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Guideline for nature protection in fortress systems

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Foreword

Many fortifications in Europe, although they often differ from each other, do have one similarity: they serve as habitats and provide habitats for numerous amounts of species and ecological communities. The occurrence and abundance of species and communities in fortifications of all ages reflect in general their typical abundance in the surrounding landscape of the region. At the same time fortifications can host specific species and communities which are rare and atypical in the specific bio-geographical context. Sometimes these species and communities even can be found because of the presence of the fortification. The causality for the abundance of specific species or communities in fortifications and of course specific biogeographic regions is seldom easy to explain and is therefore a matter of scientific discussion.

Besides the natural heritage societies are confronted to take care about their cultural heritage, as a reminder of history and in reflection of their identification. Fortifications, although many centuries were influenced by them, often are not perceived as worth to protect, due to their inconvenient history. Protection efforts in these elements are not only confronted with this aspect, but as well with the size and dimension of these objects. In addition aspects of specific and general aspects of nature protection sometimes complicate the overall situation. As a result huge confrontations between lobby groups can occur, which mostly not end in a social optimum.

This publication wants to give practitioners and experts of fortress maintenance, reconstruction and monument protection assistance for planning and carrying out their tasks from an ecological perspective. As well this publication shall enhance the knowledge among the addressed group about reasons of situations they are often confronted with. The authors know that not all conflicts will be solved by this publication, but it shall stimulate the discussion between monument and nature protection organisations and their implementation bodies and hopefully mitigate observed conflicts.

This publication is a result of the Central Europe Project Forte Cultura and concludes findings and field research results of almost 10 years, which have been carried out by students and staff of the Humboldt University at Berlin and other experts, on the topic of nature conservation and protection in European fortresses.

The authors hope that this paper will provide new aspects, ideas or options for town and regional planning, especially if decision makers, planners, citizen or managers are obliged or feel obliged to protect and conserve the cultural heritage of European fortifications.

The authors encourage everybody to contact them if questions arose and ideas or opinions need to be exchanged.

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Abbreviations:

CAP	Common Agricultural Policy
DPSIR	Drivers, Pressures, State, Impact, Responses
EEA	European Environmental Agency
EEC	European Economic Community
EC	European Commission
ELD	Environmental Liability Directive
EIA	Environmental Impact Assessment
EU	European Union
EU28	European Union of 28 member states in 2013
FCS	Favourite Conservation Status
FFH	Flora Fauna Habitat
GES	Good Environmental Status
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for the Conservation of Nature
MPA	Marine Protected Areas (FFH related)
OECD	Organisation
PEEN	Pan European Ecological Network
SAC	Special Areas of Conservation (FFH related)
SCI	Sites of Community Importance (FFH related)
SEA	Strategic Environmental Assessment
SEBI	Streamlining European Biodiversity Indicators
SPA	Special Protection Areas
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WFD	Water Framework Directive

1. Introduction

Illustration of actual problems

Modern fortifications exist almost everywhere among Europe. They differ from their style and shape and can cover up to several square kilometres. Several hundred have been erected since the beginning of the 16th century until the invention of modern artillery ammunition in the late 19th century have made these defence systems structural obsolete and useless for warfare. Modern fortifications reflect according to their erection phase different episodes of architecture, shifts and changes in weaponry, a certain type of warfare and from a political point of view the historical formation of today's Europe.

By an increasing age of a defence system its direct military related context is transfigured successively into a romanticised imagination of past times. This explains clearly why medieval defence systems are perceived more as a cultural heritage than modern fortifications, of which the vast majority is still perceived as an inconvenient heritage and ballast among public. In contrast, during the last decades some of these modern fortifications have been reconstructed and re-valued by society as a cultural heritage, e.g. the Vauban fortresses in France, which are UNESCO World Heritage since 2008. Especially these "lighthouses" of monument protection and valorisation are very much recognised among many experts, town-halls, municipalities, ministries as prime examples for urban-, rural- and overall spatial planning.

The shift or even the loss of their functions for military purposes has caused in many modern fortifications in most cases a complete absence of regular maintenance of their architectural elements and their covered overall area. Some have been even abandoned completely; others were used as military storages or garrisons until the end of the Cold War, or are still used by municipalities since decades or even centuries as urban areas. Due to reduced or even absent maintenance secondary succession (the establishment of ecological communities following a certain area-specific line of development) occurred in the areas, which results in a biogeographic specific combination of fauna and flora.

Due to structural characteristics of fortifications several zonal and azonal habitats exist on a relative small area, where under natural conditions normally forest like habitats would develop, in middle Europe in most cases zonal variations of beech and oak forests, *Querco-Fagetea* (Oberdorfer). As well in many fortifications dry or semi-dry habitats on the top of bastions and walls and in opposite, sometimes only some meters away, eutrophic ponds and swamp like habitats in ditches can be found, which serve as habitats for reptiles, amphibians, insects or birds. Sometimes as well fragments of former or native local phyto-associations or even remnants of intended vegetation patterns, like bushes or hedge rows of black locust, hawthorns or other trees occur, which were used for defensive purposes. Due to the broad abundance of walls as well associations and orders of *Asplenietea* (Oberdorfer), communities of rock and wall crevices, and or other analogue classes of rocky habitats occur, sometimes even in places where these by the absence of all artificial buildings in the landscape would never occur, like in floodplains. In summary, all structural elements of fortifications serve as natural, substituting or as completely new habitats for many plant species, communities and related animals, of which some are clearly definable as being synanthrope. Some of these habitats, communities and species, which can be found in almost all European fortresses, are listed in the FFH Directive 92/43/EEC as "of community interest" or even indicated with "priority". This especially holds true for European bats. In addition, National regulations and the Birds

Directive 79/409/EEC extend theses appendices and related protective measures. Due to the still ongoing loss of species many semi-natural or semi-anthropic habitats, like modern fortifications, have been discovered by nature protection agencies and organisations as suitable places for fulfilling above mentioned aspects of biodiversity protection.

European Union attempts of the protection of the natural heritage are part of worldwide and international coordinated attempts, mainly driven and initiated by the UNESCO or the UNEP but as well by other international and intergovernmental panels. Conventions like the "*Berne Convention on the Conservation of European Wildlife and Natural Habitats*", the "*Convention on Biological Diversity*" or the "*Ramsar convention*" have formulated needs and objectives of international cooperation for the protection of the natural heritage. Main aspects and goals of these conventions have been implemented by the European Union, especially in the FFH Directive. The FFH Directive and other regulations of the European Union are fixing for its member states specific areas, measures, activities and indicators on a supranational level, which are implemented into national laws and regulations by all EU member states. In addition to this specific EU directive specific laws and regulations, for example of red list species, do exist as well on national, sometimes also on regional levels. These national regulations reflect in addition to the FFH Directive local, regional and national characteristics of Flora and Fauna often stricter and can by that impose more complications. In addition to European and National Red list of species the IUCN Red list gives information and orientation about global trends and threat levels on species and biotopes, sometimes even more detailed, and not necessarily equals FFH and National evaluations and assessments.

The UNESCO world heritage programme also includes the protection of the cultural heritage and a mandatory European programme or directive, similar to the FFH, would be a decisive and logical result for the European Union. In contrast, laws, regulations, directives or decisions as legal acts for monument protection do exist only on a national level, or even on sublevels, like in Germany. Conventions like the "*Convention for the Protection of the Architectural Heritage of Europe*" or the "*European Landscape Convention*" are instruments which are hoped to foster and to mediate a process, but are from an actual point of view still weak instruments. Anyhow they miss in comparison to European nature protection directives a concrete legal impact level as well concrete and decisive targets, indicators or subjects, which are obligatory to follow for all EU member states. Member States are obliged to take individual statuary measures but are free to decide and to proclaim what are protected properties and to define and implement of course individual activities and measures. Some recommendations, as one legal act of the EU, concern several aspects and ideas of these 2 conventions, but are solely providing guidance and have no binding force.

The de-facto dominance of nature protection directives causes in theory but as well in practical issues conflicts, if fortified monuments but as well other protected properties or architectural heritage, with their existing structural elements and covered areas have to be maintained, reconstructed or restored.

Activities of monument protection, especially of fortress monuments, are known to be problematic and conflict creating by several aspects, such as: What activities are necessary? – What activities are planned? – What activities can be paid? – What is monument protection allowed to do? – Which objective the monument protection is following? – When are we allowed to do what? – Which compensations or set of measures have to be carried out? – Why this compensation or a set of specific measures have to be carried out? – and many other practical and theoretical questions of monument and nature protection.

