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ORIGINAL ARTICLE

Social capital and citizen perceptions of coastal management for tackling climate change impacts in Greece

N. Jones · S. Koukoulas · J. R. A. Clark · K. I. Evangelinos · P. G. Dimitrakopoulos · M. O. Eftihidou · A. Koliou · M. Mpalaska · S. Papanikolaou · G. Stathi · P. Tsaliki

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Abstract There is a growing consensus among researchers that social aspects and the involvement of local communities play a critical role in public decision-making processes in the coastal zone. Social capital is a parameter which has recently gained significant attention in this context. It is regarded that it has a significant influence on the adaptation capacity of local communities to climate change impacts. The present paper aims to contribute to this field through an examination of citizens' perceptions of three coastal zone management policies (hold the line, managed realignment and no active intervention) along with the influence of social capital on the level of social acceptability for these proposed policy options. For this purpose, a quantitative empirical study was conducted for the first time in five coastal areas of Greece that are regarded as high flood-risk areas due to sea-level rise. Respondents demonstrated that they are willing to accept changes in their social and natural environments in order to confront sea-level rise and are more positive towards the managed realignment option, as long as this is accompanied by financial compensation for those whose properties will be affected. Regarding the influence of social capital, through the results of an ordinal regression, it was observed that institutional and social trust influence positively citizens' level of agreement for the managed realignment policy. Furthermore, respondents who believe that a sense of reciprocity exists in their community are also more willing to accept active intervention policies.

Keywords Coastal management policies · Social trust · Institutional trust · Social norms · Citizens' perceptions

N. Jones (✉) · K. I. Evangelinos · P. G. Dimitrakopoulos · M. O. Eftihidou · A. Koliou · M. Mpalaska · S. Papanikolaou · G. Stathi · P. Tsaliki
Department of Environment, University of the Aegean, Lofos Panepistimiou, 81100 Mytilene, Greece
e-mail: nikoletajones@gmail.com; nikoleta.jones@open.ac.uk

Present Address:
N. Jones
Department of Geography, Open University, Walton Hall, Milton Keynes MK7 6AA, UK

S. Koukoulas
Department of Geography, University of the Aegean, Lofos Panepistimiou, 81100 Mytilene, Greece

J. R. A. Clark
School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

Introduction

Increasingly, governments in developed and developing economies are having to devise effective and efficient coastal management policies to address sea-level rise (Turner et al. 2007; Hinkel et al. 2010; Nicholls 2011). This is a challenging task given the tremendous variety of projected climate change impacts, including environmental, economic and social issues (Rosenzweig and Parry 1994; Thomas et al. 2004; Patz et al. 2005). However, setting aside the diversity of problems and variability of national cultural and economic contexts, the suite of strategic policy approaches in the coastal zone is seemingly very straightforward. These are the construction and maintenance of sea defences, no active intervention or managed realignment (Myatt et al. 2003a, b; Defra 2004; Ledoux et al. 2005; Niven and Bardsley 2012). No active intervention is recommended where further policy

measures are considered neither financially nor environmentally sustainable (Defra 2004).

There is now growing consensus among researchers that social aspects and the involvement of local communities play a critical role in public decision-making processes and adaptation to climate change (Myatt-Bell et al. 2002; Adger 2003; French 2004; Ledoux et al. 2005; Lorenzoni et al. 2007; Milligan et al. 2009; Buys et al. 2012; Koerth et al. 2013). In particular, several issues need greater consideration and analysis as part of climate change and coastal zone policy planning and implementation, such as the level of adaptiveness of local communities and the range of social and cultural factors influencing this adaptation (Lorenzoni et al. 2007; Jones and Clark 1997; Wolf et al. 2010; Schmidt et al. 2012). Moreover, it is important to examine public perceptions of proposed coastal management policies, and specifically what factors and processes determine these perceptions (Myatt-Bell et al. 2002; Myatt et al. 2003a, b; Adger 2003; Leiserowitz 2006). Such examination is necessary as social characteristics and values have a significant influence on how proposed adaptation policies at the coast will be perceived, and what limitations might occur during implementation (Leiserowitz 2006; Adger et al. 2009). Social capital is a parameter which has recently gained significant attention in this context (Adger 2001, 2003; Clark and Clarke 2011; Clark and Semmahasak 2012; Pelling and High 2005; Wolf et al. 2010; Nam 2011). Social capital may be defined as a multidimensional concept consisting of cognitive and structural elements such as social trust and reciprocity, institutional trust and social networks (Coleman 1990; Sabatini 2009; Sander and Putnam 2010). Consequently, it may significantly assist in clarifying public adaptation issues and processes (Thornes et al. 2010; Pelling and High 2005). However, to date, published studies mainly connect social capital with citizens' engagement on climate change. The present paper aims instead to investigate citizens' perceptions of proposed coastal management policies and the means by which social capital influences the level of social acceptability of, and potential satisfaction with, these policies. This exploration is undertaken here through the implementation of a large-scale quantitative empirical study conducted in five coastal areas of Greece that are regarded as high flood-risk areas due to future projections of sea-level rise.

