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## ECONOMIC VALUE OF ECOSYSTEM/LANDSCAPE GOODS AND SERVICES IN THE MUNICIPALITIES OF RUDOZEM AND BANITE<sup>1</sup>

ASSEN ASSENOV, BILYANA BORISSOVA, BORISLAV GRIGOROV,  
PETKO BOZHKOV

*Катедра Ландшафтознание и опазване на природната среда*

*Катедра Климатология, Хидрология и Геоморфология*

e-mail: assenov@gea.uni-sofia.bg; asseni; billiana@gea.uni-sofia.bg; bilyana08@gmail.com;  
borislav.g.grigorov@gmail.com; punkalia@abv.bg; petko\_bozhkov@abv.bg

*Assen Assenov, Bilyana Borissova, Borislav Grigorov, Petko Bozhkov.* ECONOMIC VALUE OF ECOSYSTEM/LANDSCAPE GOODS AND SERVICES IN THE MUNICIPALITIES OF RUDOZEM AND BANITE

In the presented study of ecosystem/landscape goods and services in Rudozem and Banite municipalities, the contingent valuation method is applied by authors through a survey conducted among 121 respondents, respectively as follows: 56 respondents in Rudozem and 65 respondents in Banite.

The results regarding the regulating, cultural and supporting ecosystem/landscape services for the region of Smolyan almost coincide in value with another similar study using the transfer method (Zervoudakis et al., 2007), carried out in all municipalities of the Rhodope Mountains. The regulating, cultural and supporting ecosystem services in the comparison study are defined at 5259 BGN/ha/year, a value which is very close to 5284 BGN/ha/year defined by the current study.

*Key words:* ecosystem services; provisioning, regulating, cultural and supporting services; contingent valuation method; functioning of landscapes; landscape ecology and planning.

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## INTRODUCTION

The following paper presents part of the results of the planned spatial expansion of of the research project “The Mountain – models of socioeconomic and cultural development” (Assenov, Borissova, 2009) by including Rudozem and Banite municipalities. Aside from their natural and geographical identity, the selected objects of the current study are considered also in administrative and economic aspect – as municipal units. Investigation of ecosystem/landscape goods and services stems from the unprecedented speed of elaboration of good decisions for socioeconomic development in terms of natural capital concept. The Living Planet Report 2014 is tenth edition of the biennial publication of WWF (World Wild Fund) which defines Living Planet Index (LPI) – database supported by Zoological Society of London. According to values of LPI, consumption of resources in Bulgaria in 2008 is equal to 1.3 Earths, in 2010 it increases up to 1.8 Earths, while in 2012 consumption reaches two Earths and Bulgaria ascends from 49<sup>th</sup> to 59<sup>th</sup> place in the world consumers ranking. LPI for 2014 indicates that Bulgaria needs 1.7 Earths to continue its current way of life, hence a tendency of returning to the state of 2010 is noticeable. The Living Planet Report (2014) determines that ecological footprint of Bulgaria (1.7) is lower than the average footprint for the entire EU (2.6). However it still exceeds what our planet can replenish. In other words, if every person lives as long as an average citizen of EU, humanity will need 2.6 Earths to endure the environmental impact. For example Belgium – the host of European institutions, has one of the highest ecological footprints per capita at global scale. If every person lives as long as an average Belgium citizen, humanity will need 4.3 Earths. Belgium is on the fifth place in the world after countries like Kuwait, Qatar and UAE. This is related with Belgium’s carbon footprint, which represents 43% of total ecological footprint of the country. Romania has the lowest ecological footprint in the entire EU, which equals 1.4 Earths. According to the authors of LPI, that phenomenon is related more to the decline of industry than to the strategic governmental vision.

EU intends to assess and evaluate ecosystem goods and services provided by nature not only in protected areas, part of NATURA 2000 ecologic network, but in all other territories of the Union. In Bulgaria two projects for biophysical assessment of ecosystem goods and services are currently getting underway and a third project for monetary evaluation of ecosystem goods and services is expected.

A project for mapping and biophysical assessment of ecosystems of 100% of territories outside NATURA 2000 network is starting in accordance with the EU 2020 Biodiversity Strategy, following Programme BG03 “Biodiversity and ecosystem services”. Programme operator is the Ministry of Environment and Water of Bulgaria, while programme partner is the Norwegian Directorate for Nature Management (DN).

Epsilon Bulgaria Ltd. implements a project under Programme BG03.02 – “Ecosystem services mapping and assessment”, funded by the Financial Mechanism of the European Economic Area (2009–2014). Epsilon Bulgaria Ltd. and Kartgeo Ltd. are partners of Sofia University “St. Kliment Ohridski”, “Landscape Ecology and Nature Protection” Department under the project entitled “Mapping and assessment of shrubs and heathlands”. Mapping and assessment of shrubs and heathlands and their services at the whole territory of Bulgaria and outside of NATURA 2000 are the aim of the project. The project is funded within the

Programme BG03 “Biodiversity and Ecosystem Services” in Bulgaria under the Financial Mechanism of the European Economic Area and its duration is 9 months.

World Bank (Vincent, 2012) reports that globally there is a lack of development towards the valuation of natural capital (NC) and the problem is still considered at conceptual level. The participants in the current study, whose results are interpreted in the following paper, aim to evaluate ecosystem goods and services in a monetary aspect, which is in unison with the findings of the World Bank.

## THEORETICAL CONCEPT

The typology of the ecosystem/landscape goods and services in the present paper is consistent with the typology of Millennium Ecosystem Assessment (2005).

Ecosystem/landscape goods and services are economic goods with a certain value. However, almost all of these goods and services, except material ones, are not considered to be in exchange for remuneration. Therefore, it is difficult to estimate their real price, but this obstacle can be overcome by the use of the scientific category “total economic value” (TEV). It consists of direct and potential use values, along with other non-use values, which are not related to the utilization of natural resources, such as the desire to preserve the environment for future generations or people’s satisfaction with landscape and ecosystems status and proper functioning.

Information is collected by surveying of local residents in Apriltsi, Smolyan, Rudozem, Banite, Chepelare and Satovcha Municipalities and Kalofer Mayoralty by application of the contingent valuation method, combined with the market price method. This is an attempt to precisely evaluate and assess ecosystem/landscape goods and services provided by nature. The application of the concept of natural capital creates certain difficulties associated with turning nature into commodity and the lack of comprehension of the importance of biodiversity and pristine environment. In this context it is significant to say that natural capital does not coincide with nature. It is a base for production in human economics and a provider of ecosystem goods and services. That is why every socioeconomic assessment of the European natural capital, as an important tool for integration of monetary values in economic systems and related politics, should go hand in hand with the perception that the economic evaluation will not include the entirely inherent value of nature, including the cultural and spiritual services, which it provides.

