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Effects of Climate Change on Intangible Well-Being (Happiness) in Sub-Saharan Africa

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ABSTRACT

This article analyzes the effect of climate change on intangible well-being over the period from 2006 to 2018 on a panel of 16 Sub-Saharan African countries. In order to achieve our objective, we used a PSTR (Panel Smooth Transition Regression) model. This estimation technique enabled us to find a non-linear relationship between climate change and happiness. Our results suggest the introduction of innovation policies such as economic complexity, industrialization and renewable energies. The latter will improve people's lives, thus increasing happiness.

Keywords: Climate change; intangible well-being; happiness; PSTR

I. INTRODUCTION

We would like to remind you that well-being is subdivided into two main approaches: material well-being (objective well-being) and immaterial well-being (subjective well-being). Criticism has been levelled at the indicator used to measure material well-being, i.e. Gross Domestic Product (GDP) per capita, in particular the fact that it does not take into account socio-cultural characteristics (Bonasia and al., 2022). Indeed, improving a population's well-being is not simply a matter of increasing its level of utility through the production of goods and services. It also includes the quality of social ties, a key driver of well-being, in addition to individual (health, education, freedom) and collective (equity and social cohesion) characteristics. Sen (1977) and Sen (1992) revisit material well-being by taking societal concerns into account. To achieve this, the pnud (1990) instituted and defined the notion of human development to take account of social aspects (health, education, gender inequalities). But it is clear that subjective well-being is exposed to climate change. Some studies have highlighted the effects of climate change on social inequality (Shayegh and al., 2021); on education (Randell and Gray, 2019); and

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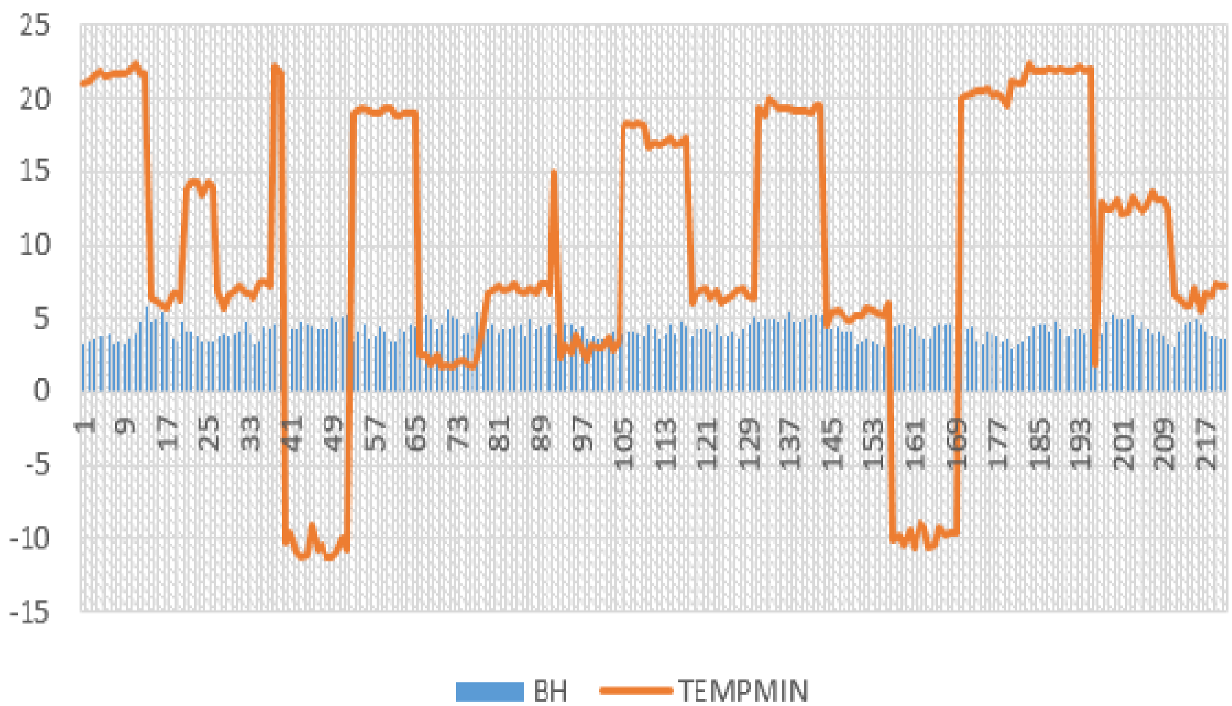
the health of the population (Tokhi and al., 2018). Today, the notion of subjective well-being has evolved to the point where we have reached the notion of happiness. Sekulova and al. (2016) have shown that climate change is a more important determinant of happiness than income.



