

GREEN CITIES – AN INTERSECTION BETWEEN MUNICIPAL STRATEGIES AND SUSTAINABLE HOUSEHOLD BEHAVIOR

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Abstract: In recent years, climate change focuses the attention of people, businesses and researchers on the concrete benefits of following the concept of Sustainable Development. In this sense, efforts to transform cities into green ones can be perceived as a topical issue for both municipalities and the households that live in them. The third largest city in Bulgaria - Varna, has the profile of a tourist summer destination. The transformation of Varna into a green city can be perceived as a common goal for both the municipality and the households. In this regard, the main task of this paper is to compare the strategic documents of the local administration for development in the period 2021 - 2027 and the goals set in them and the results of a study of the sustainable behaviour of Varna households. The main research question is whether and to what extent a match can be found between local government priorities and actual household actions to achieve sustainability goals. Based on desk research, secondary data from strategic documents of the municipality is collected and analyzed. Turning the city into a green city is established as the main priority. As part of an empirical study, data is collected from 719 Varna households about their sustainable behaviour in five main areas – resources management (water and electricity), transport, food, disposal of products. The results show that for some areas, there is a certain degree of coincidence between the activities of the municipality and the sustainable actions of households covered in the survey. The results of the study can be used in defining and adapting goals related to Sustainability and aligning them with the real needs and habits of households, as well as in designing communication campaigns aimed at stimulating the participation of households in these processes.

Keywords: Green cities, Sustainable development, Sustainable cities, Sustainable household consumption

JEL classification: M31, Q01

1. Introduction

The Green City Accord (GCA) is a European initiative of mayors who want to make the cities they govern cleaner and healthier places to live (https://environment.ec.europa.eu/topics/urban-environment/green-city-accord_en last accessed 2024/05/10). By signing the agreement, cities commit to work in five priority areas, tied to the achievement of specific goals by 2030. These goals are linked to the recommendations of the European Green Deal regarding the management of air quality, water, urban biodiversity, circular economy, recycling and noise levels in cities. For each of these zones, GCA cities commit to determining the current state of affairs and defining specific ambitious targets linked to the recommendations of the Green Deal, reporting on their progress every three years. Currently, 110 European cities participate in GCA, including three from Bulgaria - Varna, Burgas and Stara Zagora. As each of the cities reports on its starting position upon inclusion in the GCA and the specific goals it commits to, Varna points out first of all the problems it has related to maintaining water quality due to large losses from leaks (ibid, last accessed 2024/05/10). From this point of view, the focus on the holistic management of the water cycle can be defined as the main task of the city. Secondly, the city determines

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the reduction of the negative effects of the urban heat island with a view to sustainable land management and the protection of urban ecosystems. With regard to controlling the increased CO₂ emissions, the next task is the establishment of an Agency for Sustainable Energy Development, whose work is aimed at reducing emissions and increasing energy efficiency. As the city is operating for years a system for separate collection of municipal waste and its recycling, progress in this area is significant, and as a goal requires less effort than the previous ones. Of course, the commitments made by the city government are only part of the joint efforts – of local administration and other institutions, of business and citizens, to achieve the goals of the Green Deal and the related GCA.

In this position, one can find the relevance of this paper – the search for intersections between the strategies for turning the city into a green city and the efforts and behavior of citizens aimed at the same areas. Discovering common objectives of citizens' strategies and actions is a sign that the two stakeholders see a common path to achieve the SD goals and the commitments made through the GCA. On the other hand, the detection of discrepancies between the objectives described in the strategic documents and the behavior of citizens can serve to adapt the strategies of the municipality and provide valuable guidance for the involvement of citizens in the initiatives in the five key areas described.

2. Methodology

In order to fulfill the main objective of the study and to answer the defined question, the following research methods are used:

- Literature review of various theoretical sources to derive the concept and notion of „Green city” and outline the main areas of action that define a city as green.
- Desk research to collect secondary data by carrying out a content-analysis of three main strategic documents: the Integrated Development Plan of the Municipality of Varna for the period 2021-2027, the Strategy for the Implementation of the Integrated Plan 2021-2027 and the Program for the Implementation of the Integrated Plan 2021-2027 in order to: 1) Outlining the main priority areas that the Municipality of Varna identifies in order to turn the city "green"; 2) Highlighting those of the described areas for which specific actions are planned by performing keyword frequency repetition analysis.
- Empirical research to investigate the actions, attitudes and knowledge of Varna households related to sustainable behaviour*. For the purpose of the study, a survey (CAPI) was conducted in two waves:

First wave: Conduct period - February-April 2021; Quota sampling (quota attributes "number of members in household" and "age of household head"; Number of respondents - 342;

Second wave: Conduct period - October-December 2022; Quota sampling (quota attributes "number of members in household" and "age of household head"; Number of respondents - 377. Multiple response scales and Likert scale are mainly used in the research instrument. The reliability of the variables used in this research is measured by Cronbach's alpha.

*The households survey is a part of the project "Sustainable Urban Consumption – Regional Differences", funded by the Bulgarian National Science Fund (BNSF) [Contract Nr. KP-06-H35/7]. All data are analysed with JASP 0.18.3 (JASP Team (2024). JASP (Version 0.18.3) [Computer software] (a/n).

3. Literature review

The question of "green cities" is often raised in the scientific literature and from the very beginning it is considered in the context of the processes of industrialization and the possible reactions of cities in view of these processes. One possible perspective covers the social, economic and environmental benefits of sustainable industrial waste management (Ferrer, Cortezia and Neumann, 2012) and the related changes in quality of life and the change in values. In fact, the concept of "Green City" can be seen as a generalizing concept that includes a number of other concepts, all of them related to the idea of the Sustainable Development Goals (SDGs). Perhaps the most common concept – that of

sustainable cities – is derived directly from the idea of SD. In a literature review of a number of scientific publications (Janik, Ryszko and Szafraniec, 2020) A generalized definition of the "sustainable city" is a settlement that implements policies and actions aimed at achieving social, economic and environmental goals.

