Design workshops and the circular economy

Elżbieta D. Ryńska

Warsaw University of Technology
Warszawa, Poland

ABSTRACT: Civilisation has developed based on an assumption of abundance with access to resources often treated as a marginal issue. A circular economy may prove more sustainable than a linear economy, as it emphasises reliance on resources, and preserving water and energy. Included here are assumptions as to design and management applicable to interdisciplinary design, initially in educational curricula and later in the architecture profession. Selected outcomes of the study discussed here are based on conclusions drawn from design studios and workshops supervised by the author, and with academic staff at the Faculty of Architecture, Warsaw University of Technology (FA-WUT). Outcomes include those of a workshop run in October 2019 with Menno Rubbens from Dutch architects *cepezed*. The educational approaches encompass regenerative and circular solutions, and should be considered more as issues under research than as final conclusions. The findings of the education theme is that the changing approach to design should be taught at university level, because students at that stage are much more flexible.

Keywords: Circular development, architectonic design, education, circular economy, regenerative and circular solutions

INTRODUCTION

The focus of this article is on design curricula being implemented in the Faculty of Architecture at Warsaw University of Technology (FA-WUT), Warszawa, Poland, and which should lead to the introduction of circular economy solutions in the building construction sector. The issues were perceived from the point of view of designers (engineering architects). The outcomes of the study were based on various experimental approaches to design studios and workshops. Implementation of these approaches requires adequately structured programmes in education which, for this discipline, do not have uniform standards. Most of the current education curricula are focused on traditional studies in engineering and business from the perspectives of a linear economy [1].

The Netherlands is the global leader, where the circular economy is concerned, with Delft University of Technology (TU Delft) having the widest scope of *circular* teaching subjects. The Dutch focus is strongly on system thinking and design [2]. Finland has a differing approach, with strong emphasis on collaboration across sectors, both in education and industry.

Studies on the circular economy are included at post-diploma level in the MBA Centre for Environmental Policy and the MBA in Sustainability at Bard College in the USA. Curricula cover circular and sustainable development and aim to train students in the management of chain supplies, client engagement and possible modifications, according to future circular economy conditions [1]. Staff at the Brazilian University of Sao Paulo co-operate with those at the National Industrial Confederation for a Circular Economy, which includes stakeholders from the bio-energy, food, textile, electronic, plastics and construction sectors. With the Ellen MacArthur Foundation, in Cowes, UK, they have established within education four pillars for a circular economy. These are business models consisting of: the circular design, reversible cycles, activators and systems. Circular economy issues were introduced into the curricula of the UK's Cranfield University Design (MDes) programme, where teaching is based on a *design thinking* method and practical workshops [3].

Design of circular systems in manufacture processes is also visible in the Master's theses presented over the past few years at the Technical University of Delft and the FA-WUT, where, over four years, circular issues became a leading theme in Master's theses [1][3-6]. Emerging subjects connected with the circular economy are to be found in many individual schools of architecture and urban planning. This concept is becoming of interest in numerous education

centres and universities. Education is the key to challenging the present linear economy perspective, and it should inspire and change the existing approach. Nevertheless, there is still a problem as to teaching the circular economy and which disciplines should be included [2].

It should be noted that the circular economy is not a new concept, because *reuse* has been in place since the beginning of human civilisation. The Industrial Revolution and the era of the linear economy based on high abundance of goods overshadowed this initial reuse. The reuse process should not be treated as a choice through poverty, but more as an emerging awareness. Possibly, one of the future directions is internationalisation and globalisation of the ideas, as only a global approach is possible.

Kenneth E. Boulding, an economist (among other things) discussed in the mid-20th Century the issue of development with unlimited input resources and output sinks. This was in contrast to the *closed economy*, where both resources and sinks form an integral part of the economic system managed similarly to a living system [7].

In 1976, an EU Commission report, The Potential for Substituting Manpower for Energy, presented an outline of an early circular economy [8]. In this, the circular economy was based on natural systems, where all biological and technical material can be reintroduced into the development cycle. In 1989, in the article, Economics of Natural Resources and the Environment, British environmental economists R. Kerry Turner and David W. Pearce pointed out that the traditional linear economy treats the environment as an unlimited waste reservoir.

The contemporary circular economy approach includes the concept of closed loops. This includes, but is not limited to, regenerative design, biomimicry and the blue economy. This concept is highly influenced by the Hannover Principles, published in 1991, known as the Cradle to Cradle (C2C®, 2CC2, C2C, cradle 2 cradle, regenerative design) protocols or standards [9].

