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# ARTICLE **OPEN** Eco-building for eco-living, an essential step to face climate change

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The article provides an historical overview of ecological design within the context of intentional communities. It explores how this design approach has evolved over time and emphasizes its significant contributions to the struggle against climate change. The key principles used by ecovillages (renewable energies, waste recycling, water consumption, voluntary simplicity and degrowing economies, shared governance) are recalled, bringing into light interactions between eco-housing and eco-living designs at all scales. The paper discusses the various challenges faced by ecovillages, such as the need to deeply articulate their own project to a local territory, while simultaneously being part of international networks. The demonstration argues that ecovillages already act, and could have a wider potential to promote sustainable living if they were considered as "setting an example". The critical discussion acknowledges the difficulty in quantifying ecovillages' current contributions. However, for their qualitative potential, they are seen as a valuable and strong potential resource in the fight against global warming. In summary, the article highlights the holistic approach of ecovillages in addressing all climate change issues and suggests considering them as laboratories for "empathic" architecture.

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# INTRODUCTION

Eco-building and eco-living appear as essential steps in struggling climate change. Impacting both human and natural systems, architectural design plays a crucial role in this process. Scientific fields, such as sociology, economics, ecology and ideology, study ecovillages and intentional communities, but often forget the importance of their built environments. However, history of architecture can provide an original point of view. In this article, ecovillages are studied as whole entities acting on several levels of architectural design-from dwellings to territories, from spatial to social organization, from local to worldwide networks. Doing so, each of them represents a singular and 'empathic' form of ecoliving, adapted to a bioregional context and embracing a sustainable approach to daily life. The bioregional approach is intentional, as it refers to a development based on social and ecological responsibility and education. Since the 1960s, this movement integrated scientific and cultural dimensions, as well as biogeography and social ecology, being part of the 1970s communities' experiences. Rediscovered in light of contemporary ecological challenges, Bioregionalism becomes Territorialism in Europe (since the 2010s).

Observation of ecovillages allows to establish links, not with an official but an alternative history of architecture. Within this specific approach, the concept of 'empathic design' by the American architect Sim van der Ryn<sup>1</sup> becomes a theoretical line to better understand how ecovillages use to proceed.

"Design is much more than ratios, regulations, and beautiful 3D models. The way we approach design has implications for human and natural networks and the future of our planet. Integrating the design of human systems and natural systems for the benefit of humans and the living world is ecological design (...). But including the very important integration of connection to humans (self and others) is what I am calling empathic design."<sup>2</sup>

Relevant in itself, 'empathic design' also refers to an older concept, i.e. 'Place Work Folk' by the British biologist Patrick Geddes (1985–1932). Known for his pioneer vision of urban planning as the first manifestation of bioregional thinking, Geddes developed a completely original approach to regional and town planning by integrating people and their livelihood (socioeconomic needs, specific natural conditions and species) into the particular place and region they inhabit<sup>3</sup>.

Crossing Geddes' and Van der Ryn's concepts, the problematic questions the field of architectural design as an experimental method able to embrace ecological sustainability at all levels and scales. Could ecovillages be considered as laboratories of an 'empathetic architecture', acting against climate change by reconnecting with the living specific to territories, without being disconnected from the world? Two assumptions support the demonstration. First, direct observations show that ecovillages tend to build eco-housing consistent with a bioregional sitespecific approach, leading to constructive choices and allowing resilient lifestyles. Second, ecovillages share their commitments with numerous similar initiatives spread across the planet. Thus, their architectural productions become relevant on a global spatial scale, as well on a digital construction level that has become essential to their existence, activities and resources. These architectures of sharing and networking encourage gatherings and attest to the contemporaneity of communities' struggles. It appears that far from being a backward-looking dream, ecovillages support a common commitment to contain global warming, and thus its effects on the climate.

By analyzing 'total architectural' issues, the argument developed should provide a quite rare insight into ecovillages. It should be of interest to social science researchers engaged on community-based social design matters. Architects, whether convinced or not regarding the critical need to embrace ecological architectural design as a project-method, could certainly benefit from this unusual emphasis on ecovillages as an introduction to the concept of 'empathetic architecture'. This article also has an inspiring potential for a wider audience, questioning mainstream lifestyles, as well as looking for a transition or sustainable ways to be 'part of the world'.

The paper is divided into two parts. The first part looks at the history of communitarian initiatives and their response to environmental vulnerability. It also brings a short glance on their ideological, social and architectural legacy. Considering that ecohousing emphasizes local action while simultaneously eco-living promotes global connections, the second part explores how ecovillages could be seen as appropriate solutions to the climate crisis. The study concludes that ecovillages offer a relevant way to experiment sustainability and struggle against the effects of climate change.

In the realm of human sciences, literature that directly addresses the relationship between ecovillages and architecture is scarce. To our knowledge only one work specifically focuses on the subject<sup>4</sup>. Indeed, pluri-disciplinarity is revealed to be a key in capturing the communal world and its various levels of action. Although the ecological architecture movement has had few followers in its history, alternative architects like Sim van der Ryn have paved the way since the 1970s, revealing a whole alternative culture of space and eco-building methodology relevant to communities and ecovillages<sup>5</sup>. Through testimonies, the paper aims to shows how architecture serves as the foundation for a socio-spatial project.

