



Climate Protection Versus Building Heritage Preservation - Influence of Renewable Energy Installations on Historical Buildings

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Abstract. Climate change is one of the major challenges of the 21st century. Renewable energy systems using solar and wind do not emit carbon dioxide and other greenhouse gases and thus may contribute to stave off the worst effects of rising temperatures. Europe strives for becoming the world's first climate-neutral continent until 2050. Therefore, also Germany intends to expand the share of renewable energy and supports the implementation of renewable energy systems. Beside all advantages, the increased installation of renewable energy solutions also has a number of disadvantages. One of those is the negative effect on the appearance of cultural heritage.

In Germany, around 1.3 million cultural heritage structures exist. The German law obliges heritage protection authorities to preserve building heritage and to prevent the historical appearance of protected structures from negative effects. But, the implementation of renewable energy systems may create a conflict between environmental interests and building heritage preservation goals.

The authors analyze the increased implementation of renewable energy sources in Europe in general, and in Germany in particular. They focus on solar and wind energy installations. Additionally, the authors inform about current requirements resulting from German heritage preservation law. The paper explains how renewable energy solutions may negatively affect protected historical buildings and discusses the consequences for heritage preservation. As methodology, the authors use analysis of current German court cases as well as research literature under consideration of the experience of heritage protection authorities. Conclusion is that European countries should avoid playing off environmental goals and protection cultural heritage against each other, in the interest future generations.

Keywords: Building Heritage · Climate Change · Renewable Energy Solutions

1 Introduction

Europe strives for becoming the world's first climate-neutral continent until 2050. This project is called the Green Deal. Some of the key principles of the Green Deal Plan include prioritization of energy efficiency, development of a power sector based mainly

on renewable resources and securing an affordable energy supply [1]. With 10-year integrated national energy and climate plans (NECP) for the period from 2021 to 2030, European Union member states try to meet the European energy and climate targets. An overview about the plans of the European Union member states can be found in [2].

In 2019, the German Federal Government passed the Climate Action Program 2030 through which it intends to achieve Germany's climate goals between now and 2030 [3]. In Germany, 14% of all CO₂ emissions per year (120 million tons) come from the building sector [4]. A reduction of CO₂ emissions, in the interest of the global climate, shall be achieved by renovation of buildings, provision of greater energy efficiency, replacement of old heating systems, as well as development and usage of energy efficient building materials [5]. Switching to renewable energies seems to be one of the solutions on the way to climate-neutrality. As an example, in Germany, it will no longer be allowed to fit oil central heating in buildings in which it is possible to install a more climate-friendly heating system, from the year 2026 [4].

Germany intends to expand the share of renewable energy and supports the implementation of renewable energy systems. Beside all advantages, with increased installation of renewable energy solutions also disadvantages occur. One of those is the potentially negative effect on the historical appearance of cultural heritage.

In Germany, around 1.3 million protected historical buildings exist. The German law obliges the heritage protection authorities to preserve building heritage and to prevent the historical appearance of protected structures from negative effects. The growing number of court decisions in the last years in Germany show, that the increased implementation of renewable energy systems creates more and more conflicts between environmental interests and building heritage preservation. The question is, how it is possible to find a balance between increasing environmental interests and monument preservation targets.

2 Research Methodology

As a basic research, the authors analyzed the increased importance of renewable energy sources in Europe in general, and in Germany in particular. They focus on solar and wind energy installations. Additionally, the authors inform about current requirements resulting from German heritage preservation law. In a second step, the paper explains how renewable energy solutions may negatively affect protected historical buildings and discuss the consequences for heritage preservation.

As methodology, the authors use analysis of current German court cases considering the last 20 years as well as research literature under consideration of the experience of building heritage preservation authorities. They discussed relevant case law and concluded from the results the future development in the conflict between environmental and heritage preservation interests.

