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ESTIMATING THE EFFECT OF MUNICIPAL ENVIRONMENTAL INDICATORS ON LIFE SATISFACTION: EVIDENCE FROM TURKEY*

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ABSTRACT

The municipalities in Turkey have a great extent statutory tools on coping with the environmental issues. Solid waste management, environmental health, and environmental management are among these responsibilities written merely down in the Municipal Law. Taking the Metropolitan Municipality Law into consideration, it is explicit that metropolitan municipalities own greater extent duties and powers than the other municipalities. In addition to these and according to the same Law mayors also have a responsibility, which is also a power, that is to take proper measures for tranquillity, well-being, health and happiness of the inhabitants. The municipalities necessarily, thus, have to provide the life satisfaction of their inhabitants through their several facilities.

This study aims to estimate the effect of environmental factors, which are in the scope of municipalities' responsibilities, on life satisfaction. In this regard, we use both the indicator values of well-being index for provinces and the environmental statistics released by the Turkish Statistical Institute (TurkStat) by the year 2015 and 2018, respectively. Secondary, we also incorporated the environmental expenditures of the municipalities announced by the Ministry of Treasury and Finance into the model employed in the study. We employed the ordered logistic regression to estimate the effect of independent environmental variables on our dependent variable "the life satisfaction". The main results of our estimation indicate that some environmental factors, such as number of municipalities served by a sewerage system, the rate of municipal population served by drinking water treatment plants, the rate of the forest area per km² and environmental

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expenditures of municipalities, have positive effects at several degrees on the life satisfaction of the inhabitants in the case of Turkey.

STRUCTURED ABSTRACT

This study aims to estimate the effect of environmental factors, for which the municipalities are responsible, on life satisfaction. In this paper, we state our question as “do environmental indicators under the responsibility of municipalities in Turkey have an effect on life satisfaction?” Accordingly, we define the null hypothesis as “ H_0 = The environmental indicators under the responsibility of municipalities in Turkey do not determine the life satisfaction of the people”.

Diener et al. consider the environmental factors such as air pollution, commuting, green space and noise as the determiners to be associated with the levels of life satisfaction, while they also (Diener, Ronald, & Tay, 2012, s. 24). Frey and et al. consider environmental quality as both an essential determinant of well-being and policy issue (Frey, Luechinger, & Stutzer, 2009, s. 2, 15, 23). Welsch criticizes the limited application of happiness data to environmental issues while he asserts that the studies linking happiness (life satisfaction) to environmental factors are on the bottom rung of the ladder (Welsch, 2009). Giovanis estimated the effect of recycling rate on British individuals' happiness by using both the fixed-effect model and ordered probit model (Giovanis, 2014). Luechinger estimated the effect of SO_2 concentration on life satisfaction (Luechinger, 2009, s. 498). MacKerron and Mourato associated life satisfaction with the air quality in London (MacKerron & Mourato, 2009). Welsch and Kühling mainly tested the assumption that life satisfaction depends on both the quantity of consumption and its environmental-friendliness (Welsch & Kühling, 2010). Schmitt and et al. investigated the relationship between pro-environmental behaviour and life satisfaction over participants in Canada and United States, by controlling some demographic characteristics, e.g. age, gender, income, as independent variables (Schmitt, Aknin, Axsen, & Shwom, 2018, s. 136). Xiao and Li examine the relation between sustainable consumption and life satisfaction (Xiao & Li, 2011). Praag and Baarsma found that noise problem affects Amsterdammers' life satisfaction significantly negative (Praag & Baarsma, 2005).

To sum up, the literature review points out that the researchers incorporate some specific environmental indicators into their life satisfaction estimations, such as air quality, emissions of some gases and noise. In Turkey, province-based indicators and figures prompted us to make a limited estimation instead of an individual search. Despite this limitation, we were able to make a more comprehensive estimation by adding 26 indicators and figures to the model that we employed in this study.

