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# Assessment of sustainable green campus in terms of students with disabilities and landscaping: Çanakkale Onsekiz Mart University, Çanakkale, Turkey

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**Abstract**
With 75 foundation and 129 state universities, by the academic year of 2018-2019, there were approximately 8 million (7,740,502) university students in Turkey in the associate's, bachelor's, master's and doctoral categories. Considering that 0.6% approximately of these students (47,751) are disabled students, it is important to plan university campuses in line with criteria for disabled students. This study analyzed the existing landscape facilities and equipment status of the campus of Çanakkale Onsekiz Mart University by focusing on disabled student perceptions. For this purpose, firstly, the landscape principles, elements and components of the campus area were assessed based on examination and observation supported by photography imagery. Additionally, the study included a survey carried out face to face with 40 disabled students. The perceptions of the students regarding campus planning and design were taken as a basis in the survey. The data obtained from the survey were subjected to a regression analysis in the SPSS 15.0 statistical software. With the analysis, by defining the satisfaction rates of the disabled students as the "dependent variable" and the survey criteria representing landscape equipment and facilities as the "independent variable," the statistical relationships between them were obtained. Field studies and statistical analysis results in the study confirm each other. According to the analysis, the satisfaction of students with disabilities according to campus parameters was found to be significant at $P < 0.05$ level. Consequently, it is aimed for the results of this study to make a contribution in the sustainable green campus planning and design of accessible universities aiming physical/environmental and socioeconomic sustainability centered around the disabled student.

**Keywords** Disabled student · Unimpeded university · Sustainable green campus · Student perception · Sustainable planning

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## 1 Introduction

Universities are the source of knowledge, information exchange, research and development in the national and international arena and have an important share in the development of cities, regions and even countries. In this sense, universities stand out not only with their student/academician structure but also with their physical structure. Farabi and Erasmus higher education exchange programs for diversity or mobility of international students / academicians carry the studies, cultural exchange and standardization to a global dimension. With this richness of functionality, universities have been an important institutional structure of all times. Universities should plan all their educational, scientific, socio-economic activities primarily in a student-oriented fashion, and they must also have a leading position in increasing quality of student life. In this sense, it should be noted that universities have become the primary focus of several studies on student–teaching–campus integration. Previously, Hoque Clarke & Sultana, (2017), Kalayci Onak et al. (2021), Swearingen White (2014), Abd Razak et al. (2011), Banga Chhokar (2010), Finlay and Massey (2012), Brinkhurst et al. (2011), Lo (2015), Levy and Marans (2012), Townsend and Barrett (2015), Too and Bajracharya (2015), Ryan et al. (2010) and Danielle et al. (2010) investigated university campuses within the scope of sustainable practices. Therefore, in these studies, variables such as environmental sustainability, green university, eco-campus, environmental education, research, development, socio-economic structure, governance, students and academic staff were handled in different aspects and the role of higher education institutions in preparing education and society for a sustainable future was mentioned. As mentioned above, when the widely conducted studies on university–student–teaching–campus mosaic were considered, it was seen that there were a limited number of studies focusing on general student perspectives or campus planning. There are also a limited number of studies carried out in a global scale on active and effective role of students, academicians, administrators and personnel in campus planning processes. However, it is extremely important and necessary that a campus planning where university students, staff, academics and administrators participate within the scope of their opinions and thoughts increases the quality of academic and social life, especially for the potential of students with disabilities. It was determined that structural and landscape potential of ÇOMÜ[1] campus, located in the Marmara Region of Turkey, was insufficient, incomplete and in need of maintenance and repair and such deficiencies in landscape design and planning were more remarkable in terms of disabled students. The aforementioned potential for disabled students necessitates the introduction of sustainable/green campus standards in a disabled student-oriented fashion (Alkan, 2020b). Although universities in their current nature show that socioeconomic freedom, creativity and cultural values had a highly significant place in student population, it is also known that students were exposed to stress and low welfare (Nicklin et al., 2019). The dissatisfaction created by these inconveniences, even in students without disabilities, makes its impact more severe on disabled students (Hoffman, 2015). University campuses are far from disability-oriented planning and design, and such a case narrows the perspectives of disabled students toward their current and future plans. However, a green campus planned according to the needs of disabled students means an increase in student welfare, quality of life, positive learning, success and expectation for the future (Kwon et al., 2019; Soysa & Wilcomb, 2013). A campus planning, in which perception and spirituality

[1] : In this paper, the abbreviation "COMU" will be used instead of "Çanakkale Onsekiz Mart University."

(providing subjective well-being/reinforcing self-confidence, triggering learning success, reducing stress, improving psychology) are prominent in disabled student potential, will exhibit the expected performance within the scope of socio-economic, demographic and modernity aspects (D'agostino et al. 2019). In addition, such a case will provide equal opportunity for students with and without disabilities. Therefore, opinions and thoughts of multiple participants in sustainable (green) campus planning along with coordinated strategy of the participants, determining adequacy/insufficiency of all structural and vegetative variables within the scope of landscape items or landscape principles and elements that can be included or modified in the planning cannot be denied. Based on all these aspects, this study deals with the student portfolio more specifically, assesses campus planning of ÇOMÜ to increase the academic and social life standards of disabled student potential and aims to develop suggestions for revealing and improving the quality at this point. Thus, study, in this sense, exhibits an extraordinary structure able to fill a great gap in the literature (Alkan, 2019). There is no comprehensive study directly targeting disabled students; thus, this study will be a unique study in this sense.

ÇOMÜ campus with a capacity of disabled students was selected as the material of the present study for the following reasons:

- The disabled student potential of ÇOMÜ is at a very low level according to the official data in the following chapter (disability indexed student structure in Turkish universities and ÇOMÜ),
- The absence of any empirical studies in Turkish universities on campus planning with a focus of perceptions of disabled students,
- There are very few similar or close studies in the international literature,
- To bring a different dimension to the literature by examining the campus planning among Turkish universities within the scope of landscape components and associating it with the quality of life of disables students and to serve as a model for national/international studies (Yu et al., 2019),
- Making a positive contribution to the academic and social quality of life of the disabled student potential of ÇOMÜ campus within the scope of change and development through taking into account the suggestions developed.

It is possible to generalize the stages followed in the process of revealing the current situation of ÇOMÜ campus planning in terms of adequacy, diversity and suitability of potential of structural components and plant materials of campus landscape and developing suggestions for improvement as follows:

Initially, structural components and plant composition of COMU campus were determined and evaluated by on-site investigations (Alkan, 2020c). In the other phase of the study, supported by photographic images, the landscape facilities and equipment that directly affect the quality of life in COMU campus were determined from the perspective of disabled students (Alkan & Kelkit, 2019). Face-to-face interviews were made with 40 disabled students to investigate satisfaction (Dependent Variable) rates for learning and life quality-oriented landscape plant and structural equipment (Independent Variables) (Republic of Turkey, Çanakkale Onsekiz Mart University, Department of Student Affairs, 2019). Demographic structure of the students was also emphasized in this study. Resultant data were subjected to regression analysis with the use of SPSS 15.0 statistical analysis software (Alkan, 2020a). Statistical analysis results between dependent and independent variables confirmed by field surveys made the study meaningful. In previous studies conducted by Yuan and Zuo (2013), Tiwari (2015), Disterheft et al. (2015), Hoque Clarke &

Sultana, (2017), Lazar and Chithra (2022), de Queiroz Machado et al. (2021), Disterheft et al. (2015) and Tiwari (2015), multi-dimensional sustainable development approaches such as defining university campuses in terms of physical structure and student combination, taking decisions for quality improvement and developing planning strategies for optimization, were developed in administrative staff, academics and student-oriented fashion. Within the scope of the disabled student potential and the landscape design and planning of COMU campus area, this study focused on ergonomic social life standards and subjective well-being and academic achievement. Present inferences not only make a permanent and positive contribution to a realistic and sustainable campus planning, but also be a guiding model for the other universities (Davey, 2017; Kwon et al., 2019). In addition, with this study, a significant progress will be achieved in reaching the goal of a sustainable green campus through planning a balanced distribution of physical and social conditions and suggestions and criteria will be developed to ensure equal opportunity (in terms of students with and without disabilities) (Alkan, 2020b). Besides, with the analysis results and comments, this study has a potential to be a resource for similar studies and sheds light on many specific studies to be conducted on solid waste management, sustainable campus, eco-campus, education and environment.

