

Building Resilient Communities: The Traumatic Effect of Wildfire on Mati, Greece

K. Vallianou, T. Alexopoulos, V. Plaka, M. K. Seleventi, V. Skanavis, C. Skanavis

Abstract—The present research addresses the role of place attachment and emotions in community resiliency and recovery within the context of a disaster. Natural disasters represent a disruption in the normal functioning of a community, leading to a general feeling of disorientation. This study draws on the trauma caused by a natural hazard such as a forest fire. The changes of the sense of togetherness are being assessed. Finally this research determines how the place attachment of the inhabitants was affected during the reorientation process of the community. The case study area is Mati, a small coastal town in eastern Attica, Greece. The fire broke out on July 23rd, 2018. A quantitative research was conducted through questionnaires via phone interviews, one year after the disaster, to address community resiliency in the long-run. The sample was composed of 159 participants from the rural community of Mati plus 120 coming from Skyros Island that was used as a control group. Inhabitants were prompted to answer items gauging their emotions related to the event, group identification and emotional significance of their community, and place attachment before and a year after the fire took place. Importantly, the community recovery and reorientation were examined within the context of a relative absence of government backing and official support. Emotions related to the event were aggregated into 4 clusters related to: activation/vigilance, distress/disorientation, indignation, and helplessness. The findings revealed a decrease in the level of place attachment in the impacted area of Mati as compared to the control group of Skyros Island. Importantly, initial distress caused by the fire prompted the residents to identify more with their community and to report more positive feelings toward their community. Moreover, a mediation analysis indicated that the positive effect of community cohesion on place attachment one year after the disaster was mediated by the positive feelings toward the community. Finally, place attachment contributes to enhanced optimism and a more positive perspective concerning Mati's future prospects. Despite an insufficient state support to this affected area, the findings suggest an important role of emotions and place attachment during the process of recovery. Implications concerning the role of emotions and social dynamics in meshing place attachment during the disaster recovery process as well as community resiliency are discussed.

Keywords—Community resilience, natural disasters, place attachment, wildfire.

K.Vallianou, V. Plaka, and M. K. Seleventi are with the University of the Aegean, Lesvos, 81100 Greece (e-mail: envm18001@env.aegean.gr, plaka@env.aegean.gr, seleventi@env.aegean.gr).

Th. Alexopoulos is with the University of Poitiers, F-86073 Poitiers cedex 9, France (e-mail: theodore.alexopoulos@univ-poitiers.fr).

V. Skanavis is with the University of Southern California, Los Angeles, California 90089-2531 (e-mail: billskan@gmail.com)

C. Skanavis is with the University of West Attica, Athens, 11521, Greece (e-mail: kskanavi@uniwa.gr).

I. INTRODUCTION

IT is common knowledge that the number of wildfires is increasing worldwide as it is driven by global warming and severe droughts [1], [2]. Greece is already affected from this situation [3], [4]. Disastrous wildfires cause incalculable losses, with thousands of burnt hectares, fragmented natural habitats with flora and fauna. Furthermore, adverse consequences are observed with people's property damages and even worse with loss of lives. Therefore, the necessity of communities getting appropriately prepared to cope with wildfire traumatic effects is pressing. As a result, pre-disaster actions in order to prevent wildfires and post-disaster procedures that mitigate the consequences of fires are at the core of scientific research. Thus, examining community resilience and disaster recovery as a function of place attachment and residents' emotional experiences play an important role [5], [6].

A. Literature Review

As stated previously, community resilience has a significant role when residents are called upon to recover from a natural disaster [7], [8], with a large number of existing studies in the broader literature focusing on this context. Resilience is a term that expresses the ability of any system to return to its normal functioning after a disruptive incident [9], [10].

Accordingly, community resilience refers to communities capable of withstanding and adjusting to the negative effects of an abrupt disruption, such as natural disasters, and resulting to successful recovery [11]. Previous studies have emphasized that there is a number of components, which comprise community resilience. It should be stressed that the components are interconnected [12]. In an attempt to enumerate these components, Bahadur et al. [13] referred efficient governance, reconciliation with change as well as the contribution of community and their knowledge combined with the use of natural wealth for an efficient disaster recovery. Additionally, residents need to realize that they will have to coexist with the effects and more importantly they should try to cooperate and respect social values in order to increase resilience [13]. Furthermore, they claim that there is no reassurance that the community's life and functionality will return to their previous balance although residents need to remain informed and educated for dealing with pre-disaster and post-disaster natural phases as well as distress [13], [14]. Although there are many studies concerning community resilience related to traumatic events, the research on the role of public officials and governance before, during and after a disaster remains limited [15].

It is a known scientific fact that emotions are important indicators of behaviour when a natural disaster occurs [19]. Emotions represent patterns of perception, experience, physiology, action and communication in response to challenges and threats stemming from the environment. Their intensity depends on the way each situation is appraised [16]. Emotions, meaning how people feel, represent patterns of perception, experience, physiology, action and communication in response to challenges and threats stemming from the environment are caused by certain experiences and their intensity depends on the way that involved parties perceive each situation is appraised [58]. Emotions are adapted responses to environmental changes and as such have an important explanatory power to elucidate reactions to natural disasters. As has previously been reported in the literature, if there is chance to gauge community resilience, it is linked with an optimistic view for the future as well as with hope, in contrast with pessimism and despair characterizing vulnerable communities [17].