To connect ecovillage practices with theoretical approaches, it seems necessary to explore byways in the tradition of regional planning and bioregionalism. Bioregionalism, as described by its thinkers<sup>6–8</sup> is an alternative mode of microsociety organization where communities inhabit territories and base their economic systems on the principles of voluntary simplicity or degrowth<sup>9</sup>. Sociological perspectives, see relations to work as central to social life in ecovillages and much more than a simple activity<sup>10</sup>. The history of ideas sheds light on the values guiding contemporary ecovillages, tracing the roots of ecological awareness to early environmental struggles and communitarian movements<sup>11</sup>. Transmission of construction methods (materials, local know-how) and symbolic use of buildings in ancient communities can also be found in the contemporary ecovillages' practices<sup>12</sup>.

Ecovillages have implicitly incorporated foundational myths, such as the idea that rural society was an ideal disrupted by industrialization, now seeking a reconnection with nature<sup>13–15</sup>. The philosophical approach of Deep Ecology<sup>16–19</sup> touches to the deepest level of communitarian habitat through singular collective experiences connecting individuals with nature and others.

However, the state of research remains very limited regarding the ability of the communitarian movement to build architectures that would contribute to a better living on the Earth. The historical continuity between the communities of the 1960s and today's ecovillages has not been addressed, despite its concrete expression through a mutation of sociospatial approaches. Likewise, their architectural heritage, stretched between rupture and tradition, lacks documentation: their hybrid constructions, mixing academic architecture, artistic bricolage and traditional influences, are not sufficiently studied. It is true that they refer to self-building and vernacular architecture, two alternative-and mostly rural-architectural trends, less prevalent than urban architecture inherited from modern and postmodern movements. As a result, the contributions of the communitarian world to a minor history of architecture—as well as the tangible local alternative resources they already represent—are not taken into account.

## RESULTS

## Awareness of the Earth's ecological vulnerability

The ecological crisis we are facing today has become a major challenge. In this context, the construction industry sector is a significant contributor to greenhouse gas emissions<sup>20</sup> and there is an urgent need for this industry to transition to more sustainable and eco-friendly practices.

A regularly updated study<sup>21</sup> confirms that construction industry in our Western societies represents more than 30% of total gas emissions. In charge to monitor whether the sector is aligned with the Paris Agreement goals, the 2022 report "finds that despite a substantial increase in investment and success at a global level lowering the energy intensity of buildings, the sector's total energy consumption and CO2 emissions increased in 2021 above prepandemic levels. (...) The buildings and construction sector are not on track to achieve decarbonization by 2050. And the gap between the actual climate performance of the sector and the decarbonization pathway is widening."

While at the same time essential planetary resources (water, soil, biodiversity) are being depleted by the impact of human activities, demographic projections indicate that by 2050 there will be 10 billion people on Earth. How can we resolve this Anthropocene paradox? Climate change seems to be the acute part of an even deeper crisis: a crisis of habitability of the planet, as analyzed by the French philosopher Bruno Latour<sup>22</sup> and the geographer Michel Lussault<sup>23</sup>. Designing and building ecologically seems to be one of the main conditions to face the existential urgencies, and assume responsibilities toward future generations<sup>24</sup>. The field of architecture therefore appears to be an essential starting point for initiating profound changes Figs. 1 and 2.

Recent sociological Fig. 3 studies conducted in France show that the urban model has become a growing concern due to the COVID-19 pandemic, leading to an acceleration and a slight increase of the urban exodus to rural areas<sup>25,26</sup>. The globalization invites us to think that many Western countries are concerned by this phenomenon that highlights the interconnectedness of socioeconomic trends. The current events parallel the back-to-the-land movement of the 1960s-1970s, which was driven by concerns about ecological disasters, overexploitation of resources, and social inequalities caused by the rising consumerist way of life. The *Limits to Growth* Report<sup>27</sup>, as well as scientific first whistleblowers<sup>28,29</sup>, already warned about the myth of infinite growth in a finite world<sup>30</sup>. Then, the Brundtland Report published in 1987<sup>31</sup> called for sustainable development to reconcile the environment and development. However, the Earth Overshoot Day continues to move backwards each year, raising questions about the future habitability of the



**Fig. 1** Hallinguelille ecovillage (DK). View of the northern part of the village, from the communitarian house by the pond.



**Fig. 2 Communitarian Building Hallingelille (DK).** Ecovillage Hallingelille: view of the northern part of the village, from the communitarian house by the pond; view on the communitarian building from the other bank of the pond. ©The author (2018).



