Future cities' architecture, architecture for active and healthy ageing

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Abstract
Preamble: The worldwide trend of population ageing and in particular at European level produces paradigm shifts from which architecture is not an exception. According to UN, the percentage of older people (65+) will increase from 9% in 2019 to 16% in 2050 At the European level, the ageing trend is even more pronounced, in 2050 it is estimated that the percentage of older adults will reach 28%. This trend of demographic ageing is accompanied by the trend of urbanization.
Objective: The paper investigates interdisciplinarly the way in which the architecture of the cities can intelligently support an active and healthy ageing, bringing into discussion the perspective of the age in the architecture.
Preliminary studies: The paper starts from the relation of the concept of age-friendly with cities, architecture, communities, public space and is based on a critical appraisal of the literature in this research niche.
Materials and Methods: The research is interdisciplinary, architecture-medicine-psychology-social gerontology-kinetotherapy, describing the aspects of ageing that architecture must take into account. Case studies are used, moving from residential to public space.
Results: The present research proves the importance of the built environment both urban level and architectural object for a healthy lifestyle and a continuous participation in the city life. Models of good practice in Western Europe that provide opportunities for health, participation and security are revealed.
Conclusions: The perspective of the age in architecture represents a change of paradigm essential for adapting the cities of the future. It is imperative the built environment to take into account the new age pyramid, to support the extension of active and healthy life and to contribute to the compression of morbidity. The architecture of the future'a cities should encourage active ageing, optimizing the opportunities for health, autonomy, participation and security in order to increase the quality of life and well-being.

Keywords: built environment, quality of life, participation, interdisciplinarity.

1. Preamble
The ageing population trend worldwide and in particular at European level, produces paradigm shifts from which architecture is no exception. According to UN, the percentage of older people (65+) will increase from 9% in 2019 to 16% in 2050. [1] In 2018, for the

first time in history, persons aged 65 or above outnumbered children under five years of age globally. [2] At the European level, the trend of demographic ageing is even more pronounced, in 2050 it is estimated that 28% of population could be aged 65 or over. [1]

We are witnessing an aging process of the population that must be made aware, and also considered by architects, for a design adapted to the specific needs, personalized. [3] Gerontologists talk about the feminization of aging, a phenomenon that has an impact on the design of social programs. If in Europe the average life expectancy is 83,3 years for women, it is 77,9 years for men. [4]

Speaking about the distribution of population over 60 years by location (Fig. 1) it is estimated that in 2050 Europe will be on the first place with more than 30% of the population over 60, on the last place remaining Africa with only 10% of people over 60 years (life expectancy unfortunately remaining low compared to the European average and even the global average). [5]

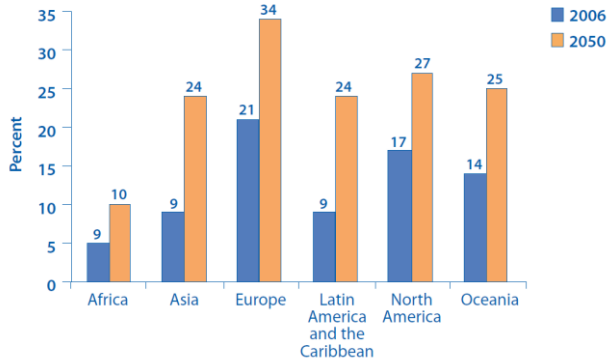


Fig. 1. Percent distribution of world population 60 or over by region, 2006 and 2050
Source: https://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf

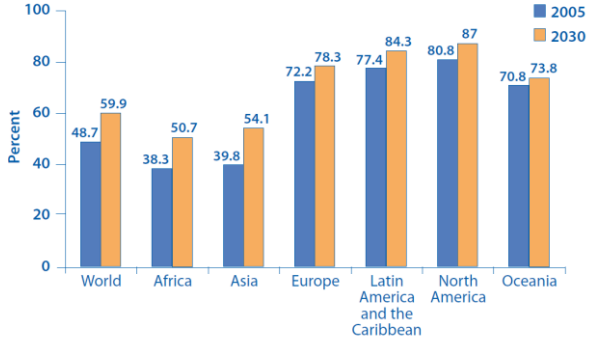


Fig. 2. Percentage of urban population in major areas
Source: https://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf

Regarding the urbanization (Fig. 2), it is estimated that in 2030 Europe will occupy the 2nd place in the world with a percentage of almost 80% urban population, the 1st place being occupied by North and South America.