The influence of social capital on coastal management policies

A wide range of definitions of social capital exist in academic literatures (Coleman 1990; Sabatini 2009; Sander and Putnam 2010). Here we focus on the three main indicators of social capital that are most commonly used in the literature: social trust and reciprocity, institutional trust and social networking (see Narayan and Cassidy 2001; van Oorschot et al. 2006; Sabatini 2009; Jones et al. 2012a).

In general, social capital is regarded as having a positive influence on the management of natural resources (Pretty 2003; Jones et al. 2012a), and aspects of it have been connected with climate change and coastal management issues (Adger 2003; Myatt et al. 2003a, b; Lorenzoni et al. 2007; Ostrom 2009). In particular, the level of trust in institutions involved in coastal management processes is expected to significantly influence the effectiveness of policy implementation (Rothstein 2005; Ostrom 2009). Specifically, the level of engagement with climate change issues is influenced by citizens' perceptions and trust in the actions taken by relevant public policy actors at local, national and international level (Wong and Zhao 2001; Lorenzoni et al. 2007). Trust in the actions of public policy actors on climate change is a vital component in understanding individuals' behaviour concerning climate change adaptation, especially if these actors are questioned for their reliability and effectiveness (Stoll-Kleemann et al. 2001). Furthermore, citizens with higher levels of trust towards public actors are also expected to be more positive towards proposed policies which might result in significant change, such as managed retreat (Myatt et al. 2003a, b). On the other hand, scepticism over how efficiently a project might be managed will affect citizens' perceptions of a proposed policy (Myatt et al. 2003b). Similarly, the implementation of previous unsuccessful policies for climate change adaptation results in a significant decrease in support of policies due to the low level of trust in institutions (Wong and Zhao 2001).

Moreover, successful implementation requires policies to engender a widespread belief that all targeted parties will comply fully (Ostrom 2009). Here, high levels of social trust are essential. Thus, with respect to climate change, it has been claimed that level of engagement is influenced by perceptions of the level of engagement of other individuals, and levels of trust that these individuals will comply with policy requirements (Lorenzoni et al. 2007). Similarly, in cases where relationships of trust are highly developed, norms of reciprocity for the protection of common pool resources are also strongly evident (Coleman 1990), thus facilitating policy implementation.

Finally, social networks are an important structural element of social capital (Coleman 1990). In general, networks are regarded as having a positive influence on environmental policy implementation by facilitating the flow of relevant information to stakeholders (Jones et al. 2012a). Participation in organizations has been linked to a higher level of awareness for coastal management policies (Myatt et al. 2003a, b). As a consequence, denser social networks may facilitate adaptation to climate change of

communities (Deressa et al. 2009) while a denser flow of information through these networks may also lead to a higher level of social acceptability (French 2004). However, networks are not always linked positively with climate change adaptation (Wolf et al. 2010; Schluter et al. 2010), confirming the need for further research.

Taken together, these studies strongly suggest, social capital has a significant impact on the adaptation capacity of local communities to climate change impacts. Furthermore, from the above discussion, it can be inferred that higher levels of social capital will have a positive influence on the public acceptance of environmental policies. The present paper aims to contribute to this field of inquiry through detailed examination of the following issues:

(a) perceptions of citizens who live in coastal areas, of three coastal zone management policies in Greek study areas which will be at risk in future due to sea-level rise.
(b) the influence of social capital parameters on the level of social acceptability for the proposed coastal management policies, and
(c) the influence of social capital as an aggregate indicator on respondents' perceptions of the proposed policies.

