Determining Potential of Coastal Areas in Producing Ecosystem Services by using AHP Method: A Case Study in Artvin, Turkey

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ABSTRACT— ***The aim of this study was to determine the potential of ecosystems in coastal areas to produce ecosystem services by a case study in Artvin province and express such potential in spatial terms. In the study, a GIS-based evaluation was made using Analytic Hierarchy Process (AHP). In this context, CORINE 2006 land cover map was reclassified and 5 ecosystems were found in Black Sea shore of Artvin province, which was chosen as the study area. These ecosystems are urban, forests, cultivated, inland waters and coastal areas. Ecosystem services produced by the ecosystems found were identified by considering Millennium Ecosystem Assessment (MEA) report. Then these ecosystems were evaluated using AHP within themselves and in the context of services they produce. As a result, it was observed that the highest amount of provisioning services is provided by forests and cultivated, while the highest amount of regulating services and cultural services are provided by forests and urban, respectively. In the study area, the ecosystem services provided by ecosystems by the highest percentage include food, fresh water, climate regulation, water purification and waste treatment, aesthetic values and recreation and ecotourism. This study, by which the potential to produce ecosystem services was determined using land cover and analytic hierarchy process, provides suggestions for spatial-based planning studies in the sample of coastal areas.***

Keywords— Ecosystems, ecosystem services, land cover, CORINE

1. INTRODUCTION

All of the world's natural and semi-natural ecosystems provide numerous benefits to humanity with their ecological, social and economic resource values (Hermann et al. 2011). The concept of ecosystem accounts for the relationships among all living organisms, including people, and the benefits for people of the services provided by ecosystems (TEEB 2010). Humans provide a range of benefits by using natural ecosystems and their parts and services which are directly useful for people (Daily et al. 1997). However, various and numerous human activities taking place in present-day conditions cause degradation of these ecosystems, making them lose their value. Urbanization was also considered to be a critical factor in determining human stress on ecosystems (Bennett et al. 2005). Therefore, residential areas are the source of negative effects on ecosystems (Schneider et al. 2012). However, humanity is fully dependent on ecosystems around the world and the services they provide such as food, fresh water, disease control, climate regulation, aesthetic values, etc. (MEA 2005).

Ecosystem services can be defined as benefits provided by ecosystems to people and it comprises structures and processes created by ecosystems (Fagerholm et al. 2012). Ecosystem services can be defined as conditions and processes created by natural ecosystems and species for sustainability of human life (Daily 1997). MEA report, which is a constituent evaluation on ecosystem services developed with the participation of 1300 experts from across the world, defines ecosystem services as the benefits people obtain from ecosystems (MEA 2005).
MEA made an integrated evaluation for researchers working on ecosystem services, including decision makers, scientists, official and non-official organizations, and classified ecosystem services under 4 categories: provisioning services, regulating services, cultural services and supporting services. Provisioning services are the products people obtain from ecosystems, such as food, fuel, fiber, fresh water, and genetic resources. Regulating services are the benefits people obtain from the regulation of ecosystem processes, including air quality maintenance, climate regulation, erosion control, regulation of human diseases, and water purification. Cultural services are the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences.

Supporting services are those that are necessary for the production of all other ecosystem services, such as primary production, production of oxygen, and soil formation (MEA 2003). The provision of these services is based upon the performance of ecological structures, processes and functions (Müller et al. 2010).

The vision of the MEA is a world in which people and institutions appreciate natural systems as vital assets, recognize the central roles these assets play in supporting human well-being, and routinely incorporate their material and intangible values into decision making (Daily et al. 2009). In this context, in studies conducted on the subjects of decision making and administration, MEA provides a powerful reference for planners and researchers working on ecosystem services. However, ecosystem values are not well accounted for in decisions concerning natural resources (Wallace 2007).