Also when we talk about urbanization, Africa is still in the last place with a percentage of about 50% urban population, again below the global average.[5] Europe will therefore face a significant change over the next 30 years, the average age increases significantly and cities must respond to this aging trend of the population.

Romania is a country with a population 19,53 Mlns of people. [6] Life expectancy at birth was estimated to be 75,83 years in 2020 [1], with proportion of population 65+ being 18,5% in 2019 [7]. It is estimated that the proportion of population 65+ will increase to 21% in 2030 and to 27,7% in 2050. [1] 53,8% of Romanian citizens live in urban areas. [6]

2. Objective

The paper investigates interdisciplinarly the way in which the architecture of the cities can intelligently support an *Active & Healthy Ageing*, bringing into discussion the perspective of the age in architecture.

3. Preliminary studies

This research starts from the relation of the concept of *age-friendly* with cities, architecture, communities, public space and is based on both bibliographic research and the professional experience of the authors in this research niche.

To begin with, we consider it is important to define the interdisciplinary concepts that we will work with in this paper. According to WHO 2002, *Active Ageing* is defined as the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. The three determinants of Active Ageing are participation, health and security. If the concept of *Active Ageing* is about quality of life, the newest concept, *Healthy Ageing* brings a change of perspective and it is related to the notion of wellbeing. *Healthy Ageing* is defined as the process of developing and maintaining the functional ability that enables wellbeing in older age. [8] When we speak about *Healthy Ageing* we do refer to cognitive training, physical exercises, diet, spirituality, counseling and participation.

Assessing *Healthy Ageing* is an important topic. In regards to health assessment of older persons, broad assessments of functioning are far better predictors of positive outcomes than a single disease or even the extent of multi-morbidities [8].

"***Functional ability*** *is about having the capabilities that enable all people to be and do what they have reason to value"* [9].

According to WHO, functional ability depends of two parameters, the intrinsic capacity of the individual and relevant environmental characteristics. Therefore, we are talking about the individual's ability to be independent but also of the environmental characteristics in which he lives and carries on his activities. *Functional skills, both motor and cognitive,*

social skills can be trained or improved through various activities such as games that focus on movement or team sports. The role of these activities is to contribute both to personal strengthening but also to the connection of individuals as necessary when the challenges can be overwhelming and only in the group can be overcome.

"Healthy Ageing is about creating the environments and opportunities that enable people to be and do what they value throughout their lives" [9].

Therefore, the importance of the environment is recognized by the WHO as being particularly important for maintaining functional skills for an independent life.

4. Materials and methods

As we have shown before, the aging process of the population is accelerated especially in Europe, the importance of the environment for maintaining the functional abilities as long as possible are the considerations from which this interdisciplinary research starts. The built environment means architecture and an architecture of the future society is the architecture intended for users who will live longer than the previous generations. A longer life does not necessarily means a healthier life. Old age is accompanied by an increased prevalence of frailty (an age-associated state of vulnerability for health problems present in older persons) and co-morbidities, but the process of aging does not determine per se frailty or co-morbidities [10].

In this context, a paradigm shift in architecture is absolutely necessary, the consideration of a new dimension, the age dimension in architecture. This age dimension in architecture requires team work and an interdisciplinary approach.

"By introducing the human ageing process as a design criterion in the creation of architecture, it becomes evident that architectural space has different meanings within the different fields of research" [11].

The architect needs to understand the changes that occur as we get older in order to properly design with the user's abilities. This means teamwork, collaborating with medical doctors from various specialties (geriatricians, psychiatrists, neurologists, medical rehabilitation), psychologist, sociologist, social worker, kinetotherapist, specialists in welfare and intelligent technology.

There is a very strong connection between *Built Environment*, *Active & Healthy Ageing* and *Quality Of Life*. *Built Environment* is a determining factor for the health of the elderly and can be a catalyst for *Active Ageing*. When it comes to the frail elderly, a built environment adapted to age-friendly principles is essential. Also, *Quality of Life* is directly influenced by the *Quality of the Built Environment*, defined both by spaces and urban assemblies and by individual architectural objects.