The selection of the proposed policies was influenced by coastal mitigation and adaptation schemes, which are currently under discussion or being implemented in several regions internationally (Defra 2004; Department of Climate Change, Australian Government 2009; Delta Committee 2008; Mangone 2010). Policies included in fieldwork included two prioritizing active intervention: 'hold the line' (HTL) (Filatova et al. 2011; Roca and Villares 2012) and 'managed realignment' or 'managed retreat' (MR) (Apine 2011; Roca and Villares 2012; Mangone 2010; Titus and Craghan 2009), and one default policy where no action is taken, that is 'no active intervention' (NAI) (Defra 2004).

Methods

Description of study areas

In order to investigate the above issues, five coastal areas were selected in Greece for empirical research. The pressing need for public policy research on coastal issues in Greece is demonstrated by the fact that while the country is expected to face significant impacts from sea-level rise in the future (Mimikou et al. 1999; National Bank of Greece 2011), no national or regional strategy has been implemented so far in order to prepare and address projected climate change impacts (Kontogianni et al. 2012). Up until now, the main policy to address coastal erosion incidents and storm surges was to build sea defences in harbour areas (cases studies reported in National Bank of Greece 2011). Due to the pressing need to plan and implement policies for climate change adaptation in Greece, a managed retreat policy with a restriction zone up to 100 m is now being considered (Hellenic Republic 2010).

The main criterion of selection of the research areas was that they were all at high risk of inundation due to sea-level rise and consequently may face significant flooding incidents in the future. We used the SRTM 90 m digital elevation model (Jarvis et al. 2008) for Greece and highlighted the areas under 1 m (Fig. 1). Areas with more 'flooded pixels' were selected as the study areas. Further refinement of the areas has taken place in order to represent a wide spectrum of social and environmental characteristics. Specifically, three study areas included cities next to wetlands of international importance. The first of these included the areas of Kavala and Keramoti, (population: 78,190) close to the National Park of Eastern Macedonia and Thrace. The second area included the cities of Mesologgi and Aitoliko (population: 25,988) situated next to Mesologgi-Aitoliko Lagoons National Park. The third study area was the city of Thessaloniki, Greece's largest coastal city (population: 790,824) and is next to the National Park of Axios–Loudias–Aliakmonas Delta. Furthermore, areas from the first and the third largest Greek islands were selected, Crete and Lesvos. These were the coastal city of Chania on Crete (population: 53.373) and also the coastal cities of Mytilene and Kalloni in Lesvos (population: 30,096). In both areas, significant tourism activities take place in the coastal zone. Selected areas are shown in Fig. 1.

Description of the questionnaire

The questionnaire used was divided into three parts and included mainly closed questions. The first considered respondents' perceptions of climate change generally, while the second investigated their perceptions of the three proposed coastal management policies (Table 1). For each policy, the level of satisfaction was explored along with respondents' perceptions of the relative benefits and disadvantages of each. In the questionnaire's introduction, the likely impacts of climate change in Greece were explained to respondents and, in particular what are the most important impacts expected in the coastal regions of Greece. They were then asked to assume that in 2060, climate change impacts will have significantly increased and as a community, they will have three options:

First policy, hold the line (HTL) Construction of defences with the aim of preventing flooding in the area. These will be financed using money raised through additional taxes.