The following sub-chapters try to provide in short background information on the current status of European nature protection objectives, activities and measures. Also we want to give an overview about known objectives of fortress monument protection. As well aspects of spatial planning, especially of urban and peri-urban areas are shortly explained. Known principal problems of maintenance are added.

2. Overview about European regulations and frameworks

2.1. European Nature Protection regulations

Inside of the European Union and its member states but as well in other European countries are existing national regulations and laws which are concerning specific and general aspects of nature protection. These national laws are by their origin and aim focussed on national and regional relevant aspects such as natural communities, biotopes, habitats and species and often also includes historically determined aspects of nature protection, in same case even aspects or complete laws of landscape protection.

Birds Directive

During early phases of today's European Union a harmonisation of national nature protection regulation was often demanded and discussed. First successful attempts for crossborder nature protection inside of the European Union have led to the establishment of the Council directive on the conservation of wild birds 79/409/EEC[1]. In this directive conservation measures acting against the decline of all (article 1) European wild birds are described. Conservation measures are "the creation of protected areas, creation of biotopes, re-establishment of destroyed biotopes and the upkeep and management in accordance with the ecological needs of habitats inside and outside of the protected zones" (Article 3). In addition almost 200 bird species are listed in Annex I, for which special conservation measures have to be realised (Article 4).

The Birds Directive, as is was called among many experts, have formulated a list of supranational needs of general principles and specific measures, which had to be implemented by all EU member states. As one result of this directive Special Protection Areas (SPA) have been established, with a gradual increase of covered, also because of new EU member states. In 2013 among EU28 a total area of 667.602 km² is covered by SPA[2], of which approximately 20 % is concerning marine habitats only.

The success of this directive was and still is discussed among experts and the status of conservation for wild birds is until now matter of ongoing discussion. Facts like enforcing negative population trends for many wild birds in Germany in the last 25 years, especially for common bird species[3] are providing the background of those discussions. Decreasing landscape quality and biodiversity indicators, especially in agricultural landscapes are often seen as main causes for this (ibid).

Since 2009 the Birds Directive is available in an updated version 2009/147/EC[4], and contains changes to species and sites which are the result of the integration of several new EU member states, like Romania and Croatia.

[1] http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1414687550255&uri=CELEX:31979L0409
[2] http://ec.europa.eu/environment/nature/natura2000/barometer/docs/Natura%202000%20barometer%202013.xls
[3] http://www.bfn.de/fileadmin/MDB/documents/themen/monitoring/ViD_2013_internet_barrfr.pdf
[4] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147

FFH / NATURA2000

In 1992 the European Council released its Flora-Fauna-Habitat Directive 92/43/EEC[5]. This directive had the aim to extend nature conservation efforts to all habitats and species, not only focussing on European wild birds. The main objective is to ensure biodiversity through the conservation of natural habitats and to reach a favourable conservation status for all wild species of flora and fauna. It is like the Birds Directive a legal act of the European Union and member states are obliged to realise it by choosing own forms and methods. Since 2007 a consolidated version is existing.[6]

Concept of the conservational areas

In several regular updated appendices specific areas and species of common interest or of specific interest (priority species) are listed. In Annex I actual (2014) 148 areas of common interest and 81 forest types are listed, of which 45 respective 27 are of specific interest. All EU member states are obliged to declare, protect and improve these areas, when they are suited within their country. For the list of geographical landscapes and ecological communities of Annex I a specific implementation manual describes the relevant indices. This manual shall be used by experts, administration and is updated regular by a commission of experts.[7]

Specific nature protection, focussing on single species has to be implemented by all EU-member states. In Annex II all species of common interest and also of specific interest are listed. The list contains in total almost 900 species in total. Annex IV lists all species in need for strict protection and includes also all species of priority interest of Annex II.

To increase and guarantee effects of nature protection the FFH Directive demands the installation of a coherent network, called the NATURA 2000 network. It consists of sites of Annex I areas and habitats of Annex II species and "*shall enable the natural habitats types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range."* (Article 3). These sites are declared as Special Areas of Conservation (SAC) or as Sites of Community Importance (SCI). The NATURA 2000 network includes as well all areas from the Birds Directive 79/409/EEC. In total 1.039.332 km² are declared as protected within the EU28, of which 24 % are related to marine habitats[8].

In summary, all listed habitats and species have become since the publication of the directive of major relevance for all EU members. The EU directive has become over the years to a *de-jure* and a *de-facto* European nature protection law. It has listed in total more than 1100 species of Annex II, IV and V, which since then have to be protected, even if national regulations did not took them into account before.

Extended aims of the NATURA2000 network

As well EU member states shall endeavour to improve the coherence, means connectivity, of the NATURA 2000 network, and include these aspects in spatial planning and as well all urban and rural development policies. The main aim is to reduce the isolation of communities and gene pools, which counteracts protection efforts. Features of the landscape, such as linear and continuous structures (dispersal corridors) and of step-stones (habitat

[5] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043
[6] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101
[7] http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf
[8] http://ec.europa.eu/environment/nature/natura2000/barometer/docs/Natura%202000%20barometer%202013.xls

islands), which essential for migration, dispersal and genetic exchange, shall be maintained or developed. (Article 3 and 10).

In general two main aspects of the ecological network can be described, which work on levels of landscapes and biogeographic regions:

- *spatial connectivity* - describes the degree of physical connectedness and is delivering informations of isolation and fragmentation of landscape elements, biotopes and habitats
- *functional connectivity* - describes the degree of ecological connectedness and the suitability of physical structures to be used by species, i.e. for migration or seasonal movements, and is therefore a qualitative expression of behavioural response using physical structures

Both aspects are crucial for an implementation of a coherent NATURA2000 network. Few EU member states countries have integrated yet these aspects into spatial planning processes and few have provided legislative regulations or frameworks for the realisation.

This aspect of *general nature protection* means to improve ecological stability and is not restricted to specific sites or species. For the first time the need for maintenance and development of sites which are not declared "as reservates", independent from their degree of protection, was demanded – the common nature, like in ordinary forests, in parks or in the agricultural landscape, have become of interest. This approach gives space for a new landscape development process, after decades of clearing and destruction of cultural and natural landscape elements.

PEEN- Pan European Ecological Network

The Pan-European Ecological Network is a direct result of the FFH Directive article 10 (see above), which specifically relates to land-use and spatial planning and a response to support the implementation the Convention on Biological Diversity (CBD). The PEEN includes the FFH and Birds Directive areas and as well areas of the Emerald network[9], and provides the basis for coordinated planning and action. "*The pan-European ecological network addresses the development of an ecological network at a European level. It will consist of core areas, corridors and buffer zones. Restoration areas will be identified where they are considered necessary. The pan-European ecological network aims to conserve the full range of ecosystems, habitats, species and landscapes of European importance and to counteract the main causes for decline by creating the right spatial and environmental conditions*."[10]

This spatial enhancement concept of ecosystems, based on the principles of articles 3 and 10 of the FFH Directive, is hoped to mitigate not only human imposed threats to communities by fragmentation of their habitats but also is hoped to facilitate adaptation of ecosystems and migration of species and communities due to global warming. Upgrading the landscape matrix and increasing the structural and functional landscape connectivity by corridor like structures like greenways, hedge rows, riverine vegetation or even the installation and enhancement of sporadic stepping stones areas like ponds, bushes, single trees, small set aside land, forest like areas, or extensive greens is in this sense one of the core ideas of this concept and stands directly in line with general attempts of all European nature protection efforts. This "Green Infrastructure" as well is aimed to enhance life quality especially in urban or peri-urban areas, where a functional integration of these landscape elements shall

[9] The Emerald network implements aims, targets and objectives of the FFH Directive for non EU member states.
[10] http://www.salzburg.gv.at/paneurop_strategie.pdf

improve air quality, serve as air exchange corridors in highly urban areas or can be even integrated into multifunctional recreational concepts and structures.

