and rivers, and includes both commercial and sport fishing. Fish species that are important in commercial fishing are:

Ohrid Lake: *Anguilla anguilla*, *Alburnus alburnus*, *Salmo letnica.* The greatest percentage of the total annual catch is from these three species.

In the past, the annual catch in Ohrid Lake was 220-240 tonnes of fish, 50 % of which was trout. At present, this quantity is considerably less (under 100 tonnes). The trout catch has declined markedly from the periods when over 140 tonnes of trout were caught annually to the present catch of only 35 tonnes.

Prespa Lake: *Alburnus belvica* and *Cyprinus carpio.* The annual catch of fish in Prespa Lake is 100 tonnes.

Dojran Lake: *Alburnus alburnus*, *Cyprinus carpio*, *Perca fluviatilis*, *Rutilus rutilus*, and *Scardinius erithrophthalmus.* Traditionally, these species amount to 98 % of the total fish catch. While the annual catch in Dojran Lake was formerly over 500 tonnes, it currently ranges from 70-90 tonnes/year. The major component of the catch today is *Carassius carassius*, with *P. fluviatilis* and *C. carpio* representing minor constituents.

Concerning the fish catch in reservoirs, there are no valid statistical data. There are estimates that over 200 tonnes/year of fish are caught from Tikves Lake only, mostly *R. rutilus*, followed by, in decreasing order, Carp, Catfish, Bleak, Perch and Nase.

With respect to sport fishing, in addition to those species listed previously under commercial fishing, important species also include: *Barbus barbus* (Barbel), *B. meridionalis* (Mediterranean barbel), *Chondrostoma nasus* (Nase), *Gobio gobio* (Gudgeon), *Leuciscus cephalus* (Chub), *L. delineatus* (Moderlieschen), *Silurus glanis* (European catfish), *Salmo trutta* (Brown trout), and *Vimba melanops* (Balkan vimba).

Again, there are no relevant data on the total fish catch by sports anglers. Occurrences of illegal fishing and the use of prohibited fishing gear (including certain types of nets, chemicals and explosives) cause grave concern.

Using the basic data on the number of water bodies (natural lakes, reservoirs and rivers) and their areas, estimates are that the annual fish catch in the Republic of Macedonia ranges from 800 to 1.200 tonnes; however, a major portion of the catch is not recorded (MEPP, 2003).

3.2.8 TOURISM AND RECREATION WATER USE

The number of tourists in the period January- November 2010, compared to the same period last year, decreased by 1.6%. The number of nights spent in the period January- November 2010, compared to the same period last year, decreased by 4.5% (State Statistical Office, 2010).

Touristic premises are usually connected to the sewage systems. Due to the additional load provoked by the tourists during certain period of the year, separate estimations were performed for wastewater quantities discharged by the tourists. In ERWRM, the wastewater quantities have

been estimated by the number of tourists and wastewater norm. This norm is from 0,280 m^3/tourist/day to 0,400 m^3/tourist/day for Skopje.

Actually, wastewater norm is 80 % from the water supply norm. Also, during estimations, time duration of the touristic season is taken under consideration. Depending on the type of touristic activity, time duration is from 120 to 270 days, while for Skopje as capital of the state and cultural, economic and trade center, 365 days.

Divided upon river basin base wastewater quantities discharged by the tourists are presented in the Table 13.

Table 13: Wastewater from Tourists (ERWRM, 1998)

No.	River Basin	Wastewater from tourists m^3/year
1	Vardar	1.632.800
2	Strumica	129.600
3	Crn Drim	3.244.200
4	Total	5.006.600

3.2.9 GEOTHERMAL AND MINERAL WATER USE

In this chapter, short overview is given on thermal and mineral water use.

In accordance with previous experience thermal water is used to heat greenhouses for vegetable production, especially from thermal water resources in Istibanja – Vinica, Polog-Kocani, Smokvica - Gevgelija and part of the Bansko - Strumica.

Current level of thermal water use is quite low. The area, where thermal water is used for greenhouse heating was estimated at 62 ha. The level of thermal and mineral water exploitation for central heating purposes is also very low and not significant.

Thermal and mineral water reosurces used in industry are not significant. There is some use present in Kocani, where thermal and mineral water resources are mostly used for rice drying.

In most cases in the Republic of Macedonia, thermal and mineral water resources are used in tourism for balneotherapy purposes. The Republic of Macedonia has a great potential in this field, where thermal and mineral water resources are representing the basis for the development of spa tourism in the future.

3.2.10 ECONOMIC ANALYSIS OF WATER USE

The main purpose of undertaking the economic analysis of water uses is to assess how important water is for the economy and socio-economic development of the country or its river basin districts. It provides the country or river basin's economic profile in terms of general indicators, e.g. economic turnover, gross income, employment or number of beneficiaries for significant water uses.

3.2.10.1 GENERAL SOCIO-ECONOMIC INDICATORS

3.2.10.1.1 Population

The Republic of Macedonia is a small country, both in territory and in population. According to the last Census of population, households and dwellings, conducted in November 2002, the total population is 2.022.547 inhabitants. Estimation for year 2009 is 2.114.550 inhabitants. The gender structure shows approximately equal participation of both genders (50,2 % men and 49,8 % women). The territorial distribution of the population in the Republic of Macedonia expresses significant inequality. The 57,8 % of the population (Census 2002) live in the cities (there are 34 cities in Republic of Macedonia) where the biggest concentration is in the capitol Skopje (20,5 %). Large part of the rural settlements (total number of settlements is 1.728) are completely depopulated (141 settlement) or have extremely small number of inhabitants, and in close future, as a result of inauspicious age structure (old population), will have no population.

3.2.10.1.2 Employment

According to the data of the State Statistical Office, in the I quarter of 2010, the labour force[1] in the Republic of Macedonia numbered 925.613 persons, of which 615.962 or 66,5 % were employed and 309.651 persons or 33,5 % were unemployed persons.

The number of employed persons in the I quarter of 2010, compared to the same period of the last year, decreased by 0,4 %. In comparison with the same period of 2009, the number of unemployed persons increased by 2,9 %. The activity rate in this period was 56,3, the employment rate was 37,5, where as the unemployment rate was 33,5.

[1] According to the Labour Force Survey conducted according to the methodological recommendations of the International Labour Organisation (ILO) and the recommendations of the European statistical bureau (Eurostat), the persons over 15 years of age are considered as employed if they:

- Have been working for money (in cash, in kind or profit), at least 1 hour;
- Have temporarily been absent from the work position, but formally have been employed or
- Have been helping (on the family asset or in the family company) without payment.

3.2.10.1.3 Gross domestic product at market prices

The Gross Domestic Product (GDP) at market prices is the final result of the production activity of the resident producer units and is the sum of gross value added of the various institutional sectors or the various industries at basic prices plus value added tax and import duties less subsidies on products (which are not allocated to industries) (Figure 15).

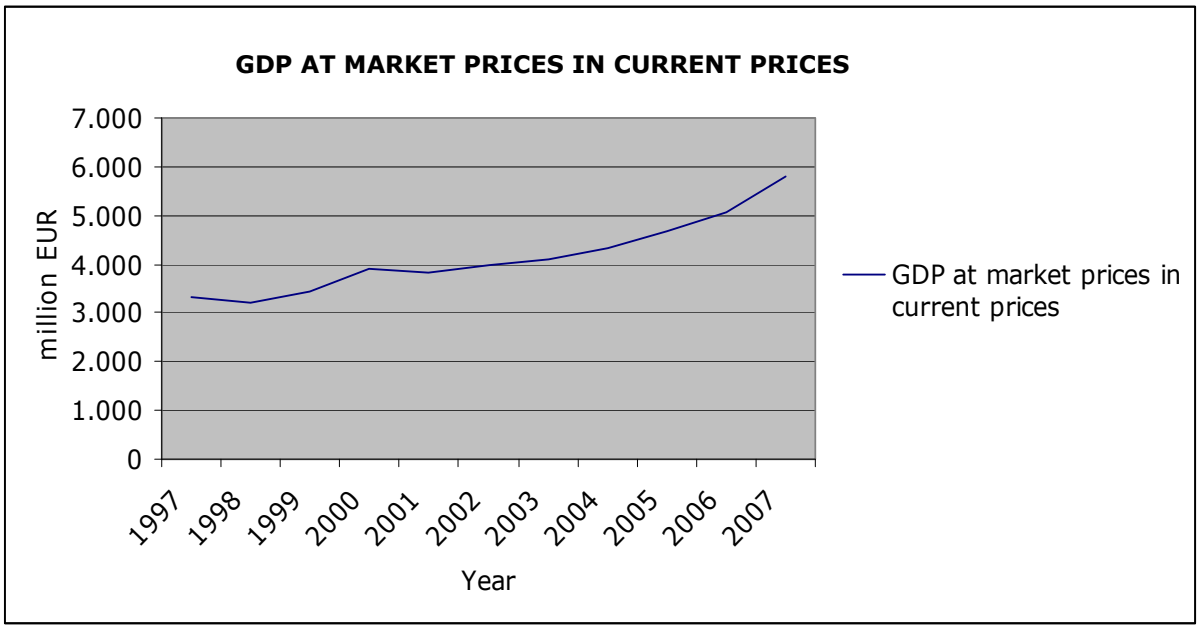


Figure 15: Gross domestic product at market prices (in million EUR) (State Statistical Office, 2009)

Gross domestic product calculated in Euros, for the period 1997-2007 shows permanent increase, except in 1998 and 2001 when it shows decrease.

3.2.10.1.4 Value added (at basic prices) by sector

Gross Value Added at basic prices represents the balance between gross output and intermediate consumption. GDP calculations are in accordance with SNA '93 and ESA'95 standards. The Gross Value Added shows the same trend of growth as the gross domestic product. In the period 2003-2007 the biggest share in Value Added was shown by the services (Figure 16).

Figure 16: Value added at basic prices by sector (State Statistical Office, 2009)

3.2.10.2 CHARACTERISTICS OF WATER SERVICES

In this chapter it is explained how Polluter Pays Principle and Principle of Recovery of costs were (are) considered in the Republic of Macedonia. Further more there is given a short description, how water services are organized in the Republic of Macedonia.

3.2.10.2.1 Consideration of polluter pays principle and principle of recovery of costs

The WFD requires that all polluters of the water environment should pay, and that implementation of the directive is achieved in a fair and proportionate way across all sectors. The Polluter Pays Principle (PPP) is difficult to apply in practice, particularly in the case of agriculture where farmers' activities have both positive (producing necessary food) and negative (contributing to diffuse water pollution) effects. It will be some time before PPP can be applied fully in this area. In the meantime, solutions still need to be found to tackle diffuse pollution at source (DEFRA, 2008).

Law on Waters provides in Article 5 a clear definition of polluter pays principle where the pollutant of coastal waters and the land is obliged to reimburse the cost of returning to the former state of coastal waters and land.

Regarding the provisions of the Law on Waters on cost-recovery principle, the user of the water is obliged to reimburse all expenses incurred in providing the service which include costs of water services and environmental costs in accordance with the principle "polluter pays."

Costs of services are defined in Article 212. These are:

- Cost of service for end users of water includes the costs of service supply, the cost of environmental protection and cost resource in accordance with the user pays principle;
- Cost of service for end users for drainage and water purification includes the cost of service for drainage and water purification, costs protection of the environment from discharges in water and costs of the recipient, in accordance with the polluter pays principle and
- The price of the service, which shall include all operational costs, maintenance costs, costs to replace depreciated parts, equity investments, interest on repayment of capital investment and loans, guarantees and other additional costs.

The description here covers municipal water related services. The municipalities set the fees and should in principle be cost-recovery based.

Fees and service levels vary from one municipality to the other. However, there are few general points to note, viz.:

- Only 3 of the 35 water & wastewater utilities have wastewater treatment facilities and
- Collection rates are low, and have been declining. Estimates provided indicate a collection rate of about, or slightly below, 50% in the case of water (including discharges and wastewater treatment). In the case of irrigation, the collection rate is estimated to be as low as 25%.

The latter issues are however addressed in the new Law on Drinking Water Supplying and Urban Wastewater Discharging (Official Gazette, No. 68, 5 October 2004).

In the Republic of Macedonia, the public enterprises (actually public water companies) are responsible and authorised by the above mentioned Law on Drinking Water Supplying and Urban Wastewater Discharging (2004) for water supply and collection and treatment of wastewater. According to this Law, the prices of water are set upon precise Methodology, by the water companies and ultimately approved by the municipality authorities (Council).

In practice the Government sets a nation-wide maximum water prices that are in line with its anti-inflation and stabilisation policies. It is important to mention that the water tariffs barely meet the water companies operating and maintenance costs and do not allow them to upgrade or modernise the distribution networks, which usually have significant leaks. This significantly contributes to the un-sustainability of the water companies. However, poor management of the water companies, huge administrative

costs and losses caused by leakage are also factors behind the unsustainable operations of the water companies.

In most households, water is not metered and the charges are set as flat annual or monthly rates. This does not encourage the user to save water and usually in this case the consumption is higher than originally calculated.

The price of drinking water differs from one municipality to another. The average price in 1999 across the State was 9,40 MKD/m^3 (0,15 EUR/m^3)[2].

The price of the drinking water is defined individually by each public utility. From the price of the water per 1 m^3, 22 % is used for watering maintenance of the public green areas. According to the data from "Study on the Conditions in the Public Communal Utilities", water supply systems in the cities Stip, Strumica, Ohrid, Kumanovo and Veles are currently under rehabilitation and reconstruction. The funds are provided as loans and grants. Due to increased costs for that investment, the price of the drinking water in these cities is much higher then in other Macedonian cities.

Average price for the above mentioned cities is 27,07 MKD/m^3 (0,45 EUR/m^3)for the households and 39,89 MKD/m^3 (0,66 EUR/m^3) for the industry.

For the remaining cities, average price is 11,73 MKD/m^3 (0,19 EUR/m^3) for the households and 24,25 MKD/m^3 (0,40 EUR/m^3) for the industry.

Average price on the national level is 19,40 MKD/m^3 (0,32 EUR/m^3) for the households and 32,07 MKD/m^3 (0,53 EUR/m^3) for the industry.

Even the price of the water is not too high (except in the first group of cities) still public utilities have rather low cost revenue collecting rate. It varies from 33 % in Gostivar up to 78 % in Gevgelija. Average cost revenue collecting rate is about 55 %. Such low cost revenue collecting rates provoke problems in the operation and maintenance of the water supply systems by the public utilities. They are facing shortage of sufficient funds for successful operation and functioning.

There are only three major municipal wastewater treatment plants and several small wastewater treatment plants in small municipalities. The majority of untreated municipal wastewater is discharged into rivers in most places. The sewage and wastewater charge is part of the water supply bill, but earmarked by the Water Company internally. The sewage and wastewater charge for households amounted to 4,97 MKD/m^3 (0,08 EUR/m^3) in 1999.

[2] Calculation is based on middle exchange rate of National Bank of the Republic of Macedonia on 1.1.2011 (1 EUR = 0.016257 MKD).

Law on Drinking Water Supplying and Urban Wastewater Discharging governs the condition of water allocation and use, water pollution, and water finance.

3.2.10.2.2 Current organization of water services

Water services are all services that provides capture, abstraction, storage, treatment and distribution of surface or groundwater, or collection and purification of waste waters into surface waters

In terms of the Law on Waters (Article 164), water management activities and services of public interest are:

1) public water supply with water intended for consumption by man and technological needs;
2) production of electricity in accordance with law;
3) irrigation and drainage of land;
4) protection and preservation of waters and aquatic ecosystems;
5) collection and drainage, treatment and discharge of wastewater;
6) protection from harmful effects of waters and
7) The exploitation of groundwater.

Regarding public water supply and waste water treatment, there are in all cities and towns public utilities (public enterprises), which manage the water supply systems. Some of the rural water supply systems are also managed by public utility formed by the local self-government unit. According of the Law on self-government, drinking water supply is responsibility of the self-government units, as well as wastewater collection, disposal and treatment of the wastewater. These public utilities are also performing other activities such as: disposal of the solid waste, maintenance of the green areas in the cities, management of the green markets etc. The Municipality Council on the proposal of the major appoints the manager of the public utility. This public utility is responsible for management and protection of the protection zones around the water resource, the resource itself, distribution network, water storage tanks, operation, maintenance and development of the system as a whole.

3.3 RIVER TRAINING AND PROTECTION AGAINST HARMFUL EFFECTS OF WATER

River training comprehends engineering measures taken to alter a natural water course (straightening, diversion, meander cut-off) with aim to protect inhabitants and their property from harmful effects of water. Protection against harmful effects of water covers activities and measures for the protection and defence against floods, protection from erosion and torrents and defence against freeze of surface water bodies. As part of this chapter also irrigation and drainage schemes are represented.

3.3.1 RIVER TRAINING

The uneven distribution of the surface waters in location, time and quality largely prevents the optimized use of water resources. Therefore, the construction of dams and the creation of accumulations that modify the water regime and make it more manageable are essential. These infrastructures enable a full and efficient use of waters both in the water management (electricity production, irrigation, water supply) and the protection of the human environment from water harmful effects.

The Republic of Macedonia has two types of dams. Large dams together with their auxiliary facilities enable the multipurpose use of water resources. The stored water is used for water supply for population, industry, irrigation, production of electric power, flood control, for maintaining the biological minimum water flow, and for sports, recreation and tourism. Started in 1938, construction became more active in the late 1950s and especially in the 1960s, resulting today in 23 large dams (Table 14, Map 18). Total water storage capacity is 1.85 billion m^3 (Table 14) and 1.11 billion m^3 available capacity. The greater part of dams (17) is present in the Vardar catchment area. There are 4 dams in Crn Drim River Basin and 2 dams in Strumica River Basin.

Most of the dams were built as embankment dams with local material. The others are concrete arches and dams.

Table 14: Volume and purpose of accumulations in the Republic of Macedonia (MZSPP, 2010)

Name	River	River Basin	Volume (10^6 m^3)	Purpose				
				Energetic	Irrigation	Water Supply	Flood protection	Water storage

Name	River	River Basin	Volume (10^6 m^3)	Purpose				
				Energetic	Irrigation	Water Supply	Flood protection	Water storage
Glaznja	Lipkovska	Vardar	26	•	•	•	•	•
Lipkovo	Lipkovska	Vardar	2	•	•	•	•	•
Kalimanci	Bregalnica	Vardar	127	•	•	•	•	•
Grdace	Kocanska	Vardar	3		•	•	•	•
Mavrovica	Mavrovica	Vardar	2,8		•	•		
Pisica	Pisica	Vardar	0,5		•			
Mladost	Otavica	Vardar	8		•		•	•
Lisice	Topolka	Vardar	28		•	•	•	•
Ratevo	Ratevska	Vardar	11		•	•	•	•
Mantovo	Bregalnica	Vardar	47		•	•		
Tikves	Crna Reka	Vardar	475	•	•		•	•
Prilep	Stara Reka	Vardar	6		•	•	•	•
Paljurci	Luda Mara	Vardar	4		•		•	•
Strezevo	Semnica	Vardar	90	•	•	•	•	•
Kozjak	Treska	Vardar	-	•	•	•	•	•
Sveta Petka	Treska	Vardar	-	•				-
Matka	Treska	Vardar	-	•				
Mavrovo	Mavrovka	Crn Drim	375	•	•		•	•
Spilje	Crn Drim	Crn Drim	520	•	•		•	•
Slatina	Slatina	Crn Drim	-		•			
Globocica	Crn Drim	Crn Drim	58	•	•		•	•
Turija	Turija	Strumica	48		•	•	•	•
Vodoca	Vodoca	Strumica	27		•	•	•	•

Although building of dams and accumulations is necessary for further development, it also has to be considered, that they are causing numerous environmental impacts that are presented in issue 3.6.1.4 Water abstraction and Flow Regulation e.g.: modification of the hydrological regime of rivers, modifications of river and terrestrial ecosystems, interrupted longitudinal, lateral and vertical river continuum,

relocation of human settlements and human activities. Those environmental impacts should be minimized by appropriate mitigation measures, e.g. fish passages, mitigation of hydropeaking, etc.

In the Republic of Macedonia there are over 120 small dams and accumulations that provide water for the irrigation of smaller areas, water supply of rural settlements and local industries, and fish farming. The height of the small dams ranges from a few metres to 28 m, while the volume of stored waters varies from 10.000 to 1 million m^3.

Beside accumulations there are also different river training measures taken for protection against harmful effects of water that are discussed in subsequent chapters, e.g. flood protection, erosion protection, irrigation and drainage schemes.

3.3.2 FLOOD PROTECTION

Because of geomorphology and climate, the Republic of Macedonia is very liable to floods. There are regional floods and local floods. Almost all rivers cause floods and over 102.000 ha could be flooded, considering 1-year return period (Table 15). As a result of natural conditions, and cover especially low forest closeness (high % of degraded forest and shrubs), rare but intensive short time rainfalls, unbalanced water regime, there are a lot of flash floods. Those floods endanger infrastructural facilities and cover agricultural land with sterile sediments (MEPP, 2005 a). There are examples of the destructive effects of such short-lasting rainfall were the floods in Negotino, Kavadarci, Valandovo and Strumica.

Table 15: Flood areas in particular river basin

River Basin	Flood area (ha)	
	$Q_{5\%}$	$Q_{1\%}$
Vardar	73.000	87.000
Crn Drim	5.000	6.000
Strumica	8.000	9.000
Total	86.000	102.000

3.3.2.1 Flood protection problematic in particular water management division

Numerous measures have been taken in the river basins to improve flood protection in the Republic of Macedonia, e.g. local regulation of riverbeds in urban areas, systematic regulation of rivers over longer sections and control embankments and dikes. Irrespective of that fact, flood problematic is still present in particular divisions. Detailed characteristics

of flood protection state or problematic for particular water management division are indicated in Table 16.

Table 16: Flood protection state in water management divisions

Water management division	Flood protection state and other river channel characteristics
Debarsko	- smaller tributaries have large sediment-carrying capacity and sediment transport; - high waters of river Radika causing damage at road Gostivar-Debar; - unstable channel of river Crn Drim downstream accumulation Spilje and - required permanent channel and vegetation maintenance, sediment extraction and local bank reinforcement.
Ohridsko-Strusko	- regulated rivers Crn Drim and lower run of Sateska River; - small rivers with outflows into Ohrid Lake has intermittent character; - high waters endanger local floods at Strusko pole; - required permanent channel maintenance; - due to gravel extraction at rivers Crna Drim and Sateska rehabilitation projects are needed;
Prespa	- rivers have large sediment-carrying capacity and erosion activity; - Golema River at Prespansko pole is flooding at high waters and - floods occur also because of channel fulfilment with sediments.
Polog	- variable cross-sections and exposure to erosion and - settlements exposed to floods: Gostivar, Tetovo, Sarakinci and settlements at foothills of Sara Gora.
Treska	- settlements exposed to floods: Makedonski Brod, some settlements in Kicevo valley; - rivers with natural vegetation and - some sections filled with sediments (extraction needed) .
Skopsko	- river Vardar extensively regulated; - in Skopje and downstream from Skopje channel deepening and bank erosion is evident; - except regulated river profiles, too narrow channels; - settlements exposed to floods: Kondovo, Dolno Lisice, Taor and settlements downstream of Zelenikove; - Lepenec River degraded in Skopska valley due to gravel extraction; - bank erosion evident at tributaries Markova and Kadina, cutting of vegetation is needed and - settlements exposed to floods: Saraj, Đ. Petrov, Skopje, Dolno Lisice, Petrovec and some other settlements in Skopska valley.
Pelagonija	- maintained channel of Crna Reka; - extensively degraded channel of river Semica due to gravel extraction and - settlements exposed to floods: Bitola, Prilep, Bucin.

Water management division	Flood protection state and other river channel characteristics
Sredna and Dolna Crna Reka	- tributaries with large sediment transport; - necessity for maintenance to preserve accumulations fulfilment with sediments and - settlements exposed to floods: Vozarci and Rosoman.
Sreden Vardar	- flood occurs in Valeska valley, in settlement Veles and also downstream in Papeliska valley, in settlement Demir Kapija; - less significant flooding of rivers Babuna, Negotinska Reka and Luda Mara; - tributaries with high sediment transport; - natural riparian vegetation of Vardar River, several sections exposed to bank erosion (Valesko, Gradsko and Demir Kapija); - large delta of Boshava Reka at outflow to Vardar River – necessity of maintenance and cutting of riparian vegetation; - settlements exposed to flood: Veles, Basino Selo, Negotino, Kavadarci, Gradsko, Krivolak, Pepeliste, Demir Kapija;
Dolen Vardar	- intermittent tributaries, rich with sediment; - natural riparian vegetation along Vardar River; - some sections along Vardar River exposed to erosion (endangered roads); - degraded Vardar's channel due to gravel extraction in the nearness of Gevgeija; - high Vardar's water causing floods in agricultural areas; - channel maintenance is needed and - settlements exposed to floods: Gevgelija, Bogdanci in Udovo.
Pcinja	- settlements exposed to floods: Kumanovo and less significant Kriva Palanka and settlements at Slavisko Pole; - rivers degraded due to gravel extraction in settlements Zgornje Konjare and Spodnje Konjare; - banks naturally vegetated with riparian vegetation and - settlements exposed to floods are also Proevci, Dobrosane, Klecovce, Dovezence.
Gorna Bregalnica	- rivers vegetated with riparian vegetation, characteristic large sediment transport; - sediments accumulation in Kalimanci accumulation; - floods present in Delcevska valley, settlement exposed to floods is Delcevo and - necessity of maintenance of Brgalnica River.
Sredna and Dolna Bregalnica	- very narrow channel of Bregalnica River in Kocanska valley; small conveyance; - usually urbanised riparian zone; - not problematic floods on agriculture area due to rice filds; - evident erosion downstream from and - settlements exposed to floods: Istibanja, Vinica, Grdovci, Mojanci, Oblesevo, Ciflik, Cesinovo and other settlements along middle run of Bregalnica River.

Water management division	Flood protection state and other river channel characteristics
Strumica	- regulations and - frequent floods at Strumicko Pole.
Dojran	- not problematic high waters.

3.3.2.2 Flood protection schemes

One of main flood protection schemes were built on the Vardar River in Skopje that dates back to after the big floods of 1895 and 1897. Since then, quay walls and control embankments were constructed and continuously expanded, in particular after the 1935 floods and during the 1950s. At the same time, the "Skopje Pole" drainage system of the city surroundings was also built up. The 1950s and 1960s marked the construction of large hydro irrigation schemes. Overall, outstanding regulation works have been undertaken also on the rivers Treska, Pcinja, Bregalnica, Crna Reka and Crn Drim (Vukelic et al.).

Large systems for flood control have been built for the regions of Skopje, Pelagonija, Strumica and Struga. There are 32,7 km of trained rivers in Skopje region, 82,3 km in Pelagonija, 79,3 km in Strumica region and 10,9 km in Struga region (Table 17). Recently in Skopje region also dam Kozjak for flood protection was built, with a retention volume of 100 million m^3.

Table 17: Characteristics of large flood control systems in the Republic of Macedonia (Ministry of Environment and Physical Planning, 2005 a)

Flood control system	River	Total length of trained river (km)
Skopje	Vardar	18,7
	Markova River	1,5
	Momin Potok with Serava River	10,0
	Lepenec	1,0
	Treska with Grupcin River	1,0
	Treska	0,5
Pelagonija	Crna	58,1

Flood control system	River	Total length of trained river (km)
	Dragor	10,7
	Semnica	12,2
	Elaska	1,3
Strumica Pole	Strumica	34,5
	Turija	9,05
	Monospitov Canal	10,3
	Vodoca and Buc	20,5
	Trkanja	4,9
Struga Pole	Crn Drim	10,9

Flood protection schemes are generally constructed in combination with irrigation and/or drainage systems. Insufficient maintenance of flood protection schemes is one of the main problems in the Republic of Macedonia. Regulated rivers are overgrowth with riparian vegetation that reduces channel conveyance and consequently causing floods.

3.3.3 EROSION PROTECTION

In the Republic of Macedonia torrential flows are very often. Numerous settlements are endangered with torrents and consequences of them: sedimentation of material in urban areas, destroyed streets, bridges, houses and other infrastructure facilities. Republic of Macedonia, together with Serbia, Montenegro and Albania performed "red zone of water erosion in Europe". One of the most erosive catchment areas has Kamenicka Reka that has mean annual production of erosive material about 150.000 m^3.

According to the Erosion map of the Republic of Macedonia (Map 19), territory is divided on 5 classes of erosion intensity – from class I that represent extreme erosion to class V that represent very low erosion (Table 18). Generally 96.5 % of the total territory is under processes of erosion - 9.405 km^2 or 38 % is encompassed by more intensive categories (I – III) (Table 19). The total annual production of erosive materials on the whole territory is about $17x10^6$ m^3/year or 685 m^3/km^2.year, which of $7,5x10^6$ m^3/year or 303 m^3/km^2.year are transported downstream. Significant part of these deposits, about $3x10^6$ m^3/year is not carried through the downstream sections of the rivers to the exit of the state territory, but deposed in nature lakes and artificial reservoirs (Blinkov and Trendafilov, 2004).

Table 18: Classes of erosion intensity

Erosion intensity	Category	Erosion coefficient z
Extreme erosion	I	1,01-1,5
High erosion	II	0,71-1,0
Medium erosion	III	0,41-0,7
Low erosion	IV	0,2-0,4
Very low erosion	V	0,01-0,19

Table 19: Areas with particular class of erosion intensity

Erosion intensity	Category	Area (km^2)	Percentage (%)
Extreme erosion	I	687,96	2,77
High erosion	II	1.823,41	7,38
Medium erosion	III	6.893,25	27,78
Low erosion	IV	7.936,08	31,98
Very low erosion	V	7.463,48	30,09

Water management divisions that has more than a half of territory characterised by strong erosion are Gorna Bregalnica (66,46 %), Sredna and Dolna Crna Reka (60,90 %) and Pcinja (59,45 %) (Table 20, Figure 17).

Table 20: Areas of particular category of erosion intensity and quantity of sediments in water management divisions

Water management division	Area of category I-III (km^2)	Area of category IV-V (km^2)	General category and coefficient
Debarsko	328,24 (28,83 %)	810,11 (71,17 %)	IV (z=0,38)
Ohridsko-Strusko	339,52 (36,63 %)	587,24 (63,37 %)	IV (z = 0,24)
Prespa	175,61 (30,75 %)	395,39 (69,25 %)	IV (z = 0,33)
Polog	623,74 (42,69 %)	837,46 (57,31 %)	IV (z=0,38)
Treska	485,91 (30,17 %)	1.124,49 (69,83 %)	IV (z=0,33)
Skopsko	666,91 (34,36 %)	1.273,93 (65,64 %)	III (z=0,43)
Pelagonija	743,69 (24,23 %)	2.325,67 (75,77 %)	IV (z = 0,28)

Sredna and Dolna Crna Reka	1.166,54 (60,90 %)	748,82 (39,10 %)	IV (z = 0,37)
Sreden Vardar	966,84 (37,82 %)	1.589,72 (62,18 %)	III (z = 0,41)
Dolen Vardar	411,42 (32,27 %)	863,44 (67,73 %)	III (z=0,42)
Pcinja	1.410,08 (59,45 %)	962,99 (40,55 %)	III (z=0,58)
Gorna Bregalnica	754,61 (66,46 %)	380,69 (33,54 %)	III (z=0,58)
Sredna and Dolna Bregalnica	871,08 (27,15 %)	2.337,35 (72,85 %)	IV (z = 0,28)
Strumica	381,00 (25,06 %)	1.139 (74,94 %)	IV (z = 0,31)
Dojran	/	/	IV (z = 0,31)

*accumulated in lake or accumulation

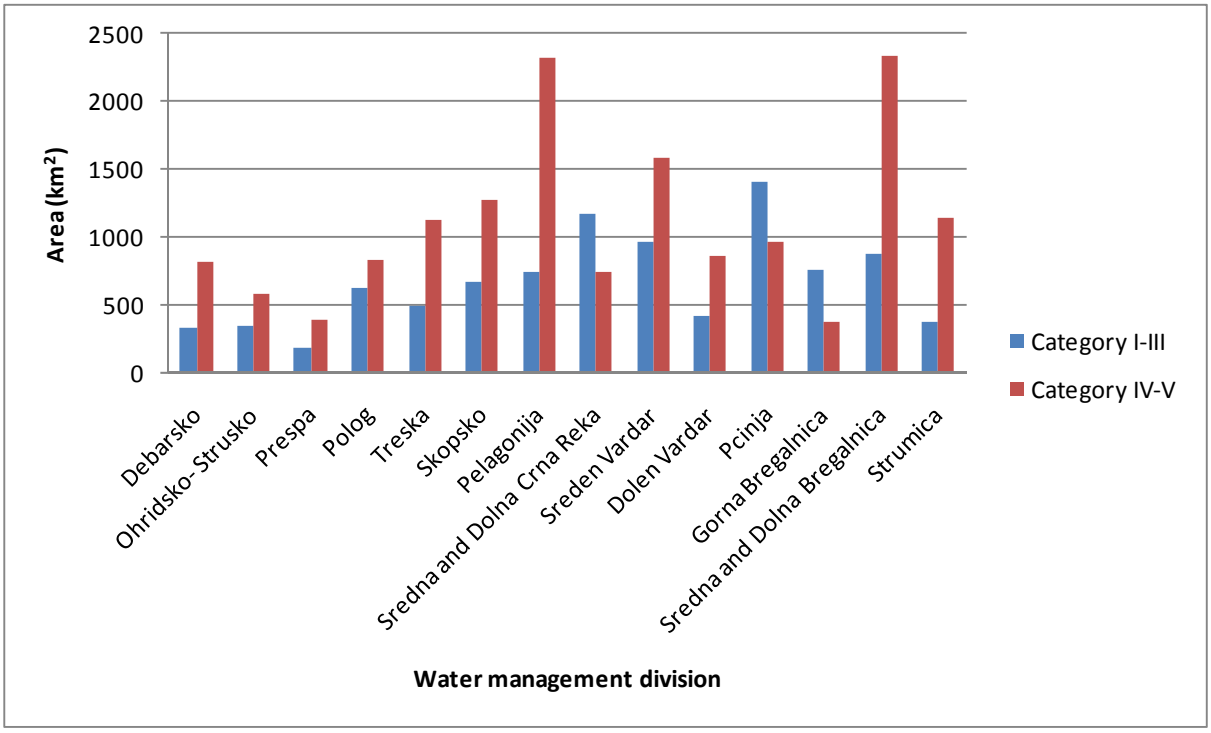


Figure 17: Areas characterised by particular category of erosion intensity in water management divisions

The largest quantity of eroded sediments is present in water management division Pcinja, while the highest percentage (72,1 %) of intercepted sediments is in water management division Ohridsko-Strusko. High percentage is also in water management divisions Debarsko (69,6 %), Prespa (62,8 %) and Polog (59,3 %) (Table 21). Sediments are mainly intercepted by lakes or accumulations. It is estimated that annual

sedimentation of erosive sediments in the reservoirs is approximately 3.000.000 m^3 (Table 22) that means loss of the same amount of space for water.

Table 21: Quantity of eroded and intercepted sediments and percentage of intercepted sediments in water management divisions

Water management division	Quantity of eroded sediments (m^3/year)	Quantity of intercepted sediments (m^3/year)	Percentage of intercepted sediments (%)
Debarsko	810.058	563.819	69,6
Ohridsko-Strusko	504.869	364.207	72,1
Prespa	260.356	163.536*	62,8
Polog	1.020.042	604.885	59,3
Treska	742.143	326.543	44,0
Skopsko	1.244.078	597.779	48,0
Pelagonija	1.169.231	350.769	30,0
Sredna and Dolna Crna Reka	211.668	107.961	51,0
Sreden Vardar	1.951.365	1.056.750	54,2
Dolen Vardar	1.916.000	353.136	18,4
Pcinja	2.285.278	845.553	37,0
Gorna Bregalnica	1.101.923	418.731 *	38,0
Sredna and Dolna Bregalnica	981.056	167.666	17,1
Strumica	521.906	213.981	41,0
Dojran	28.984	11.038*	38,1

Table 22: Annual quantity of intercepted sediments in accumulations

River/ Accumulation	Reservoir volumen (10^6 m^3)	Quantity of intercepted sediments (m^3/year)
Treska/Matka	3,55	412.643
Lipkovska/Glaznje	26,0	36.147
Lipkovska reka/Lipkovo	2,25	3.570
Radunička B. Voda/Mladost	8,0	19.010
Ratevska reka/Ratevo	10,5	29.849
Bregalnica/Kalimanci	127,0	418.731
Kočanska Reka/Gadce	2,4	21.609
Pisicka reka/Pisica	0,5	1.113
Kriva Lakavica/Mantovo	47	27.752
Semnica/Strezevo	90	49.845
Crna Reka/Tikves	475	1.019.341
Prilepska/Prilep	6,0	2.301
Luda Mara/Paljurci	4,0	26.543

Vodoca-Vodoca	27,0	16.797
Turija/Turija	48,0	62.273
Crn Drim/Globocica	58,0	102.629
Crn Drim/Spilje	520,0	563.154
Mavrovska/Mavrovo	357,0	9.119
Total	1812,2	2.822.426

Erosion and torrents are the cause for destruction and degradation of large areas of productive soil, damage and devastation of industrial facilities, irrigation schemes, hydro power systems, water supply facilities and systems etc. Taking into consideration the harmful effect of erosion, numerous protective and melioration measures have been undertaken. As a result, erosion on mountain slopes and in torrents has been reduced considerably, but efforts in the field of erosion control, reforestation and torrent control have nevertheless to be continuously pursued (Development plan).

3.3.4 IRRIGATION

Climate and paedological conditions of the country are suitable for intensive and effective agricultural production, but only if water is efficiently provided through irrigation. The arable agricultural area totals approximately 667.000 ha, essentially located in valleys. Potentially, 400.000 ha, i.e. 60 % of the total arable land, could be irrigated. A wide network of irrigation schemes has existed for some time in the country. About 160 smaller and bigger irrigation schemes have been built, covering an area of 163.692 ha of fertile arable land, i.e. 40,9 % of the area that can be irrigated.

Current condition of the schemes (except Strezevo) is characterized with poor technical condition of the structures, facilities and equipment, high water losses, low use efficiency, not enough capacity for the changed cropping pattern, no flow regulation in the convey structures (canals and pipelines) etc. Very often, the system is not completely built in accordance to the design, so some parts of the systems cannot be used. Reasons for such poor condition of the schemes are numerous (The Ministry of Environment and Physical Planning, 2005a):

- insufficient maintenance of the schemes;
- bad quality of the original construction;
- not fully built according to the design;
- inadequate design solutions;
- insufficient and poor quality of the hydro mechanical equipment;
- large number of water users;
- small size of the plots;
- bad financial situation of the water management organizations and

- rural emigration etc.