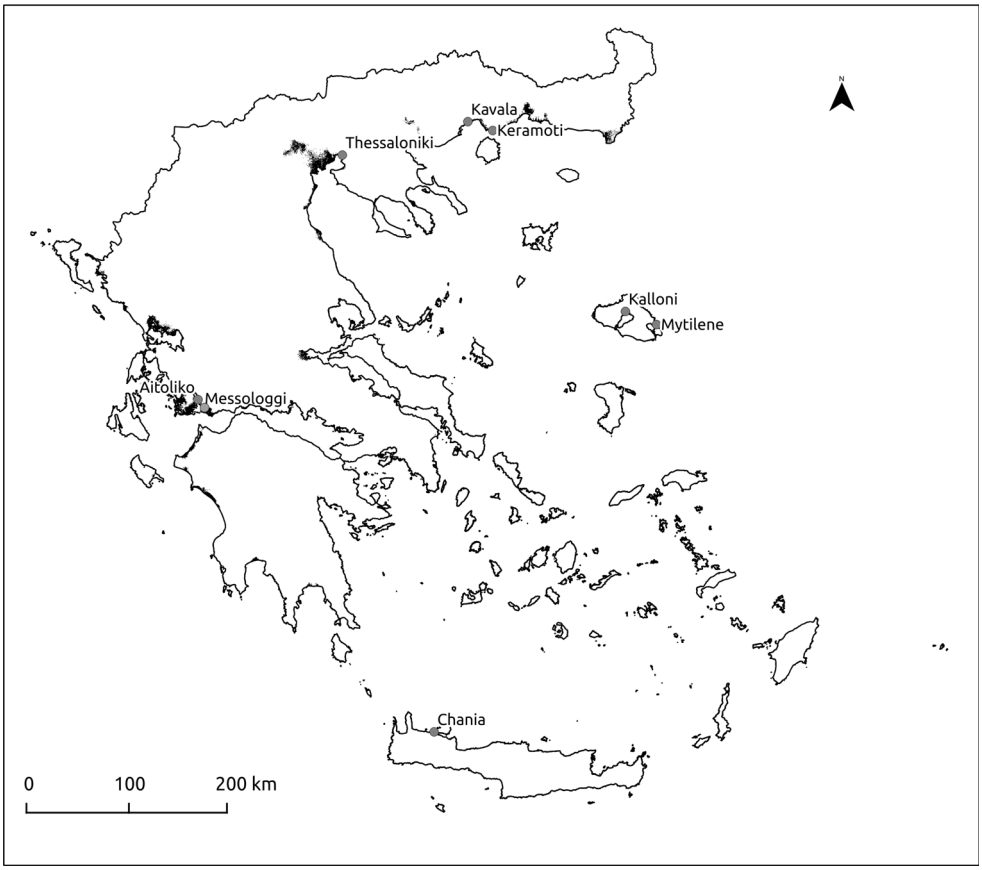

Fig. 1 Locations of the study areas in Greece. Areas *shaded* as *black* are those at high risk of inundation due to 1-m sea-level rise

Second policy, managed realignment (MR) Controlled flooding will be allowed in certain agricultural areas in order to naturally protect other zones from flooding. Compensation will be given to individuals having land or property in the area.

Third policy, no active intervention (NAI) No active intervention in the area. No defences will be constructed; thus, several parts of the mainland will be flooded. No compensation will be given to citizens who lose their property.

A time projection of 50 years was selected because current climate change models suggest that it is during this period that substantive negative effects are expected to occur in the Greek coast (National Bank of Greece 2011).

Finally, the third part of the questionnaire set out social capital questions, as they are commonly used in the international literature (van Oorschot et al. 2006; Narayan and Cassidy 2001). In Table 2, the main social capital questions are presented along with descriptive statistics in order to contextualize the results that follow.

Sample

The questionnaire was distributed in the study areas during spring and summer 2011 by researchers who were appropriately trained prior to the survey. Due to the absence of detailed population sample lists, it was decided that the distribution of the questionnaires would be based on geographical criteria. Specifically, after determining the geographical zone where the questionnaires would be distributed in each urban area, specific streets where the questionnaires would be distributed were selected on the basis of their closeness to the coast. Initially respondents were approached in streets adjacent to the coastal zone, followed by consecutive sampling in the next parallel roads. Throughout the survey, researchers examined carefully the distribution of the demographic characteristics in their sample and checked whether these were in accordance with those of the total population. In total, 1504 questionnaires were administered (Lesvos: 250, Chania-Crete: 250, Mesologgi: 244, Kavala: 250, Thessaloniki: 510). The final sample size in each area was determined by estimating a confidence interval of 95 % and a maximum confidence level of 6 in relation to the total sampling frame. The main

Table 1 Variables in the questionnaire

	Question	Answer
Perceptions on climate change	How worried are you about climate change	4-point scale (1: not at all 4: very)
	Do you believe that there is climate change	Yes/no/don't know
	If yes who is responsible for climate change	Human activities/natural processes/ both
Level of agreement	Do you agree with the implementation of the proposed policy	5-point scale (5: highest agreement)
Benefits		
HTL	Protection of biodiversity	4-point scale (1: not at all important 4: very important)
	Maintenance of tourism capacity in the area	
	Maintenance of all recreation activities on the coastal area	
	Protection of houses	
	Protection of agricultural lands	
	Protection of industrial activities	
MR	Protection of biodiversity in several areas	
	Maintenance of tourism capacity in the area	
	Continuation of most recreational activities	
	Protection of houses	
	Protection of industrial activities	
	Low construction cost (compared to 1st policy)	
	Possible further flooding in the future	
	Loss of species in the flooded areas	
NAI	No costs for citizens from policies	
Disadvantages		
HTL	Tax burden on citizens	4-point scale (1: not at all important 4: very important)
	High construction costs	
	High maintenance costs	
MR	Flooding of some agricultural lands	
	Possible further flooding in the future	
	Loss of species in the flooded areas	
NAI	Flooding of coastal areas	
	Damages in house properties	
	Damages in industries	
	Damages in agricultural areas	
	Loss of biodiversity	

characteristics of the sample are presented in Table 3. The demographics of the sample accord closely with the respective national percentages (Hellenic Statistical Authority 2001; OECD 2010).

