MATHEMATICS AND NATURAL SCIENCE

Proceedings of the Fifth International Scientific Conference – FMNS2013
12 – 16 June 2013

Faculty of Mathematics and Natural Science

VOLUME 5

GEOGRAPHY, ECOLOGY AND ENVIRONMENT PROTECTION

South-West University “Neofit Rilski”
Blagoevgrad

Fifth International Scientific Conference – FMNS2013
South-West University,
Faculty of Mathematics and Natural Science
12 – 16 June 2013

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ISSN 1314-0272

Temperature Anomalies in Bulgaria in November 2010 and 2011

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***Abstract**: In two consecutive years in November in Bulgaria were observed extremely variable values of average monthly temperatures all over the country – very high (in 2010) and quite low (in 2011). The differences in mean November temperatures for almost all stations at non-mountainous part of the country during these two years vary between 6,7^{0}C and 9,6^{0}C. At the same time in both cases was reported subnormal net precipitation, although there are significant differences in absolute values. The main reason for the observed divergent temperature anomalies should be sought in the characteristics of the atmospheric circulation in November in each of the years.*

***Keywords:** Atmospheric circulation, cold and warm advections, seasonal baric centers, temperature amplitude.*

1. INTRODUCTION

During the autumn in Bulgaria a change from summer type atmospheric circulation to winter one takes place. The basic reason for that is routed in gradually decrease of day light and the angle of incidence of the sun rays and hence the heating of the earth's surface in middle latitudes in Northern Hemisphere. This leads to change in position of Polar front and to the activation of the seasonal baric centers in Europe (Genoese minimum and East European maximum). Gradually the transportation pattern of air masses with different origins and features (temperature and moisture content) changes too, followed by alteration in weather conditions and especially temperatures. The rate and territorial manifestation of these changes over the years can be quite different, as demonstrated convincingly in the example of 2010 and 2011 years.

2. DATA

Analysis of temperatures is based on official meteorological data for 17 stations, obtained from Monthly November's hydro-meteorological bulletins for 2010 and 2011 of National Institute of Meteorology and Hydrology in

Bulgaria [3]. The analysis of atmospheric circulation is made on the basis of meteorological maps (for the temperature at 850 hPa level and geopotential height from 500 hPa level and ground level pressure) from the Wetterzentrale website [4].

3. DIFFERENCES IN TEMPERATURES IN LATE AUTUMN 2010 AND 2011

As was mentioned previously [2] in November 2010 in Bulgaria was observed unusually prolonged period of abnormally warm weather. In almost all meteorological stations in the country mean monthly temperatures that had been recorded were over and above the norm. Predominantly they were between 10 to 13^0C, with minimal excess in West Bulgaria (3,4 - 4,8^{0}C), and maximal in NE Bulgaria (6,4 - 7,1^{0}C).

November 2011 was in opposite abnormally cold. In almost all country the mean monthly temperatures were between 2 to 4^0C that means 2,5 - 3,5^{0}C below the average. Thus the amplitude in November temperatures in 2010 and 2011 for prevailing number of stations in Bulgaria varies about 7,3 and 9,3^{0}C with maximal range of 9,6^{0}C in Dobrich (Tab.1 and Fig.1).

Tab. 1: Mean monthly temperatures in November 2010 and 2011 in Bulgaria

Station	November 2010		November 2011		Amplitude ^{0}C
	mean T^{0}C	δT*	mean T^{0}C	δT*	XI 2010 – XI 2011
Montana	10.3	4.6	3.6	-2.1	6.7
Sandanski	12.9	4.0	6.2	-2.7	6.7
Vidin	9.1	3.4	1.8	-3.9	7.3
Burgas	13.9	4.8	6.6	-2.5	7.3
Kyustendil	9.6	4.0	2.2	-3.4	7.4
Plovdiv	11.2	4.2	3.8	-3.2	7.4
Sofia	10.4	5.3	2.9	-2.2	7.5
Sliven	13.0	5.3	5.5	-2.2	7.5
Varna	13.8	5.0	6.1	-2.7	7.7
Vratsa	10.9	4.7	3.1	-3.1	7.8
Pleven	11.0	4.8	3.2	-3.0	7.8
Ruse	12.0	5.3	4.0	-2.7	8.0
Blagoevgrad	11.6	4.8	3.3	-3.5	8.3
Kardzhali	12.8	4.7	4.2	-3.9	8.6
V. Tarnovo	12.4	5.8	3.1	-3.5	9.3
Razgrad	12.5	6.4	3.2	-2.9	9.3
Dobrich	12.7	7.1	3.1	-2.5	9.6

*δT - departure from the norm for 1960-1990 period [3]

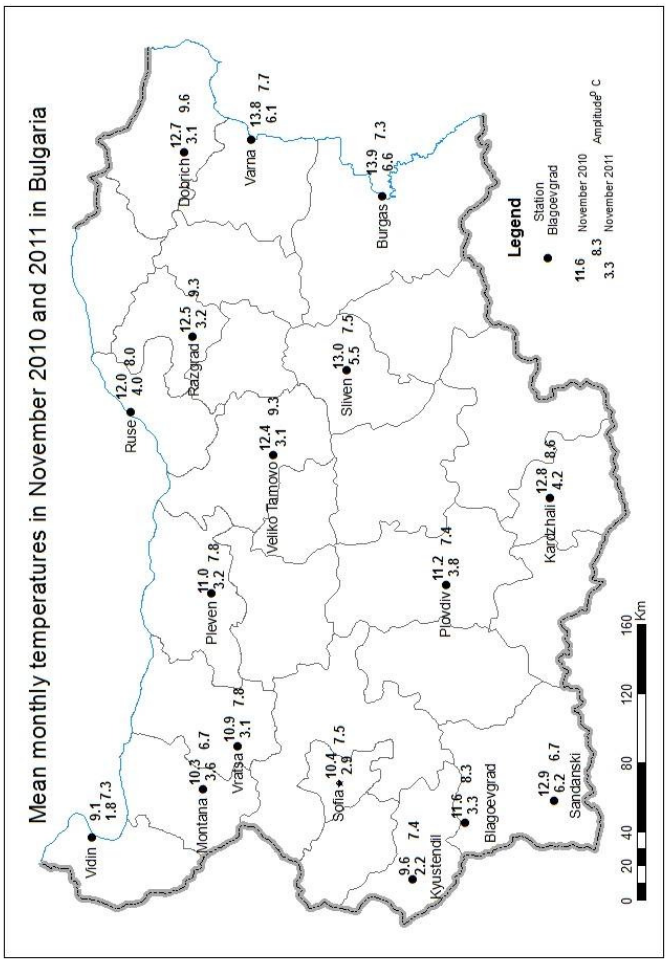

Fig.1: Mean monthly temperatures in November 2010 and 2011 in Bulgaria

4. DIFFERENCES IN ATMOSPHERIC CIRCULATION IN LATE AUTUMN 2010 AND 2011

According climate records all abovementioned is very rare phenomenon for the late autumn in Bulgaria. The explanation of these cases is connected with specific different patterns of atmospheric circulation in South-East Europe.

In November 2010 very prolonged warm advection cyclonic type atmospheric circulation pattern take place. Almost constant warm current is caused by series of North Atlantic cyclones, moving from West, or by Mediterranean cyclones, moving by South-West to North-East (Fig.2).

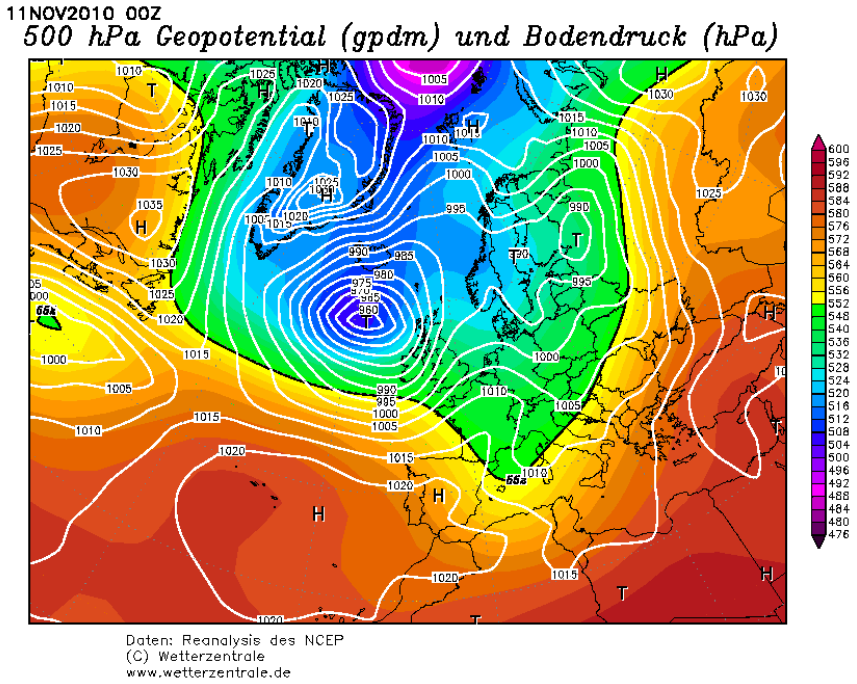

Fig.2: Atmospheric pressure map at 500 hPa and ground level – 11.11.2010 [4]

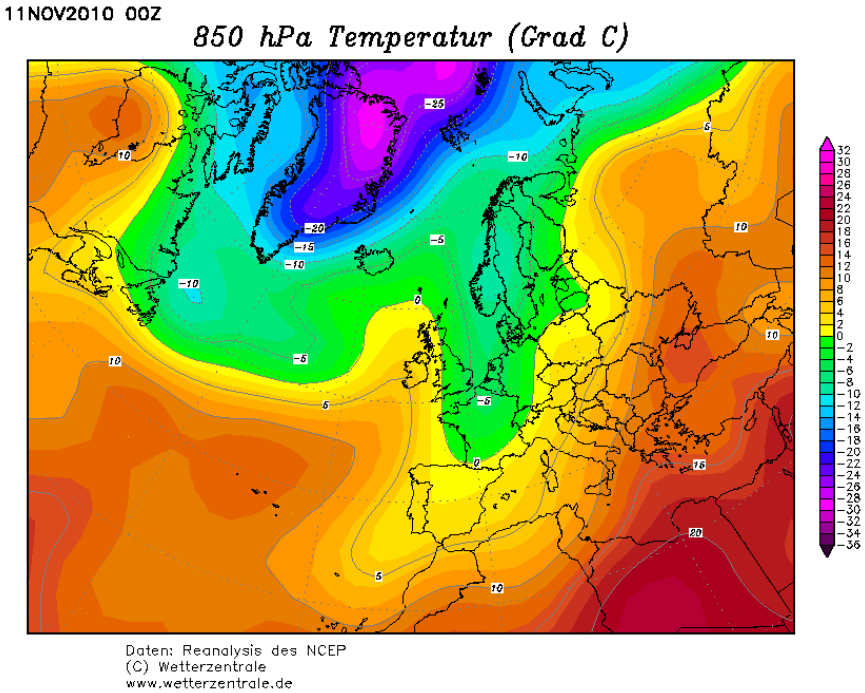

Fig. 3: Map of temperature at 850 hPa level – 11.11.2010 [4]

In both circumstances Bulgaria is situated in eastern part of the cyclones and get into its warm sections (Fig.3). The observed case is interesting because regardless the change of NAO+ with NAO- phase, the advection of air masses in South-East Europe retains for all the time predominantly from S-SW to N-NE [2].

In November 2011 over Bulgaria predominates anticyclonic type atmospheric circulation. The country came under the influence of deep anticyclones covering Western and Central Europe with centres over Scandinavia and the Baltic Sea, which gradually moved southward (Fig.4).

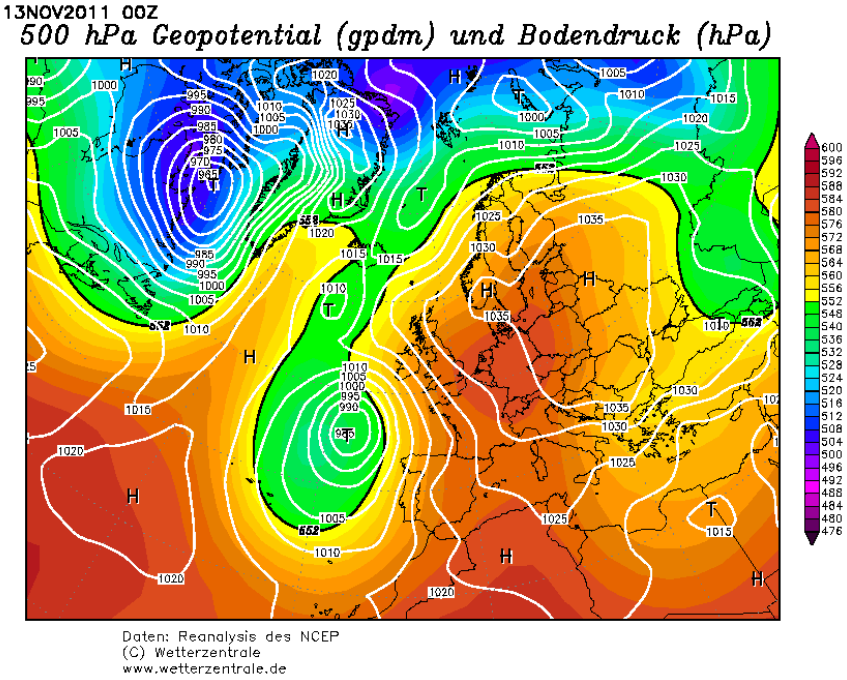

Fig.4: Atmospheric pressure map at 500 hPa and ground level – 13.11.2010 [4]

In the periphery of these large blocking anticyclones atmospheric transport over Bulgaria is oriented from the north-northeast, by which cold advection takes place (Fig.5). The cold air is subjected to additional radiation cooling at night. Long lasting fogs and low layered clouds are formed in lowlands and valleys. The weather is dry, virtually with no precipitation (monthly amounts from 0 to 6 mm).

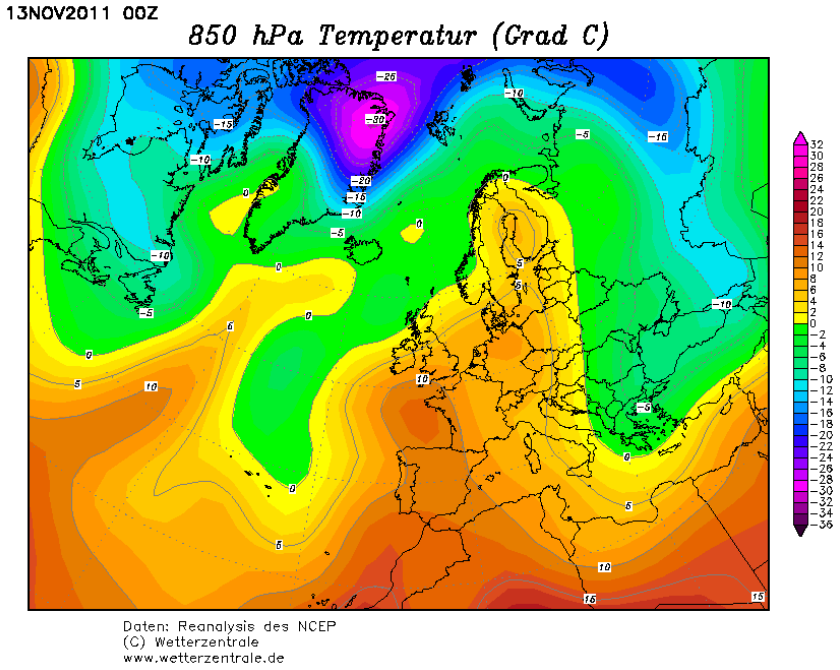

Fig. 5: Map of temperature at 850 hPa level – 13.11.2011 [4]

5. COMMENTS

As is shown by [1] in Bulgaria for 80 years period (1887-1966) has been observed only one case of excess of the average monthly temperature in November with 5 to 6^0C above the norm. For the same period, were registered a total 12 cases of average monthly temperatures with 2 to 4^0C lower the norm. Obviously, such the warm weather in November 2010 is extremely rare and almost unique phenomenon, furthermore the fault lasts over than a month. November 2011, though cooler than normal, was not extremely cold. The huge amplitude of average monthly temperatures in November for two consecutive years has no analogue in the annals of meteorological observations in Bulgaria.

6. CONCLUSIONS

Concerned example proves that no consequent change in the total radiation conditions, but the specifics of the atmospheric circulation is decisive for the observed anomalies in the field of temperatures in late autumn.

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ГЕОЭКОЛОГИЧЕСКИЙ АНАЛИЗ ГЕОЭКОСИСТЕМ ВОЛГОГРАДСКОГО ПОВОЛЖЬЯ НА ОСНОВЕ ЭКОЛОГО-ГЕОГРАФИЧЕСКОГО РАЙОНИРОВАНИЯ

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Аннотация: *Обосновано геоэкологическое районирование как методического подхода к геоэкологическому анализу геоэкосистем Волгоградского Поволжья, представленного в качестве одного из эффективных экологически ориентированных приемов оптимизации природопользования и устойчивого развития региона.*

Ключевые слова: *геоэкологический анализ, геоэкологическое районирование, геоэкосистемы, оптимизация природопользования.*

1. ВВЕДЕНИЕ.

Волгоградское Поволжье в данном исследовании рассматривается как один из наиболее освоенных в хозяйственном отношении регионов юго-востока Европейской России, в административном отношении включающего 33 муниципальных района. На площади в 112,9 тыс. км2 здесь проживает свыше 2,6 млн. чел. Природно-территориальные комплексы и ландшафты региона в условиях воздействия негативных природных и техногенных факторов динамично снижают свой экологический потенциал и преобразованы в природно-техногенные комплексы [1]. В связи с этим, научно оправдано применение метода геоэкологического (эколого-географического) районирования Волгоградского региона как одного из наиболее эффективных экологически ориентированных приемов охраны природы и оптимизации природопользования, способствующему сохранению и поддержанию необходимых условий для восстановления природно-ресурсного потенциала нарушенных ландшафтов.

2. АКТУАЛЬНОСТЬ ТЕМЫ.

Как универсальный механизм организации рационального природопользования и устойчивого развития Волгоградского региона геоэкологический подход трактуется нами как общегеографический, объектом исследования которого выступают геоэкосистемы, а предмет исследования заключен в геоэкологическом анализе их современного состояния. В настоящее время формируются более четкие представления о выделении в геоэкологическом окружении наряду с геоэкосистемой новой формы организации её вещества и энергии - территориальных природно-хозяйственных систем (ТПХС) – это исторически сложившиеся и специально созданные территориально устойчивые совокупности взаимосвязанных модифицированных природных и хозяйственных комплексов, характеризующиеся пространственно-временной организованностью и способностью функционировать как единое целое, выполняющее определенные хозяйственные и геоэкологические функции. Исходя из этого, с точки зрения ландшафтной и геоэкологической интерпретаций идей формирования ТПХС сфера возможного применения эколого-географического районирования в современных условиях Волгоградского Поволжья достаточно актуальна и является *целью* проведенных нами исследований.

3. МЕТОДЫ ИССЛЕДОВАНИЯ.

Наиболее приоритетным является осуществление метода эколого-географического районирования (делимитации) региона, в процессе которого нами проводился геоэкологический анализ инвентаризации разнообразных свойств изучаемой территории по различным её признакам - природному, техногенному, социальному, вертикально- и горизонтально- пространственному и др. При этом формировалась своеобразная модель региона, синтез которой вычленяет её системное (эмерджентное) качество и оценивает её влияние на антропо-биоценотическую подсистему территориальных выделов (районов) с использованием эколого-географического геосистемного, картографического и геоинформационного методов.

4. РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ И ОБСУЖДЕНИЕ.

Установлено, что территория Волгоградского Поволжья представляет собой единство природных и социо-хозяйственных территориальных систем. Природный блок геоэкосистем представлен биоклиматическиими

зональными и геоморфоструктурными азональными геосистемами и переходной геодинамической зоной.

Так, в биоклиматическом отношении почти всю Волгоградская область занимает степная зона. Правобережье региона южнее г. Волгограда и Волгоградское Заволжье относятся к полупустыне. А вот Волго-Ахтубинская пойма представляет интразональные луговые и лесолуговые аллювиальные геосистемы, рассекающие полупустынные и пустынные пространства Прикаспийской низменности [1].

В тоже время, в геоморфологическом аспекте геоморфоструктуры территории подразделяются на структуры крупного ранга: Волго-Уральскую и Воронежскую антеклизы, Хопёрскую и Приволжскую моноклинали, Прикаспийскую синеклизу, Скифскую плиту, которые в современном рельефе выражаются в разнообразных крупных эрозионно-денудационных и аккумулятивных формах - Приволжской, Калачской и Ергенинской возвышенностях, Волжских террасах, Общем Сырте, низком Сыртовом Заволжье, юго-восточной части Окско-Донской и Прикаспийской низменностях [2].

Исследования показали, что зональные (гидроклиматические) и азональные (геоморфоструктурные) особенности бассейнов Нижней Волги и Среднего Дона взаимно сопрягаясь создают конкретные геоэкологические районы, в пределах которых осуществляется интенсивная хозяйственная деятельность и сформировалась особая система расселения (урбанизированные районы).

В ходе работы над проблемой районирования Волгоградской области нами отмечено своеобразие переходной геодинамической зоны на стыке Волго-Уральской антеклизы и Прикаспийской синеклизы, линейно-ориентированной с северо-востока на юго-запад. Своеобразие зоны заключается в повышенной трещиноватости и водопроницаемости горных пород и грунтов, наличии разломов и локальных структур новейших движений [5], активности гидродинамических, эндогенных и экзогенных процессов (эрозионно-денудационных), не позволяющих почвам накапливать растительный перегной, в наличии геохимических аномалий, месторождений углеводородного сырья, строительных материалов. Показано, что специфические черты переходной геодинамической зоны заключаются в лесистости, флористическом разнообразии дубовых и мелколиственных лесов: нагорных, байрачных, долинных, аренных. Ландшафты этой зоны сочетают в себе реликтовые, современные и нарождающиеся элементы. Флористические эндемики: Салтовский лес в сухой заволжской степи, водно-болотный массив Волго-Ахтубинской поймы лишь малая часть реликтовых эндемиков региона. Усиленное антропогенное вмешательство вызывает мигрирующие геохимические аномалии, ведущие к накоплению загрязняющих веществ в ландшафтах террас малых долин, нижних частей склонов, устьев балок и оврагов,

водохранилищ. Отсюда овражно-балочные и долинные ландшафтные комплексы, выполняющие экологическую роль выноса и транзита загрязняющих веществ в устьевой части и на террасах - это очаги накопления опасных продуктов техногенеза [4].

В социо-хозяйственном отношении на исследуемой территории можно выделить следующие социально-экономические подрайоны: Волгоградско-Волжский, Камышинско-Иловлинский, Жирновско-Котовский, Михайловский промышленные узлы, для которых характерны типичные особенности: связь между переходной геодинамической зоной и Волгоградской агломерацией, систем хозяйства (ГЭС, плотин, водохранилищ, ТЭЦ, нефегазопромыслов, нефте-, газопроводов) и систем расселения (городские и сельские поселения), а также высокая степень техногенной нагрузки на естественные ландшафты.

5. ВЫВОДЫ.

В процессе геоэкологического районирования территория Волгоградского Поволжья рассматривалась как сложная природная геосистема, включающая геоморфоструктуры, почвенно-растительный покров, поверхностные и подземные воды и приземныйй слой атмосферы. Для всех элементов природной системы составлялись картографические модели. Там, где это было возможно отображались пространственные связи-отношения компонентов через воздушные и водные каналы (потоки) миграции вещества, энергии и информации. Наиболее четко картировались "целостные" природные геосистемы: лесостепные, степные, полупустынные, пустынные и долинные комплексы в пределах Волго-Уральской и Воронежской антеклиз, Хоперской и Приволжской моноклиналь, Прикаспийской синеклизы, Скифской плиты, переходной геодинамической зоны. Эти целостные структуры и явились морфологическим каркасом при создании карт природного блока и выделении природных границ геоэкологических районов. Менее содержательно картировались социально-экономические системы хозяйства и расселения из-за их специфических границ.

Анализ карт природного и техногенного блоков позволил выделить в регионе наиболее крупные природно-хозяйственные или геоэкологические районы: Волгоградско-Волжский, Доно-Медведицкий, Хопёрско-Бузулукский, Камышинско-Иловлинский, Заволжско-Прикаспийский. Так, например, Волгоградско-Волжский район экологически более напряженный, с максимальной техногенной нагрузкой и глубокой трансформацией природных геосистем. Район геодинамически неустойчив, обладает высоким природно-ресурсным потенциалом, близким к исчерпанию углеводородного сырья, водных, почвенных и растительных ресурсов. Для социальной подсистемы характерны

депопуляционные характеристики как в биогеоценотическом комплексе, так и среди населения в силу острой экологической ситуации. Заволжско - Прикаспийский геоэкологический район техногенно не напряженный и экологически неустойчив. Обладает низким биологическим потенциалом и очагами острых геоэкологических ситуаций на степных и полупустынных ландшафтах Волгоградского Заволжья, неблагоприятен для ведения интенсивной хозяйственной деятельности [4].

6. РЕЗЮМЕ.

Работая над проблемой геоэкологической делимитации территории Волгоградского Поволжья в каждом геоэкологическом районе нами были определены специфические особенности почвенно-растительного покрова в пределах геоморфоструктур с характерными геодинамическими и гидроклиматическими условиями, своим уровнем природно-ресурсного потенциала, своей системой производственно-хозяйственных комплексов, антропо-биоценотических подсистем и социально-демографических характеристик, своей степенью техногенной нагрузки и глубиной антропогенной трансформации геосистем. К тому же, геоэкологическое районирование может выступать в качестве механизма формирования политики рационального природопользования и устойчивого развития региона.

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ГЕОЭКОЛОГИЧЕСКИЕ ПОСЛЕДСТВИЯ НЕФТЕГАЗОДОБЫЧИ В ПРЕДЕЛАХ ВОЛГОГРАДСКОЙ ОБЛАСТИ

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Аннотация: *Исследованы геоэкологические последствия добычи нефти и газа на территории Волгоградского Поволжья для компонентов естественных ландшафтов с целью выявления масштабов их техногенной трансформации и геоэкологических проблем.*

Ключевые слова: *Нефтегазодобыча, геоэкологические последствия,* ландшафты, нефтегазопромыслы, техногенная трансформация.

1. ВВЕДЕНИЕ.