According to the EU 2020 Biodiversity Strategy, economic value of ecosystem goods and services should be assessed by enhancing the integration of those values in accountant and reporting systems in the EU and at national level up to 2020. A decision was made at the forum of the OECD (2015) in Paris, stating that the use of spatial basis for the accounting represents the systematic approach to the accounting, where economic and environmental stocks and flows are considered by holistic positions. The OECD (2015) recommends that for the purpose of integration of ecosystem information for certain spatial zones with standard economic accounting and performance measurement, the most useful examination of this asset will be as a type of quasi-production unit in addition to the standard economic units, such as industries and households. In response to this recommendation, one of the authors

(Assenov et al., 2016) suggests integration of ecosystem information on forests as services provided by nature and claims that it is possible to interpret the data about Forestry subdivisions and consider the subdivisions as quasi-production units.

## RESEARCH METHODS

The research team continues to use and apply the contingent valuation method for the evaluation of ecosystem/landscape goods and services. The questionnaire that was used in previous surveys was improved, based on gained experience and it provided encouraging results. An important note has to be made that the contingent valuation method is used in combination with the market price method to evaluate the ecosystem/landscape goods and services, provided by the municipalities of Rudozem and Banite.

The questionnaire is a research tool for obtaining empirical information about respondent's position, concerning the ecosystem/landscape goods and services, provided by nature in the selected municipalities. The preliminary work was related to the improvement and update of the questionnaire, published in previous study (Assenov, Borissova, 2016) and the organization of the teams of surveyors, which include PhD students from the Faculty of Geology and Geography (Sofia University "St. Kliment Ohridski") and the National Institute of Geophysics, Geodesy and Geography (Bulgarian Academy of Sciences). The first stage of the practical work took place in May and November 2014 and one of the aims was to find respondents, willing to participate in the research. The team recruited 65 respondents in Rudozem Municipality and 56 in Banite Municipality.

The contingent valuation method is flexible and gives opportunity for monetary evaluation of almost everything and the questionnaire is considered to be the most widely accepted form for assessment of the total economic value. Direct contact with respondents during the survey allowed us to obtain valuable information about the ecosystem/landscape goods and services.

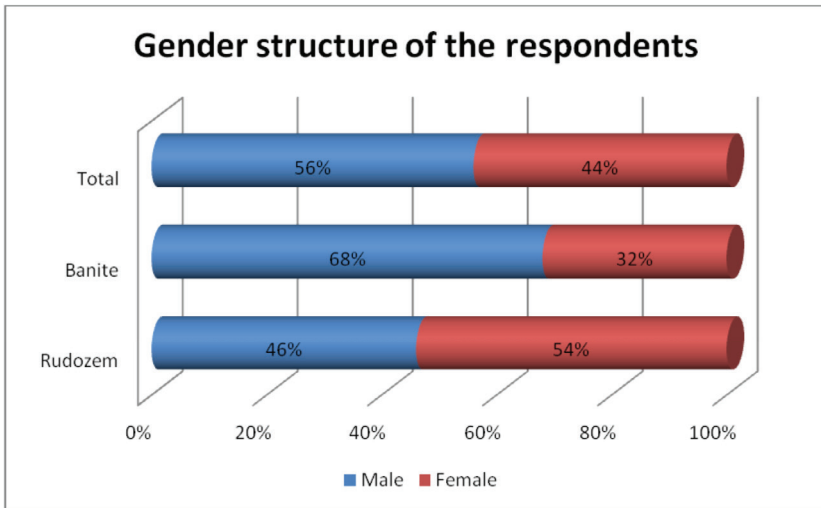
The methodology, concerning the contingent evaluation of ecosystem/landscape goods and services, is in constant development. Some issues arose during the analysis and the discussion of the results and this provided a new perspective for improvement of the questionnaire in order to increase the reliability of the results.

## PROFILE OF RESPONDENTS

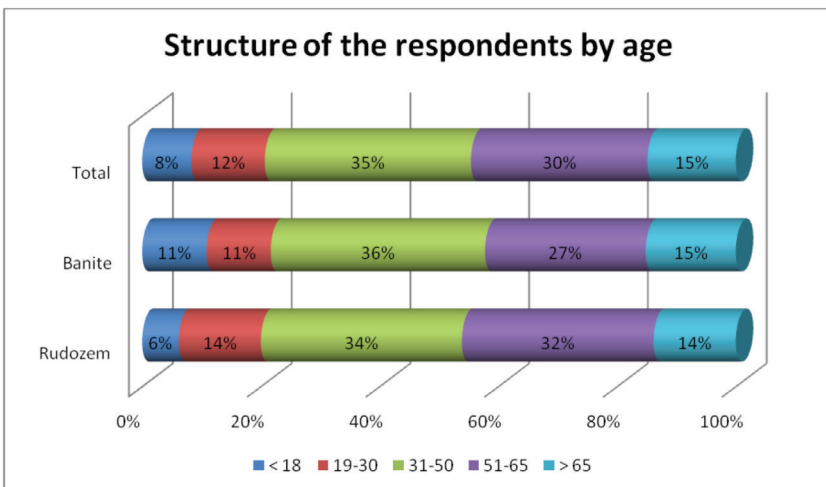
A total of 121 respondents were interviewed, constituting of 56% males and 44% females. That percentage division is typical for the villages and municipalities of the Rhodopes and it is initiated by the patriarchal relations in the family and society. The exceeding number of male respondents as a total is an outcome of Banite Municipality, which is a compound of 20 villages and not a single town. There is a different distribution of respondents by gender in the Municipality of Rudozem (Fig. 1). It is important to say that the survey was conducted in the center of the town of Rudozem, thus respondents are mainly urban residents and few of them are considered to be village residents.

The age distribution of the respondents is presented in five age groups and it is similar to the age distribution of the entire population of Bulgaria. The respondents, covering the

ranges 31–50 and 51–65 years age have the largest share and they represent the most active part of the labor force (Fig. 2). The respondents in the group between 19 and 30 years age are more in the Municipality of Rudozem than in Banite Municipality.