The contemporary circular approach has system innovations and non-standard management procedures. It is a reconfiguring of products and services in such a way as to eliminate waste and harmful substances. It uses alternative energy resources and materials, closed loops for substances and employs social, as well as environmental capital [10]. Basically, it separates social and economic development from the consumption of non-renewable resources. It aspires to achieve *best case* procedures for productive tasks through efficient use of locally accessible sources, renewable and biodegradable or recycled materials. It enhances the efficient use of resources through reuse of the materials within technical and biological loops. It also allows development of efficient systems, identifying and eliminating negative external influences (e.g. reduction of waste).

SEQUENCE

Recent years have brought a rise of public interest in environmental and sustainable development. Discussion is mainly on the manufacturing of plastics, food and transport. The construction sector's influence on the environment is visible only to a minor degree. However, statistics show that the building industry is a major user of resources, a major *manufacturer* of waste and emits high levels of greenhouse gases (GHG) [11]. But this particular activity also generates high income. This leads to the conclusion that even minor changes in moving the building industry towards sustainable development may result in useful global improvements. The policies of many countries point toward, at the *implementation level*, a sustainable construction industry. In some, like Poland, it is less advanced both practically and in education.

Circular construction appears to be the best-case solution to the problems of waste in the linear economy, which should still produce economic profits. It is also a more sustainable approach than the present linear economy [12], even if there exists a group of researchers who analyse only inconsistences and strongly criticise this approach [13]. In short, the circular model relies on an extended loop-use of resource capital, which maximises their economic value. This is a vision different from the product contemporary standard life cycle, where the end product mostly is waste. The building sector, with its durable set of products and high possibility of adapting, repairing, modernising and resale, seems to be an ideal area for implementing a closed-loop development model. Unfortunately, this industry also is slow to accept changes, and within the past decades not many ground-breaking transformations can be found [11].

Buildings are characterised by features, such as durability, potential for modernisation and further reuse. Therefore, these predispose them toward the implementation of circularity. Yet circular concepts can be perceived only in the earliest life cycle phases and, even then, the potential loops usually are not closed even if the life cycle of products is extended. This is surprising, as implementation of circularity would allow for much better resource productivity and lower environmental impact.

In some European countries, attitudes already are changing. For example, the Royal Institute of Dutch Architects has formulated a guide for designers: Manifesto of Circular Architecture [14]. This document includes information divided into five points that suggest architectonic design is the starting point where circular construction is concerned. Hence, architects, engineers and urban planners are the professionals working in an area where this idea should be implemented.

As well, Professor Walter R. Stahel points out that the contemporary building industry faces a triple challenge of: less waste during every phase; flexibility and efficiency of design, where building materials are concerned; and provision of new managerial approaches enabling maintenance of resources [12]. There are two further challenges [6]. The first deals with the requirements to introduce new education for all those involved in design procurement and construction in the building industry, with emphasis on circularity and aesthetics. The second implies a need for wide education of societies, to create a general awareness and understanding of responsibilities.

General assumptions initially were introduced in 2014 for the various design studios conducted at the FA-WUT and developed later on. The initial programme opened in 2018 as the Integrated Design of Efficient Architectural Solutions (IDEALS), an English version of Bachelor's studies accessible both by foreign and Polish participants. Compared with the still-operating Polish curriculum in engineering studies in the FA-WUT, the programme was regarded as innovative. The scope of proposed knowledge enabled the acquisition of skills in identifying cultural values alongside the application of efficiency measures.

Special attention was paid to circular economy solutions in building projects, architectural design and urban planning, including the harmonious location of designed volumes within existing surroundings. The main studio is conducted as an *atelier* (workshop or studio) under the guidance of academic teachers. All design subjects, interdisciplinary lectures and seminars form a unified educational block for students studying semesters 1 to 4, with a possible additional selection of workshops and interdisciplinary seminars during semesters 5 to 8, depending on individual choice and areas of interest.

At present, with the new state-enforced changes to education programmes, where design studios must take at least 50 percent of all teaching hours, part of this curricula will be introduced as a new educational programme dedicated to all students starting from September 2020. It will include implementation of practical professional use of sustainable and circular development solutions.

RESULTS FROM THE DESIGN STUDIOS AND WORKSHOPS

The design studios and workshops presented below have been chosen based on their important outcomes. In 2014, WUT introduced at Master's level a three-semester interdisciplinary course for students from different disciplines, also associated with the building industry. It was a set of pilot studios where architects, environmental and structural engineers worked together on projects brought into the FA-WUT by external clients. Studios were supported through a set of lectures and seminars leading to sustainable and circular solutions, EU legislation and management of the building process.