The year 2012 was declared as *European Year of Active Aging and Solidarity between the Generations.* It appears in Decision no. 940/2011 / EU of the European Parliament briefly referred to as the European Year from which the importance given at European level to the

phenomenon of aging and intergenerational solidarity emerges. [12] Architecture can support this *Active & Healthy Ageing* and intergenerational connections and let's see how.

The concept of *age-friendly* appears related to cities, communities, public space- *Age-Friendly Cities, Age-Friendly Communities, Age-Friendly Public Space*. În 2005 WHO designed a guide for Age-Friendly Cities at the opening session of the 18th World Congress of Gerontology and Geriatrics at Rio de Janeiro, Brazil. What does Age-Friendly City means?

"An age-friendly city encourages active ageing by optimizing opportunities for health, participation and security in order to enhance quality of life as people age" [5].

An age-friendly city is accesible and inclusive, adapting its structures and services for older people with varying needs and capacities [13].

The aging of the population also leads to an increase in the incidence of disabilities.

"The number of people with disabilities is growing. This is because populations are ageing – older people have a higher risk of disability – and because of the global increase in chronic health conditions associated with disability, such as diabetes, cardiovascular diseases, and mental illness" [12].

An *Age-Friendly Architecture* should allow as much access as possible for all members of the community, including those suffering from various disabilities.

According to The International Classification of Functioning, Disability and Health (ICF), disability is *"an umbrella term for impairments, activity limitations, and participation restrictions. Disability refers to the negative aspects of the interaction between individuals with a health condition (such as cerebral palsy, Down syndrome, depression) and personal and environmental factors (such as negative attitudes, inaccessible transportation and public buildings, and limited social supports)"* [14].

There have been identified 5 principles that are important when talking about cities and *Age-Friendly Architecture* that support *Active & Healthy Ageing* [15].

4.1 Outdoor spaces and buildings, transportation, and housing

These issues have a strong influence on personal mobility, safety from injury, security from crime, health behavior and social participation.

When we talk about outdoor spaces, the challenge is to create a balance between accessibility and the stimulation of doing physical activity, to empower the user and to encourage to be as independent as is possible. In the Fig.3 (a) we can see the steps of a very well-known Bucharest park, Carol Park leading to Mausoleum. Level difference is significant, equivalent to about 7 floors. How could a wheelchair user climb these stairs? In the Fig. 3 (b) we see how such a stair can be made accessible by intersecting with a ramp of a corresponding slope.

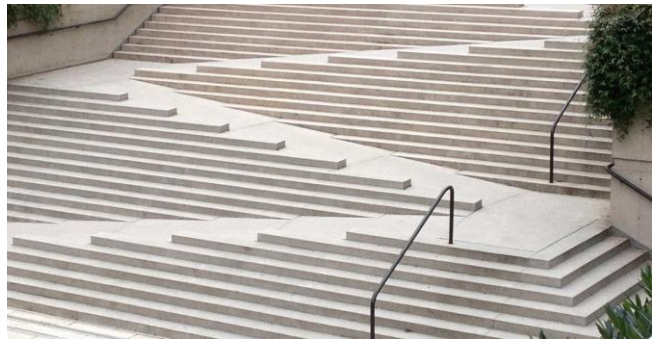


Fig. 3. Stairs and accesibility
(a) Stairs to Mausoleum, Carol Park, Bucharest, Romania; (b) Accesible stairs
Source: (a) https://foursquare.com/v/parcul-carol-i/4bd4a55c637ba593df25f570
(b) https://accessibilitymatters.ca/accessibility-and-stairs-do-not-mix-well/

A properly designed public space according to users with different abilities invites to be active, to do physical activity. An accessible, safe, comfortable public space will be used by the elderly, it will stimulate community participation, interactions, communication, it will support a healthy lifestyle. An outdoor space can be designed suitable for older persons to do physical activity. Architects are responsible for designing spaces accessible to all users, the responsibility of choosing remains strictly to the user (for example, if a healthy user chooses to use rolling stairs, lift, ramp or climb the stairs alone). People who started doing physical activity around the age of 45 enjoyed a life expectancy of 24% higher than those who remained inactive. [16] So, it's never too late!

The elderly population does not do enough physical activity. [17] Studies show that frail elderly seem to benefit from physical activity, although the optimal schedule remains unclear. More studies are needed on the fragile population to select the most favorable program. [18]

It is also very important to have centers dedicated to physical activity adapted to users with different types of abilities.

