Title: From dry land to water: Psychosocial impact on the lakeside villages of the Alqueva dam /Desde tierra firme al agua: Impacto psicosocial en los pueblos junto de la presa de Alqueva

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From dry land to water: Psychosocial impact on the lakeside villages of the Alqueva dam

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Acknowledgements:

We would like to thank Fátima Bernardo, Catarina Silva, Marta Barradas, Ana Carapinha, Catarina Gaspar, Inês Abreu, and Marta Castela for the collaboration on the study and for data collection. We would also like to thank the editors and two anonymous reviewers for their constructive comments and suggestions, which helped us to improve the manuscript.

From dry land to water: Psychosocial impact on the lakeside villages of the Alqueva dam

This quasi-experimental study focus on the psychosocial impact of the Alqueva dam on state-anxiety, residential satisfaction, and place identity of the inhabitants of four villages: Luz (forced to relocate), Estrela, (whose village became a peninsula), Amieira (whose village became a peninsula with a Marina), and Monsaraz (whose village started overlooking water). Psychosocial impact was analysed as a function of village and time. As expected, Luz evidenced the most negative psychosocial impact, as inhabitants showed higher anxiety, lower residential satisfaction towards village and house, and lower place identity. Results also evidence how changes in the immediate surroundings and landscape have significant psychosocial impact. Cross-sectional measures taken with a six-year interval evidenced no changes in time. Perceived public engagement, in particular perceived public communication and consultation, was related to greater adaptation in Luz, its role being discussed as a coping strategy. Results stress the need to manage the psychosocial impact of large projects.

Keywords: psychosocial impact, forced relocation, anxiety, residential satisfaction, place identity, public engagement.

Introduction

The construction of the Alqueva Dam in the interior southern region of Portugal, Alentejo, created the largest man-made lake in Europe. Villages formerly located in dry land, which for years suffered from serious drought periods, became lakeside villages. Although important to assure the sustainability of water demands, the implementation of such large projects, and the environment changes that come along with it, is bound to have an adverse impact on individuals and on the community.

Environmental Impact Assessment consists on identifying, evaluating, minimizing, and monitoring the different impacts of a project. Psychosocial impact can be assessed as a part of Social Impact Assessment. The psychosocial dimension allows anticipating how the perceptions of the project will influence the individual's health and well-being during and following the implementation of the project (Mata et al., 2003). It may also facilitate the communication with local individuals, and, therefore, facilitate decision making regarding the project (Carvalho et al., 2003; Mata et al., 2006). Despite such potential, Social Impact Assessment is frequently reduced to cost-benefit analyses of broad socio-economic impact and psychosocial impact is underestimated (Mata et al., 2006).

In this study we explored the psychosocial impact of three dam-related events: the forced relocation of an entire village, the changes in the immediate surroundings of two villages, and the changes in the landscape of one village. We expected results to evidence that the assessment of psychosocial impact should be performed on a regular basis.

Psychosocial impact

According to environmental stress approaches (e.g., Evans & Cohen, 1987), when an event is perceived as a threat in the life of individuals, stress processes are triggered and psychosocial impact might follow, affecting human health and well-being. Events tend to be considered more threatening the more undesirable, uncontrollable and unpredictable they are. As such, a dam installation might trigger psychosocial impact, depending on how threatening the individuals perceive it to be, and disturb the individuals' health and well-being. Over time people tend to adapt to stress-inducing events (Davison, Weiss, O'Keefe & Baum, 1991). In particular, research on dam-related forced relocations suggests that over time the individuals perceptions towards the project become more positive (Manatunge, & Takesada, 2013; Takesada, 2009).

Forced relocations have strong impact on anxiety, residential satisfaction, and place identity (e.g., Bernardo & Palma-Oliveira, 2005; Dekel & Tuval-Mashiach, 2012). Much less evidence is available regarding the impact of changes in the immediate surroundings and landscape. Although less threatening than forced relocations, changes in the immediate surroundings and landscape are still imposed and uncontrollable events for the local individuals. In addition, these changes appear to implicate part of the factors involved in forced relocations, namely the disruption of daily routine and the loss of familiar place and landscape (Dekel & Tuval-Mashiach, 2012). As such, it is reasonable to assume that changes in the immediate surroundings and landscape are also prone to have impact on anxiety, residential satisfaction, and place identity.

