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On the Structure and Evaluation of the Current Mass Development of Photovoltaics as Regards Synergies and Conflicts with Monument Care Principles

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Introduction

Solar power engineering technology is currently regularly applied in renovation or transformation of monuments. Synergies between solar power engineering and monument care principles outweigh conflicts. However, mass development of photovoltaics is a phenomenon of a quite different category. Compared to the traditional, long-term use of solar power in architecture of historical environment, mass development of photovoltaics is far more offensive from the perspective of the pressure on overall transformation of the character of historical environment of settlements. In addition, it is expressed in almost mass construction of solar parks in a cultural landscape.

Objective

Great numbers of monuments in urbanized environments are specific to Europe and European landscape is characterized by its long historical development and many cultural layers. Renewable sources in relation to the historical environment in general are increasingly described and discussed in a wide body of scientific literature. Naturally, this happens in the European context, but the trend towards expansion to the global scale can be observed [1]. When it comes to solar power engineering with special focus on photovoltaics, the character of scientific literature reflects the character of this multifaceted topic from the developmental, as well as horizontal perspective. In order to capture the basic outlines of the complex system of synergies and conflicts between development of solar power engineering, in particular the mass development of photovoltaics, and the principles of monument care, one has to proceed methodically, following individual steps:

A. Understanding solar power engineering as a complex should be the first step; this includes measures in creative architecture, in construction and technical sciences, as well as measures in other fields. From the evolutionary perspective, photovoltaics then may be viewed differently from a natural part of solar power engineering.

B. The second step must involve comparison of solar power engineering against wind power engineering. Both, solar power engineering and wind power engineering may contribute significantly to decarbonization targets, as gradually determined by global communities. However, major differences can be identified between these two complexes.

C. In the third step, the study focuses on the current mass development of photovoltaics, which seems to escape the boundaries of the traditional solar complex, and the relationship of this mass development and monument values of historical environments. The mass development of photovoltaics will be discussed in two aspects:

- As mass development of photovoltaics in an urbanized historical environment;
- As mass development of solar parks in a cultural landscape.

Methods

This study draws on the following materials:

a. Tomáš Hájek (2024) On the Topic of Use and Transformation of Historic Monuments. Open Access Journal of Archaeology & Anthropology, Iris Publishers, DOI: 10.33552/OAJAA.2024.05.00062, Volume 5 - Issue 5, October, 2024; Reprint.

b. Tomáš Hájek (2025) On Mutual Relationships Between Medical Sciences and Cultural Heritage Care. Biomedical Journal of Scientific & Technical Research, DOI: 10.26717/BJSTR.2025.61.009556, Online Booklet Edition, March, 2025 + Reprint Copies.

c. Tomáš Hájek (2025) Level of Monument Protection and Degree of Conflict in Relationship between Wind Energy and Monument Care. Biomedical Journal of Scientific & Technical Research, DOI: 10.26717/BJSTR.2025.62.009698, Online Booklet Edition, Juni, 2025 + Reprint Copies.

d. Literature research entitled: "Renewable Energy Sources and Monument Care (Conflicts and Interactions between Development of Solar Power Engineering and Monument Care)" has been completed; this research was carried out in Czech, English, German and Italian; the period covered by the research is 2001-2025.

e. Literature research entitled: "Solar Park in Landscape and its Potential Disruptive Impact on Landscaping Character of Cultural Landscape" has been completed; this research was carried out in Czech, English, German and Italian; the period covered by the research is 2000-2025.

Results

Firstly, to quote a study by Stefano De Medici entitled Italian Architectural Heritage and Photovoltaic Systems (Table 1). Matching Style with Sustainability: "Regarding the built heritage, in particular, the Green Deal highlights the need to launch a renovation wave of public and private buildings, whereas the current annual renovation rate in the Member States varies only between 0.4 and 1.2%. Strengthening the rehabilitation goal of the building stock is enshrined in the Commission's October 2020 Communication entitled "A Renovation Wave for Europe-greening our buildings, (Figures 1&2) creating jobs, improving lives." It targets a doubling of annual energy renovation rates over the next ten years, improving people's quality of life, enhancing their living spaces, reducing Europe's Greenhouse Gas Emissions (GHG), and generating an extra 160,000 green jobs in the construction industry. The Communication highlights how the COVID-19 pandemic is changing our lifestyles and future prospects. Home became our primary living environment, revealing its inadequacy to meet today's needs. Millions of Europeans are using their homes as offices for those teleworking, schools for children and teens, university classrooms, spaces for leisure, reading, playing, and even online shopping [2]."Secondly, this study should include a direct testimony showing how significantly the public interest in production of energy from renewable sources is starting to be preferred in the European Union over other interests, including the public interest in the protection of cultural heritage:

Figure 1: Ground photovoltaic power plant in Stříbro-photography by Tomáš Hájek -2026-postproduction by Petr Zajíček. Start of operation in 2009, installed output 13.6 MW. The solar park with its total mass makes a significant impression, but none of the strategies for contextualization of a solar park in a landscape is used. The photographed part of the solar park is situated in an industrial zone of the historical town of Stříbro, where the concealing strategy would probably be suitable. In general, the town of Stříbro has a unique genius locus and is situated in an undulating landscape, which allows for interesting lookouts to be created.

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Figure 2: Ground photovoltaic power plant in Ševětín-photography by Tomáš Hájek -2026-postproduction by Petr Zajíček. Start of operation in 2010, installed output 29.9 MW. The solar park is situated in an open agricultural landscape with intensive farming. It is a landscape allowing for views of the distant horizon from far and wide, yet this quietened and specific landscape lacks any dominating features. It is clearly insufficiently legible. The solar park lacks any attempt to contextualize the structure in the landscape and is surrounded by a belt of unkempt land. In this type of landscape, the concealing strategy blends with the highlighting strategy. This case presents a unique opportunity for using contextualization of the solar park in the landscape to create a new dominating feature in the landscape, increase its legibility and visibly associate the landscape with power engineering using renewable resources.

Table 1: Selected components of the solar complex [2].

Component of solar complex	Notes
Energy-optimised windows	This is aimed at utilisation of daylight and solar heat.
Architectural elements, such as domes, light wells, skylights, glazed roofs, lighting strips in roofs, reflection and diffusion shafts	This is aimed at utilisation of daylight (falling at a right angle) and solar heat.
Walls with transparent thermal insulation	This is aimed at utilisation of daylight in buildings, for example, without visual contact with the surroundings. These walls ensure even distribution of light in the interior. Savings are achieved in energy required for artificial lighting in the interior.
Glazed balcony, winter garden, atrium	These glassed-in spaces equalise temperatures: they are used for occasional residential purposes; they reduce heat loss and preheat ventilation air.
Solar wall heating with transparent wall insulation	This construction element combines thermal insulation with solar collector, thermal accumulator and heating surface. It requires south-facing facade, massive structure of the outer wall and suitable arrangement of windows.
Enclosed hot-air heating with hot air solar collectors	

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Solar thermal collector equipment for hot water service and heating rooms	The example mentioned here is a typical example of the development of ecologisation, specifically the use of a solar complex in an urbanised historical environment in the Czech Republic in the 1990s: the town of Litoměřice as a unique town in the European heritage context was significantly affected by air pollution due to the nearby brown coal surface mining and the relating heavy industry before the fall of the Iron Curtain. Extensive gas installation was the first step in the environmental rectification; this included elimination of a vast majority of local furnaces in households. New gas mains were installed, and natural gas started to be used instead of coal gas. This led to radical reduction of the content of sulphur dioxide and dust particles in the air. However, the price of natural gas increased significantly around 2000, and the usage of natural gas was no longer economical. The town's management decided to introduce subsidies for solar preparation of hot water. Following a lukewarm start, the interest of residents in these subsidies grew fast. However, further progress was greatly complicated by the historical centre of the town of Litoměřice being declared an urban conservation area. The conflict between the need for the development of a solar complex and the principles of monument care is addressed, for example, by placing thermal solar collectors outside the main buildings, for example on garage roofs. The first photovoltaics appeared in the town in 2005: solar panels with the total area of 1.7 m^2 are used as power supply for parking meters [3].
Solar equipment for power generation (photovoltaics)	This table should show clearly that photovoltaics arise naturally from the concept of energy saving measures in buildings. Production of surplus energy for the power supply network is not the original intent of photovoltaics as part of the solar complex. Photovoltaics as a natural part of the organically developing solar complex include reference to solar stand-alone and stand-by technologies.
Unglazed solar hot air collector	This can be used as an interesting architectural element. Solar complex components generally represent an excellent opportunity for creative architecture, as these can increase the value of architecture without any exceptions, including historical architecture and monuments. Usage of the so-called thermal insulation of buildings to achieve energy savings is quite the opposite to the solar complex. As the number of historically valuable buildings with additional thermal insulation is increasing, it is possible to conclude that this technology is detrimental to architectural heritage. Building proportions are distorted, architectural details in facades are eliminated and colour schemes of facades tend to be problematic [4].
Glazed thermal insulation, glazed double facade, double facade with hot air collector	Shell from air heated with solar energy reduces the heat loss in buildings.