### 1.1 Disability-indexed student structure of Turkish Universities and ÇOMÜ

Numerical data regarding the general and disabled student potential of Turkish universities and ÇOMÜ are given below:

In Turkey, there are a total of 208 higher education institutions (state and foundation universities). Number of students studying in these institutions is 7,740,502, and 47,751 of them are disabled students (Republic of Turkey, Ministry of National Education, Presidentship of Strategy Development, 2020). Of this student potential (8155 in total), 2705 students have physical disabilities, 2316 students have chronic health disabilities, 2301 students are visually impaired, and 1103 students are hearing impaired. Such a case reveals that about 40,000 disabled students with different disabilities are unregistered (Republic of Turkey, Ministry of National Education, Presidentship of Strategy Development, 2019). About 06% of total number of students in Turkey is composed of disabled students; thus, today's university campuses should be so planned as to consider the perceptions of disabled students (Grand National Assembly of Turkey, Commission Minutes, 2019). While the total number of students at ÇOMÜ is 40,484, the number of registered disabled students is 42. Therefore, 01.04% (42/40.484) of the total number of students studying at ÇOMÜ are disabled students (COMU, 2020a). Considering the total number of students (7,740,502) and the number of disabled students (47,751) in Turkey, it is necessary to mention about 250 disabled students within the body of ÇOMÜ (40,484*47,751/7,740,502) with a total number of 40,484 students; but according to the records, only 42 disabled students registered (COMU 2020c); thus, about (250–42) 208 students with disabilities receive informal education.

## 2 Previous studies

Although a limited number of national and international studies focused on disabled students and campus landscapes, comprehensive literature reviews were conducted and closely related or similar studies with the present research topic and methodology were provided below in a chronological order.

Ryan et al. (2010) evaluated education and political approaches in higher education institutions located in the Asia-Pacific geography within the scope of sustainable development. Systemic change and development of integration in the fields of education were revealed in global dimension, and positive contributions of political approaches and multiple stakeholders were emphasized. The study draws attention with its complementary element for the comparative approaches in the unique structure and theme of innovative initiatives in the Asia-Pacific.

Brinkhurst et al. (2011) examined the role of organizational dynamics in their study of campus planning within the scope of environmental sustainability. Researchers focused on the options of university staff and academic staff to be deficient or insufficient in the role of planning. Sample leading literatures were reviewed and concepts developed on business and leadership were examined. It was mentioned that greater emphasis should be given for developing the potential and efforts of university staff and faculty members in this role. A case was presented to address the leadership emphasis for staff and university faculty members, and the potential of several approaches to overcome obstacles in sustainable campus planning was mentioned.

Abd Razak et al. (2011) emphasized that physical development planning was a powerful tool for campuses to offer an ideal living environment. In this sense, role of physical development planning and efficiency in development and sustainability of 4 university campuses in Malaysia [National University of Malaysia (UKM), University Sains Malaysia (USM), University of Malaya (UM) and University Putra Malaysia (UPM)] was investigated. In this process, survey (questionnaire), behavioral observation and visuals were used as research methods. A questionnaire was applied to a total of 400 participants, 100 from each university. Statistical analyses were applied to survey results, and the results were cross-referenced with the other techniques (behavioral observation and visual study) to compare 4 universities. Selected universities had similar problems. USM with a compact campus had the least problems in terms of scope and severity of the existing problems. It was concluded that USM was able to create a sustainable life model within the campus.

Yuan and Zuo (2013) conducted a study to measure the awareness of sustainable development in higher education with the questionnaire applied to 1134 students of Shandong University and showed that majority of the students participated in the survey were conscious about the research topic. Among the awareness, criteria such as environment, security and access to disabled were mentioned at the top and attention was drawn to the social dimension of sustainability. Opportunism in learning objectives and leadership in sustainable research were critically evaluated. On the other hand, variables such as sustainable curriculum, faculty, personnel development and awards were at the bottom of awareness.

Swearingen White (2014) conducted a study at 27 universities of the USA to define the use of integrated campus sustainable plans analyzed the university campuses with the use of content analysis techniques and proposed a framework programs through a comprehensive literature review. It was determined that environmental aspects were the most prominent and social equality aspects were the least prominent in campus planning. It was mentioned that campus practices were more integrated in terms of administrative and academic

aspects and attention was drawn to the originality, content and inclusiveness of sustainable plans and to assess them in this direction. It was emphasized that campus sustainability plans were a more integrative tool with their widespread adoption and implementation. Therefore, the study revealed its originality by addressing the academic and administrative functions of integrative practices in higher education through sustainable plans.

Disterheft et al. (2015) investigated the effects of participatory approaches on sustainability of higher education. Researchers inspired from Delphi method and data were obtained by taking into account the expert opinions structured in the integration of design, methodology and qualitative strategy. The data were determined according to qualitative content analysis and systematized according to theoretical strips. It was pointed out that social and organizational learning could better be evaluated in the participatory process.

Tiwari (2015) conducted a study in Curtin University to investigate the worries of individuals in access of subway stations. Findings of a pilot study carried out in this context were included, and the concept of improved walkability was mentioned to increase public transportation safety. Therefore, positive effects of physical–environmental features on accessibility and safety criteria were emphasized.

Too and Bajracharya (2015) studied the key factors needed to integrate the university population into campus sustainability with its multi-participant aspect. It was emphasized that although awareness in efforts to improve sustainability was often revealed in many studies, it was not always possible to see the effects of these in practice. It was mentioned that there were multiple positive reasons for university population to take charge at this point. Therefore, besides a comprehensive literature review, two case studies were presented to emphasize the importance of the rationale for multiple participation. Within the scope of the findings, it was pointed out that the 6-P framework (covering the factors such as psychological needs, physical equipment, individual motivations, public perception, price mechanisms and policies) proposed for broad participation in the sustainable design and planning of two universities was applicable. Although the disciplines included in the framework were handled separately in most of the previous studies, the evaluation of them together within the framework of 6-P makes that study unique. In addition, it offered a potential for future studies to support and reinforce the accuracy of the framework in question.

Townsend and Barrett (2015) indicated campus landscaping as the first step toward the sustainability of universities. Therefore, it was stated that the environmental performance of universities was related to measuring and reporting campus landscaping. It was emphasized that this report would be an important resource for guiding sustainable campus practices. It is necessary to conduct input–output analysis to reach the "Carbon Footprint" data that should be included in the report; therefore, it was pointed out that widely used analysis will also cover the emission volumes to a large extent. Since the data obtained can be used in comparison of institutions, it was emphasized that standardized carbon footprints will increase the reliability of the comparisons; thus, necessity of establishing a framework in which universal and organizational limits were recognized for methodological consistency was pointed out. Within the scope of the data obtained by the interview method, it was mentioned that carbon footprint supplies could be determined according to the perception of the university purchasing personnel and that such a determination was not made before. The study also showed that institutions' carbon footprint results had significant practical value in increasing the sustainability of these supplies and stakeholder engagement in sustainability.

Sustainable future can be associated with the environmental sustainability of universities with its social dimension. Hoque Clarke & Sultana (2017) investigated university

campuses in Bangladesh within the scope of environmentally sustainable practices. Environmental sustainability principles followed by Canadian universities were also evaluated, and positive effects of environmental education, research, development and governance practices on environmental management were emphasized. Role of higher education institutions in preparing the sustainability of education and society for the future was stated. In this study, in which Bangladeshi universities were investigated, in the first stage, knowledge indicators were included in the context of deficiencies or inadequacies in planning of orientation or training programs. Secondly, determinations on governance, welfare and economy indicators were included in the study. In this sense, it was pointed out that many universities in Chittagong were lack of campus environmental management policies. Finally, it was determined that the prominent universities in the study did not have LEED certification within the scope of materials and energy indicators. It was also determined that there were no political approaches for solid waste recovery, recycling and reduction. It was concluded that these universities were also deprived of renewable energy systems. In addition, the weakness of taking precautions against exposure to greenhouse gas emissions such as transportation, generators, air conditioners and refrigerators was also mentioned for these universities.

