Chapter 11
Citizen Panels on Climate Targets: Ecological Impact at Individual Level

Ralf Cimander

Abstract There is hardly any valid empirical evidence on whether citizen participation has an impact on the desired objectives. This chapter provides an answer to this question, taking as example seven citizen panels on local climate targets in Austria, Germany, and Spain within the e2democracy (e2d) research project. The citizen panels were part of collaborative (e-)participation processes of citizens and businesses with local governments aimed at reducing carbon dioxide equivalents (CO_{2e}) by at least 2 % per annum over a period of up to 2 years. After the first year, the majority of panelists in the five Austro-German panels achieved or surpassed the target; in both Spanish panels, less than half did so; after the second year, the percentages of target achievers somewhat declined. So, even though many participants achieved their reduction target, a considerable number of participants did not reach it or reduced their efforts in the second year. Across all seven panels, savings could particularly be achieved in the heating energy and electricity sections. In the fields of nutrition and consumer goods, there were even cases where emissions increased. For the mobility fields of private and public transportation as well as flights, no homogeneous tendencies could be observed among the panels. Overall, even though the size of countable CO_{2e} reductions was not that high, citizen panels were particularly successful in achieving a reconsideration of the panelists' lifestyles and habits and, to some extent, encouraged effective change processes.

11.1 Introduction

One of the objectives of the e2democracy (e2d) research project was to determine whether participation in citizen panels focusing on climate action may have any impact on the development of the participants' CO_{2e} balances.[1] This chapter in-

[1] Further information on this evaluation of collaborative e-participation within the e2d project (e.g. theoretical assumptions, research design, research instruments) is provided in Chap. 7.

R. Cimander (✉)
Institute for Information Management Bremen (ifib), University of Bremen, Bremen, Germany
e-mail: ralf.cimander@icloud.com

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troduces the ecological impacts at *individual* level, that is, how many participants improved their own CO_{2e} balance by at least 2% per annum (p.a.) and the areas of everyday life in which they did so and in which they did not. By contrast, the next chapter in this book (Chap. 12) will present the ecological impacts of the seven citizen panels in terms of changes in the amount of CO_{2e} emissions of each panel and assesses whether the *collective* target of 2% savings of CO_{2e} per panel and year was achieved. The panels were located in the Bregenz and Mariazell regions (Austria), Bremen, Bremerhaven, and Wennigsen (Germany), and Pamplona and Saragossa (Spain). The main data source is the panelists' CO_{2e} balances over time (based on bimonthly individual monitoring); additional information comes from surveys among the panelists. Certainly, the development of a panelist's individual CO_{2e} balance is not only dependent on the marks and nudges set by the panel activities. A citizen panel is not a closed system; rather, panelists are exposed to many influencing factors from outside. Hence, changes in the development of a person's CO_{2e} balance need not necessarily originate from a change of attitude and behavior due to their participation in the panel but also from other factors. Examples include the need to fulfill social norms, cultural characteristics, and systemic and structural constraints like changing weather conditions or the available public traffic infrastructure. Last but not least, individual context conditions such as longer absence from home or changing family or working conditions also have their impact. However, to mitigate such unpredictable and unstable factors, the individual monitoring results have been combined with results of the accompanying regular panel surveys (Chap. 10)[2] and qualitative personal feedback gathered from panelists during up to 2 years of monitoring. This procedure will allow us to attribute behavioral changes to impulses from the citizen panels.

The chapter is structured as follows: Sect. 11.2 outlines theories of individual behavior change which are summarized in Wilber's four-quadrant model (2000) with corresponding empirical results. Section 11.3 presents the main results in cross-regional comparison, that is, the percentage of those panelists who achieved their 2% reduction target after 1–2 years of monitoring. Section 11.4 deals with the question of the areas of everyday life in which it was more likely for panelists to achieve a reduction of CO_{2e} emissions, and in which less and why. The chapter closes with a concluding summary of the impact on individual CO_{2e} balances in the seven citizen panels.

[2] Important differences between measurements by the carbon calculator and panel surveys need to be born in mind. They concern sample size and nature of questions: carbon calculator data are based on 419 cases in total and quantitative measurements of consumption aspects; relevant results of the third panel survey ask for extent and type of behavior changes and go back to 316–333 respondents in total.

11.2 Theoretical Background and Context Information

Citizen participation in environmental issues has experienced increased relevance in the recent past. This is, for instance, indicated by the concept of *environmental democracy* (Aichholzer et al. 2012; Hazen 1997) and the various engagement opportunities around climate change adaptation and mitigation (Edwards et al. 2008; Carson 2010; Höppner and Whitmarsh 2010; Bechtold et al. 2012). However, citizen participation in environmental issues differs from engagement in other fields: In order to achieve sustainable solutions through public participation in climate action issues, long-term changes in individual attitudes and lifestyles have to be achieved (Lorenzoni et al. 2007). Thus, one of the key research questions of the e2d project was whether citizen participation (particularly the form of citizen panels) can help to solidly establish climate action and sustainability in citizens' perception, values, and behaviors. The question is based on the assumption that a profound change which includes attitudes and lifestyles at individual and collective levels and comprises ecological, economic, social, and cultural changes is required. The rationale behind the specific participation design based on citizen panels in e2d builds on a combination of *individual* and *collective* action elements: Together they are expected to induce and support a sustainable change to pro-climate attitudes and behavior, and ultimately a reduction of CO_{2e} emissions. Issue-relevant information and *individual* consumption monitoring with feedback providing for individually tailored information and guidance are meant to encourage behavior reflection and change through "gentle nudges" as postulated by Thaler and Sunstein (2008). Through the citizen panels, these processes are embedded in *collective* local initiatives with opportunities for exchange and community, social capital, and capacity building to take effect (cf. Heiskanen et al. 2010), and to provide for social backing and reinforcement of individual commitments and endeavors to reorient behaviors toward reducing carbon emissions.

Whether and to what extent participation in the citizen panel actually leads to a change to pro-climate behavior and a reduction of CO_{2e} emissions is determined by several factors at different levels, in particular at individual, process, and wider context level. These can be neither described purely technologically, sociologically nor justified solely psychologically. A brief outline of theoretical strands intends to show the different factors that may influence a person's behavior.