"What a small earthquake was triggered by Regulation of the Council (EU) 2022/2577, which determines the framework for accelerating the introduction of energy from renewable sources, when Article 3 of the Regulation introduced a disprovable assumption of the prevailing public interest in equipment for the production of energy from renewable sources (despite the legal doctrine traditionally stating that legal regulation must never allow for any of the balanced public interests to prevail)."Thirdly, the study presents a quote from the Annual Report of the Solar Association operating in the Czech Republic: "...year 2022 was a turning point not only for us, but for the power engineering industry as such. The geopolitical events along with the high volatility of electricity prices confirmed our long-term warnings that the power engineering industry in its current form was not sustainable or safe (Table 2). This period represented a turning point for Czech photovoltaics, with the sector growing at a multiple rate compared to 2021 and with almost 34,000 new solar power plants being connected to the network. The general public realized the options presented by having one's own source of clean electricity and the government with the parliament finally began to support solar systems not only on roofs of family houses openly. The Solar Association achieved a major success in asserting an amendment to the legal regulations, according to which photovoltaics over 1 MW were included in public interest and public technical infrastructure, which will translate into significantly easier construction of these systems [3]."

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Table 2: Comparison of solar power engineering with wind power engineering. The table characterised solar power engineering as the solar complex with emphasis on photovoltaics. The table is therefore chronologically placed in the emergence of the current mass development of photovoltaics and thus connects with the overall objectives of this study.

Solar Power Engineering	Wind Power Engineering
a) In an urbanised environment, the solar complex with emphasis on photovoltaics focuses very strongly on the autonomy of power supply as part of the overall energy saving; when saving measures are not implemented, it loses much of its relevance.	a) Wind power engineering is a logical, coherent offensive reaction to the lack of fossil sources and to decarbonisation objectives of global communities in connection with climate change.
b) In an urbanised environment, the solar complex with emphasis on photovoltaics leans towards an insular, autarkic power engineering system. The COVID-19 pandemic with the strategy of quarantines and social isolation was coordinated with this orientation of the solar complex with emphasis on photovoltaics to some extent. It should also be stated that the insular, autarkic power engineering system as a trend in an urbanised environment is associated with certain "micro-ghettoization" within the current city agglomerations, which is linked to the global economic structural transformation.	b) Wind power engineering in principle cannot aim for an insular, autarkic system in an urbanised environment, as the solar complex with emphasis on photovoltaics does. Instead, it needs to focus on mass production of electricity in suitable landscapes, in particular in landscapes with scattered buildings, and in seascape, which is a highly promising environment for the development of wind power engineering. The planetary dimension is the core dimension of the development of wind power engineering. However, from the perspective of a kind of science fiction, which at the same time carries the notion of feasibility, solar power engineering has the potential for the leap from the planet Earth to its orbit; solar power engineering can lead the mankind into cosmos. Although solar power engineering uses the Sun's energy, it can help the mankind escape this specific sun in our solar system. It is therefore also capable of changing the archaic man, who is bound to this Sun, into a man for the cosmic future of the mankind. The GENESIS project (Global Energy Network Equipped with Solar Cells and International Superconductor Grids) can be mentioned as an example. This project involves construction of a belt of solar power plants along the equator and using a superconductive connection to ensure energy future of the mankind, or the project of creation of solar farm on the orbit in the space [5].
c) The solar complex with emphasis on photovoltaics transforms the urbanised environment into a group of autarkic power engineering islands and this may also gradually lead to certain architectural and urban consequences, as well as consequences in social ecology.	c) The planet-wide development of wind power engineering is an ambitious program possibly reflecting high growth dynamics. At the same time, it is limited by the fact that wind power engineering deepens dependency of the mankind on sources that can only be seen as renewable within a limited timeframe, despite this timeframe exceeding the currently known history of the human race.
d) A town as a system of vast mutual dependencies is thus loosening up, yet at the same time is becoming capable of renewing at a whole new level. The current urbanism is challenged through the solar complex with emphasis on photovoltaics. The question to be discussed is whether towns transformed by the solar complex with emphasis on photovoltaics in this manner may be referred to as an attempt to achieve a programmatic urban ideal within the intentions of the traditional urban search models.	d) Wind power engineering as a whole may have and indeed has a certain impact on decentralisation of the power engineering system, in particular in the rural environment. At the same time, its effect is integrative and planet wide.
e) The clearly viable strategy of transition from zero-energy buildings to plus-energy buildings is gradually being asserted in the urbanised environment. The electricity produced by photovoltaics in the context of the solar complex in the urbanised environment accompanied by energy savings inherent to the solar complex may start to play a major role in the power engineering mix as a whole. In general, the focus on the solar complex with emphasis on photovoltaics at this specific moment in history is an expression of preliminary caution in the light of rather low growth dynamics, autonomation and isolation (and these terms need to be interpreted in the language of the general spatial and urban planning, architecture or urbanism and social ecology). X	e) Solar and wind power engineering share a common characteristic arising from the fact that they awaken artistic awareness and open a new chapter in the history of arts to a significant, even surprising extent and thus facilitate the integration of these technologies in the historical environment [6].
The topic of development of solar parks (ground photovoltaic power engineering plants) in suburban landscapes, landscapes of brownfields, high-production agricultural landscapes, traditional cultural landscapes with significant non-productive function of agricultural land differs from the topic of development of the solar complex with emphasis on photovoltaics in the urbanised environment in its overall settings. Its parameters almost precisely reflect the parameters of the development of the current wind power engineering; solar park assemblies are a logical, coherent, offensive reaction to the lack of fossil sources, to the need to decentralise power engineering systems, and finally to the decarbonisation objectives set by the global communities in connection with climate change.	