Волгоградская область относится к старым нефтегазодобывающим районам со сравнительно высоким освоением нефтяных ресурсов. На начало 2013 г. по области выявлено 108 месторождений углеводородного сырья, из них 89 находятся непосредственно в разведке и разработке. Большая часть месторождений нефти и газа в географическом отношении приурочена к степному правобережью области, где нефтегазодобыча размещена, в основном, в Жирновском, Котовском и Фроловском муниципальных районах.

2. ПОСТАНОВКА ПРОБЛЕМЫ.

Нефтегазодобывающая промышленность одна из наиболее экологически опасных отраслей экономики региона. Она отличается большой землеёмкостью, сильной загрязняющей способностью, высокой пожароопасностью промышленных объектов и может наносить значительный ущерб ландшафтам. В пределах нефтегазопромыслов естественные ландшафты трансформируются в природно-техногенные комплексы, где обнаруживаются глубокие, часто необратимые изменения. Изложенные выше соображения послужили мотивом наших исследований, целью которых являлось выявление геоэкологических последствий нефтегазодобычи для ландшафтов региона.

3. МЕТОДЫ ИССЛЕДОВАНИЯ.

В ходе исследований использовались такие научные методы как: анализ научной литературы, фондовых и картографических материалов, обобщение исходных материалов полевых исследований, эколого-географический, картографический, статистический анализ с применением стандартного пакета Microsoft Excel [3], графическое моделирование, обработка полученной информации на основе ГИС-методов.

4. РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЯ И ОБСУЖДЕНИЕ.

Исследования показали, что практически все стадии нефтегазодобычи сопровождаются целым комплексом видов воздействий на компоненты ландшафтов нефтегазопромыслов в виде изъятия флюидов из недр, нарушения целостности пластов и падения давления в них, поступления в недра химических веществ, их попадания в воздух, почвы и воды, интенсивного водозабора, образования нефтешламов и т.д.

Установлено, что на территории староосвоенных нефтегазопромыслов - Арчединском, Коробковском, Жирновском, где наиболее плотная сеть скважин, экологическая обстановка отличается напряженностью. Здесь техногенным преобразованиям подвержены рельеф, почвы, поверхностные и подземные воды степных ландшафтов. Так, при перевозке буровых установок и технологического оборудования образуются рытвины, переуплотняются и загрязняются почвы, в реки поступают загрязняющие вещества (ЗВ). Потенциальную экологическую опасность несут дюкеры через р. Медведицу, Иловлю, Добринку др. [1].

Наблюдения показали, что особенно страдают ландшафты при аварийных ситуациях. К примеру, на Жирновском месторождении в 2005 г., когда от стоков нефтяных вод в пойме р. Медведицы на площади 35 га погибли деревья и водная растительность оз. Сонное.

Источниками техногенных изменений рельефа служат компрессорные и перекачивающие станции, установки предварительной подготовки нефти и газа, нефтяные качалки, автодороги, водоводы [2]. Техноморфогенез выражается в расчленении и выравнивании поверхности, срезке грунтов, выполаживании склонов, создании искусственных земляных валов. Нивелировка территории приводит к подъему грунтовых вод, набуханию глинистых грунтов, просадочности в лёссовых породах, возникают плывуны, оползни. Оползнепроявления встречаются по восточным склонам Александровского кряжа в пределах Жирновского нефтегазового месторождения (толщи песка нижнего мела и глин верхней юры) и склонам северо-восточной экспозиции Доно-Медведицкой гряды грунтовыми водами в местах выхода толщ юрских глин. Оползни мелкие - смещение делювия с глубиной захвата 1-3 м.

Поступление загрязняющих веществ в почвы и их загрязнение происходит непосредственно в пределах нефтегазопромыслов через атмосферный перенос путем сухого и мокрого осаждения загрязняющих веществ на подстилающую поверхность и наземным переносом - путем поверхностного смыва дождевыми и талыми водами. В почвах нефтегазоносных территорий фактические концентрации большинства загрязняющих веществ превышают ПДК в среднем в 1-3 раза, а иногда в 5-6 раз и более. В пробах почв и грунта определена максимальная концентрация тяжелых металлов V, Ni, Cr, Mg и др. (II класс опасности). Кроме того, на отчуждаемых участках происходит полное или частичное уничтожение растительного покрова вследствие снятия плодородного слоя почвы, механического воздействия и повышенного содержания нефтепродуктов в почвах. В растительном покрове нефтегазопромысловых ландшафтов преобладают сорняки (латук татарский, вьюнок полевой, цикорий обыкновенный), но встречаются и истинные степные виды (ковыль красивейший, овсянница волжская, донник белый и др.). В радиусе 1-1,5 км от устьев скважин растительность сильно синантропизирована [4].

Загрязненные почвы на участках Памятно-Сасовского, Коробковского, Арчединского месторождений претерпели существенные изменения морфологических признаков: изменение цвета почвы (более темный) по сравнению с незагрязненными аналогами, наличие радужных и масляных плёнок по граням

структурных отдельностей. В верхней части профиля почвы имеют темно-бурый, коричнево-бурый цвет, а в нижней - буро-охристый.

Нефтяное загрязнение вносит наибольший вклад в деградацию подземных вод. Основными причинами загрязнения являются плохая гидроизоляция шламовых амбаров, фильтрация нефти и минерализованных вод из земляных амбаров и отстойников. Наиболее подвержены загрязнению грунтовые и неглубоко залегающие межпластовые воды. Высокие концентрации нефти в подземных водах соответствуют микрограммовым значениям, что для естественных условий они резко аномальны. Исследовано, что неблагоприятное геоэкологическое состояние первых от поверхности водоносных комплексов наблюдается в долинах рек, условно благоприятное - на водоразделах в пределах Памятно-Сасовского нефтяного месторождения.

Многочисленные реки и ручьи, находящиеся в зоне влияния нефтегазовых месторождений, подвержены высокому риску загрязнения нефтью и нефтепродуктами. Полициклические углеводороды, находящиеся в сырой нефти, являются канцерогенами, губительно воздействующими на гидробионты речных геосистем, особенно бассейна р. Медведицы. Как известно, на рыб и других обитателей водоемов нефть оказывает механическое воздействие, препятствующее движению, питанию, дыханию. В связи с этим, отдельные притоки реки Медведицы (Шапочная, Тетеревятка, Бурлук) полностью или частично утратили свое рыбохозяйственное значение. Исследовано, что качество воды р. Медведицы за период нефтегазодобычи ухудшилось по содержанию нефти, нитритов, сульфатов, фенолам и др. [1].

Качество воздушного бассейна нефтегазопромыслов зависит от воздействия автотранспорта, тяжелой спецтехники и прямого поступления от них загрязняющих веществ. В структуре выбросов загрязняющих веществ доминируют окись углерода, углеводороды, окислы азота, сернистый ангидрид, фенол, формальдегид и др. От качества воздуха как канала миграции загрязняющих веществ в другие природные среды зависят показатели состояния почв, поверхностных и подземных вод.

5. ЗАКЛЮЧЕНИЕ.

Таким образом, широкомасштабная разработка месторождений нефти и газа привела к разнообразным нарушением компонентов естественных ландшафтов Волгоградского правобережья и обусловила формирование природно-техногенных комплексов, изменивших природно-ландшафтную структуру нефтегазоносных

территорий. Нефтегазодобыча спровоцировала возникновение комплексной геоэкологической проблемы, связанной с техногенной трансформацией целостности и устойчивости ландшафтов. В тоже время, эксплуатация нефтяных и газовых месторождений в регионе не приводит к масштабным влияниям, т.к. техногенные преобразования ландшафтов носят, в основном, локальный характер.

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3D Modelling with Open Source or Commercial Software

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Abstract: *This paper considers the computer 3D modeling as one of the most powerful tools for design, for understanding and analysing of objects and phenomena in the real world. The definition of 3D model is similar to that of 2D. However, the 2D modeling systems can't manage the 3D data for modeling of the reality; therefore special 3D applications are required. The qualities which are required for software in order to present realistic model of objects are discussed. The advantages and disadvantages of Open Source and commercial software for 3D modeling of urban objects are indicated from a consumer point of view. The authors present their opinion for choosing appropriate software for 3D interior and exterior modeling.*

Keywords: *3D modeling, Open Source, commercial software.*

1. INTRODUCTION

The traditional maps represent reality using the orthogonal projection of the earth. Despite the high accuracy, traditional drawings and maps quite limit the notion of objects in 3D space.

The models, created using computer technology provide accurate reflection of the real world and previously unimaginable possibilities for modelling and analysis. Only 15 years ago, CAD and GIS systems were two-dimensional, but the improvement of computers provokes the so-called three-dimensional solutions. The advantage of computer technology is that reality can be represented directly in 3D digital model through a process called 3D modelling.

The first 3D successful developments appeared as early as the 2000 are GIS systems - Virtual GIS of ERDAS, 3D Analyst of ESRI, Vertical Mapper of MapInfo, Autodesk Map 3D of Autodesk, systems SICAD, Intergraph and others. CAD products contributed for good solutions in 3D modelling, too. For instance, the most wide-spread CAD system for two-dimensional drawings and three-dimensional modelling and visualization with possibility to connection with databases is the system AutoCAD.

Parallel with these products develop and come into the market Open Source software. Suitable examples are Blender, Art of Illusion, 3ds Max, Modern Globe 3d model, K-3D, Moonlight/3D and more.

So, the question is: what type of software must be chosen and what possibilities must possess for 3D modelling? To find the correct answer we should be familiar with the concept of three-dimensional models.

3D models are computer products that represent three-dimensional objects, three-dimensional surfaces (statistical, relief, etc.) and three-dimensional images [1]. Data objects are different from those of the surface in the manner of their presentation. The first is represented by discontinuous data, while the second represents continuous phenomena. Usually, the objects have shape (geometry) and attributes. The attributes in 3D space present values relating to heights of objects or altitude. Regardless of these differences some important properties which must have a 3D model can be defined and hence the potential that must have the software for 3D modelling.

First, the development of modern CAD and GIS systems towards more efficient use of the possibilities for 3D modelling requires the introduction of new tools for visualization, modelling techniques and opportunities for organization of objects. The complex spatial objects are created by combining primitive objects or by subtracting each other or creating 3D spatial objects from closed 2D objects [5]. This requires a variety of tools to obtain complex shapes from a few simple figures, based on commands for union, subtraction and intersection.

Besides the most popular command to create 3D objects based on 2D shapes, the software must be able to change some properties of 3D models, for instance, vertical exaggeration, animation, colour background, lighting objects and materials. To add detail and textures to the model, the program must have a library of materials (brick, concrete, wood, glass, etc.) and colours that can be used to get a realistic view of three-dimensional objects.

3D modelling of reality is independent of the viewpoint. However, the realistic representation of reality requires its examination from many different perspectives. Like surfaces, three-dimensional objects can be visualized in a perspective view. To be able to get realistic and effective images except the examining of the objects from different views, the lighting should be well selected. This is critical for good visualization.

3D visualization is widely used in various research areas - the design of buildings and facilities, 3D urban mapping, 3D cadastre, geology, hydrology, civil engineering, environmental engineering, landscape architecture, archeology, meteorology, minerals and many others.

The contribution of 3D modelling to effective implementation of tasks in all areas of application is indisputable. In the practice, there are many examples of successful projects realized in various areas. That demonstrates the high effectiveness of modern technologies for three-dimensional modelling. Certainly, with time every project of building, infrastructure object or environmental monitoring will be carried out with 3D technology [3].

2. OPEN SOURCE AND FREE SOFTWARE OR CLOSED SOURCE – ADVANTAGES AND DISADVANTAGES.

The software market offers popular, paid as well as free software. The topic of the advantages and disadvantages of commercial products or their free alternatives is often discussed at various forums, especially on the web. Both have their ardent supporters and opponents.

The term "free software" is used for computer programs, that user can use free and open source code is freely distributed and can be changed. There are fully free programs without capabilities for editing but they often have flaws. It is considered that the term "open source" is synonymous with free software. The two concepts are rather complementary and in this sense they are different [4].

Free software has been used since long time by private users as well as by many public companies. The use of free systems is driven by saving substantial funds to purchase software. The adherents of free software save money for upgrades and updates, subscription support and counselling, independence of consumer by a particular supplier, too. All benefits mentioned could lead to substantial economic effect. Many people share these ideas mainly the free software developers.

The use of free software prevents from the dangers of software piracy. This is the second-leading reason for choosing the free products instead of commercials. It is considered that the paid programs that don't have free analogues are getting less. This, of course is a pleasing fact, if only quality products are offered. However it is known that the free software could be written by anyone and there aren't established requirements for the quality. This fact is a serious disadvantage especially when it concerns the usage of the software in the business

In Internet can be found free open source software for various purposes - operational systems, games, programming and database, download files, internet software, antivirus software, office software, web design and more. Some are well known and have found their place among consumers, for instance operating system Linux.

The term "open source" is closely related to the programming. In this sense, Open Source software is developed exclusively by computer specialists and in rare cases by a small number of curious users and keen on programming amateurs. However, not all users are professionals who can use the programmer code. There are many commercial programs that are easier to work with and with more opportunities than their respective free counterparts.

Patrick McKenzie [2], a software designer, published an article where he describes the advantages of commercial approach in comparison with Open Source decisions. Most arguments that he stated and are worth to think about are made from a programmer´s point of view. The most important of these arguments is that the commercial products are designed for a specific subject area and fulfil all customer requirements. Another factor is the convenience to

work with it. This includes simple and fast procedure for installing and starting the software and appropriate design of the graphical interface of menus and tools.

The most serious disadvantage of commercial products is their extremely high prices. New versions of software appear very often. Purchase of advanced versions is not always justified and useful. In such cases the companies are forced to retrain their personnel and this cost time and money. Older versions that can do everything are more efficient and profitably. Another disadvantage of the commercial product is its linkage with a specific provider.

So, the biggest difficulty for the user is to determine whether closed software is good or not. Some defects can be detected only at work.

The above considerations are no exception for the 3D-modeling programs. What software should we choose? What is a successful business model - the open and free software or commercial software?

3. COMPARATIVE ANALYSIS OF OPEN SOURCE AND COMMERCIAL PRODUCTS

3.1. 3D modelling with open source – advantages and disadvantages

Of course, the open source software is used in cartography and geographic information systems.

This article is inspired by the participation of authors in a course on "3D Urban Visualization - Open Web Technologies that took place in the laboratory of Cartography in The University of Architecture, Civil Engineering and Geodesy. Lecturers were from Technical University Delft, Netherlands and the University of Heidelberg, Germany. It should be noted that they are engineer surveyors but dedicated to the 3D open-source programming.

The course included three-dimensional modelling of urban environment using open-source software. The emphasis is on the process of modelling and the final result is the visualization of the interior and exterior of a building.

In this process were used several 3D open-source software. One of them is the popular OpenStreetMap, which can be used directly from the web http://www.openstreetmap.org/ or installed as a desktop application JOSM (Java OpenStreetMap). Also are used PostgreSQL - Relational Database Open Source, PostGIS - GIS open source software that supports information about geographic objects and LandXplorer CityGML Viewer - for obtaining a three-dimensional model and visualization.

The next mentioned software products were used for creating the 3D model of the exterior and the interior of a building:

- Creating of a 2D model by digitizing the building; addition of attributes and creating of a relationship between objects in JOSM;
- Introduction of a 2D building model in a relational database PostGIS;
- Creating of a 3D model from 2D building model and visualization with LandXplorer CityGML Viewer.

In our opinion, the whole process of 3D modelling and visualization using Open Web Technologies is a bit difficult. These technologies require knowledge not only on JOSM. Some drawbacks were found in all steps of modelling: data entry, data modelling, data management, data analysis and visualization.

First, the quality of the data is lower even in transformation of the scanned image of the building. Several difficulties were also encountered by exchanging the files with other software products.

When analyzing the data in the database using SQL operators that have complex syntax. We believe that this syntax is difficult for the users who are not familiar with the programming language. The commands are quite complex to accomplish more difficult analysis. It would be much easier if there was a relationship between the tables.

The modelling of separate parts of the building, such as doors, windows, stairways, balconies and roof with their size is also difficult. Finally, to get a realistic and impressive images should be selected a better lighting, appropriate materials making up the building and its components. All these steps of finalization of the modelling and visualization in LandXplorer CityGML Viewer are not comparable to the results that have some popular CAD and GIS commercial products.

In conclusion, this technology is difficult to apply for complex structures.

3.2. 3D modelling with commercial products - advantages and disadvantages

With no doubt, the most important advantage of 3D open-source products is that they are completely free, but they are not so easy to use by any non-specialist user, as is often claimed.

We are not adherents of the closed source, at least because some good products are very costly. Nevertheless, the software that solves real business problems is not usually open-source. So, here is the place to mention the possibility of commercial products in 3D modelling.

The advantages and disadvantages mentioned hereafter are derived only from the point of view of nonprofessional users at programming and based on our modest experience in 3D modelling.

The ordinary user must save time at the cost of the quantity of the production. He has neither time nor patience to perform complex operations

with open-source products and even less interest to waste time to learn a programming language.

The biggest advantage of these products is their functionality. Products with closed security code are easy to use, although a lot of applications still require initial acquisition of knowledge through courses. Modelling of objects and surfaces in the commercial products are brought to the knowledge of different commands. The user doesn't need to know the syntax of operators in use. It is enough to remember which is the exactly button for a definite command.

Sometimes are offered more than one solution to build 3D models. User can use those commands which are easier to implement. The strength of these products is the mentioned disadvantage of the Open source products - the realistic visualization of objects. To get this effect, the software allows us to choose the lighting and materials. Good lighting and correct materials are critical for good visualization. These products have a library of materials and give us opportunities to make individual libraries. The material can be applied not only to the whole object but to its individual elements as well. Thus, an object can have multiple materials. Adding material is a simple operation. Just by "catching" the material with the mouse and pull at particular item or to all objects in one layer.

The lighting of the model and the environment requires only knowledge of the basic principles of "inclusion" of light. It depends on us which elements will be illuminated. That defines what shadows will fall and where it will fall.

It should be noted that commercial products also enable users to be more flexible in their work, to enrich the functionality of the benefits of their product. From Internet can be used many open source libraries and applications designed to add to a particular paid software. In most cases, can be found free ready-made programs (Lisp, Script), that solve different problems. For users who can program is embedded software programming languages in the paid software. For instance, in ArcGIS can be programmed with Visual Basic or Python.

Of course, the best software has weaknesses, too. For commercial products are more than clear - still high price. On the one hand, copyright is a global agreement to protect investments made in creative solutions, and it must be respected. On the other hand, there is a clear public interest for more widespread innovation than the desire to pay sometimes for these products to unscrupulous monopolies.

It should be added that new versions are popping up. The time required to adapt to a new version of the program cost moneys.

Eventually, all the conclusions until now lead in one direction - what possibilities offer the products in order to do specific tasks. The authors have modest knowledge in 3D modelling and the comparisons presented are based on ArcGIS and AutoCAD software.

Table 1: Differences between 3D buildings created with open source CityGML software and CAD or GIS software

Features	CAD or GIS software	City GML software
Topology	+	+
Analysis	+	+
Semantics	+	+
Lighting& shadows	+	-
Visualization	++	+
Details	++	+
Texture	++	+
Material	+	-
Interior	+	-

The sign "+" means that the property is available, and "+ +", the software provides better opportunities for the presentation. The problems with visualization, textures and building elements (doors, windows, roof, etc.) with CityGML software can be seen from the attached figures.

The comparative table shows that CAD and GIS products offer more facilities for users while to achieve such quality open source products need a lot of work for "volunteers."

4. CONCLUSION

In this article we present our point of view for choosing commercial or free software for 3D interior modelling. As it was mention above, several factors can interact to determine this choice. For users, the determinant factors are time and resources. It is clear, as users, we all refer to free and open source software because of its price, but there are also other factors. Ordinary user without any knowledge of programming will choose such software that offer simplicity and that is easier of work. So, from our point of view, easy manipulation of the software and its high performance are determinant. This conclusion is also applicable to the 3D modelling products. The authors can not make such affirmations about open source products for other purposes. However, if these products offer quality and easy manipulation, than it is almost always more profitable to prefer free software. If we don’t have a real choice, it is preferable to choose the commercial software.

Fig.1 Visualization of two buildings made with: 1) the commercial software Autocad by Ivan Tsukev and 2) the free version of SketchUp by a student

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Territorial Changes of the Degree of Hydrochemical Contamination Along Ruse Lom River

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Abstract: *This report examines and analyzes the conditions and factors for the observed spatial changes in the index values of the degree of contamination on the set of hydrochemical parameters (oxygen group, dissolved and suspended solids, nutrient components) along the river Ruse Lom. It's used statistical information on 6 main points of monitoring along mostly for 1989g.-2010. The results are presented graphically and identify the most serious pollutants in the river basin – nitrates, nitrites, suspended solids and somewhat phosphates whose volumes increase along the river and reach impressive values to her mouth. The most severely contaminated areas (points) in the river basin are Popovska river below (after) Popovo, Razgrad – Pisanets along the Beli Lom as well as the region of Western Industrial Zone Ruse in the mouth.*

Keywords: *hydrochemical stations, indexes for degree of pollution, hydrochemical indicators, territorial variation, Ruse Lom river, Beli Lom river, Cherni Lom river, Popovska river, self-purification capacity/capability of the river current*

1. INTRODUCTION

The basin of Rusenski Lom River is located in the eastern part of the Danube River region (with center Pleven). It covers a large part of the territory of Ruse region, southwest of Razgrad district, northwestern part of Targovishte province and small parts of the regions of Veliko Turnovo and Shumen. Regional policy in monitoring and evaluating the quality of natural compounds and complexes (including surface water and groundwater) of close to 90% of the territory of the basin is the responsibility of the RIEW-Ruse, while the remaining 10% (i.e. the munisipalities of Popovo, Polski Trambesh, and Gorna Oryahovitsa) – the RIEW – Shumen and RIEW-Veliko Tarnovo. That part of the basin, which falls under the jurisdiction of the RIEW – Ruse, relate to the following areas: 83 region – the municipality of Ruse; 85 region (Razgrad) – the municipalities of Razgrad, Loznitsa, Samuil, Tsar Kaloyan, Vetovo; 86 region (Borovo) – the municipalities of Borovo, Byala, Dve Mogili, Ivanovo.

Main tasks of monitoring the waters are: preserving the natural conditions and parameters of the various ponds as an integral part of the geographical landscape; restoration of fragile ecological balance on the basis of connections and relations of water and akvalnite landscapes with other natural compounds and complexes; optimization of relationships "aquatic ecosystems – the life and business of the population" of the subordinate territory. Main directions of water monitoring are associated with research on the distortions in the system (dynamics) of river runoff and groundwater in temporal and territorial aspect and the quality of the water with a corresponding theoretical and practical importance.

Previous studies, devoted to the questions of the past and current status of surface water and groundwater in the basin of Rusenski Lom river are limited mainly to generalized empirical information, partially and briefly analysed in the observed indicators and posts from the NASEM (hydroecologic monitoring). More attention in this regard deserve the work of Saeva (1961) and Varbanov (2004), as well as the management plans of the Rusenski Lom river subbasin of Basin Directorate's "Danube region". While providing a large amount of content and information on the status of surface waters, most sources and developments, are deprived of an in-depth analysis of the trend of inner-annual and changes of hydrochemical pollution indicators and on individual posts, as well as in territorial laws amendment (along the rivers and in certain profiles). This further increases the need for another type of investigation and analysis on this issue, established on the disclosure of causation in the relationship between the waters and other natural components and economic activity on the territory of the river basin.

2. DATABASE AND RESEARCH METHODS

To establish the extent of the contamination is a relative indicator, which is given by the formula:

(1) $C_i = S_i / \text{LPC}_i.n$

where C*i* -- index of contamination;

S*i* – concentration of the pollutant;

LPC*i* – limit permissible concentration of the pollutant i for the second category (such as the design category recipient for all rivers of the basin with the exception of the Malki Lom and Cherni Lom rivers from the source to the first location) – see the table below

n – the length of the investigation period.

Establishing a pollution index of the indicator dissolved oxygen needs a reciprocal of that formula, thus pollution indices become comparable with other indices (Varbanov, Zlatunova, 1989). The advantage of relative performance to the categorisation of the rivers is that they are

dimensionless quantities, which gives great opportunities for comparisons and regional summaries. The disadvantage is the fact that only a certain type of revealing contamination (on an index or several indicators) against targets for a certain hydrochemical point (a stretch of the river course in its range), which prevents the construction of reliable aggregate picture of the nature and intensity of the overall pollution.

The self-purification capacity of the river current is defined by the formula:

(2) $SS = BCO_{5a} – BCO_{5b}/ BCO_{5a}. 100\%$,

where SS is self-purification capacity of the river current , %;

BCO_{5a} and BCO_{5b} are the values of the indicator in the two end points of the research division

Persistence of pollutants in river water is characterized by Cc (conservativity coefficient), which is calculated by the formula:

(3) $C_c = C_{ok}/ BCO_5$,

where C_{ok} is permanganate oxidation, mg/l

Tab. 1 Some indicators and standards for determining the permissible levels of contamination of the various categories flowing surface water used in the basin of Rusenski Lom river (pursuant to Decree No. 7)

Indicators	Unit of measure	Category		
		I	II	III
Group A. Common physical and non-organic chemical indicators				
Enrichment with oxygen	%	75	40	20
Dissolved oxygen ($C_{d.o.}$)	mg/l	6	4	2
Dissolved substances (solutes)	mg/l	700	1000	1500
Suspended solids	"	30	50	100
Nitrogen (ammonium) $N\text{-}NH_4$	"	0,1	2,0	5
Sodium nitrogen $N\text{-}NO_2$ (nitrites)	"	0,002	0,04	0,06
Nitrate nitrogen $N\text{-}NO_3$ (nitrates)	"	5	10	20
Phosphates PO_4	"	0,2	1,0	2
Group B. Common indicators for organic contaminating substances				
Oxidation (permanganate) O_k	"	10	30	40
BCO_5 (biochemical consumption of oxygen)	"	5	15	25

Processed are arrays of statistical data (received electronically from RIEW – Ruse) for the set of indicators for the points in the hydrochemical network (hydrochemical stations), for the period 1989-2010 years (with refinements made for missing data, irregular measurements and inhomogenesis in the statistical data rows of certain indicators proved by the analysis of their cumulative curves).

Also have been used and the general trends for the dynamics of indicators observed in recent years (after 2003-2005) due to reference annual reports by the Executive Agency of Environment , Basin Directorate's "Danube region" and RIEW – Ruse.

Positions of points of the monitoring network (6 main points from a total of 10 established, for which there is sufficient volume and grade of statistical coverage information) allows modification of the pollution indices of the different indicators to be examined, analyzed and evaluated in three main areas – Beli Lom river from the Beli Lom dam to the Smesite place (the merging of the two main tributary rivers in the basin), Cherni Lom river from the town of Popovo to the Smesite place as well as Ruse Lom river from the Smesite place to its mouth into the Danube, i.e. the lower current. The trend of pollution in these areas varies in volume, dynamics and structure depending on the varied impacts of natural and anthropogenic factors.

