

Croatian Youth Perception of the Low-Carbon Institutional and Awareness-Behavior Gaps

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Abstract

The low-carbon transition is an important step towards a more sustainable future. It is gaining increasing attention not only from scientists but also from the general public, including youth. This paper explores the attitudes, opinions, and perceptions of young people, i.e. Croatian university students, about the importance of the low-carbon transition and the efforts made so far by various stakeholders in this process. It also examines the existence of the low-carbon awareness–behavior gap using the data collected by a questionnaire-based pilot survey conducted in 2021.

The results show that young people believe that low-carbon transition will bring environmental, social and economic benefits and opportunities, i.e., contribute to managing resources more efficiently, reducing waste, developing new green innovations and technologies, opening new green business opportunities, and improving the quality of life in general. However, they perceive that the efforts of the whole society, including the government institutions at various levels, the private, financial and civil sectors, and citizens, are far from sufficient to move the country more rapidly towards a low-carbon future. As they perceived, the exceptions are educational and research and development institutions, most of which have responded adequately to the low-carbon challenge. The observed gap between the low-carbon awareness and perceived behavior points to the need to develop clear strategies, policies, and programs that promote changes towards low-carbon behavior, keeping in mind that increasing knowledge, awareness, motivation, and social learning are critical to this end.

Keywords: low-carbon economy; low-carbon transition; survey; youth; Croatia

1. Introduction with the conceptual foundations

Mitigation of global warming and climate change requires rapid decarbonization of the economy (see Huang and Zhai, 2021). However, that is not a simple change. Just the opposite, this is a process that requires large-scale structural changes, individual and joint/collective actions across the world, as is highlighted by the Paris Agreement (UNFCCC, 2015), ratified in November 2016. The European Union (EU) has committed itself to becoming the first carbon-neutral continent in the world (EC, 2018). To reach this goal, a low-carbon transition has to take place.

The low-carbon transition refers to substantial and simultaneous changes in all aspects of human life including changes in production and business models, transport and mobility, housing, consumer and household behavior, markets and institutions, energy, and the like. The changes aim to reduce the harmful impacts of human activities on climate and the environment (Geels et al., 2016; 2017; Roberts et al., 2018). The low-carbon transition assumes increasing energy efficiency and using more renewable resources and fewer resources in general (Geels et al., 2017). It is an important step towards a more sustainable future. It is enacted by a wide range of actors such as governments, businesses, academia, households and the public in general, which often have different agendas, i.e. interest, resources, power, knowledge, beliefs and opinions about the future. Different agendas lead to different successes in the transition.

Young people play a key role in mitigating climate change (Pandve et al., 2009) and they should be particularly interested and involved in the low-carbon transition. They usually have higher environmental awareness, which has the potential power to accelerate the transition to a low carbon future. Several papers confirmed that they are aware of global warming and climate change and the role that they have in their mitigation (Pandve et al., 2009; Gryz et al., 2021). This also confirms the reports of different surveys conducted in the EU (e.g., EC, Eurobarometer survey, 2021) or at the world level (e.g., UNDP People's climate vote, 2021). The former found, for example, that 93% and 78% of the respondents considered climate change as a serious or a very serious problem, respectively, as well as that 91% of young people think that combating climate change can improve their well-being. Furthermore, young people are more ready to adapt to the requirements of the new age and change their lifestyle towards more environmentally friendly ones. This is important since previous research confirmed that residents' behaviors generate adverse emissions (Abdul Azis et al., 2015) and affect low-carbon development (Cadez et al., 2019).

However, the behavior of young people, as people in general, is socially co-determined. Indeed, the behaviors of other people and institutions play an important role in their behavior and lifestyles. Previous studies (e.g., Pickett-Baker and Ozaki, 2008; Valente et al., 2009) confirmed the environmental/institutional influences on the behavior of young people. For example, Bevelander et al. (2018) indicated how important social context and social networks

are for creating health campaigns and achieving desired outcomes. Young people evaluate other people and the behavior of institutions on a daily basis and assess how much it is in line with what they proclaim. If the gap between “words” (strategies, plans, programs) and “actions” is large, it will affect their behavior and support or undermine the target behavior and lifestyles. We assume that young people perceive the existence of this gap.