Fig. 3 Only One Earth, The Unesco Courier, January 1973. Barbara Ward's article Only One Earth is summarized as follows: "Study of the biosphere has led us to take a new look at the interaction of man with his planet. "We are," says Barbara Ward, "the generation to see through the eyes of the astronauts the astonishing 'earthrise' of our small and beautiful planet above the barren horizons of the moon." ©UNESCO. Reproduction rights OK.

planet. We could add that if demographic and climatic projections prove to be correct, the final observation is that—even if some countries are starting to prepare for a climate transition phase—we do not really know how we will soon inhabit the only planet we have at the present. This highly ecological question calls for architectural responses able to integrate historical legacy, bioregional contexts and spatial scales.

The observation of contemporary ecovillages reveals three main concerns inherited from 19<sup>th</sup> Century utopias: ideological, social, and architectural. Ideologically, ecovillages are located outside of large urban areas to escape the unhealthy and polluted city and live

PLACE FOLK ("Natives")	WORK-FOLK ("Producers")	FOLK
PLACE-WORK	WORK	FOLK-WORK
PLACE	WORK-PLACE	FOLK-PLACE

**Fig. 4 Place Work Folk diagram, Patrick Geddes, 1904.** "Geddes formulated his place/work/folk triad in 1904 in two lectures (Civics. An applied sociology)(...). These three components also highlight the interdisciplinary relationships between geography (place), economics (work) and anthropology (folk), relationships that also evolve over time. (...) The relationship between man and his environment is present here in this conception of the region as a social and geographical unit." De Biase Alexia, <u>Patrick Geddes en héritage</u>, *Espaces et Sociétés*, 2016, DOI :10.3917/esp.167.0007. ©Project Gutenberg's www.gutenberg.org. August 17, 2004 [EBook #13205). Character set encoding: ISO-8859-1. Produced by Jon Ingram, Wilelmina Mallière and Distributed Proofreaders Europe, http://dp.rastko.net.

in harmony with nature. Socially, life in an ecovillage is regulated by shared governance that guarantees the cohesion of the community and its inclusive nature. Collective practices, such as sustainable building (conception, shapes and orientation adapted to local climate, naturals and/or recycled-reused materials, renewable energies, water recycling systems), and reducing consumption reflect a deeper desire for equality. Today's ecovillages have evolved, learning to avoid conflicts and maintain harmonious relationships between the individual and the collective<sup>32</sup>, in order to guarantee stability and longevity to their experience. When the architectural framework embodies the ideological and social choices of the community, architecture completes its purpose: bringing the ecovillage project to life, materializing a permanent search for balance between natural resources and their use. Ecovillages also use to generate income through activities like environmental education and permaculture workshops, reflecting the values of voluntary simplicity and degrowth. Ecovillages' incomes are not easy to assess, even by themselves. According with their ideologic engagement and testimonies, most of them have managed to build up a subsistence economy that mainly provides local work for few community members, and possibly finances part of the community's running costs.

Thus, ecovillages are a product of history, combined with methods of implementation, and architecture becomes a laboratory for expression, experimentation, and concretization of their project<sup>33</sup>.

## DISCUSSION

The reminder of global warming historical context allowed to establish the link with the ideological heritage in which the ecovillages are situated. The spatial mode of operation that underlies their daily actions, from the smallest local scale to the most global interactions, opens another issue.

Ecovillages embody Fig. 4 an approach to sustainable Fig. 5 living that integrates both Geddes' Place Work Folk and Van der Ryn's empathic-ecological design concepts. The focus on different scales, from the smallest amenity to the whole territory, results in a 'Russian doll system', as interlocking scales that behave like living organisms in harmony with their environment. Ecovillages embody a 'total architecture' that becomes a strength for individual and collective commitments. This specific architecture is implemented through the five principles of ecological and empathic design<sup>2</sup>: 1. opening a collaboration space, 2. conceiving a climate-responsive building (solution grow from place), 3. arising an educational environment (make nature visible), 4. designing for low-impact construction (ecologic accounting inform design), and 5. involving everyone and having fun (everyone is a designer).

This methodology is in line with pragmatism<sup>34,35</sup> which is both an instinctive and practical philosophy for approaching sustainable

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Fig. 5 "Watercolor illustration by Sim Van der Ryn, showing how ecological design exists at the intersection of the Ecosphere and Technosphere", from Design for Life (2005). Sim van der Ryn and Stuart Cowan pay tribute to Geddes as one of the pioneers of the ecological design movement: 'Designs that work in partnership with nature articulate an implicit hope that we might do the same' S. Van der Ryn & S. Cowan, *Ecological Design*, Island Press, 1996, pp. 72,162. ©Sim van der Ryn (courtesy of Micah van der Ryn).

living. However, the constant action of ecovillages can lead them to a lack of perspective, and eventually limit their evolution, reflection, and adaptation to intrinsic change of a living territory. To balance the need for action with the need for reflection, maybe researchers working on ecovillages could nourish them while they observe and collect data. Could we imagine, for example, that oral data frequently collected would be used to create a living worldwide archive of ecovillagers' testimonies, with the ambition of constituting a cultural heritage and a corpus of collaborative research, both of which have not been created before? In return, by passing on bibliographic references and appropriate methodologies, could not researchers help to introduce the historical and analytical distance necessary to empirical experiments when they have reached a certain level of development? Those questions are already discussed within a GEN Research group formed in 2021. Through online meetings, it gathers researchers in humanities from all over the world, currently working on topics emerging from ecovillages. Its purpose is to create a network of sharing and improve research in a field still seen as alternative in academics.