3. RESULTS

Along Cherni Lom River in recent years (after 2000) pollution reduction is observed on indicators phosphates PO_4 (from mostly third category in the second category, mainly), total indicator dissolved substances (organic and non-organic, with natural and anthropogenic origin), BCO_5 (mostly second category) and somewhat O_K. At the same time it's registered increasing of ammonium nitrogen $N\text{-}NH_4$ (but while retaining not high values, satisfying 2nd category, and in separate divisions, before river confluence of Baniski Lom River and after the point of Cherven to the place Smesite – even 1th category). $N\text{-}NO_3$ (nitrates) and to some extent $N\text{-}NO_2$ (nitrites) fall near the point of Cherven, but increase in other posts.Other indicators are retained with approximately unchanged values. After the town of Popovo, due to the considerable volume of highly polluted industrial and most household water entering Popovska river (which has a small average annual runoff), the absence of a water treatment plant, as well as due to the removal of more fresh water towards Irrigation system "Beli Lom" and the town of Razgrad, the oxygen pollution indicators' group ($C_{d.o}$, BCO_5, O_k), and nutrient components ($N\text{-}NH_4$, PO_4, $N\text{-}NO_2$) are increasing dramatically. At the point of Ostritsa, before the confluence of the most important tributary of Cherni Lom river – Baniski Lom, it's registered some improvement, for example, of mostly 3rd category after the town of Popovo, BCO_5 is already 2nd category during all months of the year. It can

be assumed that this improvement is due to the lack of significant sources of pollution along the river after the town of Popovo, the confluence of relatively cleaner tributary water and the processes of self-purification capacity of the river current (particularly in the area of the Krepcha Gorge).After the confluence of Baniski Lom river there is probably a slight deterioration in the status of this indicator (BCO_5), but more significant is the increase in nitrate pollution ($N\text{-}NO_3$). The improvement of BCO_5 at the point of Cherven is a fact due to the increased ability of self-purification capacity of the river current when grown volume of runoff (after acceptance of the main tributary) and increased speed of flow and turbulence of water vortexes in the region of the famous river curves nearby the villages of Pepelina, Tabachka and Cherven. As a proof – the lower average annual values of BCO_5 – 0.51 at Ostritsa against 0.36 at Cherven. At nitrates $N\text{-}NO_3$, the trend is the opposite – from 0.30 average per year after the town of Popovo to 0.58 at Ostritsa and 0.60 at Cherven. After Cherven towards the place Smesite. the category of the river in $N\text{-}NO_3$ is already the 3rd.Apparently the water pollution of Cherni Lom river with nitrate and nitrite nitrogen in the region of the Cherven Rock Canyon, largely, is due to the receipt of the waste water from agriculture and livestock farms in the area and to some extent of the waters of Baniski Lom river, which probably also have some contamination on these indicators. Its role in the increased content of nitrates in Cherni Lom river have underground waters from the alluvial sediments that have registered increased concentration – an average of 90-100 mg/l at 30-40% of the samples taken. Phosphates PO_4 pollution decreases significantly after the town of Popovo, where the average annual values of the index for this indicator reach 2.59. At the point of Ostritsa annual average values are twice smaller – 1.07 and cut 2 more times towards Cherven – 0.65, i.e. a total of 4 times reduction from the upper to the lower flow in length on this river.Similarly, the distribution of the values in the index of contamination in $N\text{-}NH_4$, whose genesis is connected mainly with some industries and public-fecal waters from the town of Popovo – there it shows high values, which quickly fell towards Cherven and after it. At the same time, it should not be missed the disturbing fact of growth in the values of $N\text{-}NH_4$ in recent years. In suspended solids pollution is significant and the waters of Cherni Lom river between Cherven and the place of Smesite are enduring a 3rd category. There has been a slight decrease in this indicator over the past years near the town of Popovo. The contents of the solutes do not change substantially along the length of the river (slight increase from Popovska river – 0.490 towards Ostritsa – 0.561; subsequent slight decrease towards Cherven – 0.540 and probably slight increase after Cherven towards the place of Smesite). The same is true for Ok – retainment of the values along the river just before the confluence

Baniski Lom river to the place of Smesite – 0.28 at Ostritsa and 0.25 at Cherven.

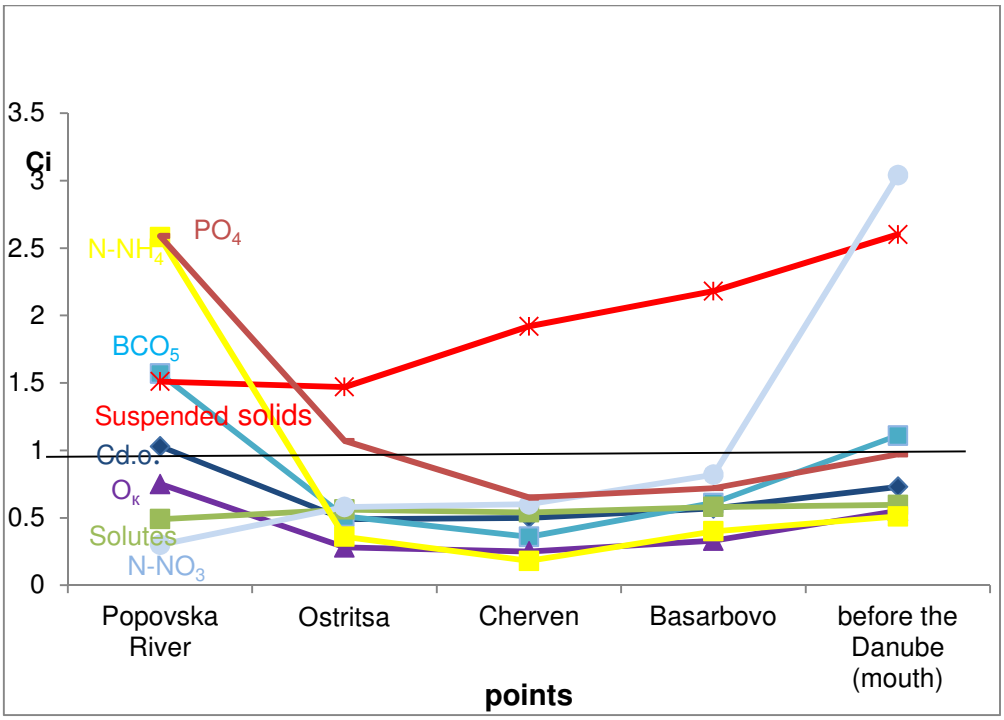

Fig. 1: Variation of river water pollution on individual indicators in the profile Popovska river – Cherni Lom river – Rusenski (General) Lom

Along Beli Lom River in recent years (since 2000) has seen a reduction of the pollution indexes for PO_4 – phosphates, ammonium nitrogen $N\text{-}NH_4$ and those of oxygen group – dissolved oxygen, BCO_5 and O_k, and at the lowest level of solutes. Other indicators are unchanged or difficult ascertainable (due to missing data and the wide dispersion of the values). Impressive is the fact that the values of BCO_5 as well as nitrates and nitrites are inflated when Malkoadenska river over "Beli Lom" dam – a major initial tributary of Beli Lom river. In these indices the river waters are 2nd category even there. If, when BCO_5 occurs some improvement after "Beli Lom" dam (which also acts as a settling tank for a certain ammount of the pollutants, but on the other hand is experiencing the problem of eutrophication) towards the town of Razgrad, especially after the infusion of relatively pure small rivers with a mountainous nature, coming from the Samuil heights, the indices of $N\text{-}NO_3$ and $N\text{-}NO_2$ remain high.The latter is due to the significant share of arable land in the area of Irrigation system

"Beli Lom" and Irrigation system “Kamenna cheshma”, and incoming in small rivers of the upper reaches of a significant amount of biogenic emissions. After the town of Razgrad, which industry is a major source of pollution of different nature and extent of the waters of Beli Lom river, the values of BCO_5 and other indicators of the so called oxygen group increase again and almost to the place of Smesite remain 2nd category. The waters of Beli Lom river in its middle and lower reaches of these indicators have a higher degree of contamination, which is confirmed by the greater annual average of the pollutant BCO_5 in Pisanets – 0.62 against lower cited above points values on Cherni Lom river. After the town of Razgrad water pollution is growing in almost all seen and examined indicators. Alongside the length of the river the degree of contamination in $N\text{-}NO_3$ and $N\text{-}NO_2$ is increasing and after the point of Pisanets (annual average of $N\text{-}NO_3$ 0,79, i.e. higher than respective index on Cherni Lom river at Cherven) river waters are 2nd, but mainly 3rd, category of these indices.The reasons may be looking at the build-up of polluted waters from agricultural land through slope runoff and tributaries Torlashki Lom river (Dolapdere) and Malki Lom river. Ammonium ions are increasing significantly, and from 2nd category before Razgrad, they become 3rd category between it and the town of Senovo. Between Senovo and Pisanets pollution in this indicator is 2nd or 3rd category and hardly after Pisanets had fallen to the 2nd permanent category, with a tendency of improvement since 2000. Last spoke to some degree of self-purification, thanks to the river curves in the upper (Krivnya) part of the Beli Lom rock canyon. Pollution of Beli Lom river with phosphates PO_4 after Razgrad is significant (annual average of 1.26 at Pisanets, but in the industrial area of the town of Razgrad is probably more), although not as much as that of Cherni Lom river after the town of Popovo. Probably a certain improvement of this indicator occurs towards the place of Smesite. In solutes index between Senovo and Pisanets, the waters of the river are permanently 2nd category, while in suspended solids in the section between Pisanets and Smesite – 3rd category. In the first indicator major contribution have anthropogenic factors, while in the second – the combined role of natural and anthropogenic factors.

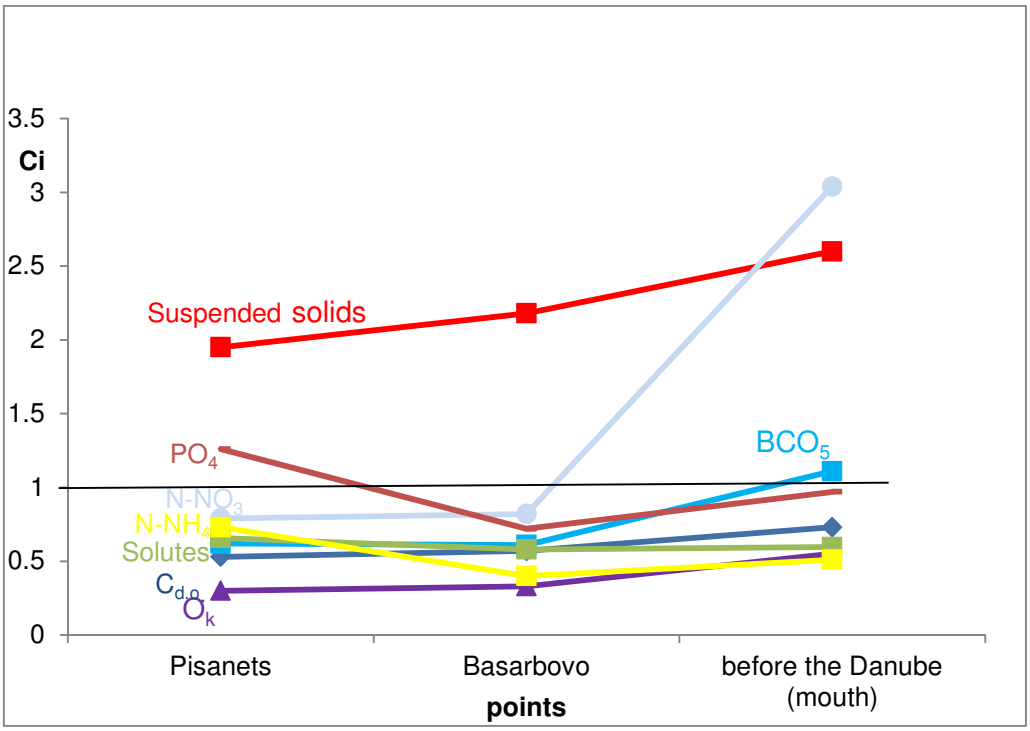

Fig. 2: Variation of river water pollution on individual indicators in the profile Beli Lom – Ruse (General) Lom

Along Ruse (General) Lom River in recent years (after 2000) there are not any definite and clear trends of change in the index values of contamination on most indicators. From the analysis of the statistical datasets for 1989 – 2003 however, it is apparent the reduction of $N\text{-}NH_4$ (somewhat the same for the indices of the oxygen group at the point of Basarbovo) and the increase of PO_4. Oxygen content near the point of Basarbovo amended too widely from 3.2 to 13 – 14 mg/l. Specific values above 11 mg/l for this stretch of the river are too controversial. For 1997, there is only one measurement, and this just reinforces the view that the contents of dissolved oxygen does not establish a particular trend of change in time (somewhat can be assumed reducing of pollution in this indicator only for Basarbovo, but not towards the point before the Danube, i.e. the river mouth), while alongside the length of the river it can be definitely talked about worsening pollution on this indicator in the Western industrial zone of the town of Ruse.Similar conclusions can be made for the other items of the oxygen group. The estimated BCO_5 values are 2nd and 3rd category as annual average on this indicator increased from 0.61 at the point of Basarbovo up to 1.11 at the mouth of the river in the Danube. Waters are

Ok in 2nd category only in the area of Ruse and when this indicator increases in annual average length of the river is having a similar intensity as when BCO_5: from 0.33 near the point of Basarbovo up to 0.55 at the mouth. While the values of $N\text{-}NO_3$ occurred roughly maintain or slightly increase compared to the hydrochemical stations in the lower streams of Cherni Lom river (Cherven) and Beli Lom river (Pisanets). The self-purification capability of river waters in terms of this indicator are the smallest, and despite the many incut meanders and the great twistings of Rusenski Lom river – factors supporting this capability, a significant permanent influx of polluted waters from this predominantly agricultural region in the lower reaches, manages to compensate and neutralize the eventual processes in that aspect.In $N\text{-}NO_3$ waters in this river stretch are 3rd category and to the mouth there is already strongly apparent increase in pollution. Unlike the nitrates, in phosphates PO_4 there is a tendency to retain or slightly decrease the values along the river – the average annual value at Pisanets –1.26, Cherven – 0.65, near the point of Basarbovo – 0.72. In the last kilometers of the river in the region of Ruse, however, receipt of the waste industrial waters, again leads to a rise in this index – at the mouth into the Danube PO_4 = 0.97. These effluents are mainly due to pollution, though episodic, with various organic (oil, petrochemicals, phenol, benzene, detergents) and inorganic (active free chlorine, heavy metals) of industrial origin immediately before the mouth of the river in the Danube.The most prominent are the results of the self-puriffication processes in river waters with respect to ammonium ions $N\text{-}NH_4$, where there is a definite reduction in the extent of contamination, especially in comparison with Beli Lom river around the town of Razgrad. For that fact contributes small number of potential sources of this pollutant in the basin of Rusenski Lom river at an increased water quantity, as well as the lesser pollution of the main tributary Cherni Lom river. Almost unchanged as values alongside the length of the river and within the 2nd category (at the mouth) and even 1st category (at the point of Basarbovo) is the indicator solutes, whereas suspended solids slightly increase alongside the length of the river and in this indicator a 3rd category is maintained. As in space and also in time only in ammonium ions may be talked about a clear downtrend. At other biogenic indicators negative trends are declared, especially at the point before the Danube.

4. CONCLUSIONS

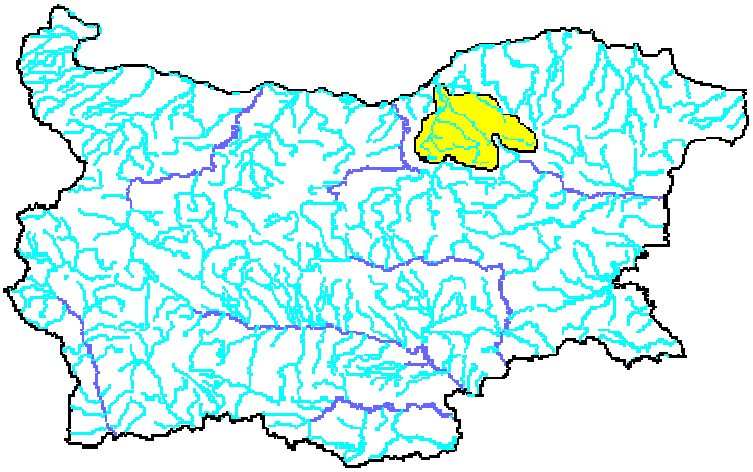

Fig.3: Location of Rusenski Lom River basin on the hydrological map of Bulgaria

We can therefore summarize that on most indicators it occurs increase of the level of contamination along the two major tributaries in the basin (Beli Lom river and Cherni Lom river) and Rusenski (General) Lom to the mouth into the Danube. This is evidenced by the increase of the coefficient of conservativity from the upper to the lower reaches of the two rivers, more noticeable of Cherni Lom.

Tab.2: Conservativity coefficient at points in the Basin of Rusenski Lom River

Point / Coef.ofconservativity	Popovska river	Ostritsa	Cherven	Pisanets	Basarbovo	mouth (before the Danube)
C_c	0.48	0.55	0.69	0.48	0.54	0.50

The most apparent is the increase in pollution along the rivers in the basin as for the suspended solids and nitrates N-NO_3, and to a lesser extent in oxygen indicators group (dissolved oxygen, BCO_5, Ok). In the second group of indicators – solutes – almost no change in the extent of contamination. In the third group indicators – phosphate and ammonium ions more distinctly N-NH_4, there is some improvement in the degree of contamination. Saying the latter, you must consider the last few miles of Ruse Lom River, in the region of the Western industrial zone of the town of

Ruse, which are heavily polluted by all indicators. Even though pollution on $N\text{-}NH_4$, PO_4 and solutes is lower than in Beli Lom River in the area of Razgrad. On the other hand, a number of pollution indicators (without BCO_5, Ok, the suspended solids and somewhat $N\text{-}NO_3$) is less than or comparable to that at the point afte (sub) the town of Popovo.

Among the most heavily contaminated areas in the basin is the Western industrial zone in Ruse around Rusenski Lom River, the region of Razgrad – Senovo – Pisanets along Beli Lom River and Popovska River after (sub) Popovo. In most of the studied indicators of the degree of contamination immediately after Popovo is greater even than that in the mouth of Rusenski Lom river. On the opposite pole on the degree of contamination, i.e. relatively the cleanest (1st – 2nd category), are the waters of Baniski Lom River and, to a certain degree, Malki Lom River. As the most unpolluted, resp. in the most favourable environmental condition (1st category according to data of the RIEW – Shumen), the waters of Malki/Omurovski Lom River from the spring until the first location (area of Lomtsi Lake) are marked, as well as the initial tributaries of the Cherni Lom River (rivers Kenevelik/Saltaklarska, Kjuchukska, Kabdenska, Kazalarska/Kazandardere, etc., leading its origins mainly from the Liljak plateau).The self-purrification capability/capacity of river waters (68% for the part Popovska river – Ostritsa and 77% for the part Popovska river – Cherven) are larger and with more expressive effect in Cherni Lom River, mostly in the range of Cherni Lom (Cherven) rock canyon. There they managed to neutralize the pollution to a large extent on some indicators (the biogenic components – phosphates PO_4 and ammonium nitrogen $N\text{-}NH_4$ and to some extent – BCO_5). Due to the large volume of pollutants and their large number of potential sources, despite the existing WTP(Water treatment plant) in the town of Razgrad (25 380 m^3/h) and despite the self-purrification capabilities in the area of Beli Lom rock canyon, alongside the length of Beli Lom river, most indicators remaine high. After the infusion of relatively uncontaminated waters of Malki Lom river nearby the village of Nisovo towards the place of Smesite, probably occurs greater improvement. In Rusenski (General) Lom it is proven by the data near the place of Basarbovo, though Cherni Lom river waters have already been adopted – it occurs a slightly improvement (compared to the place of Pisanets, but unlike Cherven) in some indicators, but towards the river mouth into the Danube, the pollution has been increasing, and as for some individual indicators ($N\text{-}NO_3$, suspended solids, industrial organic and inorganic substances) – dramatically.

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Treatment of expired pesticides

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Abstract: *The problem with expired pesticides in Bulgaria emerged in1990. Due to poor control storage in the warehouses of the former Labor - cooperative farms, agro-industrial complexes and more. Creating prerequisites for mismanagement, misconduct, increased risk for human health and environmental pollution. Most persistent organic pollutants (POPs) pesticides are highly persistent in the environment with a half-life period of dissolution of 4 to 15 years, have a high potential for bioaccumulation and bioconcentration through the food chain biota.*

This report analyzes the severity of the problem and methods for safe storage and disposal of POPs pesticides.

Key words: *POPs, pesticides, Stockholm Convention, disposal, B-B cube*

Introduction

Waste management is one of the most regulated spheres. This activity affects directly the life and the health of humans and the condition of the environment. A part of the requirements for hazardous waste are results of international agreements and conventions ratified by Republic of Bulgaria. Some of the most hazardous pollutants for the environment are the persistent organic pollutants (POPs) expired pesticides. They are organic substances that have toxic properties and are accumulated in the biosphere. The Stockholm, Basel and Rotterdam Conventions comprise the key elements in the management of the hazardous chemical substances and waste, including the persistent organic pollutants - pesticides:

- **The Rotterdam Convention** about the procedures for prior informed consent at international trade with certain chemical substances and pesticides is ratified by Republic of Bulgaria [1]. 43 chemical substances that are a subject of procedure for informed consent for export were marked. They include 32 pesticides, 4 of which are extremely dangerous and 11 industrial chemicals. It imposes strict restrictions and prohibitions to 10 persistent organic pollutants pesticides
- The Stockholm Convention for the persistent organic pollutants, ratified by Republic of Bulgaria [2] prohibits the production and use

of persistent organic pollutants that are included in it, by allowing their import and export for environmentally friendly disposal.

- The Basel Convention for control of cross-border movement of hazardous waste and their environmentally friendly disposal, ratified by Republic of Bulgaria [3], controls the cross-border movement and management of hazardous waste and their disposal. In accordance with the Basel Convention, nine of the persistent organic pollutants (dichlorodiphenyltrichloroethane (DDT), toxaphene, hexachlorobenzene, aldrin, chlordane, dieldrin, endrin, heptachlor, mirex) are classified as hazardous, and according to the requirements of the Stockholm Convention Republic of Bulgaria is obliged to take measurements for reducing the adverse effect of the persistent organic pesticides stored in warehouses on the environmental quality.

Summary

The problem with pesticides has occurred in Bulgaria after 1990 as a result of overstocking of the former Labor - cooperative farms. The main ways through which the persistent organic pesticides enter into the ambient air are:

- direct (at applying of POPs pesticides through spraying);
- vapour from soil and water contemned with POPs pesticides;
- absorption of dust particles (transport by wind);

Mainly, the POPs pesticides enter in the water through precipitation in the ambient air but also from contemned soils and waste. The persistent organic pollutants – pesticides enter in small amounts in the subsoil water as a result of elutriate from the plants and soils at pouring rains.

They enter the soils by deposing from the ambient air, but also from polluted water and waste, and as a result of elutriate from the plants. Their speed of entering into the soils depends not only on the type of soil, but on the particular type of POPs pesticide. To get a better idea of their behavior, we should take into account their solubility in water, their physical, chemical and photochemical stability, the dose, the duration of use, their deposition in the sediment, the plant, the animals and other organisms, the weather conditions – the most important of which are the solar radiation and the temperature, the physicochemical properties of the soil and the applied agrochemical activities. The POPs pesticides significantly affect the biological activity of the soil by binding with its organic components. Usually, during the first year they remain in the soil at 80-100 % and only move deeper in the profile. The chronic effects of the organochlorine pesticides is mainly characterized by adverse effects on the central and peripheral nervous systems, the liver, skin irritations and allergic reactions. The chronic effects of the pesticides at contact (oral, dermal and inhalation) with animals

may cause cancer, or increase the risk of cancer, damage in the offspring, the male and female reproductive functions and hereditary genetic disorders.

Every year, since 2000, the Regional Inspectorates of Environment and Water implement control on the depots with expired pesticides and maintain a database with the available qualities. The group of the persistent organic pollutants pesticides in the Stockholm Convention includes 15 persistent organic pollutants, where the production of 12 of them is absolutely prohibited and of the other 3 strictly restricted. None of these pesticides was produced in Bulgaria and they were used as a result of import. At present all 15 kinds of persistent organic pollutants pesticides are prohibited for sale and use as insecticides in our country. By 2010 in Bulgaria were found 161 tones of expired persistent organic pollutants pesticides, most of which are heptachlor, dichlorodiphenyltrichloroethane (DDT) and lindane.

By Ordinance No.РД – 195 / 12.05.1998 of the Ministry of Environment and Water and Ordinance No.РД – 09-991 / 11.05.1998 of the Ministry of Agriculture and Food was established the Interagency Commission for Management of the Prohibited and Expired Plant Protection Products to solve the problem with the safe storage of the expired pesticides in the country. The expired and unfit for use pesticides are stored in state (centered) and municipal (cooperative or private) storages, part of which have been renovated or newly built, and the rest are in unprotected storages or are stored in B-B cubes. In 2011 [4] the stored expired and unauthorized for use pesticides amount to 13 623 tones, which are stored in 92 properly secured storages (4467 tones), in 285 unrenovated storages (1600 tones) and in 1889 B-B cubes (7556 tones), only about 1,18 % of which are persistent organic pollutants pesticides.

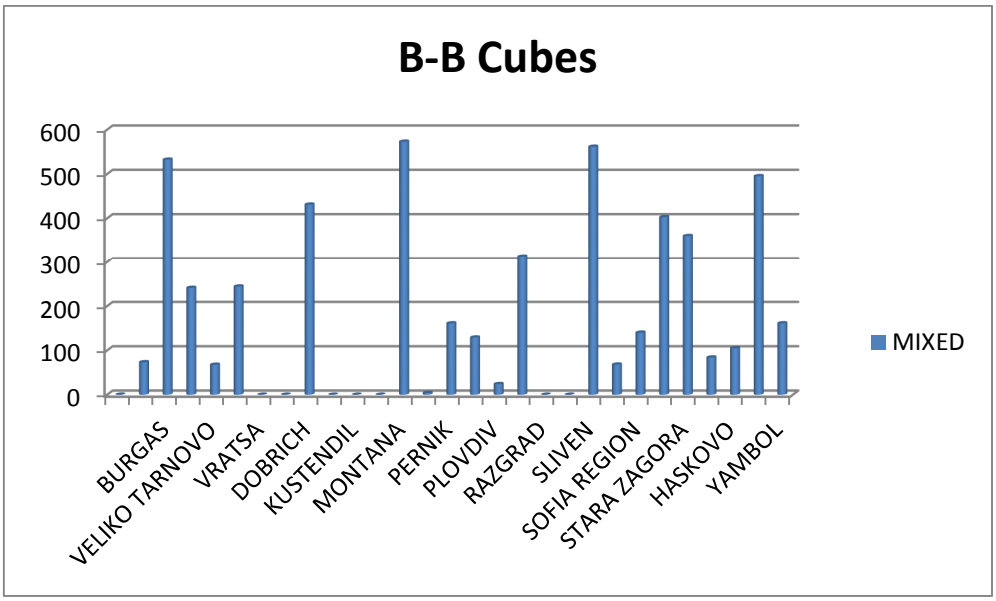

Fig.1. Quantities of mixed expired pesticides (tones) stored in B-B cubes by 2005.