Changes in behavior are measured in e2d by evaluating whether panelists have improved their individual carbon balance or not, and if so whether they have achieved the 2% p.a. savings target, improved below the target, or worsened their balance. Moreover, participants were also analyzed on the basis of their changing behavior as regards attitudes and lifestyle (see Chap. 10). However, the participation format not only had to provide the arena to facilitate these changes, it was also dependent on the ecologic, economic, social, and cultural contexts in the participating cities and regions. There are some models and theories in research focusing on explanations of action and behavior change that describe causal determinants

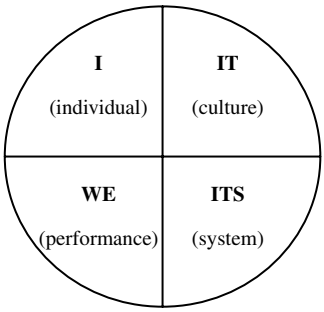

Fig. 11.1 Illustration of the four-quadrant model (adapted from Wilber 2000)

and mechanisms.[3] One of the basic intervention models is the needs-opportunities-abilities (NOA) model of consumer behavior by Vlek et al. (1997), summarized in Darnton (2010): Needs together with opportunities form *motivation,* and opportunities together with abilities form *behavioral control*. Both motivation and behavioral control create the intention that triggers *consumer behavior*. Another fundamental theory used in environmental research is the "theory of planned behavior" of Ajzen and Fishbein (1980). This theory assumes that a behavioral intention is formed depending on three constructs: "(1) the attitude toward the behavior, (2) the subjectively observed social pressure to carry out or to leave the behavior in question (subjective norm), and (3) the subjectively perceived possibilities or difficulties, as the case may be, of carrying out the action in question" (translated from Baumgartner 2004, p. 83). The model of Fietkau and Kessel (1981) adds to this the aspects of concrete behavior options to guide behavior and action incentives as further and most important influencing factors (cf. Hellbrück and Fischer 1999, p. 559; Fliegenschnee and Schelakovsky 1998, p. 46 ff.).

These intervention models and theories contain action motives from within the individual (e.g., attitudes for their own sake) and that are externally influenced (e.g., social norms set by the world outside). The intervention models and theories provide ideas for explaining the empirical findings although in e2d it was not possible to provide data on all the influencing factors mentioned. The four-quadrant model of Wilber (2000) serves as a conceptual frame of reference that integrates the elements and factors highlighted in the different models and theories (Fig. 11.1).

On the basis of Wilber's model, there are four dimensions of change. If behavior change is to be triggered, influencing factors from these four dimensions have to be considered: individual (e.g., skills and expertise, attitudes), performance (e.g., interaction, relations, and behaviors), culture (e.g., collective, common world view, and norms), and systems (e.g., larger environment, stakeholder networks, and structures).[4] The achievement of the 2 % reduction target is subject to influencing factors on all four quadrant levels. Although not all factors could be considered in the analysis of the panels, the basic approach serves as a framework in order to

[3] For further information on such theories particularly relevant for the field of climate action, please consult Chaps. 3, and 13.

[4] Further information can be found in Wilber (2000).

explain whether improvements in the individual carbon balances of panelists have been achieved or not.

11.2.1 Individual Dimension

The individual dimension concerns the internal view on attitude and behavior forming. This mainly includes social, psychological, and economic factors that form the values and attitudes toward climate action. Some of them will be briefly outlined here. First, it can be assumed that citizens interested in participating in e2d find climate change worrying or are convinced that climate change is taking place and at least in part is caused by human activity. According to the e2d panel surveys, their commitment to environmental issues motivated more than 90 % of respondents to actively take part in the project on climate change mitigation. Also more than 90 % found climate change worrying. These findings were made throughout all seven citizen panels without significant regional differences.

When panelists were asked for their opinion of who was responsible for reducing CO_{2e}, a more differentiated picture emerged. Panelists had to allocate nine points in total among the three major societal groups: citizens, businesses, and public authorities/policy makers (state). The more points they assigned to one of these groups, the more responsibility lay with this group, in their opinion. They could split the points between one, two, or all three groups. Table 11.1 shows the mean distribution of points given by panelists.

In four of seven panels and in total, panelists see the state as having most responsibility (3.3 of 9 possible points), followed by businesses (3.0) and citizens (2.7). Thus, even though there is a high commitment to environmental issues among panelists, in Austrian and Spanish panels it was the state that was seen as bearing most responsibility, and often followed by the business sector. The panels in Germany rated this aspect differently. Here, the highest scores were attributed to citizens (Bremerhaven and Wennigsen) or businesses (Bremen). This pattern is con-

Table 11.1 Share of responsibility for achieving CO_{2e} reduction targets attributed by panelists. (Source: First survey of panel members)

Who do you think is responsible to what extent for achieving the CO_{2e} reduction targets? Distribute 0–9 points	*N*	Citizens mean	Businesses mean	State mean
Bregenz	27	2.8	3.0	3.7
Mariazell	23	3.3	2.8	3.4
Bremen	88	2.6	3.3	2.8
Bremerhaven	29	3.5	3.1	3.0
Wennigsen	46	3.2	2.9	2.7
Pamplona	75	2.6	2.8	3.7
Saragossa	186	2.5	2.9	3.5
Total	474	2.7	3.0	3.3

sistent with larger cultural differences: Austria and Spain have a tradition of state dominance and reliance on the state whereas the city-states and regions in Northern Germany are known for a well-developed civic culture and strong civic self-esteem (cf. Kubicek and Croll 2008). The high rating for business responsibility in the Bremen panel, however, seems to be a result of ongoing debates whether the high CO_{2e} emissions caused by the local steel mill are to be included in the city-wide CO_{2e} balance, thus hiding any improvements made by private households, or not. Hence, the basic attitude toward politics of citizens in a country may set the frame, but local conditions can ultimately influence the public opinion of local groups. Here, a typical phenomenon becomes visible as a tendency: Although participants are committed to pro-environmental issues and have climate-friendly attitudes, a considerable percentage sees the state or businesses having prime responsibility to act; that is, *the others* should do their share first (see also European Commission 2014; Kuckartz 2010). For the targets of the e2d project, this meant that much emphasis had to be put on the motivation of panelists to continue participating in the panels.