Studies conducted within the framework of including ecosystem services in decision making and administration emphasize that ecosystem services should be expressed in spatial terms (Kandziora et al. 2013). Currently, a variety of techniques such as GIS-based mapping techniques are applied to express ecosystem services in spatial terms (Troy and Wilson 2006; Chen et al. 2009; Crossman et al. 2013). Studies conducted in this context often utilize land cover data (Koschke et al. 2012; Kandziora et al. 2013). Given that various types of area have the potential to produce a variety of ecosystem services, land cover data is a particularly important type of data in determination of the potential to produce ecosystem services.

Previous studies address determination and judgment of ecosystem services utilizing land cover data within the framework of a variety of methods. Considering the impact of each ecosystem in the world on creating various types of land, coastal areas are distinguished from other ecosystems because of their properties.

Coastal areas are habitats in which sea and land ecosystems meet and affect each other, and with their unique properties distinguishing them from other regions, they are nonrenewable natural resources rendered appealing for economic, social and competitive activities such as urbanization, industry, transportation, tourism, etc. (Sesli et al. 2003). With all such properties, coastal areas are among the major areas subject to heavy use. From this perspective, ecosystem services produced by ecosystems located in coastal regions should be identified and taken into account in terms of conservation and management. Moreover, in Regulation on Spatial Planning published by the Ministry of Environment and Urbanization (CSB 2014), it is emphasized that plans observing conservation of coastal ecosystems and use of natural resources should be made in line with the principle of sustainable development.

The aim of this study was to determine the potential of ecosystems in coastal areas to produce ecosystem services. In this context, ecosystem service values obtained using Analytic Hierarchy Process was expressed in spatial terms on the study area by GIS.

2. MATERIAL AND METHOD

2.1 Study area

Arhavi and Hopa districts located by the Black Sea of Artvin province, which borders Georgia and is located in northeast of Turkey, were chosen as the study area. Total coastal length of Artvin province by the Black Sea is 36.2 km, 9.1 km of which is in Arhavi and 27.1 km of which is in Hopa (CSB 2015). The border of the study area was specified as the planning border addressed in the Project for Management and Planning of Artvin-Rize Integrated Coastal Areas published in 2011 by the Ministry of Environment and Urbanization, and the study area has a surface area of 4161.60 ha.

The study area (*Figure 1*) is particularly rich in potential to produce ecosystem services because of its natural and cultural resource values. It stands out with an industry based on cultivation of tea, and there are 3 tea factories in the area. Hazelnut, kiwifruit, blueberry, vegetables and fruits are produced in the area, in addition to tea. Within the scope of beekeeping and fishing activities that have developed in recent years, anchovies, mackerel, bonito fishing is done, and live trout breeding is performed in Arhavi district. Furthermore, Port of Hopa located in Hopa district makes significant contributions to the district in terms of import and export. The study area also accommodates numerous recreation areas and cultural values. In this context, some of the important cultural values of Arhavi district include Ciha surveillance castle dating from the Genoese, Merkez, Ulukent and Ortacalar mosques and Ortacalar double arch bridges. Çamburnu Nature Conservation Site, Kopmuş beach in Kemalpaşa as well as Kıyıcık Beach in Arhavi are within the borders of the study area (CSB 2013; GTHB 2013).

