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University and environmental health: Green advancement at the University of Florence revealed by UI GreenMetric ranking.

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Abstract. The University of Florence (UniFi) started participating in the UI GreenMetric ranking in 2018 to measure its commitments toward sustainability. Since then, several actions have been adopted to make advancements in the six categories of the ranking, spanning from the high-quality classroom environment to actions for the well-being of students. UniFi considers sustainability a transversal discipline addressed by all the schools in its different aspects (e.g. well-being, building structure, energy efficiency, climate change responsibility, waste management, and saving water resources). In particular, the cutting edge of UniFi is represented by its education sector. The total number of courses regarding the 17 Sustainable Development Goals in 2020/21 is increasing, covering now 26% of the academic offerings. These offerings give our students many opportunities to grow with their awareness of the current difficulties, providing the instruments to address their future. This is possible also thanks to the cultural events that UniFi promotes every year, despite the difficulties raised by COVID-19. Moreover, an average of ~3700 scholarly papers related to sustainability has been published in each of the last three years, the outcome of the excellent work of the UniFi researchers. Thanks to start-ups, the academic expertise on sustainability has also been taken outside to the industrial sector.



1. Introduction

In the last decades, academic institutions have integrated sustainability activities into their practices, covering the following aspects: educational, social, economic and environmental [1]. In this context, Italian universities, which are well-established organizations with an enormous cultural heritage, have implemented sustainable principles addressing strengths and gaps [2].

In particular, the University of Florence (UniFi) started working on sustainability in 2016 by creating a “delegate for environmental communications” and then with “an institutional figure involved in implementing sustainability activities” aimed at students and employees. An enormous step forward was made with the formation of the Green Office, a group composed of the administrative staff, involved in creating a network among professors, researchers, and keen students on the sustainability topic [3, 4]. The Green Office acts as an information collector and promoter of initiatives and other dissemination events opened also to citizens [5]. Thus, it takes care of collecting data, monitoring projects and coordinating the executive aspects of the various sustainability actions such as energy saving and production, waste management and its reduction, rational use of water and other material resources, management of the urban green space, mobility from / to the university and between university sites, and other actions of the University of Florence on the subject involving research [6].

Among these actions, some are worth noting such as the installation of 33 water dispensers (called in Italian “*fontanelli*”); since 2018 they have prevented the consumption of more than 2 million plastic bottles. Moreover, 7 ecostations (“*ecotappe*” in Italian term) managed by Alia S.p.A (urban waste management service in Florence) were installed to increment the collection of used batteries, electronic waste, spray cans and printer toners [7]. In collaboration with the “mobility manager,” the Green Office obtained a discount on the public transport subscription for students in their first year of studies [8]. Meanwhile, the energy manager conducted a study for substituting LED lighting in *plesso didattico* (teaching structure) in Viale Morgagni. This action, once carried out, can be replicated in all the buildings of our University. UniFi is preparing to extend the use of energy produced from renewable sources beyond the installed power [9].

In this context, UniFi's membership of the Italian University Network for Sustainable Development (RUS) has played a key role in implementing the activities, promoting new projects and joint collaboration. RUS, a joint community of Italian Universities (a total of 82 subscribed universities) was created in 2016 [10] with the aim of promoting the achievement of the 17 Sustainable Development Goals (SDGs). Furthermore, UniFi has become a member of the European School of Sustainability Science and Research (ESSSR) [11] and the Italian Alliance for Sustainable Development (ASviS) [12]. Participation in the network has increased the awareness of sustainability development and focused attention on specific cultural events such as the European Week for Waste Reduction (WEER), the “Festival dello Sviluppo Sostenibile” (festival of sustainability development), the European Researchers' Night, and more.

To measure its commitments in the sustainability field, UniFi started participating in the UI GreenMetric World University ranking in 2018. The ranking is a tool to make advancements in the six categories of the ranking, setting and infrastructure; energy and climate change, waste, water management, transport, and education spanning from a high-quality classroom environment to actions for the well-being of students [13].