For the period 2001 – 2011 were liquidated more than 470 unrenovated storages and the expired pesticides in them were collected, repacked and moved in B-B cubes. The technology for storage of expired pesticides developed by BalBok Engineering includes the following sequence:

- Taking samples of all pesticides with different appearance including these in mixed condition;
- Determination of the compatibility of the solid pesticides by a quantitave analysis of the reactions of gassing, formation of explosive and inflammable mixtures;
- Repacking of the spilled waste in polyethylene bags;
- Filling the B-B cube up to 5 cm from the bottom with zeolite;
- Filing with packages of pesticides and zeolite of the empty spaces;
- Filling with zeolite up to 5 cm under level of the cover of the B-B cube;
- A hermetic seal of the container - B-B cube.

The number of the container and the number of the pesticides samples are written in a register.

The former practice of permanent storage of pesticides in B-B cubes shall not be implemented anymore due to the need of taking some

special measures – security guards, monitoring and providing of following actions for their final disposal and all of this raise the cost of the expired pesticides disposal. Considering the fact that in the country there are no plants for the incineration, they shall be exported for their final disposal. For the period 2007-2011 82,5 tones of expired pesticides were exported to Germany.

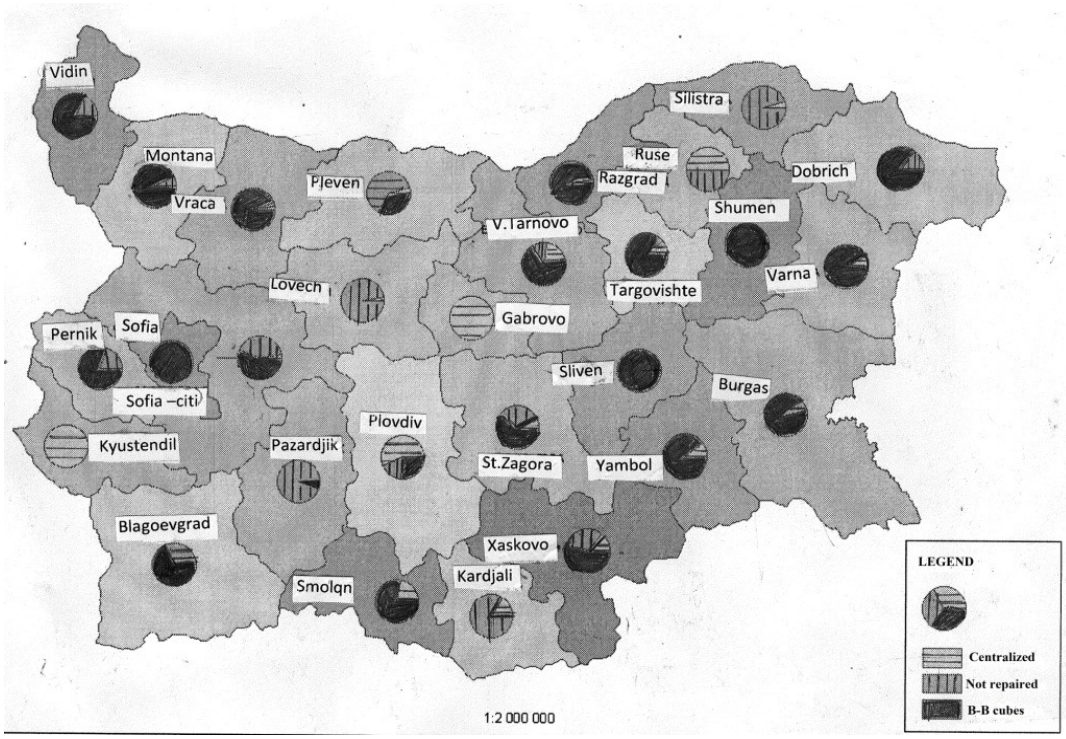

Fig. 2. Ways of storage of expired pesticides on the territory of Republic of Bulgaria

Fig.3. B-B cubes on a geo-protected platform

Fig.4. An unrenovated storage of plant protection products - village of Yoakimovo

Conclusions

1. Since 2000 every year in Bulgaria is implemented control of the suitability of the storages and the quantities of expired pesticides in the, including the persistent organic pollutants pesticides.

2. As a member state of the European Union, Bulgaria strictly follows the requirements of the ratified Convention on the problem with the expired plant protection products, including the persistent organic pollutants pesticides.

3. By 2011 12 023 tones of pesticides are stored safely in centered storages and B-B cubes.

4. It is necessary to be taken urgent measures for the final disposal of 1601 tones of pesticides stored in unprotected storages.

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The Weakest Regions in the European Union, the Most Vulnerable in the National Space

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Abstract: *Results of an Eurostat survey for the poorest regions in the European Union are presented. These regions are examined as socio-economic status in national space through eight complex characteristics demonstrating their development level of each of them. These characteristics are evaluated in five grades: weak, poor, average, good and very good. It turns out that the weakest regions in the European Union are the most vulnerable in national space too.*

Keywords: *poor regions vulnerable regions, socio-economic status, complex performance assessments in grades*

INTRODUCTION

Researches carried out at EU level and national level in areas of comparable size and population are a good instrument for comparing and outputting issues in order to outline the goals and objectives for their removal and overcome. The results are needed in the elaboration of regional strategies and regional development plans for the areas of level II.

MATERIAL SUBMISSION TO THE EDITOR

For the study are used data and researches from the European Statistics, the National Institute of Statistics and the Institute for Market Economics. In the study Regional Profiles - Development Indicators it was used the method of clustering. The present study carries out comparative analysis systematizing the problems by areas in order to arrange them according to the degree of reached growth measured by eight complex characteristics or profiles of areas in the respective regions.

RESULTS, DISCUSSIONS, CONCLUSIONS

Two Bulgarian regions - North and North Central are the poorest in the entire European Union, account analysis of European statistics. Eurostat publishes data on regional GDP per capita according to which purchasing power to regional GDP is the lowest in the Northwest region /26 percent/ and in the North-Central one /29 percent/. The districts Pleven, Ruse, Gabrovo and Lovech cover only 29% of the EU average level [3].

According to NSI these areas are characterized by approximately the same structure: a population of approximately 800,000 people, of which

over 300,000 live in rural areas. Nearly 30 percent of the population in these two areas is over 65 years old.

In the poorest Northwest region are employed 368,000, while in North-Central - 415,000 people. Thirdly in the negative rating is Northeast region in Romania /29 percent/. The following are: South-Central /Bulgaria - 30 percent /; Northeast and Southeast - Bulgaria /by 36 percent/; two Romanian regions - Southwest and Oltenya /by 36 percent/, etc. In the twenty poorest EU regions there are five of Bulgaria, Romania, Poland and Hungary on each country [3] [4] [5].

Below are summarized in tables regions and districts, including all indicators integrated in the system of 8 sets of characteristics or profiles. Algorithms for their calculation and measurement units are weak, poor, average, good, very good in the economy, the business environment, the infrastructure, the demography, the education, the health, environment and the social environment [1].

Level of development / Characteristic	Weak	Poor	Average	Good	Very good
Economy	Vidin	Montana	Lovech Pleven	Vratza	
Business Environment		Lovech	Vidin Pleven	Montana	Vratza
Infrastructure		Lovech Montana	Vidin Vratza Pleven		
Demography	Vidin Lovech Montana	Vratza	Pleven		
Education		Vidin Lovech Montana	Vratza Pleven		
Health	Pleven	Montana	Lovech	Vratza	Vidin
Environment	Vidin	Lovech	Vratza Montana Pleven		
Social environment	Vratza	Lovech Montana Pleven	Vidin		

Table 1. Socio-economic characteristics of districts in the Northwest region

Analyzing the survey results of the Northwest region it is set up that the areas occupied by level of development mainly average, poor and weak spot. Good and very good level is mainly occupied by region of Vratza, as developed economy, business environment and health, and Montana as created construction of business environment, and Vidin as health development.

Level of development / Characteristic	Weak	Poor	Average	Good	Very good
Economy	Razgrad	V. Tarnovo Silistra	Ruse	Gabrovo	
Business Environment	V. Tarnovo		Silistra	Razgrad Ruse	Gabrovo
Infrastructure		Silistra	V. Tarnovo Razgrad	Gabrovo Ruse	
Demography	Gabrovo	V. Tarnovo Razgrad Silistra	Ruse		
Education	Razgrad	Silistra	Gabrovo Ruse	V. Tarnovo	
Health	Razgrad	Ruse	V. Tarnovo Silistra		Gabrovo
Environment		Ruse Silistra	V. Tarnovo Razgrad		Gabrovo
Social environment	V. Tarnovo		Razgrad Silistra	Gabrovo	Ruse

Table 2. Socio-economic characteristics of districts in the NorthCentral region

Analysis of districts in the North-Central region shows that the areas are mainly distributed in the groups average, poor and weak level of development for the studied characteristics. In good level of the economy, infrastructure and social environment is characterized Gabrovo, the same level is the business environment in Razgrad and Ruse, as well as the construction of infrastructure and education in Veliko Tarnovo. In very good level are the characteristics of business environment, health and the

environment again in Gabrovo and of created social environment in Russe region.

Level of Development / Characteristic	Weak	Poor	Average	Good	Very good
Economy		Plovdiv Smolyan Haskovo Kardjali	Pazardzhik		
Business Environment		Haskovo	Plovdiv Kardjali	Pazardzhik	Smolyan
Infrastructure	Kardjali Pazardzhik	Smolyan	Plovdiv Haskovo		
Demography		Plovdiv Smolyan Haskovo	Pazardzhik Kardjali		
Education	Pazardzhik Haskovo	Plovdiv		Kardjali	Smolyan
Health			Plovdiv Pazardzhik Kardjali	Haskovo Smolyan	
Environment		Kardjali Haskovo	Plovdiv Pazardzhik	Smolyan	
Social environment	Pazardzhik	Haskovo	Plovdiv		Kardjali Smolyan

Table 3. Socio-economic characteristics of districts in the South-Central region

Tracking the results of the South-Central region for the areas development according to analyzed characteristics it would be concluded that the districts occupy mainly poor and average level. In good condition and poor performance are presented equal number areas. Pazardzhik is with a good business environment, with well developed education is district of Kardjali, the same is the health in districts of Haskovo and Smolyan, and the environment in Smolyan is at good level as well. Smolyan is characterized with a very good level of the business environment, the education and the social environment, and only the latter is in very good condition in Kardzhali region.

Socio-economic characteristics of areas in the Northeast region are prominently occupying mostly weak, poor and average seats. Varna is the area that is presented mainly in the group of positive characteristics as regards economy, demography, education, health, environment. Dobrich takes a good level for development of health, environment and social environment. Targovishte is representative of a very good developed business environment.

Level of development / Characteristic	Weak	Poor	Average	Good	Very good
Economy	Shumen	Dobrich Targovishte		Varna	
Business Environment			Varna Dobrich Shumen		Targovishte
Infrastructure		Dobrich Shumen Targovishte	Varna		
Demography		Targovishte	Dobrich Shumen	Varna	
Education	Targovishte	Shumen	Dobrich	Varna	
Health	Targovishte		Shumen	Varna Dobrich	
Environment		Targovishte		Varna Dobrich Shumen	
Social environment	Targovishte Shumen		Varna	Dobrich	

Table 4. Socio-economic characteristics of districts in the Northeast region

Level of development / Characteristic	Weak	Poor	Average	Good	Very good
Economy		Sliven Yambol	St.Zagora	Burgas	
Business Environment		Burgas		St.Zagora Sliven	Yambol
Infrastructure	Sliven Yambol	St.Zagora	Burgas		
Demography		Yambol	Sliven St.Zagora	Burgas	
Education	Sliven	Yambol	Burgas St.Zagora		
Health		Burgas	Sliven	Yambol	St.Zagora
Environment	St. Zagora		Yambol	Sliven	Burgas
Social environment	Sliven Yambol St.Zagora			Burgas	

Table 5. Socio-economic characteristics of districts in the Southeast region

Southeast region ranks fifth from the bottom in the last list of regions in the EU. In this region the fields in the groups are equally weak, poor, average and good as a degree of development according to the examined eight characteristics or profiles. At very good level is business environment in Yambol, health in Stara Zagora and social environment in Burgas.

It is established how some areas are relatively more developed and prosperous while others - more poor or underdeveloped. Nine specific groups areas are identified whose regional profiles are similar.

The resulting clusters are particularly interesting subject for analysis, as they display on the surface some seemingly subtle similarities between areas. For example, regions of Stara Zagora and Targovishte form a cluster because of their good business environment, economic progress and at the same time - their poor environment. At the other extreme is a cluster consisting areas of Razgrad and Silistra. The importance of this cluster is the most negative demographic development compared to other regions in the country as well as very poor state of the economy and education. Good trend in this group is launching positive changes in education. Few expected result is the formation of Gabrovo as a separate cluster because of its relatively good socio-economic status, but with a strong negative trends in demography and education.

The last thematic analysis focuses on citizens' satisfaction with living conditions in different areas. One implication is that there is no significant relationship between human well-being, as measured by GDP per capita in the areas and their satisfaction with their standard of living. First in satisfaction with their standard of living is ranked one of the poorest areas in the country - Razgrad, followed by Burgas and Silistra.

It would be observed in poor developing economy high mechanical negative growth, which in its turn leads to worsening natural population growth and increasing age dependency. The lack of availability of qualified personnel in the workforce discourages potential investors, which in turn leads to worsening demographic situation and further deepening the problems in education and economic development. In fact the only areas of positive mechanical growth are Varna and Burgas. The areas with the highest rates of net emigration and respectively depopulation for the period since 2001 are Smolyan, Yambol, Vidin, Razgrad, Vratza, Sliven [2].

In general, problems with the quality of education reflect on the labor market in different areas although employment in all areas is much higher in 2011 than in 2000 (with the exception of Kardzhali). During the last two years are shedding jobs in most areas due to the effects of the economic crisis and the subsequent stagnation of the labor market. Some areas were able to minimize the effects or to overcome them faster than others. For example, in eight areas in 2011 there is a trend of increasing employment -

Blagoevgrad, Veliko Tarnovo, Vratsa, Kardzhali, Pernik, Targovishte, Shumen and Yambol [1].

In category "Economics" there are some of the major differences between regions. For example, the GDP per capita shows that the same indicator in Silistra - the area at the bottom of the rankings in 2009, is equivalent to about one fifth of that in the area with the highest standard of life - Sofia city. The period of economic growth from 2000 to 2008 has expanded greatly the difference between the poorest and richest areas.

The study observes weak linkages between the standard of living in one area, as measured by GDP per capita and income per household, and the subjective satisfaction of the people living in the area. First is ranked one of the poorest areas in the country - Razgrad, followed by Burgas and Silistra. This discrepancy can only partly be explained by the different price levels and in general – by different cost of living between areas. On these estimates the values, needs and interests of people in the different regions of the country have their natural impact.

Strong negative trends and still better socio-economic status: Gabrovo.

Gabrovo is also separated into an independent cluster. The reason is some contrasts that characterize the socio-economic situation and development.

The area is one of the most negative demographic setup in the country. The negative perspective is that processes in Gabrovo keep deteriorating with some of the fastest rates in the country. Similar is the situation with education - Gabrovo is the most negative developed in compare with all areas. The number of students in colleges and universities of 1,000 inhabitants decreases by 10.2% per year against the reduction of 0.1 percent for the country. In addition, the share of the population aged 25-64 with tertiary education decreases by 3.6 percentage points, while the national trend is the opposite - an increase of 0.2 percentage points.

The economy of Gabrovo is also characterized by arising problems. The area is among the leading economies in the country (just after Sofia and Varna), but the paces of development in recent years are the most negative for the country.

Unemployment in the area is increasing at higher rates than for the country and the employment - with less ones. In addition, income per household is decreased by 13.2% in one year. In comparison, the income for the same period is decreased by only 1.2%. In Gabrovo trend is the number of businesses per 1,000 people to decline, while it is the opposite in the country. Gabrovo has the most intensively developing infrastructure among all areas, and this boom ranks it on the second place after Sofia (the capital) in this field. The share of households with Internet access increase five times more intensive than that of the country [1].

The water losses in public water supply and the irrigation systems reduce 4 times faster for Gabrovo compared to the overall reduction in the country.

Unlike the problems of socio-economic field Gabrovo has the best state of the environment in the country.

Contrasts in socio-economic development: Stara Zagora, Targovishte

This cluster is characterized by one of the best environments for business development (Targovishte is first in the field). Characteristic of this cluster are contrasts in the development. The cluster is among the leaders in the country for certain aspects of the socio-economic development, while for others it occupies one of the last places.

The cluster has one of the fastest growing economy (on the second place after the leading Vratsa, Sofia and Ruse) with declining unemployment in both areas - Stara Zagora and Targovishte, one and a half times and almost nine times more intense than the national. Income per household for Stara Zagora has increased by 4.7% per year, which is nearly six times faster than the growth for the country

On the other hand, trend in the environment development is one of the worst in the country (Stara Zagora has the most pronounced negative trend).

The same can be applied to the development of the social environment. The two areas that make up this cluster are among the last in the country. Infrastructure development is also negative.

In the social environment, the poverty rate increases annually about 3.5 percentage points average in both areas, while for the country it remains relatively constant [1].

In the field of infrastructure in Stara Zagora it is observed an increase in water losses of public water supplies and irrigation systems by 3.8%, while losses for the country decrease by 7.3 %.

Contrasts in the socio-economic situation and development: Vidin, Smolyan

The areas in this cluster have demographic problems. In practice Vidin is the worst demographic situation in the country. Most telling is the high rate of negative natural increase, which is over three times higher negatively than the rate of the country, and the high age dependency for the area is a half higher than for the country.

The state and the economy development are also more negative than in other areas - Vidin has weakest economy among all the 28 districts

in the country, and Smolyan has some of the most pronounced negative trends in the economy. The reduction in profitability is the most intense in Smolyan (3 times faster than that of the country). Vidin has the lowest employment - the employment rate of the population aged 15 and over age in 2010 was 35%, or one-quarter lower than that of the country. Employment in Smolyan decreases two and a half times faster than that of the country.

The trait of the areas in this cluster is dynamic infrastructure development - they are second peak immediately after Gabrovo. The same applies to the state and development of education – the cluster occupies one of leading places. Vidin has the fastest growing educational sector in the country and ranks Smolyan just after Sofia city. The areas in this cluster are among the other leading ones according both to the state and to the trends in healthcare. The cluster is characterized by relatively good social environment.

Poor socio-economic status and negative trends: Razgrad and Silistra

The cluster is composed of Razgrad and Silistra. These two areas have the most negative development of demographic processes. The age dependence is increased by respectively 15 and 15.7 percentage points for one year, while for the country it is decreased by 0.2 percentage points.

The economic situation of these two areas is also among the most degraded - only two other areas have more poorly developed economies. The state of the educational environment is identical. Razgrad and Silistra have one of the lowest GDP per capita (Silistra district is only two times lower GDP per capita than of the country). In the districts of Razgrad and Silistra 1000 people represent respectively 2 and 3 students, and for the country they are 37.

Contrast is registered in healthcare. Dynamics of health is one of the most positive in the country, but the snapshot of the health in areas of the cluster is still bad and it ranks among the last places.

Promising developments: Vratsa, Rousse

A characteristic feature of the cluster is the most intensive economic development compared to all other areas in the country. In practice, the three areas that make up the cluster, take the top three positions on the pace of economic development.

Vratsa showed positive development in almost all economic indicators, which is particularly intense on the number of enterprises per 1000 inhabitants (ten times faster than that of the country) and investment -

cost of acquisition are with growth of 6% vs. reduce by a quarter of the country.

Ruse has the most intense falling unemployment of all other areas. The cluster is one of the leaders in the development of education. This is indicated by 46% growth for Vratsa in the number of students in colleges and universities for 1000 inhabitants, contrasting with the decrease in the country.

Good socio-economic status: Blagoevgrad, Burgas, Varna, Plovdiv

The four areas in the cluster have a good demographic situation in comparison to other areas in the country. In two of the areas in the cluster – Blagoevgrad and Burgas –the general negative demographic trends for the whole country are most pronounced.

Economic situation of the cluster ranks among the top. Varna is immediately after Sofia (the capital). The dynamics of economic development of the cluster is not so pronounced. Only Plovdiv region is above the national average (positive) development, while in the other three areas the trends are negative and below those for the country.

In Varna district the number of enterprises per 1000 inhabitants is 37% higher than for the country. In the region of Plovdiv relatively rapidly is increasing income per household - the increase is 6 times more intense than that of the country.

Environment in the cluster have negative trends. Two areas (Blagoevgrad and Plovdiv) are at one of the last positions. Only Yambol has less favorable development of environment.

Dynamics of health in the cluster is also negative. District Plovdiv is at the last place in this respect among all districts in the country, and Burgas is also among the worst developing districts.

Average socio-economic status: Dobrich, Kardzhali, Kyustendil, Montana, Pleven

Socio-economic conditions of the regions in the cluster give similar position, but it is below the average for the country.

The cluster is characterized by pronounced negative trends in infrastructure development and health. Kyustendil has the most negative developed infrastructure and Dobrich – is on the last place in the development of healthcare. Kyustendil is the worst performance in terms of losses in the transport of water in the public water supply and irrigation systems. In Dobrich the growth of served by a doctor population is the fastest - 5 times higher than in the country.

The areas in the cluster are among the leaders in the status of the environment (Montana, Kardzhali, Kyustendil) and in social field (Kyustendil).

Poor socio-economic status: Veliko Tarnovo, Lovech, Pazardzhik, Pernik, Sliven, Haskovo, Shumen, Yambol

The state of infrastructure in all areas of the cluster is poor and below the average of the country. This is basically a cluster with less developed infrastructure. Three of the areas occupy the last three places in this field - Pazardjik, Yambol and Sliven. Losses in the transport of water (million cubic meters per year) for public water supply and irrigation systems of 10,000 inhabitants in Pazardjik and Yambol are nearly four times higher, and in Sliven - twice greater than in the country.

The same applies to social status - all areas in the cluster are among those with the most impaired social environment and again three of them are with the poorest one - Yambol, Sliven and Pernik. In Pernik district the population is most dissatisfied with their lives, and the dissatisfied people by functions of the institutions are the most in this area and one-third more than the national average. Yambol is the area with the highest percentage of the population living in material deprivation. This indicator is one half greater than that of the country, and it is one fifth higher in the region of Sliven.

The cluster is characterized by a poor environment for business, with exception of Yambol region, which is second in the field. Part of this cluster is the Pernik region, which has the worst business environment among all regions in the country, followed by Lovech, Haskovo, Veliko Tarnovo and Shumen.

Status and trends of economic development, demography and environment are below those for the country. Education as a snapshot is the same. Development of education, however, is the most negative. Five areas in the cluster are at the last places among all the 28 districts in the country.

Veliko Tarnovo is the area with the rapid deterioration of the scope of education system. In Lovech is observed a strong decline in the number of students in colleges and universities of 1000 people. The most significant is the reduction of number of teachers in primary and secondary school of 1000 students in Haskovo [1].

Dynamics of the environment in the cluster is also the most negative for the country. Yambol is at the last place and five other areas in the cluster are among the last ones in this regard.

The condition and the features of clusters would point out the specific policies and measures.

Clustering of regions (eg regions at NUTS 3) is regularly used in analytical practice in the EU. It helps effectively the process of making analytically justified, and hence correct, purposeful managing decisions. The implementation of such feature-rich, analytical approaches would have good potential for the formation of regional policies in the country. It reduces regional disparities and economic and social cohesion of highly differentiated regions at the time. This and other analyzes show that the

trend still deepens the differences between the regions. Reversing this trend should be a priority of government

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Environmental Peculiarities and Local Conditions in Oshtavska Stream Basin

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Summary *This report gives a brief description of the basin Oshtavska. Proposed classification of the main river and its tributaries in separate sections, depending on their order, using the Horton-Strahler`s method.*

INTRODUCTION

The Oshtavska stream rises from the south slopes of Gyrbets vruh (2597) in the north-western part of the Pirin Mountains (N/41°49′53″ and E/23°19′35″) and after the train stop of Peyo Yavorov flows into the Struma River (N/41°45′40″ and E/23°09′33″).

The length o Oshtavska River is 18 km. The area of its watershed is 77 km^2 (7700 ha), its average altitude is 1450 m. The module flow of the river is 12.31 $l/s/km^2$ and average flow per year is 0.95 million m^3/s.[2] The snowmelt in the higher regions of the Pirin Mountains is the main reason for the high values of the flow module and the water levels in the river.

SUBJECT

Hydrological characteristics of the flow of the Oshtavska stream during the period 1961-1998 years - discharges (Q m^3/s) and water volume (W million m^3) are given at table 1. [2]

Tab.1

Hydrometric station	Area of the basin (km^2)	Module flow ($l/s/km^2$)	Q – (m^3/s) W – (million per m^3).	Security %			
				Average	75	90	95
Oshtavska River, mouth	77	12,31	Q	0,948	0,742	0,651	0,600
			W	29,89	23,4	20,53	18,92

RESULTS AND DISCUSSION

The survey is based on received results, it is presented in the following tables and figures. There are discussed in the following pages.

