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Believing is seeing: laypeople's views of future socio-economic and climate change in England and in Italy

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Cross-cultural studies are particularly relevant in the context of climate change, given its pervasive character and the growing demand for climate change mitigation at both global and local levels. This paper reports on findings from comparative cross-cultural mixed-methods research eliciting perceptions of the future among citizens in Norwich (UK) and Rome (Italy). The paper explores how individuals at the two locations interpret socio-economic and climate scenarios, and how they relate environmental change to human behavior. Attitude segmentation was found to be similar in both localities. Although most participants in both locations realized the benefits of a future centered on sustainable resource use and societal welfare, individuals' attitudes and considerations about the future were not largely influenced by the scenarios. Discussions revealed that the credibility of the projections depended on individuals' prior beliefs and their trust in the science portrayed.

Keywords: climate change, cross-cultural comparison, participation, perceptions, public, scenarios

1. Introduction

Most scientists worldwide now accept that human activities are altering the global climate. The most recent projections indicate that the average global surface temperature may be between 1.8°C to 4.0°C higher than the 1980–99 average by the end of the twenty-first century (IPCC, 2007: 13). This range is based upon varied assumptions of demographic, socio-economic and technological change driving future greenhouse gas (GHG) emissions. These projections are scenarios, possible alternatives of how the climate future may unfold (Parry and Carter, 1998). Scientists concur that climate change will result in pervasive, yet differential and potentially "dangerous" impacts worldwide, unless adequate responses are readily implemented (e.g. O'Neill and Oppenheimer, 2002; Schellnhuber et al., 2006). This prospect has proven challenging to say the least, both politically and practically.

In Europe, despite fervent central support for mitigation, only the UK and Sweden are on course to meet their Kyoto Protocol commitments, whereas Italy is likely to overshoot its target even with planned additional measures (IPPR, 2005). By 2003, Italian national GHG emissions had risen between 5.5 percent and 11.6 percent since 1990 owing to increases in energy use (Cianciullo, 2003; EEA, 2005 respectively). In contrast, GHG emissions were down 15.3 percent

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by 2005 in the UK, a nation promoting strong leadership on climate change mitigation, although recent carbon dioxide reductions have not been as conspicuous as forecast (DEFRA, 2007).

For most people in Europe, however, climate change is distant from their daily lives. Although many support the need, and express willingness, to take action, only a few do (Poortinga et al., 2006; EST, 2007; BBC World Service, 2007). This disjuncture is well documented (e.g. Blake, 1999; Kollmuss and Agyeman, 2002). Furthermore, information provision with a view to changing attitudes, behaviors and even instilling support for policy has had limited success, as it fails to consider the range of individual and social influences on interpretations of science by the public (Eden, 1996; Irwin and Wynne, 1996).

Within this context, this paper seeks to contribute to public understandings of the science of climate change, and of the formation and maintenance of beliefs and attitudes. It reports on a study exploring a) public perceptions of and attitudes to climate change in two locations characterized by different national political and policy responses: Norwich in the UK and Rome in Italy; and b) the effect of information provision—in the form of scenarios representing possible future climate outcomes in relation to societal change—on individuals' attitudes in these two locations. Given the pervasive nature of climate change and the persistent question of how to develop acceptable and effective responses at both international and local levels, this study compares two different cultures of individual understandings and attitudes at a depth that quantitative surveys rarely explore. This is achieved through a combination of climate science (scenarios) and social science (survey and group discussions) methods.

2. Perceiving and describing climate change in Europe

2.1. Public understanding of climate change

This section outlines four main findings on individual understandings of climate change in Europe of relevance to this paper. Firstly, individuals are highly aware and concerned about climate change. Comparisons of polls across 30 countries in 2003 and 2006 show notable increases in the number of people who considered climate change or global warming as a very serious problem: from 63 percent to 68 percent in Italy, 50 percent to 70 percent in Great Britain (GlobeScan, 2006). Surveys in Europe also show concern about climate change across Member States: 41 percent of Italian and 42 percent of UK respondents in a 2004 EU25 survey on the environment reported to be worried about climate change, which ranked third on a par with air pollution, after water pollution and man-made disasters (TNS Opinion and Social, 2005; also Lorenzoni and Pidgeon, 2006). This supports other evidence that climate change is usually of lower importance than other personal and social issues, such as health, family, safety and finance (Poortinga and Pidgeon, 2003; LC and LNE, 2007).

Secondly, in Europe individuals acknowledge the human contribution to climate change. According to a 2006 survey (Downing and Ballantyne, 2007), 46 percent of Britons attributed global warming prevalently to anthropogenic causes; 41 percent believed it was a combination of both natural variability and human activities. Italians seem to have little doubt: 87.2 percent ascribe climate change to human actions alone, only 10.4 percent to natural factors (LC and LNE, 2007). Individuals also have an understanding albeit limited of the causes of, and solutions to, climate change. A recent European survey showed that similar proportions of respondents in Italy and the UK (~87 percent) identified the impacts of their country's energy production and consumption on climate change (Gallup Organization, 2007; see also LC and LNE, 2007). However, confusion with causes of other environmental issues persists (DEFRA, 2002; Lorenzoni et al., 2006; Poortinga et al., 2006).