- ***Sport and Fitness Center for Disabled People* /**

Baldinger Architectural Studio, SUA (2012)
From the architect:
"The SpoFit fulfills its intended program requirements and goals while promoting health, wellness and the active participation in sport and fitness activities of the widest group of empowered users; be it the individual user, the Olympic athlete, a local Sports Club or National team" [19].

The main concept is very contemporary, user-friendly design, adaptive space to different abilities and physical performances. The center offers a total environment that intelligently combines sports and recovery facilities both indoors and outdoors and it is built around the

concept of wellness, promotes active participation, physical activity (fitness), emphasizing an active lifestyle as a way of preventing disease. It empowers the user by giving him complete freedom of movement but in a safe and healthy environment. The center provides a safe and healthy environment through space, light and textures. Note the careful use of the anti-skidding finishes for the gym and the climbing area.

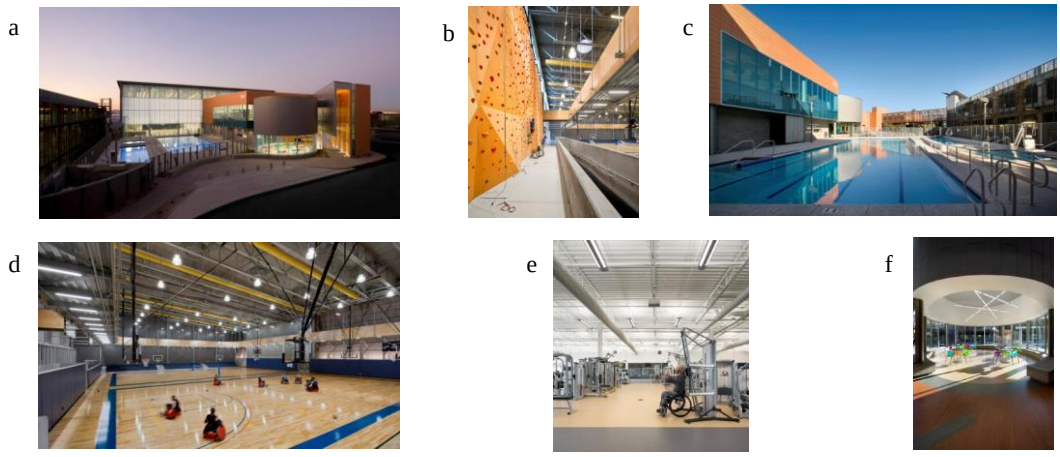


Fig. 4. Sport and Fitness Center for Disabled People
(a) Outdoor view; (b) View of climbing area; (c) View of exterior pool; (d) Basketball court for disabled persons view; (e) View of fitness hall for disabled people; (f) view of community area.
Source: https://www.archdaily.com/587732/sport-and-fitness-center-for-disabled-people-baldinger-architectural-studio

- ***Vandhalla" Egmont Rehabilitation Centre /***

CUBO Arkitekter + Force4 Architects, Danemarca (2013)

From the architect:

"*The Egmont High School holds a position as Denmark's leading institution for people with physical disabilities. Multifaceted accessibility characterizes the schools entity, and everybody is dedicated to this responsibility. The new rehabilitation centre provides a statement, a landmark that exposes the functional needs of the school architecturally and thus provides a renewed identity to the school's old buildings."* [20]

Fig. 5. Vandhalla" Egmont Rehabilitation Centre
(a) Outdoor view; (b) View of pool for disabled people; (c) View of swimming pool.
Source: https://www.archdaily.com/474130/vandhalla-egmont-rehabilitation-centre-cubo-arkitekter-force4-architects

The plan has in center the dressing rooms that form a functional node around which gravitates therapeutic areas. The main feature is the pool accessible to wheelchair users that is designed to drive the balance. The hot water pool for hydrotherapy has an adjustable level to allow developing of various exercises. The use of natural light is also noted in the recovery process. The center opens to the community, stimulating the community spirit, offering the possibility of combining cognitive training and social skills with physical training. Vandhalla" Egmont Rehabilitation Centre is dedicated to young people and brings it into discussion precisely to emphasize the importance of prevention strategies, focusing on empowerment. Such a center helps a young person with disabilities to conserv his skills for as long as possible. This is an example of a project that enables participation of people with disability and also supports frailty prevention in older age.