"When we talk about the mainstream that puts an image on your life: you are supposed to have a house, two cars, for the same family...(...) If you erase that image and go to a community or collective environment, will you lack a roof over your head and a place to eat? Maybe we're going to have a little less luxury, we're not going to have individual houses (...) But we will all have a bed to sleep in and good healthy food because we have organic, biological gardens, we are in the countryside, we have fresh air, we have all the essentials. (...) If we don't have all the little personal things that the mainstream tries to sell us to consume more and more, are we going to be unhappy? Personally, I can share that I am very happy (...)."(P. The Ecological City, Colebrook-NH 2017).

These few lines clearly highlight the concerns of many ecovillagers around the world and then communitarian motivations behind eco-designed and eco-built architecture. As it is



**Fig. 6 Spatial organization of Hallingelille ecovillage.** Signage located at the entrance of the ecovillage to guide visitors. It indicate the different neighborhoods, highlights the interlocking scales, the coherence between them and the interaction with the site. ©The Author (2018).

linked to economic, governance and implementation processes, eco-housing seems to prepare the ground for eco-living. Being a resident of an ecovillage means choosing this lifestyle, so changing 'old regular habits' to limit environmental impact and rethink all daily actions, including location and construction choices, economic activities, governance, and education systems. While the notion of sustainable development still maintains the illusion of infinite growth in a finite world, ecovillages initiate sustainable practices that allow a re-appropriation and reinterpretation of the globalized world economy. Revealing a consistence with 'pragmatic ways-of-doing', sustainable practices could be the keys to consider future 'true wealth' as starting locally. Finally, sustainable practices are part of a necessary attention to the cohesion between all design planning levels involved in the Place Work Folk Geddes' concept and its developments by the Bioregionalist movement: they open a way to articulate small and human scales with bigger ones.

Architectural choices Fig. 6 in ecovillages focus on reducing their Fig. 7 ecological footprint. Two main elements of ecological architecture are the use of bio-sourced materials and the flexibility of built spaces to adapt over time to different functions. The restoration of old buildings and retrofitting, as well as multifunctional spaces, is a complementary approach that allows the re-use of entire villages<sup>36</sup>. Furthermore, in the context of ecovillages, the construction of additional buildings is often inspired by vernacular know-how and local aesthetics that already have many bioclimatic features, while the restoration of pre-existing buildings becomes part of the community project. In the bioregional logic, reconnection with the history and culture of an area, while preserving agricultural land, comes naturally.

Ecovillages aim Fig. 8 to have low energy Fig. 9 consumption in their Fig. 10 dwellings, often consuming less energy or resources than average urban ones. One of the rare quantitative study<sup>37</sup> draws on several reports to provide examples of the benefits of eco-housing. Some examples are significant enough to be quoted : a study of the Canadian ecovillages Quayside Village and OUR Ecovillage shows that intentional urban and rural communities have a significantly smaller ecological footprint compared to conventional averages. The Dancing Rabbit ecovillage (Missouri, USA) has a resource consumption level that is less than 10% of the average American's, and the inhabitants of Ithaca Ecovillage (New York, USA) consume 35% less energy than local residents. The Sólheimar ecovillage(Iceland) recycling habits' have resulted in a 65% reduction in the village's household. Dry toilets are often the



**Fig. 7 Hemp houses Hallingelille (DK).** One of the main lines of Hallingelille ecovillage project's is to build and live in ecological buildings. The founder and her daughter's family chose a very simple architectural design, using hemp as the main construction material (bioclimatic performances, almost 100% recyclable). Ecovillages tend to build eco-housing consistent with a bioregional site specific approach that refers here to architectural/artistic productions "created, designed, or selected for a specific site," such as Land Art performances and artworks. In this context, it underlines that ecovillages are familiar with performing ways of acting and a work-in-progress, as project-building methodologies. ©The author (2018).



**Fig. 8** The ecovillage Torri Superiore (IT). The ecological restoration of this Middle Age Castello has given rise to several collective workshops over twenty years. It has been rebuilt identically, with the original materials and techniques. Some improvements necessary for the tourist reception have been realized (enlargement of doors, windows, openings for the common room). ©The author (2018).

regular, as they can decrease household water consumption by 25 to 30%.

Broadly, even Fig. 11 if ecovillages still are connected to official energy networks, they systematically integrate renewable energy sources such Fig. 12 as solar panels. Moreover, aesthetic choices usually reflect a collective desire of voluntary simplicity expressing one of the main inhabitants' values. Nevertheless, techniques used for construction remain innovative, with a focus on experimentation through workshops and DIY methods.

