2009

Wastewater Issue: High time for better management - The case of Macedonia-

Analytica

1/25/2009

Table of Contents

Introduction

Globally increased industrial production, intense agriculture activities and household consumption in the last century have led to increased use of water resources. This in turn has increased the rate of production of wastewater, polluting the nearby recipients (surface waters and groundwaters). The well-being of Earth's natural water resources has been seriously threatened. Sustainable use of water resources and their protection, water quality and targets for achieving safe drinking water supply and basic sanitation have become more promptly addressed in the international and regional legal instruments. Reactions on the diminishing of future water resources quantity and quality are emerging on European Union (EU) level too, calling out for "water to be one of the main issues on the political agenda and integrated into all policies."[1]

South East European (SEE) countries have had decades long reputation of neglect towards environmental preservation through non compliance to the national laws, which lead towards increased pressures on the natural resources, amongst which are also the water resources. During the last decades the water was perceived as a resource in abundance and there was no need to pay attention to its proper management. However, the undergoing EU accession process required another approach, effective water resources management with the fulfillment of the Water Framework Directive (Directive 2000/60/EC).[2] Therefore, safe water problems have been tackled by the aspiring SEE countries only recently. In this respect, several laws with long-term goal of building a resource-efficient and environment-friendly society have been enacted in order to hinder the trend of water pollution and improve the quality of the environment.

This paper will offer analysis on the state of wastewater management in Macedonia. Data of on-going projects will be presented with activities in constructing and expanding the treatment of wastewaters in the municipalities of Macedonia. The report will address important issues such as: types of wastewater treatment plants that have a "green light on" in the Macedonian conditions; responsibility of institutions and local self-governments regarding financial preparedness and administrative capacities for accepting liabilities from the new Law on Waters and making key actors play their role.

1. Seeber, Richard. " MEP: Water must be integrated into all policies," *EurActiv*, 10 September 2008. <http://www.euractiv.com/en/environment/mep-water-integrated-policies/article-175233> (accessed January 10,2009).
2. The implementation of the Water Framework Directive refers to biodiversity, climate change and sustainable consumption and production as Communication priorities for 2009 of the Directorate General Environment of the European Commission.

Water figures for Macedonia

When examining water resources in a country, we should first have a look at the geographical orientation of the country and its demographical and socio-economic indicators. The Republic of Macedonia (RM) is a landlocked country situated in the southern part of the Balkan Peninsula, nestled amongst hills and mountains.

A major water resource in the country is the surface water. Macedonia has a total of 488 km^2 water surfaces representing 1.90% of the total land area. The natural tectonic lakes (Lake Ohrid, Lake Prespa and Lake Dojran) cover territory of 434 km^2. In addition, Macedonia has 14 artificial and 25 natural glacial lakes.[3] The four main hydrographic catchment areas are presented with river Vardar, Crn Drim, Strumica and Juzna Morava. The river Vardar basin is the largest with 20 535 km^2, while the smallest is the river Morava basin with only 44 km^2.[4] The river water drains to the Aegean Basin, the Adriatic Basin and the Black Sea Basin.

On global level there is a distinguished increase in water consumption, which in the past 100 years has risen nearly eight times.[5] Macedonia is not an exception to these changes. Data on total water resources for Macedonia show that water availability is low, with around 6.4 billion cubic meters (BCM) during a normal year or 4.8 BCM during a dry year.[6] Thus, Macedonia is considered as a water resources deficient country. Its water resources according to the water stress indicator (WSI) in major basins mainly fall under the heavily exploited category.[7] The utilization of the water resources from table 1 indicates positive growth in the consumption pattern since the 1990ties.

Year	1990	1995	1999	2000	2001	2002	2003	2004
Total annual water used in million m^3	64	78	73.3	315.5	373	360.7	471.3	319.6

Table 1: Total annual water used in million m^3

***(Source*: Environmental indicators of the Republic of Macedonia, 2008, *Ministry of Environment and Physical Planning*, (Skopje, 2008): 144).**

3. Статистички годишник на Република Македонија 2007 [Statistical Yearbook of Republic of Macedonia 2007]. *State Statistical Office*, (Skopje, 2007): 14.
4. *Ibid*, 25.
5. Global water consumption 1900-2025 (table). Available from: Umweltbundesamt <http://www.umweltbundesamt.de/uba-info-e/wah20-e/1-2.htm > (accessed January, 15, 2009).
6. Rita Cestti et al., Water Resources Management in South Eastern Europe :Volume II - Country Water Notes and Water Fact Sheet (Washington: World Bank, 2003), 47.
7. GRIDA. "Water Scarcity Index" (graphic). Available from: GRIDA <http://maps.grida.no/go/graphic/water-scarcity-index> (accessed January 15, 2009).

The increase in the water demand follows the general trend of population growth and rapid development of the country. It has lead to increased wastewater generation too, subsequently imposing as a growing water pollution problem mainly due to people's irresponsible attitude towards this natural resource, and the lack of proper mechanisms for management and treatment of wastewater locally and nationally. The number of total population in Macedonia notes positive rate of growth with 1 400 000 in 1961 to 2 022 000 people in 2002. The household number increased as well, with 280 000 in 1961 to 564 000 in 2002. Three decades ago, a migratory process began on the relation village-town, due to the need of labor force for the growing industry in the country. It contributed to increased discrepancies between the urban and rural areas in terms of economic situation as well as in terms of number of residents. Data on in-dwelling connections to infrastructure show that when referring to sewage disposal, the national average amounts to 74.8 percent of the population and when seen as percent of non-poor and poor population percents of population are 77.8 and 64 respectively.[8] This social-demographic indicator shows the relationship between safe wastewater disposal and the standard and substandard settlements. The 95.6% of the households in Macedonia that reside in proper dwelling places (apartments, houses) have access to water, sewer network and electricity. The total number of households without any installations in their dwelling places is relatively small, only 510 households.[9] In 2004, 30% of the rural population in Macedonia had local or individual systems for water supply. Accordingly, the number of households with proper sanitation systems still is considered as small.

