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Gross National Happiness in Reunion Island (Indian Ocean): a preliminary study

Louisiana C. Teixeira¹, Amandine Junot¹, Jean-François Rebeyrotte², Clarisse Lepinay², Jaela Devakarne¹ & Pascale Chabanet³

Corresponding author: Louisiana C. Teixeira, louisiana.teixeira@ird.fr

Abstract

Over the past decades, indicators of well-being have mostly been based on monetary measures such as the country's Gross Domestic Product (GDP). However, faced with new emerging social problems, GDP appears limited as a tool to evaluate a nation's prosperity, hence the importance of considering development with a people-centered perspective. Thus, happiness has emerged as a new and essential goal in people's lives, and as a tool to understand a nation's well-functioning. The present study explored Reunion Island's Gross National Happiness (GNH) through a survey carried out with a sample of 92 individuals around the island. It consisted in a preliminary analysis in order to explore happiness determinants and distribution. The results emphasized the significant role of social and intangible aspects on happiness such as social relations, psychological well-being, ecology or education, beyond economic-monetary characteristics. Moreover, participants' better economic status was not correlated with a higher level of happiness. Finally, this preliminary analysis provided a first exploration of happiness in a sample of inhabitants of Reunion Island. It is a first step to boosting the usefulness of GNH to guide local actors and public policies to promote happiness as a driving force for progress and sustainability.

JEL classification: I3, O1, Z13, Z18.

Keywords: Subjective well-being, gross national happiness, multidimensional index, development, progress, sustainability, Indian Ocean

I. Introduction

In an increasingly complex world, it is essential to rely on indicators to understand the progress of countries and their demographic, social, economic and environmental changes. Since the 1940s, Gross Domestic Product (GDP) has been the most extensively established measure in order to assess a nation's progress, based on the assumption that economic growth is always synonymous with better quality of life (Giannetti et al., 2015). Promoted during the 20th century as a source of well-being through job creation and the income it generates, the GDP model has already demonstrated its limits (Costanza et al., 2008; Diener et al., 2008; Diener & Seligman, 2004; Stiglitz et al., 2009; Veenhoven, 2007). Indeed, despite economic growth, the wealthiest societies are facing serious social problems (social inequities, poverty, stress, conflicts, environmental issues, etc.) which seriously affect people's well-being. Several studies have revealed the absence of a correlation between well-being and economic growth (Breban, 2016; Brinkman & Brinkman, 2011; Easterlin, 1974⁴).

¹ UMR Ceped (IRD, Université de Paris Cité, Inserm), 75006 Paris, France.

² Université de La Réunion, 115 Rue Général Ailleret, 97430 Le Tampon, La Réunion, France

³ UMR Entropie (IRD, UR, CNRS, IFREMER, UNC), CS 41096, 97495 La Réunion, France

⁴ In 1974, the Easterlin paradox questioned the positive relationship between income and well-being, until then accepted by most economists. Subsequently, several studies would converge to the same conclusion: although

Based only on monetary aspects in the measurement of growth, nowadays GDP is judged too restrictive in its understanding of human development issues and ignorant of many aspects of life such as freedom, respect for human rights and democracy, peace and security, high standards of living, education and access to culture, among others (OECD, 2011). Moreover, this growth-oriented model, backed by unprecedented consumption and production, is perceived as harmful for the environment (Neve & Sachs, 2020). It is also responsible for the aggravation of societal malaise, generated by the impacts of the overexploitation of natural resources (impacts on health, natural and climatic risks, etc.) (Boniwell, 2007; Diener & Seligman, 2004; Meadows et al., 1972). These findings laid the foundations of the quest for sustainability, opening the debate on the need to replace or supplement GDP. New approaches and indicator systems are being developed with the aim of gaining a more comprehensive understanding of a country's development, taking into account the three pillars of sustainable development: social, economic and environmental well-being (Ban Ki-moon, 2012; Thinley, 2005). Thus, using GDP as an indicator of general well-being is ambivalent, even dangerous (Giannetti et al., 2015; Stiglitz et al., 2009). This corroborates the idea that it is necessary to consider other aspects that contribute to well-being (Mitchell et al., 2016).

It was only in the 1990s that Sen emphasized that welfare is not one-dimensional and must be considered at multiple scales. Applied to the economics of well-being and development, he designed the Human Development Index (HDI), one of the first multidimensional indicators created as an alternative to GDP and composed of life expectancy, education and per capita income indicators, measured by the UNDP⁵ in the 1990s (Lipchitz & Delmon, 2010). Its emergence generated an increasingly growing interest in the establishment of other similar indicators allowing the integration of non-monetary aspects with the aim of improving people's welfare (Accardo et al., 2006). Although it is hard to define well-being precisely, some descriptions consider it to consist of health, prosperity and happiness. The latter is an important component of the subjective dimension of quality of life and perceived as one of the pillars of sustainability (Petrovic, 2020). According to Davoine (2009), alternative multidimensional indicators would include advantages converging towards a desire to improve people's welfare, revealing a new development paradigm designed to promote human well-being (Colman, 2021; Marks & Wade, 2015).