To test the hypothesis, we employed an ordered-logit model by using the TurkStat level of happiness data. The reasons for employing an ordered-logit apart from most studies those employ ordered-probit are that our data is not distributed normally, and the logit model is better and considered to be simple to interpret (Cramer, 2003, s. ix). In addition, we use life expectancy data and environmental statistics of which the announcement date varies. The latest one, which focuses on the level of

happiness, has been carried out in 2014 and declared in 2015. In that survey, TurkStat explored the life satisfaction dimension with the level of happiness indicator in accordance with the literature. The primary limitation of the data is that the level of happiness measured by TurkStat based on 81 provinces. This limitation steered us to seek environmental data on province-based. As the environmental data of municipalities individually would not match the level of happiness data declared totally, we apply to TurkStat surveys in which both environmental indicators and the level of happiness revealed on the basis of 81 provinces. We did not use the aggregate data released by TurkStat, but we excluded one of two or more related data, such as 'number of municipalities served by municipal waste services', 'municipal population served by sewerage system', in order to avoid repetitive estimations. The second limitation about the level of happiness data is that TurkStat released the mentioned data in percentages, not in a Likert Scale. Thus, we transformed the percentages into four-ordered-rank happiness level to be able to use it in an ordered-logit model.

The more the level of the quantity of the municipal services and goods increase, the lesser the quality they have. This issue drives inhabitants in municipalities into less life satisfaction. The noise problem is also amongst the factor affecting life satisfaction. As the population of the municipalities increases, it gives rise to a noise problem, which affects life satisfaction negatively. The municipalities should both provide more municipal services and goods to meet the needs of individuals and pay more attention to the quality of these services and goods, of course, in a participative manner. Although the municipalities increase their environmental service capacity already, they should also increase their service quality to scale up the level of life satisfaction of the inhabitants. As the municipalities have some insufficient infrastructure and hence the satisfaction rate of the people increase when they invest in these fields, the municipalities should invest in infrastructure more than ever besides expanding the number of their services and infrastructure investments. If the municipalities are able to make their inhabitants more satisfied/happier when they cut the noise problem, increase the number of sewerage system, water treatment plants and drinking water treatment plants, and forest area per km², they should invest more in these fields to increase the level of life satisfaction of their inhabitants and eventually the society.

There are some shortcomings in the environmental data in Turkey. Considering the fact that the recycling consciousness of the people in Turkey is unsatisfactory, even so, the recycling or circular economy principles should be applied in all levels of governments so as to increase the level of life satisfaction. We currently have minimal recycling data to incorporate in analyses. This issue limits the researchers in Turkey to make comprehensive analyses involving the new environmental paradigms for measuring life satisfaction. Provided that it is possible to use more accurate and perfect data, for further studies, we suggest calculating the monetized results of life satisfaction, not only by province-based data but also by individual-based.

Keywords: Environmental indicators, life satisfaction, municipalities in Turkey, happiness, ordered-logit

YAŞAM MEMNUNİYETİ ÜZERİNDE BELEDİYELERİN ÇEVRE GÖSTERGELERİNİN ETKİSİNİN TAHMİN EDİLMESİ: TÜRKİYE'DEN KANITLAR

ÖZ

Türkiye'deki belediyeler çevre sorunlarıyla mücadele etmede geniş çapta yasal araçlara sahiptir. Katı atık yönetimi, çevre sağlığı ve çevre yönetimi yalnızca Belediye Kanununda yazılı olan sorumlulukların arasından bazılarıdır. Büyükşehir Belediye Kanunu dikkate alındığında, büyükşehirlerde büyükşehir belediyelerinin sahip olduğu görev ve yetkilerin daha da fazla olduğu görülmektedir. Bunlara ek olarak ve aynı Kanunlara göre, belediye başkanlarının, aynı zamanda yetkileri de olan, belde halkının huzur, esenlik, sağlık ve mutluluğu için gereken önlemleri alma sorumlulukları da bulunmaktadır. Böylece belediyeler ister istemez sundukları çeşitli hizmetlerle halkın yaşam memnuniyetini de sağlamak zorundadırlar.

Bu çalışma belediyelerin sorumluluk alanına giren çevresel etkenlerin yaşam memnuniyeti üzerindeki etkisini tahmin etmeyi amaçlamaktadır. Bu bakımdan, Türkiye İstatistik Kurumunun yayımlamış olduğu 2015 yılı illerin yaşam memnuniyeti gösterge değerleri ve 2018 yılındaki çevre istatistiklerini kullanmış bulunmaktayız. İkinci olarak, Hazine ve Maliye Bakanlığı tarafından duyurulan belediyelerin çevre harcamalarını da bu çalışmada uygulanan modele dâhil ettik. Bağımlı değişken olan “yaşam memnuniyeti” üzerinde çevresel bağımsız değişkenlerin etkisini tahmin etmek için sıralı lojistik regresyonu kullandık. Tahminimizin başlıca sonuçları kanalizasyon hizmeti alan belediye sayısı, içme suyu arıtma tesisi hizmeti alan belediye nüfusunun oranı, km²'ye düşen ormanlık alan ve belediyelerin çevre harcamaları gibi bazı çevresel etkenlerin Türkiye'de belediye sınırları içerisinde yaşayan yerleşiklerin yaşam memnuniyeti üzerinde çeşitli düzeylerde pozitif yönlü etkileri olduğunu göstermektedir.