A previous study after a forest fire in mountain Carmel, Israel, showed that the major emotions experienced in impacted areas, were fear and anger, with percentages of fear higher in areas closer to forest fire where levels of anger were identical regardless of proximity to the fire [6]. Prior research following an earthquake in a group of 100 residents in Fabriano, Italy suggested that the most significantly developed negative emotions affecting people were fear, worry, terror and helplessness [19]. Furthermore, [19] concluded that residents of the nearest town to the volcano expressed during the disaster, a feeling of loss, fear, grief and anger. Other studies demonstrated that affected residents were overwhelmed with feelings of uncertainty and a general attitude of pessimism as regards to the future of their place [20], [21]. Moreover, a recent study by McGee and Langer [22] conducted in the Far North, Aotearoa in New Zealand, concluded that affected residents from a wildfire in 2011, expressed intense emotions such as fear, despair and they experienced them as a traumatic event with anger for the possibility of arson exposure.

Obradovich [23] observed that communities affected by hurricane Katrina showed higher levels of mental health issues than nonaffected residents. However, [24] with a research regarding the great Hanshin-Awaji earthquake in the city of Kobe, in 1995, found that affected residents were happier in a long term basis than the non-affected. This was justified as a result of a stronger bond between neighbours in affected communities as well as victims showing appreciation for being alive.

According to Silver and Martin [25], affected people of a tornado in Goderich, Ontario, Canada even if they had generally negative emotions and a strong feeling of loss, they also showed a need to feel closer to the other members of the community after the disaster [26]. The tornado caused an environmental degradation that led to a feeling of depression to 46% of the interviewed residents [25]. This natural disaster was a community bond for them [27]. Moreover, a recent study for Wenchuan earthquake in China concluded found that

negative emotional experiences related to the disaster did not decrease place attachment, although they led to enhanced coping strategies [28]. Furthermore, [25] noted that 64% of respondents felt determined that they can actively support their community to recover after the tornado. According to them, this was a result of the successful intervention of public officials.

Various researchers [29]-[31] argued in their studies that place attachment refers to the emotional ties between people and the location they live in. One of the first attempts to explain how people are connected to a place or location, was in the 1970s [29], [32]. The term of place attachment is related to the emotional bond that people feel with their environment, the place that they operate their daily routine and as a result, they develop an emotional connection with it [33].

Studies support the significant positive role place attachment plays regarding disaster awareness and disaster preparation [5], [34]. As [25] found in their research regarding a tornado event, residents that had a strong place attachment were more willing to participate and support recovery actions [35]. Similarly, place attachment appears as a significant indicator of community resilience after flooding in Ingham, a town in Queensland, Australia [36]. In addition, [25] pointed out that the tornado caused significant disruption of the community functioning. Residents who were affected by the tornado expressed emotions of loss, uncertainty and guilt. In the meanwhile, after the tornado struck, local residents had to ensure the post-disaster recovery in collaboration with government and local authorities, but unfortunately there was an ineffective communication which has led to anger. With all these negative feelings, residents as individuals felt the need to seek for help and support from the community [37]. Moreover, as it is stated in previous studies, people that appear to have a strong place attachment are often individuals that will also develop a stronger sense of community bond [38], [39]

Research that took place in different towns of the island El Hierro, Spain regarding the correlation between place attachment and proximity to the affected area of a volcano, led to an important result: Place attachment was lower [27] while the willingness for recovery was stronger in directly affected towns as opposed to less affected areas [15]. In other words, despite the fact there was a decrease in place attachment with regard to pre-disaster levels, local people of the most destroyed towns were willing to stay and support the community reorientation [40]. Similarly, after forest fires in Sweden, [41] noticed a decrease in residents' bonding with place, from 35% to 16%.

Taner [28] in a study conducted for earthquakes in Kaiapoi, North Canterbury, New Zealand, states that, according to interviews given from local residents, there was a strong optimism for getting back to community's normality, probably connected with the strong pre-disaster place attachment. On the other hand, [25] found that only 48% of local residents affected by a tornado felt positive for the place's total recovery.

In addition to community's opinion for future prospects, trust in government and authorities intervention after a

disaster, it has been implied that all the above are significant issues. Several studies have been carried out on citizens' losing confidence in government and public officials [42]-[44]. When a natural disaster strikes, people in order to cope with it and recover, need to perceive aid and support from the government. If this is not feasible, then residents feel disappointed and lose trust in government.

Uslaner [44] reported, following the earthquake and tsunami in 2011 in Japan, the weakness of the government to support the citizens of affected areas has led them to feel that government and public officials contribute negatively to disaster effects.

According to [45] households that were the most affected from floods in Cambodia, a country in Asia, showed lower levels of trust in government and the local community. This was justified by the concern and uncertainty regarding the fair distribution of supplies to affected families [45], [46]. As well as this, the results of a study in South Korea supported that if government and public officials delay to intervene and assist the community after a disaster, it can lead to a decrease of social trust [47]. On the other hand, in cases where government gave immediate and efficient support to residents, a rise in trust has been noticed [48], [49].

This study seeks to expand the research surrounding the trauma effect of a wildfire through the expressed emotions, as well as how wildfire changes the community sense and place attachment during the reorientation process leading to community resilience. Forest fires, as all natural disasters, have the potential to seriously affect both the environment and the social structure of a local community. Unlike some of the natural disasters, such as hurricanes, tornados and tsunamis which are unpredictable, the phenomenon of forest fires could be easily predicted and controlled, since the causes are mainly anthropogenic [59].

The research was conducted through questionnaires via phone interviews one year after the disaster. The sample was composed of 159 participants from Mati town plus 120 participants from Skyros Island that was used as a control group.