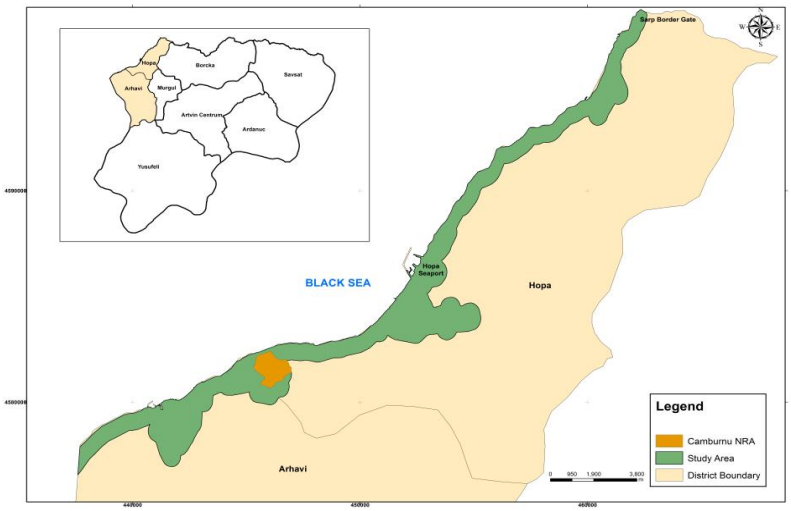

Figure 1: Study area

The study area borders Georgia so particularly in the summer, many tourists come to the area, making economic contribution to the region.

2.2 Data Collection and Method

In this study, CORINE 2006 land cover map of 1/100 000 scale in numerical format of Artvin province obtained from Ministry of Environment and Urbanization was used as the main basis. CORINE land cover classification consists of 3 hierarchical levels specified by European Environmental Agency. The first level includes 5 main classes, including artificial surfaces, agricultural areas, forest and semi-natural areas, wetlands and water bodies. The second and third levels include 15 and 44 subclasses, respectively. Depending on the diversity of land structure in Turkey, 12 more classes were added to existing 44 classes in the third level (Çivi et al. 2009).

Furthermore, zoning plans of 1/1000 scale of 2 districts and 1 town within the scope of the study area were obtained from the respective Municipalities. The shore border line (SBL) obtained from Provincial Directorate of Environment and Urbanization was utilized to identify the coast line in the study area. In the study, CORINE 2006 land cover map was reclassified by considering third level land cover classification and other data obtained, and 5 ecosystems were found: urban, forests, cultivated, coastal and inland waters (*Figure 2*).

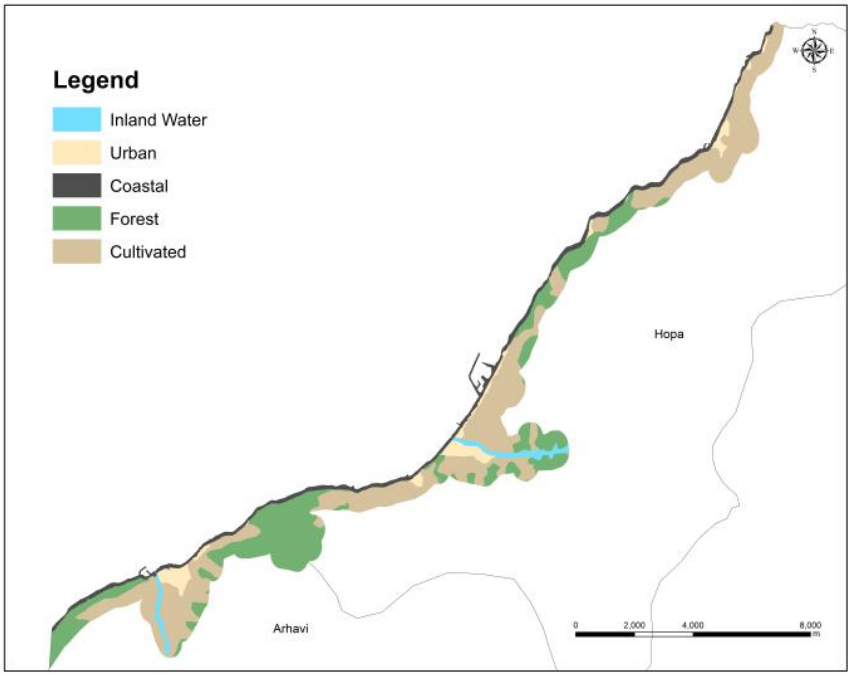

Figure 2: Ecosystems

The study area covers 2100.24 ha of cultivated, 1307.92 ha of forest, 231.69 ha of urban, 401.40 ha of coastal and 120.35 ha of inland waters (*Table 1*).