Cross border or transboundary ecological connectivity concepts, which reflect natural and ecological needs and promote relevant migration, dispersal movements have been or even are confronted with administrative constraints. For the majority of EU member states huge potentials for effective "ecological bridges" or "linkages" can be identified and described, which may serve on a regional-transboundary or even supra-regional level. Attempts of Central European EU member states often were focussing on specific species or solely conceptual frameworks and seldom have created general improved conditions.[11]

The status of realisation and implementation of the aims and goals of the FFH Directive is quite diverse inside the EU. The actual status of NATURA2000 network of areas is under the current situation in some countries satisfying, because of the declaration of a vast amount of areas. The current situation of specific species is more diverse and in some case quite dramatic. For some species a favourable conservation status is not reached and also for some the situation even got worse during the last decades. Although EU member states have included the aims of the FFH and the Birds Directives into their nature protection laws too few have been done to improve the coherence of the network and the overall quality of habitats. The discrepancy between the aims and goals of *specific nature protection* and *general nature protection* was for a long time not recognised or ignored.

Relevance of succession

One key aspect, which may help to counterbalance negative population trends or declining ecological quality in urban and even rural areas is the natural succession of habitats. Succession is a natural process of a transformation of ecological communities on a specific spot or site. Main influencing factors are of abiotic nature, especially climatic, hydraulic and pedogenic factors. With ongoing succession the complexity of ecological interactions between species and communities increases, with the result of increasing of ecological robustness and quality.

Due to the fact that in most landscapes and biogeographic regions of Europe "natural habitats" have disappeared as a result of land use change and other anthropogenic influences, only natural succession processes are able to enhance ecological quality of habitats. This means in practical terms that in most areas, habitats and landscapes, the level of external disturbances have to be controlled and in most cases reduced dramatically. Especially this holds true for all relevant aspects of the "Green Infrastructure", which shall function as migrating or moving corridors (ecological bridges or links), buffer zones, temporary stepping stones (temporary habitats). In essence it is about enhancing the *functional connectivity* within and between regions and the increase of the *ecological quality* of sites.

In most cases succession, coupled with low disturbance, is a process which is able to offer species and communities partly recovered, additional or supplementing habitats, especially in those areas where natural or semi-natural habitats are rare, i.e. in towns or peri-urban areas but as well in agricultural landscapes.

Natural succession is thought to be the main driver for the establishment of specific zonal and as well azonal habitats after the last glacial period, i.e. the establishment of specific variations of beech and oak forests *Querco-Fagetea* (Oberdorfer) in most regions of Western and Central Europe. Only in those areas where those "natural

[11] Leibenath et al. 2011 http://dx.doi.org/10.1016/j.landurbplan.2009.08.002

communities" have survived, natural succession in adjacent areas or directly in these areas after small disturbances, like storm events, can be observed.

Secondary succession describes a process of a self-establishment and a formation of ecological communities on anthropogenic influenced sites, where only incomplete natural communities, fragments of those, total abundance of all pristine elements or neobiotic elements occur. This process is observable and taking place in all places, also in fortifications. It results here in a formation of a specific mixture of plants and animals which directly dependent from maintenance/disturbance and clearing intensity but as well from abiotic conditions, such as used materials, exposition other abiotic factors.

The PEEN concept requires connecting capable structures to reach a favourable conservation status for ecosystems, biotopes species and landscapes. These structures will be in most cases semi-natural habitats or ecosystems with different degrees of (secondary) succession. These temporary habitats not necessarily have to provide the highest possible ecological quality like in core zones of reservates and can be therefore be established, periodically maintained or even used extensively, if their functional connectivity is safeguarded guaranteed. Succession is able to upgrade and to recover disturbed ecosystems or even whole landscapes. As well this natural process can help to realise the goals of European and as well world-wide nature protection attempts, especially aspects of ecological networks.

2.2. Monument and cultural heritage protection

Beside taking care about its natural heritage societies are confronted to take care about their cultural heritage, as a reminder of history and in reflection of their identification. Architecture is a cultural heritage, in which technology, science, arts and philosophy of a specific era assemble and merge. Because of its persistence over time as buildings and erections are mostly intended to endure over many generations, the architectural heritage is a reflection of the past and in most cases also bears unique witnesses of time, change, adaptation, distortion, transformation, alteration, revolution, damage or decay. As well architects and even whole schools of architects have influenced not only regions of Europe during a certain episode of history by producing buildings, but as well have created styles and irretrievable legacies of art which are in fact of common heritage and intangible value.

Although the awareness of this common cultural heritage has led already in 1954 to a signing of an "*European Cultural Convention*"[12] European countries were not able until today to create stronger instruments for the protection of the cultural and/or architectural heritage with a status of a legal act. Newer conventions, resolutions or recommendations of the European Community like the "*Convention for the Protection of the Architectural Heritage of Europe*"[13] (1985) try to include attempts of the UNESCO World Heritage Convention and the ICOMOS agenda to give advice and to realise monument protection and have since then promoted the idea of common and coordinated action in this specific field of culture and heritage protection.

A mandatory European cultural heritage or monument protection directive, similar in its obligation to EU nature protection directives, would be a decisive and logical result of existing international and European declarations of interest and would give a strong signal to existing and upcoming spatial planning inside of the European Union. Although some legal acts inside of the EU include aspects of cultural heritage protection like the

[12] http://conventions.coe.int/Treaty/en/Treaties/Html/018.htm
[13] http://conventions.coe.int/Treaty/en/Treaties/Html/121.htm

Environmental Impact Assessment[14] actual laws, regulations or decisions concerning culture and heritage protection do exist only on national levels or even on sublevels, like in the specific case of Germany. Concrete and decisive targets, indicators, proclaimed objects of relevance and time frames of action, which are obligatory to follow for all EU member states, would in this sense help to coordinate today's voluntary or semi-obligatory transnational attempts for monument or cultural heritage protection and would reduce problems of interpreting threat levels to cultural properties as objects of legal protection.

Fortifications are one part of the architectural heritage which are in most cases difficult to handle by a concerned society, especially if these fortifications are strong reminders of inconvenient history and are strongly negative connoted among public perception. Specifically the latter scenario can be found in many regions of Europe and reasons are historically determined; - quite often fortifications are witnesses of siege, conquerors, occupation, foreign rule, war, prison, terror and other (un)specific calamities. As well aspects of budget scopes and spatial dimensions complicate protection efforts of fortifications or fortified monuments.

Nature protection which results in intended or nonintended destruction or deterioration of irretrievable architectural and/or cultural heritage, of intangible values and historical legacies is difficult to justify and will not increase acceptance among a concerned public. As well it foils and fools all cultural policies and ignores human rights for cultural identity. Vice versa a nature protection ignoring heritage protection inevitably and often leads to massive conflicts with European or National legislation, with a concerned public and with strong lobby groups.

Ideological entrenchment of opposing parties will not solve this juridical and practical conflict zone, but is in many cases and regions of Europe reality. Actions of monument protection in fortifications or fortified monuments not necessarily have to cause a trojan war if all aspects of sustainability are considered equally and all public bodies in this sense exercise planning phases in a mediating and unbiased manner. As well the structural allocation of tasks and responsibilities during a planning process between different ministries and authorities and a complex factual and legal position is challenging and requires resources, expertise, understanding and knowledge.

In the specific case of fortifications, one aspect for causing or intensifying conflicts is seen in internal discussions and struggles, which historical status is matter of conservation, protection or restoration. Hence all buildings, so as fortification bear signs of time, which creates a certain uniqueness, a historical rewind to a theoretical historic status quo is questionable, especially if it is considered, that in mostly all cases fortifications have been adopted successively and many times to changes in warfare, artillery and technology. It is understandable that this discussion is one of the drivers of scientific discussion and expertise in the field of monument protection. But regarding practical issues it would be helpful for all monument protection efforts in fortifications that a reduced demand, which as well includes and respects remnants of time such as cracks, scars, craters or normal deterioration, and at the same time as well aesthetic dominated and driven restorations ideas of e.g. walls would be reduced to a structural necessity, would create more opportunities and as well better possibilities for monument protection. Reduced intensities of intervention need mostly much less money and in most cases as well is having less harmful and negative influences on flora and fauna.

[14] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32014L0052

2.3. Landscape protection and planning

Landscapes consist of naturally formed and different layers of biotic and abiotic factors, which interact and are to a certain extent dependent from each other. Therefore landscapes are unique in the sense of their specific combination of those factors. Defining and describing borders, dimensions or even a specific character of a landscape is one core task of geography and other natural sciences. Landscape protection considers beside biotic and abiotic layers and factors also cultural and aesthetic aspects, which can be also of anthropogenic origin.

Cultural landscapes, or sites as they are defined by the UNESCO world heritage are "*works of man or the combined works of nature and man*"[15]. Although the idea for the definition of cultural landscapes might be influenced by landscapes of e.g. Peruvian terraces or European heathlands, for the majority of all landscapes in Europe it can be stated, that they are, intended or not, result of human activities or the result of an interaction of human and natural factors.