When considering the concept of "green city", several possible perspectives can be defined – the city as (1) the city as a living system, as (2) an ecological system – the city as an experience of nature, and (3) as an independent, distinct place – the city as a particular place (DeKay, Mark; O'brien, 2001). According to the authors of this study, based on these three perspectives, five main groups of goals related to the achievement of the idea of a "green city" can be derived - these are the use of water resources, food, transport, places to live and the local climate. On the other hand, to each of these five groups of goals, different strategies can be defined to achieve them, such as building infrastructure and stimulating waste recycling, reducing pollution, energy efficiency of housing, ecological transport, etc. Other authors, again on the basis of a literature review, point out the variety of concepts that are used to outline the characteristics of "green cities" – these are "sustainable cities", "green cities", "smart cities", etc. – highlighting a total of 12 used concepts in which differences and specificities can be found (De Jong et al., 2015). In the cited literature review, De Jong et al. point out that the most common of these concepts is "sustainable city". It is closest to two other more widely used concepts – "green city" and "ecological city", and in a sense, although not completely, overlaps with them. As for the specific way of defining the concept of "green city", according to the authors, the closest here are the characteristics of "ecological cities" and "low carbon city". This, in turn, advocates the understanding that in this type of settlements, environmental protection and the reduction of CO₂ emissions become a priority - ideas that began to gain popularity since the 70s of the last century.

The variety of terms used to describe the idea of the "green city" can be defined as a problem that gives rise to some contradictions. Some authors define the use of the term as a marketing tool for positioning the city (Hamman, Anquetin and Monicolle, 2017). According to other authors, through the use of contradictory concepts and related communication policies, cities are actually moving away from achieving their sustainable development by defining two main priority goals for achieving it – reducing energy consumption and using renewable energy sources (Hassan and Lee, 2015). This study also clarifies that only these two groups of goals inherent in "green cities" do not exhaust the three pillars of SD – social, environmental and economic, on the basis of which the specifics of "green" versus "sustainable" cities can be deduced. In other words, it can be argued that the focus of the "green city" is on the implementation of strategies and actions related to environmental protection and solving environmental problems, rather than efforts aimed at social and economic actions.

Such a distinction is also advocated by other researchers. The term 'green city' is seen as an umbrella term for cities that focus their actions on environmental protection through a set of policies and actions related to the construction of green infrastructure, green transport, water management, ecological food, the construction of green spaces, the introduction of energy efficiency and the design and construction of sustainable buildings (Brilhante and Klaas, 2018). According to the model for assessing the green city proposed by the authors of this study, covering 50 different settlements, factors related to the general economic situation and population growth should also be taken into account, which also reflect on the environmental performance of cities. This thesis is also advocated by other researchers, although efforts to reduce carbon emissions are defined as the main priority of the "green city" (Zen, Al-Amin and Doberstein, 2019).

Other researchers link the concept of the "green city" with that of the "smart city", focusing on the use of digital technologies in energy efficiency management and reducing energy use, which lead to positive environmental effects associated with pollution (Ahvenniemi and Huovila, 2021). In their study, however, they point out that cities' strategies are aimed at achieving social and economic rather than environmental sustainability. This, in turn, may justify the need to revise models when designing urban strategies to ensure long-term sustainability is achieved (Rodrigues and Franco, 2022) by focusing efforts on building green infrastructure in cities (De Montis, Ledda and Calia, 2022). At the same time,

in solving this problem, attention is drawn to the involvement of stakeholders through marketing efforts to position the settlement as a "green city", which would lead to the improvement of living conditions in cities, especially when it comes to tourist destinations (Moreira et al., 2023).

Based on the overview related to the concept of "green city" and aspects of its use, as well as the review of a number of bibliometric studies (De Jong et al., 2015; Hamman, Anquetin and Monicolle, 2017; Rodrigues and Franco, 2022; Crippa et al., 2023; Moreira et al., 2023; Silva et al., 2024), the following main conclusions can be drawn:

- The concept of "green city", although related to that of SD and "sustainable cities", describes to a greater extent the creation and implementation of strategies aimed at the environmental rather than social and economic sustainability of cities;
- Achieving environmental sustainability is directly linked to the implementation of strategies aimed at stimulating energy efficiency and the use of renewable energy sources, which, according to the review, lead to the most sustainable results;
- While taking into account the influence of a number of economic and social factors, such as the level of GDP and population growth, actions aimed at managing water resources, Reducing carbon emissions and improving the energy efficiency, using sustainable transport, building green spaces, marketing of ecological food products, recycling and waste management are of the greatest importance for achieving environmental sustainability.
- Marketing efforts aimed at positioning cities as "green cities" lead to an increase in the quality of life in settlements and to the amplification of positive environmental effects.