MEA report was used to express ecosystem services in spatial terms, which was the aim of the study. Accordingly, an evaluation was made within the scope of provisioning, regulating and cultural services, which are the ecosystem services directly affecting public welfare. As stated by Muhacir (2014), supporting services do not directly influence public welfare so they were not included in the evaluation in this study. In this context, a total of 26 ecosystem services (sub-categories) in 3 categories (provisioning, regulating and cultural services) produced by 5 ecosystems in the study area were identified and indicated in *Table 2*.

Table 1: Land cover groups according to CORINE land cover class

Land cover group	CORINE Land cover class	% of study area
Urban	122, 1122, 123	5,57
Forest	311, 313, 324	31,43
Cultivated	243, 2421	50,47
Coastal	122, 123, 243, 313, 324, 511, 523, 1122, 2421*	9,64
Inland Waters	511	2,89

*Coastal ecosystem was designated as the area on the side of the sea of the shore border line (SBL) as a result of the superposition of CORINE Land Cover and the shore border line.

In the next stage of the study, an expert group of 7 people was surveyed according to AHP, and the weights of individual ecosystem service categories with respect to each other as well as the weights of their subcategories with respect to each other were determined. According to this, each category and subcategories were weighted, and the potential of 5 ecosystems in the study area to provide ecosystem services was calculated according to the following formula.

$$W_E = W_P(\sum_P) + W_R(\sum_R) + W_C(\sum_C)$$

Where W_E: Weight of ecosystems; W_P: Weight of provisioning services, W_R: Weight of regulating services; W_C: Weight of cultural services; $\sum_P$: Total weight of provisioning services, $\sum_R$:Total weight of regulating services, $\sum_C$:Total weight of cultural services.

Table 2.:Ecosystems and ecosystem services they provide

ECOSYSTEM SERVICES	CATEGORIES	PROVISIONING							REGULATING								CULTURAL									
	SUB CATEGORIES	Food (P1)	Fresh Water (P2)	Biological raw material (P3)	Genetic resources (P4)	Fiber (P5)	Ornamental resources (P6)	Biochemicals and pharmaceuticals (P7)	Climate regulation (R1)	Air quality regulation (R2)	Water regulation (R3)	Erosion regulation (R4)	Disease regulation (R5)	Water purification and waste treatment (R6)	Pest regulation (R7)	Pollination (R8)	Natural hazard regulation (R9)	Cultural diversity (C1)	Knowledge systems (C2)	Aesthetic values (C3)	Educational values (C4)	Inspiration (C5)	Cultural heritage values (C6)	Sense of place (C7)	Social relations (C8)	Spiritual and religious values (C9)	Recreation and ecotourism (C10)
ECOSYSTEMS	URBAN		■						■	■				■				■			■		■				■
	FOREST	■	■	■	■	■		■	■	■		■	■				■			■						■	■
	CULTIVATED	■	■	■	■	■		■	■				■	■	■					■			■				
	COASTAL	■							■					■			■			■							■
	INLAND WATER	■	■									■	■	■			■			■							■

2.3 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process (AHP) method was developed by Thomas L. Saaty in 1977 as a model which can be used during multi-criteria decision-making (Kavas, 2009; Akıncı et al., 2012). AHP in one of the powerful, easy-to-understand (Erdoğan et al. 2013) and most widely used multi-criteria decision-making techniques which allow both quantitative (objective) and qualitative (subjective) factors to be taken into consideration during determination of the most appropriate decision alternative (Bunruamkaew and Murayama 2011).