Anxiety. Anxiety can be defined as an unpleasant emotional response that arises when an event is assessed as threatening (Lazarus, 1991; Spielberger, 1983). It consists

of subjective feelings of tension, apprehension, nervousness, preoccupation, along with an activation of the autonomous nervous system. The intensity of the anxiety reaction will be proportional to the dimension of the perceived threat. Duration will depend on the persistence of the eliciting stimuli and the individual's experience in coping with similar circumstances.

Forced relocations have been recognized as a traumatic event, which can generate anxiety (Dekel & Tuval-Mashiach, 2012; Nuttman-Shwartz, Dekel, & Tuval-Mashiach, 2011). Imposed and uncontrollable changes in the immediate surroundings and landscape might also generate anxiety, although in lower magnitude than forced relocations.

Residential satisfaction. Residential satisfaction refers to the individuals' appraisal of the conditions of their residential environment in relation to their expectations. It includes satisfaction towards the place, house, and neighbors; and it reflects cognitive, affective and behavioral aspects (Amérigo & Aragonés, 1997).

Relocation studies have evidenced the subjective nature of residential satisfaction. It does not reflect mere instrumental aspects. Comparing the objective characteristics of places is not sufficient to infer residential satisfaction. Indeed, higher residential satisfaction relates to perception-type variables such as willingness to move (Day, 2013) and maintenance of social ties (Lucio & Barrett, 2010). Research has frequently evidenced that individuals forced to relocate decrease their residential satisfaction towards the new place, new house, and new neighbors (e.g., Bernardo & Palma-Oliveira, 2005). However, if neighborhood networks are preserved, it is reasonable to expect no negative impact on residential satisfaction towards neighbors.

Place identity. Place identity mirrors the importance of the physical environment, and of the occurring interactions, on the individuals' identity (Bernardo & Palma-Oliveira, 2012).

Several studies evidenced that relocations, particularly forced relocations, collapse the individual's physical and social environments, lowering place identity (Bernardo & Palma-Oliveira, 2005; Dekel & Tuval-Mashiach, 2012). Changes in the immediate surroundings and landscape will also alter the physical environment and can alter the occurring interactions. Therefore, such changes might also decrease the place identity of individuals, although in lesser extent than forced relocations.

Current Study

Objectives. This was a quasi-experimental study. The goal was to illustrate that the implementation of a large project can have differential impact on the individuals' responses of psychosocial nature that can be theoretically expected and, therefore, can be minimized.

Additionally, we explore the role of perceived public engagement on the dam project as a mitigating measure of psychosocial impact. Public engagement might mitigate psychosocial impact by enhancing the individual's perception of predictability and control over the dam-related changes. It refers to different practices of involving members of the public in the decision-making processes. Rowe and Frewer (2005) distinguished three levels of engagement based on the flow of information: public communication, consultation, and public participation. In this study we focused on the effects of perceived public communication and consultation.

Context. The psychosocial impact of the Alqueva dam was analyzed on four villages over time. The Luz village remained below the water level of the dam. A new Luz village was built within 3km away, and all 373 inhabitants (Instituto Nacional de Estatística [INE], 2001) were forced to relocate. The new village fairly reproduced the main characteristics of the old village. The relative sizes and locations of the houses were maintained, allowing for some continuity of neighbor relationships. The other villages suffered comparatively less changes. Estrela, a small land village with circa 125 inhabitants (1094 in the town; INE, 2001), progressively became a peninsula. The dam water reached up to 40m from the houses, changing the immediate surrounding environment of the village. Amieira, a circa 436 inhabitant's village (INE, 2001), was also surrounded by water, but kept all main land accesses. The Alqueva Dam boosted touristic development in Amieira, where a Marina was inaugurated in 2007. Monsaraz, a small medieval walled village, located on the top of a hill with circa 60 inhabitants (977 in the town; INE, 2001), started overlooking the Alqueva instead of dry land.