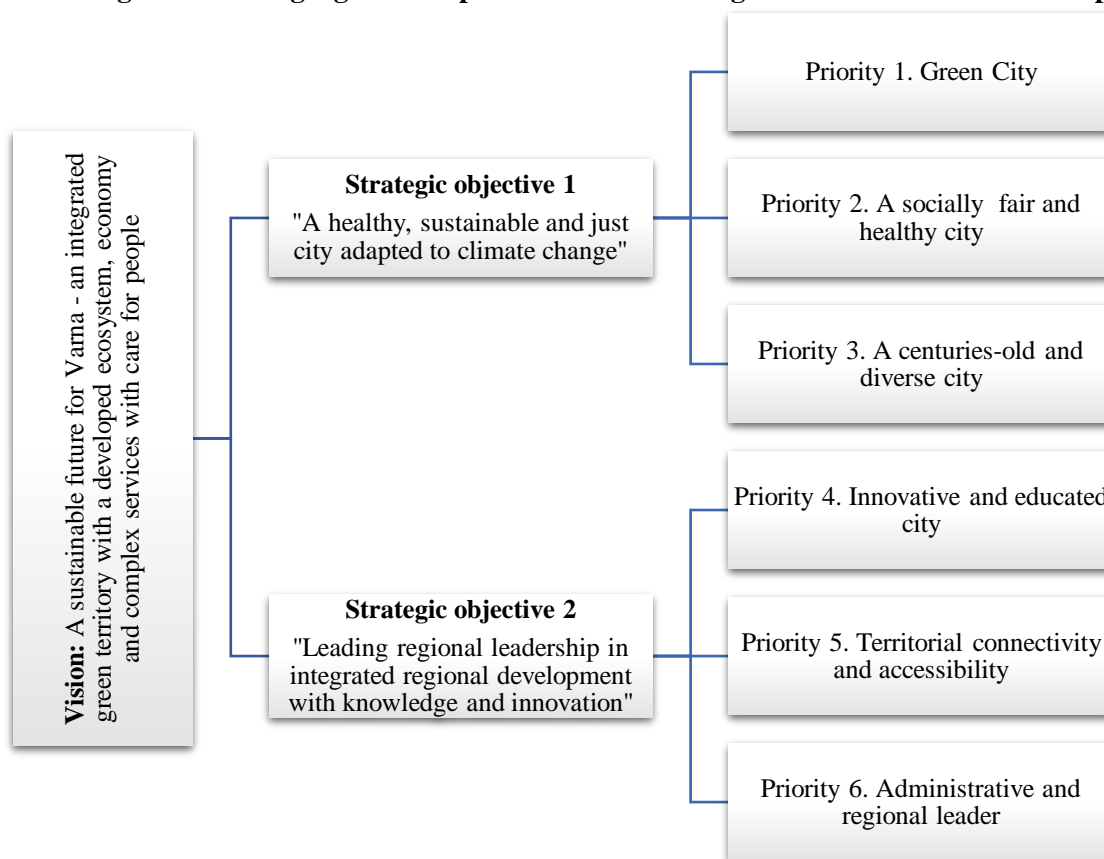
4. Results and discussions

4.1. Desk research

In order to trace the Municipality's policy regarding the commitments made as part of the Master Plan, a content analysis of three main strategic documents is carried out: 1) Integrated Development Plan of the Municipality of Varna 2021 – 2027. (IDPM); 2) Strategy for the implementation of the IDPM 3) Program for the implementation of the IDPM of Varna for the period 2021-2027.

In the The Integrated Development Plan of Varna Municipality the vision for development and sustainable future of the city is set as "an integrated green territory with a developed ecosystem, economy and complex services with care for people" (<https://www.varna.bg/bg/2140> last accessed 2024/06/29). In order to achieve and sustain this vision, the IDPM identifies a limited number of key priorities that clearly indicate the chosen direction and specificity of development, as well as the focus of the main part of the investments (see Fig. 1). The objectives and priorities of the IDPM are determined in accordance with the objectives and priorities of the strategic documents at international, European, national and regional levels, and are linked to the achievement of results for the territory of the municipality in the specified period.

Figure 1: Strategic goals and priorities for achieving the Vision of Varna Municipality



Source: IDPM (<https://www.varna.bg/bg/2140> last accessed 2024/05/16)

According to the information from the figure, in order to achieve the desired vision for Varna, two main strategic goals are identified, and three priorities are outlined to achieve the first one. First among the priorities is precisely the construction of Varna as a "Green City". In the published Strategy for the implementation of the Integrated Development Plan of the Municipality of Varna 2021 – 2027 a number of measures are set aimed at achieving this priority: "Priority 1 is aimed at utilizing and rethinking the relationship of the Municipality of Varna with nature and open to the sea, managed to integrate natural resources - sea, lake, mineral waters and green areas into the local economy and everyday life of citizens. A city with fresh air, clean water and an urban environment that predisposes one to spend time outdoors and among other people. A continuous network of quality public spaces, wide sidewalks and protected bike lanes." (Strategy for the implementation of the IDPM, 2021, <https://www.varna.bg/bg/2140> last accessed 2024/05/20). The measures and projects that are set for the implementation of the desired results are presented in the following table:

Table 1: Priority 1 "Green City" – measures and groups of projects to achieve results

Measure	Groups of projects
Measure 1.1. Conservation of natural resources	1.1.1.: Reduction of drinking water losses and improvement of its quality through construction /reconstruction/ rehabilitation of water supply infrastructure; 1.1.2.: Preservation of water quality through construction/reconstruction of sewerage systems and construction of Wastewater Treatment Plants (WWTP); 1.1.3.: Efficient use of mineral waters in the municipality of Varna; 1.1.4.: Improving waste management;

	1.1.5.: Fortification and protective measures and facilities.
Measure 1.2. Climate change mitigation	1.2.1.: Improvement of ambient air and decarbonization of the urban environment; 1.2.2.: Expansion and completion of park spaces - part of the green system; 1.2.3.: Group of projects for energy efficiency of municipal buildings /administrative, educational, health, cultural, sports, etc./; 1.2.4.: Execution of construction and installation works for municipal buildings /administrative, educational, health, sports, etc./; 1.2.5.: Energy efficiency of residential buildings (single-family and multi-family); 1.2.6.: Energy efficiency of buildings (public property, managed by administrative structures other than the municipality).
Measure 1.3. Adaptation to climate change	1.3.1.: Conservation of biodiversity and existing ecosystems.
Measure 1.4. Circular and low-carbon economy	1.4.1.: Raising awareness of the circular and low-carbon economy; 1.4.2.: Building technical infrastructure for the circular economy; 1.4.3.: Clean energy transition of the local economy.