The main questions addressed in this paper are: (a) how saliently environmental changes caused by a natural disaster affect place attachment; (b) how emotional reactions unfold and contribute to the adaptation to the changes and (c) how people draw on both their individual emotional experiences as well as their surrounding social capital (i.e., a sense of community) to renegotiate their identity in relation to their environment, reclaiming place attachment. In this way, we examine the way a community may achieve a successful reorientation after a traumatic event such as a wildfire even a year after the disaster. Thus, it is examined how a community may cope with such variables and be able to return to its normality.

To answer the above concerns, residents were asked questions that had to do with a year before up to a year after the fire.

Finally, an important question asked, associated with wildfire effects, is the community's perspective related to an

effective government interference.

II. STUDY AREA AND METHODOLOGY

A. Study Area

Mati is a coastal town and touristic resort, approximately 28 km northeast of Athens. At 16:49 on Monday, July 23rd 2018, a fire broke out near Penteli Mountain [50]. The spread of the fire was rapid due to the strong winds gusting to over 90 km/hr, with temperatures higher than 37 °C [50], [51]. The fire was heading toward the town of Neos Voutzas and reached the town of Mati. Consequently, Mati suffered destruction when 103 people lost their lives and more than 140 people were injured [50]. Furthermore, over 1,650 households and 1,431 hectares were burnt. This fire was one of the worst fires in Greece and generally in Europe, being the second extreme wildfire globally, after the bushfires in Australia with 180 deaths [50], [52]. As the potential cause of the fire, it has been indicated the human negligence or sparking caused from a power pillar [52]. Another significant element that [52] addressed is that in the area of Mati, pine trees were scattered between houses which are well known for their high level of flammability.

B. Methodology

1. Participants

As mentioned before, residents of Skyros participated in this research, as a control group. Skyros is an island located in the Aegean Sea, Greece, belonging to Sporades complex, northeast of the island of Euboea and more than 145 km far from Mati area. It is an island with a variety of vegetation and generally rich environment. The northwest part of Skyros is covered with pine forests whereas its southeast is mountainous with designated areas. It also has seaside villages and a well-developed tourism. The town of Mati and Skyros Island are both coastal areas and summer resorts with rich and mostly flammable vegetation consisted mostly of pine trees. Moreover, they are located close to urban centres, such as Athens. Skyros was chosen in order to explore a correlation of proximity to the traumatic effect, place attachment and emotional experiences. Residents of Skyros were informed for the Mati fire incident from media broadcasting the emergency situation. Many of them reported they have faced wildfires in the past. Thus, they were able to give their opinion about this traumatic event although they did not themselves witness this fire disaster.

C. Phone Interview Structure

Interviews were conducted via phone by a group of 4 interviewers, from July 17th to August 11th, 2019. Interviewees were informed that they will participate in a scientific research carried out by the Department of Public and Community Health of the University of West Attica Greece, regarding the wildfire in Mati on 23rd July 2018. Information given to responders had to do with a brief explanation of the questionnaire that was going to be administered to them in an attempt to have them recall the wildfire in Mati. The duration

of each interview was approximately ten to fifteen minutes. Moreover, at the beginning of the interview, participants were briefly informed for anonymity and that the derived data were being generated for scientific purposes only.

Place attachment before the fire: The first five questions were focusing on place attachment. Participants were asked to comment on their bonding to Mati, as the place that they used to live before the fire event. The place attachment scale was adapted from [53]. A 5-point scale was used ranging from 1 (totally disagree) to 5 (totally agree).

Emotions: Next, the participants' emotions experienced during the fire were drawn. Given the retrospective nature of this measure, the interviewer prompted participants to travel back in time and recall their emotional responses to the event. Eleven emotional adjectives selected on careful examination of previous literature [18], [23] were examined in order to identify how affected people felt during the fire event. Here, the 5-point scales are used ranging from 1 (no feeling) to 5 (feel strongly). A factorial analysis was run to reduce emotional ratings into meaningful factors (see the Results Section).

Community cohesion: Two items assessed the level of community cohesion after the fire event and during the process of reconstruction (e.g., "Members of the community shared important moments after the fire").

Community satisfaction: Four items assessed how the residents were feeling vis-à-vis their community: relieved, proud, satisfied and secure. A 5-point scale was used ranging from 1 (not at all) to 5 (to a great extent).

Perception of rescue and government support: Three items were used in order to describe how residents perceived the role of public officials and rescue teams with respect to the disaster (e.g., "Government responded effectively to the disaster"). Respondents indicated whether they agreed (Yes/No) with each affirmation. Using 4-point scales ranging from 1 (Yes) to 4 (No answer).

Future prospects: Three items focused on the residents' perception concerning the future of Mati and the community's potential for recovery.

Finally, place attachment and emotions were assessed again. Here, participants were prompted to provide answers that correspond to their current perceptions and experiences. The same 11 emotional adjectives and 5 items of place attachment were used.

