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Determining the proportions of the Ecovillage based on the Resident's Preferences in relation to the geographical location in France

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Abstract

Ecovillages are widely considered as a strategic approach to the transition to a sustainable community in the sustainability literature, and the desire for these ecovillages is reflected via each individual's activities and behavioral traits. Consequently, the resident's choices determine whether an ecovillage may be dispersed in other geographical places. The goal of this paper is to determine the most essential aspects of ecovillages based on residents' preferences in connection to France's geographical regions. The Required data were collected through a web survey conducted from 2021 to 2022, among 186 responses in 35 cities in France. The statistical analysis was performed using the SPSS and Structural Equation Modeling (SEM) designed with AMOS software. In addition, the probability level (P: 0.0001) is optimum, and Then the spatial analysis was performed in ArcGIS by spatial autocorrelation (Moran's I) and Hot Spot. The results indicate that the most important dimensions of ecovillages based on the SEM Model respectively are the transportation and access dimensions economic dimensions and Social and agricultural dimensions. Moreover, Due to the spatial autocorrelation, the studied cities in France were randomly correlated in terms of the dimensions of the ecovillage. Finally, this study helps to improve the definition of an ecovillage in different geographical locations and facilitates the practical implementation of sustainable lifestyles, and provides new ways to launch policies related to sustainable lifestyle promotion based on ecovillages.

Keywords: Sustainability, Ecovillages, Residential Preferences, Geographical Location, France.

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1. Introduction

Sustainable communities have been the focus of a lot of theoretical and empirical research in recent years, particularly in response to a push to implement sustainable development in a more integrated way (Dalal-Clayton & Sadler, 2014; Lyden et al., 2018; Singh et al., 2019; Masuda et al., 2022). Furthermore, there is a widespread belief among advocates for sustainable communities that the best visions of a sustainable society that can embed the ideas of localism are ecovillages/urban ecovillages, which are widely regarded as a strategic approach to transitioning to a sustainable society and spatial organization suitable for implementing localism. These discussions on ecovillages/urban ecovillages as a long-term sustainability strategy have far-reaching implications for society's spatial development (Xue, 2014, Demaria et al., 2013; Owen, 2012; Jenkins et al., 2020). As a result, ecovillages that act as experimental community models have the potential to help society achieve sustainability by developing alternative sustainable living possibilities. Their contribution is proved by demonstrating viable alternative solutions that can be replicated on a wider scale in the broader community and across all geographic locations (Price et al., 2020). As a result, over 1000 ecovillages in rural, urban, and suburban settings throughout the world are now members of the GEN (Global Ecovillage Network), which serves as a hub for sharing and disseminating knowledge to ecovillages worldwide (GEN, 2022).

Some sites have accomplished such objectives within, but also outside, the confines of the ecovillage, by reviving local traditional knowledge and practices (Losardo, 2016; Waerther, 2014). Ecovillages, as Dawson (2006) points out, are transforming their local landscape, physical infrastructure, governance, population, skills, and culture in ways that improve the quality of life of communities both inside and outside the ecovillage and in each geographical location (Price et al., 2020).

To provide a comprehensive description, we must acknowledge that numerous definitions of these communities exist, as each ecovillage is unique in terms of geography, culture, and community. But the most comprehensive and precise definition is that an ecovillage is an intentional, traditional, or urban

community that uses local participatory processes to integrate ecological, economic, social, and cultural dimensions of sustainability in order to regenerate social and natural environments. Environmental, residential, economic, and social metrics are interrelated (GEN, 2022; Gilman, 1991; Aoki Bissolotti et al., 2006; Waerther, 2014). According to several research and instances of ecovillages around the world (Esteves, 2017; Pickerill, 2017). The lifestyle of an ecovillage defines these commonalities not just as shareable areas, but also as a social activity governed by a commitment (Pickerill, 2016).

As a result, we may conclude that, just as there are multiple definitions of ecovillages, there are also diverse dimensions of ecovillages. However, ecovillages and the essential features that should be included in an ecovillage can be grouped into five primary dimensions, according to recent studies (GEN, 2022, Szabó et al., 2021; Rubin, 2021). We divided these five dimensions into eight dimensions to better examine the dimensions of ecovillages in this study: ecological dimension, cultural dimension, economic dimension, agricultural dimension, social dimension, individual dimension, architectural dimension, and transportation-access dimension.

The goal was to determine how residents felt about the ecovillage and its various aspects, as well as what kind of lifestyle they preferred and which dimensions were more significant. Therefore, anticipating residential preferences necessitates knowing how different residents value various aspects that make up their preferences (J. Caplan et al., 2021; Liu & Kontou, 2022; Apostolopoulos et al., 2022). Among these characteristics include living in large or small cities, sustainable lifestyles, transportation, access, and business. For example, some citizens may enjoy living in large cities or close to larger ones in neighborhoods while also preferring to live a sustainable lifestyle (for example, the urban ecovillage in downtown Los Angeles, which, although living in a big metropolis, has chosen a sustainable lifestyle). Some residents, on the other hand, prefer to live in smaller cities or even villages to avoid the crowds and commotion of the big cities. Clearly, residents have relative preferences for these characteristics (Madison, 2018; Stebbins, 2019; Kajosaari et al., 2021; Orejon-Sanchez et al., 2022). Finally, each person's desire for a sustainable lifestyle or Ecovillage is shown through their unique hobbies, status, and behavioral traits.

The decision and actions of each citizen will determine if a sustainable lifestyle may become famous and spread in diverse areas (Cheng et al., 2019).

In France, hundreds of alternative intentional community projects have developed during the last decade, mostly in rural locations. Many other radical experiences include "transition" communities, sustainable housing cooperatives, and many others. Many individuals, particularly young people, are dissatisfied with prevailing urban living models focused on consumption, hypermobility, and debt as a means of obtaining housing and basic necessities. As a result, they are more in touch with nature, in a society that is less consuming and stressful, and they are seeking alternative lifestyles, which has historically been one of the most appealing alternative lifestyle projects. According to GEN, France has over 19 Ecovillages, with the majority of them located in the south. In France, hundreds of alternative intentional community projects have developed during the last decade, mostly in rural locations. Many other radical experiences include "transition" communities, sustainable housing cooperatives, and many others. Many individuals, particularly young people, are dissatisfied with prevailing urban living models focused on consumption, hypermobility, and debt as a means of obtaining housing and basic necessities. As a result, they are more in touch with nature, in a society that is less consuming and stressful, and they are seeking alternative lifestyles, which has historically been one of the most appealing alternative lifestyle projects (Bobulescu & Fritscheova, 2021; Sattler, 2021).

Finally, the goal of this article is to determine the most essential features of ecovillages based on residents' preferences in general, as well as to examine these dimensions in relation to France's geographical regions. Each of the aspects, for example, is related to the analysis of differences and similarities between residents' perceptions in large and small cities. Then, section 2 describes the technique, including what measurements were performed, how data was collected, and the statistical and spatial analysis processes.

2. Research Methodology

Measurement and data collecting are described in this section. The methodology was created with the goal of determining the most important dimensions of ecovillages based on residential preferences. And the

demographics of the respondents' characteristics and the statistical and spatial analysis methodology are shown.

2.1. Measurement

A specially designed web survey was used to collect the data for this investigation. The study was only open to French citizens over the age of 18. The poll was done from October 15th to December 31st, 2021, and was prepared using the LimeSurvey online survey platform. There are eight constructs in the research model (dimensions). Each construct was measured with many items to confirm the validity of all the instruments, and they were all adapted from previous research. On a seven-point Likert scale, ranging from (1) Very important to (5) Not at all important, each item was evaluated.

Before finishing the main survey material, the questionnaire was pilot-tested with a convenient sample and items were amended. The main purpose of the pilot test was to improve the substance of the measuring items, thus colleagues were invited to review the questionnaire for clarity, relevance, and significance. The measurement items were enhanced and some new ones have included thanks to comments and suggestions. In the pilot test, 42 questionnaires were completed, and the data were analyzed using an item identification analysis process that integrated descriptive statistics with the identification of extreme values and homogeneity tests to produce an acceptability index score of no more than 2. The main study employed the final 51 measurement items collected from the pilot test.

2.2. Data collection

It is impossible to reach the entire population with online questionnaires. The questionnaire can be seen in Appendix A. When compared to those who have access, their use is limited to those who have email and internet connections and those who do not. Because there is no proper sampling frame available, it is impossible to draw a scientific sample of the larger population for an online survey. Typically, sampling frames are only available for closed populations or specific target groups (Bordonaro, 2017; Grossardt and Bailey, 2018; Metzler et al., 2015; Poynter, 2010).

Some ways for obtaining an acceptable probability sample for an online survey include contacting respondents by phone, distributing the link on social media, encouraging them to check in to a website, and so on (dell'Olio et al, 2018; Tanner, 2018). The web survey was distributed using probability sample methods such as list-based random and non-list-based random in this study. For List-based, we sent a link to survey participants via email, such as universities and large organizations. We also send a link to social media sites such as LinkedIn, Facebook, Instagram, Telegram, and WhatsApp for non-list-based recipients.

There are two primary elements to the web survey questionnaire. Respondent's personal information, work-related information, and questions about ecovillage definition are collected in the first section. The second section collects questions about the importance of ecovillage dimensions. The information received from the questionnaire was used to determine the most relevant dimension and to compare geographic locations in France.