Thirdly, climate change is perceived by most people as distant in both space and time, affecting more vulnerable people and places elsewhere, or future generations. Individuals tend to consider the risks from climate change greater than the benefits, but both risks and benefits are perceived to be greater for society in general than for individuals, given the tendency to underestimate the likelihood of personally experiencing negative events (Poortinga and Pidgeon; 2003; Palutikof et al., 2004; Lorenzoni and Pidgeon, 2006).

Fourthly, individuals manifest a tension between a perceived responsibility to act on climate change and the difficulty, and failure, of doing so. In the UK, Bickerstaff et al. (2004) found this could be ascribed partly to a sense of dependency on energy-intensive technologies, and in part to a perceived lack of shared responsibility and collective action. Opinion polls also reflect this discrepancy. In 2005, 62 percent of respondents to a British survey agreed that every possible action should be taken against climate change; most people, however, ascribed responsibility for action at levels beyond that of the individual, to national and international communities (Poortinga et al., 2006). In a recent Italian survey the majority of respondents emphasized the co-responsibility of all societal actors in solving environmental issues, but felt current actions—including their own—were ineffective (LC and LNE, 2007).

2.2. Information provision and interpretation

Research shows that although information provision plays an important role in awareness-raising and knowledge-gaining, it has limited influence upon attitudes and behaviors (Douglas et al., 1998). Thus, an important consideration is not only how people receive information, but also how they engage with it (e.g. Hargreaves et al., 2003).

The *Theory of Cognitive Dissonance* (Festinger, 1957) contributes to explaining in part the processes through which views are formed, retained or modified. Each individual tends to ensure the consistency and continuation ("consonance") of their knowledge and beliefs (known also as "cognitions"). Two or more cognitions can be consonant if one follows from the other, or dissonant if they do not follow from each other. If there is no consistency, a form of psychological discomfort, or dissonance, ensues. Individuals aim to reduce dissonance as much as possible. The dissonance may be overcome by changing one's cognition. If this is not possible, or not successful, then the dissonance can lead to misinterpretation or rejection of that information, whilst seeking support for one's cognitions from others (Burris et al., 1997). Swiss citizens, for instance, were found to experience dissonance when cognitions of their attitudes and lifestyles were challenged by the need to enact specific mitigation measures (Stoll-Kleemann et al., 2001).

The risk and perceptions literatures underscore the complex relationships between scientific and public knowledges, and interpretations of science. These considerations bear considerable relevance for climate change management. Increasingly, dialogue with and involvement of those affecting and those affected by environmental change is being called for, with the aim of developing acceptable and effective options. Scenarios have been proposed as a means to portray, and increasingly deliberate through citizen participation, the uncertain relation between future societal and climate change (e.g. Shackley and Deanwood, 2003; Kok et al., 2006).

2.3. Making the future meaningful: developing scenarios

Although the future is by its very essence unknown, scenarios convey this uncertainty by portraying a range of possible developments and outcomes. Scenarios can aid decision-making by enabling systematic reflection upon the conditions necessary for the realization of alternative futures and their implications (Hammond, 1998).

Credible scenarios should be internally consistent and plausible, intelligible to users, and consonant with past occurrences (Parry and Carter, 1998). Scenarios can be characterized qualitatively (e.g. narratives or storylines) and quantitatively (e.g. numerical indicators) (Gallopin et al., 1997; Alcamo, 2001). Scenario quantification is generally useful when technical aspects and well-defined options are considered. In conditions of high uncertainty, the power of these formal methods tends to decline (Alcamo, 2001; Berkhout et al., 2002), so quantitative characterizations are combined with qualitative descriptions.

In climate science, *climate scenarios* denote both the forcing factors which affect the climate (derived from modeled GHG emissions and concentrations) and descriptions of future climates over long timescales (20 years to several centuries) obtained through modeling and expert judgment (Hulme and Jenkins, 1998). The UKCIP02 national level climate scenarios provide recent projections on how climate may change in the twenty-first century in the UK. They are used in climate impact assessments, adaptation studies and decision-making (Hulme et al., 2002a, b).

Socio-economic scenarios describe future evolutions of fundamental societal characteristics, based upon trends of past social and economic changes and visions of future developments (Masini, 1999). They often span shorter timescales than climate scenarios, reflecting the 3 to 5 year timescales of many socio-economic forecasts (Berkhout and Hertin, 2000). In the UK, a re-definition of four 1998 Foresight Scenarios (OST, 1998) resulted in the UKCIP socio-economic scenarios (UKCIP, 2001). These subdivide the future "possibility space" into two independent determinants of change, schematically represented as orthogonal axes: social values (ranging from "individual" to "community") and governance ("interdependence" to "autonomy"). These two drivers describe the "character" of four possible futures. *World Markets* (WM) is defined by a tendency towards coordinated policy at the international level ("interdependence") and a propensity towards personal material wealth and private freedoms ("individual"). On the opposite quadrant lies a world driven by interest in community well-being and by regional economic and political power exerted through federal political configurations ("autonomy") (*Local Stewardship*, LS). Interest in "community" values within interdependent globalized systems characterizes *Global Sustainability* (GS) (UKCIP, 2001).