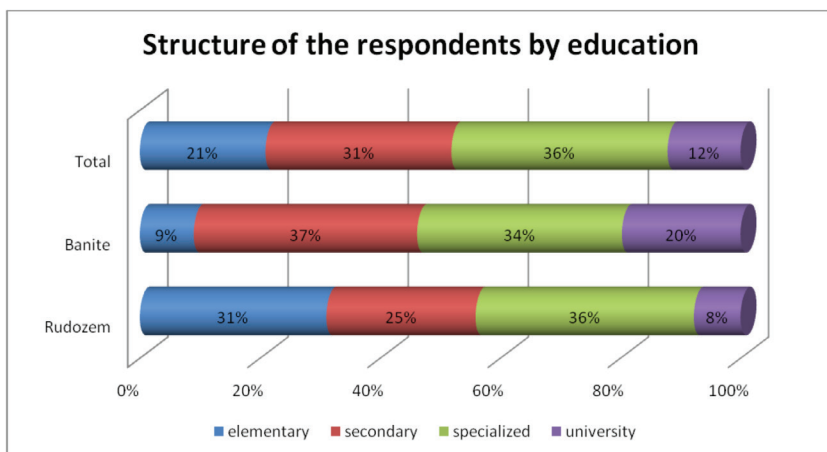
Фиг. 1. Разпределение на анкетираните по пол  
 Fig. 1. Gender structure of respondents



Фиг. 2. Разпределение на анкетираните по възраст  
 Fig. 2. Age structure of respondents

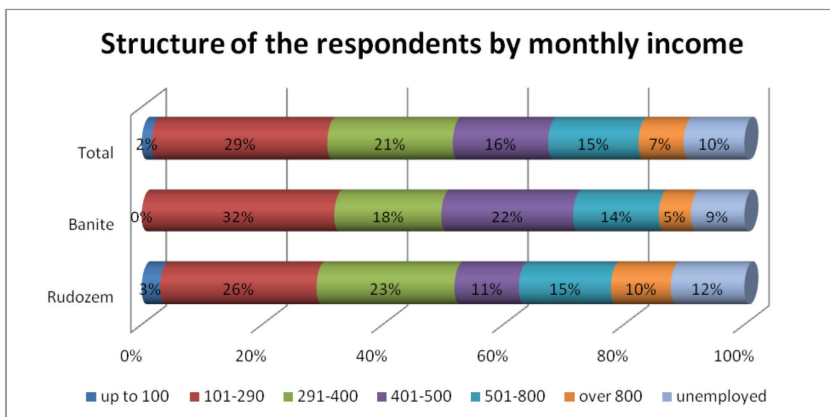
Respondents are unevenly distributed at education level. Those with primary education vary in wide range between 9 and 30% at the territory of the selected municipalities. In the Municipality of Rudozem their share is 22% more than those in the Municipality of Banite (Fig. 3). Perhaps this is close to the real situation because respondents in age group up to 18 years in Rudozem are almost twice less than the same group in the Municipality of Banite. There are also 37% of respondents that have secondary education in Banite. That is 12% more than the same group in Rudozem Municipality. Respondents with specialized or college education degree have almost the same share in selected municipalities – 36% in Rudozem and 34% in Banite. Respondents with higher degree in the Municipality of Banite are 12% more than in Rudozem Municipality, due to the assumption that people make daily work trips or spend weekends at their birthplaces.

The distribution of respondents according to monthly income is in 7 categories (Fig. 4). In the Municipality of Banite there are no respondents with income below 100 BGN, while in Rudozem their share is just 3%, i. e. very low. The second category of respondents with an income between 101 and 290 BGN is the largest group in the selected municipalities. Its upper brake value represents minimal monthly wage in Bulgaria at the moment of the survey (Fig. 4). 18% of the respondents in Banite and 23% of respondents in Rudozem have monthly income between 291 and 400 BGN. In the Municipality of Banite there are twice as many respondents with monthly income between 401 and 500 BGN than in Municipality of Rudozem (Fig. 4). This difference is related to the higher share of respondents in the next two categories in Rudozem compared to Banite – 15 and 10% for the first municipality and 14 and 5% for the second municipality, respectively. The higher share of respondents with the maximum monthly income can be explained with the presence of larger industrial enter-



Фиг. 3. Разпределение на анкетираните по образование

Fig. 3. Education structure of respondents



Фиг. 4. Разпределение на анкетираните по месечен доход в лв.

Fig. 4. Monthly income of respondents in BGN

prises in the municipal center. Unemployed respondents in the selected administrative units have similar share – 9% in Banite and 12% in Rudozem. Larger unemployment rate in the Municipality of Rudozem is a result of the greater population. Data shows that the unemployed residents in Rudozem are all men and unemployment ratio is 6 women to 2 men. This can be explained by the lack of jobs for women in this typical mining town.

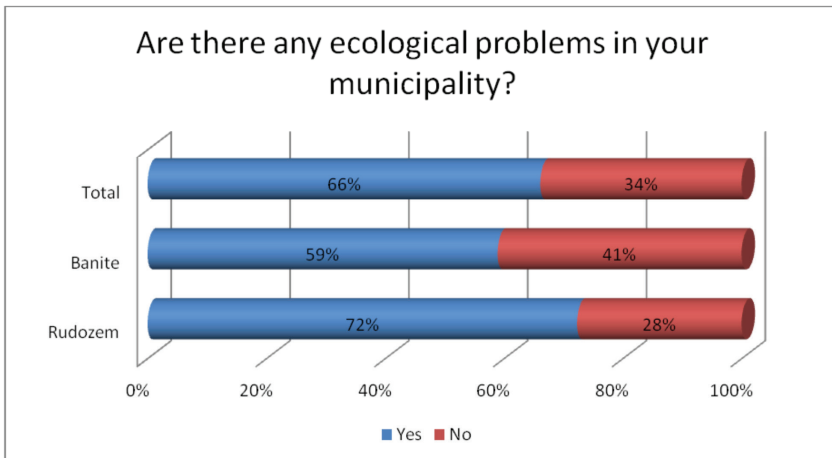
## RESULTS AND DISSCUSION

### ANALYSIS OF THE VALUATION OF ECOSYSTEM GOODS AND SERVICES

The answer of question № 6 gives undoubted insight about the presence of any ecological problems in the selected administrative units. 59% of the respondents in the Municipality of Banite claim that there are ecological problems on the territory of the municipality. 72% of the respondents in Rudozem give a positive answer, that is due to declining mining industry (Fig. 5).