Kalayci Onak et al. (2021) examined university campuses, which were the materials for many research within the scope of socio-economic and environmental determinants, in particular, İzmir Katip Çelebi University Çiğli Campus. University campus was handled with a small city model approach, pedestrian and bicycle road system in a combination of sustainability, and ecological criteria were investigated and suggestions were developed for an ecological and sustainable transportation system in this context.

de Queiroz Machado et al. (2021) conducted a study in a higher education institution of Brazil to investigate organizational sustainability and innovation management comparatively. Qualitative findings determined through interviews, observations and analyses made a positive contribution to the sustainable activities of higher education institutions with the curriculum and stakeholders. The study emphasized the importance of research as well as the technological aspects of higher education institutions.

Lazar and Chithra (2022) emphasized the importance of environmental, social, cultural and economic parameters in sustainable development and the built environment. In this context, inadequacy of the literatures was mentioned. A general cultural vision has been revealed through a comprehensive literature review on UN reports, development models and green building classification systems. The benefits of cultural indicators in the sustainable built environment were determined by multiple literature review. Cultural approaches not only contribute to the efficient use of energy resources in building integration, but also offer various benefits such as job opportunities for users and sustainable economic behavior changes. It was emphasized that cultural approach developed region-based designs and importance and positive effect of the cultural dimension was indispensable in sustainable development.

The Table 1 in which majority of previous studies were summarized virtually and compared with the present study was provided below. The Table 1 is expected to allow easier comparison with the previous literature and clearly put forth contributions of the present study to the current literature.

**Table 1** Comparison of the present study with previous literature in terms of scope, method and findings

| Literature | Scope | Method | Findings |
|---|---|---|---|
| Brinkhurst et al. (2011) | Within the scope of environmental sustainability, campus planning was examined in terms of organizational dynamics | As a guide, sample literatures were scanned and concepts developed on business and leadership were examined | Within the scope of campus sustainability, leadership of the staff and university faculty members were emphasized |
| Abd Razak et al. (2011), | It was emphasized that physical development planning was a powerful tool for campuses to offer an ideal living environment. In this sense, physical development planning and effectiveness in the change and development of 4 university campuses in Malaysia to make progress in sustainability were investigated | In this process, questionnaires, behavioral observations and visuals were used as research methods. Statistical analysis was applied to the survey results and the results were cross-referenced with the other techniques (behavioral observation and visual study) and compared and evaluated within the scope of 4 universities | It was determined that the selected universities had similar problems. USM with a compact campus, had the least problems in terms of scope and severity according to the individual approach in physical development planning |
| Yuan and Zuo (2013), | It is a study that measures awareness on sustainable development in higher education | The data were obtained through a survey conducted within the scope of 1134 samples consisting of Shandong University students | Among the awareness, criteria such as environment, security and access to the disabled were mentioned at the top and attention was drawn to the social dimension of sustainability. Opportunism in learning objectives and leadership in sustainable research were critically evaluated |
| Disterheft et al. (2015), | Effects of participatory approaches in higher education on sustainability was investigated | Data were obtained by taking into account the expert opinions structured in the integration of design, methodology and qualitative strategy, inspired by the Delphi method | It was pointed out that social and organizational learning could better be evaluated in the participatory process |

**Table 1** (continued)

| Literature | Scope | Method | Findings |
|---|---|---|---|
| Townsend and Barrett (2015), | The research focused on the priority and importance of planting in sustainable campuses | It was pointed out that environmental performance was directly related to campus greening; therefore, "Carbon footprint" data should be accessed (by making input-output analysis) and reported through interviews with university personnel | Since the reports can be evaluated in the comparison of institutions, it was put forth that standardizing the carbon footprints will increase the reliability of the comparisons, and therefore, it is necessary to establish a framework in which universal and organizational limits are recognized for methodological consistency |
| Too and Bajracharya (2015), | The main factors needed to integrate the university population into campus sustainability with its multi-participant aspect were studied | Two case studies were presented to emphasize the importance of the reasons put forward for multiple participation, as well as a large-scale literature review | Within the scope of the findings, it was pointed out that the proposed 6-P framework (which covers factors such as psychological needs, physical equipment, individual motivations, public perception, price mechanisms and policies) for broad participation in the sustainable design and planning of two universities was applicable |
| Hok et al.'ın (2017) | The campuses of universities in Bangladesh were researched within the scope of environmentally sustainable practices | Campus environmental management policies, governance, welfare and economy indicators were examined. Renewable energy indicators were evaluated | It was concluded that many universities in Chittagong lack campus environmental management policy |
| de Queiroz Machado et al.'ın (2021), | In the study carried out in a higher education institution in Brazil, organizational sustainability and innovation management were investigated comparatively | Qualitative findings determined according to interviews, observations and analysis in the study contributed positively to curriculum and sustainable activities of higher education institutions with stakeholders | The study emphasizes the importance of research as well as the technological aspects of higher education institutions |

**Table 1** (continued)

| Literature | Scope | Method | Findings |
|---|---|---|---|
| Lazar and Chithra (2022), | Sustainable development and the importance of environmental, social, cultural and economic parameters in the built environment were studied | The general cultural vision was put forth by examining the United Nations-sourced reports and literature related to development models and green building classification systems. The benefits of cultural indicators in the sustainable built environment were determined by multiple literature review | It was emphasized that cultural approach developed region-based design plannings and importance and positive effect of the cultural dimension was indispensable in sustainable development |
| (This study)<br>Assessment of sustainable green campus in terms of students with disability and landscaping: Çanakkale Onsekiz Mart University, Çanakkale-Türkiye | Sustainable green campus landscape was evaluated within the scope of plant and structural elements, with fieldwork (based on observation, examination and determination) and with the perception of disabled students | The plant and structural dimension of the campus was investigated through a questionnaire based on the perception of disabled student. Statistical analysis was applied to the survey data. In addition, the plant and structural elements of the campus were investigated based on observations, examinations and determinations | Disabled student satisfaction was evaluated in line with the perceptions of disabled students regarding green campus equipment. Statistical analysis revealed significant relationships between the satisfaction and perceptions of disabled students. It was concluded that the campus should be supported within the scope of the plant potential and structural reinforcements necessary for the sustainable green campus, depending on the perception of disabled students and field work |

## 3 Material and methods

Terziolu campus of Çanakkale Onsekiz Mart University, which draws attention with the inadequacies and deficiencies in open and green space planning in the disabled student index, was selected as the material of the present study. The campus is surrounded by Gendarmerie Memorial Forest and Radar Hill in the east and the Dardanelles and urban settlement area in the Northwest and North (Fig. 1/2,3). The study area was established on 3 ha land area and located at the intersection of 40° 6′39.58″ North Latitude and 26°24′59.75″ East Longitude (COMU, 2020b). Geographical location map was obtained with the use of ArcGis 10.3 software (Fig. 1/1). High altitude and the Dardanelles scenery in the northwest with a high visual impact make COMU attractive for students, province, region and country (Fig. 1/3).