Source: Strategy for the implementation of the IDPM for the city of Varna (<https://www.varna.bg/bg/2140> last accessed 2024/05/20)

Based on the information presented in the table, it can be summarized that according to the adopted strategy, when achieving strategic objective number one, projects related to water resources management, carbon reduction, the construction of green spaces and recycling and waste management. A comparative analysis with the theoretical positions on the concept of "Green City" made it clear that the Municipality of Varna is taking serious actions to achieve the vision of an "integrated green territory". In the information presented in the table, certain measures and projects cannot be found solely with regard to the use of sustainable transport and the marketing of ecological food products. Upon further reading of the content of the strategy in point 4.5, one can find detailed measures for adaptation to climate change (Measure 1.3. from Table 1), and the development of sustainable transport on the territory of the municipality is also part of these measures. (Strategy for the implementation of the IDPM 2021-2027).

In the end, after reviewing the overall content of the strategy for the implementation of the IDPM, the main measures and actions that the Municipality of Varna intends to implement by 2027 can be determined, the latter being grouped according to the key areas outlined in the "Green city" concept.

Table 2: Measures and activities of the Municipality of Varna according to the outlined key areas in the concept of "Green City"

Key area in the Green City concept	Measures and activities of the Municipality of Varna
1. Managing water resources	<ol style="list-style-type: none"> 1. Reducing the loss of drinking water and improving its quality by building of water supply infrastructure; 2. Conservation of water quality through construction/reconstruction of sewerage systems and construction of wastewater treatment plants 3. Provision of backup drinking and domestic water supply with mineral water to public and multi-family residential buildings 4. Control over the use of water resources, including for energy purposes; 5. Provision of backup drinking and domestic water supply with mineral water to public and multi-family residential buildings;

<p>2. Reducing carbon emissions and improving the energy efficiency</p>	<ol style="list-style-type: none"> 1. Improvement of ambient air and decarbonization of the urban environment; 2. Promoting the construction and commissioning of plants and enterprises for the production of electricity from renewable sources and biofuels; 3. Encouraging the installation of local installations in public private buildings for the production of electricity (solar panels) and heating of water for domestic hot water supply (solar collectors) from a renewable energy source "sun", biomass, etc.; 4. Control of greenhouse gas emissions through the introduction of a municipal software system for monitoring and reporting real-time data on the state of the ambient air, connected to the National Automated System for Environmental Monitoring; 5. Reducing greenhouse gas emissions by introducing energy-saving household appliances replacing old and inefficient heating devices in households; 6. Establishment of low emission zones on the territory of Varna Municipality through the construction of municipal systems for video surveillance, management, control and regulation of greenhouse gas emissions from transport and domestic heating; 7. Improving the management of ecosystems on the territory of Varna Municipality and creating an information system with a database for reporting the state of environmental components and factors. 8. Checking the energy efficiency of heating installations with hot water boilers and air conditioning systems in buildings; 9. Introduction of energy management and energy efficiency management systems, including systems for control and monitoring of energy consumption from municipal and state-owned buildings; 10. Carrying out gasification in municipal sites; 11. Conducting energy efficiency audits and certification of municipal and residential buildings on the territory of the municipality; 12. Introduction of a package of energy efficiency measures in residential buildings on the territory of the municipality, as a priority for multi-family residential buildings; 13. Design and installation of renewable energy systems in municipal, state and residential buildings - solar installations, photovoltaic installations, heat pumps, biomass, geothermal water, etc; 14. Efficient use of geothermal sources to provide heating and cooling of public buildings; 15. Efficient and environmentally friendly use of biomass in order to utilize its energy potential; 16. Rational use of woody biomass by building partnerships with other municipalities. 17. Preparation and implementation of a project for repair, reconstruction and modernization of artificial street lighting in order to reduce energy consumption and increase energy efficiency;
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	<p>18. Administrative incentives for industry and business to use energy from renewable sources, e.g. tax preferences, specialized administrative services and other incentives;</p> <p>19. Building partnerships for the development and implementation of a system of services for consulting small and medium-sized enterprises for the introduction of packages of energy efficiency measures and recovery of energy from renewable sources, etc.</p>
3. Using sustainable transport	<p>1. Reconstruction and modernization of the existing transport infrastructure in the municipality in order to improve and reorganize the transport situation;</p> <p>2. Use of electric vehicles in public transport, including alternative fuels - biodiesel, bioethanol;</p> <p>3. Coordination of optimal routes and control for compliance with contracts with public transport companies;</p> <p>4. Optimization of the parking system, including optimization of the "blue zone";</p> <p>5. Construction of a system for bicycle routes connecting major urban areas, including the construction of bicycle lanes</p> <p>6. Installation of car charging stations</p> <p>7. Reduce the number of trips by private vehicles and limit greenhouse gas emissions.</p>
4. Building green spaces	<p>1. Expansion and completion of park spaces - part of the green system;</p> <p>2. Creation of recreation areas – construction of green belts, park spaces, recreational areas around water sources, etc.</p> <p>3. Protection and effective use of surface water through reconstruction and rehabilitation of the existing drainage system and construction of a new one along the routes of existing ravines in Varna;</p> <p>4. Rehabilitation of pedestrian alleys and sidewalks;</p> <p>5. Application of fortification and protection measures and structures to protect green spaces.</p>
5. Marketing of ecological food products	No measures and activities are found in this area
6. Recycling and waste management	<p>1. Efficient waste treatment – separation and processing, investing in eco investments.</p> <p>2. Construction of:</p> <p>2.1. An integrated management system for municipal, including biodegradable waste at regional level, to achieve recycling targets and reduce the amount of landfilled waste;</p> <p>2.2. Centers for preparation for re-use and repair of oversized, voluminous and other types of waste;</p> <p>2.3. Sites for delivery of construction, large-sized, voluminous and other types of waste generated by households on the territory of Varna Municipality.</p> <p>3. Increasing the efficiency of resource use, reducing the impact of their use through measures to promote reuse, recycling and other waste recovery;</p> <p>4. Implementation of measures for the preservation of natural resources through the construction of an integrated management system for end-of-life tires generated on the territory of the</p>