Socio-demographic Composition of Panels In environmental research, the focus of analysis has increasingly shifted to the field of lifestyle research. Certain attitudes and preferences are more effective in certain milieus and, thus, influence climate-relevant action. In accordance with Höppner and Whitmarsh (2010, p. 48), "human engagement with climate change may be understood as a person's state of connection to climate change, and comprises different though interconnected aspects: cognitive, emotional and behavioral." Lifestyles of panelists as such were not the focus of e2d research. However, basic socio-demographic data were gathered from the survey questionnaires and matched where possible with the monitoring data gathered through the CO_{2e} calculator. Table 11.2 gives an overview of the basic composition of the panels at the time of the baseline measurements. The following characteristics are considered: gender (male, female), age (< 30, 31–50, and 51 + years), parenthood (children vs. no children), education (compulsory school, secondary school, and university degree), and employment status (employed, not

Table 11.2 Composition of the citizen panels—basic socio-demographic characteristics. (Source: First survey of panel members)

	N	Gender % male	Age % 51 and older	Children % yes	Education % university degree	Occupation % employed
Bregenz	29	41.4	65.4	74.1	37.0	66.7
Mariazell	24	58.3	78.3	78.3	9.1	39.1
Bremen	89	53.9	45.5	54.6	75.6	64.0
Bremerhaven	29	62.1	55.2	93.1	35.7	62.1
Wennigsen	52	50.0	66.0	88.0	59.6	54.0
Pamplona	82	39.0	45.0	71.8	55.7	66.3
Saragossa	209	54.1	51.0	63.4	40.5	47.1
Total	514	51.2	52.4	68.6	49.0	55.4

employed). Local deviances from the general trend became apparent, for example, concerning age: in nearly all panels, the largest group of participants is consisted of those who are 51 years and older (only the Pamplona panel deviates from the general trend with the group aged 31–50 dominating). The patterns regarding the other characteristics are quite varied among the seven panels. With few local exceptions, slightly more men took part in the panels. The mean age is somewhat above the average age distribution in the three countries and, partly as a consequence, also the percentage of panelists with children is quite high and above average for many panels. The widest range could be found in education, and with an average of 49 %, the share of academics is well above the corresponding figure in the local populations, except for the Mariazell region. More than half of the participants were in employment while others were already retired, went to school, or stayed at home.

Some of these results were also found in other studies. For example, the Eurobarometer studies (European Commission 2009, 2014) or Kuckartz (2011) underpin the notion that it is the better educated, white-collar workers who regard climate change as more important and who are more often engaged in environmental issues. However, according to the Eurobarometer survey, more females took action toward fighting climate change or seem to be more concerned than men. The age distribution also differs. According to the Eurobarometer surveys (European Commission 2009, 2014) and Kuckartz (2011), older people and people who stay at home are less interested and concerned by environmental issues. In e2d, the age composition varies from a "young" panel in Pamplona where only 45 % are above 50 to the Mariazell region where about 78 % are of this age. Overall, more than half of the panelists are over 50 years old. Thus, at least regarding age and education, the panels are not representative for the national or local population. However, as the development of the CO_{2e} balances at the collective level (Chap. 12) shows and as will be detailed later on, the above-average share of academics and middle agers has not led to significantly higher CO_{2e} reductions or better results.

11.2.2 Behavioral (Performance) Dimension

The relevance of values and attitudes for behavior change is obvious (Ajzen and Fishbein 1980). But as shown in Chap. 10, a considerable percentage of the panelists did not act consistently. One reason is that panelists are different, that is, they have diverse values, opinions, resources, and constraints. They tend to follow their interests in accordance with their current needs. Needless to say, engagement in a citizen panel competes with other preferences in life. Not all interests can be followed by individuals to the required extent, as their time is limited. Compared to many other engagement opportunities, however, engagement in environmental issues has a particular disadvantage. Ecologically sensible ways of action are often both unfamiliar and require increased efforts and, thus, are likely to turn out to be so-called "high-cost activities" (Michelsen 1991, p. 16). In accordance with the low-cost hypothesis by Diekmann and Preisendörfer (1992), high-cost activities require extra endeavors

by individuals to undertake a certain activity or to change their prevailing behavior. "The lower the cost pressure in a situation is, the easier the actors find it to translate their environmental attitudes into the corresponding behavior. Conversely, the importance of the attitudes decreases if the situation involves larger demands on behavior" (translated from Diekmann and Preisendörfer 2001, pp. 117 f.).[5] Many people are prepared to engage in activities that do not cause much cost, but only few go beyond and start activities that require a real change of behavior (Maibach et al. 2009; O'Neill and Hulme 2009; Whitmarsh 2009) and that entail CO_{2e} reductions to a greater extent. This finding can also be observed in the e2d panels. Even though panelists define the transition between low-cost and high-cost activities differently, there are tendencies that allow for such generalization in e2d.

One of the basic instruments employed in e2d that meant to trigger behavior change was monitoring and feedback using a CO_{2e} calculator (for details, see Chaps. 7 and 8). Comparative feedback was meant to inform citizens on the development of their individual carbon balances, of that of the other panelists, and subsequently to inspire behavior change. As to be expected, about 70 % of reporting panelists answered that their individual success in CO_{2e} reduction motivated them to keep on monitoring their own behavior. Moreover, more than 61 % rated the comparison functionalities with the carbon balances of other participants in their panel as being important. In light of these views, one would have expected different results for the Spanish as compared to the Austro-German panels (because of a restriction in the Spanish carbon calculator's functionality). But surprisingly, for both questions (except for the Bregenz panel), no significant differences could be observed among the seven panels. This result is in accordance with the findings of several intervention studies and reviews that in summary determined that feedback—in particular when given frequently—has proven its merits and was successful in reducing energy use, including in the long run. Smart meters that automatically give direct feedback on household energy consumption have achieved reductions in the range of 4–20 % (e.g., Abrahamse et al. 2005; Darby 2006; Ehrhardt-Martinez et al. 2010; Gleerup et al. 2010; Schleich et al. 2011).

11.2.3 Cultural and Systemic Dimensions

To explain differences among the citizen panels in the three countries, alongside reasons from the individual and behavioral dimensions, social context factors are also relevant. According to Wilber's (2000) model introduced above, first and upmost are the social norms that may support or hinder the change of individual behavior. In research as well as in the practitioner community[6], there is a growing

[5] See also the related section on the low-cost hypothesis in Chap. 12.

