

1 **A Phenomenological Inquiry of Building and Living in European Earthship Homes**

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3 **Authors: Colin A Booth, PhD Sona Rasheed, MSc Abdul-Majeed Mahamadu, PhD Rosemary Horry, MSc,**
4 **MBA Samuel Abbey, PhD Patrick Manu, PhD Kwasi A B Awuah, PhD Emmanuel Aboagye-Nimo, PhD**
5 **Panagiotis Georgakis, PhD Abhinesh Prabhakaran, PhD**

6 **Abstract**

7

8 Earthships remain a relatively under explored type of sustainable/alternative home. This is the first study to
9 investigate the personal experiences of constructing and living in European Earthship–homes. The aim of this
10 study is to reveal insights into the ‘hands–on’ practical experience of persons who have constructed their own
11 Earthship–homes; and to also gather insights into the collective experience of these dwellers on the realities of
12 living full–time in an Earthship–home. A phenomenological methodology, using an inductive research approach,
13 was utilised through a qualitative research strategy to solicit insights into the personal experiences of these unique
14 persons. The main themes and sub–themes that emerge from analysis are that anyone from any background can
15 make the shift to building/living in an Earthship–home. However, a mixed skillset and knowledge of building
16 trades, plus a physical and emotional prowess is needed for the long–haul build process, together with access to
17 financial means and/or available materials are critical factors that influence the outcome of the Earthship building.
18 Meanwhile, once constructed, off–grid living in an Earthship–home gives dwellers a greater connectivity with the
19 natural world, raises awareness of consumerism and an enhanced appreciation of human impacts.

20

21 **Keywords:** Recycling and reuse of materials, UN SDG-12, Housing, Sustainable construction.

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23

24 1. INTRODUCTION

25

26 Autonomous-living is a utopian dream for many people, particularly for those who want to remove or minimise
27 the burden of paying a mortgage/rent or paying utility bills each month. Further, it aids those wanting to reduce
28 their environmental impact on the planet by reducing their carbon-footprint through the use of natural resources
29 (sun, wind and rain) to support their home services (heating, cooling, power, water and wastewater treatment) or
30 improving their sustainable-living by growing their own food (Barr and Gilg, 2006; Aertsens *et al.*, 2009; Hagbert
31 and Bradley, 2017). For most people, this desire, or lifestyle, remains a dream or becomes a later-life regret of
32 “*something I should have done*” (DeGenova, 1996; Newall *et al.*, 2009).

33 Making the shift from conventional living to alternative living can be a challenge for those who are
34 unsure or who are risk adverse, and for those who may not want to jeopardise the security, comfort or investment
35 that a traditional home can provide (Daigle and Vasseur, 2019). For others they may simply be cautious of
36 stepping-across into the unknown of leaving their traditions and norms behind to move into an alien surrounding
37 of off-grid living. However, for some, it may be that they are willing to step forward but they lack the knowledge
38 and/or the skillsets to build and/or maintain an off-grid home. After all, sustainable building is not a topic widely
39 covered in educational curricula (CLC, 2019). Acknowledging that many people do become trained trade-persons
40 (e.g. bricklayer, plumber, etc.), the opportunity to gather the necessary expertise to build an autonomous building
41 remains limited so the shift still may never happen.

42 Earthships, a type of autonomous building, credited to the innovative architect Michael Reynolds: the
43 father of Earthships (Prinz, 2015), are marketed as being the exemplar, or epitome, of sustainable housing. First
44 built in the semi-arid climate of New Mexico, USA, by reusing or repurposing mostly reclaimed urban waste
45 products (such as vehicle tyres and beverage bottles/cans, etc.), their design includes the utilisation of low
46 embodied energy materials, passive solar heating and cooling, photovoltaic power systems, rainwater harvesting,
47 and solar hot water heating, along with black and grey water treatment systems (Earthship Bioteecture, 2005; Miller
48 *et al.*, 2005; Rockwood, 2014). Architectural designs and instruction manuals for constructing Earthships are
49 widely available (Reynolds, 1990, 1991, 1993, 2001, 2005; Hewitt and Telfer, 2007, 2012) and these have evolved
50 to encompass building/living in various climatic zones. For instance, in recent years, Earthships have been
51 designed and constructed to become homes in both the temperate and Mediterranean climates of Northern and
52 Southern Europe (Figure 1).

53 The knowledge and skillsets to construct an Earthship is readily available if you are willing to pay to
54 attend training courses, which are regularly available by Earthship Biotecture, where you are taught how to
55 construct an Earthship building and given hands-on experience of the processes involved
56 (www.earthshipbiotecture.com). For those unable to commit to making a payment for training, they can volunteer
57 to provide the physical labour for free ‘on the job’ training by helping another person(s) construct their Earthship
58 home (e.g. Grand Designs, 2009). However, to date, no publications have reported the personal experiences of
59 the builders who have constructed their own Earthship homes.

60 There is a limited number of people who have experienced the lifestyle of living in an Earthship. Whilst
61 the general public can have the opportunity to pay to stay in an Earthship Guest-hostel (such as those available in
62 New Zealand or USA) or in an Earthship Eco-resort (such as those available in Fiji or Indonesia), their experience
63 is often short-lived and does not reveal the practical elements of owning, maintaining and living in an Earthship
64 building. Therefore, to date, the personal experiences of those who have made the full-time shift to Earthship
65 dwelling in Europe are also unreported. In fact, Berardi (2013) suggests that the social aspects of any type of
66 sustainable building are still rarely investigated.