It is in this context that the world witnessed the emergence of the Gross National Happiness (GNH) index in the 1970s. This indicator was established in Bhutan in the late 1990s and was recognized in the 2010s by the United Nations and other international bodies such as OECD⁶ and OPHI⁷. This indicator responds to the need to launch a new paradigm based on sustainability, social equity and human happiness. It also considers happiness not simply as a numerical rating of people's happiness (a person initially rating themselves as "very happy" or "unhappy") but as a people's holistic assessment of their living conditions (Sen, 2000; Ura et al., 2012; Veenhoven, 2007). In addition to material welfare, GNH encompasses well-being derived from health, psychological well-being, culture, spirituality, governance and sustainability. The indicator advances the combination of these aspects as a significant determinant of the good functioning of a society, since happy civilizations are supposed to be healthier and have greater social capital (Boniwell, 2007; Maesen & Walker, 2012; Sirgy, 2011; Sirgy et al., 2004).

within the same country wealthy individuals declare themselves happier than the underprivileged, in the long term there is no significant relationship between a magnitude such as per capita income and the average level of happiness reported. Economic growth is thus considered to be accompanied by a stagnation in the level of life satisfaction (Easterlin, 1974).

⁵ United Nations Development Programme

⁶ Organization for Economic Co-operation and Development

⁷ Oxford Poverty and Human Development Initiative

Becoming an alternative indicator of development, the concept of happiness (or subjective well-being) has spread throughout the world. Nonetheless, to date in Reunion, happiness has received little attention from research and local public action even if the island is facing numerous social challenges (demographic transition, urbanization, poverty, environmental issues, and so on). This work aimed to be the first to explore the nature of happiness in Reunion Island's inhabitants in a holistic way via the GNH index, and provides a pathway for reflection to guide local actors and public policies in Reunion Island toward a more sustainable happy society.

II. Materials & Methods

2.1 Study area

Reunion Island is a tropical, insular, French overseas department located in the Indian Ocean, between Mauritius and Madagascar. Due to its remoteness from mainland France, the island is heavily dependent on the external market, which implies significant socioeconomic vulnerabilities: the highest unemployment rates in France, especially among young people lacking significantly in qualifications or training, and 40% of its population living below the mainland poverty threshold (Insee, 2019). Furthermore, Reunion Island has a long history of social inequalities (for example, access to education, health, and employment) (Fianu et al., 2022; Vaillant, 2008) and identity crisis inherited from colonial history (Jauze, 2011; Junot & Praene, 2021; Simonin et al., 1997) which has led to social tension as the Chaudron riots in 1991 or the social movement of the "yellow vests" in 2018.

Moreover, the population is growing rapidly: it has more than doubled in 50 years, rising from 416,500 in 1970 to 868,800 in 2022, and is set to reach one million inhabitants in 2030 (Insee, 2019). The possibilities for growth and expansion are limited, due to the mountainous relief, the natural heritage⁸, and also due to climate issues that are particularly sensitive for the island context (IPCC, 2012; Nurse et al., 2014). Ultimately, Reunion's history is recent since it was colonized just over 350 years ago by successive waves of migrants of colonialists, slaves, indentured labourers, merchants, etc., from Europe, Africa, Madagascar, the Comoro Islands, Asia and the Americas. Thus, the island has a mixed multi-ethnic and multicultural population which has created a unique lifestyle through Creole identity and a specific social and cultural organization (Dissart & Nicault, 2020; Jauze, 2011; Junot & Praene, 2021; Simonin et al., 1997; Watin & Wolff, 1995).

2.2 Data: procedure and sample

The data for this study was obtained from a survey carried out across the island in 2020. As this was a preliminary sample, the objective was to establish a cohort of approximately 100 participants, recruited by convenience sampling using snowball methods. This non-probability sampling method is useful in this formative research consisting in an initial assessment of the index. Initially, participants were recruited via social networks by the committee of local actors who have developed the index. Then these respondents were invited to share the announcement of the survey with their network. People interested in participating in the survey were invited to contact the survey committee, who posted the announcement to schedule a date and place to carry out the interview. The Reunionese GNH questionnaire was administered by one person from the survey committee. Face-to-face interviews were

⁸ Two thirds of which are classified as a nature reserve and a UNESCO World Heritage site.

used to gather data. This method allows the control of interactions and the gaining of a deeper insight into specific answers by treating the questionnaire like a meaningful discussion.

In addition to the Reunionese GNH questionnaire, participants completed a demographic information section that included questions on gender, age, geographic location (north-south-east-west, living in the uplands of the island or living in its low-lying/coastal areas), household composition, education level, socio-professional categories and place of birth (born on the island or not). The questionnaire contained 150 questions and the average response time was one and a half hours.

2.3 GNH Index measurement

2.3.1 Dimensions

Based on the multiple constituent elements of people's living conditions, the GNH index is a multidimensional tool that considers the real living conditions of an individual, expressing their deprivations or satisfactions (Sen, 2000) in nine domains: psychological well-being, health, education, time use, culture, good governance, community vitality, ecology and standards of living. Then, to calculate GNH, a weight is assigned to each domain according to the level of importance of each one for explaining the overall index, which can be evenly distributed or otherwise attributed according to cultural criteria observed in a representative sample. The Bhutanese GNH index has been adapted to the lifestyle of Reunion's inhabitants. This adaptation was carried out by a committee of local actors from civil society, the economic world, university and science, and the public sector, with the support of the Centre BNB France⁹ following the participatory method. This gave rise to the Reunionese questionnaire and the Reunion Island GNH index.

The weights of the Reunion Island GNH's dimensions and sub-dimensions are obtained by the personal choice of the respondent¹⁰ (Table 1). In other words, the respondent is asked to give a mark between 0 and 10 to each domain/sub-domain, according to the degree of importance given by the person to the theme. Thus, the more the domain is considered to impact their level of happiness, the closer this score should be to 10.