There are many pressing issues in the water sector, such as:

- small rate of in-dwelling connections to sewage infrastructure, un-rational water use and poor to unsatisfactory water quality condition of several surface waters, along with insufficient protection of the quality of the waters;
- very low water-supply and sewerage service prices;[10]
- insufficient investments in the sewerage infrastructure as well as not having adequate financing of the wastewater management;
- lack of substantial amount of implementing legislation which is in compliance with the EU *acquis*;
- lack of a National Strategy on Water for the implementation steps of the Water Framework Directive and Water Master Plan that already should have replaced the

8. World Bank. *World Bank*, "Preparation of a Strategy and Action Plan for Reform of Communal Services Enterprise Sector, with focus on Water, Sewerage and Solid Waste Management," June 1 2007, 11. <http://econsult.worldbank.org/suite/public/collaboration/GetDocument.none?doid=69529> (accessed January 10, 2009).

9. Социоекономски диспаритети меѓу општините во Република Македонија [Socioeconomic disparities between municipalities in Republic of Macedonia].*State Statistical Office*, (Skopje, November 2004): 43.

10. The domestic water use was charged USD 0.14-0.53 per cubic meter in Macedonia (2000), in Greece (1998) was 1.14 and Croatia (2000) USD 0.28-82.53 per cubic meter. Rita Cestti et al., Water Resources Management in South Eastern Europe : Volume I - Issues and Directions (Washington: World Bank, 2003) : 17.

Water Master Plan from 1976 (thus allowing proper institutionalized, territorial organization and planning processes in the water sector);

- administrative capacity (human and financial resources) is still insufficient both at state and local levels and
- low level of monitoring system and available data.

These issues are a result of neglect to the freshwaters by the whole society. Main influence on this condition had the past marked with unsatisfactory attention and financial resources allocated to wastewater treatment, paving the way towards worrying quality of the recipients i.e. water-bodies.

Institutional actors and water related legislation

The second National Environmental Action Plan of the Republic of Macedonia (NEAP II) introduces the requirements of the EU Directives related to integrated water resources management and future water pollution control efforts. However, little has been done in regards to the implementation of the planed actions and measures in the NEAP II.

Regulatory bodies find themselves tangled in a web because of existing fragmented responsibilities between them, alongside the lack of investments and the great shortage of technical engineers to fulfill the demand in hydrogeological engineering and comprehensive water quality policy drafting. The Central European countries like Estonia, Lithuania are facing the same challenges in implementation of the demanding Urban Wastewater Treatment Directive (91/271/EEC), Drinking Water Directive (98/8/EC) and Water Framework Directive (2000/60 /EC).[11]

In the focus of this report are the following institutional actors:

- The Ministry of Environment and Physical Planning (MOEPP) which has recently become the designated entity for developing national policies and guidelines for the overall water management including river basins management and permitting system.[12] Its mandate is to endorse strategies, practices and measures for water protection against pollution. The MOEPP also supervises the monitoring of water quality and implementation of water related laws.
- The Ministry of Transport and Communications (MOTC) is responsible for overseeing development plans for water-supply systems and sewerage network infrastructure, implemented with financial allocations of the state budget.

11. Kati Kangur, "Risk Regulation Bureaucracies in EU Accession States: Drinking Water Safety in Estonia and Lithuania," 7. <http://www.essex.ac.uk/ecpr/events/graduateconference/barcelona/papers/193.pdf.> (accessed December 20, 2009).
12. Former responsible authority was the Ministry of Agriculture, Forestry and Water Economy (MAFWE). Now MAFWE remains responsible for irrigation policies.

- The local-self governments with the on-going decentralization processes became responsible to carry out activities for local water monitoring network such as constructing, operation, maintenance, rehabilitation of water-supply and wastewater collection networks and implementation of wastewater treatment plant (WWTP) projects. These obligations are discussed further in the report in the Wastewater treatment section.

The Law on water from 1998 (Official Gazette of Republic of Macedonia, number 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[13] has led to adoption of new Law on waters.[14] The new Law on water that will fully operate from 2010[15] 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). According to the SOFRECO "Strengthening of Environmental Management, Republic of Macedonia: Sector Approximation Strategy," most demanding implementation tasks in terms of time and resources (financial and human resources) will be: "…Developing and approving wastewater management strategies and implementation plans particularly under the Urban Wastewater Treatment Directive (91/271/EEC); Developing appropriate institutional arrangements and tools for regulation and enforcement; Planning, design and construction of new infrastructure and facilities; Providing permits for new infrastructure and facilities."

Therefore, it is important for all critical actors to be capable jointly to endure the pressure of the fast track of directives targets worth 724 million EUR (capital costs)[16], making the water quality sector one of the most demanding sectors in conformation to the EU environmental *acquis*. Considerable amount of prudent work lies ahead on the pace of responsible authorities (in the first line the local self-governments units, the second-relevant ministries-MOEPP) towards the Union and for succeeding in realizing one of the fundamental tenets of every individual- the right to a healthy and clean environment.

