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Contemporaneity – Zakopane-ness – the heritage of Zakopane searching for urban reserves. The potential of underground spaces. Designing in a narrow and demanding location

Współczesność – zakopiańskość – zakopiańszczyzna. W poszukiwaniu rezerw urbanistycznych. Potencjał podziemia. Projektowanie w ciasnej i wymagającej lokalizacji

Abstract

Zakopane is a regional tourist city that is unique on the national scale. It is a one of a kind mountain resort with an exceptional history and atmosphere. It is a fashionable place where visitors can both rest and test themselves. It currently requires not only sustainable development but also that the effects of negligence and its deficiencies in spheres required for it to comfortably function be addressed, in addition to the supplementation of its offering both in terms of use and culture. The small-scale architecture of the Podhale region must rise to contemporary challenges. Presenting underground projects from all over the world aids in raising awareness as to the development potential of the area, demonstrating one of the paths to solving the problems of overburdened cities. Examples show means of relieving the pressure of current needs, simultaneously relieving the above-ground service programme of cities and increasing the amounts of greenery at their disposal.

Keywords: the case of Zakopane, the overburdening of cities, pro-environmental solutions, global underground projects

Streszczenie

Zakopane jest regionalnym miastem turystycznym unikalnym w skali całej Polski. Jedyny górski kurort o wyjątkowej historii i klimacie. Modne miejsce wypoczynku i wyczynu. Wymaga obecnie nie tylko troski zrównoważonego rozwoju, ale naprawy zaniedbań i wyrównania braków dla komfortowego funkcjonowania oraz dopełnienia oferty zarówno użytkowej jak i kulturalnej. Drobna w skali architektura Podhala musi sprostać wyzwaniom współczesnym. Uświadomieniu możliwości rozwoju tego miejsca sprzyja prezentacja realizacji podziemnych z całego świata jako jednej z dróg rozwiązywania problemów przeciążonych miast. Przykłady wskazują sposoby rozładowania presji potrzeb, odciążając równocześnie naziemny program usługowy miast i zwiększając zasoby zieleni.

Słowa kluczowe: casus Zakopanego, przeciążenie miast, rozwiązania proekologiczne, podziemne realizacje światowe

1. ZAKOPANE – the baggage of the place on the scale of needs

The phenomenon of the heritage of Zakopane is primarily associated with the exceptional character of nature. It is a charming place amidst rocky mountains, a small area of the Tatra Mountains that has remained within Polish borders and whose beauty and unquestionable appeal of its rugged landscape are the pride of the Polish people. However, it is primarily the Highlanders – the inhabitants of Podhale – who take pride in it. Zakopane, first discovered and utilised for the purpose of restoring health and later for sports and broadly understood tourism – is currently "bursting at the seams". Contemporaneity has brought with it greater needs not only in terms of lodging and technical infrastructure, but also circulation, sanitation and general needs concerning an equalisation of the quality of life in the difficult local terrain and climate conditions. It also requires an immense amount of specialised services – in order to ensure attractive and diverse forms of recreation. The once-quiet resort, which used to attract the artistic bohemia, whose members sought inspiration at the source of its remarkable folklore, cultural values and a specific philosophy of survival, has turned into the go-to place for the more and less ambitious, as well as simply those who follow trends. Among them are those who pursue attractions, otherness, in addition to Polishness and regionalism, but also those who want to test themselves and experience survival, which is currently very popular. The more comfort one has in one's everyday life in the city – the more impressed one is with the challenges of a trapper's life.

As hosts, the residents of Zakopane want to provide everyone with an appropriate quality of service. After a period of the town's uncontrolled growth, which has led to a rapid growth of chaotic development – Zakopane is currently aiming to regain control of and restructure its development. This sudden growth has become damaging to the valuable elements of the area's culture, and in the face of oft-crossed liminal urban values and an increase in the incidence of unacceptable phenomena such as smog at the foot of the Tatra Mountains and climate change in general – growth has turned out to be dangerous and alarming.

Centres of cultural life, including the Tytus Chałubiński Tatra Museum which operates here and has been a focal point for scholars, activists and local culture enthusiasts, follow this trend of making development more sustainable. Professionals, academics, artists, mountain climbers, collectors of Zakopane-related artefacts, connoisseurs of the culture of the place and activists have been cultivating and archiving the traces and stages of the area's cultural wealth for years. The museum's collection grows, as do the needs concerning securing, exhibiting and presenting it, in addition to those associated with education and giving the collection a contemporary message. At the same time, the Tatra Museum is making plans to open a Contemporary Art Gallery in order to refresh the formula of its operations and to fill in a gap in its efforts towards the development of culture and progress in social life. So far, Zakopane, an area that is so eagerly and gregariously visited, has lacked an area that would "set the tone" and formulate leading cultural standards. It lacks a cultural institution that would be open to new trends in the arts and that would create local fashions, creating a focal point for dynamic creative groups and attracting individuals who revolutionise their environment and create new art. There is a lack of a qualified space for artistic messages and discussions,