Previous evidence also pointed to low-carbon awareness as an important determinant of behavior (Bai and Liu, 2013; Kaffashi & Shamsudin, 2019; Pfeifer et al., 2021). Low-carbon awareness refers to an individual’s subjective judgements towards the low-carbon changes (for a brief review of the concept, see Liu et al., 2021). It is related to understanding the role of carbon emissions in global warming and climate change and the carbon consequences of an individual’s activities. However, opposite findings of the effects of low-carbon awareness on behavior may be found in the literature as well. For example, Liu et al. (2017) showed that consumers’ low-carbon awareness has little effect on their behavior. There is a lack of research on how the gap between awareness and behavior in the area of the low-carbon transition affects the shaping of lifestyles and behavior of young people.

Drawing from the socio-technical transition theory, this paper aims to explore the attitudes, opinions and perceptions of young people, i.e. Croatian university students, about the benefits and opportunities that the low-carbon transition brings and the efforts made so far by various stakeholders in this process. The paper also aims to check if there is a gap between low-carbon awareness and the perceived behavior of young people, as the first step in influencing their behavior towards low-carbon. For this purpose, an online survey is used to collect data and a correlation analysis and one-way Analysis of Variance (ANOVA) are performed.

Knowing the youth’s opinions and understanding their perception of the contribution of their peers and leading actors in building a low-carbon economy can help in creating an appropriate policy, i.e. institutional reaction directed to change the environmentally harmful behavior and accelerate the low-carbon transition.

As pointed out by Geels et al. (2017), the feasibility of the low-carbon transition can be studied within a framework of socio-technical transition theory, the multilevel perspective in particular (Geels, 2019), which considers the interdependent social, cultural, political and technical processes of transitions. It enables researchers to assess public awareness and acceptance, as well as the role of stakeholders in managing and implementing this process. The multilevel perspective is particularly appropriate when social transformation towards sustainability through the transition in systems that provides societal functions is in place (for a review, see Geels, 2019). The low-carbon transition is a co-evolving, multi-dimensional long-term process, with complex mutually interrelated interactions between different subsystems, such as technical, socio-economic, business, political or cultural (see Geels, 2017). However, this paper does not provide a comprehensive picture of the low-carbon issues examined; it provides the first insight into the institutional and awareness-behavior gaps from the young people’s perspective.

This paper is organized as follows. Section 2 briefly describes the methodology, while Section 3 presents and discusses the results of the survey. Section 4 concludes.

2. Methodology

The paper used an online survey, descriptive statistics, correlation analysis and one-way ANOVA to explore the attitudes, opinions and perceptions of young people on low-carbon issues. The survey of the Croatian Josip Juraj Strossmayer University students was carried out in Osijek during March and April 2021. Using the convenience sampling method, the data were collected from 361 students, who participated in the research voluntarily.

The questionnaire included three groups of questions besides the socio-demographic characteristics of the respondents, such as gender, ages, place of residence, field of education, or marital status. They were related to the students' attitudes, opinions and perceptions on *i*) low-carbon opportunities and efforts that stakeholders invested in the low-carbon transition so far; *ii*) their low-carbon lifestyle, the level of low-carbon awareness, barriers and incentives they perceive to exist, and *iii*) their low-carbon planned behavior. The Likert five-scale questions were used to collect the opinions, attitudes and perceptions on low-carbon issues from university students.

Most of the respondents were female (203, 56.23%) and under 25 years old (307; 85.04%), with previous education completed in social sciences (164; 45.43%) or technical sciences (86; 23.83%). Most of them assessed their financial situation as average (125; 34.90%) or good (179; 49.58%).