	<p>Municipality of Varna, with the establishment of a site and an installation for recovery;</p> <p>5. Construction of automated systems for monitoring and prevention of pollution of ecosystems with waste in order to reduce the risk of climate change;</p> <p>6. Implementation of good practices related to sustainable consumption, circular economy and waste management;</p> <p>7. Construction of an information system from a database and SWOT analysis of the generated waste in the resort complexes located on the territory of Varna Municipality</p>
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Source: Adapted from the authors according to the Strategy for the implementation of the IDPM

Table 2 systematizes most of the measures envisaged to achieve Priority 1 "Green City" of the Integrated Development Plan. It is noteworthy that despite the large range of activities identified, the strategy lacks any information regarding the fifth key area of the green city – the realization of ecological food products. During an additional search for documents in the database of the Municipality of Varna in connection with this area, no separate documents found to regulate any activity in this direction. Here it can be mentioned that there is a program to support local organic producers at the national level, but apparently in the municipality of Varna this area has not yet been set as a priority. Summarizing the above in Table 2, it can be said that the largest number of measures is envisaged in the key area "Carbon emissions and energy efficiency" – 19, followed by the area "Waste management and recycling" – 9, "Development of sustainable transport" – 7, "Water resources management" and "Construction of green areas" with 5 measures each. Is the Municipality of Varna really putting the most effort into reducing emissions of harmful gases into the atmosphere and increasing energy efficiency, or are there still no specific actions planned for some of the measures identified? The answer to this question can be found by closely following the content of the Program for the implementation of the IDPM (<https://www.varna.bg/bg/2140> last accessed 2024/06/29), which describes all planned activities/project ideas for individual priorities and measures, with a brief description, an area for the implementation of an integrated approach, an indicative budget, a source of funding, a deadline for implementation and the unit in the municipality responsible for the implementation of the measure. In order to identify the area in which the Municipality of Varna plans to focus its efforts until 2027, a content analysis of the content of the program for the implementation of the IDPM by key roads corresponding to the main areas defined in the "Green city" concept is made. (see Table 3)

Table 3: Analysis of the Program for the Implementation of IDPM by keywords and areas

Key areas/words	Frequency	Related actions
1. Managing water resources	38	There are no planned actions for which there is no project readiness
water, water(s)	16	Collection and disposal of rainwater and surface water, wastewater management, efficient use of mineral water, improvement of drinking water quality, reduction of water losses, use of solar systems to provide hot water, etc.
plumbing, plumbing network, plumbing connections	13	Reconstruction and replacement of water pipes and water supply networks, construction of new water supply connections, especially in the villages adjacent to the municipality of Varna.
water supply and water supply systems	9	Renewal of obsolete or construction of new water supply facilities, use of geothermal water for water supply for heating and cooling, as well as for drinking and domestic needs

2. Reducing carbon emissions and improving the energy efficiency	161	There are 80 planned actions for which there is no project readiness
Emissions	11	Formation of zones with low emissions of harmful gases (no design readiness), reduction of the effect of gas emissions and damage from carbon dioxide and carbon footprint, regulation of harmful emissions from the port of Varna
Greenhouse	1	Replacement of inefficient heating devices in households
Energy efficiency	129	Audit and certification of municipal and residential buildings, ensuring energy efficiency of municipal buildings mainly for health and social services and the port of Varna.
renewable sources (RES)	20	Implementation of installations for the use of renewable energy sources in industrial buildings, Varna Zoo, municipal and residential buildings. Use of photovoltaic systems in municipal buildings. Implementation of solar panels and systems for providing hot water and street lighting. Supplying energy to ships at a pier.
3. Using sustainable transport	11	There are no planned actions for which there is no project readiness
Transport, incl.	8	Restriction of the movement of polluting vehicles. Reducing gas emissions by using hydrogen buses, electric buses and trolleybuses with autonomous battery drive. Development of bicycle sharing services and electric individual vehicles.
Eco-friendly transport	2	Construction of high-speed ecological transport (light metro)
Electric Vehicles	3	Wider use of electric vehicles and electric scooters for the needs of the municipality. Construction of charging stations (min. 10) and charging infrastructure for electric vehicles.
4. Building green spaces	13	There is 1 planned activity for which there is no project readiness.
green areas	9	Improvement of green areas and construction of new recreation areas. Improvement of the spaces between the blocks. Construction of a system for the use of the collected rainwater for watering the green areas.
"Green Fund"	1	Constant collection of targeted funds for the transformation of the urban environment into a greener one.
Green Belt	1	Creation of new practical spaces around water sources for recreation and equal access (there is no project readiness).
Green Register	2	Creation of an interactive system for monitoring the size and condition of green areas in the city of Varna, called "green register".
5. Marketing of ecological food products	0	There are no open activities related to this area. The keywords used refer to waste and tourism and medicinal products respectively
Food		
Products		

6. Recycling and waste management	36	There are 5 planned activities for which there is no project readiness
Waste, incl. Waste Management recyclable, recyclable	34 14	Reducing waste management costs as well as preventing the formation of new waste. Organization of all activities for collection, separation, treatment (recycling) and recovery of recycled waste, disposal or recovery of waste unsuitable for recycling. Cleaning of the waste channel of the Varna Wastewater Treatment Plant from construction and household waste. Replacement of equipment and waste collection system. Creation of a sustainable model for separate collection, treatment and recovery of recyclable waste (no project readiness). Construction of an automated system for monitoring, certification and processing of waste pollution. (no project readiness)
Wastewater	2	Wastewater management in the city of Varna.