Because irrigation infrastructure has not been regularly maintained, managed and complete, only 77 % or 126.000 ha are properly irrigated (Table 23, Map 14). Of this area, 61 % is irrigated by sprinklers and 39 % with other types of surface irrigation. The total water quantity required for the irrigated area is approximately 900 million m^3, which represents 25 % of the total water quantity available from the river network during an average dry year (one sixth in a normal year). Irrigation is foreseen as a basis for the restoration of the country's agricultural potential.

Table 23: Irrigation systems in the Republic of Macedonia (MZSPP, 2010)

Water management division	River	Area (ha)	Quantity ($10^3 m^3$)
Pcinja	Lipkovska, Pcinja, Kriva Reka	8.002	52.277
Polog	Vardar	13.350	91.928
Skopsko	Vardar, Trska, Lepenec, Markova reka	1.428	10.449
Gorna Bregalnica	Bregalnica, Ratevska, groundwater	1.334	7.258
Sredna and Dolna Bregalnica	Bregalnica, Zletovska, Iakovica, Mavrovic	25.758	235.086
Sreden Vardar	Vardar, Babuna, Topolka, Otavica	4.390	39.868
Strumica	Kriva Lakvica, Turija, Vodoca, Belasicki	18.432	117.941
Treska	Treska, Tajmiska, Krapa	1.445	7.974
Dolna Crna Reka	Crna	12.360	87.994
Pelagonija	Crna, Zemenica, Gradska	24.734	144.252
Dolen Vardar	Vardar, Luda Mara, Dojransko Lake	6.858	52.724
Dojran	Luda Mara, Dojransko Lake	250	1.922
Ohridsko-Strusko	Koselska, Ohridsko Lake, Crn Drim, Sat	4.010	26.236
Debarsko	AK Spilje	622	4.073
Prespa	Prespansko Lake	3.635	19.353

3.3.5 SURFACE WATER DRAINAGE

Drainage systems cover a total area of 82.195 ha. Construction of extensive drainage system was started in the 1930s to drain the frequent floods, and continued till the 1960s. Drainage was necessary in many areas (or 'poles') - Skopsko Pole, Pelagonija, Strusko Pole, Strumicko

Pole, and in minor extend in Kocansko Pole, Ovco Pole, Prespansko in others. Characteristics of drainage systems are indicated in Table 24.

Table 24: Characteristics of drainage systems

Drainage system	Characteristics
Skopsko Pole	- drainage area 6.600 ha and - main recipient for drainage water is river Vardar.
Pelagonija	- drainage system divided to Bitolsko Pole (area 30.000 ha) and Prilepsko Pole (24.150 ha); - main recipient is river Crn Drim; for Prilepsko Pole river Blato (left tributary of the river Crna Reka) and
Strumicko Pole	- main recipient is river Strumica.
Kocansko-Stipsko and Ovce Pole	- encompass area on the left and right side of river Bregalnica (6.000 ha) and - main recipient is river Bregalnica.
Prespansko Pole	- encompass area on the left and right side of river Golema Reka (1.800 ha) .

The current status of the drainage systems in the Republic of Macedonia is not satisfactory in relation to the recipients and other drainage network with its facilities, as well as the detailed canal network. As a result of malfunctioning of the drainage systems, many areas were flooded in the past. Chanel conveyance is reduced because of vegetation overgrowth. Conveyance is evidently reduced at Mladinski canal (50-80 %), Monospotovski canal (30-50 %) and river Strumica (30-40 %).

Another problem is high groundwater that appears on the surface and damages the agricultural production, constructions, infrastructure etc. (MEPP, 2005 a).

3.4 IMPACT OF HUMAN ACTIVITY ON THE STATUS OF SURFACE AND GROUNDWATERS

Review of impact of human activity on the status of surface and groundwaters is prepared separately for point and diffuse source pollution, pressures related to biological issues – introduced and invasive species (European Agency for Reconstruction, 2005; 2005 a; EC, 2003; MEPP, 2008), water abstractions, flow regulations and morphological alteration.

3.4.1 POINT AND DIFFUSE SOURCE POLLUTION

The main point source pollution arises from:

- urban waste water from settlements;
- industry;
- agriculture;
- waste management and mining and
- other point pressures.

The main diffuse source pollution arises from:

- agriculture and
- urban waste water from dispersed population.

The point and diffuse source pollution as also a summarised impact on surface and groundwater in the Republic of Macedonia are given in greater detail taking into account quoted sources.

3.4.1.1 Point source pollution

3.4.1.1.1 Urban waste water from settlements

- Urban waste water collection (sewage systems)

Generally, existing sewage systems in major urban areas are designed to collect and convey both, wastewater and precipitation water. Only 12 cities have constructed separate sewage systems. City of Skopje has constructed separate system for wastewater (56 %) and for precipitation water (18 %). Usually, collectors for precipitation water discharge water into closest recipient, while wastewater is discharged downstream from the urban areas. According to the data from "Study on the Conditions in the Public Communal Utilities", there is collector network of 280,6 km and 1.239,1 km of sewage network on national level.

According to data from Census 2002, from total number of dwellings 697.529, 417.653 or 60 % are connected to public sewage, 143.353 or 21 % of dwellings have septic tanks and 85.007 or 12 % of the dwellings have free wastewater discharge. Compared with the connections to public water supply systems, there is significant

difference. Almost 180.000 dwellings, which are connected to the public water supply systems, are not connected to public sewage.

Sewage systems are local systems for each urban area. Beside these local systems there are three larger or regional sewage systems for protection of Ohrid, Prespa and Dojran Lake.

The sewage system for protection of the Ohrid Lake consis of eastern, western and main collector pipeline, pumping stations and wastewater treatment plant. Eastern collector is collecting wastewater starting from monastery "St. Naum", up to city of Ohrid and then is connected to the main collector pipeline in Struga. Total length of this collector pipeline is 44 km. Western collector is covering west cost of the lake, starting from village Radozda up to city of Struga, with total length of 12 km. This pipeline is in construction phase. The main collector is conveying the wastewater from city of Struga up to the wastewater treatment plant in village Vranista.

The sewage system for protection of the Prespa Lake consists of eastern, western and northern collector, pumping stations and wastewater treatment plant. Only the northern collector is constructed and the first phase of the wastewater treatment plant, but the plant is not under operation.

The sewage system for protection of Dojran Lake consists of collector around the lake and wastewater treatment plant. Also, the plant is not under operation.

Current condition of the sewage systems is different in certain urban and rural areas. Generally, the systems are rather old, worn out, the collecting network is constructed of different materials, the pipes are cracked and there is leakage of the wastewater in the ground. The capacity very often is not sufficient to collect all the wastewater. The systems are not separate systems for urban wastewater and precipitation water, and during the floods, the pipes are overloaded and suffer from increased pressure.

In the urban areas where the sewage systems are reconstructed or newly constructed collection and disposal of the wastewater is efficiently performed.

- Urban waste water treatment (waste water treatment plants)

The waste water treatment plants are shown in the map of wastewater treatment plants in the Republic of Macedonia (Map 12). Beside the 3 wastewater treatment plants for protection of Ohrid, Prespa and Dojran Lake, there are also treatment plants in Sv. Nikole and Makedonski

Brod. Unfortunately, only wastewater treatment plants in Vraniste, Struga and in Makedonski Brod are under operation.

Capacity of the first one is 120.000 p.e., while in Makedonski brod, the capacity is 5000 p.e.. The wastewater treatment plant in Vranista has facilities for mechanical, biological and chemical treatment. The purification rate of the treated wastewater is satisfying in accordance to the requirements and it is discharged into river Crn Drim. Recently, treatment plants in Sv. Nikole, Dojran and in Ezerani, Prespa, were reconstructed, but still their operation is not fully satisfying.

According to the results on the distribution of the population in the Republic of Macedonia in relation to treated municipal wastewaters involving only mechanical treatment, biological treatment and application of latest treatment technology, and in relation to public sewage, it can be concluded that the percentage of such population is very low (Figure 18). Despite of the rising trend, the current state is unsatisfactory with regard to EU requirements.

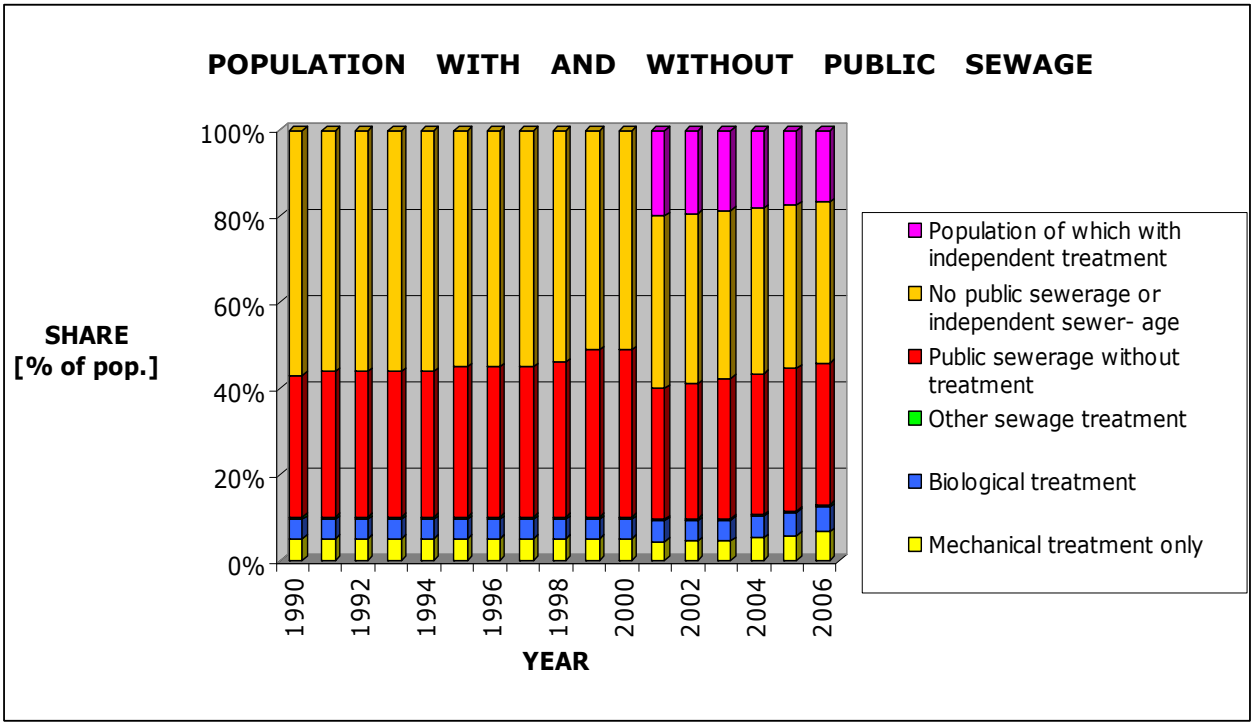


Figure 18: Share of population with and without connection to public sewage and data of level of treatment for years 1990 to 2006 (MEPP, 2008)

Regarding the urban wastewater quantities there is no monitoring of the discharged wastewater from municipal sewage systems. The principal of their estimation is based on wastewater norm per capita per day.

In the Figure there are estimations of wastewater quantities, which were prepared in frame of Expert Report on Water Resources Management for Spatial Plan of the Republic of Macedonia (left column in the Figure 19) and in NEAP 2 (right column in the Figure 19).

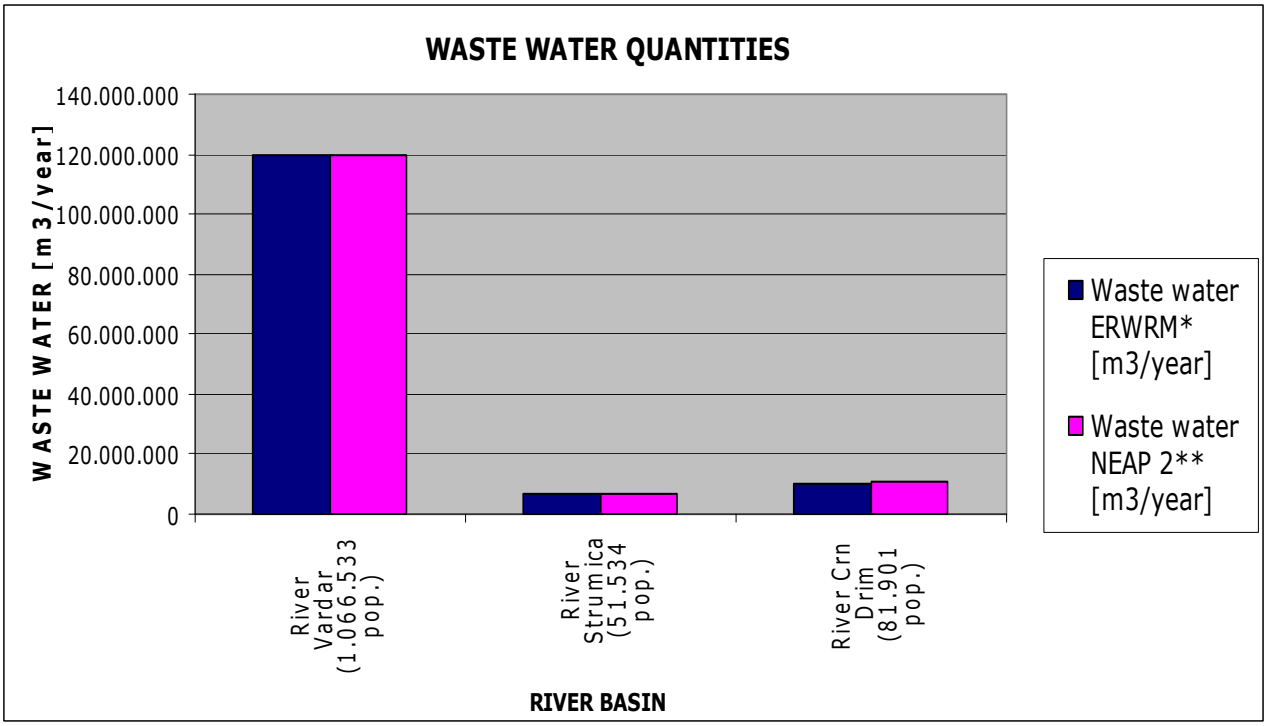


Figure 19: Wastewater Quantities according to ERWRM and NEAP 2.

*In ERWRM, estimations were performed using the number of population for each municipality from Census 1994 and wastewater norm.
**For the NEAP 2, same estimations were performed, but using the number of population from Census 2002.

There is no data on the urban wastewater quality, due to not existing systematic monitoring. In the Law on Waters (Article 150), there are provisions that any wastewater producer must install, operate and maintain measuring devices, as well must provide wastewater quality analysis; in the practice the law is not respected.

Only the laboratory of the Water Supply and Sewage Utility in Skopje (Centre for sanitation control and supervision) has equipment for performing analyses. The wastewater quality is monitored at six locations where main sewage pipes discharge the wastewater into river Vardar. The sampling frequency is two times in a month and the following parameters are controlled: basic physical indicators, parameters for oxygen regime, nutrients, anion contents and specific indicators such as presence of phenol, oil and fuels and surface active substances.

In the Figure 20 there are estimations of wastewater pollution load in tones per year for rivers Vardar, Strumica and Crn Drim.

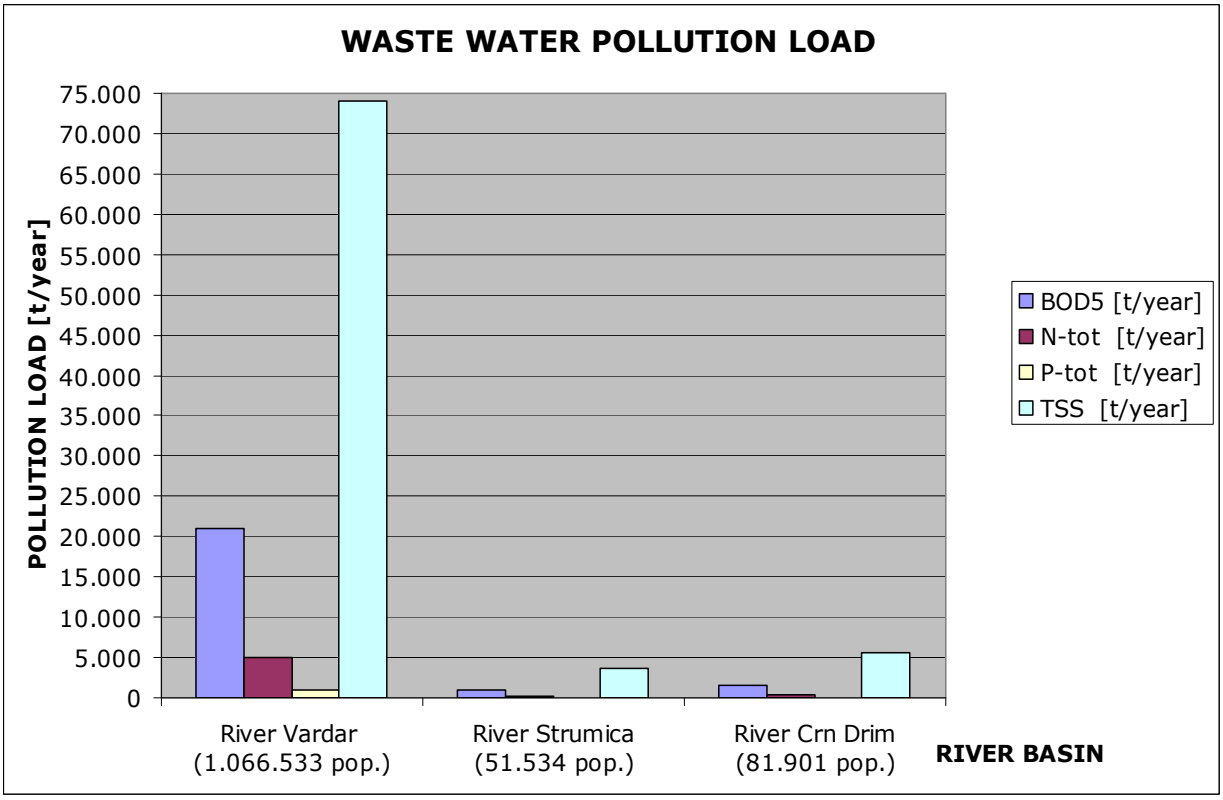


Figure 20: Wastewater Pollution Load in t/year (estimated values in accordance to American Public Health Association)

- Management of sewage sludge

The Law on Water regulates the manner and procedure for recovery of sewage sludge from waste treatment plants, limit values for concentrations of heavy metals in the soil at which the sewage sludge is used and in the sewage sludge, limit annal values of heavy metals which can be introduced in the soil, and the required information for reporting for sewage sludge producers. The quantity and quality of sewage sludge to be re-used (i.e. for land-spreading, co-incineration, composting), which is also one of the requirements of the Sewage Sludge Directive, will be defined in the monitoring program which will be adopted as part of the River Basins Management Plans (MEEP).

The reuse of sewage sludge in agriculture is not regulated at the moment. Advanced sewage sludge treatment (drying, composting etc.) is not practiced in the Republic of Macedonia. Therefore, the use of sewage sludge is currently negligible. However, with increase of the sewage and waste water treatment plants it will become an issue and will have to be dealt with properly (MEEP).

3.4.1.1.2 Industry

In accordance to ERWRM a limited number of industrial waste water treatment plants have been constructed, and most of them only have mechanical treatment. A limited number of industrial waste water treatment plants have mechanical and chemical (or biological) treatment. Some of the industrial waste water treatment plants are out of operation because of malfunction or lack of spare parts or because proper maintenance is too expensive. In the absence of a clear development strategy, it is very difficult to predict industry's future demand for water. ERWRM however estimates industry's demand in 2010 and 2020 to lie in the range of 287.014.000 m^3/year. There is a direct relation between the quantity of discharged industrial waste water and the supplied quantities. The prediction of industry's waste water production in 2010 and 2020 is 229.611.200 m^3/year.

No wastewater monitoring programme is in place. Only industries "Alkaloid", "OHIS" and refinery "OKTA" near Skopje have their own monitoring system of the wastewater and they transfer the data to Information Center at MEPP (Table 25).

Also, Central Laboratory for Environment at MEPP, performed some analysis of wastewater from the following factories: "Agroplod"-Resen, "Blagoj Gorev"-Veles, "Brilijant"- Stip, Cement factory "USJE"-Skopje, "Gold-mak" Radovis, JSP "Skopje"-Skopje, and others.

Analysis showed higher value of COD then the maximum allowed in the recipients where the wastewater from the vegetable oil factories "Brilijant"-Stip and "Blagoj Gorev"-Veles was discharged, as well as from the factories: "Edinstvo", "Gold mak" and "Vigon Inzenering".

The creation of a cadastre of water polluters is ongoing (about 50 % of the estimated total number polluters are registered). There is a need for a clear organization of the updating process as soon as the initial cadastre is created.

In the map there are locations of industrial pollutionbsites in the Republic of Macedonia (Map 21). The main potential industrial water polluters[3] are: the copper mine Bucim in Radovis (restarted in 2005 after a long period of non-operation); a factory for metal lining in Kicevo; the industry Jugohrom for ferroalloyes; the zinc and lead melting factory in Veles; the lead and zinc mines in Kamenica, Probistip and Toranica (currently, the last two are out of operation); the chemical industry OHIS in Skopje; the thermo power plant in Bitola; the

3 According to Post conflict Environmental Assessment performed by UNEP in 2000

fertilizer factory in Veles; together with other smaller factories and plants. Significant quantities of waste water are discharged from mine pits and flotation units. Around 420 m^3/h untreated waste water is discharged from four flotation units for metal ore.

In the table (Table 25) 16 identified industrial contaminated sites - "hot-spots" including information on status of operation for individual site.

Table 25: Identified industrial contaminated sites - "hot-spots" (MEPP, 2005 a)

Nr.	Site ('hotspot')	Municipality	Status of operation	Environmental Liability
1	OHIS Chemical Industry	Skopje	Abandoned, partly operational	Macedonia /OHIS
2	Silmak Ferro/Silicium Smelter (former HEK Jugochrom)	Jegunovce	Dumpsite closed	Arbitrary
3	MHK Zletovo Lead/zinc Smelter	Veles	Closed (7 yrs)	Due diligence
4	Lojane Chromium/antimony Mine	Lojane	Abandoned (35 yrs)	Macedonia
5	Toranica Lead/zinc Mine	Kriva Palanka	Closed (>10 yrs)	Macedonia
6	Zletovo Lead/zinc Mine	Probistip	Closed (8 yrs)	Macedonia
7	Sasa Lead/zinc Mine	Makedonska Kamenica	Closed (8 yrs)	Macedonia
8	Bucim Copper Mine	Radovis	Operational	Arbitrary
9	REK Bitola (lignite mine/power plant)	Bitola	Operational	REK Bitola
10	REK Oslomej (lignite mine/power plant)	Kicevo	Operational	REK Oslomej
11	Makstil Steelworks	Skopje	Operational	Makstil
12	OKTA (petroleum refinery)	Skopje	Operational	OKTA
13	Tane Caleski (metal products)	Kicevo	Closed (3 yrs)	Macedonia
14	MHK Zletovo Fertilizer Plant	Veles	Closed (2 yrs)	Macedonia
15	Godel Tannery	Skopje	Closed (5 yrs)	Macedonia
16	Feni Industry (ferro-nickel alloys)	Kavadarci	Operational	Feni industry

3.4.1.1.3 Agriculture (livestock farms)

Discharges of waste water from livestock farms (cows, beef, pigs and poultry) and slaughterhouses are treated as point pollution sources. These pollution sources discharge wastewater directly to the recipients, almost without any treatment. According to the available data there are several large animal and poultry farms in the Republic of Macedonia with the capacity which is shown in the Table 26.

Table 26: Capacity of large animal and poultry farms (Kungolovski)

Name and Location of the farm	Dairy cows	Beef cattle	Pigs	Hens
Trubarevo - Skopje	300			
Rzanicino - Skopje	300			
Cento - Skopje	300			
Konjare - Skopje		100		
Petrovec - Skopje (military farm and slaughterhouse)			5.000	
Kumanovo		300	28.000-30.000	
Celopek - Tetovo			3.000	
Sv. Nikole (farm and slaughterhouse)	300	500	10.000	
Krivolak		800		
Kavadarci - Sopot		100		
Stip		100		
Gradsko - Veles			10.000	
Gevgelija			14.000	200.000
Belimbegovo-Skopje, Ohrid, Resen, Bitola				No data

There are no available data on the quantity and quality of the discharged waste waters from farms, except from the Kumanovo and Petrovec farms[4]. The main indicator for heavy pollution from these farms and slaughterhouses is the poor quality of the surface water (rivers, where they discharge the wastewaters).

Some of the farms have facilities for primary wastewater treatment, but they are not sufficient for treatment of waste water with nutrient and microbiological pressures.

The livestock farms are also point sources due to livestock manure (organic fertilizer) storaging and processing of the manure. Organic manure production amounts to about 3 million t/year of which 40 % is from sheep 40 % from large ruminants and pigs and 20 % from poultry.

4 Kumanovo – farm: 800 m^3/day, and Petrovec farm and slaughterhouse 101,25 m^3/day

The pasture areas are also potential endangered areas from the livestock manure. The application of the livestock manure as fertilizer does not reduce the danger of presence of nitrates in the ground water. On contrary, locations of storage for livestock manure are high potential danger for nitrate pollution of the water, due to the large quantities located on one place and danger of infiltration of the rainwater in the ground.

In the past, nutrients from *large-scale pig and poultry* breeding units and livestock production were a main cause of pollution primarily by inadequate waste storage facilities and little use of waste treatment technology. Nowadays, the pig and poultry production has declined, but the existing intensive farms are still significant sources of pollution. This, and possible plans for further intensive production may constitute a real threat to the environment in case the issue of proper waste management is not sufficiently dealt with.

3.4.1.1.4 Waste management and mining

- Waste

Collection, transport and landfill are the main methods for final disposal of almost each waste fraction. Only approximately 70% of the population is involved in public municipal waste collection system. Collection of non-separated municipal and non-hazardous industrial waste, as well as non-separated non-hazardous and hazardous waste fractions is common practice. Scrap metals represent the biggest part of the collected recyclable materials. There are no formal collection systems for construction and demolition waste as well as for high-risk animal tissues from slaughterhouses and animal breeding farms. The level of management of hazardous and non-hazardous medical waste within the hospitals is generally low (MEPP).

In accordance to data of Waste Management Strategy of the Republic of Macedonia (2008) estimated total amount of generated waste, inclusive of waste from mining amounts to approximately 26 million t/year. The main waste fractions arise from mineral excavation and ore processing (17,3 million t/year). The expected growth of waste quantities is 1,7% per year depending on the dynamic of economic development in the country (MEPP).

- Landfills

In the Republic of Macedonia there are 55 active municipal landfills operating without permits. Only the landfill DRISLA that covers the region of Skopje has the operational permit and is the only waste site compliant with national requirements. However, even this waste site doesn't comply with contemporary technical standards or with the requirements of the EU Landfill Directive. Active municipal waste landfills are categorized according to the assessment of their environmental risk. According to this

categorization 16 landfills are ranked with high risk, 16 with medium, and 19 with low environmental risk (MEPP). Map of the existing municipal landfills of the Republic of Macedoina is presented in the map (Map 22).

Municipal waste that is not collected by official enterprises is disposed at illegal landfills. There is estimation of approximately 1.000 illegal landfills, in particular in rural municipalities (MEPP).

- Mining

In the Republic of Macedonia the hazardous waste generated by mining and processing industries faced severe problems during the transition period and many have stopped their activities, with no chance of being restarted in the near future. Their on-site process waste dumps were abandoned as well, and little or no information is available on the history of these dump sites (MEPP). Existing mines of the Republic of Macedoina (64 mines) are presented in the map (Map 23).

In the frame of National Waste Management Plan (MEPP, 2005b) 16 Industrial Contaminated Sites - "hotspots" were identified and evaluated. Out of those, historical mining waste is presented in the table (Table 27), including current status of operation.

Table 27: Historical mining waste (MEPP, 2005b)

Mining Environmental Hot Spot	Current status	Landfill waste quantity (m^3)	Landfill area (m^2)
BUCHIM (copper mine) - Radovis Open pit; Waste Rock Dump; Tailings	In operation	250.000.000	900.000
MHK Zletovo (lead and zinc smelter) - Veles Tailings; Dumps	Out of operation	1.115.00	95.000
LOJANE (chromium, arsenic, antimony mine) - Kumanovo	Abandoned	1.000.000	95.000
SASA (lead and zinc mine) - Makedonska Kamenica	In operation	30.000.000	285.000
SILMAK (ferro-silicon plant, former HEK Jugohrom) - Jegunovce Tailings (Cr6)	Out of operation	851.000	80.000
Toranica (lead and zinc mine) - Kriva Palanka	Out of operation	3.000.000	25.000
ZLETOVO (lead and zinc mine) - Probistip	In operation	14.000.000	280.000

Mining Environmental Hot Spot	Current status	Landfill waste quantity (m^3)	Landfill area (m^2)
REK Bitola (thermal power plant and lignite mine) - Bitola.	In operation	11.000.000	100.000
FENI Industry (ferro-nickel smelter) - Kavadrci	In operation	2.200.000	167.000
REK Oslomej (thermal power plant and coal mine) - Kicevo	In operation	2.000.000	280.000

3.4.1.1.5 Other point source pollution

Besides continuous environmental impacts from the above discharges, several great incidents have taken place in the past period, in a form of floods over large areas around the tailings disposal sites and surface and ground water resources contamination. The latest incident was recorded in the lead and zinc mine Sasa, in 2003, and similar accident took place several years ago in the copper mine Bucim.

There is also risk of contaminations of surface and groundwaters from road and railway accidents being increased with higher density of roads and railways shown in the map (Map 20), especially where no preventive measures for accidents (for example collection and treatment of water from roads) is taken.

3.4.1.2 Diffuse source pollution

3.4.1.2.1 Agriculture

There are about 180.000 individual agricultural holdings with a relatively small average size of 2,6 ha and with substantial fragment.

The livestock sector is characterized by a large number of small, subsistence oriented households; commercially oriented family farms; and a decreasing number of large specialized livestock enterprises.

- Land use

Land use within the Republic of Macedonia has been categorised on the basis of productive purposes (agriculture and forestry) and nonproductive purposes (water and watercourses, infrastructure, settlements and non-arable land). As it is shown it the map of Land use in the Republic of Macedonia (Map 13) the main land use is agricultural land, the second gratest part belongs to forest. Settlements represent 1,4 % of the total area (Figure 21).

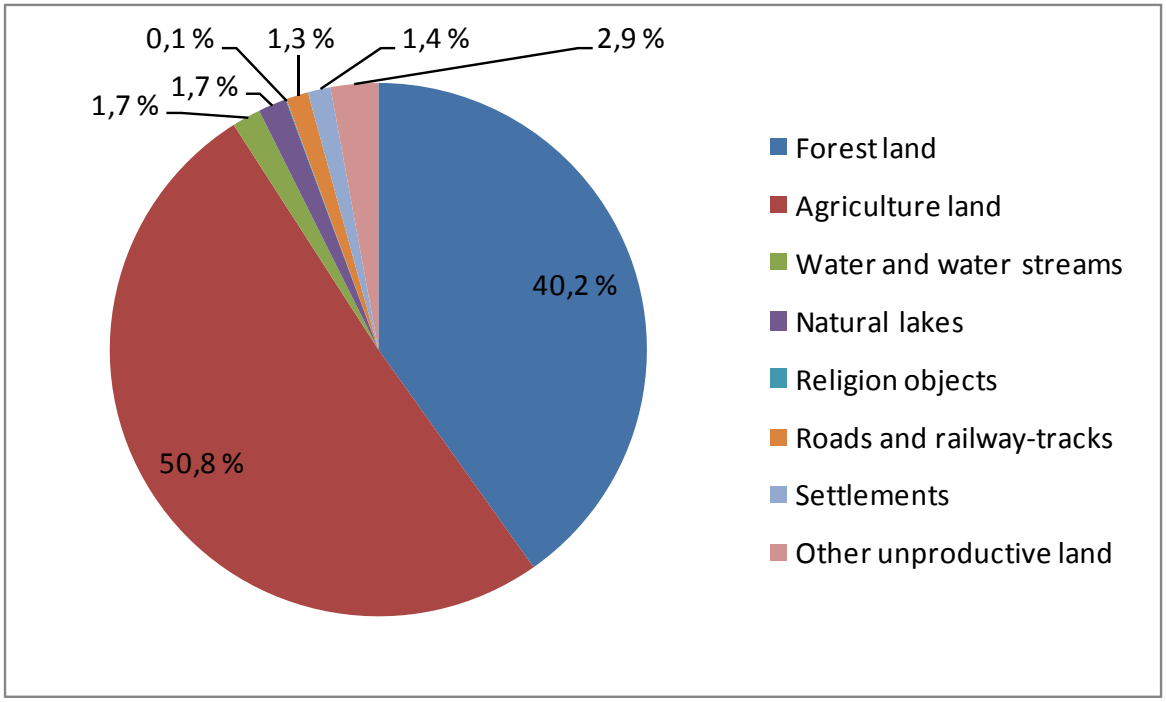


Figure 21: Land use in the Republic of Macedonia (www.inweb.gr)

In accordance to the data form the year 2000 State Survey Administration productive land has been exhibiting a slight decrease over the past twenty years.

In 2005, the share of the area under organic farming in the Republic of Macedonia amounted 0,049% and 0,060% area under conversion in the total cultivable land. Out of the total agricultural land area, 0,127% of the area was used for organic farming, including also forest areas, pastures and uncultivated land and 0,027% area under conversion.

- Gross Nutrient Balances

The nutrient balance or nitrogen balance[5] establishes the link between nutrients used in agriculture and changes in the quality of the environment, in order to achieve sustainable use of soil nutrients in terms of their input and output.

In the period from 2000 to 2001, significant rise in gross nitrogen balance was tracked, followed by a period of stagnation, to note rapid drop in the period from 2002 to 2003 and further slight fall in the gross nitrogen

[5] The nutrient balance estimates the potential surplus of nitrogen on agricultural land. This is done by calculating the balance between nitrogen added to a hectare agricultural land. It accounts for all inputs to and outputs from the farm. The inputs consist of the amount of nitrogen applied via mineral fertilisers and animal manure as well as nitrogen fixation by legumes, deposition from the air, and some other minor sources. Nitrogen output is contained in the harvested crops, or grass and crops eaten by livestock. Uncontrolled escape of nitrogen to the atmosphere, e.g. as N_2O from agriculture is difficult to estimate and therefore not taken into account.

balance expressed both in thousand tonnes and kilograms nitrogen per hectare agricultural land (kgN/ha) (Figure 22). Constant exceed in nitrogen balance indicates potential environmental problems, while constant deficit indicates potential risk of reduced nutrients in the soil.

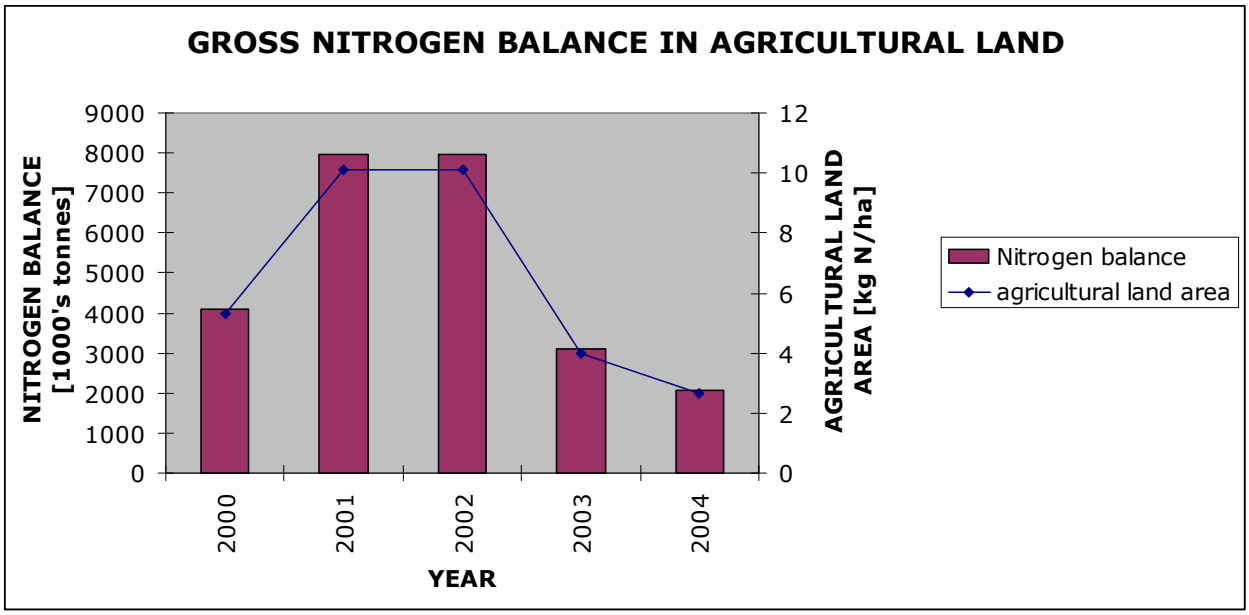


Figure 22: Gross nitrogen balance in agricultural land for years 2000 to 2004 (MEPP, 2008)

- Mineral Fertilizer Consumption

Mineral fertilizer consumption in agriculture noted a falling trend in the period from 2000 to 2005 (Figure 23). Consumption of nitrogen mineral fertilizers decreased for 29,8 %. Consumption of potassium fertilizers dropped for 92,3 %. Consumption of combined mineral fertilizers dropped for 53 %, while the total consumption of mineral fertilizers decreased for 39,7 %. Consumption of phosphorus fertilizers has only increased for 31 %.

