Preface

The origin of this book is tightly linked with the EveryAware project that I had the honour to coordinate from 2011 to 2014 (www.everyaware.eu). EveryAware was funded by the European Commission under the big Future and Emerging Technologies (FET) umbrella (http://cordis.europa.eu/fp7/ict/programme/fet_en.html) and in particular the FET-Open scheme of the 7th Framework Programme. EveryAware has been a collective effort where different institutions and excellent senior and junior researchers teamed up with a common goal in mind: that of merging the opportunities offered by the Information and Communication Technologies (ICT) for participatory sensing with a scientific approach to the emergence of opinions and awareness. Somehow the red line informing the whole project is beautifully summarised by the following Chinese proverb:

Tell me, I forget.
Show me, I remember.
Involve me, I understand.

Thus, the general idea was that of involving nonskilled individuals in the very collection process of environmental data, much in the same spirit of the Citizen Science (Dickinson and Bonney 2015), but crucially coupling this activity with a systematic gathering of opinions about their perception of the urban environment, from various points of view (noise pollution, air quality, mobility efficiency, etc.). The integration of participatory sensing with the monitoring of subjective opinions, perhaps the true innovation EveryAware put forward, is crucial since it has the potential to expose the mechanisms through which the local perception of individuals of an environmental issue, corroborated by quantitative and personalised data, could evolve into socially shared opinions, eventually driving behavioural changes. With this aim in mind, EveryAware proposed a scientific agenda to the problem of enhancing environmental awareness using a wide range of tools going from Information and Communication Technologies, social information technologies, data science, and theoretical modelling, ending up with a new technological platform, the EveryAware platform (cs.everyaware.eu) that combines sensing technologies, networking applications, and data-processing tools. EveryAware put together a truly transdisciplinary effort to turn what appeared, since the very beginning, as a very ambitious and challenging project, in a concrete successful reality. Several institutions gave a key contribution in this endeavour, and I wish to take this opportunity to thank each and every one of them for the impressive boost they gave to the project. In particular, ISI Foundation in Turin (ISI) provided the coordination of the whole project; ISI Foundation, led by Francesca Tria along with Sapienza University of Rome (PHYS-SAPIENZA), led by Vito D.P. Servedio, gave a strong contribution in analysing and modelling the social dynamics generated by the project also solving fundamental problems in the aggregation of massive noisy quantitative and qualitative data; University College London, led by Muki Haklay, brought into the project its specialised expertise in community building through the use of Geographic Information Systems; the Flemish Institute for Technological Research in Antwerp (VITO), led by Jan Theunis, gave an important contribution in the domain of environmental monitoring and modelling, making sure that the results of the project were relevant and realistic with respect to the issue of sustainability; the Gottfried Wilhelm Leibniz Universität of Hannover (LUH), led by Gerd Stumme and Andreas Hotho, has been a strong computer science partner that put state of the art technologies and competences in data science to the service of the project. Finally, the CSP Consortium in Turin, an ISI subcontractor, gave a strong contribution in setting up the sensing devices adopted throughout the project.

The present book has been conceived within the EveryAware Consortium to provide the scientific community at large with the patrimony of knowledge acquired during the project so that further initiatives can flourish along the same direction. Its aim is that of presenting in a comprehensive and non-technical way the experience learned through the EveryAware project as a lens to gather the potential of the emerging frameworks of participatory sensing, citizen science, and social computation, coupled with the theoretical and modelling tools recently developed by physicists, mathematicians, and computer and social scientists to analyse, interpret, and visualise complex data sets. What is emerging is a very clear proof of concept about the potential ICT-mediated social sensing can have in monitoring and possibly affecting individual perceptions, the emergence of awareness, and the dynamics of opinions.

Before going into the details of the book content, let me summarise the context in which EveryAware moved and what has been achieved.

The Context

Our societies are being transformed by the pervasive role technology is playing on our culture and everyday life, in a so deeply way that many refer to this phenomenon as the third industrial revolution (Rifkin 2011, 2014). Techno-social systems is the locution more and more adopted to quickly refer to social systems (Vespignani 2009) in which technology entangles, in an original and unpredictable way, cognitive, behavioural, and social aspects of human beings. Technology helps connecting people and circulating information and affects more and more the way humans interact with each other. Every day, a huge amount of information is exchanged by people through posts and comments online, tweets or emails, or phone calls as a natural aptitude of humans to share news, thoughts, feelings, or experiences. This revolution does not come without a cost, and in our complex world always new global challenges emerge that call for new paradigms and original thinking to be faced: climate change, global financial crises, global pandemics, growth of cities, urbanisation, and migration patterns (Batty 2008, 2013; Gore 2007; Randers et al. 2004; Stern 2007).