COMU has a high level of education opportunity with education/training, teaching staff, student potential and educational materials. In this sense, the university has a large and versatile research potential. The university has made significant progress in regional

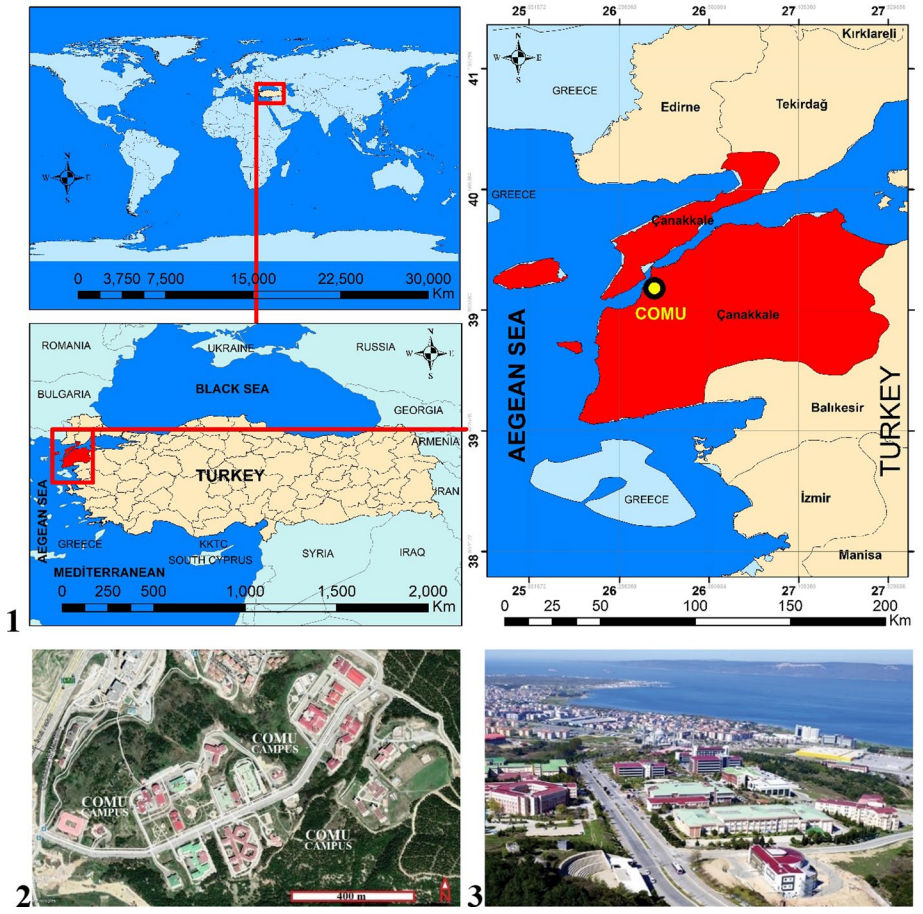



**Fig. 1** Çanakkale Onsekiz Mart University geographical location (1), Google Earth appearance (2) (adapted from Google Earth, 2020) and aerial appearance (3) (COMU, 2020b)

and national recognition by making important progress in many scientific research such as R&D (Research and Development), EU (European Union), Marmara Development Agency and BAP (Scientific Research Project). The works done within the integration of management, students, academics, internal and external stakeholder are very important for YÖKAK (Higher Education Quality Board) Quality Assurance and Institutional Accreditation of COMU. The university was placed within the first 16 higher education institutions of Turkey conditionally accredited for two years by Higher Education Quality Board (COMU, 2021).

Despite all this positive potential mentioned for COMU, inadequacy, lack and negligence of structural and landscape items were evaluated in terms of disabled students and suggestions were developed for optimization of campus utilization. The steps followed in this process are given below.

First of all, landscape structural components of the campus area were examined based on observations and assessed in terms of adequacy, necessity, suitability, quality and maintenance-repair criteria. Structural components determined in disabled student-oriented fashion included: inner campus accessibility, ring services, security, water supply (fountain, lavabo, wc), wheelchair, ramp equipment, stairways-handrail-guardrail combination, disabled elevator, stair elevator, chair lift, cable car, light rail, disabled parking, bus stop, pedestrian crossings, Arkad (covered walking path with columns on both sides), Hıyaban (a road with trees on both sides), green areas, sports fields, multipurpose activity areas (exercise park, game, music, entertainment areas) and all these items were assessed in terms of maintenance-repair, aesthetics functionality and plant potential and quality and supported by photographic images.

Existing plant materials, which stand out in the landscape dimension of the campus, were examined and evaluated within the scope of species, adequacy, maintenance-repair. Based on the evaluation, within the scope of sustainable campus planning it was deemed necessary to add plant species suitable for the region ecology, aesthetically and functionally suitable for rational use to the herbal landscape potential of the campus for optimization of the campus area.

Photographs taken from the existing structural and plant components that will serve as an example in the campus area were used to support the study and make it clearer and more understandable.

In the second stage, landscape facilities and equipment that directly affect the quality of life in the COMU campus were evaluated from the perspective of disabled students. Initially, in the light of investigated parameters, face-to-face questionnaires were applied to 40 disabled students to identify satisfaction-oriented student perceptions designating student life quality. It was predicted that resultant data will play an important role in construction of campus planning that meets the expectations within the scope of structural and landscape items and the perceptions of disabled students.

Demographic structure of the students was also emphasized. Statistical analyses were conducted with the use of SPSS 15.0 software. A model was generated with linear regression analysis. In this model, listed parameters in the first stage were included as "independent variables" and satisfaction was included as the "dependent variable." Statistical relationships between the dependent variable and the independent variables were

determined; significant relations and significance levels between them were determined. The level of perception at the student level of the parameters affecting the satisfaction rate was determined with a 1- scale indicating importance level of the parameters. In this Likert-type scale, 1: very important; 2: important; 3: slightly important; 4: unimportant; 5: very unimportant), (Likert, 1932–1933). Disabled student satisfaction rates were also determined depending on the scale in question. Statistical analysis results between dependent and independent variables confirmed by field surveys made the study meaningful. In fact, P (significance level) value ($P < 0.05$) of less than 0.05 and adjusted R2 value of 0.759 indicated that independent variables had a positive effect of approximately 76% on dependent variable (satisfaction rate). Also, Durbin Watson (2.187) value of around 2 and VIF value (< 3) of less than 3 made the regression important for the study. Finally, suggestions were developed for the rational use of the open and green spaces of the COMU campus with a focus on disabled students.

To create a general perception regarding the physical planning of the COMU campus as a study area, the following information should be given:

Figure 2 gives a perspective appearance of the settlement plan of the COMU campus with combinations of physical structures, dormitories, academic units, open and green spaces. The distribution of units according to numbers given in Fig. 2 is as follows:

1. Entrance, 2. Çanakkale Technical and Social Sciences Vocational School, Faculty of Theology, 3. Faculty of Medicine, 4. COMU creche, 5. Physical Education and Sports Vocational School and Enclosed Sports Hall, 6. Yamaç café, 7. Rectorship-Departments, 8. Library, 9. Student Social Activity Center, 10. Institute of Science, Institute of Social Sciences, 11. Faculty of Marine Science and Technology, 12. Faculty of Agriculture, 13. ATMs, 14. Faculty of Science and Literature, 15. Troia Cultural Center, 16. Open amphitheater, 17. Faculty of Engineering, 18. Foreign Language Vocational School, Institute of Health Science, Health Vocational School, 19. Faculty of Fine Arts, 20. Student dormitories, and 21. Medical center (COMU, 2020b).

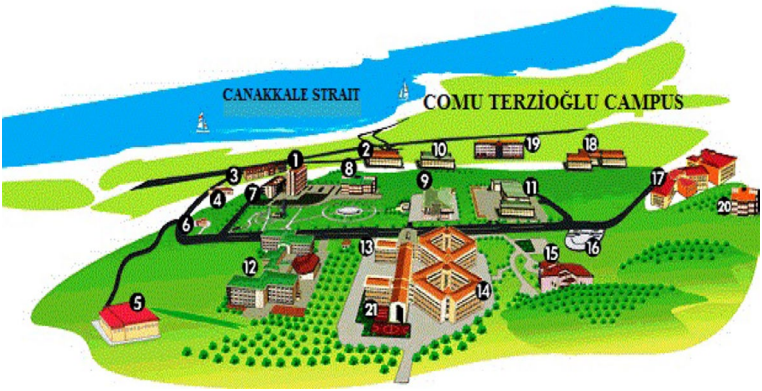



**Fig. 2** Canakkale Onsekiz Mart University (COMU), Terzioğlu Campus, settlement plan perspective view (COMU, 2020b)

## 4 Results

In the study analyzing the COMU campus based on disabled students, landscape facilities and equipment were found to be very insufficient as clarified by fieldtrips, investigation and identifications in the study area. Within this scope, firstly the plant formation in the area was researched.