The Bhutanese GNH take into account the current situation of individuals based mainly on the perception of their present and past. Hence, to the nine domains of the Bhutanese indicator, we added future expectations, an additional criterion to conceive the Reunionese GNH index. The aim is to capture people's perceptions about the evolution of their living conditions (likelihood of improvement or deterioration) in each domain of happiness. In fact, having a disposition to hold positive expectations for the future is related to well-being: more positive emotions, with greater life satisfaction and more efforts to achieve personal goals (Fredrickson et al., 2003; Gorsy, 2017; Matthews & Cook, 2009). Thus, future expectations are determinant for understanding wellbeing, since they can influence the assessment of the current degree of happiness (Ahn et al., 2007; Diener, Kesebir, et al., 2008; Senik, 2005).

⁹ The association responsible for the adaptation of the Bhutanese GNH indicator for France.

¹⁰ In the case of the present study, we will keep the self-declaration for the weights' definition since it is a preliminary exploratory analysis. In future research, we will explore the establishment of fixed weights, attributed according to cultural criteria through the trends observed in a representative sample.

From the index of future expectations, we obtain domain-specific parameters that adjust the overall happiness index obtained from the nine weighted dimensions. The level of adjustment can impact the overall happiness score positively or negatively, depending on the person's level of positive or negative expectations about a change in their future, i.e. future expectations can take on a value that is positive (from 0 to 100%) or negative (from -100% to 0).

Hence, the equation for Reunion Island's GNH index can be defined as follows:

$$\begin{aligned}
 GNH_{RUN} = & \alpha * [Psychological\ Wellbeing + (\alpha * Expectations) * Psychological\ Wellbeing] + \\
 & +\beta * [Health + (\beta * Expectations) * Health] + \\
 & +\gamma * [Time\ Use + (\gamma * Expectations) * Time\ Use] + \\
 & +\delta * [Education + (\delta * Expectations) * Education] + \\
 & +\sigma * [Culture + (\sigma * Expectations) * Culture] + \\
 & +\eta * [Governance + (\eta * Expectations) * Governance] + \\
 & +\theta * [Social\ Relations + (\theta * Expectations) * Social\ Relations] + \\
 & +\lambda * [Ecology + (\lambda * Expectations) * Ecology] + \\
 & +\mu * [Living\ Standards + (\mu * Expectations) * Living\ Standards]
 \end{aligned}$$

Where $\beta, \gamma, \delta, \sigma, \eta, \theta, \lambda, \mu$ denote the domain's weights. The domain's indexes are represented by "Psychological Well-being", "Health", "Time Use", "Education", "Culture", "Governance", "Social Relations", "Ecology" and "Living Standards". "Expectations" illustrates the index of future expectations.

When transforming $(\alpha * Expectations) = \varphi$, $(\beta * Expectations) = \omega$, $(\gamma * Expectations) = \tau$, $(\delta * Expectations) = \rho$, $(\sigma * Expectations) = \zeta$, $(\eta * Expectations) = \pi$, $(\theta * Expectations) = \chi$, $(\lambda * Expectations) = \varepsilon$ and $(\mu * Expectations) = \kappa$, we can simplify our equation to:

$$\begin{aligned}
 GNH_{RUN} = & \alpha * [Psychological\ Wellbeing + \varphi * Psychological\ Wellbeing] + \\
 & +\beta * [Health + \omega * Health] + \\
 & +\gamma * [Time\ Use + \tau * Time\ Use] + \\
 & +\delta * [Education + \rho * Education] + \\
 & +\sigma * [Culture + \zeta * Culture] + \\
 & +\eta * [Governance + \pi * Governance] + \\
 & +\theta * [Social\ Relations + \chi * Social\ Relations] + \\
 & +\lambda * [Ecology + \varepsilon * Ecology] + \\
 & +\mu * [Living\ Standards + \kappa * Living\ Standards]
 \end{aligned}$$

Where $\omega, \tau, \rho, \zeta, \pi, \chi, \varepsilon, \kappa$ denote the domain-specific parameters of future expectations. The happiness score is calculated according to the nine domains, the personal weights attributed to each of them, and the domain-specific parameters of future expectations.

Table 1: Domains, indicators, and associated weights

Domain	Indicator	Weight (%) Reunion Island
Psychological Well-being	Perception of Living Standards Positive Emotions Negative Emotions Spirituality	Personal Choice
Health	Perception of Health Health Lifestyle Healthcare Access Health Psychological Health	Personal Choice
Time Use	Psychological Needs Personal Balance Activities Satisfaction	Personal Choice
Education	Knowledge Know-how Soft Skills	Personal Choice
Culture	Identity Languages Artistic and Artisanal Practices Cultural Access	Personal Choice
Good Governance	Representative Democracy Citizen Participation Access to Public Services Efficiency of Public Policies	Personal Choice
Social Relations	Perception of Security Family and Friends Mutual Aid and Bartering Relationships with Others	Personal Choice
Ecology	Pollution Urban Problems Flora/Fauna Disappearance Problems Impacting Humankind and its Activities	Personal Choice
Living Standards	Household Resources Assets and Property Owned Housing Quality	Personal Choice

Additional Criterion		
Future Expectations	Psychological Well-being Health Time Use Education Culture Governance Social Relations Ecology Living Standards	

2.3.2 Happiness Score and the Happiness Threshold

A happiness score (from 0% to 100%) is assigned to each person according to their satisfaction score in each domain. It is calculated from the weighted sum of the satisfaction scores experienced. The score increases in line with the number of satisfaction scores and reaches a maximum of 100% when the person is happy in all the domains analyzed. A person who is considered unhappy receives a score < 51%.