Analyses of visited fields Fig. 13 confirms a wider observation of ecovillages around the world: ideal size is for them a small-village scale (from Fig. 14 about five to one hundred-fifty inhabitants), and a spatial design typology that aims to reduce impacts on the environment by seeking integration in the landscape. Ecovillages



Fig. 9 Bioclimatic dwellers and communitarian building, Hameau des Buis (FR). Ecovillage Hameau des Buis consists mainly of singlefamily houses. An old building has been rehabilitated and became the communitarian house, as well as part of the school of the ecovillage. The bioclimatic housing program followed a pragmatic process, always adapting the dream to reality when technical and financial problems emerged. Pragmatism is also a philosophical point where Geddes' and Van der Ryn's thoughts joint. John Dewey (1859–1952), principal theorist, defended that the real material of actions is facts, not the thinking, experiences being the only way to act efficiently. ©The author (2018).



**Fig. 10 Bioclimatic dwellers and communitarian building, Hameau des Buis (FR).** Ecovillage Hameau des Buis consists mainly of single-family houses. An old building has been rehabilitated and became the communitarian house, as well as part of the school of the ecovillage. The bioclimatic housing program followed a pragmatic process, always adapting the dream to reality when technical and financial problems emerged. Pragmatism is also a philosophical point where Geddes' and Van der Ryn's thoughts joint. John Dewey (1859–1952), principal theorist, defended that the real material of actions is facts, not the thinking, experiences being the only way to act efficiently. ©The author (2018).

may focus on permaculture, forestry, and outdoor livestock. Farming can also be handled in various ways, from home gardens to small-scale farm production. The interdependency between the different levels of construction and the grid that connects them creates a virtuous circle that supports daily needs. Some of them, like La Cité écologique (Quebec, Canada), have so well developed their agricultural and farm production that they can achieve up to 80% self-sufficiency in vegetables and transformed products (cheese, bread, fish, eggs, etc.) in all seasons.



Fig. 11 Seeds space and collective housing in La Cité écologique Ham-Nord (CA). Between 2017 and 2023, the ecovillage has grown up its food self-sufficiency from 35% to 80% of the needs of 150 inhabitants. ©The author (2017).



**Fig. 13 Solar panels at Ecological City Colebrook (NH-USA) and Hallingelille (DK).** ©The author (2017 and 2018). Solar panels are frequently used in ecovillages. Even if they remain connected to official grids, it's a way of underlining their interest in renewable energies and their desire to break with fossil fuels exploitation.



**Fig. 12** Seeds space and collective housing in La Cité écologique Ham-Nord (CA). Between 2017 and 2023, the ecovillage has grown up its food self-sufficiency from 35% to 80% of the needs of 150 inhabitants. ©The author (2017).

However, this rate is rarely reached. Even more, ecovillages represent a small percentage of the planet's space and population. There is certainly still a lot to be done in order to address larger scales and make a significant impact on climate issues related to accessible food production.

How many people would have to adopt the eco-village lifestyle to achieve meaningful global results? Given the rapid creation and disappearance of many community projects (90% failure rate)<sup>32</sup>, the current state of the data makes very difficult to quantify the population concerned today in relation to the world's population. As there is a clear imbalance between urban and ecovillage growth, it would be unwise (and too optimistic?) to make predictions, especially since current statistics predict that in 2050, nearly 70% of the world's population will live in cities<sup>38</sup>, known to produce 70% of greenhouse gases.

Anyway, ecovillages do not wish to change the scale that guarantees their high-quality of life. As confirmed by an ecovillager, *Small is* [definitely] *beautiful*!<sup>39</sup>:

"We could get a little bigger, but we don't want to exceed a certain number either. The bigger we get, the more



**Fig. 14** Solar panels at Ecological City Colebrook (NH-USA) and Hallingelille (DK). ©The author (2017 and 2018). Solar panels are frequently used in ecovillages. Even if they remain connected to official grids, it's a way of underlining their interest in renewable energies and their desire to break with fossil fuels exploitation.

complications there are... (...) We have grown to about 150 (...). I would say it's a good number of people to stay socially well connected with each other, to keep things running smoothly. We really feel like a village, with a chain of mutual aid, a solidarity." (N. La Cité écologique -Ham-Nord, Quebec-CA, 2017).

The latest architectural scale developed by ecovillages has led to the formation of international networks such as the Global Ecovillage Network (GEN) and the Foundation for Intentional Communities (FIC). Over the past thirty years, these two organizations have helped to bring cohesion and unity among various local ecovillages around the world. Their digital platforms highlight the network's current structuring and development by giving access to two complementary maps, providing a constantly updated "picture" of the network's evolution, with brief descriptions of each project's specific feature. Even with very different back-grounds, the ecovillages mentioned in this paper belong to this 'global ecovillage family' that spans across all continents. Since then, fighting against climate change does not mean limiting oneself to a local perimeter.