Even though the students were working on concept design, data presented also included themes showing the potential final schematic outcomes of their early decisions during construction, use, possible modernisation and the building's life cycle. Strong emphasis was placed on individual research on reuse and recycling of both complete structural elements, their components and finishing materials. Attention also was paid to the analyses of the building's location on the site and parameters that could influence the building's energy requirements. Daylight issues and natural ventilation also were included as valuable assets when massing (developing) the concept, but the choice as to scope and types of solution was left for students to decide. Software programs provided also allowed students to check if, and how, the layout of the designed spaces might determine more efficient energy demands, and whether there may be some secondary sources of heat gains to be reused [15].

Each of the studio sessions started with a client meeting, who presented their idea as to the site, function and programme of the proposed building. Next came an individual check of the site, urban context, characteristic morphology, and green and blue infrastructure. Regular meetings were held with academic staff and consultants: urban planners, environmental engineers, landscape architects and, if required, architects dealing with historic surroundings. A client meeting was held once every two months, to present and discuss the outcomes of students' designs.

Project 1

The first project took place in 2014 and was prepared by a group of fourth year Bachelor's students of architecture, as a semester analysis undertaken at the request of the local authorities representing a suburban Warsaw district. At the time introduced in Poland were the first legal changes enforced from 2013, which indicated local authorities were the parties responsible for collecting selected waste from inhabitants. Since there was no previous implementation history, staff at WUT were requested to prepare a brief for a typical point for selective collection of communal waste. Their approach was simple and included a small office from where to arrange the collection of different types of waste.

Students first prepared an analysis of the waste approach in other countries and, based on their findings, evaluated local perceptions. Their approach included wasteless management of building materials, which included upcycling and preparation of Local Harvest maps, as well as the promotion of Fab Lab. They also proposed children's education, and a flea market where inhabitants could sell directly any unwanted materials. Semester designs often showed innovative architectural solutions, which included the reuse of locally harvested building materials [15].

This proved too innovative for the local authorities, as the idea of circular choices was not understood. The proposition was perceived as requiring more time for preparation, and more expensive. This attitude confirmed that the introduction of any new approaches or solutions would have to be made in line with user and contractor education workshops.

Project 2

The second project was developed as a semester studio at Master's level in the FA-WUT, and included co-operation with the representatives of the Warsaw Copernicus Science Centre (2014/15). The proposed site adjoined the existing Centre, where an underground parking lot was located. This area remained unused, as the client decided an entrance ramp would collide with other functions, and that the number of parking spaces was too few to create a service support for the existing building. The client wanted a best-case scenario for a new laboratory building and presented a detailed functional scheme, which became the backbone of later studies. The students were to decide whether to repurpose existing structural elements and, if so, with structural engineers, check the local bearing capacity, where a new structure was proposed. Much attention was paid to the introduction of recycled materials and alternative energy sources [6][15].

The proposed solutions revealed a series of compact - cube-like - volumes, with differentiated aesthetic features and various building materials. Other solutions included rectangular buildings, often terraced with many green roof spaces and green walls, as well as high use of daylight features. The students were asked to emphasise circular energy solutions. Most of the proposals were prepared within the budget proposed by the client, and the return on costs were not to exceed eight years. A collage of two of the proposed solutions was used to prepare a client's brief for a competition announced later, and included strong emphasis on the reuse of existing structural members and other building materials [6][15].

The outputs of the studio proved the students were not accustomed to working with a modification to an existing structure. Such an approach was a novelty to them, since most of the studios (apart from historic buildings) deal both with new buildings and new building materials. Most of the teaching hours were dedicated to interdisciplinary design, as structural engineers had to work with the design from its initial stages. The conclusion was that the academic curricula did not provide enough emphasis on reuse and repurpose issues, nor on interdisciplinary approaches.

Project 3

The final project took place in October 2019, in Warsaw. It was a workshop entitled Circular Design for Architects and formed a part of Warsaw Circular Week (7-13 October 2019). It was prepared with the support of architect Menno Rubbens from the Dutch architect studio, *cepezed* (sponsored by Dutch enterprises). The aim of holding the workshop was to create designer awareness of regenerative design, on an urban architectural scale (Figure 1 to Figure 4). This means the students were required to [6]:

- Sustain and preserve what is already available on the given site and include circular choices where possible.
- Use existing waste as resource: utilise waste streams for possible circular reuse and recover waste for further reuse and recycling.
- Design for a circular future for the site: adapt a systematic check during the design process to employ best-case durable building materials with 3R; that is, with a 'reduce, reuse and recycle' scheme in place.
- Utilise teamwork and interdisciplinary approaches to create synergy.