Concerning the happiness threshold, it is used to identify those who are multidimensionally happy. It can be defined as follows:

- 1) Very happy: when the GNH global happiness score is over 76%;
- 2) Happy: when the GNH global happiness score is between 66% and 76%;
- 3) Not very happy: when the GNH global happiness score is between 51% and 65%;
- 4) Unhappy: when the GNH global happiness score is below 51%.

Another prerequisite for happiness depends on the indicator's breadth. This latter can be defined as the percentage of domains in which people are considered deprived (considering the "insufficiency" in each domain). A person suffers insufficiency in a domain if their score for it does not reach at least the happy level, i.e., if their indicator receives a score below 66%. Moreover, happiness is reached only when sufficiency (a domain score of over 66%) is achieved in at least six domains out of nine. Hence, if a person presents a global happiness score of over 66% but achieves sufficiency in only five domains (or less) out of nine, not all the conditions for happiness will be met. Thus, this person may be considered deprived of happiness.

2.4. Data analysis

The happiness distribution was explored with the calculation of the happiness score as seen above. Moreover, a one-way ANOVA with a post hoc Scheffé test was performed to evaluate the differences in global happiness score by gender, age, geographic location, household composition, education level, socio-professional categories and place of birth. Ultimately, correlations and hierarchical regressions analysis were performed to analyze the contribution of the nine GNH domains to the global happiness score. The significant level was set at $p < 0.05$ for all the analyses.

III. Results

3.1 Sample description

The effective sample comprised 92 participants (36 men and 56 women) with an average age of 46 (range 22-92 years). 15% of our sample were unemployed, 21% were retired, 7% were students and 57% were economically active. 71% of the respondents lived in the coastal areas compared to 29% living in the uplands, while 36% of them lived in the north, 39% in the south, 11% in the east, and 11% in the west of the island. 68% of the participants are natives of the island. Non-natives had an average length of residence of more than 10 years (Table 2).

Table 2: Sample description

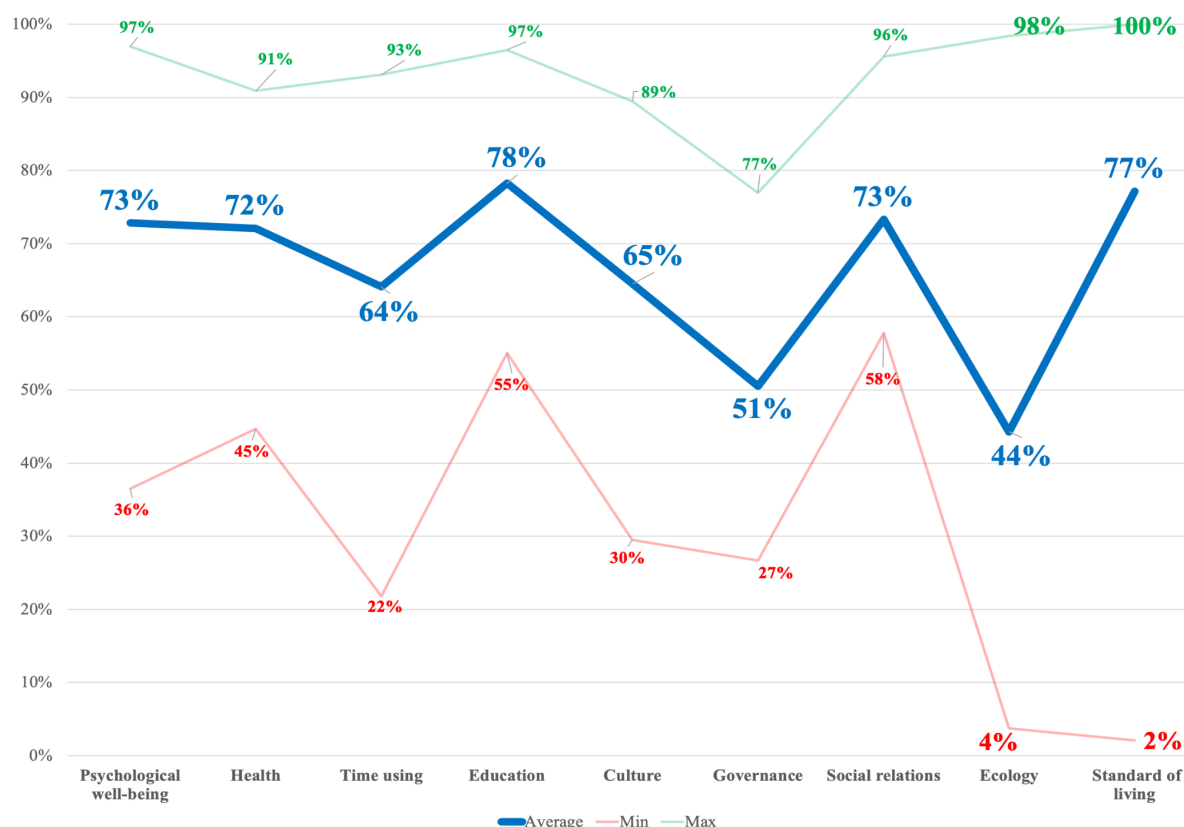
Sample Characteristics	Total	%
Women	56	61%
Men	36	39%
22-34 years of age	22	24%
35-44 years of age	29	31%
45-54 years of age	8	9%
55-64 years of age	22	24%
> 65 years of age	11	12%
Unemployed	14	15%
Retired	19	21%
Students	6	7%
Employed	53	57%
Natives	63	68%
Non-natives	29	32%
Average length of residence of non-natives	More than 10 years	NA
North of the island	34	36%
South of the island	36	39%
West of the island	11	11%
East of the island	11	11%

Living in the uplands of the island	27	29%
Living in the low-lying/coastal areas	65	71%

3.2 Distribution of happiness

The exploratory analysis revealed that more than half (59%) of our sample achieved a global happiness score over 66%. On average, this latter score reached 67%, just above the happiness threshold of 66%. However, domain-level analysis revealed that not all the conditions for happiness are met. When considering the indicator's breadth, people in our sample are considered deprived in four out of nine domains¹¹. The biggest deprivations can be observed in the domains of governance and ecology (average scores of 51% and 44% respectively). A slight deprivation could be also noted in the domains of "culture" and "time use" (average scores of 65% and 64% respectively) (Figure 1)¹².