Source: Compiled by the authors on the basis of the content of the Program for the implementation of the IDPM (<https://www.varna.bg/bg/2140> last accessed 2024/06/29)

Despite the fact that the Program for the Implementation of the IDPM contains detailed activities for the individual measures, a closer analysis of the content makes it noticeable that for some of these activities there are no projects to work on. This means that the municipality of Varna has set measures and activities that it is currently not ready to implement. Thus, the detected frequency repetitions in content analysis should be reduced by the specified number of activities that cannot be performed (see Table 3)

As a result of a comparative analysis of the information from Tables 2 and 3, it can be concluded that there are some differences between the measures and activities set out in the Strategy and the Program for the implementation of the IDPM. (see Table 4)

Table 4: Ranking of the priority districts of Varna Municipality according to the Strategy and the Program for the implementation of the IDPM

Key area	Place according to the Strategy	Place according to the Program
1. Managing water resources	4	2
2. Reducing carbon emissions and improving the energy efficiency	1	1
3. Using sustainable transport	3	5
4. Building green spaces	4	4
5. Marketing of ecological food products	-	-
6. Recycling and waste management	2	3

Source: Own calculation

It is clear from the table that the main priorities on which the Municipality of Varna is focusing its efforts at the moment are: **Reducing carbon emissions and improving the energy efficiency; Managing water resources; Recycling and waste management.** In the last place remains **Using sustainable transport.**

4.2. Empirical research

From the presentation so far, it becomes clear that a significant part of the measures that the Municipality of Varna implements are aimed at households living in the city of Varna and its adjacent territories. This fact is dictated by the fact that the consumption of resources by households is part of the total urban consumption, which, together with the administration and business, exerts significant pressure on the urban environment and its opportunities for protection and development. For this reason, this study focuses on the knowledge, attitudes and actions of Varna households for sustainable consumption, which is directly related to the achievement of Priority 1 "Green City".

Within the framework of the survey among households in the city of Varna, it can be drawn the following important conclusions related to the zones of the concept of a "green city".

Managing water resources

8 variables (Multiple Response Scale) related to household actions in the context of water resources management are analyzed. The majority of the observed actions are indicated by more than half of the households. Firstly, 80.1%, of respondents indicate that a washing machine that is not full of clothes is not allowed in their household, and secondly, 76.7% of households do not leave running water while dishes and utensils are washed with detergent. Other frequently cited actions are: not keeping the water running while brushing your teeth (73.9%); Do not run an incomplete dishwasher (65.4%) and not leaving the shower to work when soaping (56.1%). Only 16.4% of households have devices to reduce the consumption of tap water, and 36% - have devices with a self-regulator for the amount of water, according to the work performed.

Concerning attitudes to limit water use, two variables are used (Level of agreement is acceptable; Cronbach's Alpha – 0,794). For about 80% of households, it is important to reduce the amount of water used and 75% of households strive to reduce the amount of water used.

Reduction carbon emissions and energy efficiency

15 variables (Multiple Response Scale) are used to identify household actions, mainly focusing on household energy efficiency as a way to reduce carbon emissions. First of all, the observed variables aim at measuring the actions that households take to improve the energy efficiency of their homes. 96.8% of households use aluminium, PVC, or wooden joinery with glazing on the windows, 91.2% of households have energy-saving lighting, and 85.5% have additional external plaster or cladding on the building. Thermal insulation of the walls or floor is available in 77.6% of households. 81% use energy-saving appliances. Households using solar panels to heat water or generate electricity 9.7%.

Secondly, variables related to saving electricity are also observed. energy. 90.9% do not leave the lamps on when there is no one in the rooms, 88.4% do not leave the TV running when there is no one in the room, 87.8% do not leave the window open for a long time when the heating is running.

Two variables are used to identify attitudes to improve energy efficiency (Level of agreement is acceptable; Cronbach's Alpha – 0,784). For over 80% of households, it is important and they strive to reduce the amount of electricity used.

Using sustainable transport

Almost 38% of households in Varna have bicycles, 3.4% - electric cars and 6.7% - electric scooters. Concerning actions related to sustainable transport, 8 variables (Multiple Response Scale) also used here. Within the city, the majority of households (76.9%) strive to move on foot, and 64.4% also limit additional transport when buying household products. Approximately half of households (50.2%) avoid using a private car in the city center, 39.9% within the city, and 36.9% do not travel alone in a car.

Two variables are used for attitudes toward using sustainable transport (Level of agreement is good; Cronbach's Alpha – 0,868). For 54.4% of households, it is important to reduce the use of a private car for moving around the city and 47.8% of households seek to reduce the use of a private car for commuting.

Building green spaces

As a practice, 76.9% of the respondents indicate that they strive to move more often on foot, 64.4% - try to avoid the use of additional transport when shopping, and 50.2% avoid the use of a private

car when moving to the central parts of the settlement. These prerequisites based on which it can be concluded that for a significant part of the city's residents, the improvement of public spaces, in general, and the increase of green spaces, in particular, would improve the environment in which citizens spend a significant part of their time.