- ***The Grand Prairie (Texas) Parks and Recreation Department markets The Summit,* SUA / (2015)**

The center (Fig.6) is dedicated to active adults 50+ and it is configured on 2 areas: relaxation area (theater, food-court- Fig. 6(c), ballroom) and active area (games room, fitness center- Fig.6(b), swimming center, gym space and runway). [21]

a b c

Fig. 6. The Grand Prairie Center
(a) Exterior view; (b) Gym space; (c) Food-court
Source: https://www.athleticbusiness.com/rec-center/designing-recreation-centers-for-seniors.html

"One of the greatest misunderstandings about senior centers is that they serve one generation. In fact, as currently configured, senior centers target members of the so-called Silent Generation, Depression-era babies who are now between 69 and 89; the remaining members of the Greatest Generation, the youngest of whom are now 90; and increasingly, the Baby Boomers, who are now in the range of 50 to 68 years old." [21]

4.2 Transportation

Regarding transportation, it is mandatory staff working in transport to be trained in older people's issues. It is recommended involving older people in transport planning and design. Other sectors, such as health, should also have responsibility for transport issues.

4.3 Age-friendly housing

Of course, public spaces and buildings are important to stimulate participation in community life, but we always start from home. As we get older, from age 50 onwards it woud be good to think about adapting our home so we can be active as long as possible. At the same time, the authorities must consider the construction of age-friendly housing (Fig. 7, 8). [22]) It is recommended to use the principles of Universal Design for housing in order to meet the needs of an aging population. [23] As architects we must pay attention to

the choice of materials for falls prevention. Are important the colors, texture, maintenance issues, how to decorate the kitchen and especially the bathroom, the most dangerous spaces in the house for an elderly.

Fig. 7. KTGY-2012 Residential Assembly Los Angeles, USA
Source: https://news.theregistrysf.com/wp-content/uploads/2012/07/Heritage-Oaks_Outdoor-Kitchen.jpg

Fig. 8. 30 Senior Housing / Bastiaan Jongerius Architecten
Source: https://www.archdaily.com/410233/30-senior-housing-bastiaan-jongerius-architecten?ad_source=search&ad_medium=search result all

4.4 Respect and social inclusion

In a very recent study (2018) researchers at the University of Liverpool and Newcastle University set out to investigate the impact of programs designed to promote respect and social inclusion among older people living in the community.

The findings show that music and singing, intergenerational initiatives, art and culture, and multi-activity interventions (e.g. health promotion) promoted the well-being, subjective health, quality of life, physical and mental health of older people. [24]

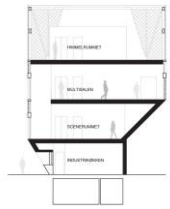
When we talk about respect and social inclusion, we think of harmonious intergenerational relationships, of communication between generations. A harmonious community is an intergenerational community where ageism does not exists.

- ***Community Centre with Integenerational Facilities Herstedlund* / Dorte Mandrup, Denmark (2009)**

There are community centers designed as intergenerational, one example is Herstelund Centers (Denmark, 2009) (Fig.9).

"The community center should be able to incorporate many different ages and interests over time, and many types of communities from the informal meeting around an event, summer festival, a big football or presentation to the special interests and common eating." [25]

a 

b 

c 

Fig. 9. Community Centre with Integenerational Facilities Herstedlund / Dorte Mandrup, Denmark, 2009
(a), (c) Exterior views; (b) Section.
Source: https://www.archdaily.com/34043/community-centre-herstedlund-dorte-mandrup-arkitekter?ad_source=search&ad_medium=search_result_all

The concept of multi / inter-generationality is a rich resource, still insufficiently exploited in the case of community centers, yet used rather declarative. Causes? Outdated mentalities, insufficient experience, unaware of changes in the age pyramid, incomplete cooperation between specialists in various fields.