Water pollution trends in Macedonia

In Macedonia, as in many other countries in the world, the water pollution comes from domestic, municipal, commercial, industrial, and agricultural activities. Among the many contaminants associated with water pollution, the human pathogens, heavy metals, organic

13. 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.
14. Указ за прогласување на закон за води [Ordinance on proclamation of the Law on waters]. *Official Gazette of the Republic of Macedonia*, No. 87/08, (15 June 2008).
15. When the secondary legislation is adopted in order to achieve full transposition.
16. SOFRECO, "Strengthening of Environmental Management, Republic of Macedonia : Sector Approximation Strategy, Water Sector." (May 2007): 68. CD-ROM.

and inorganic pollutants, nutrients are the primary constituents of concern in wastewater. Wastewater management represents activities and measures aiming at prevention of pollution of surface water through the reduction of the release of wastewater into surface waters (inland or sea waters), excluding the activities for preservation of groundwaters. It includes the collection and treatment of wastewater including monitoring and regulation activities.[17]

Limited investment of wastewater collection and treatment infrastructure in the past has resulted in a significant shortfall in sanitary coverage and a growing surface water pollution problem. The discharge of raw and insufficiently treated wastes to the major river catchments has contaminated surface waters in many regions of the country. The principle is: the bigger the human presence in an area the greater the pollution on any medium. Accordingly, water pollution in the highly populated regions of Macedonia like the Polog region and Skopje region tends to be greater than in other parts of the country like the Pelagonija region with less population density.

Secondary treatment can be explained as a process that occurs after the removal of the large objects in the sewage water and after the sedimentation of the influent-entered wastewater-, the stage of biological treatment follows where the organic material in the sewage is being dissolved under aerobic conditions by microbial action. The process prevents pollution of the freshwater sources from organic matter*, pathogens and microorganism contaminants**, nutrients like nitrogen and phosphorus***.

* With effects of exhaustion of oxygen presence in water during its disintegration, causing stress or suffocation of aquatic life, (*Source*: UNESCO, "The State of the Resource : Chapter 4," <http://www.unesco.org/water/wwap/wwdr/wwdr2/pdf/wwdr2_ch_4.pdf.> (accessed December 25, 2009) : 141).

** They cause waterborn diseases that are spread from contaminated potable water supplies and are responsible for the high rate of childhood mortality in developing countries. (*Source*: *Ibid.)*

*** Build up of nutrients in water bodies (if excessive is called eutrophication) stimulates growth of algae for which decomposition the microorganisms consume large volumes of oxygen contributing to suffocation of the aquatic life thus causing increase in organic matter in the water that needs to be further disintegrated. High amounts of nitrogen are detrimental to human health too, if the water from rivers is used as drinking water.

At present, a large volume of concentrated municipal and industrial wastewater is discharged in the nearby rivers. The unmanaged waste load degrades water quality to varying degrees. The pollution of rivers raises a particular concern. River water is often used for irrigation and the existing high potential is used for human contact with polluted wastewater leading to waterborne diseases.[18]

Municipal pollution

The municipal (or urban) wastewaters are a major polluter of the surface waters in almost every SEE country, as carriers of the biological overload of the waters.[19] In Serbia only 5.3

17. Additionally it includes prevention actions of emission to surface water. Organisation for Economic Co-operation and Development, Pollution Abatement and Control Expenditure in OECD countries (March 6, 2007), 17, quoted in "Национална стратегија за инвестиции во животната средина, Нацрт верзија [National Strategy for Investments in the Environment, Draft version]," *Ministry of Environment and Physical Planning*, (Skopje, November, 2008):9.

18. Such as diarrhea, amoebiasis, enteric fever (typhoid), hepatitis A.

19. Large volumes of organic matter in the freshwater bodies reduces both the chemical and biological quality of the water and leads to a distortion in the aquatic system, reducing the quality of the water for human consumption and other purposes: irrigation, recreation, fishing.

percents of the total quantities of municipal wastewaters is discharged in the recipients with proper treatment.[20] Even in EU by the end of 1998, there were 72 agglomerations that were still discharging large portion of wastewaters into nearby recipients untreated, thus not meeting the objectives of the Urban Wastewater Treatment (UWWT) Directive.[21]
Municipal wastewater is a large contributor to the pollution of the Macedonia's water courses. It caries large quantities of domestic wastewater (from household activities)[22], sanitary wastewater from commercial[23], institutional facilities[24], together with storm water-run off[25], agricultural run-off and large portion of untreated industrial wastewaters.[26] For instance, the City of Skopje where the coverage of the city sewerage network is nearly 80%, has on daily basis 200 liters per capita generated wastewater, which presently all are discharged from nearly 60 drain sites (the construction of the main collection pipes is in progress) along the river bed of Vardar.[27]

Different polluters affect recipients' water quality in different manner. In respect to the aforesaid, at the very beginning, strict separation of industrial wastewaters from municipal should be achieved. If industrial effluents are discharged without pre-treatment into watercourses that are subjected to treatment in WWTP, the effluents can overload the system or poison the treatment systems that rely on biological processes. Therefore, according to the Law on water supply and outflow of urban wastewater and the new Law on water, industries must pre-treat their wastes to meet acceptable standards before discharging to municipal sewer systems or to the environment. Presently terms, manner and emission limit value for discharges of wastewater are in a draft version. They should be adopted after 2010, when the Law on water becomes fully operational. For now a good example of on-site treatment of the chemical pollution of the wastewater is at the factory for sunflower oil "Brilijant", which has its own wastewater treatment plant.