To explore how individuals adapted to the dam impact, a first round of data was collected in 2003, one year after the opening of the Alqueva dam, the consequent relocation of the Luz village inhabitants, and the landscape changes on the lakeside villages (T1). A second round of data was collected with an independent sample six years later, in 2009 (T2), thus allowing a between-subject analyses of the dam impact over time.

Hypotheses. The magnitude of the psychosocial impact was expected to correspond to the magnitude of the changes imposed by the dam on each village, being higher on the relocated Luz inhabitants and lower on Monsaraz' inhabitants, which had

a new hilly landscape. Psychosocial impacts were also expected to diverge as a function of time, as a positive adaptation should relate to a decrease of these impacts in time.

We posed the following hypotheses.

Anxiety. We expected anxiety to be higher in Luz (forced relocation), followed by Estrela (changes in the immediate surroundings), Amieira (changes in the immediate surroundings but also touristic development), and Monsaraz (landscape changes) (hypothesis 1.1); and to be higher at T1 than at T2 (hypothesis 1.2).

Residential satisfaction. We anticipated residential satisfaction towards the place, i.e., towards the village, to be lower in Luz (forced relocation), followed by Estrela (changes in the immediate surroundings), Amieira (changes in the immediate surroundings but also touristic development), and Monsaraz (landscape changes) (hypothesis 2.1); and we expected residential satisfaction towards the village to be lower at T1 than at T2 (hypothesis 2.2).

We further expected residential satisfaction towards the house to be lower in Luz, due to the forced relocation to a new house, than in the other villages (hypothesis 2.3); and to be lower at T1 than at T2 in Luz (hypothesis 2.4).

We predicted to find no differences in residential satisfaction towards the neighbors as a function of village (hypothesis 2.5) or time (hypothesis 2.6), as neighbor's networks were preserved in the new Luz village.

Place identity. We expected place identity to be lower in Luz (forced relocation), followed by Estrela (changes in the immediate surroundings), Amieira (changes in the immediate surroundings but also touristic development), and Monsaraz (landscape

changes) (hypothesis 3). Since data regarding this variable was only collected on T2, over time change was not contemplated.

Perceived public engagement. We predicted that higher perceived public engagement might enhance predictability and control over the dam-related changes and, therefore, relate to lower state-anxiety, higher residential satisfaction, and higher place identity (hypothesis 4).

Method

Sample

One hundred and seventy-four inhabitants of the four villages (52.7% male) aged between 18 and 91 (M = 53.58; SD = 18.47) participated in this study. Two independent samples were surveyed at T1 (N = 67) and at T2 (N = 100). The distribution and characteristics of participants by village are shown on Table 1. All participants responded voluntarily after being informed of the study goals and being assured of the anonymity and confidentiality of the data.

[Insert Table 1 around here]

Tools

State-Trait Anxiety Inventory - Form Y. STAI questionnaire (Spielberger, 1983) is a commonly used measure of anxiety in adults. Form Y is composed by 40 statements. Twenty items assess the temporary condition of state anxiety (e.g., "*I am worried*") and the other 20 assess the more general and long-standing quality of trait anxiety (e.g., "*I am a steady person*"). The current study focused on state-anxiety, since

it intends to measure anxiety as a response to a situational event. Respondents are asked to rank all statements on a scale of 1 to 4 (e.g., from "*Almost Never*" to "*Almost Always*"). Levels of anxiety are measured by summing all items. The coding and standardization of results was performed according to age and gender (Spielberger, 1983). The Portuguese translation used in the current study by Santos and Silva (1997) shown a very satisfactory internal consistency index (α = .92).

Residential satisfaction. Based on the previous work of Abreu (1997), a residential satisfaction survey was specifically designed for the current study. It consisted of 19 Likert-type items whose response scale ranged from 1 to 5. After statistical analysis of internal consistency, items were averaged into composite measures. Satisfaction towards the *village* included four items, such as "*How satisfied are you with your village landscape?*" (α = .74). Satisfaction towards the *house* gathered nine items, such as "*Your house is*", answered on a scale from "*Very comfortable*" to "*Very uncomfortable*" (α = .81). Satisfaction towards the *neighbors* was measured by the item "*How are the relationships with your neighbors?*".

Place identity. Gathered three items, such as "*Do you feel you belong to your village?*" (α = .78).