III. RESULTS

Place attachment: The five items of the place attachment scale were aggregated to form an overall index of place attachment before the fire ($\alpha = 0.89$) and one year after the fire ($\alpha = 0.87$). In order to determine whether place attachment had been affected as a result of the fire, we performed a 2 (location: Mati vs. Skyros) x 2 (place attachment: before vs. after) mixed-model ANOVA with the last variable being within-participants. The analysis revealed a main effect of location, $F(1, 266) = 4.68$, $p = 0.031$, $d = 0.26$, a main effect of time of measurement of place attachment, $F(1, 266) = 76.70$, $p < 0.001$, $d = 1.06$, and an interaction between location and

place attachment, $F(1, 266) = 79.55$, $p < 0.001$, $d = 1.09$ (see Fig. 1). The interaction indicates that there is a decrease in place attachment in the residents of Mati, $F(1, 266) = 188.61$, $p < 0.001$, $d = 40$. Reported place attachment was higher before the fire ($M = 4.74$; $SD = 0.43$) than after the fire ($M = 3.75$; $SD = 1.09$). For the residents of Skyros, the level of place attachment remains unchanged, $F(1, 266) = 0.01$, $p = 0.91$.

Emotions: A factorial analysis using Varimax rotation was performed on the emotion adjectives across the two times of measurement. A 6-factor solution was kept accounting for 67% of the total variance. This analysis allowed us to group together the adjectives into four meaningful subscales: active/vigilance, distress/disorientation, helplessness, and indignation (see Table I). The reason a 6-factor solution was obtained, had to do with the fact that for two of these subscales distinct factors emerged for measurement time 1 and 2. The emotion adjectives were aggregated to form 6 scores: active/vigilance at time 1 ($\alpha = 0.83$), active/vigilance at time 2 ($\alpha = 0.82$), distress/disorientation at time 1 ($\alpha = 0.79$), distress/disorientation at time 2 ($\alpha = 0.82$), indignation at time 1 ($\alpha = 0.70$), and indignation at time 2 ($\alpha = 0.73$). The helplessness index at time 1 and 2 was formed only by one item.

We computed a score for each participant on the different subscales and we performed a 2 (location: Mati vs. Skyros) x 2 (time: 1 vs. 2) x 4 (type of emotion: active/vigilance vs. distress/disorientation vs. helplessness vs. indignation) mixed-model ANOVA with the two last variables being within-participants. The analysis yielded a main effect of location, $F(1, 234) = 35.78$, $p < 0.001$, $d = 0.77$, a main effect of time of measurement, $F(1, 234) = 44.28$, $p < 0.001$, $d = 0.87$, and a main effect of type of emotion, $F(3, 702) = 64.85$, $p < 0.001$, $d = 1.03$. These were qualified by a location x time of measurement interaction, $F(1, 234) = 5.96$, $p = 0.015$, $d = 0.31$, a location x type of emotion interaction, $F(3, 702) = 14.40$, $p < 0.001$, $d = .49$, a time of measurement x type of emotion interaction, $F(3, 702) = 58.53$, $p = 0.015$, $d = 1.00$, and the crucial location x time of measurement x type of emotion two-way interaction, $F(3, 702) = 29.62$, $p < 0.001$, $d = 0.70$, indicating that the dynamics of emotional changes differ across locations (see Fig. 2). Concerning the stricken town of Mati, we observed a significant decrease in helplessness across time, $F(1, 234) = 29.56$, $p < 0.001$, a significant increase in activation/vigilance, $F(1, 234) = 62.82$, $p < 0.001$, a considerable decrease in reported distress, $F(1, 234) = 420.35$, $p < 0.001$, but comparable (high) levels of indignation with time, $F(1, 234) = 0.31$, $p = 0.57$. In Skyros, the reported emotions were globally lower and the pattern of fluctuations across time was less marked. We observed a significant decrease in helplessness across time, $F(1, 234) = 4.08$, $p = 0.044$, an increase in activation/vigilance, $F(1, 234) = 4.37$, $p = 0.037$, a decrease in reported distress, $F(1, 234) = 7.16$, $p = 0.007$, and a decrease in indignation, $F(1, 234) = 6.89$, $p = 0.009$.

The relationships between initial place attachment (before the fire) and the reported emotions during the fire through a

series of correlations (see Fig. 2) were explored, for the residents of Mati. Place attachment was only positively correlated with reported helplessness during the fire ($r = 0.16$, $p < .05$). No significant correlations were observed between place attachment and the other emotions.

Contribution of community cohesion and satisfaction to place attachment: In order to empirically assess the framework of disorientation/reorientation proposed by [20], a series of multiple regressions on the data from Mati residents were performed in order to assess a mediational model. First, within this framework, it is claimed that the initial distress and disorientation may act as a lever to seek and enhance the sense of community. It was, therefore, sought to observe whether initial distress felt during the fire was a predictor of community cohesion. Indeed, initial distress predicted community cohesion, $B = 0.29$, $t(156) = 3.20$, $p = 0.0017$, $\eta^2 = 0.06$. An enhanced community connectedness and identity should have a positive effect on people-place relationships. The place attachment (at time 2, one year after the fire) on community cohesion was thus regressed. The analysis revealed that community cohesion is a reliable predictor of place attachment, $B = 0.28$, $t(156) = 3.98$, $p = 0.0012$, $\eta^2 = 0.09$. This relationship should be mediated by community satisfaction: indeed, a greater sense of community should result in a greater propensity to derive positive feelings from the community and contribute to maintaining place attachment during the reorientation process. In order to test this, place attachment on community satisfaction was further regressed. Confirming our rationale, community satisfaction was strongly related to place attachment, $B = 0.32$, $t(156) = 4.43$, $p = 0.000017$, $\eta^2 = 0.11$. Then, place attachment on both community cohesion and community satisfaction was regressed. In this model, community satisfaction significantly predicted place attachment, $B = 0.23$, $t(154) = 2.21$, $p = 0.028$, while the effect of community cohesion was no longer significant, $B = 0.12$, $t(156) = 1.19$, $p = 0.23$. Thus, the effect of community cohesion on place attachment seems to be mediated by community satisfaction.