Data analysis

Survey data were conducted using appropriate statistical packages. Correlations between ordinal variables were explored with the Spearman's correlation coefficient, while connections between dichotomous and ordinal variables were measured with the chi-square test. In order to investigate the influence of social capital variables as an aggregate indicator on the level of agreement, ordinal regressions were implemented. The new aggregate measure was created through confirmatory factor analysis (CFA) and assists in exploring the influence of social capital overlooking the significant correlations presented among its parameters (van Oorschot et al. 2006; Jones et al. 2012a). Social capital indicators were combined into four

Table 2 Social capital questions and descriptive statistics

Trust in	Mean (SD)	Median
Government	1.55 (0.72)	1.00
European Union (EU)	2.17 (0.87)	2.00
Local communities	2.32 (0.91)	2.00
Fellow citizens	2.61 (0.94)	3.00
Private sector	1.84 (0.84)	2.00
Most people can be trusted or you can't be too careful (generalized trust)	5.00 (2.38)	5.00
	Positive answer (%)	
Trust in the support of your neighbours in case of flood	61.8	
Trust in the support of your friends/relatives in case of flood	76.3	
Member in NGO in the past 12 months	22.3	
Volunteer in NGO in the past 12 months	24.9	
Information on local council's decision	56.5	

Table 3 Sample characteristics

	%
Educational level	
<6 years	10.4
9 years-high school	11.0
12 years-secondary	27.3
14 years-post-secondary	16.2
16–17 years-higher education	28.2
>16 years-master/PhD	6.3
Income level	
No income	21.9
up to 12,000 euro	30.1
12,000–3,000	39.0
300,01–60,000	7.1
over 60,000	1.1
Gender	
Male	49.5
Female	50.3
Age (mean)	41.49 (mean)

main categories: institutional trust for coastal management, social trust for coastal management, generalized trust and reciprocity, and social networks (see Table 4). These four categories were then combined in a final factor measuring aggregate social capital. The results of the path diagram and factor loadings of the CFA are shown in Table 4. Fit statistics provided reveal that the model is acceptable (GFI = 0.99, AGFI = 0.98, RMSEA = 0.06) (Joreskog and Sorbom 1984).

Table 4 Results of confirmatory factor analysis

Social capital factors	Social capital variables	Factor loadings	Factor loadings with final latent variable (social capital)
Institutional trust for coastal management	Government	0.81	0.99
	EU	0.72	
	Private industries	0.62	
Social trust for coastal management	Local communities	0.97	0.66
	Fellow citizens	0.70	
Generalized trust and reciprocity	Gen. trust	0.84	0.40
	Trust in neighbours	0.88	
	Trust in friends/ relatives	0.51	
Social networks	Member	0.32	0.11
	Volunteer	1.84	

Results

Respondents' perceptions of climate change

A first issue investigated was how concerned respondents were about climate change generally. Survey results showed a majority of the sample was 'quite' or 'very' worried (47.7 and 39.8 %, respectively). Far fewer respondents considered, they were only a 'little' (9.4 %) or 'not at all' worried (2.7 %). Regarding belief of the actual existence of climate change, the majority of respondents agreed with the statement that 'climate change exists' (77 %), with 5.4 % stating that they 'did not know'. The rest of the sample stated that they did not believe in the existence of climate change (17.2 %). Lastly concerning the agency of climate change, 47.3 % stated 'human activities' were chiefly responsible, 3.5 % 'natural processes', and 46.6 % 'both' were implicated.

Respondents' perceptions of the proposed policies

Level of agreement

Respondents were asked to state their level of satisfaction with each proposed policy (5-point Likert scale). The highest level of satisfaction was expressed for 'managed realignment' (MR) (mean 3.7, median 4.00, SD 0.93), and the lowest for 'no active intervention' (NAI) (mean 1.83, median 2.00, SD 0.95). The 'hold the line' (HTL) policy showed a lower agreement compared to the MR policy (mean 3.14, median 3.00, SD 1.03). Mean differences are statistically significant ($p < 0.01$). In general, citizens who

tend to disagree with the 'no active intervention' policy also agree with the 'hold the line' and 'managed realignment' policy.