[6] E.g. grassroots innovations such as the transition towns initiative (Website: http://www.transitionnetwork.org/ [Accessed November 5, 2014]) or the Carbon Reduction Action Groups (c.f. Whitmarsh et al. 2010; Feola and Nunes 2013; Neal 2013).

commitment that it is not only individual attitudes that have to be addressed through activities aimed at behavior change in environmental issues but also the context in which citizens live (e.g., Hornik 1997; Kollmuss and Agyeman 2002; Steg and Vlek 2009). Social and cultural contexts frame and constrain behavioral choices and "are particularly critical for collective resource dilemmas such as climate change" (Rabinovich et al. 2010, p. 67). Social norms describe what people normally do or what behavior is common or desired in a specific cultural or social context (cf. Schultz et al. 2007). "Because people measure the appropriateness of their behavior by how far away they are from the norm, being deviant is being above *or* below the norm" (Schultz et al. 2007, p. 430). Schwartz's norm activation model attributes a key role to the fulfillment of social norms in order to explain altruistic behavior (Schwartz and Howard 1981). The social norm is of a moral quality and, transferred to an ecological context, represents a person's deep conviction that they are making a personal contribution to mitigating climate change (Hunecke et al. 1999, p. 13). For example, panelists in e2d could consider it their civic duty to do something against climate change (cf. Kuckartz 2009, p. 4) or they could take up competition by actively contributing to CO_{2e} reduction in order to become more climate friendly than their neighbors. Even if failures are reported,[7] field experiments that called upon social norms evidenced success in target achievement (Kuckartz 2009, p. 429).

The seven citizen panels were designed to establish compliance with the social norm of sustained pro-climate behavior in their city or region. A first approach was that the citizen panels provided space for information exchange and discussion among participants, at local level as well as to some extent also between the panels in the three countries. Together with the monitoring instrument, this enabled group formation and generated team spirit toward reaching the same goal (see Chap. 10). Moreover, the panels provided the arena for comparing and discussing their own achievements with those of others and set a certain benchmark that offered orientation, that is, a kind of norm for panelists. In accordance with Hinding (2002, p. 58), this allowed knowledge deficits to be compensated for and for support for everyday practices to develop. Thus, appealing to pro-climate social norms had a positive impact on the attitudes and behavior of panelists.

Systemic influences on the participation processes in e2d mainly concern geographic and climate conditions as well as questions of available infrastructure and its use. Another example where national peculiarities become apparent is the salience of the climate issue. When looking for city partners before the start of the e2d project, it soon became apparent that water shortage is a more prominent problem directly facing citizens in Spain than the need for energy savings or CO_{2e} reduction. In accordance with the Kyoto Protocol (Aachener Stiftung Kathy Beys 2014), Spain was allowed to increase its CO_{2e} emissions until the year 2012 (+15 % compared to 1990) while Austria and Germany had to reduce them (−13 and −21 %, respectively). Moreover, due to increasing dry weather particularly in summer, Spain regularly faces water shortages. The need for water saving in Austria and Germany does

[7] As regards the reported failures, the wish for status (recognition) and the belonging to a social milieu can also favor value systems respectively social norms that are harmful to the environment.

not directly result from water shortage but from the principle of the efficient use of resources. Hence, it is not surprising that water saving is more popular in Spain than reducing CO_{2e}. So finally, values and attitudes or behavior changes are influenced by several and diverse context factors that may shape a common understanding and may trigger the wish for compliance with the social norm of sustained pro-climate behavior.

11.3 Individual CO_{2e} Reduction in Cross-Regional Comparison

11.3.1 Extent of Target Achievement

Continuous CO_{2e} monitoring (see Chap. 8) enabled panelists as well as organizers to keep track of changes and to see whether individual balances had improved over time or not. Figure 11.2 presents a first overview of the main results. It shows the share of those who achieved the target to reduce CO_{2e} emissions individually by at least 2 % p.a. (bottom part of the bars) for the first and second year per citizen panel. The middle part of the bars shows those who improved below the 2 % target. The upper part represents those who failed to improve.

Overall, the results are positive, particularly when the developments in the first year in the Austro-German panels are considered. In these panels, the majority achieved or surpassed the 2 % reduction target. The range of target achievers extends from 59 % in Bremen to 74 % in Wennigsen. The results for Pamplona and Saragossa are different; here, about 38 and 46 %, respectively, achieved their goal.

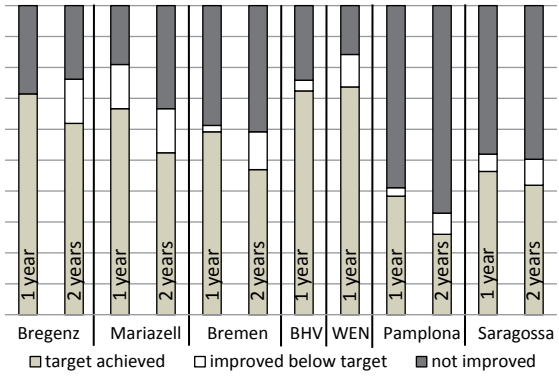

Fig. 11.2 Percentages of panelists who reduced their CO_{2e} emissions by at least 2 % p.a. ("target achievers") per region and monitoring period (due to a late start of the citizen panels in Bremerhaven (BHV) and Wennigsen (WEN), the monitoring periods there were limited to 18 and 12 months, respectively). N Bregenz: 21, Mariazell: 21, Bremen: 49, Bremerhaven: 29, Wennigsen: 38, Pamplona: 73, Saragossa: 179

For the second year of monitoring, however, the shares of target achievers decreased to a range of between 26 % in Pamplona and 62 % in Bregenz, which indicates that it was generally more difficult to achieve further emission reductions or to maintain the efforts in the second year.

This is important for the question of the suitable length of the participation period for achieving sustained impacts. Indeed, one of the research questions in e2d was whether longer participation periods contribute to better results, that is, to a further decrease of CO_{2e} emissions. Longer participation periods are expected to support the establishment of new habits by repetition and, thus, assist the transformation of these habits into daily routines. Recurring engagement in the topic of climate action, whether discussion, taking action, or simply reading the panel newsletter, may prevent relapse into old routines. Besides, longer monitoring periods are needed as it takes some time until habits change or investments in climate action technologies take effect and can be observed through the monitoring and feedback functionalities. Moreover, longer participation periods are also necessary for methodological reasons as the impact of natural seasonal variations may be balanced by several subsequent years.

