

Individual Adaptation Determinants and Themes for Environmental Resilience

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Abstract— It is now an accepted fact that climate change is an event with increasing consequences and that we humans must do something about it. At this stage, the adaptation of individuals plays a key role. In this study, we searched for various behavioral theories and variables for our future study. With an 8-question in-depth interview (7 people for sample size) and a survey of 68 actions (77 people for sample size), we investigated what subjects people tend to make changes in their daily lives. As a result, it has emerged that the tendency is to change the vehicles used in transportation. And the majority of the participants think that the partners who need to take action regarding the climate crisis are the service providers (states, NGOs, industry, and companies) rather than the consumers (individuals).

Keywords—climate change, environmental sustainability, adaptation, individual adaptation, interview, survey.

I. INTRODUCTION

We know that climate change leads to deterioration in the plant ecosystem, and we see that this change has consequences such as the extinction of the existence of species. In other words, if it goes in this order and speed, our world will turn into a planet unsuitable for life. So, climate change is an event with increasing consequences and we humans must do something about it. Today, climate change has reached a significant point. Various organizations (EU, states, NGOs) have taken action to take measures on behalf of climate change. We are confronted with this reality using natural events that occur above normal and destructive disasters such as increasing fires and hurricanes. So, can we as individuals do something about it? Whether it is from the point of view of organizations, production, municipalities, or states, taking action in the name of environmental sustainability requires the adaptation of individuals. If individuals do not adapt to the changes made, continuity cannot be ensured and reverts to old behaviors begin. If we

as individuals adapt to these adaptations and care about them, we can become a "sustainability agent" and inform the people around us, and we can make things change by asking the public institutions that serve us, the companies we shop with, the institutions we cooperate with, to take steps in this regard. Let's not forget that changes begin with a person, ourselves. If we want to change society, we must first start with ourselves. Therefore, individual adaptation is an essential point of change.

This study aims to measure the weights of what actions individuals think about the environment while making choices in their daily lives in environmental sustainability or which activities they want to implement for this purpose. And it is a preliminary preparation for the work we will do next.

II. LITERATURE REVIEW

Adaptation in environmental sustainability has been studied in many different themes until today. Some of the themes studied up to now may be listed as green electricity, green products from manufacturers (green consumption), renewable energy systems, solar power, green information technology adoption, IS&IT, green fertilizer technology, green power, consumer behavior, green composting, green food consumption intention, green products, EVS, sustainable consumption, environmental actions in households, electronic devices, transport and waste sectors, electric scooter, glass, and electronic products, purchase green consumer chemicals, and consumers' purchase intention to sustainable apparel products.

Many adaptation and behavior theories have been studied from past to present, and these theories have also been used in academic studies of individual adaptation in environmental sustainability in general. Some of the theories

are the theory of reasoned action (TRA), the theory of planned behavior (TPB), the technology acceptance model (TAM), the unified theory of acceptance and use of technology, diffusion of innovation theory (DOI), norm activation model (NAM), elaboration likelihood model, motivation-ability theory, utilitarian theory, belief-action-outcome, value-attitude-behavior (VAB). Based on these models and their variables, various studies were conducted on different themes. In Table 1, we see some of the most studied variables and the publications in which these variables were examined.

Awareness as well as compatibility (Asadi S. et al., 2015; Eccarius T. and Lu C.-C., 2020), personal norms (Dalvi-Esfahani M. and Rahman A.A., 2016), and social pressure (Dahlinger A. and Wortmann F., 2016; Adnan N., et al., 2019) seem to be effective in developing friendly environmental relationship.

The systematic study of the concepts of relative advantage (Kapoor K.K. and Dwivedi Y.K., 2020; Arkesteijn K. and Oerlemans L., 2005; Adnan N., et al., 2019.) and usefulness (Dahlinger A. and Wortmann F., 2016; Bekaroo G., et al., 2018; Ozaki R., 2011; Claudy M.C., et al., 2013; Mamun A.A., et al., 2020.) shows that besides the product not harming the environment, other features of the product are also important. It is understood that paying attention to this issue is necessary when designing an environmentally friendly product.