Benefits

Regarding perceptions of the benefits accompanying the proposed policies, respondents viewed HTL's (Table 5) most important benefit as the protection of property, followed by the protection of agricultural land and biodiversity. The least important benefit was the protection of industrial activities. Similarly, for the MR policy the most important benefit was property protection followed by lower construction costs compared to HTL. The least important benefit for respondents was the maintenance of recreational activities. In the NAI option, the benefit of no construction costs yielded a relatively low score compared to the benefits of other policies.

Disadvantages

Generally respondents showed a greater concern with the disadvantages of each policy. All disadvantages were regarded as important as they presented an average mean score over 3 on a 4-point Likert scale. For HTL, the most important disadvantage was high maintenance costs that the policy would incur (Table 6), followed by high construction costs and the tax burden on citizens. In MR, the most significant disadvantage was the possibility of further flooding in future, followed by species loss and flooding of agricultural land. Finally in NAI, the most important disadvantages were damage caused to houses and other property and loss of agricultural land. The least important disadvantage was viewed as damage to industries in the study areas.

Table 5 Perceptions on the benefits of each policy

Benefit (1: not at all important 4: very important)	Mean (SD)	Median
HTL		
Protection of biodiversity	3.19 (0.77)	3.00
Maintenance of tourism capacity in the area	2.92 (0.83)	3.00
Maintenance of all recreation activities	2.68 (0.90)	3.00
Protection of houses	3.68 (0.59)	4.00
Protection of agricultural lands	3.53 (0.68)	4.00
Protection of industrial activities	2.95 (0.88)	3.00
MR		
Protection of biodiversity in several areas	3.23 (0.73)	3.00
Maintenance of tourism capacity in the area	2.93 (0.82)	3.00
Continuation of most recreational activities	2.70 (0.87)	3.00
Protection of houses	3.69 (0.57)	4.00
Protection of industrial activities	2.90 (0.83)	3.00
Lower construction cost	3.39 (0.75)	3.00
NAI		
No construction cost	2.65 (1.09)	3.00

Social capital and citizens perceptions

Social capital parameters

In order to explore the influence of social capital on citizens' perceptions, correlation analysis was initially conducted (Spearman's coefficient) of social and institutional trust with citizens' level of satisfaction (Table 7). According to the analysis, trust in government is positively correlated with the level of agreement for the MR policy and negatively correlated with the NAI policy. The level of trust in the EU influences positively the level of agreement in the HTL and MR policy and negatively in the NAI policy.

Regarding correlations with social trust, a similar influence was evident for all coastal zone management policy options (Table 7). Social trust has a statistically significant positive influence on the level of agreement for the MR policy and a negative influence on the level of agreement with the NAI option. No statistically significant connection was apparent with the HTL policy. Regarding the impact of social reciprocity on the level of agreement, the most significant relations were evident with the NAI and MR policies. Respondents who trusted their friends/family to assist them in case of flooding tended to disagree with the implementation of NAI ($x^2 = 37.60$, $p < 0.01$) and to favour the implementation of MR ($x^2 = 11.81$, $p < 0.05$). Furthermore, respondents who tended to disagree with NAI had higher levels of trust in their neighbours ($x^2 = 20.54$, $p < 0.01$).

Table 6 Disadvantages of the proposed policies

Disadvantage (1: not at all important 4: very important)	Mean (SD)	Median
HTL		
Tax burden on citizens	3.24 (0.82)	3.00
High construction costs	3.30 (0.72)	3.00
High maintenance costs	3.40 (0.70)	4.00
MR		
Flooding of some agricultural lands	3.21 (1.09)	3.00
Possible further flooding in the future	3.37 (0.70)	3.00
Loss of species in the flooded areas	3.34 (0.74)	3.00
NAI		
Flooding of coastal areas	3.43 (0.73)	4.00
Damages in house properties	3.73 (0.56)	4.00
Damages in industries	3.21 (0.82)	3.00
Damages in agricultural areas	3.55 (0.67)	4.00
Loss of biodiversity	3.47 (0.74)	4.00