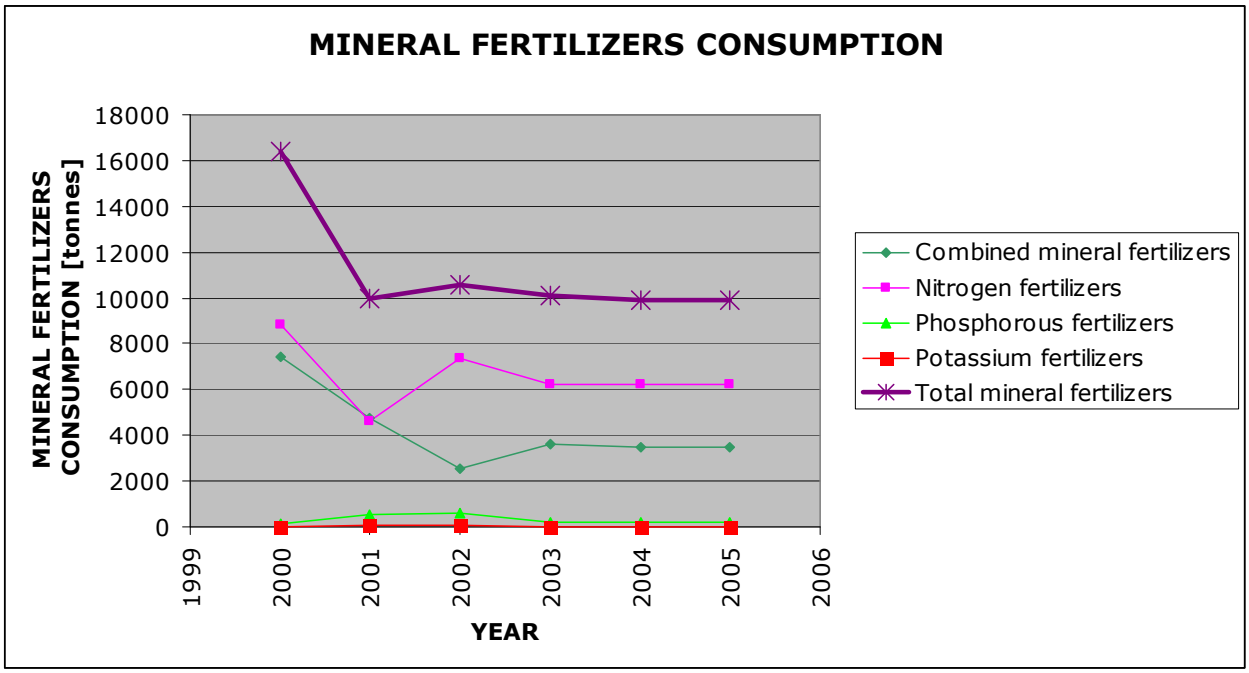
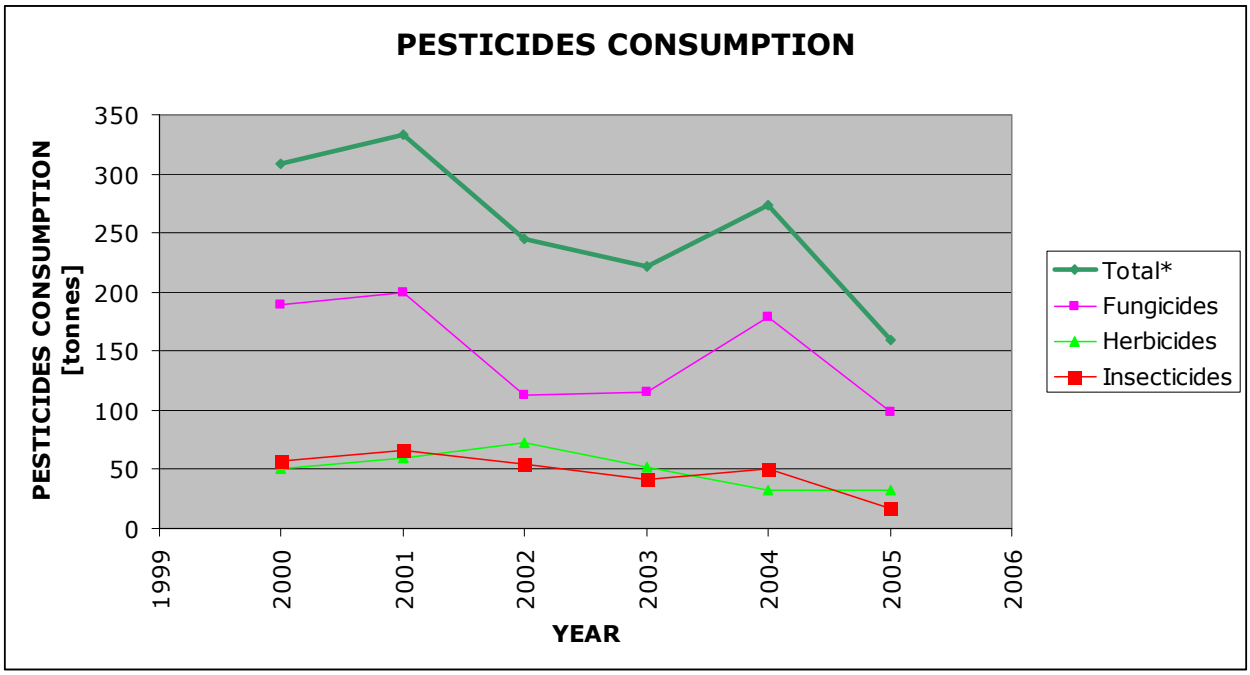


Figure 23: Mineral Fertilizers Consumption for years 2000 to 2005 (MEPP, 2008)

It is difficult to connect the reduction in mineral fertilizers consumption directly with the impact on the quality of the environment. The ultimate effect on the quality of environment depends to a great extent on other factors, such as use of organic fertilizer, yield from crops, soil types, management of agricultural farms, etc.

- Consumption of Pesticides

Application of pesticides in agriculture, including all plant protection products, like fungicides, herbicides, insecticides and total quantity shows a trend of slight reduction in quantity consumed in the Republic of Macedonia in the period between 2000 and 2005, with an exception of 2001 when increase in quantities consumed was recorded (Figure 24). In terms of share of pesticides in 2005, the highest quantity consumed of fungicides was 67 %, followed by insecticides with 11 % and herbicides with 22 %.



*The category "total", apart from recorded fungicides, herbicides and insecticides, covers other pesticides as well

Figure 24: Pesticides Consumption for years 2000 to 2005 (MEPP, 2008)

3.4.1.2.2 Urban waste water from dispersed population

More than 750.000 inhabitants live in 1.742 rural areas. The villages are of a compact structure and, from the geographical perspective more than 70 % of them have good conditions for development as they are located in the plains (38 %) and on the hills (40 %). However, also a significant number of villages are located in the mountain areas (22 %).

Almost one third of the villages are very small, i.e. up to 100 inhabitants and about 140 of them are depopulated. Population drainage of large areas can most often be seen in the mountain areas. The villages of between 2.000 and 5.000 inhabitants which are distributed in the gravitation area of the cities are economically sustainable.

Generally, the basic infrastructure and related installations of rural areas (water supply, sewage and waste water treatment, roads, electricity) are insufficient.

3.4.1.3 Impacts from point and diffuse source pollution

3.4.1.3.1 Impacts from point and diffuse source pollution on surface waters

Surface waters in the Republic of Macedonia are seriously endangered by various sources of physical, chemical and biological pollution. Water

quality current condition of the most of surface water is not satisfying the requirements of the secondary legislations.

Main polluter is the urban wastewater, which is discharged directly into the rivers and streams without treatment. In the period until the year 2006, there was no reduction in BOD_5 and in concentrations of ammonium observed in rivers in the Republic of Macedonia (Chapter 3.1.5.1). At some monitoring stations, located on the rivers Crna Reka and Vardar, eutrophic water status with high BOD_5 value was recorded. These results could reflect the status of inefficient treatment of urban and industrial wastewaters in the country, as well as the inadequate protection of river basins.

Considerable share of pollution is based also on wastewater from chemical, food processing, ferrous, leather industry as well as from animal farms. The largest cities in the Republic of Macedonia, like Bitola, Prilep, Strumica, Tetovo, Gostivar, Veles, and Stip have no wastewater treatment plant. Industries also do not treat the wastewater and especially dangerous are beside the organic pollution from food processing industry and slaughterhouses, pollution with heavy metals: chromium, iron, cadmium, lead and zinc. The main polluters of water in Macedonia consist of the following industries: chemical, leather, food processing, metal refining and other industries, as well as swine production facilities and communal wastewaters.

The irresponsible discharges of high concentrations of organic and inorganic pollutants over a period of years have led to the deterioration of riverine ecosystems as it is given in the Table 28.

Table 28: Major river systems in the Republic of Macedonia, types of pollution, sources of pollution, legal category and observed category (MEPP, 2003)

River System (and location)	Pollution	Source of Pollution	Regulated Category	Observed Category
Vardar				
- Vrutok	Organic	Solid waste	I	I-II
- Jegunovse	Inorganic	Chromium	II	III-IV
- Skopje-Saraj	Organic-inorganic	Agriculture, wastewater	II	III-IV
- Skopje-Jurumleri	Organic-inorganic	Industry, wastewater	II	>IV
- Veles	Organic-inorganic	Industry, wastewater	III	>IV
- Fertiliser factory-Veles	Inorganic	Chemical industry	III	>IV
- Demir Kapija	Organic-inorganic	Wastewater, tributaries	II	IV- >IV

River System (and location)	Pollution	Source of Pollution	Regulated Category	Observed Category
- Gevgelija	Organic-inorganic	Wastewater, industry, agriculture	II	IV- >IV
Lepenec	Inorganic	Asphalt plant, industry	II	IV-III
Treska	Organic	Wastewater	II	II-III
Pcinja	Organic-inorganic	Industry, wastewater	II	IV- >IV
Bregalnica	Organic-inorganic	Wastewater, mines	II-III	IV- >IV
Crna	Organic-inorganic	Wastewater, industry	III-II	IV- >IV
Dragor	Organic-inorgani	Wastewater, industry	III	>IV

The state of eutrophic aquatic ecosystems is also alarming in terms of pollution. This is of particular concern in Dojran Lake, which is rapidly losing its identity as a lake ecosystem, instead being reduced to the status of a marsh. Although direct efforts have been undertaken for the protection of Ohrid Lake, little has been done to protect Prespa Lake, the main source of water in this relic system. In addition, the major reservoirs Strezevo, Tikvesh Lake and Turija are also under great pressure.

The trend of decreasing of pollution which is shown for river Vardar is a positive one for the water quality, but unfortunately, this trend is a result of decreased intensity of industry's activities and not due to undertaken measures for protection of the surface water.

The condition of the surface water quality is better in areas with low population density and on areas without industry.

To summer up, the major polluters of surface and groundwaters are the municipal sewage systems that collect household and industrial waste water (in many settlements rainfall drainage, too) and the industrial sewage systems. In the agricultural northeast, there is significant pollution from livestock waste, farms, slaughterhouses, milk processing, meat and canned food industries. In general, polluted waters are directly discharged into receiving water bodies without any treatment. Some rivers are actually turned into collectors of waste water by enormous pollution discharges. This is the case of the Vardar in Skopje after the urban waste-water discharges, in Veles after the waste-water discharge from the smelter plant and the fertilizer plant; and also with

the Dragor near Bitola and the Kumanovka near Kumanovo. The water quality of the Vardar, Crna Reka, Strumica and Bregalnica rivers, after receiving household and industrial waste waters from the towns of Tetovo, Skopje, Veles (Vardar), Prilep, Bitola (Crna Reka), Kocani, Stip (Bregalnica) and Strumica (Strumnica), is below regulation standard and in poor hydrobiological condition. In years before 2002 the situation has somewhat improved because of the industrial decline.

3.4.1.3.2 Impacts from point and diffuse source pollution on groundwaters

In the legislation and professional practice of the Republic of the Macedonia there is no firmly intended use and applicable criteria for the pollution (aquifers) that could be applied for proper classification. For water which is used for sanitary purposes (drinking water) there are provisions given by legislation and policies for certain criterias for water use in terms of their chemical, physical, bacteriological and radiological characteristics.

As already mentioned the problem of groundwater pollution should be strictly observed as a common problem of pollution of the overall environment, water, air and soil.

In general, potential sources of groundwater pollution are industrial, agricultural and urban waste water pollution. A small part of urban and industrial waste waters is treated. The share of waste water treatment infrastructure is low but in constant growth. It danger of groundwater pollution is in direct connection with potential contaminants, so these two things need to be analyzed in parallel.

The preparation of the cadastre of pollutants at the state level is in the final stage. With the completion of the cadastre relevant data on pollutants will be provided. With application of the cadastre of pollutants and map of vulnerability of groundwater for pressures form pollution "hot spots" of pollution will be identified from which will inevitably lead to preventive measures.

Basic guidance on protection of groundwater against pollution should have a preventive nature. The stress should be given to early detection or observation of possible sources of pollution and in taking appropriate measures to prevent their harmful impact on water.

Nevertheless there are many examples of already caused water pollution sourcing from wastewater discharges, and in general from human activities, particularly in areas of concentrated industrial production: chemical, metallurgical, textile and oil-processing industry and other production. Under the influence of polluters smaller or larger zones of contamination were formed within groundwater.

Complete liquidation of the so formed zones of contamination and re-establishment of satisfactory quality of groundwater represents a very

difficult, sometimes unsolvable task. Therefore, often the approach is to take measures aimed in localization of pollution in terms of pollution prevention, or in prevention of further spread of pollution within a given aquifer.

Groundwater, which is used as a source for dinking water supply in a wider extent, in this respect has special significance. The groundwater protection can not be discussed without capturing organized monitoring in a national level, which unfortunately currently does not exist.

For successful resolving the tasks in the scope of this issue, hydrogeological studies for the ascertainment and assessment of the groundwater reserves and designing of water sources intakes, should be completed and extended for the purpose of definition of the groundwater quality and its longtermed and organized protection.

Therefore, knowledge of hydrogeological and other environmental conditions, the state of contaminated sites, or threats of groundwater pollution, the existence of certain sources of pollution and "hot spots" or potential opportunities in this regard are undoubtedly a necessary pre-condition for timely undertaking of permanent or temporary measures for groundwater protection.

In the Republic of Macedonia there are groundwaters locally contaminated or highly endangered due to pollution. Those are waters in alluvial sediments of major rivers such as the River Vardar, Bregalnica, Treska, Crna Reka. Groundwater has the character of mineral raw materials and it is regulated by the Law on Mineral Resources. The fact that groundwater and surface waters are often in mutual interaction both in relation to quality and quantity undoubtedly imposes the demand for involvement of this matter in the Law on Waters.

Such incorporation of water within two laws may not be the most appropriate solution. As previously mentioned that the groundwater protection can not be viewed in isolation but is part of the general environmental protection brings to the conclusion that this matter should be regulated by the Law on Environment and on Nature Protection. It is necessary that in the process corresponding European directives are implemented and consistently carried out.

3.4.2 PRESSURES RELATED TO BIOLOGICAL ISSUES – INTRODUCED AND INVASIVE SPECIES

Invasive non-native species can threaten native species or their habitats, causing ecological damage and damage to economic activities. The reason is in inherently high reproductive rates and consecutive many of introduced species may become invasive, especially if their expansion is

not controlled. Additionally, they occupy the habitats of indigenous species and displace them (MEPP, 2003).

In the Republic of Macedonia, invasive plant species are found in some aquatic ecosystems. An example is the species *Elodea canadensis* (Elodea), which was first introduced into Ohrid Lake. It is an invasive weedy species which rapidly reproduces and expands, out-competing the indigenous submersed macrophytic species and occupying their habitat.

Most of the introduced and invasive species of fauna belong to the superclass *Pisces* and class *Mammalia*.

Concerning the fish fauna of natural aquatic ecosystems, the following introduced species are now considered to be invasive: *Acerina cernula*, *Ameiurus nebulosus*, *Carassius auratus*, *C. carassius*, *Lepomis gibbosus*, *Oncorchynchus mykiss* and *Pseudorasbora parva.* The abundance of the populations of these fish species is continuously increasing due to the competitively inferior indigenous species. These invasive species are found primarily in the key ecosystems of Ohrid and Prespa Lakes, as well as in the watershed of the Vardar River.

Among Mammals (*Mammalia)*, the group of exotic species includes the Muskrat (*Ondatra zibethicus)*, whose population has spread in a north-south direction along the Vardar River and into the eastern part of its watershed, and the Coypu (*Myocastor coypus)*, which is currently restricted to Prespa Lake and the upper course of the Vardar River. Fortunately, these two species have not yet had a direct negative impact on the indigenous fauna of mammals.

3.4.3 WATER ABSTRACTION, FLOW REGULATION AND MORPHOLOGICAL ALTERATION

Pressures related to water abstraction, flow regulation and morphological alteration may arise from ongoing human activity (e.g. water abstraction for hydropower plants), historic human activity (e.g. engineering works as river straightening, bank reinforcement etc.) or new development (e.g. increasing demand for drinking water supplies). In the Republic of Macedonia there are many so-called hydromorphological pressures due to mentioned above activities. Main pressures are:

3.4.3.1 Impoundments (accumulations) with large dams

In the Republic of Macedonia there are numerous accumulations with large dams. Those dams are causing significant environmental impacts, i.e. interruption of fish migration (where dams are not eqipted with fish passages), interruption of the flow of sediment downstream of the

dams, loss of in-channel habitats, change form lothic to lenthic ecosystem etc. Beside large dams there are also over 120 small dams constructed as part of small hydropower plants, fish farms etc.

3.4.3.2 Water abstractions

Water is abstracted for different purposes, mainly for water supply, hydropower production and irrigation. Those pressures cause negative impacts as low flows or dry up especially in summer period, high temperature in pools isolated by low flows, exacerbation effects of pollution because very limied dilution and others,

3.4.3.3 Physical changes (e.g. river strengthening, reprofiling, bank reinforcement, embankments etc.)

Rivers in Macedonia are morphologicaly altered due to flood and erosion protection measures. Rivers are regulated especially in regions Skopsko, Pelagonija, Strumica and Struga. Significant physical changes are recognized at rivers Vardar, Treska, Crna Reka, Strumica and Crn Drim. Numerous regulations are constructed in contrast with good practice (i.e. recent regulations at Vardar's tributaries Dosnica and Bosavica in the nearness of Demir Kapija) and cause significant negative environmental impacts like loss of connection between surface water and groundwater due to river bad reinforcement, loss of in-channel habitats and significant changes to erosion and sediment deposition in the surrounding channel as a result of channel straightening, loss of floodplain wetlands and associated biodiversity from the construction of embankments, increased inputs of fine sediments due to farm run-off or loss of bankside vegetation etc.,

3.4.3.4 Gravel extractions

Gravel extraction is problematic in many rivers in the Republic of Macdonia. This pressure causes river bank and river bad erosion and consequently degradation of aquatic habitat and is evident at rivers Lepenec (Skopsko), Vardar (Polog, Sarakinci, Skopje, Gevgelija), Pcinja (Konjare), Sateska (Pesocani), Crn Drim and others. Excessive gravel extractions also lead to loss of habitat for fish spawning, invertebrates and aquatic plants;

3.4.3.5 Hydropower plant operation (hydropeaking)

For accumulation hydropower plants variable water lavels in reservoir and variable discharge below generating stations are typical. In the Republic of Macedonia this type of hydropower plants is prevailing. Pressures are reflected in bare banks and potential stranding of fish, preventing the growth of plants and spawning of fish etc.,

3.4.3.6 Water divertion

In the Republic of Macedonia water is diverted from one to another river basin for different purposes – hydropower production, water supply and irrigation. This pressure is recognized at Crn Drim River Basin to Vardar River Basin (accumulation Mavrovo), Treska River Basin to Crna Reka River Basin (water supply system), Kriva Lakvica River to Strumica River Basin (irrigation system).

3.4.3.7 Lake water level diminishing

Due to unsustainable water use and water management lake water level diminishing is recognized, especially at Dojran and Prespa Lake.

4. WATER MANAGEMENT OBJECTIVES

The main water management objective is achieving an integrated and coordinated water regime on the territory of the Republic of Macedonia. This includes not only location and construction of water systems but also quantity and quality state of water in a manner that best suits a particular location and certain period of time. By integrated water management in the Republic of Macedonia it is necessary to:

- ensure sufficient quality of drinking water for public supply;
- ensure the necessary quantity of water of adequate quality for various commercial purposes;
- protect people and material goods from the harmful effects of water;
- achieve and preserve good water status of surface and groundwater bodies
- protect aquatic and water dependent ecosystems and
- harmonize measures of water management with other sectors of space users.

In this regard, it is possible to determine the number of strategic objectives and objectives to be achieved within the framework of water management. Some of them can be achieved exclusively through water management; a part of them could only be realized through the cooperation with other sectoral policies.

It is necessary to especially outline the objectives of public interest (protection against floods and other harmful effects of water, public water supply and water protection). On that basis the development of water management can be directed within the water management activities. The objectives can be realized through integrated measures or independently. Developmental basis for the water use are mostly depended on market and should be determined by the competent institutions. Water management sector should cooperate in the respect of interpreting the significance of certain multipurpose accumulations and their impacts on the water regime, aquatic ecosystems and the ecosystems dependent on water.

In order to realize an integrated, unified and rational water management in the Republic of Macedonia it is also necessary to continue to work on the processes of development of water management through:

- planning, implementing and monitoring of the effects of measures which should be made at the level of basic services and should be integral (surface and groundwater, river basins and water resources, users and resources);
- legal, financial and institutional framework and
- promotion of the inclusion of competent authorities, of all water users and the public.

4.1 PROTECTION AGAINST FLOODS AND OTHER HARMFUL EFFECTS OF WATER

In the field of protection against floods and other harmful effects objectives for river training, flood protection, erosion protection, irrigation and drainage are listed.

4.1.1 RIVER TRAINING

Alteration of hydrological regimes. Construction of reservoirs (accumulations) is necessary for mitigation of extreme hydrological phenomena, e.g. drought and floods that are more intense due to climate change. In the planning stage all the accumulations should be individually evaluated and analyzed comprehensively and thereby take into account impacts on the environment and nature;

Sediment exploitation. Exploitation of river sediment can be done only on defined parts of the river - natural tolerance and sediment capacity should be considered. Extracted sediment quantities must be renewable, so it is important to organize systematic monitoring of sediment transport and morphological characteristics of the riverbed. Commercial exploitation of gravel can be performed only with permission. Foreseen locations for sediment exploitation should consider aspects of groundwater protection, protection of environment and nature;

4.1.2 FLOOD PROTECTION

Coordination of competence and responsibility. Flood protection improvement requires application of numerous integrated, systematic and cost-effective preventive measures – structural and non-structural measures. A prerequisite for their application is active and coordinated participation of all stakeholders – water and economy sectors, service of protection and rescue, hydro-meteorological service, health planners, local governments, regional governments, users and managers of multipurpose reservoirs, farmers, nature protection institutions, scientists and researcher, media, higher education institutions, NGOs and citizens. State of security from floods cannot be achieved without implementation of civil engineering measures which include regular economic and technical maintenance of watercourses, water resources and aquatic building structures and works on developing the system for implementation of construction of flood protection measures. Preventive flood control of international basins is planned through cooperation with competent authorities from other states in accordance with the accepted multilateral and bilateral agreement on cooperation in water management.

Definition of priority areas of action. Considering health, safety and environmental aspects, priorities for preventive flood control should be defined in settlements with more than 30.000 residents. Along large rivers existing embankments should gradually be reconstructed and upgraded at critical sections. Activities should be carried out in order determined by different criteria, which include: number of households, potential damage, general water management significance, costs of investment etc.

Implementation of structural (civil engineering) measures. Preventive flood protection measures should increase retention capacity of soil and vegetation. Necessarily balance between demands for further urbanization and using commercial space, and the need for land use to slow runoff and retaining water in the basin should be searched. Flood protection systems should be planned as a rationalization of multipurpose utilization of water and land, and take account economic feasibility and impacts on the environment and nature.

Operational flood control plan. Plan should be prepared for particular water system. Floods on international river basins should be conducted jointly with the competent authority of the neighbouring states.

Monitoring and forecasting of hydro-meteorological phenomenon. Flood protection efficiency should be improved due to modernization of the existing system for monitoring and forecasting of hydro-meteorological phenomena (automatic measuring stations, radars, satellite imagery, forecast models, etc.) and existing communications systems.

River basin management. Maximum flow rates of flood waves, especially on smaller and middle part of the basin can be reduced, preserved and improved with natural retention capacity of soil, waterways and riparian areas. Implementation of such measures enables water infiltration into the soil and makes it available for future use; provide favourable water regimes for ecosystems associated with water, while partly reduce the risks from extreme flooding. Natural swamps and flood area of the basin, therefore should be preserved, and wherever possible and economically justified, rehabilitated or extended. Forest surface should be preserved and extended, especially in mountainous areas with high risks of erosion. Protection of river banks erosion, wherever possible, should be resolved with vegetation buffer zone. In areas of large cities planners should ensure the best possible infiltration of rainwater into the ground - parks and green areas in new urban areas should be included. Existing sources of pollution on potentially vulnerable areas of flooding should gradually be sanitized.

The financial security of property on flood risk areas. Because of improvement of financial security of property, flood risks should be precisely defined. Existing flood risk maps should be upgraded, flood hazard maps should be prepared and flood damage assessed at potentially vulnerable areas.

The role of other factors in preventive flood control. Protection and rescue demand proper functioning of regional and local centres, which alter population, organize work of civil protection, make strategic and operational plans for disaster management, organize evacuation of the population in case of floods, arrange immediate medical assistance to casualties and arrange rehabilitation measures after flood. Other factors in the protection against floods are also scientific institutions, media and interested non-governmental organizations with an active and constructive participation in the development process of planning documents.

4.1.3 EROSION PROTECTION

Coordination. Long-term sustainable erosion protection will be achieved by coordination of multi-disciplinary activities. A prerequisite for cooperative action is the preparation and implementation of strategy for erosion protection under the coordination of central state bodies responsible for agriculture, forestry, water economy, environment protection, physical planning and construction and others competent authority.

Implementation of general anti-erosion measures. General anti-erosion measures comprehend legislative measures, education of the population, systematical monitoring of erosion processes, integrate issues of protection from erosion in the spatial plans, forest plans, water management plans and other planning documents.

Implementation of measures for protection from erosion. Rehabilitation of natural erosion processes should consider dynamic equilibrium between basin and river. Priority measures for erosion protection should be determined with some particular criteria such as: water management significance, presence of vulnerable water building, structures and/or water management system, degree of sensitivity, estimated costs and other investments.

4.1.4 IRRIGATION AND DRAINAGE

Coordination competence. Irrigation and drainage systems are joint tasks of agricultural and water management. Obsolete systems should be rehabilitated in accordance with development plans, needs and financial possibilities of agricultural sector, needs for flood protection measures and others.

Implementation of structural (civil engineering) measures. For effective functioning of systems flood protection measures should be considered. Network of canals and other structures should be maintained and improved. Measures should consider higher efficiency of water use. New irrigation systems should be constructed in accordance to other planning documents.

4.2 WATER USE

Water management should ensure sustainable use of water resources, which includes the ensurance of sufficient water quantity and development needs of all users, taking into the account natural ecosystem capabilities.

Economic development and increase in living standards of population, which uses water from public water supply system, requires further development of public water supply.

The conditions for sustainability of water supply systems must be achieved in order to ensure sufficient water quantities. That determines the basic objective: securing drinking water supply for population in accordance with the hygienic and sanitary standards, which includes an increase of water supply level of the population from public water supply system.

Development objectives and economic policy will determine water use in the future. The users within their areas should set up water requirements for different purposes (hydropower, irrigation, fish and shell farming, navigation, recreation, mineral and geothermal water use and others). Water resources should contribute to their satisfactory development of water needs. In the following chapters, an overview of water management objectives for different types of water use will be given.

4.2.1 DRINKING WATER SUPPLY

Objectives in this field are:

Increasing the level of drinking water supply of the population. The current level of population connected to public water supply systems must increase. The increase should be achieved with upgrading existing and building new water supply systems. In areas with higher connection rates, certain systems shouldl be extended to the peripheral parts of cities, thus the edge of settlements will join the existing public water supply systems. The cooperation with the local government shouldl continuously work on renewal and adjustment of public water supply system.

Introduction of the economic price of water. Introduction of water pricing with consideration of fundamental "polluter pays" principle should progressively be implemented with integration of technological systems and establishment of distribution areas with a unique price of water.

Adjustments to the price of water should contribute to an increase of public water supply safety, construction and operation of water supply systems according to European standards and supervision of the water quality and service level. The implementation of economic water price should also result in sustainable and efficient water use.

Reducing water losses from public water supply systems. Reduction of losses from public water supply systems to acceptable values (15 - 20%), taking into the account the model of developed European countries should be permanent task of the municipal economy. This should result in getting additional water quantities and reduction of water needs.

Satisfying the need for water. In the future it is expected that water needs could increase or decrease. At this point main factors, which will have an impact on increase or decrease of water needs are listed:

- Increasing the level of supply of the population,
- Development needs in industry and tourism,
- Rehabilitation of water losses and
- Rationalization of consumption due to the introduction of economic price of water.

Increase safety procedures for public water supply. Water from groundwater resources should continue to be the main source of water, which is used for public water supply. Compared to the surface water, groundwater has good natural protection from pollution and is safer from sanitary point of view. Public water supplier that is dependent on a single (ground) water resource should determine additional water resources. In the areas of high aquifer vulnerability (anthropogenic impact, undeveloped areas, low connection rates to sewage system, etc.) certain measures must be implemented. That will ensure required water quality and increase safety of public water supply.

4.2.2 WASTE WATER TREATMENT

Main objective in this field is **to increase the current level of connection rate** to sewage system and wastewater treatment plants.

The objective is also to check the possibilites of re-use of treated municipal waste water for different uses, especially for irrigation for areas which are not directly used for harvesting food which can be directly consumed (for example, for orchards, maize fields, parks…).

4.2.3 INDUSTRY

Objectives in this field are:

Required quantity of cooling water in the industry. Economic growth and development will further develop required quantities of cooling water. Given the considerable needs of the industrial sector is particularly important.

To encourage the introduction of water recirculation in technological processes wherever possible.

To determine plans for exploitation and protection of water resources used for production of water for market sale.

4.2.4 AGRICULTURE

Objectives in this field are:

- **Efficient water use** for irrigation purposes;
- **Securing the necessary quantity of water** for irrigation purposes;
- Fragmentation of agricultural land and
- Halting the decline of existing irrigation systems and bringing them into the drive of willingness to comply with new conditions and needs, where there is interest for it.

Generally, most of irrigation systems have functional difficulties. The most common problems are the obsolete equipment and infrastructure, inadequate maintenance because of lack of funds and transitional processes in the water economy and the agriculture sector. Priority in irrigation sector is the **rehabilitation of the existing schemes, their modernization and installation of new equipment,** application of water saving techniques and flow control in the main canals.

4.2.5 ENERGY PRODUCTION

The available water resources and the remaining hydro potential are strategically important for the republic of Macedonia. Strategy for energy development announced an increase interest for the construction of hydropower plants, in parallel with the increase in fossil fuel prices. Needs for electricity of the Republic of Macedonia are predicted within the strategy, where possibilities of producing electricity from renewable

energy sources are presented. Within these options, the option of building new HPP is analyzed.

As one of the strategic objectives of the Republic of Macedonia which is defined with a strategy for energy development, is **the construction of new HPPs**. Through this, part of electricity needed for the future will be provided. For the period from 2010 to 2021 large HPP with reservoir are planned to be built. Regarding the the dynamics of building a new HPPs for electricity production, four scenarios are expected. Besides the two scenarios in which the growth of electricity consumption in the future period is analyzed, there is a basic scenario with growth of electricity consumption at 3 % and primary scenario with the assumption for reduced investment in building new capacities for electricity production.

4.2.6 NAVIGATION

At this point it is important that strategy and other strategic documents which are related to the transport are committed to strengthen environmental better transport option. One of them is related to internal water transport. Main objectives in this field are:

- **to integrate inland waterways** in the European navigation system arrangement;
- **to maintain the existing waterways**;
- **to include water infrastructure** in the transport network development of river ports;
- **to include participation of relevant institutions** in the planning system of internal waterways and
- **to ensure respect for the sustainability of the water regime, environmental protection and nature of morphological features,** together with relevant sectors to take measures in order to reduce the risk of pollution incidents.

4.2.7 FISH FARMING

In the Republic of Macedonia it is expected significant water use for fish-farming in natural waters and reservoirs. Limiting factors in the development of this sector of the economy are water and land availability. There are some prerequisites for the development of warm and cold ponds, depending on market needs and interests of stakeholders. Water management allows the **development of fish ponds,** especially warm

ones, because of their multi-purpose use (maintenance of good water status, sport fishing, tourism, habitat for birds, ensuring biodiversity, etc.).

4.2.8 TOURISM AND RECREATION WATER USE

The need **to ensure water supply and wastewater treatment in the tourist season** is dominated by the needs of the local population. It requires a different approach with next objectives:

- to plan public water supply and wastewater treatment services in technical sense;
- to consider the available resources of drinking water and wastewater receivers and
- to set priorities for construction of municipal infrastructure, related to the public water supply.

The role of water management in the development of sports, swimming and water sports should be reflected in the assessment of user needs, environmental and landscape features, water and ecosystems associated with water conservation and water quality needed for these purposes.

4.2.9 GEOTHEMAL AND MINERAL WATER USE

According to the experiences in European countries, the need for mineral and geothermal waters will continue to grow. The Republic of Macedonia should **encourage through its institutions multipurpose use of geothermal water**, such as for medical purposes, tourism, recreation and other use. To ensure sustainability of geothermal and mineral water resources, the use of mineral and geothermal water should be adjusted to their ecological and other features.

4.3 WATER PROTECTION

The purpose of water protection is the preservation of human health and the environment, which includes achieving and preserving good water state, preventing water pollution, preventing hydromorphological changes

and rehabilitation of water status where it is devastated. Objectives of water protection in the Republic of Macedonia comprises:

- **Protection of surface and groundwater as a drinking water reserve** (existing and planned reserves);
- **Protection of protected and other areas of importance, related to water areas** - areas of special protection of waters, areas for preservation of human health and the preservation of water and water-dependent ecosystems and preserving of biodiversity in the frame of integrated water management;
- **Improvement of ecological functions of waters** where the water quality is deteriorated and where required water quality is not achieved, with integrated water management and gradual implementation of comprehensive measures for water protection and systematic monitoring of effects of measures implemented in the river basin;
- **Reduction of the quantity of dangerous substances at source of pollution** with implementation of water protection measures and
- Contribution to **sustainable water management** with rational and sustainable use of water resources.

In accordance to EU Water Framework Directive it is necessary to **achieve the objective of good water status of surface and groundwater bodies** by defining and implementing the necessary measures within integrated programmes of measures, taking into account existing EU requirements. Where good water status already exists, it should be maintained. For groundwater, in addition to the requirements of good status, any significant and sustained upward trend in the concentration of any pollutant should be identified and reversed.

Main environmental objectives, which should be implemented in the Republic of Macedonia due to obligations of EU Water Framework Directive (Article 4) and which are also regulated through the Law of Water[6] are:

(a) for surface waters, it is required

- to implement the necessary measures to prevent deterioration of the status of all bodies of surface water;

[6] Article 90 is referring to environmental objectives for surface waters and Article 92 for ground waters.

- to protect, enhance and restore all bodies of surface water with the aim of achieving good surface water status;
- to protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status and
- to implement the necessary measures with the aim of progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances.

(b) for groundwater, it is required

- to implement the measures necessary to prevent or limit the input of pollutants into groundwater and to prevent the deterioration of the status of all bodies of groundwater;
- to protect, enhance and restore all bodies of groundwater, ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status;
- to implement the measures necessary to reverse any significant and sustained upward trend in the concentration of any pollutant resulting from the impact of human activity in order progressively to reduce pollution of groundwater.

(c) for protected areas, it is required

- to achieve compliance with any standards and objectives.

Where more than one of the objectives relates to a given body of water, the most stringent shall apply.

In cases where a body of water is so affected by human activity or its natural condition is such that it may be unfeasible or unreasonably expensive to achieve good status, less stringent environmental objectives may be set on the basis of appropriate, evident and transparent criteria, and all practicable steps should be taken to prevent any further deterioration of the status of waters.

Management of the sources of pollution should be implemented by **reducing and eliminating hazardous substances** depending on their toxicity, persistence and bio-accumulation.

Strategic objectives indicate obligations for **management of the sources of pollution with polluter pays principle**.

In the following chapters, an overview of water protection objectives for pressures will be given.

4.3.1 POINT SOURCE POLLUTION

4.3.1.1 URBAN WASTE WATER

The **assurance of high level of treatment of waste water** through the construction of public sewage systems (sewage and waste water treatment plants) is a priority activity. Construction of public sewage system in the tourist areas is a particular problem, where the solutions should be adapted considering the seasonal nature of tourism. The objective is to ensure the health of the population and the protection of natural resources.

The **construction of public sewage systems and waste water treatment plants** should be implemented **according to the technical instructions for design, construction and maintenance of systems**, based on the provisions of Urban Waste Water Treatment Directive and Sewage Sludge Directive. Under the provision of Directive on urban wastewater treatment, the EU Member States are required to provide connection to wastewater collection systems in all agglomerations exceeding 2.000 population equivalents. Secondary (biological) treatment must be provided in all agglomerations exceeding 2.000 population equivalents and discharging wastewater directly into receiving freshwater resources. It provides for specific requirements for different deadlines for compliance achievement depending on the sensitivity of receiving waters with regard to agglomerations exceeding 10.000 population equivalents.

In the case of smaller agglomerations and those connected to wastewater collection systems, the treated wastewater at the outlet has to comply with quality targets of the recipient.

Development priorities for construction of sewage systems are:

- the size of the sewage systems with respect to existing and planned load (from population and industry connected to the public sewage system);
- the integrity of the sewage systems that should be achieved through full functionality of the whole waste water collection, drainage, treatment and an appropriate discharge of treated wastewater with adequate technical and sanitary conditions of performing services (waterproof, processing of the sewage sludge, etc.);
- sewage systems in areas where with deteriorated water status (surface or groundwater water bodies) and

- sewage systems in protected and other areas of importance related to water, especially eutrophication sensitive areas due to the discharge of urban waste water.

Gradually, the introduction of economic price for waste water treatment should be achieved.

4.3.1.2 INDUSTRY

Management of point source pollution in the economy is based on introduction of **national and international standards for discharges of wastewater into the environment**.

Technical starting points related to the emission standards for wastewater into the environment can mainly arise from the provisions of the Directive on Industrial Pollution Prevention and Control (IPPC) which is aimed at **control and prevention of water resources pollution by industry** and the Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment[7].