The chosen site was part of Warsaw: a mixed-function area used by multifamily dwellings and small industrial enterprises. Students were divided into two working groups. One dealt with possible industrial material flows and circularity on the urban level. The second, with students divided into pairs, had each undertaking a design of a multipurpose building on a site of their choice. The workshop had thematic lectures and presentations dealing with circularity and sustainability. Part of the task was a small integration workshop run by a representative of the NGO, the Institute of Innovation and Responsible Development INNOWO, in Poland. The urban group focused on small industries covering circa 50 percent of an area. They opined:

- Many functions in the area are related to the automobile industry (vulcanisation, sale of car parts, oil and metal recycling processes); various unused new and waste materials were found on the industrial plots.
- Pedestrians' communication was not well provided for; traffic high noise levels and an excess of random irregular parking lots and wastelands, without organised park and ride facilities; the implication also was that the area was not well invested in; no evidence of organised green and blue infrastructure was found**.**

The design stage allowed the development of the core solutions shown below:

- Concept for provision of management for the circulation of goods within the district (with special emphasis on existing small industries).
- Introduction of complementary functions supporting loop-solutions: car dealers, provision of a small harvest area with unused materials from factories, a place for dismantling cars, second-hand car parts, logistics and laboratory centre, car tyres and plastic processing.
- Creation of loops and complementary links between existing and planned functions: industrial, housing and public.
- Change of function for numerous, unused warehouse and storage areas.

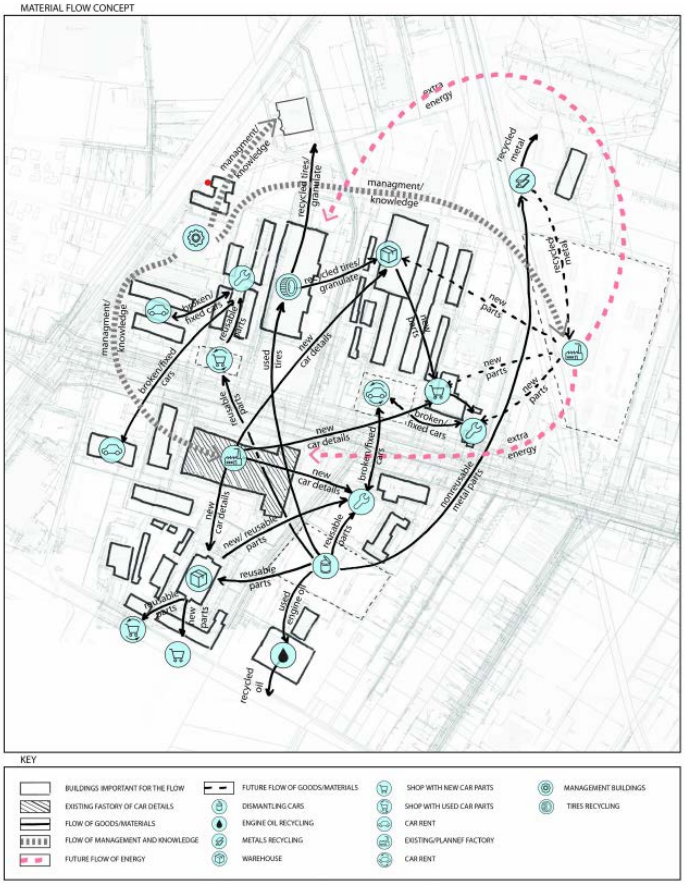

Figure 1: Material flow concept. Circular Workshop. Participants: G. Chechlacz, A. Jezierska, M. Kubasińska and K. Rytel (Faculty of Architecture, WUT, 2019).

The large-scale outcomes included introduction of a communication core, and a belt surrounding the development area where functions are designed. The solution also included a street grid inside the core loop area to be used for internal interaction. Students presented a car-sharing system with electric cars and placed it in the vicinity of the communication node, next to the suburban railway station. It was pointed out that a bus lane along the main throughway, when also admitting electric cars, may prove more efficient than other possible choices. Another concept featured two important areas with a prevailing soft green surface and included the possibility of water retention to improve the zone's microclimate parameters.