Source: Author

Trends in minimum temperatures and happiness

We observe the same trend between happiness and minimum temperatures, proving a link between these different variables. In view of the above, we ask ourselves the following question: What is the effect of climate change on happiness in sub-Saharan Africa?

II. LITERATURE REVIEW

II.1 Theoretical review

Firstly, the hedonic pricing approach is based on the assumption that perfectly mobile individuals will locate where they can maximize their net benefits. If a household wishes to benefit, for example, from less monthly rainfall or more hours of sunshine, it will have to buy a house in

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such an area and pay a premium for it. As a result, Rosen (1974) and Roback (1982), the main proponents of the hedonic pricing approach, argue that the value of marginal changes in commodities in general can then be derived from regressions of house prices and wages. Rosen (1974) [1] provided the theoretical basis for the hedonic approach. He described a model of market behavior in a market with differentiated goods and illustrated how willingness to pay for environmental improvement can be derived from the relationship between property prices and their attributes: structural characteristics, location specificities and environmental quality. Since then, the hedonic approach has been widely applied to estimate the economic value of non-market goods, but very few studies have been undertaken to measure the amenity value of climate for individuals or households. Although Hoch and Drake (1974) were among the first to analyze wage differentials, were among the first to analyze wage differentials, Roback (1982) was the first to study the effects of climate on wages and house prices. Others, building on the work of Roback (1982) but using more detailed data were Blomquist and al. (1988). Since then, a number of researchers have analyzed the amenity value of climate for households. Englin (1996) studied the amenity value of precipitation and found that households would prefer less precipitation and greater seasonal variation. Other studies include those by Nordhaus (1996), Cragg and Kahn (1997, 1999). Estimates show an inconvenience premium of around 0,17 % of GDP. Cragg and Kahn estimated the demand for climate amenities as a function of the determinants of population migration decisions.

Second, we can distinguish the theory of Aristotle's eudemonism, which regarded happiness as a principle that every human being seeks to attain (McMahon, 2006). This theoretical foundation underlies the work of contemporary authors who have left their mark on the field, such as Ryff (1995), or even (Waterman, 1993). It means taking up essential challenges, having the feeling of living life to the full, of being oneself, of being at one with one's activity (Waterman, 1993). It also presupposes harmonious relations with others, which the concept of social well-being sums up (Keyes, 1998). Finally, it is based on self-determination (Ryff and Singer, 1998), on effort and the application of skills, as opposed to the hedonic pleasure that can be experienced when passively obtaining a collective reward, for example. However, this happiness could be hampered by climate change. Moreover, there are a multitude of studies on the effects of climate change.

Third among the theories linking climate change to happiness is the love theory. It's true, Steel (2000) examined how the triangular theory of love from Sternberg (1987) and the theory of Walster and al. (1978) on passionate and companionate love influence the polar environment.

1. For an overview of the hedonic pricing approach, see for example (Braden and Kolstad, 1991) or (Freeman, 1993)

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Also, Brooks and al. (2006) offer a rich theoretical discussion of how people's stories about a national park reveal that they build meaningful relationships with the park over time. In addition, Hay (1998) theorizes that certain attachment needs can be satisfied by a sense of place in the same way as in interpersonal relationships.

II.2 The effect of climate change on happiness: an empirical review

First, we have theories about the negative impact of climate change on happiness. Numerous studies point to a consensus that environmental degradation is a serious threat to human health and happiness (Ferrer-i Carbonell and Gowdy, 2007; Majeed and Ozturk, 2020; McMichael and al., 2003; Tiwari and al., 2011). What's more, Apergis and Majeed (2021) show that greenhouse gas emissions have a significant and negative impact on happiness over the period 1990 to 2015. Bonasia and al. (2022) find a direct link between happiness and long-term environmental protection spending in Europe over the period 1997 to 2019. Tiwari et al. (2011); Cuñado and De Gracia (2013) find found the negative effects of climate change on happiness in a panel of 21 countries and in Spain, respectively. Likewise, Schmidt (2013); Ahumada and Iturra (2021); Guo and al. (2021); Song and al. (2020) prove that climate change has a negative effect on happiness. Also, Tiwari and Mutascu (2015) have shown that climate change has a negative effect on happiness. Majeed (2020) prove that climate change has a negative impact on happiness. Likewise, McMichael and al. (2003); Ferrer-i Carbonell and Gowdy (2007); Le Dang and al. (2014) prove show that climate change has a negative effect on happiness. MacKerron and Mourato (2009); Weinhold (2013); Liao and al. (2015) show that climate change reduces happiness. Lin and al. (2019) prove that climate change has a negative effect on happiness. Li et al. (2014) find that climate change has a negative impact on happiness. Zhang and al. (2017a, b) show that climate change has a negative impact on happiness. Rehdanz and Maddison (2008); Luechinger (2010); Luechinger and Raschky (2009) show that climate change has a negative impact on happiness.

