

Global citizen deliberation: Case of world-wide views on climate and energy



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ABSTRACT

As the global environmental issues are increasingly coordinated through international negotiations, new methods are needed to engage citizens worldwide in the policy-making processes. In this paper, through quantitative analysis of the data from World Wide Views, we draw insight about the citizens' views on issues of climate and energy. We employed bivariate and multivariate statistical analysis to identify significance associated with public views on climate and energy. In bivariate analysis, we used non-parametric statistical tests. Logistic regression was also employed to identify association with specific variables. The results from nonparametric tests by country and country groups show statistically significant associations with citizen's views on curbing GHG emissions through renewable energy, carbon pricing, and devising policies to address climate change. The national contexts also contributed to directing citizens' views with respect to their attitudes and proposed action on climate and energy. More than any other variables, country and country group showed significant relation with public views, highlighting the complexity of global deliberative forums in issues related that transcend international boundaries. Despite common agreement toward a globally binding goal of zero emissions in the Paris agreement, we also found variation at the country level.

1. Introduction

Public engagement in science and policy has been the focus of scholarly inquiry since the late 1980s, as well as practical innovations (Eversole, 2010; Chilvers and Kearnes, 2015). Based on the premise that complex global problems, especially involving competing values and tradeoffs, are best addressed through participation of citizens (Chambers, 2003; Fishkin, 2009), engaging citizens entails getting them involved in the process of learning, debating and deliberating on a topic of concern to the public (IAP2, 2007). Through the process of deliberations, participating citizens are given the opportunity to describe and articulate their views on the issue at hand (Gutmann and Thompson, 2004), giving more value to public voices in the policy-making processes. Although the deliberative methods vary considerably in scope and intensity, with sessions lasting anywhere from a few hours to several days, the attributes that separates it from other methods stem from its roots in theories of deliberative democracy (Rask et al., 2018), with four core elements (Burkhalter, 2002; Siegel et al., 2013).

First, organizers convene a demographically representative group of

people to have diversity of viewpoints. Second, participants are informed about the issue they will discuss and deliberate ahead of time through educational materials. Third, all participants get the opportunity to participate and deliberate; while they are also encouraged to listen and respond to fellow participant's perspectives. Finally, the outcomes of deliberation are reported to facilitate the understanding of the public's perspectives and incorporating them into policy-making processes. It is difficult to attribute direct policy outcomes of any given deliberation, the growing literature on public deliberation points toward three items as especially important indicators of successful deliberations: demographically balanced participants, shared understandings and recommendations, and awareness of the deliberation at the policy levels (see Rask et al., 2018).

With the scale of the problems and the policies to tackle them becoming more global in scope, new and inclusive methods are warranted to engage citizens worldwide in global policy-making processes (Rask and Worthington, 2012). The World Wide Views (WWViews), based on several decades of innovation by the Danish Board of Technology (DBT) in engaging citizens in policy-making processes, is a

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response to this call. The DBT, a strong advocate of citizen engagement, has developed and implemented a wide range of methods for involving citizens in policy-making processes at multiple levels (Worthington et al., 2013). The DBT has established a strong track record of engaging citizens that complement representative democracy through sustained and informed consideration of important global issues, such as climate change.

WWViews on Global Warming, held on September 26, 2009, was the first-ever globe encompassing democratic deliberation involving roughly 4000 citizens in 38 countries. With no official connection to the United Nations Framework Convention on Climate Change (UNFCCC) summit in Copenhagen (COP15), WWViews became one in a multitude of voices competing for the attention of policy-makers in what turned out to be the largest environmental convention in history. The second WWViews, held on September 15, 2012, brought over 3000 citizens from 25 countries to deliberate on Biodiversity. These results were discussed at two side events of the Eleventh Meeting of the Parties of the UN Convention on Biological Diversity (COP11) in India in October 2012 (Bedsted et al., 2015a). The third WWViews on Climate and Energy, held on June 6, 2015, was the largest ever global citizen consultation, involving 10,000 citizens in 76 countries. This event was co-organized by the UNFCCC secretariat, DBT, Missions Publiques (MP), and the French National Commission for Public Debate (CNDP), and actively supported by the French Government (Bedsted et al., 2015b) prior to the COP21 in Paris. The goal of our research, through in-depth analysis of citizens' views on approaches to reduce emission of greenhouse gas, is to assess how public views are shaped by social, political and economic context in which the WWViews on climate and energy was deliberated.

Realizing the prospect of public deliberation in addressing global environmental concerns, WWViews are being used widely in national and international policy contexts (Rask and Worthington, 2012) and the results have been reported at aggregate level. There lies a considerable variation in public views within and between regions and/or nations, however. Understanding these differences and tracing how they arise can be very helpful for understanding citizens' views on climate and energy issues, one of the greatest challenges of the 21st century. Therefore, it is important to understand the link between national and global aspirations. In this paper, through quantitative analysis of the data from WWViews, we draw insight about the citizens' views on global climate and energy. More specifically, we seek to understand how the participants, representing different social, political and economic backgrounds, view the problem of rapidly changing global climate; how attitudes towards climate and energy are shaped by the context in which the WWViews deliberations conducted; and what factors may have contributed to shaping public views.

The next section presents the theoretical underpinnings around WWViews and global efforts of governing climate and energy. Here we discuss how WWViews is situated between democratization of science and deliberative democracy and discuss how WWViews process evokes global citizenship and whether it is possible to expect people to rise above the national position to represent themselves as global citizens. The third section presents data and methodology used in our research. First, we describe WWViews deliberation method, including the selection of participants which is followed by our research design, data processing and analysis. The fourth section presents our results which lays out findings of statistical analysis discussing some remarkable observations. In the fifth section we discuss major findings along with climate change and energy policies, scenarios and approaches by selected countries or country groups. Finally, we conclude presenting insights that can be drawn regarding deliberation in global issues and the approach of WWViews.

2. Literature review

Citizen participation in public policy processes has been the subject of both policy aspiration and scholarly critique (Berg and Lidskog,

2018). Designed to capture the voices of the people, not just the stakeholders, WWViews has brought two scholarly approaches to sharp focus: a) Science and Technology Studies (STS) and b) Deliberative Democracy. The STS approach is concerned with the democratization of science with an emphasis on public participation in the generation and/or evaluation of knowledge. The deliberative democracy approach looks for having meaningful deliberation in public policy-making. While both approaches recognize the importance of democratizing the global policy-making process, the central tenet of WWViews is its careful consideration of dialogue and deliberation as a basis for policy-making. Through its emphasis on engagement and deliberation, with expert's inputs, WWViews provides opportunity to educate participants allowing them to reflect and make informed decisions (Irwin, 2001). By expanding typical expert and/or stakeholder driven conversation regarding the governance of science to include lay citizens (Worthington et al., 2013), the model developed by DBT seeks to democratize the process of making science-policy amenable to society.

Through the process of reflexivity, WWViews give citizens a voice in discussions about complex issues involving science and technology. It does so by combining the two key values of democratic governance: inclusiveness and deliberation (Fishkin, 2009). Participants can change their views through the process of deliberation, especially when they are presented with alternative perspectives in a compulsive manner (Phillips, 2011). By emphasizing deliberation, WWViews participants are not only provided with the opportunity to weigh competing arguments before coming to their own conclusion but also remaking the idea of participation towards more concrete outcomes. In this sense, it contests the view of the liberal interpretations of democracy, where citizens are regarded as having fixed interests that can be aggregated into collective decisions through devices such as voting and representation (Saward, 2006).