Otherwise, the need for more intensive green areas (belts) along main streets were pointed out. The idea included the introduction of buildings for temporary services and/or for rent for small business: modular, adaptable building (i.e. from containers), built according to the principles of the circular economy. An undeveloped site was designated for automotive industry use and included a management circulation concept of industrial goods within the area of the district.

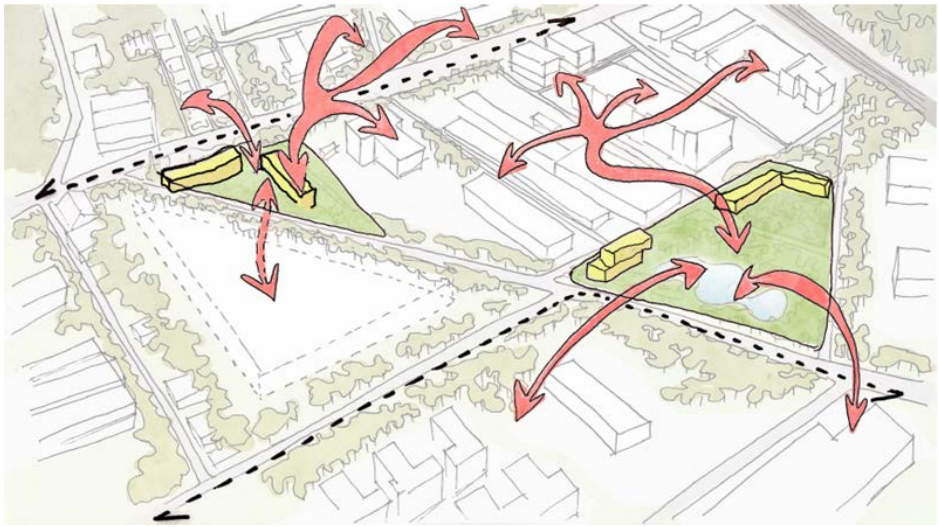

Figure 2: Main integration hub concept. Circular Workshop. Participants: G. Chechlacz, A. Jezierska, M. Kubasińska and K. Rytel (Faculty of Architecture, WUT, 2019).

The comprehensive circular complex was based on industrial functions, with emphasis on the automobile industry. This was further supported with the introduction of complementary functions. Solutions included a provision for loops to be developed between existing and new functions. A circular design of specific buildings focused on environmentally friendly architecture. Sustainability meant using the best available technologies and methods to reduce contamination and resource use throughout the entire life cycle of a building. The promotion of good health and environment choices also featured.

Proposed design solutions included planning for the entire life cycle of a building, spanning across the design, construction phase, demolishment and reuse of materials once the building has served its purpose. It was also emphasised that architects should feel responsible for future urbanisation choices and consider solutions of every building detail, from the concept stage of the design process. Interdisciplinary thinking ensures diversity, which makes the building sector adaptive and ensures reuse perhaps in a different form in the future.

The students' concepts also included approaches where, during design, architects should look for solutions in which a maximum result can be achieved with a minimum of effort, materials or installations. By following the example of nature, designers should create buildings that function well without improvement, i.e. a maximum of results with a minimum of effort. One of the main aspects during design is to achieve an adaptable structure which, in turn, allows for durability. However, it was noted that, in today's world, buildings change their function and purpose quite frequently. Taking this into account, architects should design flexible buildings that could be easily repaired or replaced.

For the workshop participants, circular improvement in architecture was easy: a use of modular systems that easily could be assembled and disassembled. Many components or materials could be recovered, reused or recycled, rather than being landfill. Material selection being one of the most important factors in design, the points below should be noted:

- All materials have specific physical properties, such as density, thermal conductivity, resistance and permeability.
- An appropriate selection of products could make a significant contribution to the environmental impact of the building.
- Sourcing renewables; in the best case non-toxic materials will increase reuse and recyclability, and ultimately will allow materials to become part of circular management, thereby acting as *input* for manufacture of new materials.