At the same time, we can say that values play a key role in behavioral changes (social or individual) in the light of concepts such as Self-efficacy (Ozaki R., 2011; Asadi S. et al., 2016.), Perceived Social Pressure (Dahlinger A. and Wortmann F., 2016; Akman I. and Mishra A., 2014; Zhang L. et al., 2019; Adnan N., et al., 2019; Eccarius T. and Lu C.-C., 2020.), Value (Nath V. et al., 2013; Claudy M.C., et al., 2013; Dalvi-Esfahani M. and Rahman A.A., 2016; Zhu Q. et al., 2013; Eccarius T. and Lu C.-C., 2020).

Table 1 lists the most frequently encountered independent variables as determinants in the literature review and the sources of these variables. These constructs revealed by this research include the potential variables of the model to be formed.

Table 1 CONCEPTS AND RELATED PUBLICATIONS

Construct	Publication
Feeling of responsibility	Asadi S. et al., 2015; Asadi S. et al., 2016; Dalvi-Esfahani M., and Rahman A.A., 2016.
Attitude	Asadi S. et al., 2015 Nath V., Kumar R., Agrawal R., Gautam A., Sharma V., 2013; Claudy M.C. et al 2013; Asadi S. et al., 2016; Adnan N. et al 2019; Arkesteijn K. and Oerlemans L., 2005; Dahlinger A. and Wortmann F., 2016; Mamun A.A., et al 2020; Dalvi-Esfahani M. and

	Rahman A.A., 2016; Zainudina N. et al 2019; Scott A., Oates C. and Young W., 2015; Shevchuk N. and Oinas-Kukkonen H., 2019; Adnan N. et al 2019; Eccarius T. and Lu C.-C., 2020; Jung et al, 2020.
Awareness	Asadi S. et al., 2015; Asadi S. et al., 2016; Adnan N. et al 2019; Dalvi-Esfahani M. and Rahman A.A., 2016; Zainudina N. et al., 2019; Adnan N. et al., 2019; Eccarius T. and Lu C.-C., 2020.
Behavior Control	Asadi S. et al., 2015; Adnan N. et al., 2019; Akman I. et al., 2016; Mamun A.A. et al., 2020; Zainudina N., et al., 2019; Zhang L., et al., 2019; Adnan N., et al Asadi S. et al., 2015; Asadi S. et al., 2016; Adnan N. et al 2019; Dalvi-Esfahani M. and Rahman A.A., 2016; Zainudina N. et al., 2019; Adnan N. et al., 2019; Eccarius T. and Lu C.-C., 2020.al, 2019; Eccarius T. and Lu C.-C., 2020.
Compatibility	Ozaki R., 2011; Claudy M.C., et al., 2013; Kapoor K.K. and Dwivedi Y.K., 2020; Adnan N., et al., 2019; Adnan N., et al., 2019; Eccarius T. and Lu C.-C., 2020;
Environmental Concern	Zhang L., et al., 2019; Adnan N., et al., 2019; Michal Patak, Lenka Branska and Zuzana Pecinova., 2021
EoU	Wang W. et al., 2019; Arkesteijn K. and Oerlemans L., 2005; Dahlinger A. and Wortmann F., 2016; Bekaroo G., et al., 2018.
Intention	Asadi S. et al., 2015; Ozaki R., 2011; Claudy M.C., et al., 2013; Kapoor K.K. and Dwivedi Y.K., 2020; Asadi S. et al., 2016; Adnan N., et al., 2019; Akman I. and Mishra A., 2014; Dahlinger A. and Wortmann F., 2016; Mamun A.A., et al., 2020; Zainudina N., et al., 2019; Zhu Q. et al., 2013; Huang Y. and Qian L., 2021; Zhang L. et al., 2019; Shevchuk N. and Oinas-Kukkonen H., 2019; Bekaroo G., et al., 2018; Eccarius T. and Lu C.-C., 2020; Patak et al, 2021; Jung et al, 2020.
Personal Norm	Asadi S. et al., 2015; Asadi S. et al., 2016; Dahlinger A. and Wortmann F., 2016; Dalvi-Esfahani M. and Rahman A.A., 2016; Scott A., Oates C., Young W., 2015.
Perceived Social Pressure	Dahlinger A. and Wortmann F., 2016; Scott A. et al., 2015; Eccarius T. and Lu C.-C., 2020; Jung et al., 2020; Asadi S. et al., 2015; Asadi S. et al., 2016; Adnan N., et al., 2019; Akman I. and Mishra A., 2014; Mamun A.A., et al., 2020; Zainudina N., et al., 2019; Zhang L. et al., 2019; Adnan N., et al., 2019; Eccarius T. and Lu C.-C., 2020.
Relative advantage	Kapoor K.K. and Dwivedi Y.K., 2020; Arkesteijn K. and Oerlemans L., 2005; Adnan N., et al., 2019.
Self-efficacy	Ozaki R., 2011; Asadi S. et al., 2016.
Usefulness	Dahlinger A. and Wortmann F., 2016; Bekaroo G., et al., 2018; Ozaki R., 2011; Claudy M.C., et al., 2013; Mamun A.A., et al., 2020.
Value	Ozaki R., 2011; Nath V. et al., 2013; Claudy M.C., et al., 2013; Dalvi-Esfahani M. and Rahman A.A., 2016; Zhu Q. et al., 2013; Biswas A. and Roy M., 2015; Eccarius T. and Lu C.-C., 2020; Jung et al, 2020.