Perceived public engagement. Included perceived public communication, measured through the individuals' perception of information provision ("*How much information have you received about the changes that were going to happen?*"), and perceived consultation, measured through the individuals' perception of required collaboration ("*Was your collaboration required along this process?*"). Items were averaged into a composite measure of perceived public engagement (α = .74).

Procedure

Data was prospectively collected in 2003 (T1) and in 2009 (T2). Data from T2 was collected with a different sample of inhabitants from the four villages, so time comparisons are between-subjects. Participants were approached on the street and door to door on each village and surveyed face to face.

Results

Differential impact of the Alqueva dam on the villages and on time

Two-way ANOVAs were conducted to examine the effects of village and time on anxiety and residential satisfaction. Results revealed main effects of village on all psychosocial variables, with the anticipated exception of residential satisfaction towards neighbors (see Table 2). Overall, results grossly confirmed our expectations regarding the effect of the village on the psychosocial variables.

Main effects of time did not emerge, so none of the time related hypotheses (1.2, 2.2, and 2.3) were confirmed. Contrary to our expectations, time did not lead to a decrease in anxiety or to an increase in residential satisfaction.

Place identity data was only collected on T2. A one-way ANOVA was used to test the effects of village (Table 2).

[Insert Table 2 around here]

Anxiety. Anxiety was moderate/high for all the villages. There was a little effect of village on anxiety, with pairwise comparisons evidencing a higher level in Luz than in Amieira. The environment changes caused by the dam had a similar negative impact

on the anxiety of the inhabitants of Luz, Estrela and Monsaraz. Hypothesis 1.1 was thus partially confirmed (see Table 2).

Anxiety was higher among the relocated Luz inhabitants than among Amieira inhabitants. Touristic development may have buffered the negative impact of environmental changes in Amieira. This result stresses the importance of facilitating coping strategies when planning and monitoring the implementation of such large projects.

Residential satisfaction. Satisfaction towards the village was descriptively lower in Luz, followed by Estrela, Amieira, and Monsaraz. Village had a medium effect on residential satisfaction towards the village. Pairwise comparisons evidenced differences among all villages except between Amieira and Monsaraz. Therefore, hypothesis 2.1 was partially confirmed. Results mirror the magnitude of the environmental changes caused by the dam.

Hypothesis 2.3 was partially confirmed. Village had a small effect on residential satisfaction towards the house. Pairwise comparisons evidenced that it was lower in Luz in comparison with Estrela, and in comparison with Monsaraz. However, no differences emerged between Luz and Amieira. The fact that satisfaction towards the house was as low in Amieira as in Luz was unexpected. It is probably related to other contextual variables, such as infrastructural characteristics, which were not screened in the current study.

Hypothesis 2.5 and 2.6 were confirmed. Neither village nor time had effect on residential satisfaction towards the neighbors. The preservation of neighborhood

networks on the relocation of Luz inhabitants seems to have worked. The fact that the rupture in neighborhood networks was minimized may have buffered the anxiety of the relocated individuals, thus helping to explain why state-anxiety levels were not significantly higher among Luz inhabitants in comparison with Estrela and Monsaraz.

Place identity. Village had a medium effect on place identity. Pairwise comparisons evidenced that place identity was lower in Luz than in the other villages. However, there were no differences between Estrela and Amieira and between Amieira and Monsaraz. Thus, hypothesis 3 was partially confirmed.

Place identity loss was higher for Luz than any other village. This study evidences that forced relocations have an impact in place identity, replicating previous studies (e.g., Bernardo & Palma-Oliveira, 2005). There is not much research on the impact of environmental changes on place identity. The present results suggest that changes in the immediate surroundings and landscape are less likely to impact place identity than forced relocations.

Coping with the impact of the Alqueva dam: The role of perceived public engagement

A hypothesis 4 was partially corroborated for the Luz village (Table 3). Higher levels of perceived public engagement correlated strongly with higher levels of satisfaction towards the village, and correlated moderately/strongly with higher levels of satisfaction towards neighbors and house and with lower levels of state-anxiety. Perceived public engagement, in particular perceived communication and consultation, appears to have been a coping strategy that facilitated adapting to the forced relocation by buffering impact on anxiety and residential satisfaction. It probably enhanced Luz inhabitant's

perceptions of control and feedback on particular appraisals and psychological responses. However, no significant relation was found between perceived public engagement and place identity. Perceived public engagement might not have been enough to counter the strong negative influence of forced relocation on place identity.