Final Remarks

A. Technological accessories of photovoltaic panels are rather large: voltage converters, electric meters, accumulators, cables, batteries. This means that when photovoltaic systems are installed within monuments, this undoubtedly involves transformation or a major change of the relevant monument, at least in terms of its mass and to a certain extent also in terms of its function. In addition, this also involves transformation of the entire historical environment, including the urbanized environment. While transformation of monuments always comes with a significant potential for conflict, monuments benefit from the usage of renewable energy sources owing to the synergic effect, i.e. owing to a better condition of entire sets of monuments. When comparing synergies against conflicts, it is essential that monument care authorities proceed in line with the so-called test of proportionality when assessing suitability of installation of photovoltaics within monuments (or buildings in valuable historical environments) while respecting the fact that installation of photovoltaics is becoming a public interest [4]. In practice, this means individual assessment of specific cases of installation while refraining from absolutization of any of the public interests.

B. The mass character of the development of photovoltaics in the urbanized environment, which intensifies in the 2020s, gradually also influences opinions in monument care. While monument care is and has to be conservative by principle, it is starting to lean towards more flexible approach. Mass development of photovoltaics in the urbanized environment in particular in Europe undoubtedly poses a rather major threat to monument values, when this phenomenon is viewed from the perspective of the traditional monument care, in particular in the central European region. The imminent total replacement of material in the authentic roof covering in the historical residential structure with highly advanced BIPV leads to the phenomenon of total imitation, which is foreign or even hostile to the ideas of monument care. On the other hand, it is possible to state that the climate change increases the dynamics of cultural and art development. (Table 3) This may lead to a new concept of the overall value of a cultural monument, which may newly comprise of three values:

1. The value of historical uniqueness;
2. The aesthetic value of the work of art;
3. The high-tech value of the unlimited technical and technological creativity linked to achieving environmental objectives beneficial for the planet. A cultural monument always reflects the eternity in some ways; the high-tech value of a monument comes with an almost endless potential for further development. The so-called Window Integrated Photovoltaics (WIPV) can be mentioned as an example and further development in nanotechnologies continues. As Flavio Rosa stated: "Third generation solar cells (tandem, perovskite, dye-sensitized, organic, new concepts…) account for a broad spectrum of concepts, ranging from low-cost low-efficiency systems (dye-sensitized, organic solar cells) to high-cost high-efficiency systems (III-V multifunction), with various purposes from building integration to space application [5]."

Table 3: Analysis of synergies and conflicts between mass development of photovoltaics in the urbanised historical environment and monument care principles.