As a result, we sent the questionnaire across France via social media and social networks to people aged 18 to 66. The primary survey had 186 replies in the end. Then, to make the data easier to understand, we divided the 35 cities analyzed into six groups depending on their population index: Paris (capital), very large, large, medium, small, and very tiny cities (Table 1). Figure 1 shows the locations.

Table.1. Characteristics of the case study

Category	Population	The name of cities	The number of responses
Capital	2,181,306	Paris	34
Very big	500,000>	Marseille, Lyon	12
Big	500,000-200,000	Strasbourg, Nantes, Toulouse, Bordeaux, Montpellier, Lille	56
Medium	200,000-50,000	Dijon, Besancon, Nancy, Grenoble, Versailles, Courbevoie, Vitry-sur-Seine, Villeurbanne, Bobigny, Pau, Reims, Angers	36
Small	50,000-20,000	Châtenay-Malabry, Caluire-et-Cuire, Charenton-le-Pont, Le Creusot, Livry-Gargan	27
Very small	< 20,000	Blain, Mont-Saint-Aignan, Chenôve, Baugy, Ensisheim, Dourdan, Le Luc, Ciel, Saint-Claude	21
Total		35	186

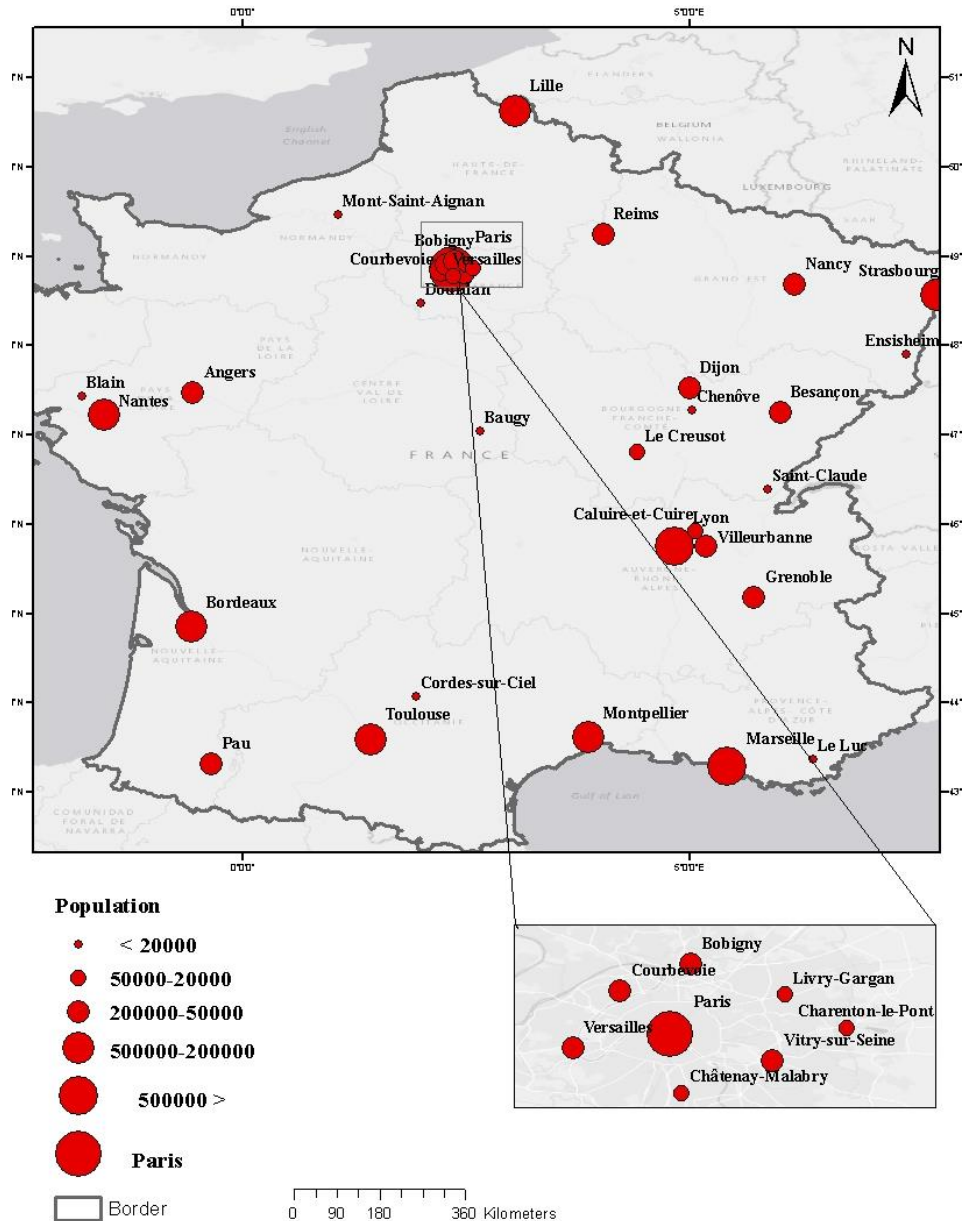


Fig. 1. Case Study of the research

2.3. Statistical analysis

The statistical analysis was done with SPSS and the Structural Equation Modeling (SEM) was created utilizing the AMOS (Analysis of Moment Structures) software. Since concepts like "economic" and "ecology" are not directly observable and must be deduced from a series of measurable data, the SEM model with latent variables was utilized. This model can be used to look at a collection of relationships between one or more independent variables, whether they're continuous or discrete. It devises a method for

breaking the correlations detected in a system of equations that explain their causal assumptions. The SEM model investigates causal linkages between directly observable data, assuming that all existing relationships are linear (Zhang & Li, 2019). As a result, SEM provides three significant advantages over traditional multivariate techniques: (1) explicit measurement error evaluation; (2) estimation of latent (unobserved) variables via observable variables; and (3) model testing, in which a structure can be imposed and data fit assessed. By not explicitly addressing measurement error, most multivariate techniques accidentally disregard it, whereas SEM models estimate these error variance parameters for both independent and dependent variables (Novikova et al., 2013).

The Structural Equation Model provides for the measurement of a "hidden variable" using numerous observed variables, as well as the specification, estimation, evaluation, and presentation of graphics that depict hypothetical relationships between the variables. It also influences how the desired hidden variable affects the number of variables seen for a "hidden variable," as well as how the incorrect variable affects it. The hidden (or latent) variables in this model include Ecological (ECL), Cultural (CUL), Architecture (ARC), Economic (ECN), Agriculture (AGR), Individual (IND), Social (SOC), Transportation and Access (TAA). Several observable variables are related to each of these latent variables. These observed variables were determined and selected based on previous research (Table 2).

- ❖ ECL is related to 9 observed variables: "Green spaces", "Biodiversity conservation", "Recovery of nature", "Local people's perception of the environment", "Waste recycling in the production cycle", and "Waste recycling and composting infrastructure", "Urban industrial and agricultural wastewater management", "Wastewater treatment for irrigation", "Processing and converting surplus food".
- ❖ CUL is related to 5 observed variables: "Contribution of natural resources to art and local culture", "Cultural values", "Culture of mutual respect and solidarity", "Sharing creativity art and innovation", and "Artistic and cultural activities in environmental protection".

- ❖ ARC is related to 4 observed variables: “Attention to the aesthetics and architecture”, “The use of natural and local materials”, “The resistance to climatic and environmental hazards”, “The design and construction in harmony with nature”.
- ❖ ECN is related to 7 observed variables: “Small Business Support”, “Self-employment”, “Supply chain management”, “Production and consumption of local and organic”, “local ownership”, “Attention to tourist attractions”, and “Employment opportunities in the tourism”.
- ❖ AGR is related to 4 observed variables: “Organic farming”, “Green cultivation techniques”, “Recycling of agricultural products”, and “Technology adoption”.
- ❖ IND is related to 5 observed variables: “Identifying oneself with the region”, “Respect for human and future lives”, “Acceptance of innovations”, “Political isolation”, “Environmental awareness”.
- ❖ SOC is related to 8 observed variables: “Participation among the inhabitants”, “local cooperation in protecting the environment”, “Cohesion solidarity and unity between people”, “Communication with neighborhood units”, “Sensitization of populations to climate change”, “Extension education programs”, “Workshops on environmentally”, “Preserving old traditions”.
- ❖ TAA is related to 9 observed variables: “Increase walking trails”, “Reducing vehicle use”, “Alternative Transport”, “Improving the state of communication”, “Access to health services”, “Access to appropriate technology”, “Proximity to large cities”, “Access to the station”, “Easy access to airports”.

2.4. Spatial analysis

The spatial autocorrelation (Moran's I) and Hot Spot in ARC GIS software were employed in this paper's spatial analysis.

The phrase 'hot spot' has been used to indicate a location or value that is higher than its surrounds across disciplines. For all features in the data, Hot Spot analysis calculates "Getis-Ord G_i^* " statistics. z-scores is the G_i^* statistic returned for each feature in the dataset. The z-scores and p-values that result indicate where

characteristics with high or low values cluster spatially. This tool operates by examining each feature in the context of its surroundings. A high-value feature is intriguing, but it might not be a statistically significant hotspot. A feature must have a high value and be surrounded by additional characteristics with high values to be statistically significant. The local sum of a complication and its neighbors is small in comparison to the total number of complications. The outcome will be a score if the "Local sum" is unexpectedly larger than the expected local sum and the difference is so large that it cannot be attributed to chance (Rostaei & Alizadeh, 2020).