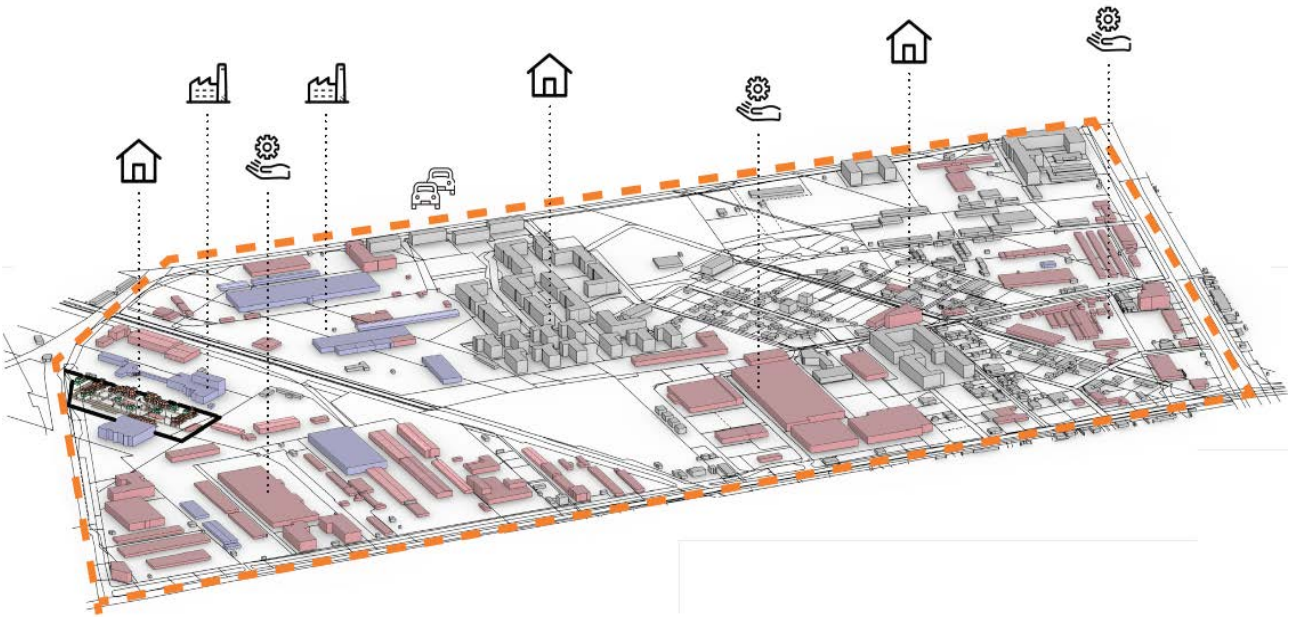

Figure 3: Concept proposition for a multifunctional area, site development. Circular Workshop. Participants: K. Marciniak and A. Warowna (Faculty of Architecture, WUT, 2019).

The main focus on the design of buildings was sustainable and circular buildings, starting from the concept stage and continuing throughout the life of the structure to eventual deconstruction and recycling of resources. Students became aware that urban scale investment may influence the global climate and environment. The circular economy offers tools to allow urban areas stable and long-term growth. To understand this, both designers and users must think of a city as an independent organism that has unique local parameters and resources.

Within this circular transformation, there still is an unanswered question as to the scale of proposed loops [16][17]. Contemporary construction allows achievement of nZEB (nearly zero-energy buildings) and PlusEnergy buildings that have been designed, constructed and utilised based on loop assumptions and energy drawn from alternative resources. Still, as the workshop has shown, in many cases closed energy, water, building materials or services within a single building might prove impossible or not effective.