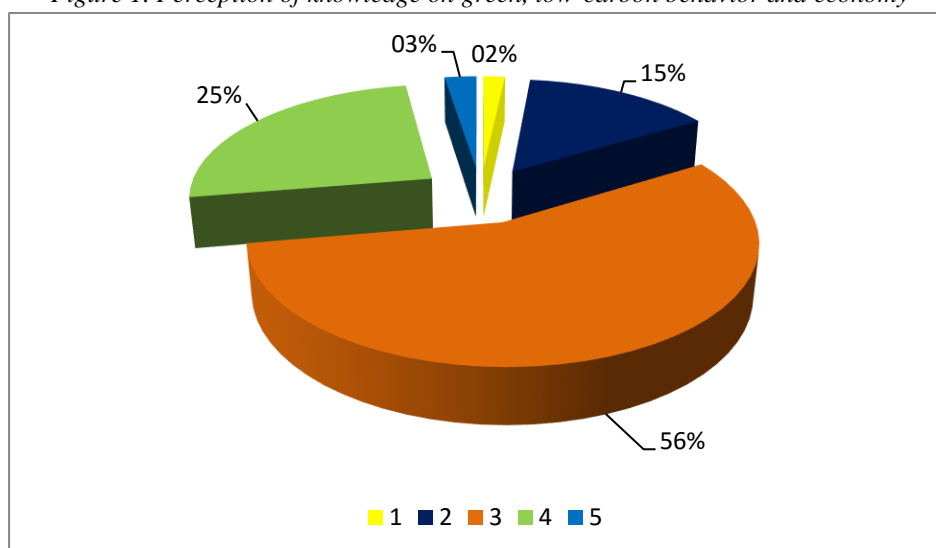
3. Exploring perceived opportunities of the low-carbon transition and stakeholder engagement

A recent global effort to accelerate the transition to a low-carbon economy has been based on the premise that it provides economic benefits that outweigh the potential costs over time (see Roberts et al., 2018). The low-carbon transition will induce a complex transformation of the socio-economic system, whereas some sectors or agents will gain, while others will face economic and social difficulties (Green and Gambhir, 2020). Previous studies highlighted numerous benefits potentially generated by the low-carbon transition in Europe (Sovacool et al., 2020). However, there is a lack of research on the low-carbon issues from the perspective of young people. We firstly explored their perception of benefits and opportunities generated by this transition given that managing and accelerating transition is possible only if there is a high level of agreement on its importance. Then, we examined young people's views on the contributions made by selected stakeholders in the low-carbon transition so far.

3.1. Perceived benefits and opportunities of the low-carbon transition

The identification of benefits and opportunities potentially generated by the low-carbon transition began with the question “How do you assess your level of knowledge of green, low-carbon behavior and economy?” As shown in Figure 1, most of the respondents (202; 56.0%) perceived their level of knowledge as average and only 2.5% of respondents awarded themselves the highest grade (5).

Figure 1. Perception of knowledge on green, low-carbon behavior and economy



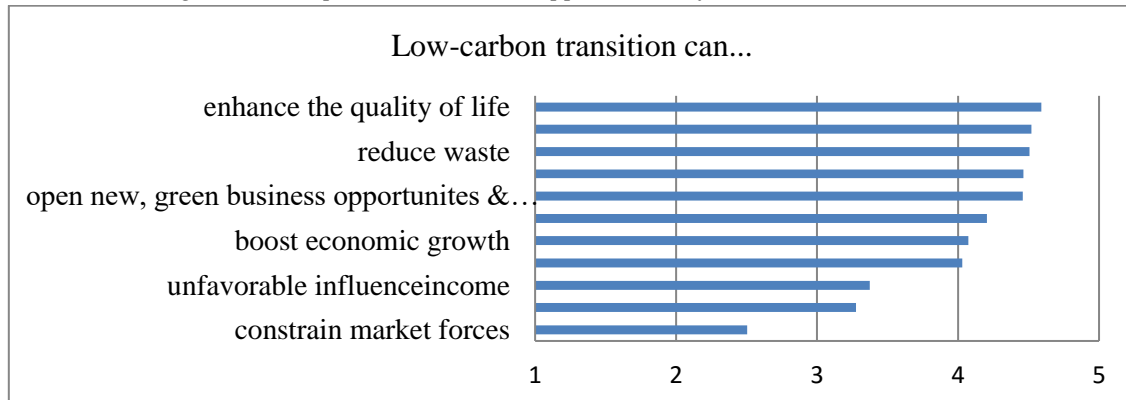
Note: Response continuum: from 1 (very poor) to 5 (excellent).

This result indicates that students are aware of the complexity of the low-carbon issues and the lack of knowledge. As already mentioned, the low-carbon transition assumes structural changes in all subsystems and aspects of their life. The lack of required knowledge, skills and competencies is a great challenge that should be addressed. Indeed, developing new knowledge, behavior and competencies is a very important factor in building a low-carbon economy. Neij and Nemet (2022) emphasized that the low-carbon transition requires, above all, local learning, i.e., the acquisition of new knowledge and skills to reduce implementation costs and accelerate the adoption of low-carbon technologies.