In the production Best available techniques (BAT) should be considered, which shall mean the **most effective and advanced stage in the development of activities and their methods of operation** which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole[8]:

- 'Techniques' shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- 'Available' techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator and

[7] Provisions for food industry are partly incorporated in the Urban Waste Water Treatment Directive.

[8] Directive on integrated pollution prevention and control (96/61/EC) (Art. 2(11)).

- 'Best' shall mean most effective in achieving a high general level of protection of the environment as a whole.

The objective of water management is to establish a regulatory framework that will oblige the industry to apply these principles of the water protection.

Wastewater management plans should also contain the list of measures and activities in case of emergency and accidental pollution.

4.3.1.3 WASTE MANAGEMENT

The waste management system is reflected in all components of the environment, especially in the groundwater that is the main source of drinking water.

According to the Waste Management Strategy of the Republic of Macedonia (2008 - 2020), **strategic goals and objectives** comprise of:

- establishment and harmonization of policy and legislation on waste management;
- establishment of effective institutional arrangements;
- strengthening human resources and capacities;
- introduction of stable financial resources and economic mechanisms;
- raising public awareness and awareness of all stakeholders;
- establishment of data collection/information system;
- establishment of contemporary technical waste management system
- application of efficient and cost-effective techniques (PPP)
- introduction of separate landfills for hazardous and non-hazardous waste and
- progressive closing-down and/or remediation of existing municipal landfills and industrial "hot spots".

It is also important to consider objectives related to waste management arising form other sectors and strategies.

4.3.2 DIFFUSE SOURCE POLLUTION

Objectives for water protection from diffuse source pollution comprises of golas related to **reduction of pollution** from:

- agriculture (nutrient and pesticide pollution) ;
- urban waste water from dispersed population;
- erosion of polluted soil;
- rainfall runoff from urban and rural areas and from roads and
- uncontrolled or illegal dumping of waste.

In the management of diffuse source pollution from agriculture the provisions of the Directive on nitrates (Nitrate Directive) and the Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment should be applied. It is also important to consider polluter pays principle.

The objective of the Nitrate Directive is to reduce and prevent in future the water pollution by organic matter originating from agricultural lands, as well as the requirements of the Directive on urban wastewater treatment aimed at reducing the pollution from sewage and industrial wastewater treatment plants.

By Water Framework Directive nutrient concentrations are specified in relation to type and are related to ecological state of water body. The target values for concentration of nitrates for year 2015 could be distinctly lower than the target values, defined by Directive on drinking water, Directive on abstraction of surface water intended for drinking, Nitrate Directive and Directive on urban wastewater treatment.

4.3.3 SPATIAL PLANNING AND ENVIRONMENTAL MANAGEMENT

Water protection sector should be managed by **integrated approach**, cooperating with other sectors; involving institutions in charge of the implementation of environmental protection, and above all competent institutions for spatial planning, for forest management, nature protection, protection of air and soil protection. At the level of implementation of spatial and development plans it is important to cooperate with local communities.

Achievement of the objective of good water status, preservation of human health and preservation of water and water-dependent ecosystems also depends on exposure to risk of emergency and accidental pollution. The reduction of risk can be achieved by integrated approach of economic subjects and water sector together with efficient monitoring and

information (notification) program and time of response for taking sanitation measures.

The provisions of the Seveso II Directive, which applies to some thousands of industrial establishments where dangerous substances are present in quantities exceeding the thresholds in the directive, and the Directives on Environmental Assessment (Environmental Impact Assessment Directive and Strategic Environmental Assessment Directive) should be implemented systematically. The common principle of both Environmental Assessment Directives is to ensure that plans, programmes and projects likely to have significant effects on the environment are made subject to an environmental assessment, prior to their approval or authorization. Consultation with the public is a key feature of environmental assessment procedures.

4.3.4 INTRODUCED AND INVASIVE SPECIES

Problems caused by invasive non-native species have to be tackled through prevention, early detection and carefully considered appropriate action. There are monitoring projects for alien invasive species proposed in the NSBAP (Identification and monitoring of invasive and allergenic species). The Law on Protection of Nature (2005) prohibits the introduction of alien species on the territory of the Republic of Macedonia.

The objective set for introduced and invasive species is to **control threats from invasive alien species into water environment**.

4.3.5 CLIMATE CHANGE

The objective set for climate change is in continuous **adaptation to climate change** and other pressures embedded across the water sector, resulting in sustainable delivery of secure water supplies.

4.4 PROTECTED AND OTHER AREAS OF IMPORTANCE RELATED TO WATER

Water resources in protected and other areas of importance related to water imports regulations from other sectors and harmonizes its objectives with corresponding authorities and competent institutions (and

their planning documents), in particular with bodies competent for spatial planning and nature protection.

In the following chapters, an overview of objectives for different protected and other areas of importance related to water will be given.

4.4.1 NATURAL SITES OF IMPORTANCE, INCLUDING THE NATURA 2000

Together the Birds and Habitats Directives require to take a number of measures in order to protect all bird species, their sites and their habitats. The main objectives for the Natura 2000 sites are to (BirdLife International, 2010):

- enable taking measures to **conserve all naturally occurring bird species** across the EU;
- classify as Special Protection Areas (SPAs) the most suitable territories for listed species and migratory species;
- **maintain SPAs in favourable conservation status**;
- prepare and implement management plans, setting clear conservation objectives for all SPAs;
- **provide co-financing for the management** of these protected sites (SPAs);
- **regulate the hunting of certain species of birds** and
- follow the procedure for carrying out **appropriate assessments of environmental impacts on SPAs**.

4.4.2 BATHING WATERS

The objective for bathing waters is **reduction and prevention of water pollution**, as well as achievement of hygienic and sanitary safety. 95% of the samples have to comply with mandatory **standards for microbiological parameters** (total coliforms and faecal coliforms) **and physicochemical parameters** (mineral oils, surface-active substances and phenols).

4.4.3 DRINKING WATER PROTECTED AREAS

The objective for drinking protected areas is **insurance of longterm quality drinking water**, which is necessary for public drinking water

supply. It is necessary to assure quality drinking water for current water supply as also for the future (strategic drinking water reserves).

4.4.4 EUTROPHICATION SENSITIVE AREAS DUE TO THE DISCHARGE OF URBAN WASTE WATER AND NITRATE SENSITIVE AREAS

The objectives for eutrophication sensitive areas due to the discharge of urban waste water and nitrate sensitive areas should be set by **limiting the effluent quality of wastewater from public sewage systems and inputs of nutrients from agriculture**.

4.5 PROFESSIONAL AND OPERATIONAL FRAMEWORK OF WATER MANAGEMENT

The competent authorities of Water Management conduct all national water policy in professional, administrative, regulatory and supervisory sense. Water management is achieved within the jurisdiction of state administrative and professional institutions, as well as cooperation with other authorities, regional administration and local self-government, economic sectors, scientific and professional institutions.

In order to further develop water management, and compliance with international obligations and other sectors, it is necessary to **improve water management in the legal, institutional, financial, scientific and technical terms**.

The task of the water management is coordination of interests and needs of stakeholders, within the framework of integrated water resources management. Education of professional and scientific personnel to perform tasks of water management is a prerequisite for achieving the set objectives.

River basin management is the foundation for a successful sustainable water management which include:
- identifying water bodies and
- extension of coverage and jurisdiction over water bodies in the Republic of Macedonia.

Basic elements of water management are systemized into 4 groups:
- planning;
- implementation of measures;

- systematic monitoring and control measures implementation and
- professional and technical support to other participants in water management.

4.5.1 PLANNING

Water management is planning at the level of the water bodies. Information on the planning of water management will be conducted in accordance with the rules of European legislation.

For the purpose of efficient implementation, detailed elaboration of measures and activities of river basin management plans are necessary. Developmental plans for water management should be produced for specific activities (public water supply plan, water protection plan, flood protection plan and other aspects of adverse effects of water and etc.).

4.5.2 IMPLEMENTATION

The main instruments of water management that will continue to implement activities and measures of water management are:

- water rights acts (conditions, approvals, permits and concessions) that regulate use of water and water resources and
- funding and financing to encourage implementation of measures in the interest of water management.

Regulating the use of water rights with acts remains an important administrative tool for managing water, so it is necessary to:

- introduce water units (water bodies, river basin districts,...) as the basic elements of management;
- expand activities in the regulation of wastewater treatment and water supply activities (establishment of a distribution/service areas) and
- implement procedures to adjust the regulatory regime and standards of the European Union including the gradual introduction of the concept of economic price of water.

It takes work to improve the efficiency of the procedure of issuing water rights acts, which will be largely achieved by the establishment and development of water information systems.

4.5.3 SYSTEMATIC MONITORING AND SUPERVISION OF THE IMPLEMENTATION OF THE MEASURES

Effective water management involves knowledge of water regimes, knowledge of user requirements and the impact of the water system and knowledge of quantified effects of the implemented measures and activities.

Collection and analysis of data is in the responsibility of several institutions and requires compliance monitoring program. Institutions must take care of the quality of data collected and timely exchange of data and information. It is necessary to:

- extent data and information with needs of water management and analyze and interpret in the context of water units and water areas;
- expand data collection and data about the state of transition waters;
- gradually modernize monitoring of water management, particularly in terms of automatic delivery of hydrological data in real time and
- establish effective coordination and cooperation with other institutions that have information relevant to water management.

Such an improvement of monitoring will also enable compliance to relevant European and monitoring system for data exchange on the one hand, and ensure full respect of commitments regarding international reporting of the waters in Republic of Macedonia on the other.

4.5.4 TECHNICAL EXPERT SUPPORT

Providing technical and expert support to governing bodies, regional administration, local self-government and users, remains one of the major tasks of water management. Given the extensive interest and activity of water economy, particularly in the takeover of rules of European legislation, it is important to give technical expert support to:

- governing bodies in the process of adjustment, acceptance and implementation of European legislation;
- scientific and professional institutions in the promotion of knowledge, methods and approaches related to water management;
- local self-government in the improvement and rational development of planning in the part concerning water and
- users in finding and implementing the best possible methods to use better technologies and agricultural practices.

4.5.5 INFORMATION SYSTEM

Water Information System should provide appropriate information, communication infrastructure and professional support for the continued storage and processing of data relating to qualitative and quantitative characteristics of environment. Water Information System will enable storage of data and information, checking the timeliness, reliability, authenticity and validity of data / information and confirmation of their quality. Water information system should support implementation of the obligations of information exchange (reporting on international, bilateral / multilateral agreements). Data on water information system should be accessible to public without charge.

5. PROGRAMME OF ACTIVITIES AND MEASURES

This chapter sets out the Government's plans for water in the future and the measures that will be taken to ensure that good clean water is available for people, businesses and nature. It looks ahead to 2040 and describes the way to get to the desired future water use. It looks at the water cycle as a whole, from rainfall and drainage through to discharge and treatment.

This document provides a clear direction for the Republic of Macedonia and sets the long term vision of where the water sector should be by 2040.

In the table below an overview of measures and activities for achieving objectives described in previous chapters are given.

5.1 PROTECTION AGAINST FLOODS AND OTHER HARMFUL EFFECTS OF WATER

In the following table (Table 29), an overview of necessary measures and activities for protection against floods and other harmful effects of water are given.

Table 29: Overview of necessary measures and activities for protection against floods.

RIVER TRAINING
Construction of accumulation
Preparation of "good practice" guidance for sustainable river training
FLOOD PROTECTION
Administrative instruments
Preparation of program for protection from harmful effects of waters within the respective river basin as an integral part of plans for river basin management.
Disabling of spatial construction work and other activities that could increase the danger of flooding and damage.
Implementation of Floods Directive (Directive 2007/60/EC) (Preparation of

preliminary flood risk assessment, flood hazard maps, flood risk maps and flood risk management plans according to Floods Directive)
Rising of public awareness
Preparation of detailed flood plans for local/regional centres
Preparation of integral international plans for flood protection
Structural flood protection measures
Maintenance of water buildings (dams, reservoirs, protective embankments etc.) in a way that ensures acceptance of flood waves, as well as providing protection from natural disasters
Providing preventive measures (construction of dykes, reservoirs, river regulation, regulation of erosion, afforestation, etc.)
Utilising floodplains and wetlands as natural flood storage areas
Rehabilitation measures
Removal of waste, rubble and barren from floodplains
Non-structural flood protection measures
Improvement of catchment level planning of flood management measures
Integration of rural land use and flood management policies and funding
Improvement of hydro meteorological prognosis
Preservation of retention areas (floodplain and wetlands)
Arrangements of integral urban development plan (avoiding from areas with flood risk)
Intense control over interventions on areas with flood risk
Education of engineers and other water related workers
EROSION PROTECTION

Administrative instruments
Preparation of program for protection from harmful effects of waters within the respective river basin as an integral part of plans for river basin management.
Preparation and implementation of legal framework for protection of accumulations from sedimentation
Prohibition and restrictions for cutting of trees and shrubs and prohibition of grazing cattle
Prohibition on removing soil, sand, gravel and stone within erosion area
Structural erosion protection measures
Afforestation and grass slopes erosion control
Considering of rules against erosion (i.e. planting of trees must be done in a way that provides protection from erosion)
Sustainable forest management
Maintenance of erosion protection buildings
IRRIGATION AND DRAINAGE
Administrative instruments
Water drainage monitoring - measure the amount and quality of discharged water
Structural measures
Maintenance of canal network for drainage and irrigation
Revitalization and reconstruction of existing systems (higher efficiency and decrease of losses)
Construction of irrigation systems

5.2 WATER USE

In the following table (Table 30), an overview of necessary measures for different types of water use is given.

Table 30: Overview of necessary measures for different types of water use.

ACTIVITIES AND MEASURES
Public water supply – drinking water supply
Provide sufficient quantities of drinking water from existing or new sources (resources) along with strict enforcement of protective measures on water protection zones
Create the conditions for lifting the percentage of people connected to public water supply system in the future investment cycle (85 - 90%)
Preparation a long-term development plan for public water supply
To determine the distribution / service areas as economic and technological whole. On each distribution area should be established: • One utility company with a unique price of water for the whole area, (the reorganization and optimization of utility companies); • Technology enlargement - to implement when it is economically justified.
Improve management, degree of use and security of water supply
Ensure drinking water quality to all users
Establish rationalization in water consumption (economical use of drinking water, especially in households with modern home-appliances and sanitary equipment)
Reduction of losses from public water supply system
Gradually connect local water supply systems into public systems due to quality control and introducing principle "Polluter pays". All other ways of

water supply (wells, cisterns etc.) gradually introduce into public system
Sustainable use of water resources
Industry
Creating the conditions for the further development of abstraction of drinking water sold in the market according to economic interest and renewability of resources
Matching needs and possibilities of water use for cooling purposes, especially with the expected economic growth
Agriculture
Reconstruction and rehabilitation of the existing irrigation schemes
Construction of new irrigation schemes
Development of irrigation systems, according to users in accordance with the national projects and strategies for irrigation in the Republic of Macedonia
Energy production
Construction of hydropower facilities and installations within the multifunction system according to current strategic and planning documents
Develop a cadastral location for building small hydropower plants that will contain the final list of locations where to build small hydropower plants taking into account the environmental, landscape and other criteria
Navigation
Creating the conditions for the development of inland navigation with reconstruction and renovation of existing waterways and construction of new ones under multi-purpose projects in cooperation with neighboring countries, according to the planning documents, treaties and obligations
Preparation of a long-term plan for development of inland navigation

Fish farming
Improving conditions of water use for fish farming in ponds according to economy and markets
Perform systematic analysis and measures to rationalize water consumption in ponds
Tourism and recreation water use
Creating the preconditions for using the natural advantages of surface water for the development of water use for swimming, sports and recreation
Preparation of a long-term plan for development of water use in tourism and for recreation
Geothermal and mineral water use
Creating conditions for more intensive use of mineral and geothermal waters for the economic and energy production purposes, particularly through multi-purpose use and management of these resources (health care, tourism, recreation and similar)
Preparation of a long-term plan for development of mineral and geothermal water use
Groundwater
Application of new techniques for irrigation in order to maximally use the groundwater resources
Permanent, planned and organized survey of groundwater in scope to define potential resources
For complete valorization of the potential of groundwater should intensify fundamental hydrogeological research, primarily making OHGK 1:100 000, for the whole territory of Macedonia
Maximum capture major sources of groundwater in the regional systems that

will allow transfer of water from one area to another water management for meeting the long-term water needs of water management in dry areas
Making priority lists based on the capabilities of bearings potentials of groundwater and the needs for drinking water within a water management area
Revitalization and modernization of water supply systems and irrigation to reduce water losses and increase the level of utilization
Increasing the power of water exploitation systems, construction of parallel systems for water supply of water for drinking and industry, distribution of high quality leads to greater distance, bottling and sale of high quality groundwater
Starting a planned and organized process of artificial recharge of groundwater on the possibilities and needs
Making consumer cadastre of groundwater and permanent monitoring and recording of consumption at the national level
Regulating the exploitation of groundwater by laws and executive acts
COMMON ACTIVITIES AND MEASURES
Sustainable use of water resources, especially in economic, environmental and social terms
Conduct systematic research and determine the availability of water resources to ensure sufficient quantity of water
Improving the monitoring of all water uses in the Republic of Macedonia (all river basins) through water information system, according to the needs and requirements of European monitoring indicators for water use
Cooperation between water management institutions in order to implement regulations, acts and other legislation in the field of water use, which will ensure sustainable use of water resources
Create conditions for more intensive use of mineral and geothermal waters for the economic and energy purposes, particularly through multi-purpose use

and management of these resources (tourism, recreation, etc.). Develop a long-term development plan for mineral and geothermal water use

5.3 WATER PROTECTION

In the table below (Table 31) is given an overview on activities and measures which will be taken in the Republic of Macedonia in order to reach water protection objectives.

Table 31: Overview on activities and measures to reach water protection objectives.

ACTIVITIES AND MEASURES
Planning of water protection within the frame of integrated water management
Plan for: • reduction of the point source pollution, prepared according to the principles: - preventive techniques of pollution control in place of origin; - precautionary and - "polluter pays". for the population (including rural areas), touristic areas and industries; • determination of limit values for hazardous and harmful substances and • preparation of guidance's on technical solutions, as well as technical recommendations for the design, construction and maintenance of drainage systems, pre-treatment and treatment of wastewater.
Analyze of pressures and impacts* for: • point and diffuse source pollution (including hazardous and harmful substances) and • diffuse source pollution with planning of water protection measures in accordance with the planned use of water and defined "sensitive areas" and "vulnerable areas"
Preparation of hazard maps of groundwater level state
Consideration of priority development of the activities acceptable from

ecological point of view and activities in which priority is non-polluted environment (tourism, green food etc.) by regional planning
Systematic monitoring of water quality
Improvement and/or the introduction of monitoring of water quality for: • surface water (rivers and lakes); • groundwater and • water in protected areas. Introduction of systematic monitoring of chemical and ecological state, as well as connection with the Water Information System and Environmental Information System
Improvement of monitoring of water pollution sources for: • point sources (waste water treatment plants, industry and landfills) and • diffuse sources (agriculture, transport, etc.)
Finalization and regular maintenance of data of register of polluters (considering reporting obligations for IPPC and SEVESO)
Legal framework and Standards
Amendment of regulations and standards for the industry: • classification of industry sectors in accordance to limit values and the characteristic indicators for wastewater quality and • making up deficiencies in regulations that determine the limit values for indicators of water quality
Implementation of environmental management and systematic monitoring of measures and state with objective of finding economic incentives for priority investments in the industry
Implementation of different stakeholders in the process
Integrated management for water supply and sanitation, with emphasis on rural and urban areas
Defining the protective zones of current and possible future sources of groundwater

Water protection measures
A joined-up approach
Integrated and river basin related approach for water protection (considering state of water, pressures and impacts and vulnerability of water body)
Preventive care bearings from contamination of groundwater (from various sources), or respecting the prescribed measures in certain zones of sanitary protection (where provided)
Pollution from sewage (households, industry)
Collection and adequate treatment of urban and industrial waste waters before discharge into environment (as regulated in the Law on Waters (Articles 112 to 116))
Construction of sewage systems and waste water treatment plant to systematically increase the connection level to infrastructure. Planned activities related to the reduction of source of pollution from population should be done in phases: • 1st phase covering discharges from agglomerations of more than 15.000 p.e. ; • 2nd phase covering discharges from agglomerations between 10.000 p.e. and 15.000 p.e. and • 3rd phase covering discharges from agglomerations between 2.000 p.e. and 10.000 p.e. The remaining requirements of the Directive 91/271/EEC concerning urban waste water treatment shall be carried out after 3rd phase. Secondary treatment should be provided for discharges from agglomerations of more than 2000 p.e., and more advanced treatment for agglomerations more than 10 000 population equivalents in designated sensitive areas and their catchments. Where the establishment of a collecting system is not justified either because it would produce no environmental benefit or because it would involve excessive cost, individual systems or other appropriate systems which achieve the same level of environmental protection shall be used. When constructing sewage systems and waste water treatment plant for urban waste water, the priorities have to be set considering the size of settlements (bigger settlements are set as priority) and the sensitivity of areas

(eutrophication sensitive areas due to the discharge of urban waste water have to be considered as priority).
Development of joint planning of investment programs into public sewage systems. Encourage separate sewage systems with collection and treatment of polluted rainwater from urban areas
Construction of storm water retention tanks in cases of mixed sewage systems
Assuracnce of road drainage systems with treatment of waste waters with priority on drinking water protected areas (set in Article 98 of the Law of Waters) as run-off from roads which is likely to contain heavy metals and hydrocarbons
Appropriate usage and disposal of sludge from treatment of urban waste water (in accordance to Article 118 of the Law of Waters) taking in account the lowest possible extent of negative environmental impacts
Systematic work on the promotion of activities related to the reduction of discharges of hazardous and harmful substances from industrial production in water in accordance to national and international regulations
Pollution into sewage
Reduction of the amount of pollution entering sewage which results in the reduction of the amount which can be done at waste water treatment plants
Elimination of phosphates from domestic laundry cleaning products which should be done progressively (considerable share of phosphate pollution to water comes from detergent use) with introduction of controls to effectively phase out phosphates as an ingredient in domestic laundry cleaning products
Diffuse source pollution from agriculture
Promotion of the Catchment Sensitive farming[9] in a form of advice to farmers in the most nutrient and pesticide sensitive areas resulting in responsible use

[9] Catchment Sensitive Farming (CSF) is land management that keeps diffuse emissions of pollutants to levels consistent with the ecological sensitivity and uses of rivers, groundwaters and other aquatic habitats, both in the immediate catchment and further downstream. It includes managing appropriately the use of fertilizers, manures and

of fertilisers which can make a major contribution to improving water quality as well as to reducing farmers' costs (the Law on Waters (Article 102))
Maximisation of implementation of good farming practices with providing advice, guidance and funding (choice of the best combination of regulatory and other measures)
Implementation of measures for: - rational use of natural resources, as well as controlled use of pesticides, i.e. plant protection products and - establishment of soil monitoring and information system to monitor the status of pesticides consumption. (NEAP 2)
Implementation of measures for protected and other areas of importance related to water to reduce the impact of erosion as a source of diffused pollution of surface waters from agriculture
Pollution from other sources
Implementation of measures for for reduction of pollution of water bodies from dangerous substances (the Law on Waters (Article 74)) The priorities should be set in tackling emissions of the most persistent, toxic and bioaccumulative substances over a longer period.
Increased use of legislation including fixed penalty notices, beach signage and clean up campaigns to address the problems of aquatic litter
Improvement of solid waste management in economical and ecological terms
Control of the solid waste with construction of disposal plants
Preveniteve measures to reduce or prevent risks of contaminations of surface and groundwaters from road and railway (for example collection and treatment of water from roads)
Pressures related to biological issues - introduced and invasive species
Preventive measures to prevent introduction of non-native species in water

pesticides; promoting good soil structure and rain infiltration to avoid run-off and erosion; protecting watercourses from faecal contamination, sedimentation and pesticides; reducing stocking density; managing stock on farms to avoid compaction and poaching of land; and separating clean and dirty water on farms.

environment with introduction of technical demands for fish farms
Preventive measures to prevent introduction of non-native species with rising public awareness and education for target groups: - general public; - aquarists (releasing aquarium species in the environment) and - fisherman (releasing non-native species, used as life baits.
Water abstractions and flow regulations measures
<u>Administrative instruments</u>
Prohibition (except permission or consent under the Law on Waters, Article 136) on gravel, sand and stone extraction from river beds and banks, which worsens water regime; change the direction of river, depositing of waste, rubble and barren; other activities that could damage rivers, lakes and accumulations; cutting tress and other vegetation; building dams, embankments or other water buildings that could have negative impact on water flow
Licences for water abstractions (regulatory controls)
Application of good practices in the field of water abstraction and flow regulation (environmental flows, residual flows, fish passages etc.)
Definition of "go" and "no go" areas for planning new (small) hydropower plants, considering ecological status of water
Strengthening of transboundary cooperation between authorized institutions and governments (especially in case of Dojran and Prespa lake)
Preparation of cadastre of water objects and their characteristics as hydromorphological pressures
Preparation and implementation of methodology for ecologically acceptable groundwater abstraction considering negative impacts on river discharge
Preparation of guidelines for sustainable engineering (especially for new flood protection schemes)
Preparation of guidelines for sustainable river maintenance
<u>Structural measures</u>
Reconstruction of obsolete large schemes (increase of hydropower plant production efficiency)
River restoration measures (restoring rivers to a more natural conditions and thus achieve substantial environmental, social and economic benefits)

Creation of buffer strips alongside the rivers to reduce pollution, recover habitat diversity, diminish bank erosion, alleviating downstream flood risk

5.4 PROTECTED AND OTHER AREAS OF IMPORTANCE RELATED TO WATER

In the table below (Table 32), an overview is given on activities and measures which will be taken in the Republic of Macedonia in order to reach water protection objectives for protected and other areas of importance related to water.

Table 32: Overview on activities and measures for protected and other areas of importance related to water.

ACTIVITIES AND MEASURES
Setting of a register for all protected areas, in accordance with the requirements of the Law on Waters and of European Directives
Development of programs of measures in protected areas, in accordance with the regulations which regulate protection of protected areas and in accordance with the monitoring results of water quality in those areas. Measures in protected areas shouldn't be planned in contradiction with the measures of water management plans.
Work on the improvement of inspection control in space planning, particularly in use of water goods, in protected areas, catchment areas of strategic water sources for drinking water supply and water constructions
Measures for bathing waters
Measures for tackling microbial contamination of bathing waters.
Harmonization of national standards with requirements of European legislative.
Measures for drinking water protected areas
Defining protected areas to protect all wells used for water supply (in addition to existing protected areas on several bigger springs) (Article 98 to 100 of the Law on Waters)
Consistent implementation and execution of the corresponding European

directives with consideration of: - harmonisation, coordination and state control of the process of water protection and - resolving possible ambiguities in the legal regulation.
Promotion of organic farming in drinking water protected areas
Measures for eutrophication sensitive areas due to the discharge of urban waste water and nitrate sensitive areas
Official proclamation and protection of: - sensitive areas due to the discharge of urban waste water and - nitrate sensitive areas
More stringent standards for effluent quality for[10]: - the agglomerations near natural lakes and - the following towns, which are likely to discharge into sensitive areas: Skopje, Bitola, Prilep, Strumica, Radovis, Stip, Kocani and Sveti Nikole

5.5 PROFESSIONAL AND OPERATIONAL FRAMEWORK OF WATER MANAGEMENT

In the following table (Table 33), an overview of necessary measures and activities for professional and operational framework of water management is given.

Table 33: Overview of necessary measures and activities for professional and operational framework of water management.

ACTIVITIES AND MEASURES
Planning
Development and adoption of river basin management plans
Involvement of the public (stakeholders, NGOs and citizens) in the process of

[10] Assumption for future sensitive areas (preliminary)

river basin management plans
Implementation
Establishment of better legislative framework which will regulate national, regional and local water sector, including the purposes of harmonization with the acquis communautaire
Financing and co-financing the implementation of measures and activities (planning and flood protection, water use and water protection)
Systematic monitoring and controlling the impact of implemented measures
<u>Data and information related to determining the water regime</u>
Improvement of monitoring system of surface and groundwater according to the needs of water management, including: • adjustment of the monitoring programs; • establishing a system of indicators; • introduction of new standards and technical regulations and • introduction of automated data collection and transmission.
Adjustment, treatment and analysis of data
Customizing the monitoring to the purposes of monitoring the water regime of protected areas, areas of special protection of water and areas of strategic reserves of water
Introduction to the practice the regular reporting in accordance with requirements of the European Union: • plans for river basin management; • report on the state of water and • other reports.
<u>Data on users, water use and water protection</u>
Data on users and data on the exploitation of water, relevant for water management and whose collection is in the responsibility of other Institutions: • adjustment of observations, including scattered sources of pollution;

- establish a system of quality control data and
- ensuring delivery of data and information on time.

Establishment of monitoring in the competence of the water business sector

Data and information collected in the water-related documentation, registers and other spatial data

Register of water licences and water rights - improving water management books, automation of access to documents especially the part of performance of public services

Cadastres of the water, water resources and water works - extension and adjustments:

- introducing a system of transitional waters with surface water and groundwater;
- involving protected and other areas of importance related to water and
- deployment in system of flood risk.

Cadastres of protection and water use - to encourage standardization and efficient data collection, and establishing liability of delivered data

Technical and expert support

Technical and professional support includes:

- scientific and technical research, including field and laboratory research works;
- participation in the educational process (teaching, lectures, presentations, publishing, etc.);
- promoting new methods and technologies;
- participation in the preparation of planning documents for water users in the part that concerns water management (economy, local and regional governments, utility companies);
- participation in the implementation of projects and support stakeholders in implementing the standards and regulations of the European Union accession process and
- presentation of the Republic of Macedonia in the international institutions and committees related to the water management.

Improvement of the performance of scientific and technical tasks, with establishment of scientific - technical institution for water

Water Information System
Adaptation of the Information System for the water requirements according to the European legislation and making the system accessible to public

5.6 INTERNATIONAL COOPERATION AND EU ACCESSION PROCESS

International cooperation and EU accession process is possible only with the use of strategic guidelines, international collaboration and cooperation. In the following table (Table 34), an overview of measures and activities for achieving international cooperation and EU accession process is given.

Table 34: Overview of measures and activities for achieving international cooperation and EU accession process.

ACTIVITIES AND MEASURES
Implementation of the operational plans and implementation of the acquis communitaire in the subject water
Continuing of the work within the framework of international, multilateral and bilateral treaties and agreements
Cooperation with similar bodies in other countries; representing the Republic of Macedonia in international professional institutions and commissions related to the water management

5.7 FRAMEWORK AND INSTRUMENTS

In the following table (Table 35), an overview of measures and activities for better achieving basic concepts of the modern water policy and the requirements of the Water Framework Directive is given.

Table 35: Overview of measures and activities for better achieving basic concepts of the modern water policy and the requirements of the Water Framework Directive.

ACTIVITIES AND MEASURES

Including options from the Water Strategy in legislative framework
Implementation of the activities and measures from the Water Strategy on national and local level
Modification of the current water sector organisation in the Republic of Macedonia
Education of the professional and scientific personnel to perform assignments of integrated water management (knowledge can be reviewed with self-evaluation form in Annex)

5.8 ECONOMIC INSTRUMENTS

According to the WFD, the water-pricing policies should give incentives for an efficient use of water resources and pollution prevention. Cost recovery is the key objective in the field of water services. According to the polluter pays principle the different water uses should contribute adequately to the recovery of costs. Besides the environmental aspects of the WFD, also economic and social should be considered in the process of forming tariffs. In the following table (Table 36) necessary activities and measures are listed to be taken into consideration.

Table 36: Necessary activities and measures – economic instruments.

ACTIVITIES AND MEASURES
Economic instruments
Gradual introduction of economic price of water for public water supply (and other branches) which will cover actual costs taking into consideration fundamental "polluter pays principle" with: • introduction of the development fee; • prescription of mandatory price structure for water supply and wastewater treatment services; • adaptation of water taxes and compensation fees to developmental needs; • maintenance of sustainable water use; • ensurance of gradual and social acceptable rates for local population and • involvement of stakeholders in the decision making process.

Introduction of: • cost coverage of waste water collection and treatment; • cost recovery of water services using "polluter pays" principle and • economic cost of water by reforming charges for water protection and respecting social acceptability of water prices.
Gradual progress in applying principles of "polluter pays" principle in industry and agriculture.
Gradual progress in applying economic valuation of environmental values into the economic cost of water.

5.9 COMPETENT AUTHORITIES FOR THE IMPLEMENTATION OF ACTIVITIES AND MEASURES

Although the MEPP is the main competent authority for the implementation of activities and measures foreseen with this strategy, cooperation with other ministries responsible for agriculture, forestry, water economy, transport, communication, education, science, health and others is necessary. With aim to achieve stated objectives, government, private sector, voluntary sector and public must work together. Especially public represents a source which can assist government in the formulation and implementation of projects, policies, regulations and laws.

6. FINANCING SOURCES FOR PROGRAMME OF ACTIVITIES AND MEASURES

This chapter gives us an overview on financing options and plans for the measures that will be taken. Beside possible financing sources for programme of activities and measures, it describes current and future investments for measures, which have to be taken to achieve the environmental objectives.

6.1 FINANCING SOURCES FROM NATIONAL AND INTERNATIONAL FUNDS

6.1.1 NATIONAL DOCUMENTS ON FINANCING SOURCES

In the Republic of Macedonia there are two main national documents referring to financing sources for current and future investments:

- National Environmental Investment Strategy 2009-2013 and
- Public investment programme 2009-2011.

6.1.1.1 NATIONAL ENVIRONMENTAL INVESTMENT STRATEGY 2009-2013

The Government of the Republic of Macedonia recognises environmental protection and sustainable development as priorities both in their own right and as an essential part of the process leading to eventual European Union (EU) accession. The role of the government involves not only setting the regulatory and policy framework for other actors, but also actively investing in certain areas where legislation and other policy instruments are not sufficient on their own. The present National Environmental Investment Strategy (NEIS) addresses those areas in which the government considers that active investment is needed. It does not address other legislative and policy aspects of environmental protection (MEPP, 2009 a).

The NEIS defines the measures necessary to provide more intensive investment by the government. Non-investment measures are also defined as a prerequisite for the smooth implementation of the NEIS, in relation to institutional strengthening, capacity building (especially at the local level) and project preparation. Legal transposition and related investments are not included in this NEIS.

The NEIS is based on the directions and recommendations given in existing environmental strategic documents, such as the National

Environmental Action Plan (NEAP) and the National Strategy for Environmental Approximation (NSEA). In keeping with these strategies, the following issues were given particular attention during the preparation of the NEIS:

- The ongoing process of harmonisation with the environmental acquis, based on the National Programme for Approximation with the EU Acquis;
- The ongoing decentralisation process — the delegation of new competencies to local self-government units, including competencies in the environmental sector and
- The achievement of sustainable economic and social development goals through increased cooperation and the implementation of integrated management in the environmental sector.

The areas in which by far the greatest investments are needed in order to achieve compliance with EU (environmental) legislation are integrated pollution prevention and control, and water, wastewater and waste management. The government commits most public resources — at least 88 percent of the available funds — to the water and waste sectors through the competent line ministries. Sources of financing are the central budget, local budgets, the Instrument for Pre-accession Assistance (IPA) and other international financial institutions (IFIs). The industrial and energy sectors will be able to address pollution control measures using a loan facility to be funded by an appropriate IFI and with a government guarantee. Another possible source of financing for this sector is IPA Component V, which covers integrated pollution prevention and control (IPPC) permits in the agrobusiness sector. The other sectors covered by this NEIS are industrial hotspots, air quality management, climate protection and nature protection. The remaining 12 percent of 12 the total allocated financial resources in the investment package presented in the NEIS is committed to these sectors.

The NEIS covers the period 2009 to 2013 and comprises three pillars:

1. The definition of an envelope of funds from national and international sources;
2. The allocation of these funds to clearly defined and agreed priorities and
3. Institutional strengthening and changes to ensure the efficient and effective implementation of the NEIS.

The first pillar represents the total value of planned funds for the implementation of the NEIS, that is, 205 million EUR (at 2008 prices and exchange rates), comprising:

- Central government funds (46,9 % of the total);
- EU funds (the IPA instrument, providing 25 % of the total);
- Bilateral donors (7,6 %) and
- Own contributions (20,5 %).

The amount expected to be disbursed within the timeframe of the NEIS (i.e. up to the end of 2013) is EUR 155 million, with the remainder (EUR 50 million) being disbursed in 2014, 2015 and 2016. This level of disbursement corresponds to approximately 3 % of gross fixed capital formation, which compares favourably with levels of public environmental investment expenditure recorded by other similar countries at a comparable period (e.g. the Czech Republic, Hungary, Poland and Slovakia).

The second pillar of the NEIS involves the allocation of funds to sectors and subsectors, Municipalities/beneficiaries will apply and compete for funds through a published call for proposals/open call, and the selection will be made in accordance with the existing regulations/criteria and methodologies issued by the government.

The largest share of funds in the next period will be allocated based on a limited competition between pre-selected priority projects: this applies for the period 2009-2013 to the areas of regional waste management and industrial hotspots, while after 2013 this will apply to water supply and sewage projects. The limited competition will be implemented with defined technical assistance for project preparation and a system of benchmarks and selection criteria.

6.1.1.2 PUBLIC INVESTMENT PROGRAMME 2009-2011

The Public Investment Programme of the Republic of Macedonia 2009-2011 was prepared in accordance with the Work Programme of the Government of the Republic of Macedonia. Since 1995, a data base of investment projects in the public infrastructure of the Republic of Macedonia was set up in the Ministry of Finance and the concerned Ministries and that is continuously innovated. During the preparation of the Programme, it was taken into consideration that the undertaken activities for intensifying the country's reform processes, and particularly the public sector transformation processes require approach towards application of adequate methodology in the public investments planning implementation and their execution monitoring, for which the World bank and the European Union through the PHARE Programme provided compliant technical support to the Government of the Republic of Macedonia. When preparing the Programme, sectoral development policies and priority infrastructure projects have been taken into account, which are includet in the 2008 - 2012 Government Operational Programme.

With the Programme 2009-2011 the Government's contribution in the implementation of the public investment strategy will be represented mainly through organization, support, regulation, promotion and stimulation of the development activities in the public sector domain.

6.1.2 THE ECONOMIC PRICE OF WATER

The price of water must contain elements, which on one hand ensure the availability and protection of water resources and on the other sustainable development of water infrastructure.