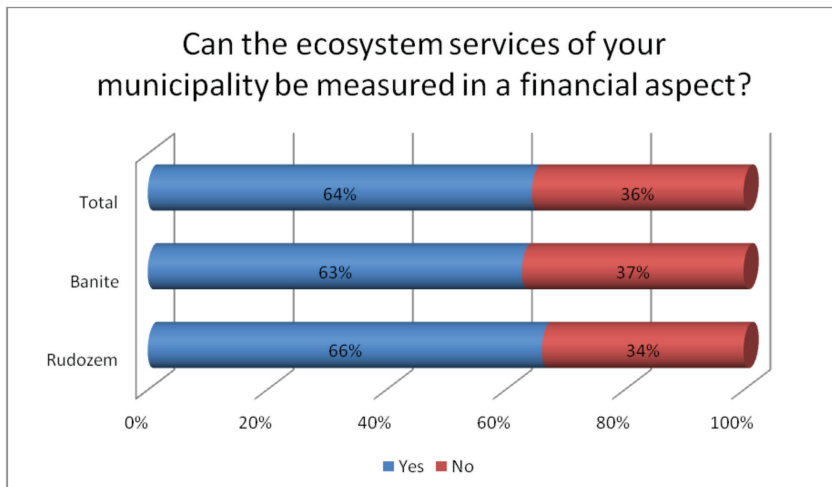
The answer of question № 7 indicates people's position about monetary valuation of ecosystem goods and services. Respondents give similar answers in both municipalities (Fig. 6) despite the fact that no information about the type of ecosystem services and goods was provided. The prevailing positive response is not a consequence of knowledge about ecosystem services and goods, but is related to surveyor's experience from previous studies in Apriltsi, Kalofer, Smolyan and Gorna Arda and the inserted guidance information in the questionnaire. Awareness of damages of floods, forest fires and illegal logging have contributed to the dominating positive answers – 63% in Banite and 66% in Rudozem.

Question № 8 is an open one and gives the opportunity of a free choice, although in the municipality with better preserved nature, the willingness of respondents to pay for eco-



Фиг. 5. Наличие на екологични проблеми

Fig. 5. Presence of ecological problems

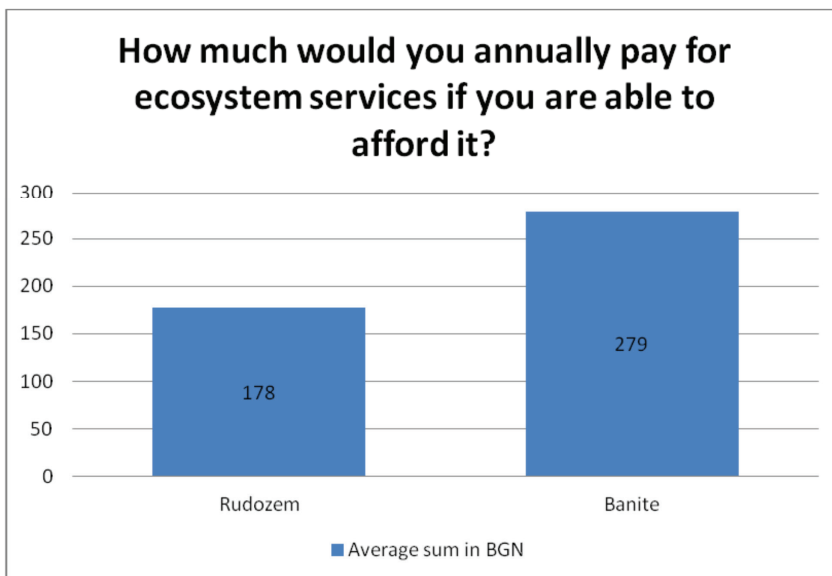


Фиг. 6. Възможност да се оценят екосистемните услуги в парични стойности

Fig. 6. Possibility for monetary valuation of ecosystem goods and services

system/landscape goods and services is declared by a sum, higher with over 100 BGN in Banite compared to Rudozem: 279 BGN in Banite Municipality and 178 BGN in Rudozem Municipality, respectively (Fig. 7). The responses here are comparable to those of the previ-



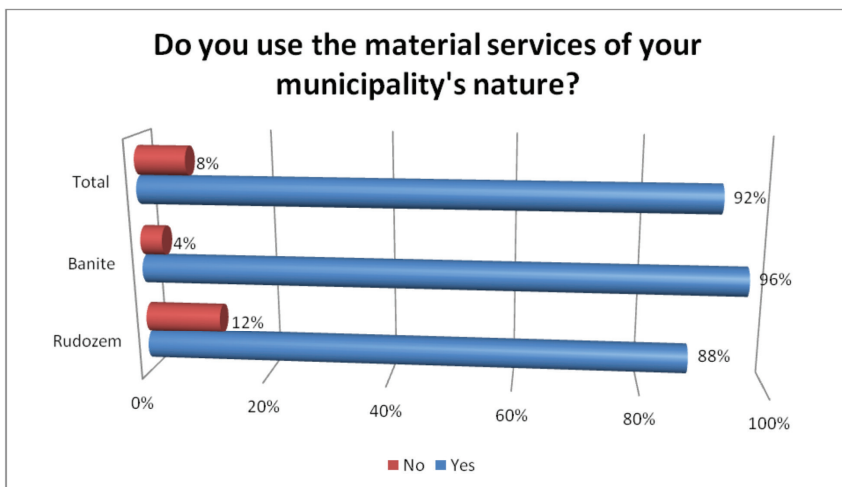


Фиг. 7. Заявена годишна сума за заплащане на екосистемни услуги

Fig. 7. Declared annual amount of money for payment of the ecosystem services

ous research (Assenov, Borissova, 2016) in Gorna Arda, where respondents declare a sum of 344 BGN per year. The response of this question is closest to the contingent valuation method results and it is a hypothetical sum, which represents a declared willingness of a respondent to pay for the ecosystem/landscape goods and services of his municipality. The responses often correlate with the incomes of the surveyed person, but there are some cases when the respondent declares a sum, higher than his income and there are even unemployed people who claim that they are willing to pay higher amount of money. People living close to nature are ready to pay more for the protection of the ecosystem/landscape goods and services and this is confirmed by the comparison with the results of Gorna Arda.