67 The absence of any available evidence to guide individuals or communities on the opportunities and
68 obstacles of autonomous building/living-in an Earthship home is a research gap that this study addresses.
69 Therefore, the aim of this study is two-fold: firstly, to reveal insights into the ‘hands-on’ practical experiences of
70 several people who have constructed their own Earthship homes; and, secondly, to also gather insights into the
71 collective experiences of these dwellers on the realities of living full-time in an Earthship home.

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73 In achieving the aim, the study addresses the following research questions:

- 74 • What ‘lived experiences’ have individuals learnt from building an Earthship home?
75 • What ‘lived experiences’ have individuals learnt from living in an Earthship home?

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78 INSERT Figure 1: Photo of the Brighton Earthship (taken 03/11/2019). Whilst this example is used as a
79 community building, rather than a home, its appearance and design accords with those of other Earthships.

80

81 2. BACKGROUND

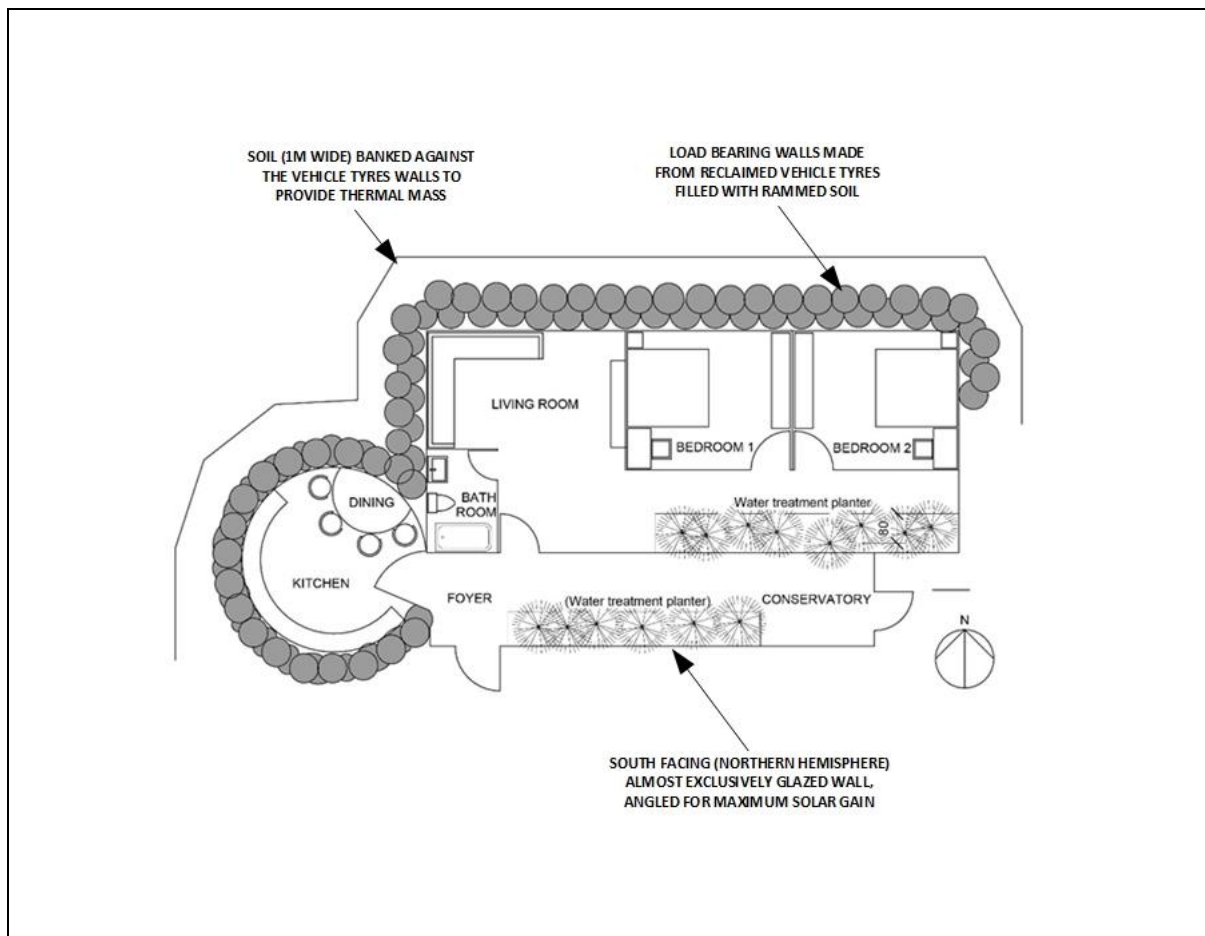
82

83 The terms sustainable, green and ecological are seemingly interchangeable nomenclatures used (rightly or
84 wrongly) to describe many environmentally-sensitive buildings and homes. However, whatever the nomenclature
85 used, the common feature between all these terms is that they attempt to minimise the environmental impact of
86 the buildings and their intended use. For instance, Kibert (2008) describe green buildings as “*healthy facilities
87 designed and built in a resource-efficient manner, using ecologically based principles*”; while, Berardi (2013)
88 suggests “*a sustainable building can be defined as a healthy facility designed and built in a cradle-to-grave
89 resource-efficient manner, using ecological principles, social equity, and life-cycle quality value, and which
90 promotes a sense of sustainable community*”. Whichever label is adopted to describe these buildings, eco-design
91 is a defining characteristic of them all – with Earthships considered an exemplar in both eco-design and
92 sustainable living.