Based on the information in the explanatory memorandum for the implementation of sustainable issues in German construction legislation, the authors analyzed and illustrated the intention of the legislator and by which methods the new legislation shall contribute to life quality for human and animals as well as to protection of the environment.

From the research results the authors concluded that it is crucial to find a balance between environmental interests and monument preservation targets, in the interest of future generations.

3 Renewable Energy Solutions

Germany intends to expand the share of renewable energy and supports the implementation of renewable energy systems, such as solar panels, photovoltaic panels, and wind turbines. In the following, the authors provide the legal and political background in Europe and Germany to support that process.

3.1 Legal and Political Background in Europe

The political background for the European target to become the world's first climate-neutral continent until 2050 is the so called Green Deal. The Green Deal can be defined as a set of policy initiatives by the European Commission with the target to reduce European Union's greenhouse gas emissions for 2030 to at least 50% and towards 55% compared with the emissions of 1990 [1]. As a result, new legislation is intended for example on the field of building renovation and innovation [1]. Some of the key principles of the Green Deal include prioritization of energy efficiency, development of a power sector based mainly on renewable resources and securing an affordable energy supply [1].

Legal basis for the environment policy of the European Union are Articles 4, 11, and 191 to 193 of the Treaty on the Functioning of the European Union (TFEU) [7]. The authority resulting from that treaty allows the European Union to act in all areas of environment policy, such as air and water pollution, waste management and climate change. Its scope for action is limited by the principle of subsidiarity and the requirement for unanimity in the Council in the fields of fiscal matters, town and country planning, land use, quantitative water resource management, choice of energy sources and structure of energy supply [7]. As one further European regulation, the Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable source [8] should be mentioned.

On the basis on Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action [6], European Union member states are obliged to establish 10-year integrated national energy and climate plans (NECP) for the period from 2021 to 2030 to meet the European energy and climate targets for 2030. In 2023, the European Union member states will up-date their climate and national energy plans to adhere to the European Union's climate goal for 2030. The national plans summarize how the member states intend to address the following areas: energy efficiency, renewables, greenhouse gas emissions reductions, interconnections, and research and innovation. An overview about the plans of the European Union member states can be found in [2].

3.2 Legal and Political Background in Germany

On the political level, in the meantime, an almost unimaginable number of papers, plans, commitments and memoranda exist to achieve the climate goals. In this paper, only the

German Climate Action Plan 2050 of 2016 [9], Climate Action Programme 2030 [10], and the German NECP of 2019 [3] should be mentioned. Target of all activities, among others, is the development of a power sector based mainly on renewable resources. Thus, renewable energies should make up 65% of gross electricity consumption in Germany in 2030, for example by wind, sun, water or biomass. The German Federal Government plans expansion of wind power – offshore and onshore. Onshore wind power should be increased from currently around 54 gigawatts output to 71 gigawatts by 2030 and offshore wind power from 6.4 in 2019 to 20 gigawatts by 2030 [11]. An overview about the current number of wind turbines in the Federal States of Germany the authors provide in Fig. 1.