Inclusion also means thinking of the elderly with neurocognitive disorders. As part of this aging process, the incidence of neurocognitive disorders increases. In 2015, dementia affected 47 million people worldwide (or roughly 5% of the world's elderly population), a figure that is predicted to increase to 75 million in 2030 and 132 million by 2050 . [26] What can we do as architects for such elders? The therapeutic gardens (Fig.10) work very well. A therapeutic garden dedicated to the elderly with neurocognitive disorders is designed according to some specific principles such as sustainability, orientation, accessibility, socialization, meaningful activities, multisensory stimulation, safety. [27]

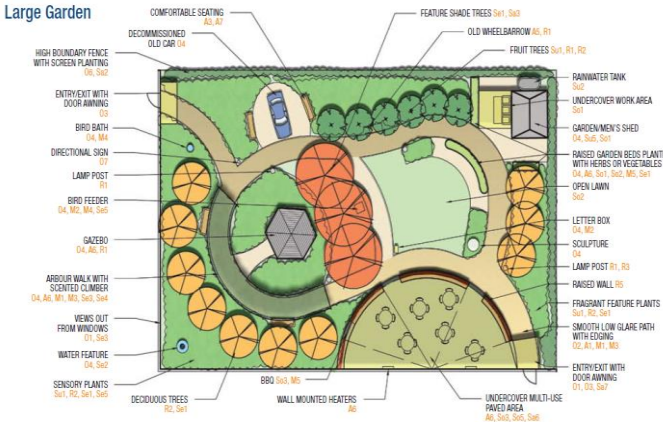


Fig. 10. Dementia Garden
Source: http://therapeuticgardens.com.au/suggested-layouts-for-dementia-gardens/arkitekter?ad_source=search&ad_medium=search_result_all

4.5 Social participation

Aging in place is desirable for the elderly. Aging in place is defined as *"remaining living in the community, with some level of independence, rather than in residential care"*; it refers to functional, symbolic, and emotional attachments and meanings of homes, neighbourhoods, and communities. [28] In Romania most of the elderly prefer to age in their homes. Because of loneliness especially in the elderly who lost their partner, depression can occur. It is very important for the elderly to age in place but also in the community, to socialize, to interact, to have a social life. In this sense, senior clubs can play an important role (Fig. 11). In such clubs the elderly can interact, socialize, carry out various activities: arts and crafts, musical entertainment, intellectual stimulation games,

group discussions (books, movies, current events), physical activities, celebrations of events and birthdays, lifelong learning.

a  b  c 

Fig.11. Senior clubs
(a) Simi Valley Senior Center. USA; (b) Seniors Club- Plumbuita Parc, Bucharest, Romania; (c) Calderon Center, Bucharest, Romania
Source: (a) https://www.simivalley.org/Home/ShowImage?id=502 ;
(b), (c) https://dandasimona.wordpress.com/2013/03/24/clubul-seniorilor/.

4.6 Communication and information

A study published by Vitelli [29] analyzed a group of seniors that took classes at the University of Madrid between 2007 and 2011 and proved that lifelong learning reduced the occurrence of depression compared with the control group. Universities for seniors are a model in this regard. In Romania, the University for the 3rd age in Galați, U3a Galați [30] operates within the University of the Lower Danube and for 1 year the project was started in Cluj. Seniors get informed, learn new things, socialize, interact. The space where these interactions take place it is recommended to be designed or adapted also on age-friendly and Universal Design principles. Places of worship like churches, synagogues, mosques, religious establishments often offer and envolved older persons in different activities such charity work. Also the internet, virtual space offers many opportunities for lifelong learning in multiple domains.

4.7 Community support and health services

For the elderly who need socio-medical care in varying proportions, an age-friendly city offers options like: *Day-Care Centers*, *Nursing Homes* or *Respite Centers* (Fig.11). [31]

Independent or semi-dependent seniors can spend their free time in *Community Day-Care Centers* (Fig. 11(a)).

Community centers dedicated to seniors are widespread in the US, Canada, England. There are generally small buildings, most often developed only on the ground floor, or the ground floor and one floor, with a modest, domestic architecture.

a  b  c 

Fig.11. Options for socio-medical care
(a) Urban Day Care Center for Alzheimer Patients, Pontevedra, Spain; (b) Retirement and Nursing Home Wilder Kaiser (2017, Austria); (c) Alzheimer Respite Center (2009, Dublin, Irlanda)
Source: https://www.archdaily.com/295469/urban-day-care-center-for-alzheimer-patients-cid-santos/ https://www.archdaily.com/889737/retirement-and-nursing-home-wilder-kaiser-srap-sedlak-rissland-plus-durschinger-architekten/ http://www.niallmclaughlin.com/projects/alzheimers-respite-centre-dublin/

Nursing Homes (Fig.11(b)) are institutions of medical-social assistance in which the medical component predominates. Nursing homes are primarily aimed for the elderly with chronic diseases, patients who require continuous care, treatment and recovery. Most residents have disabilities without necessarily being restrained in bed, but needing assistive devices for walking (walking sticks, frames or wheelchairs). Stays are long, most often for life, but can also be for a certain period in the case of patients who are in convalescence or needing recovery [32,33].