The statistical technique of spatial autocorrelation (Moran's I) is used to calculate the degree of dispersion or concentration of features or spatial data. It's worth noting that this technique assesses the spatial feature distribution pattern by simultaneously observing the feature's position and attributes. The results of this analysis address the query, "What is the state of the spatial feature distribution (random, dispersed, or cluster)?" (Aghajani et al., 2017). "Moran's I" has well-established statistical features for describing global spatial autocorrelation, however, it fails to identify clustered spatial patterns and hotspots (Tewara et al, 2018). We used the optimized hotspot analysis tool in ArcGIS10.3 to find the most important dimension of ecovillages in the cities under study to locate hotspots.

3. Results and Discussion

Given that residents' perspectives were used to assess the importance of the ecovillage's dimensions, it's crucial to look at their demographic characteristics, data reliability and validity, Amos model outputs, and finally spatial analysis and relationships of cities studied based on each dimension on maps in ArcGIS. Demographic features of replies, Reliability and Validity, Model Fits, and Spatial Statistics Analysis are the four sub-sections of this section. Then, section 3 indicates the Results and Discussion with demographic characteristics, Reliability and Validity, Model fits, and Spatial Statistics Analysis.

3.1. Demographic characteristics

In terms of demographics, the survey covers a wide range of inhabitants in the residential area, indicating that the sample was representative of all socioeconomic groups. 55.9% of the respondents were men, while

43.5 percent were women; 33.9 percent were between the ages of 27 and 34, 17% were between the ages of 18 and 26, 17.2% were between the ages of 45 and 54, 16.7% were between the ages of 35 and 44, 12.4 percent were between the ages of 55 and 64, and 2.2 percent were over 65. Master's degrees accounted for 40.3 percent of the total, PhDs for 25.3 percent, and bachelor's degrees for 18.3 percent. Higher intellectual professionals (Engineers, doctors, human resources managers, high school teachers, pharmacists, lawyers) accounted for 21% of the respondents, students for 19.9%, employees for 15.6 percent, and manual laborers for 10.2%. Below are the specifics of this data.

Following the demographic questions, some questions concerning their distance from employment and whether or not they travel for work were asked in order to assess their capacity and chance to relocate. We also inquired about the pandemic scenario (such as covid-19) and its impact on their residential preferences. To see if they have worked from home during the epidemic and if the situation has influenced their decision to dwell in a small town or hamlet. Finally, we wanted to hear about their thoughts on the ecovillage concept and which weather conditions they think are best for alternative lifestyles or ecovillages.

Figure 2 shows the situation. 33.9 percent of respondents worked within a 5-kilometer radius, while 28 percent worked within a 15-kilometer radius. Furthermore, 38% travel less than 5 times per week, 24.2 percent do not travel, and 23.7 percent travel 5 to 7 times per week between work. During the pandemic, 37% of respondents said they did a lot of telecommuting. Furthermore, 31% responded that the pandemic scenario had no impact on their decision to live in a small town or village, and 28% claimed that the pandemic had caused them to relocate. 50% of respondents say that weather conditions are unimportant for alternative lifestyles or ecovillages, while 22.6 percent believe that a temperate and humid environment is preferable. In the previous one, we supplied the description of ecovillages (the one in the introduction) along with several photographs of ecovillages to give respondents a visual representation of the ecovillage. As a result, 40 percent were aware of the ecovillage definition and agreed with it, while 38.7% were unaware of ecovillages yet agreed with the description.

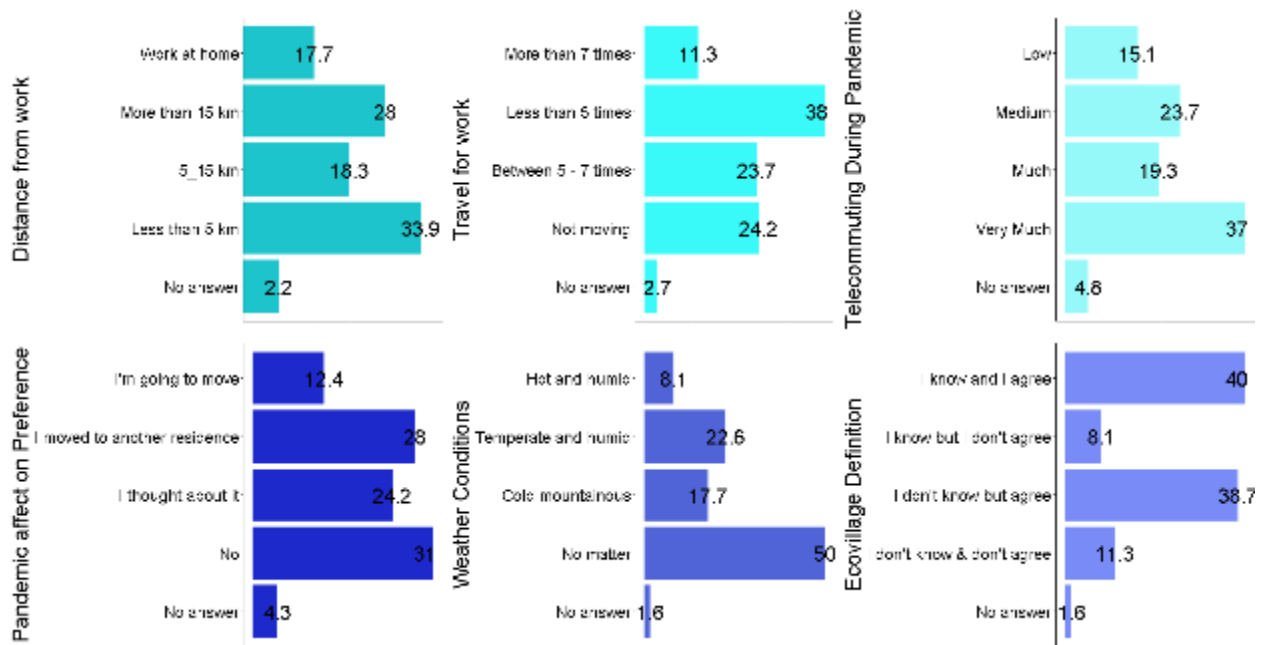


Fig.2. personal questions

3.1.1. Classify Demographic characteristics in relation to Ecovillage's Dimension

Based on the results of the questionnaire, the relationship between Demographic characteristics and the main variables can be analyzed as follows. Female respondents pay more attention to Ecological (4.15), Agriculture (4.21), architecture (4.04), Individual (3.74), and culture (3.73) dimensions. And male respondents pay more attention to Economic (3.89), Social (3.82), and Transportation & Access (3.80) Dimensions of Ecovillage. The ages of 27-34, pay more attention to Ecological (4.94), Architecture (4.75), Economic (4.35), and Transportation and access (4.27). The ages of 35-44, pay more attention to Agriculture (4.75) and Culture (4.50). The ages of 35-44, pay more attention to social (4.12) and Individual (4.10). About professionals, higher intellectual professionals pay more attention to individual (4.13) and social (4.0) dimensions. Students gave higher responses to culture (4.75), architecture (4.36), and agriculture (4.19), and employees gave higher responses to ecological (4.20), transportation and access (3.88), and economic (3.87).

3.2. Reliability and Validity

SEM modeling with AMOS was employed based on estimating various parameters in a two-step method to determine the value of the ecovillage's dimension. The structural model is first evaluated by looking into the consistency and reliability of the latent variables involved. The model's discriminant validity and composite reliability components show its quality. The measurement model is then tested in step two by

estimating the path coefficients (Adnan et al., 2019). Based on the findings of a two-step process, we have published the results below. Finally, the model's general fit is discussed.

Cronbach's alpha was used to assess the questionnaire's reliability. According to the literature, Cronbach's alpha should be greater than 0.7, and in this case, the value of the data is 0.862. Because we emphasize the relevance of Dimensions (indicators, items), data reliability and validity are critical. To ensure that our Model has both reliability and validity, Composite Reliability Scores (CR) and Average Variance Extracted (AVE) of the latent variables were calculated in AMOS (Chen et al., 2015, Hair et al., 2019).

An evaluation of the measurement model was performed in order to check the reliability and validity of constructs inside the model. The factor loadings extracted from the model are used to calculate CR for this purpose. A cutoff value of 0.7 is suggested by CR (Wang, et al, 2022). The table shows that all of the constructions were more than the threshold value (3). The amount of variance captured by the latent variable from its measurement items vs the amount of variance attributable to measurement mistakes is calculated using AVE to assess the construct's internal consistency. According to research, AVE should be more than 0.5. As demonstrated in Table, the AVE score for all constructions is more than 0.5. (3). This suggests that the latent variables account for at least half of the measurement variation (Nasution et al., 2020).

Table.3.Construct reliability and validity scores

Dimensions	CR	AVE
Ecological	0.87	0.67
Economic	0.70	0.53
Culture	0.74	0.56
Agriculture	0.75	0.57
Architecture	0.81	0.63
Individual	0.74	0.56
Social	0.84	0.61
Transportation-Access	0.75	0.57

3.3. Model fits

Figure 3 shows the SEM model of the correlations between latent and evident variables in ecovillage. All factor loads are positive in this diagram. In this figure, Oval shapes represent the error term (e) of each variable. Also, the names of observed variables are displayed based on the abbreviation of hidden variables. For example, observed variables of the ecological variable are named ECO1, ECO2, ECO3, etc. As a result, all model fit indices have been evaluated at an appropriate level, indicating that the global model is completely fit. All detected factors had positive and substantial impact coefficients within their scales, according to Table (4). (Moeinaddini et al., 2020, Wang et al., 2022).