The outcome for the second year was received with some disillusionment by the organizing public authorities, the research team, and also the panelists. Even though the majority of the Austro-German panels achieved the target in the first and second year, a considerable percentage of the panelists did not improve their balance. Moreover, none of the panels managed to transform the commitment of their participants from the first year into continuous CO_{2e} reductions to the same extent again in the subsequent year. This may have several reasons: *First*, individual attitudes and behaviors are manifested by repetition and by daily routines. Attempts to change one's beliefs and intentions could be less effective if they do not consider the persistency of established habits. Bas Verplanken argues that successful habit-change interventions involve breaking through routines by disrupting contextual factors that automatically cue habit performance (Whitmarsh et al. 2010, p. 8). As mentioned before, attempting to change contextual factors would have overburdened the e2d research project. *Second,* participation periods of up to 2 years are very long and good arguments are needed to keep the participants active that long. Nevertheless, participants understood this length as being necessary to experience seasonal and annual changes, to achieve a valuable feedback, and to trigger behavior changes: more than 84 % rated the duration as adequate. However, it is quite demanding for organizers to keep motivation high over longer time periods, particularly in times when people prefer short-term participation modes expressed, for example, in ad hoc flash-mobs or online petitions and avoid long-term commitments that restrict their individuality. It is only logical that participants were lost over time as not all panelists share the same interests or can take the same time for participation activities. *Third,* it was not possible to exactly meet the individual needs and preferences of all panelists concerning their state of affairs regarding climate action. Anyhow, the nudges set by the participation design were successful in some cases. To some extent, group activities continued even after the panel activities had officially ended: Regular meetings that support the e2d targets were established in

all three German panels; Saragossa still supports its group of volunteers that had already been collaborating on local public issues for years, now on new aspects of climate action; and in the Mariazell region, municipal governments have joined a climate alliance which promises to reinforce the grassroot-level activities of local panel members.

11.3.2 Results per Consumption Area

A closer look at the achievements in individual areas of everyday activity provides a more detailed picture. Concentrating on the first year, Fig. 11.3 presents the results per citizen panel and per consumption area: heating, electricity, mobility (private car, public traffic, and flights), nutrition, and consumer goods. Per citizen panel, for each consumption area, the shares of target achievers, that is, the percentage of those who reduced their CO_{2e} balance by 2% or more, are summed up to one bar. As there are seven consumption areas, the maximum range of the scale for target achievers would be 700% (i.e., if all panelists had achieved a 2% reduction in each area). Individual sections from bottom to top of each bar read as follows, for example, for Bregenz: 71% of all panelists reduced their CO_{2e} emissions in the heating sector by 2% or more, 62% in the electricity sector, 33% in the private car section, and so forth.

Panelists in Wennigsen most frequently achieved the 2% reduction target in the various consumption areas, followed by Bremerhaven, Bremen, Mariazell, Bregenz, Saragossa, and, finally, Pamplona. For the Spanish panels, it has to be noted that the panelists' baseline emissions were much lower in Pamplona and Saragossa than for the Austro-German panels. Obviously, and for logical reasons, the lower the starting emissions are, the more challenging it is to achieve further savings (for details,

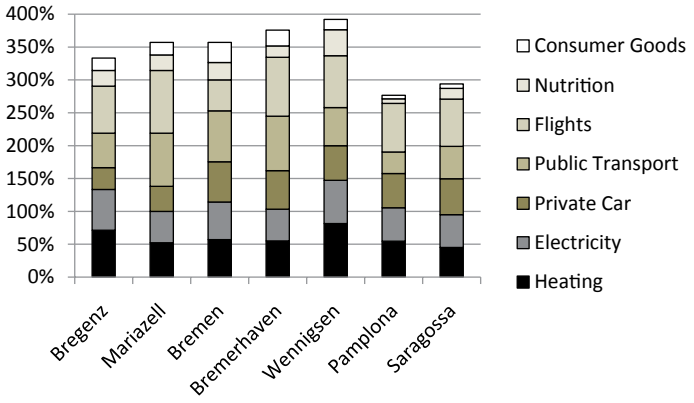

Fig. 11.3 Target achievers (CO_{2e} reduction by 2% or more) per consumption area after 1 year (in %). N Bregenz: 21, Mariazell: 21, Bremen: 49, Bremerhaven: 29, Wennigsen: 38, Pamplona: 73, Saragossa: 179

see Chaps. 8 and 12). Other explanations for the differences have to be sought in the different types of panel organization and panel support. As detailed in Chap. 7, panels were organized and maintained by different organization types and offered different information and exchange opportunities. Particularly, the CO_{2e} calculator and the feedback facilities implemented in the Spanish panels differed from those used in the Austro-German ones (see Chap. 8). Still the answers to survey questions on the general publicity of the climate initiative, the information material provided on energy saving and CO_{2e} reduction, the offers for personal advice on energy saving, etc., did not reveal significant differences between the panels. A small but important exception is the assessment of the range of information events and other meetings. Here, the organizers of the Austrian and German panels provided more opportunities than those in Spain. This is reflected in the high level of satisfaction with the range of events in the Austro-German panels (85 and 81 %, respectively) and lower rates in Pamplona (49 %) and Saragossa (65 %). Another perhaps more relevant difference in the participants' assessments in the Spanish panels concerns the attitude toward the effects of the continuous information about their own carbon balance (individual feedback). Spanish panelists attributed less importance to this aspect. Only 24 % of participants in Saragossa and 26 % in Pamplona found the continuous information about their carbon balance helpful, compared to 65 % in Austria and 71 % in Germany. Presumably, this reflects a disadvantage of the Spanish CO_{2e} feedback as feedback on the participants' own carbon balance was only available while they were entering data. Afterward, it could not be accessed until the next time they entered data, whereas for Austro-German panelists their carbon balance was continuously provided on their personal project web space or was mailed to offliners. Thus, another reason for the considerable differences between the success rates in Figs. 11.2 and 11.3 is to be seen as the lack of continuous access to the individual feedback and the resulting attitude of Spanish panelists that in their view feedback was of less importance. Despite these differences and the broad range of target achievers, there are obvious common features in the characteristics of the seven citizen panels:

- Smaller panels yielded better results.
- Smaller panels were located in smaller cities and regions, or in rural or rather remote geographical areas.