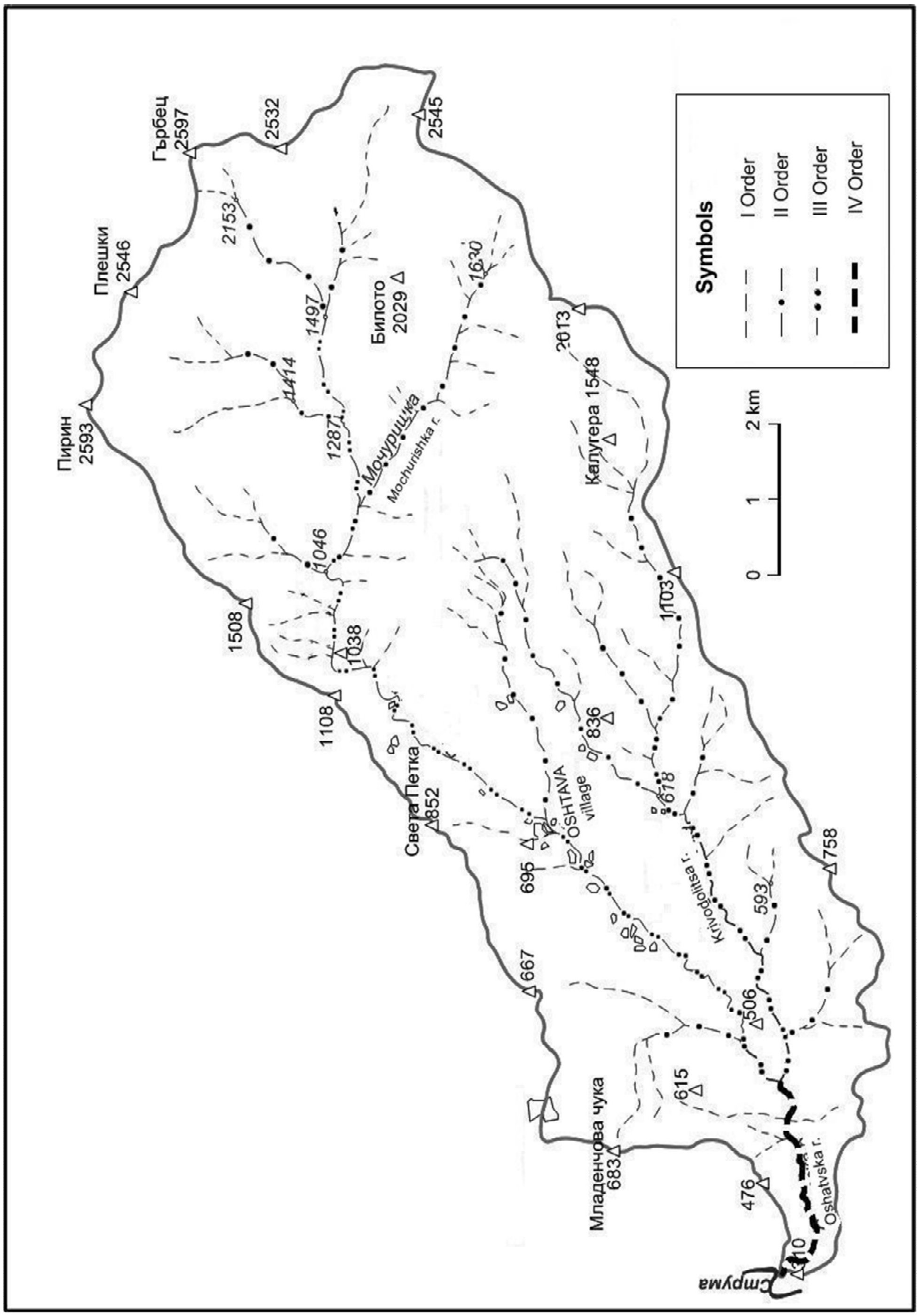

Symbols
I Order
II Order
III Order
IV Order
0
1
2 km
Пирин 2593
Плешки 2546
Гърбец 2597
2532
2545
Билото 2029
2013
Калугера 1548
Mochurishka r.
Мочурища
1508
1108
Света Петка 852
OSHTAVA village
695
836
618
1103
Krivodolitsa r.
593
758
667
506
615
Младенчова чука 683
476
Oshatvska r.
410
Струма

Fig.1

STRUCTURE AND CLASSIFICATION OF DIFFERENT TYPES OF SECTIONS IN OSHTAVSKA RIVER BASIN

No.	Section	Number of river sections (streams)					Long of river sections (streams) (km)				
		First order	Second order	Third order	Fourth order	Fifth order	First order	Second order	Third order	Fourth order	Fifth order
1.	From springs to inflow of a river Mochurishka (incl.)	**19** (29,7%)	**4** (28,6%)	**1** (25%)	**-**	**-**	Between **0,15** and **2,10**	Between **1,35** and **3,70**	**~ 3**	-	-
2.	After Mochurishka River to the village Oshtava	**16** (25%)	**2** (14,3%)	**1** (25%)	-	**-**	Between **0,60** and **1,50**	Between **1,40** and **3,50**	**~ 7**	-	-
3.	After village Oshtava to inflow of river Krivodolnitsa (incl.)	**25** (39,1%)	**7** (50%)	**2** (50%)	-	**-**	Between **0,40** and **3,10**	Between **0,90** and **5,60**	Between **4,30** and **5,60**	**-**	**-**
4.	After Krivodolnitsa river to mouth of Oshatvska river	**4** (6,2%)	**1** (7,1%)	-	**1** (100%)	-	Between **0,30** and **1,40**	**~ 0,10**	-	**~ 3,5**	-
	Total	**64** (100%)	**14** (100%)	**4** (100%)	**1** (100%)						

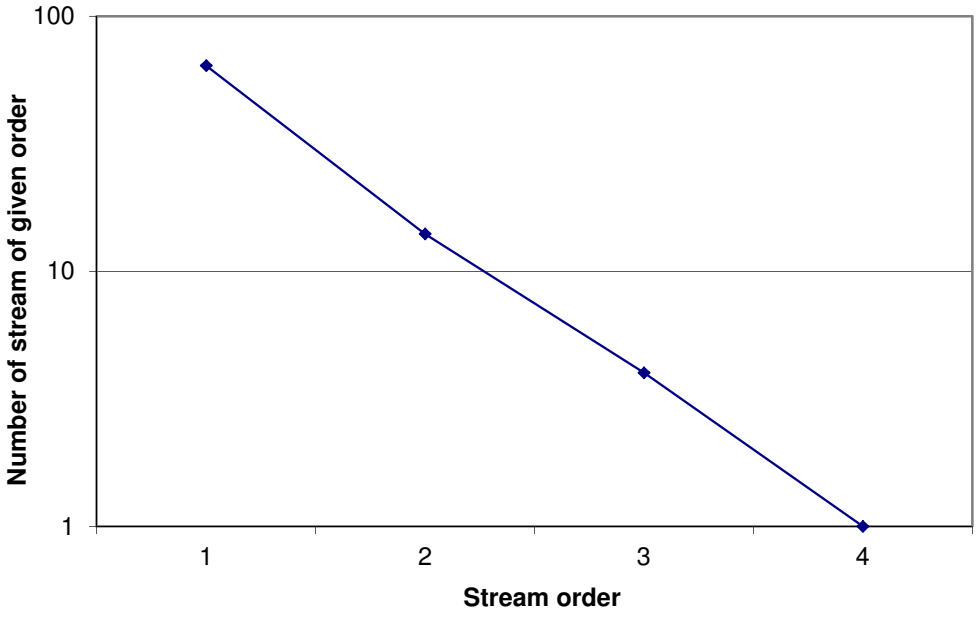
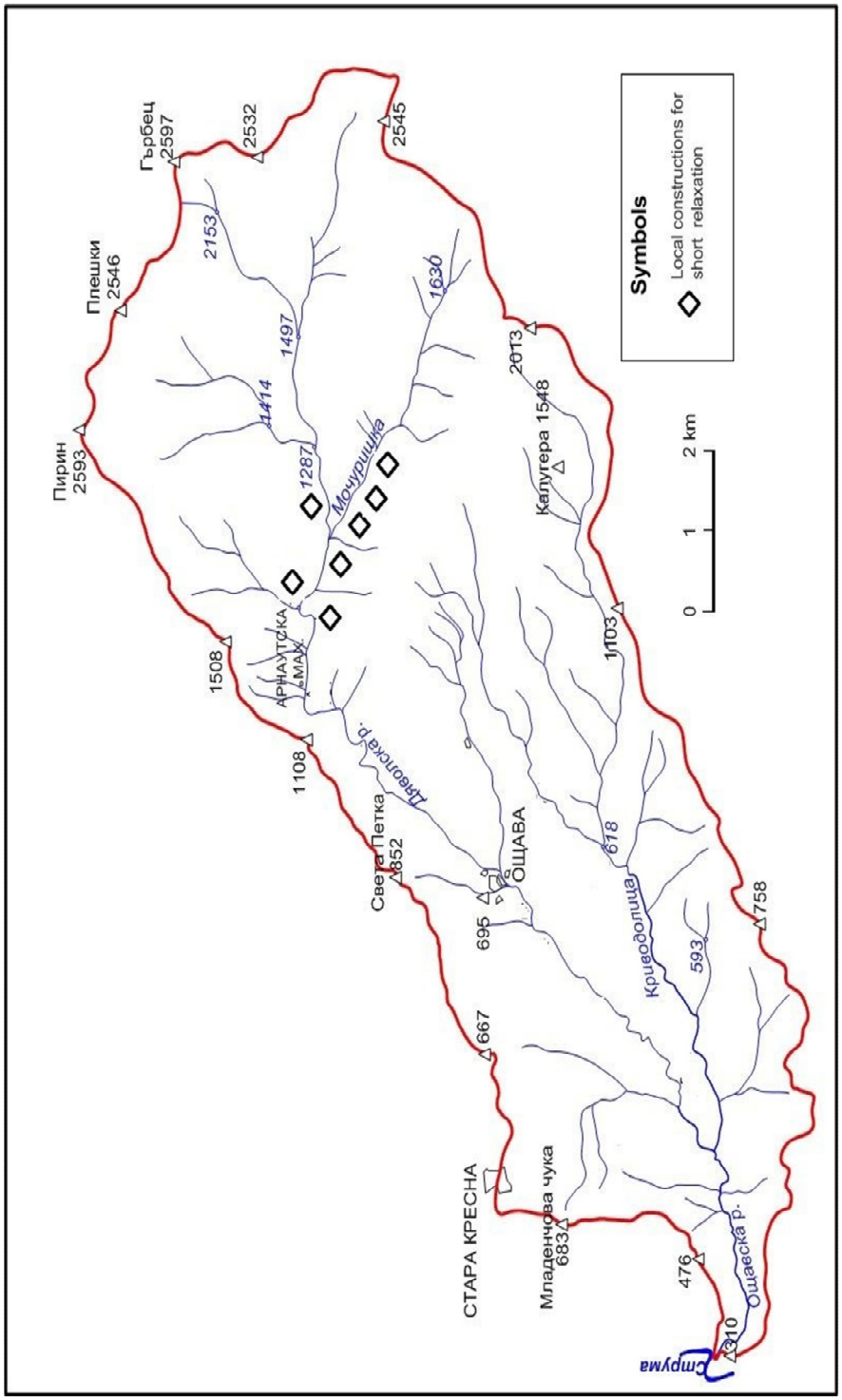


Fig.2

Relationship between the stream order and the number of streams of a given order for the Oshtavska River watershed.

The first order are 77,1% of the total number, 19,6% are by second order. The third order are 4,8% and the fourth order is only 1,2%.

The overall prevalence of first order sections clearly shows that they have a dominant role in the formation of different habitats in the local river basin. These areas are located mainly in the forest (in the upper and middle part of the basin) at feeding dominated by woody vegetation. The decaying forest is formed like a nutrient medium. It is essential for the overall formation of river basin like a specific habitat Oshtavska as not only a local character, but also affect the formation of the nutrient medium in the Struma River and near to the municipality of Kresna. There are similar conditions in second order. Therefore, about 94% of the entire river system Oshtavska stream is formed by coarse nutrient medium, which serves not only as a local medium, but is important in the transport of nutrients in areas of higher order. There are conditions to quickly transfer practical fresh food substance through the last stretch of the fourth order in the Struma River on Fig.1.



The diagram presented a location at local constructions for short relaxtion. The member of Fishermen Association "BALKANKA 2009" (President Ivan Mishev) built these spots with donation from State forestry gorge "Kresna" [3]

In relation to the above is a brief analysis of the environmental (natural) potential in the Oshtavska stream basin. The idea emerged as a result of the expedition exploring the state of the built local constructions for short relaxtion, which are essentially one has not sufficiently evaluated to gain a more rational utilization of resources in the area without negative impact on the environment.

The total basin area is 7,700 ha, the majority (85%) is a forest (6,545 ha), the remaining area is mainly used for agricultural purposes (1155 ha). It was used the most popular methods for evaluation of ecosystem services [1,4,5].

Tab. 2 Evaluation of ecosystem services in Oshtavska River basin

Oshtavska River basin	Absolute values ha	*Evaluation of ecosystem services* (BGN/ha/year)			*Total evaluation of ecosystem services* (million BGN/ha/year)		
		Prov.	R/C/S	Comb.	Prov.	R/C/S	Comb.
Forest areas	6545	238	2020	2258	1,55	13,22	14,77
Agricultural areas	1155	421	140	561	0,48	0,16	0,65
Total	7700			2819			15,42

Prov. – Provision services; **R/C/S** – Regulation, Culture, Support services; **Comb.** –Combination services

The total value of services of forests is worth 14.77 million BGN, as 1.55 million relate to the direct benefit or provision services. Forestland is determined by diverse representatives of coniferous and broadleaved species, it is a prerequisite for further calculation of the valuation of ecosystem services in forest areas.Therefore, the services will be multifunctional and varied, and their values will vary widely.

Agricultural areas comprise 15% of the total area and a total of about 650 thousand BGN of which 480 thousand BGN provided by provision services. It should be noted that it includes the cost of agricultural practices (labor, subsidies, cost of fertilizer, etc.) and external costs outside of the site (soil erosion, water purification, etc.).

CONCLUSION

The obtained values are quite indicative in terms of unused possibilities of natural resources in Oshtavska stream basin. It has to do more compelling and more specific research, because it`s need regards the determination of quantitative parameters of ecosystem services as and seek

forms of promoting such an approach in the implementation of various activities to protect the environment.

The research results show that although small and insignificant basin area Oshtavska stream is worth the attention of researchers and experts. It`s need take account local peculiarities in the management of the use of drainage basins, water and protection from pollution.

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Toward the Development of Ecosystem Services in Blagoevgrad District

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Abstract: *The need for and benefits of ecosystem services and its contribution to economic and social development are ways to protect the environment.*

Keywords: *Ecosystem services , forest, agricultural areas*

INTRODUCTION

During the last twenty, twenty – five years in the different activities by protecting the environment is putting aside the more influence over funding and promoting the idea of a wider financial support in this area. Depth analyzes were performed in ordered to substantiate the economics parameters for greater commitment for protecting the environment and their concrete commitment with the management of these activities

SUBJECT

More widely began to use the term ecosystem services as the most common was viewed the benefits (direct and indirect) that the society (people) gets from nature including the functioning the ecosystems [constant]

There are four main types of ecosystem services:

Material services – products acquired from ecosystems.

Regulating services – benefits from the regulatory role of ecosystem processes / to processes of ecosystems/.

Supporting services – the services that are creating the conditions, which are necessary for providing all other ecosystem services.

Cultural services – immaterial benefits of ecosystems.

Majority of the population does not perceive correct use of these ecosystem services. Without changing of thinking and political will to make the necessary changes at the local, regional, national and global level, the

reversal of the negative trends would be impossible. The correct understanding of the role of the environment and its valuable contribution to the economic and social welfare of the people is essential for making competent management decisions on important issues as the use of natural resources. One of the basic elements of ecosystem services and their economic value, which is important in making the right management decisions.

In this present research was made an attempt to apply the results published until now, to do an analyze and evaluation of the situation in Blagoevgrad, but are also made data and on the water areas and anthropogenic areas.

Tab.№1 *Average values of some ecosystem services (lv/ha/year)*

Categories of ecosystem services	**Forest areas**	**Agricultural services (agrarian)**	**Water areas**	**Anthropogenic areas**
Material services				
Food	65	421	52	-
Fuels	100	-	51	-
Fresh water	-	-	53	-
Regulating services				
Air quality management	41	-	-	662
Fixation of the carbon	25	47	-	20
Safe – keeping of carbon	968	2305	-	623
Water regulation	172	-	8712	-
Water purification and waste management	75	-	1064	-
Regulating the natural disasters	1564	-	1740	0.29
Cultural services				
Esthetic value	150	71	-	-
Recreation and ecotourism	229	-	197	4824

Each of ecosystem services is closely related to the others. For example, the rivers and wetlands have the ability to sedimented mechanical particles, and with this the pollutants affixed to each, thereby purifying the

water. The trees do play a part in cleaning the air, as well as water flow regulation. The trees have a role in the purification of air and water flow regulation. Ecosystem services are understood benefits - direct or indirect, dissolved out from a human ecosystem functioning. These and other services have value, but since most of these services, with the exception of the material is not bought and sold in the market is very difficult, if not impossible, to determine their price. From the foregoing Table 1 shows that the range of values (lev / ha / year) for different groups and types of ecological systems vary widely (from 0.29 in 4824). This wide range indicates that very extent the results are approximately, because now we have gathered enough information worldwide.

The average values of one-forest ecosystem services areas at this stage are reliable and sufficient and can be used and incorporated into the creation of new Structural plans of municipalities in Blagoevgrad. Are necessary improvements in the quality of ecosystem services of all agricultural land. Although anthropogenic ecosystem services are important areas of the city, there is not enough practical information. The drafters of urban development plans in Bulgaria should always take into account the "greening" of the settlements in their preparation. Water area offer services related to water treatment, regulation of natural risks, as well as services related to recreation, which have comparatively high price.

The results obtained show that were largely underappreciated benefits of different activities related to protection of the environment. To a large extent an assumption to commit ourselves to significant impacts, eg. air pollution from industrial activities, rapid urbanization and impermissible water pollution from industrial activities and the prevailing consumer behavior in raising the standard of living. Are engaged in such activities compared to the commitments concerning the implementation of environmentally sound behavior in the use of all resources and overall development of society.

Tab.№2 *Costing of ecosystem services provided by*

Blagoevgrad district Absolute value, ha			**Total value of ecosystem services (million BGN / ha / yr.)**					
			Forest area			**Agricultural area**		
Municipalities	**Forest area**	**Agricultural area**	**M-I***	**R/C/S***	**Com***	**M-I****	**R/C/S****	**Com****
Bansko	27 655,5	13 727,3	6,58	55,86	62,45	5,78	1,92	7,70
Belitsa	22 186,2	6 313,3	5,28	44,82	50,10	2,66	0,88	3,54
Blagoevgrad	26 319,6	29 229,1	6,26	53,17	59,43	12,31	4,09	16,40
Gotse Delchev	17 821,6	11 247,2	4,24	36,00	40,24	4,74	1,57	6,31
Garmen	27 027,0	9 593,0	6,43	54,59	61,03	4,04	1,34	5,38
Kresna	24 655,1	7 724,2	5,87	49,80	55,67	3,25	1,08	4,33
Petrich	29 839,0	30 386,9	7,10	60,27	67,38	12,79	4,25	17,05
Razlog	24 396,9	15 625,6	5,81	49,28	55,09	6,58	2,19	8,77
Sandanski	54 345,0	34 847,7	12,93	109,78	122,71	14,67	4,88	19,55
Satovcha	17 589,6	13 931,6	4,19	35,53	39,72	5,87	1,95	7,82
Simitli	34 886,7	17 426,2	8,30	70,47	78,77	7,34	2,44	9,78
Strumyani	21 190,3	12 700,6	5,04	42,80	47,85	5,35	1,78	7,13
Hadjidimovo	14 680,9	16 067,2	3,49	29,66	33,15	6,76	2,25	9,01
Yakoruda	21 000,2	10 940,2	5,00	42,42	47,42	4,61	1,53	6,14
total	**363 593,6**	**229 760,1**	**86,54**	**734,46**	**820,99**	**96,73**	**32,17**	**128,90**

M-I – Material services; **R/C/S** – Regulating, Cultural, Supporting services; **Com.** – Combined services ***Forest area** – M-i 238 BGN/ha/yr. ;R/C/S-2020 BGN/ha/yr.; Com- 2258 BGN/ha/yr. ** **Agricultural area** – M-i 421 BGN/ha/yr. ; R/C/S- 140 BGN/ha/yr. ; Com- 561 BGN/ha/yr.

Blagoevgrad district is located in the southwest Bulgaria. It is the third-largest in total area of 640 142.4 ha. In the area are located mountains of Rila, Pirin, Belasitsa Slavyanka Vlahina etc.., And National Park "Pirin" and part of the National Park "Rila". Because of its rich heritage of geothermal energy the field is suitable for the development of wellness and ecotourism.

As we have into account total area of the territory occupied by the forest ecosystems in it (363 593.6 ha) amounted to 56.8%. This value indicates characteristic feature of the area ie prevailing influence and importance of forest territories. Agricultural (agrarian) land amounts to 35.9% (229 760.1 ha) of the total area.

As stated above, the relevant territory in Blagoevgrad district carried out various activities aimed at the realization of a particular type products (eg, harvesting of wood or agricultural production). Essentially, these activities do not reflect the full potential of the area both in terms of immediate economic results and in terms of activities on protection of the environment. Table 2 is an attempt to summarize the results of ecosystem services which are in a position to realize in agricultural and rural areas.

Ecosystem services provided by the forest areas amount to approximately 821 million BGN / ha / yr., Including material service ~ 86 million BGN / ha / yr. Regulatory / cultural / support ~ 695 million BGN / ha / yr.

Ecosystem services from agriculture (agricultural) areas are estimated to be 129 million BGN / ha / yr., Of which 97 million BGN / ha / yr. are material services. Regulatory / cultural / support ~ 32 million BGN / ha / yr.

Deserves to be paid attention on Garmen and Blagoevgrad district, the results of which showed that deserves attention is the potential available to this area and consequently the opportunities which follow can be used for development of tourism.

Relative to area of Blagoevgrad conclude approximately equal distribution of proportion with the exception of Sandanski municipalities (16%), Blagoevgrad, Petrich (10%).

On the territory of Blagoevgrad the largest share of the forest areas owns Sandansi community that can benefit from ecosystem services relevant to forest areas, 122.71 million BGN / ha / yr and rural areas, 19.55 million BGN / ha / yr, the next municipality has lots of forest areas and agricultural areas respectively 67.38 million BGN / ha / year and 17.05 million BGN / ha / yr is a municipality of Petrich, Municipality of Garmen, Bansko, Blagoevgrad have approximately same territory and the amounts received by ecosystem services are the same difference between the other small municipalities.

Blagoevgrad district in total for value of ecosystem services, forest area is about 820.99 million BGN / ha / yr, while agricultural territories around 128.90 million BGN / ha / yr.

CONCLUSION:

Analyses have been made and exploring of the benefits of working in different sectors in the economy of Blagoevgrad district In respect of resource use (the example of forest and agricultural areas) and relate this to to activities involving protection of the environment. Stress is put on need for deeper understanding of the benefits of using natural resources and resources in the area order to obtain much better results, coupled with a better understanding of the activities for environmental.

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Small and Medium Enterprises and Their Impact on the Environmental Situation in Bulgaria

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***Abstract*:** *We performed a study of SMEs in Bulgaria. Analyzed data on the structure, scope of activities and their location in different administrative districts in the country in relation to assessment of the condition of the environment.*

Keywords: *Small and medium enterprises (SMEs), environmental protection*

INTRODUCTION

Among the main goals of normal transition in our economy restructuring, financial stability and achieve sustainable economic growth rates. Definite role in achieving these goals is the small and medium business. Small and medium enterprises (SMEs) as its organizational form is a flexible tool for solving economic and social problems. The role of SMEs in the process of accession the Bulgarian economy to the EU economy is linked to the place they occupy in the strategy of structural transformation. The creation of significant sector of SMEs is a stimulating factor for development of the economy because it facilitates adaptation to the emerging new environment of the European Economic Area.

Participation of SMEs in national economic structures and their role as an instrument of economic policy are not only national but also at regional level, conditioned the need for their thorough research. It is related to the place of SMEs in solving certain socio-economic problems of areas with specific characteristics.

I. STAGES IN THE THE DEVELOPMENT OF SMES

Specificities in the economic development of Bulgaria arising from limited resources (quantitative and qualitative terms) are imposed a SMEs as an important sector in its the holding in almost all stages of its development.

The process of creating and strengthening of SMEs in the economy can be conditionally sections of four stages. The first starts from and continues do 1944g the Liberation. SMEs were the predominant form of the holding organization. Together with the advanced broad artisanal production have existed and larger enterprises set by researchers Yurukov M., Iv. Batakliev ,V. Kanchov like factories. They are were engaged in the tobacco trade, milling, manufacturing of furniture, ceramics, extraction of coal and building materials.

The second phase begins from 1944 and continues until the 80s of the twentieth century. With the industrialization of the country goes to the new forms and principles of construction of the national economy. Small businesses are replaced by large and often ineffective the, overburdened by bureaucracy production units. In a study area to create large enterprises in number of sectors. By the beginning of 80s the policy liquidate largely SMEs whole territory.

The changes in the macroeconomic environment and the "defects" that indicate large enterprises lead to reassessment of the SMEs. Thus began the third stage of development of the process. The following are several normative documents which return the economic scene SMEs*. Creates coordinating authority - Bulgarian Industrial Economic Association. By Decree № 56 builds on the company of our economy and allow the formation of SMEs based on private property. During this stage, Bulgaria emerge development plants in dozens of cities and villages as affiliates of larger enterprises in the country.

In the current (fourth) stage government policy is aimed at creating optimal conditions for the establishment and development of SMEs, because they are one of the conditions for its operation. Act was adopted SMEs (1999), who later undergoes a few additions and amendments, and regulations for its implementation. Created shall be SME Agency of the Ministry of Industry. SMEs have several advantages such as high flexibility and adaptability, a simplified management, organizational and production structure, are highly motivated the owners-managers, strong social impact on local and regional level and others.

II. FEATURES IN THE THE TERRITORIAL LOCATION OF SMES IN BULGARIA

The goal of the analysis is to show the territorial peculiarities in available to SMEs and the factors influencing occurrence and its development in Bulgaria. The analysis is secured with statistics for 2010., And 2011. It clearly showed interesting tendencies and dependencies in the distribution SMEs by sectors of the economy.

The first factor influencing the formation of small and medium enterprises in the area is the location of a town or village in the system of settlements in the countryas well as its functions. The settlement affect by its size, location and administrative structure of the settlement. The more one big city and there are communication infrastructure and connections to other cities, so it is more attractive for investment in SMEs.

Another factor affecting the localization and development of SMEs is the natural potential of the city and its adjacent territory. Collateralisation with raw materials and energy resources is an important factor the localization of SMEs in the settlement even when the its production activities is not directly dependent on the them. Usually the the processing industry require very good value provision from the raw materials for the production and water resources, so they occur in the immediate vicinity the raw material manufacturer in order to reduce transportation costs.