According to the statistical results of the structural model, the transportation and access dimension (with a factor load of 0.97), the economic dimension (with a factor load of 0.90), the social and agricultural dimensions (with factor loading 0.87), the individual dimension (with factor loading 0.86), the ecological dimension (with factor loading 0.83), the architectural dimension (with factor loading 0.81) and culture are the most important dimensions of Ecovillage (With a factor load of 0.71).

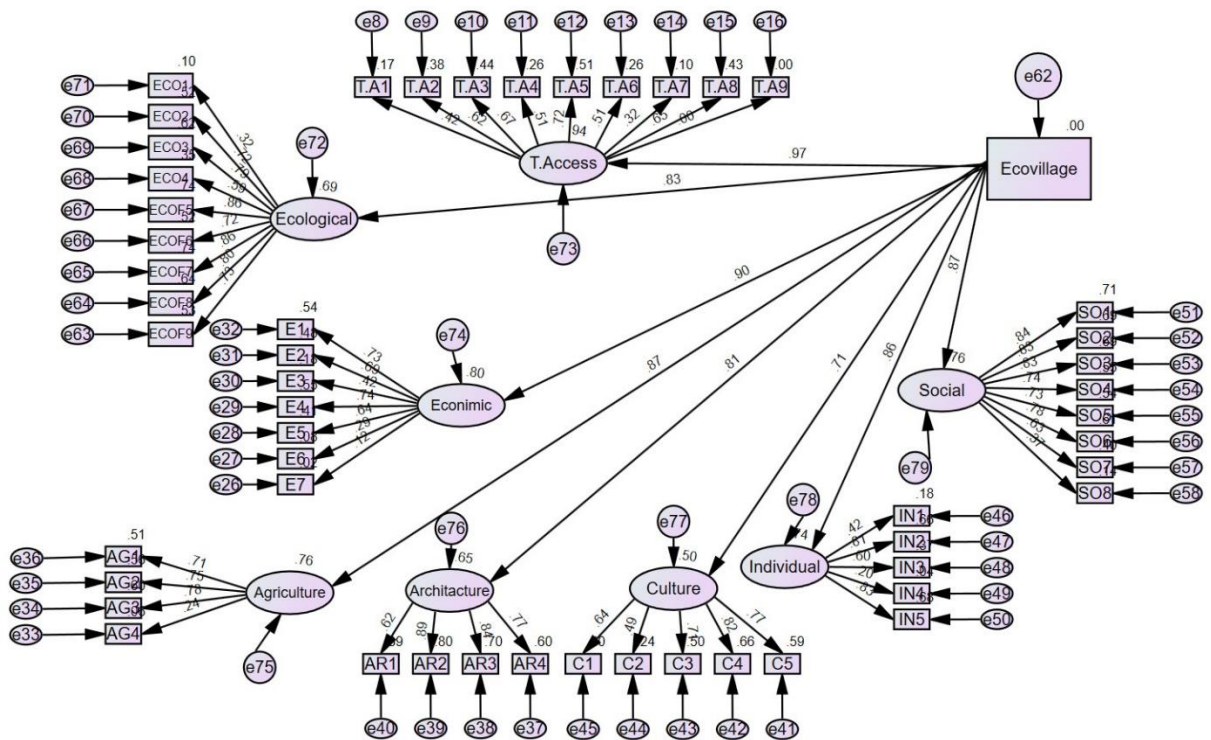


Figure.3. the Model of structural equations

-To be more precise about indicators from each dimension, in the Transportation and access dimension, the most relevant ones were access to health services, alternative transportation, and proximity to large cities. This is in line with zabó et al (2021) and Sherry's (2019) findings, which include ensuring vehicle functionality at the expense of renewable or inexhaustible energy sources, natural resource utilization in vehicles and infrastructure, ensuring the necessary level of accessibility for people of this generation and future generations, and human health promotion.

-In terms of the economic dimension, the most important factors were local and organic production and consumption, small company support, and self-employment. Given that economic activities have contributed to environmental instability, becoming an ecovillage necessitates a focus on organic production and consumption, as well as sustainable business practices (Williamson, 2002; Massy, 2017; Milani Price et al., 2020). As a result, ecovillages may be considered unique sites to illuminate a broader understanding of various economies, small companies, and small-scale production, particularly food processing (Gibson-Graham, 2008; Gibson-Graham et al., 2016; Szabó et al., 2021).

-The most essential aspects of agriculture were green farming techniques and agricultural product recycling. This is in line with the findings of Adalilar et al. from 2015, who indicated that the sustainable agricultural analysis is aimed at constructing the future ecovillage model in harmony with nature. Green cultivation, solar and wind energy use, agricultural product recycling, rainfall collection and use, and accumulated water capacity are all aspects to consider when designing a sustainable agriculture plan.

-In terms of the social component, the most important factors were resident participation, local environmental cooperation, and social cohesiveness and solidarity. Reciprocity is thought to promote the development of social capital in intentional communities in ecovillages by highlighting strong social links among community members through "mutual support and communication" (Waerther, 2014). (Mulder et al., 2006). As a result, local actions, participation, and cooperation by local governments will be a critical factor in achieving its goals (Goll, 2015; Adalilar et al., 2015).

-Respect for human and future lives, as well as political isolation, were the most important in the individual dimension. Individual adaptation to nature, animals, and respect for human future existence is one of the most essential foundations of ecovillages. As a result, one of the most common definitions of an ecovillage is "human-scale, full-featured settlements in which human activities are harmlessly incorporated into the natural world in a way that supports healthy human growth and can be effectively perpetuated indefinitely" (Blahovestova et al, 2020; Ardzijauskaite, 2009). As a result, Verma & Tiwari (2019) believes that ecovillages allow people to discover their unique relationship with the living land. Individuals enjoy working with earth, water, wind, plants, and animals on a daily basis. They meet their daily requirements — food, clothing, and a secure haven – while respecting natural cycles (Verma & Tiwari, 2019).

-In terms of the ecological dimension, the most important ones were waste recycling in the production cycle, urban industrial and agricultural wastewater management, and wastewater treatment for irrigation. The importance of settlement operations in disrupting the natural balance can be considered the reason for this. As a result, reducing human settlement pressure on nature is critical to long-term sustainability (Sherry, 2019; Xue, 2014). Reuse, recycling, trash recycling, wastewater management, and composting are all used to achieve this reduction (Blahovestov, et al., 2020).

-The use of natural and local materials, as well as resilience to climatic and environmental risks, were the most essential architectural features. The foregoing variables, as well as ecological considerations, are used to determine the layout and architecture of the houses. These concepts also underpin food production, energy production, waste management, green works, and civil processes (Mohan et al., 2016; Blahovestova et al., 2020). The ecological design also looks for alternative energy sources using local resources and frequently requires residents' active participation in the construction process (Westskog et al., 2018).

-In terms of the cultural dimension, the most essential ones were sharing creativity, innovation, and artistic and cultural activities for environmental conservation. According to some studies, the entrenched culture of sharing as a means of creating ecovillages' creativity and innovation is exemplified in particular (Litfin, 2014; Pickerill, 2016, 2017; Seyfang et al., 2014). Most ecovillages do not emphasize specific profound

practices in that capacity in the Cultural dimension, but ecovillages appreciate and support – the Earth and all living creatures on it, Sharing creativity, Spiritual and aesthetic improvement, and declaration, and otherworldly assorted qualities in their own unique ways (Tiwari, 2019).

Table.4. Results of confirmatory factor analysis (construct validity)

Sig	Standard regression weight	The relationship between variables		
***	.833	Ecological	←-	Ecovillage
***	.708	Cultural	←-	Ecovillage
***	.808	Architecture	←-	Ecovillage
***	.896	Economic	←-	Ecovillage
***	.875	Agriculture	←-	Ecovillage
***	.863	Individual	←-	Ecovillage
***	.871	Social	←-	Ecovillage
***	.968	Transportation-Access	←-	Ecovillage
***	.278	Green spaces	←-	Ecological
***	.704	Recovery of nature	←-	Ecological
***	.774	Biodiversity conservation	←-	Ecological
***	.573	Local people understand the environment	←-	Ecological
***	.833	Waste recycling in the production cycle	←-	Ecological
***	.651	Waste recycling and composting infrastructure	←-	Ecological
***	.818	Urban industrial and agricultural wastewater management	←-	Ecological
***	.729	Wastewater treatment for irrigation	←-	Ecological
***	.696	Processing and converting surplus food	←-	Ecological
***	.616	Contribution of natural resources to art and local culture	←-	Cultural
***	.424	Cultural values	←-	Cultural
***	.719	Culture of mutual respect and solidarity	←-	Cultural
***	.816	Sharing creativity art and innovation	←-	Cultural
***	.754	Artistic and cultural activities in environmental protection	←-	Cultural
***	.695	Attention to the aesthetics and architecture	←-	Architecture
***	.733	Use natural and local materials	←-	Architecture
***	.815	Resistance to climatic and environmental risks	←-	Architecture
***	.733	The design and construction in harmony with nature	←-	Architecture
***	.585	Small Business Support	←-	Economic
***	.632	Self-employment	←-	Economic
***	.371	Supply chain management	←-	Economic
***	.786	Local and organic production and consumption	←-	Economic
***	.565	local ownership	←-	Economic
***	.146	Attention to tourist attractions	←-	Economic
***	.001	Employment opportunities in the tourism	←-	Economic
***	.695	Organic farming	←-	Agriculture
***	.749	Green cultivation techniques	←-	Agriculture
***	.741	Recycling of agricultural products	←-	Agriculture
***	.165	Technology adoption	←-	Agriculture
***	.354	Identifying oneself with the region	←-	Individual
***	.831	Respect for human and future lives	←-	Individual
***	.529	Acceptance of innovations	←-	Individual
***	.119	Political isolation	←-	Individual