Municipal wastewaters should be treated in a proper sewage plant before discharge. If not they disrupt the watercourses by releasing deleterious substances, treating both surface waters and groundwaters (these waters are important source of potable water supply). The municipal water pollution increases the risks to public health from infections and transmission of waterborn diseases. However, little progress has been made in municipal wastewater treatment in the past few years. There is secondary treatment (see text box on previous page) of the municipal wastewater[28] in only few cities in Macedonia - in Kumanovo, Prespa, Struga, Sveti Nikole, Makedonski Brod and Dojran. The present WWTP satisfy around 10-12% of the demand or the total treatment capacity approximately is 250

20. Национална стратегија одржив развоја : Предлог [National Strategy on Sustainable Development : Final Draft]. *Government of the Republic of Serbia*, (Belgrade, 2008):82 < http://www.odrzivi-razvoj.sr.gov.yu/cyr/strategije.php> (accessed on December 15, 2008).
21. Large EU Cities, end of 1998 (chart). Available from: UNEP-GRID <http://www.grid.unep.ch/product/publication/freshwater_europe/images/waste_cities_graph.jpg> (accessed January 20, 2009).
22. There is a clear difference between water consumption of households and industry (see table 2). One explanation can be that the increased urbanization following the year 2000, lead to increase in the number of households connected to the public water supply network, thus making the significant difference in the water utilization. Substantial part of gross water utilization subsequently is discharged (returned) to water systems.
23. Especially worrying are the car maintenance services, car-washing services, photo and printing services.
24. Hospitals, infirmaries are in focus.
25. The sewerage systems in Macedonia are mainly old, combined systems, therefore separation of these waters does not exist.
26. For example meat processing industries, tanneries, textiles manufacturing, galvanization small industrial activities.
27. Slobodan Dimitrovski, interview by author, Skopje, RM, December 2, 2008.
28. Industrial and agricultural wastewaters are not included at the conventional wastewater treatment plants (WWTP).

thousand population equivalent (p.e.) (see table 3 below).[29] All other urban areas have their wastewaters (municipal, industrial and atmospheric run-off) discharged untreated into rivers causing possible pollution of the water bodies downstream of the highly populated areas, resulting in deteriorated river water quality. From 1988 to 2006 decrease of the biological oxygen demand (BOD_5) and ammonium in rivers could not be recorded. According to the Ordinance for classification of water (Official Gazette of Republic of Macedonia, number 18/99), water samples from measuring sites on the river basins of Crna Reka and Vardar on several occasions were described as class IV water quality, or highly eutrophic, polluted water.[30]

	Water Supply Network		Wastewater Network		Wastewater Treatment Plants		
	Existing	Upgrade needed	Existing	Upgrade needed	Existing	Upgrade needed	New
Agglomerations over 15.000 p.e.	27	20	27	21	4	1	22
Agglomerations 2.000 – 15.000 p.e.	41	38	41	38	3	1	37

Table 3: Number of major capital infrastructure structures

***(Source*: SOFRECO, "Strengthening of Environmental Management, former Yugoslav Republic of Macedonia : Sector Approximation Strategy, Water Sector." (May 2007) : 68. CD-ROM).**

MOTC and the MOEPP every year allocate finances for building and rehabilitation of the water and wastewater infrastructure, but the resources are very modest. Capital expenditures of EUR 1.5 million are planned for 2009 from the budget of RM for water-supply and collection sewer systems[31] contrary to the EUR 15.5 million regarded as local-governments own allocations. This is still considered as low level of presence of governmental capital expenditures for this sector. The Draft version from November 2008 of the National Strategy for Investments in the Environment of RM envisaged EUR 102.4 million[32] for the fulfillment of projects on water supply and wastewater treatment. Maybe this attitude goes hand in hand with the principle in a recession times too much ecology cannot be afforded, because it hardly produces new job posts and is a major consumer of the budget. However, Macedonia is obliged to reach the 10th Millennium Development Goal of halving the proportion of people without access to safe drinking water and basic sanitation by 2015. This means staggering sums need to be allocated annually to increase

29. 1 population equivalent (p.e.) equals to 60g BOD5 in untreated wastewater. BOD_5 is organic matter pollution measured as biological oxygen demand in five days. Указ за прогласување на закон за води [Ordinance on proclamation of the Law on waters]. *Official Gazette of the Republic of Macedonia*, No. 87/08, (15 June 2008) : art4.

30. Индикатори за животната средина на Република Македонија ,2008 [Environmental indicators of the Republic of Macedonia, 2008]. *Ministry of Environment and Physical Planning*, (Skopje, 2008): 148.

31. Закон за извршување на Буџет на Република Македонија, 2009 [Law for the execution of the Budget of the Republic of Macedonia, 2009]. *Official Gazette of the Republic of Macedonia*, No. 116/08, (31 December 2008) : art29.

32. Out of total EUR 205 million (in 2008 exchange rate) or 47% representation, mainly allocated from the national budget and with half of the allocations (or 21%representation) coming from local-self government financing. Национална Стратегија за инвестиции во животната средина, Нацрт верзија [National Strategy for Investments in the Environment, Draft version]. *Ministry of Environment and Physical Planning*, (Skopje, November, 2008): 20-23.

access to water supply services and to maintain and improve municipal sewer and water systems in this country that serve both poor and non-poor communities.

Still many of the local self-governments, especially the small and ones with mainly rural population, do not have the finances to initiate and support the costly projects for construction of wastewater treatment plants and completion of new and reconstruction of old water-supply and collecting infrastructure.[33] Even in Skopje, the city with 2009 budget of approximately EUR 52 million[34], has more than twenty thousand households still using septic tanks. These people do not have access to the communal infrastructure, because projects for construction of the network need substantial financial resources, which the municipalities are in lack of.[35] One of the reasons that this money is not available is that Macedonians are not paying the true cost of their water and sewerage services.

Another reason can be found in the many buildings illegally built over the years without connection to the communal infrastructure. According to Article 13 of the Law on communal activities[36] construction and maintenance of the communal infrastructure comes from: investors own restitution or rent for utilization of the building site in and compensation for the adaptation of the building site, which is paid during construction of the building structure; from the price of the communal service; the budget of the founder of the infrastructure; donations and other means established by law. People that have not paid for the service delivered by the municipality (because they are not registered as users), are utilizing and polluting water, due to improper sanitation. Violation by owners of building sites to Article 11 and 12 of the Law on communal activities is rather cheap, ranging from EUR 2500 to 5000.