one that would centralise the weight of the obligations associated with the development of such a movement. Success is, without a doubt, conditioned by the presence of such persons and organisers of cultural life who would fulfil similar roles to the one that Zofia Gołubiew has played in the operations of Krakow's National Museum or Maria Potocka in the case of MOCAK, but there is also a need to provide appropriate facilities and equipment. Taking care of the remarkable work of, among others, Władysław Hasior, and having inherited his artistic trademark, including an entire villa and a collection that can be considered the mark of artworks of the highest quality – the Museum can be *de facto* acknowledged as having potential and a complete set of branding resources to this end. Following models such as those of New York's MoMA, the Guggenheim Museum in Bilbao or such commercial brand powerhouses like Louis Vuitton which open museums and galleries, or even global corporations like Benetton, Nike or Adidas and many others – the Tatra Museum has the capacity to name an entire philosophy of living "Zakopane style", profiting not only from the museum's admission fees, but also by expanding the formula of its operations and competence, for instance through branded products offered on its premises or elsewhere. The Museum has already organised a competition for souvenirs that would be true to Zakopane – that would refer to the tradition of the place and would not be mass-produced in some manufacturing plant on the other side of world.

We are all well-aware of the uniqueness of Zakopane. We are aware of the unique aura of this place, which has continued to charm Podhale enthusiasts, artists who are sensitive to the beauty of nature, hikers and mountain climbers, as well as crowds of tourists, including foreign ones, who – enchanted with the local atmosphere – return here over and over. The mental potential of "Zakopane-ness", which is comprised of the area's otherness in a rich profile of its offering of uses and meanings, is sufficient to create a valuable image of local high art, not only in the form of regional and stylised products offered by CPLiA artisans, but also both sublime local art and the most elite modern art.

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Modern, cutting-edge contemporary art is unpredictable. It is not confined by subject matter, format or the matter from which it is made. All procedures, citations and combinations are allowed. Purity of technique has ceased to be a requirement. What counts is the semantic expression, innovation and a non-conventionality of message. The pro-social orientation of action has taken on a particular significance. Art has become an advocate of the user, of society, of the individual as a separate entity and as a part of nature. Therefore, as an answer to a specific need, the needs of the museum as an institution that organises cultural life and exhibitions – have changed as well. The most flexible and least-limiting exhibition spaces are required. Spaces with the capacity for the arrangement of all manners of exhibitions, presenting objects of varying size, action-art spectacles, multimedia displays, performances, events, artistic gatherings, etc. These requirements also include the costs of maintaining cultural facilities, whose income is nowhere near spectacular. The cause of this state of affairs is the lower interest of society which is not used to a permanent contact with art. There is also a need to reduce the prices of admission to cultural events – in order to attract attendees – and

to conduct affordable educational community-oriented campaigns. The sum total of all of this leads to immense difficulties in conducting cultural operations with this profile.

Nevertheless, as always, the status and quality of culture are a mark of a society's class and determine its overall and community awareness, a high level of which is required in the current period of globalisation and international and intercontinental exchange.

Cutting its coat according to its cloth, the Tatra Museum is preparing to introduce changes to its image that are necessitated by contemporaneity, as well as to build new facilities meant to host contemporary art exhibitions and new spaces for the storage of already existing collections. The urban planning determinants of Zakopane prohibit extravagance, leaving only the currently-owned land reserves of the Museum at the disposal of designers. This includes its immediate vicinity, or rather the areas around the historic buildings – facilities that are the property of the Museum. This is practically the only non-developed fragment of its plots. Land dearth is not the only design constraint. Chiefly, all of Zakopane is an area of low-height development that is largely scattered, with small-scale architecture. Therefore, operating using an advertising, visible, large form of monument-type architecture that is akin to a sculpture, and which is typically associated with buildings that house arts galleries all around the world – is absolutely out of the question.

2. THE UNDERGROUND – an unexplored potential of space

Where should we look for land reserves? Where should we look for a space capable of providing the unrestrained development of contemporaneity, the provision of an effective infrastructure, an extensive variety of services and – in this wide array of needs – how do we find the appropriate conditions that will be free of limitations to the artistic development of all cultural disciplines, particularly contemporary art, which is particularly demanding? The situation is all the more troubling when we look at the constantly increasing amount of people flowing both into and through cities, whose target liminal size has largely already been reached. It is further constrained by the environmental necessity of preserving the remaining wildlife reserves and burdened by the duty of rebuilding those parts of nature that have been exploited and damaged.