Sig	Standard regression weight	The relationship between variables		
***	.874	Environmental awareness	←-	Individual
***	.81	Participation among the inhabitants	←-	Social
***	.804	local cooperation in protecting the environment	←-	Social
***	.831	Cohesion solidarity and unity between people	←-	Social
***	.734	Communication with neighborhood units	←-	Social
***	.718	Sensitization of populations to climate change	←-	Social
***	.711	Extension education programs	←-	Social
***	.574	Workshops on environmentally	←-	Social
***	.315	Preserving old traditions	←-	Social
***	.333	Increase walking trails	←-	Transportation-Access
***	.612	Reducing vehicle use	←-	Transportation-Access
***	.695	Alternative Transport	←-	Transportation-Access
***	.395	Improving the state of communication	←-	Transportation-Access
***	.725	Access to health services	←-	Transportation-Access
***	.455	Access to appropriate technology	←-	Transportation-Access
***	.317	Proximity to large cities	←-	Transportation-Access
***	.682	Access to the station	←-	Transportation-Access
***	.112	Easy access to airports	←-	Transportation-Access

Indicators are closely related when it comes to error variables (which capture variation not incorporated in the model). The maximum likelihood estimation was used to estimate all of the variables. As a result, the collected data are deemed adequate, and the model fits well.

One of the most often used nonparametric tests to detect the disparity between an actual and predicted dataset is the chi-square (2) goodness-of-fit test. The sole goodness-of-fit test related with significance testing is this one and its limiting probability (p); the other metrics and indices are just descriptive. The result produced with the (2) is satisfactory in this regard: 2365.546 with 1185 degrees of freedom (DF). The probability level (0.000) is also quite good. This indicates that the variables differ greatly (Moeinaddini et al., 2020).

Model fit indices are shown in Table 5. The model's goodness indicators are 0.664, indicating that the scenario is positive. The model also has an adaptive fit of 0.771 and 0.787, according to Tucker fit indices. The economic adaptive fit index is 0.732, whereas the economic fit index is 0.607. The Root Mean Square Error of Approximation (RMSEA) is a measure of statistical model goodness-of-fit, with the purpose of achieving an approximate or close fit with the model rather than a precise fit, which is often impractical for large populations. A good match for the model is indicated by values below 0.07. As a result, the RMSEA

result is 0.073, which is somewhat higher than 0.07 but acceptable. In general, the Model shows that the model is well-fitting (Adnan et al., 2019).

Table5. Status of fitting indicators

Indicator	The value of the index in the desired pattern
NPAR	141
CMIN	2365.546
DF	1185
P	.000
GFI	.664
CMIN/DF	1.996
RMSEA	.073
TLI	.771
CFI	.787
PNFI	.607
PCFI	.732

The factor loads in the model of measuring the pattern of structural equations must be greater than 0.30; if the factor is less than 0.30, the model will be damaged, and it must be deleted. Because all factor loads are more than 0.30, the model fit indices have been evaluated to an appropriate level, indicating that the research model is completely fit. In other words, both models' measures of their independent variable have a strong correlation or covariance (Fig.4).

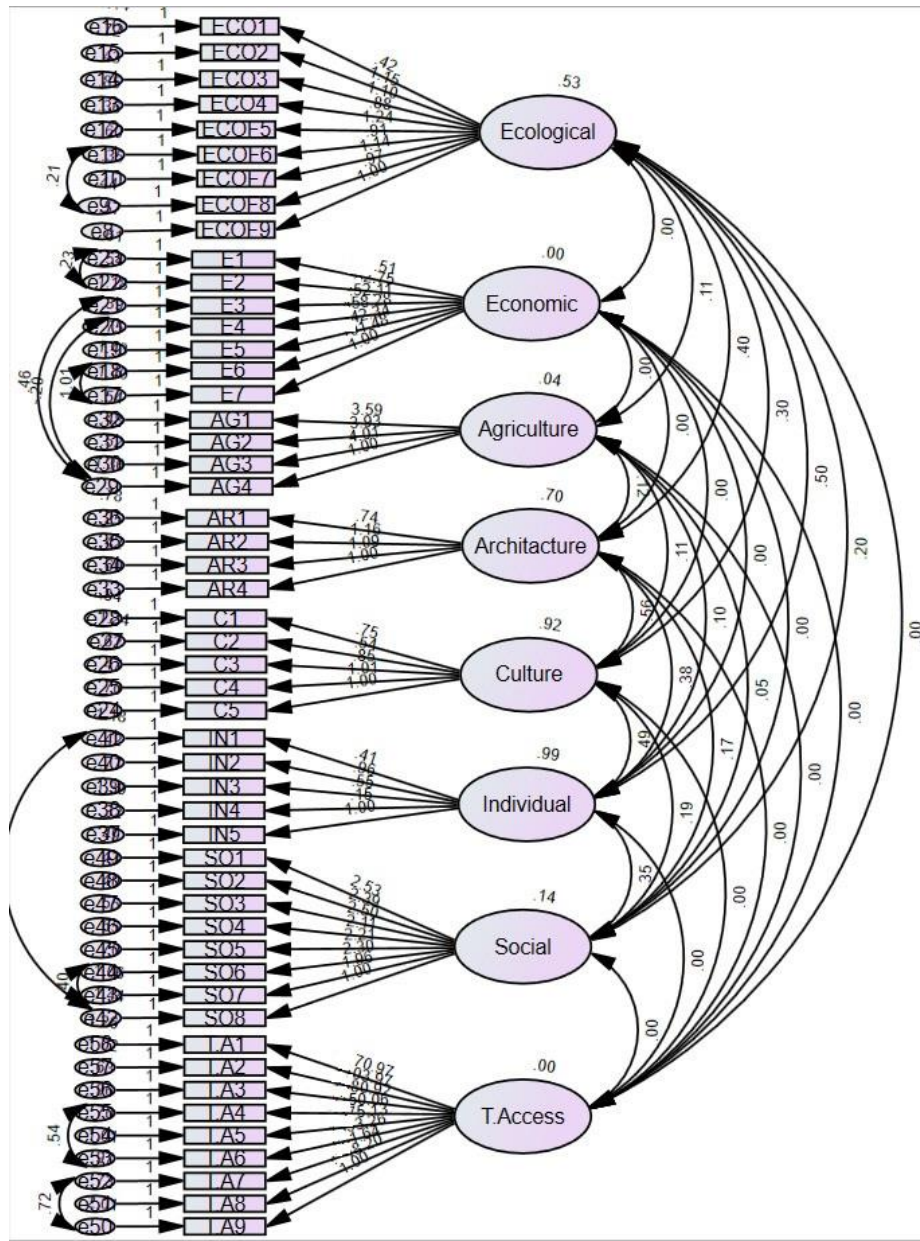


Fig.4 Model for measuring the pattern of structural equations of research

3.4. Spatial Statistics Analysis

3.4.1. Spatial autocorrelation

The graphic output of spatial autocorrelation (Moran's I) analysis shows that the points under consideration are dispersed or grouped depending on the intended index. The analyzed sites do not contain spatial autocorrelation, according to Moran's diagram. In general, if the Moran index value is close to a positive number (+1), the data has spatial autocorrelation and a cluster pattern; if the Moran index value is close to

a negative number (-1), the data is fragmented (Table 5). In other words, if the diagram represents a clustered pattern, it means that nearby spatial features have more similar values, if the diagram represents a clustered pattern, it means that nearby spatial features have more similar values, if the diagram represents a random pattern, it means that nearby spatial features have more values that are randomly similar, and finally, if the diagram represents a dispersion pattern, it means that nearby spatial features have more dissimilar values (Figure5).

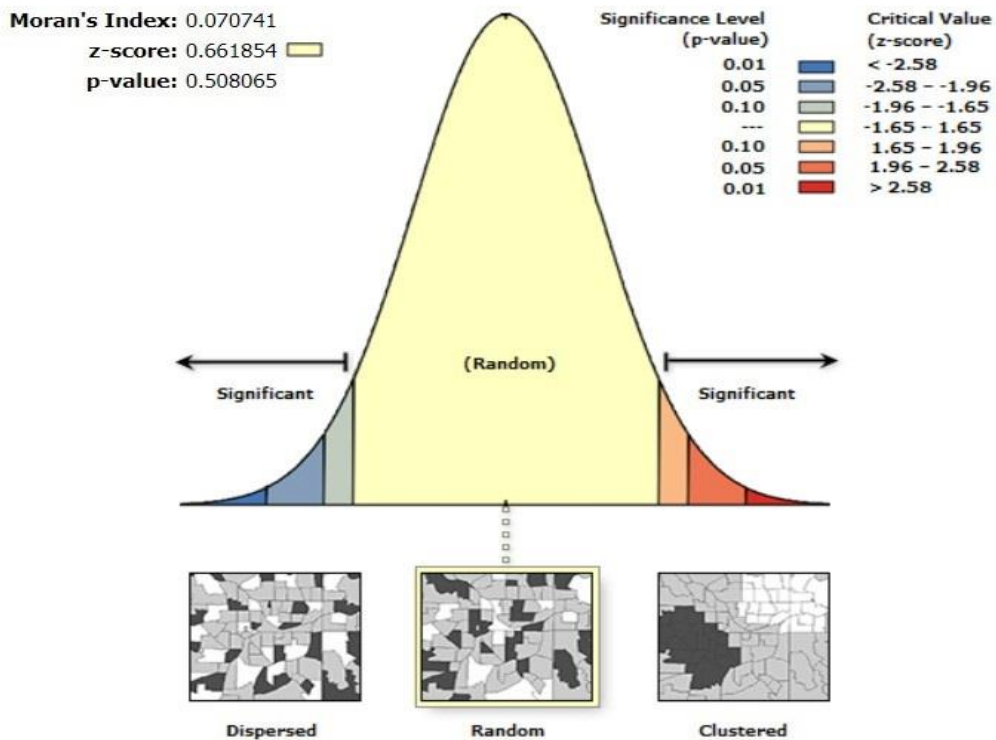


Fig5. Analysis of Spatial Autocorrelation Graphic Results (Moran's Index)