To achieve the economic price of water it is necessary to:

- introduce the development fee – which should be implemented by associations of cities and municipalities;
- prescribe mandatory price structure of water supply and wastewater treatment services, taking into the consideration the principle of full cost recovery;
- adapt water taxes and compensation fees to developmental needs;
- maintain sustainable water use, taking into consideration the user pays and polluter pays principle;
- ensure a gradual and social acceptable rates for local population and
- encourage the involvement of stakeholders in the decision making process, especially on the collection and spending funds, generated from the economic price of water.

6.1.3 EUROPEAN FUNDS

Permanent and priority task of water management sector, local government and municipal companies is to prepare projects, to strengthen institutional capacities and implement necessary organizational adjustments in order to prepare themselves for the effective disbursement of European funds.

Different types of funds are provided by the EU to help regions that are lagging behind in their modernization and development. In order to take a full advantage of the benefits that IPA and later on the Structural Funds provide, the countries will have to keep on with the reforms and create an effective and properly functioning institutional and legislative system as well as an appropriate administrative capacity that will be able to successfully manage these funds.

This should lead to gain as much funds as possible for the development of water utility infrastructure in the Republic of Macedonia and thereby accelerate the achievement of the development objectives. As a candidate member state that only recently got the recommendation for start of the negotiations for full EU membership, Macedonia should be well acquainted with the EU funding opportunities.

EU provides financial aid for all types of organisations including - companies, public bodies, universities and NGOs situated mainly in the Member States, however certain programmes target also Non-Member States. Small, medium and large sized projects can be financed by the EU in various fields from agriculture to education, from environment to transport.

6.1.3.1 SHORT OVERVIEW

This section introduces short overview of the funding opportunities of the EU for the 2007- 2013 financial period structured in five categories (EU Funding Portal 2007-2013):

Pre-Accession Assistance: EU provides funding for candidate countries and potential candidate countries in order to support their efforts to enhance political, economic and institutional reforms. Instrument for Pre-accession (IPA) comprises a broad range of financial support for various types of projects in the fields of agriculture, environment, transport, IT, human rights, civil society, media, etc.

IPA was created with Council Regulation (EC) 1085/2006 of 17 July 2006 and its implementation provisions in Commission Regulation (EC) 718/2007. It put under the same umbrella the previous funds available for the pre-accession countries like: PHARE, ISPA, SAPARD, CARDS. It is intended to mirror the EU Structural Funds and help the countries that are on the way to join the Union to learn how to manage them.

IPA has several components[11]:

I. Transition Assistance and Institution Building;
II. Cross-BorderCo-operation (with EU Member states and other countries eligible for IPA);
III. Regional Development (providing support to transport, environment infrastructure and enhancing competitiveness and reducing regional disparities);
IV. Human Resources Development (strengthening human capital and combating exclusion);
V. Rural Development (rural development type of measures).

Components I and II are open to all beneficiary countries whereas Components III, IV and V are open to the Candidate Countries only.

[11] Commission, E. (n.d.). *How IPA works*. Retrieved from Regional Policy InfoRegio European Commission:

http://ec.europa.eu/regional_policy/funds/ipa/works_en.htm

Until year 2009 implementation of IPA was centralized, which means all of the funding went through the EC Delegation Mission. From 2009 on, the country got the accreditation from EU to apply decentralized implementation of the assistance for the III and IV component. In addition a new sector has been created that will have responsibility for all tendering, contracting and payment activities related to projects financed under the IPA of the European Commission in the Republic of Macedonia. It is called Central Financing and Contracting Department[12] within the Ministry of Finance and it is in charge of the implementation of the tenders.

External Assistance: EU's external assistance target other countries than the Member States and aims to support various types of reforms, political and economic stability, as well as countries or regions in crisis.

Regional Assistance: The regional assistance accounts for a larger portion of the expenditures and finances regional development within the Member States in order to obtain economic and social prosperity and to reduce the gaps in development between regions.

Natural Resources: The Natural Resources section comprises several funding opportunities in the fields of agriculture, rural development, environment and fisheries.

Community Programmes: EU provides financial assistance through various community programmes in a broad range of fields such as research, competitiveness and innovation, media, education, health, youth, culture, etc. Different organisations, bodies and companies from all Member States can participate, as well as participants from Non-Member States according to their agreements with the EU. The Republic of Macedonia is eligible also for this kind of Community funds, such as 7th Framework Programme for Research, technological Development and demostration activities (FP7) and Competitivness and Inovation Framework Programme (CIP).

FP7 is a special programme for research projects, created for the period 2007-2013 and has budget of over 50 billion EUR. It provides funding to co-finance research, technological development and demonstration projects based on competitive calls and independent peer review of project proposals. There are six possible funding schemes: Collaborative

[12] Central Financing and Contracting Department, Ministry of Financing of the Republic of Macedonia,

http://cfcd.finance.gov.mk/Home.html

Projects, Networks of Excellence, Coordination and Support Actions, Individual Projects, Support for training and career development of researchers. Most of the projects are given to consortiums made up of several partners from the EU and all around the world. The main idea behind it is the networking possibility and the sharing of ideas and knowledge in research that will help Europe to thrive as a knowledge-based society.

CIP programme supports innovation activities (including eco-innovation), provides better access to finance and delivers business support services in the regions. It encourages a better take-up and use of information and communications technologies (ICT) and helps to develop the information society. It also promotes the increased use of renewable energies and energy efficiency. It has total budget of 3,6 billion EUR and same as the other programmes it runs from 2007 to 2013.[13]

6.1.3.2 RECOMMENDATIONS FOR EFFICIENT USE OF EU FUNDS

Regarding Analytica analysis (Analytica, 2009a) on efficient usage of EU funds, The Republic of Macedonia is lagging behind in terms of IPA usage. Institucional capacity has been a persistent problem. This issue together with the others are contributing to insufficient usage of EU funds in the Republic of Macedonia. Possible recommendations on efficent use of EU funds are listed in the next paragraphs.

Firstly, management of the EU funds should be coordinated and simplified. Having one or two departments or agencies that will coordinate everything connected with the IPA and other EU Funds is of an essential importance for everyone who needs information to know where to get it. Open and transparent working, with qualitative strategic documentation is a must-have if the Republic of Macedonia wants to have the benefits from the EU funds.

Closely connected to the first one, second recommendation addresses the way the Government is promoting the EU Funds in Macedonia. Apart of having reliable contacts that are easy to get through, public informational campaign is an important component of the promotion. Printed brochures that are easily understandable, disseminating them around the country, organizing regular info-days and creating interactive IPA forum where questions will be answered and ideas will be exchanged, are only some of the mechanisms for increased awareness for IPA and the other Community Programmes within the society.

[13] Competitiveness and Innovation Programme 2007-2013 (CIP), European Commission, http://ec.europa.eu/cip/index_en.htm

Thirdly, one of the most important issues is the full scale cooperation between all the interested parties in EU financing. On one side is the EU Mission which "gives" the money. On the other is the government which coordinates and manages the funds and on third are other end beneficiaries. All parties should work closely while developing the strategic national documents. The Government should provide access to all comments communicated during these consultations.

At last, non-formal education for the EU funding programmes is a precondition for successful applications and projects. Education of all the actors and especially potential beneficiaries has key influence on the increase of usage of allocated funds each year. The education is being implemented through different seminars and workshops.

6.1.4 OTHER FINANCING OPTIONS

In defining the financial sources of funding beside the economic water price, (e.g. funds for protection from harmful effects of water, drain-melioration, irrigation etc.) and European funds, Macedonian water policy would have to adhere to the following strategic objectives:

- financing system for protection from harmful effects of water should reflect the concept of integrated water management and planning;
- keeping the concept of water charges for different water uses;
- ensuring the solidarity of all users in the field of water management and

establish "the principle of priority need" in accordance with funding, plans and objectives in water management sector.

6.2 ESTIMATION OF CURRENT AND FUTURE INVESTMENTS IN WATER SECTOR

The content of this chapter was prepared on the basis of current Public investment programme 2009-2011, which was prepared in accordance with the Work programme of the Government of the Republic of Macedonia. Focus is given to the investments in drinking water supply and sewage systems as well as to the main economic sectors, which are using water for production.

6.2.1 DRINKING WATER SUPPLY AND WASTE WATER TREATMENT

The investment activities in the water supply development shall be conducted towards reconstruction, construction completion and optimisation of the existing water supply systems and construction of new water supply systems. In future, the investment activities will be directed towards reconstruction and completing the construction of the existing sewage networks as well as construction of new networks and treatment plants. This step is taken for the purpose of solving the devastated sewage systems and the lack of the same in a large number of settlements.

In the (Table 37) current and future investments (after 2011) for water supply and waste water treatment are given.

Table 37: Current and future investments for water supply and wastewater treatment from 2009 to 2011 and after (Government of Macedonia, 2009)

Investment/Year	**TOTAL** (in millions MKD)	**before 2009** (in millions MKD)	**2009** (in millions MKD)	**2010** (in millions MKD)	**2011** (in millions MKD)	**after 2011** (in millions MKD)
HS Zletovica - 1st stage water supply	**4.821**	2.583	1.447	792	0	0
Studencica water supply system	**30**	0	30	0	0	0
Water supply system Prilep	**624**	110	132	220	162	0
Rehabilitation of landslides	**163**	59	35	34	35	0
Water supply of Sveti Nikole	**141**	60	25	21	8	27
Water supply of inhabited places in the Republic of Macedonia	**3.691**	0	123	554	738	2.276
Cascade barriers of Vardar River I.	**1.059**	0	146	370	543	0
Water supply pipeline Tetovo	**315**	70	55	86	100	4
Construction programme for water supply and sewage systems in populated areas	**527**	0	263	100	163	0
Water support in the Republic of Macedonia	**418**	47	234	137	0	0
Cascade barriers of Vardar River II.	**1.060**	0	98	650	311	0
Monitoring systems of the rivers in the Republic of Macedonia	**74**	73	2	0	0	0
Reconstruction and construction of waste water treatment plants and other facilities	**125**	0	40	40	45	0
Integrated management with the eco-systems in the Prespa Lake basin	**128**	18	49	62	0	0

Investment/Year	TOTAL (in millions MKD)	before 2009 (in millions MKD)	2009 (in millions MKD)	2010 (in millions MKD)	2011 (in millions MKD)	after 2011 (in millions MKD)
TOTAL	**13.176**	**3.019**	**2.680**	**3.064**	**2.106**	**2.307**

Most of the investments are reffering to construction of water supply systems. These investments are already in place and have also appropriate financial sources. Total is estimated at 13.176 millions MKD (212 millions EUR)[14]. There are also some investments, for which the financing has not been provided yet (Table 38). The investments are mostly dealing with solving of wastewater problems. In the future there should be enough financial sources for financing these investments. Total is estimated at 12.876 millions MKD (210 millions EUR).

Table 38: Investments without financing sources (Government of Macedonia, 2009)

Investment	in millions MKD
Preparation of Feasibility study for construction of the HMS "Raven - Rechica"	15
Preparation of Feasibility study for construction of the HS "Konsko"	25
Waste water treatment system, city of Skopje	8.812
Water Supply and Sewage Project – first stage	772
Construction of wastewater treatment station in Gevgelija	246
Preparation of technical documentation of waste water treatment systems	1.910
Construction of purification station for waste water-Prilep	1.097
TOTAL	**12.876**

6.2.2 AGRICULTURE

The investment activities in irrigation development through non-credit types of financing and trough selective indebtedness with foreign soft loans should be focused, primarily, on:

- reconstruction and modernisation of the existing irrigation systems and
- completion and equipment of new necessary irrigation systems.

In the Table 39 current and future investments for agriculture are given.

[14] Calculation is based on middle exchange rate of National Bank of the Republic of Macedonia on 1.1.2011 (1 EUR = 0.016257 MKD).

Table 39: Current and future investments for agriculture from 2009 to 2011 and after (Government of Macedonia, 2009)

Investment/Year	**TOTAL** (in millions MKD)	**before 2009** (in millions MKD)	**2009** (in millions MKD)	**2010** (in millions MKD)	**2011** (in millions MKD)	**after 2011** (in millions MKD)
Irrigation of Southern region of the River Vardar	1.010	779	0	231	0	0
HMS Lisice - phase 2 - construction of irrigation systems	2.628	0	40	251	301	2.037
Programme for irrigation of the Southern Valley of the River Vardar	1.374	148	154	162	328	581
Construction of dam on Orizarska river	2.768	0	10	100	201	2.457
Regulation of the water flows of the Vardar River	372	73	0	148	151	0
TOTAL	**8.152**	**1.001**	**204**	**892**	**981**	**5.075**

The investments are estimated at 8.152 millions MKD (132,5 millions EUR).

In the agricultural sector there are are also investments, for which financial sources has not been provided yet. According to the Public investment programme 2009-2011 there are lack of financial sources for second phase of HPP "Zletovica". Main purpose of the investment is construction of irrigation systems. The investment is estimated at 2.768 millions MKD (45 millions EUR).

6.2.3 ENERGY

Regarding this condition and the environment of energy system construction in market oriented economy the activities in the next period will be focused on more intensive utilisation of the hydro-energy resources through construction of new hydro electric power plants; (via issuance of concessions and PPP).

In the Table 40 current and future investments for energy sector are given. In the period 2009-2011 there is forseen a construction of new HPP Sveta Petka, which is already in progress and revitalisation of the existing ones.

The costs are estimated at 6.050 millions MKD (nearly 100 millions EUR).

Table 40: Current and future investments for energy sector from 2009 to 2011 and after (Government of Macedonia, 2009)

Investment/Year	TOTAL (in millions MKD)	before 2009 (in millions MKD)	2009 (in millions MKD)	2010 (in millions MKD)	2011 (in millions MKD)	after 2011 (in millions MKD)
Construction of HPP Sveta Petka	4.088	3.142	946	0	0	0
Reconstruction and revitalisation of the existing HPPs	1.962	0	283	308	356	1.016
TOTAL	**6.050**	**3.142**	**1.229**	**308**	**356**	**1.016**

Construction of a new dam (69 m high) and HPP "Sveta Petka" between HPP Kozjak and HPP Matka, which is located downstream is planned. Along with this, the water from the lake "Sveta Petka" will be used for irrigation of the Skopje valey and for technical water for the town of Skopje.

Reconstruction is forseen for HPP Vrutok, HPP Vrben, HPP Raven, HPP Globochica, HPP Tikvesh and HPP Shpilje. With the reconstruction and revitalisation of the existing HPPs their working time will be prolonged for 30-35 additional years through:

- adaptation of the HPPs with the technical characteristics;
- modernisation of the control system, management system, regulation system (turbine, voltage) and protection system (generators, transformators and long distance power line);
- increasing the installed capacity for around 49.5 MW, that will provide an additional annual production of around 80 milions KWh electricity and
- elimination of the current weaknesses, bad technical solutions etc.

In the energy sector there are investments, for which financial sources has not been provided yet and investments, which are based on concessions in the future.

These investments are listed in the Table 41.

Table 41: Investments without financing sources in energy sector and with future concessions for energy production (Government of Macedonia, 2009)

Investment without financing sources	in millions MKD
Hydroelectric Power Plant "Zletovica" 3 phase – energetics	1.789
TOTAL	**1.789**
Investment with concessions	**in millions MKD**

Construction of 400 small HPP	43.058
Construction of 12 HPP - Vardar River Valley	72.584
Construction of the HPP "Chebren"	20.814
Construction of Hydro Power Plant "Galishte"	12.317
Construction of Hydro Power Plant "Boskov most"	4.306
TOTAL	**153.079**

Hydro potential available to be used through construction of small hydro power plants in the Republic of Macedonia is relatively low. It is estimated that in the coming period, it is realistic to expect realization of 400 new small hydro power plants. Locations of these projects are in different parts of the country. Total installed power of these power plants is 256 MW, with a possibility for an average annual production of 1.190 GW/h. This project implementation is foreseen to be realized through concession.

The project "Vardar River Valley" envisages construction of 12 medium hydro power plants: Kukurecani, Dubrovo, Babuna, Zgropolci, Krivolak, Demir Kapija, Veles, Gradsko, Gradec, Miletkovo, Gavato and Gevgelija, with total installed power of 307,04 MW, and total annual production of 1331,30 GWh. This project implementation is foreseen to be realized through concession.

The Project HPP Chebren foresees construction of concrete dam 192,5 m high, draining and sup-plying facilities, and a powerplant with installed capacity of 333/347 MW and average annual production of 840/786 GWh of electricity. The facility is a part of the hydropower system Crna Reka and represents one of the three consecutive hydroelectric power plants. A small dam, the "Orlov Kamen" 55,00 m high, will operate as a downstream reservoir for HPP "Chebren". This storage will be situated at the end of the storage Galishte separated by the concrete arch dam.

The Project HPP Chebren foresees construction of rock-fill dam 14,5 m high creating an accumulation of 344 million m^3, and construction of power plant with installed capacity of 193,5 MW and possible annual production of 262,50 million KWh of electricity.- The facility is a part of the hydroenergy system Crna Reka and represents one of the three consecutive hydro electric power plants. The HPP Tikvesh is already in exploitation, and the second one (Chebren) is in stage of project promotion for concession arrangement.

"Boshkov Most" Hydro Power Plant is planned to be constructed in the western part of Republic of Macedonia in the vicinity of Debar. It is a typical derivation power with rock-fill dam 42,50 m high with a storage lake on the sterms of the Mala Reka catchment area, derivation chanel, penstock, multiple intake and supply facilities, tunnel (8,987 m) and

power house with installed capacity of 70 MW and possible annual production of 126,7 million KWh of electricity. The financing will be with consesions (BOT).

7. VISION FOR THE FUTURE

In the future, the Republic of Macedonia should give special effort on activities, necessary for the implementation of water legislation. In this chapter there are recommendations for the institutional structure in water sector and training of the people dealing with water management, which will help to achieve goals form this strategy. All this activities should be done with public participation and public support.

7.1 ACTIVITIES NECESSARY FOR THE IMPLEMENTATION OF WATER LEGISLATION

This chapter presents progress on transposition and implementation of European Community environmental legislation in the Republic of Macedonia. A few directives were in the meantime amended or repealed. Therefore, the overall score may have changed since the beginning of the year 2010 (EU, 2009; European Parliament resolution, 2010).

The transposition of most of the directives from the water sector has progressed with the adoption of the Law on Water in August 2008 as amended in 2009. Thus the Law on Water ensures almost full transposition of the Water Framework Directive 2000/60/EC. Nevertheless additional subsidiary legislation is to be drafted, stipulated in the Law on Water, which will ensure full transposition of the water directives. The transposition of the Drinking Water Directive has been completed also through the new Law on Waters, and the Rulebook on safety of water for human consumption (RSWHC) OG 46/08. Marginal progress was reported under the Urban Waste Water Directive, Nitrate Directive, Bathing Water Directive, Dangerous Substances to Water Directive and the other directives dealing with specific discharges into the water.

Also the Floods Directive and the new Ground Water Directive are assessed as reaching medium transposition scores. Additional pertinent legislation which should be noted is the Law on the Collection and Treatment of Waste Waters and Law on Drinking Water Supply and Discharge of Urban Waste Water, Rulebook on safety of water for human consumption, and Decree on Water Classification. Most of the directives have transposition dates scheduled for 2010, whereas the Urban Waste Water Directive is planned for 2013 and the new Ground Water Directive for 2014.

The Law on Water provides the basis for transferring responsibilities in the water area from the Ministry of Agriculture, Forestry and Water Economy to the MEPP which was scheduled to take place as of 1st of January 2010. The implementation in the water sector is considered to be in a very early stage and requires additional efforts. Since the previous progress

monitoring year only minor implementation progress was recorded for the Drinking Water Directive. Regarding all the relevant water directives none of the individual implementing obligations have been put in place apart from the designation of the competent authority. In fact the Drinking Water Directive and the Bathing Water Directive are the only directives where five and seven single implementation obligations were achieved. For all the relevant directives, the date for full implementation remains end of 2014. Only the Fish Water Directive is scheduled for implementation in 2013.

Under this area in the following directives were covered:

- Water Framework Directive (2000/60/EC) as amended by Decision 2455/2001/EC;
- Urban Waste Water Directive (91/271/EEC) as amended by Directive 98/15/EC and Regulation (EC) 1882/2003;
- Drinking Water Directive (98/83/EC) as amended by Regulation (EC) 1882/2003;
- Nitrates Directive (91/676/EEC) as amended by Regulation (EC) 1882/2003;
- Bathing Water Directive (2006/7/EC);
- Groundwater Directive (2006/118/EC) of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration;
- Dangerous Substances to Water Directive (2006/11/EC);
- Mercury Discharges from Chlor-Alkali Industries Directive (82/176/EEC) as amended by Directive 91/692/EEC;
- Cadmium Discharges Directive (83/513/EEC) as amended by Directive 91/692/EEC;
- Other Mercury Discharges Directive (84/156/EEC) as amended by Directive 91/692/EEC;
- HCH Discharges Directive (84/491/EEC) as amended by Directive 91/692/EEC;
- List One Substances Directive (86/280/EEC) as amended by Directives 88/347/EEC, 90/415/EEC and 91/692/EEC;
- Fish Water Directive (2006/44/EC) and
- Floods Directive (2007/60/EC).

7.1.1 IMPLEMENTATION OF WATER FRAMEWORK DIRECTIVE IN MACEDONIA

The transposition of the Water Framework Directive (2000/60/EC) has progressed significantly with the adoption of the Law on Water in July/August 2008. The adoption of the law ensures almost full transposition of the Directive. Full transposition will be achieved with the adoption of subsidiary legislation by the end of 2010.

The date of full implementation is foreseen for January 2014. The timing for implementation of all obligations has been set. The Law on Waters provides a basis for the implementation which will be achieved through the adoption of the secondary legislation, but also through other activities. The MEPP will be the driver for implementation of the Directive, with involvement also from the Ministry of Agriculture, Forestry and Water-Economy. The future competences under the Directive have been determined so as to fall under the MEPP, with only partial competence falling under MAFWE with irrigation, and other minor issues.

There are four river basins defined in the Law on Waters (Vadar, Crn Drim, Strumica and Juzna Morava). A river basin management plan is being developed by the MEPP. Regarding Crn Drim, encompassing lakes Ohrid and Prespa, an agreement has been signed with Albania regarding management of Lake Ohrid, and with Albania and Greece regarding Lake Prespa. The Government shall prescribe the requirements and procedures for establishing of water protection zones, and for the information and mapping. The Government shall adopt a programme for measures for each river basin districts in the territory of the Republic of Macedonia aiming at achieving the environmental objectives determined by this law and in the river basin management plan data for each river basin district have been partially collected, but it has not been made systematically and in accordance with WFD.

7.1.2 TIMEFRAME FOR THE IMPLEMENTATION OF FLOODS DIRECTIVE IN MACEDONIA

The transposition of Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks starts at a relatively high level transposed into national legislation. The Law on Waters refers to a set of subsidiary legislation which should come into effect by the end of 2010.

The Law on Waters lays the foundations for implementing the Directive together with the required subsidiary legislation. The implementation schedule has been defined and full implementation is set for the beginning of 2014. The competent authority for water management is the MEPP.

7.1.3 TIMEFRAME FOR THE IMPLEMENTATION OF WATER PROTECTION RELATED EU DIRECTIVES IN MACEDONIA[15]

7.1.3.1 GROUNDWATER DIRECTIVE (2006/118/EC)

The transposition into national legislation of Directive 2006/118 of the European Parliament and of the Council on the protection of groundwater against pollution and deterioration is at a very low level. The Law on Waters even though with a low level of transposition, serves as the basis for transposition. The above mentioned law provides for the legal basis for the transposition of the Directive, which will come into life by the end of 2014 after the adoption of several pieces of secondary legislation.

The Law on Waters lays the foundations for implementing the Directive together with the required subsidiary legislation. The implementation schedule has been defined and full implementation is set for end of 2014. The competent authority for water management is the MEPP.

7.1.3.2 DRINKING WATER DIRECTIVE (98/83/EC)

The transposition of this Directive has been finalized. The adoption of the Law on Waters and the Rulebook on safety of water for human consumption (RSWHC) OG 46/08, lead to its full transposition.

Almost all of the implementing obligations were achieved with major progressed marked in the end of 2008. What remains to be achieved are the system of quality assurance of the treatment, equipment and materials and a reporting system on the quality to the consumers and to the Commission. The full implementation is planned for January 2014.

The relevant competent authorities have been identified: The Ministry of Transport and Communication has the overall responsibility for the infrastructure of water delivery and the municipalities are responsible for the delivery of water. The latter have public water supply enterprises managing the infrastructure for water supply and are also responsible for extraction, delivery and treatment of Drinking Water. The Ministry of Health together with the Food Directorate and national institutes for health protection have the overall responsibility for monitoring drinking water quality, for enforcement and for informing the public for Drinking Water quality. There is not yet any comprehensive overview over individual supplies of drinking water, although some data is in place. Standards for drinking water have been introduced which are partially in line with EU requirements under the 2008 Rulebook on safety of water for human consumption. Drinking water monitoring system is in place as is a procedure for failures to meet a drinking water standard.

[15] Implementation of Water Framework Directive (2000/60/EC) is given separately.

7.1.3.3 URBAN WASTE WATER DIRECTIVE (91/271/EEC)

The transposition of this Directive advanced with the adoption of the Law on Waters during the summer of 2008. The adoption of the law ensures transposition of more then half of the provisions of the Directive. The full transposition will be achieved with the adoption of subsidiary legislation by the end of 2013. Other relevant legislation is the Law on the Collection and Treatment of Waste Waters and Law on Drinking Water Supply and Discharge of Urban Waste Water.

The schedule for implementation is January 2014 setting intermediary deadlines for many obligations for the end of 2009. The set deadline of 2014 for full implementation of the Directive seems unrealistic given the current state of play and the high costs involved reaching full compliance.

There are institutional arrangements in place for carrying out the collection and treatment of Urban Waste Water. The service provider is obligated for discharge of urban waste water by collecting them from the users of the services using sewage system, waste water treatment and discharge to the recipient.

In the Law on Waters, as amended in 2009, it is regulated that the Ministry of Transport and Communications together with the MEPP are responsible for developing of programme for discharge, treatment and collecting of Urban Waste Water and the programme is developed on the basis of proposals from the municipalities.

7.1.3.4 NITRATES DIRECTIVE (91/676/EEC)

The transposition of this Directive made only a slight progress after the adoption of the Law on Waters in 2008. Many of the legal provisions do not ensure transposition of the Directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which will be in place by end of 2012. The annexes will be transposed into additional subsidiary legislation.

The implementation of this Directive is foreseen to be completed by the beginning of 2014. The competent authority for water management from 1st of January 2010 is MEPP. Implementation is governed by the Law on Waters and its subsidiary legislation. Law on Water envisaged adoption of Monitoring Programme.

7.1.3.5 BATHING WATER DIRECTIVE (2006/7/EC)

The level of transposition of the Directive is improved further since the adoption of the Law on Waters, though not significantly. The full transposition will occur once the subsidiary legislation is enacted which will transpose the Directives' annexes and a few other provisions. The date for full transposition is defined for end of 2011.

The Law on Waters and its amendment lays the foundations for implementing the Directive together with the required subsidiary legislation. Competent authorities responsible for realizing of requirements are the Ministry of Health and MEPP. A few implementing obligations are considered achieved as of the end of 2008 and namely the establishing monitoring system, the establishing of a system for the assessment of bathing water quality, development of a system that ensures establishment of bathing water profiles, and taking monitoring measures regarding the risk of cyoanobacterial, macro-algae and/or marine phytoplankton proliferation. Further measures were taken to ensure a system to provide information to the public and provisions for transboundary cooperation.

Full implementation is set for January 2014. The implementation schedule has been defined. The current monitoring of parameters representing risk, are not concise and precise, they will be regulated by the rulebook.

7.1.3.6 FISH WATER DIRECTIVE (2006/44/EC)

The transposition of Council Directive 2006/44/EC of 6. September 2006 on the quality of fresh waters needing protection or improvement in order to support fish life marked progress due to the Law on Waters which was adopted in mid-2008. Still many of the draft law provisions upon adoption do not ensure transposition of the Directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which will be in place by end of 2012. The full transposition will occur once the subsidiary legislation is adopted. The Directive's annexes will be transposed into subsidiary legislation to follow.

The Law on Waters and additional pieces of legislation will lay the foundations for implementing the Directive. Yet the implementation of this Directive was not initiated, yet the deadlines for the completion of implementation of specific obligations have remained as foreseen under previous PM for end of 2013. Ministry of Environment and Physical Planning is the competent authority designated by the Law on Waters. The MEPP shall prescribe the criteria for selection of the measure points of the state and local monitoring network.

7.1.3.7 DANGEROUS SUBSTANCES TO WATER DIRECTIVE (2006/11/EC)

The transposition of this Directive marked significant progress due to the adoption of the Law on Waters in mid-2008 as amended in 2009. Still many of the law provisions do not ensure transposition of the Directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted.

The Law on Waters lays the foundations for implementing the Directive together with the required subsidiary legislation. The implementation schedule has been defined and full implementation is set for January 2014. MEPP has prepared a Rulebook on emission standards for dangerous substances. Regarding water quality objective the Degree of classification of water is in power (Official Gazette no. 18/99) in which maximum allowed values on certain parameters for classification of water in five classes are being set. Classification is set on the base of purity of water and it use. However this Rulebook is not in compliance with respective directives.

7.1.3.8 LIST I SUBSTANCES DIRECTIVE (86/280/EEC)

The transposition of Council Directive 86/280/EEC of 12 June 1986 on limit values and quality objectives for discharges of certain dangerous substances included in List I of the Annex to Directive 76/464/EEC marked slight progress due to the Law on Waters which was adopted in mid-2008. Still many of the law provisions do not ensure transposition of the directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted.

7.1.3.9 MERCURY DISCHARGES FROM CHLOR-ALKALI INDUSTRIES DIRECTIVE (82/176/EEC)

The transposition of Council Directive 82/176/EEC of 22 March 1982 on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry marked progress due to the adoption of Law on Waters which was enacted in mid-2008. Still many of the provisions do not ensure transposition of the directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted. The directive's annexes will be transposed into subsidiary legislation to follow.

7.1.3.10 CADMIUM DISCHARGES DIRECTIVE (83/513/EEC)

The transposition of Council Directive 83/513/EEC of 26 September 1983 on limit values and quality objectives for cadmium discharges marked progress due to the adoption of the Law on Waters in mid-2008. Still many of the law provisions upon adoption do not ensure transposition of the directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted. The directive's annexes will be transposed into subsidiary legislation to follow.

7.1.3.11 OTHER MERCURY DISCHARGES DIRECTIVE (84/156/EEC)

The transposition of Council Directive 84/156/EEC of 8 March 1984 on limit values and quality objectives for mercury discharges by sectors other than the chlor-alkali electrolysis industry marked minor progress due to the Law on Waters which was adopted in mid-2008. Still many of the law provisions upon adoption do not ensure transposition of the directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted. The directive's annexes will be transposed into subsidiary legislation to follow.

7.1.3.12 HCH DISCHARGES DIRECTIVE (84/491/EEC)

The transposition of Council Directive 84/491/EEC of 9 October 1984 on limit values and quality objectives for discharges of hexachlorocyclohexane marked progress due to the Law on Waters which was adopted in mid-2008. Still many of the law provisions do not ensure transposition of the directive's provisions. The law rather sets forth the legal basis for the adoption of further subsidiary legislation which should be in place by end of 2010. The full transposition will occur once the subsidiary legislation is adopted. The directive's annexes will be transposed into subsidiary legislation to follow.

7.1.4 HOW TO IMPROVE THE IMPLEMENTATION PROCESS OF EU DIRECTIVES

Progress has been made, in particular for horizontal legislation and waste management. Some sectors, like water quality or IPPC, are still lagging behind. Implementation of the legislation remains a considerable challenge. Administrative capacity is weak at both national and local levels. Significant further efforts are still needed to further align with the

EU acquis in this sector and, moreover, to ensure the required investments. Overall, preparations in the field of environment are moderately advanced. (Conclusion of the Commission on the Environment Chapter: Progress Report Former Yugoslav Republic of Macedonia 2009).

Considers that, although the alignment of environmental legislation is moderately advanced, its implementation at local level still requires considerable improvement; reiterates its call for effective monitoring of water quality and water levels in the Ohrid, Prespa and Dojran border lakes and the river Vardar; calls for closer cross-border cooperation on environmental issues, on the basis of EU standards, and welcomes in this regard initiatives at regional level, such as the recent meeting between the premiers of Greece, the Republic of Macedonia and Albania.

7.2 RECOMMENDATIONS FOR THE INSTITUTIONAL STRUCTURE IN WATER SECTOR

Current organization of the water sector in the Republic of Macedonia is divided into several ministries. Their responsibility and obligations are to manage with water resources in the most efficient way, to preserve them in their natural condition and to improve them. With proper institutional structure and organization it is much easier to reach these objectives.

The institutional structure is already setted up, but future needs and development in water management often requires additional changes and improvements in this field.

At this point some further steps and recommendations, regarding the current organization of water sector in the Republic of Macedonia should be addressed:

- Achieving the EU standards for environmental quality by developing and implementing the framework of the laws related to water and environment.

- Developing the capacity of the environmental sector in Macedonia - including local self government, industry, environmental service providers, government institutions and non-governmental organizations - to fulfil its responsibilities.

- Decentralization. Many services that are today performed by the national administration can (and many times should) be delegated to the local or regional authorities. Activities such as municipal services, urban planning, local monitoring and local regulations are in most countries performed by municipalities or some kind of regions. The

benefits of decentralization are that the environmental problems are solved closer to their origin and to the citizens.

- Finalize the organizational set up within the MEPP, which includes introducing a human resource management system in the MEPP. The objectives of securing a healthy environment and meeting EU requirements can only be achieved with a professional and motivated staff. In this sense, it is necessary to increase the capacities of the MEPP for human resources management, thereby providing direct and personal accountability of every civil servant and at the same time giving them the opportunity to express their creativity and capability with different types of self evaluation techniques (Annex III; **Error! Reference source not found.**).

The MEPP is capable to:

- reinforce the Department for Sustainable Development;
- strengthen capacity to prepare policies and strategies and to facilitate intersectoral coordination with relevant ministries;
- coordinate with local authorities in the preparation and implementation of Local Environmental Action Plans and the development of economic instruments;
- strengthen The Department for European Integration;
- establish coordination and cooperation between the Department for Legislation and Standardization and the Department for European Integration is of critical importance and
- give the highest priority to strengthening its implementation bodies – the Environment Office and the State Environment Inspectorate.

To fullfil its obligations as the competent body for environmental protection, the MEPP needs clear definitions of its responsibility and its mandate regarding the environmental aspects of legislation, monitoring, data management and enforcement. This will probably take a long time and a number of legislative changes. At the same time, some action is possible now, where there is a clear common understanding among ministries of the functions of the Ministry of Environment as a national body for the environmental monitoring system.

7.3 TRAINING IN THE FIELD OF WATER MANAGEMENT

Academics and practitioners have recently identified the need for the evaluation function within working processes. They have been focusing on the evaluation process as a strategic tool for knowledge and information acquisition with the aim of facilitating decision making and organizational learning. Evaluation supports informed decision making which is necessary in every stage of any business process initiative. By gathering information and generating knowledge, those involved in or affected by the working process have the opportunity to understand the issues involved in the process. Another advantage of evaluation is knowledge construction and capacity building. Evaluation can be used as a tool to gather information, systematize the lessons learned and then disseminate this information to facilitate similar projects, processes, or change initiatives in the future (Vakola, 2000).

Evaluation of employees' knowledge and their work allows us to understand how things could be done as seen from a novel perspective compared to the existing way of doing things. It helps in revealing problems and bottlenecks, clarifying options, reducing uncertainties, and providing information about programs, policies and processes.

The purpose of this instrument is not to measure the concrete results and outcomes; rather it is to gauge the status of an existing knowledge of the employees working in institutions dealing with river basin management.

Based on the findings, the institution can focus on the problem areas where the employees lack knowledge. When they set the problem areas, further investigation must be conducted in order to find suitable approaches. The institution must decide on how to solve the problem areas and choose appropriate methods for dealing with them. It has several options to upgrade knowledge of the employees such as:

- professional seminars;
- occupational education;
- workshops;
- conferences;
- discussion forums;
- additional material on the subject;
- expert help;
- knowledge transfer of co-workers and
- similar activities.

The institution must assess which approach is the most appropriate and efficient to share and learn ideas and experience.

7.3.1.1 ABOUT THE SELF-EVALUATION FORM

The proposed self-evaluation form of knowledge in river basin management (Annex III; Table 44) is designed to assess the employee's knowledge and competencies necessary for individual area of work. The employee is required to understand and work according to European and Macedonian legislation in river basin management. Additionally, the employee is expected to solve problems by integrating knowledge from different areas of river basin management, use various presentations of concepts, solve problems that have several solution paths, and use different legal documents to solve them.

The self-evaluation form of knowledge is in the form of a questionnaire to be distributed internally within the institution planning or conducting river basin management. It is up to the institution whether the self-evaluation form is anonymous or employees' name and position within the institution must be provided. This depends on the purpose of the final results expected by the evaluator. In case of requiring the level of general knowledge of the employees, there is no need for the form to request the participants name. If the institution needs to know the level of knowledge of individual employees, the form should request the name of the participant. It is worth noting that results tend to be more accurate (and honest) in case of anonymous forms.

The questions should be worded to encourage thinking and finding information on which river basin management is based, directly or indirectly. Each institution has to identify what is relevant for them and add and delete questions as well as reformulate them to fit the purpose and context.

There are two parts of the test. The first part contains multiple choice questions where levels are evaluated from 1 (below average) to 4 (superior) and the second part contains multiple choice questions with options a, b and c. Self evaluation form in the field of river basin management is suitable for staff working in the institutional structure in the water management sector in Republic of Macedonia or any other dealing with river basin management.

7.3.1.2 WHAT TO EXPECT

The employees will take the self-evaluation form at their office location. There are two parts of the test. The first part contains multiple choice questions where levels are evaluated from 1 (below average) to 4

(superior) and the second part contains multiple choice questions with options a, b and c.

Self evaluation form in the field of river basin management is suitable for staff working in the institutional structure in the water management sector in Republic of Macedonia or any other dealing with river basin management.

7.4 PUBLIC PARTICIPATION IN THE FIELD OF WATER MANAGEMENT

Public participation seeks and facilitates the involvement of those potentially affected by or interested in a decision. The principle of public participation holds that those who are affected by a decision have a right to be involved in the decision-making process. Public participation is viewed as a tool, intended to inform planning, organising or funding of activities.