We want to restore the necessary direct contact with nature to both humans and all biological life – providing land on the surface of the Earth that can be used to freely enjoy contact with nature, clean air, sunlight and a dark night sky, unpolluted by artificial light. The sole general direction of the development of architecture and urban planning appears to be the pursuit of freeing up green spaces and giving them back to pedestrians. The placement of housing functions, which require full contact with nature, typically involves tall above-ground buildings. Meanwhile, the functions of infrastructure, circulation and even services – can be hidden and placed underground. This is no longer a utopian trend. The initial experimental projects featuring the construction of underground infrastructure, shelters, multiple-level underground railways, road tunnels, water reservoirs and tanks, commercial and shopping malls, and even large public spaces illuminated with natural light, as well as museums and

galleries, have become a model that is being implemented and copied increasingly often. This proves that the underground, which has been used almost solely for mining purposes until relatively recently, can be used for everyday human occupancy over a very broad range of activities which can be housed at considerable depths. Contemporary research, engineering and the constantly growing experience in the construction of underground structures provides the perfect equipment, an increase in safety and the constant improvement of the implementation of increasingly bold solutions, as well as lowering the cost of such projects.

Of course, just as the current sustainable and planned urbanisation, as well as urban and territorial policy, the management of underground spaces requires effective construction law and other legislative provisions. It requires provisions that will regulate the problems of ownership and the conditions of new development and use – analogously to surface--based ones. In addition, legal matters concerning underground projects are always tied with applicable rights pertaining to surface problems. This is because the large-scale development of a city's underground is not possible without precisely defining the size, levels, depths and mutual multi-dimensional relations that support each other, although they can also sometimes cancel each other out – e.g. in the case of infrastructural grids and functional and technical pathway sequences of various types. We can, however, investigate examples of already functioning "underground cities" from around the world.

Why do we search for space underground?

It is hard not to agree that removing the presence of inconvenient spaces occupied by parked cars and the entirety of the noisy and troublesome vehicular traffic from our immediate vicinity would be a desirable solution. It would mean dealing away with transit that splits urban areas with insurmountable barriers and occupies precious square kilometres of agglomerations and consumes both innocent and guilty victims of vehicular traffic. Would it not be healthier in every possible way to assign the surface of the Earth for biological life, and in urban areas – to devote them to public spaces with a significant preference for pedestrian use? Housing buildings with service zones would become the main visible image of urbanisation. The entire infrastructure of the city could become invisible – it would blend into the background, housed primarily underground. Infeasible? On the contrary – it can already be widely implemented today.

This is but one of the methods of combating climate change, which is our regrettable civilisational achievement – change that can lead to the doom of life on Earth. Any increase in the average temperature of the Globe, no matter how minimal, leads to a decrease in the quality of life and a worsening of human health, in addition to geographic changes that will result in mass migrations once the most urbanised oceanic and sea coastal areas become flooded. We are already experiencing increasingly frequent and intense weather anomalies that cause unforeseen cataclysms and result in irreparable damage. We struggle to breathe in the smog, suffer from burns caused by the sun, which affects us through layers of greenhouse gasses, we fall ill because of spreading pandemics borne by microbes that multiply in disastrous quantities, insects perish, ceasing to pollinate edible plants and breaking the

natural chain of biological dependencies of many species of animals, including humans. Even if we do not clearly experience it yet, each and every one of us has observed the change and remembers colder winters, longer springs, more flowers, fruits and a greater biodiversity. Without a doubt, the projected consequences of the heating up of the planet that are reflected in all manners of studies appear decidedly catastrophic. It is our duty to society to stop this increase in temperature, which is associated with an entire range of measures that change our habits and amend our understanding of the increase of comfort of use. However, this is not associated with limiting our comfort by any means – quite the contrary – an appropriate selection of solutions and the replacement of obsolete elements of infrastructure is conducive to improving the necessary parameters. It is a long-term endeavour, but the heat we are feeling suggests immediate interventions. Ones that should be taken now.

3. SETTING COURSE underground

This is not the only alternative form of reparative action, merely one of the means of stabilising the current alarming situation. What is at stake here is not only the mere improvement of human health, but simply saving lives and ensuring our survival. Only by choosing a model that features many simultaneously conducted reparative efforts meant to address the damage that has been done to nature and restore lost reservoirs of wildlife to bring back balance can we prevent the complete destruction of nature and the end of life on Earth. Only by choosing synergic solutions and multi-directional reparative actions can we achieve a general improvement of the global situation. We do not analyse the causes and effects of the inconveniences that have already affected us every day. We live in our own present. Only in the global dimension – which is debated on by scholars, activists, politicians and government authorities who are familiar with overall readings – can we see the totality of the damage, its current consequences and further long-term effects.

We have justified ambitions to meet the highest standards of living. However, if we observe the experiences of leading and more affluent countries, we will have a chance to avoid their mistakes. As we are a large central European country, we are not allowed to ignore the consequences of the economic boom. We belong to a community of countries that are also equally responsible for the highest increase in pollution and destruction – and, therefore, are even more obligated to search for ways to reverse their pernicious consequences. [7] No matter how the situation unfolds – if we do not find ourselves in the intellectual lead – we will always remain in a definitively losing position.

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This is why, regardless of the global scale of the problem, starting at the grassroots, as teachers and designers, we strive to face the smallest tasks just as responsibly, with said tasks presented analogously: in the spheres of housing, services, society and culture, but perhaps most importantly – that of education. We analogously strive to think of ways to solve design problems, both on the go and in a systemic manner. In this case this concerns narrow urban plots.