Secondly, we review the studies that demonstrate a non-linear relationship between climate change and happiness. Rehdanz and Maddison (2005) find that climate change decreases happiness and climate change increases happiness. In the same vein, Gu and al. (2017) find that pollution positively affects the happiness of high-income earners, and negatively that of middle- and low-income earners. Thus, Brereton and al. (2006) show that people living near major transport hubs have low levels of satisfaction with noise, while those living near the coast have higher levels of happiness. What's more, Brereton and al. (2008) found that wind speed had a significant negative influence on happiness, while the effects of increases in minimum January and maximum July temperatures were positive and significant.

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Given the different points of view in the literature, we feel it is essential to verify these relationships empirically in sub-Saharan Africa.

III. Data and estimation method

The data used in this work come from secondary sources. The data is extracted from the World Development Indicators (mondiale, 2021b), Worldwide Governance indicators (WGI), UNESCO Institute for Statistics (mondiale, 2020), World Bank Climate Change Knowledge Portal (mondiale, 2021a) and World Happiness Report (John F. Helliwell, Richard Layard, Jeffrey D. Sachs, Jan-Emmanuel De Neve, Lara B. Aknin, and Shun Wang, 2022). The work covers a panel of Sub-Saharan African countries over the period from 2005 to 2018. The choice of sample and study period was conditioned by data availability. The dependent variable in our first chapter is GDP per capita at constant 2010 prices. The choice of this variable was inspired by the study of Mensah and al. (2019). The dependent variables in our second chapter are the human development index and happiness, both of which are proxies for immaterial well-being (subjective well-being). The choice of the human development index as the dependent variable is motivated by (Van Tran and al., 2019). The second dependent variable, happiness, is justified in the article by Bonasia and al. (2022). The variable of interest is climate change, measured by temperature, precipitation and CO2 emissions. The choice of this variable is justified in the article by (Brini, 2021).

Table 1 below gives a description of the variables used.

Table 1: Variable description

VARIABLES	DESCRIPTION	UNIT
BH	National happiness index	[0;10]
TEMPMIN	Minimum temperature	Degrees Celsius
PIB	Gross domestic product per capita	constant 2015 prices
TRA	Labour force participation rate	Percentage of total population aged 15 to 64
RQ	Regulatory quality	Score
RNT	Total natural resource rents	Percentage of GDP
POPA	Population aged 65 and over	Percentage of total population

Source: Author

The general PSTR function with two models is as follows:

$$y_{i,t} = u_i + \beta_0 x_{i,t} + \beta_1' x_{i,t} g\left(q_{i,t}, \gamma, c\right) + \varepsilon_{i,t} \quad (1)$$

With $= 1, \dots, N$; $t = 1, \dots, T$

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N represents the number of cross-sections and T refers to temporal dimensions; $y_{i,t}$ démontre la variable dépendante; u_i represents the individual fixed effect; $x_{i,t}$ denotes the vector of explanatory and control variables; $g(q_{i,t}, \gamma, c)$ refers to the transition function and is determined by $q_{i,t}$ which is the threshold variable; c is the threshold parameter; $gamma$ is the parameter that depends on the slope of the transition function; $varepsilon_{i,t}$ represents the error term.

Thus, the general function of the PSTR model is as follows:

$$BH_{i,t} = u_i + PIBx_{i,t} + TEMPMIN_1' x_{i,t} g(q_{i,t}, \gamma, c) + \alpha TRA_{i,t} + \varsigma POPA_{i,t} + \phi RNT_{i,t} + \varphi RQ_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where i denotes the number of cross-sections (in this study, 16 countries in Sub-Saharan Africa), t is the time period (2006-2018).

$g(q_{i,t}, \gamma, c)$ refers to the transition function and is determined by $q_{i,t}$ which is the threshold variable; c is the threshold parameter; γ is the parameter that depends on the slope of the transition function; $\varepsilon_{i,t}$ represents the error term.

IV. Economic results and discussion

We study the linearity relationship between climate change (TEMPMIN) and happiness (BH) in Sub-Saharan Africa.

Table 2: Linearity test

Test name	Threshold variable	Test statistics
Lagrange-Wald (LM)	TEMPMIN	23,666
Lagrange-Fisher (LMF)	TEMPMIN	4,545
Likelihood ratio (LRT)	TEMPMIN	25,125

Source: Author

Note: H0 : Linear model; H1 : PSTR model with at least one threshold variable (r=1); *,**,*** represent significance at 10%, 5% and 1% respectively.

To achieve this, we use three tests: the Wald test (LM), the Fisher test (LMF) and the likelihood ratio test (LRT). Two assumptions underlie this test, namely whether the model is a linear panel, and whether the model is a non-linear panel (PSTR). Beforehand, we use several proxies to capture climate change, which is our threshold variable. The proxy used to capture climate

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change here is TEMPMIN (minimum temperatures). In our case, our statistics are significant at 1%, allowing us to accept hypothesis H1, which states that the panel is non-linear.