The graphic output of spatial autocorrelation (Moran's I) analysis shows that the points under investigation are distributed or grouped according to the specified index. The examined sites have randomly spatial autocorrelation, according to Moran's figure. In other words, the figure depicts a random pattern, implying that values near spatial characteristics are more likely to be randomly similar. In a study conducted in Tehran, Sadeghinia and Alijani (2015) iterated the utility of spatial-temporal analysis of green cover in urban environments using the spatial autocorrelation technique. Other ecological research can benefit from

spatial autocorrelation and hot spot cold spot analysis. Babiker et al. (2007) looked at how borehole data was organized in space to determine groundwater quality. Another study used a spatial filtering mechanism that combined drought indices acquired from satellite pictures with spatial autocorrelation computations to provide precise spatial information about drought-prone locations (Lin and Chen, 2011). Kumari et al. (2019) investigated the spatial pattern of land surface temperature in response to land cover around a thermal power plant using Moran's I and GIS. Lopez et al. (2017) combined human and remote sensing to identify and explain urbanization hot areas and Moran's I in the south of Mexico City.

Table6. The numerical output of spatial autocorrelation analysis

Moran's Index	0.070741
Variance	0.022898
z-score	0.661854
p-value	0.508065

3.4.2. Hot spots cold spots

The Hot Spot Analysis tool was then utilized to see the relationship between cities based on each dimension. For each dimension in the data, a G_i was discovered in this analysis (Ijumulana et al., 2020). The resulting z-scores and p-values, as previously stated, show where characteristics with high or low values cluster spatially (Majumder et al., 2019). In other words, the greater the z-score is for statistically significant positive z-scores, the more intense the clustering of high values (hot spot), and the smaller the z-score is for statistically significant negative z-scores, the more intense the clustering of low values (cold spot) (cold spot). As a result, the red patches on the maps below show hot locations, and these places in this study represent the most critical dimensions in Ecovillages. Furthermore, the lower and negative the value, the closer we get to the blue or frigid places on the maps. Furthermore, these places represent the Ecovillages' less important dimensions.

- ✓ The relevance of the Ecological, Transportation, and Access elements of Ecovillage in France is depicted in Fig.6, with the Ecological component being very important in Reims, Baugy, Le

Creusot, Besancon, Montpellier, and Toulouse and very low in Courbevoie and Bobigny. The Transportation and Access dimension is very important in Vitry-sur-Seine, Nancy, Le Creusot, Saint-Claude, Marseille, and Le Luc, and very low in Courbevoie and Bobigny.

- ✓ The importance of the Economic and Agriculture dimensions of Ecovillage are shown in Fig.6, with the Economic dimension having a very high importance in Vitry-sur-Seine, Nancy, Saint-Claude, Caluire-et-Cuire, and Montpellier and a very low importance in Villeurbanne, Bobigny, Baugy, Chenove, and Ensisheim. Agriculture is highly important in Vitry-sur-Seine, Nancy, Caluire-et-Cuire, and Toulouse, while it is very important in Villeurbanne, Courbevoie, Bobigny, and Mont-Saint-Aignan.

- ✓ The relevance of the Culture and Architecture dimensions of Ecovillage are depicted in Fig.7, with the Culture dimension having a very high importance in Reims, Dourdan, Bordeaux, Saint-Claude, and Cordes-sur-Ciel and a very low importance in Baugy and Courbevoie. Reims, Besancon, Saint-Claude, Caluire-et-culre, Courbevoie, and Blain place a high value on architecture, while Ensisheim, Chenove, Bobigny, and Nantes place a low value on it.

- ✓ The relevance of the Social and Individual dimensions of Ecovillage are depicted in Fig.7, with the Social dimension being very important in Livry-Gargan, Dourdan, Besancon, Montpellier, and Marseille, and very low in Bobigny, Versailles, Vitry-sur-Seine, Courbevoie, Ensisheim, and Cordes-sur-Ciel. Individual dimension relevance is extremely high in Livry-Gargan, Culuire-et-Cuire, Mont-saint-Aignan, Lille, Strasbourg, Besancon, Saint-Claude, Le Creusot, Marseille, and Montpellier, and extremely low in Vitry-sur-Seine, Courbevoie, Cordes-sur-Ciel, and Ensisheim.

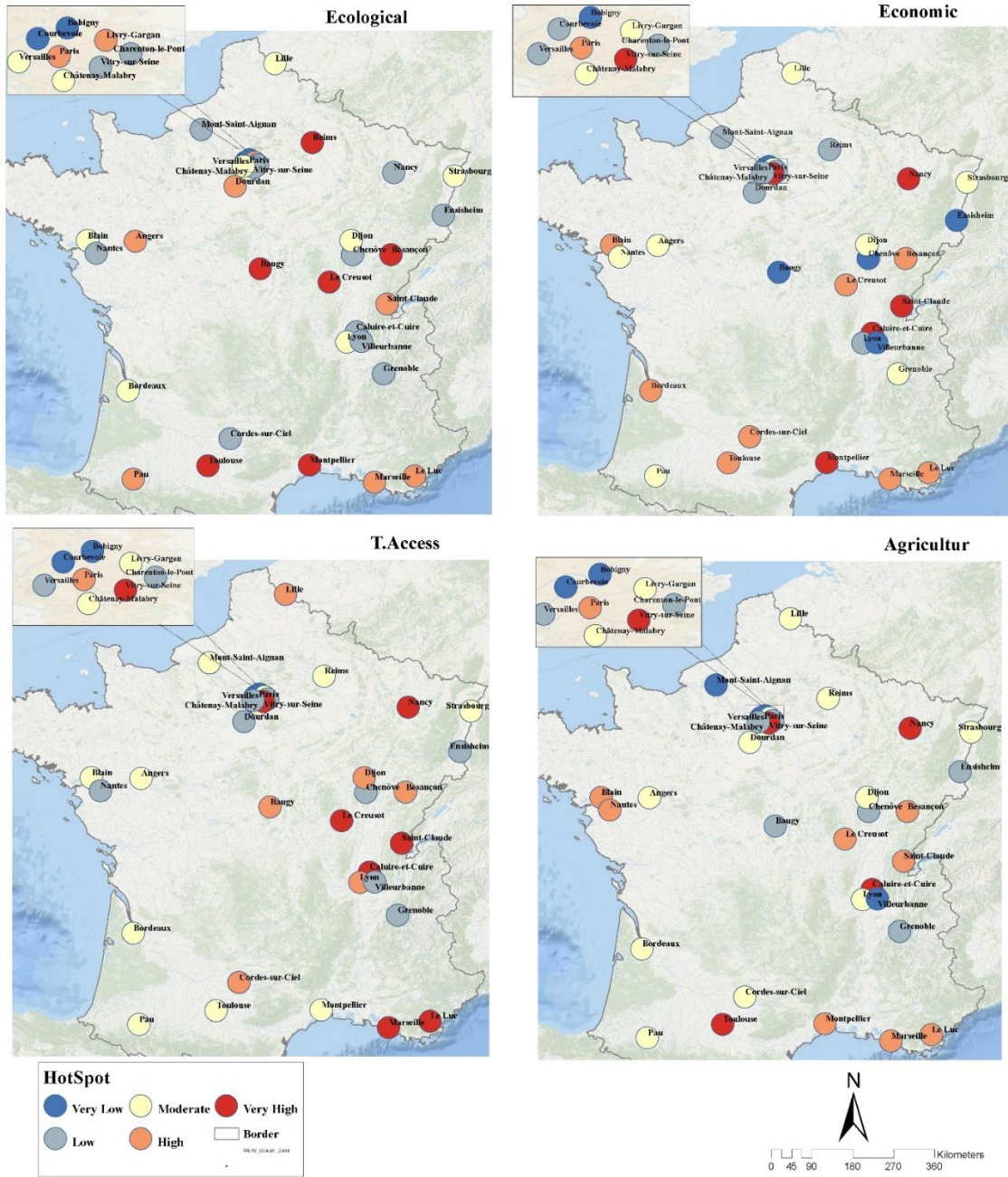


Figure 6. Hot spot and Cold spot of Ecological, Transportation and access, Economic and Agriculture Dimensions