In recent years public participation has become to be seen as a vital part of addressing environmental problems and bringing about sustainable development. In this context the limits of solely relying on technocratic bureaucratic monopoly of decision making, and it is argued that public participation allows governments to adopt policies and enact laws that are relevant to communities and take into account their needs.

7.4.1 ACTIVITIES CONCERNING PUBLIC PARTICIPATION

The purpose of public participation is to ensure that members of the public can understand what is happening in the environment around them. It also ensures that the public is able to participate in an informed manner. This means that environmental information is important in itself but also a precondition for public participation.

The dissemination of information serves several purposes:

- To ensure that process is open and transparent;
- To raise public awareness and change public behaviour within certain areas and
- To ensure stakeholder involvement and public participation.

Public participation is a core principle in water management as required by the EU Water Framework Directive (2000/60/EC). Public Participation is required according to Article 14 of the WFD. Article 14 defines, that

Member States shall encourage the active involvement of all interested parties in the implementation of the Directive, in particular in the production, review and updating of the river basin management plans. Member States shall ensure that, for each river basin district, they publish and make available for comments to the public:

- a timetable and work programme for the production of the plan;
- an interim overview of the significant water management issues identified in the river basin and
- draft copies of the river basin management plan.

The EU Water Framework Directive Common Implementation Strategy process (WFD CIS) delivered an official, pan-European "Horizontal Guidance Document on Public Participation" (EU Horizontal Guidance Document). WFD CIS defines main terminology, important for public participation process:

- ***Public participation***

  Allowing the public to influence the outcome of plans and working processes. Used in this guidance as a container concept covering all forms of participation in decision-making. Term not used in the WFD.

- ***Public*** *(or* ***"general public"****)*

  "One or more natural or legal persons, and, in accordance with national legislation or practice, their associations, organisations or groups" (SEIA Directive (2001/42/EC), Aarhus Convention art. 2(4))

- ***Interested party*** *(or* ***"stakeholder"****)*

  Any person, group or organisation with an interest or "stake" in an issue, either because they will be directly affected or because they may have some influence on its outcome. "Interested party" also includes members of the public who are not yet aware that they will be affected (in practice most individual citizens and many small NGOs and companies).

- ***Broad public***

  Members of the public with only a limited interest in the issue concerned and limited influence on its outcome. Collectively, their interest and influence may be significant.

- ***Consultation***

  Lowest level of public participation if we consider information supply as being the foundation. The government makes documents available for written comments, organises a public hearing or actively seeks the comments and opinions of the public through for instance surveys and interviews. "Consultation" in art. 14 of the Directive refer to written consultations only. Preamble 14 and 46 and Annex VII refer to consultation in general.

- ***Active involvement***

  A higher level of participation than consultation. Active involvement implies that stakeholders are invited to contribute actively to the planning process by discussing issues and contributing to their solution.

Bodies of the central government and the bodies of the municipalities in Macedonia should:

- ensure public participation (PP) in Water Strategy implementation;
- facilitate the establishment of effective structures and mechanisms for public participation in the Strategy that will continue operating beyond the implementation and
- inform key stakeholders about appropriate public participation activities and structures at the different levels.

Based on the Water Strategy and Water Framework Directive, five river basin management plans should be adopted. An Operational Plan in public participation for all activities in river basin management plans should be developed. The Operational Plan should provide details on the activities at the roof level, including a timetable and a work plan (covering a 12-24 months period). The Operational Plan has to be seen as a planning document, which is regularly updated to the needs of the effective adoption of the plans.

7.4.2 STAKEHOLDERS INVOLVEMENT IN PUBLIC PARTICIPATION

There are a number of good reasons for involving stakeholders in environmental decision making and in the development of plans programmes and policies relating to the environment. Full integration of environmental considerations into governmental decision making requires public authorities to be in position of accurate comprehensive and up to

date information. Involvement of the relevant stakeholders and the public can be a major source of such information.

Involvement of stakeholders and the public can take many forms. Ideally it involves the activity of members of society in partnership with the public authorities to reach optimal results in decision making and policy making. Proper involvement of stakeholders and the public require:

- effective notice of the stakeholders and the public to be involved;
- adequate information;
- proper procedures and
- appropriate taken into account the outcome of the involvement of stakeholders and the public.

When the strategic environmental assessments identify instruments, activities and actions in order to achieve the objectives and targets of the Strategy, relevant stakeholders should be consulted as early as possibly. The relevant stakeholders to be consulted might be different for different proposals of instruments, activities and actions. It may be stakeholders:

- that have a special knowledge regarding the consequences of the proposed instrument, activity or action, these might include:
  - Scientific institutions and
  - NGOs
- whose activities will be influenced by the proposed instrument, action or activity.

Public participation on the water management level has to be integrated into the existing processes on national level where the widest range of stakeholders is involved in decision and policy making. It is important that the stakeholders are consulted in an open and transparent way. The stakeholders should be consulted in different ways:

- Written consultations;
- Interviews and
- Workshops.

There is a very large range of stakeholders with a large spectrum of interests differing from each other ready to participate in the water management issues. Each of those stakeholder groups at every water management level needs a special approach to reach their needs and

interests - different channels and tools of communication, different information packages, different timing; different level of detailed description; but all of them need clarity and transparency in the information. One of the most important pre-condition for stakeholder involvement is to formulate very clearly the problems and questions in which stakeholders can contribute the most. The package of programs and activities to enhance public participation should be as diverse as possible and reach the audience wherever possible.

Special attention is needed to the local level. At local municipality and stakeholders' level often insufficient planning and implementation capacity of local governments takes place due to inadequate resources and limited information and awareness.

Public participation has to be seen as a process and is not a one-time event. A strategic approach and careful planning are therefore prerequisites for successful public participation. It is strongly recommended that the process should be started immediately.

7.5 CONCLUSION

The Water Strategy of the Republic of Macedonia sets out how the water sector should look like by 2040, and some of the steps it will need to take to get there. It is a vision where rivers, canals and lakes have improved for people and ecosystems, and where it continue to provide excellent quality of drinking water. It is a vision of a sector that values and protects its water resources and where flood risk is addressed with markedly greater understanding and use of good surface water.

Water management and the field of water policy are regulated in European and Macedonian legislation. The most important part of legislation of the Republic of Macedonia in the field of water management is already established. The transposition of most of the directives from the water sector has progressed with the adoption of the Law on Water. Nevertheless additional subsidiary legislation is to be drafted, stipulated in the Law on Waters, which will ensure full transposition of the directives related to water management. At this point it is very important that legislation, which is already or will be transposed, is fulfilling the obligations from European Union and its legislation in the field of water management.

Responsibilities and obligations in water management are implemented through appropriate governmental institutions. Competencies are divided into six ministries, Ministry of environment and physical planning, Ministry of agriculture, forestry and water-economy, Ministry of economy, Ministry of transport and communications, Ministry of education and science,

Ministry of health and the Republic institute for health protection. At this point some further steps and recommendations, regarding the current organization of water sector in the Republic of Macedonia should be addressed. Administrative capacity in water sector is weak at both national and local level. Significant further efforts are still needed to further align with the EU acquis in this sector.

In the Strategy state of surface water and groundwater is analysed in detail with aim of setting necessary objectives and measures. State is treated from three different aspects – state of water use, state of river training and protection against harmful effects of water and state of water and ecosystem quality.

Water in the Republic of Macedonia is mainly used for drinking water supply, industry, irrigation, mining, hydropower production, tourism and recreation purposes. In the field of drinking water supply one of main indicators is that 88,9 % of the total number of individual households are supplied with drinking water from public water pipeline. Still a part of the households drink water, which is neither biologically nor chemically examined. In the future many actions in the field of water use should be done. The emphasis should be also given to water use for hydropower production, because currently only 26,6 % of technically useful potential is used.

State of river training and protection against harmful effects of water encompass analysis of river training, flood protection, erosion protection, irrigation and surface water drainage. The uneven distribution of the surface water in location, time and quality demanded construction of dams and accumulations that enable optimize use of water resources and ensure flood safety. Flood safety is ensured also with large flood protection schemes that are generally constructed in combination with irrigation and/or drainage systems. Insufficient maintenance of flood protection and irrigation schemes is one of the main problems in the Republic of Macedonia. The current status of the drainage systems in the Republic of Macedonia is not satisfactory - as a result of malfunctioning of the drainage systems, many areas were flooded in the past. Due to torrential flows numerous settlements are also exposed to erosion.

State of water quality and ecosystems is defined with analysis of point and diffuse source of pollution, biological pressures and hydromorphological pressures. Worrying indicator for water quality is that almost half of dwellings are not equipped with instalations to public sewage system. Generally, the systems are rather old, worn out, the collecting network is constructed of different materials, the pipes are cracked and there is leakage of the wastewater in the ground. There is also very small number of wastewater treatment plants in the Republic of Macedonia and this situation should be improved in the future. Beside wastewater important

polluters are also industry and agriculture (large farms, pesticides, fertilizers). Impacts on water and ecosystem quality have also invasive plant species that are found in some aquatic ecosystems and numerous hydromorphological pressures i.e. impoundments, water and gravel extraction, morphological alteration and others.

The main water management objective is achieving an integrated and coordinated water regime on the territory of the Republic of Macedonia. This includes not only location and construction of water systems but also quantity and quality state of water in a manner that best suits a particular location and certain period of time.

By integrated water management in the Republic of Macedonia it is necessary to ensure sufficient quality of drinking water for public supply, ensure the necessary quantity of water of adequate quality for various commercial purposes, protect people and material goods against floods and other harmful effects of water. The objectives are set for river training, flood protection, erosion protection, irrigation and drainage. It is also necessary to achieve and preserve good water status of surface and groundwater bodies, protect aquatic and water dependent ecosystems and to harmonize measures of water management with other sectors of space users. The stress should also be given to sustainable use of water resources, which includes the insurance of sufficient water quantity and development needs of all users, taking into the account natural ecosystem capabilities.

The Strategy is focused on the actions and measures that will be taken for the period until the year 2040 to ensure that quality drinking water is available for people, businesses and nature. It looks at the water cycle as a whole, from rainfall and drainage through to discharge and treatment.
In order to realize an integrated, unified and rational water management in the Republic of Macedonia it is necessary to continue to work on the processes of development of water management through planning, implementing and monitoring of the effects of actions and measures which should be made at the level of basic services and should be integral and set legal, financial and institutional framework and promotion of the inclusion of competent authorities, of all water users and the public.

In the Strategy actions and measures are given separately for protection against floods and other harmful effects of water, water use, water protection, protected and other areas of importance related to water, professional and operational framework of water management, international cooperation and EU accession process, framework and instruments and economic instruments. The actions and measures include administrative instruments, structural measures, measures for improvement of different types of water use, legal instruments and

standards, control and monitoring instruments, data collection and management, economic instruments, etc.

The emphasis should also be given to the principle of prevention as the funds required for the restoration of the damage are distinctly higher than the necessary funds for the continued, organized and planned surface and groundwater protection.

The Strategy is giving a short view of possible financing sources and funds for the implementation of the activities and programme of measures. The preparation of the investment projects is a demanding and costly process, that can only start if financial resources are provided. Implementing large capital investments in water management will contribute to achieving environmental objectives and strengthening absorption capacities for EU funds. In the strategy the focus is given to the investments from Public Investment Programme 2009-2011 of the Republic of Macedonia. Main investment projects are construction of water supply and sewage systems, reconstruction and modernisation of the existing irrigation systems, completion and equipment of new necessary irrigation systems and more intensive utilisation of the hydro-energy resources through construction of new hydro electric power plants.

In the future, Republic of Macedonia should give special effort on training of the people dealing with water management. Evaluation of employees' knowledge and their work allows us to understand how things could be done as seen from a novel perspective compared to the existing way of doing things. It helps in revealing problems and bottlenecks, clarifying options, reducing uncertainties, and providing information about programs, policies and processes. Based on the findings, the institution can focus on the problem areas where the employees lack knowledge.

All the activities in further implementation should be done with public participation and public support. Public participation is a core principle in water management as required by the EU Water Framework Directive. Republic of Macedonia shall encourage the active involvement of all interested parties in the implementation of the legislation, in particular in the production, review and updating of the river basin management plans. Full integration of environmental considerations into governmental decision making requires public authorities to be in position of accurate comprehensive and up to date information. Involvement of the relevant stakeholders and the public can be a major source of such information.

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Ministry of Environment and Physical Planning

www.moepp.gov.mk

• Department of Environment

Ministry of Agriculture, Forestry and Water Management

www.mzsv.gov.mk

• Water Department

Ministry of Transport and Communications

www.mtc.gov.mk

Ministry of Economy

www.economy.gov.mk

Ministry of Health

www.moh.gov.mk

• National Institute for Health Protection

Hydrometeorology

www.meteo.gov.mk

Real space planning

www.app.gov.mk

Ministry of Local Government

www.mls.gov.mk

Center for Crisis Management

www.cuk.gov.mk

Directorate for Protection and Rescue

www.dzs.gov.mk

Department for European Affairs

www.sep.gov.mk

ANNEXES

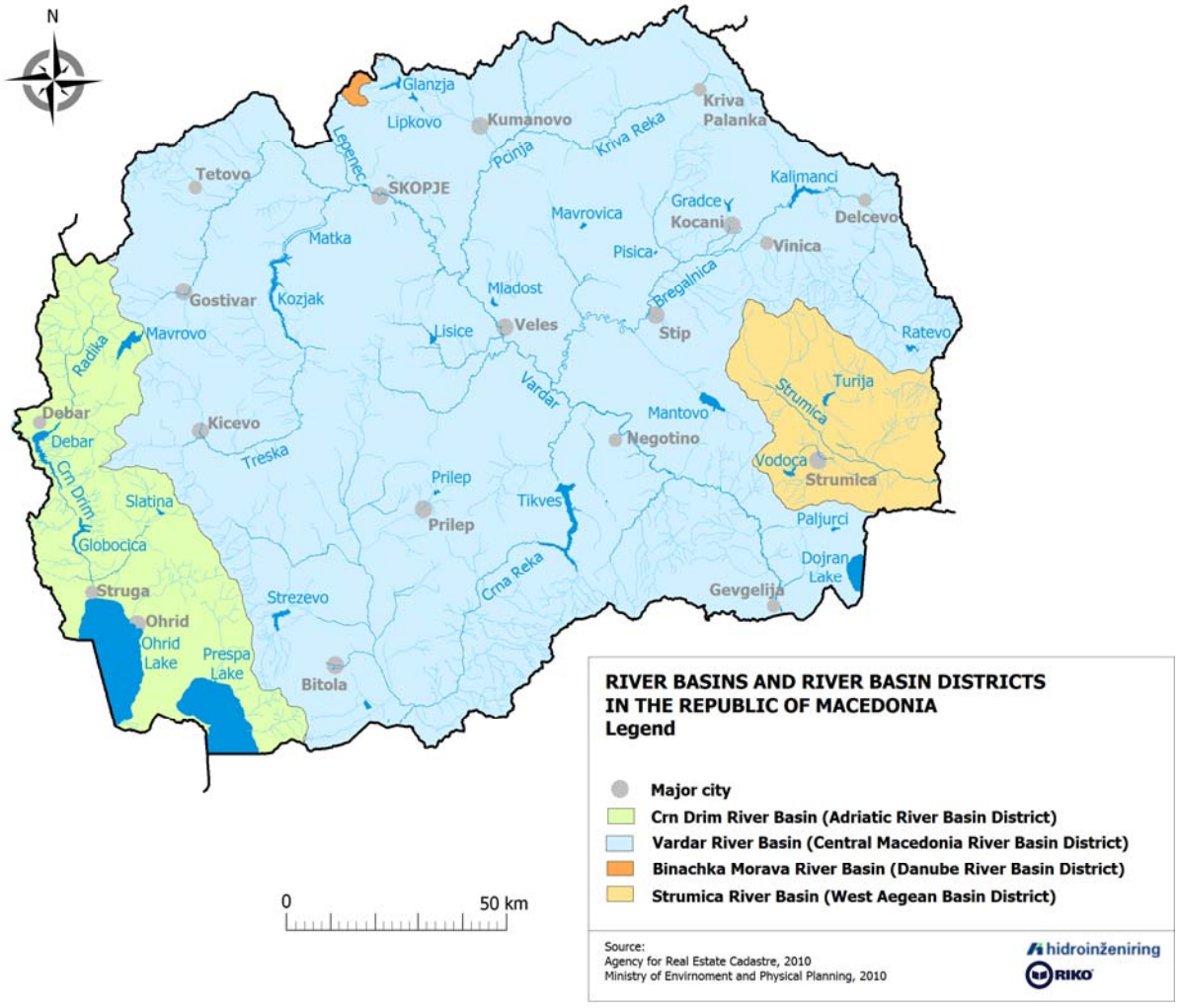
ANNEX I – CARTOGRAFIC MATERIALS

ANNEX II – TABELARIC DATA

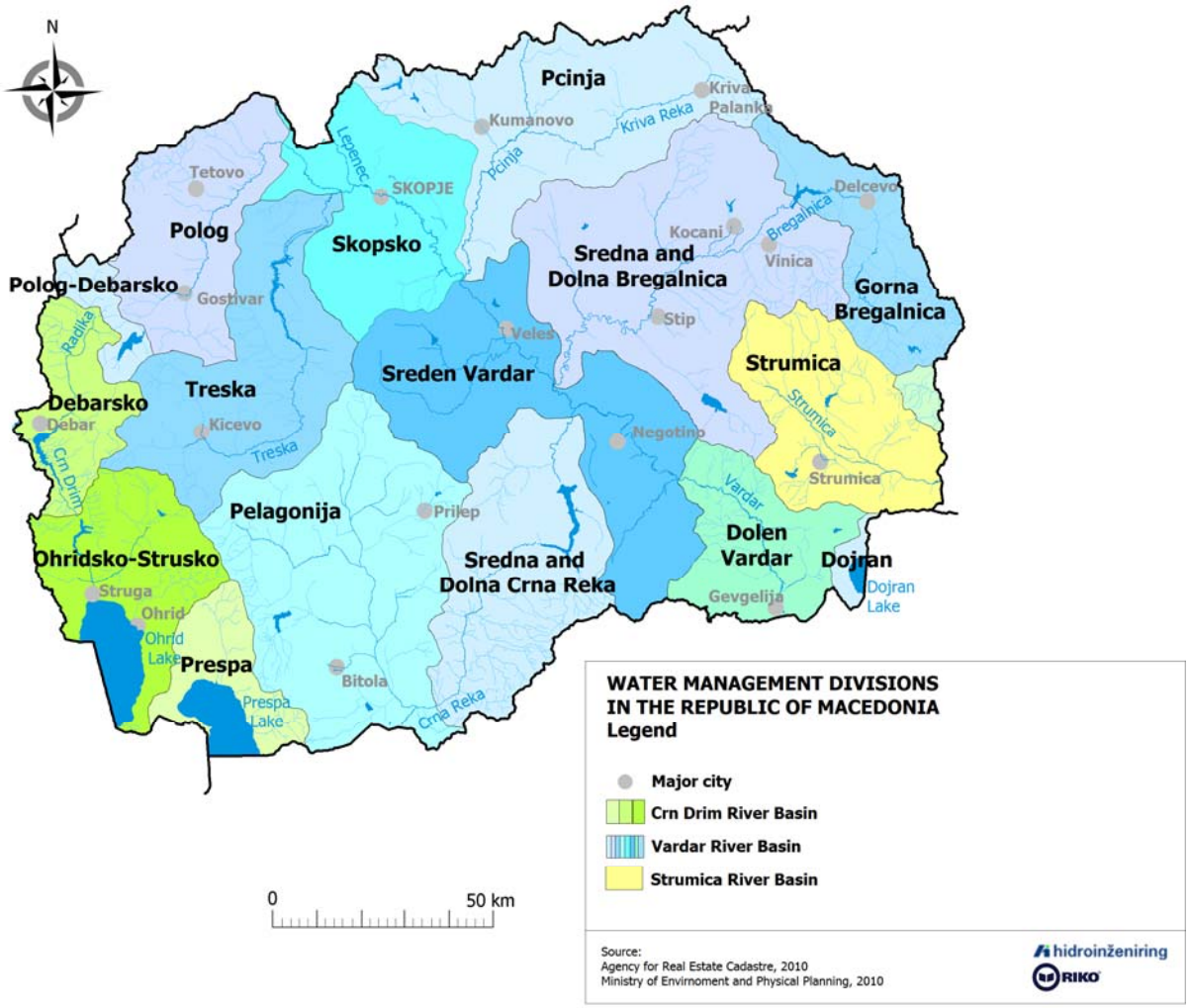
ANNEX III – EMPLOYEE SELF-EVALUATION FORM

ANNEX I – CARTOGRAPHIC MATERIALS

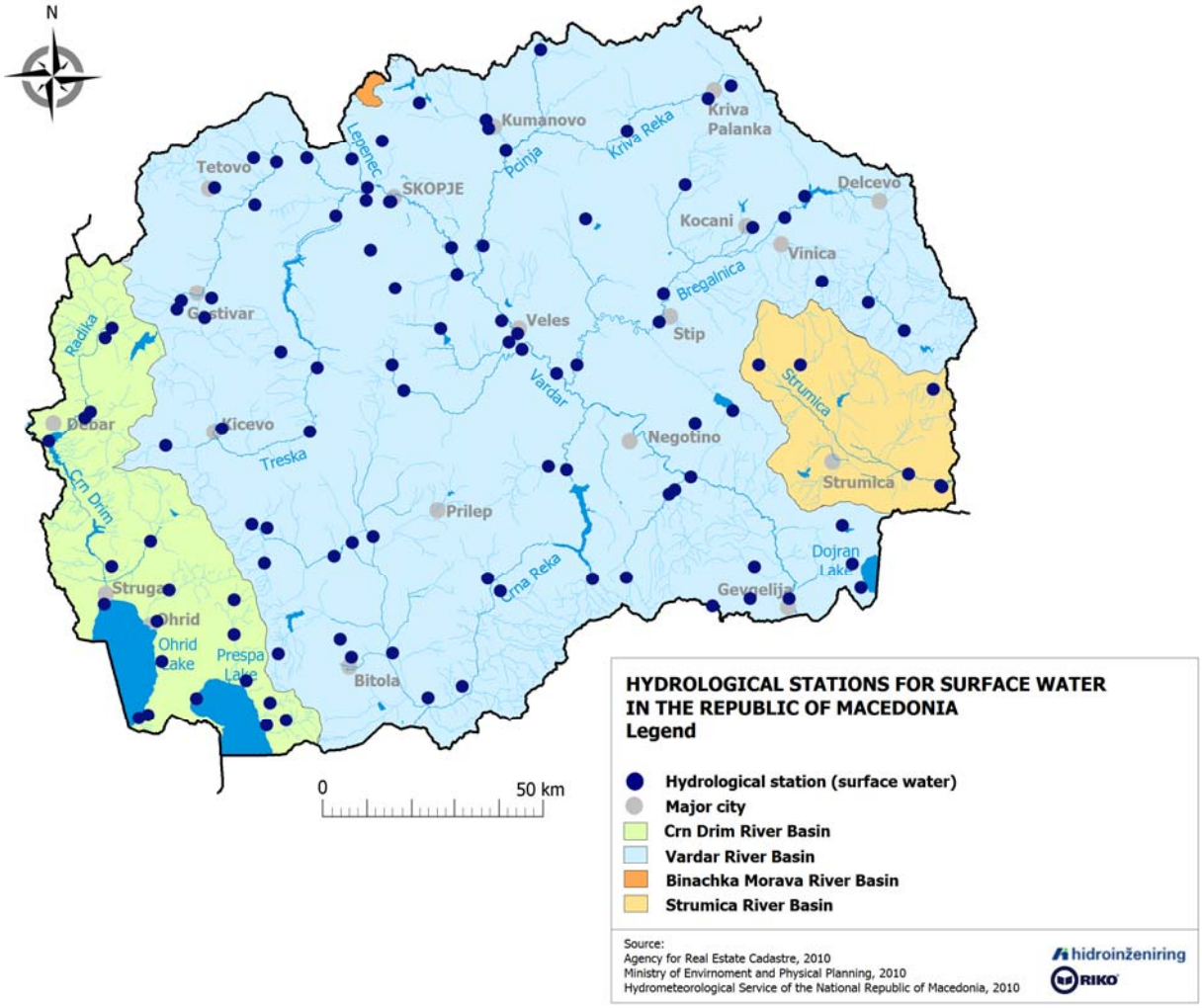
Map 1: River basins and river basin districts in the Republic of Macedonia



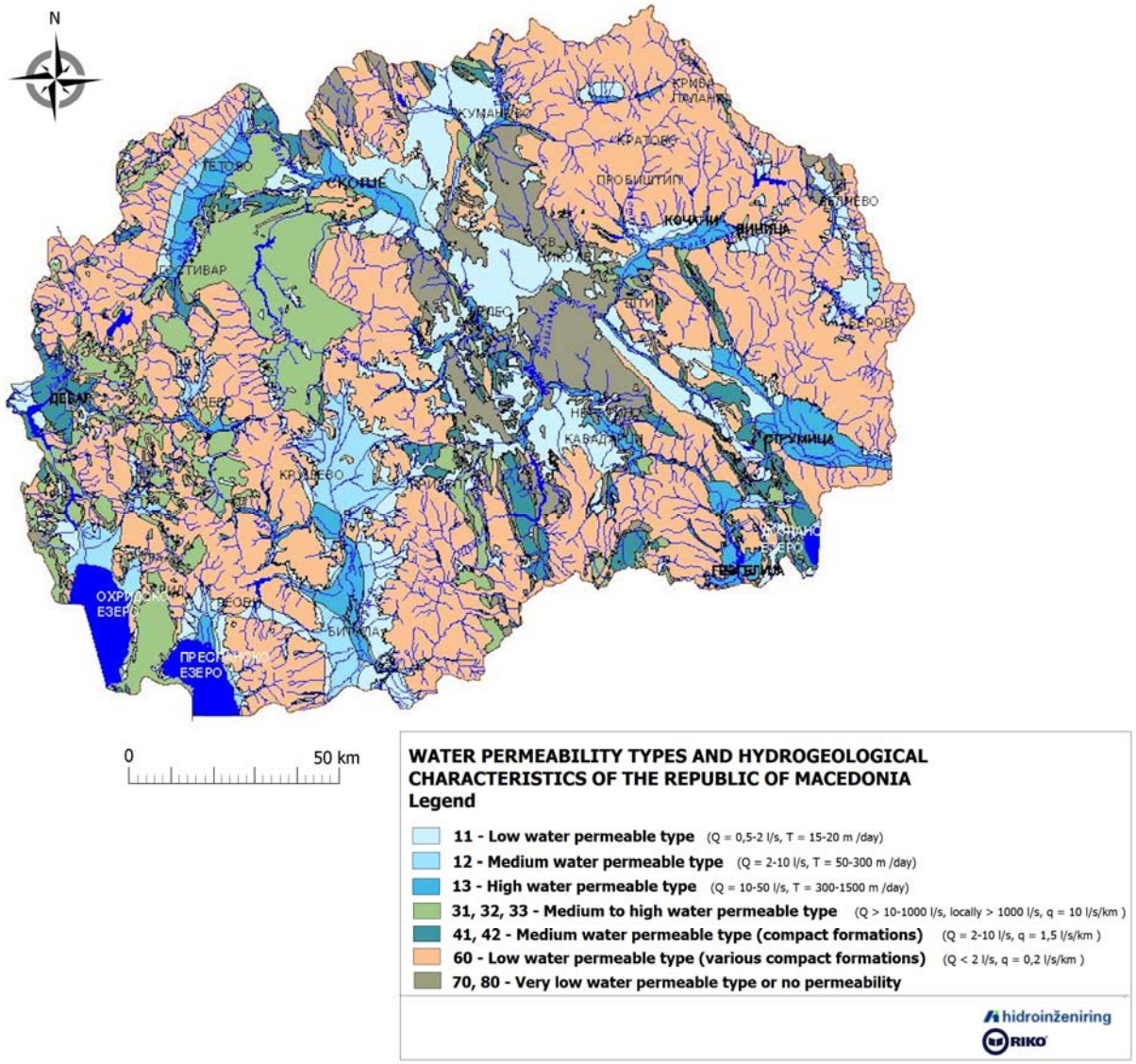
Map 2: Water management divisions in the Republic of Macedonia



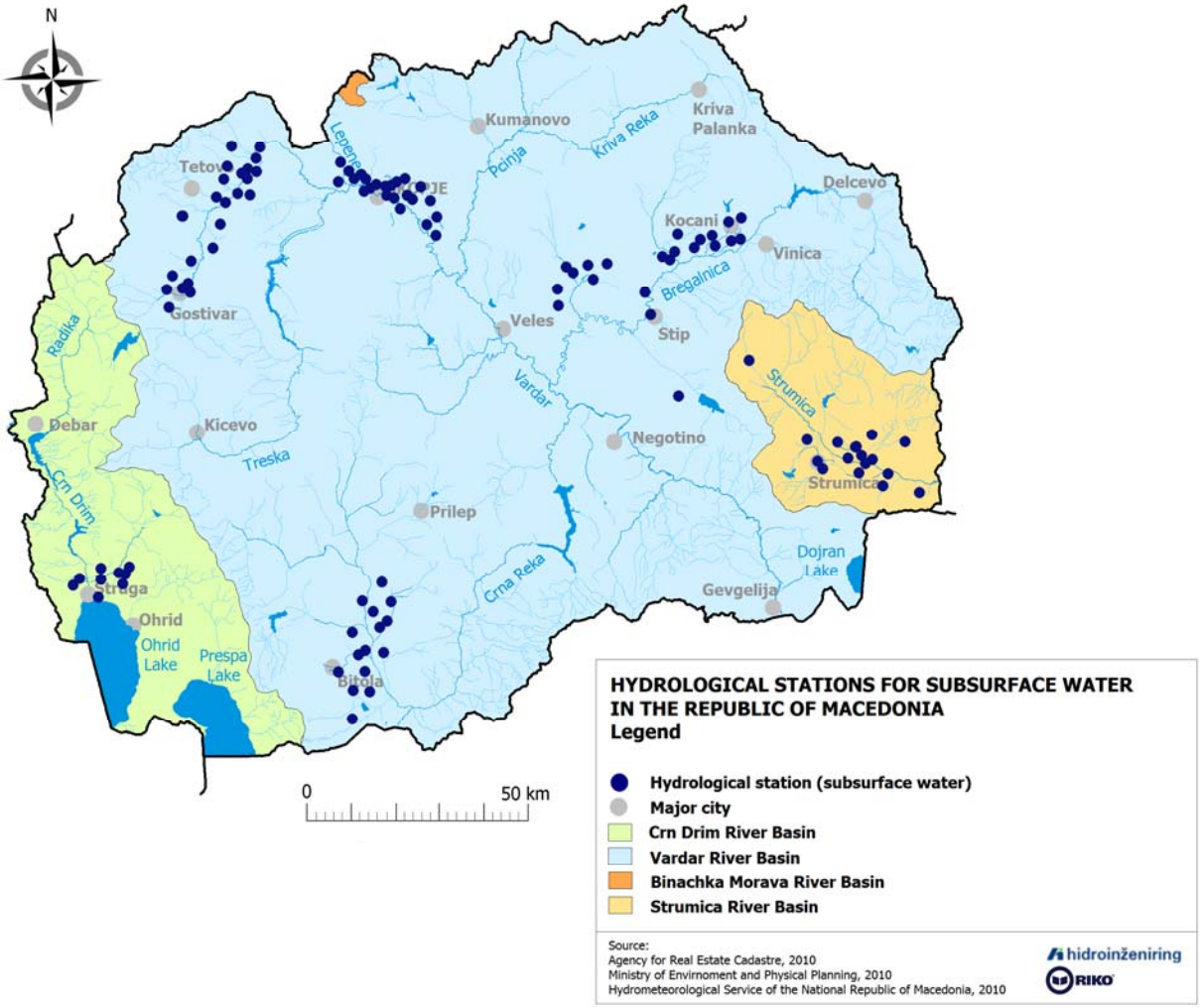
Map 3: Hydrological stations for surface water in the Republic of Macedonia



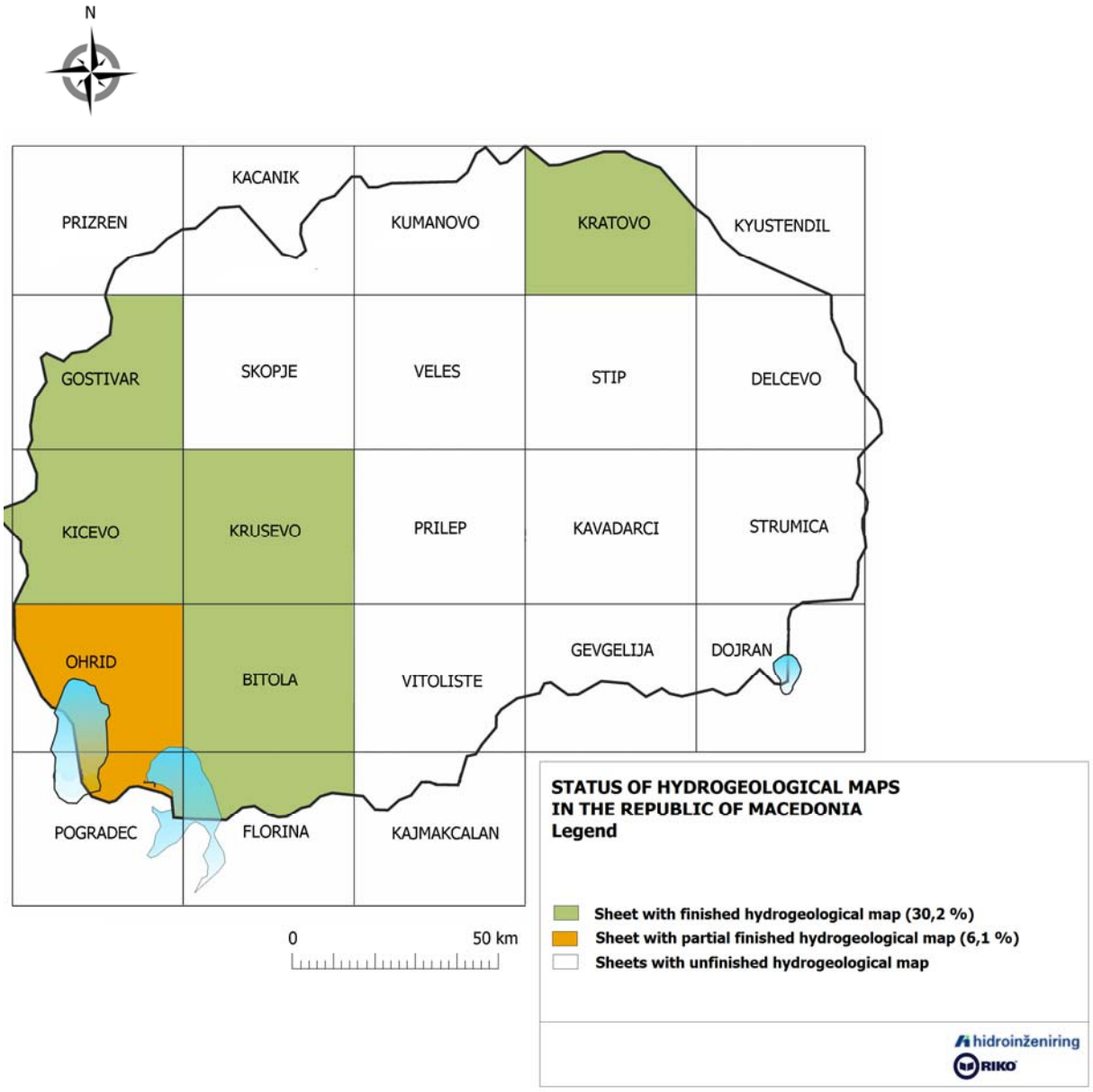
Map 4: Water permeability types and hydrogeological characteristics in the Republic of Macedonia



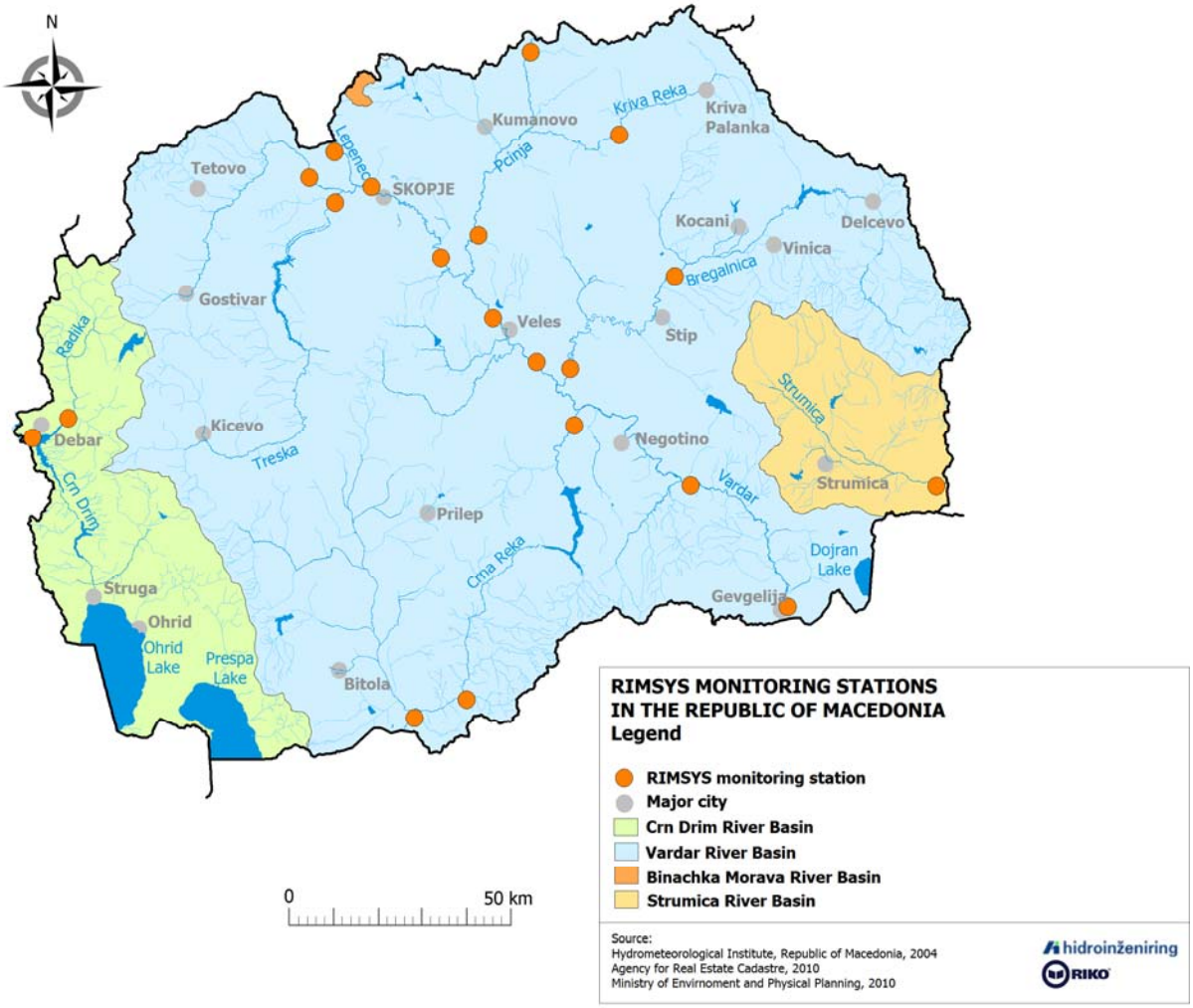
Map 5: Hydrological stations for subsurface water in the Republic of Macedonia