The low-carbon transition opens up enormous challenges for society as a whole, but also leads to many benefits and opportunities that make it cost-effective to tackle them (see Figure 2). The majority of the respondents (more than 85%) strongly agree that the low-carbon transition brings a more efficient usage of resources, reduction of waste, opening green business opportunities and green start-ups, and enhancing the quality of life in general. The respondents agree that the low-carbon transition may boost economic growth, reduce the

energy dependence on imports and create new jobs. They do not think that it would considerably constraint the efficiency of the market mechanism and jeopardize profits of the business sector and disposable income of households.

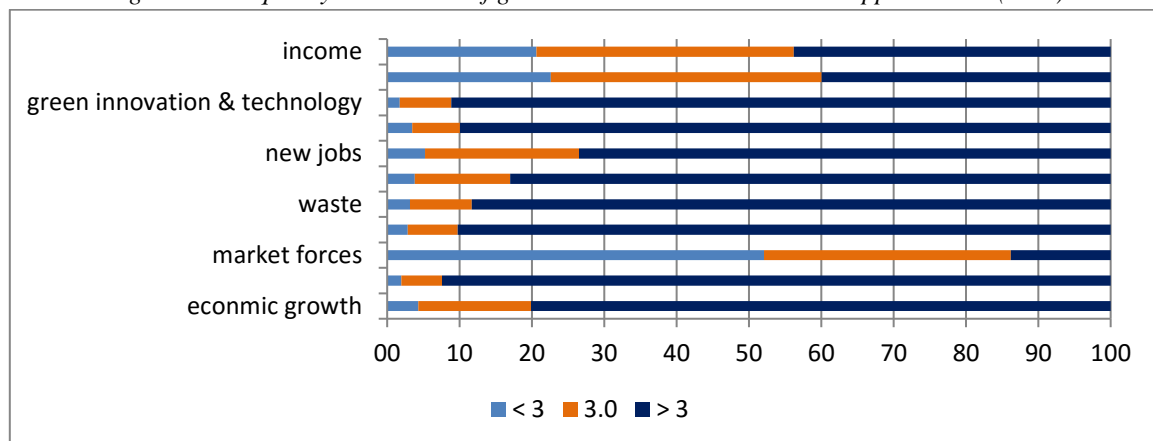
Figure 2. Perceptions on economic opportunities of the low-carbon transition



Note: response continuum: from 1 (completely disagree) to 5 (completely agree). Likert scale response is reversed for three last items (profit, income, market forces).

Figure 3 illustrates the frequency distribution of the respondents' responses related to benefits/opportunities generated by the low-carbon transition. The response continuum is reduced in scale (from 1 to 3) to be more graphically readable.

Figure 3. Frequency distribution of grades on low-carbon economic opportunities (in %)



Note: <3 (strongly disagree and disagree responses); > 3 (agree and strongly agree responses). Likert scale response is reversed for three last items (profit, income, market forces).

These results are in general in line with the Eurobarometer's findings (EC, Eurobarometer survey, 2021) of the opportunities that fighting climate change may bring to the European economy (e.g., new innovation and jobs or more energy security), although we should note,

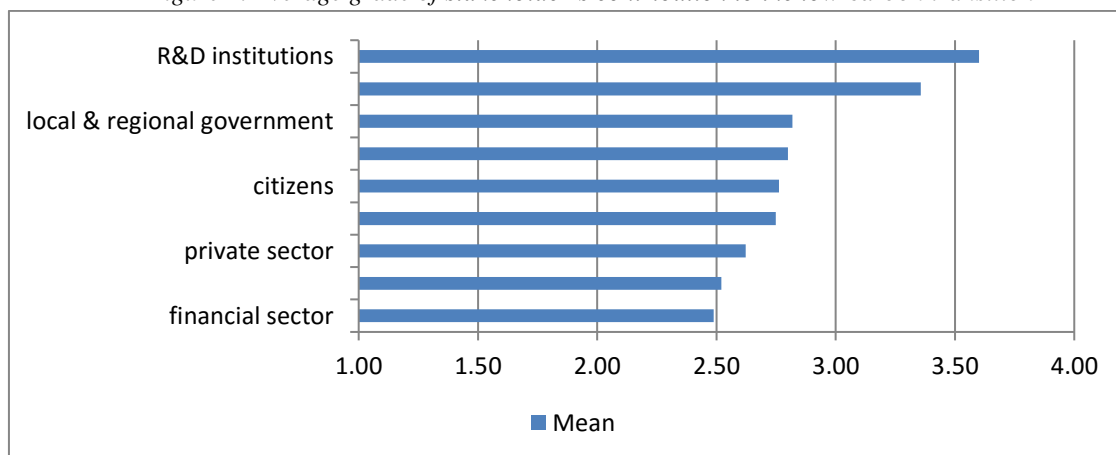
the students perceive them more optimistic. This is expected; younger people are proven to be more optimistic, positive and globally-minded than their elders (UNICEF, 2021).