Question № 9 draws respondents' attention to the use of material ecosystem services. The negative responses of this question are a lot more in Rudozem Municipality – 12%, while in Banite Municipality only 4% of the surveyed have given a negative reply (Fig. 8). The respondents of these two municipalities have given more positive responses compared to the previous research (Assenov, Borissova, 2016) in Kalofer, Gorna Arda and Smolyan, while only the surveyed in Apriltsi Municipality have given negative replies – 14%, which is close enough to the negative responses in Rudozem Municipality. Part of the negative replies here are a direct consequence of a misunderstanding of the question, because a major part of the population in the municipalities of Rudozem and Banite use firewood and in those households where there is steam heating present, the initiation of the steam process is possible, because of the use of firewood. The improvement of the questionnaire by introducing



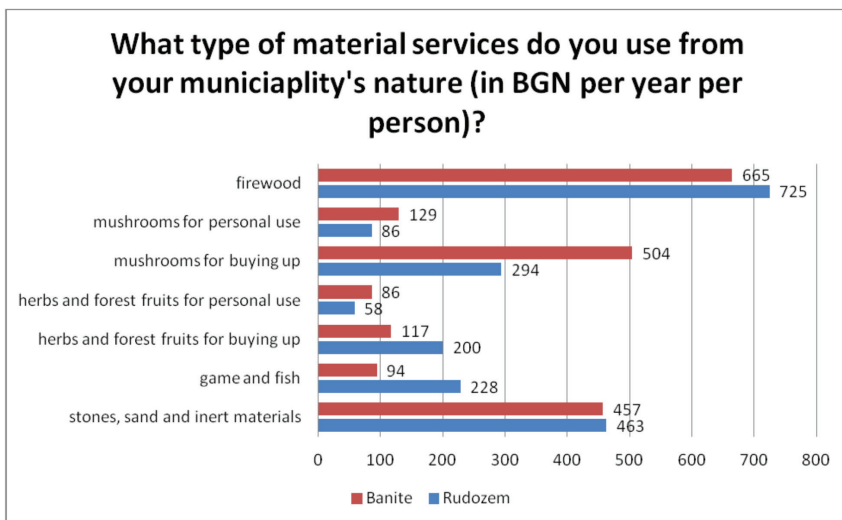
Фиг. 8. Използване на материални услуги

Fig. 8. Use of material services

additional subquestions shedding more light about the material ecosystem/landscape goods and services, especially those, concerning heating by the use of electricity or petrol derivatives, demanded more attention of the interviewers in the process of explaining the question. Undoubtedly, the electrical energy, used by people, who own electrical appliances, such as electric stoves, air-conditioning etc., is also an ecosystem service, no matter how it is produced: by thermal power stations, hydroelectric power stations, pumped-storage hydroelectricity stations or nuclear power plants.

The first subquestion of question № 10 regards the options of provisioning ecosystem/landscape goods and services, provided by nature, as means of heating, such as firewood or other types for heating (use of electrical devices or petrol derivatives), of which respondents could choose. In this case we can compare these responses with the others in Apriltsi, Kalofer, Gorna Arda and Smolyan only on the terms of the cost of firewood, because the alternative options for heating appeared for the first time in Kalofer and after that in Smolyan and interviewers weren't prepared enough to present a correct reflection of this data.

The responses of the first subquestion of question №10, concerning the costs of the volume of wood, used by a respondent, show that the sum in Rudozem Municipality is 725 BGN for heating per person per year, while the sum in Banite Municipality is 665 BGN per person per year (Fig. 9). The amount of money in Apriltsi Municipality is 562 BGN, in Smolyan-Gorna Arda is 548 BGN and in Kalofer is the lowest – 522 BGN (Assenov, Borissova, 2016), therefore the amount of money in Banite Municipality and especially that in the Municipality of Rudozem is much higher, and local marketeering may hold the key for some of the reasons, that have led to this matter. We assume that if we calculate the amount of money, paid for electricity, petrol derivatives and natural gas, the sum for all of the three research objects

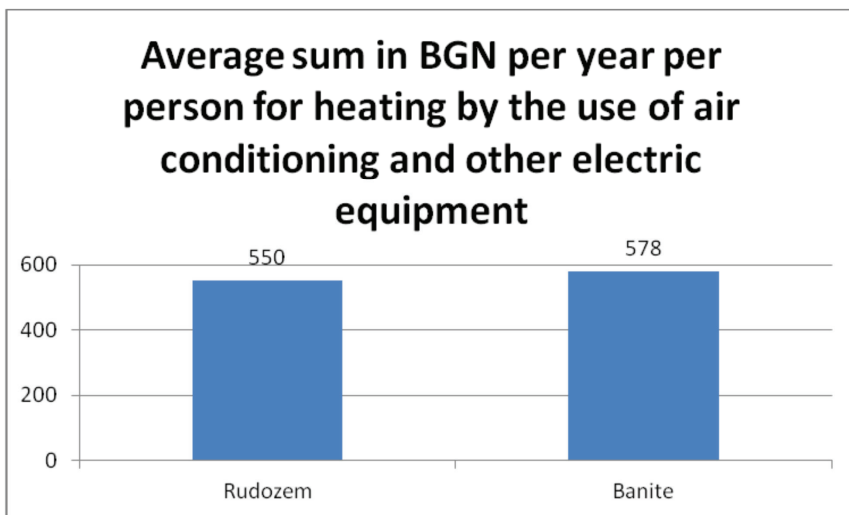


Фиг. 9. Вид на използваните материални услуги

Fig. 9. Type of used material services

will be equal. A major part of the respondents in the area of the municipalities of Rudozem and Banite, that replied on this subquestion, have also specified an expense for electricity as a source for heating alongside with the sums for firewood. The sum for electricity spent in Rudozem and Banite Municipality is 550 BGN and 578 BGN, respectively (Fig. 10). There is minimal difference and the higher amount of money in Banite Municipality is probably a compensation for the lower expenditure for firewood (Fig. 9).

The second subquestion of question № 10 (Fig. 9) is related to the cost of collected mushrooms for personal use and for buying up. The average sum for mushrooms for personal use per person per year is 129 BGN in Banite Municipality and 86 BGN in the Municipality of Rudozem (Fig. 9). When we compare these results with those of the previous research (Assenov, Borissova, 2016), it becomes clear that the amount of money in the Municipalities of Banite and Rudozem is higher than that in Apriltsi – 58 BGN, Kalofer – 37 BGN and Smolyan-Gorna Arda – 73 BGN. The same difference is observed when it comes to mushrooms for buying up, where the sum in Banite Municipality is 504 BGN per person per year, while in the Municipality of Rudozem it is 294 BGN per person per year. In the previous research (Assenov, Borissova, 2016) the amount of money for mushrooms for buying up per person per year is 53 BGN in Apriltsi, 37 BGN in Smolyan-Gorna Arda and 0 BGN in Kalofer and we reckon that this difference is significant. The collection of mushrooms for buying up in the Rhodopean municipalities is an important mean for living during the warmer part of the year and the results illustrate the fact that there is a considerable difference between Stara Planina Mountain and the Rhodopes about this matter.



