

# Challenges of sustainability efforts of universities regarding the sustainable development goals: a case study in the University of Zanjan, Iran

Seyed Mohsen Najafian <sup>1</sup>, Esmail Karamidehkordi \*<sup>2</sup>

<sup>1</sup> President of the University, University of Zanjan, Zanjan, 45371-38791, Iran

<sup>2</sup> Director of International Scientific Cooperation Office, University of Zanjan, Zanjan, 45371-38791, Iran

**Abstract.** The purpose of this presentation is to introduce some activities and programmes of the University of Zanjan in changing its campus environment towards a sustainable campus, emphasising setting and infrastructure, waste management, water management, and education and research. This comprehensive university with over 10000 students and 1000 staff is located in a semiarid area with a campus area of 421 ha and is 6 km away from the Zanjan City, center of Zanjan Province. In over four decades, it has expanded its tree cultivation to over 72 hectares, and its total vegetation area covers over 94 percent of total campus area. The university has increased and improved its investment on sustainability, smart buildings and water management in both buildings and vegetated areas. The waste management programmes have been implemented through using electronic correspondence and document submission in different activities of the university; separating plastics, glasses and papers and waste recycling; toxic waste handling in all labs; composting organic waste; inorganic waste management; and recycling sewage disposal. Though the university has provided free buses and shuttles to both staff and students inside the campus and between the city and campus to reduce private car use, it still needs to encourage bicycle use and improve its facilities to support it. Developing renewable energy for the future is still a challenge for this university and needs both innovation and investment. Students and academic staff have also been encouraged to move their conventional education and research methods and contents to more sustainable approaches, for example in courses syllabuses, student activities, research projects, publications and investments. The GreenMetric World University Ranking Network is expected to enhance its scope to contribute much more on sustainable development goals. A sustainable university should play an important role in innovation and technology research and development in sustainability; enhancing staff and students' sustainability knowledge and social capacities; changing the campus environment to an Eco-friendly and sustainable environment; and enhancing social and human capacities of communities and public and private institutions.

## 1 Introduction

Sustainable development concept and strategies have evolved for over three decades, when the "Our Common Future" report was published during the World Conference on Environment and Development in 1987 (Brundtland Report): "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. The world has faced a crucial challenge on how to achieve this goal. Numerous international events and conventions regarding sustainable development have been held to enhance international community' knowledge and actions for this subject, for example the World Commission on Environment and Development (1987 in Norway), the Earth Summit' in Rio de Janeiro (1992 in Brazil), The United Nations Framework Convention on Climate Change (UNFCCC) in 1992, the Millennium Development Goals (MDGs) in 2000, the UN World Summit on Sustainable Development (WSSD), Johannesburg in 2002, the Kyoto Protocol (2005), the

UN Climate Conference 'COP15', Copenhagen in 2009, the UN summit, 'Rio+20', Brazil in 2012, the UN Summit, Sustainable Development Goals, 2030 Agenda for Sustainable Development in 2015, and the COP23: UN Climate Change Conference in 2017 [1-3] [4] [5].

Universality, integration and transformation are three main indicators for achieving sustainable development goals (SDGs). The terminology of *universality* means these goals apply to every nation and every sector. Cities, rural communities, businesses, schools, universities, organizations, all are challenged to act. The word *integration* implies that the goals are all interconnected in a system, so it is not possible to aim to achieve just one goal. Finally, *transformation* indicates that achieving these goals involves making very big, fundamental changes in how we live on Earth [2]. This means every nation and sector; including rural and urban communities, public and private institutions, non-governmental organizations and higher education institutions (HEIs) should work to manage interconnected and complex sustainability challenges to

\* Corresponding author: [najafian@znu.zc.ir](mailto:najafian@znu.zc.ir)

make fundamental changes in how we live on the Earth. HEIs can contribute to the sustainable development through several mechanisms: 1) innovation and technology research and development, 2) enhancing staff and students' sustainability knowledge and social capacities, 3) changing HEIs environment to an eco-friendly and sustainable environment, and 4) enhancing social and human capacities of rural and urban communities and public and private institutions [6]. The assessments made by the University of Indonesia GreenMetric since 2010 to measure and rank universities around the world is one of the international commitments to encourage the HEIs to take sustainability as a serious key concept into account. Based on UI GreenMetric [7], the University of Zanjan has been ranked as the 47<sup>th</sup> university among 619 universities in the world and the 1<sup>st</sup> among Iranian universities.

This paper aims to introduce some activities and programs of the University of Zanjan in changing its campus environment towards a sustainable campus, emphasizing setting and infrastructure, waste management, water management, and education and research.