Landscape planning tries to incorporate and formulate specific and superior economic, cultural, infrastructural environmental and other factors, desires and needs, objectives and targets, functions and services. Since landscapes and the specific tradition and the implementation of landscape planning is different between most countries in Europe, common and coordinated landscape policy, to achieve e.g. strategic goals of EUROPE 2020, seems to be needful and necessary.

The fortified cultural landscape

Mankind has changed from the very beginning of civilisation the former solely natural evolved landscape into a landscape, which is aimed to provide services and functions for the needs and requirements of the actual society. The "*European Landscape Convention*" defines a landscape as "*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors"*.[16] The erection of modern fortifications at a specific place was in most cases combined with a definition, formation and shaping of shooting ranges and other strategic areas in combination with the use of natural structures for strategic reasons. Examples of those combinations of short and medium range defensive functions and strategic fields of actions can be found almost everywhere. Here the fortress systems of Wroclaw (PL), the New Dutch Waterline (NL) but as well Alpine defence systems in Northern Italy or Slovenia are such referenced multifunctional strategic landscapes or landscape parts. Even today many formerly indirectly linked buildings or erections of fortifications do exist and are integral parts of the landscape such as dykes, roads, channels, inundation fields, providing grounds, staging areas, firing ranges, field fortifications, tunnels or even glacis. Many of them and as well the majority of their according fortifications have lost their primarily military functions and the origin of their erection has been forgotten. This "disarming of the landscape" stands in line with increasing urbanisation, accelerating industrialisation, demands for space and the overall change in warfare and weaponry. The transformation of former military related areas into civilian areas means in practical issues that structures have been reshaped, converted or persisted until today, but have lost one of their intended purposes. The latter holds true especially for hydro regulatory structures and their relevant area of influence. Protecting the fortified (cultural) landscape or fragments of those opens immediately questions of landscape management and landscape planning.

The European Landscape Convention, signed in October 2000, by all EU member states, aims to promote landscape protection, management and planning through European co-operation on these issues. It is similar to

[15] http://whc.unesco.org/archive/convention-en.pdf
[16] http://www.coe.int/t/dg4/cultureheritage/heritage/Landscape/Publications/Convention-Txt-Ref_en.pdf

other EU conventions not a legal act of the EU or the European Council but tries to frame and govern direct or indirect ecological, cultural, agricultural, infrastructural, social and economic impacts and requirements on landscapes.

Spatial planning inside of the EU

Spatial and territorial planning in general is becoming more and more complex due to an increase of requirements and goals to achieve on a global but as well on regional scale. The integrated and cross-sectional planning is becoming more and more relevant, since the Agenda21 have formulated these approaches as being inevitable for sustainable development. The European Spatial Development Perspective[17] of the EU has formulated decisive ways in 1999 for the period until 2010, as a part of the Lisbon strategy. As a result many cross-sectional and specific programs have been implemented and carried out.

After the Lisbon treaty in 2007 a follow up was steadily development with the result, that spatial and territorial planning of EU member states is by that obliged to realise and to implement new and extended goals and targets of European territorial planning, especially aspects of cohesion. The Territorial Agenda of the EU[18], as an orientation towards a realisation of EUROPE2020 goals, tries to promote ways how different aspects of sustainable development and EU territorial planning can be realised. 6 main fields and principles of actions have been identified, which shall be respected to reach e.g. territorial cohesion inside of the EU:

1. Promotion of polycentric and balanced territorial development through the connection of cities and urban areas
2. Encouraging integrated development in cities, rural and specific regions through new partnerships between cities and rural
3. Territorial integration in cross border and transnational functional regions
4. Improvement of territorial connectivity for individuals, communities and enterprises through the development and strengthening of Trans-European Networks
5. Ensuring global competitiveness of the regions based on string local economies
6. Managing and connecting ecological, landscape and cultural values of regions

Especially aspects of ecological sustainability, to reach and to ensure aims and goals of environmental protection and as well to respect specific targets of the FFH and the Birds Directives but as well of other environmental policies several tools and instruments of European spatial and territorial planning have been revised, updated and integrated I into national realities.

Environmental Assessment of plans, programs and projects

The Strategic Environmental Assessment (SEA) Directive 2001/42/EC[19] and the Environmental Impact Assessment (EIA) Directive 2014/52/EC[20] are as legal acts of the EU frameworks which are intended and used to identify and to reduce significant negative impacts of programs, plans, projects and other activities on natural, human and cultural assets. Both are relevant for the majority of all spatial planning projects and territorial

[17] http://ec.europa.eu/regional_policy/sources/docoffic/official/reports/pdf/sum_en.pdf
[18] http://www.eu-territorial-agenda.eu/Reference%20Documents/Final%20TA2020.pdf
[19] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001L0042&from=EN
[20] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN

development programs of the EU and its member states. Whereas the EIA is relevant for specific and defined activities on regional or local levels, the SEA is relevant for higher planning levels, like regional development plans and infrastructural and sectoral planning activities. Annex I of the EIA Directive list all projects, where an EIA is obligatory. Annex II identifies projects, where authorities can induce an EIA.

The SEA and specifically the EIA are frameworks, which are oriented towards safeguarding aims and goals of the FFH and the Birds Directive. Ecological landscape master plans or the integration of ecological aspects in landscape planning are implementing main aspects of FFH and Birds Directive, and are framing decisions in all countries and co-influence decisions on cross-sectoral and infrastructural planning. Especially new attempts of the EU and its member states of increasing the coherence of the NATURA2000 network and the PEEN through the installation and upgrading of green infrastructure, corridors, step-stones and buffer zones are influencing more and more decisions especially on infrastructural projects in rural but as well in peri-urban or urban areas. Therefore the SEA and the EIA are also instruments which shall identify impacts and implications to sites and their management.

Any plan or project or in combination with other plans or projects can be subject to an FFH assessment, if a FFH area, a habitat of Annex I or species of Annex II and its preservation objectives are significantly affected (Art.6.3 FFH Directive), either directly or from outside. In case of occurring or expected negative effects alternative solutions have to be developed and, if no solutions are realisable, compensation measures, with the focus of the integrity and the coherence of the NATURA2000 network. have to be undertaken and implemented. Other imperative reasons of overriding public interest, human health or public safety may be raised.

1. Screening
2. Scoping
3. Evaluation and assessment of exceptions

The thresholds for becoming significant are set individually by EU member states but in orientation towards the general FFH objective.

The FFH implication assessment is the strongest version of European nature and environmental assessment of plans and projects. Similar operating assessments are existing in all European countries. They are integrated parts of national nature protection laws and are as well in most cases integrated in national codes of construction laws and/or in town and country building laws. Their aim is as well to safeguard and to enhance environmental quality and can contain besides major aspects of flora and fauna protection as well diverse aspects of landscape protection.

The SEA and specifically the EIA and the FFH assessment are from a operational point of view similar acting *ex-ante* instruments with the aim to identify, to reduce and to prevent negative effects on the environmental quality. They shall identify and avoid conflicts which may rise by certain plans and projects and shall solve arising conflicts by a precautionary principle. Solutions shall be realisable, shall safeguard and enhance overall environmental quality and are subject to mutual and target oriented agreements.

ELD - Environmental Liability Directive

The Environmental Liability Directive 2004/35/EC is an additional legal act of the EU which purpose is "to establish a framework of environmental liability based on the 'polluter pays principle' to prevent and remedy environmental damage" caused by occupational activities.[21] It applies to threats and damages to water bodies and land and as well to all protected areas or species of the FFH and Birds directives and may as well apply to those, which are designated by national regulation for equivalent purposes (national red list of species and habitats) This is the case for actually 14 EU member states (status 2010).[22] The ELD shall as well safeguard that European biodiversity is restored or maintained in a favourable conservation status, and implements therefore main objectives and aims from the FFH and Birds directive. The ELD is in most cases considered as an *ex-post* acting framework or instrument.