Reasons for these common features are in particular to be seen in socializing effects that can be achieved better in small groups. Mariazell and Wennigsen were the smallest municipalities within the seven regions considered. Many panel participants knew each other before the citizen panel started and were recruited by word of mouth via cultural associations, and particularly in Wennigsen by sharing the same train journey to work. Thus, on the one hand, group effects could be achieved more easily in that activities could be approached together and motivation to compare each other was higher. On the other hand, a kind of pressure was created by social control. To behave in accordance with the target achievement could become an important aim for panelists. By contrast, the panels in the bigger municipalities tended to suffer from potential anonymity. Here, it was easier to lose sight of the climate

saving targets as often there were fewer opportunities to regularly talk about these issues or compare target achievement and efforts with others face to face. It is not by accident that modern group activities striving for change in environmental contexts like the transition town initiative make it their own goal to bring the rural into urban contexts, that is, to transfer well-functioning pro-environmental activities that work well in small groups and that originate in the countryside into cities that were not used to dealing with them before.

11.4 Areas of Improvement and Deterioration

Generally, participants were encouraged to decrease their CO_{2e} emissions in all activities of their daily life, that is, in all of the different consumption areas. In the following, the focus is on the balance of changes in each area, again for the first year. Figure 11.4 presents the results per area, pointing out areas of improvement or deterioration by the majority. This is crucial, since it is not automatically the case that if people save energy in their home, they will also save energy in the mobility sector or that they will live a sustainable lifestyle in general. For a better visualization of which consumption area has developed better and which less, the percentage of those panelists who have improved their carbon balance minus those who have failed to improve is displayed. The share is presented in percent per panel and the shares of all seven panels are totaled to one bar per consumption area (theoretically, this total could again reach a maximum of 700 %). The higher the bars, the more panelists improved in these areas. For example, in the heating area, in Bregenz 18

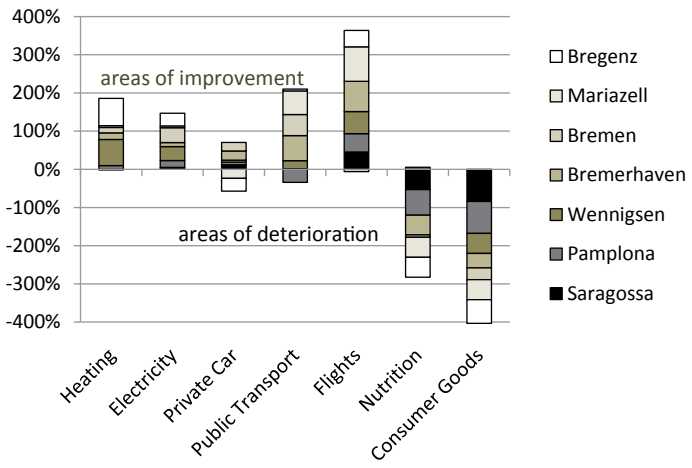

Fig. 11.4 Areas of improvement and deterioration per citizen panel in the first year percentages based on the balance of panelists who reduced CO_{2e} emissions and those who increased them, summed up across regions for each area. N Bregenz: 21, Mariazell: 21, Bremen: 49, Bremerhaven: 29, Wennigsen: 38, Pamplona: 73, Saragossa: 179

panelists reduced and 3 increased their emissions. Hence, on balance, 15 out of 21 panelists (18 − 3 = 15) can be counted as a positive net contribution to the reduction of CO_{2e} emissions in the heating sector. This corresponds to approximately 71 % of the panelists from Bregenz (top section in the bar for heating area). The balance figures have been calculated for the other panels in the same way. Since lower balance figures are depicted by often very small bar sections, Fig. 11.4 visualizes orders of magnitude rather than showing exact percentage differences. Two cautionary notes seem to be appropriate: First, results for the smallest panels (Bregenz and Mariazell) need to be read with special caution because the small *N* tends to produce biased percentage figures; second, CO_{2e} calculations are most complex in the areas of nutrition and general consumption and changes are only captured in rough terms as they suffer from a lack of exact measurability.

As Fig. 11.4 shows, panelists were particularly successful in the fields of heating energy and electricity. The positive bar sections for all panels show that there were more panelists who improved their balance than those who worsened it. More mixed results were achieved for the mobility section. The developments for *private car* are characterized by more improvements in the German and Spanish panels and more deterioration in the Austrian ones. With the exception of the Pamplona panel in the *public transport* domain and the Bremen panel in the *flights* section, the majority of panelists improved their CO_{2e} balances in these areas. The *nutrition* and the general *consumer goods* areas are clearly different from the other areas: Here, in all panels, the cases where the carbon balance deteriorated seem to outnumber those with improved records (except for Bremen in nutrition). But what are the reasons for these different results? The following sets out some reasons for the different sections.

11.4.1 Heating Energy and Electricity

The various forms of nudges set by the panel activities allowed for countable carbon reductions and relate to the areas of heating energy, electricity, and water consumption. These are the areas where (compared to, e.g., mobility or nutrition) data gathering was rather simple and exact. Thus, saving effects could easily be observed by comparing the consumption data with results of recent periods (see Chap. 8). Moreover, panelists' activities in these areas can predominantly be assigned to the low-cost categories. For example, more than one third of panelists indicated in the final assessment survey that they had changed their electricity behavior from standby to switching off their electrical appliances completely when not in use. Even more stated that they had changed their ventilation habits from permanently open hopper window to completely open window for only few minutes. At first sight, this seemed to be a success across the seven panels. However, considering the type of habits and changes, these are clearly no great effort and have to be allocated to low-cost changes. Moreover, such changes are associated with energy savings and hence are also driven by financial benefits.