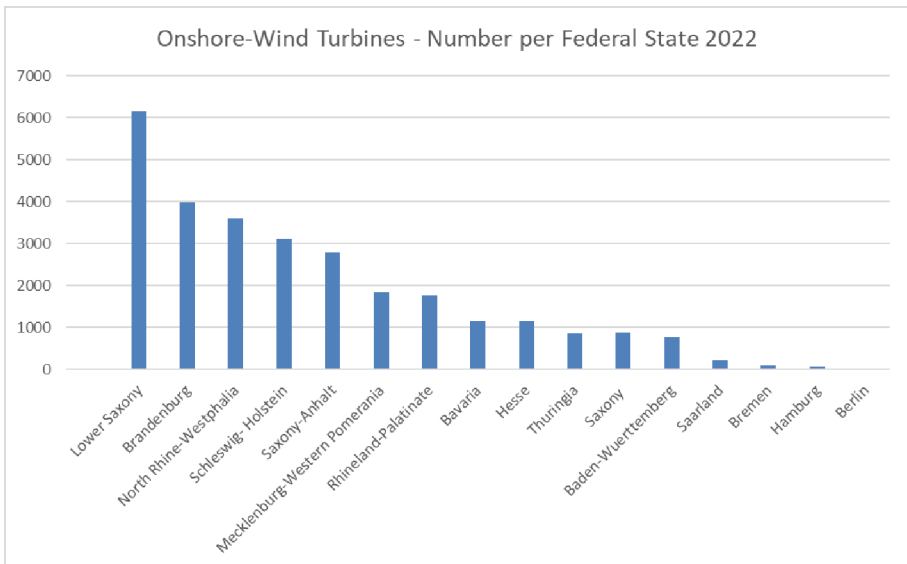


Fig. 1. Overview about the number of wind turbines in the German Federal States 2022 (Data retrieved from Statista [12]).

Additionally to the extension of wind turbines, Germany is striving for an increased energy generation from solar power systems. Until 2030, the output of photovoltaic installations shall be increased by unlimited expansion of solar installations [11]. The German Federal Government intends to encourage self-supply and funding for landlord-to-tenant electricity. Furthermore, the introduction of independent tenders for large rooftop installations was decided [11].

In Germany, environment protection is state objective since 1994. State objectives are guidelines and directives of state's activities [13] and constitutional rules with legally binding effect [14]. Also in their constitutions, the German Federal States commit themselves to protect the natural resources, see as an example Article 10 of the Constitution of the Federal State of Saxony [15]. Legal regulations containing requirements for construction and installations of renewable energy systems can be found in the Federal law as well as in the Federal States' law, depending on the issue that is regulated.

The German Building Code [16] is federal legislation. It contains requirements regarding land use for human settlement, transport and other purposes and explain whether, what and how much it is allowed to build and which usage of the structure is permitted. Furthermore, the legislator regulates how to arrange buildings on the plot and if spaces must be left between buildings and/or property lines [17].

Beside the Federal planning rules, German Federal States' building regulations mainly serve the purpose of hazard prevention and regulate the implementation of buildings as well as structural works [18]. Constructions are to design, to construct, to maintain, to alter and to remove in a way that public safety and order, especially life, health and natural living resources will not be endangered. The same applies for the removal of constructions and a change in usage [19].

Germany amended and newly enacted legislation to adhere to the climate goal, such as the Renewable Energies Act [20], the Climate Change Act [21], and the Offshore Wind Energy Act [22]. Within this development, the Federal Government has also agreed the first measures to simplify the planning and approval processes for wind power plants (draft of the Infrastructure Acceleration Act [23]). Also, the Federal States amended acts and statutes, such as the Federal State of Germany the Saxon Building Code [19]. Besides other revisions, the minimum distances between wind turbines and residential buildings can be reduced under 1,000 m under certain conditions, in the worst case to a minimum of 3 m. That should help to achieve the German goal to classify 2% of the land as an area where installation of wind turbines is allowed. Furthermore, the legislator facilitates the implementation of photovoltaic panels and solar thermal systems.

4 Building Heritage Protection Requirements

In Germany, heritage protection enjoys a status of high importance [24]. In Germany, around 1.3 million protected historical buildings exist, of which 51 are UNESCO World Heritage [25]. To preserve these architectural witnesses, in the year 2022, Germany invested more than 172 million Euro in heritage protection [26]. Germany ensures and encourages the protection of monuments not only by funding, but also by legal requirements, approval procedures, and taxes.

Building Heritage Protection is under Federal legislation. Therefore, in each of the 16 German Federal States heritage protection acts exist (such as the Saxon Heritage Protection Act [27]). They define, among others, what protectable heritage is, contain requirements for the treatment of monuments as well as the tasks and competences of the state heritage protection authorities. In other acts and statutes, such as the Federal States' constitutions, the importance of heritage protection is recognized as well.