Фиг. 10. Средна сума за отопление с електроенергия

Fig. 10. Average sum for electric heating

The third subquestion of question № 10 (Fig. 9) is related to the collection of herbs and forest fruits and the sum for personal use is 86 BGN per person per year for the municipality of Banite and 58 BGN per person per year for Rudozem Municipality. Naturally, the result in the rural Banite Municipality is higher, which we owe to people's mentality in country municipalities and to the environmental conditions that surround them, because there is plenty of resources. The difference here with the sums in Apriltsi – 64 BGN per person per year, Kalofer – 34 BGN per person per year and in Smolyan-Gorna Arda – 68 BGN per person per year, we owe to the different mentalities of people, inhabiting urban and rural areas.

In the same subquestion concerning the collection of herbs and forest fruits for buying up, the amount of money for Banite Municipality is 117 BGN per person per year and 200 BGN per person per year for the Municipality of Rudozem (Fig. 9). There is an increase in the sums for buying up compared to the amount of money spent for personal use (the same situation is observed in the subquestion about mushrooms), but the sum in Rudozem Municipality is almost two times higher than that in Banite Municipality.

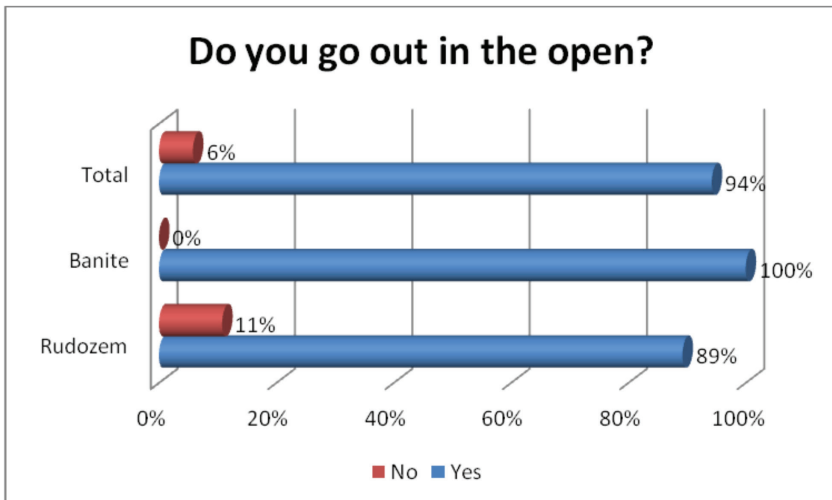
The Municipalities of Rudozem and Banite are definitely standing out against the values of the same ecosystem/landscape service in Apriltsi – 14 BGN per person per year, Kalofer – 4 BGN per person per year and in Smolyan-Gorna Arda – 22 BGN per person per year (Assenov, Borissova, 2016).

The fourth subquestion of question № 10 (Fig. 9) reflects the responses about the sum of the material ecosystem/landscape service – game and fish, which is 94 BGN per person per year in Banite Municipality, and it is 2.5 times higher in Rudozem Municipality – 228 BGN per person per year. Replies in both municipalities differ considerably from responses in Apriltsi –

60 BGN per person per year, Kalofer – 11 BGN per person per year and Smolyan-Gorna Arda – 62 BGN per person per year (Assenov, Borissova, 2016). Results in Apriltsi and Kalofer are influenced by poaching hunt and catch, connected inseparably with unofficially owned guns, and this can be considered to be a main reason for the intentional lowering of the actual amount of money, declared in the questionnaire. Smolyan is a regional center and the lower sums there are logical, even so they are balanced by the responses in Gorna Arda.

The replies of the fifth subquestion of question № 10, concerning the material ecosystem/landscape service – extraction of stones, sand and inert materials show that the sum is 457 BGN per person per year in Banite Municipality and 463 BGN per person per year in the Municipality of Rudozem (Fig. 9). The extraction of stones in the Rhodope Mountains has become an industry for subsistence for a significant part of the population. That is the reason for the considerable difference between the already mentioned amounts of money and former results as for the same ecosystem/landscape service those, surveyed have suggested in Apriltsi – 74 BGN per person per year and in Kalofer – 20 BGN per person per year. However, the sum of 132 BGN per person per year in Smolyan-Gorna Arda is nearer the amount of money in the municipalities of Banite and Rudozem, but we mustn't forget that this is an average sum between the town of Smolyan and the villages in Gorna Arda.

Question № 11 concerns the use of cultural ecosystem/landscape goods and services of surveyed people, inhabiting the municipalities of Banite and Rudozem, by telling whether they go out in the open or not and if the reply is a positive one, then the question of “how often do they do this” emerges. All respondents (100%) in Banite Municipality have given a positive reply, compared to 89% of those in Rudozem Municipality, thus 11% of them have given a negative response (Fig. 11). These results are close enough to those in Apriltsi – 94%



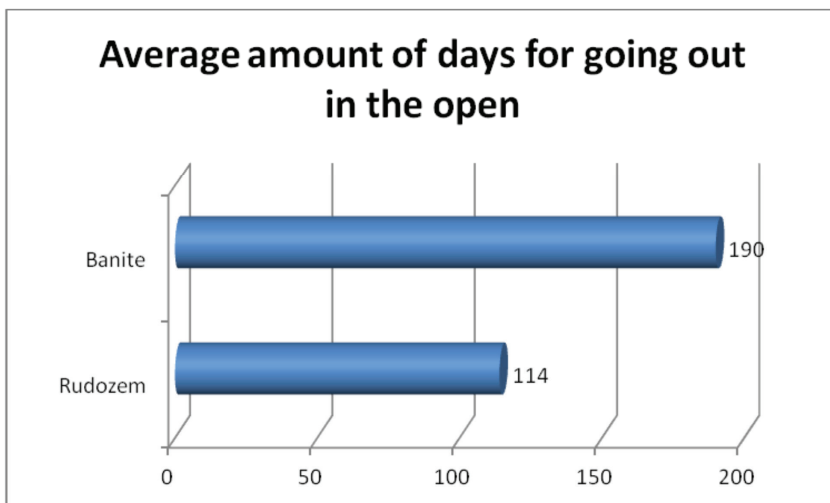
Фиг. 11. Излизане сред природата

Fig. 11. Going out in the open

“yes”, Kalofer – 97% “yes” and Smolyan-Gorna Arda – 96% “yes” (Assenov, Borissova, 2016).

Respondents in Banite Municipality go out in the open in an average amount of 190 days per year, while those in Rudozem Municipality do this in an average sum of 114 days. The results in Apriltsi, Kalofer and Smolyan-Gorna Arda are respectively 149, 85 and 102 days (Assenov, Borissova, 2016).