The issue of sustainability is now on top of the political and societal agenda and is considered to be of extreme importance and urgency. We already have overwhelming evidence that the current organisation of our economies and societies is seriously damaging (Revkin 2011) biological ecosystems and human living conditions in the very short term (Ancona et al. 2015; Beelen et al. 2015; Eeftens et al. 2012; Peterson et al. 2015; Sunyer et al. 2015; Zhao et al. 2015), with potentially catastrophic effects in the long term (Climate Change Evidence & Causes 2014; Haines and Parry 1993; The Arctic in the Anthropocene 2014; Williams et al. 2015). A recent report from WHO (2014) states that in 2012 7 million people died—one in eight of total global deaths as a result of air pollution exposure, confirming that air pollution is now the world's largest single environmental health risk (Burnett et al. 2014).

Yet, there is generally not sufficient awareness to foster a rapid and effective change in behaviour and habits. If we look at the past policies, we observe a growing debate about several environmental issues and an emerging consensus about the need for a reorganisation of our most impacting daily activities—energy consumption, transport, housing, etc.—towards a more efficient and sustainable development mode. Unfortunately, the achievement of such a goal has been undermined by the difficulty of matching global/societal needs and individual needs (Hardin 1968; Ostrom 1990; Ostrom et al. 1994): still is the cumulative sum of people's individual actions to have an impact both on the local environment (e.g. local air or water quality, noise disturbance, local biodiversity, etc.) and at the global level (e.g. climate change, use of resources, etc.). Only filling this gap, by empowering people with new tools to assess the status of their environment and become aware of their living conditions and their future consequences, can make 'the environmental revolution' possible.

Public participation in environmental decision-making was pushed to the fore as a result of the 1992 Rio Declaration on Environment and Development. However, the provision and production of environmental information, particularly on issues such as noise pollution and air quality, rely heavily on a 'top-down' approach in which public authorities collect the data and release it to the public. There is still room to develop better mechanisms that support citizens to not only consume but to generate their own environmental information. If successful, such processes could lead to an increased awareness and learning about current environmental issues. Furthermore, this may serve to encourage more citizens to participate in environmental decision-making and ultimately stimulate them to take steps to improve their own environment based on new observation techniques.

The EveryAware project responded to this societal need by pushing the evolution of ICT with the aim of supporting informed action at the hyperlocal scale, providing capabilities for environmental monitoring, data aggregation, and information presentation. The goal was that of enhancing knowledge, understanding, and social awareness about environmental issues emerging in urban habitats through the use of ICT tools deployed to gather user-generated and user-mediated information from mobile sensing devices. To this end EveryAware exploited recent progress in Information and Communication Technologies (ICT) that have the potential to trigger the much needed transition towards a sustainable society. In particular:

- *ICT for Participatory Sensing*. Nowadays, low-cost sensing technologies are being developed to allow citizens to directly assess the state of the environment; social networking tools allow effective data and opinion collection and real-time information sharing processes. Through the use of ICT tools deployed to gather user-generated and user-mediated information from web-based and mobile sensing devices, the knowledge, social awareness, and understanding of environmental issues and living conditions in urban habitats will be enhanced. The possibility to access to digital fingerprints of individuals is opening tremendous avenues for an unprecedented monitoring at a 'microscopic level' of collective phenomena involving human beings. We are thus moving very fast towards a sort of a tomography of our societies, with a key contribution of people acting as data gathering 'sensors'. Interestingly, this participatory sensing also presents challenges regarding quality and cost of sensors, reliability and representativeness of collected data, widespread and enduring participation, as well as privacy. Participatory sensing data will have to be integrated with pre-existing information. New models of interaction between citizens, authorities, and scientists will have to be developed. In addition, the innovative integration of mobile technology, sensors, and socially aware ICT can contribute to a shift towards a green and sustainable economy, which has been seen by many policy makers as one of the exit strategies from the current financial and economic crisis.
- *Web-Gaming, Social Computing, and Internet-Mediated Collaboration*. In the last few years, the Web has been progressively acquiring the status of an infrastructure for social computing that allows researchers to coordinate the cognitive abilities of users in online communities and to suggest how to steer the collective action towards predefined goals. This general trend is also triggering the adoption of Web-games as a very interesting laboratory to run experiments in the social sciences and whenever the peculiar human computation abilities are crucially required for research purposes. There is a wide range of potential areas of interests going from opinion and language dynamics to decision-making, game-theory, geography, human mobility, economics, psychology, etc. For instance, spatial games (related to traffic, mobility, coordination, etc.) are aimed at investigating how people (from literate to non-literate) explore geographical