Marketing of ecological food products

The consumption of organic and certified food is indicated as a practice by 48.6% of households. Within the framework of the consumer survey, two scales related to ecological food products are considered – attitudes and values (5 points Likert Scale).

Attitudes measured using a scale of 5 variables (Level of agreement is good; Cronbach's Alpha – 0,897). In general, it can be said that households have neither a positive nor a negative attitude towards the consumption of ecological food products. For 41.6% the attitude is positive, for 16.0% it is negative, and for 42.3% of households it is neither positive nor negative. For 52.4% of households, the products consumed must be free of environmentally harmful ingredients and/or substances.

Values measured in a similar way using 5 variables (Level of agreement is excellent; Cronbach's Alpha – 0,924). The values regarding the consumption of ecological food products can be said to be rather positive. For 71% of households, the values positive, for 4.6% - negative, and for 24.4% they neither negative nor positive. For 80.4% of households, the products they purchase mustn't contain environmentally harmful ingredients and/or substances; for 68.2% - after their use, they can be disposed of in an environmentally friendly way; for 65.2% - to be produced using environmental technologies; for 63.1% - to be made of recyclable materials and for 63% - to have recyclable packaging.

Recycling and waste management

32 variables (Multiple Response Scale) are used to identify actions regarding recycling and waste management. Here some of the most important results on how households got rid of the following waste (The percentages may exceed 100%, as respondents could indicate more than one answer, a/n.):

- Old household appliances – 40.1% of households handed over for secondary raw materials; 28.9% use the services of companies to transport them from home, and 36.4% indicated that they had been disposed of in household waste containers;
- Bulky waste – 46.2% left next to the household waste container, 31% use the services of a transportation company;
- Batteries – 77.2% of households dispose of them together with other waste, and 52.1% say they prefer to use rechargeable batteries;
- Hazardous waste – 76.8% succeed in keeping them; with 25% - to dispose of them with other waste, and 13.5% to leave them next to the containers.

38.7% of the city's residents practice separate waste disposal, and 6.3% of them do not even have containers for separate waste collection around their homes, but they still practice it. 61.3% do not practice separate waste disposal, and half of them do not do so because there no containers for separate waste collection near their homes.

Four variables are used for recycling and waste management attitudes (Level of agreement is questionable; Cronbach's Alpha – 0,622). For 90% of households, it is important and they strive to use the purchased appliances as long as possible. For about 50% of households, it is important and they strive to dispose of waste separately.

According to the information gathered from the empirical research, it can be concluded that for households the most important is saving electricity and energy efficiency, then saving water resources. In third place is the willingness of citizens to walk or cycle, which is directly related to the availability and construction of green spaces. In fourth place is the action of households to use sustainable transport, with very few having alternative means of transport. In fifth place remains the marketing of environmentally friendly products, but the percentages close, which means that not a small proportion of households want to see results in this a. The last place is occupied by households' actions on waste separation.

Within the framework of the study what aspects of the concept of "green city" households have their actions and what the attitudes towards this, the question of what their knowledge is, is also interesting. The conducted study includes 9 variables (5 points Likert Scale), through which it can be derived an overall assessment of the knowledge of city residents regarding various aspects of the "green city" (Level of agreement is good; Cronbach's Alpha – 0,784). In general, it can be said about the totality that the level of knowledge is very high. For 91.8% of the respondents, it is high, for 7.2% it can be defined as medium, and with low levels of knowledge 1%.

5. Conclusions

Based on the entire presented work and the analyses made in it, the following main conclusions can be drawn:

The concept of "Green city" is more associated with the environmental sustainability of cities than with their social and economic sustainability. Achieving environmental sustainability is directly linked to the implementation of strategies to optimise water resource management, reduce carbon emissions, improve energy efficiency, promote the use of renewable energy sources, use sustainable transport, build green spaces, market eco-friendly food products, recycling and waste management.

Marketing efforts aimed at positioning cities as "Green cities" lead to an increase in the quality of life in settlements and to a reinforcement of positive environmental effects.

According to the information of the three main strategic documents Varna Municipality undertakes numerous actions to transform the city into a "Green city". However, there certain differences between the measures identified in the Integrated Plan's Implementation Strategy and the actual activities set out in its Program.

The main priorities on which the Municipality of Varna is focusing its efforts at the moment: Reducing carbon emissions and improving the energy efficiency; Managing water resources; Recycling and waste management. In the last place remains - Using sustainable transport.

Despite the fact that the Program for the Implementation of the Integrated Plan contains detailed activities for the individual priority measures, the Municipality of Varna is not ready to implement a large part of them.

For the Varna households the most important is saving electricity and energy efficiency, then saving water resources. In third place is the willingness of citizens to walk or cycle, which is directly related to the availability and construction of green spaces. The last place is occupied by households' actions on waste separation.

For some key as, there is a certain degree of coincidence between the activities of the municipality and the sustainable actions of households. There is a coincidence in the two key as – "Reducing carbon emissions and improving the energy efficiency" and "Managing water resources". (see Table 5). It is interesting whether household behaviour is driven by the desire to achieve sustainability or by the desire to reduce the cost of electricity and water consumed. This issue could be the subject of a further research.

Table 5: Comparison of municipal activities and the sustainable actions of households

Key area	Place according to Municipal activities	Place according to sustainable household actions
1. Managing water resources	2	2
2. Reducing carbon emissions and improving the energy efficiency	1	1
3. Using sustainable transport	5	4

4. Building green spaces	4	3
5. Marketing of ecological food products	-	5
6. Recycling and waste management	3	6

Source: Own calculation

Some problem as can be highlighted in the behaviour of households:

- ❖ Use of renewable energy sources - very few of the households surveyed use renewable energy sources. In order to have more clarity it is necessary to look for possible reasons for the reported situation.
- ❖ Use of sustainable transport - the results indicate that efforts needed to encourage a bigger share of households in Varna to use alternative means of transport or different forms of shared travel.
- ❖ Recycling and waste disposal - it is necessary to establish the reasons for the reported behaviour and to organize and carry out a wide information campaign about the benefits of the separate collection and disposal of waste among the population of the city of Varna, and in addition to offer incentives for performing real actions in this direction.