[Insert Table 3 around here]

In Estrela, Amieira, and Monsaraz there was no relationship between perceived public engagement and psychosocial variables. We analyzed if there were differences on perceived public engagement among villages that could justify these results. ANOVA evidenced that perceived public engagement in Luz (M = 2.55; SD = 1.15) was superior to Monsaraz (M = 1.87; SD = 0.86). However, Luz results did not differ from Estrela (M = 2.90; SD = 1.21) and Amieira (M = 1.98; SD = 0.96; $F(3,163)$ = 8.12, $p < .001$, η^2 =. 130). So, differences on the perceptions of public engagement apparently cannot explain the latter results. It is reasonable to interpret that the influence of the perception of public engagement on residential satisfaction and anxiety was more evident in inhabitants from Luz simply because they had a greater need to cope.

Discussion

In this study we focused on the psychosocial impact of the Alqueva dam installation over time on four differentially affected villages. Results replicate previous findings regarding the negative and lasting impact of relocation on anxiety, residential satisfaction and place identity (e.g., Bernardo & Palma-Oliveira, 2005). Results also give new and less common evidence on the psychosocial impact of changes in the

immediate surroundings and landscape. Although also related to high anxiety, these changes seem to be more related to lower satisfaction towards the place of residence.

We found greater psychosocial impact on the villages where the dam caused greater changes and offered no benefits. The benefits of touristic development in Amieira appear to have been used as a coping strategy to reevaluate the threat posed by changes in the immediate surroundings, thus minimizing psychosocial impact. Indeed, providing adequate compensations seems to allow individuals to overcome the negative consequences of dam projects (see Manatunge & Takesada, 2013). The similar levels of satisfaction towards the village in Amieira and Monsaraz may also be a reflection of the positive effects of tourism. Tourism might have raised the satisfaction in Amieira to the levels found in Monsaraz.

The preservation of neighborhood networks on the relocation of Luz inhabitants illustrates a good practice in forced relocation situations. Many studies have documented that when neighborhood networks are not preserved there is a decrease in residential satisfaction towards the (new) neighbors (e.g., Bernardo & Palma-Oliveira, 2005). In addition, residential satisfaction towards neighbors allows for social support, and social support can have strong buffering effects on stress (e.g., Cohen & Wills, 1985). It is probably more difficult to get support from new neighbors than from familiar neighbors. Therefore, neighborhood networks should always be preserved.

We found no evidence of better adaptation over-time. For six years, anxiety appears to have remained moderate/high and residential satisfaction towards the village and house remained on a medium level. Results show how a forced relocation, new

environments, and new landscapes, may threaten individuals and pose a lasting challenge to the adaptation process. It is likely that six years is not enough to improve adaption. Indeed, studies that found signs of improvement in adaptation in dam projects relied on much longer time periods (Manatunge & Takesada, 2013; Takesada, 2009).

A large body of research shows cognitive and emotional benefits of the presence of water (e.g., White et al., 2010). Viewing water scenes may have a restorative effect, reducing stress and promoting positive moods and feelings. This was not the case for this study.The dam-project filled the environment with water scenes. However, anxiety and satisfaction towards villages did not change in time. One could argue this is due to the problems caused by the dam installation. Nonetheless, even in Monsaraz, a village where changes were only felt on landscape, residential satisfaction did not increase and anxiety did not decrease. The fact that all changes were imposed and uncontrollable by the individuals may help understand why water scenes did not have a restorative effect. Instead of being restorative, water might have been perceived as an unwanted and artificial element that took the place of dry land.

Regarding practical implications, results shed light on the importance of carefully considering the psychosocial dimension on Environmental Impact Assessments. By preventing and managing psychosocial impact, the psychosocial costs of stress-inducing projects can be minimized. By knowing which areas are more vulnerable and how they can be protected, a better planning and monitoring can be set in motion.