spaces and use geographical information in a way that is meaningful and culturally appropriate for them. Specific tasks can include coordination, exploration, cooperation, and annotation. At the same time, these games/experiments would allow the collection of sensible information about how people perceive their environment, e.g. by evaluating which scale and level of details in imagery is most meaningful. This information can be organised in layers, e.g. traffic or pollution in urban environments, social interest, landmarks, etc., and made available through suitable interactive visualisation tools in order to help people to understand environmental changes, so to facilitate informed decision-making. Along the same lines, the citizen games share the common denominator of the management of the commons as well as the monitoring of the environmental changes. Interesting activities here include the development of new tools for the sustainable management of natural resources (in particular for marginalised communities), a more aware use of them, good practices for recycling, food management, mobility, energy consumption, communication, etc.

- *Collective Awareness and Decision-Making*. The access to both personal and community data, collected by users, processed with suitable analysis tools, and represented in an appropriate format by usable communication interfaces, has the potential of triggering a bottom-up improvement of collective social strategies. By providing personally and locally relevant information to citizens, i.e. related to their immediate locality rather than to the city or region in which they live as a whole, one can hope to stimulate fundamental shifts in public opinion with subsequent changes in individual behaviour and pressure on policy makers. Enabling this level of transparency critically allows an effective communication of desirable environmental strategies to the general public and to institutional agencies. For instance, fostering awareness and improving environmental monitoring could contribute to the reduction of pollution and waste of energy or the improvement of biodiversity in urban areas. Fostering the birth of environmentally positive communities, stimulating bottom-up participation, and collecting public opinions and perceptions in a trusted way are all factors that will empower the general public and policy makers with tools to gauge and orient the democratic processes of decision-making.

In this framework, EveryAware deployed the infrastructures to support participatory sensing in an environmental framework, high-performance data gathering, and storage. The resulting EveryAware platform is highly effective and represented the main backbone for all the EveryAware activities. The very same realisation of the EveryAware infrastructure represents a major achievement of the project since for the first time we demonstrated a complete end-to-end infrastructure able to integrate participatory sensing, accuracy of measurements from low-cost sensors, people engagement, and mobile and Web technologies. This infrastructure has been successfully deployed in several case studies (cs.everyaware.eu) devoted to noise pollution (Becker et al. 2013) and Air-quality (Sirbu et al. 2015). In addition EveryAware launched the Experimental Tribe platform (Caminiti et al. 2013) (www.xtribe.eu), a general-purpose platform designed for scientific gaming and social computation whose aim is that of providing the scientific community with a tool to realise Web-based experiments by skipping all the unnecessary technical coding overhead. Finally, a great deal of attention has been devoted to the theoretical investigation of the social dynamics underlying the processes through which opinions are formed and individuals enhance their awareness.

Summary Description of the Project Context and Objectives

The EveryAware project expected to contribute significantly to the social goals of achieving greater awareness of localised, personalised environmental information through the implementation of novel infrastructures for bi-directional communication.

Specifically, it aimed to develop the tools and the knowledge needed to make environmental information transparent, available, and easily integrated with the perceptions of people, regarded as a first-order observable. *Bridging the gap between opinions and sensor data is the single factor that can make environmental knowledge actionable at the grassroots level.* Current approaches to the onset of sustainable practices in citizens' environmental behaviour have been based on top-down strategies for understanding behaviour (Jackson 2005) and have met with mixed success (Collins et al. 2003). The participation of citizens has traditionally been limited to opinion polls and public discussions where people have been asked to convey their needs and their opinions to panels of designated experts responsible for tackling emerging issues. The environmental monitoring activity, the public dissemination and discussion, and the policy making are performed in separate places and at different times, with little transparency about how environmental issues are treated by each actor throughout the whole process.

EveryAware project, conversely, has been based on the idea that citizens should be involved not only as passive receivers of pre-packaged environmental information, but also as active producers of it, by means of the networking possibilities allowed by mobile devices, pervasive Internet access, Web 2.0, and the mobile Web tools that support sharing and annotations of geo-localised content. The framework envisioned in the project allows users to participate in all stages of environment management: by contributing to enrich its monitoring, expressing opinions, joining a motivated community, and eventually implementing best practices with the potential to improve environmental conditions.