III. METHODOLOGY

Searches were done with keywords from the Scopus database. Out of 348 articles, 82 of them were examined, and variables were taken from 35 of them.

The variables and the mentioned publications were gathered (table 1), then the frequency of the concepts in the literature and compared with the interview results (table 5).

The semi-structure interview consisting of 8 open questions was planned and conducted (table 2). The interview was conducted with 7 people from different profiles, and the interviews lasted an average of 30 minutes each. While some of the interviews were done face to face, the rest were done online. We see the profiles of the Interview participants in the table3.

Table 2 SEMI-STRUCTURE INTERVIEW QUESTION

1a) What do you think about "Environment/Climate change"?
1b) Is climate change significant to you? why is it?
2) Which tangible aspect of climate change might affect you most negatively?
3) Have you heard of the concept of a green lifestyle before? What do you think?
4a) Do you believe climate change is preventable?
4b) (you and your friends) Do you think you can contribute to the prevention of climate change by making a few small changes in your daily life?
5) Are there any actions you take individually to prevent climate change?
DEMO - Infographic
6) Are you willing to make changes in your standard of living in order to do something about it?
7) LIST is displayed.
On what topic would you like to contribute (mark if there are contributors)?
8) What are the factors that encourage you to take measures/support about climate change and what are the factors that prevent you?

Table 3 PROFILES OF INTERVIEWEES

Age	Gender	Education	Profession	Work	Income
56	M	Primary school	Retired	-	2.000 ₺
51	F	Primary school	Housewife	-	5.000 ₺
31	F	Undergraduate	Physiotherapist	+	12.500 ₺
26	M	High school	Student	S	2.400 ₺
27	M	Postgraduate	Engineer	+	4500 ₺
26	M	Undergraduate	Chemical engineer	+	6.500 ₺
27	F	Postgraduate	Master architect	+	6.500 ₺

F: Female, M: Male

Then, a questionnaire was created from 68 actions and questions prepared based on the study called Climate Change 2020 Key Factor in Decision Making, a study organized by the European Investment Bank. It was applied to 77 people

with different demographic characteristics. The sample is randomly selected. 70,1% of the survey participants are female, and the remaining 29,9% are male. Age range is between 16 and 56 whereas 78% of the age is between 20 and 39.

A list of precautionary activities had been prepared, the participation of respondents had been sought. Then most and least attractive activities were found and discussed.

A simple Climate Change a Key Factor in Decision-Making questionnaire had also been conducted in Turkey to understand the position of people and then compared with other countries results.

Table 4 provides a brief summary of the main steps of the research.

Table 4 SUMMARY OF RESEARCH STEPS

Study	Date	Description
Literature Review and examine EU directives, folder/files	May 2020	Searches were done with keywords from the Scopus database. Out of 348 articles, 82 of them were examined, and variables were taken from 35 of them.
Communicate with experts & stakeholders	July 2021	Online interviews were conducted with different experts.
Interviews	Dec 2021	The interview was conducted by asking 7 participants of different demographics 8 questions.
Quantitative Study	Jan 2022	The questionnaire was prepared with 68 actions. 72 people answered the questionnaire.