11.4.2 Mobility

The case of mobility is different. All three types of transport mentioned (private car, public transport, and flights) are connected with each other. Changes in one sector may have impacts on the other. Besides, the most pro-environmental types of mobility, walking or cycling, are not counted in carbon balancing (as they do not emit carbon emissions). But all four sectors have to be considered together when mobility behavior is concerned. Several context factors become important. A survey result on the change of behavior from private car to pro-environmental means of transport will serve as explanation (see Table 11.3):

The answers varied considerably among the seven panels. Differences can again be explained by the low-cost hypothesis in relation to the public mobility infrastructure available in the seven cities and regions. The bigger cities of Bremen, Bremerhaven, Pamplona, and Saragossa offer different and more frequent public transport systems than the smaller ones. Bremen and Saragossa even operate tramway services. Certainly in these cities, a high share had already started using public transportation earlier or changed to public transport due to their participation in the panel. Cycling is also much more attractive in these cities, since they provide special cycle lanes and these areas are rather flat and without steep hills. The Mariazell region, a mountainous rural area, is most different to the others. Public transportation is rather infrequent and less popular. Distances and time required for work-related travel often make going by car the only option. Moreover, the higher age of panel members in Mariazell was an additional barrier to using a bicycle. These characteristics are mirrored in the survey results. Wennigsen, even though also a town in a rather rural area, has a high share of changers and of those who had already used pro-environmental transportation before. The reason is that many citizens of Wennigsen work in Hannover, one of the biggest German cities. A frequent and fast train connects both towns. Moreover, some panelists carpooled. Hence, the available mobility infrastructure can support or limit behavior change. In other words, the less developed the pro-environmental mobility infrastructure is, the higher is the efforts and costs for changing individual behavior. Overall, the numbers of those

Table 11.3 Behavior change in the mobility sector due to panel participation. (Source: Third survey of panel members)

I take the bicycle, bus or train more often instead of going by car. Citizen panel in…	*N*	No, I do not %	Yes, since my participation %	I already started this earlier %
Bregenz	21	0.0	66.7	33.3
Mariazell	21	57.1	23.8	19.1
Bremen	58	12.1	19.0	69.0
Bremerhaven	23	8.7	39.1	52.2
Wennigsen	39	18.0	38.5	43.6
Pamplona	46	19.6	28.3	52.2
Saragossa	122	23.8	32.8	43.4

who changed their behavior following and as a result of their participation in the panel are quite substantial. About one third of all respondents managed the change even if for many it turned out to be a high-cost activity.

As far as the public transport is concerned, it is astonishing that most panelists achieved CO_{2e} reductions in this section. However, of all areas, a decrease of emissions in the public transport area could be more a poor indicator than a good one. In order to be environment-friendly, distances travelled by car or plane will be replaced by public transport or even by bike or just walking. This means that emissions by public transport are supposed to increase as those of motorized individual traffic decrease. But as can be seen in Chap. 12, in the majority of cases, private car and airplane CO_{2e} emissions also increased during the monitoring period. Since merely considering CO_{2e} balances may hide transformation processes from individual traffic to public or pro-environmental means of transport, a closer look has been taken of this issue. However, a correlation test between improvers in the private car section and those who deteriorated in the public transport domain did not reveal the expected or hoped-for results; no significant relationship could be observed between those who reduced their car emissions and those who increased their public transport CO_{2e} emissions and vice versa. Thus, it was not possible to achieve this important aim of the local climate initiatives.

Regarding flights, the Bremen panel is the only one where there was more deterioration of carbon balances. This deviation from the trend may be explained by the fact that Bremen is the only one of the seven cases with a city airport that offers meaningful flight connections. Even though Pamplona and Saragossa also have airports, flight connections are limited to national destinations only (Pamplona) or are only provided by a small number of carriers with limited flight destinations (Saragossa). It is not that convenient for the participants of most panels to take a flight since they have to travel longer distances to reach the nearest airport with meaningful flight activity.

11.4.3 Nutrition and Consumer Goods

As explained in Chap. 8, the calculation of individual CO_{2e} emissions in the nutrition and consumer goods section is much more complex than, for example, in the heating or electricity domain. Hence, calculator questions were less detailed and calculations were based on certain assumptions that finally led to less precise individual results. And, as detailed above, small panel sizes may bias the results. This should be borne in mind when interpreting the results. The results show that nutrition and consumer goods were the fields where the performance was least good. Except for the Bremen panel, more panelists' carbon balance deteriorated here. One reason for the better performance of participants from Bremen is that these—compared to the six other panels—indicated that they were most interested in the food topic in the regular panel surveys. Of respondents, 76 % ranked nutrition as an area of interest in Bremen, compared to an average of 48 % in all seven panels. This high

Table 11.4 Change in nutrition behavior due to panel participation. (Source: Third survey among panel members)

Nutrition: I have reduced my meat consumption. Panels in…	*N*	No, I have not %	Yes, since my participation %	I already started this earlier %
Austria	41	17.1	41.5	41.5
Germany	120	20.8	29.2	50.0
Spain	168	42.9	26.2	31.0

interest may have supported their willingness to change and led to better results in this area. However, anyone who ever started a diet knows that changing nutrition habits is clearly to be counted among the high-cost activities. Moreover, as shown in Table 11.4, the question of meat consumption—compared to many other habits—is to a certain extent related to national peculiarities and cultural traditions.

Bearing in mind the unrepresentative panel composition with an excess of rather well-situated citizens, often academics and ecologically minded persons, a high percentage of panelists in Austria and Germany had already reduced their meat consumption before the panel started and during the monitoring period.

Hence, finally, approximately 80% of Austro-German panelists showed a pro-climate meat consumption behavior before or since the panel started. The situation is different in Spain. Eating meat still seems to be deeper seated in cultural traditions than is the case in Austria and Germany. Changing a common culture or traditions is a longer process and demands regular stimuli. According to the above-mentioned four-quadrant model of Wilber (2000), culture belongs to the interior-collective or the "we" level. Culture and traditions embody social norms and certainly influence individual choices. For Spanish panelists, changes in meat consumption are more to be seen as a high-cost activity than was the case for the Austro-German panelists. The calculation of the emissions through consumer goods in general is to a large part dependent on the entries in the other sections (see Chap. 8) and will not be detailed here. It seems that, within a consumer society, the citizen panels were not successful in changing general consumption values and behavior more thoroughly.

11.4.4 General Findings on Low-Cost and High-Cost Action

In addition to the costs of changing behavior, panelists were also confronted with the costs of data collection for the bimonthly monitoring. A large share of the savings in the areas of electricity, water, and heating energy consumption can be attributed to the monitoring and feedback. Such consumption data can be monitored directly and mostly without problems. More difficult and of a rather high-cost nature, however, are activities in the mobility section. Panelists had to keep records on their daily trips taken by private car and public transportation. Moreover, they had to calculate their individual kilometer share if they travelled with several people in one car. Thus, data gathering, particularly in the mobility section, could turn out to be complicated and hence was high cost for many panelists. Data collection for the

nutrition and consumer goods section is not only time-consuming but also costly. Keeping track of the purchases and everyday meals could be a task for the whole family and required absolute continuity of efforts.