3.2. Stakeholders in low-carbon transition: the institutional performance gap

Achieving carbon neutrality requires complex simultaneous efforts of different actors in a society directed to the transformation of the whole economic system. Each actor plays an important role in this process, and their actions are guided not only by their cost-benefit calculations, but also by beliefs, competing interest, conflicting values and agendas at multiple levels (niche-innovations, sociotechnical regimes and sociotechnical landscape), as pointed out by Geels et al. (2017). However, because of the challenges generated by the low-carbon transition and changes that they cause in the socio-economic system or the landscape, the actors should act collectively and jointly (Geels and Schot, 2007; Geels et al., 2017). The need for widespread efforts is particularly highlighted by the recent IPCC Special Report on Global Warming of 1.5°C (IPCC, 2018) and transitions as outcomes of coordination between multi-level developments.

Although the currently ongoing low-carbon transition also benefits from emergent technical, economic and cultural developments, it should be actively pushed by policymakers at each level (local, regional, national and international). Previous literature suggests that such efforts are lacking (Roberts et al., 2018). We asked the respondents to evaluate the contribution of the selected stakeholder groups to the implementation of the green, low-carbon transition. Figure 4 illustrates their opinions.

Figure 4. Average grade of stakeholder's contribution to the low-carbon transition

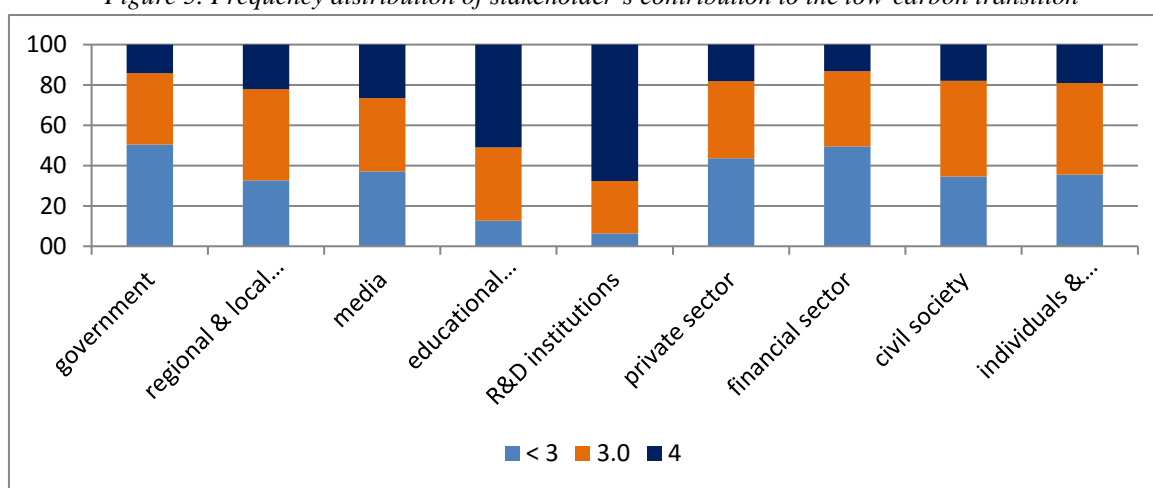


Note: response continuum: from 1 (extremely low) over 3 (neither low nor high) to 5 (extremely high).

Although none of the selected stakeholders has received the highest grade (5) for their contribution in building a low-carbon economy so far, the highest contribution is recognized

to R&D (research and development) and educational institutions, and the lowest to the financial sector and the government. One sample t-test indicates that the average grade for each stakeholder effort invested so far in the low-carbon transition is significantly different from the average grade (3, neither low nor high). Figure 5 shows the frequency distribution (in %) of the university students' answers.

Figure 5. Frequency distribution of stakeholder's contribution to the low-carbon transition



Note: <3 (extremely low or low); 3 (neither low nor high), 4 high).