IV. FINDINGS

When we look at the interview, we observe that people are generally aware of the climate crisis. However, we see that if they did not receive training on this issue, they did know what to do as a solution and did not envisage much about this issue before. When asked whether they want to do something individually, they say that they want to contribute individually. Still, they will do so if it is a social movement and a large part of the society participates. They believe this should be regulated at the state level. Participants think that individuals should be compelled outside of individual effort such as legal obligation, control, regulation with taxes. They want the responsibility to be shared equally. One of the most apparent results of the interviews is the economic/monetary problems that come at the forefront of the obstacles encountered when it is desired to take individual measures on climate change. Country and government policies follow this obstacle. Participants who received training on the climate crisis think that the impact of an improvement in production processes will be greater. When we look at the demographic, male interviewees think that they see a more pessimistic picture and that climate change is unavoidable. In the interviews, it is seen that people adopt the activities that they learned in childhood, such as not wasting water and turning off the lights, reducing consumption, and realizing these activities as a habit. These behaviors learned in

childhood remained as habits for the rest of their lives, and these habits were transformed and added. This finding reveals how important the childhood period is in terms of adaptation.

In table 4, we see the most studied variables in the literature review and their frequencies in the interview. In the Interview, we discovered new factors that we did not encounter in the literature. These are helpless, legal regulation, legal enforcement, health concerns, government incentives, risk, feeling good, afraid, trust, cost, incentive, motivation, dependence, knowledge, habit, lifestyle, limited-time, unemployment, access to a limited product, infrastructure, comfort.

Except for intermediary variables intention (Claudy M.C., et al., 2013; Kapoor K.K. and Dwivedi Y.K., 2020; Akman I. and Mishra A., 2014; Dahlinger A. and Wortmann F., 2016; Huang Y. and Qian L., 2021) and attitude (Asadi S. et al., 2015; Adnan N. et al. 2019; Jung et al, 2020.) most studied. While the concepts of Value (Ozaki R., 2011; Nath V. et al., 2013; Claudy M.C., et al., 2013; Zhu Q. et al., 2013) Social Pressure (Dahlinger A. and Wortmann F., 2016; Scott A. et al., 2015), and Behavior Control (Asadi S. et al., 2015; Akman I. et al., 2016; Zhang L., et al., 2019; Eccarius T. and Lu C.-C., 2020.) are studied a lot in the literature, we mostly encounter the concepts of Value, Awareness, Usefulness, and Environmental Concern in the semi-structure interview we created. See table 4.

Survey participants, 89% of whom have a bachelor's or associate's degree, stated that the most important and leading stakeholder in climate change is the State with 39%. 'Consumers' is 18% in this table. Other stakeholders are non-governmental organizations, industrial organizations, and municipalities. 24% of women and 4% of men think that the most critical stakeholder is consumers. From this, it can be deduced that women are more prone to take action individually.

In 2022, the rate of those who think that climate change will affect the decision-making processes in their daily life is 91%.

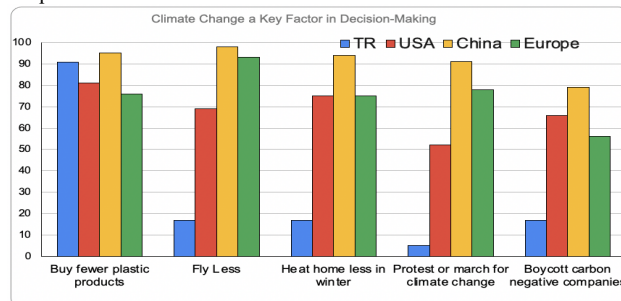
Table 5 INFLUENTIAL FACTORS OF GREEN-AWARE ACTIONS

Construct	Count (LR)	Interviews Findings
Intention	25	X
Attitude	23	XXX
Value	14	XXX
Perceived Social Pressure	14	XX
Behavior Control	11	X
Awareness	9	XXX
Personal Norm	6	X
Usefulness	6	XXX
Compatibility	6	X
EoU	4	X
Feeling of responsibility	4	XX
Relative advantage	3	XX
Environmental Concern	3	XXX

The European Investment Bank conducted a study called Climate Change a Key Factor in Decision-Making for 2020. In this study, some activities in the USA, Europe, and China on preventing climate change in 2020 were listed, and the participants were asked whether they would do it or not. With the survey we conducted, we researched these activities for the year 2022 in TR (sample size 77) and compared them with these ready data. When we look at Graph 1, we see that the sample in Turkey does not promise a big change in behavior other than buying less plastic. This result indicates that a separate study is needed.