Over the last two decades, there has been a widespread use of public deliberations and with it the meaning has also changed considerably and substantial literature on deliberative democracy has emerged. Berg and Lidskog (2018) have discussed three major viewpoints regarding who should participate in deliberation on science. First, those who are concerned by the problem in question should participate as they have an important and unique viewpoint. Second, people with general knowledge on the issue should participate so that they can actively contribute as informed citizens. Finally, irrespective of whether they have specialized knowledge people should be allowed to participate. By inviting lay people into the deliberation, WWViews gave agency to citizens by providing a platform to openly discuss and deliberate their views. The emphasis on public deliberation for public policy-making is beginning to be mainstream as it has been credited for creating active citizenry (Chirawurah et al., 2019) and can be employed to engage citizens in the true dilemma posed by policy tradeoffs (Kim et al., 2018).

While some scholars refer to deliberation as merely talking in a group, others consider it as a practice of systematically weighing arguments and creating mutual understanding and reciprocity among the participants (Bächtiger et al., 2010). To clarify the concept Bächtiger et al. (2010) have divided deliberative practices into two types. Type one, rooted in Habermasian communicative action, relies on rational discourse and has strong procedural clarity with the goal of reaching consensus. Type two deliberation is a rather flexible form of discourse as it welcomes alternative forms of communication such as roleplay, stories etc., and is more concerned with the process. In general, the deliberations involve task-oriented discussion in a manner that emphasizes civility, authenticity and inclusivity for a common good with carefully considered topics as a basis of decision making (Phillips et al., 2015; Kim et al., 2018). Civility and authenticity refer that deliberation should be noncoercive, connect claims to general principles, and promote reciprocity. Inclusivity means that multiple views and interests should be included in deliberation. Finally, the system should be consequential, which means that it should have some impact on collective decision making. According to Habermas (1996); Chambers (2003) and

Stevenson and Dryzek (2014) successful deliberation relies on creating a process whereby citizens adopt a public mindset and go beyond self-interest to make it unique and credible.

Deliberative discussion, therefore, lies at the intersection of what Maoz (2004, 2011) theorizes as the *coexistence* and *confrontational* whereby coexistence refers to collective engagement in collaborative tasks with emphasis in commonalities and confrontational emphasizes direct discussions of issues (see also Hammack et al., 2014). According to Kim et al. (2018) deliberative discussions by WWViews have elements of both, as they require participants to work together and ask them to stay on task while also engaging directly on issues that matter to them. Additionally, policy-making for controversial issues at the global level requires participants to think as global citizens contributing to common good. This expanded understanding of citizenship is primarily due to the economic, political and cultural transformation that has taken place over the years and particularly due to the globalization of issues which transcends the idea of citizenship from the nation-states. The important question to ask - is it possible for citizens to transcend from being a citizen of a nation-state to a global citizen?

The STS scholars have enriched the policy and expertise literature through nuanced accounts of knowledge-making practices that depict a far more contingent picture of science than conventional theories emphasizing dispassionate inquiry and objective results. In her comparative study of the public policy of life science across the United States, the European Union, the UK and Germany, Jasianoff (2004) found that though each country has a similar background yet they perceive risk differently. Citizens in each nation-state are accustomed to settled practice of knowledge making and refer to this collective reason as civic epistemology (Jasanoff, 2004). The insight from STS literature is that *how* knowledge is produced shapes *what* knowledge is produced, and the ways in which it is used. In this frame, the social relations of knowledge-making become a central focus. Following Blue (2017), we argue that public reasoning is situated, in other words, the normative commitment regarding dealing with climate change is rooted in national or institutional context. WWViews positioned itself more as a group or “*we*” (rather than an individual or “*I*”) and respondents represented themselves as both national and global citizens (Phillips et al., 2015). Citizens are expected to participate as “world citizens”, and to address global rather than individual or local issues. It belongs to a *genre* of participatory tools with the explicit objective of engaging broad sample of citizens from across the world with the explicit goal of influencing global policy-making processes. For that reason, WWViews is an important, path breaking example in this *genre*.

One skepticism about deliberation is that they might consider participants as passive recipients of knowledge. For example, Blue and Medlock (2014) argue that WWViews made citizens passive recipients of dominant scientific viewpoints, vetted by IPCC, rather than active agents for vetting, creating, contesting norms. WWViews debate was already established by experts so it was not able to give alternative perspective or other issue framing (Pepermas and Maeseele, 2016). Although WWViews offers certain advantages over other methods of public consultation because of its emphasis on consensus building through dialogue, engagement of the public might be differently affected for people with diverse practical experience and educational background. Our contribution stems from these criticisms as we are interested to find out if global framing was able to produce similar responses regarding citizens’ preference for addressing climate and energy issues or if the social, political, economic and national context had considerable influence on people’s opinion.

One of the interesting aspects about the governance of climate and energy is that, though the problem is framed as global, it has always relied on nation states and their commitments to curb greenhouse gas emission (Heede, 2014). Each country has a different energy mix, unique policy provisions and varying socio-economic, cultural and political understanding of climate and energy. In the US, for example, oil and natural gas constitute over 65 percent of energy supply today, and

expected to continue at the same level through 2040 and beyond. The Nationally Determined Contribution (NDC) submitted by each country to UNFCCC shows how differently nation-states plan to reduce emissions and carry out adaptation. We are aware that national policy-makers are more interested in national results, but by comparing those results at both the global and the national level, we offer insight into the potential link between national to global policy-making.

3. Methods

WWViews climate and energy is a multisite global citizen consultation and the method consists of three major phases: preparation, WWViews event day, and dissemination of information. The preparation began about a year before the event day with the identification and training of partner organizers. In the preparation phase, WWViews partners, scholars, policy-makers, and civil society organizations were engaged in the development of well-balanced information booklets and questionnaires for the event. Designed to illustrate the broader issues on climate and energy, the information booklet was divided into five themes: importance of tackling climate goals, tools to tackle climate change, UN negotiations and national commitments, fairness in distribution of efforts, and keeping climate promises into discussion (climateandenergy.wwviews.org). All background materials were produced in English and translated into local languages for non-English speakers. The preparation phase also includes informing the citizens about the event. The event organizers at each location used multiple approaches to inform and encourage interested citizens to take part in the WWViews on climate and energy event. Participants who applied were then selected by the event organizer, ensuring demographic diversity of the region (e.g., age, gender, education, income). While it was a self-selection process as interested participants needed to voluntarily apply, the project manager made the final decision of selecting approximately 100 participants. All participants selected to participate in WWViews were provided a briefing material, an information booklet about two weeks prior to the event.

It should be noted that participating citizens may not be representative of the entire population of each country (or city) due to non-random-sampling and purposeful and/or self-selection. However, the deliberative method that combines balanced and relevant information, reasoned discussion and a demographic mix of the participants, we argue, would be similar to those generated by demographically mixed citizens. The broader goal here is to compose participants in such a way that it brings multiple voices. For the purpose of WWViews, the participants are typically understood as ordinary citizens and expected to represent the voice of the citizens. The question of representation in WWViews deliberation is an important one and has been asked since DBT’s very first consensus conference in 1987. According to Kluver (1995), DBT cannot ensure a statistically representative sample and does not aim for representativeness. Kluver (1995) further argues that a demographically ‘mixed’ citizen can provide perspective which a representative sample cannot guarantee. In this way, following Agger et al. (2008) the results of the WWViews climate and energy can be understood as representative, not in a simple statistical sense, but in terms of providing ‘deliberative representation’ or representation of different societal arguments and discourses.

On WWViews climate and energy event day, June 6, 2015, deliberation started on the island of Fiji and ended 27 h later in Tempe, Arizona, USA. Each location followed a standard schedule and format for organizing the event. Each thematic session was introduced by the head facilitator followed by an information video. Seated into a table of 5–7, moderated by a facilitator, the citizens then listen to and reflected on their own views prior to casting their vote. Trained to facilitate the discussion, the facilitators were expected to lead the discussion in an unbiased manner. At the end of each session citizens casted their votes anonymously on alternative answers to a total of 29 questions (five to eight questions in each session). Votes were counted by the staff and

immediately reported to climateandenergy.wwviews.org thereby enabling international, quantitative comparisons.