The general aim is to prevent damages in a precautionary principle and, if significant damages i.e. "significant adverse effects" have occurred, they must be remedied. The significance of a damage furthermore has to be assessed in reference to the baseline condition, either by the operator or a relevant competent authority. The "normal" status of water, land and species or habitats without the occupational activity is in most cases the baseline condition and some *opt-out* aspects are implemented in Annex I of the ELD. The ELD is aimed as a FFH article 6.2 supplementing framework and shall apply to occupational activities which are not significantly effecting NATURA2000 sites but are threatening the coherence of the NATURA2000 network and its aims. By that any biodiversity damage has to be prevented or remedied if the operator has been faulty or negligent (fault based liability), with the problems of proving being faulty or negligent. The ELD threshold for a significance is a occurred or likely occurring negative or adverse effect on the FCS of a species or a habitat.

The ELD has been since its establishment subject to divergent and misleading interpretations, concerning scope of assessment, preventive, remedial and compensatory measures and the significance of damages. A future harmonisation of the ELD especially with the FFH Directive, i.e. of article 6, is therefore highly reasonable. For example, due to non harmonised interpretation of the "significance" of a damage towards biodiversity and the FCS between the FFH Directive and the ELD, it is reasonable, that a stricter clarification and definition of "significance" will occur in alignment with aims and procedures of article 6.2 of the FFH Directive. Also the extension of "strict liability" towards all biodiversity damages is highly reasonable. [23]

Implications of environmental assessments for fortifications and constructional activities

As a generalisation it can be said, that in the case of reconstruction plans for fortifications an assessment has to identify, which impacts on the environmental quality may arise and which effects on flora and fauna would occur. For this assessment all available environmental data like case studies and results of ecological field researches are collected and interpreted and if they have not being carried out they are and have to be initiated.

In many cases fortifications are sites of specific species and habitats, sometimes as well of protected species or habitats, especially if they have been abandoned or little maintained. With a high probability fortifications are sites of certain FFH Directive Annex I habitats or pre-stages of these and as well sites and locations for species of FFH Annex II, especially of bats, although fortifications are human made structures and substituting and secondary biotopes of succession. As well they mostly give habitats for national red list species or habitats. Therefore it can be assumed that any fortification is a site where protected species and/or protected habitats are

[21] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32004L0035
[22] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52010DC0581
[23] http://ec.europa.eu/environment/legal/liability/pdf/Milieu%20report%20-%20ELD%20Biodiversity%20Damage.pdf

located. By an environmental assessment it has to be clarified, which specific species/habitats are effected directly by a construction or reconstruction plan.

Identifying conflicts and solving these is subject to many actors involved. The potential of conflicts is naturally high, especially if unidirectional and mono-sectoral aims are followed. Cross-sectoral, integrative and transdisciplinary approaches which as well respect and include spatial and not only sites specific dimensions of environmental and cultural protection are more likely to be feasible to solve conflicts and to reduce negative effects. Frameworks like the EUROPE2020 strategy and its goals, the Territorial Agenda of the EU and as well nature and culture protection efforts can help to give orientation and support to target oriented solutions.

Nevertheless nature protection demands in its diversity of specific and unspecific aims complex solutions which are in most cases realistic to be implemented and planned. Enhancing the overall environmental quality is from a strategic point of view a promising method and approach for conflict solving and solution finding, but demands case specific solutions.

Spatial planning in rural areas - functions of green areas

Especially in congested urban areas and in cities non-sealed areas like parks, gardens, woods, green cemeteries, greenways, roadside greeneries and all forms of non-intended vegetation patterns do have several functions and in most cases positive impacts for the environmental quality and of course for human and public health like:

- improvement of air quality
- reduction of dust loads
- noise reduction
- positive climatic effects like cooling effects and increasing of air humidity
- space for recreation and recreational activities
- aesthetic and visual diversification
- habitats for flora and fauna
- sites for biotope connectivity
- improvement of groundwater quality and quantity
- counterbalance of negative impacts of areas of high hemerobic degrees

Modern urban spatial planning tries to consider these positive effects, whereas local possibilities to implement all aspects are quite different, keeping in mind, that other urban planning topics like infrastructure, housing, economy, social dimensions, culture or education have to be considered as well and space in urban areas is always limited. Balanced sustainable development has become nevertheless more and more important, since life quality aspects of cities and urban areas specifically are one factor of cities' attractiveness and characteristics.

It was realised especially in the last years, that environmental protection acts and their specific targets, e.g. the reduction of particulate matter PM_{10} with a diameter of lower 10µm[24], not only can be achieved by technical improvements or technical measures. Especially in those areas, where all forms of "green infrastructure" are absent, air pollution by PM_{10} still remains high or could not be substantially reduced.[25] Therefore new points can be made why green areas and green infrastructure is necessary and relevant for cities and urban areas.

[24] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0050
[25] i.e. Tiwal et al., 2009; http://www.sciencedirect.com/science/article/pii/S0269749109002255

Green belts, corridors and "islands" serve as green lungs for all cities and are best suited for being used as well for recreational activities and the overall improvement of urban quality of life. At the same time it is necessary to integrate urban areas, independently from their density of settlement, into the establishment and enhancement of a coherent ecological network, since in Europe urban and metropolitan areas are covering large amounts of areas with a still ongoing growth of urban areas and increasing urban population[26].

Anticipating the fragmentation of ecosystems by the establishment of diverse and multifunctional green infrastructure inside of urban areas and settlements, its maintenance, development and systematic upgrading will lead to benefits for the environmental quality and of course to increasing human and public health, well-being and quality of life. Therefore it is inevitable to extend urban planning objectives and implement all aspects of nature and environmental protection, specific and general approaches, at the same time. The idea of core zones, buffer zones and migration structures can be used as well as a principal guiding scheme for planning new urban green infrastructure. The Toledo Declaration on Urban Development[27] and the expected future Urban Agenda of the EU try to give orientation and try to foster Inter-European cooperation for sustainable city development, which demand "green, ecological and environmental regeneration" as one elementary part of sustainable and inclusive urban development.

As well European fortifications are best suited, due to their localisation and their structure, to fulfil new spatial functions for urban areas, their citizen and the natural environment. Especially in urban areas many spatial planning objectives exist at the same time and often overlap and interact with each other in a spatial dimension. Poly-beneficial functions of green areas are opportunities for town planners but as well for the development of appropriate use concepts for fortified areas, towns or landscapes.

[26] http://www.eea.europa.eu/articles/analysing-and-managing-urban-growth
[27] http://ec.europa.eu/regional_policy/archive/newsroom/pdf/201006_toledo_declaration_en.pdf

Picture 1: Vigo Citadel, a 17th century fortification transformed into a park © Junghans

3. Discussion

For understanding actual problematics of European and national nature protection efforts, their results and the necessary attempts and actions for future activities and implementations, this chapter shall provide deeper basic information and promote understanding for activities related to assessments, their background and their implications. Especially the context between the actual status of conservation of FFH species and habitats and the necessity for assessments for all constructional activities or plan shall be clarified. In this sense the FFH assessment procedure of article 6 2007/143/EC shall be used as an exemplary guiding scheme since it is almost unified and valid for all EU member states.

Although states may implement stronger procedures and standards related to their specific context, which some have, the FFH article 6 assessment routines are in principle transferable to any activity by which biodiversity aspects are affected. The guiding principle of the FFH assessment routines are by that defined by a quite strict interpretation and evaluation of "significance of impacts" towards biodiversity and a Favourite Conservation Status (FCS).

Nevertheless the specific FCS of species and habitats is in many situations matter of discussion, often caused by gaps in documentation, it is inevitable to respect especially during huge reconstruction activities in fortresses requirements for preserving the irretrievable natural capital in respect of future generations.

3.1. Significance of impact

This chapter provides short insight into principle aspects of assessment objectives, targets and schemes of the FFH assessment routines. The example of the FFH assessment is used here as the FFH is as a legal act binding for all EU member states. Although member states can implement stricter rules for any nature and environmental

impact assessments related to plans and programs, the FFH assessment procedures are due to their universality and obligation a leading framework. This is as well the case for many reconstruction programs and plans for European fortifications. To understand the theoretical implications but as well the practical relevance of the procedure helps to find solutions and shall enlighten specific problematics of the FFH assessment. The problems may vary from country to country but are well known by practitioners and environmental organisations or agencies.