Figure 1. Global happiness scores by domain - average, maximum and minimum among the 92 respondents



¹¹ 44% instead of 33%, which is the prerequisite for happiness in the indicator's breadth.

¹² The high dispersions observed for the domains of ecology and standard of living are noteworthy. Despite a high average score for standard of living and a low average score for ecology, the highest and the lowest satisfactions could be found among respondents in these two domains.

Furthermore, the analysis of the effect of socio-demographic variables on the overall happiness score revealed no gender difference for the overall happiness score (67%) (Table 3). Nonetheless, happiness varied by participants' age. Respondents over 55, presenting significantly higher happiness scores, seemed happier than younger respondents. Similarly, happiness did not differ significantly according to the qualification level. Concerning the activity sector's categories, retired respondents were significantly happier than economically active people. Regarding geographic location, a significant difference in the overall happiness score was observed between regions, with participants living in the south of the island appearing to be happier. Ultimately, participants living in the uplands of the island appeared to be happier than people living in the low-lying/coastal areas (Table 3).

Table 3: Analysis of Global Happiness score by socio-demographic variables (ANOVA test)

		Means of Global Happiness	Std. Dev.
Gender	Men	0.67	0.07
	Women	0.67	0.08
Age	22-34 years of age	0.65	0.05
	35-44 years of age	0.64	0.08
	45-54 years of age	0.66*	0.05
	55-64 years of age	0.70*	0.08
	> 65 years of age	0.71*	0.06
Geographic location	North	0.64	0.07
	South	0.69*	0.08
	West	0.66	0.06
	East	0.68	0.06
	Living in the uplands of the island	0.71*	0.08
	Living in the low-lying/coastal areas	0.65	0.06
Qualification level	No diploma	0.82	-
	General high school leaving certificate (French <i>baccalauréat</i>)	0.67	0.06
	Vocational high school diploma	0.71	0.07
	University degree	0.67	0.07
	Other	0.65	0.13

Activity sector	Farmers, farm operators	-	-
	Artisans, merchants and contractors	0.64	0.08
	Management and intellectual professions	0.65	0.08
	Intermediate professions	0.66	0.06
	Clerical employees	0.67	0.11
	Manual labourers	0.67	-
	Retired	0.71*	0.07
	Unemployed and students	0.68	0.07

* *Significant difference of mean ($p < 0.05$)*

Following this preliminary analysis on the distribution of happiness, we decomposed the sample's GNH by domain in order to determine their contribution to the happiness score, as will be seen in the next section.

3.3 Happiness Contribution Analysis

Multiple linear regressions were performed to determine which dimensions contribute most and least to happiness (table 4)¹³.

There was a linear relationship between the nine domains and overall happiness. The nine weighted indices explained 98.27% of the global happiness index's fluctuations. When considering the nine domains, education and ecology contributed the most to the sample's overall happiness score (12.91% and 12.90% respectively), and governance and standard of living contributed the least (7.79%). It was interesting to note that, despite a fairly high average happiness score for the standard of living domain (Figure 1), it did not make a large and significant contribution to happiness, which could partly be explained by the strong dispersion in the response pattern observed in it. On the contrary, we also observed that despite a rather low average score for the ecology domain, the latter played an important role, contributing significantly to the respondents' overall happiness score. Average domain weight could also explain the inversed pattern of contribution observed for these latter domains of ecology and standard of living, as will be described below.

¹³ Before analyzing the regressions, a correlation analysis was performed to check whether there was a strong correlation between the different domains. It can be found in the paper's appendix (Table A.1). Moreover, a complementary regression analysis on 'happy' and 'unhappy' respondents was performed to confirm the pattern of the observed results. It can be found in the paper's appendix (tables A.2 and A.3).

Still on table 4, if we compare these contributions to the average domain's weight - that illustrates the dimensions to which respondents gave greater importance - psychological well-being, health, social relations and ecology (12.93% 12.24%, 11.95% and 11.78% respectively) mattered the most to respondents, while standard of living and governance mattered the least (10.47% and 8.65% respectively). This could also explain the lower contribution of standard of living and governance to fluctuations in happiness (8.80% and 7.79% respectively). Moreover, whilst on the one hand psychological well-being, health and social relations only occupied the fourth, the fifth and the seventh positions in the ranking of contribution to overall happiness, thus expressing a certain dissatisfaction on the part of the respondents in the areas of greater importance, on the other hand, the participants appeared to have a more optimistic perception of their future regarding these same domains.

Then, when exploring the average impact of future expectations on the happiness score, expectations regarding well-being (0.55%), education (0.45%), social relations (0.44%), and health (0.43%) seemed to have a greater impact on overall happiness for the respondents. Nonetheless, standard of living (0.24%), ecology (0.24%) and governance (0.09%) were the domains for which respondents presented a less optimistic perception regarding their future, and these domains were thus the least influential on overall happiness.