Closer integration between socio-economic and climate scenarios has been advocated to more clearly describe the relationship between climatic and societal changes (e.g. Trumbo and Shanahan, 2000; Berkhout et al., 2002). The IPCC Standard Reference Emissions Scenarios (SRES), for instance, combine the two (Nakicenovic and Swart, 2000).

Two studies in particular provide useful insight into the use of combined scenarios with members of the public. The ULYSSES (Urban Lifestyles, Sustainability, and Integrated Environment Assessment) project explored public and stakeholder participation in sustainability science. Over 400 individuals in six European urban areas and one US city participated in discussions on climate change and energy use. Participants were encouraged to interact with computer-modeled scenarios of climate change, which supported group deliberation. However, most participants were surprised by the degree of uncertainty conveyed by the models and did not find them conducive to exploring policy options adequately. Trust in science and institutions influenced the use of climate change information (De Marchi et al., 1998; Kasemir et al., 2003).

In another study, descriptions of four possible socio-economic future worlds matched with varying levels of climate change were developed for stakeholders in the UK region of East Anglia as tools to assess their vulnerability and adaptive capacity (Lorenzoni et al., 2000a, b). By representing social and environmental changes on compatible timescales, this scenario-based approach encouraged reflexivity among the users, providing a powerful learning vehicle about climate impacts (see also Berkhout et al., 2002). For a few of the stakeholders who participated in this study, the approach generated more sophisticated and dynamic accounts of the potential feedbacks between natural and human systems than expert-led and defined assessments.

In contrast to the UK, no such coordinated approach to the construction and formulation of scenarios (climate, socio-economic or integrated) existed in Italy until after 2002, when the fieldwork for the study presented in this paper was completed (M. Sciortino, F. Giorgi and A. Mariotti, pers. comm., 2002). Some Italian groups are currently developing national scenarios for impact assessments based on downscaling of global and regional models, calibrated with local level data (UCEA, 2006).

3. Methods

The work described here builds on and extends the above two studies by undertaking comparative participatory research in two contrasting cultural settings. Individuals' views on climate change were elicited through a quantitative survey and qualitative discussion groups in Rome (Italy) and Norwich (UK). The survey on environmental attitudes, personal views on climate change, on options and responsibilities for managing climate change, was administered in July 2000 in Norwich and February 2001 in Rome with adults and high-school students. Completed adult questionnaires totaled 135 in Norwich and 206 in Rome (equivalent to 23.5 percent and 35.4 percent response rate), representing a demographically diverse sample. To complement the survey, discussion groups were held in the two cities with adult respondents who had indicated in the questionnaire their willingness to participate in further research. Section 3.1 below outlines how the scenarios used in discussions at both locations were derived; Section 3.2 the grouping of discussion participants; and Section 3.3 the discussion protocols.

3.1. Developing scenarios

Following guidelines set out by Alcamo (2001), scenarios relating socio-economic development to climatic change were derived for the two case studies. Existing scenarios were reinterpreted to depict projections for the East Anglia region (of which Norwich is one of the main cities). The exercise proved more challenging for the Lazio region, where Rome is situated, owing to the lack of existing climate scenarios for Italy. The combined scenarios for the Lazio area were derived from various other climate scenarios based on the IPCC SRES, meteorological data from two weather stations near Rome and projections of socio-economic change. Thus, although the methodologies in scenario construction differ between the two case study areas owing to the practical constraints outlined below, the focus of this study is primarily not to compare these data; rather the interest lies in exploring people's reactions and responses to projections of the future for their own locality and the evolution of their understanding during group discussions.

3.1.1. Scenarios for the East Anglia region

Descriptions of three worlds and associated climate scenarios were devised for the East Anglia region in two steps. Firstly, the storylines of possible future socio-economic change in East Anglia were produced by re-interpreting existing descriptions of possible regional futures as used by Lorenzoni et al. (2000a) and updating these with statistical information on recent developments and future trends in the region (GOEE and DETR, 2000). The year 2000 was chosen as the base year for the descriptive socio-economic scenarios. Three storylines (i.e. WM, GS, LS) were represented, as the Lorenzoni et al. (2000b) study indicated the *Provincial Enterprise* scenario was very difficult for individuals to envision. Secondly, these storylines were associated with downscaled climate scenarios for East Anglia produced by

Viner et al. (2000) detailing temperature and precipitation changes (in summer and winter months) up to the 2050s. The 2050s were selected as the common time horizon for both climate and non-climate scenarios. Although the Lorenzoni et al. (2000a, b) research had observed that individuals related more easily to an "immediate" 20 years into the future, modeling exercises indicate that divergences in climatic changes dependent upon varying socio-economic circumstances become more clearly distinguishable in 50 years' time, owing to the inertia of the physical climate system in revealing the effect of GHG emissions on the climate system. The baseline years for the climate indicators were, when possible, taken to be those of the generally accepted period 1961–90.

