

## Postgraduate studies and sustainable architecture

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**ABSTRACT:** Sustainability in architecture and construction is the principal contemporary topic discussed within the discipline. Meeting the requirements of the paradigm of sustainability in design and building technologies by architects and civil engineers is inextricably linked with an adequate professional knowledge and expertise. As this domain is relatively new and, therefore, still insufficiently based on experience, there is an urgent need for a relevant educational system designed for the graduates in architecture in order to make them knowledgeable in the field. One of the first postgraduate studies in Europe dealing with these problems started in 2014 at Cracow University of Technology, Kraków, Poland. The programme of these studies had been worked out by the Faculty of Architecture in collaboration with the Polish Green Building Council. It is based on a series of subjects comprised within a couple of modules covering a broad scope of problems like energy, ecology, environment, materials, climatic and legal aspects, management, etc. It also addresses the government's special requirements established for those who wish to obtain the right to assess the energy efficiency of buildings.

**Keywords:** Sustainable architecture, education in architecture

### INTRODUCTION

Architectural education should be subjected to constant modification, as it is in the case of other disciplines taught in architectural schools at universities or other educational institutions. New ways of designing, especially the so-called integrated design methods, have introduced innovative systems of cooperation between various participants of creative processes leading to the construction of buildings.

Another crucial aspect of the ongoing changes in this regard are new building technologies, which come so rapidly that practising architects are rarely capable of becoming familiar with them in a reasonably short time; therefore, their implementation in projects becomes too risky. Special emphasis is put on sustainability of designed buildings in projects. This new paradigm in architecture entails substantial modifications not only in designing methods for practitioners, but also has an impact on educational systems. They should include new knowledge concerning the non-standard ways of dealing with emerging problems in architecture, and town and regional planning that completely change the traditional philosophy of dealing with challenges of contemporary environment.

Many universities all over the world make efforts to adapt their teaching programmes and methods to these new challenges aimed at a better preparation of their graduates to meet these new requirements for architects and urban planners. Subjects and teaching modules are being modified or supplemented with the additional required bulk of new knowledge. This relates usually to Master programmes in architecture. Older graduates, however, are devoid of the opportunity to acquire new relevant skills and are insufficiently qualified. This puts them in an uncomfortable professional position and frequently eliminates them from the building market. The lack of educational offerings in this regard is detrimental for practising architects and planners, but also for some other professionals representing related disciplines. For them, the knowledge of new requirements for different aspects of environmental shaping has also become useful in the recent decades.

This gap in the educational systems cannot be filled at the Master's degree level, but rather in postgraduate studies, which allow not only graduated architects, but also other professionals to be admitted and to undertake supplementary studies. The Faculty of Architecture at Cracow University of Technology had perceived this opportunity and prepared a relevant offer, both for architects and other related professionals. A new postgraduate study entitled *Sustainable Architecture and Construction* started in 2012 and was continued in subsequent years, as later editions admitting new

students every October. At that time, this offer at the postgraduate level seemed to be quite new, if not the first one, within the European educational system.

## COURSE BACKGROUND

Postgraduate studies are designed either to extend the potential students' knowledge within their professional field or to offer them completely new skills helping to be more flexible and to gain a better position on the job market. Good-job-oriented students nowadays undertake their own research designed to find the kind of educational offer that is the most suitable for their future occupation. They treat it, quite reasonably, as an important investment giving them an edge over other graduates who are active in the search for a good job. This competition is making them calculate profits from enrolling in a given type of studies. They search for such an offer, which beside purely professional knowledge, would make them eligible for planned positions and even with an attractive employer. Highly appreciated are special certificates accompanying the completion of the study.

A chief asset of those who have completed the course is their right to avoid obligatory special ministerial examinations, which would make them eligible for obtaining the government licence for being an energy assessor for buildings. This document permits its holder to act on the building market as a specialist issuing certificates of energy performance for buildings. This sort of activity can be a source of basic or additional income for interested building professionals. The Polish building regulations stipulate that such a right can be granted to all licenced architects and engineers competent in building, including structural engineers, environmental engineers or others dealing with buildings without any complementing courses and examinations. But this right, and a relevant permit, can also be granted to other graduates of Bachelor programmes on condition that they have taken special courses and passed ministerial examinations in the subject. Exoneration from such courses can be obtained by the completion of the presented studies. The curriculum, however, should comprise all modules of the ministerial courses, and this requirement has been satisfactorily met. This is what makes the studies so attractive to students, and justifies their continuation.

## DEFINITION OF THE PROBLEM

At first view, it seems that the accomplishment of a suitable curriculum addressing postgraduate students should lead to no major problems for well experienced educators employed by universities, especially in disciplines related to dominating areas of teaching. The composition of the teaching staff is relatively easy, because the majority of them are in place and usually only few new instructors not employed with the university have to be involved to complete the staff capable of assuring the attainment of the principal objectives of the study. However, this simple vision has encountered some unexpected obstacles in this case.