Once we've passed this linearity test, we'll try to determine the number of regimes or phases in this non-linearity relationship.

Table 3: Regime number tests: tests for absence of residual non-linearity

Number of plans	Test name	Threshold variable	Test statistics
r=1	Lagrange-Wald (LM)	TEMPMIN	17,320***
r=1	Lagrange-Fisher (LMF)	TEMPMIN	3,034***
r=1	Likelihood ratio (LRT)	TEMPMIN	18,084***
r=2	Lagrange-Wald (LM)	TEMPMIN	21,135***
r=2	Lagrange-Fisher (LMF)	TEMPMIN	3,664***
r=2	Likelihood ratio (LRT)	TEMPMIN	22,287***

Source: Author

Note: H0: PSTR with r = 1 versus H1: PSTR with at least r = 2; H0: PSTR model with two regimes versus H1: PSTR model with at least three regimes; *, **, *** represent significance at 10%, 5% and 1% respectively.

The likelihood ratio test (LRT) yielded a statistic of 18.084, followed by the Lagrange-Wald (LM) statistic estimated at 17.320 and the Lagrange-Fisher (LMF) statistic of 3.034. All these statistics are significant at the 1% level. We therefore reject hypothesis H0 and accept hypothesis H1, according to which there are at least two regimes. The same tests are run again, comparing H0: PSTR model with two diets against H1: PSTR model with at least three diets. All three statistics are again significant at the 1% level. The likelihood ratio statistic is 22.287. It dominates the Wald and Fisher statistics, which are 21.135 and 3.664 respectively. So we arrive at the result that there are two regimes for our TEMPMIN threshold variable.

Table 4: Determining the number of localization parameters

Number of location parameters	m=1	
Optimal number of transition functions r (m)	r=1	r=2
Number of parameters	5	5
AIC criterion		-1,897
BIC criterion		-1,592
RSS	26,343	23,491

Source: Author

Table 5 shows the results of the PSTR model for minimum temperatures and happiness.

Table 5: Final estimation of the PSTR model

Variables	β_0	t-statistics	β_1	t-statistics	β_2	t-statistics
PIB	-0,0410*** (0,0091)	-4,5240	0,0711*** (0,0156)	4,5620	-0,0335*** (0,0155)	-2,1598
TRA	-0,0067 (0,0076)	-0,8752	-0,0327*** (0,0111)	-2,9465	0,0302*** (0,0094)	3,2303
POPA	-0,0507 (0,1159)	-0,4377	0,7991*** (0,2036)	3,9247	-0,8306*** (0,1747)	-4,7550
RNT	0,0130 (0,0110)	1,1806	-0,0861*** (0,0425)	-2,0264	0,0828*** (0,0383)	2,1637
RQ	0,3680*** (0,1669)	2,2055	-1,8859*** (0,4346)	-4,3392	1,2607*** (0,3994)	3,1569

Source: Author, based on data from WDI (2021); World Happiness (2021) and Climate Change Knowledge Portal (2021)

Note: ***, **, * designate the respective degrees of significance of 1%; 5% and 10%.

β_0; β_1; β_2 are the estimated parameters of the explanatory variables for each transition function, and the variances are in brackets.

For our first estimated parameter (β_0), gross domestic product is a proxy for happiness. Liu (2022) find a U-shaped relationship between natural resources and CO2 emissions in Latin America over the period 1990 to 2020. In our case, a one-unit increase in gross domestic product leads to a reduction in happiness of -0.0410. This means that climate change has an indirect effect on happiness through gross domestic product. Regulatory quality is an indirect indicator of happiness. Hussain and al. (2022) show that corruption increases long-term environmental pollution in 59 Belt and Road Initiative (BRI) countries between 2002 and 2020. In our case, a one-unit increase in regulatory quality leads to a 0.3680 increase in happiness. This means that climate change has an indirect effect on happiness via regulatory quality.