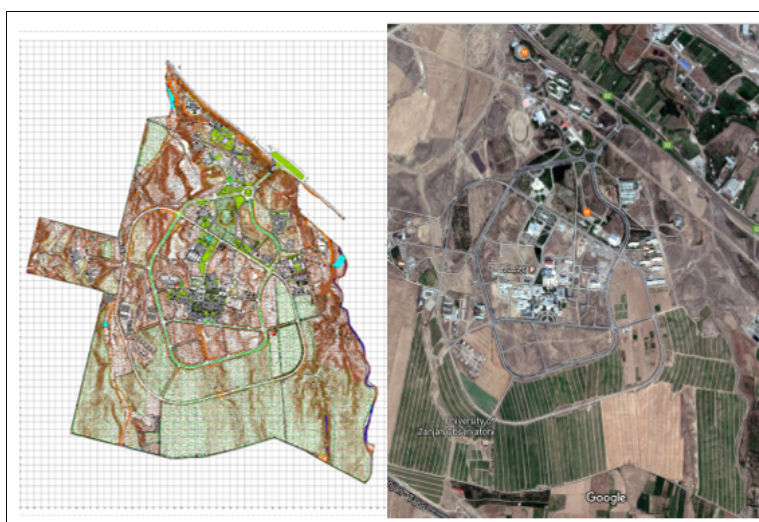
## 2 Sustainability in the University of Zanjan campus

### 2.1 Setting and infrastructure

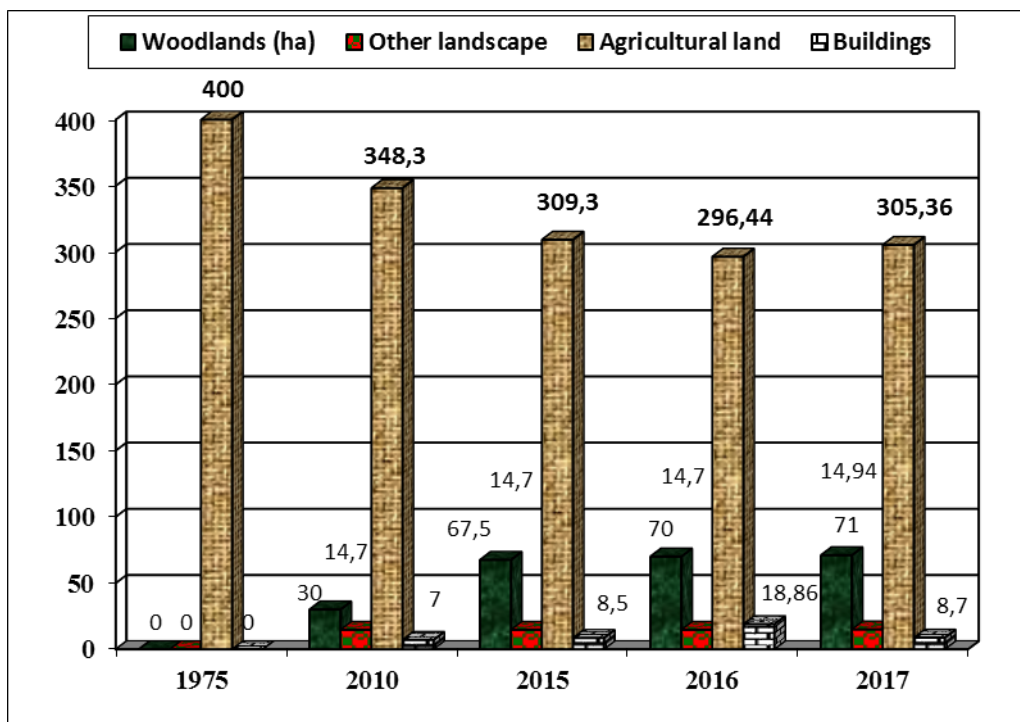
According to Higher Education Planning and Research Institution [8], 2500 higher education institutions, including 130 non-medical and 63 medical state-run universities. The University of Zanjan is ranked 20<sup>th</sup> among all public and Iranian Universities. Base on the Times Higher Education World University Ranking 2018, it is among 1000 universities of the world and 18 Iranian universities [9]. As a public university, this university was established as an agricultural higher education institute in a public granted land in a semiarid

rural area 6 km away from the city in 1975, but it was gradually developed as a comprehensive university in five main faculties titled Agriculture, Engineering, Humanities, Science and Art and Architecture in its main campus, comprising 37 educational departments and a research institute with 4 research departments. It has almost 10000 students with 1000 academic and administrative staff. Its main campus is located in an area of 400 hectares, in the south west of the Zanjan City, the center of the Zanjan Province, at the north west of Iran (with a distance of 330 km away from the capital city of Tehran). The second and third campuses are located in the Abhar Township and the Tarom Township of the Zanjan Province.