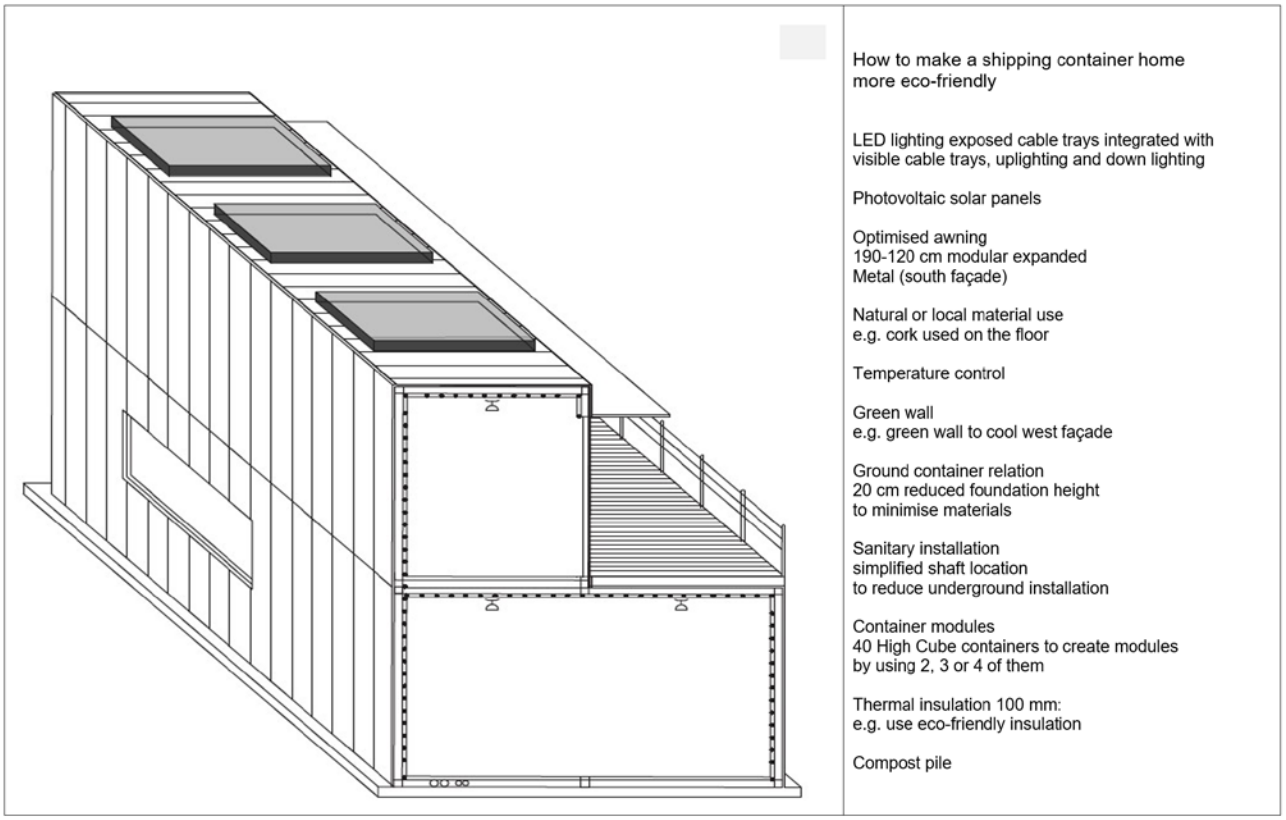

Figure 4: Concept proposition for a multifunctional building, based on a shipping container load-bearing structure. Circular Workshop. Participants: K. Marciniak and A. Warowna (Faculty of Architecture, WUT, 2019).

Therefore, a search for relations, synergistic exchange of *surpluses*, circular services between areas with different characteristics, function and morphology should become the new mantra of urban planning and architectonic design [18]. Hence, workshop participants decided that architects represent one of the professions responsible for the future of city development. This approach proved that implementation of circular thinking in engineering architecture is possible at the level of education when professional rigidness is still undeveloped. The outcomes show this is an area still being researched and is a good option for further development in education curricula.

CONCLUSIONS

Circularity is still under development. Optimal design of closed loops should result in a reduction of waste and increased economic value. The main concern is whether these circular solutions can be realised in practice; research indicates that the circular economy in Europe is very much in its infancy [5]. Even if implementation of a circular model in the construction industry is economically and environmentally viable, it still must pass several barriers, such as education, establishment of circularity benchmarks and preparation of sound data allowing the tracing of material flows. Since building materials mostly are durable, one possible problem is the recycling of materials coming from different time periods, manufactured to different standards, often with the use of components later forbidden [18].

This state, complemented by the outcomes from studios and workshops, underlines the weakness in the present teaching of circularity at the FA-WUT. Most noticeable was the detachment of seminars that deal with professional areas, such as building materials design and pre-feasibility analyses from design studios. Students either work on design solutions provided by the teachers or on their own designs from previous semesters, which means they cannot achieve a holistic approach to design. Furthermore, the students are not mobilised to search for individual solutions. Other seminars, such as building codes, sustainable development and urban planning are also viewed as being *cut off* from design.

Even during the preparation of diplomas, building detail and building physics, structural solutions, landscape architecture or historic heritage values are considered to require additional consultation hours, and not be an integral part of design. Therefore, innovative thinking should be implemented from the first semesters of design education.

Another weak link is insufficient contact with professional practice. First contact with a construction site takes place only after the fourth semester, and it is only then that the students begin to understand the knowledge of earlier seminars. One of the solutions is to establish a semester programme, where students prepare a holistic concept design that includes technical solutions. There is already a trial with a small group of students from the Faculty of Architecture, who form working groups with students from the Faculties of Civil Engineering and Environmental Engineering. This was mentioned earlier as a pilot approach to design, and was modified in 2017 to become the BIM Design Studio, where the full scope of design and urban issues is analysed.