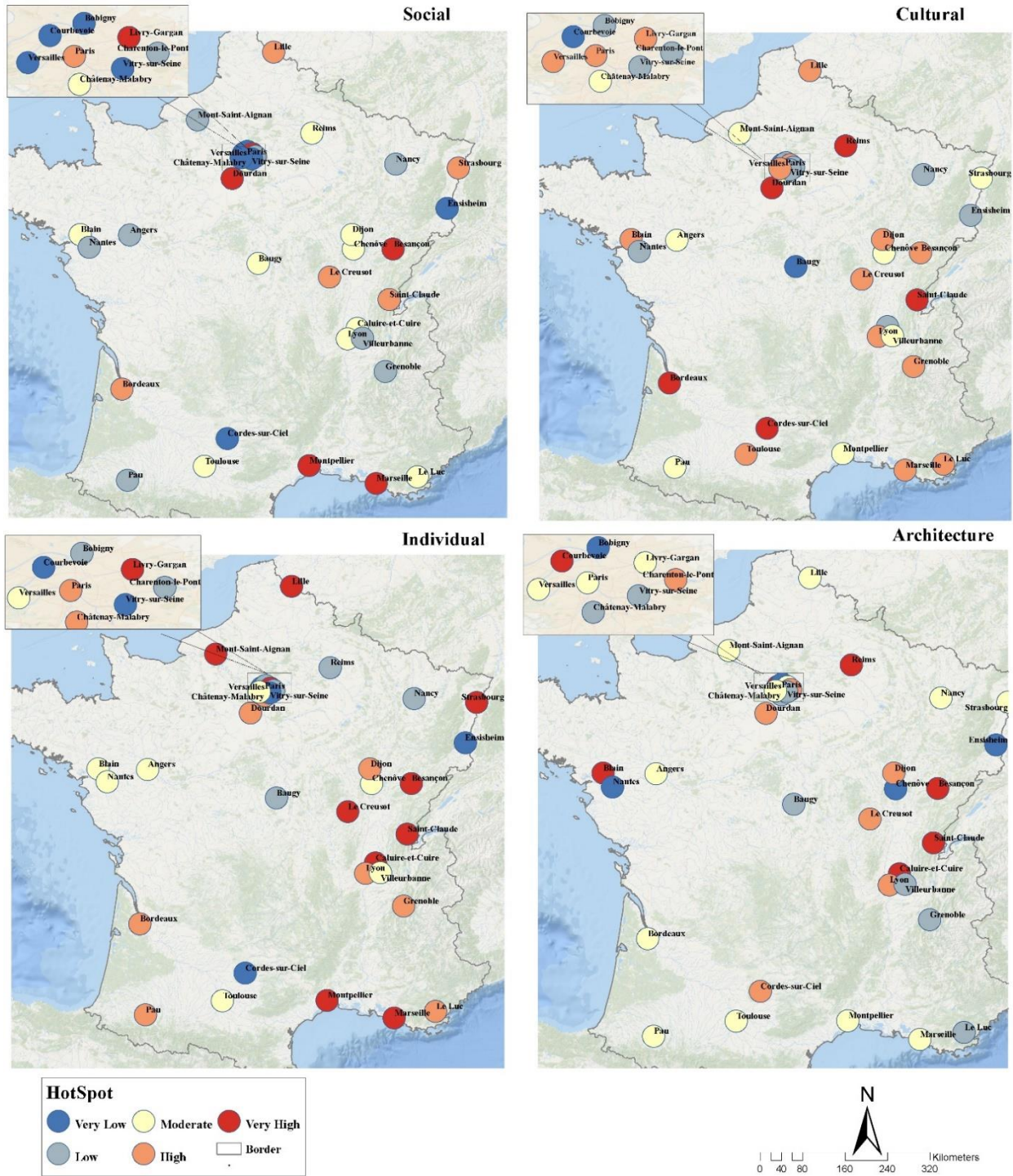


Figure 7. Hot Spot and Cold Spot of Culture and Architecture, Social and Individual Dimensions

Conclusion

Dissatisfaction with city life and environmental issues has prompted some people to seek a healthier, more serene life closer to nature. Ecovillages have risen as a viable alternative to traditional settlements and lifestyles in response to this demand. Residents' preferences regarding these communities and the disparities between what they expect in different geographical areas are present in ecovillages that are still in the process of creating their life cycle. We employed a questionnaire to assess these expectations, then statistical and spatial analysis methods to examine them. The following are the conclusions drawn from the study's findings in this context.

The majority of the respondents were professionals, between the ages of 27 and 34, male, and with a master's degree. Furthermore, most respondents' distance from work was between 5 and 15 kilometers in personal inquiries. Moreover, for employment, the majority of them went less than five times every week. Furthermore, most of them did a lot of telecommuting throughout the pandemic. When it came to the definition of an ecovillage, the majority of them agreed with the one provided in the survey.

Cronbach's alpha was used to assess the questionnaire's reliability, and it was found to be adequate at 0.862. CR and AVE were calculated to check the reliability and validity of constructs inside the model, and the findings were acceptable based on Table (3).

The model has an excellent fit with the chi-square (2) 2365.546 and 1185 degrees of freedom, according to the results of the SEM model in Amos program (DF). In a nutshell, according to the respondents, the most important dimensions of ecovillages are transportation and access (with a factor load of 0.97), economic dimension (with a factor load of 0.90), social and agricultural dimensions (with a factor loading of 0.87), and to be more specific, in the Transportation and access dimension, access to health services, alternative transportation, and proximity to large cities. Local and organic production and consumption, small company support, and self-employment are all economic factors Green farming techniques and agricultural product recycling were the most important in the agricultural component, while engagement among residents, local collaboration in environmental protection, and social cohesion and solidarity were the most essential in the social dimension. Due to the spatial autocorrelation, the studied cities in France were randomly correlated

in terms of the dimensions of the ecovillage. This means that the cities that are close together and in the same cluster, have different perspectives about the importance of the dimensions of the ecovillages.

It may be determined which cities are distinct in terms of which Dimensions using the hot areas and cold places in Figures 6 and 7. In each dimension, it is also possible to determine which cities are hot spots (extremely high in terms of the importance of the dimensions) and which cities are cold spots (very low in terms of the value of dimensions). Given the 35 cities analyzed, we grouped the cities based on population to prevent a separate analysis of each of these cities and to summarize the statistical maps. We placed Paris in the top category since its population was substantially different from that of other cities, and the remaining cities were categorized as very large, large, medium, small, and very small cities, accordingly (Fig.8). Therefore, respondents in Paris, very large cities, and medium-sized cities, have given the most important to the dimensions studied Compared to other cities.

To be more specific, practically all dimensions are given similar weight in Paris and the major towns (Marseille and Lyon). The social, individual, agricultural, and economic components have all gotten increased attention in big cities. All dimensions are roughly equal in importance in small cities. The social and individual components have also been given significant weight in very tiny cities.

Therefore, as a long-term initiative, the ecovillage concept advocates for the integration or synthesis of geographically diverse knowledge for more community-based management or place-based development that incorporates the individual to form a larger region. In this setting, society passes on to future generations more sustainable practices mediated by narratives, norms, and procedures. Sustainability knowledge is conveyed holistically in geographical terms through residents, who express sustainability knowledge as narratives, values, and beliefs. This highlights the need of considering individuals' perspectives on these values, beliefs, and narratives as spatial relationships. The geographical dimension can serve as a bridge between local and national policymaking and activities.

These findings may make it easier to put sustainable lifestyles into practice and provide new strategies to introduce legislation promoting sustainable lifestyles based on ecovillages. Because the objectives of an ecovillage are so different from those of today's society, planners must be more critical and evaluative of current non-sustainable rural/urban development methods that are incompatible with the goals of sustainability and fairness. Challenging reality is not an easy task, as it involves various societal actors with competing interests in the production of social reality. To overcome those opponents, planners will need to identify stakeholders that share common values in order to achieve sustainable living goals. To reach an agreement within the alliance, debate, communication, and deliberation should be encouraged.

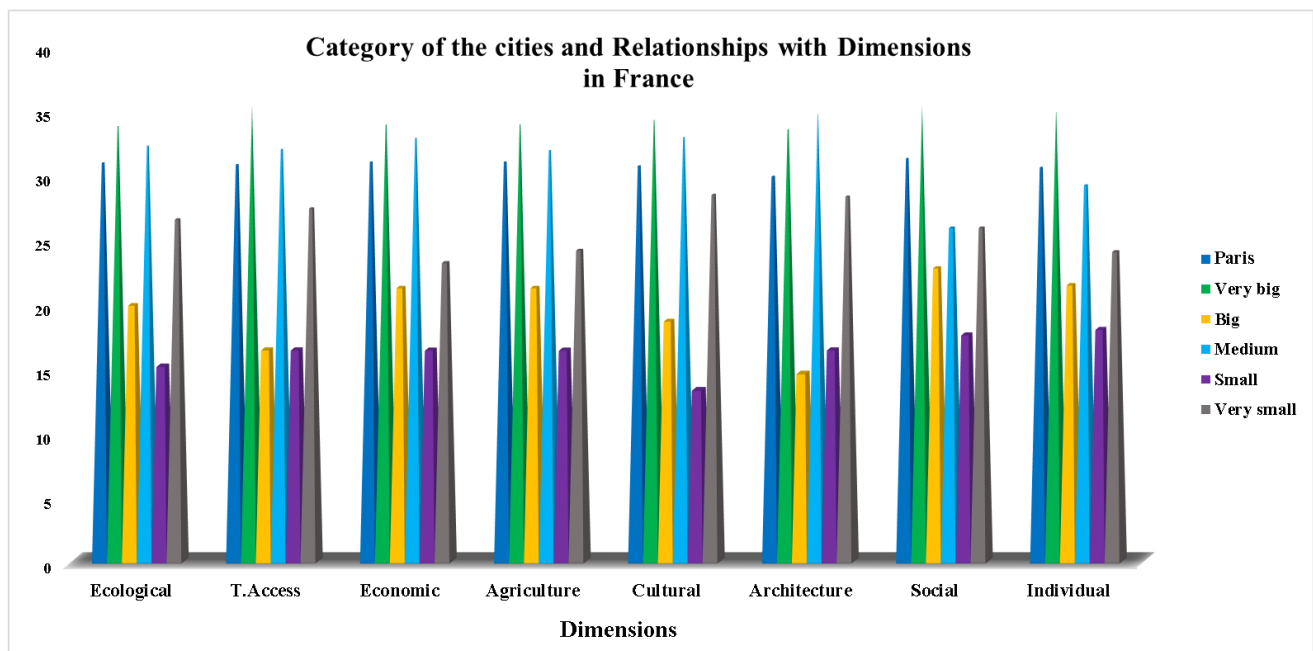


Fig.8 Category of the cities and their relationships with Dimensions of Ecovillage

Highlights

- ✓ The concept of ecovillage as a sustainable lifestyle.
- ✓ Interpretation of the dimensions of the ecovillage based on Resident's Preferences of France.
- ✓ Identify the most important dimensions of ecovillages in different geographical locations.
- ✓ Determining the proportions of the Ecovillage
- ✓ Ecovillages are widely considered as a strategic approach

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Appendix A: the Questionnaire

Part 1. Personal information:

Who are you?