Table 7 Correlations between trust and the level of agreement

	HTL	MR	NAI
Government	0.010	0.079**	−0.085**
EU	0.070**	0.087**	−0.135**
Private industries	0.020	0.072**	−0.052*
Local communities	0.016	0.132**	−0.160**
Fellow citizens	0.045	0.096**	−0.078**
Generalized trust	0.009	0.074**	−0.159**

** $p < 0.01$; * $p < 0.05$ level

Finally, regarding social networks, the analysis showed that respondents who were informed of local councils' decision were less willing to agree with NAI ($x^2 = 25.98$, $p < 0.01$). Furthermore, the level of agreement with NAI was statistically connected with volunteerism ($x^2 = 11.21$, $p < 0.05$). However, there is no clear indication whether volunteerism has a positive or a negative influence on the level of agreement. No other statistically significant correlations were evident with membership and volunteerism in NGOs, or with the level of satisfaction with the other proposed policies.

Social capital as an aggregate indicator

The results of the ordinal regression are presented in Table 8. The dependent variable (level of agreement) is analysed divided into its four constituents except for the 'totally agree' choice which was set as the reference category (TD: totally disagree, D: disagree, N: neutral, A: agree). According to these results, only in the case of NAI citizens with higher levels of social capital are less willing to agree with this option (Table 8).

Discussion and conclusions

A variety of intriguing findings emerge from the fieldwork which we briefly review and discuss here. First is the high level of public concern over climate change and a general belief in its existence as a phenomenon. These results are in accordance with previous findings supporting a high level of concern for climate change internationally (Buys et al. 2012; Lorenzoni and Pidgeon 2006; Schmidt et al. 2012). Furthermore, virtually the entire sample regarded climate change as either solely anthropogenic or arising in combination with natural processes, verifying results of previous studies (Schmidt et al. 2012).

Concerning citizens' preferences between the two active intervention policies, a clear preference was evinced for the MR option compared to HTL. This finding contrasts findings from related studies conducted in England (Myatt et al. 2003a). One possible explanation is the provision of compensation payments in the proposed scenario, in contrast to the current model of MR promulgated in England (Ledoux et al. 2005), and at the same time the request for payment in the HTL option. Furthermore, in the case of the HTL, the construction of new sea defences is likely to significantly alter existing coastal environments, implying major dislocation in the day-to-day activities of local communities. Finally, the preference for MR might be attributable to the belief that this option is less costly, compared to construction of hard defences (Rupp and Nicholls 2002); nonetheless, it should be noted that the costs of these schemes often escalates significantly once construction begins, depending on the application site (Rupp and Nicholls 2002; Ledoux et al. 2005). A main concern of citizens was financial impacts and property loss (Myatt-Bell et al. 2002). In addition, in the MR option, possible future flooding was regarded as an important disadvantage as it might be accompanied by additional constructions and thus exacerbates financial costs to communities. Consequently, long-term policy effectiveness was questioned (c.f. Myatt et al. 2003a).

These findings are critically important, given that managed retreat is now being actively considered as an option for some Greek coastal areas (Hellenic Republic 2010). In particular, the study offers preliminary evidence that

Table 8 Results of ordinal regression investigating the influence of social capital on the level of agreement

	HTL			MR			NAI		
	Est.	Wald	Sig.	Est.	Wald	Sig.	Est.	Wald	Sig.
Dependent variable: level of agreement									
TD	−2.403	672.286	0.000	−3.584	519.026	0.000	.273	28.552	0.000
D	−1.240	437.171	0.000	−2.273	679.130	0.000	1.675	556.585	0.000
N	−0.187	16.777	0.000	−0.908	281.443	0.000	2.723	670.268	0.000
A	1.130	553.845	0.000	0.555	159.269	0.000	4.027	451.168	0.000
Independent variable: social capital									
	−0.008	0.034	0.854	0.037	0.617	0.432	−0.139	6.386	0.012

TD totally disagree, *D* disagree, *N* neither agree nor disagree, *A* agree

citizens would be willing to accept these policy changes, if they were accompanied by adequate compensation for communities. This is an important starting point. However, further research is necessary in order to identify the optimum way of designing and applying this policy. This might include estimation of all environmental and socio-economic impacts to local communities, along with the estimation of the necessary level of compensation to citizens who will be affected by the policy through, for example, loss of properties and agricultural land. Geovisualization techniques and geographical information systems (GIS) software with 3D visualization functionality, together with low-cost landscape visualization packages, provide new opportunities for communicating coastal change and adaptation options to the public as well as estimating the associated costs (Jude et al. 2006, 2007, 2014). The consideration of the financial aspects is even more important nowadays due to the economic crises that Greece is currently facing. Economic aspects which should be taken into consideration during coastal planning refer both to finding funding, both for HTL and MR strategies, and also finding resources in order to compensate individuals who will be affected negatively by their implementation. This is a very important issue as the application of an MR option without compensation will potentially have devastating effects for the local population and will find significant opposition.