Thirds, is the human element. It is decisive for the development prospects of SMEs in Bulgaria. Highly qualified professionals at European level in the Bulgarian business in the SME transform it into competitive on the European market. Development of SMEs in competitive environment imposes requires the providing them with with high qualifications footage. For this purpose, have significant role and a number of EU funded programs. They offer very good possibilities for retraining and lifelong learning, training courses in various spheres of activity and more.

In information (2011) for the number of SMEs in administrative districts represented in the graphs (Figure №1, Figure №2) are observed dependencies.

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* - Council of Ministers Decree (CMD) №5 by 1979 ;CMD №12 by 1982 ;CMD №33 by 1984

Fig.№1 *Sectoral breakdown for North Bulgaria*

Fig.№2 *Sectoral breakdown for South Bulgaria*

Predominate areas in which there is a balanced distribution of SMEs sectors. Nearly upon all areas at most of the SMEs the tertiary sector. Predominate mainly by SMEs, tourism, transport and communications, trade and others. Next the second highest number of SMEs ranks secondary sector, have a balanced location of firms in industry and construction.

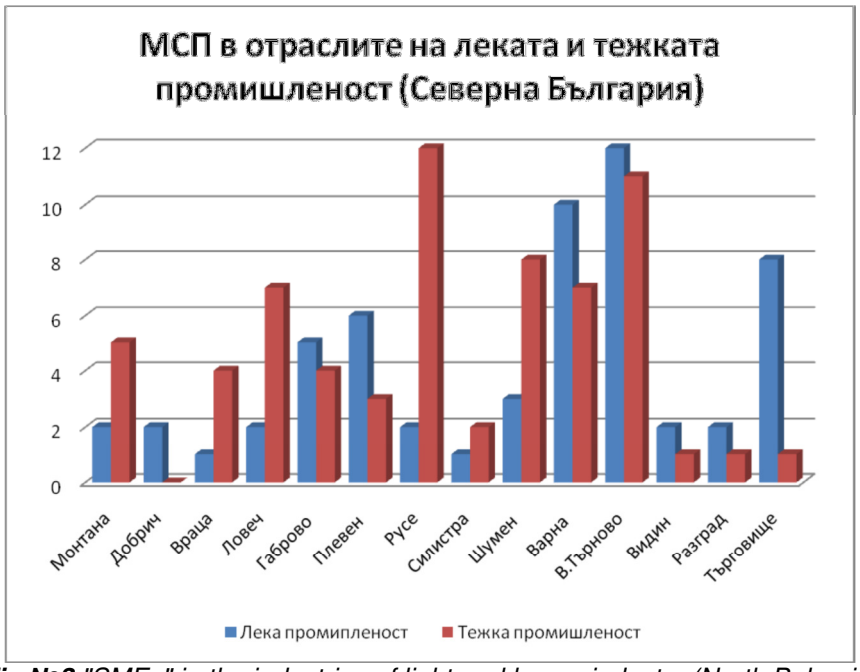

Fig.№3 *"SMEs" in the industries of light and heavy industry (North Bulgaria)*

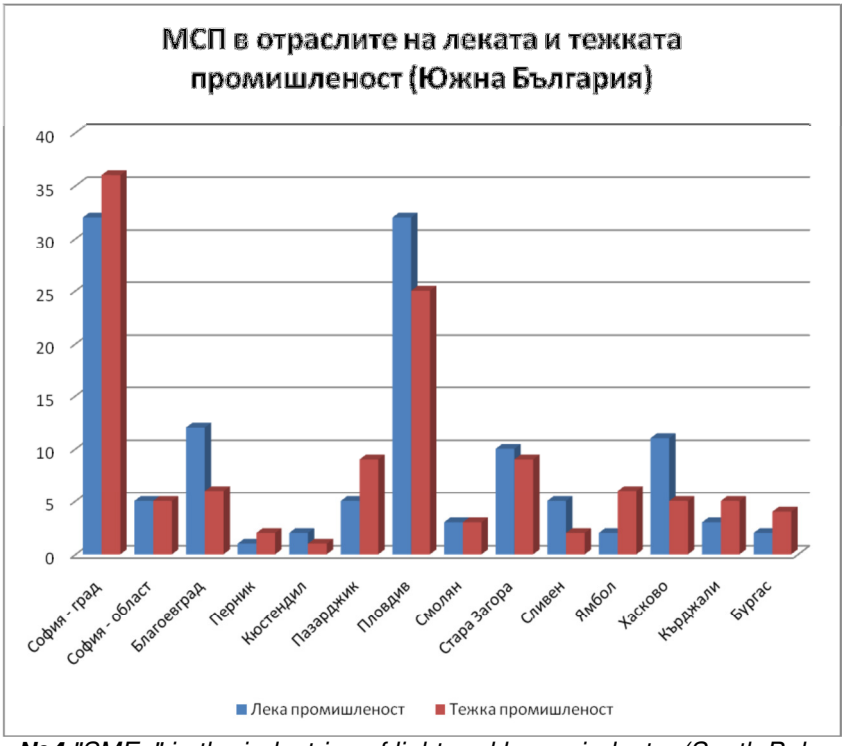

Fig.№4 *"SMEs" in the industries of light and heavy industry (South Bulgaria)*

Of industries was observed clustering of companies in the SME sector in light industry - activities and processes related to the production of garments, footwear, food and beverages. The second highest importance are the companies producing chemical productsand metallurgy, manufacture of metal productsmachines and equipment, and more. The smallest share at companies in the primary sector. They are agriculture, forestry, hunting and fishing, extraction of raw materials - mining and quarrying. Despite the good agricultural and climatic conditions and agricultural ecological environment in the country, SMEs in the agriculture sector structure missing the areas - Dobrich, Vidin, Blagoevgrad, Kyustendil, Pernik, Pazardzhik. This may perhaps be due to consolidation of agricultural lands, followed by an the entering of foreign investments. For this reason SMEs lose positions in the sector. At the same time, most small farmers do not have sufficient motivation to register as suchwhich further negatively affects the their sector presence. This trend is included. and areas with the most favorable conditions for the development of agriculture and livestock in the country.

SMEs and their development are "the backbone of the economy" and are an indicator of its development. Material impact in the last years on the development of small and medium business in Bulgaria is the global economic crisis. In order to survive small and medium business in the conditions of economic crisis are important conceptual creative like - the automation of the various industries search of new markets for their products, creating new products, the emergence of new materials for greater labor productivity and a lower final price of the product for the consumer. "A new era" in the development of small and medium enterprises will come with the establishment of a favorable environment for the its existence.

For example, the entry into operation of the e-government could greatly reduce bureaucracy and the wasting time and funds the part of business. Another measure to stimulate the development of SMEs are various tax incentives and relief for the recruitment of students and young professionals.

CONCLUSION

Analysis of the structure and the territorial distribution of SMEs shows that in terms of their impact on the environment components needed more specific and specific surveys. Available information (used in the present study) is a good base and position in this regard. It is necessary to a deeper to clarify the specific peculiarities in the different administrative districts in the country and to identify the specific impacts of the different industries that are represented in setting up and the existence of small and

medium enterprises. In such a way much will be clearly identified their role in the environmental protection.

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Present Day Small Glaciers on the Balkan Peninsula

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***Abstract**: The paper makes a short revision of the presently existing small glaciers in the mountains of the Balkan peninsula and of the fluctuation of their size in the last decades. Results for the last observation year (October 2011 – October 2012) are obtained during authors' own field studies.*

***Keywords:** small glaciers, glacierets, Albanian Alps, Durmitor, Pirin.*

1. INTRODUCTION

Glaciers have been widely known to be among the best indicators of short-term climate variations. One of the most obvious consequences of the global warming in the last three decades is the retreat of glaciers almost everywhere on Earth. Although having no glaciers of their classical type, the Balkan peninsula hosts the present-day most southerly situated patches of permanent ice. These are found in the Albanian Alps (Albania), Durmitor (Montenegro) and Pirin (Bulgaria), and are proved to have existed without a complete melt at least since the beginning of the Little Ice Age (XIV c. AD) [1],[2],[3],[9],[10]. All these small firn-ice patches (areas of several decares to several hectares), are situated above 2000 m a. s. l., below the regional snow line due to a favourable combination of local environmental conditions: northerly aspect, strong shading by high rock walls (usually from three sides), a carbonate bedrock that supports the drain of glacier meltwaters and hinders the melt at glacier base, great actual ammount of snow precipitation that falls over glacier surface (usually most part of it comes as a windblown snow and avalanches from adjacent areas.

2. SMALL GLACIERS ON THE BALKANS - AN OVERVIEW

The Albanian Alps form the south-eatern end of the central Dinaric chain (fig. 1, 2). They are situated to the NE of Shkodra lake and to the west of the field of Metohija (Kosovo). This mountain system consists of several ranges that converge at the highest massif of Maja e Jezerces (Ezerski vrh, 2694 m a. s. l.). The highest western part of the massif, which is built up of limestone, is probably the most heavily glaciated mountain area in the

Balkan peninsula during the Pleistocene, and this resulted in the creation of the most rugged mountain topography in the region - a vast area of barren rocks an screes, inaccessible needle sharp peaks and aretes.

According to the latest studies [5] the existence of seven permanent ice patches was recorded in the Albanian Alps. Five of them are located below the north facing walls of the highest peak Maja e Jezerces at altitudes between 2320 and 2570 m a. s. l., one is found more to the SW - on the ridge Maja e Made (Mertur) at 2320-2480 m a. s. l., and one to the NE, below the north 200 m high cliffs of the 2562 m high Dobra Kolata peak (tab 1). Two of these seven features have the appearance of *small glaciers* – with formed glacial tongues and crescent shaped end moraines. The others more resemple *glacierets*: with relatively flat strongly inclined surface (35-45°), without formed tongues, their width is often greater than length.

For the last two years (2011-2012) the area each of these features occupy was calculated to be in the range of 1.3 to 2.9 ha. On this basis it was found that at present the largest present day small glacial feature on the Balkan peninsula is the glacieret Maja e Jezerces III in the Albanian Alps.

The Durmitor mountains located in the NW corner of Montenegro, are the second highest within the main Dinaric chain (2523 m a. s. l.). Quite small in size, they rise over a flat karst plateau at 1450-1600 m a. s. l. To the NW and SW Durmitor is bordered by the deep canyons of the rivers Tara and Piva. To the east is the connection to the adjacent Sinjaevina Mts. Durmitor's main ridge rises to 2200-2500 m a. s. l. and forms a 20 km long arc opened to NE. The highest peak, Bobotov kuk, is situated almost in the centre of the mountain. Four major side ridges crawl out to the north of the central crest.

The main part of Durmitor is built up of mesosoic limestone with a considerable thickness [5]. The mountain was heavily glaciated during the ice ages, which resulted in the formation of deep cirques surrounded by high cliffs, especially on the northern slopes. During the holocene the relict glacial landforms have been subjected to a strong karstification, and this created a chaotic topography with numerous sinkholes and caves. At present the mountain receives quite abundant precipitation – about 2600 mm/y, most falling as snow in winter [1].

Debeli Namet is the only small glacier in the Durmitor mountains at present. It is located in Velika Kalica cirque – one of the narrowest and at the same time deepest north facing cirques. The cirque resembles a vast bath opened to NNE, about 2 km long and 500 m wide. The cirque is surrounded by the highest and the longest continuous cliff in the Durmitor mountains (200 to 400 m tall). To the south, beyond the cliff is found the flattened plateau-like surface of Sljeme ridge (2451 m a. s. l.) with several karstic deoressions on it.

The glacier is situated at the southern end of the cirque bottom, below an amphitheatre of rocks. It is usually about 300-350 m long and 130-150 m wide. A well shaped tongue is observed in glacier's lower end. It is surrounded by a huge curved moraine which dates from the end of 19th century [8].

The Pirin mountains in South-west Bulgaria are part of the large Rhodope massif, and are second highest in the country and third highest on the Balkans. Pirin is a strongly uplifted horst. The main ridge stretches from NNW to SSE, making numerous curves. Three main and several minor side ridges diverge to west and east, so the mountain obsesses a massive shape. To the north is located the highest mountain section, built up of premesosoic marbles. It rises up to 2915 m a. s. l. at Vihren peak Five large, deep and dry cirques are carved in the northeast slopes here. Permanent ice features, which have been categorized as microglaciers, or glacierets, are found in two of them. These are the Snezhnika glacieret in the cirque Golema Kazan under the NE wall of Vihren peak, and Banski suhodol glacieret in the cirque with the same name. The sufficiently smaller amount of precipitation falling annually in the highets parts of Pirin (about 1000 mm, [2]) is to some extent compensated by the lower temperatures, as the glacierets in Pirin are situated at much higher altitudes than those in the Western Balkans. They are also smaller in size.

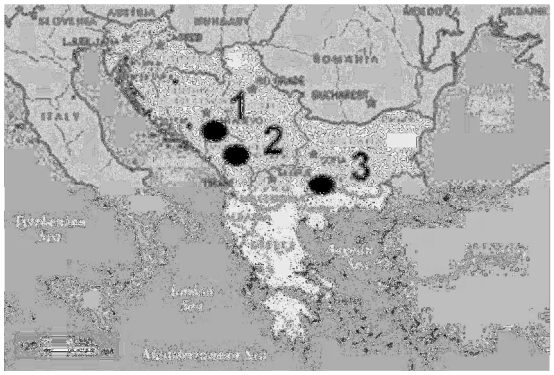

Fig. 1. Mountain locations on the Balkan peninsula with present day small glaciers and glacierets: 1 – Durmitor Mts., 2 – Albanian Alps, 3 – Pirin

3. RECENT CHANGES IN SIZE

Changes in the area glaciers occupy is easiest to register. Measurements are done usually in mid-September to mid-October, at the end of the ablation season. During this time glaciers are smallest in the year, and then the ice left in them is the final result of the balance: winter accummu lation minus summer melting. The size of small glaciers and glacierets varies quite much from year to year.

Tab. 1: Permanent ice features in the mountains of the Balkan peninsula

Name		Coordinates		Altitude	aspect	area	Type
		latitude	Longitude				
M. Jezerces I	1	42°26'43"	19°48'55"	2320 – 2380	NE	1.3 – 1.6	Glacieret
M. Jezerces II	1	42°26'40"	19°49'03"	2320 - 2410	NE	2.0 – 2.4	Glacieret
M. Jezerces III	1	42°26'28"	19°49'03"	2365 - 2570	E	2.9 – 4.9	Glacieret
M. Jezerces IV	1	42°26'43"	19°48'39"	2345 - 2520	NNW	1.6 – 1.8	Glacieret
M. Jezerces V	1	42°26'46"	19°48'30"	2320 - 2420	N	1.9 – 2.3	sm.glacier
Maja e Made	1	42°23'56"	19°53'02"	2320 - 2480	NNW	1.5 – 1.7	sm.glacier
Dobra Kolata	1	42°29'00"	19°54'06"	2250 - 2300	NNE	2.2 – 3.7	Glacieret
Debeli Namet	2	43°06'59"	19°04'07"	2035 - 2200	NNE	1.2 – 5.0	sm.glacier
Snezhnika	3	41°46'09"	23°24'10"	2400 - 2450	E	0.3 – 0.9	Glacieret
Ban.suhodol	3	41°46'55"	23°23'40"	2620 - 2745	N	1.0 – 1.2	Glacieret

Location: 1 – Albanian Alps; 2 – Durmitor; 3 – Pirin

In the years before, the small glaciers and glacierets in the Albanian Alps were studied by [10], [11] and [14]. According to the data presented there has been a considerable shrink of the small glacial features from the years 2006-2007 to the years 2011-2012. First of all, [11] reported about a glacier with an area of about 4.5 ha, situated NW of the Maja e Jezerces peak at 1980 - 2100 m a. s. l. (the so called Maja e Koljaet glacier). In October 2011 only a shallow snow spot was found there [5], and the same melted almost entirely in 2012. Comparing data in [10] and [11] with our measurements in 2011 [5], a 17% decrease in area was registered for the glacieret Maja e Jezerces I and II (together), and 10% for Maja e Jezerces III. However, these results might have generated some errors due to the difference in measurement techniques (we used GIS processing based on satelite and land photos). In the period between the autumns of 2011 and 2012 we registered a decrease in the size of all observed glacier features in the Albanian Alps. It was greater at Maja e Jezerces III and V (fig.2), smaller at Maja e Jezerces I and II, and smallest at Maja e Made glacier.

The Debeli Namet glacier in Durmitor has been better studied. Data about Its size in autumn for particular years is presented by [1] and [9]. Size for the years 1954, 1971 and 1981 is obtained from calculations on the basis of aerial photos [1], other measurements were done on the field. We measured the size of this glacier with a rope in the autumns of 2011 and 2012. Results (fig.3) indicate variations in size of a quite big amplitude (from 1.7 ha in 1993 to 5 ha in 2006), and no expressed tendency in the last 3

decades. During the last period (Oct. 2011 to Oct. 2012) we recorded a decrease in the area with 19% from 2.7 ha to 2.2 ha. Although the smallest since 2003, the size in 2012 is still much greater than in 1993 and 1998. The observed great amplitude of variations of the Debeli Namet glacier is to some extent a result of the specific morphology of the glacier bed, expressed in the presence of a steady rock surface at the upper end of the

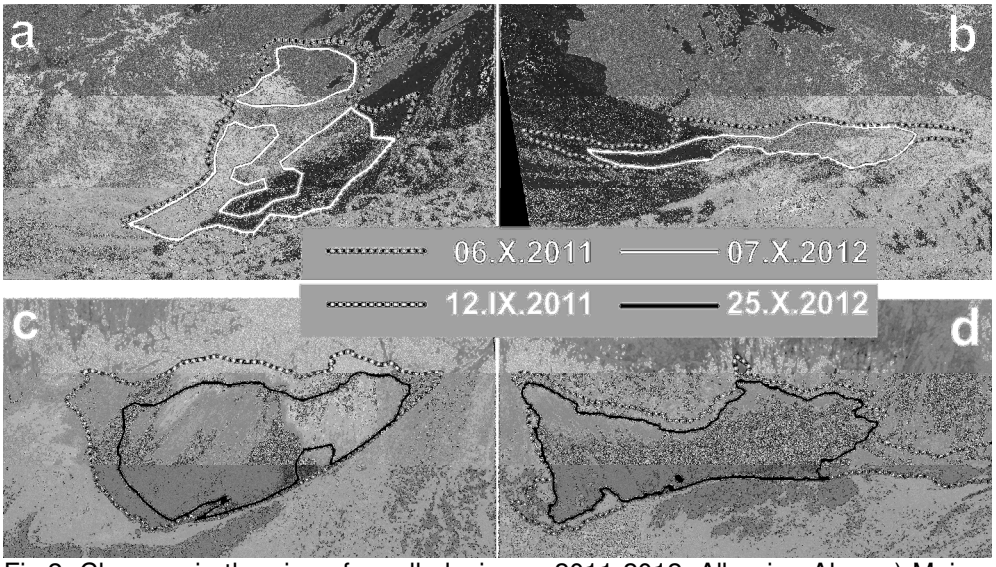

Fig.2. Changes in the size of small glaciers – 2011-2012: Albanian Alps: a) Maja e Jezerces III; b) Maja e Jezerces V; Pirin: c) Snezhnika; d) Banski suhodol

firn surface, before the back rock wall. This makes the glacier expand more in an upper (backward) direction in colder and snowier years.

In the Pirin mountains, Snezhnika glacier has been studied since 1957. The first research was done by [12]. [6] and [7] presented results from regular annual size measurements in the period 1994–2007. Since then the area was recorded by [2],[3] and [4]. Here also no clear trend has been observed in the last 20 years (fig 3). A 37% shrink was registered between September 2011 (0.54 ha) and October 2012 (0.34 ha) (fig 2).

Banski suhodol glacieret has been monitored since 2009, when its area was measured to be about 1.2 ha [4]. Photos made by us every autumn in 2009-2012 showed the considerable stability of the glacieret and quite small variations. The exception is the period from September 2011 to October 2012, when a reduction of area by about 25% is observed (fig 2).

4. CONCLUSION

Still at least ten small glacial features (glacierets and small glaciers) are found in the mountains of the Balkan peninsula – 7 in the Albanian Alps, 1 in the Durmitor mountains of Montenegro, and 2 in the Pirin mountains of

Bulgaria. This is the only region of Europe where such exist south of the 42nd parallel (in the Pirin mountains). Although these ice patches are quite small in size (up to 3 ha), they were proved to have presisted without a complete melt at least for the last 600 years, which means they are more glaciers than snow patches. Regular observations in the last decades show considerable variations of size from year to year, but without a general tendency towards shrink, contrary to most glaciers in the world. A relatively good concordance has been observed in the dymanics of Debeli Namet and Snezhnika for the period 2005 - 2012 (fig.3). The most important factor for glacier fluctuation in Balkan region seems to be the summer temperature. This was demonstrated in the last year (October 2011 to October 2012), when the great amount of fallen snow in winter was followed by an extremely hot summer (see the climatic analysis in [13]). In result all small glacial features in the peninsula underwent a considerable shrink.

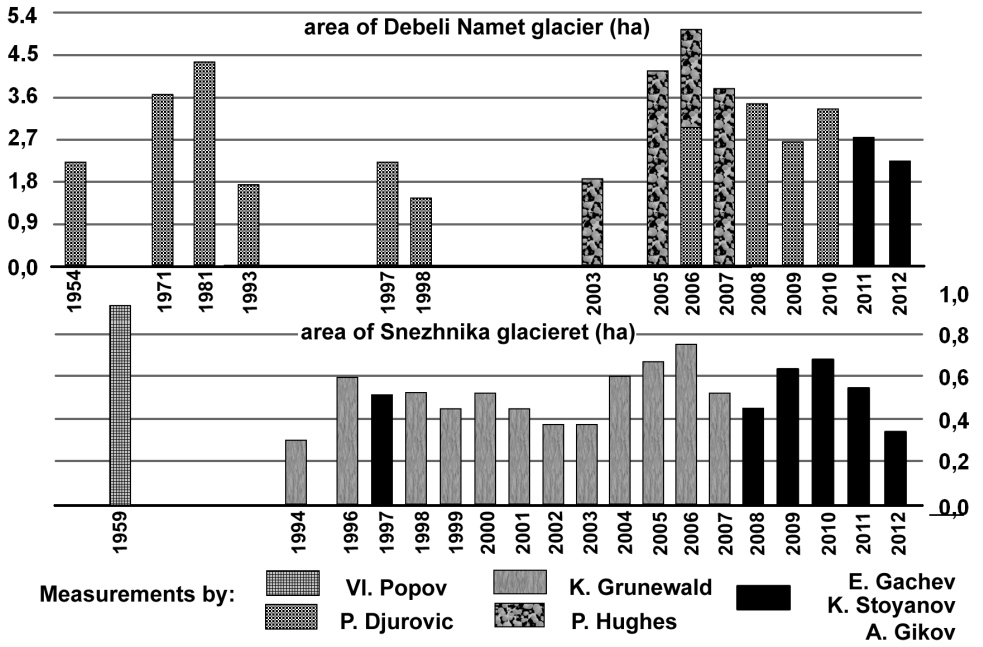

Fig.3. Size (area) measured in autumn of Debeli Namet glacier (Durmitor) and Snezhnika glacieret (Pirin), based on data by [1], [2], [3] and this paper.

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Climatic controls over the recent development of small glaciers on the Balkan peninsula

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***Abstract**: The paper presents an analysis of the long-term climate conditions that support the existence of few small firn-ice patches (small glacierets and glaciers) in the mountains of the Balkan peninsula and the recent changes in these conditions. Along with this, a special attention is paid to the climate conditions in the high mountains in the last two years – 2011 and 2012. The abnormal heat of the last two summers caused a serious shrink of glacier size and mass throughout all the Balkan peninsula.*
***Keywords:** small glaciers, glacierets, temperature, precipitation.*

1. INTRODUCTION

As it was already mentioned [7], at present there are favorable environmental conditions (climatic, geological and geomorphic) for the presence of various nival features: snow fields, glacierets and small glaciers, in three mountain massifs throughout the Balkan peninsula. These are the Albanian Alps, the Durmitor (Montenegro) and the Pirin mountains (Bulgaria) (see fig. 1 in [7]). Although smaller in size than previously, these nival features managed to survive even in the last decades, marked by extraordinarily high temperatures.

Small glaciers of Southern Europe exist in marginal conditions – situated much lower than the present snow line, in strongly shaded parts of deep north-facing relict Pleistocene (Wurmian) glacial cirques. On the Balkans permanent ice is found only in high mountains built of carbonate rocks – limestone and marble, as these rocks are light in colour and have higher albedo than most silicate rocks. In summer, glacier meltwaters sink in the karstic caverns and leave the bottom of ice bodies dry, thus hindering their melt. The great accummulation of snow in winter is vital for the multi-annual preservation of ice mass. The high amount of winter precipitation, which is typical for the Mediterranean climate, is not enough to compensate summer heats. That is why premament ice can survive only in locations where strong shading (usually from three sides) is combined with a great additional amount of snow, which does not come directly from the sky, but is transported from the adjacent slope and summit surfaces by the wind (a windblown snow) or by avalanches. Thus the actual precipitation over

glacier surface can be twice bigger the sum of atmospheric precipitation itself.

Small glaciers of Southern Europe are climate sensitive [9], and this makes their research important. Although persistent in long-term sense, they are subject to large variations of their size and mass from year to year: they appear as a direct result of the variations of local climate. To estimate local climate is a real chgallenge, as *on site* climatic data is almost absent. That is why researchers need to use information from remote locations, and should have good knowledge of geography and mountains.

2. PRESENT DAY SMALL GLACIERS' CLIMATIC BACKGROUND

The climate of the Dinaric Alps, of which both the Albanian Alps and the Durmitor are part, is determined by the proximity to the Adriatic sea (about 70 km to the highest central ridges) and the configuration of the whole mountain chain which is parallel to the coast. In result, slopes turned to west and southwest, which appear windward, gain abundant precipitation carried by warm, damp and vertically unstable air masses, formed over the Adriatic itself. Especially great are precipitation amounts near the gulf of Kotor (Boka Kotorska) where the maximum average annual precipitation in Europe is registered – Crkvice station: 4622 mm [1].

As there are no operating climatic stations in both the Albanian Alps and the Durmitor, the analysis of climate is done based on meteostations located elsewhere in the region. As basic stations are considered: Žabljak at 1450 m a. s. l., situated at the NE foot of Durmitor, Vermosh at 1152 m a. s. l. in the valley of Grncar river north of the Albanian Alps, the stations Plav, Berane and Rozaje, located in the valleys of the rivers Lim and Ibar (northeast of the Albanian Alps). For reference we use data from Bjelašnica (in Bosna i Hercegovina) located at 2067 m a. s. l. north-west from the Durmitor mountains (fig. 1).