Photovoltaic systems [10]	Structure of Synergies and Conflicts Between Photovoltaic Systems and Monument Care Principles
Lean-to System	Individual installed photovoltaic modules are separate new constructions in the historical environment. This does not involve transformation of a specific monument. Instead, the historical environment is transformed as a whole, or more specifically this environment is enriched with modern construction elements. This could also be referred to as a contrast method of supplementation of the historical environment [11]. Various monument care systems approach this type of transformation differently, depending on specific philosophical and methodological bases applied in these systems, and these bases also naturally reflect the cultural tradition of the relevant country as an extract thereof.
Partially Embedded Systems (Building Applied Photovoltaics – BAPV)	This type of transformation maintains a visible boundary between the original monument and the additionally constructed modern transformation elements. This method creates a low level of illusion of the external maintenance of the authentic historical environment and thus becomes undoubtedly relevant from the monument care point of view. On the other hand, the general aesthetics of the historical environment becomes rather fragmented and incoherent. Dominant application of this concept leads to an almost strained image of a residential structure inclining towards the aesthetics of ugliness. If a monument combines a historical and aesthetic value, it is clear that it represents artistic beauty in addition to historical uniqueness. Whan applied to the maximum, this approach eliminates the notion of a monument. A monument that is too ugly and unsightly cannot be a cultural monument by definition. The author of this study would like to quote his opinions on the topic of solar collectors from 2005, which show that he preferred the BAPV systems: *"What is a solar module? It is something clearly visible from other locations, a supplement symbolising a new unity, which was lost and renewed in light of global problems of the civilisation, as we strive to protect the nature and the monument at the same time. The solar module is clearly separated from the monument, does not become a part of the monument and can be removed. It does not interfere with any parts of the monument – neither its mass, nor its ornament, shape of floorplan. A new element from the optical point of view has only been included. It is distinguished from the monument in an honest manner. It does not pretend to be anything else than an element collecting energy. By installing a collector on a monument, we breach none of the basic axioms of monument care: i.e. let a monument live, use it and refrain from deception [12]. Therefore, masking monuments contrary to the historical truth is not permitted. By installing a visually distinct solar panel on a roof, we do not breach any of the basic axioms of monument care in the sense of Wirth's idea… [13]"*

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Embedded Systems (Building Integrated Photovoltaics – BIPV)	This type of transformation protects the overall original external aesthetic coherence of the historical environment. However, this effort is at the expense of the overall authenticity of the historical environment, in particular as regards the original mass of monuments. On the other hand, this approach can also be perceived as one introducing the element of playfulness, fantasy and unlimited technological creativity in the historical environment. In addition, a cultural monument in this case gains a new environmental dimension and the original unity of environmental protection and protection of cultural heritage is renewed at an entirely new level. The concept of a cultural monument involves a modern synthesis between: a) the value of historical uniqueness; b) the aesthetic value of a work of art; c) the value of technical and technological progress characterised by unprecedented playfulness and fantasy; this could be referred to as the high-tech value of a cultural monument. However, this must be legitimised by a direct link to environmental benefits with respect to the substitution for fossil fuels, decentralisation of power engineering industry and decarbonisation in connection with the change of climate. Mass application of BIPV in the historical environment creates a high level of illusion, which is typically not welcomed by monument care, but the high-tech value of a specific monument in connection with the environmental objectives eliminates this illusion with a reference to an exceptional environmental useful value. It is therefore possible to agree with the following general opinion: *"In all types of protected areas, MHMP OPP (the Monument Care Department of the Municipal Offices of the Capital City of Prague) prefers integrated systems or systems in areas concealed by attics, and each installation is subject to individual assessment in view of the value and character of the relevant building and environment [14]."*