In AHP method, a hierarchical model consisting of a purpose, criteria, subcriteria and options is developed for each problem (Özcan et al. 2009; Akıncı et al. 2013), and this model allows users to determine weights of the criteria. Here, depending on the criterion in the next level up, lower criteria are scored according to AHP preference scale (*Table 3*) suggested by Saaty (1990) during their paired comparisons among themselves and a paired comparison matrix is created (Kavas 2009; Akıncı et al. 2013), and the weight of each criterion is calculated by normalizing the paired comparison matrix.

Table 3: Basic evaluation scale of AHP (Saaty 1990)

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment strongly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong	demonstrated importance its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

In AHP method, inconsistencies may emerge because paired comparisons made while creating the matrix are established subjectively, even though such comparisons are objective (Kavas 2009). Therefore, logical consistency of paired comparisons should be checked (Öztürk and Batuk 2010). In this context, Consistency Ratio (CR) suggested by Saaty (1980) is used to measure consistency of judgments. At this point, if a consistency ratio calculated for paired comparison matrix is below the upper limit (0.10) suggested by Saaty, judgments have satisfactory consistency (Öztürk and Batuk 2007; Akıncı et al. 2012). Otherwise, a reclassification should be made (Kavas 2009).

3. RESULT AND DISCUSSION

3.1 Application of AHP Questionnaire and Determination of Weights

In this study, first, the expert group of 7 people was asked to compare ecosystem service categories and list them in the order of importance in the context of coastal areas. As a result of the evaluation, ecosystem service categories were listed as provisioning, cultural and regulating services in decreasing order (*Table 4*).

In the second stage, AHP questionnaire was applied to the same expert group for each ecosystem service category and the order of importance of ecosystem service subcategories on planning and management of coastal areas was established. Accordingly, the evaluation matrixes for 7 ecosystem service subcategories in provisioning category, 9 ecosystem service subcategories in regulating category and 10 ecosystem service subcategories in cultural category are given in *Tables 5*, *6* and *7*, respectively.

Table 4: The value of the ecosystem services categories

Ecosystem Services	Expert Opinions								Weights
	E1	E2	E3	E4	E5	E6	E7	E_T	E_T/T
Provisioning	3	2	3	3	1	1	3	16	0,381
Regulating	2	1	1	1	3	3	1	12	0,286
Cultural	1	3	2	2	2	2	2	14	0,333
					Total			42	1

Table 5: Assessment matrix of provisioning services and subcategories value

Sub Category	P1	P2	P3	P4	P5	P6	P7	Weights
P1	1,00	0,33	3,00	5,00	5,00	6,00	7,00	0,253
P2	3,03	1,00	5,00	7,00	5,00	8,00	8,00	0,414
P3	0,33	0,20	1,00	3,00	3,00	3,00	2,00	0,116
P4	0,20	0,14	0,33	1,00	0,33	2,00	2,00	0,054
P5	0,20	0,20	0,33	3,03	1,00	3,00	2,00	0,085
P6	0,17	0,13	0,33	0,50	0,33	1,00	0,50	0,033
P7	0,14	0,13	0,50	0,50	0,50	2,00	1,00	0,045
Total	5,07	2,12	10,50	20,03	15,16	25,00	22,50	1,00

Calculated consistency ratios of judgments found as a result of paired comparisons of provisioning, regulating and cultural services were 0.08903, 0.08911 and 0.04945, respectively. These ratios being lower than the highest limit of 0.10 -as suggested by Saaty (1980)- indicate that the judgements of this research are sufficient in respect to consistency.