When the cultural and natural structure within the diversity of plant material was assessed, the species emerging in the present planting structure on the campus are given in Table 2.

In the study, increasing rational planning based on esthetics and functionality of cultivated plants within the campus plant design was emphasized to affect quality of life of disabled students and hence increase the positive contribution to their learning. The plant genus and species list emerging in the plant design model combined with rational planning for COMU are given in Table 3.

Additionally, within the scope of structural equipment included in the campus landscaping, model studies supported by structural elements and designs like ramps, stairs (appropriate slope and step numbers), balustrade/railings, handrails/parapet (upper section of railing for grip), gazebo, arcades (covered paths), portico/porch (covered structural elements attached to buildings protecting against sun and rain), disabled elevators, chair lifts/cable car, light rail system, free public transport/ring services (campus and in town) and exercise parks were completed. Within this scope, the following identifications were made.

Considering the horizontal distance (nearly 1600 m) and elevation/vertical distance (nearly 200 m) from the entry point to COMU campus to the Higher Education Credit and Hostels Institution (KYK) dormitory at the highest elevation, the percentage slope within the campus was identified as nearly 12% (calculated from Google Earth (2020)). When planning ramp equipment for disabled students, it is necessary that maximum slope be 8% (AU, 2020). This makes it unavoidable to assess slope elevators, chair lifts, cable cars and elevator alternatives in combination with stairs for accessibility within the campus.

**Table 2** Outside plant species on COMU campus

| Number | Current plants | Number | Current plants | Number | Current plants |
|---|---|---|---|---|---|
| 1 | *Abelia floribunda* | 16 | *Cupressus arizonica* | 31 | *Liriodendron tulipifera* |
| 2 | *Acer platanoiodes* | 17 | *Cupressus sempervirens* | 32 | *Lonicera japonica* |
| 3 | *Aesculus hippocastanum* | 18 | *Cyperus alternifolius* | 33 | *Malus sylvestris* |
| 4 | *Agave americana* | 19 | *Eleagnus angustifolia* | 34 | *Medicago arborea* |
| 5 | *Albizzia julibrissin* | 20 | *Euonymus spp* | 35 | *Morus alba* |
| 6 | *Arbutus andrachne* | 21 | *Ficus carica* | 36 | *Myrtus communis* |
| 7 | *Arbutus unedo* | 22 | *Fraxinus excelsior* | 37 | *Picea abies* |
| 8 | *Betula pendula* | 23 | *Ginkgo biloba* | 38 | *Platanus orientalis* |
| 9 | *Buddleia davidii* | 24 | *Hedera spp.* | 39 | *Populus alba* |
| 10 | *Buxus sempervirens* | 25 | *Hibiscus syriacus* | 40 | *Pyracantha coccinea* |
| 11 | *Callistemon citrinus* | 26 | *Hydrangea macrophylla* | 41 | *Quercus coccifera* |
| 12 | *Campsis radicans* | 27 | *Ilex aquifolium* | 42 | *Salix babylonica* |
| 13 | *Cedrus atlantica* | 28 | *Juniperus oxycedrus* | 43 | *Wisteria floribunda* |
| 14 | *Ceratonia sliqua* | 29 | *Laurus nobilis* | 44 | *Wisteria sinensis* |
| 15 | *Chaenomeles spp* | 30 | *Liquidambar styraciflua* | 45 | *Yucca aloifolia* |

**Table 3** Outdoor decorative plants that can be used in planting design model for COMU campus

| Number | Landscaping—Plants | Number | Landscaping—Plants | Number | Landscaping—Plants |
|---|---|---|---|---|---|
| 1 | *Acer palmatum* | 18 | *Iris pseudacorus* | 35 | *Pontederia cordata* |
| 2 | *Araucaria araucana* | 19 | *Jacaranda mimosifolia* | 36 | *Prunus cerasifera* |
| 3 | *Berberis thunbergi* | 20 | *Juglans regia* | 37 | *Pseudotsuga Menziesii* |
| 4 | *Bougainvilea glabra* | 21 | *Juniperus spp* | 38 | *Punica granatum* |
| 5 | *Carpinus betulus 'Fastigiata'* | 22 | *Lagerstromea indica* | 39 | *Rhododendron 'Shammarello'* |
| 6 | *Catalpa bignonioides* | 23 | *Lantana camara* | 40 | *Robinia neomexicana* |
| 7 | *Cedrus libani* | 24 | *Laurus nobilis* | 41 | *Rosmarinus offcinalis* |
| 8 | *Cercis siliquastrum* | 25 | *Ligustrum tobira* | 42 | *Salix babylonica* |
| 9 | *Chamaecyparis nootkatensis 'Pendula'* | 26 | *Liriodendron tulipifera* | 43 | *Taxodium Distichum* |
| 10 | *Citrus reticulata* | 27 | *Magnolia grandiflora* | 44 | *Taxus baccata* |
| 11 | *Codiaeum variegatum* | 28 | *Nerium oleander* | 45 | *Thuja occidentalis* |
| 12 | *Cupressus arizonica* | 29 | *Nymphaea 'Comanche'* | 46 | *Tilia tomentosa* |
| 13 | *Cupressus sempervirens* | 30 | *Nymphaea 'Sulphurea'* | 47 | *Typha angustifolia* |
| 14 | *Cyperus alternifolius* | 31 | *Nymphaea 'Virginalis'* | 48 | *Typha latifolia* |
| 15 | *Ficus carica* | 32 | *Nymphoides indica variegata* | 49 | *Washingtonia filifera* |
| 16 | *Ficus elastica…* | 33 | *Phoenix canariensis* | 50 | *Wisteria sinensis* |
| 17 | *Hydrangea arborescens* | 34 | *Platanus occidentalis* | 51 | *Zantedeschia aethiopica* |

The surfaces with different elevations in Fig. 3/1,2,3 include visual images indicating that some have ramps/elevator equipment for disabled students and some do not. In spite of the excess elevation difference for accessibility of student dormitories from academic units, it was identified that access was mainly by stairs or footpaths. It is possible to identify the deficiency of disabled accessibility in terms of elevators or chair lifts.

Just as lighting within the campus area is occasionally effective and ideal (Fig. 4/1), the following images indicate it is insufficient (Fig. 4/2). From this aspect, the importance of lighting within the scope of secondary teaching (evening classes) is noted. Specific to disabled students, it is very important to assess outdoor area lighting within the scope of equipment and consider it with approaches focused on the student, quality of life and subjective well-being. Additionally, some areas of the university campus had water source/sinks/WC (Fig. 4/3); however, in a general sense the deficiency of this type of equipment was mentioned.

The lack of disabled parking spaces in parking designs is notable, as shown in Fig. 5/1,2,3; inclusion of more disabled parking spaces is among the emerging findings



**Fig. 3** Images from COMU Terzioğlu Campus (in terms of accessibility of ramps and elevators for disabled students)




**Fig. 4** Images from COMU Terzioğlu Campus (night lighting, water sources, bathrooms and WC equipment)



**Fig. 5** Images from COMU Terzioğlu campus (in terms of disabled parking and accessibility)



**Fig. 6** Images from COMU Terzioğlu Campus (in terms of grass area)

in the study. Additionally, it appears there is no ramp/elevator for use by disabled students between surfaces with different elevations. The elevation differences between surfaces in the COMU campus are variable, and this emphasizes the need to assess alternative applications like chair lifts and cable cars for this campus. In this way, it appears possible to reveal an effective design in terms of accessibility for all students with new and support planning studies.