C. Deepening urbanization of the human race has been subject to criticism for decades. The Fossil City concept is one of these critical concepts and the Solar City concept is described in contrast as an ideal city of its kind. It is important to point out that the theory of ideal cities has been pursued throughout the thousand-year-old history of urbanism. As the urbanist Jiří Hrůza points out: "Modelling in urbanism gained its essential place in urbanism long time ago. Each urbanist project, each draft, each scheme of future development of a town and its parts – all these are essentially models. Spectacular models are images of future cities described by utopians, similarly to Howard's Garden City, Le Corbusier's Shining City, Milyutin's Linear City or Ladovsky's City-Rocket [6]." The adverse situation of the Fossil City or the Fossil Megapolis stems from the ongoing concentration and centralization of power engineering based on fossil sources; (Figures 3&4) this cannot be changed even by the functional reform of the Fossil City attempted by Le Corbusier. This study will not attempt a discussion of how far power engineering decentralization in the current globalized human society can go and to what extent it may work as a universal cure (Table 4). On the other hand, the study will not discuss the topic of centralization of renewable sources either. However, it is clear that the climate change is a horizon requiring a major reform of a city with energy balance based on fossil fuels. Reforming the concepts of a city, agglomeration, megapolis and suburbs in times of climate change is a framework delivering clear meaning to the mass development of photovoltaics in an urbanized environment. Only then the discussion on balancing environmental interests and interests of cultural heritage protection can be conducted with true understanding and thus can lead to a rational consensus.

Figure 3: Ground photovoltaic power plant in Vepřek - photography by Tomáš Hájek-2026-postproduction by Petr Zajíček. Start of operation in 2010, installed output 35.1 MW. The solar park is situated in an open agricultural and industrial landscape with intensive farming and significant presence of residential structures and roads. The farmed land reaches to the edge of the solar park, creating the impression of symbiosis between agriculture and renewable sources. Yet, this arrangement represents a clearly unused opportunity from the perspective of landscape creation; combination of the concealing and highlighting methods would be suitable here. Plants could let the solar park peak through, while creating a certain visual shield. Most importantly, they could be an opportunity for enriching ecologically and aesthetically and harmonize a relatively fragmented and environmentally burdened landscape, which is quite valuable from the historical or even monument care point of view.

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Figure 4: Ground photovoltaic power plant in Ralsko - photography by Tomáš Hájek-2026-postproduction by Petr Zajíček. Start of operation in 2010, installed output 55.8 MW. The robust arrangement of solar parks, which continues to grow significantly, is situated in the former military area between the towns of Mimoň and Mnichovo Hradiště, centred around the town of Ralsko. From the geological, natural, landscaping and historical point of view, this area is unique. Former military areas in general represent an extraordinarily significant opportunity for the mass development of solar parks. Many areas of this type have been left after the Cold War in particular in the Czech Republic. They share the following characteristics: large area, relatively low density of population, low level of development of industry, agriculture and residential structures, necessity to remedy extensive environmental damage before starting with any renewal of the area. In general, it can be said that the development of solar parks, including their contextualization, is a unique opportunity for gradual renewal of the landscape and its function in the case of former military areas following their decontamination and remedy of environmental damage. As regards the former military area in Ralsko, the set of solar parks should be systematically interconnected with planted greenery and the creation of networks of paths in a landscape that has a great potential, yet currently makes an impression of emptiness, lack of functional use or being forgotten and even being tragic to some extent.

Table 4: Analysis of synergies and conflicts between mass development of solar parks (ground photovoltaic power plants) in .a cultural landscape and monument care principles.

The following analytical information from 2023 can be used in a statement on the current approaches to controlling the development of solar parks in a cultural landscape, for example in view of the monument value of the landscape: “*No existence of relevant foreign sources addressing these topics to an adequate scale and based on protection of the existing values and limits of land usage was found at the time of preparing the zoning study [15].*” This information is surprising, considering how significant the development of solar parks in a cultural landscape is and how big its potential for the future is.
As regards the impact of solar parks on the landscaping character of the cultural landscape, a quote from the methodical guideline on the assessment of suitability of placement of wind and photovoltaic power plants in view of nature and landscape protection can be included: “*In the case of a photovoltaic power plant, the area covered with photovoltaic panels is the most important parameter from the visual point of view. Therefore, photovoltaic power plants are applied in the landscape as flat, horizontal dominants. At a shorter distance, the technicist and geometrical character of the construction attracts attention. From a greater distance, photovoltaic power plants appear mostly as homogenous areas. Reflection from photovoltaic panels play a role in some cases and can be minimised with suitable technical measures. Two aspects are most important in photovoltaic power plants from the perspective of their impact on the landscape. Firstly, it is the size of the continuous area (or arrangement of multiple continuous areas) covered with panels. Secondly, it is the orientation of the land on which panels are installed with regard to the relevant landscape characteristics. These two aspects determine the definition of visibility zones. In general, it can be said that compared to wind power plants, the extent of the visually affected area in the case of photovoltaic power plants is much smaller (by tens of km²) [16].*