For the second estimated parameter (β_1), gross domestic product is an indirect indicator of climate change. Bekun and al. (2019) find a positive and significant relationship between carbon dioxide emissions, natural resource rents, economic growth over the period 1996 to 2014 using a PMG-ARDL in 16 European Union countries. Here, a one-unit increase in gross domestic product leads to a 0.0711 increase in happiness. This means that climate change has an indirect effect on happiness via the gross domestic product channel. The labor force participation rate is an indirect indicator of climate change. Remuzgo and Sarabia (2015) show that CO2 emissions

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per active population fell by 22% between 1990 and 2010. In our case, a one-unit increase in the labor force participation rate results in a -0.0327 decrease in happiness. This proves that climate change has an indirect effect on happiness through the labor force participation rate. The population aged 65 and over is an indirect indicator of climate change. Amuka (2018) find a positive relationship between life expectancy and CO2 emissions in Nigeria over the period 1995 to 2013. In our case, a one-unit increase in the population aged 65 and over leads to an increase in happiness of 0.7991. This means that climate change has an indirect effect on happiness across the population aged 65. Total natural resource rents represent an indirect indicator of climate change. Agboola and al. (2021) demonstrate that oil rents mitigate the effect of environmental degradation in Saudi Arabia over the period 1971-2016. In our case, a one-unit increase in total natural resource rents leads to a reduction in happiness of -0.0861. This means that climate change has an indirect effect on happiness via total natural resource rents. Regulatory quality is an indirect indicator of climate change. Zhang and al. (2016) prove that there is an inverted U-shaped Environmental Kuznets Curve (EKC) between corruption and CO2 emissions in Asia-Pacific Economic Cooperation (APEC) countries. In our case, a one-unit increase in regulatory quality leads to a reduction in happiness of -1.8859. This means that climate change has an indirect effect on happiness via regulatory quality.

For our third estimated parameter (β_2), gross domestic product is an indirect indicator of climate change. Wang (2020) show that natural resources increase carbon dioxide emissions in G7 countries for the period 1996 to 2017. Apergis and Majeed (2021) show that all forms of greenhouse gases have a negative impact on transnational happiness in 95 countries covering the period 1990 to 2015. In our case, a one-unit increase in gross domestic product results in a -0.0335 drop in happiness. This means that climate change has an indirect effect on happiness through gross domestic product. The labor force participation rate is an indirect indicator of climate change. Yu (2018) find that the labor force increases CO2 emissions in China using the STIRPAT model. In our case, a one-unit increase in the labor force participation rate leads to a 0.0302 increase in happiness. This means that climate change has an indirect effect on happiness via the labor force. The population aged 65 and over is an indirect indicator of climate change. Azam and al. (2023) find that life expectancy decreases as CO2 emissions increase using an ARDL model in Pakistan over the period 1975 to 2020. In our case increase of one unit in the population aged 65 and over leads to a decrease in happiness of -0.8306. This means that climate change has an indirect effect on happiness via the population aged 65 and over. Total natural resource rents are an indirect indicator of climate change. Wang (2020) show that natural resources increase carbon dioxide emissions in G7 countries for the period 1996 to 2017. In our case, a one-unit increase in total natural resource rents leads to a 0.0828 increase in happiness. This means that climate change has an indirect effect on happiness via natural resource rents. The quality of regulation is an indirect indicator of climate change. Mahmood (2022) show that

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improving law and order conditions would reduce CO2 emissions in the short term, and further improvements in the state of the place could have a positive effect on CO2 emissions in Pakistan over the period 1996 to 2019. Here, a one-unit increase in regulatory quality leads to a 1.2607 increase in happiness. This means that climate change has an indirect effect on happiness through regulatory quality.

Table 6 shows the estimated parameters.

Table 6: Estimated parameters

	First transition function	Second transition function
Estimated slope parameters	6,6535	23,9385
Estimated location parameters	1,1128	1,3396

Source: Author

The estimated slope parameter increases from 6.6535 to 23.9385, describing an S-shaped relationship between happiness (BH) and climate change (TEMPMIN). This result corroborates our hypothesis of a non-linear relationship between happiness and climate change. On the other hand (Sekulova and van Den Bergh, 2013) have demonstrated that climate policy should improve happiness. On the other hand, Gu and al. (2017) find that pollution positively affects the happiness of high-income earners and negatively that of middle- and low-income earners, describing an inverted U-shaped relationship.

V. CONCLUSION

The aim of this chapter has been to analyze the effect of climate change on human development and happiness in Sub-Saharan Africa on a panel of 16 countries over the period from 2005 to 2018. In order to achieve our objective, we have used data from the World Development Indicators (mondiale, 2021b), Worldwide Governance indicators (WGI), UNESCO Institute for Statistics (mondiale, 2020), of the World Bank's Climate Change Knowledge Portal (mondiale, 2021a) of the World Happiness Report (John F. Helliwell, Richard Layard, Jeffrey D. Sachs, Jan-Emmanuel De Neve, Lara B. Aknin, and Shun Wang, 2022).

The model adapted here is the PSTR (Panel Smooth Transition Regression) model from John and al. (1995). The dependent variable in our second chapter is happiness, which is a proxy for immaterial well-being (subjective well-being). For climate change, we used TEMPMIN (minimum temperatures).

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Our results showed that there is a non-linear S-shaped relationship between happiness and climate change, with a slope coefficient ranging from 6.6535 to 23.9385. In view of the above, we propose economic complexity, industrialization and renewable energies.