Dissemination of the results began in June with a press conference at the UNFCCC negotiations in Bonn, including additional presentations for negotiation and stakeholder groups. The WWViews on climate and energy event was closely tied to the COP21 process to optimize its impacts. To that end, it diverged from their usual practice of letting the participants formulate the deliberation agenda themselves. The results were also presented at the United Nations Economic Commission for Europe (UNECE) and World Summit Climate and Territories in France and disseminated to policy-makers and officials, who were engaged in global climate negotiations.

3.1. Data and data preparation

WWViews data is available in binary and categorical variables. We used categorical data as input to our analysis. For the purpose of this research, we categorized the participating countries into four groups: Western European (WE), North American (NA), BASIC, and less developed (LD) countries (see Fig. 1). One of the major considerations for this grouping was based on the countries' relative position on climate and energy. For example, most WE countries have diverse energy portfolios, an indication of their commitments to reducing GHG emissions. Similarly, LD countries need to meet their energy demand, while facing potential negative impacts of climate change. For this reason, the policy framing of these countries tends to focus on enhancing energy access to their citizens and simultaneously responding to climate change. Rapidly developing BASIC countries are also building their economy by using fossil fuel. Consequently, these countries are not keen on immediate action to reduce GHG emissions. Although cognizant of the potential consequences of climate change, NA countries are still locked into carbon intensive economies. These positions have given rise to different policy pathways towards meeting their energy needs, giving rise to multiple views on climate and energy.

For the purpose of this study we did not include small island nations because of their potential biases towards responding to the WWViews questions as they are considered extremely vulnerable to climate

change. Two overseas French territories (Reunion and Guadeloupe) were also excluded from our sample for the same reason. A few LD countries were also excluded due to inconsistency in data reporting. Finally, we selected 11 LD, 8 WE, 4 BASIC, and 2 NA countries, constituting 25 in countries in total (see Fig. 1). For our study we selected 9 questions out of a total of 29 deliberated questions focusing only on those related to energy policy as well as pathways to tackle climate change. Based on the type of questions and the choices provided, some of the responses were regrouped. For example, the question "Which of the following approaches do you prefer for making large-scale cuts in greenhouse gas emissions" participants could select two choices for the question from the list of eight multiple choices. We also decided to exclude options *g* (no cuts should be made) and *h* (don't know/don't answer) from our analysis because of low response rate and did not offer any insight into the preferred approaches to reduce GHG emissions. We regrouped the remaining six choices based on similarities of the energy pathways. The first category, Renewable Energy (hereafter, RE), promotes and invests in the usage of renewable energy technologies. The second category, Low Carbon (hereafter, LC), favors low carbon technologies, carbon pricing (i.e., carbon emission taxes or trading schemes), and cutting fossil fuel subsidies as a means to reduce carbon consumption. The third category, Institutions and Policies (hereafter, IP), supports the formation of new socio-economic institutions and legalization of new standards to improve energy efficiency.

We also included demographic variables obtained from the questionnaires as well as economic and energy information using secondary data sources (see Table 1). Demographic information consisted of age and gender. Missing data for gender and age group was imputed using k-Nearest Neighbor Imputation (kNN) technique based on distance from all the other variables included in the study (Kowarik and Templ, 2016). Energy and economic data (see Table 1) included information related to renewable energy, carbon-based energy, and economic status of each country. Renewable energy data provided information on renewable energy consumption and production. Carbon-based energy data included information about energy use, pricing, emissions, and intensity. In this study, carbon intensity is calculated as the total carbon emissions divided by gross domestic product (GDP). Lastly, economic

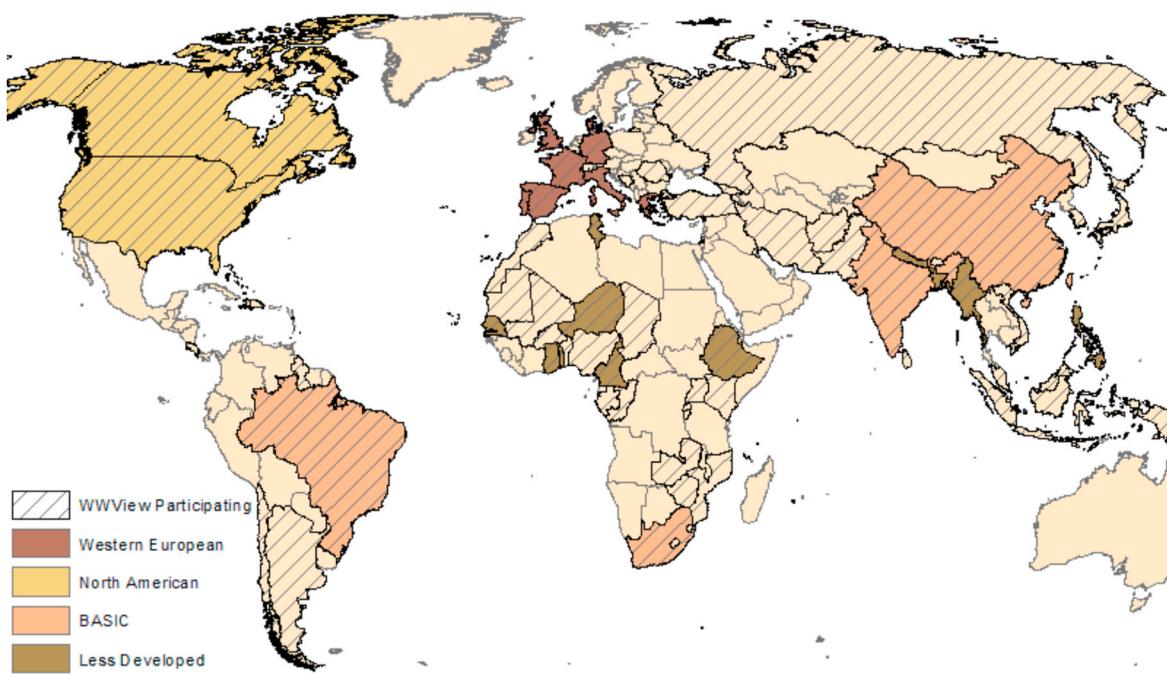


Fig. 1. All participating WWView displayed with hatched lines. Selected WWView countries shown according to regional group. Western European, North American, BASIC, and Less Developed shown in maroon, gold, orange, and brown respectively. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

Table 1

List of renewable energy, energy consumption and production, research and development, and economic data.

Variable	Year	Source	Units
Energy Use	2015	World Bank	kg/kg oil equiv energy use
Fossil Fuel Energy Consumption	2014	World Bank	Percent
Renewable Energy (RE) Consumption	2014	World Bank	Percent of total energy
Electricity Production from RE	2014	World Bank	Percent
Gasoline Pricing	2014	World Bank	USD/liter
Diesel Pricing	2014	World Bank	USD/liter
Solar Production of Total Energy	2015	International Energy Agency	GWh
Wind Production of Total Energy	2015	International Energy Agency	GWh
Hydro Production of Total Energy	2015	International Energy Agency	GWh
Biofuel Production of Total Energy	2015	International Energy Agency	GWh
CO2 Intensity	2014	World Bank	kg/kg oil equiv energy use
Carbon Tax	2014	World Bank	Binary (Y/N)
CO2 emissions	2014	World Bank	metric ton/capita
Projected CO2 emissions (2030)	2017	International Futures University of Denver	metric ton/capita
Economic Status	2017	World Bank	Ordinal

data provided information based on economy size. These data were selected for the year of 2014 to coincide with public views during the survey period. We used data for the year of 2015 where data availability was an issue. Annex A1 provides descriptive statistics on demographic data, country group, gender and age group; Annexes A2 and A3 show categorical and numerical variables, respectively, regarding citizen views and country specific economic data.