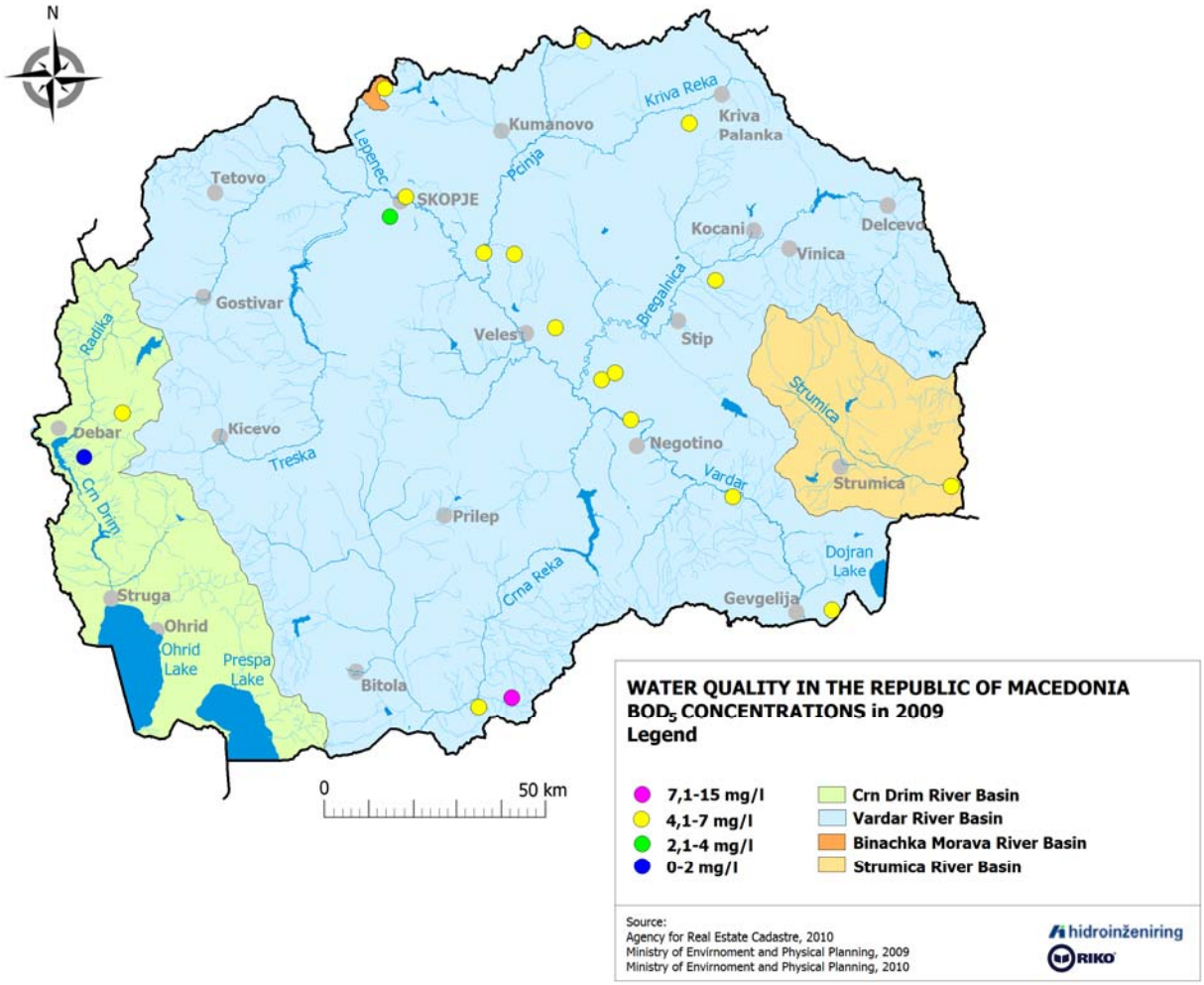
Map 6: Status of hydrogeological maps in the Republic of Macedonia



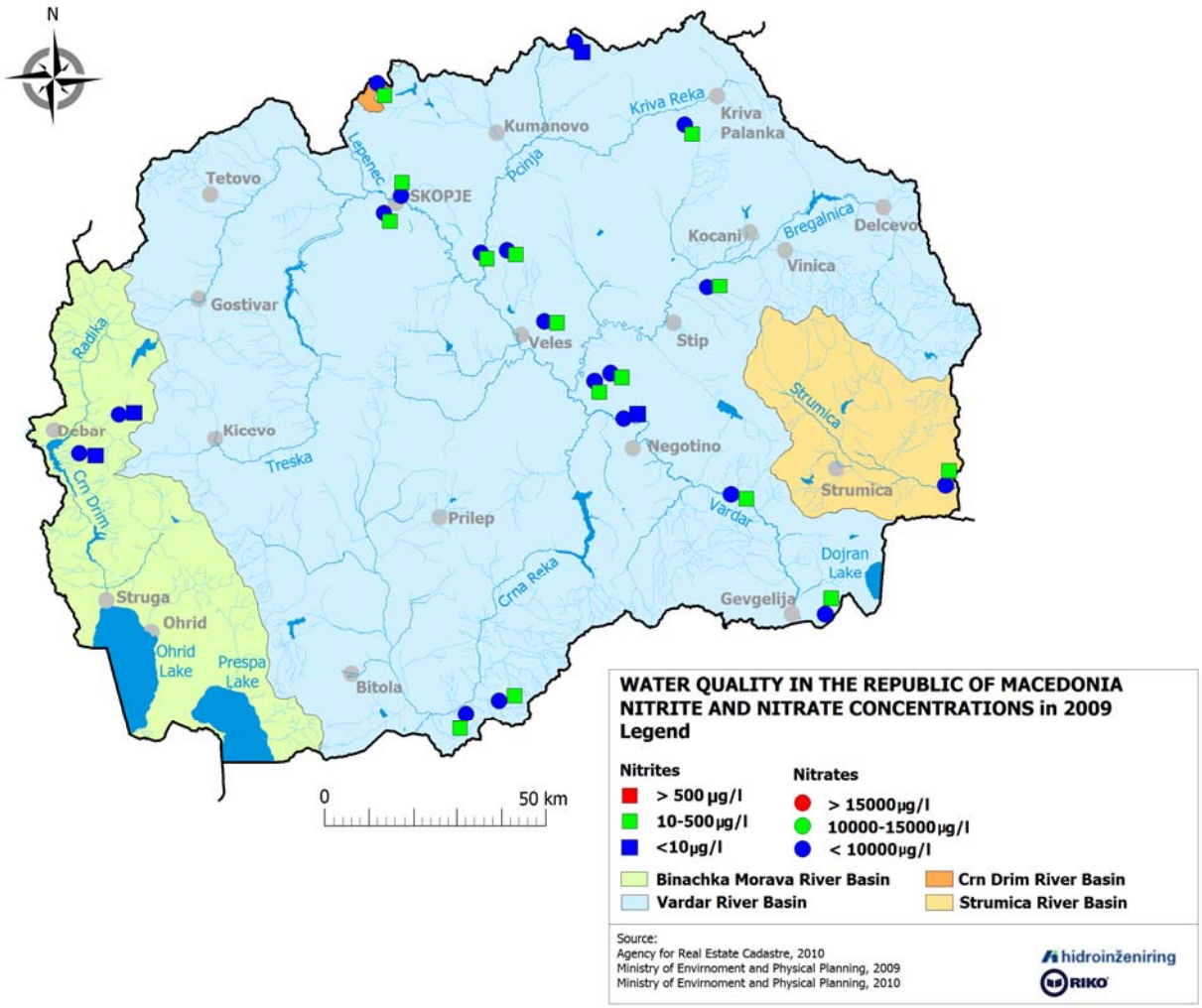
Map 7: RIMSYS monitoring stations in the Republic of Macedonia



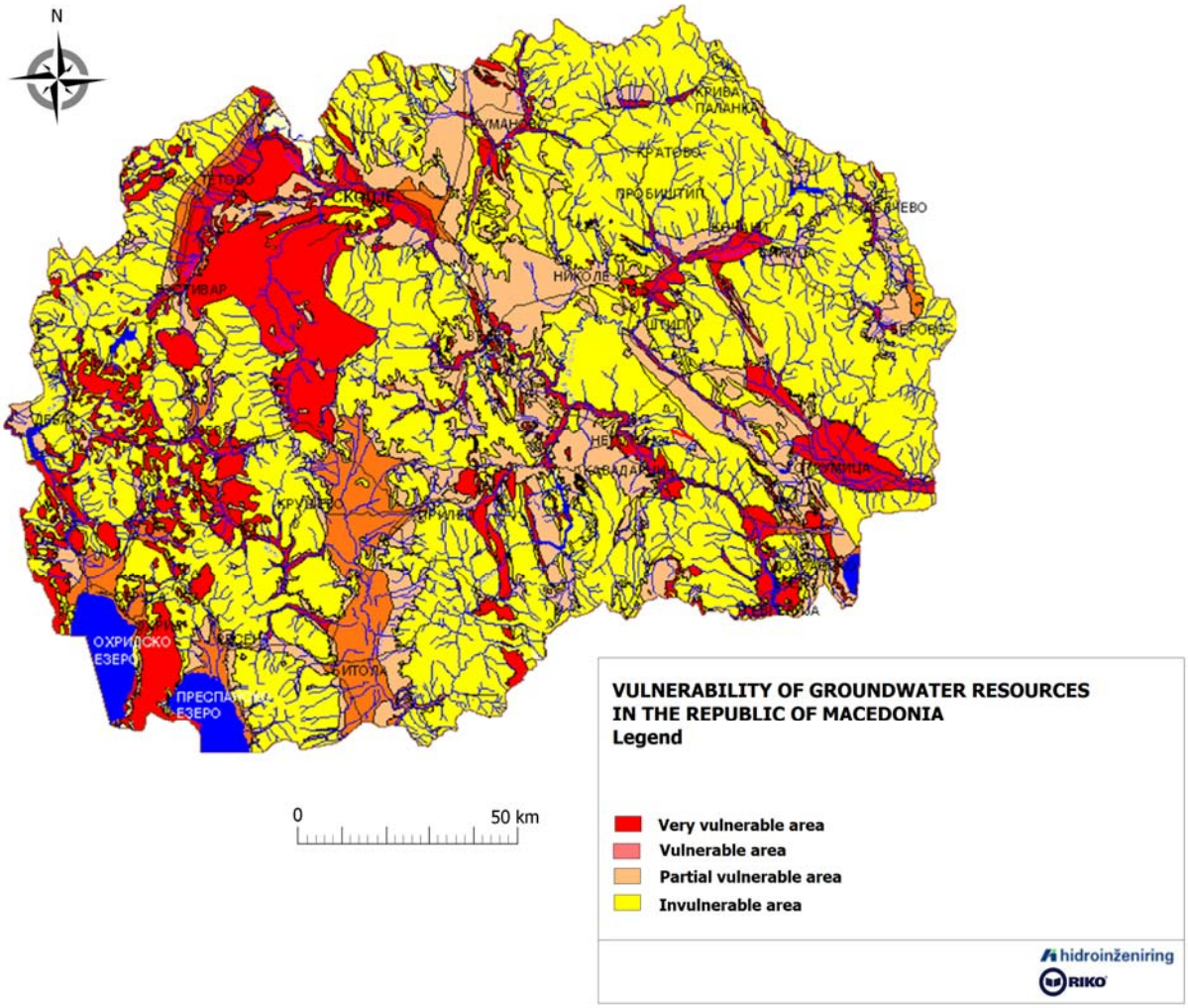
Map 8: Water quality in the Republic of Macedonia – BOD_5 concentrations in 2009



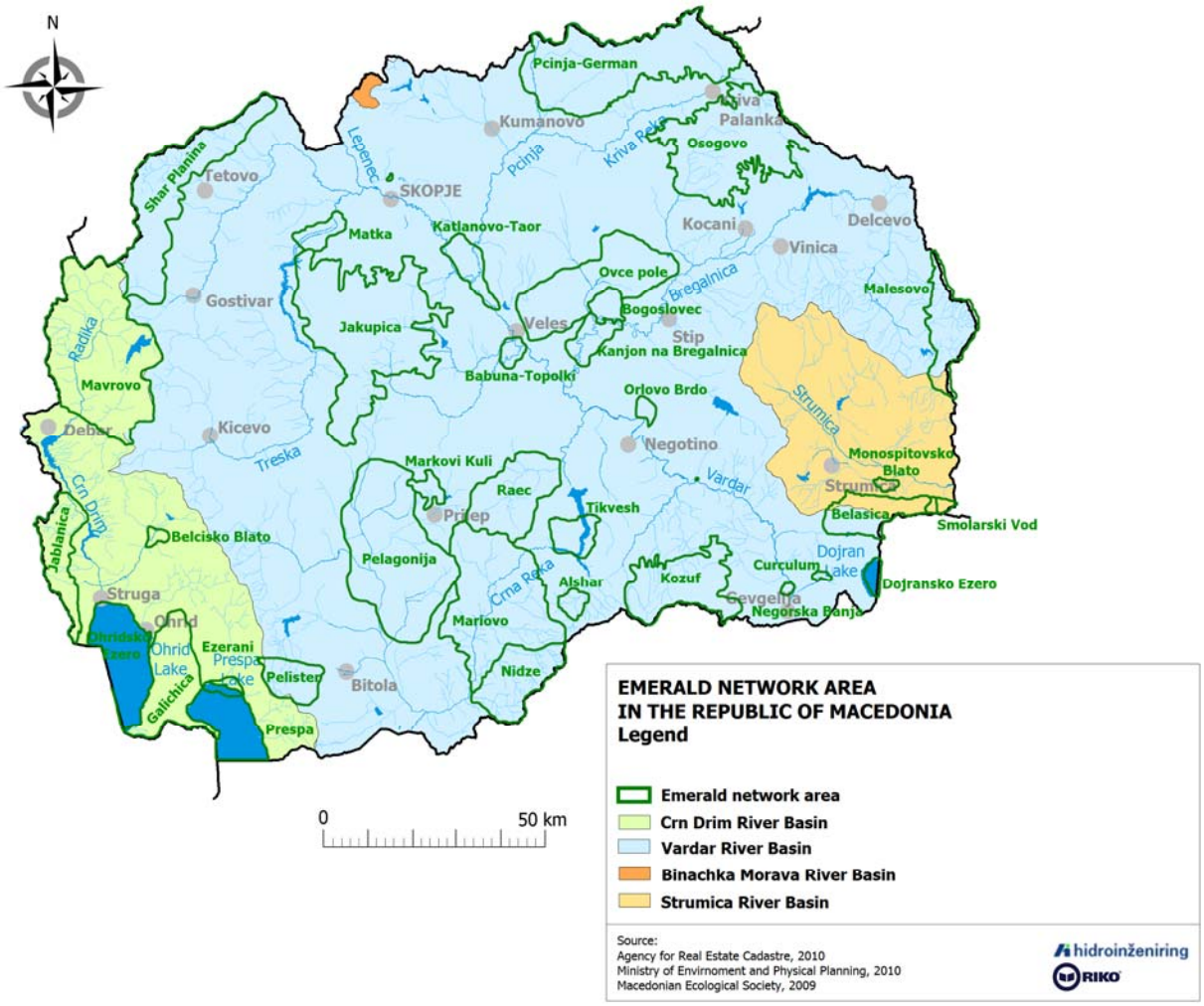
Map 9: Water quality in the Republic of Macedonia – Nitrite and nitrate concentrations in 2009



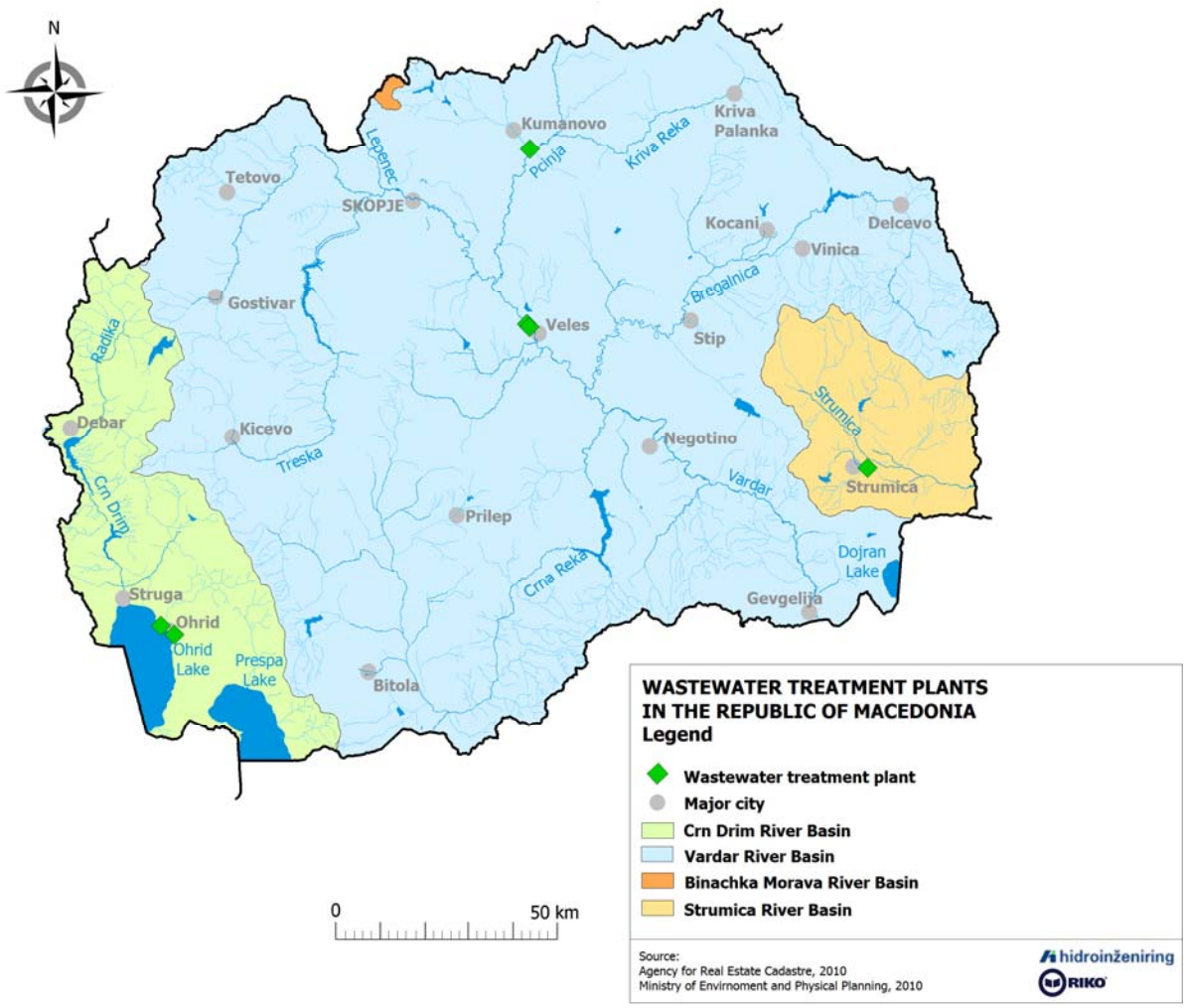
Map 10: Vulnerability of groundwater resources in the Republic of Macedonia



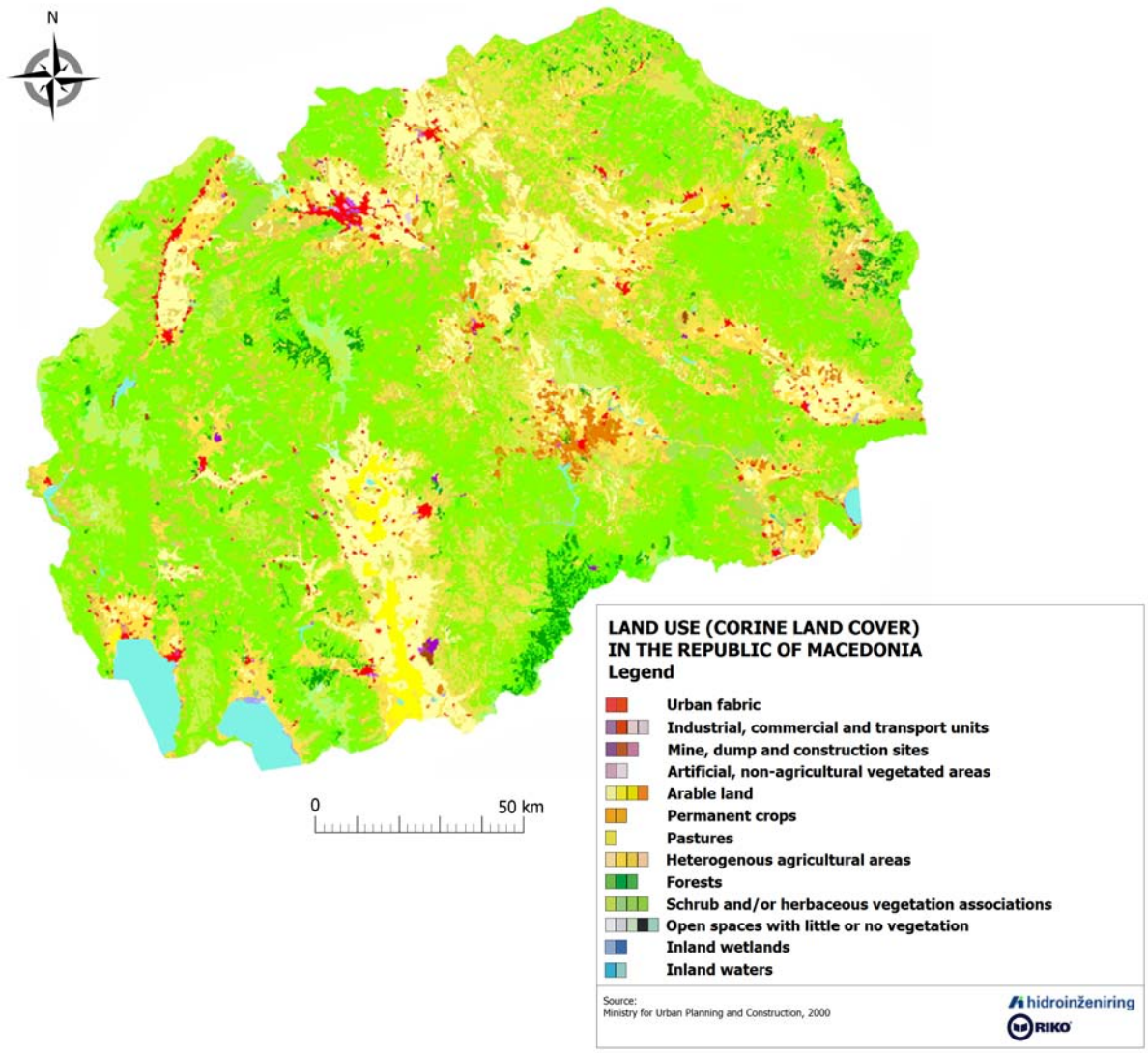
Map 11: Emerald network in the Republic of Macedonia



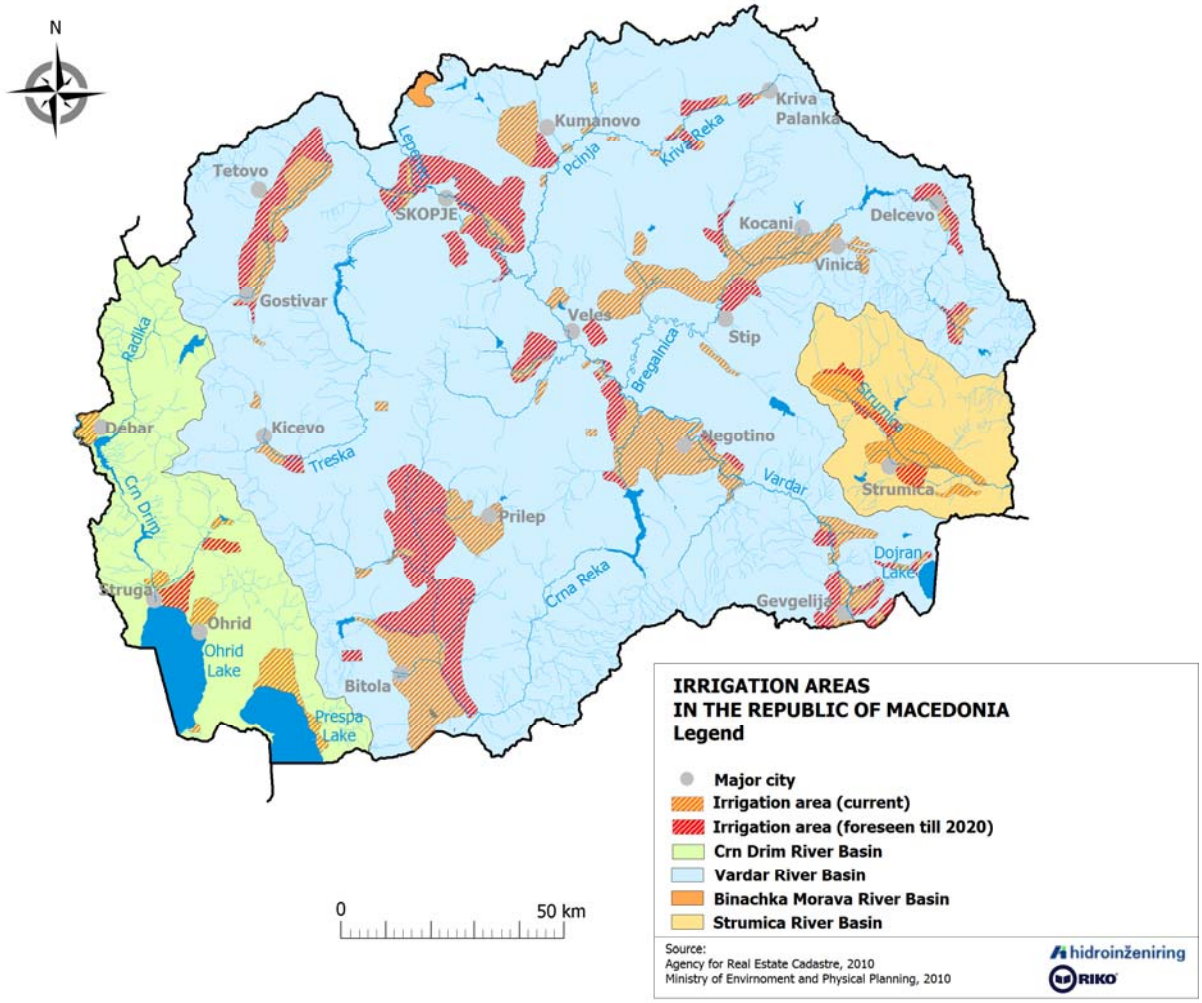
Map 12: Wastewater treatment plants in the Republic of Macedonia



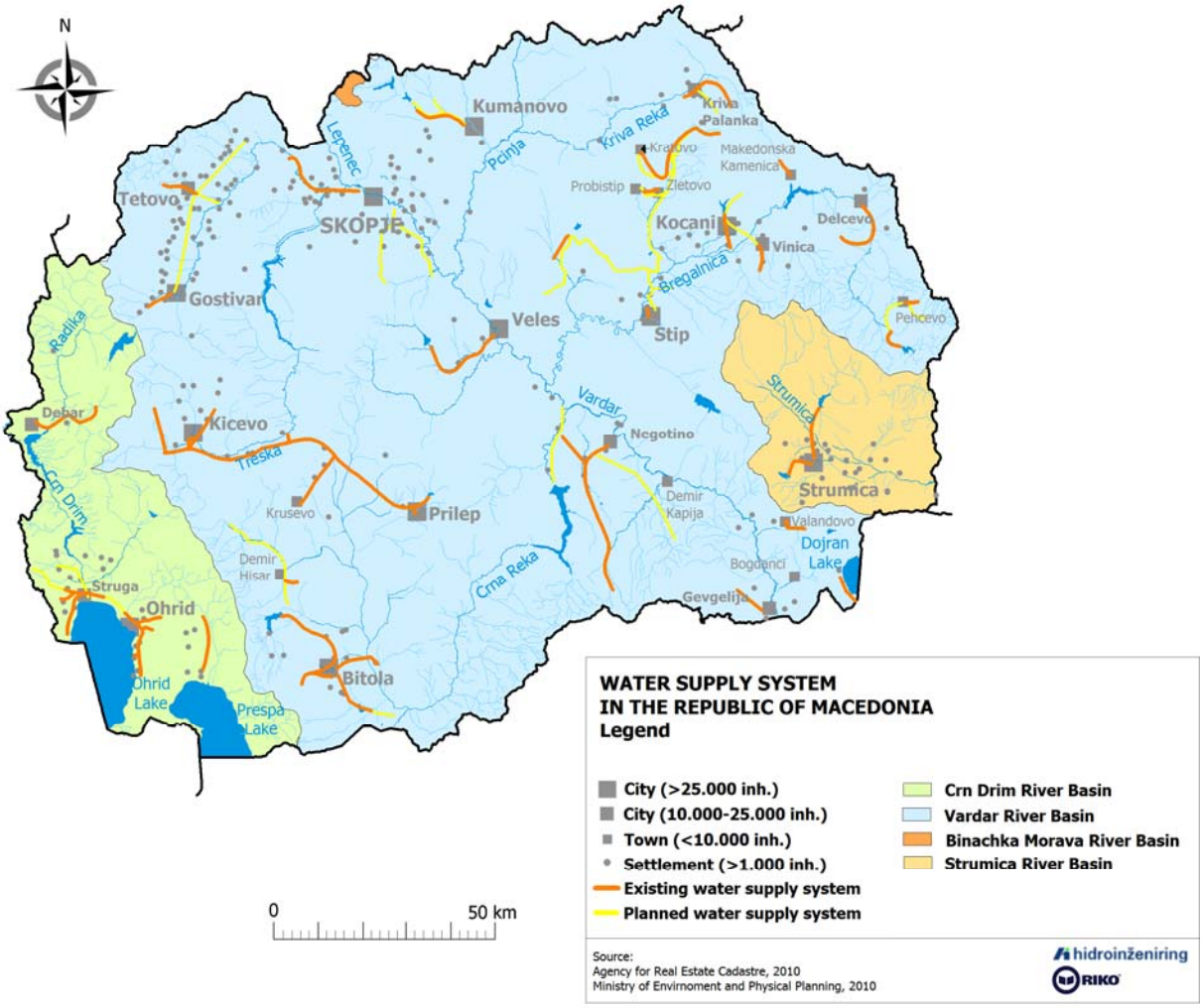
Map 13: Land use in the Republic of Macedonia



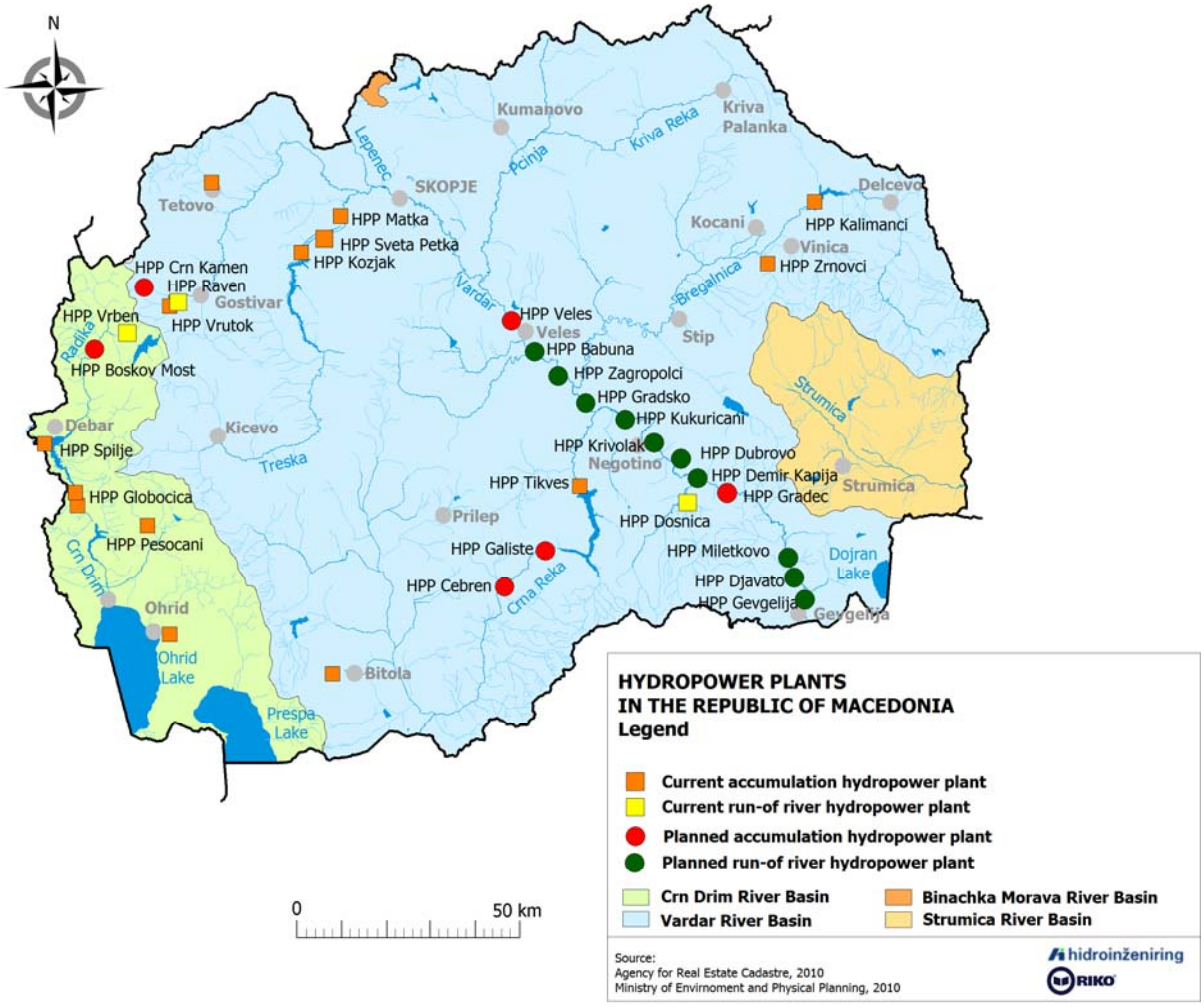
Map 14: Irrigation area in the Republic of Macedonia



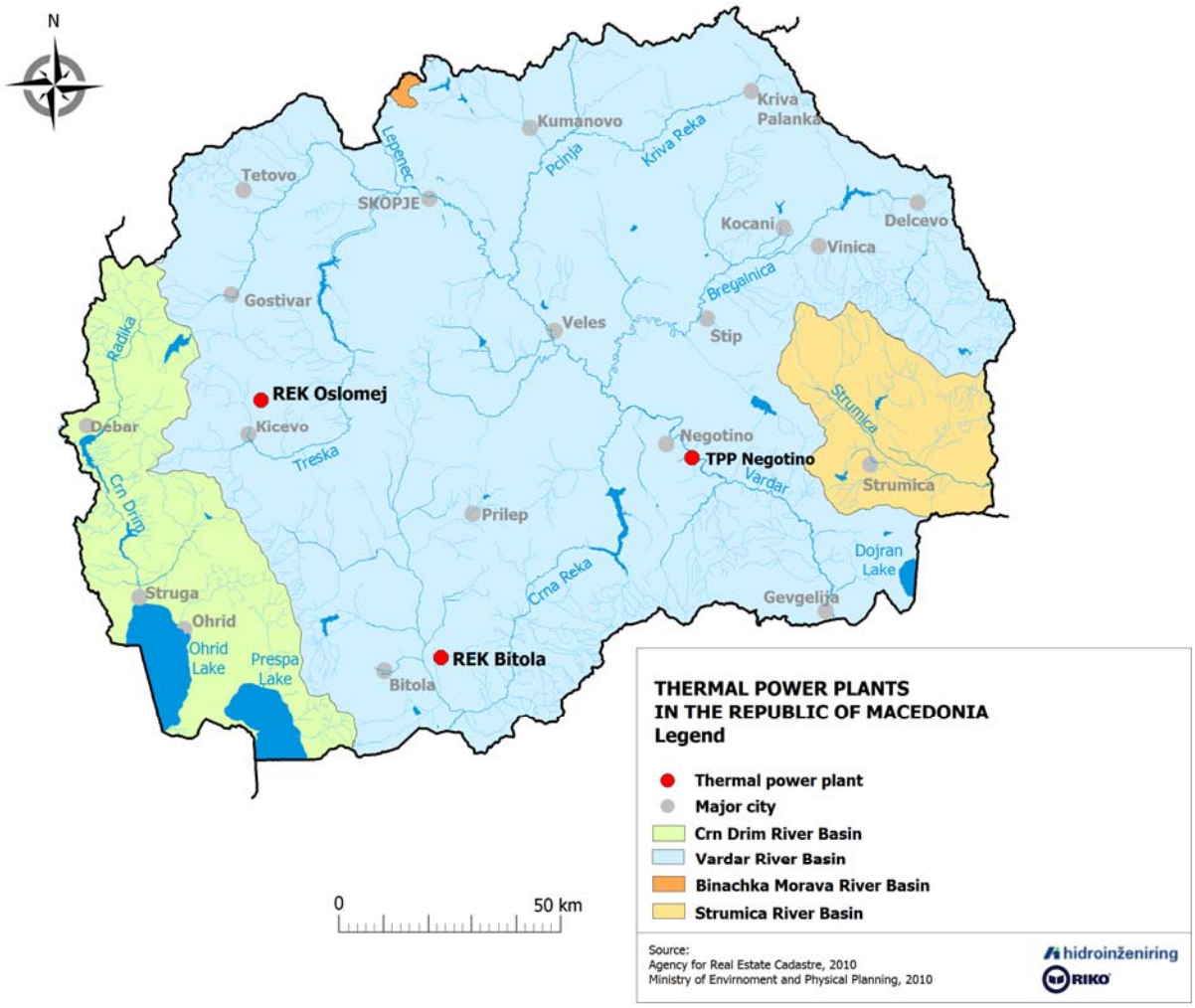
Map 15: Water supply systems in the Republic of Macedonia