Although each of the stakeholders has its duties, agendas and responsibilities, the role of policy authorities is critical. The respondents did not assess their importance, but more than six in ten Europeans consider the national governments as the most responsible for tackling climate change (EC, Eurobarometer survey, 2021). As pointed out by Geels et al. (2017), they should first promote low-carbon niche innovations and support coalitions that encourage learning, network building and initial deployment and then gradually increase selection pressures through stricter regulations. They should coordinate the individual actions given the target and goal setting (Geels et al., 2017). The respondents are not satisfied with their achievements so far. This is a dire forewarning because, without efficient and effective management of the transition process, the entirety of it can be significantly slowed down, and thus achieving the previously defined goals could be called into question. Roberts et al. (2018) already pointed out that institutions need to go beyond routine calls for more „political will“. An in-depth analysis of policy mixes is needed to explore the reasons for the institutional performance gap between the performance targeted and set by institutions in various policies, programs and actions and the performance perceived by youth.

Along with the government, the respondents think that the contribution of the financial sector to the low-carbon transition is poor. However, its role is important in building a low-carbon economy. The financial sector can allocate capital and direct financial flows towards more low-carbon and in general sustainable activities (Louche et al., 2019). It can also promote changes in corporate behavior and influence policy outcomes towards low-carbon (Boissnot et

al., 2016). Whether the contribution of the financial sector was misperceived or it had failed in its task should be further investigated.

The fact that young people rate the contribution of educational institutions in creating a low-carbon economy as very good, opens rooms and the need for the development of modern low-carbon educational curricula that will reduce the lack of knowledge they feel. One should not forget that knowledge is critical for effective actions in facilitating behavior change (Fielder and Deegan, 2007; Neij and Nemet, 2022)) and that education is the crucial actor of transformation towards low-carbon development (Phang et al., 2010). Yusof et al. (2016) demonstrated the positive effect of formal education for undergraduate students in an appropriate learning environment. For a review of low-carbon education, see Hudha et al. (2020).

If the respondents think that the relevant actors, including the people surrounding them, failed to fully contribute to the acceleration of the transition to a low-carbon economy, the easiness and the pace of the change could be delayed. In contrast, if they think that low-carbon behavior is a prevailing modus of behavior, it will put pressure on them to change their demeanor.

3.3. The existence of the low-carbon awareness-behavior gap

The behavior of people is determined by numerous, mutually interlinked factors. Biosocial, cultural and situational factors are some of them. As already mentioned, the respondents think that the efforts taken by most of the actors (including the citizens) to date invested in building a low-carbon economy are in general insufficient. We wanted to explore is there any gap in low-carbon awareness and the perceived behavior of young people. To that end, following Abdul Azis et al. (2015), we created two multiple-item constructs – low-carbon awareness and perceived behavior.

Each construct is built as the mean of a set of multiple items. The following seven items, designed by Lin et al. (2006), were used to create the former: global warming problems have consequences for my life; I worry about global warming problems; I can see with my own eyes that the environment is deteriorating; the attention given to the greenhouse effect is exaggerated (reverse-scored); I am optimistic about the environmental quality in the future (reverse-scored); a better environment starts with me; people who do not take the carbon footprint into account try to escape their responsibility. These items reflect three dimensions of low-carbon awareness that have been already recognized in the literature (Abdul Azis et al., 2015) – low carbon value, low-carbon attitude and low-carbon knowledge. Geels (2010) already revealed that an increase in environmental awareness is taking place at the level of the socio-economic landscape.

The second construct is composed of the following twelve items (Pfeifer et al., 2021): I don't forget to separate the waste for recycling; I reduce the use of plastic bags and similar hard-to-decompose items; I buy/wear second-hand clothes; I use drinking water sparingly; I'm reducing the amount of household waste; I buy locally produced products; I consume green

products; I don't forget to turn off devices (TV, computer, ...) that I do not use at the moment; I monitor energy consumption and try to reduce it (e.g., turn off lights and use LED bulbs, reduce heating or cooling temperatures); I use alternatives in transporting that are more friendly to the environment (bicycles, hiking and the like); I use public transport instead of private cars; I use my car in transport. These items cover four categories that are recognized in the literature as the important ones for determining low-carbon behavior: recycling activities, purchasing green products, energy efficiency and conservation, and travel mode choice (Abdul Azis et al., 2015).