The average annual air temperatute at Vermosh is 6.7ºC according to [13], while at Bjelašnica it is 1.2ºC [1]. When we have in mind these values, along with the fact that Bjelašnica is located more to the north (43°48' N, about 200 km to the NW from Prokletije Mts.), we can conclude that in Durmitor the annual average air temperature at 2000 m a. s. l. should be about 1.9 to 2.0°C while in the Albanian Alps, 2.3 to 2.4°C. This is exactly the altidude of the lower end of Debeli Namet glacier, as well as of the former large glacier in the Albanian Alps, which was described by [12] but was found to have melted by 2011 [6]. As it can be seen, these temperatures are quite high to sustain permanent ice, but one should bear in mind that the most important for glacier survival is summer temperature rather than

Fig. 1. Location and altitude of the used climatic stations in the Western Balkans

the annual, and winter temperatures are not critical for this. That is why maririme climates usually have climatic snow line placed at lower altitude than continental climates. This difference gets bigger due to the greater precipitation in maririme climates. In Durmitor during the pleistocene ice ages the snow line dropped down to 1400-1600 m a. s. l. [2], while in the Pirin it was no lower than 2200-2300 m a. s. l. [15].

The warming, which has occurred globally during since the 80s of the last century, has been also felt in the mountain areas of the Balkans. At Bjelašnica the annual average air temperature for 2001-2010 is also higher than the standart period: 1.6℃ [17]. Thus the termal conditions for the preservation of glaciers has been getting worse during the last decade.

As already mentioned, the mountains close to the Adriatic coast receive abundant precipitation, especially over the SW slopes. At Boga village in the SW foot of the Albanian Alps, average annual sums above 3000 mm were recorded in the second half of the 20th century [13]. Precipitation amounts decrease to NE, where the valley of Lim and Ibar are in a rain shadow: Plav, 1078 mm/y; Berane, 924 mm/y; Rožaje, 885 mm/y [18]. This is a non-steady decrease that depends locally on slope aspect, the character of topography and prevailing air currents. It is known that even small mountain barriers can exert a sufficient influence on the distribution of precipitation. For instance, at Kolašin station, located in the valley of Tara river 80 km away from the sea, the annual precipitation is 2139 mm, and at Žabljak, which is even further and is in a rain shadow: 1458 mm [18]. It can be suggested that the precipitation within the highest mountain interior of both Durmitor and the Albanian Alps are about 2000 mm or slightly more (about 2600 mm/y is proposed by [2]).

Another important peculiarity of the precipitation not only in the region, but in general in the southern half of the Balkan peninsula, is their

concentration in the cold half of the year, which supports snow accummulation in mountains. Autumn and winter are the seasons with the maximum share in the annual sum: in the region each of these seasons has from 25 до 34% of the annual total. The minimum is in summer: about 15-20%. Only the station of Rožaje far to the NE has a temperate continental precipitation regime with a maximum in summer (28%) and a minimum in winter (22%) but differences are small. For all other stations the highest montly sums are measured in November: from 100 to 300 mm, although below 1500 m a. s. l. they are most of all in the form of rain. Winter sums, which are most important for snow accummulation in mountains, are impressive: Plav, 356 mm; Žabljak, 362 mm; Berane, 251 mm [18]. In winter rain predominates at altitudes below 1000 m a. s. l. due to the high average and maximum temperatures: Žabljak, +0.3°C; Kolašin, +2.7°C; Plav, +3.4°C. Between 1000 and 1500 m a. s. l. precipitation is mixed, while above 1500 m most of it ts snow. In cold winters however snow prevails also at low altitudes, and this leads to a formation of very thick snow cover there. Thus, during the cold February of 2012 the height of snow at Kolašin reached 192 cm, at Plav, 165 cm, and at Žabljak, 208 cm. For the first two stations this has been an absolute record! [18].

In the mountains the snow cover is quite unevenly thick, due to the diverse topography and the position in relation to prevailing winds. Locally, conditions appear for the accummulation of very thick snow drifts, especially in negative forms, and this is probably the main factor for the formation of small glaciers and snow fields in the mountains of the Balkan peninsula. Such favorable conditions can explain the existence of two glacierets in the Pirin mountains, despite the much smaller precipitation in comparison with the Dinarides. For the Debeli Namet glacier in the Durmitor, [10] calculated that the actual sum of precipitation necessary to ensure stability of the glacier at present temperature conditions, is about 5100 mm/y – i. e. about twice the atmospheric precipitation. For the glaciers near Maja e Jezerces, the same author ([11]) calculated a necessary sum of 4137 to 5531 mm.

The eastern part of the Balkan peninsula has a much drier climate. Based on calculations and on a measurement for a number of years (1957-1959), the average annual precipitation in the highest parts of northern Pirin is about 1000 mm ([14]). However, glacierets in Pirin are at higher altitudes than those in the Dinarides, so the defficit of precipitation is partly compensated by lower temperature. According to an extrapolation for the period 1973-2005 [8] calculated an average annual temperature about -0.6°C for the site of Snezhnika glacieret (2450 m a. s. l.), and the temperature is even lower at Banski suhodol glacieret, which is situated between 2620 and 2745 m a. s. l. (about -1.7°C according to [5]).

The climate in Bulgarian mountains has also been a subject of warming for the last three decades. Average annual air temperature at Musala peak

for the decade 2001-2010 (-2.3℃) is 0.5℃ higher than the average for the last 30 years (-2.8℃) [4],[16]. At the same station only 4 out of the last 20 years have temperatures lower than the averages for the normal period 1961-1990 [19].

3. THE SEASON 2011-2012

The last two years were completely in line with the general tendency towards above normal summer temperatures over the Balkan peninsula. Comparison to the standard period (1961-1990) at two high mountain stations: Musala peak (Bulgaria) and Bjelašnica (Bosnia and Hertzegovina) show expressed anomalies especially for July and August, but also for the annual averages (tab. 1).

Tab. 1: Temperatures for the warm half of the year: long-term monthly averages (standard period), and monthly averages for the years 2011 and 2012 ([1],[17],[19])

station	Alt.	period	month						Average V-X
			V	VI	VII	VIII	IX	X	
Musala peak	2925	1961-90	-0,9	2,5	5,1	5,4	2,6	-1,2	2,3
Musala peak	2925	2011	-1,3	3,3	6,6	7,4	4,9	-2,3	3,1
Musala peak	2925	2012	-0,2	6,4	9,4	7,4	5,4	1,5	5,0
Bjelasnica	2067	1952-70	3,0	7,8	9,6	9,6	7,0	2,9	6,7
Bjelasnica	2067	2011	3,8	8,4	10,9	12,8	10,5	1,3	8,0
Bjelasnica	2067	2012	3,2	11,7	13,9	13,7	9,4	5,5	9,6

The monthly temperatures in the summers of 2011 and 2012 in the high mountain areas of the Balkan peninsula were higher than the standard averages by 0.8 to 2.9℃. These differences were more pronounced at Bjelašnica than at Musala peak. The summer of 2012 has been the hottest in Bulgaria since the beginning of climatic observations. In the Western Balkans, June 2012 has been ever hottest at 4 stations in Montenegro, and July 2012 has been the hottest in Montenegro for the last 60 years in 14 climatic stations [18]. August 2012 was also very hot, as record highs were registered in 4 stations.

At the same time, in 2011 the quantity of precipitation was quite below the norm. The total annual sum at Musala peak for that year was only 573 mm [19] (about half the normal), and a sequence of months with amounts below normal was registered in winter and spring. 2011 was also very dry for the whole territory of Montenegro: absolute minimums were recorded for a number of stations close to the coast. For instance, Podgorica had an annual total of 844 mm (the average is 1658 mm) [18].

The winter of 2011 was also poor in snow at Bjelašnica: the thickness of snow cover for March 2011 was only 70 cm (tab. 2).

Tab. 2: Average monthly snow cover thickness (cm) at Bjelašnica station in March and April for the last 8 years [17]

Year	March	April	Year	March	April
2005	266	141	2009	274	90
2006	318	229	2010	179	123
2007	159	98	2011	70	36
2008	143	158	2012	179	92

In 2012 precipitation was also under the norm, but the anomaly was much less expressed than in 2011. In contrast to the previous year, the winter of 2012 was unique with extraordinarily thick snow cover, but it rapidly melted during the extremely hot summer.

4. CONCLUSION

In the mountains of the Balkan peninsula, the climate at the sites where small glaciers and glacierets still exist, is characterized by relatively high air temperatures, both annual and summer, because of the more southern latitudes compared to the areas in Europe, where there is a classical mountain glaciation. At just few sites the income of snow in winter is so great that it is able to overwhelm the high ablation rates during the usually hot summers. In fact, in our region a glacier cannot survive the hot summer relying on just the atmospheric precipitation even in the wettest mountain locations. This is possible only if there is an enormous additional income of snow from adjacent areas: blown by the wind or transported by avalanches. That is why the distribution of the 10 permanent ice patches in the Albanian Alps, the Durmitor and the Pirin mountains [7], is strongly determined by local topography.

The last two years: 2011 and 2012, were characterized by abnormally high summer temperatures and dryness at the same time. These anomalies were observed all over the Balkan peninsula. Such climatic factors were highly infavourable for the existence of small glaciers and a serious shrink was registered for all of them [7]. On the basis of our continuous observations, and also taking the previous studies [3],[8],[11],[12] into account, we suggest that the steady state of Balkan small glaciers in the autumn of 2012 has been the minimum for the last 10-12 years.

The climatic situation in 2012 proved that the effect of the greater snow accummulation in winter can be completely neglected by the high summer temperatures, and that these temperatures are indeed the main factor which causes inter-annual variation of the size and mass of small glaciers, at least in our region.

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Productive characteristics of soils in the municipality of Yastrebovo, Stara Zagora district

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Abstract: *Soil resources in Bulgaria have high productive potential, regulatory and buffer functions. They are subjected to natural and anthropogenic degradation which adversely affect the functioning of ecosystems.*

The existing organization within the agricultural land reform after the restitution of their property creates significant obstacles to agricultural production and application of spectacular anti soil erosion and other soil conservation and improvement practices and systems.

The purpose of this paper is to determine the characteristics of soil resources and assessment of agricultural land near the village Yastrebovo. To achieve this objective it is necessary to solve the following tasks:

1. *Detailed description of the main soil types prevalent in the area.*
2. *To determine suitability (productive capacity) of soil resources for crop.*
3. *To evaluate natural and anthropogenic degradation of soil resources and identify technologies to maintain and increase their fertility.*

The basis for solving these problems is to develop a GIS of Soil Resources (GISoSR) for the Site and using the following methods:

- *A critical analysis of available literature;*
- *Remote Sensing*

Keywords: *Geographic Information System of Soil Resource (GISoSR), bonitet, productive capacity of soil resources*

1. INTRODUCTION

The agricultural land is a major natural resource that man uses for his own gain. Without it is impossible existence. The soil cover of Bulgaria is characterized by great diversity, the diversity of the factors of soil formation - soil forming rocks, highly fragmented landscape and different bio-climatic conditions. Human activity has given and gives a deep impact on the soil. Unfortunately you do not always use it and thought appropriate to protect it. As a consequence, in our soils are plowed or heavily and destroyed or severely altered fertility in an unfavorable direction.

In our soils are affected by some natural processes such as erosion, dehumification, acidification, technogenic pollution, salinization, soil compaction secondary and seasonal surface waterlogged.

As a result of the land division agricultural lands were distributed among 5 million indigent owners of small plots of land. During this period were neglected, abandoned and destroyed many built before erosion and other soil improvement equipment.

Soil resources of Bulgaria have high productive potential, regulatory and buffer functions. They are exposed to natural and anthropogenic degradation which adversely affect the functioning of ecosystems.

The existing organization within the Agricultural Land Reform after recovery of their property creates significant obstacles to agricultural production and the implementation of spectacular protivoeroziynite and other soil conservation and improvement practices and systems.

The purpose of this paper is to determine the characteristics of soil resources and assessment of agricultural land near the village Yastrebovo. To achieve this objective it is necessary to solve the following tasks:

- Detailed description of the main soil types prevalent in the area.
- To determine suitability (productive capacity) of soil resources for crop.
- To evaluate natural and anthropogenic degradation of soil resources and identify technologies to maintain and increase their fertility.

The basis for solving these problems is to develop a GIS of Soil Resources (GISoSR) for the site and using critical analysis of available literature information, statistical analysis and remote sensing methods.

2. OBJECT AND METHODS

2.1. Geographical characteristics

Village Yastrebovo falls in Chirpan-Yambol agroecological region. This area covers the middle part of the Thracian lowland and northern lowland area Tundzha hilly area. The terrain is relatively flat, however, affected by tectonic movements prevalent sinking. Soil forming materials are mainly Pliocene clay deposits and less by Quaternary alluvial sediments with light mechanical structure.

The soil resources of the object are presented on Fig. 1 and agroecological regions – on Fig. 2.

2.2. Soil resources

The general view of the object is presented in Fig. 1.

Fig. 1: Soil resources of the object.

LEGEND

1. Leached Vertisols, clayly
2. Chromic Luvisols, thiny, with rendzinas
3. Chromic Luvisols – podzolic
4. Chromic Luvisols, sandy clay loam
5. Chromic Luvisols, dark colored and unsaturated
6. Delluvial and Delluvial Meadow, mainly neutral
7. Eutric Cambisols, very thiny and slightly leached
8. Calcaric Fluvisols and Meadow Calcaric Fluvisols

The soil cover of Chirpan - Yambol region is mainly composed of Leached Vertisols, Chromic Luvisols and Meadow Calcaric Fluvisols – Fig. 1.

Leached vertisols are the most common soil type in the area. They are distinguished by a powerful medium (50-80 cm) humus horizon and a powerful profile, heavy structure (65-75 % physical clay) and low differentiation texture (texture coefficient of 1.1), a significant organic content (2.5-3 % humus) and medium acidic to neutral pH (pH 5.8-6.8 in H_2O). A small part of the Vertisols is affected by weak erosion.

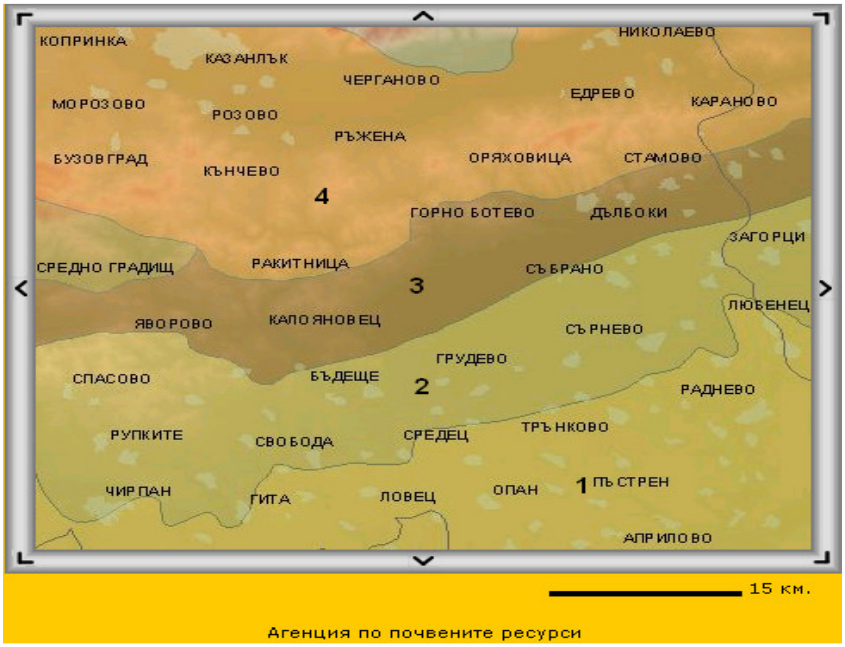

Fig. 2: Agroecological regions.

LEGEND

1. Chirpan - Yambol Region
2. Nova Zagora Region
3. The Bases of Sredna Gora and Rodopi Region
4. Karlovo - Kazanlak Region

Yastrebovo village is located in southern Bulgaria [11]. It is located in the Upper Trakia lowland, Opan municipality, Stara Zagora District. It is located in Chirpan - Yambol Agroecological Region at about 168 meters above sea level and has an area of 19,592 square meters. The population of the village is 416 people. The relief is flat and hilly. In the territorial scope of the Stara Zagora region covered field, parts of Central Forest, southern slopes of the Balkans and the Kazanlak cattle. The climate is transitional continental. The average annual temperatures are between 8° and 13° C, with a significant impact on the Mediterranean climate. The average annual rainfall is 577 l/m^2, which is below the national average annual rainfall. The natural vegetation is a forest (mixed oak) and grass.

The soil cover of Chirpan - Yambol region is mainly composed of Leached Vertisols, Chromic Luvisols and Meadow Calcaric Fluvisols – Fig. 1.

Leached vertisols are the most common soil type in the area. They are distinguished by a powerful medium (50-80 cm) humus horizon and a powerful profile, heavy structure (65-75 % physical clay) and low

differentiation texture (texture coefficient of 1.1), a significant organic content (2.5-3 % humus) and medium acidic to neutral pH (pH 5.8-6.8 in H_2O). A small part of the Vertisols is affected by weak erosion.

The studied soil profile of Pellic Vertisol near Yastrebovo village is presented in Fig. 3.

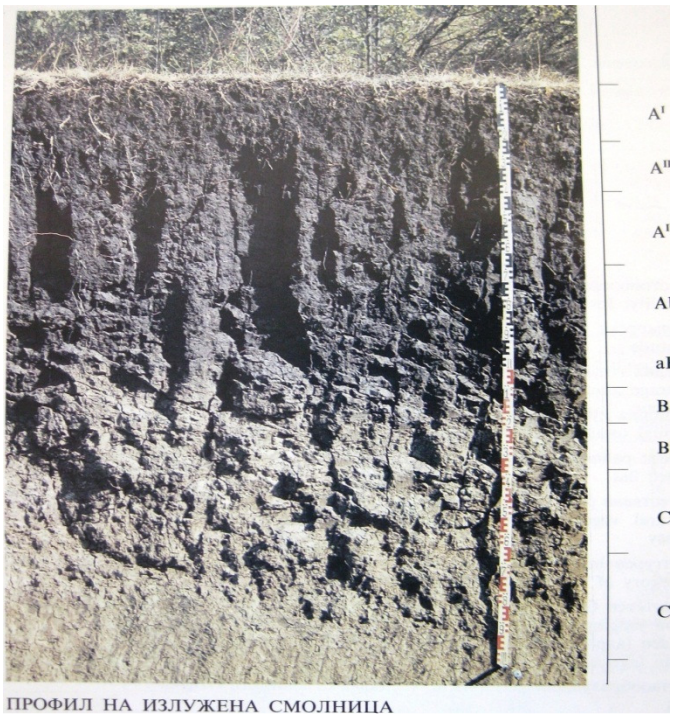

Fig. 3: Pellic Vertisol profile with natural vegetation.

2.3. Methods

For better using of GIS of Soil Resources a new version of the attributive table formation was created. This gives the possibility soil physical and water properties to be included into the table. The simulation procedure for soil hydro-physical properties determination was realized by using soil particle size distribution data only. This develops a calculation algorithm for soil water content dynamic monitoring, which was realized for some of Bulgarian soils by [4], with developed in his Ph.D. thesis simulation model. To perform the classification of the soil mechanical composition is necessary to pass from Kachinsky classification scheme [1], which is mainly used in Bulgaria to the USDA classification scheme developed in [2,3,9,10].

The survey instruments used ArcGIS 9.3 - ArcMap for objects, Visual Basic and Access to realize the determination of hydro-physical and hydrological properties of studied soils [5,6,7,8].

The derivation of soil moisture at field capacity (SMfc), soil moisture at wilting point (SMwp) hydraulic conductivity at full saturation (K0), effective water content (Tpwc), total porosity (SM0) from standard soil texture information, percent of sand, silt, clay according to the USDA classification scheme and soil texture classification for a given soil, are presented in Fig. 7. These data could be added in the GIS of soil resources attributive table.

3. RESULTS AND DISCUSSIONS

The main characteristics of the soil profile studies are presented in Fig. 4, and the soil texture in Fig. 5. The profile is characterized by slightly acid to neutral pH and poor texture differentiation – Tk=1.54. The humus content is from 4.88 A' horizon and decreases in depth. Carbonates appear in the B1 (118-134 cm) horizon and their content increases with depth to reach 4.91 in C1k horizon (less than 162 cm). In Fig. 6 presents the classification of soil horizons and soil profile according to soil texture (particle-size distributions). As shown in Fig. 6 horizons soil varies from clay loam in the A 'and A'' to light clay in the other horizons. In general, soil is defined as light clay (average Clay content - 48% Silt - 33% Sand - 19%. Upon the main soil water properties observed the following distribution:

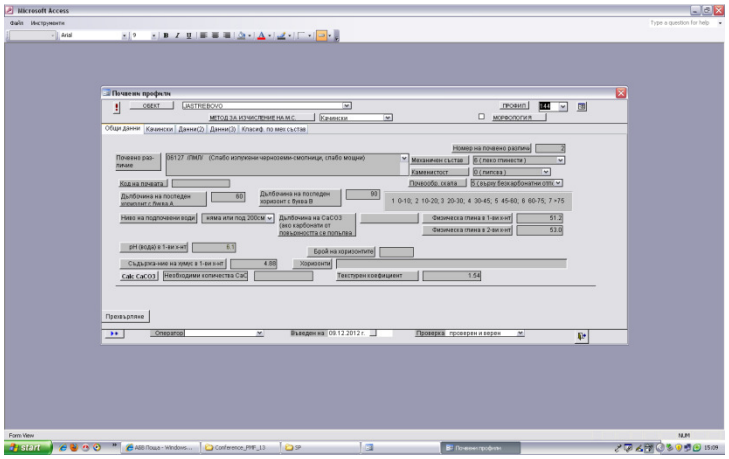

Fig. 4: Profile characteristics.

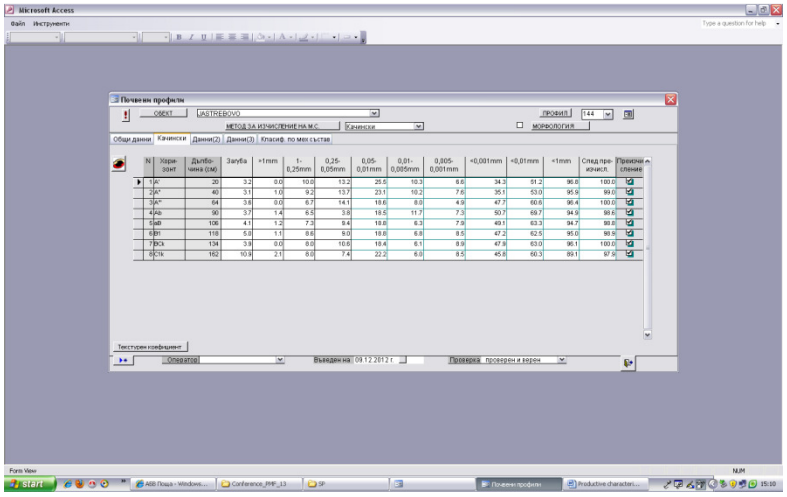

Fig. 5: Profile particle-size distributions.

Total porosity - vary from 0.445 in A 'and A" to 0.453 in the other horizons. Total porosity for the profile is 0.451;

Soil moisture at field capacity - from 0.369 in A 'and A" to 0.346 in the other horizons. For this profile the value is 0.350;

Soil moisture at wilting point - from 0.258 in A 'and A" to 0.204 in the other horizons. For this profile the value is 0.218;

Hydraulic conductivity at saturation - of 0.98 in the A 'and A" to 3.50 in the other horizons. Hydraulic conductivity at saturation for the profile is 2.88.

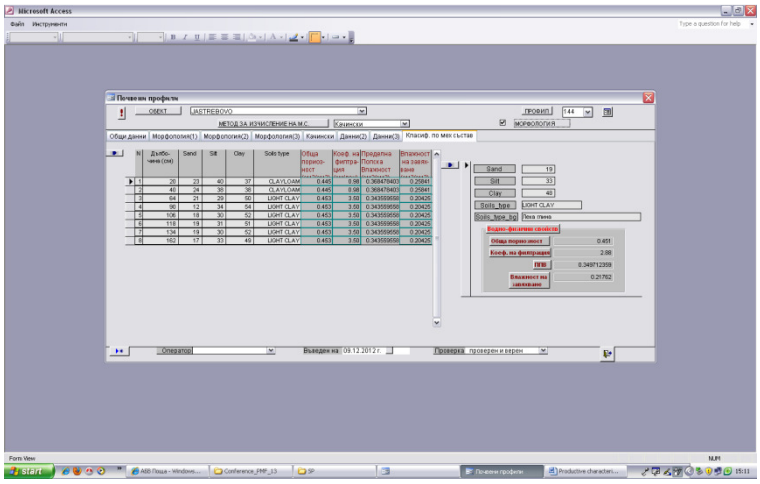

Fig. 6: Soil classification according to soil texture (particle-size distributions of the soil profile).

Total available soil water content - Tpwc (m^3/ha), which have an important meaning for the regulation of the water amount in the soils, is determined by:

(1) $$T_{\text{pwc}} = 100 * h * \alpha(SM_{fc} - SM_{w})$$

where:

α is the soil bulk density (g/cm^3)

h is the soil depth (m)

SM_{fc} **-** water content at field capacity (%)

SM_{w} - water content at wilting point (%)

Total available soil water content is from 167.3 m^3/ha in Ab horizon to 529.7 m^3/ha in C1k horizon. Total available water content for this profile is 2642 m^3/ha.

4. CONCLUSIONS

Despite some not very favorable properties Vertisols have very good qualities that create great potential for high fertility. Therefore Vertisols belong to the soils with high fertility. To correct the negative impact of some of the features it is necessary to implement a few - important events. To improve the physical properties should be increased organic matter and structuring the plugging soil horizon through organic fertilization and adequate crop rotation. Maintaining favorable physical properties can be carried out through soil application of aggregates - sand, crushed slag, crushed lignite coals and others.

The best soil conservation can be achieved through a joint approach involving real actors and building a strong strategy, supported by strong science and technical basis. There must be a foundation of scientific knowledge infrastructure for the knowledge of the participants, and last but not least, substantial economic resources to support conservation efforts and sustainable land management.

Information on the agricultural lands, including soil maps, soil and climatic characteristics, nutrients supply, cleanliness, the agricultural lands productivity assessment (bonitet), etc. should be available to farmers and tenants plans and subsequent conservation activities - planting trees, guidance for drainage, advice on crop rotations, planting specifications, help on the game, help systems for pastures and breeding domestic animals and others.