References

Agboola, M. O., F. V. Bekun, and U. Joshua (2021). Pathway to environmental sustainability: nexus between economic growth, energy consumption, co2 emission, oil rent and total natural resources rent in saudi arabia. Resources Policy 74, 102380.

Ahumada, G. and V. Iturra (2021). If the air was cleaner, would we be happier? an economic assessment of the effects of air pollution on individual subjective well-being in chile. Journal of Cleaner Production 289, 125152.

Amuka, J. I., A. F. O. U. R. O. O. A. N. . O. T. (2018). Climate change and life expectancy in a developing country: evidence from greenhouse gas (co2) emission in nigeria. International Journal of Economics and Financial Issues 8(4), 113.

Apergis, N. and M. T. Majeed (2021). Greenhouse gas emissions and cross-national happiness: a global perspective. Air Quality, Atmosphere & Health, 1–12.

Azam, M., I. Uddin, and N. Saqib (2023). The determinants of life expectancy and environmental degradation in Pakistan: evidence from ardl bounds test approach. Environmental Science and Pollution Research 30(1), 2233–2246.

Bekun, F. V., A. A. Alola, and S. A. Sarkodie (2019). Toward a sustainable environment: Nexus between co2 emissions, resource rent, renewable and nonrenewable energy in 16-eu countries. Science of the Total Environment 657, 1023–1029.

Blomquist, G. C., M. C. Berger, and J. P. Hoehn (1988). New estimates of quality of life in urban areas. The American Economic Review, 89–107.

Bonasia, M., E. De Simone, M. D'Uva, and O. Napolitano (2022). Environmental protection and happiness: A long-run relationship in europe. Environmental Impact Assessment Re- view 93, 106704.

Braden, J. B. and C. D. Kolstad (1991). Measuring the demand for environmental quality. Number 333.7 M484. Elsevier.

Brereton, F., J. P. Clinch, and S. Ferreira (2006). Environmental amenities and subjective well-being: testing the validity of hedonic pricing.

ISSN: 2455-8834

Volume:09, Issue:07 "July 2024"

Brereton, F., J. P. Clinch, and S. Ferreira (2008). Happiness, geography and the environment. Ecological economics 65(2), 386–396.

Brini, R. (2021). Renewable and non-renewable electricity consumption, economic growth and climate change: Evidence from a panel of selected african countries. Energy 223, 120064.

Brooks, J. J., G. N. Wallace, and D. R. Williams (2006). Place as relationship partner: An alternative metaphor for understanding the quality of visitor experience in a backcountry setting. Leisure Sciences 28(4), 331–349.

Cragg, M. and M. Kahn (1997). New estimates of climate demand: evidence from location choice. Journal of Urban Economics 42(2), 261–284.

Cragg, M. I. and M. E. Kahn (1999). Climate consumption and climate pricing from 1940 to 1990. Regional Science and Urban Economics 29(4), 519–539.

Cuñado, J. and F. P. De Gracia (2013). Environment and happiness: New evidence for spain. Social indicators research 112(3), 549–567.

Englin, J. (1996). Estimating the amenity value of rainfall. The Annals of Regional Science 30(3), 273–283.

Ferrer-i Carbonell, A. and J. M. Gowdy (2007). Environmental degradation and happiness. Ecological economics 60(3), 509–516.

Freeman, M. A. (1993). The measurement of environment and resource values: Theory and methods. Resources for the Future.

Gu, L., M. W. Rosenberg, and J. Zeng (2017). Competing forces of socioeconomic development and environmental degradation on health and happiness for different income groups in china. International Journal of Health Services 47(4), 752–777.

Guo, W., L. Chen, Y. Fan, M. Liu, and F. Jiang (2021). Effect of ambient air quality on subjective well-being among chinese working adults. Journal of Cleaner Production 296, 126509.

Hay, I. (1998). Making moral imaginations. research ethics, pedagogy, and professional human geography. Ethics, Place & Environment 1(1), 55–75.

Hoch, I. and J. Drake (1974). Wages, climate, and the quality of life. Journal of Environmental Economics and Management 1(4), 268–295.

Hussain, M. N., Z. Li, A. Sattar, and M. Ilyas (2022). Dynamic linkage between tourism, corruption and co2 emission on economic growth in bri countries. Leisure Sciences, 1–19.

John, A., R. Pecchenino, D. Schimmelpfennig, and S. Schreft (1995). Short-lived agents and the long-lived environment. Journal of public economics 58(1), 127–141.

John F. Helliwell, Richard Layard, Jeffrey D. Sachs, Jan-Emmanuel De Neve, Lara B. Aknin, and Shun Wang (2022). World happiness report.

Keyes, C. L. M. (1998). Social well-being. Social psychology quarterly, 121–140.