Table 4: Understanding happiness - contributions, weights and future expectations

Ranking of domains	Contribution of each domain to overall happiness (%)	Ranking of domains	Average domain's weight	Ranking of domains	Average impact of future expectations on the happiness score
Education	12.91%	Psychological well-being	12.93%	Psychological well-being	0.55%
Ecology	12.90%	Health	12.24%	Education	0.45%
Time use	12.47%	Social relations	11.95%	Social relations	0.44%
Psychological well-being	12.29%	Ecology	11.78%	Health	0.43%
Health	11.99%	Time use	11.10%	Time use	0.36%
Culture	11.17%	Education	10.60%	Culture	0.26%
Social relations	9.68%	Culture	10.55%	Standard of living	0.24%
Standard of living	8.80%	Standard of living	10.47%	Ecology	0.24%
Governance	7.79%	Governance	8.65%	Governance	0.09%
Total	100%	Total	100%	Total	3.05%

IV. Discussion

Happiness: distribution and explanatory factors

Happiness is defined here according to the result of people's evaluations of the quality of their lives in the latter's multiple domains (Diener & Seligman, 2004; Triandis, 2010) following the four pillars of GNH: sustainable and equitable socio-economic development, environmental conservation, preservation and promoting of culture, and good governance (Ura et al., 2012). More than half of our sample (59%) displayed a global score above 66%. These results are in line with other surveys in the world that also assess the level of people's satisfaction in the form of a 'satisfaction score'. It seems that happiness is actually felt by a majority of people in the world (Veenhoven, 2007, 2010)¹⁴.

Distribution of happiness

Our results show no difference in the overall happiness score according to gender or level of education in Reunion Island; however, the score varied according to the respondents' age, economic situation and geographical location. Indeed, the older and more inactive the respondents, the higher their happiness score. Senior citizens are thus more inclined to happiness, with a tendency to forget their past failures and to grant more importance to activities associated with their present happiness (Grant Study, Harvard, 2022); this confirms the hypothesis of an increase in happiness after the midlife period from age 40 to 50 years (Blanchflower & Oswald, 2004, 2008; Steptoe et al., 2005). As for non-working individuals (the unemployed and retired), studies highlight that good time management and free time are significant factors of well-being (World Happiness Report; Flesch et al., 2012). The statements of individuals in the working population on the difficulty of managing their time and the associated consequences (such as stress and burnout) illustrate this hypothesis. In contrast, employment, which is often associated with high levels of well-being (Chuerattanakorn, 2007; Guo & Hu, 2011; Tella et al., 2003), does not appear to lead to higher happiness scores when a certain income threshold is exceeded (Easterlin, 2001).

With regard to geographical location, people living in the more rural south, east and uplands of Reunion had higher overall happiness scores than those living in the more economically developed north, west and lowland areas of the island. These results raise questions about how quality of life and well-being are measured through strictly economic measures such as GDP, as well as the role of nature, which is more present in rural areas and considered to be a determining element of well-being (Junot & Paquet, 2021; Korpela et al., 2017; Nisbet et al., 2009; Nisbet & Zelenski, 2011; Ulrich et al., 1991). The Reunionese population's attachment to rurality and nature (Junot & Praene, 2021) could be a significant factor in their well-being, as could the social dimension of living spaces, which are more communal in rural areas, particularly in the south.

¹⁴ For example, surveys conducted by the United Nations also show that 59% of individuals say they are satisfied with their lives (score over 7/10) or the Happy Planet indicator, the main measure of sustainable well-being in the world (scores of 50-76/100). When following the Bhutanese methodology to meet the two prerequisites for happiness (Global happiness score above 66% & Score over 66% in at least 6 out of 9 domains), our results converge to those of Bhutan. It reveals that 40% of our sample achieved happiness, against 43% in Bhutan, according to the Bhutanese GNH survey of 2015 (Balasubramanian & Cashin, 2019).

Explanatory factors of well-being

Our results also allow us to identify which factors are perceived as more or less important for happiness. Standard of living is the domain, along with governance, that had the least influence on the overall happiness score. Whilst the economic factor is generally presented as an essential condition for well-being (Caporale et al., 2007; Di Tella & MacCulloch, 2008; Fleche et al., 2012; Graham, 2011; Veenhoven & Ouweneel, 1991) its low contribution could be explained by major disparities in the respondents' material living conditions, as well as the low importance attributed to this happiness factor by participants. The negative attitude towards governance is not consistent with other studies around the world, where this domain is considered fundamental for happiness (Helliwell et al., 2017; Helliwell & Huang, 2008; Ott, 2011; Veenhoven, 2010). In Reunion Island, this result may be linked to a lack of interest in politics and mistrust in the ability of politicians to ensure the well-being of its population (OECD, 2019). This lack of trust is compounded by the political legacy of colonialism, its associated frustrations, and the perceived inability of politicians to solve the island's economic and social problems (Tandrayen-Ragoobur et al., 2021).