Anahtar Kelimeler: Çevresel göstergeler, yaşam memnuniyeti, Türkiye'de belediyeler, lojistik regresyon, sıralı logit.

Introduction

Life satisfaction, happiness, individual welfare and subjective well-being, which are possible to use interchangeably, are among the most attractive in-demand research topics having been measured for a long time. For instance, Welsch says that life satisfaction generally refers to happiness or subjective well-being in the literature (Welsch, 2009, s. 2736). Diener et al. define the subjective well-being as “a broad category of phenomena that includes people's emotional responses, domain satisfactions, and global judgments of life satisfaction” (Diener, Suh, Lucas, & Smith, 1999, s. 277). In his another study, Diener expresses that the literature is usually labelled as subjective well-being (Xiao & Li, 2011, s. 323). It can be claimed that the reason for taking the well-being or satisfaction as subjective in the literature is that the people state their selves satisfied or not.

World Happiness Report considers the happiness as a vague, subjective and eventually a politic issue by handling the term a ‘self-reported’ expression and asserting that human being gains

it thanks to social norms and a sense of belonging to the community (Helliwell, Layard, & Sachs, 2012, s. 6). Wilson believed that the happy person should be young, educated, religious, high-paid and married (Diener, Suh, Lucas, & Smith, 1999, s. 295). Ambrey points out the life satisfaction, utility, welfare and similar terms can be used synonymously especially in economics (Ambrey, 2014, s. 12). According to MacKerron and Mourato, besides using the terms above interchangeably, they also encountered the quality of life and hedonism in the literature. Nevertheless, they prefer to associate life satisfaction with eudaimonia (MacKerron & Mourato, 2009, s. 1442). Ryan et al. define eudaimonia as “*living a complete human life, or the realization of valued human potentials*” in their study, in which they distinguish between hedonic, being in a desire for fun and pleasure, and eudaimonic approaches to wellness (Ryan, Huta, & Deci, 2008). Hence, the literature directs us to use these terms interchangeably.

The terms are generally studied with some determiners such as income, unemployment, marital status, education, age, sex and other variables. However, associating life satisfaction with environmental factors can be considered as a recent development. For some decades, especially after the recognition of the global warming and hence the climate change, the humanity began to pay growing attention to environmental issues with the help of international institutions, the concerned nations and the consciousness of people.

In this paper, we aim to estimate the effect of environmental indicators and figures on the life satisfaction of the people in Turkey, in a province-based manner as TurkStat does. TurkStat measured the life satisfaction in 81 provinces of Turkey and released the results by these provinces as a whole. Nevertheless, this limitation has allowed us to make a province-based estimation. In this respect, first, we began to review the literature with the life satisfaction definition of TurkStat.

TurkStat defines the happiness as “*the situation characterized by the lack of pain, sorrow and persecution and by presence of joy, cheerfulness and satisfaction; that is being satisfied in generally with life*” (TurkStat, 2016). In this manner, TurkStat resembles World Happiness Report by defining the term with its antonyms.

Bentham explains the happiness to be equivalent to pleasure, whereas he asserts that nature places human being under the governance of *pain* and *pleasure* (Ambrey, 2014, s. 14). Happiness can be considered as an empirical indicator of utility (Welsch, 2009, s. 2736). According to Welsch, using happiness data for environmental assessment is significantly simple. In a previous study (Welsch & Kühling, 2009), in which he is a co-author, air pollution is taken as an explanatory variable, which is not a responsibility or an assignment for the municipalities in Turkey.

OECD points out that the strong economic growth of Turkey had been comparably disassociated from some sustainability indicators such as waste generation, energy use, air emissions and water consumption (OECD, 2019a, s. 3). For example, Turkey has the highest greenhouse gas emission growth among OECD members (OECD, 2019a, s. 25). It is expected that greenhouse gas emissions of Turkey will be tripled as of 2030 compared with the year 1990. The increase in these gases stems mainly from energy consumption (OECD, 2019a, s. 39).