The aforesaid issue haunts many local-self government units. For example, Skopje and Prilep are municipalities that three decades ago experienced rapid influx of people from rural areas and natural population growth, doubling or tripling the number of population inhabiting parts of the cities that are not urbanized. Constructing illegal buildings is a growing challenge that needs to be addressed immediately because it is downsizing municipality's budget. Currently new law is being drafted regulating the abovementioned issue, making the process of legalization of the structures to be followed by mandatory payment of the costs for constructing water-supply and sewage infrastructure to and for the building location.[37]

33. For example the expenditures for implementation of the WWTP project in Kumanovo were EUR 11million for approximately 91 000 p.e.
34. EUR 32.7 million will be allocated for capital investments: water facilities, WWTP etc. "The city budget will be 52 million euros heavy," *Dnevnik*, 25 December 2008, Section Skopje, 17.
35. Tasev, Marija. "Capital with over twenty thousand septic tanks," *Dnevnik*, 17 November 2008, 14.
36. Закон за комунални дејности [Law on communal activities]. *Official Gazette of the Republic of Macedonia*, No. 45/97 (12 September 1997), amended No. 23/99 and No. 45/02.
37. MOTC official, e-mail message to author, December 26, 2009.

Industrial pollution

Since the 70ties Macedonia has experienced a rapid industrial development[38], making industrial wastewater to constitute not only large, but also growing fraction of the total volume of produced wastewater. From graph 1 the processing industry can be observed as industry with highest release of effluent waters[39] in water courses, while the manufacture of fabricated metal products (except machinery and equipment) has the lowest releases in water courses.

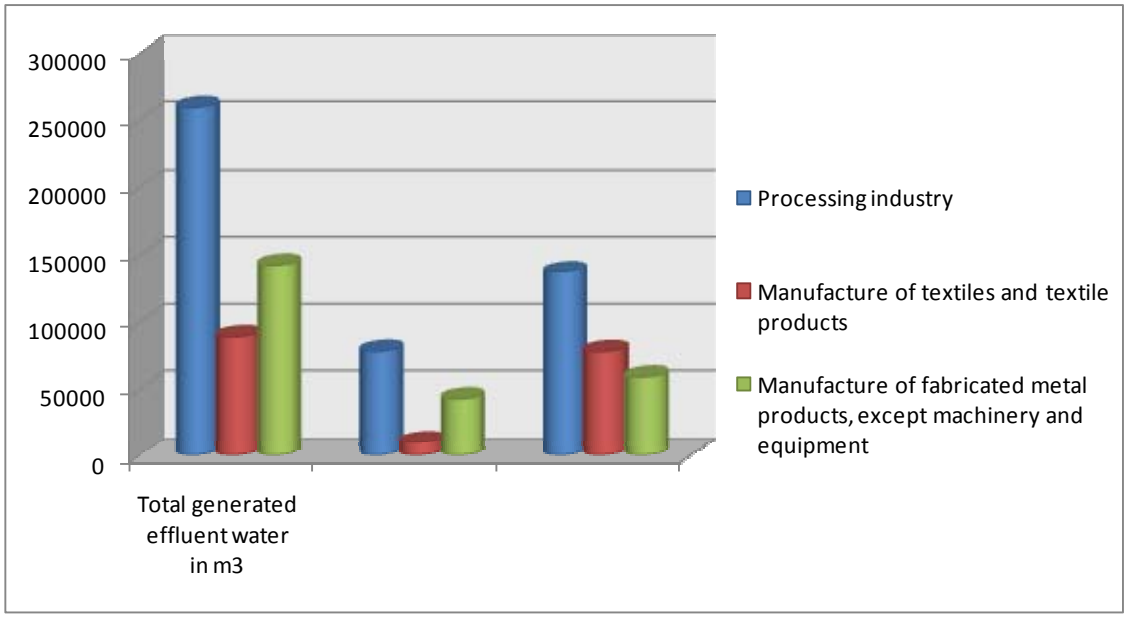

Chart 1: Effluent water in m^3 according to industries

***(Source*: Statistical Yearbook of the Republic of Macedonia 2007, *State Statistical Office*, (Skopje, 2007): 438-440).**

Industrial wastewaters in Macedonia are generated by large, small, and micro-scale industries. Industrial wastewater is commonly linked to point source (PS) pollution[40] of surface water bodies. Management and pre-treatment of industrial wastewater discharges to drains is a critical issue considering the potential direct human health risks and environmental consequences. High concentrations of heavy metals like Pb, Zn, Cd, Ni, Hg (that are depositing in the river sediments) are found in industrial discharges. Furthermore there can be a presence of toxic organic compounds like the Polycyclic Aromatic Hydrocarbons (PAHs), Polyclorinated Biphenyls (PCBs), and even more threatening micro-

38. Macedonia, FYR at the glance (table). Available from: World Bank < http://devdata.worldbank.org/AAG/mkd_aag.pdf> (accessed January, 15, 2009).
39. According to the Statistical Yearbook of the Republic of Macedonia 2007 from the State Statistical Office of the Republic of Macedonia, effluent water is the total volume of water treated as effluent water following its utilization in the reference year.
40. Point sources are mainly associated with releases of contaminants from a stationed location (end-pipe from industries, ship discharges, mines, municipality drains). This type of pollution is more easily quantified and treated contrary to non-point sources (NPS), which is characterized with diverse and widely spread sources (agricultural areas with wide use of fertilizers, pesticides etc). UNESCO, "The State of the Resource : Chapter 4," <http://www.unesco.org/water/wwap/wwdr/wwdr2/pdf/wwdr2_ch_4.pdf.> (accessed December 25, 2009) : 139.