Thanks to the actions already in progress and the newly developed ones, UniFi improved its placement in the GreenMetric World University Rankings UI ranking in 2021 [14]. The University of Florence ranked 18th out of 33 Italian participating universities, compared to 2020 when it was 25th out of 32. Moreover, UniFi placed 322nd of 956 total participants, compared to 2020 when it was 432nd out of 912, thus showing remarkable progress. In particular, the cutting edge of UniFi is represented by the education and research sector. In this category, UniFi made its best score in 2021 due to the emersion of its attitude to guarantee teaching courses oriented to sustainability and raising awareness among the new generations.

This paper aims at showing the activities promoted by UniFi to integrate the SDG principles in the school's courses, to show the main dissemination events developed for the students and employees. The spread of the best practices are fundamental in an enlarged context such as academic institutions, representing the preeminent way of carrying out the sustainability principles. Furthermore, SDG issues have become an assimilated issue in the different subjects of research.

2. Courses regarding sustainability

The total number of courses, regarding the 17 SDGs in 2020/21, covers 26% of the total academic offerings. UniFi considers sustainability, a discipline integrated into the different aspects, i.e., well-being, building structure, energy efficiency, climate change responsibility, waste management, and saving water resources.

These will give many opportunities to the students to grow with the awareness of the current difficulties, providing instruments to address the future.

3. Events dedicated to students and citizens

3.1 Cultural festivals

Cultural events have been promoted every year despite the difficulties raised by COVID-19.

The main cultural events, where sustainability was one of the main topics, have been organized within the European Researchers' Night. In this context, the Green Office had the possibility to describe the new actions adopted to promote best practices. Moreover, seminars dedicated to the Science Shop as a tool for public engagement and sustainability communication have been organized in the framework of the European Project INSPIRES [15]. We also wrote a book entitled: "Waste? Instructions for a sustainable future" [16], with the aim of raising awareness about waste reduction, especially regarding plastic waste dumped in the environment, which has been ranked among the six most serious environmental emergencies by the United Nations Environment Programme.



Figure 1: A) UniFi: the Ateneo Sostenibile stand during the European Researchers' Night; B) Presentation of the book entitled "Waste? Instructions for a sustainable future" with the authors: Giovanna Pacini, Franco Bagnoli and Sara Falsini.

3.2 Dissemination Events and Best practices

Several dissemination events addressed to students and citizens have been organized such as The Green Dragon UNIFI, a dragon boat inaugurated at the Canottieri Comunali Firenze, a ten-seater boat that will be used every week for cleaning the river and the embankments. A Green Office representative participated as speaker at the Summer School 2022 of the Italian Section of the World Environmental Education Congress (WEEC) [17], giving her contribution about concrete actions developed by UniFi

in the six categories of the Green Metric. On the occasion of the 4th edition of Climbing for Climate the trekking “Water and nature: two heritages to be safeguarded” was organized around the hill close to Florence in collaboration with the Club Alpino Italiano. In collaboration with the Science Shop, the Green Office was involved in spreading the best practices through posters; see Figure 2. These are targeted at students and employees in general who should adopt a sustainable lifestyle, and be more attentive to the reduction of waste.

A learning course for the administrative/technical staff to raise awareness among the employees about different topics such as Greenmetrics, the RUS and EUniWell networks operating in the Educational sectors.



Figure 2: A) Poster to push students and employees to do their own part in making the world more sustainable; B) Stickers to spread best practices.

Moreover, best practices are spread through stickers to remind users of university buildings (employees and students) to save water, turn off air conditioning or heating, save and reuse paper, turn off the light, recycle waste, favoring the separate collection of waste or avoiding waste in general.

News and events are communicated through a dedicated webpage which is updated every week. Moreover, to spread news or actions rapidly we go through social networks such as Facebook. (UniFi: Ateneo Sostenibile)[18].

4. Sustainability report

Since 2016, the University of Florence has provided a Sustainability Report which is prepared in accordance with Global Report Initiative sustainability reporting guidelines, and provides an assessment of the financial, social and environmental impacts on the stakeholders of the University of Florence. The Global Reporting Initiative (GRI) produces the most widely used global standards for sustainability reporting worldwide.

The Florence University Sustainability Report 2020 is available [19].

5. Research activities and start-ups

Moreover, an average per year of ~3700 scholarly papers have been published in the last three years, the outcome of the excellent work of the UniFi researchers (Table 1). The largest production regards Goal n.3, “good health and well-being for people” with an average of 1,400 papers published in the last three areas.