The aim of the last question – № 12, is related to how the surveyed evaluate the non-material benefits (supporting, regulating and cultural ecosystem/landscape services) that nature provides to inhabitants of the two municipalities. Despite the present elucidating information, applied to the questionnaire about similar evaluations of the non-material benefits in other EU states, respondents find it difficult to understand that this is a matter of non-material ecosystem/landscape goods and services, provided by nature at the area of 1 ha. These are examples of goods and services, that market lacks of, and the surveyed try to comprehend the meaning of the question by considering the market cost of a hypothetical area of 1 ha or by comparing them with other material goods that the market offers. The lack of understanding of this question, along with the probable lower education status of the respondents, may be the reason for the 55% in Banite Municipality and 27% in Rudozem Municipality that suppose that 1 ha provides services worth between 100 and 500 BGN per year. However, almost half of the respondents in Banite Municipality – 45% and 73% of those in Rudozem Municipality have given replies in the range of 500 and 1000 BGN and over 1000 BGN per hectare per year. It is satisfactory that these responses are near the actual value of the non-material benefits of the ecosystem/landscape services provided by 1 ha per year.

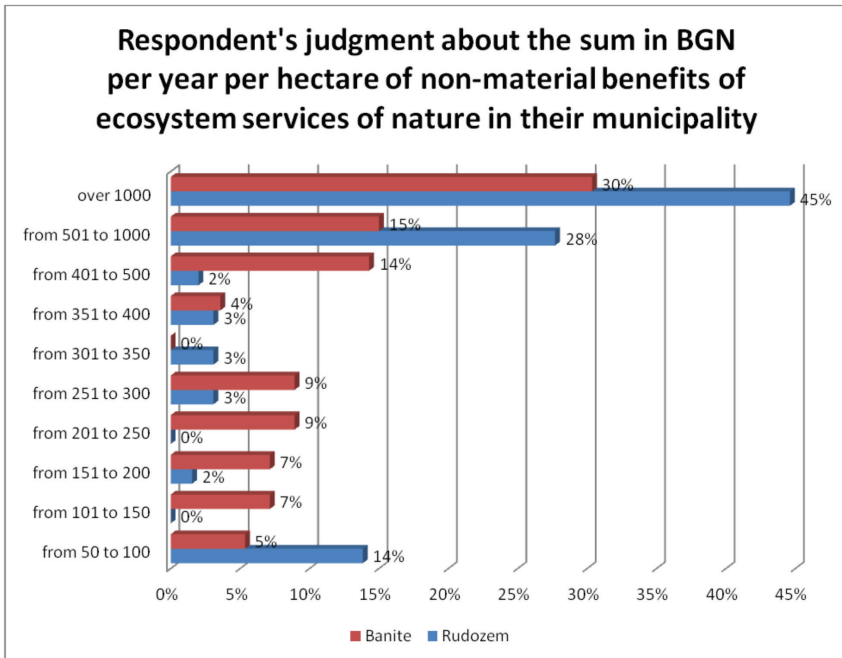


Фиг. 12. Среден годишен брой дни на излизане сред природата

Fig. 12. Average amount of days for going out in the open

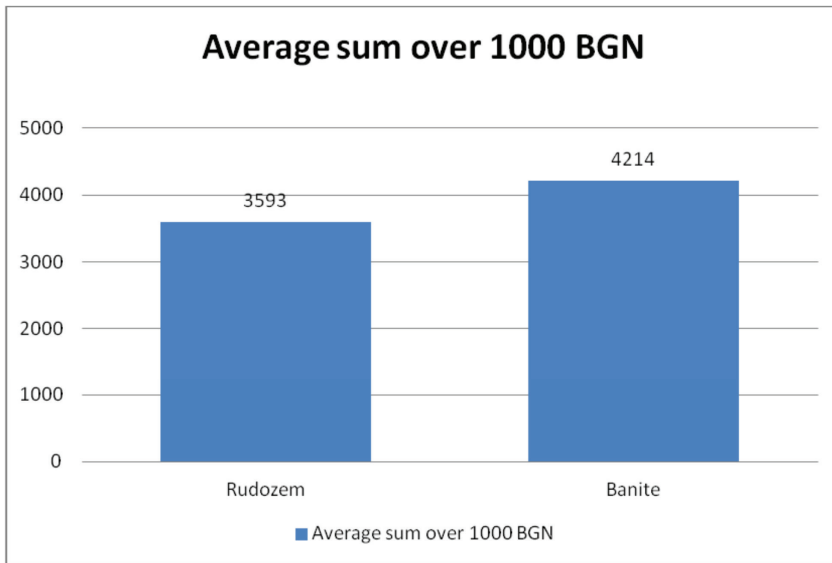
Question № 12 also gives the surveyed an option of a free response, where each respondent may point a sum over 1000 BGN, that is related to the value of the non-material benefits of the ecosystem/landscape services provided by 1 ha per year. 30% of the surveyed in Banite Municipality and 45% of the respondents in Rudozem Municipality have made a suggestion (Fig. 13). Eliminating the extremes, we calculated the average amount of money, which is 4214 BGN per hectare per year for Banite Municipality and 3593 BGN per hectare per year for the Municipality of Rudozem (Fig. 14). The responses in Apriltsi, Kalofer and Smolyan-Gorna Arda are respectively 2636, 4400 and 5284 BGN per hectare per year (Assenov, Borissova, 2016). We can conclude that the municipalities of Apriltsi and Banite are those with the closest responses. The average sum in Rudozem Municipality is closest to that of Kalofer Municipality.

The results of the evaluation of the ecosystem/landscape goods and services in the municipalities of Banite and Rudozem require the search of a corrective with the results of other similar researches. The number of this kind of studies, carried out in Bulgaria, is still small, but one of the first of this type (Zervoudakis et al., 2007) is conducted for all municipalities in the Rhodope Mountains and can be used as a starting point for a comparison. Zervoudakis et al. (2007) use the transfer method for evaluation in order to evaluate different types of CORINE Land Cover in BGN per hectare per year, which gives us the opportunity



Фиг. 13. Оценка на нематериалните ползи

Fig. 13. Evaluation of the non-material benefits



Фиг. 14. Средна сума на нематериалните ползи над 1000 лв.