Any plan, any constructional activity and any program independent from its dimension and its place is suspected to affect aims and objectives of the FFH Directive and the NATURA2000 network., especially if FFH area or any biodiversity related protection area are close to the project or are even touching in spatial dimension borders of the areas. In addition almost every constructional activity is having impact either on biodiversity and/or on abiotic resources like water and land. Therefore the significance of the impact has to be assessed. In principle, the FFH assessment for species and habitats demands that any doubt from a scientific perspective has to be removed before a plan or a project can be allowed. One leading principle is the "no deterioration concept". Therefore a project or a plan is evaluated for their impact on the FCS of species and habitats and the development objective of a site. Impacts on the Favourite Conservation Status are assessed towards, like:

- Whether structure and functions are in a foreseeable future persisting
- Whether the size of a certain area is affected
- Whether significant impacts downgrade the FCS

The significance of an impact is determined among other things by the sensitivity and the size of an area or habitat, the relevance of a species or a habitat in the biogeographical context, in the regional context and in the context of the NATURA2000 network, its goals and objectives.

Table 1: Exemplary factors for the evaluation of significance of impacts

type	**object of evaluation/assessment**
loss of area	percentual loss
fragmentation	duration, permanence, magnitude in comparison to former status
disturbance	duration, permanence, distance to the site
abundance	time frame of recovery
water quantity	relative change
water quality	relative change

Thresholds for a significance of impacts related to size or area effects are defined individually by EU member states. These thresholds are used first evaluation whether a significant impact may occur (screeing) and during the assessment to determined concrete dimensions of impacts (scoping). The likelihood of significant impacts is in this sense in many countries as well individual determined due to different biogeographic abundances of species and habitats and some cases, like in Germany, graded/classified related to the sensitivity of a habitat or a species.

Coordinated and scientifically approved thresholds valid for all European habitats or species and used as a common European framework or standard may provide in the future better coherence for reaching a FCS. These

thresholds maybe as well amended or adopted by local peculiarities and as well with amendments for other habitats or species. The authors were not able due to time reasons similar approaches, which may exist inside of the EU.

Table 2 gives a brief overview about thresholds for specific habitats as an example. Similar thresholds are existing for FFH Annex II species and for species of Annex I of the Birds directive. Especially these species relevant thresholds are strictly related to deeper documentation and site specific surveys, since population quality factors like abundance are mainly influence population robustness. Given thresholds of table 2 may not be used as such without the referenced document. As well the referenced document lists not for every Annex I habitat thresholds and highlight threats to habitats or species due to cumulative effects, especially for smaller areas.

As well any plans and programs, like infrastructural plans or land use plans, can be and as well shall be subject to FFH or other environmental assessments like the SEA or the EIA, at least to scoping, since “cumulative effects”, “cutting effects” and indirect effects often significantly affect the coherence of the NATURA2000 and biotope connectivity.

Table 2: Overview about thresholds for limits of area losses of FFH Annex I species, according to Lambrecht & Trautner (2007)[28] for an orientation towards significance of impacts:

FFH habitat of Annex I		**Orientation towards a "quantitative-absolute loss of area"** The loss of area may not exceed the given limit in m²		
FFH code	**Name**	**Class I** if rel. area loss ≤ 1%	**Class II** if rel. area loss ≤ 0,5%	**Class III** if rel. area loss ≤ 0,1%
4030	European dry heaths	25 m²	125 m²	250 m²
6210	Semi-natural dry grasslands and scrub-land facies on calcareous substrates (*Festuco-Brometalia*)	50 m²	250 m²	500 m²
6510	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	100 m²	500 m²	1000 m²
8120	Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	50 m²	250 m²	500 m²
9180	*Tilio-Acerion* forests of slopes, screes and ravines	50 m²	250 m²	500 m²

For determining the contextual relevance and the significance of impacts towards the FCS procedures of the FFH article have to be followed, which have been during the last years matter of discussion and evaluation. As amending instruments for the NATURA2000 management handbook[29] several guidance documents have been published, of which 2 are specifically dealing with articles 6(3) and 6(4) of the FFH directive[30].

The standard procedure for an assessment of a plan or a project which may affect aims and goals of the FFH Directive and is determined by several steps:

1. screening — identifies if a significant impact is likely to occur by a certain activity
2. scoping — identifies the dimension of the significance, if all doubts could not be removed during screening process in step 1
3. prevention — identification of alternative solutions including as well the zero-option (plan or project will not be carried out) regarding the specific and quantified significance of the impact

3.1 minimisation compensation and substitution of significant

Especially the identification and realisation of alternative solutions has caused in the last decade problems in all EU member states, beside non-conform procedures, having in mind that not all aspects or impacts can be substituted or compensated. This holds true especially if zero-options, which have to be always an option not only for sensitive/rare/priority habitats or species, have not been accounted or even have been neglected options due to several reasons. As well time frames for those activities have been often set too short-termed, having in mind that with the beginning of an activity ecological equivalent or better functions of a substitution or a

[28] http://www.bfn.de/fileadmin/MDB/images/themen/eingriffsregelung/BfN-FuE_FFH-FKV_Bericht_und_Anhang_Juni_2007.pdf

[29] http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

[30] http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf
http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/new_guidance_art6_4_en.pdf

compensation have to be intact and are able to be used as such. Nevertheless it is doubtable in general that the efficacy of compensational measures and substitutions is given, especially if area thresholds are high and the sensitivity and uniqueness of a biotope/habitat is high, what is the case in most FFH sites. Omitting negative assessments due to "imperative overriding public interest" as an *ultima ratio* intended option of FFH assessment has become in numerous cases a convenient method for several projects or plans and therefore was and is matter of several legal proceedings which often stated unjustified and wrong applications of this option. Regarding non FFH idea conform procedures regarding "alternative solutions" and other aspects of article 6(4) the actual (from 26.4.2012) *"Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC"* is strongly recommended.

Whereas the FFH assessment for the significance of impacts relates to Annex I habitats and to all species of the FFH Annexes II and species of the Birds directive the European Liability Directive (ELD) includes all other remaining FFH species of Annex IV. In contrast to the definition of significance of FFH Article 6 as affecting the Favourite Conservation Status (FCS) the ELD defines significance as a solely adverse effect on the population, its dynamic and the ecological functions of a habitat. That has led since the implementation of the ELD too quite diverse and NATURA2000 objective related non-conform interpretations of biodiversity affecting events in several EU member states. In some cases and countries solely catastrophic events have been reported or interpreted as significantly affecting biodiversity aspects, mainly disastrous water pollution.[31] As well the guiding principle of "prevention of any significance" is misunderstood in many cases in the sense that a strict *ex-ante* scheme is only in rare cases applied in replacement for *ex-post* measures and violates therefore the coherence of this Directive with the FFH Directive. The application of a site and context specific "base line condition", which of course can be an unfavourable-inadequate or bad condition, for assessing significance towards biodiversity affecting events in addition deteriorates the concept of the FCS. As well the concept of fault-based liability for other occupational activities than those listed in Annex I of the ELD is not working as an *ex-ante* prevention scheme and foils the precautionary principle. Therefore the evaluation of gained experience between 2007 and 2012 states that the ELD shall be specifically amended with distinct references to objectives and procedures of the FFH Directive in respect for the coherence of the NATURA2000 network.empfindliche gebiete

Significance of implications of plans, projects or activities for nature related aspects such as protected species, habitats or biotopes are for many stakeholders difficult to understand and as well often difficult to propagate. Maintaining or establishing a Favourite Conservation Status for species and habitats, increasing the functional biotope connectivity and the coherence of the NATURA2000 network and as well establishing a Pan European Ecological Network are aims and objectives which have to be followed if the irretrievable Natural Heritage shall be preserved for future generations. Schemes and objectives of the FFH assessment shall be a guiding principle for all biodiversity touching projects, plans and actions and as well subject to all plans and activities concerning European fortifications as one part of the common and as well irretrievable European Cultural Heritage.

[31] http://ec.europa.eu/environment/legal/liability/pdf/Milieu%20report%20-%20ELD%20Biodiversity%20Damage.pdf

3.2. Status of conservation of European species and habitats

*"The conservation status of a **natural habitat** means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species [..]*

*The conservation status of a natural habitat will be taken as '**favourable**' when:*

- *its natural range and areas it covers within that range are stable or increasing, and*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *the conservation status of its typical species is favourable [...]*

*The conservation status of a **species** means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations [..]*

*The conservation status will be taken as '**favourable**' when:*

- *population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis;"*

Article 1(g) and 1(i) of the FFH directive[32]

"Protect and restore habitats and natural systems and halt the loss of biodiversity by 2010"

Headline objective of the Gothenburg summit of the European Commision 2001[33]

"Current rates of species extinction are unparalleled. Driven mainly by human activities, species are currently being lost 100 to 1,000 times faster than the natural rate: according to the FAO, 60% of the world's ecosystems are degraded or used unsustainably;[…]

2020 headline target

Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible"

EU biodiversity strategy to 2020 - COM(2011) 244[34]

[32] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101
[33] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52001DC0264
[34] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0244

Table 3 and 4 depict that a Favourable Conservation Status is only valid for a minority of all European habitat and species and not necessarily the result of specific extra measures. Many of these areas or species have been already in a favourite conservation status, when the FFH Directive was established and are especially the cause for an installation of these areas. So that it is not possibly to say that a FCS was "reached" but it has "remained". This data is a summary of all informations gathered during the period between 2001 and 2006. For an explanation of European biogeographic regions as been used in table 4 please see as well the picture I of Annex.