Surfaces with grass areas are notably insufficient in Fig. 6/1,2,3; supporting this will have positive effect on disabled student perceptions and quality of life in addition to creating positive effects in terms of the whole student population and all users. Again, in the same way, it is notable that care and maintenance of plant and structural equipment are insufficient. The lack of inclusion of climbing ramps considering disabled students due to the elevation differences on roads from the lecture buildings to the housing units (dormitories, residential building) and the lack of inclusion of elevator equipment in places with excessive % slope elevation difference are notable. Within this scope, the need to include elevator and chair lift equipment in planning comes to the agenda; in fact, there is a need to use transport vehicles like cable cars and light rail system for mass transportation.

Based on identifications in Fig. 7/1,2,3, the need to include more esthetic and functional designs for structural and plant formation is understood within the scope of the elevation differences in the campus. At this point, it is important that care and maintenance activities for structural and plant formations gain a more widespread and sustainable quality within the campus. Additionally, the insufficiency of suitable open-air exercise parks pushes the physical dimensions of physical education and development of disabled students in campus life into the background.

According to the research findings, the need to plan the ergonomic structure of accessibility for the disabled student population was determined (Fig. 8/1,2,3). It was identified that the present ring services within the campus are insufficient. Within this scope, it is unavoidable to organize ring services to include the axis of student dormitories and

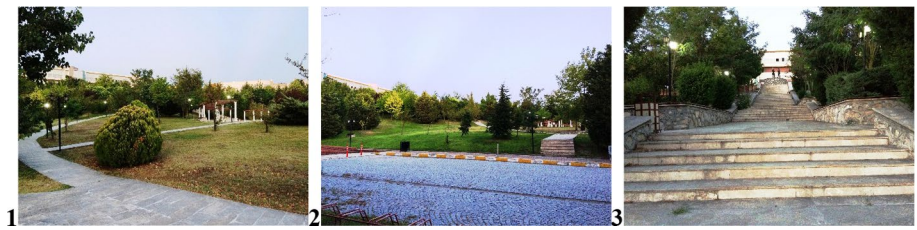


**Fig. 7** Images from COMU Terzioğlu Campus (in terms of landscape equipment)



**Fig. 8** Images from COMU Terzioğlu Campus (in terms of ring services)

academic units as much as within the campus for formal and secondary teaching. As such, expanding the service network of this parameter is among expectations to allow town and intercity/interuniversity accessibility within the scope of social activities.

There is a need to include more qualified landscape planning. At this point, the need to include planning for landscape equipment with suitable ergonomic structures like enclosed paths (arcades), tree-lined paths, balustrades/railings, handrails, stairs with suitable step numbers for slope and step heights was noted (Fig. 9/1,2,3).

According to Table 4, it is notable that the total student population attending COMU is 40,484. While nearly 06% of the total student population in all universities in Turkey (Grand National Assembly of Turkey, Commission Minutes, 2019) in general are disabled students, it was found that in COMU nearly 01.04% of students are disabled (COMU, 2020a). This situation reveals the need to assess campus planning approaches in proximity to student planning.

According to data in Table 4, the total number of university students in Turkey in general is 7,740,502 including 47,751 disabled students and the number of disabled students attending COMU should be nearly 250 (40,484*47,751/7740502). According to COMU (2020c), information was reached that there were 42 disabled students. These data indicate that nearly 208 disabled students (250–42) in COMU have not registered their disability status. This situation shows that campus planning has not attached sufficient importance to disabled student perceptions. An important route in line with expectations about disabled students being a focus in open and green space (campus) planning, which directly affects quality of life, is to determine the number of disabled students within the university in a true sense and to note their perceptions.

In this stage of the study, analysis was completed about disabled student perceptions of planning and design of COMU campus. For this, interviews were held with 40 disabled students on campus. In line with their opinions and thoughts, a survey study assessing student satisfaction/quality of life dealt with campus landscaping structures with the criteria of accessibility, security, water/sink/WC, wheelchairs, ramp equipment, stairs, disabled elevators, light rail system, disabled parking, bus stops, pedestrian crossings, green spaces,



**Fig. 9** Images from COMU Terzioğlu Campus (in terms of structural and planting landscape equipment)

**Table 4** Active student numbers and student numbers according to disability in Çanakkale Onsekiz Mart University (COMU) and universities in Turkey

| Student numbers according to disability species between universities in Turkey and Canakkale Onsekiz Mart University [COMU] | | | | | | |
|---|---|---|---|---|---|---|
| Number of students and percentage distributions according to disability species | | | | | Total number of active students | |
| Disability species | COMU | Percent (%) | Turkey | Percent (%) | COMU | Turkey |
| Chronic health | 5 | 0.012 | 2316 | 0.03 | 40,484 | 7,740,502 |
| Hearing impaired | 2 | 0.005 | 1103 | 0.014 | | |
| Seeing impaired | 11 | 0.027 | 2031 | 0.026 | | |
| Temporary insufficiency | 1 | 0.002 | – | – | | |
| Physical disabilities | 10 | 0.025 | 2705 | 0.035 | | |
| Language and speech disabilities | 2 | 0.005 | – | – | | |
| Other (unregistered) | 11 | 0.027 | 39,596 | 0.512 | | |
| Total | 42 | | 47,751 | | | |

COMU: 01.04% of active students are disabled students. Universities in Turkey (General): 06% of active students are disabled students

Canakkale Onsekiz Mart University Department of Editorial: Data reached by petition dated 11.08.2020 and numbered 200,011,121 (COMU, 2020a)

sports areas, multipurpose activity areas, care-maintenance, esthetic/functionality and plant potential. Satisfaction rate was the dependent variable, with the criteria listed above independent variables with data statistically correlated using SPSS 15.0 software. Tables and interpretations of data with linear regression analysis performed and demographic data obtained from the survey are given below.

The demographic structure of disabled students who voluntarily participated in the survey about COMU campus is given in Fig. 10. Accordingly, 25% of participants were female and 75% were male. In terms of academic level, 60% of disabled students were undergraduates and 22.5% were master students. Additionally, it was concluded that in line with perceptions according to campus parameters 24 disabled students were 90% satisfied, while 12 disabled students were 100% satisfied.

If the descriptive element in the model of the significance level ($p$) value is smaller than 0.05, it shows that at least one independent variable in the model positively affects the dependent variable. The determinant of this is the adjusted $R^2$ value. This value was

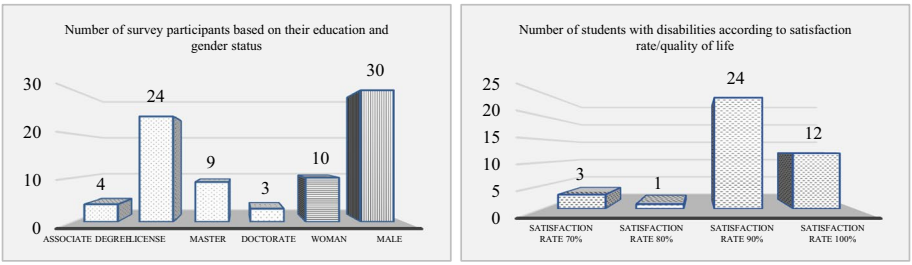



**Fig. 10** Education, gender and satisfaction rate distributions of survey participants

**Table 5** Model Summary(b)

| Model | R | R Square | Adjusted R Square | Std. ERROR OF THE ESTİMATE | Change statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change | |
| 1 | 0.923(a) | 0.852 | 0.759 | 3.75030 | 0.852 | 9.195 | 15 | 24 | 0.000 | 2.187 |

a Predictors: (Constant), Green_spaces, Accessibility, Aesthetics_functionality, Sport_areas, Ramp_equipment, Security, Plant_potential, Maintenance_repair, Wheelchairs, Disable_parking_space, Multi_purpose_activity_areas, Stairs, Water_source_lavabo_wc, Disabled_elevators, Stops