93 Earthship buildings – designed to promote sustainability – are considered environmentally-friendly
94 buildings that have no requirement to draw on non-renewable resources to support contemporary living (Purdy,

95 2011). Based on a U-shaped modulus (Kang *et al.*, 2011), most Earthship buildings are designed with three earth-
96 rammed, load-bearing walls made from staggered reclaimed vehicle tyres, banked with soil (~1m wide) for
97 thermal mass, and finished with an eco-cement render, which helps to cool the buildings in summer and warm
98 the buildings in winter (Figure 2). The walls are anchored down, which serves as a connection for a shallow
99 pitched roof that often supports skylights to brighten the rooms beneath. The fourth wall is often almost
100 exclusively glazed, positioned south facing (in the northern hemisphere) and angled for maximum solar gain so
101 no heating facilities are required and only minimal power is needed from solar panels and/or wind turbines.

102



103

104 INSERT Figure 2: An architectural plan of the typical layout of an Earthship two-bed building.

105

106 Internal walls are usually timber stud partitioned, with colourful glass bottles and decorative drink cans often
107 embedded within the walls to enhance the aesthetics and, in doing so, they concomitantly repurpose everyday
108 household waste. The roof is usually a timber deck (internal ceiling), which is insulated, covered in a vapour
109 barrier and externally it is shielded with metal sheets (Ip and Miller, 2009). Another key feature of Earthship

110 buildings is the utility services are provided entirely from natural resources. For instance, drinking water is mostly
 111 captured from rainfall, directed from the roof towards large underground storage tanks where it is filtered and
 112 treated for later use by the building occupants; grey waste water is channelled (from the sinks) towards planters
 113 to provide water for food-bearing plants growing in the conservatory at the front of the buildings; black waste
 114 water (from the toilet) drains to an outside septic tank or botanical wastewater filtration treatment unit, where
 115 natural reedbed technology purifies the water; and electrical power is generated by nearby wind turbines and/or
 116 several photovoltaic solar panels (positioned on the roof).

117
 118 Since the first Earthship was built (1970), by Michael Reynolds, others have been refining his designs and
 119 specifications. For instance, Barnas *et al.* (2017) has proposed modifications to the design of Earthship buildings
 120 so they can be adapted for colder-climates. However, what has not changed are the principles underpinning the
 121 Earthship eco-design. Nowadays, there are believed to be thousands of Earthship buildings in existence around
 122 the world (Kratzer, 2014). These are known to span at least 40 countries and whose purposes range from schools
 123 or survival shelters to hostels or homes (Booth *et al.*, 2021). They are also located across all the global main
 124 climatic regions: Tropical (Fiji), Arid (Mexico), Mediterranean (Spain), Temperate (Scotland) and Cold-Polar
 125 (Canada). Table 1 lists those places where Earthships are known to have been built across the nations of Europe.

126
 127

128 Table 1: The location of the European Earthship buildings (n = 12 countries).

129

| # | Location | Country |
|---|-----------|----------------|
| 1 | Strombeek | Belgium |
| 2 | Sazava | Czech Republic |
| 3 | Brighton | England |
| 4 | Rostrenen | France |
| 5 | Tempelhof | Germany |
| 6 | Zwolle | Netherlands |
| 7 | Krzywca | Poland |
| 8 | Gardunha | Portugal |
| 9 | Oradea | Romania |

| | | |
|----|---------------|----------|
| 10 | Kinghorn Fife | Scotland |
| 11 | Valencia | Spain |
| 12 | Skattungbyn | Sweden |

130

131 The work of Booth *et al.* (2021, 2022) attempted to gauge public perceptions of the benefits and barriers of
 132 building and living in an Earthship home. Their findings reveal environmental drivers (e.g. use of recycled
 133 materials and renewable energy consumption) are the chief motivators towards the uptake of Earthship
 134 building/living, rather than the social and economic dimensions involved; while, administrative/preparatory issues
 135 (e.g. acquiring necessary permits/permissions to build and securing financial support (mortgage/loan)) are
 136 considered the main challenges towards the uptake of Earthship building/living, rather than the principles of
 137 autonomous housing. They conclude that the general public deem the general principles of Earthships are an
 138 acceptable choice of building/living but it is the formal means of building or buying an Earthship home are
 139 considered the greatest hurdles against the uptake of Earthship buildings. Mindful of the insights provided by
 140 Booth *et al.* (2021, 2022), this study will explore these issues with those who have experienced building an
 141 Earthship home and are now living in an Earthship home.

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145 **3. RESEARCH DESIGN AND METHODOLOGY**

146

147 A phenomenological-based methodology (i.e. gathering personal experiences) using an inductive research
 148 approach (i.e. an inquiry to synthesise experiences and observations) was utilised to align with the study's aim.
 149 Phenomenology (Husserl, 1989) aims to produce an idiographic account of lived experience rather than one
 150 prescribed by pre-existing theoretical preconceptions (Smith and Osborn, 2015). Using a lifeworld perspective to
 151 obtain insights through a phenomenological lens often allows for deeper accounts of individual experience to
 152 emerge (Willig, 2013). Phenomenological investigations are widely reported across a host of disciplines but, to
 153 date, have been rarely reported for housing (Marquez *et al.*, 2019; Serjeant *et al.*, 2021) or lifestyle related (Casida
 154 *et al.*, 2011; Li *et al.*, 2021) studies.