The soil monitoring system began to grow and become a source of information for future political decisions. After improving the monitoring techniques it is possible to design and build a database through which more accurately assess trends and identify physical dimensions and measures of conservation practices, the farms - served, the land areas – gently treated and tones soil losses - saved.

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Accidents at the Transport of Dangerous Goods on Road in the Territory of Bulgaria

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Abstract: *The dangerous goods are substances or products whose carriage requiring compliance with the specific rules. The requirements regarding way of packing, sorting, loading, unloading and transportation are required. The accidents happen, when the rules for safety doesn't observe. It can lead to partial or full spilling of hazardous substances, which is accompanied by severe consequences for humans and the environment (fires, explosions, gassing, etc.). All this requires searching for additional solutions to ensure the security and safety for transported goods*

Keywords: *explosion, evacuation, ADR, flammable materials, Ministry of interior*

INTRODUCTION

Transportation of dangerous goods on the territory of Bulgaria and the European Union is regulated by European agreement concerning the international carriage of dangerous goods by road. (ADR) [1]. Provisions and requirements for transportation of dangerous goods write in ADR. It is apply to base vehicle and tank. The base vehicle is tractor vehicle or trailer, which have to compare by kind of tank. There are many different parts of devices and functions for transportation unit, it is the reason for many conditions in ADR about different vehicles. This leads to different frequencies of the control checks and maintenance.

GOAL AND OBJECTIVES

The carriage of dangerous goods is a potential risk for accidents and gassing of entire cities. The measures for safety transportation have to improve constantly. There are many different types of products such as liquefied petroleum gases, petrol, gasoline, acids, fertilizers, ammonia and other inflammable materials with strong toxicity.

The purpose of this report is to focus on seriousness of the accident during transport of dangerous goods and the effects caused by them.

The tasks associated about investigations the reasons of accidents and spills. It was made own preparation of references about accidents and their analysis. Also it was given solutions to ensure safety and security of such goods. The proposals are given based of different cases reported on TV

and the press. They are leading to explosions, gassing of entire settlements, evacuations, environmental catastrophes and large financial losses.

It shows data about accidents in the period 2009-2012 year in Fig.1. The trend has seen a sharp increase in accidents since 2010, their number has almost tripled. This shows the seriousness of the problem and it should not be underestimated, also impact and consequences on the environment and human health are enormous.

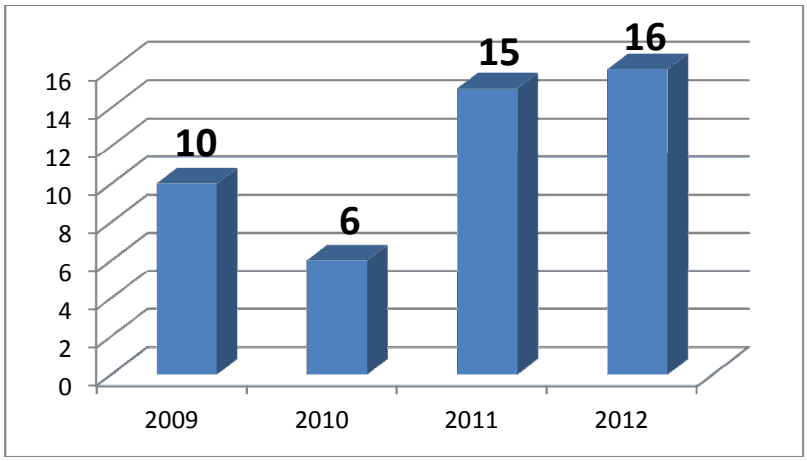

Fig.1. Accidents for the period 2009- 2012

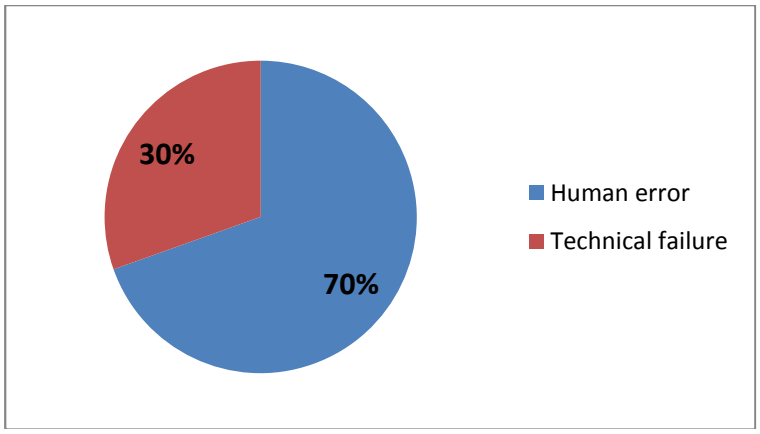

Fig.2. Reasons for the accidents for the period 2009- 2012

It is worth noting that most accidents are caused by human error (failure of safety measures). The technical faults a smaller percentage, but they are not for underestimation and ignoring. It must be observed rules and safety measures for the management strictly of the whole process of transportation

of dangerous goods. It can be concluded that it is necessary to pay more attention and control on routes with the highest concentration of accidents.

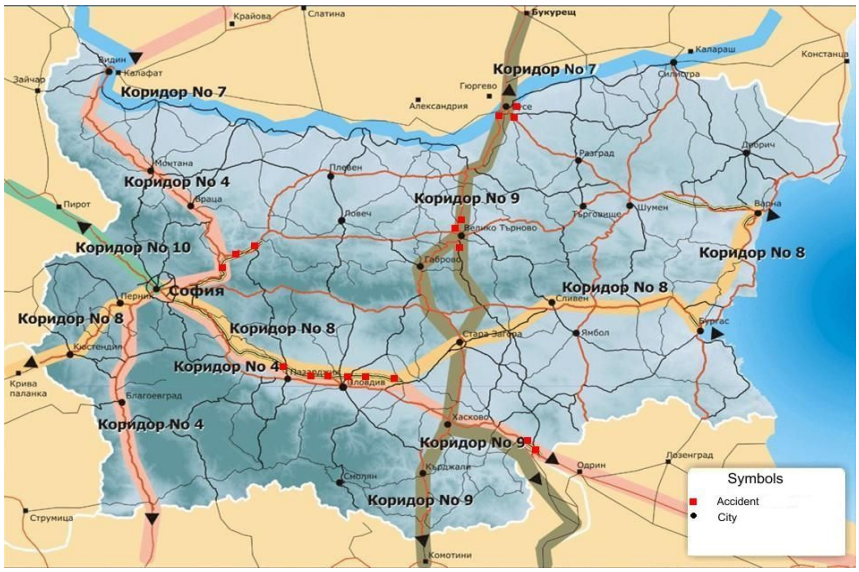

Fig.3. Location of the occurred accidents

The data collected indicate that all accidents have occurred on nodes that are part of a general European transport corridors № 4, № 7, № 8 and № 9. (fig.3). The biggest concentration of accidents was on highway "Trakiya" - six case. The main reason is improper maneuvers and inappropriate speed by drivers. There are three accidents on highway "Hemus", the reason is same like "Trakiya". Three accidents were registered in the city of Ruse, which is important border crossing, district center and part of the European transport corridor № 9. There were three accidents near to city of Veliko Tarnovo. The unfavorable conditions on the road network and the violation of traffic rules are reasons for accidents.

Examples:

Accident with styrene spill near the town of Debelets (Veliko Tarnovo). [2,3.]. Tanker carrying 20 tons styrene (acrylonitrile-butadiene-styrene) was overturned on 11th July, 2012 year. The driver was falling asleep and loss of control to vehicle. As a consequence the vehicle slammed into guardrail, overturned and dragged between 30 and 40 meters on grass. There were 350 people, including 50 children, which had to evacuate at first time. After that all people (2200 - 2300) in the city was evacuated.

The samples show degraded performance, especially in terms of the acidity in the water. This is due to styrene and foam, which was bathed tank. The carbonic acid used for cooling at the tanker, it was decreased pH of the

water. This led to the extinction of the fish. The studies suggest exceeding the norm for styrene in water - 3,7 mg/l, it is 18,5 times more from standard (0,2 mg/l). Belitsa River is a protected area in the Habitats Directive № BG 0000281, included in the European Natura 2000 network, so its pollution is a serious offense under Art.278v by Criminal Code. [4]

Tanker with LPG exploded in base "Toplivo gas" near to Kremikovtzi.

Tanker exploded at 16:00 pm. There was about 5,000 m^3 LPG during the accident. The explosion occurred while the tank vehicle loaded from one of the tanks. Until tank was charging, the connector has burst and started expire large amount LPG. The official version is that the explosion was caused by a breach of safety rules when loading and unloading. The vehicle was with engine connected. The heat emitted by the internal combustion engine is the cause of ignition of LPG and hence the explosion that destroyed the tank vehicle. It was called to 112 and then arrived eight fire trucks, five ambulances and two teams of civil protection. The fire was brought under control and extinguished for 30 min. The firemen continued cooling at tank, because it was possibility for second explosion.

RESULTS, DISCUSSIONS, CONCLUSIONS

In the following pages it presented additional measures to prevent accidents and fires and their localization in the existing range on base analysis and it done researches. After the tank is faulty most importantly timely warning to the authorities of the General Directorate "Fire Safety and Protection of Population". If it is respond and locate the accident faster, the damage will be less. The analysis of statistics shows that over 75% of cases are by human error (speeding, wrong overtaking, etc.).

We offer the following suggestions to prevent more accidents:

1. The vehicle must be equipment with GPS device for navigation and tracking. The company responsible for the transportation of dangerous goods will know at all times where are the vehicles. It is necessary to build command center, which will able to control next tasks:

- Compliance with exactly defined route for your vehicle;
- When the driver is over speed limit, it will send lighting and sound warning messages.

2. Annual preparation of register with the locations of accidents involving dangerous goods. The routes have to bypass the settlements, although the Pan-European transport corridors cross through many settlements in Bulgaria. Although the speed limit, the risk of a crash or other technical failure has not disappeared. The accidents near to settlements are more dangerous for people, because:

- The damage from the accident would affect a large number located in the "epicenter of the event."

- The immediate evacuation of the population can lead to panic among residents, which would hamper the work of the teams working on the removal of the accident.

These are the main reasons that require detours demand.

3. Practical courses for drivers every year. The course will present how to operate in risky situations and simulation possible scenarios of development accidents. These courses should be mandatory for all drivers. Drivers who have not undergone such training can be denied the right to perform such services.

4. The sign indicating the type of dangerous goods to be lighted so that drivers of other vehicles to see it clearly.

5. The signs or markings to indicate the required extinguishing agent in case of fire (water, dry powder, foam, etc.).

6. The vehicle must be checked before each course. The vehicle have to has technical passport indicating the date and time of examination by a specialized mechanic. It must be present information about toxic substances and the measures to be taken by potential victims of inhaling dangerous fumes.

The huge advantage that allows tracking device is the exact location of the accident involving dangerous goods. Exact details of the accident and the type of dangerous goods as may be notified by the relevant checkpoint organizations. This will help prepare for the removal of the accident and will allow us to predict the possible effects. That would be the fastest and most secure way of communication, detection and removal incurred accident.

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LOCALIZATION OF FIRES IN LANDFILLS AND ILLEGAL DUMPSITES

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**Medical University Sofia*

Abstract: *The data about the fires in landfills and dumpsites, for the period 2009-2012 are disturbing. The requirements in the regulations which provide for the safety of the landfills are not sufficient. It is necessary to be introduced a mobile fire extinguishing technique as well as better organization of management of landfills.*

Keywords: *fire, localization, landfill*

INTRODUCTION

The design and construction of the landfill of waste shall be carried out in accordance with the underlying normative documents requirements.[3]

The measures which are provided for landfills, are obviously not sufficient, because the number of fires increase every year. The smoke as a result of combustion, often require the evacuation of population in nearby settlements. This in turn requires to be declared "emergency situation" and to start implementing plans to action (in Bulgaria these are disaster protection plans).[4]

The evacuation of the population requires a complex organization and management. The costs for information, evacuation of people from their homes, their transportation, their placement in a safe place and the provision of food and water, requires a lot of financial resources. Much cheaper for the municipal administrations and the relevant Ministry would be to equip the landfill with the preventive technique than to expend funds for the evacuation of citizens and elimination of the consequences of a possible fire.

PURPOSE AND OBJECTIVES OF THE STUDY

The researches of fires in landfills shown that a number of settlements have been gassed up. All this makes it necessary to offer a solution which can help to localize them in the initial stages of development.

The aim is detecting and locating fires. The introduction of a mobile equipment. Provision of water or gas (CO_2) extinguishing.

The team offers two ways in which this can be accomplished.

1. In each landfill is necessary to be available specialized equipment, to remove the part of the first (recultivated) layer to the level of the burning wastes. For extinguishing can be used water. The water can be taken from a private water source or from the near located plumbing. The water has many uses - for cooling, wetting, for steam. She can move and fill any empty space. From 1 liter of water gets 1700 steam. The steam dilutes the reacting materials, pushes air and thus terminate the burning. Fires in landfills are carried out in the mode of heterogeneous combustion – smoldering with a strong smoke. The water has a high heat resistance. Its money can be decomposed of H_2 and O_2 at a temperature of 1700 ° C. [6]

The water has low thermal conductivity, which contributes for the creation a surface over hot material such as thermal insulation. Some gases and aerosols are capable to dissolve in water vapors. The significant thermal sustainability of water allows to be used for for extinguishing of most solid materials and its capability dissolving the burning fluids when it is in dispersed state. [5]

2. Introduction of a mobile installation for extinguishing in the landfills CO_2

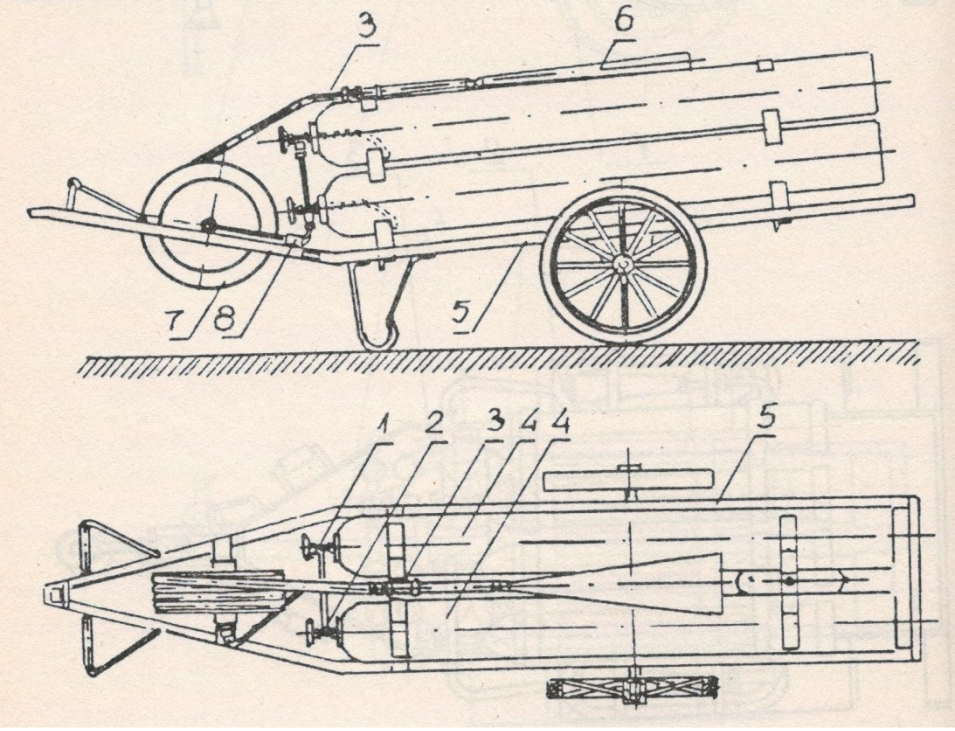

Fig.1 [1]

The statistics of fires shows that throughout the country for the period 01.01.2009 until September 2012, are registered a total of 45 fires.

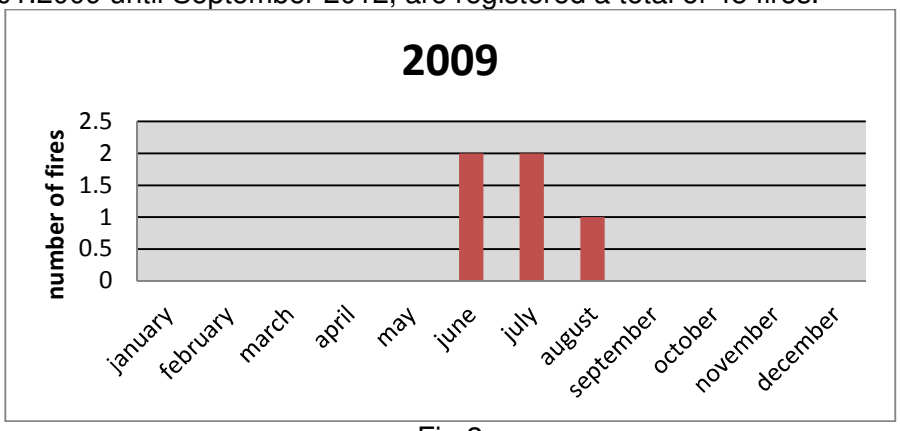

Fig.2

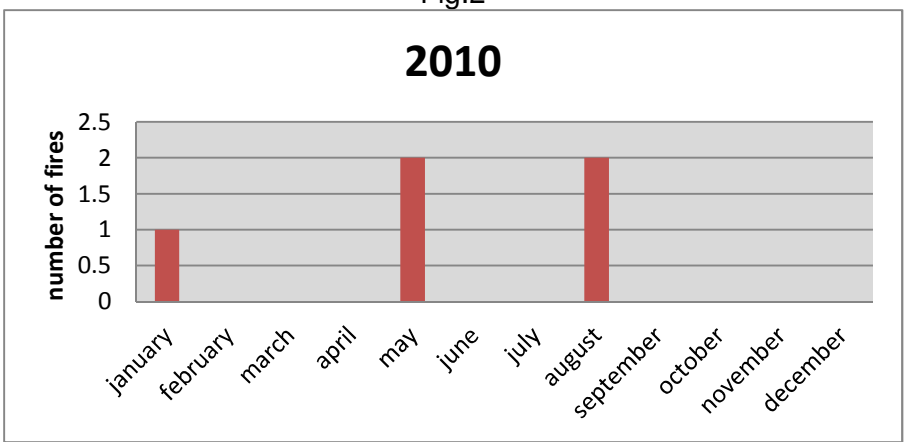

Fig.3

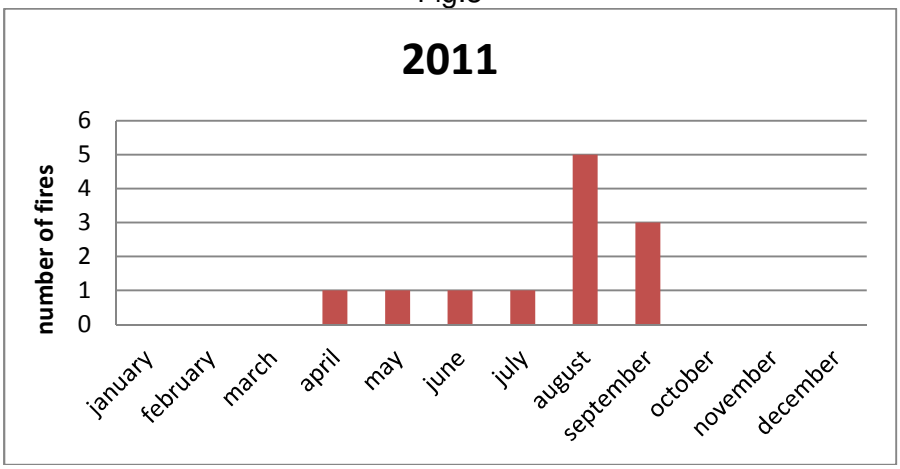

Fig.4

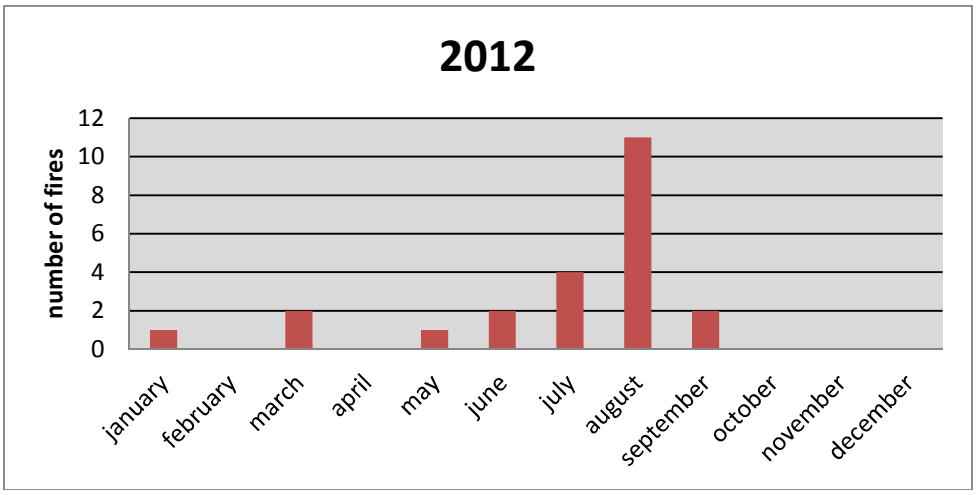

Fig.5

For 2009 and 2010, the number of fires is equal – five for both years. Over the next two years, the number of fires increased to 12 for 2011, and doubled to 23 for the year 2012.

This shows that despite the creation of a program to improve the system for the treatment of waste, after 2009, instead of diminishing, the accidents and incidents in landfills are on the increase.

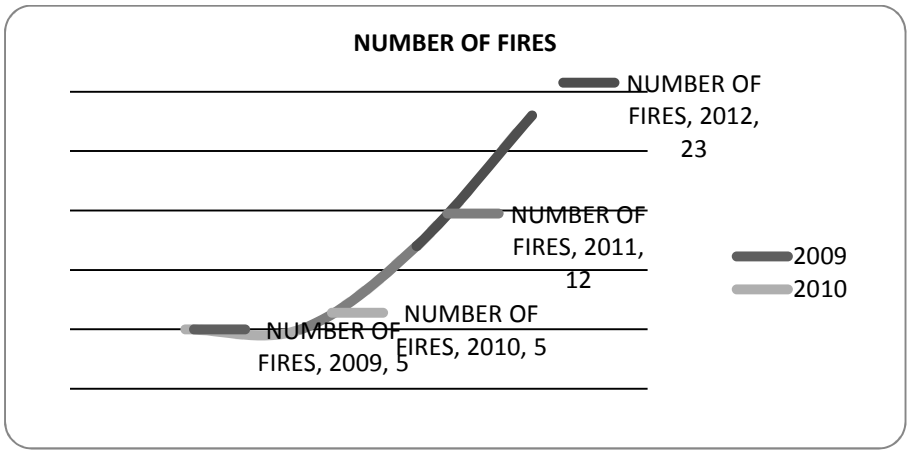

Fig.6

This is an alarming fact that shows that the measures that are taken are ineffective and there is no sufficient control to the staff in landfills.

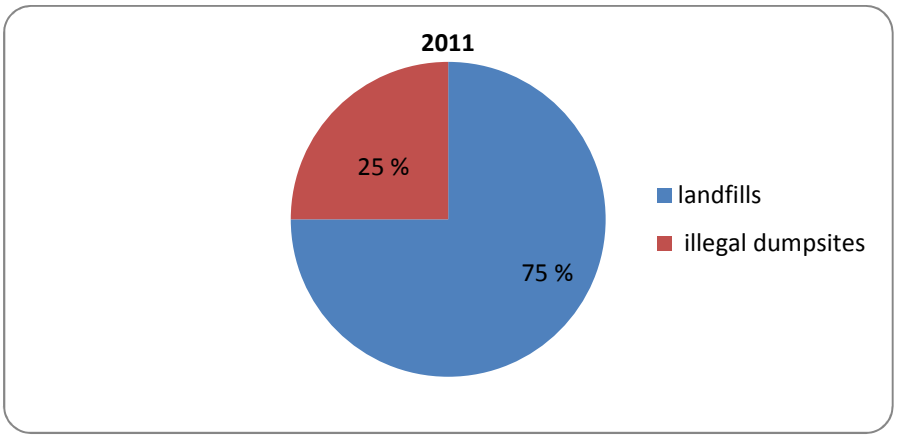

Fig.8

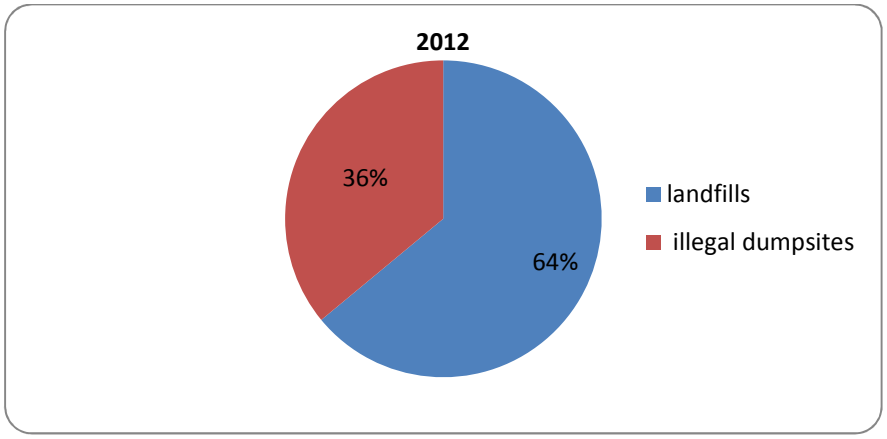

Fig.9

For the period January 2009 to September 2012 have occurred 45 fires. Most of the fires have occurred in illegal dump sites. For the period January 2009 to September 2012 have occurred 45 fires. Most of the fires have occurred in illegal dump sites. The reasons are ignition of flammable materials by hot glass or improper handling of fire. This in turn is a sign of improper operation of the landfill - failure of necessary measures and requirements for the prevention of fires in landfills and allowing outsiders into their territory.

RESULTS, DISCUSSIONS, CONCLUSIONS

It is necessary the construction and maintenance of mineralized bands around the landfill.

In landfill must be build an underground water tank, which will enable faster and more efficiently localization of an ignition.

The landfill need to be enclosed in order to restrict access of outsiders and to limit the spreading of wastes by stray dogs.

The people need to be informed, in case of fire, for the consequences to health from products of combustion of the materials.

The rose of the winds is need to be known especially in the valleys, where there is danger of mists in terms of inversion.

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