The new programme, which will start in October 2020, will include a change in the teaching structure and possible modification to *an atelier type*, where a semester design will include seminars and lectures containing a full scope of issues accompanying professional design. The idea is that the issues scoping reuse, repair, remanufacture and refurbishment will be included within the teaching hours allotted to each semester design studio. It is obvious that the education curricula at present do not reflect enough recycle processes and management of building waste.

Therefore, relevant curricula implemented in the programme will include: data on technologies allowing for building self-support; circular building material technologies; reuse and upcycling processes; recycling and industrial symbiosis; modular and prefab approaches. Possibly, transformation at the industrial level may be further supported by a well-educated group of professionals, who will understand the need for circular development as part of their professional curricula.

REFERENCES

1. Ellen Macarthur Foundation, Higher Education Programme Version 2. Circular Economy and Curriculum Development in Higher Education. Briefing Notes, Support and Illustrative Resources (2017), 14 January 2019, www.ellenmacarthurfoundation.org
2. Forlslund, T., Clinton, N. and Webster, K., A Global Snapshot of Circular Economy Learning Offerings in Higher Education. Ellen MacArthur Foundation (2018), 03 January 2019, www.ellenmacarthur.com
3. Circular Economy. Unfolding the Science of Systems. 15 January 2020 www.cranfield.ac.uk
4. European Environmental Agency (EEA). Circular by Design - Products in the Circular Economy. EEA Report no 6/2017 (2017), 02 May 2019, www.eea.europa.eu
5. European Environmental Agency (EEA). Paving the Way for Circular Economy: Insights on Status and Potential. EEA Report no 11/2019 (2019), 02 October 2019, www.eea.europa.eu
6. Ryńska, E., *Developing and Designing Circular Cities: Emerging Research and Opportunities.* (1st Edn), IGI Global Disseminator of Knowledge, 165-178 (2020).
7. Jarrett, H. (Ed), *Environmental Quality in a Growing Economy*. Baltimore, MD: Resources for the Future/Johns Hopkins University Press, 3-14 (1996)
8. Stahel, W., *Performance Economy*. London: Palgrave Macmillan (2006).
9. McDonough, W. and Braungart, M., *The Hannover Principles. Design for Sustainability*. (10th Anniversary Edn), William McDonough & Partners (2003).
10. Ellen MacArthur Foundation, Growth within a Circular Economy, Vision for a Competitive Europe (2015), 6 November 2018, https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthur Foundation_Growth-Within_July15.pdf
11. UN Environment, towards a Zero Emission, Efficient and Resilient Building and Construction Sector. Global Status Report 2017. Global Alliance for Building and Construction, International Energy Agency (2017), 12 September 2019, www.worldgbc.org
12. Baker-Brown, D., *The Re-use Atlas. A Designer's Guide towards a Circular Economy*. RIBA Publishing (2017).
13. Lacy, P. and Rutqvist, J., *Waste to Wealth. The Circular Economy Advantage.* New York, NY: Palgrave Macmillan (2015).
14. BNA. Royal Institute of Dutch Architects. Manifesto Circular Architecture (2018). 15 May 2019, www.dutcharchitects.org/we-are-going-circular/
15. Ryńska, E.D., Interdisciplinary training within the education curricula for architects and engineers. *Global J. of Engng. Educ.*, 18, **3**, 202-206 (2016).
16. State of Green, From Linear to Circular Economy. Experiences from Denmark and New York on Closing the Loop through Partnerships and Circular Business Models (2018), 05 November 2018, www.stateofgreen. com/en/publications
17. Ellen MacArthur Foundation, Circular Economy in Cities (2019), 11 May 2019, https://www.ellenmacarthurfoundation.org/ publications/circular-economy-in-cities-project-guide
18. Addis, B., *Building with Reclaimed Components and Materials*. London, GB: Earthscan (2006).

BIOGRAPHY

Elżbieta D. Ryńska is a Professor (PhD Eng. Arch.) presently working in the Faculty of Architecture at Warsaw University of Technology (FA-WUT), Warszawa, Poland. Her main interests include sustainable development in urban planning and architectonic design, efficient energy management in design and construction process, linear and circular economics in construction and planning, and resilient cities. She is the author of many books and papers; is a promoter of diplomas and PhD dissertations; and recipient of various EU grants. Professor Ryńska also is a self-employed expert for various companies both as a PM and as an environmental specialist (BREEAM AP, WELL AP). Professor Ryńska is the co-ordinator of IDEALS: Integrated Design of Efficient Architectural Solutions, an English version of Bachelor's studies in the FA-WUT, and an initiator of various workshops and international conferences. She supervises many Master's theses and PhD dissertations in sustainable architecture and urban planning.