Contribution of emotions to changes in place attachment: A series of multiple regression analyses in order to examine the extent to which emotions felt during the fire or one year after the fire could predict changes in place attachment (i.e., the difference between place attachment before and after the fire). When the four subscales of emotional reactions during the fire were used as predictors, only activation/vigilance emerged as a significant predictor of place attachment change, $B = 0.19$, $t(151) = 2.47$, $p = 0.014$. The same analysis was carried out with the four subscales of emotional reactions one year after the fire, and again the only significant predictor was activation/vigilance, $B = 0.33$, $t(152) = 3.17$, $p = 0.0017$. Interestingly, when the data of the residents of Skyros were used, neither of the emotional indicators did emerge as reliable predictors of place attachment change.

Future prospects: The correlation of the two items assessing the residents' perceptions of the future prospects of Mati (after reverse scoring the item on uncertainty) was reliable ($r = 0.28$, $p < 0.05$). They were combined into a single index. The

relationship between place attachment change and the perception of the town's future was examined. Interestingly, place attachment change was positively correlated with optimism concerning Mati's future prospects, ($r = 0.38$, $p < 0.05$). Thus, a strengthened sense of place seems to contribute positively to a favorable perspective of future recovery.

TABLE I
EMOTION SUBSCALES AFTER THE FACTOR ANALYSIS

Subscale	Variables	Reliability (time 1)	Reliability (time 2)
active/vigilance	active,attentive, determined,strong	0.83	0.82
distress/disorientation	distressed,fearful,lost,upset	0.79	0.82
indignation	angry,sad	0.70	0.73
helpless	helpless	-	-

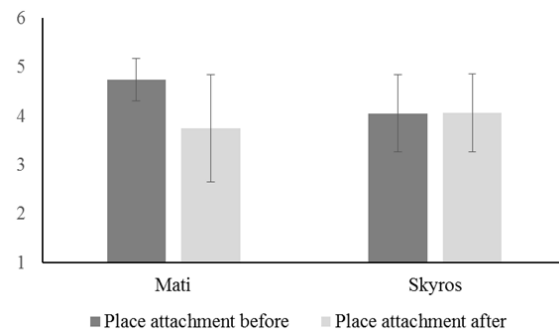


Fig. 1 Mean place attachment before and after the fire as a function of place of residence (solid bars represent the standard deviations)

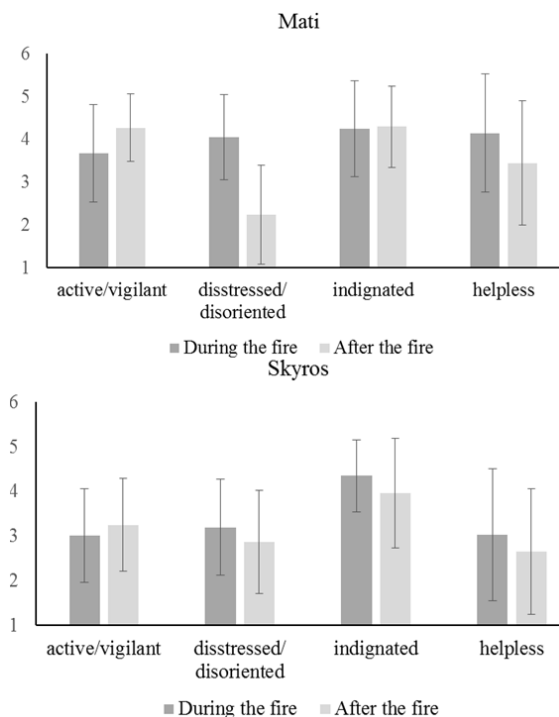


Fig. 2 Mean self-reported emotional experiences as a function of place of residence and time of measurement (solid bars represent standard deviations)

IV. DISCUSSION

In line with previous studies, this research outlines the importance of place attachment relating to natural disasters [25], [41], [53]. This study supports that place attachment in the Mati area was higher before the fire than after the incident. This finding is consistent with what has been found from [19], showing that place attachment reduced in the residential areas closer to the volcanic eruption. A similar pattern of results was obtained in [41] where the emotional bond between people and place disappeared after the disaster. Furthermore, this study's analysis showed that there was a significant positive correlation but only between place attachment and the emotion of helplessness during the fire. Specifically, people with stronger emotional bond with the place before the fire felt more helpless during the fire.

It is crucial to note that our study is in accordance with findings reported by [20] regarding disorientation/reorientation. Indeed, residents of the Mati area that were overwhelmed with distress during the fire appeared with strengthened need to connect with the community by seeking support. As a result, the fact that people turned to community and gained satisfaction contributes to place attachment and conduces the reorientation process. A similar conclusion was reached by [25] as well as [54] which support that sharing a negative experience, such as a natural disaster, empowers community ties and reinforces community resilience.

The generated results differ considerably from those of [55] who found in a case of flood disaster that place attachment was not affected by this experience. Strong was the evidence that only residents with emotions of activation/vigilance during the fire, contributed in place attachment.

Our results demonstrated that place attachment had a positive correlation with future optimism. Specifically, residents with strong place attachment are positive regarding disaster recovery and reconstruction [41]. It has been shown that despite the negative feelings of residents in affected areas, their pleasant memories before the fire and their bond with the place, gave them strength and encouraged them to participate in the recovery process [27].