The life satisfaction indicator of OECD aims to measure “*how people evaluate their life as a whole*” instead of self-reported life satisfaction. The organisation uses a scale from 0 to 10 to measure the life satisfaction levels of the member countries. Turkey, having 5.5 rates, shares the lowest levels with Greece and Portugal whereas the OECD average is 6.5. OECD also remarks that “*having access to green spaces*” is also a determiner of the quality of life (OECD, 2019b).

OECD environmental tax indicators show that the percentage of environmental taxes collected by Turkey is above OECD average as of percentage of GDP with 3.3% whereas the related taxes are 1.8% of GDP of the United Kingdom and 3.5% of GDP of Italy. Turkey collects two types

of environmental tax, i.e. tax on motor vehicles and tax on energy, of which percentages of GDP are 1.1% and 2.2%, respectively, as of 2016 (OECD, 2019c). Therefore, the environmental revenues and expenditures are included in the model as they may have some effects.

In 2016, TurkStat released the well-being index for provinces in Turkey, which assembles housing, work-life, income and wealth, health, education, safety, civic engagement, access to infrastructure services, social life, environment and life satisfaction dimensions, with their indicator values. The index, which presents a composite manner, aims to measure, compare and keep track in a time of the well-being of individuals and households on distinct life dimensions (TurkStat, 2016). Two of the dimensions of the index are determined as the environment and life satisfaction. The environment dimension gathers five indicators, one of which is 'satisfaction rate with municipal cleaning services', whereas the dimension 'life satisfaction' has merely the 'level of happiness' indicator.

Studies Coupling the Environment and Life Satisfaction

In recent studies, researchers tend to link happiness and environmental economics (Welsch, 2009, s. 2741). However, there is also an ascending number of researches coupling the environment and life satisfaction, some of which presented as below.

Diener et al. consider the environmental factors such as air pollution, commuting, green space and noise as the determiners to be associated with the levels of life satisfaction, while they also assert that economic indicators exclude environmental factors (Diener, Ronald, & Tay, 2013, s. 519).

Frey and et al. consider environmental quality as both an essential determinant of well-being and policy issue. They also take air pollution as an environmental disamenity and argue that the life satisfaction approach could improve by additional comparisons (Frey, Luechinger, & Stutzer, 2009, s. 2, 15, 23). Welsch criticizes the limited application of happiness data to environmental issues while he asserts that the studies linking happiness (life satisfaction) to environmental factors are on the bottom rung of the ladder (Welsch, 2009).

Giovanis estimated the effect of recycling rate on British individuals' happiness by using both the fixed-effect model and ordered probit model. His ordered probit model presents that the self-reported well-being of the total sample increases 0.0018% when the recycling rate reduces one percentage at the significance level 0.05, whereas the other environmental indicator 'precipitation' also increases the well-being and wind speed is not significant (Giovanis, 2014).

Luechinger estimated the effect of sulfur dioxide (SO_2) concentration on life satisfaction and found that one unit increase in SO_2 level decreases the life satisfaction of the German people 0.5% (Luechinger, 2009, s. 498).

In a similar study focusing on air pollution, Smyth and et al. examine the relationship between air pollution, measured as SO_2 emissions, and subjective well-being of the people living in urban areas of China. Considering China as a country confronting environmental problems, they employed an ordered-probit model to estimate the factors ranging from SO_2 emissions, traffic congestion to sociodemographic determiners such as gender, marital status and age. Their results show that a 1% increase in air pollution increases the probability of placing an individual into a lower well-being category by 15.58% (Smyth, Mishra, & Qian, 2008).

MacKerron and Mourato associated life satisfaction with the air quality in London. They mainly found out that air pollution levels have a negative effect significantly on life satisfaction by using an ordinary least squares model, in addition to two other models in their research. An increase in nitrogen dioxide (NO_2) level reduces Londoners' life satisfaction by 4.2%, at the same time

expressing that the findings are not possible to be generalized with confidence (MacKerron & Mourato, 2009).

Welsch and Kühling mainly tested the assumption that life satisfaction depends on both the quantity of consumption and its environmental-friendliness, using roughly 24,000 individuals in 27 countries, including Turkey, by employing an ordered-probit model. One of their findings is that life satisfaction is positively and significantly associated with the consumption of environmental-friendly products, the recycling or reuse of goods, and water conservation. They also found that pro-environmental attitudes of the individuals are associated with higher subjective well-being (Welsch & Kühling, 2010).