Table 3: Status of conservation in EU25 period 2001-2006[35]

Condition \ type	**Favourable**	**unfavourable-inadequate**	**unfavourable-bad**	**Unknown but not favourable**	**unknown**	**Not possible to access**
Annex I habitats	17%	28%	37%	4%	13%	1%
species	17%	30%	22%	3%	26%	2%

Table 4: Conservational status of FFH habitats/species in different biogeographic regions in the period 2001-206 (adopted)[36]

Biogeographic regions	**Favourable** **Habitats/** *species* [%]	**Unfavourable–inadequate** **Habitats/** *species* [%]	**Unfavourable-bad** **Habitats/** *species* [%]	**Unknown but not favourable** **Habitats/** *species* [%]	**Unknown** **Habitats/** *species* [%]	**Not possible to access** **Habitats/** *species* [%]
Alpine	**33**/*23*	**31**/*29*	**23**/*24*	**4**/*2*	**8**/*16*	**1**/*3*
Atlantic	-/*7*	**18**/*25*	**56**/*33*	**4**/*2*	**22**/*31*	-/*2*
Continental	**19**/*12*	**33**/*38*	**43**/*33*	-/*3*	**5**/*12*	-/*2*
Mediterranian	**21**/*14*	**23**/*23*	**13**/*13*	**14**/*3*	**26**/*46*	**2**/*1*
Pannonian	**11**/*22*	**18**/*42*	**67**/*15*	-/*6*	**4**/*15*	-/-

In general it can be said that the FCS has to be yet reached for at least 50% of all habitats and species. Especially in the continental biogeographic region, where the overall data situation is excellent, more than 80% of all habitats or species are in a unfavourable conservation status. Actual data from EU member states let assume that this situation even got worse during the last decade or still remained in a bad condition. Indicator values for a favourite conservation status of many breeding birds of several landscapes zone in Germany, i.e. rural, freshwater or forest habitats have not improved and remain since 2 decades more or less at the same values, i.e. at 65 to 75% from the target values. Especially in agricultural areas these indicator values even have decreased significantly during the last decades from 75 % in 1990 to 56% in 2012 of the target value and may be a reason for an observed decrease of populations size for approximately 30% of all breeding birds in Germany. Especially breedings birds with bigger population sizes (>100k), e.g. common birds like skylarks or goldfinch, are affected significantly but as well other birds.[37] Other biodiversity indicators for farmland or rural areas, e.g. for butterflies, show as well a decline in abundance.[38]

In comparison to these situations several indices, national surveys and a meta-study let assume that for some species of all 53 European bat species, the conservation status has improved: the population size of 16 European

[35] http://forum.eionet.europa.eu/x_habitat-art17report/library/papers_technical/habitats_version_1
[36] Ibid
[37] http://www.dda-web.de/downloads/texts/publications/vid2013_barrierefrei.pdf
[38] http://www.eea.europa.eu/publications/the-european-grassland-butterfly-indicator-19902011/at_download/file

bats species from 9 EU countries has increased by 42% between 1993 and 2011.[39] This trend could be interpreted as a result of efficient and precautionary measures towards the protection of roosting and wintering habitats of these these species, which are indeed quite sensitive towards changes in habitat quality and react slowly on improvements due to low reproduction rates. But nevertheless this study reports an improved situation for for less than one third of all European bats, whereas for the remaining species the situation regarding the conservational status is not favourable, as as well national surveys and monitoring efforts let assume.

In general it can be stated the the actual conservational status of all European habitats and species is not in the aimed condition as being favourable for all species and habitats[40], especially if FFH species and habitats in some sense perform as indicators for the European ecological situation or for a Good Environmental Status (GES) as such. European nature protection attempts, which performed as well in comparison with other framework like the Water Framework Directive[41] ,the Marine Strategy Framework[42] and as well several policies such as the CAP have not been as successful as necessary and wanted.

National and trans-national indicators on biodiversity or other aspects of a ecological situation which have been developed in the last decades are used to monitor effects and the actual "health status" of a ecosystem because their parts [of the indicators] inter- and correlate with several biotic and especially abiotic aspects, such as rain acidity level, aerial nitrogen deposition or external disturbances. The SEBI initiative[43] has developed 26 indicators which are by their origin related to the DPSIR model of the OECD and have been adopted by the EEA in 1999.[44] These indicators are in many countries used as such or have been adopted to national situations. But in general these indicators provide useful information on the actual situation towards a good environmental status for European ecosystems. Many of these indicators reflect actually [with a status of 2010] a bad or a unfavourable condition of the ecosystem in the sense that many targets have not been reached yet, especially if national situations are observed[45]. It is possible than in the next reporting period, with an update of these indicators in 2015/16 many indicators have improved. But it seems likely that many biodiversity affecting aspects on environmental issues have not yet reached their targets, especially those of the WFD or only have improved slowly, such as the land loss index. Nevertheless much more have to be done towards a favourable environmental condition and a favourable conservational status of species and habitats. This holds true especially for all species which are solely located on national red lists due to their natural abundance pattern, which is a result of biogeographic conditions and of course sometimes as well the result of human activities, such as for synanthrope lizards, bats or specific plants, such as the wandering sailor, *Cymbalaria muralis*.

[39] Haysom et al., 2011 http://www.eea.europa.eu/publications/european-bat-population-trends-2013/at_download/file
[40] http://www.eea.europa.eu/publications/eu-2010-biodiversity-baseline/
[41] http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32000L0060
[42] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056
[43] http://biodiversity.europa.eu/policy/eu-biodiversity-indicators-and-related-eu-targets-simplified-overview
[44] http://www.eea.europa.eu/publications/TEC25/at_download/file
[45] http://www.biologischevielfalt.de/fileadmin/NBS/indikatoren/Indicator_Report_2010_NBS_Web.pdf
http://www.biologischevielfalt.de/indikatoren_bericht_nbs.html

4. Propositions and recommendations

Since the authors are not familiar with the development of reconstructions plan for fortifications, it is not useful to provide therefore specific recommendations related to specific technologies or methods of reconstruction.

Nevertheless it is recommended to separate master plans into specific target oriented modules of activities, for that they can be carried out and implemented independently. As well these distinct modules may be as well sub-divided and adapted specifically to site-specific measures and local peculiarities. This division and sub-division into specific target and object related modules seems to be reasonable by the 2 most relevant factors of reconstructions and their availability: budget and time. Especially the latter aspect is relevant if fortifications of huge dimensions or intensive works have to be carried out and it is likely or pre-known, that activities may firstly demand a lot of time and secondly activities may likely affect species or habitats. But of course, the key factor of a reconstruction is a budgetary and therefore it seems reasonable to slice all project into smaller pieces, which may be better supportable, reportable and realisable. During the last years of practical research and contacts to fortress owners or managers and as well during the corresponding CE project ForteCultura it became clearer that a modularisation of specific tasks related to reconstruction of fortresses are for the majority of all fortresses relevant and the most favourable circumstance, especially regarding that budgetary supply is limited and expenditures which are related to reconstruction are due to labour cost naturally high and could reach easily several hunderts of millions of Euro, and more of course. Smaller modules are better providable by money are of course better to administer and to manage.

It is as well recommended that reconstructional activities are planned in a long-term perspective, often it is of course a task for generations, and short-term urgent and intensive activities are solely concentrating on stability and structure protecting measures for maintaining the cultural heritage and to prevent bigger and often more costly activities once the structure is completely lost.

The prevention of safety and security affecting situations and as well averting of danger is in all countries overriding any concerns of nature protection if this situation is an immediate danger to public safety and/or lives. Nevertheless those situations shall be avoided and prevented from getting hazardous. Therefore a precautionary principle shall be applied as well during planning processes and are in many kwnown cases as well applied.