In contrast, other factors were found to contribute significantly to happiness. Health and psychological well-being were the domains that contribute most to the happiness of the sample as numerous studies have shown for populations worldwide, using GNH (Balasubramanian & Cashin, 2019; Verma & Ura, 2022) but also other indicators of well-being (World Values Survey, 1994-2008; World happiness report, 2014-2016; Ura, Alkire & Zangmo, 2012; Heliwell, 2009). Personal relationships are also an essential domain for happiness, highlighting the major importance of social relationships in happiness (Baumeister & Leary, 1995; Deci & Ryan, 2002; Helliwell et al., 2017; Grant Study, Harvard, 2022). In Reunion Island, this significant contribution of social relations, like that of culture, can be linked to the important place of strong community and solidarity networks in the islanders' lifestyles (Junot & Praene, 2021; Petrosillo et al., 2013; Watin & Wolff, 1995); culture is also perceived as a means of expressing collective and individual identity (Friedman, 1989; Junot & Praene, 2021; Lu & Gilmour, 2007; Ramkissoon, 2015). Respondents' emphasis on education as a factor contributing to happiness can be linked to the fact that this latter offers the opportunity to acquire knowledge and skills and thus to reach fulfillment (Chuerattanakorn, 2007, Blanchflower & Oswald, 2004; Easterlin, 2001; Ferrer-i-Carbonell, 2005; Frey & Stutzer, 2002) which is a condition for happiness in line with the eudaimonic conception of well-being (Deci & Ryan, 2002b; Ryff, 2014; Sebastian, 2015; Seligman, 2011; Waterman, 1993).

Finally, ecology was given high priority in terms of happiness, with ecology and the quality of the environment playing an important role in the happiness of the Reunionese, who have a very close relationship with nature that is associated with strong heritage and identity values (Cauna, 2003; Chalencon, 2016; Junot & Praene, 2021, 2021; Thevenot, 1993). It is of note that this domain was not very satisfactory for the respondents, a result supported by another study on the island (Junot & Praene, 2021), which can be explained in particular by the constant human pressure on its natural resources (demographic growth, urbanization) in addition to which comes global warming, with its especially high impact on tropical island environments (IPCC, 2012 ; Nurse *et al.*, 2014). Low satisfaction score in relation to ecology is also found worldwide, particularly when it comes to concerns about global warming, which participants perceive as a serious threat to them and their families (74% of respondents), increasing the difficulties of their daily lives (65% of respondents, World Happiness Report, 2020). The physical environment and nature play a key role in happiness, with individuals perceiving them as important factors in both their health and their needs and aspirations (Costanza et

al., 2007; Murgas & Klobučník, 2018; Nisbet et al., 2009) with nature also perceived as an essential contributor to their well-being (Capaldi et al., 2014; Junot & Paquet, 2021; Nisbet & Zelenski, 2011).

Our overall results are consistent with other studies revealing the determining role of social and intangible factors on happiness (Brook, 2013; Ura, 2015; Clark et al., 2017; Andrijić, 2021; Helliwell, 2009).

GNH interests and limitations

The notion of happiness is obviously more complex than what the GNH index allows to be measured. Indeed, there is no universally accepted definition as it is a complex subjective concept, in particular because of its multidimensional nature. Nonetheless, GNH is relatively comprehensive since it considers happiness as a people's holistic assessment of their living conditions (Sen, 1993; Ura et al., 2012; Veenhoven, 2010). It takes into account the subjective experience of pleasure and satisfaction, and the absence of pain or negative experiences and feelings (Deci & Ryan, 2008). It also considers the development conditions of individual strengths and virtues, purpose, meaning in life and thus the actualization of the true self (Deci & Ryan, 2002b; Ryff, 2014; Waterman, 1993). GNH therefore covers the two conceptions of happiness with measures of both hedonic and eudaimonic aspects and thus tends to grasp happiness in its complexity.

The relevance or the possibility of aggregating such heterogeneous elements (psychological well-being, health, social relations, ecology, culture, governance, time use, education and standard of living) in the form of a single indicator can be questioned. Aggregation presupposes an equivalence between levels of the different domains, and that a weakness in one can be compensated by a high level in another. That property is however one of the main interests of this synthetic indicator: the possibility that a place presenting a high level of satisfaction in terms of material standard of living but investing little in health and education might present a weakened level of overall quality of life. Looking at the national level of countries worldwide, we could cite the case of certain oil-producing emirates and, to a lesser extent, countries with an Anglo-Saxon model. They exhibit weakened levels of human development despite high levels of economic progress (Goujon, 2011).

Finally, the main limitation of this study lies in the characteristics of the sample used. First, its restricted size, which is not representative of Reunion Island's population, provides only a preliminary description of the happiness of a group of individuals. Second, the sample was not random since we were constrained to use the snowball recruitment method. However, even with these sample limitations, the respondents' profiles were varied, displaying different socio-demographic characteristics. It allowed us to explore a rich framework and the possibility of a more comprehensive analysis. Moreover, there were several noteworthy results consistent with past research on global happiness. Nonetheless, in future research, a larger sample size will be required to draw more definitive conclusions in the status and distribution of happiness among the Reunionese population.

Conclusion and perspectives

In conclusion, our results confirm the general idea that economic development might not be sufficient to ensure individuals' happiness and well-being. Indeed, the analysis of happiness in its multiple dimensions allows growing social and environmental problems to be taken into account, an area in which using GDP is limited, in that it reduces multiple societal crises to capitalist functioning (Catrice et al., 2018). The measurement of happiness in its systemic approach via GNH enables the identification of what is essential for a population's current and future quality of life, as well as the difficulties and inequalities that need to be addressed. By making it possible to highlight and measure what characterizes individuals' quality of life, the GNH indicator is a useful tool for public policy, as it pinpoints potential action levers for improving people's happiness. It also makes it possible to envisage a society based on happiness as a positive resource for how it functions, laying down the fundamental principles of a democratic and tolerant society (Diener et al., 2008; Diener & Tov, 2009).