In the case of Zakopane, in order to approach the ambitious spatial task that is the design of a contemporary arts gallery in such a demanding town – we reached to the underground, which is a still-untouched reserve of the area's development potential. It offers the possibility of obtaining space for numerous service functions in a manner that is "invisible" to users, particularly in the case of functions of significant size, which are required by the needs of contemporaneity and do not fit the categories of the traditional heritage of Zakopane and its spatial capacity.

4. MODELS from advanced countries

In order to familiarise ourselves with the experiences and pursuits of the most advanced countries, all we have to do is to look at a presentation of civilisational changes which were summarised and had their conclusions formulated during an open session of the ITA (currently ITA-AITES – International Tunneling and Underground Spaces Association), which took place in Singapore in May 2004 and was moderated by the ITA vice-president Jean-Paul Godard from France.

The basis for this discussion was the projected growth of the global population to 5 billion in 2030. Forecasts project that the global population will double relative to the state seen in 2007. This dramatic population growth primarily pertains to poorly developed countries, as the population of developed countries increases at a significantly slower pace. Economically leading countries are more prone to experiencing a population decline. Nevertheless, the main population pressure concerns the urbanisation of cities as the most well-developed form of residence. This is the root of the greatest amount of civilisational problems and the most important concern pertains to urban life.

As can be generally observed, the traditional life of major representative urban spaces, which are open urban interiors that have always been at the centre of attention and have focused and been the site of the organisation of all major events – all activity has relocated itself to new, functionally alien places. The central administrative spaces of cities, the beautifully composed and designed squares, promenades and the official foregrounds of monumental central buildings have become deserted. The entire pedestrian traffic has relocated itself to circulation spaces, accompanied by often improvised gastronomic and commercial buildings. It is there that meeting places are organised, as the busy contemporary life is determined by ease of access by car or motorcycle, and these areas must be economically feasible – cheaper to use, flexible and not too demanding. At the same time, major urban arterials have become multiple-carriageway transit barriers, full of cars that block the flow of traffic, tearing cities apart and dividing them into poorly accessible sectors. The river of cars is accompanied by the constant hum of engines, exhaust and the quite frequent sounds of car horns and the sirens of emergency service vehicles, which are becoming particularly noisy. Noise has become the second-worst curse of large cities, right after smog. Convincing others to travel by bicycle does perhaps make arriving at one's destination quicker, but at the cost of inhaling additional doses of poison and the troubles of squeezing past car bodies. The panoramas of historical cities,

once proud of their meticulously fine-grained tissue interspersed with church towers serving as orientation points and place icons, have become "enriched" by housing block estates and the smokestacks and cooling towers of heating plants almost everywhere. Silos that mark industrial districts release clouds of smoke, either constantly or at night, leaving us without air that is free of particulate matter and toxic substances. These settle in the lowest parts of the atmosphere, at the height occupied by pedestrians and animals, in addition to forming an impassable gas barrier in its upper parts – resulting in the so-called greenhouse effect. It is not the dense matter of the city and the density of development itself that are *de facto* the most inconvenient. The greatest enemy of city residents is the infrastructure of city life: traffic, deliveries, all manners of service infrastructure and the heating and air conditioning of nearly all facilities. The users' favourite cars have become their greatest enemy. This achievement of our times, which gives us an ease of travel, a feeling of freedom and the fulfilment of many dreams and ambitions, even allowing us to reach previously unattainable goals – has become a health trap and a burden. This is why living in central districts and mass transport that make us independent of the car are eagerly being returned to. Nevertheless, it is difficult for us to abandon the ease and comfort of the use of our own cars. And it is essentially not about removing the freedom of city residents and taking away their pleasure of free travel. More and more urban circulation tunnels and parking garages that have been built underground hide constantly growing traffic. It is also a fact that it is the new and increasingly effective arterials that generate a greater flow of cars. It is easy to see how surface overpasses – built in key areas of cities to facilitate a smooth flow of traffic – are full of practically immobile cars that barely move forward, particularly during rush hour. A similar situation can be observed in the tunnels and on the highways and city diagonals that are successively being opened (Los Angeles, Seattle), but at least they remain unseen, they do not burden public spaces, which is why they do not cause inconvenience or opposition from pedestrians.

Interest in building in underground spaces is becoming increasingly high. The benefits that can be gained from it appear to be indisputable. [1] First, the increasingly dense and rich amenities grid that forms the infrastructure of the entire city can be restructured. During every construction project, every replacement or renovation, grid connections are discovered, systematised and every receiver's access to the grid is remodelled, forks are linked into new trunklines, assuming not only their development and extension, but also securing permanent access to them – which is needed by supervision and maintenance services. This accessibility is also used for other goals that can be useful in providing infrastructure to the city, e.g. in watering the root mass of city greenery, including both newly-planted greenery and the many old or solitary large trees located in heavily paved areas. It is easier to fit and hide surface runoff collection and storm drain reserve tanks or to reroute the beds of rivers that often weaken the foundations of endangered areas of the city. The placement of large infrastructural structures underground makes it possible to avoid their associated interference with the landscape and the skyline of the city, as well as to use the land on the surface in a different, more suitable manner – for instance by placing large multi-level parking garages underneath the paved surfaces of city squares.