155 A qualitative research strategy meant semi-structured interviews were adopted as the method of inquiry.
 156 This ensured the central questions were posed in the same way to each participant, whilst allowing some flexibility

157 to adjust questions, where necessary, and to follow-up on any interesting replies. The choice of questions was
 158 influenced by recent Earthship literature that identified a suite of potential benefits and barriers of Earthship
 159 building/living (Booth *et al.*, 2021, 2022). Since the main purpose of the interviews was to solicit the personal
 160 experiences of dwellers who had self-built their own Earthship buildings and were then living in them as their
 161 full-time homes, the interview schedule was divided into four themes: (i) participant demographics and
 162 backgrounds; (ii) building an Earthship home; (iii) living in an Earthship home; and (iv) looking back to look
 163 forward. Examples of the main questions asked to the participants are listed in Table 2.

164

165 Table 2: A list of the questions posed to the Earthship interviewees.

166

| # | Interview questions |
|----|--|
| 1 | What inspired you to build an Earthship home? |
| 2 | What skills, knowledge or help did you assemble to build your Earthship home? |
| 3 | How did you choose and source the materials used to build your Earthship home? |
| 4 | How did you finance your Earthship home? |
| 5 | What were the greatest hurdles you faced creating your Earthship home? |
| 6 | What effect has living in an Earthship home had on your everyday life? |
| 8 | What have been the greatest challenges in adopting an Earthship lifestyle? |
| 9 | What maintenance, updating or alterations to your Earthship home have been required? |
| 10 | What interest has your Earthship home provoked from other people? |
| 11 | Do you think an Earthship could be sold on the property market? |
| 12 | What would ever make you leave this lifestyle behind? |
| 13 | What were the greatest hurdles you faced creating your Earthship home? |
| 14 | Reflecting on your experience, is there anything that you would change or wish you had done differently? |

167

168 3.1 Sample Size, Selection and Recruitment

169 There has been only a handful of Earthship buildings constructed across Europe (Table 2). For this reason,
 170 probability sampling approaches (i.e. random or systematic sampling etc.) were not included because they would
 171 not contribute to achieving the objectives of this research. In contrast, purposive sampling (a non-probability

172 sampling technique) was adopted, which used explicit inclusion criteria (namely, participants must have built their
173 own Earthship and be living in their own Earthship). This allowed a specific targeted group of participants to be
174 invited for interview. However, with so few Earthships built in each European country, to date, the specific nations
175 where the study participants are dwelling have not been named to avoid any possible breach of confidentiality for
176 those participants who kindly agreed to support this study. The spread of those persons invited to participate
177 covered both Northern (temperate climate) and Southern (Mediterranean climate) Europe countries. All
178 interviewees were offered the opportunity to have in-person face-to-face interviews or online face-to-face
179 interviews.

180

181 **3.2 Data Collection and Analysis**

182 All narrative interviews were digitally audio recorded (each lasting 50–60 minutes) and then transcribed verbatim
183 by the researchers. To preserve the anonymity of participants and guarantee their confidentiality, pseudonyms
184 were applied to the text. As with other phenomenological studies, no computer data analysis software was used
185 to interrogate the datasets (Capodanno *et al.*, 2020). Moreover, the transcripts were scrutinised by a stepwise
186 process (Table 3), which involves repeated reading of the transcripts to extract interrelated themes and meanings,
187 so as to describe the assembly of the phenomenon being investigated (Smith, 1995; Osborn and Smith, 1998).
188 This is conceivable because the small sample size of most phenomenological studies permits micro-level reading
189 of participants' narratives.

190 The researchers involved in the study set aside their own pre-understandings so as to accord with the
191 phenomenological principle of epoche (or bracketing), which attempts to circumvent any preconceptions or
192 expectations to facilitate the phenomenon of the study objectively. As none of the researchers involved in the
193 study have been involved in the construction of an Earthship building, nor have they spent any time living in an
194 Earthship, the researchers' own values should not threaten the interpretations reported.

195

196 Table 3: Description of the stepwise process used to analyse the participant interview narratives (based on Smith
197 (1995), Osborn and Smith (1998)).

198

| Step | Description |
|-------------|---|
| 1 | Interview transcripts were read, and re-read several times, to ensure a general sense was obtained of the whole nature of participant's narratives. |

| | |
|---|---|
| 2 | Returning to the beginning, the transcripts were re-read and any emerging themes identified and organised tentatively. |
| 3 | Attention was then focused on the themes themselves to group and define them in more detail and establish their interrelationships. |
| 4 | The shared themes were then organised to formulate consistent and meaningful statements, which contribute to an account of the meaning and essence of the participants' experience grounded in their own words. |
| 5 | The superordinate themes and statements were then referred back to the original transcripts to verify their occurrence. |

199

200 Ethical approval was sought before the interviews were conducted. Approval meant all participants were informed
 201 in a participant information cover letter that their consent and involvement was anonymous and entirely voluntary.
 202 The interviewer and interviewees were accompanied by a companion on site visits to ensure the safety and welfare
 203 of those involved in the meetings. After which, all interviewees (both in-person and online) were given a two-
 204 week window to allow them (if they desired) to withdraw their responses. This procedure is compliant with the
 205 expectations of university research ethics regulations in the UK.

206

207

208 **4. RESULTS**

209

210 Using the themes and subthemes generated by the analysis, along with selected verbatim quotes, the findings of
 211 the study are presented beneath under four main section headings: (i) participant demographics and backgrounds;
 212 (ii) building an Earthship home; (iii) living in an Earthship home; and (iv) Looking back to look forward. To
 213 protect anonymity of the participants, no personal information about the participants is used in any of the
 214 descriptions or in any of the direct comments included.