3.1.2. Scenarios for the Lazio region

Given the unavailability of future climate scenarios for Italy at the time of research, data from various existing sources were translated to create climate indicators to be used in Roman discussion groups. ACACIA projections (Parry, 2000) provided temperature changes over the summer and winter months in the 2050s for the A2-high and B1-low (climate) scenarios, and changes in mean winter and summer precipitation in the 2050s for the A2 scenario. These projections, based on the SRES98 scenarios, were matched to the OST worlds, becoming WM/A1, GS/B1, LS/B2 (see Lorenzoni et al., 2000a, b for methodological details). However, as the ACACIA projections did not provide temperature and precipitation indicators for WM/A1 and LS/B2 worlds, nor rainfall in the 2050s under a GS/B1 scenario, the ACACIA A2-high (climate) scenario was used as a proxy for the A1-medium (climate) scenario and related to a WM world. Data for B1 and B2 climate indicators were sourced from Carter et al. (2000). The data thus obtained allowed the compilation of climate indicators for the Lazio region, represented in pictorial form comparable to those used in the Norwich case study. The socio-economic scenarios devised for East Anglia were re-interpreted to reflect the geographical, cultural and social characteristics of the Lazio region.

3.2. Selection of discussion group participants

Group participants were selected on the basis of their beliefs about climate change, defined through a statistical analysis of their survey responses. Factor analysis with varimax rotation was applied separately to the survey datasets from Norwich and Rome on answers to nine questions relating to the importance of climate change, human influences on the climate, and personal and global effects of climate, all measured on a five-point Likert-type scale. The aim of the factor analysis was to reduce this set of variables into independent (orthogonal) dimensions representing people's views on climate change.

Analyses of both datasets highlighted two factors (Factor 1 and Factor 2) as the most significant. They explained 29.2 percent and 15.8 percent of the variance in Norwich; and 24.6 percent and 20.9 percent of the variance of the Roman adult dataset. The correspondence of the two factors across both localities (i.e. the composition of Factor 1 in Norwich mirrored that of Factor 1 in Rome, and similarly for Factor 2), as well as the significant proportion of variance explained by the two factors, indicate that this procedure yielded the same "classification" of respondents' views on climate change and human influence in both Norwich and Rome. Factor 1 describes beliefs about human impact on the climate. It can be visualized as a horizontal axis independently representing the range of beliefs, from negative values indicating "humans do not affect the climate" to positive values "humans affect the climate." The second dominant factor (Factor 2) can be envisaged as a vertical axis ranging from positive values indicating that "climate change is not important nor of concern" to negative values "climate change is important and of concern."

The factor analysis resulted in the definition of factor scores for each individual adult response along the two dimensions. The scores can be imagined as points on the four-quadrant space defined by the two orthogonal factor axes. Similar scores were sorted into clusters with common characteristics, which we refer to as typologies. To ensure that only individuals whose views are clearly defined within one typology were classified as such, those whose scores could not be clearly distinguished according to either Factor 1 or Factor 2 (i.e. whose scores ranged between –0.25 and +0.25 on either factor) were excluded from further study. The analysis thus defined four typologies of people's views on climate change (Figure 1):

- *Denying*: views of individuals for whom climate change is no threat to their existence or, as far as they are concerned, to the life of others. Their stance is that humans do not affect the climate and climate change is unimportant.
- *Doubting*: views of those people who do not think climate change is a human-made problem, although they still consider the issue as important.
- *Uninterested*: views of individuals who acknowledge there is an issue (they recognize that human beings affect the climate system), but have no desire to engage with it (it is unimportant).