Fig. 14. Average sum for non-material benefits over 1000 BG

to compare the former and the current research and search for similarities and differences. Average values of the ecosystem services of an area of 1 ha for all municipalities in the Rhodope Mountains are determined in the cited research. The similarities between the study of Zervoudakis et al. (2007) and the current one, conducted by the use of different methods, is that the material ecosystem services always have lower value, compared to the total value of the regulating, cultural and ecosystem services. Zervoudakis et al. (2007) provide sums in BGN per hectare per year, where for forests they are 191 BGN per hectare per year, 107 BGN per hectare per year for meadows and open spaces, 3453 BGN per hectare per year for water and water spaces and the total amount of money provided by these material services is 3751 BGN per hectare per year. If we compare and equalize the forests in Zervoudakis et al. (2007) research with the firewood in ours, we will find out that the sum for the Municipality of Banite is 665 BGN per person per year and 725 BGN per person per year for Rudozem Municipality, but not per hectare, but per person per year. If part of the forests, meadows and open spaces are equalized to mushrooms, forest fruits and game in our questionnaire, we will discover that the 107 BGN per year per hectare in Zervoudakis et al. (2007) research is over eight times lower than the one, unveiled in Banite Municipality with the average of 883 BGN per person per year (Fig. 10, mushrooms (129+504=633) + herbs and forest fruits (86+117=203) + half of the value of game and fish (47 BGN) = 883 BGN per hectare per year) and almost ten times lower than the one in Rudozem Municipality with the average of 1052 per hectare per year (Fig. 10, mushrooms (86+294=380) + herbs and forest



fruits (58+200=258) + the half of game and fish (114 BGN) = 1052 BGN). There is a question in our questionnaire about the material ecosystem services, concerning stones and inert materials and they are evaluated by respondents in the municipalities of Banite and Rudozem respectively at 457 BGN per hectare per year and at 463 BGN per hectare per year.

Although these values cannot be collated as BGN per hectare per year and BGN per person per year, it is apparent that they are much higher in the questionnaire survey if we multiply them with the population of the two municipalities (4503 in Banite Municipality and 9599 in the Municipality of Rudozem as of 31.12.2014) and by Zervoudakis et al. (2007) research if we multiply them with the 30 112 ha (total area of Banite Municipality) and the 19 175 ha (total area of Rudozem Municipality). This comparison underlines the more objective result, following a consultation with the population, even if we eliminate the suspicion that respondents are not always willing to reply correctly, especially when it comes to mushrooms, forest fruits, game and stones. According to Zervoudakis et al. (2007) the regulating, cultural and supporting ecosystem services in the municipalities of Banite and Rudozem, represented by forests, cost 1093 BGN per hectare per year, meadows and open spaces – 291 BGN per hectare per year, agricultural areas – 140 BGN per hectare per year (by Zervoudakis et al., 2007) as an average value for the whole area of the Rhodope Mountains), water areas cost 10 144 BGN per hectare per year and wet zones cost 14 771 BGN per hectare per year in both municipalities.

Table 1  
Таблица 1

Economic value of ecosystem services in Banite and Rudozem Municipalities  
(Zervoudakis et al., 2007)

Икономическа стойност на екосистемните услуги в общините Баните  
и Рудозем (Зервудакис и др., 2007)

CLC		Municipality	Forests	Meadows/ open spaces	Water bodies	Wet zones	Agricult. areas	Anthropogenic areas	Total	
Area (ha)		Banite	19005	6002	198		4695	411	30112	
		Rudozem	14837	2006	112	0	1946	386	19175	
Value of ESS (BGN/ ha/year)	Material	Banite	191	107	3453	12357	1259			
		Rudozem	191	107	3453	12357	1259			
	Reg./cult./supp.	Banite	1093	291	10144	14771				
		Rudozem	1093	291	10144	14771				
	Combination	Banite	1284	398	13597	27128	1259			
		Rudozem	1284	398	13597	27128	1259			
Total value mln./BGN/year	Material	Banite	3,6	0,6	0,7	0,0	5,9		10,9	
		Rudozem	2,8	0,2	0,4	0,0	2,5		5,9	
	Reg./cult./supp.	Banite	20,8	1,7	2,0	0,0	0,0		24,5	
		Rudozem	16,2	0,6	1,1	0,0	0,0		17,9	
	Combination	Banite	24,4	2,4	2,7	0,0	5,9		35,4	
		Rudozem	19,1	0,8	1,5	0,0	2,5		23,8	
	% of total value		Banite	68,9	6,7	7,6	0,0	16,7		100,0
			Rudozem	80,0	3,4	6,4	0,0	10,3		100,0

The total value of these services (Zervoudakis et al., 2007) excluding wet zones, is 11 528 BGN per hectare per year for the municipalities of Banite and Rudozem. Question № 12 gives a reply about the value of the same ecosystem services, defined as non-material ecosystem services. The average sum of the replies of 30% of respondents in Banite Municipality (Fig. 14), that proposed a sum over 1000 BGN per hectare per year, is 4214 BGN per hectare per year, and the sum is 3593 BGN per hectare per year, according to 45% of the respondents in Rudozem Municipality. This amount of money is completely commensurable as a price with the already mentioned research, but it is two or three times lower, because we use the contingent valuation method in our research and there is always a risk of misunderstanding of the last question by respondents.

In Zervoudakis et al. (2007) research the price of the round timber, earned by the Forestries, is added to the total value of BGN per hectare per year. There is a criticism of the contingent valuation method of ecosystem services, following people's psychological difference when they make a hypothetical decision, but this can be neglected, because respondents have declared approximately the same values, that have been calculated through estimations, assumptions and insuring against too high values, in other countries in the temperate zone.

The authors of the current research accept the results and efforts of future studies in the field have to be aimed at the search of other regularities, tied to the sustainable development of mountain areas.

## CONCLUSIONS

The current research was conducted by the use of the contingent valuation method, combined with the market price method, following the aim to evaluate the ecosystem/landscape goods and services and it is a continuation of the previous research in Apriltsi, Kalofer and Smolyan-Gorna Arda. The analysis of the values, concerning ecosystem/landscape services in the current study, has led us to draw some conclusions:

- The inspiring results of the evaluation of the ecosystem/landscape services by the use of the contingent valuation method gives hope that this method will be used in other studies.
- We assume that the average values, concerning regulating, cultural and supporting ecosystem/landscape services, are close enough to their real dimensions.
- This is an open field and there is still room for improvement of the questions in the questionnaire.
- The current investigation, conducted among residents of the municipalities of Banite and Rudozem also proved to have an educational benefit for the locals. Among the interviewers were assistant professors, PhD students and students from the Faculty of Geology and Geography and the Faculty of Biology of Sofia University "St. Kliment Ohridski", as well as PhD students from both, Space Research and Technology Institute and the National Institute of Geophysics, Geodesy and Geography of Bulgarian Academy of Sciences.
- The conducted evaluation of the ecosystem/landscape services in two of the Rhodopean municipalities can be used as a base for extension of the research's range and is also a premise for modeling the landscape planning of the two objects.

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