The benefits of using underground structures – which are hidden beneath the surface – appear to be obvious: They include the procurement of new urban and facility spaces without

visibly expanding cities, safeguarding against disasters which traditionally endanger surface buildings – as experiments and studies have indicated at a much greater safety of underground buildings owing to their lower sensitivity to shocks and the effects of disasters that affect the surface of the earth. Typhoons, floods and building collapses are not felt underground. Underground spaces are new reserves of space that can be procured for the needs of the city.

The specificity of locations in which underground solutions are searched for is varied. This diversity of individual situations inspires designers similarly as it does above the surface, even if it is not associated with a visible, impressive image and has a more engineering-related character, as it is built using tunnelling technologies rather than traditional construction--related ones.

5. LEADING PROJECTS from around the world

At present, the French and Dutch thought is in the lead. It is the source of the best experts on underground space engineering. Of course, the entire engineering and academic world is also interested in underground spaces, and its projects concern – as usual – the most affluent countries, those that face danger or those that are in a difficult, demanding situation – and who take the risk of innovative solutions and can afford large experimental construction projects. At present, it is China and the Far East who are in the lead in terms of both quantity and quality, and who cooperate with and purchase technologies and know-how from the West. But Poland also has its contributions to global engineering achievements, e.g. the historical fortifications by Tadeusz Kościuszko, which played a part in the American War of Independence, while in South America there was Ernest Malinowski, the famous builder of 50 of Lima's tunnels and bridges, who is best known for building the highest ropeway in the world in terms of elevation – the Central Trans-Andean Railways. When we look closer to home, we will find the former vice-rector of the Cracow University of Technology, Sylwester Oleszkiewicz, who conducted the renovation and upgrading of the CN Tower in Toronto, which has a rotating restaurant platform. Both the former and the latter were also patriots of their respective countries: Kościuszko of the United States of America and Malinowski of Peru, particularly after the heroic defence of Callao. A statue devoted to Malinowski stands at the highest point of the railway in the Andes, authored by another Pole, sculptor Gustaw Zemła. In all probability, every sphere of creativity has its heroes in various corners of the world, people who we still consider to be Polish, just as nearby Argentina considers Witold Gombrowicz to be one of its leading twentieth-century writers. This discrepancy between one's place of birth and their greatest lifetime activity is proof of the universalism of thought and the community of existence. As we can see, it is the contribution to global achievements that counts, which, irrespective of nationality and one's geographical location, spurs on intellectual development, the awareness of life on Earth and engineering thought in the common direction of a sustainable civilisation.

Tunnelling engineering and technologies have often proven to be of aid in difficult situations, not only in atypical locations, such as, for instance, the opera building in Sydney,

which, on account of being located on an isthmus, had to house all of its complicated and multi-level infrastructure underground – including a multi-level parking garage for its guests – so that its iconic massing, that of a building extending into the sea, could be exposed without being burdened by unsightly views and the necessarily large area of its supporting facilities.

From among European cities, Paris, for instance, has supported its needs with the construction of tunnels numerous times. It did so primarily through the design of underground railway lines that intersected at multiple levels while running through the entirety of the expansive historical section of the city. Apart from the underground railway, a commuter railway was introduced in the form of the Regional Express Network, the so-called RER, which is a railway that partially makes use of the same tracks as its underground counterpart, but is supported by an additional track. Furthermore, the RER has been expanded to include express railways outside of the city. The deepest RER tunnel reached a depth of as much as 30 m already at the turn of the century. The network's large capacity and extensive stations make it possible to expand and increase its density, as well as the number of trains, without burdening the surface spaces of the city. In some areas a line can run on the surface and sometimes, for instance in the case of line C, even along a bridge above the Seine. However, the most comfortable spaces, which house all the necessary services in their monumental interiors, such as the Auber station, can be found underground. Contemporary technologies make it possible to fully secure the underground from water and damp. Railway lines have been built underneath the Seine, as in the case of line "7" Sully--Morland, or in parallel to riverbeds, like the METEOR line; fully automated lines are also being built, as in the case of the latter, which is being built using a system developed by Siemens.

The former Place du Trône, the contemporary Place de la Nation, houses a multi-level safe intersection of the city's circulation routes underneath its surface. The immense circulation node is invisible to pedestrians. The square is often used as a place of mass gatherings, as marches and demonstrations have traditionally culminated here.

It is obvious that hiding such a large amount of circulation routes underground protects the pedestrians who walk on the surface, leaving the views of the city untouched and pro--environmentally protecting the already urbanised surface.