215

216 **4.1 Participant Demographics and Backgrounds**

217 Seven participants (four male and three female) responded to the invitation to be interviewed about their 'lived'
 218 Earthship experiences. This sample size accords with the expectations of a phenomenological study (i.e. the
 219 sample size should be between 6–8 persons (Gauntlett *et al.*, 2017)) and, as such, is similar to those reported by

220 Smith and Osborn (2007) and by Marriott and Thompson (2008), who used six participants and eight participants,
221 respectively, in their phenomenological studies.

222 The participants came from an almost equal share of both Northern and Southern European countries.
223 Four of the participants interviewed opted for in-person face-to-face meetings at the site of their Earthships and
224 three participants opted to be interviewed in online face-to-face meetings. Each of the participants who agreed to
225 take part in the study confirmed they had personally built and were now living in their own Earthship home.
226 Therefore, all the participants met the eligibility criteria set out earlier. The timescales that participants have been
227 living in their Earthships ranged from two to eight years.

228 Most of the participants stated their ages were between 30–40 years, with one between 50–60 years, and
229 most said they had graduated from university with degree-level qualifications. The range of the participants’
230 former professions (i.e. teachers, ecologist, software engineer and an artist) is reflective of their high qualification
231 status. Given these conventional professions, it is perhaps not surprising that the majority of the participants said
232 they were previously living ‘normal’ lives – with them all keen to state that they had previously been paying rents
233 and utility bills and that they had been living in ‘traditional’ brick/stone- and timber-built homes (i.e. a Victorian
234 (pre-1901) building, a Farmhouse and an apartment, amongst others), before they embarked on an Earthship
235 lifestyle. However, it is noteworthy to mention that two participants also revealed they had also previously tried
236 alternative living at some point in their earlier lives (i.e. living in a small-hut for five years and living in a yurt
237 for three years) before deciding to build their Earthship homes. The prompts and decisions they claimed that
238 underpinned participant’s desires to leave their former lives and construct an Earthship building, so as to adopt an
239 autonomous lifestyle, varied in their order of importance but, in the main, all the responses revolved around
240 concerns for their former financial outlays each month (e.g. rents, bills, and maintenance) and discomforts of their
241 former home/lifestyle (e.g. extreme seasonal inside temperatures, limited natural room lighting and available
242 outside space).

243

244 **4.2 Building an Earthship Home**

245

246 All the participants stated that they first became aware of Earthship buildings in the years just before and after the
247 turn of the Millennium – some whilst doing volunteering work and others whilst they were travelling the world.
248 An increasing awareness of global sustainability issues and a growing interest in environmental principles were
249 the overriding drivers that underpinned participants inspiration towards Earthship buildings. This is highlighted

250 by the statement of the participant who [leaning on a chair, and looking up and down] said *“I’ve always felt that*
251 *the world is in trouble and that people need to change their cultures and I really feel strongly that comes from the*
252 *way we live in buildings because it shapes the way we interact with the rest of the world so if we build buildings*
253 *that makes us conscious by the default by the way they are built they make us connected again with nature...I*
254 *think that buildings are the main element of the change”*. Moreover, they all seemed to have had a burning
255 ambition to self-build their own home, especially with eco-design features. This is evidenced by a participant
256 who [seemingly excited by the question asked] said, *“When I came across the Earthship philosophy, I really loved*
257 *the idea of being able to build it ourselves. And I also really love the look of the Earthships once they are built.”*

258 In all the cases each of the participants brought-in additional external support with their build process.
259 For many of them, they called upon the services of the original Earthship architectural pioneer, Michael Reynolds,
260 and his support crew, to initiate their Earthship build projects so they did not make any mistakes. This is
261 highlighted by the statement of the participant who said *“We wanted to make it a really good building, we wanted*
262 *it to be built to a high specification, short time scale, and be really professional built...the Earthship is like a*
263 *machine [smile] so if you don’t get the components and parts in the right place the machine is not going to work.*
264 *So, it was really important that we got the experts in to explain how to put this building together”* [nodding their
265 head]. Most of the participants also decided to involve specialist contractors at various points of their Earthship
266 builds, namely companies who could safeguard the performance of the roof structure and water-tightness; and to
267 mount the solar panels and install batteries to power their homes. It is important to note that all participants
268 beckoned help from friends, family and/or volunteers to help in the construction of their Earthship homes. Despite
269 bringing-in this extra support and services, all the buildings took more than a year to construct and one of them
270 took almost eight years to complete.

271 Most of the construction materials used in each of the builds was collected for free, often from garages,
272 recycling centres, companies or friends. For instance, all the interviewees confirmed that the structural walls were
273 made from recycled tyres filled with rammed earth and the spaces between were filled with aluminium cans.
274 Furthermore, they had used glass and plastic bottles in the decoration of their interior walls. This is evidenced by
275 the participant who [enthusiastic and animated] said *“The beer and wine bottles and cans have come from friends,*
276 *we put out the call to the local garden clubs to collect things for us”* [followed by giggles]. All participants were
277 keen to emphasise their homes were mostly derived from reclaimed salvage – all saying that most of their timber
278 and all their doors were reclaimed materials that were heading for landfill and by them recycling or reusing them,
279 they had now found a second life. This is highlighted by the participant who [grinning] said *“Do you know the*

280 *Wombles?*” [laughing loudly] and then said “*all of the doors in the place are reclaimed...we pick them up from*
281 *the sides of the roads or we bought them from people who were getting rid; or some people just have given them*
282 *to us knowing that we are the Wombles!*”. This latter comment is particularly interesting because the Wombles
283 were children’s TV characters (programmes first aired in 1973) whose environmental ethos was considered to be
284 ahead of its time. Almost 50–years ago they were promoting the reusing and recycling of materials in their home
285 and in their everyday lives from things that others had discarded or no longer wanted.