Similar to Welsch and Kühling, Schmitt and et al. investigated the relationship between pro-environmental behaviour and life satisfaction over participants in Canada and the United States, by predicting six hypotheses. The relevant hypothesis to ours' is that if individuals engage in pro-environmental behaviour more frequently, they would be positively related to life satisfaction (Schmitt, Aknin, Axsen, & Shwom, 2018). In this regard, they controlled some demographic characteristics, e.g. age, gender, income, as independent variables. They found that engagement in pro-environmental behaviour is associated with greater subjective well-being by using a series of multiple linear regression models. In their words, "*the more frequently the participants reported engaging in the behaviour, the higher life satisfaction they reported*" (Schmitt, Aknin, Axsen, & Shwom, 2018, s. 136).

Xiao and Li examine the relation between the life satisfaction and the sustainable consumption, by using the United Nations definition as "*the use of goods and services that respond to basic needs and bring a better quality of life, while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations*". They specifically focus 'the environment-friendly purchase or green purchase' aspect of the term in their study, in which they collected data from 14 cities in China and employed both ANOVA and regression methods (Xiao & Li, 2011).

Praag and Baarsma found that noise problem affects Amsterdammers' life satisfaction significantly negative. If the noise stemming from Schiphol Airport, Amsterdam, increases one percentage, the well-being equation diminishes 11.26% at 0.05 level according to their estimations, in which an ordered-probit model is employed (Praag & Baarsma, 2005).

The literature review points out that the researchers incorporate some specific environmental indicators into their life satisfaction estimations, such as air quality, emissions of some gases and noise. Unlike these studies, we focus on the environmental indicators and figures that the municipalities provide. In Turkey, province-based indicators and figures prompted us to make a limited estimation instead of an individual search. Despite this limitation, we were able to make a more comprehensive estimation by adding 26 indicators and figures to the model that we employed in this study. In other words, we both added and excluded some related variable to our model, taking the literature into consideration.

Data and Model

The announcement date of the data related to life expectancy, level of happiness and environmental statistics by TurkStat varies. The latest one, which focuses on the level of happiness, has been carried out in 2014 and declared in 2015. In that survey, TurkStat explored the life satisfaction dimension with the level of happiness indicator in accordance with the literature. The limitation of the survey was that the level of happiness measured by TurkStat based on 81 provinces. This limited-to-province data steered us to seek the environmental data on province-based. As the environmental data of municipalities individually would not match the level of happiness data

declared totally, we apply to TurkStat surveys in which both environmental indicators and the level of happiness revealed on the basis of 81 provinces. We did not use the aggregate data released by TurkStat, but we excluded one of two or more related data, such as ‘number of municipalities served by municipal waste services’, ‘municipal population served by sewerage system’, in order to avoid repetitive estimations.

TurkStat did not consider ‘environment’ as a value as a source of happiness in Life Satisfaction Survey, of which results were released in 2014 (TurkStat, 2014). Nevertheless, the Institution takes the “environment” dimension and its some indicators in explaining the life satisfaction dimension, in contrast to the previous similar survey, in Well-being Index for Provinces, the result of a survey conducted in 2015 (TurkStat, 2016).

As the TurkStat declared the level of happiness index in percentage values ranging from zero (the least satisfied/happy) to one (the most satisfied/happy), we had to bin the data in order to run an ordered logistic regression. Hence, we grouped the level of happiness through following Eurobarometer four-point verbal life satisfaction scale (European Commission, 2017, s. 7). The happiness, the dependent variable of the study, has four groups that are *not all satisfied*, *not very satisfied*, *fairly satisfied*, or *very satisfied*. To adapt this qualitative scale into our model, we transform the responses as follows through the percentages determined in the Index:

Table 1: Transformation of the Percentages in the Index to Numeric Variables

Happiness responds	Transformed Number	Percentages in the Index
<i>Not all satisfied</i>	“1”	0 – 0,25
<i>Not very satisfied</i>	“2”	0,26 – 0,50
<i>Fairly satisfied</i>	“3”	0,51 – 0,75
<i>Very satisfied</i>	“4”	0,76 – 1,00

Source: Tabulated by the author

The transformed responds to life satisfaction resulted in, as stated in Table 2. The people living in 43 of 81 provinces consider themselves satisfied, whereas the others living in 38 of the total are not satisfied. Table 2 shows the percentages of the responses by the satisfaction level of the provinces. According to the Table, 40.7% of the provinces are not very satisfied, but 34.6% of them are fairly satisfied.