Another important result of this research is that emotions of distress/disorientation in Mati are in higher levels, during the disaster than after the disaster. On the other hand, participants from Skyros expressed emotions of distress and fear although with a lower intensity, in accordance with the information they had from the incident transmission. This is in complete agreement with previous studies which say proximity has a significant role in the intensity of emotions [38]. In agreement with literature, fear is the most common emotional experience during a natural disaster [19], [18], [22].

V. CONCLUSION

This study, in general, emphasizes the significance of emotions and place attachment during recovery from a natural disaster. It is important to realize that building community resilience is a complex process. The wealth of environmental problems, plaguing us globally, requires special attention,

largely due to the frequent indifference of citizens in the environmental decision making process [56].

As a matter of fact in building resilient communities, there are some important characteristics to be seriously considered. Primarily, place attachment is a strong indicator in the establishment of community resilience. The stronger the place attachment is; the more intensive is the need for recovery. Furthermore, environmental awareness and education are vital parameters. Decision-making is a process guided by emotions [57]. Specifically, citizens need to be familiar with environmental issues, in order to gradually become environmentally responsible in environmental protection. In addition, during disaster phases, a strong sense of community can fill the emotional gap and work as a morale booster for residents. This leads to an enhanced place attachment that is crucial for community resilience.

Additionally, an effective strategy of support from government and public officials shall strengthen the dialogue with the community and encourage their engagement in the recovery process. In other words, knowing how local residents feel could be beneficial for more accurate recovery planning. Investing further on media communication and engagement during and after environmental accidents, as well as in building a strong environmental interest, seems to be the way to have resilient communities [56].

REFERENCES

- [1] W. Heinet al., "Climate change and natural disasters: Government mitigation activities and public property demand response," *Land Use Policy*, vol. 82, pp. 436–443, Mar. 2019, doi: 10.1016/j.landusepol.2018.12.026.
- [2] J. Parente, M. Amraoui, I. Menezes, and M. G. Pereira, "Drought in Portugal: Current regime, comparison of indices and impacts on extreme wildfires," *Science of The Total Environment*, vol. 685, pp. 150–173, Oct. 2019, doi: 10.1016/j.scitotenv.2019.05.298.
- [3] A. Karali, M. Hatzaki, C. Giannakopoulos, A. Roussos, G. Xanthopoulos, and V. Tenentes, "Sensitivity and evaluation of current fire risk and future projections due to climate change: the case study of Greece," *Natural Hazards and Earth System Sciences*, vol. 14, Jan. 2014, doi: 10.5194/nhess-14-143-2014.
- [4] D. de Rigo, G. Libertà, T. Durrant, T. Artes, and J. San-Miguel-Ayanz, *Forest fire danger extremes in Europe under climate change: variability and uncertainty*. 2017.
- [5] S. Mishra, S. Mazumdar, and D. Suar, "Place attachment and flood preparedness," *Journal of Environmental Psychology*, vol. 30, no. 2, pp. 187–197, Jun. 2010, doi: 10.1016/j.jenvp.2009.11.005.
- [6] T. Shavit, S. Shahrabani, U. Benzion, and M. Rosenboim, "The Effect of Fire on Emotions and Risk Perceptions: A Field Study after the Carmel Forest Fire Disaster," *Journal of Environmental Psychology*, vol. 36, pp. 129–135, Dec. 2013, doi: 10.1016/j.jenvp.2013.07.018.
- [7] M. Molavi, "Measuring Urban Resilience to Natural Hazards," *TeMA. Journal of Land Use, Mobility and Environment*, vol. 11, no. 2, pp. 195–212, 2018.
- [8] J. Moreno, "The role of communities in coping with natural disasters: Lessons from the 2010 Chile Earthquake and Tsunami," *Procedia Engineering*, vol. 212, pp. 1040–1045, Jan. 2018, doi: 10.1016/j.proeng.2018.01.134.
- [9] C. Folke et al., "Regime shifts, resilience, and biodiversity in ecosystem management," *Annu. Rev. Ecol. Evol. Syst.*, vol. 35, pp. 557–581, 2004.
- [10] M. Arouri, C. Nguyen, and A. B. Youssef, "Natural Disasters, Household Welfare, and Resilience: Evidence from Rural Vietnam," *World Development*, vol. 70, pp. 59–77, Jun. 2015, doi: 10.1016/j.worlddev.2014.12.017.
- [11] S. L. Cutter et al., "A place-based model for understanding community resilience to natural disasters," *Global Environmental Change*, vol. 18, no. 4, pp. 598–606, Oct. 2008, doi: 10.1016/j.gloenvcha.2008.07.013.