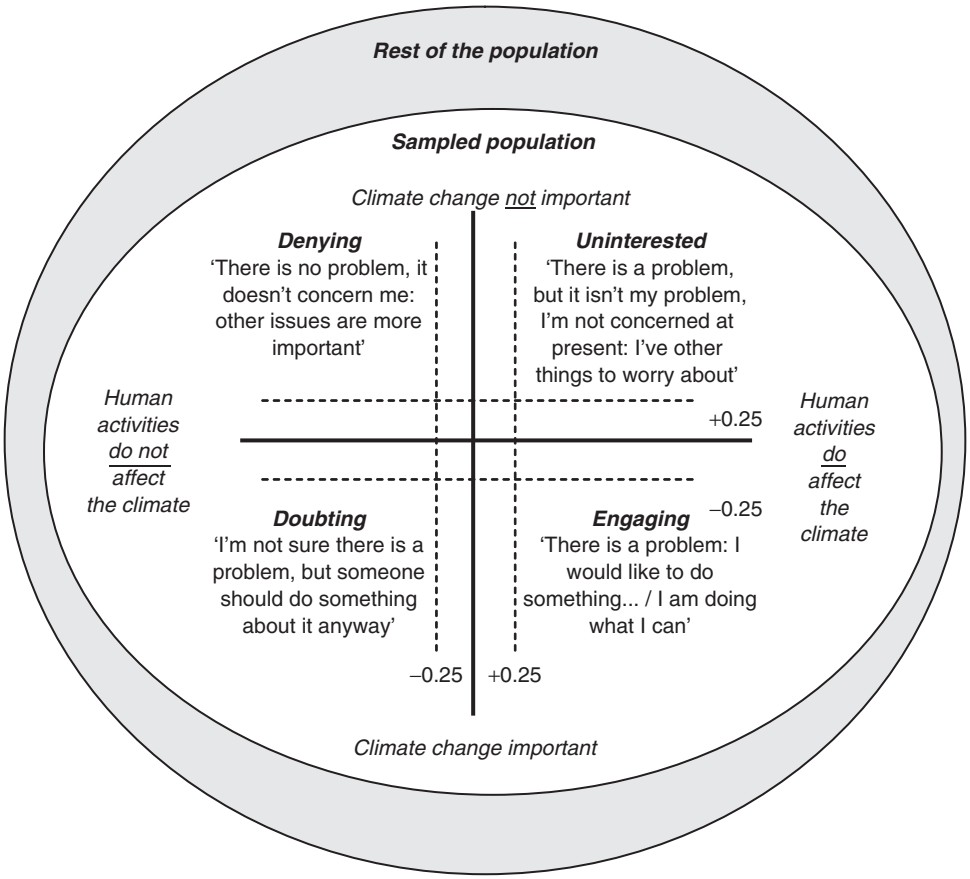

Figure 1. Subdivision of Norwich and Roman adult respondents' opinions into "typologies" according to their individual factor scores. This diagram schematically shows the –0.25 to +0.25 scores' cut-off points.

- *Engaging*: views of those who are worried and concerned about climate change, who feel climate change is something to face up to and take action on. They generally believe humans affect the climate and that climate change is important.

To test how the typological subdivisions related to other aspects of climate change, discussion groups were organized with individuals of each typology. Recruitment to the discussions consisted of contacting those adults who had stated their interest in participating in further research and whose factor scores lay clearly in one of the four quadrants. Respondents were organized into separate sessions, depending on their typological classification. Four discussion groups were held in November and December 2000 in Norwich (totaling 19 participants). The difficulty of recruiting participants in Rome resulted in three separate discussion groups to ensure a minimum number of attendees: the first discussion group included *Uninterested* and *Denying* views; the second was only for *Engaging*; the third was for *Doubting* and one *Engaging*,[1] held in May and June 2001 (10 discussants in total). The two parts of the study were thus conducted during different seasons. All group discussions followed the same format defined in the protocol and lasted for just over 2 hours. Discussions were recorded, transcribed and—where necessary—translated from Italian into English; these were analyzed thematically and compared.

3.3. The protocols

The first half of the group discussion focused on participants' views on climate change, their expectations and responsibility for its management, and its long-term relevance. The second part was designed to elicit participants' views of future changes, through the use of socio-economic and climate scenarios, with particular reference to three specific themes:

i. Future societal development. This involved showing participants descriptions of three possible socio-economic developments (WM, GS and LS) in the 2050s with reference to their case study region, and discussing these. The purview was to elicit participants' responses to the scenarios, to explore and compare participants' preferred vision(s) of the future and their judgments of likely future development.
ii. Effects of socio-economic change on the climate. Participants were asked to consider the dependency of climate change upon societal development. The aim was to explore how individuals related to the wider implications of pursuing specific future pathways.
iii. Climate change scenarios. Participants were shown mapped illustrations of projected climate change according to the three socio-economic "worlds" in their region in the 2050s. For each "world," four colored maps were shown on one page, indicating summer and winter temperature changes, and summer and winter rainfall changes. The maps also provided mean temperature change and percentage precipitation change. A schematic thermometer gave an indication of past temperature averages in summer and winter (in degrees Celsius and Fahrenheit) over the periods 1997–9 and 1961–90 as a comparison. A similar bar chart provided summer and winter rainfall (in mm) during the same periods. Participants were encouraged to discuss their understanding of the illustrations, the scenarios' usefulness, and reflect upon these in light of their previous group considerations.

4. Empirical findings: interpreting climate change and the scenarios

All groups articulated their views using a variety of discourses and narratives, drawing upon their experience, beliefs, views and observations. During the first part of the group

discussions, it became evident that participants possessed a strong awareness of climate change. Most, although with some hesitation and skepticism, acknowledged a human contribution. Despite their concern about climate change and the recognition of its societal importance, most considered it an intractable problem, alluding to uncertainties in the science and in the ineffectiveness of actions as major constraints to addressing the issue. Climate change was perceived to be distant, an issue that people would only significantly act upon when perceived to be directly affected.

The *Engaging* discussants emerged as the only ones whose strong personal concern for environmental issues, including climate change, manifested in a willingness to suspend disbelief in potential barriers to change and support action regardless. Notably the *Uninterested*, *Engaging* and *Doubting* groups in both locations mentioned recycling as a manifestation of environmental responsibility partly enabled by governments. Although most people professed to take part, several skeptically questioned its cost-effectiveness and individual value (e.g. Norwich *Doubting*; Roman *Engaging*; a common reaction in discussions on climate change, see also Lowe et al., 2006). All discussants felt 50 years to be a very long time-span for personal visioning. Imagining long-term futures also proved difficult as the quickening pace of (societal) change over the last 50 years meant the past could not be relied upon as a yardstick for future change (documented also by Green et al., 2002). Most people, they argued, would more easily consider two decades into the future (supported by recent work, e.g. Tonn et al., 2006). Although most participants considered current society responsible for the prospects of future generations, this was not felt to be a main driver for action. The myopia of present (Western) societies was recognized and although denounced, reluctantly borne by the participants with a sense of inevitability.