In the German definition, building heritage means buildings and constructions whose conservation and use are of public interest because of their historical, artistic, scientific, urban and landscaping importance [27]. After registered on the list of building heritage, historical structures deemed to be state protected [27]. Heritage preservation's target is to protect and to maintain protected historical structures, especially to check their structural conditions and to avoid danger. For reaching this aim, owners and/or users of protected structures shall cooperate with the heritage protection authorities. Owners and users of building heritage are required to treat the protected constructions with care,

to preserve it in compliance with historic preservation principles and to protect it from danger.

To reach the aim of building heritage protection, responsible authorities have the right to take appropriate measures. Among other duties, the authorities are empowered to request information from owners and users about the protected structure, to inspect it, and to impose a fine if owners or users do not act in compliance with building heritage protection regulations. Before a protected structure's owner is allowed to reconstruct, to alter, to destroy or to remove the building, an authorization of the state heritage protection authority is needed [27]. That includes the implementation of renewable energy systems on or nearby a protected structure. Installation of renewable energy solutions, for example solar power systems on a roof, are not allowed if it considerably impacts the historical appearance of the protected structure [27]. The definition if and in which extent installations or wind turbines affect the historical appearance of buildings, often leads to disputes between the authorities and the building owners.

5 Conflict Between Environmental Interests and Building Heritage Protection

Since the last 20 years, the number of court decisions on renewable energy systems on or nearby building heritage has been increased. That is not surprising because of the political objective to strive for an increased energy generation from solar and wind power systems. Due to the high number of protected structures in Germany, it is inevitable that building heritage will be affected. That more and more leads to conflicts between environmental interests and building heritage preservation goals. As mentioned before, both the protection of environment and the preservation of building heritage are of high importance for the German society, proved by their explicit reference in the German Basic Law and in the Federal States' constitutions. Because the law does not give priority to one of these both interests, in case of conflict, courts have to balance between the two goals in the respective individual case [28]. The authors discuss the following current court decisions to explain, how German courts prioritize these both interest and how conflicts can be solved.

5.1 Court Decisions Regarding Solar Energy

Before deciding about an application for the installation of solar energy systems, state authorities check the compliance with construction law and heritage protection law requirements. The renewable energy project has to comply with the heritage protection acts of the German Federal States, for example with section 12 (I) Saxon Heritage Protection Act [27]. The approval is to grant if the project complies with heritage protection goals. That means, that not only ugly construction or those which violate the esthetic sensitivity of the observer are illegal. Additionally, new energy installations are not allowed to reduce the special effect of building heritage it has as artificial object, as historical witness, or as an architectural key element [29]. A renewable energy installation on a protected structure shall not develop a dominating optical effect and by this, impact the architectural-historical appearance of the building heritage [30]. A general statement,

under which preconditions solar energy systems on protected structures are permitted, is not possible. It is always a decision in the individual case. Because of heterogeneous requirements in the several heritage protection acts of the Federal States, balancing building heritage preservation interests and climate goals may produce different judgements in comparable cases if decided in different Federal States.

Case 1 - Solar Energy System on Single Residence in a Historical Settlement [31]. In 2020, the Higher Administrative Court for North Rhine-Westphalia decided a case about the application for installation of a solar energy system on the roof of a historical building. This building is a protected structure itself and also a part of a protected historical architectural ensemble. The owner applied for a permission to install a solar energy system which covers less than a quarter of the roof. The responsible authority did not permit the installation with the argument, that the solar system dominates the historical appearance of the building and, thus, has a violating impact on the monument. The Higher Administrative Court for North Rhine-Westphalia added, that although the solar panels only cover one quarter of the total roof area, the energy installation appears as a dominating technical element on the small roof area that is visible from the street [31]. Furthermore, the court explained, that building heritage preservation is of great importance and is not to rank behind the interest in secure and environmental friendly energy supply [31]. Courts decide in each individual case about the compliance of installations with heritage protection requirements and policy commitments are not allowed to influence this judgement [31].