Respite Centers for Alzheimer's patients (Fig.11(c)) are addressed to both patients and their families. For a short period of time, patients can be cared for in such centers and their caregivers can take a resting break, to help avoiding burnout. The challenge in designing an assisted environment for Alzheimer's patients is to produce calm, coherent spaces to reduce distractions that might annoy, guide and encourage mobility. By design it is possible to mitigate the disorientation, confusion and aggression of the users and to encourage the socialization and the feeling of security [34].

In addition to physical activity are important socialization, communication, volunteering, intergenerational activities.

5.Results

The concepts of *Active&Healthy Ageing* are the frame for *Age-Friendly Cities*. The present research proves the importance of the built environment both at the urban level and at the architectural object level for a healthy lifestyle and a continuous participation in the city life. The architecture stimulates intergenerational communication and fight ageism. Research reveals examples of good practice in countries that apply *Active&Healthy Aging* policies and programs. Models of good practice in Western Europe that provide opportunities for health, participation and security are revealed.

Romania is also an aging country and must take into account the importance of the built environment for *Active&Healthy Aging*. We propose a hollistic bio-psycho-social approach, for *Active Ageing Architecture*. An important aspect is the design of intergenerational facilities at the district and city level.

6.Conclusions

The perspective of the age in architecture represents a change of paradigm essential for adapting the cities of the future. This change of paradigm must be used at all levels, public space, private space, housing, socio-cultural facilties, to the city level. It is imperative that the built environment take into account the new age pyramid, support the extension of active and healthy life and contribute to the compression of morbidity. Architecture has an

important role in: changing lifestyle, increasing independence, supporting physical activity for healthy people but also for people with disabilities, facilitates communication, interaction, promoting active and healthy aging. An Age-Friendly Architecture is an Universal Architecture.

Future cities's architecture should encourage *Active&Healthy Aging*, optimizing the opportunities for health, autonomy, participation and security in order to increase the quality of life and well-being.

References

[1] United Nations Population Division (2019), World Population Prospects: the 2019 Revision, https://population.un.org/wpp/, date: 14.02.2020.
[2] United Nations, *Ageing*, https://www.un.org/en/sections/issues-depth/ageing/, date: 22.02.2020.
[3] Zamfir, M.V. (2011), *Reconsiderarea centrelor pentru vârstnici*. *Perspectiva medicului geriatru*, Argument, no. 3, pp. 84-92.
[4] Eurostat, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=People_in_the_EU_-_statistics_on_demographic_changes, date: 22.02.2020.
[5] World Health Organization (2007), *Global Age-friendly Cities: A guide*, WHO Press, Geneva, Switzerland, https://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf, date: 22.02.2020.
[6] National Statistics Institute (2020), *Romania in figures*, National Statistics Institute Publishing, Bucharest, Romania.
[7] Eurostat (2020), https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjanind&lang=en, date: 14.02.2020.
[8] World Health Organization (2007), *World report on ageing and health*, WHO Press, Geneva, Switzerland.
[9] World Health Organization (2020), https://www.who.int/ageing/healthy-ageing/en/, date: 14.02.2020.
[10] ADVANTAGE Joint Action: State of the art report on the prevention and management of frailty. (2019), http://advantageja.eu/images/SoAR-AdvantageJA_Fulltext.pdf, date: 14.02.2020
[11] Andersson, J.E. (2011), *Architecture and aging*, *Doctoral Thesis in Architecture, Stockholm*, https://www.researchgate.net/publication/258340950_Architecture_and_Ageing_On_the_Interaction_between_Frail_Older_People_and_the_Built_Environment, date: 22.02.2020.
[12] European Union (2011), *Decision No 940/2011/EU of the European Parliament and of the Council of 14 September 2011 on the European Year for Active Ageing and Solidarity between Generations (2012)***,** *Official Journal of the European Union, Volume. L-246, pp. 5–10.*
[13] World Health Organization (2015), *Measuring the age-friendlyness of cities. A guide to using core indicators, i* WHO Press, Geneva, Switzerland.
[14] World Health Organization. (2011), *World Report on Disability*, WHO Press, Geneva, Switzerland, pp. 7-8.
[15] Infographic (2015), *Are you living in an age-friendly city?*, https://inhabitat.com/infographic-are-you-living-in-an-age-friendly-city/, date: 23.02.2020.
[16] Harvard Health Publishing (2014), *Exercise and aging: Can you walk away from the Father Time*, https://www.health.harvard.edu/staying-healthy/exercise-and-aging-can-you-walk-away-from-father-time, date: 23.02.2020.
[17] Jansen, F.M.; Prins R.; Schop-Etman, A. et al. (2015), *Physical activity in non-frail and frail older adults*, PLoS ONE. Vol. 10,No. 4, e0123168.
[18] de Labra, C.; Guimaraes-Pinheiro, C.; Millán-Calenti, J. (2015), *Effects of physical exercise interventions in frail older adults: a systematic review of randomized controlled trials*, BMC Geriatrics, Vol. 15:154, pp.1-16.
[19] Baldinger Architectural Studio, https://www.archdaily.com/587732/sport-and-fitness-center-for-disabled-people-baldinger-architectural-studio), date: 22.02.2020.
[20] Archdaily, https://www.archdaily.com/474130/vandhalla-egmont-rehabilitation-centre-cubo-arkitekter-force4-architects, date: 22.02.2020.