Le Dang, H., E. Li, I. Nuberg, and J. Bruwer (2014). Farmers' perceived risks of climate change and influencing factors : A study in the mekong delta, vietnam. Environmental ma- nagement 54(2), 331–345.

Li, Z., H. Folmer, and J. Xue (2014). To what extent does air pollution affect happiness ? the case of the jinchuan mining area, china. Ecological Economics 99, 88–99.

Liao, P.-s., D. Shaw, and Y.-m. Lin (2015). Environmental quality and life satisfaction: Subjective versus objective measures of air quality. Social Indicators Research 124(2), 599–616.

Lin, W.-H., W.-C. Pan, and C.-C. Yi (2019). "happiness in the air ?" the effects of air pollution on adolescent happiness. BMC Public Health 19(1), 1–10.

Liu, H., A. M. A. A. Z. M. W.. K. I. (2022). A non-linear analysis of the impacts of natural resources and education on environmental quality: Green energy and its role in the future. Resources Policy 79, 102940.

Luechinger, S. (2010). Life satisfaction and transboundary air pollution. Economics Let- ters 107(1), 4–6.

Luechinger, S. and P. A. Raschky (2009). Valuing flood disasters using the life satisfaction approach. Journal of Public Economics 93(3-4), 620–633.

MacKerron, G. and S. Mourato (2009). Life satisfaction and air quality in london. Ecological Economics 68(5), 1441–1453.

Mahmood, H., H. S. T. M. . F. M. (2022). Rule of law, control of corruption and co2 emissions in pakistan. International Journal of Energy Economics and Policy 12(4), 72–77.

Majeed, M. (2020). Reexamination of environmental kuznets curve for ecological footprint: the role of biocapacity, human capital, and trade. Majeed, MT, & Mazhar, M., Reexamination of

ISSN: 2455-8834

Volume:09, Issue:07 "July 2024"

Environmental Kuznets Curve for Ecological Footprint: The Role of Biocapacity, Human Capital, and Trade. Pakistan Journal of Commerce and Social Sciences 14(1), 202–254.

Majeed, M. T. and I. Ozturk (2020). Environmental degradation and population health outcomes: a global panel data analysis. Environmental Science and Pollution Research 27(13), 15901–15911.

McMahon, D. M. (2006). Happiness: A history. Grove Press.

McMichael, A. J. et al. (2003). Global climate change and health: an old story writ large. Climate change and human health: Risks and responses. Geneva, Switzerland: World Health organization.

McMichael, A. J., D. H. Campbell-Lendrum, C. F. Corvalán, K. L. Ebi, A. Githeko, J. D. Scheraga, and A. Woodward (2003). Climate change and human health: risks and responses. World Health Organization.

Mensah, I. A., M. Sun, C. Gao, A. Y. Omari-Sasu, D. Zhu, B. C. Ampimah, and A. Quarcoo (2019). Analysis on the nexus of economic growth, fossil fuel energy consumption, co2 emissions and oil price in africa based on a pmg panel ardl approach. Journal of Cleaner Production 228, 161–174.

mondiale, B. (2020). Worldwide governance indicators. Technical report, Banque mondiale.
mondiale, B. (2021a). Climate change knowledge portal. Technical report, Banque mondiale.

mondiale, B. (2021b). Des données au service d'une vie meilleure. Technical report, Banque mondiale.

Nordhaus, W. (1996). Climate amenities and global warming. Climate change: Integrating science, economics, and policy 19.

pnud (1990). Rapport mondial sur le développement hum ain. Technical report, Programme des Nations Unies pour le Développement.

Randell, H. and C. Gray (2019). Climate change and educational attainment in the global tropics. Proceedings of the National Academy of Sciences 116(18), 8840–8845.

Rehdanz, K. and D. Maddison (2005). Climate and happiness. Ecological Economics 52(1), 111–125.

Rehdanz, K. and D. Maddison (2008). Local environmental quality and life-satisfaction in germany. Ecological economics 64(4), 787–797.

ISSN: 2455-8834
Volume:09, Issue:07 "July 2024"

Remuzgo, L. and J. M. Sarabia (2015). International inequality in co2 emissions: A new factorial decomposition based on kaya factors. Environmental Science & Policy 54, 15–24.

Roback, J. (1982). Wages, rents, and the quality of life. Journal of political Economy 90(6), 1257–1278.

Rosen, S. (1974). Hedonic prices and implicit markets: product differentiation in pure competition. Journal of political economy 82(1), 34–55.

Ryff, C. D. (1995). Psychological well-being in adult life. Current directions in psychological science 4(4), 99–104.

Ryff, C. D. and B. Singer (1998). The contours of positive human health. Psychological inquiry 9(1), 1–28.

Schmidt, J. (2013). The empirical falsity of the human subject: New materialism, climate change and the shared critique of artifice. Resilience 1(3), 174–192.