286 When it came to financing the building of the Earthships, most of the participants stated that they were
287 able to afford the material and construction costs of their Earthship homes without the need to borrow funds (e.g.
288 mortgage or personal loans). This was possible by using equity funds accumulated by the sale of their own
289 ‘conventional’ homes. For the a few that did need to seek some financial support, they only borrowed money in
290 the latter stages of the build to finish–off the project. This is highlighted by the participant who [fidgeting before
291 replying] said “*At the beginning we saved up money...but when it came time to install the roof and the solar*
292 *system we took out a loan, which was expensive. We paid it back within eight years so it is all paid now*” [and
293 expressed with some obvious relief at this outcome]. It is noteworthy to mention that all these loans were
294 public/government financial supported opportunities.

295 Planning permission and the associated bureaucracy attached to building a home of this type were
296 deemed as the overwhelming challenges aired by all the participants. This is highlighted by the statement of the
297 participant who [paused and firmly] said “*Planning permission is not a problem...well, it is a problem but not*
298 *because it is an Earthship. It is a problem because of the way that permits are given to live on land*”. However,
299 some were keen to also point–out that once planners became understanding and appreciative of the Earthship’s
300 principles, its design played in its favour with the planning authorities. This is evidenced by the participant who
301 [convincingly resolute] said “*you have an advantage because an Earthship is aligned with the future, where*
302 *everybody knows we need...the whole kind of low carbon thinking*”.

303 The other notable challenges shared amongst the participants was the sheer physicality of the build
304 process and the incessant time it takes to build an Earthship home. Several participants felt that having some
305 building experience would have somewhat addressed both these issues. In fact, all participants enforced the need
306 for experienced persons to be involved in the construction process – particularly constructing the roof structure as
307 this was a physical and time–consuming task, which became expensive when professional persons were needed
308 to make it fully functional.

309

310 **4.3 Living in an Earthship Home**

311

312 There was overwhelming agreement amongst the participants that living in an Earthship has meant they have
313 become better connected with nature and this has influenced their lifestyle behaviours. For instance, the majority
314 stated they regularly spent time watching the weather, leading them to monitor the performance of their solar
315 panels and, as a consequence, this has led them to being mindful about their personal energy use. Several
316 participants described the experience of living in an Earthship as feeling like being outside all the time but having
317 the comforts of being inside. Participants also highlight the enforced shifts in adopting an environmentally-
318 friendly lifestyle and awareness of consumerism. This is evidenced by the participant who [in a stern voice] said,
319 *“It enforces its inhabitants...you cannot buy toxic or polluting soap and things like that, because it would kill the*
320 *bacteria in your planter...you have to make the right choices at the market”*. It is noteworthy to also highlight the
321 choice of the words the range of participants used to describing the experience of living in an Earthship – these
322 included: comforting, luxurious, spacious, heated, quiet, relaxed, easier and sensory.

323 The consensus amongst the participants was that living in an Earthship was a much more comfortable
324 lifestyle than they had originally envisaged. This is highlighted by the participant who [in a passionate tone] said
325 *“They can be built so beautifully and you can make it as comfortable as you like, if you have the creativity and*
326 *maybe money or time”*. Moreover, two entwined themes emerged around the benefits participants had experienced
327 from living off-grid, namely, cost savings made from not paying utility bills and the security provided to them,
328 in terms of self-sufficiency of energy, water and heating. This was often exclaimed with immense pride towards
329 their home and lifestyle and is highlighted by the participant who [beaming with pride] said *“we have a home*
330 *which is very desirable”*.

331 Most participants shared a view that the ongoing upkeep of outside wooden features (e.g. window frames,
332 etc.), which are regularly exposed to weather stresses, was the greatest maintenance challenge. However, their
333 greatest maintenance worry was the need to one-day have to replace their solar panels. Otherwise, all participants
334 listed routine maintenance requirements you would expect from living in an Earthship (e.g. cleaning water filters,
335 checking and filling batteries, caring for food-bearing plants, amongst others) and nothing that they could not do
336 themselves. This is evidenced by the statement, *“Because you built it yourself, you understand how it works so I*
337 *think the maintenance is easier”*.

338

339 **4.4 Reflection on Experiences**

340

341 Themes identified from participants suggestions about what they wished they had done differently are changes in
342 the design and size of the building/rooms (e.g. add a double conservatory, add a porch or create a larger
343 bathroom/utility space) or differences in the materials used (e.g. use less cement or use more natural materials).
344 However, the most important message is to choose the best and most appropriate site for the Earthship. This is
345 reiterated by the participant who [seemingly saddened] said, “*The one that we are living in now we had planned*
346 *it to be the test one...I mean it is not in a bad position it is just not where we would have had the main one*” [and
347 then smiled].

348 When asked to reflect on the journey of experiences they had gone through, the majority of participants
349 believe most of society are not physically and/or emotionally ready to make the shift to an Earthship. It was
350 suggested that some nations have almost zero demand for anything sustainable. However, most believe there is
351 an acceptance that Earthships could be sold just like other homes on the open market but they would never be
352 mainstream because homes are treated as an investment. This is evidenced by the participant who was nodding
353 and gesturing whilst saying “*The supply is not adequate and the demand is not adequate because people are*
354 *conventional. When people think about buying a house they do think about it like an investment, it is their financial*
355 *future...people’s choices are towards conventional because investment is conservative*”.