organic pollutants: endocrine disrupters, pesticides, food additives, pharmaceuticals. The later mentioned can cause poisoning, mutations, reproductive disruptions, immune suppression in the aquatic organisms and humans. Yet, almost all industry and agriculture subjects in Macedonia release their effluent waters without any pre-treatment into the sewer system or directly into the nearby recipients which in both ways is a misdemeanor of the Article 19 by the Law on drinking water supply and outflow of urban wastewaters.[41]

River pollution from industrial activities in Macedonia was noted on several occasions in 2008. It had major impacts on the human population and to the aquatic systems. Recently in November 2008[42] the population of the municipality of Ilinden protested against the long-term environmental pollution, both to air and water, of the nearby oil refinery "OKTA". The pollution has reached worrying levels, high above the limited values of allowed emissions of sulfur dioxide in air and aluminium sulphyde and organic compounds in the wastewaters of the refinery. Furthermore, back in July 2008[43], the public remembers the "strange" ecological disaster when 10 tonnes of fish were killed. The accident was caused by Macedonian Transmission System Operator (MEPSO) with sudden release of huge amounts of water into the river Vardar, to cover the increasing demands for electricity in that period. The reason for this environmental disaster was in fact the accelerated erosion of the riverbed - after the abnormal rise of the water level- which led to increased fragments of soil in the form of sludge to end up in fish gills, clogging them and causing fish deaths. This is a perfect example demonstrating that sediment loading is just as harmful to the aquatic systems as water pollution and over-abstraction of water.

Monitoring of industrial discharges is an additional problem. Even though the industrial capacities like the oil refinery "OKTA", the pharmaceutical company "Alkaloid"and as WWTP the Vranishta installation are being monitored by the Central Laboratory of MOEPP, river pollution in the municipality Ilinden -on the liability of OKTA – reached sky-high levels in the preceding year. Measurements can show "satisfying" results and not the real pollution of the water when the monitoring in performed in other time than the discharge time, usually in night hours (when taking samples is rather complicated).

The above described issues are as consequence of:

- lack of will to invest in the costly technology and the lack of awareness amongst the managers of the enterprises on the need of pre-treatment of the effluents prior their discharge;
- limited or no monitoring of the discharges by the relevant authorities from the local self-governments (appointed local environment inspector), the State Environment Inspectorate (MOEPP), the State Communal Inspectorate (MOTC), the State Sanitary and Health Inspectorate and the Food Directorate (Ministry of Health-MOH) and

41. Закон за снабдување со вода за пиење и одведување на урбани отпадни води [Law on drinking water supply and outflow of urban wastewaters]. *Official Gazette of the Republic of Macedonia*, No. 68/04 (5 October 2004) with amendments No. 28/06 and No. 103/08.
42. Rizvanovic, Sead. "The refinery has accepted the demands-possible seize of the barricades," *A1*, 20 November, 2008. <http://www.a1.com.mk/vesti/default.aspx?VestID=100431> (accessed January 5, 2009).
43. Gaxovska, Zorana. "Lack of oxygen - cause for fish deaths," *A1*, 24 June, 2008. <http://www.a1.com.mk/vesti/default.aspx?VestID=95629> (accessed January 5,2009).

- relatively low prices[44] for non-compliance to the Article 23, paragraph 1 of the Law on drinking water supply and discharge of urban wastewaters.

Monitoring and Reporting

Information on the generation of wastewater from all sources is scarce, outdated and approximate. The information dating back from 1996, shows the generation of the wastewater from all sources was roughly 0.53 BCM, with approximately 10% treated discharge (compare information on page 9). Comparing of data can lead to conclusion that presently nothing has changed in treatment of effluents even though compared to 1996 the number of operating WWTP has doubled. However, some progress has been achieved in the area of monitoring the polluters. Macedonia is not substantially lagging behind to its EU candidate neighbor Croatia in the area of water quality monitoring system.[45] The Cadastre of pollutants (Department for modeling at the MOEPP) canalizes information collected from 1002 installations[46] to the MOEPP Department for Industrial Pollution Prevention and Control and other collaborative institutions. The water users have to provide information on the time frame, type (identification data) and capacity of the investigated installation, including information on water supply quantities, wastewater quality and generation, type of purification treatments etc. However secondary legislation on the cadastre's content is still acquired. This does not allow an efficient program for monitoring of environments' quality and prevention of pollution to be established which will facilitate forecasting of eventual changes in the state of the environment.

The existing model for data input and monitoring of emitters (from all sectors: waste, air, soil, water) is faced with lack of finances for upgrade to advanced software and cartographic model, insufficient human resources capacities, irresponsibility of reporting to the authorities. A sum up of all the factors results with insufficient extent of monitoring and poor quality of the produced information, which is far from EU reporting requirements (seeking information to be accurate and permanent).

Relating to the abovementioned issues, statistical data on the constructed and maintained pubic water-supply and sewage networks of every municipality (with its Public Enterprise) are full with gaps and are not continuous, dating from certain periods of time. It appears regardless the existence of modern technology like the Global Information System (GIS) for

44. From DEN 80 000 to 200 000 or EUR 1400-3400.
45. European Commission, "Croatia 2008 Progress Report," *Europa-Enlargement*, 61. <http://ec.europa.eu/enlargement/pdf/press_corner/key-documents/reports_nov_2008/croatia_progress_report_en.pdf.> (accessed January 5, 2009) .
46. Involved sectors are: services from PCEs, industry, veterinary institutions, car cleaning and car washing services, dry-cleaning services, hotels, hospitals. Among them 42 (in 2008) are holders of permit for major polluters (Industrial Pollution Prevention and Control A - IPPC A). Ljupka Dimovska-Zajkov, interview by author, Skopje, RM, July 9, 2008.

easy access and capture of all data in a country, Macedonia and neighboring countries even lag behind some developing countries because this system still is not in function.[47]