The advent of digital technology has played a significant role in the growth and development of the ecovillage movement. Internet has opened up avenues of communication and made it possible for people living in remote communities to freely connect and communicate with each other on a global scale, as often as they need. Digital networks also brought a significant empowerment process: ecovillages have very quickly organized online spaces for meeting, debating, learning and creating knowledge. One is tempted to compare them to 'alternative schools open to one and all'. An ecovillager (L. Torri Superiore, 2018) who helped founding GEN Europe confirms that a strong educative dynamic raised up with the movement at the end of the 1990s, allowing to discover and develop permaculture methods in Italy.

Beyond an immediate appropriation of the Internet as a tool, the impact was particularly evident during the 2020-21 lockdowns when GEN held its first Online Ecovillage Summit (*Living Solutions for a Regenerative World, Aug.2021*). This virtual event marked a turning point in the history of communities around the world and demonstrated the potential of the Internet in connecting people: 'making community" beyond distance. This precise goal has been sought after since the 19<sup>th</sup> Century social and architectural utopias —as Fourier's Phalanges, Owen's New Harmony, Cabet's Icarie but was never fully achieved until now.

The rise of ecovillage concept and movement in the 1990s was supported by the Danish Gaïa Trust Foundation. It was certainly, at least in part, a response to the criticism and reflections of the first wave of ecological awareness that emerged in the 1970s. Using the Internet as a powerful catalyst for societal change, ecovillages have been able to transform the *Age of Aquarius* initiated by hippie and New Age communities<sup>40</sup> into the *Age of the Network* (or should we say Webwork?). This major historical shift confirms that, being pragmatic experimental places at all scales, ecovillages behave as laboratories of architecture.

However, the magnitude of these opportunities was met with limitations. Taking advantage of an historical legacy (from the Cold War to successive oil crises, to the economic and security withdrawal policies of the 1980s), Western States had already removed climate issues and claimed economic growth as the real emergency<sup>41</sup>. This global trend is now very difficult to reverse as the real obstacles, from financial interests to skeptical beliefs, have become complex to transform.

Where did the theoretical framework of this article—Patrick Geddes' Place Work Folk concept crossed with Sim van der Ryn's Empathic design—drive us? It enabled to demonstrate that ecovillages engage sustainable actions against climate change effects, particularly because their projects rise at the convergence of an ideological history and behaviors rooted in reality. It also helped to briefly describe the 'empathetic architecture concept' as proposed in the problematic.

Based on the reference that a laboratory of architecture can be defined as a device for building potentialities<sup>42</sup>, the contribution of this paper intends to make ecovillages appear as architectural laboratories producing a site-specific architecture empathetic at all scales: 1. an ecological architecture in its methods and construction choices, i.e. a combination of pragmatic and sustainable practices, 2. an architecture of reconnection with local territories and the living, i.e. a deep consistency with its biotope, 3. a network architecture opened to the world, i.e. a space of learning, circulation and production of knowledge.

However, considering the immense struggle to contain the effects of climate change, the alternative school of ecology that ecovillages tend to represent remains difficult to quantify. With only ten percent of initiatives surviving<sup>32</sup>, there are certainly not enough members around the world to significantly weight in the mainstream balance. Should we hope that digital networks

'power' will compensate for ecovillages 'low representativeness' by a wider diffusion of their experiments?

The paper argues that, even if ecovillages climate actions are more noticeable for now at the qualitative level than at the quantitative one, they remain remarkable for their intrinsic value. At least in architecture design and urban planning, they could significantly guide the overall thinking on global warming. First, this proposal aims to change the way communitarian experiences are considered, while rehabilitating a history of alternative thinking and production, which at least since the 1960s have been announcing all the conclusions of nowadays experts reports on climate, as well as the depletion of planetary resources. In a second time, the argumentation hopes to mobilize professionals of architecture attention's by encouraging them to question the current frameworks of the construction sector, as well as to go further to meet the communitarian self-builders and engage an architecture empathic with planet's needs. A real transformation could come from the meeting of these two communitiesarchitects and communitarian self-builders-that often share same convictions for a better living on Earth.

In conclusion, the article Fig. 15 suggests to envision ecovillages inspiring examples for current urban and architectural as ecological challenges. Why insisting on the term 'examples' instead of using 'models'? The semantic nuance here becomes important: models typically imply a process of standardization. However, one of the main struggles faced by ecovillages is to break away from the ideological legacy of the 1950s-60s consumerism and its ecological consequences. Moreover, there is a significant risk associated with models, as they often pave the way for a desire to reproduce or/and multiply specific experiences on a larger scale. Ecovillages obviously function as living systems, growing organically and being deeply rooted to their specific contexts. How can they be replicated without losing the meaning and effectiveness of their actions in addressing the impacts of climate change? Being inspiring examples would be challenging enough.