b Dependent Variable: Satisfaction_ratio

**Table 6** ANOVA(b)

| Model | | Sum of Squares | df | Mean Square | F | Sig |
|---|---|---|---|---|---|---|
| 1 | Regression | 1939.946 | 15 | 129.330 | 9.195 | 0.000(a) |
| | Residual | 337.554 | 24 | 14.065 | | |
| | Total | 2277.500 | 39 | | | |

a Predictors: (Constant), Green_spaces, Accessibility, Aesthetics_functionality, Sport_areas, Ramp_equipment, Security, Plant_potential, Maintenance_repair, Wheelchairs, Disable_parking_space, Multi_purpose_activity_areas, Stairs, Water_source_lavabo_wc, Disabled_elevators, Stops

b Dependent Variable: Satisfaction_ratio

calculated as 0.759. This situation means that the independent variables (Green_spaces, Accessibility, esthetics_functionality, Sport_areas, Ramp_equipment, Security, Plant_potential, Maintenance_repair, Wheelchairs, Disabled_parking_spaces, Multipurpose_activity_areas, Stairs, Water_source_sink_WC, Disabled_elevators, Bus Stops) explained nearly 76% of the variance in the dependent variable (satisfaction rate). This value is above the mean, which is satisfactory within the scope of social science. Additionally, the Durbin Watson statistic was calculated as 2.187 and this value being close to 2 means there is no autocorrelation; in other words, there is no correlation between error terms and this confirms the reliability of the model (Table 5). This makes the regression study significant.

As understood from the ANOVA test, the general significance level (P) was 0.00, which is smaller than 0.05, showing the correlation between dependent and independent variables is significant. This result means the regression is significant (Table 6).

The coefficients and significance levels for the regression model are stated in Table 7. According to the table, the model coefficient (190,363) is negatively affected by the independent variable coefficients. However, 87% of all independent variables have coefficient values which are significant at acceptable levels of 5% ($P < 0.05$), indicating that the independent variables of "sports areas" (0.432) and "green spaces" (0.54) with coefficient values above 5% need to be excluded from the model. These variables being excluded from the model may be due to user perceptions and tendencies. For example, the "sports areas" variable includes enclosed and open sports areas in the COMU campus, while the "green spaces" variable may be associated with the forest surrounding COMU. As collinearity statistics (VIF values) did not exceed 3 or more, there was no correlation between independent variables and it was concluded that fifteen variables should remain in the model.

Compatibility of the data obtained from campus studies with data obtained from disabled student perceptions; in other words, confirming each other, increase the validity of the study. The significance of correlations in statistical data and interpretations of the regression model will act as a reference for similar or more advanced studies which brings the study to an important position in terms of scientific and academic dimensions.

**Table 7** Coefficients[a]

| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig | 95% Confidence Interval for B | | Correlations | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Lower Bound | Upper Bound | Zero-order | Partial | Part | Tolerance | VIF |
| 1 | (Constant) | 190.363 | 11.462 | | 16.609 | 0.000 | 166.708 | 214.019 | | | | | |
| | Accessibility | −2.455 | 1.135 | −0.226 | −2.163 | 0.041 | −4.797 | −0.113 | −0.137 | −0.404 | −0.170 | 0.564 | 1.774 |
| | Maintenance_repair | −2.549 | 0.708 | −0.335 | −3.598 | 0.001 | −4.011 | −1.087 | −0.372 | −0.592 | −0.283 | 0.712 | 1.405 |
| | Water_source_lavabo_wc | −2.459 | 1.075 | −0.246 | −2.287 | 0.031 | −4.679 | −0.240 | −0.043 | −0.423 | −0.180 | 0.534 | 1.873 |
| | Security | −2.396 | 1.043 | −0.229 | −2.297 | 0.031 | −4.549 | −0.243 | 0.047 | −0.425 | −0.181 | 0.622 | 1.607 |
| | Stops | −4.572 | 1.097 | −0.457 | −4.167 | 0.000 | −6.837 | −2.308 | −0.262 | −0.648 | −0.327 | 0.513 | 1.950 |
| | Disable_parking_space | −3.373 | 1.119 | −.278 | −3.014 | 0.006 | −5.682 | −1.063 | −0.253 | −0.524 | −0.237 | 0.725 | 1.380 |
| | Disabled_elevators | −2.007 | 0.955 | −0.222 | −2.102 | 0.046 | −3.978 | −0.036 | −0.152 | −0.394 | −0.165 | 0.551 | 1.814 |
| | Ramp_equipment | −2.156 | 0.982 | −0.201 | −2.195 | 0.038 | −4.184 | −0.129 | −0.258 | −0.409 | −0.173 | 0.737 | 1.357 |
| | Multi_purpose_activity_areas | −1.950 | 0.827 | −0.229 | −2.358 | 0.027 | −3.657 | −0.243 | −0.252 | −0.434 | −0.185 | 0.653 | 1.532 |
| | Wheelchairs | −2.791 | 1.316 | −0.202 | −2.121 | 0.044 | −5.507 | −0.075 | −0.026 | −0.397 | −0.167 | 0.678 | 1.474 |
| | Stairs | −3.790 | 0.982 | −0.367 | −3.859 | 0.001 | −5.817 | −1.763 | −0.448 | −0.619 | −0.303 | 0.682 | 1.466 |
| | Plant_potential | −4.323 | 1.298 | −0.360 | −3.330 | 0.003 | −7.003 | −1.644 | −0.120 | −0.562 | −0.262 | 0.529 | 1.891 |
| | Sport_areas | −0.764 | 0.955 | −0.072 | −0.800 | 0.432 | −2.736 | 1.207 | 0.141 | −0.161 | −0.063 | 0.771 | 1.298 |
| | Aesthetics_functionality | −2.565 | 0.698 | −0.318 | −3.676 | 0.001 | −4.005 | −1.125 | −0.189 | −0.600 | −0.289 | 0.826 | 1.210 |
| | Green_spaces | −1.791 | 0.883 | −0.190 | −2.028 | 0.054 | −3.615 | 0.032 | −0.529 | −0.382 | −0.159 | 0.707 | 1.415 |

[a]Dependent variable: Satisfaction_ratio

## 5 Discussion and conclusions

The study has the qualities of a model study ensuring case analysis linked to the disabled student index in landscape planning and design of a COMU campus. Thus, it has potential to illuminate administrations undertaking an effective role in campus planning actions (Tonon, 2020). Firstly, the landscape equipment and components of the campus area were investigated and then continued with identification of species representing plant cover. Areas which were insufficient in terms of plant cover were supported by suitable functional plants within the scope of the model application. The effect of criteria like accessibility and security on campus within the scope of disabled student satisfaction was revealed. Within this scope, insufficiencies were determined and solutions developed. Apart from survival studies linked to the increase in quality of life of disabled students, their potential for learning and psychological development and being creative and beneficial is a public responsibility and at the same time a necessity. Thus, campus planning with focus on education and quality of life, and sensitive to equivalence of opportunities, will minimize the welfare difference between disabled/abled students (Kwon et al., 2019). In this stage, it is unavoidable that local, administrative and university administrations produce proactive action plans. Noting the opinions and thoughts of the whole student population when completing these plans should be an irreplaceable element in campus planning and design. With these study results, plans will include more effective management and sustainable green campus living spaces in combination with universities (Ministry of Family & Social Policies of the Republic of Turkey, 2011). A study by Okulicz-Kozaryn and Valente (2019) and de Borba et al. (2020), Kwon et al. (2019) researched the role of classes as physical spaces for learning activities within the scope of student–academic–space and displays overlap with this study in terms of focus on outdoor/campus–student theme, but does not overlap with other sections. Mokher et al. (2020), Cole, (2010), Bowman, (2010), Johnson et al. (2020) Chang et al. (2019), Deb and Strodl (2019), Perucca (2019), Lin and Shek (2019). Yu et al. (2019), D'agostino et al. (2019), Kim (2018) ve Koç and Turan (2020) determined organizational learning, institutional transformation and results with a survey study. In the institutional transformation process, the study emphasized rational results obtained with cooperation in a multi-stakeholder participant approach and has similar structure to this study. Studies noting faculty–student relationships and interaction mentioned positive contributions to education and spiritual motivation. A common aspect with this study is the association with student satisfaction. The inclusion of use of a survey to obtain data overlaps with this study. Additionally, the direct correlation with improving quality of life and social relationships of the disabled student population with green/sustainable campus planning is associated with the results. A study by Jiang et al. (2020) concluded that the "security" parameter had positive effect on the physical health of individuals in rural areas and on mental health of individuals in urban areas. The high level of security of disabled students in the campus area in this study was concluded to have positive effect on mental and bodily health of students. Pagan (2020) and Alkan (2020a) emphasized positive effects on general quality of life of sports-based activities in perceptions of disabled and abled students. There are parallels with this study within the scope of data obtained about disabled student perceptions. The dimension about perceptions of abled students does not comply with this study. As in this study, the location and importance of outdoor-focused recreational activities on student quality of life was mentioned (Schmiedeberg & Schröder, 2017; Zullig & White, 2011). Lera-Lopez et al. (2017), Sirgy et al. (2017) ve Mazumdar (2017) noted the positive effect of recreational/physical activities, especially entertainment–relaxation and bodily activities in free time, for individual welfare which confirms the increase in life satisfaction of