Namely this occurs because information is still perceived as a source of income. This diminishes the basic role of the public information- to be valid and applicable. However, just recently progress has been made in this area. The MOTC at the request of the local self-governments in Macedonia has managed to establish basic database for their needs in the sector of construction of water supply and sewage systems. Immediately on the very beginning of its creation, this database was faced with gaps that need to be bridged. The database still is not functioning as a valid source of information on the condition of the performance of the local self-governments and thus offering structured and efficient reporting of the condition at national level, since data input is not complete, because the basic feeds of the database, the local authorities have low awareness on its importance, leading to its neglect.[48]

Wastewater treatment

Water supply and sewerage services are responsibilities of the municipalities through their municipal-owned enterprises or Public Communal Enterprises (PCEs). The communal services vary widely in Macedonia, with noted drastic declines in the smaller municipalities and ones with mainly rural communities.[49] The PCEs are facing performance related problems mainly due to high dependency on municipal budget allocations for the completed services. Aside the legislative and regulatory framework[50] in practice PCEs responsibilities are largely interwined with those of the local authority, especially regarding the financial management. This hampers the ability of the enterprises to provide good local public services, amongst them being operation and maintenance of WWTP.

In the village Krivogashtani, the WWTP is in the final stage of construction, while the City of Skopje, municipality of Prilep, Gevgelija, Berovo have had feasibility studies on WWTP prepared by international consultant agencies. Currently municipality of Prilep has released international tender for implementation of the WWTP project.[51] The financing will be executed through grants from EU's Instrument for Pre-Accession Assistance (IPA) Component III available to Macedonia as a candidate country (e.g.Prilep); loans from

47. The GIS technological line at the Service for spatial information system (Ministry of Environment and Physical Planning) shows satisfying utilization of the possibilities of the GIS technology and should be excluded from the previous statements.
48. MOTC official, e-mail message to author, January 14, 2009.
49. World Bank. *World Bank*, "Preparation of a Strategy and Action Plan for Reform of Communal Services Enterprise Sector, with focus on Water, Sewerage and Solid Waste Management," June 1 2007, 1. <http://econsult.worldbank.org/suite/public/collaboration/GetDocument.none?doid=69529> (accessed January 10, 2009).
50. Communal sector laws: Law on public enterprises (Official Gazette of Republic of Macedonia No. 38/96, with amendments No. 6/02; No. 40/03 and No. 49/06); Law on local-self government (Official Gazette of Republic of Macedonia No. 5/02); Law on communal activities (Official Gazette of Republic of Macedonia No. 45/97, with amendments No. 23/99 and No. 45/02); Law on local government finances (Official Gazette of Republic of Macedonia No. 61/04, with amendments No. 96/04 and No. 67/07); Law on drinking water supply and outflow of urban wastewaters (Official Gazette of Republic of Macedonia No. 68/04 with amendments No. 28/06 and No. 103/08).
51. Macedonian companies have not participated in the building of the existing WWTP in Macedonia, because of the lack of competent and experienced engineers in the wastewater construction sector. On the other side Austrian, German (example Roediger) and Swiss constructing companies have impeccably implemented the WWTP projects.

international (European Investment Bank-EIB) and bilateral funding institutions (Kreditanstalt für Wiederaufbau – KfW for the municipalities Gostivar, Tetovo, Kavadarci, Negotino, Bitola, Kocani); and other investment sources available for Macedonia. However, the investment planners at the responsible authorities should scrutinize critically upon this panoply of funding (like the donors critical view into the planning process), hence situations on halted projects of WWTP construction as in Strumica, Veles and Štip - financed by European Bank for Reconstruction and Development-EBRD are stopped from reiterating.[52]

From the examples with the WWTP in Macedonia we can see that there is an urgent need to improve the effectiveness and sustainability of existing and future Urban Wastewater Management (UWM) facilities, through tariff reforms, innovative financing mechanisms (prospective EU funding through the IPA instrument should be taken into account), and management regimes. This is attributable to several reasons. Namely the principal shortcoming of the conventional WWT facilities is found in their requirement for large volumes of water, costly infrastructure that needs to be built to "feed" the system and high maintenance costs for the expensive technology which utilizes much electricity, water, and operation staff.

The WWTP in Kumanovo is financially hardly sustainable after the takeover by the PCE "Vodovod, Kumanovo" in 2007. Even though is the most modern WWTP built in Macedonia and maybe in the region[53] coupled with biogas production (for now for its own utilization for heating of the plant) and possible stabilised sludge (as soil amendment) marketing, it has huge expenditures mainly for electricity and thickening polymer acquisition that cannot be covered with the low water charges. Currently there is only 60% collection rate of charges for communal services (for water abstraction and pollution tariffs) which is a low rate.[54] Additionally urgent new enforcement efforts on nonpayment should be undertaken and widely applied. That is the right approach to the polluter pays principle that safeguards the EU's environment and soon it will be necessary to be applied in Macedonia too.

52. Национална Стратегија за инвестиции во животната средина, Нацрт верзија [National Strategy for Investments in the Environment, Draft version]. *Ministry of Environment and Physical Planning*, (Skopje, November, 2008): 20-23.

53. Municipality of Kumanovo together with four municipalities: Struga, Veles, Stip, Strumica were part of the Action Plan for Municipal Infrastructure which included investments in water supply and wastewater management in the form of credits and grants managed by the European Bank for Reconstruction and development (EBRD). With a credit from the Swiss State Secretariat for Economic Affairs (SECO) and EBRD of EUR10.5milion, and the Macedonian government as a guarantee, the implementation of the project for construction of WWTP for 91 thousand p.e. in Kumanovo, village Dobroshane, together with construction of a main collector line and similar components needed for functioning of this modern installation was instated. The WWTP began operating November 2006. Since then it has achieved its high efficiency in water purification (nearly 99%) with performance according to EU standards, providing 800 cubic meters per hour water of second class quality in the River Kumanovska.