Case 2 - Photovoltaic System on a Half Timbered House [32]. In the case decided by the Administrative Court Braunschweig in 2021, the plaintiff applied for a photovoltaic system on the roof of his historical building. The total roof area of 135 m² should be covered with a photovoltaic installation with a size of 37.6 m². The authority rejected the application with the argument, that the technical system covers a major part of the southern roof area which is characterized by a continuous red brick surface. Because the photovoltaic system has another color and, because of its size and differing material, it dominated the historical roof. Thus, the installation disturbs the homogenous appearance of the protected structure. The Administrative Court Braunschweig agreed that the photovoltaic system impacts the historical appearance of the building. Nevertheless, it defined the impact as quite low and decided, that in this case, heritage preservation interests are of secondary importance compared to private interests of the owner and the public interest in supporting renewable energies [32]. The southern perspective of the building is not really worth to see and is partially covered by evergreen trees and plants. Furthermore, the solar panels only cover one quarter of the southern roof and even the untrained observer is able to differentiate between the historical appearance of the roof and the technical innovation [32]. Thus, after balancing the interests in that specific case, the court decided in favor of the renewable energies and the private owner interests.

5.2 Court Arguments Regarding Wind Energy Turbines

While the examination of an application for the erection of wind turbines, state authorities check the compliance of the project with emission law, planning law, and heritage

protection law requirements. Building heritage preservation goals are to consider on both the Federal law level as well as the Federal States' law level.

On Federal level, the interest in expanding wind energy has to be balanced with heritage protection concerns, Section 35 (I), (III) Federal Building Code [16]. Construction projects shall not violate public interests. As one of these public interests, building heritage protection was officially added in 1987 to Section 35 (III) no. 5 Federal Building Code [16]. That means, if the wind turbines do not affect building heritage, the state authorities may grant a permission for their erection. The main problems in applying for erection of wind turbines is, that their height and domination in the landscape very often affect single monuments or protected historical architectural ensembles. If the wind energy installations reduce the special historical, architectural and/or cultural importance of the building heritage, the authorities have to reject the installation application. It is not necessary, that the turbines destroy the appearance of the protected structures; affecting its characteristic appearance in the surrounding landscape is sufficient [33].

Furthermore, the wind turbine project has to comply with the heritage protection acts of the German Federal States, for example with Section 12 (I), (II) Saxon Heritage Protection Act [27]. Wind turbine projects need an approval of the state heritage protection authorities, if an erection in the surrounding of protected historical structures is planned. The approval is to grant if the project complies with heritage protection goals. That means, that not only ugly construction or those which violate the esthetic sensitivity of the observer are illegal. Additionally, new energy installations are not allowed to reduce the special effect of building heritage it has as artificial object, as historical witness, or as an architectural key element [29]. A general statement, under which preconditions wind turbines can be permitted in the surrounding of building heritage is not possible. It is always a decision in the individual case.

Case 3 - Oster Coldinner Grashaus [29]. In 2010, the Higher Administrative Court for Lower Saxony decided a dispute about the installation of a wind turbine 350 m away from a big historical farm (*Oster Coldinner Grashaus*). The plaintiff applied for the permission to erect a wind turbine which the responsible authority rejected. The key question of the case was, if only the *Grashaus* itself and its immediate surrounding shall be protected, or if the wind turbine in a distance of 350 m affects the historical appearance of the protected structure. In the first instance, the Administrative Court Oldenburg decided in favor for the wind turbines without hearing heritage protection experts. The court argued, that the protection of the *Grashaus* reaches not beyond the immediate surrounding of the farm. Furthermore, the farm is sufficiently screened by the branches of some trees [29].