The recruitment action was supposed to attract architects and graduates in other closely related disciplines. However, the reality proved otherwise. Some other professions, distant from the building sciences, also became represented and those candidates had to be enrolled. That was the result of ambiguity of the legislation concerning energy certification and the education of relevant specialists. This legislative inconsistency was a direct cause of problems with an adequate construction of curriculum for the study. Given all the defined aspects, its authors had to have an extensive discussion about the selection of the most adequate composition of teaching modules permitting an effective acquisition of specialist knowledge and necessary skills by multidisciplinary students, as well as about the ways of authentic involvement of non-building-educated students in the new discipline and making the educational method attractive enough to avoid dissatisfaction and dropouts.

## GUIDELINES FOR THE CURRICULUM

The issue of sustainable architecture has been discussed extensively for about 20 years. Many scientific papers and books have been published on the subject. It has become popular not only in the media, but also in educational systems at several levels. The bulk of these discussions, however, have been associated with institutions of higher education, starting with universities. In these debates, professional organisations like chambers of architects and other related professions are also involved. They organise specialist courses for their members to make them more competent and up-to-date on the challenges that sustainability in architecture and building create. The biggest advantage of these endeavours is making professionals fully aware of the scope and complexity of the issue. Sustainability is an issue that concerns many disciplines, architecture being one of them. By its nature, it comprises the entirety of fragmented knowledge within this idea, being a sort of a merger, given its responsibility for the shape and condition of the environment. This makes it difficult for the efforts dedicated to form a reasonable and effective curriculum for education in this field.

The curricula for the studies in sustainable architecture are diverse, as different are the schools of architecture. At the time of commencing the study discussed, there were a few schools in Europe or elsewhere that taught this discipline at an academic level. Basically, it was predominantly taught in Master programmes. Among those schools were:

- University of Nottingham (MSc Sustainable Energy and Entrepreneurship);
- University of Portsmouth (MA Sustainable Architecture);

- University of Sheffield (MSc Sustainable Architecture Studies);
- Norwegian University of Science and Technology- Trondheim (Master of Science in Sustainable Architecture Programme);
- University of Sydney (Master of Design Science Programme - Sustainable Design);
- Politecnico di Milano (Master Programme - Sustainable and Landscape Design).

It should be mentioned, however, that the postgraduate study at Cracow University of Technology means, basically, the study after completion of a Master's programme. Therefore, the curriculum must have been structured in a different way from the Master's programmes taught at other universities. Another inconvenience was the necessity to take the ministerial programme and to harmonise it with the resulting combined proposal. It must be said that the ministerial curriculum constitutes about 60% of the combined programme. The complimentary subjects added to that basis made the offer more complete and multifaceted.

The curriculum consists of 43 subjects, which are grouped into 11 comprehensive and cohesive modules covering all problems (Table 1), which architects and urban planners may need to deal with, and in which they have to be competent in diversified degree. This would help them to allow for all major aspects of ecology in their professional activity. Such competence is indispensable in contemporary designing, and is gradually becoming a professional standard. It permits architects not only to come up with valuable creative proposals, but also to meet requirements set up by building regulations in the majority of developed and even underdeveloped countries.

Table 1: Structure of the programme with teaching modules.

Modules	
I	Introduction
II	Legal aspects of the subject
II	Energy
IV	Materials
V	Water
VI	Users' comfort
VII	Climate
VIII	Integrated design of sustainable built environment
IX	Energy and ecological assessment of buildings
X	Management and education
XI	Final examination

Each module comprises from between one to six subjects, which generally fit its title. Among them are theoretical and practical subjects. For example, the module named *Energy*, which is the basic one, comprises the following subjects: Methods and Technologies of Energy gaining from Renewable Resources, Flow of Energy through Building Skins, Embodied Energy in Buildings, Energy Concepts for Buildings, Energy Concepts for Urban Complexes. According to university regulations, postgraduate study programmes should comprise a minimum of 150 teaching hours. The curriculum for the study in question contains 200 hours of teaching load and, thus, meets the minimum requirement.

The teaching method assumes that the students should become sensitive to energy issues during the course. It concerns not only building problems, but also the proper energy-conscious behaviour of building occupants. This is an important part of the teaching, which found its implementation in the organisation of *Energy Day*. Special demonstrations convincingly carried out in this regard would enhance the awareness of participants and permit to view the energy problems from different perspectives.

The ministerial part of the programme rightfully requires that every student individually carry out one certificate of energy efficiency of a building during the study. Having acquired this skill within the course, the students can prove this during a special non-conclusive examination dedicated to this issue. The final examination, concluding the study, encompasses the most important subjects and allows students to obtain the relevant certificate acknowledged by the Ministry of Building and Infrastructure.