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Two basic strategies for systematic creation of a mutual contextual link between a solar park and a cultural landscape are available: a) concealing photovoltaic panels/farms in the landscape; b) highlighting photovoltaic panels/farms in the landscape [17]. In both cases, landscapers, planners and architects working in the landscape, artistic designers and visual artists, environmentalists and zone planners are and will be faced with a major task of developing a comprehensive strategy of landscaping and architectural interventions mainly in (but not limited to) buffer zones of solar parks, with the aim to integrate solar parks in the overall context of the cultural landscape. In addition, the strategy of mass development of solar parks in a cultural landscape can be created in a manner ensuring its synergy with objectives of biodiversity protection [18]. To reiterate the general objectives of this study – it is essential that theory and practice confirm that the following win-win-win strategy as regards synergies and conflicts between mass development of solar parks in a cultural landscape and monument care principles can be asserted: a) mass development of solar parks in a cultural landscape significantly contributed to the policy of departure from fossil fuels and thus directly helps to protect monuments threatened, for example, by acid rain [19];

b) mass development of solar parks in a cultural landscape can be harmonised with the current agri-environmental procedures to a great extent, meaning that the agricultural production ability of the agricultural landscape is maintained; in addition, the modern society increasingly reaches into the agricultural landscape and this will unavoidably translate into the care for landscape structures and the memory of the agricultural landscape; c) according to the current theory and practice to date, mass development of solar parks in a cultural landscape can be harmonised with objectives of maintaining biodiversity and with objectives of maintaining and strengthening unproductive functions of agricultural land, which means that the original unity between environmental protection and protection of cultural heritage is maintained and can be further developed. An important question (to be discussed further on the final part of this study) is whether a solar park will be seen as a temporary structure, which would result is fluidity or even illusiveness of the development of renewable power engineering, or as a permanent structure.

D. Landscaping contextualization of a solar park is a major challenge touched by this study merely in identifying this challenge. However, the following should be pointed out: landscaping contextualization requires extensive plant and land modification and establishment of non-provisional network of routes. Planting needs to be planned from a long-term perspective; the character of the planting scheme must have the same characteristics of an environmental approach as the existence of a solar park. A high-quality network of routes also needs to be of a long-term character. For the planting scheme and routes being conceived as long-term, a solar park should have the character of a permanent structure, rather than a temporary one, as is the case in the Czech Republic. A solar park should be conceived as a permanent structure, in which the park of photovoltaic panels is replaced, for example, every 25 years. In the case of a permanent structure, zone planning, landscape planning, architecture and urbanism will approach the task with greater creative enthusiasm than in the case of a temporary structure. A solar park can then be associated with landscaping work of a deeper and more permanent character, with the creation of bio-corridors (Table 5), biocentres and line greenery in broader landscape plans. Synergy between a solar park and development of greenery in an urbanized environment noteworthy from the perspective of urbanism and landscape planning can be created. To recollect past issues, the study quotes from the report of the Program for the Care of Greenery in Urbanized Environment from the beginning of the millennium, which mentions greenery in industrial and suburban landscapes as a major problem: "An urban landscape phenomenon entirely new for our country has also appeared – spontaneous, mass, large-scale, loosely regulated commercial and industrial construction along busy roads and around larger towns, which remains without any response from the socially economic, urban, architectural, aesthetic or landscaping perspective [7-23]." If a solar park is considered a permanent structure, the regularity of distribution of installations will be considered more carefully at the national and regional level to pay attention to brownfields, suburban roof landscapes, recultivated post-mining areas and large natural or artificial bodies of water, and to reduce the burden on landscapes with high agricultural production or landscapes with a traditional mix of natural and cultural elements with major non-productive functions of agricultural land.

Table 5: Two basic options for balancing synergies and conflicts in an urbanised environment between mass development of photovoltaics and monument care principles.

Solar complex with mass development of photovoltaics in an urbanised environment	Deep reform of the Fossil City in view of the climate change is not taking place.	Rational compromise between the requirements for mass development of photovoltaics and monument care principles is not viable by principle.
Solar complex with mass development of photovoltaics in an urbanised environment	Deep reform of the Fossil City in view of the climate change is taking place.	Rational compromise between the requirements for mass development of photovoltaics and monument care principles is viable.

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Conflict of Interest

No conflict of interest

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