1. You are: A man A woman

2. How old are you?

- 15-19 years
- 20-24 years old
- 25-29 years old
- 30-34 years
- 35-39 years
- 40-44 years
- 45-49 years old
- 50-54 years
- 55-59 years old
- 60-64 years
- 65 years or older

3. What socio-professional category do you belong to?

- | | |
|--|----------------------------------|
| • Farmer | Worker |
| • Craftsman, merchant and entrepreneur | Retirement |
| • Executive and higher intellectual profession | Student / apprentice |
| • Intermediate occupation | Employee |
| • Employee student | Other / no professional activity |

4. Please enter your postal code:

5. If you are active, approximately how far is your work from your home?

- Less than 5 kilometers
- Between 5 and 15 kilometers
- More than 15 kilometers

6. If you are active: Including day breaks, how many times per week do you travel to and from work?

- I'm not moving
- Less than 5 times a week
- Between 5 and 7 times a week
- More than 7 times a week

7. How many children under the age of 14 live with you?

- 0
- 1
- 2
- 3 or more

8. What is your marital status: Married Single Other

9. What is your level of education: Diploma License Masters Doctorate

10. Did you experience a period of telecommuting during the pandemic crisis?

- No Yes (0-50%) Yes (50-100%) Yes (exclusively, 100%)

11. Did the pandemic situation affect your choice to live in a small town or village?

- No Yes, I thought about it Yes, I moved to another residence

12. What weather conditions do you think are preferable for your place of residence?

No matter Hot and dry climate Cold mountainous climate Temperate and humid climate Hot and humid climate

13. Do you know the concept of eco-village and do you agree with its definition? An ecovillage can be defined as a rural or urban community that is consciously designed through local participatory processes in the four dimensions of sustainability (social, cultural, ecological and economic) to regenerate social and natural environments. Examples are shown in the following pictures. ***Do you know the concept and do you agree with this definition?***

- I do not know and I do not agree I do not know but I agree I know but I do not agree I know and I agree

Why ? (optional):





Part 2: Residential Preferences

In the following questions, we assess residential preferences. Please indicate your opinion on each question. This notice may concern your main residence and will clarify the definition of an ecovillage.

So, General Question is: what is the role of the following in your residential neighborhood?

1-In your opinion, within an ecovillage, what do you think of Perception of nature? Is it:

- Very important
- Important
- Of moderate importance
- Not important
- Not important at all

1.1. Note from 1 to 5 what seems essential to you in the field of Perception of nature:

Indicators	1	2	3	4	5
Green space (artificial vegetation which is both socially effective, for the general public to use, and ecologically effective, ie to beautify the village)					
Biodiversity conservation (conservation of ecosystems and plant and animal species)					

Recovery of nature (reforestation, replanting of destroyed plants)					
Local people understand the environment (What do people know about the importance of the environment and its protection?)					

2. In your opinion, within an ecovillage, what do you think of recycling? Is it:

- Very important
- Important
- Of moderate importance
- Not important
- Not important at all

2.2. Write down from 1 to 5 what you think is essential in the field of recycling:

Indicators	1	2	3	4	5
Waste recycling in the production cycle (Converting waste into materials that can produce new products.)					
Waste recycling and composting infrastructure (creating access to relevant facilities in this regard)					
Urban, industrial and agricultural wastewater management (monitoring and prevention of the entry of this wastewater into villages and lakes)					
Wastewater treatment for irrigation (To save water consumption)					
Processing and converting surplus food (Reduce waste and create added value)					

3. Based on Ecovillages, What type of transportation do you think is more suitable?

- Car
- Trains
- Buses
- Airplane
- Bike
- On foot

3.3. Note from 1 to 5 what seems essential to you to reduce pollutants in residential neighborhood?

Indicators	1	2	3	4	5
Increase walking trails					
Reducing vehicle use					
the existence of alternative transport					

4. Based on Ecovillages, What type of energy do you think is more suitable?

- Conventional
- Alternative

4.1. If Alternative, Note from 1 to 5 which one it seems more suitable in your area?

Indicators	1	2	3	4	5
Tidal Energy					
Wind Energy					
Geothermal Power					
Natural Gas					

Wave Energy					
Hydroelectric Energy					
Solar Power					

4.2. In your opinion, within an ecovillage, which one of the following is better to reduce energy consumption?

- The use of Alternative energies
- Change consumption patterns
- Energy efficient buildings (new constructions or renovated existing buildings, to provide a significant reduction of the energy need for heating and cooling.)

5. In your opinion, within an ecovillage, what do you think of economic situation? Is it:

- Very important
- Important
- Of moderate importance
- Not important
- Not important at all

5.1. Based on Ecovillages, What is the role of following items to improve the economic situation? (Note from 1 to 5)

Indicators	1	2	3	4	5
Small Business Support					
self-employment in improving the local economy					
Supply chain management (the process of planning, executing and controlling supply chain operations in the most optimal way possible.)					
production and consumption of local and organic(food produced without the use of pesticides and chemical fertilizers)					
local ownership (inhabitants, own the surrounding land and gardens)					
Attention to tourist attractions					
creating employment opportunities in the tourism sector					

6. In your opinion, within an ecovillage, what is the role of following items to improve the Agriculture situation? (Note from 1 to 5)

Indicators	1	2	3	4	5
Organic farming					
Green cultivation techniques or permaculture (crop rotation, mulching, green maneuvers, combined agriculture, etc.)					
Recycling of agricultural products (Recycling of products such as fertilizers, animal feed, energy recovery, the manufacture of environmentally friendly bricks from agricultural waste to replace clay, etc.)					
Technology adoption in agriculture					

7. Based on Ecovillages, What do you think of the role of Culture / Art? It is:

- Very important
- Important

- Of moderate importance
- Not important
- Not important at all

7.1. In your opinion, what is the role of following items to improve the Culture situation in Ecovillages? (Note from 1 to 5)

Indicators	1	2	3	4	5
contribution of natural resources to art and local culture (The role of these natural resources in the sense of belonging and local culture of the region)					
cultural values (Focus on cultural attitudes and beliefs)					
The culture of mutual respect and solidarity (Improving relations between people in the community)					
sharing creativity, art and innovation (Enabling acceptance of innovation and new arts)					
artistic and cultural activities in environmental protection					

8. In your opinion, what is the role of following items to improve the Architecture situation in Ecovillages? (Note from 1 to 5)

Indicators	1	2	3	4	5
Attention to the aesthetics and architecture of buildings					
the use of natural and local materials in village architecture					
The importance of the resistance of buildings to climatic and environmental hazards					
the design, construction and builders in harmony with nature (Interaction between the body and the peripheral bed of the area)					

9. Based on Ecovillages, What do you think of the role of Social status? It is:

- Very important
- Important
- Of moderate importance
- Not important
- Not important at all

9.1. In your opinion, what is the role of following items to improve the Social situation in Ecovillages? (Note from 1 to 5)

Indicators	1	2	3	4	5
Promote participation among the inhabitants					
local cooperation in protecting the environment (Do not throw garbage, no pollution of lakes, rivers etc, do not hunt, fish illegally etc.)					
Identifying oneself with the village or the region (close link with the living environment)					
Cohesion, solidarity and unity between people (The Level of solidarity between people and its role in the preservation of the environment)					
Social interaction and communication with neighborhood units					
Respect for human, non-human and future lives (To achieve a sustainable way of life)					
Sensitization of populations to climate change (Increase awareness and information of villagers to fight against the destructive consequences of climate change)					
Extension education programs (to increase environmental awareness)					
Workshops on environmentally friendly communities					
Preserving old traditions (The need to revive local customs and preserve values)					
Acceptance of innovations (Being flexible)					
Political isolation (awareness of the political situation)					

Environmental awareness and human impact on it (How effective is human performance in environmental tastes?)					
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10. In your opinion, what is the role of following items to improve the Access Status? (Note from 1 to 5)

Indicators	1	2	3	4	5
Proximity to large cities					
Access to the station					
Easy access to airports					
Access to health services (medical establishments)					
Access to appropriate technology (Internet, mobile phone, etc.)					
Improving the state of communication (communication routes, transport, internet)					