3.2. Statistical analysis

We employed bivariate and multivariate techniques to identify statistical significance associated with public views on climate and energy. In bivariate analysis, we used non-parametric statistical tests (i.e., Chi-square test of independence, Fisher-Freeman-Halton exact test) to assess whether a statistically significant relationship exists between 1) public views on: a) reducing GHG emissions by Renewable Energy, b) reducing GHG emissions by Low Carbon, c) Reducing GHG emissions by Institutions and Policies, d) climate change as a national priority, and e) global goal of zero emissions, and 2) country and country group where respondents reside. Chi-square tests of independence examine whether an association exists by comparing the observed values with that of expected values if the variables were truly independent of each other. In this study, the expected cell value of the contingency table either equaled to or exceeded 5 in at least 80% of the cells, where no cells had an expected value of less than one. Fisher-Freeman-Halton exact tests were conducted for low frequency events. P-values were compared with significance levels using the Bonferroni correction to keep family-wise significance levels at 0.05.

Adjusted standardized residuals (RES_{adj}) were calculated to estimate the contribution of individual cells in the result of the statistical test for the whole contingency table (Agresti, 2013). RES_{adj} measures the strength of the difference between observed and expected values, adjusted for the marginal counts. Positive standardized residuals indicate the observed count is greater than what would be expected if the variables were independent (i.e., positive association), whereas, negative values imply the observed count is significantly less than expected under the null hypothesis (i.e., negative association). A RES_{adj} with absolute value exceeding about 3 indicates the observed counts in this cell

are significantly different from expected counts (MacDonald and Gardner, 2000). The threshold 3 is derived based on Bonferroni adjustment to the significant level, given the number of cells in the contingency table is large (50) in this study. Specifically, the significance level is set to be 0.05/50 or 0.001 which translates into a z critical value of ± 3 approximately (following z distribution), in order to achieve a family-wise type-I error rate (false positives) equal to 5%.

We further studied the relationship among public views on climate and energy, as well as national policies using multivariate statistical analysis. Specifically, the relationships between countries and public views on climate and energy were modeled by considering individual-level drivers (public responses) and country-level drivers (national energy and economic factors). Country groups were also included in the models to see whether public views on climate and energy vary from one country group to another. Similar to bivariate analysis, several models were built to examine statistically significant factors regarding a) approaches to reducing GHG emissions, b) climate change as a national priority and c) global goal of zero emissions. Target variables were modeled separately, considering their number of categories. “Reducing GHG emissions approaches” were three binary variables (i.e., whether agree this approach or not), therefore each approach was treated as one dichotomous dependent variable. Variables “climate change as a national priority” and “global goal of zero emissions” both include four categories. Thus, each target variable was re-defined to be four dichotomous dependent variables, with each dichotomous variable indicating one specific category versus the rest of categories. The definition of dependent variables for model building are listed in Table 2. Each model was built using independent variables from the same variable candidate pools in our data, shown in Table 3.

Logistic regression was applied to identify the variables associated with public views. First, variance inflation factor (VIF) filtering was implemented to alleviate severe multicollinearity of independent variables. VIF is calculated using the reduced set of predictors and the predictor with the highest VIF is removed if a VIF-threshold (10 in this study) is exceeded. Then, we fitted random intercept logistic regression models to treat individual citizens within a country to be correlated (i.e., country as random intercept). By performing Likelihood Ratio Test for random intercept, models with insignificant random intercept were refitted using conventional logistic regression to consider individuals within a country to be independent. Variable selection was performed using the Stepwise method and least squares approximation (LSA) method to obtain a more parsimonious model. Fitted models with lower Akaike information criterion (AIC) were chosen to be the final model. Lastly, 50-folds cross-validation was performed to evaluate the model

Table 2

Definitions of dependent variables, with coding used for logistic regression models in Tables 5–7.

Approach to reduce GHG emissions?

Reduce GHG by Renewable Energy - Agree (1) or Not agree (0): for Model A1
 Reduce GHG by Low Carbon - Agree (1) or Not agree (0): for Model A2
 Reduce GHG by Institutions and Policies - Agree (1) or Not agree (0): for Model A3

How do you feel about your country is dealing with climate change?
 Climate change is a national priority and it should be - Agree (1) or Not agree (0): for Model B1
 Climate change is a national priority but it should not be - Agree (1) or Not agree (0): for Model B2
 Climate change is not a national priority but it should be - Agree (1) or Not agree (0): for Model B3
 Climate change is not a national priority and it should not be - Agree (1) or Not agree (0): for Model B4

Should a Paris agreement include a global long-term goal for zero emissions at the end of this century?
 Yes, legally binding for all countries - Agree (1) or Not agree (0): for Model C1
 Yes, but should only be legally binding for developed and emerging nations - Agree (1) or Not agree (0): for Model C2
 Yes, but voluntary for all nations - Agree (1) or Not agree (0): for Model C3
 No - Agree (1) or Not agree (0): for Model C4

Table 3

Definitions of independent variables, with coding used for logistic regression models (Tables 5–7).

Demographic Variable
Country Group (LD - reference level)
NA (1) or otherwise (0)
NA (1) or otherwise (0)
BASIC (1) or otherwise (0)
Age (Below 24 - reference level)
Between 24 and 44 (1) or otherwise (0)
Between 44 and 64 (1) or otherwise (0)
Above 64 (1) or otherwise (0)
Gender - Male (1) or Female (0)
Questionnaire variable from WWV
How concerned are you about the impacts of climate change? (Not concerned – reference level)
Moderately concerned (1) or otherwise (0)
Very concerned (1) or otherwise (0)
What would you think should be the focus of global efforts in the coming decades? (Equally be on adaptation and mitigation - reference level)
Primarily be on adaptation (1) or otherwise (0)
Primarily be on mitigation (1) or otherwise (0)
Would you support a carbon tax? (No - reference level)
Yes, for all countries (1) or otherwise (0)
Yes, for all countries but with gradually increasing costs in countries that do not reduce their emissions (1) or otherwise (0)
Yes, graduated according to the level of development (1) or otherwise (0)
How should the world deal with exploration for new fossil fuel reserves? (The world should continue to explore - reference level)
Stop exploration for all fossil fuel reserves (1) or otherwise (0)
Stop only the exploration for coal (1) or otherwise (0)
Should your country take measures to reduce its greenhouse gas emissions? (No - reference level)
Yes, but only if many other countries take measures (1) or otherwise (0)
Yes, even if many other countries do not take measures (1) or otherwise (0)
Should private sector contributions count as part of the offers to climate finance from developed countries? (No - reference level)
Yes, but only a small part (1) or otherwise (0)
Yes, about half or more (1) or otherwise (0)
Policy related and economic variables
Direct Carbon Tax - Yes (1) or No (0)
Size of economy (Low_income - reference level)
High_Income (1) or otherwise (0)
Upper_middle (1) or otherwise (0)
Lower_middle (1) or otherwise (0)
Energy Use
Percentage Fossil Fuel
Consumption RE
Percentage of electricity production from renewable source in total
Gasoline Price
Diesel Price
Wind Power
Solar Power
Hydro Power
Biofuel electricity
CO2 Intensity
CO2 emissions 2014
Projected CO2 emissions 2030
Random intercept
Country

performance. This method separated the whole datasets into 50 equal subsets, and we iterated 50 times to utilize one-fold as a validation set while the remaining 49 subsets are used for model training. Several logistic regressions were used for modeling target variables with multiple levels as an alternative of multilevel multinomial logistic regression. This method is more computationally efficient and avoids issues related to unstable parameter estimates.