According to the general rule of thumb, a Cronbach's alpha, which measures the reliability of a construct, of 0.7 and above is good. Hence, the calculated value of Cronbach alpha suggests that the internal consistency of both constructs (0.728 and 0.723, respectively) is acceptable. The Kendall's tau b and Spearman's rho statistics indicate the positive (0.231 and 0.318) and statistically significant association between them at the 5% significance level. Table 1, which provides descriptive statistics, indicates the existence of the gap between these two constructs.

Table 1. Perception of low-carbon awareness and behavior

Construct	Mean	Median	Std. Deviation	Valid N	Missing
Awareness	3.770	3.857	0.579	361	0
Behavior	3.269	3.231	0.504	361	0

Note: response continuum: from 1 (disagree) over 3 (neither disagree nor agree) to 5 (completely agree). From 1 (never) over 3 (sometimes) to 5 (every time)

The respondents' level of low-carbon awareness is higher than their level of perceived low-carbon behavior. This finding is expected and not specific for Croatian young people. Indeed, it is in line with previous research on this topic (for a review, see Abdul Azis et al., 2015), although one should note that there are different results. For example, Bai and Liu (2013) revealed that the level of low-carbon behavior of the citizens of Tianjin (China) was higher than their awareness. As noted by the authors, this was due to the stronger influence of motivators than barriers.

To determine if there was a statistically significant difference between the mean scores of low-carbon awareness and perceived low-carbon behavior (Table 1), the one-way ANOVA was carried out. It confirmed that the perceived behavior of the respondents is significantly different for at least one of the estimated low-carbon awareness levels ($F_{38,322} = 2.848$; $p < 0.001$). Low-carbon awareness of Croatian university students is not completely translated into behavior. Certainly, there are numerous reasons for the existence of the low-carbon awareness-behavior gap. The reasons for that provide a promising avenue for further research. Understanding the reasons of this gap and the multilevel perspectives surrounding the low-carbon transition can help all stakeholders accelerate this process and bring it to success.

The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of two or more independent (unrelated)

groups (although you tend to only see it used when there are a minimum of three, rather than two groups). For example, you could use a one-way ANOVA to understand whether exam performance differed based on test anxiety levels amongst students, dividing students into three independent groups (e.g., low, medium and high-stressed students)

4. Conclusion

The low-carbon transition is a co-evolving, multi-dimensional long-term process, with complex mutually interrelated interactions between different subsystems. It is an important step towards a more sustainable future. It is enacted by a wide range of stakeholders, including young people, which were in the focus of this paper. The paper explored the attitudes, opinions and perceptions of young people, i.e., Croatian university students, about the benefits and opportunities that the low-carbon transition brings and the efforts made so far by various stakeholders in this process. It also examined whether there is a gap between students' low-carbon awareness and their perceived low-carbon behavior.

The data needed for the analyses was collected by an online survey. It was carried out in Osijek during March and April 2021. The attitudes, opinions and perceptions were collected from 361 young respondents, students of the Croatian Josip Juraj Strossmayer University of Osijek.

The results showed that young people recognize economic benefits that the low-carbon transition opens up in all aspects of life, but also that they are dissatisfied with the contribution that stakeholders have made so far in building a low-carbon economy. Particularly low grades have been given to the efforts made so far by the government and the financial sector in the low-carbon transition. This institutional performance gap between the performance targeted and set by institutions and the performance perceived by youth is a serious warning for institutions, especially given their critical role in building a low-carbon economy. Educational and R&D institutions are best rated by young people. This is good, especially because the trust that young people implicitly show in them should be used in creating modern low-carbon educational programs. Young people are aware of their lack of knowledge about low-carbon issues, though it can be largely reduced through various formal and non-formal education programs. The results also indicated the presence of the low-carbon awareness-behavior gap. Awareness of low-carbon issues is not fully translated into perceived behavior, a challenge that needs to be adequately addressed by the actors such as the government (at all levels) or the private, financial and civil sectors. Future research should focus on analyzing the reasons for the existence of both gaps and ways for their closing, keeping in mind that increasing knowledge, awareness, motivation, and social learning are critical to this end. In addition, further research should examine the attitudes, opinions, and perceptions of different categories

of young people, not just university students, toward the different levels of low-carbon transition proposed by socio-technical transition theory.

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