Table 2: Responses to Life Satisfaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not all satisfied	5	6,2	6,2	6,2
	not very satisfied	33	40,7	40,7	46,9
	fairly satisfied	28	34,6	34,6	81,5
	very satisfied	15	18,5	18,5	100,0
	Total	81	100,0	100,0	

Source: Tabulated by the author

Table 3 summarizes the variables used in the analysis by their full definitions, and their some descriptive statistics. There are provinces in Turkey, the municipalities of which still have no

sewerage system, wastewater treatment plant or drinking water treatment plant. Every province has 30.71% forest area per km², on average, whereas some have only 0.04% at the minimum and approximately 70% at maximum. However, there are also provinces in Turkey, only 25% of the municipal population of which has wastewater treatment plants, which is far below than 15 of the EU member states that have 80% on average, whereas the same figure is 100% in Malta, over 80% in Belgium and over 60% in Bulgaria (Eurostat, 2017, s. 13). Besides the insufficient indicators, provinces have some better figures, such as the average rate of population served by municipal waste services in total municipal population (97.53%), the average percentage of the population receiving waste services (78.73%), and the average rate of municipal population served by water supply network in total municipal population (96.81%).

Table 3: Summary of variables

Variable	Definition	Mean	Min	Max
PopWasteServ	Percentage of the population receiving waste services (%)	78.73%	35.71%	100%
NoiseProblem	Percentage of households having noise problems from the streets (%)	15.66%	6.36%	33.75%
SatMunClean	Satisfaction rate with municipal cleaning services (%)	63.98%	30.96%	88.25%
RtPopWinMunPop	Rate of the population served by municipal waste services in the total municipal population (%)	97.53%	80%	100%
MunPopbyWasteServ	The population of municipalities served by municipal waste services	874616.3	35995	14358627
MunWasColl	Amount of municipal waste collected (Tonnes/Year)	345811.4	21045	6064688
PopSewinMunPop	Rate of the population served by the sewerage system in the total municipal population (%)	45.21%	0%	98%
MunSewSys	Number of municipalities served by a sewerage system	6.33	0	40
WasWatTrPlnt	Number of municipalities served by a wastewater treatment plant	7.46	0	54
TreWasWatbyPlnt	Amount of wastewater treated by wastewater treatment plants (thousand m3/year)	43009.73	0	1180820
WasWatPerCap	Amount of wastewater discharged per capita in municipalities (litres/capita-day)	162.06	70	398
RtPopWasWatMunPop	Rate of the population served by wastewater treatment plants in total municipal population	87.43%	25%	100%
WatDistrbtd	Amount of water distributed (m3/year)	41907964.23	2938510	723137756
WatAbstPerCap	Water abstraction per capita in municipalities (litres/capita-day)	223.12	119	427
MunPopDrnkWatPlnt	Municipal population served by drinking water treatment plants	520261.5	0	14358627
RtPopWatTrPlntMunPop	Rate of the municipal population served by drinking water treatment plants in total municipal population	35.88%	0	100%

MunDrWatTrPlnt	Number of municipalities served by drinking water treatment plants	5.38	0	40
CapDrWatPlnt	The total capacity of drinking water treatment plants (Thousand m ³ /Year)	36975.31	0	951497
MunPopWatSpNtw	Municipal population served by a water supply network	870643.7	36601	14358627
RtMunPopWatSpinMum	Rate of the municipal population served by water supply network in total municipal population	96.81%	76%	100%
MunWatSpNtw	Number of municipalities served by a water supply network	17.21	4	59
WatAbstMunWatSpNtw	Water abstraction for municipal water supply network (Thousand m ³ /Year)	64659.35	3978	951497
EnvRevMun	Environmental revenues of municipalities (TL)	149763302.6	810604	4897937907
EnvExpMun	Environmental expenditures of municipalities (TL)	215159315.1	5848783	4463278267
ForestArea	Forest area per km ² (%)	30.71%	0.04%	69.71%
RtPopSewPiSys	The access rate of the population to sewerage and pipe system (%)	74.37%	31.11%	100%

In this paper, we state our question as “do environmental indicators under the responsibility of municipalities in Turkey have an effect on life satisfaction?” Accordingly, we define the null hypothesis as “ H_0 = The environmental indicators under the responsibility of municipalities in Turkey do not determine the life satisfaction of the people”. To test the hypothesis, we employed the models as follows:

$$Y_i = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \dots + \alpha_{26} x_{26} \quad (1)$$

$$\frac{dY}{dx} = \alpha_i \quad (2)$$

The model (1) involves the level of happiness as the dependent variable Y and 26 environmental indicators x that are under the responsibility of municipalities as the independent variables. The symbol α indicates the coefficients of each independent variables involved in the model. The reasons for employing an ordered-logit apart from most studies those employ ordered-probit are that our data is not distributed normally, and the logit model is better and considered to be simple to interpret (Cramer, 2003, s. ix). The formula (2) estimates ‘the marginal effect at the means’ of one-unit change of x independent variable on Y dependent variable in percentages, by taking the derivatives of Y and x . In other words, we aim to determine the percentage change of Y in relation to an increase of x by calculating the marginal effect.