The notion of geo-localised user-generated content is of course not novel. A number of participatory websites and Internet-based scientific projects have been successfully deployed (see Goodchild (2007), Flanagin and Metzger (2008), and Hudson-Smith et al. (2009) or http://tah.openstreetmap.org for examples and a review of the field of Volunteered Geographic Information). However, most collaborative Web-based systems have bound themselves to merely visualise the data collected by users, without a scientific analysis of it. In contrast, EveryAware proposed that users participate in the scientific endeavour itself by making use of current and emerging hand-held electronic devices incorporating significant computing power. Such devices should be easily connected to sensing equipment and to the Internet without requiring specific expertise from the user. In the field of environmental monitoring and research, it was, and still is, a great novelty to deal with data from a large number of mobile, randomly distributed, 'uncontrolled', low-cost, and therefore potentially less reliable sensors carried by nonskilled individuals, as compared to the practice of a limited number of mostly stationary and highly controlled data collection systems based on expensive high-quality measurement instruments. It was additionally novel to involve non-expert users in an end-to-end process from data capture to final output. The integration of participatory sensing with the monitoring of subjective opinions has been the key and crucial novelty of EveryAware, as it has the potential to expose the mechanisms by which the local perception of an environmental issue, corroborated by quantitative data, evolves into socially shared opinions and how the latter, eventually, drive behavioural changes. In our opinion, this approach represents a scientific and technological advance from several points of view as explained below, and EveryAware carefully addressed all the different research and technological challenges it implies. In the following, we briefly describe them.

The EveryAware Platform A key technological novelty of the EveryAware project has been the design and the implementation of the so-called EveryAware platform that handles both sensor and subjective data acquisition. The platform is a modular system composed by several components: a SensorBox to gather objective data about the environment, a smartphone controlling the data acquisition and the user experience, a system of data gathering, storage, analysis, and visualisation, and several Web-services. This approach guarantees high scalability of the overall system and allows for further developments aimed at having pluggable sensors, eventually miniaturised and integrated (e.g. wearable sensors). At the same time, the associated software platforms allow users to easily upload their sensor readings and equally easily tag these with subjective information. The ICT challenge here was that of making this upload process as automatic and natural for the user as possible.

Community Engagement Work dating as far back as 1969 (Arnstein 1969) lists the possible levels of citizens' participation, ranging from non-participation to citizen control (where budgets are assigned to the citizens themselves) and more recent projects (Aoki et al. 2009; Haklay and Whitaker 2008; Maisonneuve 2008; Paulos et al. 2007; The Digital Geographers 2009) stress the importance of the participation process and the impact that informed community members have on local decisions. Such participation can improve both the science literacy of a population (Paulos et al. 2009) and offer different views of communities (Srivastava et al. 2006) to scientists: the real-time monitoring of opinions related to empirical observations will provide environmental sociologists with a corpus of detailed knowledge about how environmental conditions are perceived by a community: What issues are regarded as most relevant? How are novel behaviours propagated? What motivates participation, engagement, and behaviour change? Motivation for users' engagement and continuing participation in online project such as Wikipedia (http://www.wikipedia.org/) or OpenStreetMap (http://www.openstreetmap.org/) has already been extensively examined (Benkler 2002; Haklay et al. 2007; Nov 2007). However, similar motivations cannot necessarily be attributed to the citizen sensing participants in the EveryAware project, which presumably requires a higher level of commitment to that of a Wikipedian (who contributes 8.27 h per week on average (Nov 2007). Obtaining information related to encouraging initial and continued participation was therefore fundamental to the developers of systems such as EveryAware as it can be utilised to ensure that participants are highly motivated to engage with the project and more importantly remain engaged over the longer term. Novel research has been focused on two aspects of the problem. Firstly, a number of participant recruitment techniques (such as social networking sites, flyers, posters, e-mail campaigns) have been trialled systematically to identify those that achieve greatest success and validate whether similar techniques can be applied both in cross-border situations and with groups having different interests. Secondly, still ongoing research is identifying a list of motivations for ongoing participation once recruited, with a particular focus on those users who remain engaged with the project over a longer term. The results from both elements of research not only informed all the stages of the project but will also be of great relevance to similar participatory projects elsewhere.