When we look at China, the USA, Europe, and Turkey, it is seen that participating in protests or marches for climate change and boycotting carbon negative companies are among the least planned actions, while consuming less plastic is the most deliberate action. It can be understood from the rates in the chart that China wants to take serious effort on this issue (graph 1).

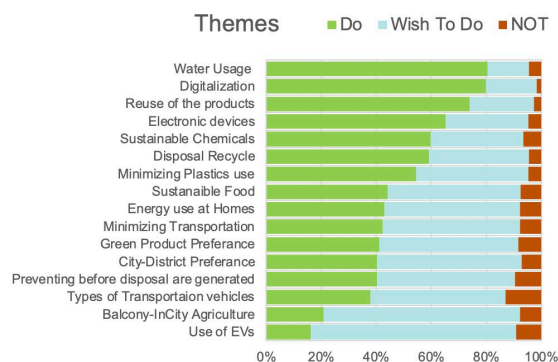
Graph 1 CLIMATE CHANGE A KEY FACTOR IN DECISION-MAKING



We conducted a field survey with 64 remedy actions under 16 categories, and the participants were given 'do' and 'wish to do' options for each step in the list. Each category had found the different reactions from our sample, people have already adopted some, and some are not found to be attractive yet (Graph 2)

When we look at Graph 2, we see that people do not take actions that are more expensive in terms of cost and actions that are not in their hands in terms of infrastructure, but generally declare that they do activities that depend on their preferences. This brings us to the fact that the institutions in charge of infrastructure should provide the necessary infrastructure in this area and that we make choices within the financial means

GRAPH 2 ATTRACTION OF ACTIONS CATEGORIES



As a result of the analysis, we see the 5 most-done actions and the 5 most-desired actions in table 6. According to this, even as a relative advantage in preventing climate change, the most common ones are 'Preferring to walk to suitable places', 'Not leaving water unopened', 'Doing both online and manual transactions online', 'To digitally request documents that can also be obtained digitally, such as paper invoices, credit card statements', 'Choosing energy-efficient products'. The actions they want to contribute the most are 'Harvesting rainwater', 'Preferring EVs in individual vehicles' 'Preferring washable cotton/textiles instead of disposable cotton for make-up removal', 'Preferring an electric motor', 'EVs prefer shared vehicles'. It is seen that "to prefer shared vehicles". It is a remarkable detail that 3 out of 5 of the actions they want to contribute the most are about the types of vehicles used in transportation. It is thought that the action of 'Preferring washable cotton/textile products instead of disposable cotton for make-up removal' is in the top 5 is related to the fact that 70,1% of the survey participants are female.

Table 6 TABLE 6 MOST AND LEAST PREFERRED/REALIZED ACTIONS

Action	Wish To Do	Do
Prefer to walk to suitable places	5%	94%
Not leaving the water running unnecessarily (for example, the water should not be left on while brushing teeth, washing hands.)	4%	92%
Making both online and manual transactions online (for example, paying bills from the bank application)	10%	90%
To digitally request documents that can also be obtained digitally, such as paper invoices, credit card statements	14%	86%
Use existing one with a few repairs instead of buying new one	13%	84%
...		
Preferring washable cotton/textiles instead of disposable cotton for make-up removal	70%	12%
Preferring EVs in individual vehicles	74%	10%
EVs prefer shared vehicles	71%	9%
Preferring an electric motor	74%	9%
Harvesting rainwater	82%	9%

V. CONCLUSION

This study is a preliminary preparation for the work we will do later and helped us understand the themes of what they want to do individually in environmental sustainability and create the variables for the adaptation model. In the light of the data we have obtained in our future study, we will try to explain the concepts that are effective in individual (related to the decisions we make in daily life) adaptation to environmental sustainability and the relationship between them.

The variables that we do not come across in the literature review but come across in the in-depth interview are helpful, legal regulation, legal enforcement, health concerns, governments incentives, risk, feeling good, afraid, trust, cost, incentive, motivation, dependence, knowledge, habit, lifestyle, limited-time, unemployment, access to a limited product, Infrastructure, comfort. We think it would be beneficial to consider these variables in the new models to be created.

This study shows that people generally think that social action can be achieved and that this social movement can be achieved with legal obligations.

The majority of the participants think that the partners who need to take action regarding the climate crisis are the service providers (states, NGOs, industry, and municipalities) rather than the consumers (individuals).

The limitations of this research are the small sample size and the current country's economic situation.

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