[21] Springs, S., https://www.athleticbusiness.com/rec-center/designing-recreation-centers-for-seniors.html, date: 22.02.2020.
[22] Perkins, B. (2009), *10 top design trends in senior living facilities*, Building Design+Construction, https://www.bdcnetwork.com/10-top-design-trends-senior%C2%A0living-facilities, date: 22.02.2020.
[23] The Center for Universal Design, North Carolina State University College of Design (2006), *UNIIVERSAL DESIGN* IN *HOUSING*, https://projects.ncsu.edu/ncsu/design/cud/pubs_p/docs/UDinHousing.pdf, date: 22.02.2020.
[24] Pedersen, T. (2018), https://psychcentral.com/news/2018/02/13/promoting-respect-inclusion-for-older-adults-in-community/132497.html, date: 22.02.2020.
[25] Archdaily, http://www.archdaily.com/34043/community-centre-herstedlund-dorte-mandrup-arkitekter/, date: 22.02.2020.
[26] World Health Organization (2017), *Global action plan on the public health response to dementia 2017 – 2025*, WHO Press, Geneva, Switzerland.
[27] Alzheimer's wa, Dementia Enabling Environments, *Garden Design Principles*, https://www.enablingenvironments.com.au/garden-design-principles.html, date: 23.02.2020.
[28] Wiles JL**,** Leibing A, Guberman N, Reeve J, Allen R. (2011), *The Meaning of "Aging in Place" to Older People*, The Gerontologist, Vol. 52, no. 3, pp. 357–366
[29] Vitelli, R. (2012), *Can lifelong learning help as we age?*, https://www.psychologytoday.com/intl/blog/media-spotlight/201210/can-lifelong-learning-help-we-age, date 23.02.2020.
[30] U3A Galați, http://www.u3a.ugal.ro/, date 23.02.2020.
[31] Zamfir, M, Marin, A, Zamfir, MV. (2015), *Arhitectura centrelor de zi pentru persoane vârstnice cu demență ALZHEIMER - o abordare interdisciplinară medic-arhitect-psiholog*, Arhitectura Vindecătoare, EUIM, pp 130-159.
[32] Usher, M. (2018), *To design for the elderly don't look at the past,* Archdaily, https://www.archdaily.com/904759/to-design-for-the-elderly-dont-look-to-the-past, date 22.02.2020.
[33] National Institute of Building Sciences, USA, https://www.wbdg.org/building-types/health-care-facilities/nursing-home, date 23.02.2020.
[34] Níall McLaughlin Architects, http://www.niallmclaughlin.com/, date 23.02.2020.