4. Results

As illustrated in Table 4, nonparametric independence tests show

statistically significant associations between 1) country and 2) citizen's views on a) reducing GHG by renewable energy, b) reducing GHG by Low Carbon, c) reducing GHG by institutions and policies, d) climate change as a national priority, and e) global goal of zero emissions. When testing independence between country groups and the aforementioned citizen's views, they all showed statistically significant associations, except the relationship with respect to citizen's views on reducing GHG emissions by institutions and policies (*p value* = 0.0339). Among the ten independence tests, eight of them are based on Chi-square tests, whereas two are based on Fisher–Freeman–Halton exact tests due to low frequency events (see Table 4). The tables of frequency distribution of designated public opinions by country and by country groups are shown in Appendix A4 and A5, respectively.

Next, we examine the strength of the associations between countries and their preferred approach to dealing with climate and energy challenges. The size and color of the circle shown in Fig. 2 represent the adjusted standardized residual (RES_{adj}). Positive associations are displayed in blue and negative associations in red. Color intensity and circle size are proportional to the RES_{adj} as derived from *Chi-square* statistics. Canada and the UK show large negative RES_{adj} (less than -3), indicating that renewable energy is not a preferred option to reduce GHG emissions. They prefer their government to impose responsible policy to price carbon either in the form of cutting subsidies or increasing tax. The citizens of the US and China also indicated their interest in pricing carbon. With the exception of a few countries, most LD countries show no significant interest in having new institutional and policy arrangements to make large scale cuts in greenhouse gas emission.

Several LD countries (Bangladesh, Ethiopia, Ghana, Myanmar and Senegal) and two WE countries (Denmark and the UK) have positive RES_{adj} (greater than 3) indicating that climate change is a national priority and it should be. Citizens in four WE countries (France, Greece, Italy and Spain), both NA countries (US and Canada), Tunisia, and Brazil showed significant agreement that climate change is not a national priority, but it should be. Interestingly the citizens of Niger, a resource rich country, recognized climate change is a national priority, but it should not be. Although the globally binding goal of zero emissions in the Paris agreement was preferred by the majority of WWViews participants, variation at the country level exists. As illustrated in Fig. 2, citizens from Italy and the UK show strong agreement that the goal of zero emissions should be legally binding for all countries, whereas, citizens from the US were more likely to disagree with the long-term goal of zero emissions by the end of the 21st century. In Cameroon and Myanmar, citizens show strong agreement that the goal of zero emissions should only be binding for developed and emerging economies, whereas, the citizens from Senegal preferred it voluntarily for all nations.

Table 5 reports the results of three logistic regression models, which examine support for approaches to reduce GHG emissions based on respondent characteristics, citizen's aspirations from WWViews, and economic and energy related information (see Tables 2 and 3 for description of dependent and independent variables, respectively). Model A1 shows that whether direct carbon tax, country group,

Table 4

Results showing p-values of nonparametric independence tests.

No.	Public views	Country	Country group
1	Reduce GHG by Renewable Energy	0.0000*	0.0000*
2	Reduce GHG by Low Carbon	0.0000*	0.0000*
3	Reduce GHG by Institutions and Policies	0.0000*	0.0339
4	Climate change as a national priority	0.0005*	0.0000*
5	Global goal of zero emissions	0.0005*	0.0000*

P-values in italic indicate results by Fisher–Freeman–Halton exact test, whereas the rest by Chi-square test. Asterisks indicate statistically significant association with 95% familywise confidence (*p value* < 0.005 for each test under the Bonferroni correction for multiple hypothesis tests).

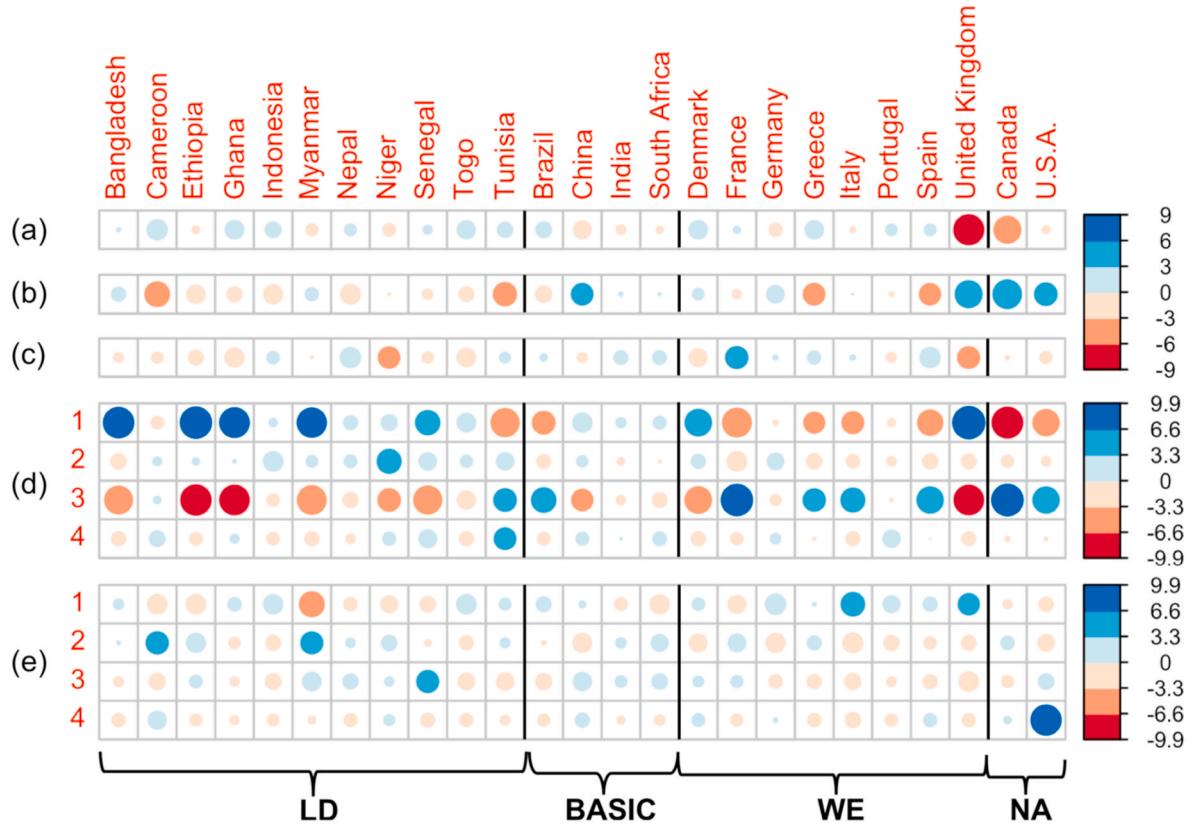


Fig. 2. Adjusted standardized residuals (RESAadj) show citizen preferences regarding (a) renewable energy (RE), (b) carbon tax and reducing subsidies on fossil fuels (LC), (c) new institutions and policy (IP) approaches as well as whether (d) climate change should be a national priority (where 1 is “Climate change is a national priority and it should be”, 2 is “Climate change is a national priority but it should not be”, 3 is “Climate change is not a national priority but it should be”, and 4 is “Climate change is not a national priority but it should not be”) and (e) global long-term goal for zero emission (where, 1 is “Yes, and it should be legally binding for all countries”, 2 is “Yes, but it should only be legally binding for developed and emerging nations”, 3 is “Yes, but it should be voluntary for all nations”, and 4 is “No”). Positive associations are displayed in blue and negative associations are displayed in red. Size and color intensity reflect the strength of association. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

hydropower, and solar power are significant factors affecting citizen views on RE as an approach to curb GHG emissions. Model A2 demonstrates the statistically significant effect of preference of carbon tax on citizen views on LC as an approach to reduce GHG. However, Model A3 does not identify any significant factors associated with whether citizens consider IP as an approach to reduce GHG or not.