Table 6: Assessment matrix of regulating services and subcategories value

Sub Category	R1	R2	R3	R4	R5	R6	R7	R8	R9	Weights
R1	1,00	2,00	4,00	6,00	7,00	7,00	7,00	2,00	7,00	0,296
R2	0,50	1,00	2,00	3,00	4,00	4,00	5,00	0,20	5,00	0,144
R3	0,25	0,50	1,00	3,00	5,00	2,00	4,00	0,50	2,00	0,103
R4	0,17	0,33	0,33	1,00	5,00	2,00	4,00	0,50	2,00	0,078
R5	0,14	0,25	0,20	0,20	1,00	0,50	0,50	0,11	0,50	0,023
R6	0,14	0,25	0,50	0,50	2,00	1,00	2,00	0,20	1,00	0,043
R7	0,14	0,20	0,25	0,25	2,00	0,50	1,00	0,11	0,50	0,028
R8	0,50	5,00	2,00	2,00	9,09	5,00	9,09	1,00	7,00	0,244
R9	0,14	0,20	0,50	0,50	2,00	1,00	2,00	0,14	1,00	0,041
Total	2,99	9,73	10,78	16,45	37,09	23,00	34,59	4,76	26,00	1,00

In view of provisioning service category, the most important subcategory was fresh water (P2) with a weight of 0.414, while the second most important subcategory was food (P1) with a weight of 0.253. The least important subcategory in this category was ornamental resources (P6) with a weight of 0.033.

In regulating services category, the most important subcategory was climate regulation (R1) with a weight of 0.296, followed by pollination (R8) with a weight of 0.244. Disease regulation (R5) appeared to be the least important subcategory with a weight of 0.023 in this category.

In cultural services category, the most important subcategory was cultural diversity (C1) service with a weight of 0.255, followed by cultural heritage values (C6) with a weight of 0.212. The least important subcategory of this category was knowledge systems (C2) with a weight of 0.018.

Table 7: Assessment matrix of cultural services and subcategories value

Sub Category	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Weights
C1	1,00	9,00	5,00	7,00	7,00	2,00	9,00	2,00	4,00	2,00	0,255
C2	0,11	1,00	0,25	0,50	0,33	0,14	0,50	0,14	0,20	0,14	0,018
C3	0,20	4,00	1,00	2,00	2,00	0,20	3,00	0,33	0,50	0,33	0,054
C4	0,14	2,00	0,50	1,00	0,50	0,14	2,00	0,20	0,25	0,17	0,029
C5	0,14	3,03	0,50	2,00	1,00	0,17	2,00	0,20	0,33	0,20	0,037
C6	0,50	7,14	5,00	7,14	5,88	1,00	7,00	3,00	3,00	2,00	0,212
C7	0,11	2,00	0,33	0,50	0,50	0,14	1,00	0,17	0,20	0,14	0,023
C8	0,50	7,14	3,03	5,00	5,00	0,33	5,88	1,00	2,00	0,50	0,127
C9	0,25	5,00	2,00	4,00	3,03	0,33	5,00	0,50	1,00	0,33	0,084
C10	0,50	7,14	3,03	5,88	5,00	0,50	7,14	2,00	3,03	1,00	0,161
Total	3,46	47,46	20,64	35,03	30,24	4,96	42,53	9,54	14,51	6,81	1,00

In their study, putting ecosystem services in hierarchical order in watershed scale using AHP, Bryan et al., (2010) found "food" as the most important ecosystem service out of provisioning service categories followed by the services of "biochemical and pharmaceuticals" and "fresh water". In addition, they also reported that "air quality regulation" and "climate regulation" were the most important ecosystem services within regulating service categories while among cultural services categories, it was determined that services of "cultural diversity" and "cultural heritage value" were the most important services.

In addition, by determining the weights of the ecosystem services in a watershed planning study with AHP, Albayrak (2010) sorted services in importance level as ecological, economical, and socio-cultural aspects. The fresh water was the most important one followed by the biochemical and pharmaceuticals, and food in that study as well. Moreover, it was interesting to see that both the recreational and ecotourism services were found to be the least important services in that study.

Rather different results were found in a study initiated to determine the importance of ecosystem services for rural tourism planning in Muhacir (2014). While the most important one was the food among the category of provisioning service, it was natural hazard regulation and knowledge systems within the categories of regulating and cultural services, respectively.