The total ground floor (first floor) area of buildings is estimated to be 87000 out of 4000000 m<sup>2</sup> total university area in its main campus, with 189000 m<sup>2</sup> total main campus building area and 55000 smart building areas (in different floors). This means only 2.2 percent of the university area is covered by buildings. Moreover, the average land per students is calculated as 400 m<sup>2</sup>. The university has significantly increased its woodland area since its establishment, which was originally covered by rangelands and croplands. Woodland and orchard areas inside the campus have increased from 0 ha in 1975 and 30 ha in 2010 to over 71 ha in 2017 (17.75 percent of the university). The first week of March every year, the Iranian celebrate natural resources management and environment week and one of the days is called "Tree Planting Day", in which the university calls its students and staff to participate in this event for plantation. Moreover, 76.34 percent of the campus (304.36 ha) was covered by agricultural lands (rangelands and croplands) and other planted landscape vegetation in 2017, which have been used for research, education, landscape management and production. Water can be absorbed in almost 94.09 percent of the university area, including agricultural lands, woodlands and other planted landscape vegetation. The area of parking space is 23000 ha (in ground floor).



**Fig. 1.** University of Zanjan topography and ariel view



**Fig. 2.** Agricultural lands, buildings and woodland areas in the main campus of the University of Zanjan (ha)

All the woodland areas have been planted by drought resistant trees proper for semiarid areas. Moreover, the irrigation for trees has changed to the dripped irrigation method and other modern irrigation techniques have been utilized in croplands. This has improved the irrigation efficiency and conserved water resources. These conservation activities and other sustainability efforts have demanded an investment of over 25 percent of the total university budget.

## 2.2 Energy and climate change

During the last decade, energy efficient appliances have partially been replacing conventional appliances (40%-60%). The program for smart building is in initial stage, in which 55000 out of 189000 m<sup>2</sup> total main campus building area (29%) has been implemented under this program (in different floors) by the end of 2016. Electricity and heating systems have partially been changed through utilizing some more eco-friendly technologies, for example using double glazing windows, smart electricity and heating in some buildings, and using solar energy. Most buildings have natural ventilation and full-day natural lighting. Energy management and climate change policies have been ratified in the long term strategic program of the university, particularly using solar power and biogas technologies, smart use of electricity and heating systems, greenhouse gas emission reduction, green building design through using natural ventilation and lighting, etc. The university has not calculated the campus yearly carbon emission yet, but it has been considered as a mandate for the future. The ten-year strategic program of the university has

planned to increase solar energy production and usage in campus from 100 kwh to over 4000 kwh by 2025. Some other practical steps at the university include:

- Recovering the energy efficiency by improving the thermal insulation of existing buildings;
- Considering architectural technologies in the design and construction process of new developments aiming passive energy savings;
- Applying modern HVAC systems for building services, which has improved energy efficiency;
- Adjustments of the internal electricity grid of the university and the main feeder post; and
- Modification of natural gas pressure-reducing and metering station.
- Some planned arrangements for future include:
- Controlling and redesigning main structures of older buildings to make them resistant to earthquakes, according to the new edition of Iranian 2800 standard,
- Double-glazing the openings of previously built faculties, departments and office buildings,
- Repairing and/or installing thermal insulating panels on external walls and roofs,
- Optimising the suspended ceiling systems to improve their functionality, preferably by using recycled parts of the old system,
- Planning for power generation by CCHP power plants by private sector investments,
- Official negotiations for installation of a large network of solar panels and wind turbines to

increase renewable energy generation to %20 of the regular demand in three years. The plan is a part of a larger joint program with the Ministry of Energy, to establish an eco-park with education, research and power generation purposes.

The university is also interested to develop its international collaboration with international institutions for research and development of renewable energy technologies and their implementation in the campus.

### **2.3 Waste management**

Vegetation waste is either used by for livestock consumption in the university farm or composted through natural composting or using vermicompost. Inorganic waste such as plastic and papers are collected separately for recycling. The university has a contract with an environmental NGO to give these wastes to that organization for recycling. Waste bins inside and outside all buildings have been detected by different waste signs, including recycle signs. Toxic wastes are also handled by labs and farm through collecting, containing and giving to relevant registered organizations for their disposal. One of the main achievement of the university during the last two years has been “modernising refined water and sewage systems during a long-term plan”. Sewage disposal has been managed by using technologies in order that its water is reused and its sludge is treated through reusing and composting for farms. The university strategic plan and policies has put sustainable waste management into its agenda through programs such as using biogas technologies for sewage management, continuing recycling and composting, and toxic waste management. The water produced from sewage treatment will be used in farms and for landscape management.