For the interpretation of the results, we used odds ratios, which is the exponentials of logistic regression coefficient. In general, odds ratios greater than 1 (i.e., log odds ratio greater than 0) indicate positive effects, while odds ratios smaller than 1 (i.e., log odds ratio less than 0) indicate negative effects. For numerical independent variables, the odds ratio can be interpreted as multiplicative effects on the odds favoring an approach to curb GHG emissions per one-unit increase in a single independent variable. For example, the odds ratio of 0.71 ($e^{-0.34}$) for hydropower in model A1 indicates that a one-unit increase in the hydropower is associated with a 29% decrease ($e^{-0.34}-1$) in the predicted odds of citizens favoring RE as an approach to reduce GHG emissions. For categorical independent variables, the interpretation for odds ratio of indicator independent variables is slightly different. Here, the ratio is the effect between one level and reference level for one categorical variable on the odds of favoring an approach to curb GHG emissions. For example, the odds ratio of 2.76 ($e^{1.01}$) for country group NA in model A1 demonstrates the predicted odds for North America countries of 0.48 ($e^{-0.74}$) times the odds for the rest of country groups (reference level including LC, WE, and BASIC). These odds represent the ratio of possibility that citizens agree to those who disagree on RE as an approach to reduce GHG emissions.

When asked about their preferred approach to dealing with GHG

emissions in the future, controlling for other effects, citizens of NA are significantly less likely to choose RE as an option compared to the rest of country groups (with odds ratio 2.76 interpreted in the previous paragraph). Citizens from countries with existing carbon tax were less likely to choose the RE approach to curb GHG emissions compared to citizens from countries having no carbon tax. Countries with significant hydropower usage seem to be significantly less enthusiastic about investment in other RE approaches as a means to reduce GHG emissions (0.71 or $e^{-0.34}-1$ for unit increase in odds, discussed in previous paragraph), whereas, countries with relatively higher solar power usage are amenable to investing in RE. Finally, citizens who support carbon tax were significantly more likely to support a low carbon (LC) approach for cutting GHG emissions compared to citizens who do not support carbon tax.

Table 6 presents the logistic regression results for modeling citizens’ views on whether climate change should be considered as a national priority or not. Four models have been fitted (B1 – B4, see **Table 2** for the dependent variables). Our study reveals age specific preference with regards to dealing with climate change in the future. Controlling for all other variables, citizens above 64 years were significantly less likely to agree that “climate change is not a national priority, but it should be” and citizens between the age of 44–64 are more likely to consider “climate change as national priority and it should be”. Citizens who also want to include private sector’s contributions as a part of climate finance from developed countries were more likely to choose “climate change is a national priority and it should be” and less likely to choose that “climate change is not a national priority and it should be” controlling all other variables compared to the citizens who do not prefer private sector

Table 5

Parameter estimates of fixed effects for modeling citizen views on approaches to reduce GHG.

Variable Type	Variable	Reference Level for Categorical Variable	Level for Categorical Variable	Approach to reduce GHG emissions (response variable)					
				RE		LC		IP	
				estimate	s.d.	estimate	s.d.	estimate	s.d.
(Intercept)	(Intercept)	/	/	1.61	0.09	-1.84	0.21	0.04	0.11
Demographic variable	Country Group	LD	NA	-0.74	0.15	0.92	0.29	/	/
		WE	/	/	/	/	/	0.12	0.15
		BASIC	/	/	/	/	/	/	/
	Age	Below 24	(24,44]	-0.20	0.10	/	/	/	/
			(44,64]	/	/	/	/	/	/
			Above 64	/	/	/	/	-0.21	0.14
Questionnaire variable from WWV	Gender	Female	Male	/	/	0.15	0.09	-0.22	0.08
	Would you support a carbon tax?	No	Yes, for all countries	-0.33	0.13	1.01	0.19	-0.24	0.12
			Yes, for all countries but with gradually increasing costs in countries that do not reduce their emissions	/	/	0.76	0.16	/	/
			Yes, graduated according to the level of development	/	/	0.71	0.17	/	/
	What would you think should be the focus of global efforts in the coming decades?	Equally be on adaptation and mitigation	Primarily be on adaptation	-0.24	0.15	/	/	/	/
			Primarily be on mitigation	/	/	/	/	/	/
	How should the world deal with exploration for new fossil fuel reserves?	The world should continue to explore	Stop exploration for all fossil fuel reserves	/	/	0.33	0.11	-0.17	0.09
	How concern are you about the impacts of climate change?	Not concerned	Stop only the exploration for coal	/	/	0.25	0.14	/	/
			Moderately concerned	/	/	0.26	0.10	/	/
			Very concerned	/	/	/	/	/	/
Policy related and economic variables	CO2 intensity	/	/	/	/	/	/	0.09	0.05
	Direct Carbon Tax	No	Yes	-0.42	0.11	0.54	0.20	/	/
	Hydro Power	/	/	-0.34	0.08	0.26	0.10	/	/
	Solar Power	/	/	0.28	0.08	-0.11	0.08	/	/
	Energy Use	/	/	-0.14	0.05	/	/	/	/
	Diesel Price	/	/	0.09	0.05	/	/	/	/
Variance of Random Intercept	Variance of Random Intercept	/	/	/	/	0.10	0.32	0.07	0.26

Significant factors with 95% familywise confidence (p-value < 0.001 for each test under the Bonferroni correction for multiple hypothesis tests) are highlighted in red.

contribution to be counted. Citizens who want to see their country take measures to reduce its greenhouse gas emissions also have a higher propensity of feeling that their country is dealing with climate change as “*not a national priority and it should not be*” than respondents fully agree or disagree that the country should take measures to reduce its greenhouse gas emissions.

Factors having statistically significant effects on citizens’ views on global commitments for zero emissions are also identified (see Table 7). Respondents who favor stopping exploration for all fossil fuel reserves, mitigation strategies for long-term global efforts, or carbon tax for all countries, tend to view the global long-term goal for zero emission as a legally binding agreement for all countries. However, citizens are less likely to choose a global long-term goal given the choice that their country should take measures only following the actions of many other countries. This is an enormous collective problem whereby citizens may think their own actions may not make difference if others will not act responsibly to address global climate issues. Citizens, who support a gradual increase in carbon tax based on the level of development or favor stopping only exploration for coal, are more likely to select legally binding for developed and emerging nations. Citizens who tend to agree on mitigation as the primary focus of global efforts expressed a low level of support for a voluntary global effort. Interestingly, citizens in NA are more likely to not support a global goal for zero emission than citizens from the rest of country groups. Citizens, who also chose this option (no global agreement), were less likely to choose a graduated carbon tax based on level of development, punitive carbon tax based on emission activity, or stop exploration for fossil fuel reserves. Deployment of alternative energy technologies, such as solar and wind power and low-carbon emission technology, have been successful to varying degrees. However, level of investment in alternative energy technology and policies to support them are not robust to tackle rising trends in global

emissions in a significant way.

5. Discussion

The goal of our research was to assess WWViews deliberations and their policy context by country groups on the issue of climate and energy. The research on the policy context in each country is important as each country has a different energy mix, unique policy provisions and varying social, economic and political understanding of climate and energy which shapes public awareness and expectations. For example, countries with increasing interest on and investment in RE may continue to do so in the future compared to countries that rely heavily on fossil fuels for its economic activities and tackling global warming means leaving most of it in the ground.