In a watershed scale study on detecting the effects of climate change on ecosystems, AHP was used to specify ecosystem services in order of priority (Shi et al. 2014) and they reported that the food and fresh water were the prior among the category of provisioning services while it was the climate regulation when it comes to the category of regulating services (Shi et al. 2014). The cultural services were not considered in this study.

Besides the studies using the methods of multi-criteria decision-making on determining multiple ecosystem services, there are also studies taken place for evaluating only one ecosystem service (Nahuelhaul et al. 2013).

3.2 Spatial Evaluation of Ecosystems

With regard to 26 ecosystem services included in the evaluation, urban ecosystem has the potential to provide a total of 8 ecosystem services, including fresh water, climate regulation, air quality regulation, water purification and waste treatment, cultural diversity, educational values, cultural heritage values, recreation and ecotourism, forest ecosystem has the potential to provide a total of 14 ecosystem services, including food, fresh water, biological raw material , genetic resources, fiber, biochemicals and pharmaceuticals, climate regulation, air quality regulation, erosion regulation, disease regulation, natural hazard regulation, aesthetic values, spiritual and religious values, cultivated ecosystem has the potential to provide a total of 12 ecosystem services, including food, fresh water, biological raw material, genetic resources, fiber, biochemicals and pharmaceuticals, climate regulation, disease regulation, water purification and waste treatment, pest regulation, aesthetic values and cultural heritage values, coastal ecosystem has the potential to provide a total of 6 ecosystem services, including food, climate regulation, water purification and waste treatment, natural hazard regulation, aesthetic values and recreation and ecotourim, and inland waters ecosystem has the potential to provide a total of 8 ecosystem services, including food, fresh water, erosion regulation, disease regulation, water purification and waste treatment, natural hazard regulation, aesthetic values and recreation and ecotourism (*Table 8*).

Table 8: Ecosystems, ecosystem services and their values

Ecosystems	Ecosystem services	Value
Urban	P2, R1, R2, R6, C1, C4, C6, C10	0,5701
Forest	P1, P2, P3, P4, P5, T7, R1, R2, R4, R5, R9, C3, C9, C10	0,8117
Cultivated	P1, P2, P3, P4, T5, T7, R1, R5, R6, R7, C3, C6	0,7378
Coastal	P1, R1, R6, R9, C3, C10	0,4998
Inland Water	P1, P2, R4, R5, R6, R9, C3, C10	0,5818

Accordingly, the ecosystem which provides the highest number of ecosystem services is forest ecosystem (14 services), while coastal areas provide the least number of ecosystem services (6 services).

It is clear that any of the ecosystem services categories is provided by all ecosystems, while the highest number of provisioning, regulating and supporting services is provided by forests and cultivated (6 services), forests (5 services) and urban ecosystems (4 services), respectively.

In a similar research by Fontana and others (2103), a potential for ecosystem services of land cover types were analyzed and the results showed that pasture lands generated the most ecosystem services with an increasing trend by time followed by the agricultural lands and forests.

When ecosystems were evaluated based on ecosystem services subcategories, the ecosystem services which were provided to the highest extent in the study area were P1 (Food), P2 (Fresh water), R1 (Climate regulation), R6 (water purification and waste treatment), C3 (Aesthetic values) and C10 (Recreation and ecotourism), which were provided by 4 out of 5 ecosystems. On the other hand, P6 (ornamental resources) and C4 (Educational value) were provided by none of the ecosystems.According to this, the weight of each ecosystem obtained from AHP survey by considering ecosystem services provided by the respective ecosystem was put in the formula, and the weights with respect to the potential to produce ecosystem service of the ecosystems on the land cover were determined (*Table 8*).

The most important and the least important subcategories provided by each ecosystem category were selected by the weights obtained as a result of AHP, and the areas providing these subcategories in the study area were expressed in spatial terms. In this context, P2 and P6 were selected from provisioning services category, R1 and R5 from regulating services category and C1 and C2 from cultural services category (*Figure 3*). P6 and C2 services were provided by none of the ecosystems in the study area so they were excluded from the scope of spatial evaluation. Indeed, it can be seen that these services are the least important ecosystem services within their own categories.