- [12] J. B. Houston, M. L. Spialek, J. Cox, M. M. Greenwood, and J. First, "The centrality of communication and media in fostering community resilience: A framework for assessment and intervention," *American Behavioral Scientist*, vol. 59, no. 2, pp. 270–283, 2015.
- [13] A. V. Bahadur, M. Ibrahim, and T. Tanner, "The resilience renaissance? Unpacking of resilience for tackling climate change and disasters," 2010.
- [14] F. C. Nucifora Jr, I. Subbarao, and E. B. Hsu, "Changing the paradigm: A novel framework for the study of resilience," 2012.
- [15] S. Kruse et al., "Conceptualizing community resilience to natural hazards the emBRACE framework," *Nat. Hazards Earth Syst. Sci.*, vol. 17, no. 12, pp. 2321–2333, Dec. 2017, doi: 10.5194/nhess-17-2321-2017.
- [16] R. J. Davidson and S. Begley, *El perfil emocional de tu cerebro*, vol. 225. GrupoPlaneta (GBS), 2012.
- [17] G. Kennedy, M. Richards, M. Chicarelli, A. Ernst, A. Harrell, and D. SITES, "Disaster mitigation: initial response," *Southern medical journal*, vol. 106, no. 1, pp. 13–16, 2013.
- [18] G. Prati, V. Catufi, and L. Pietrantonio, "Emotional and behavioural reactions to tremors of the Umbria-Marche earthquake," *Disasters*, vol. 36, no. 3, pp. 439–451, Jul. 2012, doi: 10.1111/j.1467-7717.2011.01264.x.
- [19] C. Ruiz and B. Hernández, "Emotions and coping strategies during an episode of volcanic activity and their relations to place attachment," *Journal of Environmental Psychology*, vol. 38, pp. 279–287, Jun. 2014, doi: 10.1016/j.jenvp.2014.03.008.
- [20] R. S. Cox and K.-M. E. Perry, "Like a Fish Out of Water: Reconsidering Disaster Recovery and the Role of Place and Social Capital in Community Disaster Resilience," *American Journal of Community Psychology*, vol. 48, no. 3–4, pp. 395–411, Dec. 2011, doi: 10.1007/s10464-011-9427-0.
- [21] K. E. Klockow, R. A. Pepler, and R. A. McPherson, "Tornado folk science in Alabama and Mississippi in the 27 April 2011 tornado outbreak," *GeoJournal*, vol. 79, no. 6, pp. 791–804, Dec. 2014, doi: 10.1007/s10708-013-9518-6.
- [22] T. McGee and E. R. (Lisa) Langer, "Residents' preparedness, experiences and actions during an extreme wildfire in the Far North, Aotearoa New Zealand," *International Journal of Disaster Risk Reduction*, vol. 41, p. 101303, Dec. 2019, doi: 10.1016/j.ijdrr.2019.101303.
- [23] N. Obradovich, R. Migliorini, M. P. Paulus, and I. Rahwan, "Empirical evidence of mental health risks posed by climate change," *Proc Natl AcadSci USA*, vol. 115, no. 43, p. 10953, Oct. 2018, doi: 10.1073/pnas.1801528115.
- [24] E. Yamamura, "Natural disasters and their long-term effect on happiness: the case of the great Hanshin-Awaji earthquake," 2012.
- [25] A. Silver and J. Grek-Martin, "'Now we understand what community really means': Reconceptualizing the role of sense of place in the disaster recovery process," *Journal of Environmental Psychology*, vol. 42, pp. 32–41, Jun. 2015, doi: 10.1016/j.jenvp.2015.01.004.
- [26] K. Segal, J. Jong, and J. Halberstadt, "The fusing power of natural disasters: An experimental study," *Self and Identity*, vol. 17, no. 5, pp. 574–586, Sep. 2018, doi: 10.1080/15298868.2018.1458645.
- [27] K. Tanner, "Place attachment and place-based security: the experiences of red and green zone residents in post-earthquake Kaiapoi," Unpublished geography Dissertation, University of Canterbury, Christchurch, New Zealand, 2012.
- [28] C. Zheng, J. Zhang, Y. Guo, Y. Zhang, and L. Qian, "Disruption and reestablishment of place attachment after large-scale disasters: The role of perceived risk, negative emotions, and coping," *International Journal of Disaster Risk Reduction*, vol. 40, p. 101273, Nov. 2019, doi: 10.1016/j.ijdrr.2019.101273.
- [29] S. M. Low and I. Altman, "Place attachment: A conceptual inquiry," *Human Behavior & Environment: Advances in Theory & Research*, vol. 12, pp. 1–12, 1992.
- [30] S. Mazumdar, "Religious place attachment, squatting, and 'qualitative' research: A commentary," *Journal of Environmental Psychology*, vol. 25, no. 1, pp. 87–95, Mar. 2005, doi: 10.1016/j.jenvp.2004.09.003.
- [31] S. Mazumdar and S. Mazumdar, "Sacred space and place attachment," *Journal of Environmental Psychology*, vol. 13, no. 3, pp. 231–242, 1993.
- [32] E. C. Relph, *Place and placelessness*. Pion Limited, 1976.
- [33] M. C. Hidalgo and B. Hernandez, "Place attachment: Conceptual and empirical questions," *Journal of environmental psychology*, vol. 21, no. 3, pp. 273–281, 2001.
- [34] Y. Zhang, H.-L. Zhang, J. Zhang, and S. Cheng, "Predicting residents' pro-environmental behaviors at tourist sites: The role of awareness of disaster's consequences, values, and place attachment," *Journal of Environmental Psychology*, vol. 40, pp. 131–146, Dec. 2014, doi: 10.1016/j.jenvp.2014.06.001.
- [35] C. Anton and C. Lawrence, "The relationship between place attachment, the theory of planned behaviour and residents' response to place change," *Journal of Environmental Psychology*, vol. 47, May 2016, doi: 10.1016/j.jenvp.2016.05.010.