The study is not easy for students, because it has a specialist character. If graduate architects and others, such as civil, structural, environmental or other engineers are expected to feel familiar with the considered problems, there are other professionals who can find themselves in a difficult situation in continuing the study. The truth is that according to ministerial regulations, every student having majored in whatever academic discipline, and graduated from a university, is eligible for this study. This gives them a credit as to their preliminary competence in the field of engineering sciences. This, however, raises serious competence-related doubts. It has been observed over a few yearly editions of the study that other professions, being relatively distant from engineering, have also been represented during recruitment. It is an interesting issue, and it proves that the topic of the study is attractive for many other professionals. Nowadays, sustainability is gaining more and more attention in societies, as it covers a wide scope of contemporary problems. No wonder that the representatives of different professions are deeply interested in enhancement of their knowledge in this regard. However, it is not only in their own interest that they get involved in the educational process of this kind.

Representatives of professions, such as lawyers, economists, facility managers and various municipal or community officers have also attended the courses. This gives an idea of special requirements that the curriculum must have met in order to fit the diversity of competence and skills represented by prospective students.

## REPORTED PROBLEMS

Given the obvious diversity in basic academic education of the enrolled students, the author could have expected some major problems appearing over time. Completely new issues, which for many participants were thoroughly unknown, turned out to be an interesting challenge. Therefore, there were no dropouts at all during the course. The freshmen in the discipline found the new knowledge useful in their professional activity. This probably resulted from their conviction about the importance of sustainability issues in many areas of contemporary life. However, some remarks have been reported on the part of all the students. Most of them were focused on shortcomings like:

- excessively extensive scope of the programme;
- repeating the same information by different speakers;
- repeating information obtained at university before graduation;
- disputed sequence of lectures within some subjects;
- lack of design charrette in the programme (expressed by architects);
- insufficient number of the built examples of green buildings presented during the course;
- very few visits on sustainable building sites;
- time needed for work on energy certificates too short (non-engineering professionals).

There were also some organisational remarks of lesser importance. It must be said, however, that general opinion about the study expressed by the students was positive, and they felt satisfied with the acquired knowledge.

## DISCUSSION

The definition of the problem and discussion carried out during the initial stages had led to an elaborate and apparently optimum curriculum. But the results of the first years of education turned out to be flawed, because of the appearance of imperfections, as the remarks reported by the students revealed. They indicated that there was a crucial problem in the poor link between the conveyed knowledge and the practical aspects of prospective professional activity that the graduates envisaged undertaking. This is an undeniable fault of the applied educational method, which has to be adequately dealt with in the future editions of the study.

The method adopted for the curriculum was intended to satisfy both building-educated students, as well as non-building-educated ones. This difficult objective required that the authors envisage the absence of a architectural and building design subject within the taught modules as these skills are strange to non-building-educated students. But, this approach has provoked some sort of dissatisfaction particularly on the part of architects, and made them signal the above-mentioned remarks. An obvious solution to the problem would seem to be to admit only architects and building engineers to the course. However, other interested professions would not have the option of achieving certificates of energy assessors to which they were eligible, due to the legislative situation.

Moreover, the building market needs professionals competent in energy and ecology issues who are also educated in such disciplines as law, economics, management or other similar professions, and they do not have to be competent in carrying out architectural or building designs. This reflects contemporary trends in the professional market, where interdisciplinarity becomes more and more expected and appreciated. The situation in this regard is growing to be even more complicated by important modification within some professions, including architects. This comes about as a result of integrated design methods involving many other engineering professionals within design teams in order to achieve more ecological and energy effective built environment.

On the part of the organisers, these remarks should be seriously taken into account, and the future results of the expected ameliorations in the curriculum to better satisfy the students should be closely monitored.

## CONCLUSIONS

Postgraduate studies are becoming more and more popular in Poland, along with doctoral studies. It is the consequence of governmental politics designed to raise the percentage of well-educated society to meet the demand from the country's economy to increase the supply of highly qualified professionals. This is particularly important in the case of sustainability-conscious employees, who could efficiently work or collaborate with other professionals to respond to new challenges on the market, energy and environmental issues in the first place.

Postgraduate studies play a regulatory role on the professional market by allowing a relatively quick adaptation of the workforce to emerging new professions and specialties. This is why they gradually gain in significance for young people seriously thinking about their future career. But they also play a substantial role for experienced employees permitting them to adapt to the emerging needs of the market, and to enhance and update their professional knowledge.

The situation on the educational market is constantly changing. New postgraduate studies, covering new emerging disciplines and occupations seem in many cases to be very attractive for potential students, and recruitment procedures give optimistic perspectives concerning their successful continuation in the next years. However, having terminated subsequent editions, some first signs of a downtrend have started to be signalled. This should be treated as a slowly fading attraction of the educational offer, and it should be taken seriously by organising schools. This is a moment in which a new proposal should start to be preparing.

Changes in the demand for new skills and expertise have a constant character, just like new emerging innovative technologies and organisational systems. Postgraduate study providers should take it into account, and to analyse the market constantly in order to avoid inadequate educational offers. Dwindling demand for studies in sustainable architecture is not yet the case, but in view of the increasing number of schools offering postgraduate studies in this area, they may soon face the above-mentioned problems of a diminishing number of candidates. Therefore, it would be advisable for them to be vigilant in this respect, and to be properly prepared for new educational challenges.

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## BIOGRAPHY



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