Processing Sensor Data Specific issues emerged concerning sensor data. To illustrate this point, let us focus on air quality sensors. Although in most epidemiological studies air quality is commonly defined at the level of a city, recent air quality studies have highlighted that significant differences in pollutant concentrations, and in related health effects, can occur over the day and between different locations (Beckx et al. 2009; Kaur et al. 2007; Milton and Steed 2007; Wilson et al. 2005). The measurement of air quality at a high spatial and temporal resolution can yield a tremendous advance in the characterisation of the pollutants' urban concentration variability. Measuring mobility and activity patterns allows researchers to gauge the real-world exposure of citizens and in turn the overall effect on the health of urban communities.

The use of networks of available low-cost sensors will enlarge the data coverage. In the past, the adoption of low-cost sensors for ambient air quality monitoring has always been constrained by lack of accuracy, selectivity, and reliability (Carotta et al. 2007). However, new sensing technologies (arising from additional developments in the fields of semiconductors, nanotechnologies, and fibre optics, amongst others) will bring the detection limits of commercial sensors to the part-per-billion range needed for air quality monitoring. At the same time selectivity increases (Brunet et al. 2008; Elmi et al. 2008; Li et al. 2003; Viricellea et al. 2006). Thanks to the integration of cheap sensors in sensor networks, increased data availability, network intelligence, and advanced data mining techniques, limited accuracy and reliability can further be countered (Kularatna and Sudantha 2008; Ma et al. 2008; Tsujitaa et al. 2005) (see also IDEA project http://www.idea-project.be).

Several research projects have developed or are developing low-cost portable air quality sensing tools based on commercially available sensors (Aoki et al. 2008; Eisenman et al. 2007; Honicky et al. 2008; Hull et al. 2006; Maisonneuve et al. 2009; Milton and Steed 2007; Völgyesi et al. 2008) (see also http://www.lamontreverte.org/, the Cambridge Mobile Urban Sensing (CamMobSens) http://www.escience.cam.ac.uk/mobiledata/ or http://urban.cens.ucla.edu/projects/cyclesense/). However, when EveryAware started, none of those efforts had reported extensive field trials or reported full-scale validation exercises. Specific technical challenges have also to be tackled such as the precision of GPS in densely built urban environments (Milton and Steed 2007).

Combining Sensor and Subjective Data One of the main novelties of EveryAware has been the strong effort towards an integration of sensor and subjective data in order to provide insights about the social perception of the state of the environment (see also below). A quantitative analysis of the gap between perceived and measured environment had never been attempted in a systematic way. Both kinds of data are affected by the procedures to gather them as well by intrinsic biases, both in space and in time. This raised new issues of data validation, calibration, interpretation, and representativeness that had to be tackled in a creative way and embedded in digital data-processing procedures in an, as much as possible, autonomous, learning way.

Citizen Science An important challenge concerns the development of and examination of the use of Web-based tools through which (groups of) interested lay people and scientific experts can interact directly, discuss provisional results of data collection, and mutually enrich both the data itself and the interpretation of the data. Here the actual challenge was the presentation of complex scientific analysis in a user-friendly manner to non-specialists. From this point of view, the project paid a special attention to ICT challenges that include (i) the usability of the interface design so that users can easily find the desired information (at the individual level or aggregated) (ii) the appropriateness of the actual displaying methods: how to present results so that non-specialist users understand both the analysis undertaken and the outcomes? Will access to this information help users feel rewarded and part of a community, encouraging further participation? Thus, the overall novelty of this component of the project has the development of a user-friendly manner to present complex scientific analysis (both the methods and the results) to non-specialists.

Opinions and Behavioural Change The direct involvement of the users in the research as described above leads to the potential discovery of emerging behavioural patterns, as well as to an assessment of the impact of new technological solutions at the socio-economic level. Despite these benefits, none of the existing studies (Aoki et al. 2008, 2009; Eisenman et al. 2007; Honicky et al. 2008; Hull et al. 2006; Ma et al. 2008; Maisonneuve et al. 2009; Milton and Steed 2007; Paulos et al. 2007) (see also http://www.escience.cam.ac.uk/mobiledata/ or http://urban.cens.ucla.edu/projects/cyclesense/) using citizen sensors specifically evaluate individual behaviour change in any way, although Honicky et al. (2008) and Milton and Steed (2007) raise this as an issue to be investigated.

This issue is closely linked with the concept of participant motivation described above—will a participant sufficiently engaged with the project also modify his or her behaviour as a result of the personalised information presented? Lawrence (2009) notes that the link between engagement and behaviour change is not yet fully established in the context of environmental change and climate change discourse. Although other studies using diverse sources of data have identified the usefulness of such individualised information (Darby 2008; Paulos et al. 2007), many of the citizen sensor studies are still at pilot stage (Honicky et al. 2008; Milton and Steed 2007) and do not state behavioural investigation as one of their direct aims.