Nonetheless, there is still much to be explored in future research to strengthen the results and levers for action. As a relatively recent alternative indicator, GNH still deserves research attention to guarantee its robustness and validation. These questions should not however erase the interest of this index, with the potential to complement other already existing alternative indicators. First, it allows simultaneously different tangible and intangible dimensions to be measured and the coverage of regional specificities, thus providing a systemic approach to the living conditions of individuals. Second, by indexing valued societal conditions, it can also guide local actors to promote better quality of life for a society targeting happiness in its holistic dimension as a driving force for progress and sustainability.

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Appendix

1. Correlation Analysis

Firstly, a correlation analysis was performed to explore the relationship between the global happiness score and the nine GNH domains. The correlation analysis revealed a strong link between all GNH domains and the global happiness score. Time use and psychological well-being were the most correlated with the global happiness score, and culture was less correlated (Table A.1).

Table A.1 Correlation Analysis between global happiness score and the nine GNH domains

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Education	-	-.06	.29**	.49**	.22*	.18	.47**	.12	.25**	.49**
2. Ecology	-	-	.10	.09	.13	-.15	.13	.25*	.07	.45**
3. Time use	-	-	-	.49**	.62**	.16	.36**	.19	.28**	.73**
4. Psychological well-being	-	-	-	-	.51**	.14	.32**	.20	.29**	.72**
5. Health	-	-	-	-	-	-.05	.26*	.45**	.25**	.64**
6. Culture	-	-	-	-	-	-	.08	.30	.13	.28**
7. Social relations	-	-	-	-	-	-	-	.30**	.13	.54**
8. Standard of living	-	-	-	-	-	-	-	-	.16	.53**
9. Governance	-	-	-	-	-	-	-	-	-	.44**

2. Happiness Contribution Analysis for happy and unhappy

The analysis allowed us to specify which factors better explained happiness for happy and not very happy/unhappy respondents.

Concerning the happy participants in our sample (Table A.2), health, psychological well-being, education and ecology were the largest contributors to happiness (12.92%, 12.79%, 12.64%, and 12.54% respectively) and governance the lowest (7.34%). Comparing these contributions to the average domain weight (which illustrates the domains to which happy respondents gave greater importance), we can observe that the most valued domains, psychological well-being (12.91%) and health (12.56%), were also the ones that contributed most to an increased level of happiness, suggesting that happy people enjoy greater satisfaction precisely in the domains they value the most. When exploring the average

impact of future expectations on the happiness score, these participants also appeared to have a more optimistic perception of their future regarding these domains, in particular for psychological well-being (0.60 %), but also education (0.49%), social relations (0.47%) and time use (0.42%).

When considering the weights attributed to the standard of living and governance, they were given less importance, which could also explain the lesser impact of these domains on fluctuations in happiness. These domains were also those in which respondents presented a less optimistic perception regarding their future.

Table A.2 Understanding happiness - contributions and weights to happy respondents

Ranking of domains	Contribution of each domain to overall happiness (%)	Ranking of domains	Average domain's weight	Ranking of domains	Average impact of future expectations on the happiness score
Health	12.92%	Psychological well-being	12.91%	Psychological well-being	0.60%
Psychological well-being	12.79%	Health	12.56%	Education	0.49%
Education	12.64%	Ecology	11.63%	Health	0.48%
Ecology	12.54%	Social relations	11.61%	Social relations	0.47%
Culture	11.32%	Time use	11.26%	Time use	0.42%
Time use	11.30%	Education	10.85%	Culture	0.31%
Social relations	9.67%	Standard of living	10.61%	Standard of living	0.28%
Standard of living	9.48%	Culture	10.52%	Ecology	0.27%
Governance	7.34%	Governance	8.37%	Governance	0.11%
Total	100%	Total	100%	Total	3.42%

Concerning the not very happy and unhappy respondents in our sample (Table A.3), education and ecology were the largest contributors to happiness (13.47% and 13.08% respectively) and standard of living and health the lowest (8.90% and 8.78% respectively). If we compare these contributions to the average domain weight, we can observe that the most valued dimensions, psychological well-being (12.97%) and social relations (12.42%), are not the ones that contributed the most to these respondents'

happiness. This suggests that not very happy/unhappy people might suffer from some dissatisfaction precisely in the domains they value the most and enjoy greater satisfaction in less valued dimensions such as education.

Nonetheless, when exploring the average impact of future expectations on the happiness score of these respondents, as for the whole sample, these participants appeared to have a more optimistic perception of their future regarding the most valued dimensions such as psychological well-being and social relations (0.43% and 12.42% respectively), presenting a greater impact on overall happiness. Conversely, less important domains were also those for which respondents presented a less optimistic perception regarding their future, particularly governance (0.03%), but also standard of living, culture and ecology (0.15%).

Table A.3 Understanding happiness - contributions and weights for not very happy/unhappy respondents

Ranking of domains	Contribution of each domain to overall happiness (%)	Ranking of domains	Average domain's weight	Ranking of domains	Average impact of future expectations on the happiness score
Education	13.47%	Psychological well-being	12.97%	Psychological well-being	0.43%
Ecology	13.08%	Social relations	12.42%	Education	0.36%
Time use	12.58%	Ecology	12.00%	Social relations	0.34%
Culture	12.17%	Health	11.79%	Health	0.31%
Psychological well-being	11.13%	Time use	10.87%	Time use	0.25%
Governance	10.63%	Culture	10.61%	Culture	0.15%
Social relations	9.27%	Standard of living	10.26%	Ecology	0.15%
Standard of living	8.90%	Education	10.24%	Standard of living	0.15%
Health	8.78%	Governance	9.05%	Governance	0.03%
Total	100%	Total	100%	Total	2.18%