## METHODS

## Main methodological focus: cross-disciplinary historiography

The history of contemporary architecture is the field of reference for the research on which this article is based. Literary and theoretical references have made it clear that the reconstruction



**Fig. 15** Torri Superiore eco-village is dedicated to rehabilitate an entire territory through traditional terraced olive growing and permaculture techniques. In this region, where arable land is heavily conditioned by geography, the size of the farm is measured in terms of the number of trees, not agricultural area. ©The author (2018).

of an architectural history of communities and ecovillages is of limited interest if restrained solely to a formal, technical or aesthetic approach. A multi-disciplinary approach (sociology, economics, history of ideas and philosophy) is therefore necessary to introduce depth and a critical dimension into analyses. A historical data collection table (time-line 16th-21rst centuries) allowed to cross-referenced the various milestones in several disciplinary fields (sociopolitical history, history of intentional communities, history of architecture and architectural utopias, history of ecology, history of technical progress). These different layers of reading have enabled to carry out a temporal "coring", and to bring to light concordances between the fields of utopia and ecology.

## Historical sequence and geographical perimeter

The historical sequence (1965–2015) places the contemporary period in perspective. The last fifty years have seen a density of events on a global scale, and are decisive in understanding the emergence of ecovillages in the 1990s, as well as the ecological stakes involved in their current dynamics.

The geographical perimeter of the research (USA/Europe) has evolved over the course of the prospection phases, necessitating to create two historical subsequences. Initially, the focus was on the United States. Historically prolific in community experiments, this territory experienced an inventive apogee in the 1960s to 1980s, from which Europe received its influences. However, at the end of the 1990s, thanks to studies and funding from the Danish foundation Gaïa Trust, Europe took over from this dynamic, leading to the emergence of the ecovillage concept.

As a result, two historical subsequences have emerged - 1965–1995 for sites in the USA and Canada, and 1995–2015 for those in Europe (Italy, Denmark, France).

## Construction of the research field sample

The eight research sites are located in the United States and Quebec, and in Europe. They have been founded between 1967 and 2011: Lama Foudation (since 1967, NM-USA) Arcosanti (since 1970, AZ-USA), Earthship (since 1994, NM-USA), La Cité écologique (since 1983, Ham-Nord-CAN; since 2003, Colebrook-USA), Torri Superiore (since 1997, IT), Hallingelille (since 2005, DK), Le Hameau des Buis (since 2006, FR).

Three criteria were used to construct the sample: 1. active communities, in order to observe experiences in process, and opened to worldwide issues (ecological issues, welcoming outsiders, residents accepting testimony); 2. the longevity of these experiences, in order to develop a dual comparative analysis, between the experiences themselves, and between the two historical sub-periods; 3. an ecological architectural commitment (construction of buildings, rehabilitation of sites and territories). The three criteria combined allowed to highlight the going-on dynamics in the evolution of the global community movement.

The identification was carried out on the Internet, supplemented by research into the available literature. Contacts were made by e-mail, videoconference or telephone. Visits to the eight communities and ecovillages that responded to visit requests were conducted in 2017 and 2018.

An open questionnaire guiding in 21 interviews was adapted to each visit situation and each contact (availability, responsibilities within the ecovillage).

The representativeness of this sample remains relative. It reflects a diversity of experiences, but is not statistical. Moreover, numerical data on the communities is always partial and difficult to verify, due to the rapid appearance-disappearance of numerous projects, which are impossible to count even on a local scale. This difficulty is outlined in the article.

#### Data processing

Analysis and synthesis grids were constructed from the information gathered (websites, on-site checks, interviews). Scientific and literary writings were gathered, studied and compared to support the proposed multidisciplinary and forward-looking analysis.

The structuring references and concepts are quoted in the article (see refs. 1-3,6-8,11,12,42).

## DATA AVAILABILITY

Data are available from the author: Sylvia Amar [https://college-doctoral.univ-amu.fr/ fr/inscrit/9808] and on two scientific open archives: https://theses.fr/2020AIXM0201. https://hal.archives-ouvertes.fr/tel-03653428.

## MATERIAL AVAILABILITY

Material are available from the author: Sylvia Amar [https://college-doctoral.univamu.fr/fr/inscrit/9808] and on two scientific open archives: https://theses.fr/ 2020AIXM0201. https://hal.archives-ouvertes.fr/tel-03653428.