356 All participants were clear that now they had built their dream home, they had no immediate intentions
357 of leaving their Earthships, as revealed by the statement, “*we are not planning to ever move*” [the participant then
358 gave a smile and self-reassuring nod of their head]. However, when encouraged to describe circumstances that
359 may force them to move, most participants indicated that caring for aging relatives or their children wanting
360 move-on could cause them to reconsider the lifestyle choices. Others joked that it would take a natural disaster to
361 uproot them from their Earthship. This is highlighted by the participant who [after lots of laughter] said “*I guess*
362 *some disaster...like an earthquake*” [and laughed again]. To appreciate the context, they had spent 8 years building
363 their Earthship and had only lived in it for short time since finishing so they were still exhausted by the process.

364 When reflecting on their experience, most participants identified a lack of professional knowledge at the
365 start of the build as their greatest shortfall in the journey of building their Earthship and, as such, their prerequisite
366 advice would be to upskill before starting. This is evidenced by the statement, “*you’ve got to work out how you*
367 *are going to gain the skills and the knowledge to make sure that you build it properly*”. Similarly, they all described
368 fitness, stamina, commitment and patience as essential personal requirements needed to complete the build.
369 However, it seems project management know-how is the overriding attribute of advice towards the delivery of a

370 successful outcome. This is highlighted by a participant who [pausing thoughtfully] said, “*cost is so important*
371 *because all the while you are building you are not earning so where is your money coming from?*” and further
372 highlighted by the statement, “*How [are] you going to manage the budget?...an Earthship is a lot of about reusing*
373 *materials [but] you do still have to buy some things*”.

374

375 **6. DISCUSSION**

376

377 This study suggests local authority planners maybe hostile towards an Earthship application at the beginning of
378 the formal process; however, it seems there is a likelihood of them favouring the proposed building when they
379 pause to truly value the Earthship philosophy, as guidance within National Planning Policy Frameworks highlight
380 that developments should be planned to reduce carbon emissions and protect the environment (e.g. MHCLG,
381 2021). In the UK, for instance, soon after the first Earthship was built (completed 2006) in Brighton, England, the
382 local council then gave permission for the development of sixteen Earthship homes (one–bed, two–bed and three–
383 bed houses), including some for social housing, to be built on the seafront overlooking Brighton marina. In fact,
384 the Head of Sustainability at Brighton and Hove Council, was reported to have said “*This is just the sort of*
385 *forward–thinking scheme that we should be championing*” (BBC, 2007). Therefore, it seems once a precedent has
386 been set and there is an acceptance and appreciation of Earthship homes, the perception that planning will be a
387 cumbersome obstacle can be spurned and shelved.

388 The enormity and magnitude of planning and building a self–build home should never be underestimated
389 (Benson & Hamiduddin, 2017; Salet *et al.*, 2020), and this seems particularly true for Earthship homes. From the
390 accounts analysed in this study, constructing an Earthship home is without doubt a physical, emotion and lengthy
391 journey for every builder but the reward it seems is worth the efforts and sacrifices. This is supported by a similar
392 housing scheme, the Hedgehog Housing Co–op, which saw a group of people who were in housing need, spend
393 two years building a collection of affordable eco–homes for themselves (Grand Designs, 1999). Like the Earthship
394 builders, none of the group had experience of building houses. However, each of the intended households
395 committed to spending 30 hours of unpaid work per week on site (on top of the many hours they each spent in
396 paid employment), working together until they had all helped build each other’s homes. The ten homes they built
397 were not traditional stone or brick buildings, rather they are highly insulated wooden–frame structures, topped
398 with turf–roofs. Like Earthships, they were positioned south–facing to capture the most natural light and heat from
399 the sun and the layout of each home was individualised to the preferences of each family. It has been more than

400 twenty years since those homes were built, and whilst the children of the households have grown and created their
401 own lives, the self-builders are still living their dream in their eco-homes (Grand Designs, 2001, 2012).

402 This study has shown that whilst many of the materials acquired to construct Earthship homes may be
403 recycled or reused resources, and can often be available for free, Earthship builders will need to pay-out for some
404 goods and services that they may not have originally planned or budgeted. Longer-term, this may lead to regrets
405 in the choice of materials used (i.e. possibly increasing the building's carbon footprint) or the likelihood of needing
406 to take-out loans to finance their builds. However, on the positive side, as most European nations have
407 implemented energy efficiency strategies (e.g. EU Directive on Energy Efficiency, 2018), several governments
408 are offering financial initiatives to incentivise the delivery of residential energy efficiency. Therefore, it is highly
409 likely that these will be available to Earthship builders because their eco-design accords with the expectations of
410 net zero/low carbon buildings. Many of the world's governments acknowledge the need to address the anticipated
411 impacts of climate change so one strategic approach has been to minimise building energy usage. For instance,
412 the Scottish Government's HEEPS (Home Energy Scotland Loan Scheme) was offering £15,000 interest-free
413 loans towards the use of energy efficient measures. Such a scheme could certainly be appealing to an Earthship
414 builder.

415 Earthship living has reportedly had a positive influence on the lives of all the participants – the study has
416 shown it has brought them closer to nature. This could be hugely important for those choosing to live in Earthships
417 because there is a growing volume of evidence to indicate that engaging with natural environments is associated
418 with a range of positive health, wellbeing and pro-environmental outcomes (Lovell *et al.*, 2018). Several studies
419 have shown that nature connectivity improves personal happiness and life satisfaction (Mayer *et al.*, 2009), plus
420 it provides reductions in both physical and psychological stress levels (Ewert and Chang, 2018). Furthermore, this
421 could also be a useful factor in determining the monetary value of an Earthship building because 'natural capital'
422 is becoming increasingly recognised in accounting for the wealth it provides (McKenna *et al.*, 2019). However,
423 others may suggest that attempting to monetise nature is putting a price on something priceless (Helm, 2015).