Surprisingly, the areas in which most panelists were able to improve their CO_{2e} reductions and in which they have failed to improve tend to be similar in all seven panels. National peculiarities such as climatic and weather conditions that have a particular influence on the heating and electricity consumption or different participation cultures with, for example, the long-standing group of volunteers among the panel in Saragossa, regular group meetings in the Austro-German panels or community size do not seem to have played the expected key roles. Categories for low-cost and high-cost activities were frequently perceived in the same way independent of the country or municipality of origin. Rather it was the cultural and systemic context factors (see Wilber's four-quadrant model) that made it particularly difficult for panelists to break away from their own routines. External context conditions such as the lack of appropriate pro-climate alternatives, as, for example, in the mobility sector, are one factor that influences the individual assessment of what is a high-cost and what is a low-cost activity. Another factor is the growing necessity to save water rather than to reduce CO_{2e} in Spain, and cultural traditions. A further influence is the intense identification of panelists with the milieu they live in and with its own social norms that do not necessarily need to comply with the social norms of sustained pro-climate behavior.

11.5 Conclusions

According to the American economists Thaler and Sunstein (2008), who adopt the position of libertarian paternalism, it is the task of choice architects to design environments appropriately in order to compensate for perception and motivation deficits as mentioned in this chapter with regard to pro-climate behavior. A specific participation format based on a citizen panel in collaboration with public authorities was meant to fill this gap. Individual feedback to participants in the citizen panels was designed to initiate and monitor pro-climate action and climate-friendly behavior. But as described, a change of behavior is not only dependent on the monitoring of the participant's own consumption but also dependent on the systemic, cultural, and social contexts in which he or she lives, its prevailing individual attitudes and habits, and, finally, its will for change. There is absolutely no general choice architecture that is able to find a pro-climate path through all these prevailing contextual requirements. Even more, the environmental behavior of individuals is heterogeneous and not consistent. The results of the cross-regional comparison of the seven panels and the differences in the performance of the seven consumption areas reflect these complex dependencies. Nevertheless, some common patterns could be found.

Concerning the target achievement of reducing the individual carbon balance by at least 2% p.a., the panels within each country developed rather similarly. There were three clusters, with the German panels performing best, closely followed by

the Austrians, and, finally, those from Spain. Overall, however, the share of those who achieved their reduction target is only slightly higher than that of those who did not, particularly when the second monitoring year is considered. Common patterns could also be found related to size and location of the towns. Citizen panels in small and rural areas developed better than in bigger and urban cities. Similar developments were also found within the consumption areas. The at-home sections of heating energy and electricity developed best. Here, the majority of participants in almost all panels improved their carbon balance. Data collection in these sections was rather simple and permitted a valid carbon calculation using the CO_{2e} calculator. The situation is different in the mobility section with a nonuniform development among the panels and the various transport means. Even though carbon calculation based on distances covered by different means of transport is reliable from a scientific point of view, data collection was costly for panelists and was based on bimonthly estimates rather than on actual distances covered on a daily basis. Moreover, the calculation of the development of the flight emissions was handicapped by the limited monitoring facilities of the Austro-German CO_{2e} calculator that did not allow for exact entries in the baseline measurement. Thus, the results in this area need to be interpreted with care. Further similarities could be found in the nutrition and consumer goods sections. Here, in almost all panels, only a minority achieved a reduction of individual CO_{2e} emissions, and the majority failed. However, here too, methodological constraints need to be considered in the interpretation of the results. From a scientific point of view, CO_{2e} calculation in both areas is most challenging due to the lack of reliable emission factors. Thus, common CO_{2e} calculators can only provide basic indicators that do not allow for exact calculation but only for roughly estimated tendencies. Moreover, the small panel sizes, particularly in Austria, may bias the results as outliers may have an overrepresented effect. Thus, here too, results need to be interpreted with care.

However, it is clear that "there is a need for basic information provision to overcome lack of knowledge about climate change and its implications for individuals. For those willing to mitigate climate change, this will encourage them to channel their energies into appropriate activities" (Lorenzoni et al. 2007, p. 454). In this respect, nudges set by comparative monitoring and other panel activities increased panelists' knowledge, their reflection on their own lifestyle, and in many cases also led to a change of attitudes and behavior. However, as the results also show, it is only a small majority who improved in actual energy savings and CO_{2e} reduction during the up to 2 years of monitoring. Moreover, the implementation of low-cost activities was in the foreground and perhaps only few took significant steps toward a low-carbon lifestyle. This is despite the fact that in the surveys a majority claimed to be interested in the actions individuals can take to address climate change mitigation.

What is also surprising is that in the second year of participation fewer participants achieved a further CO_{2e} reduction than in the first year. Even though longer participation periods may prevent relapse, this also means that either longer participation periods are of no additional value compared to shorter engagement periods or new inspirations must continuously be set to trigger further improvements. We also learned that systemic influences and cultural norms play a key role.

In accordance with Lorenzoni et al. (2007, p. 445), we would argue that "targeted and tailored information provision should be supported by wider structural change to enable citizens and communities to reduce their carbon dependency." The citizen panels were not meant to change external context factors. However, the participation design enabled group formation and the panels were able to foster compliance with environment-friendly norms, a precondition for a transition to sustainable development in a local community.

During the past few years, attention to CO_{2e} and climate change mitigation and adaption has certainly increased. If we want to further develop the awareness and responsibility of citizens, businesses, and municipalities, successful public involvement programs need to address the systemic, cultural, social, as well as individual (cognitive, conative, and affective) requirements of a transition toward sustainable societies (cf. Weber 2008, p. 241). The e2d research design was not oriented toward an in-depth study of socio-ecological and environmental-psychological aspects. The citizen panels certainly may have helped overcome initial resistance at some point, but a more grounded assessment of this must be a task for further research. However, both from survey results and through continuous exchange with panelists during data collection, panel meetings, and the provision of telephone support for any question panelists had, an increased degree of sensitization for climate change mitigation could undoubtedly be observed. Most panelists started by making initial changes; some did more, some less. But all panelists addressed the subject of climate action, and even if no direct activities were initiated, they at least started to reflect on their own behavior. This might be more than the majority of citizens normally do.

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