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## REFERENCES

- 1. Van der Ryn, S. & Cowan, S. Ecological Design. (Island Press, 2010).
- 2. Van der Ryn, S. Design for an empathic world: reconnecting people, nature, and self. (Island Press, 2013).
- Wahl, D. C. Design and Planning for People in Place: Sir Patrick Geddes (1854–1932) and the Emergence of Ecological Planning, Ecological Design, and Bioregionalism. *Medium* https://designforsustainability.medium.com/design-andplanning-for-people-in-place-sir-patrick-geddes-1854-1932-and-the-emergenceof-2efa4886317e (2017).
- 4. Marchand, C. Apprendre à éco-habiter. (Pourquoi pas vous?, 2010).
- 5. van der Ryn, S. Design for life: the architecture of Sim Van der Ryn. (2005).
- 6. M. Vincent McGinnis. Bioregionalism. (Taylor & Francis, 1998).
- Sale, K. Dwellers in the land: the bioregional vision. (University of Georgia Press, 2000).
- 8. Environmental anthropology engaging ecotopia: bioregionalism, permaculture, and ecovillages. (2013).
- 9. Latouche, S. Petit traité de la décroissance sereine. (Mille et une Nuits, 2011).
- Lallement, M. Un désir d'égalité: vivre et travailler dans des communautés utopiaues. (Éditions du Seuil, 2019).
- Audier, S. La société écologique et ses ennemis: pour une histoire alternative de l'émancipation. (2017).
- Hayden, D. Seven American utopias: the architecture of communitarian socialism, 1790–1975. (Mass, 1976).
- Marx, L. The machine in the garden: technology and the pastoral idea in America. (Oxford University Press, 1964).
- Ghorra-Gobin, C. La ville américaine. De l'idéal pastoral à l'artificialisation de l'espace naturel. Ann. Rech. Urbaine 74, 69–74 (1997).
- 15. Thoreau, H. D., Harrison, J., Matthieussent, B. & Granger, M. Walden. (1854).
- Naess, A. The shallow and the deep, long-range ecology movement. A summary. Inquiry 16, 95–100 (1973).
- Naess, A., Ruelle, C. T. & Afeissa, H.-S. Écologie, communauté et style de vie. (Éd. Dehors, 2013).
- 18. Naess, A. & Dunand, S. La réalisation de soi. (Wildproject, 2017).
- Callicott, J. B., Lanaspeze, B. É., Scientifique T., Larrère, C. & Descola, P. Éthique de la terre. (Éditions Wildproject, 2010).
- Rapport du GIEC: les solutions urgentes. Greenpeace France https:// www.greenpeace.fr/rapport-du-giec-les-solutions-urgentes-pour-le-climat/.
- Environment, U. N. United Nations Environment Programme (2022). 2022 Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector. Nairobi. UNEP - UN Environment Programme http://www.unep.org/resources/publication/2022-global-status-reportbuildings-and-construction (2022).
- 22. Latour, B. Où atterrir?: comment s'orienter en politique. (la Découverte, 2017).
- Lussault, M. L'avènement du monde: essai sur l'habitation humaine de la Terre. (Éd. du Seuil, 2013).
- 24. Jonas, H. Le principe responsabilité: une éthique pour la civilisation technologique. (Editions du Cerf, 1992, 1992).
- 25. Senil, N. Vers un tournant rural en France. The Conversation (2021).

- 26. Architecture, P. U. C. L'exode urbain? Petits flux, grands effets Les mobilités résidentielles à l'ère (post-)covid. Plan Urbanisme Construction Architecture https:// www.urbanisme-puca.gouv.fr/l-exode-urbain-petits-flux-grands-effets-lesa2388.html (2022).
- 27. Meadows, D. H. The limits to growth: a report for the Club of Rome's Project on the Predicament of Mankind, (Universe Books, 1972).
- 28. Carson, R. L. Silent Spring. (Fawcett, 1962).
- 29. Ehrlich, P. R. The population bomb. (Ballantine book, 1971).
- 30. Exposition du CCA 1973: Désolé, plus d'essence. https://www.cca.qc.ca/ desoleplusdessence/.
- 31. Our Common Future: From One Earth to One World A/42/427 Annex, Overview -UN Documents: Gathering a body of global agreements, http://www.undocuments.net/ocf-ov.htm (1987).
- 32. Christian, D. L. C. Creating a life together: practical tools to grow ecovillages and intentional communities. (New Society Publishers, 2015).
- 33. Amar, S. Laboratoires d'architectures écotopiques Des communautés d'hier aux écovillages d'aujourd'hui (Etats-Unis - Europe, 1965-2015). (Aix-Marseille Université, 2020).
- 34. Le pragmatisme. (1971).
- 35. Lefebvre, P. Quand le pragmatisme est invité en architecture: une rencontre placée sous le signe de l'évidence. CLARA N° 3, 15-30 (2015).
- 36. Bordas, A. M. L'architecture soutenable de demain. Permanence, flexibilité, réutilisation, adéquation à la ressource. in Architecture évolutive-réversible: formes et dispositifs (École nationale supérieure d'architecture de Bretagne, 2022).
- 37. Camu, E. Les écovillages comme alternative systémique aux problèmes environnementaux? Le cas wallon. (2021).
- 38. terresolidaire. Six mythes autour de la compensation carbone. CCFD-Terre Solidaire https://ccfd-terresolidaire.org/six-mythes-autour-de-la-compensation-carbone/ (2021).
- 39. Schumacher, E. F. Small is beautiful. A Study of Economics as If People Mattered. (Blond & Briggs, 1973).
- 40. Turner, F. From Counterculture to Cyberculture Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism. (University of Chicago Press, 2006).
- 41. Rich, N. & Fauquemberg, D. Perdre la terre: une histoire de notre temps. (2019). 42. Helal, B. Les laboratoires de l'architecture: enquête épistémologique sur un paradigme historique. (2017).

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The author declare no competing interests.

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