Results also stress the need to invest in public engagement. Meaningfully engaging local people during each step of the project can facilitate coping. The study

illustrates positive effects of perceived engagement, in particular of perceived public communication and consultation. However, it must be acknowledged that this study focused on perceptions, which may or may not reflect the actual practices of public engagement that were implemented. For instance, a perception of little information may mean that little information was provided, but it may also mean that the provided information did not successfully reach the public. Also, the perception of consultation does not measure the extent to which inhabitants responded to the required collaboration. Future studies could explore the relation between engagement perceptions and practices, as well as its relation with public engagement effectiveness. Future studies could also explore the mitigating effects of public participation, which is the highest level of public engagement, and was not examined in this study.

Further limitations should be pointed out. Its cross-sectional design did not allow for proper analyses of change over-time, so future studies are advised to use a longitudinal multi-wave method with intra-individual observations. Also, although the sample represented a considerable proportion of the inhabitants of each village, the number of participants was small, particularly for T1. Despite limitations, this quasi-experimental study can be considered a “starting point” for future studies addressing how environment changes can have a differential and lasting psychosocial impact on individuals. A better understanding and empirical demonstration of the potential role of public engagement as an adaptive factor is also worth further research.

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Table 1

Distribution and characteristics of the participants by village

Village	Dam-related change	Time		Age		Gender	
		N (%)		*M (SD)*		*N* (%)	
		T1	T2	T1	T2	Male	Female
Luz	Forced relocation	19 (28.4)	29 (29.0)	49.00 (17.45)	40.55 (19.10)	24 (50.0)	24 (50.0)
Estrela	Immediate surroundings	19 (28.4)	26 (26.0)	58.89 (10.35)	53.13 (23.94)	22 (48.9)	23 (51.1)
Amieira	Immediate surroundings; tourism	12 (25.4)	31 (31.0)	56.58 (22.35)	52.23 (19.70)	10 (32.3)	21 (67.7)
Monsaraz	Landscape	17 (17.9)	14 (14.0)	57.17 (16.02)	59.64 (14.47)	32 (74.4)	11 (25.6)

Note. $N = 167$

Table 2

Descriptive statistics and ANOVA results for anxiety, residential satisfaction and local identity by village

	M(SD)			
Variable	Anxiety	RS Village	RS House	RS Neighbors	Local Identity
Luz	57.85(13.48)[a]	3.08(0.96)[a]	3.54(0.55)[a]	4.25(0.56)[a]	3.17(0.76)[a]
Estrela	55.51(10.82)[a,b]	3.66(0.62)[b]	4.01(0.38)[b]	4.31(0.51) [a]	3.80(0.52)[b]
Amieira	51.60(9.75)[b]	4.14(0.63)[c]	3.81(0.58)[a,b]	4.23(0.57) [a]	4.15(0.65)[b,c]
Monsaraz	53.26 (10.85) [a,b]	4.35(0.48)[c]	3.93(0.37)[b]	4.16(0.64) [a]	4.52(0.71)[c]

	Anxiety		RS Village		RS House		RS Neighbors		Local Identity	
Source	*F*(3,159)	$\eta_p 2$	*F*(3,159)	$\eta_p 2$	*F*(3,159)	$\eta_p 2$	*F*(3,159)	$\eta_p 2$	*F*(3,96)	$\eta_p 2$
Village	3.12*	.056	23.69***	.309	8.29**	.135	0.34	.006	16.94***	.346

Notes. RS = Residential Satisfaction. Anxiety ranges from 20 to 80; other variables from 1 to 5. Anxiety and residential satisfaction were submitted to two-way ANOVAs for village and time; local identity was submitted to a one-way ANOVA for village. Means with different superscript letters, within the same column, are significantly different from each other (Tukey's HSD, $p < .050$).

*$p < .050$, **$p < .010$, ***$p < .001$

Table 3

Correlations between perceived public engagement and psychosocial measures in Luz

Variable	Perceived public engagement
State Anxiety	.-37*
RS Village	.51***
RS House	.40**
RS Neighbors	.34*

Note. RS = Residential Satisfaction. Perceived public engagement gathers perceived public communication and perceived consultation.

* $p < .050$, ** $p < .010$, ***$p < .001$