4.1. Views of possible societal development

In the second part of the group discussions, participants' reactions to the socio-economic scenarios evolved from an initial curiosity to a progressively more in-depth scrutiny of the information portrayed, including its credibility. Participants questioned some aspects of the scenarios, suggesting they were unrealistic (projecting current trends that may well not be possible) or inflexible, not allowing for unexpected changes (surprises). The potentially ambiguous outcomes of societal development in an LS scenario were of concern to Norwich *Doubting* and *Uninterested*, Roman *Denying* and *Doubting*. They underlined the two-pronged nature of LS which, as a collection of semi-autonomous inward-looking regions exploiting their own resources, either could develop into a nurturing world, fostering local communities and environmental improvement, or could result in a dismembered, individualistic and polluted world. The Norwich groups expressed strong skepticism about the long-term viability of such a world and questioned some of the scenario assumptions (e.g., existence of an oil-industry in 50 years' time; the timing of voluntary agreements).

As the in-depth discussions progressed beyond the specifics of the scenarios' narratives, all participants at both locations, irrespective of their typological classifications, expressed two consistent perspectives. Firstly, discussants shared the hope that the future would be a "better place"; that humanity would strive towards fairness, equity and reduced environmental disruption. Secondly, their aspirations were tempered by their personal experiences and views. Although they manifested a preference for a utopian-style GS, participants maintained this would only be achieved through a radical rethinking and restructuring of the current prevalent system (identified with WM), requiring concerted and coherent action by all sectors of society. Most participants doubted the ability of societies worldwide to work towards a common goal, and denounced as unfair the increasing responsibility being allocated to

individuals. Furthermore, discussants had little faith in the willingness of young generations to take up the role of custodians of the future; youngsters were perceived as alienated from the past and uninterested in shaping a better future (N. *Denying*, N. *Doubting*). These barriers veiled the discussions with pessimism: "At the moment we tend to the WM … I can't see us breaking that stranglehold" (N. *Denying*). Some participants reiterated their belief that prevalent socio-political systems would only undergo significant change if triggered by a crisis or external force (N. *Doubting*, N. *Engaging*). However, others pointed out that the current WM world was already manifesting incremental development towards sustainability (N. *Doubting*, N. *Uninterested*, N. *Denying*). The Roman *Doubting* and *Engaging* and Norwich *Uninterested* argued that any future world could only derive from modifications to the current prevalent paradigm, capitalism, being the only economic and political system that had endured (history had proven communism and socialism impracticable).

Overall, participants felt that a combination of all three scenarios would realistically encapsulate future societal and environmental change. Several explanations could be adduced for this response: a) as participants were not asked explicitly to imagine futures other than the three presented to them, alternatives were not explored; b) the two hours allotted for the discussions may have been insufficient for participants to consider in depth the complex repercussions and interactions among the three scenarios; c) a mixture of skepticism and cynicism, in addition to the difficulty of projecting into the future, may have deflected participants towards what they may have considered as realistic features of each scenario.

4.2. Effects of socio-economic changes on the climate

Participants generally found it difficult to estimate the effects of human development on the climate. Surprisingly, the Norwich *Uninterested* at first interpreted the question the other way round, which led them to consider which climatic changes could favor the development of the three socio-economic worlds—one participant, for instance, suggested that GS would only occur if weather extremes became more frequent, thus forcing transition. In Rome, the discussants identified the WM scenario as that which would result in the most erratic or extreme climate, whereas they recognized that in a GS world the rate of climate change would slow down. Participants' opinions of climate change in the LS scenario, however, differed markedly, mainly owing to their diverse interpretations of how regional development would occur, affecting geopolitics overall. For instance, an *Engaging* participant was uncertain about climatic developments under LS, as regional independence (resulting in a lack of global coordination) could foster disjointed and contrasting approaches to climate management. An *Uninterested* participant argued that under LS climate change would be marginally less pronounced than in WM, whereas most of the *Doubting* maintained that changes in the climate would be more pronounced and undesirable in WM and LS situations, than in a GS world. Both the Norwich and Roman groups, after some debate, attributed joint responsibility for climate change to all societal actors, whose future role and influence would vary according to "world" characteristics. The style of governance in fostering collective action (rather than a particular "world") was emphasized by most participants as offering the greatest potential for amelioration.

4.3. Reactions to the climate change scenarios

Both Norwich and Roman participants were initially surprised by the marked difference in temperature changes among the scenarios. Recalling the previous discussion on the dependence of climate on societal changes, discussants then recognized that the climatic changes portrayed by the scenarios reflected their earlier conclusions (Section 4.2).

Nevertheless, in Norwich all groups were surprised about the limited effect on the climate of an LS world, resembling the WM climate indicators more closely than they had imagined. The incongruities between participants' understanding of the three socio-economic worlds and their difficulty in interpreting these in relation to possible climate outcomes, led them to question the validity of the assumptions and rationale underlying the socio-economic scenarios, and their path-dependency. Discussants, for instance, asked for clarifications on the origins of the scenarios, for more precise information on the extent of local sea level change (which was not possible given the scenarios' resolution).