Findings

In Table 4, the estimates initially show that the Model explains 43.26% of the dependent variable “the level of happiness”. There are also nine independent variables that are statistically significant at the 0.05 and 0.01 confidence levels.

Table 4: Significance and R² Values of the Ordered Logistic Regression

			Number of obs	81
			LR chi ² (26)	85.31
			Prob > chi ²	0.0000
Log pseudolikelihood = -55.942692			Pseudo R ²	0.4326
Independent Variables	<i>not all satisfied</i>	<i>not very satisfied</i>	<i>fairly satisfied</i>	<i>very satisfied</i>
PopWasteServ	0.00396	0.0123	-0.00458	-0.0117
NoiseProblem	0.0160***	0.0497***	-0.0185**	-0.0472***
SatMunClean	0.00226**	0.00702***	-0.00261**	-0.00667***
RtPopWinMunPop	-0.00426	-0.0132	0.00493	0.0126
MunPopbyWasteServ	7.08e-08	0.000000220	-8.18e-08	-0.000000209
MunWasColl	6.21e-08	0.000000193	-7.18e-08	-0.000000183
PopSewinMunPop	0.000758*	0.00236*	-0.000876	-0.00224**
MunSewSys	-0.0119**	-0.0370***	0.0138*	0.0352***
WasWatTrPlnt	0.00868***	0.0270***	-0.0100**	-0.0256***
TreWasWatbyPlnt	-0.000000821*	-0.00000255*	0.000000948*	0.00000242*
WasWatPerCap	0.0000780	0.000242	-0.0000901	-0.000230
RtPopWasWatMunPop	0.00213	0.00661	-0.00246	-0.00628
WatDistrbtd	1.41e-09*	4.38e-09	-1.63e-09	-4.16e-09*
WatAbstPerCap	0.000181	0.000563	-0.000209	-0.000535
MunPopDrnkWatPlnt	0.000000279***	0.000000867***	-	-
			0.000000322***	0.000000823***
RtPopWatTrPlntMunPop	-0.000901*	-0.00280***	0.00104**	0.00266**
MunDrWatTrPlnt	0.00390	0.0121	-0.00450	-0.0115
CapDrWatPlnt	-0.00000338***	-0.0000105***	0.00000390**	0.00000997***
MunPopWatSpNtw	-0.000000173	-0.000000539	0.000000200	0.000000512
RtMunPopWatSpinMum	0.00376	0.0117	-0.00434	-0.0111
MunWatSpNtw	-0.00178	-0.00554*	0.00206	0.00526*
WatAbstMunWatSpNtw	0.00000181**	0.00000562*	-0.00000209*	-0.00000534*
EnvRevMun	1.80e-10*	5.59e-10*	-2.08e-10	-5.31e-10*
EnvExpMun	-5.67e-10***	-1.76e-09***	6.56e-10**	1.67e-09***
ForestArea	-0.00153**	-0.00476***	0.00177**	0.00452***
RtPopSewPiSys	-0.00448	-0.0139	0.00517	0.0132
N	81	81	81	81

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

According to Table 4, it is possible to summarise the main results as follows:

The probability of being “very satisfied” decreases 4.72% if the percentage of households having noise problem from the streets increase in one percentage, with respect to whom has not that problem. In contrast, the probability of being “not all satisfied” increase 1.60% due to the same situation, whereas the probability of being “not very satisfied” also increase by approximately 5%.

The probability of being “very satisfied” increases by 3.53% if the number of municipalities served by a sewerage system also increase in one percentage. At the same path with this, the probability of being “not all satisfied” decrease 1.19% due to the same situation.

The probability of being “very satisfied” increases by 0.27% if the rate of the municipal population served by drinking water treatment plants in the total municipal population also increase in one percentage. At the same path with this, the probability of being “not all satisfied” decrease 0.01% due to the same situation.