54. Tariffs will be increased for 20-30% (Skopje, Prilep). Taking the economy of scale into advisement, they "...cannot be realistically raised above 4% of household income." Gillespie Brendan. "Funds well spent or wasted," *Environment for Europeans*, October 2000, 7. < http://ec.europa.eu/environment/news/efe/pdf/news4_en.pdf.> (accessed January 10, 2009).

The construction of WWTP should always follow the broader national interest: protecting human health and maintaining ecological balance in the aquatic ecosystems with regards to feasible operational and maintenance costs. Unconventional systems, which have substantial disparities from the conventional systems, always should be in favor in smaller agglomerations[55] with maximum 1500 p.e. The commenced constructed wetlands (see text box on the left) project in December 2008, in the village Nakolec, municipality of Prespa, is a good practice that should be followed in future constructions of small systems for wastewater purification. With the bio-manipulation of ordinary swamps, rural communities that cannot join to the main collector of cities' sewage network and rely on septic tanks as collection systems, can achieve proper wastewater treatment (especially for removal of organic matter and pathogens). The maintenance and operational costs are low, only one worker and one pump for the water, which results in low energy requirements.

Wetlands (marshes and swamps) are transitional area between aquatic and terrestrial ecosystems, a wildlife habitats that are regularly saturated by surface water or groundwater. They serve as "kidneys of the landscape" filtering the water by trapping sediment and organic matter into them.

(Source: Heather Stovall, "Natural Alternatives to Conventional Wastewater Treatment," June 2007, 16. <http://lda.ucdavis.edu/people/2007/HStovall.pdf. > (accessed January 10, 2009).

Conclusions for further action

As EU candidate country, Macedonia is faced with high standards for water protection demanded by the European Commission's Enlargement Directorate. But how to reach even the minimum standards required for compliance to the environmental *acquis* in one of the most demanding policy areas, the wastewater management?

Policy changes in the water quality and water protection sector are required immediately. They should entail cross-sector coherence in particularly in industry and agriculture. Unmanaged municipal and industrial wastewaters should receive priority consideration with clear political will on both local and national levels, hence water pollution abatement and control can ensure sustainability of water resources for present and future generations.

In respect to wastewater management, we recommend that the government should consider and engage its future efforts for achieving realistic environmentally sustainable economical development through implementing the following reforms:

- cost-effective utilization of natural resources by "developing and applying appropriate water quality management tools and systems"[56];

55. Article 2.4 of Urban Wastewater Treatment Directive (Directive 91/271/EEC) defines the "agglomeration" as follows: 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." Urban Wastewater Treatment Directive. *Official Journal of the European Communities* (OJ) L135, (30 May 1991) : art.2.

56. Zhongping Zhu et al., "Application of policies and procedures for improved urban wastewater discharge and reuse," Ministry of water resources and irrigation, APRP-Water Policy Activity, Report No.46, December 2001, E-1 <http://rmportal.net/tools/environmental-policy-

- gradual increase of public investments for environmental protection (polluter pays principle) can be achieved with better incentives for compliance for the industries (the large industries especially). It is crucial constant monitoring and proper enforcement to be established to encourage persistent compliance, taking into account the length of time that supports these "better" incentives.[57]
- enabling positive climate for private-public partnerships (PPP)[58]: private sector finances will be needed to meet the demands of initiating communal infrastructure projects as well as achieving improvements in the services to the consumers.[59]

What is very important is to accept the troubled challenges in the water quality sector and to commence with hard work on the abovementioned challenges, because that is the thorny way forward not just in EU accession milestones, but in the venture for amending Macedonians attitude towards our natural asset-clean water. After all, we as water consumers/wastewater producers are going to be the principal bearers for implementation of the related EU Directives.

and-institutional-strengthening-epiq-iqc/epiq-environmental-policy-and-institutional-strengthening-cd-vol-1/epiq-cd-1-tech-area-dissemination-of-policy-knowledge-environmental-communication/report-46.doc.> (accessed November 5, 2008).

57. *Ibid.*

58. That will enable competitiveness in the water and sanitation sector, thus achieving upgraded communal services delivered to the communities. SOFRECO, "Strengthening of Environmental Management, Republic of Macedonia : Sector Approximation Strategy, Water Sector." (May 2007): 69. CD-ROM.

59. World Bank. *World Bank*, "Preparation of a Strategy and Action Plan for Reform of Communal Services Enterprise Sector, with focus on Water, Sewerage and Solid Waste Management," June 1 2007, 5. <http://econsult.worldbank.org/suite/public/collaboration/GetDocument.none?doid=69529> (accessed January 10, 2009).

analytica
thinking laboratory...

Environment, Agriculture and Rural Development Program

Previous policy publications:

Composting in Macedonia-Sound alternative or just a roten idea?"

Forthcoming policy publications:

Policy Brief: Macedonian performance in the area of environment"(Feb.2009)

Contact Information

ANALYTICA

Dame Gruev 7/8-3
1000 Skopje, Macedonia
tel: + 389 2 312 1948
web: www.analyticamk.org
info@analyticamk.org

Research Fellow on Environment, Agriculture and Rural Development Program:

Karolina Pendovska

kpendovska@analyticamk.org

Analytica is a non-profit independent institution dedicated to helping individuals and institutions with the aim to foster lasting improvement in the democracy and governance in Macedonia and elsewhere in the region of South Eastern Europe.

Analytica is a public policy research organization and a "think tank". It is dedicated to promoting greater cooperation and understanding among the people in Macedonia and wider in the region of South Eastern Europe.

The publishing of the report is supported by the European Fund for the Balkans, Project "Building National Capacities: Harmonisation, Legislation and Management".