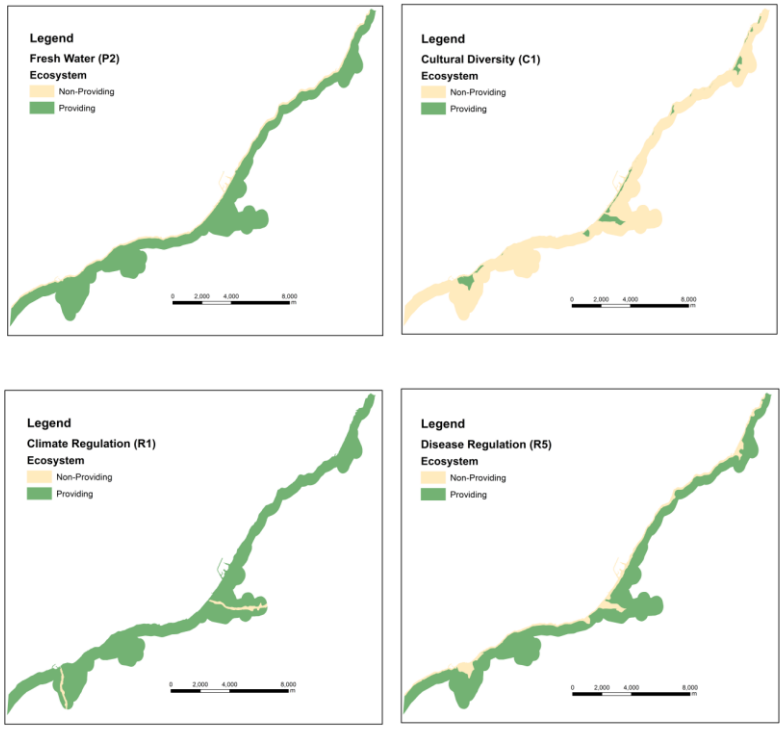

Figure 3: The areas of the providing P2, C1, R1 and R5 services

4. CONCLUSIONS

This study aimed to determine the potential of ecosystems in coastal areas to produce ecosystem services and was performed in the coast line of Arhavi and Hopa districts located by the Black Sea of Artvin Province. In the study, within the context of forest, cultivated, urban, coastal and inland waters ecosystems obtained as a reclassification of CORINE land cover, ecosystem services in MEA report were evaluated using AHP and GIS and expressed in spatial terms.

As a result of the analysis, the importance of ecosystem services was established as provisioning, cultural and regulating services in decreasing order.

The ecosystem services which were provided to the highest extent in the study area, with the potential to be provided by 4 ecosystems, were P1 (Food), P2 (Fresh water), R1 (Climate regulation), R6 (water purification and waste treatment), C3 (Aesthetic values) and C10 (Recreation and ecotourism), whereas P6 (ornamental resources) and C4 (Educational value) were the ecosystem services provided by none of the ecosystems. Therefore, it can be concluded that the importance of ecosystem services may vary due to the differences in subject, scope and study area, but overall the food and freshwater services were found to be at top places in such studies.

As a result of the evaluations, forest and cultivated ecosystems occupy an area of 82% according to CORINE land cover classification and forests are the ecosystem with the highest weight by ecosystem weights, which lead to the conclusion that the study area is a quality area in terms of the potential to provide ecosystem services. It is unavoidable that any degradation that may take place in these ecosystems will lead to irreparable damage. This matter is also addressed in the Regulation on Spatial Planning published in 2014, which provides the legal basis for all spatial plans in Turkey, and in the regulation, it is recommended that the plans must be made on the basis of ecosystems for several areas, including coastal areas. In this context, it is clear that such ecosystems and ecosystem services produced by them should be used by observing the balance of conservation-use.

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