Another policy for waste management has been paper reduce program for over 15 years. This policy has been implemented through developing the Information Technology in student’s halls, catering systems, educational semester registrations, course evaluations, electronic teaching, student assignments, research records, conferences and workshops, journal paper submission and review, student’s seminars and theses, using library materials eBook and papers), e-book publication, etc.

### **2.4 Water management**

Water crisis is considered as a crucial challenge in all parts of Iran, including the Zanzan Province. The university has considered this issue in its short and long term strategic plans. There are two separate drinkable and non-drinkable water systems in the university. Using new technologies for irrigation has helped the water use efficiency in the campus, despite the increase of vegetation in the university. Drought resistant plant cultivation has also had a contribution in

water reduction. The university has improved the irrigation practices in all agricultural lands and woodlands through applying modern irrigation technologies by converting from gravity surface irrigation systems to pressurized irrigation sprinkler systems (such as solid set, hand move, side roll, drip-trickles, center pivot and systems) and gate pipes. The strategic plan of the university has also emphasized on the following aspects:

- Studies for a pilot plan to use recycled/refined water in the irrigation of university green lands for growing agricultural crops and maintaining the landscape. It will also be used in flash tanks at the major water-consuming student accommodations.
- Restoring biodiversity and supporting local wildlife.

### **2.5 Transportation management**

Public transportation is provided inside the campus and between the university and the Zanzan City free of charge to both staff and students. The policy and program of the university is to continue public transportation support and to increase bicycle and pedestrian use and to limit the motor vehicles in the campus. It has encouraged the staff to share their cars between the university and the city. The strategic plan for the future has also emphasized on establishing a tram on the campus and establish a bicycle road between the city and the University for 6 km to enhance safety for bicycle riders.

### **2.6 Education and research**

On average, 700 papers on sustainability or environment are published in English or Persian and 55 events through international and national conferences, workshops, meetings, campaigns, speeches, etc. are organized. There are 33 students' organizations in the university that participate in facilitating sustainable and environment activities. The University of Zanzan consists of five main faculties including Agriculture, Engineering, Science, Humanities and Art and Architecture. The enrolled students in the academic year of 2017- 2018 have been over 10000 (64% Bachelor, 29% Master and 7% PhD) in 230 undergraduate and postgraduate programs (28% Bachelor, 46% Master and 26% PhD) studying in 37 educational departments. Approximately one fourth of educational programs provide courses and research regarding sustainability and environmental concerns. One third of research projects and budget have directly or indirectly been allocated to sustainable development.

### **2.7 Equity in education**

Most Iranian students do not pay any tuition fee for their education, but if they should, they get loans for their education. Almost 55 percent of the students are female. The university facilitates low cost and



subsidized accommodation for all students inside the campus through student halls, located in separate areas for male and female students. These student halls have all the facilities required for student life, including IT services, reading rooms, gyms, restaurants, subsidized meals, mosques, and so on. Single foreign students with scholarship can use free-catered accommodation. The university also facilitates accommodation for other married and single foreign students without scholarship, through university private accommodation.

### 3 Conclusion

Education and research for sustainability may need a significant change in not only in curricula and programs change but institutionalizing this concept in these institutions. The HEIs have a profound influence on all other institutions through educating and producing human resources who must care sustainability. The assessments made by the University of Indonesia Green Metric since 2010 to measure and rank universities around the world is one of the international commitments to encourage the HEIs to take sustainability as a serious key concept into account.

The University of Zanjan has increased and improved its vegetation and investment on sustainability, smart buildings and water management in both buildings and vegetated areas. The waste management programs have been implemented through using electronic correspondence and document submission in different activities of the university; separating plastics, glasses and papers and waste recycling; toxic waste handling in all labs; composting organic waste; inorganic waste management; and recycling sewage disposal. Though the university has provided free buses and shuttles to both staff and students inside the campus and between the city and campus to reduce private car use, it still needs to encourage bicycle use and improve its facilities to support it. Developing renewable energy for the future is still a challenge for this university and needs both innovation and investment. Students and academic staff have also been encouraged to move their conventional education and research methods and contents to more sustainable approaches, for example in courses syllabuses, student activities, research projects, publications and investments. The GreenMetric World University Ranking Network is expected to enhance its scope to contribute much more on sustainable development goals. A sustainable university should play an important role in innovation

and technology research and development in sustainability; enhancing staff and students' sustainability knowledge and social capacities; changing the campus environment to an Eco-friendly and sustainable environment; and enhancing social and human capacities of communities and public and private institutions.

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