The Higher Administrative Court, as court of appeal, changed the judgement of the Administrative Court Oldenburg and decided in favor of building heritage protection. It argued that the court of first instance should have heard a heritage preservation expert [29]. Only an expert is able to decide which distance is necessary for not affecting the protected structure in the individual case. The Higher Administrative Court further clarified, that there is no sufficient screening of the farm by the branches of the surrounding trees. Not only the farm itself needs protection as historical witness but also the surrounding which is characterized by that building [29]. The farm is located in a sparsely populated region on a *Wurt*, which is an historical artificial hill that should protect the

farm from storm tiding. The *Wurt* itself is protected as archeological monument. Thus, the Higher Administrative Court argued, not only the protected historical building but also the surrounding cultural landscape would lose its typical appearance if the wind turbine would be installed [29].

Case 4 - Wiesbaden City and Surrounding [34]. In this case, the plaintiff applied for the permission to erect 10 wind turbines in and nearby the city of Wiesbaden. The responsible authorities rejected the application. The dispute was decided by the Administrative Court of Wiesbaden. As well as in the *Grashaus* case discussed before, the administrative court did not hear building heritage preservation experts. The judges found the verdict that in this individual case the wind turbines do not affect the historical city parts of Wiesbaden or the protected structures in the surrounding [34]. The court individually examined the influence of the wind turbines on each of the 6 protected historical buildings or sites. In each of the examined situations the wind turbines are visible, but the court either did not find that the turbines have a dominating and violating impact on the monuments, or it argued that the interest in generate renewable energy has a higher value than building heritage protection [34].

This verdict is interesting because it was found exactly 10 years after the *Oster Coldinner Grashaus* judgement. While analyzing the development of courts' argumentation in wind turbine cases since the last 10 years, the authors experienced a shift in the consideration and balancing of goals resulting in preferencing renewable energy interests detrimental to heritage protection. This is not surprising and it will be intensified in future due to the self-commitment of Germany to increase the share of renewable energy until 2030 and the resulting legal amendments.

5.3 Future Development

The verdicts discussed above were found before the year 2023. In this year, the German Federal Government amended the Renewable Energies Act [20]. The amendment shall increase the importance of renewable energy generation within the process of balancing environmental and building heritage interests on Federal level. Furthermore, the German Federal government intends to remove the requirement of minimum distances between residential houses and wind turbines and to plans withdraw the Federal States' rights to implement such minimum distances by regulations on Federal States' level. It is expected to become a hard fight between the Federal government and the Federal States because these plans are violating the Federal States' constitutional guaranteed federalism. Currently it is unclear, how this development will influence future court decisions in conflicts between environmental interests and building heritage preservation. Nevertheless, it is obvious, that German policy decided for a gradual reduction of building heritage protection in future. This is a dangerous way because, on the one side, protected historical structures are excellent historical witnesses and help future generations to understand the past for the benefit of the future. On the other side, for Germany, building heritage is an important factor in the tourism industry. Each year, 100 million people are visiting the German building heritage, spending around 1 billion of Euros [35]. Despite every understanding for the climate protection interests, Germany would do well to acknowledge the importance of building heritage for society and future

generations. While balancing environmental interests and heritage preservation goals, all options shall be examined, such as alternative places for wind energy solutions, far away from protected structures.

6 Conclusions

As a result from the self-commitment of the European Union and Germany to become the world's first climate-neutral continent until 2050, Germany is striving for an increased energy generation from wind and solar power systems. Until 2030, the share of renewable energy generation shall be increased significantly. The methods, for example the installation of solar energy systems on the roofs of historical structures or the erection of wind turbines nearby protected build-ings, lead to conflicts with building heritage preservation concerns.

Germany amended legal regulations and plans more revisions to reach the goal of climate neutrality. For the responsible heritage protection authorities, it will become harder to defend heritage protection interests against an impact by technical installations. Thus, the German society is asked to acknowledge the great importance of building heritage for future generations as well as for the tourism.

European countries should avoid playing off environmental interests and the protection of cultural heritage against each other. The solution must be to find a balance between climate protection goals and heritage preservation, for example by a search for alternative places for wind and solar energy solutions, far away from protected structures.

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