Engineering associated with underground exploration tunnelling has a historical dimension for Paris. It is no coincidence that the French specialise in this branch of research. The Parisian catacombs – underground corridors and spaces that house invaluable relics of the past – are well-known to underground enthusiasts and common tourists alike. They are dated to the Roman times, as former quarries used as a source of limestone for the building of roads and fortifications, and later as a place of isolating the bodies of plague victims during epidemics, a refuge for the city's poor (we will find such images even in the belles-lettres, see *Les Misérables* by V. Hugo), finally, a place the resistance used for their hideouts during the Second World War. Contemporary cultural life was likewise shocked towards the end of the previous century (1989) by tunnelling underneath Paris' largest and most precious museum facility – the Louvre Palace. We all know the appearance and history of the famous "pyramid", which, having grown like an "Egyptian alien" from underneath the ground in the centre of a historical courtyard in the very heart and "command centre" of the Empire, divided all interested parties, ultimately simply saving the reason for the museum's existence.

From among the latest underground projects, it is the Chinese who are currently in the lead. As the beneficiaries of over 50 % of global manufacturing revenue, amounting to 37 billion euro per year, they are the largest development market in terms of the construction of new underground railways, stations and roads that connect the country's expanding cities. Another 50 Chinese cities will soon become equipped with new underground railway systems, and the growth of their populations necessitates the construction of rapid transit rail and road connections, which have been placed underground because of the goal of conserving surface space. However, coming from the opposite side, it is also the Chinese who have been building the largest dam in the world, on the Yangtze River, since 1994. As scientists have discovered, the enormity of its engineering structure, which converts the flow of enormous volumes of water, has disrupted the previous angle of the Earth's axis of rotation and has slowed down its movement, which has caused days to become longer, the equator to extend in length and the poles to flatten. The Three Gorges Dam has caused an environmental and cultural disaster, irreversibly destroying many biological species. It has resulted in the flooding of 13 cities with invaluable heritage sites, as well as over fifteen hundred villages and towns, causing migrations, floods and earthquakes because of its placement in a seismically active area. It has also turned rivers that once carried drinking water into barely flowing streams of refuse and wastewater that poison biological life. The political decision to construct the massive hydroelectric power plant with the aim of satisfying the country's gigantic development needs has given affordable electricity to some, while outright taking or breaking the lives of others (an estimated 70 thousand have died, with many others suffering from homelessness, expropriation and disease). All of us have also indirectly felt the consequences of this drastic interference with naturally-shaped systems and relationships.

It appears that operating in the underground is much safer – when it is based on the current state of scientific and engineering knowledge and using tried and tested tunnelling technologies [1]. However, there is no doubt that global cooperation – based on spreading knowledge and popularising achievements, exchanging experiences and propagating well--performing solutions, cooperation and the mutual support of global expert centres and the consulting of particularly large and risky projects that can affect changes in the environment – is necessary. There can be absolutely no doubt that the most important thing is to ensure that decisions about planned initiatives are not subjected to political considerations. Governments, particularly those of developing countries, make populist decisions that are based not as much on short-term gain, but the desire to consolidate their power much too often and without due consideration. Decisions are often made in an unscrupulous manner, without analysing future long-term consequences or considering the interest of not only all of a country's own citizens, but even leading to damaging the good of the community, its neighbours, various stakeholders and all who are indirectly involved. Typically, the long-term consequences of the thoughtless actions of governing circles are attributed to the successors of these decision-makers, as they sort of inherit the extant situation from them and it is those successors that must make unpopular reparatory decisions, for which they must then take responsibility.

At present, China is in the economic lead. As a very large country with an immense potential based on natural resources and manufactured goods, with a wealth of historical culture not

only in terms of what has already been studied, but also of what is being discovered during the exploration of underground spaces, as well as with an immense human resources potential – currently also including their own academics who have graduated from the best western universities – the Chinese display capabilities far beyond those of the Old World. It is for this simple reason, as well as because of their participation in making difficult decisions and taking responsibility for the fate of the entire world, that academic and engineering circles, along with broadly understood urbanists, who are responsible for the future functioning and form of our cities, are engaging in cooperation with China. Cultural differences and the many years of political isolation should no longer prove to be an obstacle in engaging in such contacts.

In 2018, the fourth international conference devoted to the presentation of successive designs and projects from the field of global tunnelling presented for the ITA Tunnelling Award [8] took place in **Chuzhou**. The projects submitted for the prize speak for themselves. The vast majority of the projects were Chinese. Below is a list of the contenders for the prize. These are as follows:

1. An undersea tunnel connecting the dynamic centres of the Chinese economic zone, Shenzhen, which is its largest port, and Zhongshan, on two sides of the Pearl River estuary (China)
2. A large and innovative tunnel boring machine (TBM), with the largest drill (15 m tunnel diameter), built in order to bore a tunnel for the Jiajiang road, exiting a bridge on the Yangtze River (China)
3. A 34-kilometre-long railway tunnel with the largest cross-section to date – Ganligongshan (China)
4. A large religious complex on the experimental grounds of an environmentally-friendly processed waste deposit site in a post-mining area – the reinforcement of a 150-metre-deep excavation, the restoration of the terrain's geomorphology and topography, landscape reconstruction and the placement of the support structure of a lotus flower-like structure with a diameter of 38 metres – which functions as a rotating stage. The project included a covering composed of aluminium frames with a tall tower, made using space technology (China)
5. The Honggu underwater road tunnel across the Ganjiang River in Nanchang (China)
6. A new border tunnel between Austria and Italy along Brenner Pass (Austria and Italy)
7. The Grand Paris Express, an extension of the RER underground and commuter railway system which includes additional lines connecting Arc Express loops (lines 11 and 14, line 18)
8. The Fehmarn Belt Fixed Link undersea road and railway tunnel linking central Europe with Scandinavia via an expressway (Denmark and Germany)
9. A two-level replacement tunnel for the Alaskan Way Viaduct (after the viaduct was severely affected by an earthquake), the so-called SR99 Tunnel, running diagonally underneath the entire city of Seattle (USA)
10. Line 4 Amarilla – an automated underground railway line in Sao Paolo, South America's most advanced line (Brazil)
11. The MRT (Mass Rapid Transport), a hi-tech rapid railway network (Singapore)

The previous editions of the conference hosted over 750 guests and received 234 submissions. The latest project of the year title winners for 2018 were:

1. A Chinese bridge and tunnel crossing connecting Hong Kong, Zhuhai and Macau, between island stations that link the sections of the route. With a total length of 29 kilometres, the crossing includes a 6,7-kilometre-long tunnel, 5.6 km of which is under the surface of the sea. Built over a period of 8 years and delivered in 2018, its cost was over 500 million euro.
2. The Chinese Queershan Tunnel, along the northern China National Highway G317, linking the Sichuan province with Tibet via a two-route tunnel, shortening the Sichuan–Tibet highway, whose entirety runs through a dangerous mountainous area that has a cold climate, which has earned it the title of a high-risk road. The 7-kilometre-long tunnel was opened for use in 2017 and was built at an elevation of 4,5 thousand metres above sea level. The construction took 5 years to complete, with the total cost being in excess of 160 million euro.
3. The Zarbalizadeh Shallow Tunnel in Tehran, connecting the east and west of the densely built-up city underground. It has been built below the level used by the railway network, which was operating during the entire tunnelling procedure – as a normally functioning underground railway. The tunnel will reduce the time it takes to travel across the city and reduce traffic in Iran's densely-developed capital. Completed in 2017, its cost was 6.5 million euro.
4. Technical project innovation of the year – this award was given to the Chinese TBM machine with a horseshoe-shaped EPB drill, which had been used during the construction of the Baicheng tunnel, which links Western Mongolia with Central China. The new drill shape is cheaper to manufacture and offers better performance. Its cost is 60 million euro.
5. Technical product/equipment innovation of the year – this award was won by a luminescent material that collects energy and offers a variety of uses, ranging from energy-efficient lighting, to covering tunnel walls or information signs. It is safe and environmentally-friendly (China).
6. Safety initiative of the year – this award was given to ROBY 850 (Hong Kong, China) – a semi-automatic drilling robot that can replace human workers during drilling and the assembly of installations and platforms in tunnels. It increases work safety and effectiveness.
7. Innovative underground space concept of the year – this title was bestowed on the Norwegian Rock Blasting Museum. It is probably the only one of its kind. Founded 25 years ago in 1992, it presents the history of tunnelling and road engineering using multimedia, also showing contemporary TBM machines – the museum itself is housed in an underground semi-circular tunnel. The stone cavern also features a restaurant, as the museum's special attraction.
8. The title of young tunneller of the year was given to the Italian Giuseppe M. Gaspari (1983), who holds a degree in Civil Engineering and a Master's Degree in Geotechnics and a second level Master's Degree in Tunnelling and TBMs. He currently holds

a management position (for a sewage servicing tunnel) in Toronto (Canada) and is a Project Design Manager for the Suffolk Outfall in New York (USA).

20. The lifetime achievement award in the field of tunnelling was given to professor Evert Hoek from Zimbabwe, who holds a degree in mechanical engineering from the university of Cape Town. He specialises in the problems of brittle fracture associated with rockbursts in very deep mines in South Africa. He is a Fellow of the Royal Academy of Engineering (UK), a Foreign Associate of the US National Academy of Engineering (USA) and of the Canadian Academy of Engineering (Canada). He has published over 100 articles and 3 books and has worked on large civil and mining projects, including dam foundations, hydroelectric power plants and tunnels in 35 countries.