The probability of being “very satisfied” increases by 0.01% if the number of the total capacity of drinking water treatment plants (1.000 m3/year) also increase in one percentage. At the same path with this, the probability of being “not all satisfied” decrease 0.01% due to the same situation.

The probability of being “very satisfied” increases by 0.01% if the rate of the environmental expenditures of municipalities also increase in one percentage. At the same path with this, the probability of being “not all satisfied” decrease 0.01% due to the same situation.

The probability of being “very satisfied” increases by 1.32% if the rate of the forest area per km² also increases in one percentage. At the same path with this, the probability of being “not all satisfied” decrease 0.15% due to the same situation.

However, the findings result in some unexpected figures. First, the probability of being “very satisfied” decreases by 0.67% if the satisfaction rate with municipal cleaning services increases in one percentage. Similarly, the probability of being “not all satisfied” increases by 0.23% due to the same satisfaction rate.

The probability of being “very satisfied” decrease 0.22% if the rate of the population served by a sewerage system in the total municipal population increase in one percentage. Similarly, the probability of being “not all satisfied” increases by 0.87% due to the same rate.

The probability of being “very satisfied” decrease 0.01% if the municipal population served by drinking water treatment plants increase in one percentage. Similarly, the probability of being “not all satisfied” increases by 0.01% due to the same population.

However, most indicators and figures are not significant at the 0.05 or 0.01 significance levels. The percentage of population receiving waste services, the rate of population served by municipal waste services in total municipal population, the population of municipalities served by municipal waste services, the amount of municipal waste collected, the rate of population served by sewerage system in total municipal population, the amount of wastewater treated by wastewater treatment plants, the amount of wastewater discharged per capita in municipalities, the rate of population served by wastewater treatment plants in total municipal population, the amount of water distributed, the water abstraction per capita in municipalities, the rate of municipal population served by drinking water treatment plants in total population, the number of municipalities served by drinking water treatment plants, the municipal population served by water supply network, the rate of municipal population served by water supply network in total municipal population, the number of municipalities served by water supply network, the amount of environmental revenues of municipalities, and the access rate of population to sewerage and pipe system are not determiners of happiness in Turkey.

Conclusion and Policy Recommendations

To be able to make estimations profoundly, it is necessary to use comprehensive data instead of province-based one, which gathers the answers of responders under a ‘provincial unit’. In parallel with the way that the literature drags us, the life satisfaction phenomenon should be estimated individual-based.

In brief, the level of the happiness or life satisfaction of the individuals decrease when:

- i. The satisfaction rate with municipal cleaning services increase,
- ii. The rate of the population served by a sewerage system in the total municipal population increase and
- iii. The municipal population served by drinking water treatment plants increase

The more the level of the quantity of the municipal services and goods increase, the lesser the quality they have. This issue drives inhabitants in municipalities into less life satisfaction. However, further studies should research and prove the reverse relationship between two variables. The noise problem is also a factor affecting life satisfaction. As the population of the municipalities increases, it gives rise to a noise problem, which affects life satisfaction negatively. The municipalities should both provide more municipal services and goods to meet the needs of individuals and pay more attention to the quality of these services and goods, of course, in a participative manner. Although the municipalities increase their environmental service capacity already, they should also increase their service quality to scale up the level of life satisfaction of the inhabitants. As the municipalities have some insufficient infrastructure and hence the satisfaction rate of the people increase when they invest in these fields, the municipalities should invest in infrastructure more than ever besides expanding the number of their services and infrastructure investments. If the municipalities are able to make their inhabitants more satisfied/happier when they cut the noise problem, increase the number of sewerage system, water treatment plants and drinking water treatment plants, and forest area per km², they should invest more in these fields to increase the level of life satisfaction of their inhabitants and eventually the society.

There are some shortcomings in the environmental data in Turkey. Considering the fact that the recycling consciousness of the people in Turkey is unsatisfactory, even so, the recycling or circular economy principles should be applied in all levels of governments so as to increase the level of life satisfaction. We currently have minimal recycling data to incorporate in analyses. This issue limits the researchers in Turkey to make comprehensive analyses involving the new environmental paradigms for measuring life satisfaction. The level of SO₂ or NO₂ concentrations, other indicators of air pollution, are other lacking or insufficient environmental indicators at least at the municipal level. This lack, however, does not mean the data in Turkey is not detailed, but it does mean some data is insufficient. Provided that it is possible to use more accurate and perfect data, for further studies, we suggest calculating the monetized results of life satisfaction, not only by province-based data but also by individual-based.

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