Apart from the identification of citizens' perceptions towards different coastal management policy options, the study also demonstrates the importance of social capital in formulating the level of social acceptability towards such policies. Specifically, the results show that respondents who tend to trust institutions in combating the deleterious effects of climate change are also more willing to accept that institutions' proposed policy solution (MR, Table 6) while the opposite result is evident in the NAI option. These findings are in accordance with recent studies where the importance of institutional trust on community capacity to adapt and citizens' perceptions of proposed policies has been underlined (Adger 2003; Glenk and Fischer 2010; Myatt et al. 2003a). Specifically, this type of trust has a significant influence on the level of acceptance of information regarding risk issues, the level of community engagement and also on what individuals regard as appropriate environmental behaviour (Ishizaka and Tanaka 2003; Lorenzoni et al. 2007; Tjernstrom and Tietenberg 2008).

Similar relationships were presented between generalized trust with the level of social acceptability. Respondents who tend to trust their fellow citizens were more willing to accept the MR policy and less willing to accept the NAI option. This result accords with the recognition of the positive influences of social trust (Coleman 1990; Lorenzoni et al. 2007; Ostrom 2009). Individuals with higher levels of trust tend to believe that fellow citizens will act in the common good and also exhibit higher levels of engagement (Lorenzoni et al. 2007) while assisting in the effective implementation of an active intervention policy (Jones et al. 2012b). The study also revealed that citizens who felt they could rely on the assistance of their neighbours, family and friends in case of flooding were also more in favour of the MR option. A possible explanation is that although they regard that assistance from fellow citizens will be available, this is not sufficient in itself to address the possible effects of flooding and that, consequently, active intervention policies should be implemented.

Concerning the impact of formal social networks, no significant correlations emerged, confounding previous claims underlining the importance of information provision on citizens' perceptions for coastal management policies (French 2004; Deressa et al. 2009). However, it has been suggested that different types of social networks may have a diverse influence on citizens' behaviour concerning climate change issues (Wolf et al. 2010). Consequently, further research is essential with the use of additional indicators measuring different types of networks, such as bridging, bonding and linking social capital networks (Pretty 2003; Putnam 2000: 22).

Finally, the study data confirm that social capital, as an individual 'stock' indicator, has an impact only in the case of the NAI policy (Table 7). Thus, individuals with higher levels of social capital tend to disagree with the no active intervention policy which does not provide a solution to the problem in the long term. The non-existence of a connection with the aggregate indicator and the MR option can be attributed to the low influence of social networks noted earlier.

The above significant links between social capital parameters and citizens' perceptions confirm the importance of determining these factors prior to implementing coastal management policy in order to identify which social factors influence citizens' response to proposed policies and in what way. This is especially important in Greece, where low levels of social capital have been observed (Jones et al. 2008). The most clear-cut example is the low level of institutional trust in national government. According to the present study, citizens with low levels of trust towards the national government are also less willing to accept policies such as MR. Consequently, since an MR option is currently considered in Greece, it is essential to increase the level of trust towards the management institutions. This can be achieved through an increase on the flow of information and the application of deliberation techniques. Furthermore, additional actors who citizens tend to trust more should be involved in the decision-making process, such as NGOs, local authorities or community groups. Such changes will assist in the decentralization of the environmental policy planning and

management in Greece and will assist in the increase in the level of social acceptability for proposed policies.

Apart from the social capital parameters underlined here, there are several additional socio-economic factors which should be considered when selecting policy options and planning their implementation from a social perspective. These include, among others, the characteristics of the local community and its connection to the coast, the main economic activities and the socio-economic impacts of a policy. In this context, further social surveys should be applied, combining quantitative and qualitative social research methods, in order to identify social factors and the impact they have on citizens' perceptions for climate change adaptation policies. The application of such techniques would allow the in-depth exploration of the interaction between local communities and coastal areas and reveal areas where specific emphasis should be given in order to identify optimal coastal management policy configurations and to increase the level of public acceptability and satisfaction with these proposed choices.

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