Poland has been represented in the ITA by the Subcomittee of Underground Construction of the Polish Committee of Geotechnical Engineering since 1978. The International Tunnelling Association – the ITA – renamed ITA-AITES soon afterwards (International Tunneling Association-Association Internationale des Travaux en Southerrains) and presently called the International Tunnelling and Underground Association – was founded in 1974, connecting the best experts on tunnelling – western experts who jointly consult innovative projects. Since then, their operations have gone beyond Europe to include all continents, with China and the Far East being in the lead in terms of the quantity and size of projects. Among the abovementioned countries particular attention should also be given to **Malaysia**, a dynamically developing country that readily adapts the latest technical solutions, particularly those that facilitate sustainable development. An experimental tunnel has been built there, constituting a part of the ring road of the country's rapidly expanding and growing capital of Kuala Lumpur, which used to be affected by frequent flooding during the storms of the rainy season. The tunnel periodically serves as a surface runoff reservoir. The effective two-level high-capacity tunnel, which dives underground at a section above the city, where the waters of nearby tributaries typically caused flooding – slowly reduces and shuts down vehicular traffic when there is a threat of flooding, successively becoming filled with water. The excess surface runoff is collected there, increasing the water level inside the tunnel and filling its enclosed reservoir. In the lower, southern portion, which is located outside of the city, an open outfall slowly releases the excess water, regulating and easing its flow. It has been called a smart tunnel and not without reason, as it fulfils the criteria of smart or so-called intelligent structures, which operate in a pro-environmental manner, facilitating sustainable development and preventing disasters.

6. UNDERGROUND RESERVES of urban space

The underground has been a refuge for runaways and the excluded for centuries, with corridors dug to evacuate places that were under siege, or otherwise intended to be secret and private. During wars, the underground facilitated survival, protection from enemies, disasters and the elements and – ultimately – from chemical weapons and gasses from various

munitions and bombs, from nuclear radiation, blast waves, etc. Underground bunkers for the military, the general population or state governments are adapted and stocked with appropriate supplies even today. For instance, in Los Angeles, a city constantly under threat of seismic shocks and the collapse of its built tissue, there are entire "underground fortifications" – numerous bunkers for various purposes, including sheltering the general population. The city hall building alone has a fully equipped and constantly operating multi-level control centre with monitors displaying camera feeds from all areas of the city. During peaceful times they are used to regulate traffic and track any irregularities on the streets. All we are left with is to trust that what we perceive or perhaps even feel as surveillance or the stripping of our privacy and independence, is just an automatic record of city life, facilitating an increase in everyday safety, and merely provides information about various threats without interfering with the privacy of residential and semi-private interiors. This is *de facto* the case, unless a precedent allowing the release of this information as if from Pandora's Box occurs.

Nevertheless, surveillance records provide data about the city that is invaluable to the various services, scholars and urbanists. It is provided by increasingly automated devices, including fully digital data that is more and more compatible with various forms of use, suitable for processing for any need or regulation, including the optimisation of the use of appropriate materials, energy or the optimisation of the state of the atmosphere. We have become capable of providing fully comfortable housing conditions underground. The wealthiest possess not only underground shelters but also comfortable residences, hidden from the sight of the overly curious, providing nearly complete safety. Nothing stands in the way of successively incorporating underground spaces into large-scale use.

The greatest problem that urbanists currently face is creating a system of mutual relationships between the underground and the surface. We know from our current experience that the urban layout of buildings, their surface composition, as well as that of all receivers of building service grids, does not need to correspond to the layout of installation grid lines found beneath the surface. Even when the main trunklines follow the pattern of surface circulation, individual recipients typically lay their installation branches using shortcuts. When we increase the density of development we often find surprises and chaotic nodes that need to be restructured and – perhaps most importantly – reliably documented. In order to appropriately utilise the potential of the underground, it needs to be surveyed (geomorphology) and planned. Surface networks must correspond to underground networks. The new underground tissue must cooperate with the extant and planned surface tissue. Spatial dialogue between all of the stakeholders of this space is also necessary. A vision of a new city and a strategy of building it is necessary. This vision should take into consideration all of the needs of its stakeholders and target users. While drafting a new urban code fit for this vision, we have the opportunity to foresee all of the benefits the city will enjoy and minimise the effects of neglect. The new underground tissue should be comparable with its surface counterpart. But most importantly, it must possess error-free circulation links with the spaces on the surface. At present, when we discuss **circulation**, we must have not only surface-based circulation in mind, but also the one on multiple surface and underground levels, in addition to vertical circulation between various levels and depths – appropriately to the needs of the

functional programme. The planning of the future of the underground is not only a balance of needs and possibilities, but also the close cooperation of planners, urban designers and architects, in addition to close multi-disciplinary cooperation, as it is the beginnings – the initial decisions – that set the patterns and directions of underground development that will determine its ultimate shape[1].

Original text based on the author's participation in the Ninth session of the World Urban Forum (WUF9) in Kuala Lumpur, an architectural thesis design workshop in Zakopane in 2018 and the book published by WUF9 participants Han Admiraal and Antonia Cornaro [1].

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[1] Quote: „A New Urban underground paradigm, in our opinion, is based on participation, collaboration, understanding, and innovative multi-use solutions. In this way, the final urban frontier could well prove to be an urban asset that contributes to creating the resilient, sustainable, inclusive and liveable cities we need" [1, p. 19].

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