The citizens who participated on climate and energy WWViews prefer urgent and stronger action to reduce greenhouse gas emission (Bedsted et al., 2015b). Similar to other studies (e.g. Sovacool, 2016; Pohjolainen et al., 2018), our findings also reveal that contextual factors such as values associated with individual and/or society and national policy context influence citizen’s attitude towards climate change and energy policies. For this reason, public views remain contextual making it difficult for citizens to think for global common good even if they are expected to act like a global citizen. Although, attitudes towards providing renewable energy subsidies through public funds are widely held across developed countries, there are exceptions. For example, citizens from the US, UK, Canada seem not very keen on investing in RE. Likewise citizens from China, which has emerged as the world’s major producer of renewable energy technologies, were also less enthusiastic about further investment on RE. To our surprise citizens from the US and Canada indicated that they are likely to join initiatives to lower the carbon only when LD countries also commit. This suggest that developed

Table 6

Parameter estimates of fixed effects for modeling citizen views regarding dealing with climate change.

Variable Type	Variable	Reference Level for Categorical Variable	Level for Categorical Variable	How do you feel about your country is dealing with climate change (response variable)							
				National priority and it should be		National priority but it should not be		Not a national priority but it should be		Not a national priority and it should not be	
				estimate	s.d.	estimate	s.d.	estimate	s.d.	estimate	s.d.
(Intercept)	(Intercept)	/	/	-0.76	0.39	-2.43	0.26	0.03	0.38	-4.17	0.22
Demographic variable	Country Group	LD	NA	-2.58	0.84	/	/	2.49	0.81	/	/
		WE	WE	-1.05	0.52	-0.62	0.27	1.15	0.51	/	/
		BASIC	BASIC	-0.71	0.64	/	/	0.65	0.63	0.70	0.42
Questionnaire variable from WWV	Age	Below 24	(24,44]	/	/	/	/	/	/	/	/
			(44,64]	0.46	0.12	-0.50	0.30	-0.30	0.11	-1.03	0.35
			Above 64	0.56	0.17	/	/	-0.58	0.17	/	/
	Gender	Female	Male	0.21	0.10	/	/	-0.21	0.10	/	/
			Female	0.29	0.12	/	/	-0.34	0.11	/	/
	How concern are you about the impacts of climate change?	Not concerned	Moderately concerned	/	/	-0.51	0.23	/	/	/	/
	Would you support a carbon tax?	No	Yes, for all countries	0.30	0.14	/	/	-0.15	0.15	/	/
			Yes, graduated according to the level of development	0.11	0.11	-0.43	0.27	/	/	0.50	0.26
			Yes, for all countries but with gradually increasing costs in countries that do not reduce their emissions					-0.90	0.28	0.29	0.10
	What would you think should be the focus of global efforts in the coming decades	Equally be on adaptation and mitigation	Primarily be on Mitigation	-0.31	0.18	/	/	0.39	0.18	/	/
Policy related and economic variables	Should private sector contributions count as part of the offers to climate finance from developed countries?	No	Primarily be on adaptation	0.45	0.22	-0.38	0.14	-0.44	0.22	/	/
			Yes, but only a small part	0.66	0.17	/	/	-0.65	0.17	/	/
	How should the world deal with exploration for new fossil fuel reserves?	Continue to explore	Yes, about half or more	0.69	0.17	/	/	-0.70	0.16	/	/
			Stop exploration for all fossil fuel reserves	/	/	/	/	0.17	0.10	/	/
			Stop only the exploration for coal	/	/	0.54	0.25	/	/	/	/
	Should your country take measure to reduce its greenhouse gas emissions?	No	Yes, but only if many other countries take measures	/	/	/	/	-0.17	0.14	1.60	0.26
			Yes, even if many other countries do not take measures	/	/	/	/	/	/	/	/
	CO2_Intensity	/	/	-0.06	0.09	-0.33	0.12	0.02	0.09	0.45	0.15
	Hydro Power	/	/	-0.19	0.15	/	/	0.32	0.15	-0.50	0.18
	Direct Carbon Tax	No	Yes	0.91	0.57	/	/	-0.86	0.56	/	/
	Solar Power	/	/	0.04	0.13	/	/	-0.01	0.12	/	/
	Energy Use	/	/	-0.01	0.10	/	/	-0.04	0.09	/	/
Random Intercept	Variance of Random Intercept	/	/	0.92	0.96	/	/	0.87	0.93	/	/

Significant factors with 95% familywise confidence (p-value < 0.001 for each test under the Bonferroni correction for multiple hypothesis tests) are highlighted in red.

countries too have different levels of readiness about energy policies and climate.

Even though WE countries have some of the most advanced climate change policies (GHG emissions, renewable energy mandates), we found that their citizens seek a more progressive stance on future climate change efforts and initiatives. In 2009, EU countries set up a binding target for reduction of GHG emissions by 20% from the base of 1990 and increase the share of RE simultaneously. The EU has continued with this strategy by setting up a new target of GHG emissions reduction by 40% and renewable energy target of 27% by 2030 (Knopf et al., 2015). While there is widespread support among WWViews for cutting GHG emissions, it is important to note that some EU nations known for their welfare society (e.g. Denmark, France, Spain and Portugal) were already ahead of this mandate in 2014 while the UK still lags behind. With annual expenditure of 12 billion euro in fossil fuel subsidy and only 8.3 billion euro allocated to renewable energy annually, UK continues to spend more money on fossil fuels (Carrington, 2019). This is despite

citizens in these countries are generally quite concerned about climate change. While it is difficult to link how energy policies and pledges contribute to citizens' views, they certainly provide context.

While a net-zero GHG emission target by 2050 can be achievable with the technologies that are presently available to society, it may not happen in the absence of stable and well-designed policies, including significant investment in RE, low-carbon infrastructure, and energy efficiency. Current energy policies are insufficient to take us to a net-zero GHG emission target by 2050, however. With heavy subsidies on fossil fuels, the top two GHGs emitters (China and the US) still have a long road ahead to become carbon neutral. As a global leader in RE, China has a strong advantage but the country's growing appetite for fossil fuel is out of alignment with the Paris agreement. The US continues to extract and burn fossil fuels more than ever before and continuing subsidies on fossil fuels is a barrier to make RE transition, hence they are significantly less likely to choose RE as an option compared to the rest of country groups. Interestingly, citizens from these countries prefer reducing GHG

Table 7

Parameter estimates of fixed effects for modeling citizen views of long-term goal of zero emission.