- [36] H. J. Boon, "Disaster resilience in a flood-impacted rural Australian town," *Natural Hazards*, vol. 71, no. 1, pp. 683–701, Mar. 2014, doi: 10.1007/s11069-013-0935-0.
- [37] E. A. Heide, "Common misconceptions about disasters: Panic, the disaster syndrome, and looting," *The first 72 hours: A community approach to disaster preparedness*, vol. 337, 2004.
- [38] I. Anguelovski, "From Environmental Trauma to Safe Haven: Place Attachment and Place Remaking in Three Marginalized Neighborhoods of Barcelona, Boston, and Havana," *City & Community*, vol. 12, no. 3, pp. 211–237, 2013, doi: 10.1111/cico.12026.
- [39] L. C. Manzo and D. D. Perkins, "Finding Common Ground: The Importance of Place Attachment to Community Participation and Planning," *Journal of Planning Literature*, vol. 20, no. 4, pp. 335–350, May 2006, doi: 10.1177/0885412205286160.
- [40] A. Maki, P. C. Dwyer, S. Blazek, M. Snyder, R. González, and S. Lay, "Responding to natural disasters: Examining identity and prosociality in the context of a major earthquake," *British Journal of Social Psychology*, vol. 58, no. 1, pp. 66–87, Jan. 2019, doi: 10.1111/bjso.12281.
- [41] I. Knez, A. Butler, Å. O. Sang, E. Ångman, I. Sarlöv-Herlin, and A. Åkerskog, "Before and after a natural disaster: Disruption in emotion component of place-identity and wellbeing," *Journal of Environmental Psychology*, vol. 55, pp. 11–17, 2018.
- [42] F. López-Martínez, S. Gil-Guirado, and A. Pérez-Morales, "Who can you trust? Implications of institutional vulnerability in flood exposure along the Spanish Mediterranean coast," *Environmental Science & Policy*, vol. 76, pp. 29–39, Oct. 2017, doi: 10.1016/j.envsci.2017.06.004.
- [43] Z. Kesetovic, P. Marić, and V. Ninković, "Crisis Communication of Local Authorities in Emergency Situations – Communicating 'May Floods' in the Republic of Serbia," *Lex localis - Journal of Local Self-Government*, vol. 15, Jan. 2017, doi: 10.4335/15.1.93-109(2017).
- [44] E. Uslaner, "Disaster and political trust: The Japan Tsunami and Earthquake of 2011," 2016.
- [45] S. Chantarat, S. Oum, K. Samphantharak, and V. Sann, "Natural Disasters, Preferences, and Behaviors: Evidence from the 2011 Mega Flood in Cambodia," *Journal of Asian Economics*, vol. 63, pp. 44–74, Aug. 2019, doi: 10.1016/j.asieco.2019.05.001.
- [46] A. De Juan, J. Pierskalla, and E. Schwarz, "Natural disasters, aid distribution, and social conflict – Micro-level evidence from the 2015 earthquake in Nepal," *World Development*, vol. 126, p. 104715, Feb. 2020, doi: 10.1016/j.worlddev.2019.104715.
- [47] S. H. Kang and M. Skidmore, "The Effects of Natural Disasters on Social Trust: Evidence from South Korea," *Sustainability*, vol. 10, Aug. 2018, doi: 10.3390/su10092973.
- [48] Z. Han, X. Lu, E. I. Hörhager, and J. Yan, "The effects of trust in government on earthquake survivors' risk perception and preparedness in China," *Natural Hazards*, vol. 86, no. 1, pp. 437–452, 2017.
- [49] R. Shupp, S. Loveridge, M. Skidmore, J. Lim, and C. Rogers, "Trust and Patience after a Tornado," *Wea. Climate Soc.*, vol. 9, no. 4, pp. 659–668, Jun. 2017, doi: 10.1175/WCAS-D-16-0135.1.
- [50] A. Barberopoulou and T. Tsiropoulos, "The fire of July 23rd, 2018 Mati, Attiki Greece: Lessons learned in the face of lacking crisis management," 2019.
- [51] S. Dafis, "The July 2018 Attica wildfires: Scientific report v1.1," 2018.
- [52] D. Blandford, "Burn Baby Burn" –Controlling the Risk of Wildfires in Greece, 2019.
- [53] C. Ruiz, B. Hernández, and M. Hidalgo, "Confirmation of the factorial structure of neighbourhood attachment and neighbourhood identity scale," *Psychology*, vol. 2, pp. 157–165, May 2011, doi: 10.1174/217119711795712586.
- [54] T. Q. Phan and E. M. Airoidi, "A natural experiment of social network formation and dynamics," *Proceedings of the National Academy of Sciences*, vol. 112, no. 21, pp. 6595–6600, 2015.
- [55] D. Clarke, C. Murphy, and I. Lorenzoni, "Place attachment, disruption and transformative adaptation," *Journal of Environmental Psychology*, vol. 55, pp. 81–89, Feb. 2018, doi: 10.1016/j.jenvp.2017.12.006.
- [56] C. Giannoulis, C. Skanavis and E. Karapatsiou, "Environmental

- Awareness: Environmental Accidents as an example to be avoided. A Summative International Analysis”, *Studies in Media and Communication*, vol.2, no1, pp. 38-48, 2014.
- [57] E. N. Vasdeki, M. I. Michail, K.C. Vratsanou, M. Botzori, K. Marini, V. Petreniti and C. Skanavis, “Emotional status affecting environmental decision making: the case of environmental video expose. Further implications on Tourism audiences,” 10th International Conference on Islands Tourism, Palermo, Italy, pp. 81–89, Jan. 2019.
- [58] F. Ric, T. Alexopoulos, D. Muller and B. Aubé. “Emotional norms for 524 French personality-trait words”, *Behavior Research Methods*, vol.45, pp. 414-421, 2013.
- [59] K. Papaspiliou, C. Skanavis and C. Giannoulis. “Civic Ecology Education and Resilient Societies: a Survey of Forest Fires in Greece”, *Journal of Education and Training Studies*, vol.2, no2, pp. 48-57, 2014.