One might have expected that the *Denying*, and perhaps the *Uninterested*, groups would dismiss the climate change scenarios on the basis of their uncomfortable fit with their views. Thus, both groups' cynicism came as no surprise. They concluded the scenarios were incomplete (did not include other factors that could confound future change) and thus were not credible. As a *Denying* participant argued: "You've got some cynical, intelligent people who are not going to be fobbed off with half-baked information." Other reservations were raised by some *Engaging* participants. They tried to reconcile their personal experiences of recent weather events with the contrasting information in the climate scenarios—indicating a willingness to believe the scientific information portrayed and leading to a discussion on the time-lags between manifestation of climate change impacts and their mitigation. However, they also questioned the range of scenarios presented, referring to the omission of high consequence–low probability events, such as the collapse of the Gulf Stream and melting permafrost, denoting their knowledge and possibly their interest in gaining further insights into the scientific underpinnings of the scenarios.

Unlike the Norwich discussants, Roman participants conceded that the climate scenarios could be plausible given that the projections seemed to match recent weather events in Rome (warm winter, cold spring and an unusually warm start to the 2001 summer). Nevertheless, the *Denying* and *Uninterested* still commented on the uncertainty shrouding scientific forecasts in general, arguing that predictions proved wrong by actual events can generate confusion and incredulity among laypeople. However, the potentially catastrophic outcomes of pursuing a WM system seemed to dishearten them, as they saw no possibility of improving the situation without strong leadership. Although one *Engaging* participant expressed moderate skepticism at the pronounced change depicted in the scenarios, these were generally found to be credible and to reflect the groups' beliefs, values and actions. Amongst the *Doubting* participants the climate scenarios opened the debate on detectable human influence on the climate, yet the group refrained from expressing a judgment on this. Rather, whatever the cause of these changes, the societal outcomes were considered negative and they thus argued for better management (i.e. adaptation). This suggests that these individuals removed themselves from debating the uncertainties of science, delegating to others the responsibility of enacting change.

5. Discussion

Three important considerations emerge from individuals' discussions of the scenarios in Norwich and Rome.

5.1. Consistency of interpretations

The findings of this study indicate that in both locations at an individual level, and to some extent at a group level, when the science and its representation in the form of scenarios was not

threatening (i.e. it retained consistency with personal experiences and beliefs), it remained unchallenged. When inconsistency between scientific projections and personal views occurred, scientific knowledge was contested because it carried profound implications, some of which were deemed unacceptable or unrealistic, impinging on personal beliefs about climate change. Indeed, individuals made sense of the scenario information according to their established views and their experiences of recent weather events. These beliefs were used to support or reject the information they were presented with, as Festinger's (1957) cognitive dissonance theory would suggest (see also Stoll-Kleemann et al., 2001).

Moser and Dilling (2004) also acknowledge that a variety of misconceptions and difficulties in assimilating information arise from the fact that people interpret external stimuli through a variety of pre-existing beliefs and conceptualizations. Holloway (1999) observed a process of reinforcing among farmers faced with issues related to climate change, as they connected futures scenario information with events that they had already experienced. Discussants in this study, particularly those who refused to place faith in the authority of science (i.e. Norwich *Denying*) and who were circumspect about the (mis)use of science, counterbalanced the weight of scientific information with their personal experience (individuals participating in the ULYSSES project also manifested this concern, Dahinden et al., 2003). The *Denying* group, for instance, did not noticeably modify their views in the light of new information obtained during the discussions, although they were interested in perspectives different to their own.

5.2. Similarity of outlooks

The statistically defined typological classifications of Norwich and Roman outlooks were upheld in the typological group discussions; this was particularly apparent during the Norwich discussions where the same scenarios were interpreted very differently. For instance, the *Uninterested* required additional explanations as to why the warming trend suggested in the scenarios contradicted their own experience of recently cool summers. Similar interpretations were observed by Whitmarsh among individuals who were skeptical about climate change and used the informational uncertainties to support their beliefs (Lorenzoni et al., 2007). On the other hand, the *Engaging* group attempted to reconcile the discrepancy in personal experience of the weather with scientific projections reported in the scenarios, by suggesting that recent events were exceptional and therefore diverged from the average represented in the scenarios. The notable differences between the Norwich *Engaging* and the other typologies' responses to the scenarios substantiated the usefulness of the statistical classifications of respondents. The possibility of differentiating individuals in these two cities according to their beliefs on the causes of climate change and its importance, suggests that similar distinctions may be present throughout Europe. These findings support both the mainly quantitative literature which denotes commonalities (e.g. Dunlap, 1998; Lorenzoni and Pidgeon, 2006) and segmentation in public views of climate change (cf. Leiserowitz's (2005) "interpretive communities" in the USA).