Table 1: Number of paper published by the University of Florence in the last three years classified on the basis of the 17 SDGs.

| SDG | 2019 | 2020 | 2021 |
|--|------|------|------|
| Goal 1: No poverty | 22 | 60 | 30 |
| Goal 2: Zero hunger | 74 | 89 | 116 |
| Goal 3: Good health and well-being for people | 1430 | 1552 | 1320 |
| Goal 4: Quality education | 313 | 630 | 231 |
| Goal 5: Gender equality | 28 | 81 | 45 |
| Goal 6: Clean water and sanitation | 78 | 64 | 72 |
| Goal 7: Affordable and clean energy | 153 | 167 | 133 |
| Goal 8: Decent work and economic growth | 42 | 124 | 73 |
| Goal 9: Industry, Innovation, and Infrastructure | 483 | 523 | 208 |
| Goal 10: Reducing inequalities | 67 | 142 | 118 |
| Goal 11: Sustainable cities and communities | 233 | 391 | 206 |
| Goal 12: Responsible consumption and production | 87 | 145 | 102 |
| Goal 13: Climate action | 100 | 112 | 112 |
| Goal 14: Life below water | 46 | 47 | 72 |
| Goal 15: Life on land | 126 | 192 | 151 |
| Goal 16: Peace, justice and strong institutions | 119 | 272 | 134 |
| Goal 17: Partnerships for the goals | 23 | 71 | 37 |
| Total | 3424 | 4662 | 3160 |

Average 2019-2021: 3749

The academic expertise on sustainability is currently being taken outside to the industrial sector thanks to the start-ups. In particular, five start-ups have been found to address the Carbon Sink Group which helps every company enhance its contribution to fight against climate change.

Bluebiloba works to overcome the problems related to the fragmentation of forest properties by promoting the sustainable management of Tuscan and Italian forest resources.

Georisk Engineering operates in the fields of geoengineering and quantitative analysis of natural risks resulting from climate change, with the aims of developing innovative methods for analysis and design; Pnat Project Nature uses the comprehension of plant patterns and behaviors to inspire innovative design concepts and products, from the small to the building scale. This start-up aims at integrating plants within people's city, house and lifestyle.

Ecodrone offers highly customizable products and services for the monitoring of marine and lake basins and fresh water.

Fotosintetica & Microbiologica's (F&M) deep knowledge along with proprietary photobioreactor technologies (GWP®) and a collection of over 1,200 microalgal and cyanobacterial strains, makes it the ideal partner for starting applied research and commercial activities on microalgae.

6. European alliance

It is worth to be mentioning EUniWell, European university for Well-Being – UniFI which is one of the 44 European University Alliances, selected for a funding program by the European Commission under the ERASMUS+ programme in 2020. EUniWell is formed by the nine universities of Cologne (Germany), Birmingham (UK), Florence (Italy), Leiden (The Netherlands), Linnaeus (Sweden), Murcia

(Spain), Nantes (France) and Semmelweis (Hungary). Recently, the Taras Shevchenko National University of Kyiv from Ukraine joined EUniWell [20].

EUniWell organized the Mini COP26 at the headquarters of the British Institute of Florence [21]. In this context, the Education role strongly emerged since it should reshape the mindset, pushing the community towards the energy transition from fossil fuels. Education has the potential to make people aware of the increase in global warming due to human activities [22]. In the EUniWell spirit, during the Rectors' Assembly in Florence, the host planted seven trees in the UniFi garden. This is just a symbolic action to mitigate the release of GHG emissions of the guest who had come by plane.

A developing project, involving the representative of the RUS Subgroup "*Food*", the Science and Sustainability Shop together with the collaboration of EUniWell is represented by the introduction of an entirely vegetable menu in the university canteen. Making the menu 100% vegetarian, we reduced:

- the Carbon Footprint by 73.5% which corresponds to almost 440 kg less of CO₂eq;
- the Water Footprint by 42.8%, or more than 178,000 litres less.

Conclusions

UniFi is planning several activities: an event dedicated to the reduction of waste in the operating room on the occasion of the European Week for Waste Reduction; improving energy efficiency; and a GreenBook describing the best practices needed to minimize energy loss and to reduce waste in general.

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