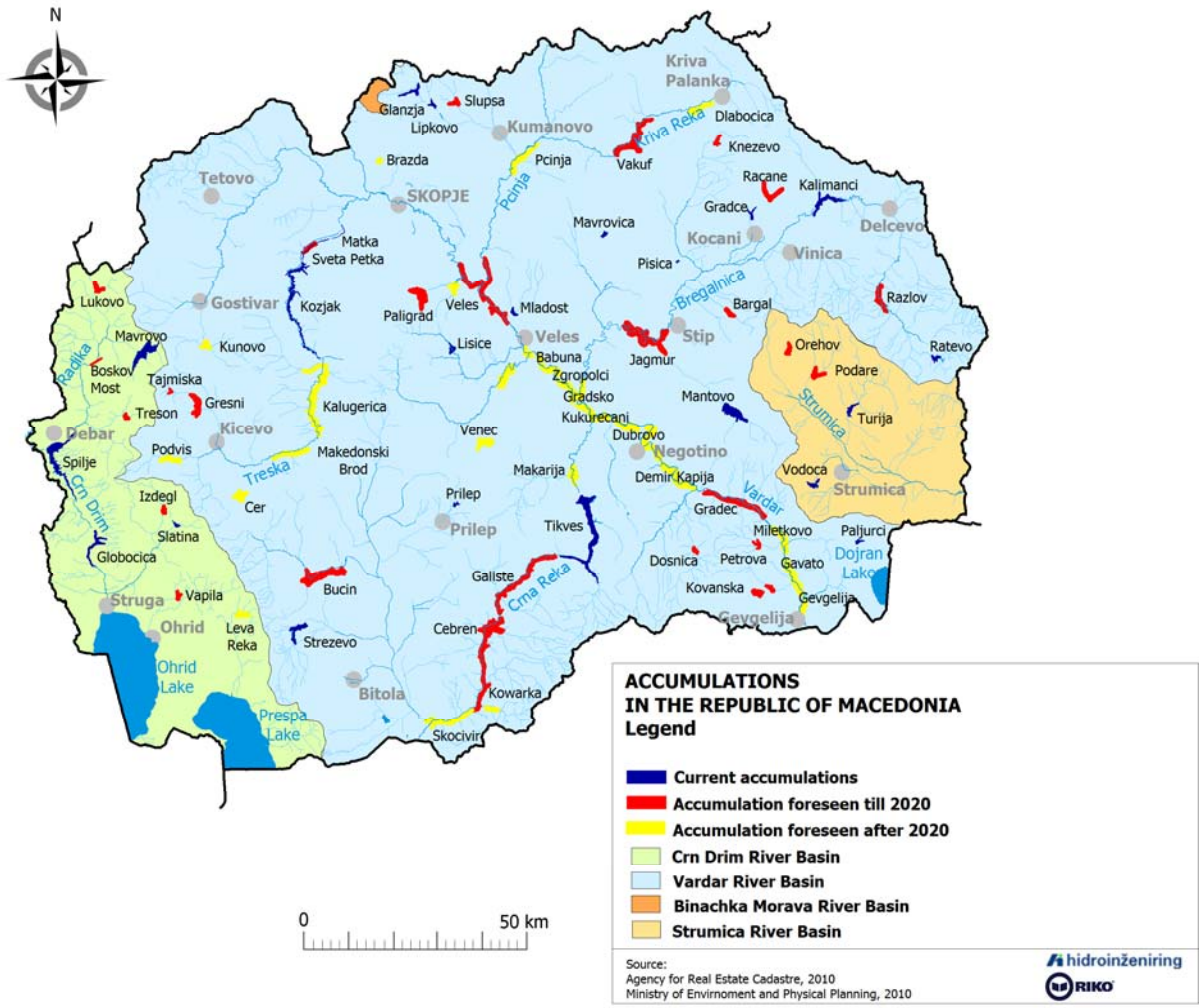
Map 16: Hydropower plants in the Republic of Macedonia



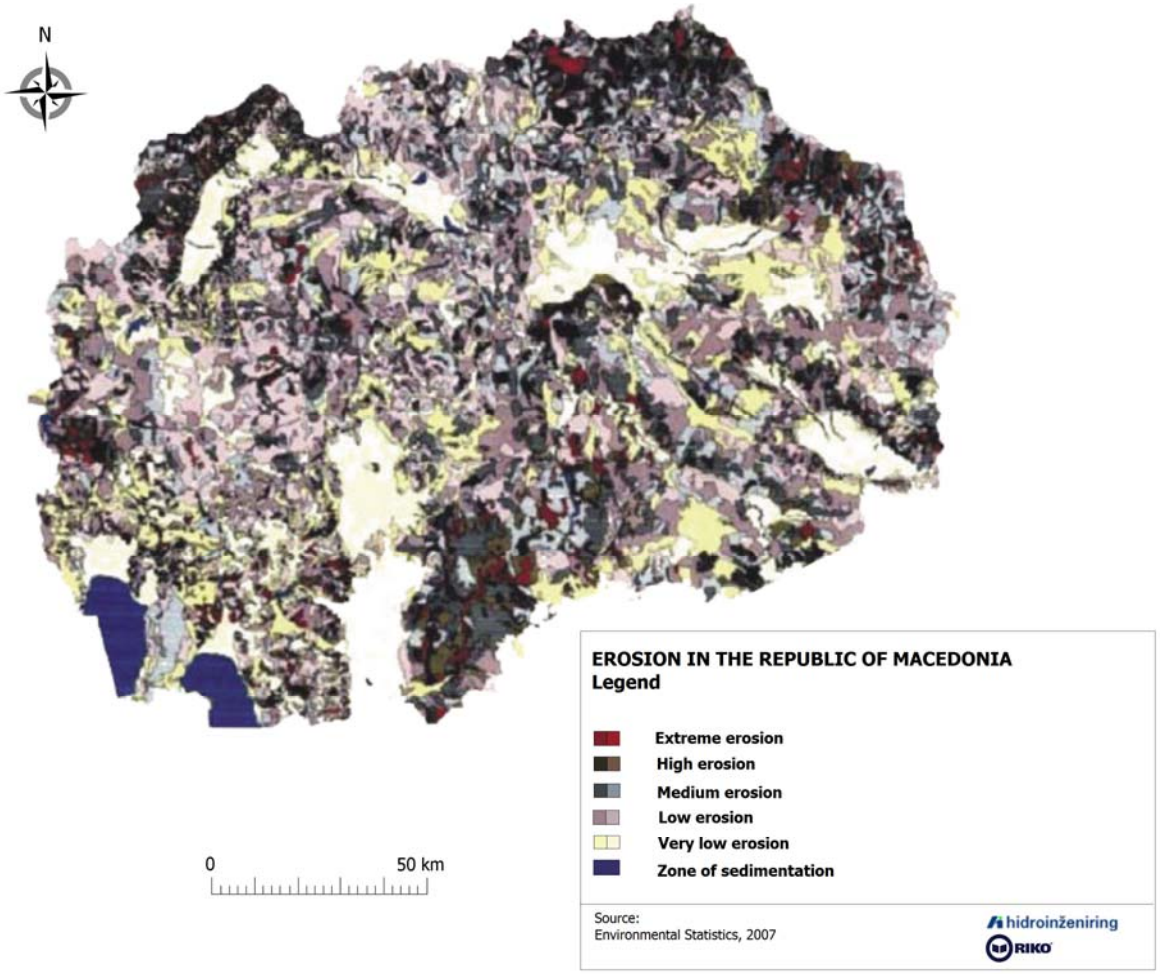
Map 17: Thermal power plants in the Republic of Macedonia



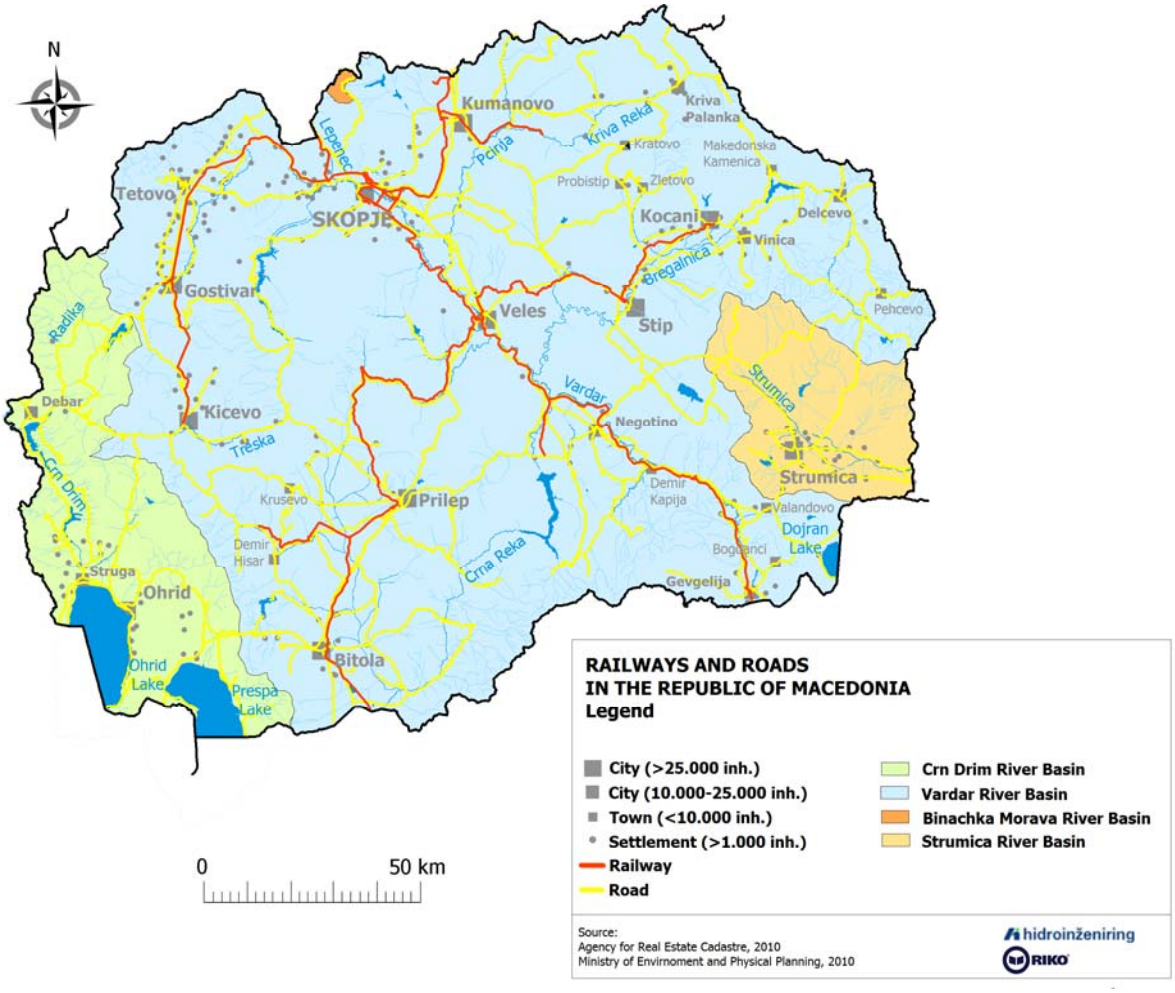
Map 18: Accumulations in the Republic of Macedonia



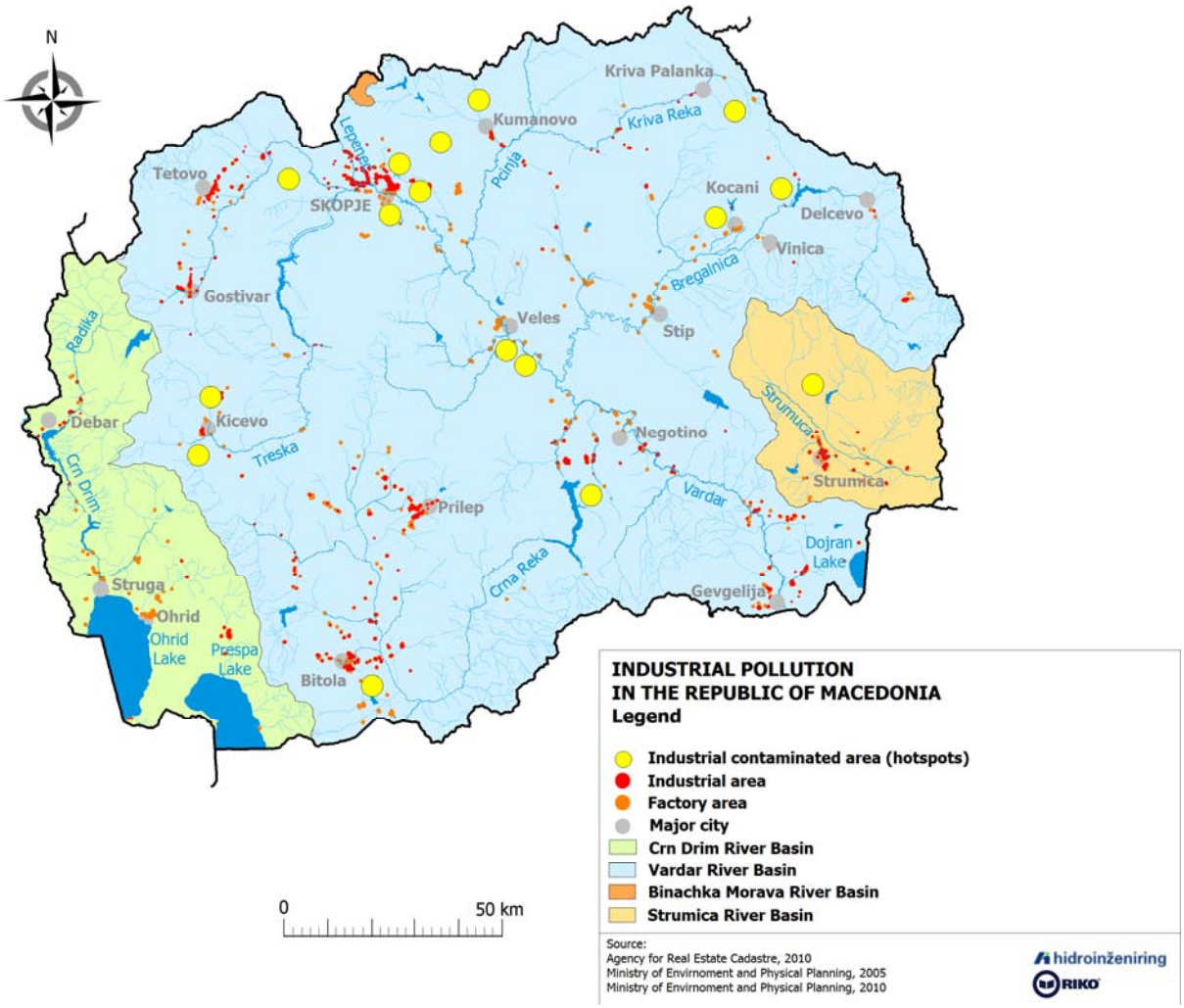
Map 19: Erosion in the Republic of Macedonia



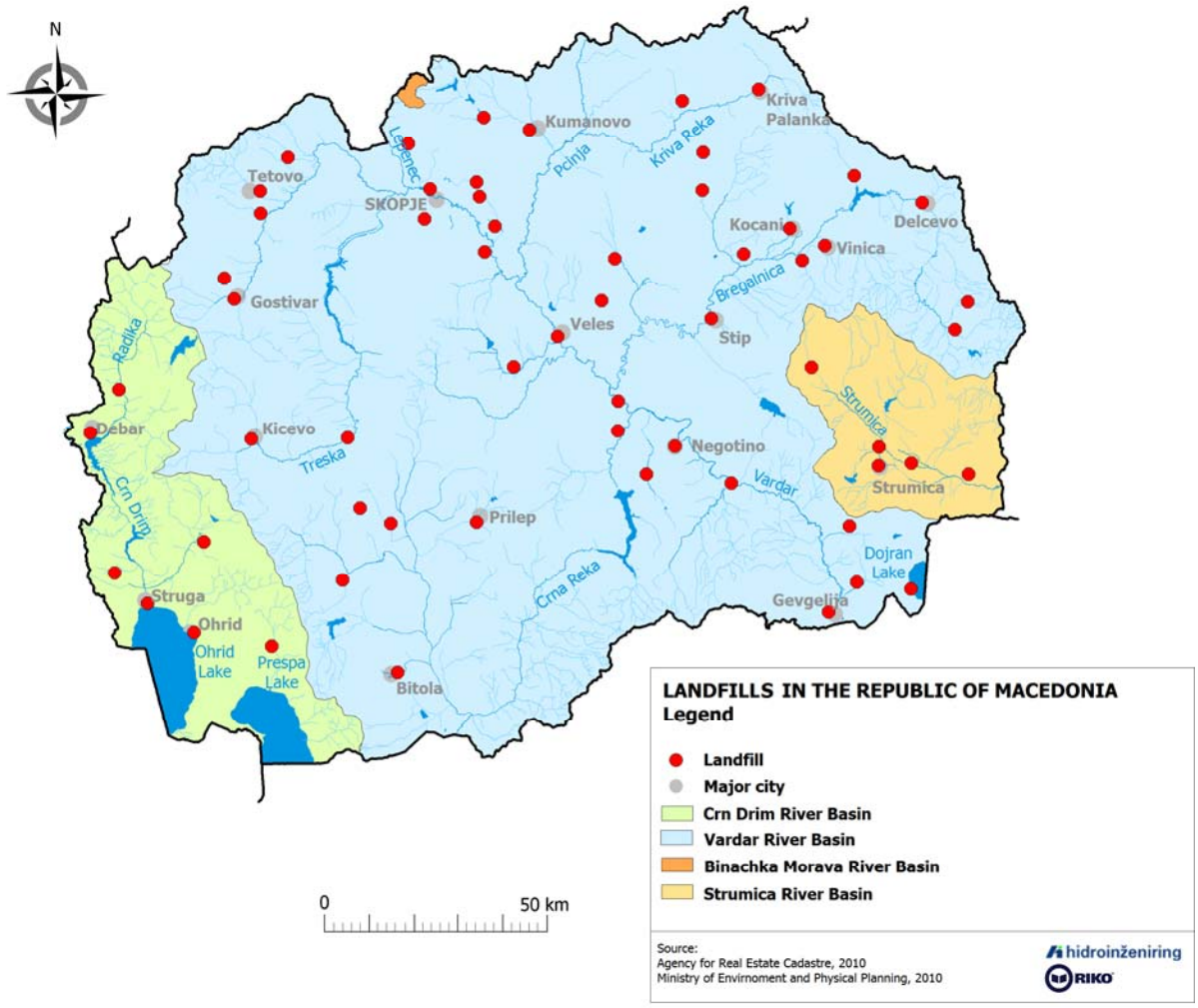
Map 20: Roads and railways in the Republic of Macedonia



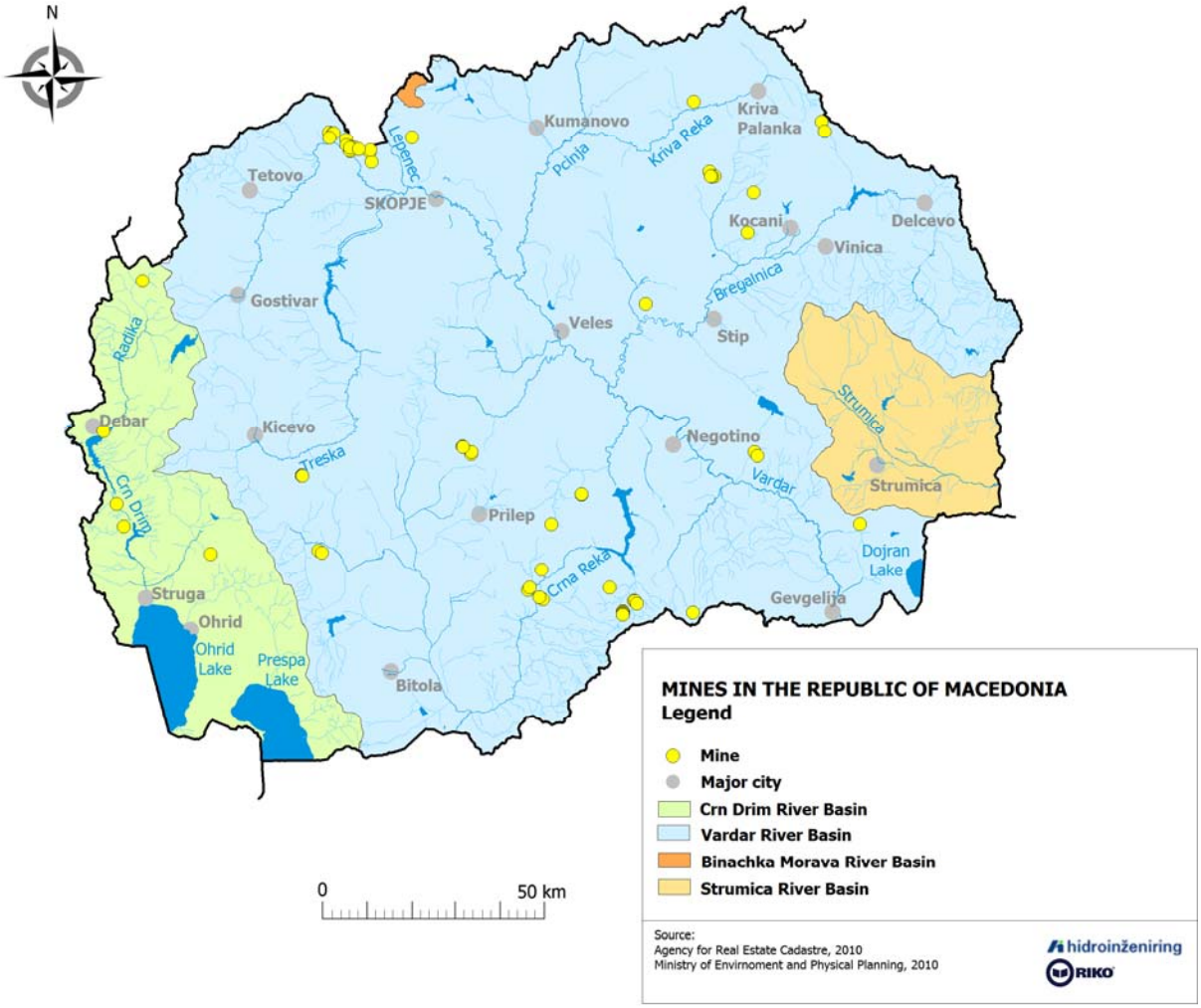
Map 21: Industrial pollution in the Republic of Macedonia



Map 22: Landfills in the Republic of Macedonia



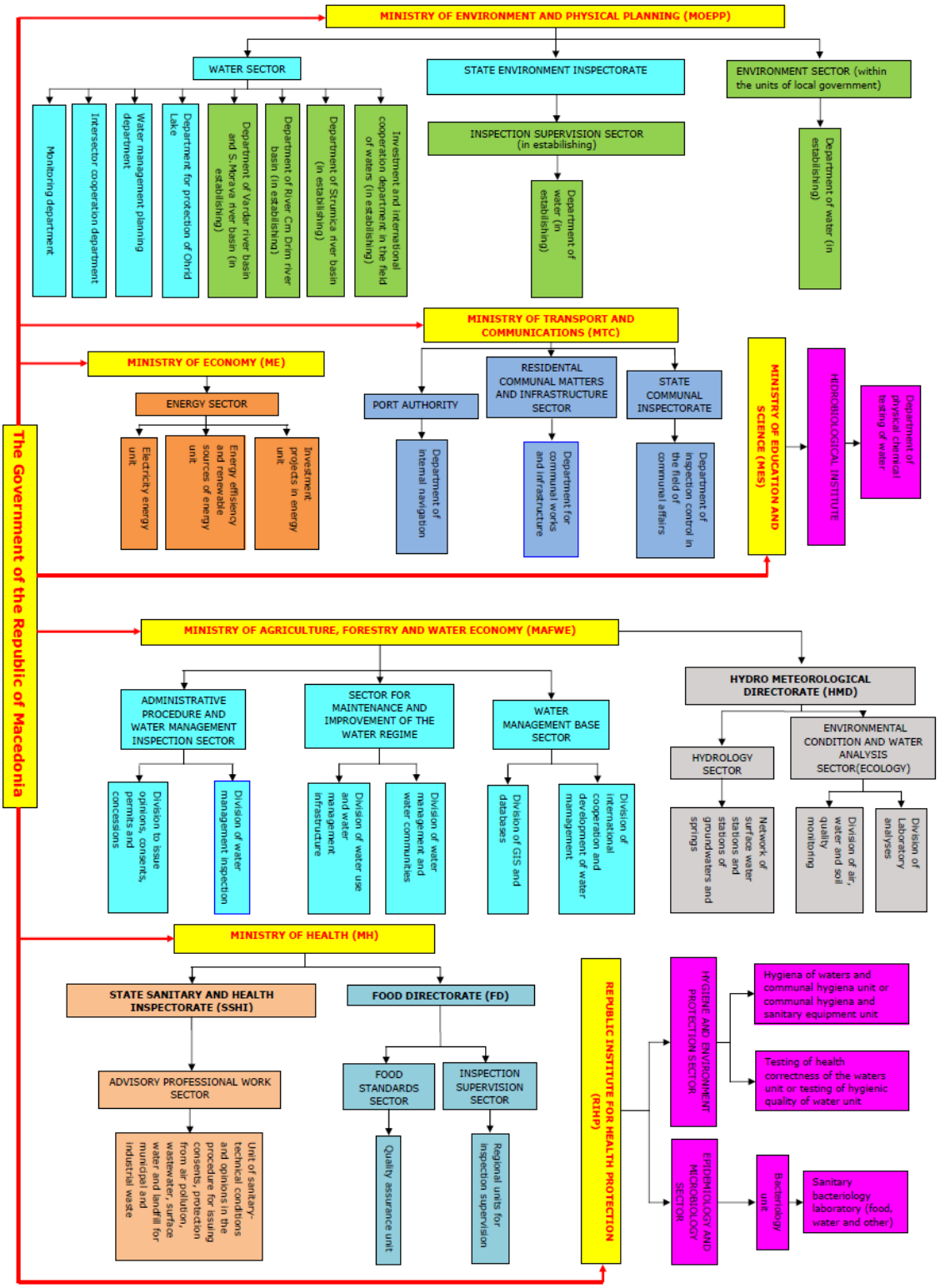
Map 23: Mines in the Republic of Macedonia



ANNEX II – TABELARIC DATA

Annex II-1: Organisational chart

Figure 25: Organisational chart



Annex II-2: Natural sites of importance

Table 42: Natural sites of importance

Locality	Geographical coordinates [1)]	Surface area, ha	Year of proclamation
Strict Nature Reserve			
Ploche Litotelmi	42˚09'N/22˚01 'E	75	2003
Lokvi-Golemo Konjare	41˚20'N/22˚26'E	50	2003
Tikvesh	41˚37'N/20˚42'E	10.650	1997
Ezerani	41˚00'N/21˚00'E	2080	1996
National Parks			
Galichica	40˚59'N/20˚52'E	22.750	1958
Mavrovo	41˚40'N/20˚46'E	73.088	1949
Pelister	40˚57'N/21˚14'E	12.500	1948
Sites of Natural Significance			
Karshi Bavchi	42˚04'N/22˚1 1 'E	10	1967
Skopska tvrdina	42˚00'N/21˚26'E	0,67	1987
Zrze	-	100	1996
Zvegor	41˚59'N/22˚50'E	75	1986
Drenochka klisura	41˚03'N/20˚47'E	26	1991
Gol chovek	41˚10'N/22˚25'E	5	1987
Gorna Slatinska Peshtera	41˚35'N/21˚29'E	-	1953
Vevchanski izvori	41˚14'N/20˚35'E	-	1999
Arboretum	41˚58'N/21˚33'E	3,3	1965
Dojransko Ezero	41˚12'N/22˚44'E	2.730	1977
Kalnitsa	41˚25'N/22˚02'E	17	1960
Klisura Demir Kapija	41˚24'N/22˚16'E	200	1960
Konopishte	41˚14'N/22˚05'E	70	1990
Markovi Kuli	41˚24'N/21˚33'E	2.300	1965
Canjon Matka	41˚57'N/21˚18'E	5.443	1994
Ohridsko Ezero	41˚03'N/20˚47'E	23.000	1958
Prespansko Ezero	40˚57'N/21˚03'E	17.680	1977
Koleshinski Vodopad	41˚22'N/22˚48'E	-	1985
Orashac	42˚03'N/21˚48'E	2	-
Kale Banjichko	41˚42'N/21˚38'E	97	1983
Beleshnichka Reka	41˚40'N/21˚17'E	4.180	2002
Stebla od platan, Star Dojran	-	-	1970
Div prnar, Gevgelija	-	-	1997
Slatinski Izvor	41˚34'N/21˚13'E	-	2004
Platan, s.Koleshino, Strumica	-	-	1986
Platan-chinar, Ohrid	-	-	1967
Dabovo steblo, s.Beli	41˚56'N/22˚23'E	-	1983
Makedonski dab, s.Trpejtsa, Ohrid	40˚57'N/20˚47'E	-	1967
Crni orevi, Demir Kapija	41˚24'N/22˚15'E	-	1963
Crna dudinka, Lesnovski	42˚01 'N/22˚14'E	-	1962

Locality	Geographical coordinates [1)]	Surface area, ha	Year of proclamation
Manastir			
Monospitovsko blato	-	250	-
Orlovo Brdo	41˚32'N/22˚08'E	-	2003
Konche	41˚29'N/22˚23'E	0,66	1986
Gladnitsa	41˚11'N/22˚11'E	52	1988
Duvalo (Kosel)	41˚10'N/20˚50'E	-	1979
Morodvis	41˚51'N/22˚25'E	0,5	1986
Platan s.Kalishte, Struga	41˚08'N/21˚39'E	-	1961
Murite	41˚42'N/22˚59'E	10	1987
Majdan	41˚09'N/21˚57'E	-	2002
Peshtera Mlechnik	41˚16'N/20˚39'E	1	1964
Peshtera Ubavica	41˚42'N/20˚55'E	2	1968
Rechitsa	41˚59'N/20˚58'E	-	1986
Smolarski vodopad	-	-	2002
Katlanovski predel	41˚54'N/21˚42'E	5.442	1991

1) Greenwich Longitude

Source: The State Statistical Office (The State Statistical Office, 2009)

Annex II-3: Estimated reserves of underground water by water management divisions

Table 43: Estimated reserves of underground water by water management divisions.

Water management division	Type	Groundwater body	Estimated reserves of groundwater	Exploitation (m^3/s)
			Static ($h10^6m^3$)	
Polog	Compact	Polog	2250	2,5
	Karst	Suva Gora, Bistra Bukovic		2,0
	Fissured-karst	Sar Planina		0,5
Total				**5,0**
Skopje	Compact	Skopska kotlina	702,5	7,0
	Karst	Veden		3,2
		Krasta		0,3
	Fissured	Skopska Crna Gora		0,1
Total				**10,6**
Treska	Compact	Alluvium at river Treska	158	1,0
	Karst-fissured	Bistra, Baba Sac, Porecie		9,0
Total				**11,0**
Pcinja	Compact	Alluvium at Pcinja and Kriva Reka		0,7
		Alluvium at river Vardar		
		Kumanovsko pole	67,5	
		Slavisko pole		
	Karst-fissured			0,4
Total				**1,1**
Sreden Vardar	Compact	Alluvium at river Vardar		1,5
		Veleska kotlina		
		Kavadaresko-Negotinska kotlina		

	Karst-fissured			0,5
Total				**2,0**
Gorna Bregalnica	Compact	Alluvium at river Bregalnica		0,5
		Berov.-Pehcev.-Delcevska kotlina	247	
	Karst-fissured			0,2
Total				**0,7**
Sredna and dolna Bregalnica	Compact	Alluvium at river Bregalnica		1,0
		Alluvium at Zletovska Reka		
		Alluvium at Lakavica		
		Kocansko-Vinicka kotlina	360	
		Ovce Pole		
	Karst-fissured			0,2
Total				**1,2**
Pelagonija and Dolna Crna Reka	Compact	Alluvium at Crna Reka		5,0
		Alluvium at river Cemnica		
		Pelagonija (Quaternary)	6105	
		Prilepsko pole (Pliocene)	75	
		Bitolsko pole (Pliocene)	96	
	Karst-fissured			1,0
Total				**6,0**
Dolen Vardar	Compact	Alluvium at river Vardar		5,0
		Gevgeliska kotlina (Quaternary)	200	
		Valandovska kotlina (Quaternary)	142	
		Valand./Gevgel. kotlina (Pliocene)		
	Karst-fissured	Kozuf		0,4

		Plaus		
Total				**5,4**
Dojran	Compact	Asanlisko Pole		0,05
	Karst-fissured	Deribas, Toplec		0,1
Total				**0,15**
Strumica	Compact	Radovisko pole		0,8
		Strumisko pole	1850	
	Karst-fissured			0,2
Total				**1,0**
Prespa	Compact	Prespanska kotlina	>100	0,5
	Karst-fissured			0,2
Total				0,7
Ohridsko Struska	Compact	Ohrid.-Struska kotlina (Quaternary)	161	0,5
		Ohrid.-Struska kotlina (Pliocene)	72	
	Karst-fissured	Galicica		5,0
		Jablanica		
		Ilinska planina		
Total				5,5
Debarsko	Compact	Debarska kotlina (Quaternary-Pliocene)		0,3
	Karst-fissured			0,5
Total				0,8
Grand total				50,15

ANNEX III – EMPLOYEE SELF-EVALUATION FORM

Table 44: Employee self-evaluation form

Employee Self-Evaluation Form

- River basin management -

Name:_____
Position:_____

Evaluator:_____
Date:_____

Purposes of the Employee Self Evaluation:

To examine your knowledge of river basin management and identify your strengths and weaknesses.

To outline and agree upon your knowledge and continuing education requirements.

These evaluations will serve as a record of development and progress of each employee.

Privacy Statement

The results of the evaluation will only be made available to the direct management of the employees and will not be shared or distributed in any other way within or outside the institution.

Part 1

Answer the following questions by checking the appropriate box to the right.

	Below Average (1)	**Satisfactory (2)**	**Above Average (3)**	**Superior (4)**
1. I know what the basic European Directives are in the field of water management.				
2. I know who is responsible for the implementation of the Water Framework Directive in Republic of Macedonia.				
3. I know the structural organization of water management within the 6 responsible ministries of the Republic of Macedonia.				
4. I know what the main purpose of the river basin management plans is.				
5. I know the objectives that have to be reached in relation to protection of water in accordance to Water Framework Directive.				
6. I know purpose, goals and objectives that have to be reached in accordance to Floods Directive.				
7. I know where flood protection measures are needed.				

	Below Average (1)	**Satisfactory (2)**	**Above Average (3)**	**Superior (4)**
8. I know the content of work of (other) people working on water management issues				
9. I feel I can contribute to sustainable water use.				
10. I know what the long-term goals of water use are.				
11. I feel I have had enough training to perform my job.				
Total number of responses in each column				

Part 2

Answer the following questions by checking the appropriate letter.

1. How do I assess the completeness and accuracy of my knowledge of the European and Macedonian water related legislation?

   a. Knowledge is complete and accurate
   b. Knowledge is somewhat complete and accurate
   c. My knowledge feels outdated
   d. Needs improvement

2. How do I assess the completeness and accuracy of my knowledge of the existing measures taken to assure good status of water (e.g. related to pressures from agriculture, industrial and urban waste water…)?

   a. Knowledge is complete and accurate
   b. Knowledge is somewhat complete and accurate
   c. My knowledge feels outdated
   d. Needs significant improvement

3. How do I assess the completeness and accuracy of my knowledge of the status of surface waters (lakes and rivers) in the Republic of Macedonia – quality and quantity state?

   a. Knowledge is complete and accurate
   b. Knowledge is somewhat complete and accurate
   c. My knowledge feels outdated
   d. Needs improvement

4. How do I assess the completeness and accuracy of my knowledge of the status of groundwater in the Republic of Macedonia – quality and quantity state?

a. Knowledge is complete and accurate
b. Knowledge is somewhat complete and accurate
c. My knowledge feels outdated
d. Needs improvement

5. How do I assess the completeness and accuracy of my knowledge of the economic analysis and social aspects of water use?

a. Knowledge is complete and accurate
b. Knowledge is somewhat complete and accurate
c. My knowledge feels outdated
d. Needs improvement

6. To what extent do I discuss river basin management with my colleagues?

5.1. Consistently communicate accurate information
5.2. Communication of accurate information is somewhat consistent
5.3. Needs significant improvement

7. To what extent do I utilize transboundary or international information about good practices in water management?

a. Always seek out and utilize the information
b. Sometimes utilize the information
c. Never utilize the information

8. How many people are dealing with economic issues of the Water Framework Directive?

a. One to five
b. Five to ten
c. Ten or more

9. How many hours per week do I devote to acquaintance with European and national legislation related to water management?

   a. One to three hours
   b. Four to five hours
   c. Six or more hours

10. How many hours per week do I devote to review main water news?

   a. One to three hours
   b. Four to five hours
   c. Six or more hours

11. In what area or areas would you like to gain more experience, training or education?
   a. _____
   b. _____

12. Other suggestions or comments:
   a. _____
   b. _____

Thank you for completing this evaluation, your comments and suggestions are very important to the evaluation process.

Signature of employee _____

Signature of evaluator _____

Project implemented by:

hidroinženiring d.o.o.

RIKO