Sekulova, F., J. Van den Bergh, et al. (2016). Floods and happiness: Empirical evidence from bulgaria. Ecological Economics 126(C), 51–57.

Sekulova, F. and J. C. van Den Bergh (2013). Climate change, income and happiness : An empirical study for barcelona. Global Environmental Change 23(6), 1467–1475.

Sen, A. (1977). Starvation and exchange entitlements: a general approach and its application to the great bengal famine. Cambridge Journal of Economics 1(1), 33–59.

Sen, A. (1992). Inequality reexamined. Oxford University Press.

Shayegh, S., V. Manoussi, and S. Dasgupta (2021). Climate change and development in south africa : the impact of rising temperatures on economic productivity and labour availability. Climate and Development 13(8), 725–735.

Song, Y., A. Zhou, and M. Zhang (2020). Exploring the effect of subjective air pollution on happiness in china. Environmental Science and Pollution Research 27(34), 43299–43311.

Steel, G. D. (2000). Polar bonds: Environmental relationships in the polar regions. Environment and Behavior 32(6), 796–816.

Sternberg, R. J. (1987). Liking versus loving: A comparative evaluation of theories. Psychological Bulletin 102(3), 331.

ISSN: 2455-8834

Volume:09, Issue:07 "July 2024"

Tiwari, A. K. et al. (2011). Happiness and environmental degradation: What determines happiness?”. Economics Bulletin 31(4), 3192–3210.

Tiwari, A. K. and M. Mutascu (2015). The relationship between environmental degradation and happiness in 23 developed contemporary economies. Management of Environmental Quality: An International Journal.

Tokhi, M., L. Comrie-Thomson, J. Davis, A. Portela, M. Chersich, and S. Luchters (2018). Involving men to improve maternal and newborn health: a systematic review of the effectiveness of interventions. PloS one 13(1), e0191620.

Van Tran, N., Q. Van Tran, L. T. T. Do, L. H. Dinh, and H. T. T. Do (2019). Trade off bet- ween environment, energy consumption and human development: Do levels of economic development matter? Energy 173, 483–493.

Walster, E. H., E. Hatfield, and G. W. Walster (1978). A new look at love. Reading, Mass.: Addison-Wesley.

Wang, L., V. X. V. S. M. . A. A. (2020). Globalization and carbon emissions: is there any role of agriculture value-added, financial development, and natural resource rent in the aftermath of cop21 ? Journal of Environmental Management 268, 110712.

Waterman, A. S. (1993). Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. Journal of personality and social psychology 64(4), 678.

Weinhold, D. (2013). The happiness-reducing costs of noise pollution. Journal of regional science 53(2), 292–303.

Yu, Y., D. Y. R.. C. F. F. (2018). Impact of population aging and industrial structure on co2 emissions and emissions trend prediction in china. Atmospheric Pollution Research 9(3), 446–454.

Zhang, X., X. Zhang, and X. Chen (2017a). Happiness in the air: How does a dirty sky affect mental health and subjective well-being? Journal of environmental economics and management 85, 81–94.

Zhang, X., X. Zhang, and X. Chen (2017b). Valuing air quality using happiness data: the case of china. Ecological economics 137, 29–36.

Zhang, Y.-J., Y.-L. Jin, J. Chevallier, and B. Shen (2016). The effect of corruption on carbon dioxide emissions in apec countries: a panel quantile regression analysis. Technological Forecasting and Social Change 112, 220–227.

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Appendix

Table: Descriptive statistics

	BH	TEMPMIN	PIB	TRA	RQ	RNT	POPA
Mean	4.249995	9.713982	1353.461	72.83880	-0.393047	8.990606	2.703741
Median	4.242538	7.287500	982.3108	72.53000	-0.407090	7.658902	2.746691
Maximum	5.819827	22.40000	6973.099	90.34000	0.610934	37.57857	4.223874
Minimum	2.902734	-11.29167	416.7468	47.11000	-1.210751	0.752330	1.871194
Std. Dev.	0.562026	10.14895	1350.722	9.640131	0.381183	6.239966	0.445098
Skewness	0.178518	-0.572351	2.945734	-0.721458	0.365424	1.768571	0.174608
Kurtosis	2.496541	2.404665	11.22344	3.641307	3.369935	7.437865	3.422622
Jarque-Bera	3.301524	14.42796	886.8975	21.60842	5.815241	279.1189	2.604859
Probability	0.191904	0.000736	0.000000	0.000020	0.054606	0.000000	0.271870
Sum	883.9989	2020.508	281520.0	15150.47	-81.75385	1870.046	562.3781
Sum Sq. Dev.	65.38581	21321.23	3.78E+08	19236.95	30.07725	8059.995	41.00929
Observations	208	208	208	208	208	208	208