Some problem as can be highlighted in the actions of Varna Municipality:

- ❖ Marketing of ecological food products - almost half of respondents say that it is important to them to buy products, produced "in an environmentally friendly way" and that help reduce waste from their creation and consumption, unfortunately, the Municipality of Varna does not envisage any action in this direction in the near future.
- ❖ Better organization for separate waste disposal - from the responses of the surveyed households that do not dispose of their waste separately, it is clear that for half of them do not do so because there no containers for separate waste collection near their homes. It is important to note that the availability of sufficient such containers depends on the Municipality of Varna.

It is noteworthy that regardless of actions related to sustainable consumption, Varna households show a very high level of knowledge about sustainability. In addition, a large proportion of respondents have positive attitudes towards sustainable consumption. These facts signal that households can become a reliable partner of the Municipality of Varna to achieve the adopted vision and set priorities. It is necessary to establish the reasons for the discrepancy between knowledge, attitudes and actions of households and to take measures to eliminate it.

References

- Ahvenniemi, H. and Huovila, A. (2021) 'How do cities promote urban sustainability and smartness? An evaluation of the city strategies of six largest Finnish cities', *Environment, Development and Sustainability*, 23(3), pp. 4174–4200. doi:10.1007/s10668-020-00765-3
- Brillhante, O. and Klaas, J. (2018) 'Green city concept and a method to measure green city performance over time applied to fifty cities globally: Influence of GDP, population size and energy efficiency', *Sustainability (Switzerland)*, 10(6), doi: 10.3390/su10062031
- Crippa, J. et al. (2023) 'Urban branding and circular economy: a bibliometric analysis', *Environment, Development and Sustainability*, 25(3), pp. 2173–2200. doi: 10.1007/s10668-022-02173-1
- Dekay, M., O'Brien, M. (2001) 'GRAY CITY, GREEN CITY: New Thinking and New Settlement Patterns Can Bring About Urban Sustainability', *Forum for applied research and public policy.*, (June 2001). Available at: https://www.researchgate.net/publication/292939651_GRAY_CITY_GREEN_CITY_New_Thinking_and_New_Settlement_Patterns_Can_Bring_About_Urban_Sustainability
- Ferrer, G., Cortezia, S. and Neumann, J. M. (2012) 'Green City: Environmental and Social Responsibility in an Industrial Cluster', *Journal of Industrial Ecology*, 16(1), pp. 142–152. doi: 10.1111/j.1530-9290.2011.00442

- Hamman, P., Anquetin, V. and Monicolle, C. (2017) ‘Contemporary Meanings of the “Sustainable City”’: A Comparative Review of the French- and English-Language Literature’, *Sustainable Development*, 25(4), pp. 336–355. doi: 10.1002/sd.1660
- Hassan, A. M. and Lee, H. (2015) ‘The paradox of the sustainable city: definitions and examples’, *Environment, Development and Sustainability*, 17(6), pp. 1267–1285. doi: 10.1007/s10668-014-9604-z
- *Integrated Development Plan of the Municipality of Varna 2021 – 2027*, available at: <https://www.varna.bg/bg/2140> (2021) last accessed 2024/05/16
- Janik, A., Ryszek, A. and Szafraniec, M. (2020) ‘Smart and Sustainable Cities?’, *Smart and Sustainable Cities?*, (140). doi: 10.4324/9781003120247
- De Jong, M. et al. (2015) ‘Sustainable-smart-resilient-low carbon-eco-knowledge cities; Making sense of a multitude of concepts promoting sustainable urbanization’, *Journal of Cleaner Production. Elsevier Ltd*, 109, pp. 25–38. doi: 10.1016/j.jclepro.2015.02.004
- De Montis, A., Ledda, A. and Calia, G. (2022) ‘Integrating green infrastructures in spatial planning: a scrutiny of regional tools in Sardinia, Italy’, *European Planning Studies*, 30(2), pp. 251–268. doi: 10.1080/09654313.2021.1947987
- Moreira, A. C. et al. (2023) ‘Sustainable and Green City Brand. An Exploratory Review’, *Cuadernos de Gestion*, 23(1), pp. 23–35. doi: 10.5295/cdg.221715ac
- *Program for the implementation of the Integrated Development Plan of the Municipality of Varna 2021 – 2027*, available at: <https://www.varna.bg/bg/2140> (2021) last accessed 2024/06/29
- Rodrigues, M. and Franco, M. (2022) ‘Bibliometric review about eco-cities and urban sustainable development: trend topics’, *Environment, Development and Sustainability*, 24(12), pp. 13683–13704. doi: 10.1007/s10668-021-02006-7
- Silva, L. C. S. et al. (2024) ‘Understanding Smart Cities: A Systematic Review’, *Revista de Administração da UFMS*, 17(1), p. 7. doi: 10.5902/1983465973468
- *Strategy for the implementation of the Integrated Development Plan of the Municipality of Varna 2021 – 2027*, available at: <https://www.varna.bg/bg/2140> (2021) last accessed 2024/05/20
- Zen, I. S., Al-Amin, A. Q. and Doberstein, B. (2019) ‘Mainstreaming climate adaptation and mitigation policy: Towards multi-level climate governance in Melaka, Malaysia’, *Urban Climate*, 30(January). doi: 10.1016/j.uclim.2019.100501