In general, the dynamic processes underlying the formation and the evolution of opinions, uses, and behaviours have rarely been investigated in experimental settings and almost never coupled to the exposure of users to suitably detected and processed relevant information. Influencing behaviour change is notoriously difficult due to the complexity and variety of factors that affect behaviour (Jackson 2005), and a number of alternative models have been proposed. 'Expectancy-value' theories group together model whose choice is motivated by the expectations we have about the consequences of our behaviour and the values we attach to those decisions (Jackson 2005) (e.g. the rational choice model). Staged models (Prochaska and DiClemente 1986 and Lee and Owen (1985) (State Government of Victoria 2006)) include the fact that understanding and assimilation of the consequences of an action may be incomplete, that information may relate to events in the future (e.g. the possibility of developing lung cancer), and that a distinct cognitive effort is required to modify behaviour (Jackson 2005). The basis of all behaviour models, however, is the assumption that knowledge and awareness of an issue or a problem are key requirements for a behavioural change. However, very few studies have been undertaken on changes in individual behaviour due to the provision of individual-specific information.

A theoretical contribution to the understanding of opinion and behaviour change came from recent studies performed in the opinion dynamics field (Castellano et al. 2009). Such interdisciplinary area focuses on the modelisation of opinion spreading in large social networks, with a heavy use of mathematical tools and methods borrowed from statistical physics. Many models have been developed in the literature to explain how social systems develop a consensus on a given issue (e.g. on political votes) or which social interaction favours the coexistence of multiple opinions in a community (Lambiotte and Ausloos 2007; Sznajd-Weron and Sznajd 2000). However, empirical bases behind such models are still scarce, in particular for what concerns the opinion dynamics, which requires the monitoring of a social system during time. Although some of the partners had already explored these problems in recent works, focussing on the emergence of semantic agreement in social networks (TAGora 2007), crucial issues such as the study and the modelisation of the resistance to opinion shift are still a largely unexplored field. The EveryAware project contributed to provide the empirical, computational, and theoretical basis for an advance in such line of research.

Book Structure

The book will cover the above-mentioned themes in a series of chapters organised in the following three main parts.

Part I *New Sensing Technologies for Societies and Environment* (coordinated by: Andreas Hotho, Gerd Stumme and Jan Theunis). Part I presents an overview of novel ICT-based or ICT-mediated concepts, tools, and methods in data collection/monitoring using both technological and human sensors. It describes the technological potential and challenges/boundaries of these sensing opportunities to observe the environment, people's activities, and subjective elements such as opinions, interpretations, and moods. It also describes issues related to data ownership and privacy.

Part II *Citizen Science, Participatory Sensing, and Social Computation* (coordinated by: Muki Haklay and Vito D.P. Servedio). This part discusses concrete case studies where the tools described in Part I have been successfully deployed to monitor the social processes behind the emergence of awareness.

Part III *Collective Awareness, Learning and Decision-Making* (coordinated by: Vittorio Loreto and Francesca Tria). Finally, Part III gives an overview of different studies and approaches that have been pursued with the aim of gaining a deeper insight into the mechanisms that drive people's understanding of environmental issues and enhance their awareness with the final goal of elucidating under which conditions it is possible to foster an effective change towards more virtuous behaviours.

Each part includes a series of contributions not only from scholars who took part to the project but also from experts in their own respective fields, and it will be opened by a short introduction that summarises the main themes and put the different contributions in the right perspective. I hope this will provide the audience with a comprehensive picture of the state of the art along with hints about the roadmap in front of us. Have a nice trip.

Now it is time for the acknowledgements. First of all, I wish to thank all my co-editors and colleagues for the constant support both during the project's lifetime and the preparation of this book. Also on their behalf, I wish to thank all the contributors who gracefully accepted to submit their papers for this volume and made a strong effort to keep the deadlines. Also many thanks to all the friends and colleagues who helped us in reviewing the book's contributions and make the whole book a consistent piece of work. Finally, I wish to thank all the junior and senior scientists and administrative and scientific secretaries who made an especially egregious job in keeping together all the different threads the project generated and put their enthusiasm at the service of the whole Consortium. Last, but not least, I wish to

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Rome, Italy/Turin, Italy/Paris, France Vittorio Loreto
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