424 Earthship living has also enabled the participants to enjoy improved comfort, particularly in terms of
425 financial savings and self-sufficient security. Several studies have shown that residential satisfaction can be
426 directly attributed to home ownership (Elsinga & Hoekstra, 2005; Huang *et al.*, 2015), which in the case of
427 Earthship builders is presumably further enhanced by the achievement of knowing that they self-built their own
428 properties. Homeownership is suggested to provide residents with greater security, higher self-esteem, better
429 social identity and a financial advantage to create/appreciate wealth (Huang *et al.*, 2015). Of particular note is the

430 study of Huang *et al.* (2015), which concluded that housing design and its facilities were the most important
431 attributes in determining an individuals' residential satisfaction and life quality. These are both unique features of
432 Earthship homes.

433 Since the first experimental Earthships where built in the 1970's, there has been a surge in the number
434 of Earthship buildings constructed across the globe. Nowadays, there are believed to be thousands of Earthship
435 buildings in existence around the world (Kratzer, 2014). Therefore, it seems there are an increasing slice of society
436 that is ready to make the shift to Earthship homes and the lifestyle they provide. This study has shown there is a
437 common belief that Earthships could be readily bought and sold and, moreover, they would not be considered an
438 investment risk. Fortunately, as alternative and autonomous housing is becoming more commonplace, some
439 sustainability-driven lenders (e.g. the Triodos Bank and the Ecology Building Society) (Thompson and Cowton,
440 2004; Yip and Bocken, 2018; Seyfang and Gilbert-Squires, 2019), are recognising the shift towards
441 alternative/autonomous housing and they are now providing the financial backing for such endeavours. This swing
442 may be strengthened by the knowledge that earth-sheltered houses in Nottinghamshire (The Hockerton Housing
443 Project (Vale and Vale, 2013)) have readily sold and resold on the open market and their values have sizeably
444 increased alongside market prices.

445 Like the residents of the Hedgehog scheme who have been living in their homes for >20 years, none of
446 the Earthship participants involved in this study are considering moving-on anytime soon. Given the shortage and
447 affordance of traditional mass housing, it seems there has never been a greater need for an alternative self-build
448 solution to meet housing needs than now. Anybody wanting an Earthship (or similar) home may need to start the
449 planning and building process for themselves sooner rather than later. Foremost because the option of
450 self/community building is becoming a prevalent choice across many northern European counties. For instance,
451 the Homeruskwartier neighbourhood of Almere (106 hectares of reclaimed land, 26km east of Amsterdam,
452 Netherlands) is expected to create 20,000 assisted self-build homes for lower- and middle-income households
453 (Bossuyt, 2020). However, before starting one of these projects, the advice gathered from the participants of this
454 study is for anyone beginning the Earthship journey is to obtain as much of the necessary knowledge and skills
455 before starting.

456

457 **7. CONCLUSIONS AND RECOMMENDATIONS**

458

459 In this study, we have explored the personal experiences of European Earthship self-builders and, by adopting a
460 phenomenological stance, allowed the analysis of those experiences to be categorised into themes and sub-themes
461 that reveal unique insights into the encounters of those who have built their own Earthship homes and exposed
462 the perspicacity of living in their own Earthship homes. In doing so, we have answered both of the research
463 questioned posed earlier in this paper.

464 According to the findings of our study, anyone from any background can make the shift to building/living
465 in an Earthship home. Nonetheless, it is clear that a mixed skillset and knowledge of building trades, plus the
466 physical and emotional prowess needed for the long-haul build process, alongside access to sufficient financial
467 means and/or available materials, are critical factors influencing the outcome of an Earthship building.

468 Earthship living has been revealed to have a positive influence on the lives of its dwellers and it has
469 brought them closer to nature, which is known to improve personal health and well-being traits. It has also enabled
470 them to enjoy improved comfort, particularly in terms of financial savings and self-sufficient security. Despite
471 some maintenance issues, not too different from conventional homes, having self-built means making repairs can
472 be easier because of their personal confidence, insight and understanding of their own building

473 Earthship buildings are likely to remain on the margins of housing supply/demand. However, for those
474 who have gone through the process of creating their own Earthship dream home, and are now rejoicing in the
475 fruits of their labours, their collective voices suggest they have no intentions of relinquishing them for others just
476 yet. Therefore, for those in society still exhuming a passion towards sustainable homes and green living it is likely
477 they will need to drive the vision of their Earthship building/living themselves if they want this home/lifestyle to
478 transpire.

479 There are many paradoxes to unravel and a host of unpalatable truths to confront before we can achieve
480 sustainable buildings/living (Horton and Horton, 2019). Therefore, based on the findings of this study, the
481 following is a list of recommendations for future research on Earthship buildings:

- 482 • Exploring the practicability of existing funding models (particularly the partnership or locally-led/bottom-
483 up models) that could be utilized for Earthship homes.
- 484 • Unpicking a route of least resistance through the bureaucratic obstacles of permissions and licenses needed
485 to gain approval to build an Earthship.
- 486 • Development of building standards to regulate the approaches to construction, as well as stipulating quality
487 requirements for Earthship building construction.
- 488 • Promoting participatory grassroots community build projects to execute the delivery of Earthship homes.

489 • Assessing the value of tangible and intangible benefits derived from autonomous low-impact Earthship
490 living.

491

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505

506

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