A question raised by our analysis is the longevity of the typological classifications. This study has provided a snapshot of views in two comparable contexts. However, as risk perceptions have been shown to be defined by individuals' characteristics and by the social context within which individuals operate (e.g., see Dake's (1992) comments), the four typological views of climate change in this study could be *fluid*, i.e. relative rather than absolute in time. It is plausible that the evolution of knowledge, understanding, beliefs and policy on climate change could over time either invalidate these typologies (as individuals readjust their views to reflect internal and external stimuli), or alter the proportions of individuals in each typology.

In terms of directions for future research, the study suggests additional attention could be dedicated to investigating:

- The representativeness of typological outlooks across other nationalities, through large scale, longitudinal studies (the robust findings in both Rome and Norwich suggest this would be likely in a European context).
- The consistency of responses to socio-economic and climate scenarios through discussions in typologically heterogeneous groups.
- The underlying cognitive structures of different typological outlooks. This paper suggests that individuals have deep-seated values and beliefs. These, in conjunction with external stimuli, shape people's views and opinions on a subject or issue. Would individuals of similar typological outlooks also share similar cognitive views beyond those explored in this paper on climate change?

5.3. Improving (re)presentations of the future

The group discussions yielded interesting suggestions for improving the scenario representations. Whilst discussants generally acknowledged the benefits of using scenarios to think about the future, they also argued that the scenarios presented were somewhat "unworldly," which limited their interest and credibility. Initially, participants took some time in understanding the notion of mutual development that underpinned the scenarios. It is possible that the difficulty in acknowledging or perceiving the interactions and interdependencies between human behaviors and the climate resided in a discrepancy between participants' worldviews and the theoretical notions portrayed in the scenarios. In both locations discussants suggested improvements to the scenarios:

- Portray changes on timescales commensurate with individually relevant timescales i.e. 20 years into the future rather than 50. This highlights a dichotomy between individuals' concepts of the future (e.g. Tonn et al., 2006) and scientific representation: by about 2025 the differences in climatic changes among scenarios are almost negligible; whereas they become more discernible from the 2050s onwards (IPCC, 2007: 14).
- Provide details of the methods, processes and sources of information used to derive the scenarios; describe projected local impacts with greater accuracy (similarly see Kasemir et al., 2003).
- Incorporate scenarios into motivating communications based on carefully tailored information—avoiding shock or alarm as these will not necessarily generate engagement (reflecting recent studies, e.g. Moser and Dilling, 2004; Lowe et al., 2006).

The careful and distanced manner with which the majority of group participants approached the information portrayed in the scenarios can be also explained in relation to their expectations of science and certainty. Some discussants felt that it was not their role to engage with scientific tools which were trying to represent complex reality in such a simplified way, thereby undermining science's own credibility. They favored information that a) makes explicit the uncertainties inherent in complex systems, and b) is more realistic about the future, representing combinations of scenarios to portray, amongst others, also a most likely future. Similarly the ULYSSES team also found that whereas some discussants desired greater sophistication in the global model outputs (Dahinden et al., 2003), others developed more trust in simple regional tools. These apparently contrasting findings suggest that for

individuals with no particular in-depth knowledge of climate change, accepting complex climate change information is a challenging process. In some cases the failure of science to meet high expectations of knowledge and certainty appeared to be, perhaps intentionally by less engaged participants, translated into reasons for inaction. If information appeals only when trusted and when consistent with existing beliefs, it begs the wider question of how imagery and communication may be used to catalyze opinion towards particular future objectives (Olson, 1995) or motivate action towards creating that "better place" desired by study participants. On a practical level, given the tendency of individuals to reinforce their existing cognitions, there is increasing focus on "marketing" climate change to individuals, tailoring information according to their existing understandings and priorities, through appropriate messengers, channels, means and terminology (e.g. Moser and Dilling, 2004; Futerra, 2005).

6. Conclusions

The aims of the study presented in this paper were to investigate understandings of climate change in Norwich (UK) and Rome (Italy), and the extent to which socio-economic and climate scenarios serve as a means to explore with members of the public the links and interactions between environmental change and human development. General conclusions from the study are:

- The two factors differentiating individuals' views—the importance of climate change and causes of climate change—were found in both populations, reinforcing other studies which indicate that publics share similar sets of perspectives.
- Individuals' conceivable timescales for visioning and engagement extend at the most to two decades into the future.
- Socio-economic and climate scenarios functioned as reflexive tools, in that they provoked profound—and sometimes intense—deliberation among group participants. Although the scenarios encouraged individuals to reflect upon their own beliefs about climate change, this reflection did not necessarily entail change of attitudes or opinion.
- The utility of scenarios depended on the expectations, credibility and trust reposed in them by the users. Many discussants, with the exception of those who were "engaged" with the issue, perceived and mobilized these conditions as constraints to further engagement. Credible science is therefore a necessary, but not sufficient condition, to encourage change.
- Some "publics" will be mobilized towards altering their views and attitudes on climate change through additional information, but only if this is consonant with their existing beliefs. For others, information provision about climate change may trigger resistance to change and even reinforce existing views.
- Consistent with other research, communication effectiveness and range are likely to be increased when tailored to publics according to their segmentation of beliefs and attitudes.

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Note

1 Logistical difficulties at the beginning of the group session meant it was not possible to exclude this one view from the discussions.

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