Variable Type	Variable	Reference Level for Categorical Variable	Level for Categorical Variable	Should a Paris agreement include a global long term goal for zero emissions at the end of this century (response variable)							
				Yes, legally binding for all countries		Yes, but legally binding for developed and emerging nations		Yes, but voluntary for all nations		No	
				estimate	s.d.	estimate	s.d.	estimate	s.d.	estimate	s.d.
(Intercept)	(Intercept)	/	/	-0.07	0.16	-1.71	0.13	-1.58	0.24	-1.94	0.45
Demographic variable	Country Group	LD	WE	0.63	0.20	-0.59	0.22	/	/	/	/
		NA	/	/	-0.42	0.31	0.54	0.42	2.14	0.35	
		BASIC	/	/	/	/	/	/	/	/	/
	Age	Below 24	(24,44]	/	/	/	/	-0.38	0.17	-1.24	0.39
			(44,64]	/	/	/	/	-0.41	0.18	-0.91	0.39
			Above 64	/	/	/	/	/	/	-1.24	0.65
Questionnaire variable from WWV	Gender	Female	Male	-0.14	0.09	/	/	0.38	0.14	0.49	0.32
	How should the world deal with exploration for new fossil fuel reserves?	Continue to explore	Stop exploration for all fossil fuel reserves	0.53	0.09	/	/	-0.44	0.14	-1.13	0.33
			Stop only the exploration for coal	/	/	0.42	0.12	/	/	/	/
	Should your country take measure to reduce its greenhouse gas emissions?	No	Yes, but only if many other countries take measures	-0.62	0.13	0.45	0.14	0.51	0.18	0.58	0.39
			Yes, even if many other countries do not take measures	/	/	/	/	/	/	/	/
	What would you think should be the focus of global efforts in the coming decades?	Equally be on adaptation and mitigation	Primarily be on mitigation	0.41	0.12	/	/	-0.72	0.16	/	/
			Primarily be on adaptation	/	/	/	/	/	/	/	/
	Would you support a carbon tax?	No	Yes, for all countries but with gradually increasing costs in countries that do not reduce their emissions	0.68	0.10	/	/	-0.43	0.14	-1.95	0.41
			Yes, for all countries	0.69	0.15	/	/	/	/	-1.26	0.50
			Yes, graduated according to the level of development	/	/	0.74	0.11	/	/	-1.46	0.39
	Should private sector contributions count as part of the offers to climate finance from developed countries?	No	Yes, about half or more	/	/	/	/	/	/	-0.49	0.31
			Yes, but only a small part	/	/	/	/	/	/	/	/
Policy related and economic variables	Direct Carbon Tax	No	Yes	-0.52	0.24	0.40	0.24	0.22	0.30	/	/
	Electricity in total renewable	/	/	0.03	0.06	/	/	/	/	/	/
	Hydro Power	/	/	/	/	-0.24	0.11	0.22	0.16	0.31	0.13
	Solar Power	/	/	/	/	0.16	0.09	-0.33	0.16	/	/
	Biofuel Electricity	/	/	/	/	/	/	0.36	0.16	/	/
	Energy Use	/	/	/	/	/	/	-0.19	0.12	/	/
	Diesel Price	/	/	/	/	/	/	0.19	0.09	/	/
Variance of Random Intercept	Variance of Random Intercept	/	/	0.12	0.35	0.09	0.30	0.18	0.42	/	/

Significant factors with 95% familywise confidence (p-value < 0.001 for each test under the Bonferroni correction for multiple hypothesis tests) are highlighted in red. Global citizen deliberation: case of World-Wide Views on Climate and Energy.

emissions. Most LD countries citizens show no significant interest in having new institutional and policy arrangements to make large scale cuts in GHG emission. As LD countries struggle to wean themselves off fossil fuels, they have the opportunity to go straight to RE. Decentralized energy systems harnessing local sources is more favorable. The views of citizens from LD countries about their interest in RE may have reflected some of these local realities, rather than their understanding of global politics of climate and energy.

It is remarkable that respondents all over the world believe that climate change should be a national priority and citizens of most countries agree that all countries should have legally binding long-term goals for zero emission. In this regard the citizens who participated in the WWViews on climate and energy acted from being a citizen of a

nation-state to a global citizen. Both WE and BASIC countries support the notion that climate change has not been their national priority, but it should be. They also suggest that their countries should take additional measures to combat climate change. Since the Paris agreement, some BASIC countries have pledged their commitment to reduce GHG emissions in their nation's NDC. India and Brazil have pledged to reduce emission intensity of GDP by 33% and 43%, respectively, of their base emissions in 2005. Both China and South Africa have pledged a peak emission approach as they prioritize their development needs. China pledges to cut carbon dioxide emissions by 60% per GDP after they have reached peak emissions in 2030. Different levels of commitments to reduce GHG emissions, however, illustrate that global framing of the issue has not been able to produce unified responses to curb GHG

emissions, reinforcing the fact the social, political, economic and national context provide considerable influence on people's opinion.

Interestingly, the findings of this study show that citizens in NA do not support a global goal of zero emission. It is important to note that citizens, who also chose this option (no global agreement), were less likely to choose a graduate carbon tax based on level of development, punitive carbon tax based on emission activity, or stop exploration for fossil fuel reserves. Here, variations in citizens' views between the US and Canada likely exist as Hagen and Pijawka (2015) found notable national differences between the US, Canada, and Mexico regarding perceptions of climate change and renewable energy with the US the least concerned about these matters. Recently, Canada has enacted pro-environment policies with carbon-neutral targets and the introduction of carbon tax from 2019 (Nuccitelli, 2018), while the US has had a historically complicated relationship with reducing GHG emissions and global agreements. For the US, their level of commitment has waned over the years, in part, due to climate change as a partisan issue, despite their initial efforts in launching the UNFCCC. The US has failed to produce strong policies to deal with climate change because of the disagreements about the validity of scientific findings and level of action needed to combat climate change (Worland, 2017; Hulme, 2009). The US has also raised questions of fairness regarding heavy polluters from BASIC and LD countries ignoring factors of equity. The US pulled out of the Kyoto Protocol citing high polluting countries such as India and China should not be exempted from reducing emissions (Okereke and Coventry, 2016) and has maintained this position, rejecting the agreement in the 2009 Copenhagen Summit and withdrawing from the Paris agreement.

This different levels of readiness on climate and energy issue is consistent with a recent study by Pohjolainen et al. (2018) that analyzed the data from European Social Survey from 23 participating countries (most of Europe and Russia). However, the logistic regressions give some indication that younger citizens, age group less than 24 years, are more likely than none to agree that climate change should be a national priority regardless of its current priority. It is logical and probable as we have seen recently through global climate strike and the emergence of young climate advocates that the younger citizens care more about climate change. Consistent with some of the studies on public deliberation conducted in Europe (e.g. Sovacool, 2016; Blue, 2017) our study also reveals that public attitudes towards climate and energy is situational rather than universal suggesting that despite shared concern about climate change, policy responses to energy transition are shaped by social, political, and institutional contexts.

6. Conclusion and policy implications

Citizens who participated in WWViews climate and energy seem to have greater sensitivity to climate change and also awareness of the range of solutions such as carbon pricing and taxation to cut GHG emissions. Public deliberation such as WWViews can enhance learning and provide alternative ways of dealing with global problems. However, one of the most challenging future tasks is to find solutions that would re-orientate current energy practices in support of alternative ones that are amenable to society. It is hard to be optimistic about alternative energy future, especially given the enormous collective problem that today's society is confronting. While it is important to have global goals and uniform procedures such as embraced by WWViews, it is equally important to leave rooms for contextual and open interpretations. Contextual approach to public deliberation, embedded in cultural fabric of society, may foster plural perspectives in dealing with complex social problem such as climate and energy. To this end, one approach might be to have more flexible and open-ended questions to encourage diversity of thoughts and plurality of perspectives.

While a global solution may not be feasible for all nations, working towards a shared common goal that aligns with national interests with available resources could be more realistic way to address climate

change. A large number of publics who participated in WWViews climate and energy event wish that their governments take proactive approach in tackling climate change by reducing greenhouse gas emissions but they also have their doubts, telling the story of deficiency in trust. For this reason, the dissemination of the results through press conferences and presentations for stakeholder groups is also important to build trust between public and policy-makers. To this end, in order to have a broader policy impacts, the results from WWViews on climate and energy were also presented at the United Nations Economic Commission for Europe (UNECE) and World Summit on Climate and Territories in France. Simultaneously, the results were also disseminated to policy-makers, public officials, and civil society actors who were engaged in global climate negotiations. In this regard the WWViews process has the potential to act like 'the voice of the ordinary citizens' and play a role as a transnational actor to contribute to global common good.

CRediT authorship contribution statement

Netra Chhetri: Conceptualization, Writing - original draft, Supervision. **Rajiv Ghimire:** Writing - original draft, Methodology. **Melissa Wagner:** Data curation, Methodology. **Meng Wang:** Formal analysis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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