disabled students with these campus activities**.** Improvements in the living welfare of all students, led by disabled students, in universities, is a marker of positive markers like developments in subjective well-being and self-confidence, while also showing social development**.** Mazumdar (2017) indexed quality of life/human welfare with socio-economic–environment development and noted the aspects involving development, which is notable for overlapping with this study. Wang and Wang (2017) proposed distant communication in health services was a complementary element for ensuring health face to face and emphasized that there may be an increase in quality of life of urban population masses in this way. A common aspect with this study can be said to be targeting the quality of life of individuals. The study is predicted to guide the decision-making process in planning and design applications for disabled student populations in university campuses based on the results. It appears unavoidable that decision-makers undertake an effective/proactive role for optimization of personal/student satisfaction, quality of life, learning acquirements, individual development and health parameters by noting the will of all students within a multi-participant approach. Within the scope of displaying a firm stance in university social life, it is necessary to take steps to create a "free transport system," to ease easy-access to teaching and to increase resources used for transport. The analysis results and recommendations identified in campus studies of Çanakkale Onsekiz Mart University, changing and developing in favor of disabled students in the learning and socioeconomic structure, can be planned for administrations and student populations in other universities (Israel, Koester & McKay 2020). The study emphasizes the need for more specific approaches in different dimensions (efficacy for student learning on campus, socioeconomic structure/physical structure of the campus) and for research to be performed with a broad perspective (Hermanowicz & Woodring, 2019).

The positive relationship between objective environment and prosperity has been a common meeting point in both studies (Huebner and Dew 1996; Cummins et al. 2003). In the studies where adolescent individuals evaluated their life satisfaction, they achieved high reliability results ((Huebner et al. 1999; Seligson et al. 2003; Veljkon and Dragan 2013). Studies evaluating subjective well-being swells in adolescents (Tomyn & Cummins, 2011; Tian et al., 2015; Losada et al. 2020) coincide with the theme of this study. Muhammad et al. (2014) investigated the impact of the academic structure in the well-being of students. As in this study, the positive effects of sustainable campus applications are addressed to the environment (Hoque et al., 2017). Urbanski and Filho (2015) study touched on campus sustainability in terms of program development. Leal Filho et al. (2020) discussed and evaluated campus sustainability in terms of governance. Van Wynsberghe and Moore (2015) evaluated sustainable development in the combination of curriculum and pedagogy. In this study, the physical conditions of the campus were discussed. This study focused on the design and planning of the academic structure and campus in the potential of disabled students. The target of this article was to find the acceptable thresholds for learning and social life in terms of students with disabilities for the structural and planting construction of the Çanakkale campus. For this reason, an application-dominant inference is present. According to the results of the manuscript, the plant and landscaping architecture of the campus was investigated from the perspective of students with disabilities, focusing on suggestions and strategies targeting a sustainable green campus. The manuscript has the potential to guide studies to be performed about researching different dimensions like internal or structural equipment of a university campus focusing on students with disabilities. In the literature screening, campus planning designed with sustainable green campus potential did not meet expectations by noting satisfaction of students with disabilities. This study has the quality of being a study based on the perspective and academic assessment of students with disabilities for ÇOMÜ, included in the top 34 for potential of Turkish universities (COMU,

2020c) with the literature and inferences. Thus, a different positive approach to sustainable green campus planning indexed to students with disability was developed. At this point, the study is very important in terms of determining the steps that may be needed or should be taken to develop and improve ÇOMÜ as a sustainable green campus.

Recommendations about development with focus on disabled students in COMU campus are given below.

Findings in the study indicate the need for more proactive/interventional studies to encourage morale of disabled students in university (Deb et al. 2019). It is important to allocate more resources within the scope of campus planning for higher education organizations.

Sustainable development strategies should be developed for urban components as well as on campus (Saldaña-Durán, 2020). The establishment of the "Sustainability Development Association" inside the university will contribute positively to the campus sustainability process (Lidstone et al., 2015).

Acquirements from positive processes like critical awareness and self-assessment in combination with teaching and learning are directly proportional to the functional campus areas (Morris, 2019). Attention should be paid to education of the users about campus use within the scope of hygiene, cleaning and visual positive effects.

The saturation point in the lack of othering perception ensuring contributions to subjective well-being is an effective factor in the potential for quality of life and ease of learning for disabled students. Priority should be to develop disabled student approaches (sensitive to empathy) and strategies which include disabled students in all areas and do not displace them into the background in terms of both the university population and society. From this aspect, it is important to give weight to public education. For this, there is a need to organize widespread education seminars, courses, meetings and symposium.

Within the scope of secondary education (evening), outdoor lighting plans should carefully include psychological and bodily comfort. Surface landscaping in the area should more frequently include planning emphasizing esthetics and functionality; attention should be paid to the need to maintain planting patterns and grass areas without interruption.

A rich plan in terms of water sources, sinks and lighting elements in the university campus will create improvements in recreational activities and subjective well-being of all students. Sensitive approaches by effective actors in administration in relation to this topic are among expectations.

Within the scope of campus landscape equipment, support with structural elements like ramps, stairs, railings, handrails, gazebos, arcades, tree-lined paths and disabled elevators should be a precondition for learning and above all subjective well-being of students.

Due to the elevation difference, it appears unavoidable to include transport vehicles like slope elevators/elevators, chair lifts/cable cars and light rails systems in plans for COMU campus.

Ring services are organized on a single line in COMU campus due to the agreement between the university management and Çanakkale Controlled Special Public Bus officials. It is important to include students attending evening classes within this service.

Learning-based ring services between dormitories-academic units should be included within the scope of accessibility on campus. Apart from transport gains for the academic concept, it should be extended to the promotion and social planning concepts with importance given to sustainability.

Physical education and development activities, with important share in quality of life for disabled students, will be more effective with inclusion of common open-air exercise parks in planning.

The landscape plant list determined in the study should be used for landscape planning and design within the scope of the campus assessed with emphasis on esthetics and functionality.

In light of findings obtained in the research, when the number of disabled students and disability types in universities in Turkey are examined, it was revealed that there should be nearly 250 disabled students attending COMU. In line with this number, 42 student records were identified according to disability type; however, it was concluded that nearly 208 students should be registered according to disability type. Following more sensitive strategies about this topic and registering student numbers according to disability type will ensure rational steps are taken for many operations and processes in addition to design of campus planning within the scope of this study according to perceptions of disabled students.

To achieve the ideal of sustainable development, individuals in the society, non-governmental organizations, professional chambers, universities, unions, local and central administrations, public institutions and organizations and representatives of the private sector should take joint action.

Training should be provided on physical structuring of the campus and the quality of education for sustainable development.

For sustainable development, an innovative approach should be adopted in higher education curricula covering the entire students.

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