4.1. Recommendations for an assessment method

Since this paper is aimed to provide basic understanding for nature protection aspects and their implications for reconstructional or maintenance efforts in fortifications or in fortified elements, recommendations must follow common and basic principles, which may be of course adapted to the specific situation. As the FFH Directive is a common framework for EU member states procedures and methods which aim are the protection of the natural heritage shall orient themselves at the relevant procedures coupled especially with article 6(3) and 6(4) of the FFH Directive. According the underlying procedure and methodology of article 6(3) and 6(4) in every national language numerous expert opinions, surveys and studies have been published in the last decades which are recommended here and the official guidance documents and opinion of the European commission[46] in particular.

Due to the universality of these methodologies the recommendation is to follow in principle this attempt.

[46] http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

Recommended procedure for assessing significantly affecting actions related to reconstructional activities or maintenance in fortifications:

1. spatial framing of the examination area
2. observational survey and evaluation of nature and landscape elements
3. prognosis of likely effects caused by the project, plan or action
4. assessment of possibilities and alternatives including as well the zero option for a prevention and minimisation of disturbances and harms
5. accounting (scoping) of the impact and clarification of the necessary dimension of compensational measures of alternatives or the original plan
6. conceptualisation of compensational measures, if necessary

This procedure is as well carried out by official agencies and bodies of nature protection efforts, if a FFH species or site is likely to be affected by an activity or plan. Because in many cases fortifications and their defensive structures like casemates, moats, ditches, ramparts, glacis and walls, are presumably hosts for FFH species such as bats, lizards, snakes or butterflies or even whole habitats or pre-stadiums of these such as specific scrubs or grasslands this assessment method would be anyhow applied in most cases.

This assessment procedure can be carried out of course during the planning process by planning bodies, but will be at the end in most cases matter of official assessments, if necessary. Especially the mentioned observational survey and evaluation of nature and landscape elements was in many cases of known activities seldom carried out sufficiently or have been not at all implemented by the planner. Especially here a lot of emphasis and work should be invested to clarify as many as possible aspects. This survey under optimal conditions should be carried out over a period of at least 12 months and should integrate standard survey methods for all relevant groups and habitats.

Although fortifications seldom are offering complex and high qualitative habitats ecological requirements of many species match with these conditions of alternative and substituting habitats. Sometimes these conditions are ecological margins for species and may be significantly affected. An evaluation of the implications of a planned activity includes aspects of abiotic changes, imissions and the permanence of disturbances and as well the sensitivity of species or sites.

According to these findings the planners shall search for options to avoid any harm and to minimise negative or significant effects on abiotic and biotic factors, regardless of the abundance of protected species or habitats. Modularisation and a spatiotemporal decoupling of the activities offers one possibility to minimise any significant or negative effect. As well it can provide temporal alternatives for moving species and offers of course shelter during constructional activities. As well it is recommended if bigger areas or surface are touched A: to minimise activities to an absolutely minimum which at the same time often also saves money and B: to minimise spatial interference to similar sensitivity driven thresholds as provided by table 2 of page 21.

During scoping likely effects of alternatives or the original plan are assessed for a clarification whether or to which extent compensational measures have to be implemented. In general it is recommended to search *ex-ante* for suitable and possible compensational areas and spaces, especially if first results of the observational survey state a potential need. As well the implementing body or the planners may choose the option to provide evidence

for a non-significant effect by an expert opinion. In general these compensational measures extend much more than the affected site due to an uncertainty of the effectiveness of compensational measure in general and of the time lag between a starting phase (establishment) and the site(s) becoming effective as such and as intended. Therefore for any compensational activity should be available and used at least double the size of the affected site. As well the aim of compensational measure shall be, although it is not always and everywhere interpreted, an improvement of the overall ecological and conservational situation of species and habitats. The baseline condition of the initial status almost never is a favourable condition. Many compensational measures are therefore orientated towards an ecological upgrading of the existing sites. Many fortifications have huge potentials for providing excellent habitats of e.g. high qualitative dry or semi-dry semi-natural grassland habitats, which are in most countries sparsely distributed. Many of these specific habitats of course need decisive and constant maintenance, especially if they are in their initial stages of development. For a establishment and as well the maintenance do exist as well several guidelines and scientific opinions. Here especially the official guideline regarding management dependent FFH habitats associated with farmland and agricultural practices[47] is recommended. The ecological functions, which have to be compensated, must be ensured and guaranteed and have to perform when the activity starts. The conceptualisation and as well the implementation, which includes as well a monitoring, of those measures takes a lot of time and of course demands resources, which shall and must be provided by the operator, planner or the relevant implementing body.

Relevant regional and national authorities, scientific institutes and as well other organisations can provide information, assistance and supervision during those planning procedures. It is as well recommended to choose a communicative, trans-disciplinary and solution oriented attempt in general.

As well it is recommended to test and clarify whether local situations are applicable to be used within the PEEN of greenways, corridors and stepstones according to the FFH articles 3 and 10. National authorities or, like in the case of Germany federal authorities, have formulated target indicators and/or target species according to landscape management plans for the establishment of those structures. These species belong in general to typical landscape structures or elements such as ponds, different types of meadows, shrubs or forest-alike elements, in which the abundance of these species is a qualitative indicator for their ecological value and a degree of the functional connectedness. Since these “target species” as well reflect local or regional protection requirements of species or habitats it is almost impossible to name feasible Pan-European species, except those which are already named in FFH or Birds directive, which may be suitable as indicators and orientation towards an development of those elements. Further research and trans-national coordination needs to be done to clarify which species and/or habitats can be established or shall be used as targets if those structures shall be established especially if fortifications or former fortified landscapes are considered.

But anyhow, attempts which try to substantially enhance biotope connectivity, both on a structural and on a functional level, are as well suited to be implemented and have been accepted in many cases as compensational or additional measures by relevant authorities or public bodies, if harms to flora and fauna are caused by a project or an activity. Future activities shall as a recommendation successively expand those attempts since these are driving factors for an overall increase of environmental quality of which as well societies and natural communities are benefiting.

[47] http://ec.europa.eu/environment/nature/natura2000/management/docs/FARMING%20FOR%20NATURA%202000-ANNEXES%20A-D-final.pdf

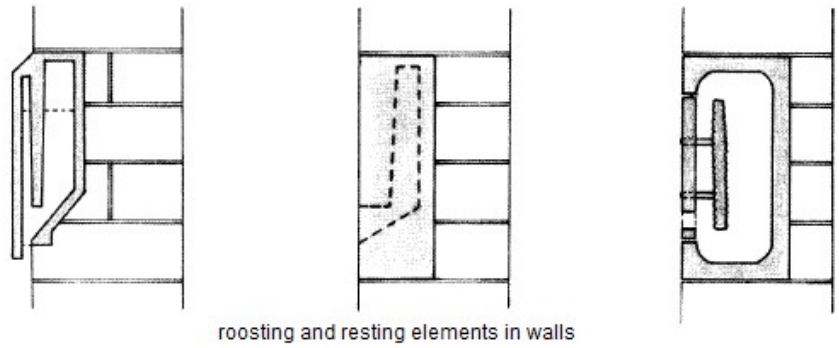
4.2. Case examples and recommendations

As fortifications host typical communities or species this sub-chapter shall provide some recommendations for respecting nature protection during reconstructional activities in fortifications and beyond these activities in general.

Bats

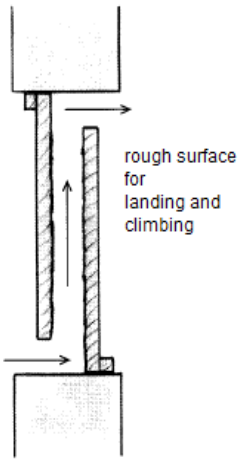
Bats are sensitive to changes in temperatures and humidity levels and are mainly depending on cracks or crevices in walls, in which they hide and as well roost. All activities shall respect these demands, such as:

- no complete filling of cracks, crevices or gaps in walls, only to the extent it is absolutely necessary for the structural integrity
- if bigger or almost complete fillings are inevitable surveys must clarify whether these cracks are used by bats
- surveys and especially constructional activities have to be carried out during warm periods when a natural activity and a possible autonomous relocation can be guaranteed
- complete sealing of windows, shooting wholes, vents or other forms shall be avoided firstly to guarantee an air exchange to prevent mould or other harming conditions and secondly as well to guarantee a safe "flight" for bats (meshes of grids or iron works shall be at least 10cm in diameter)
- during reconstructional activities obstacle free approaching corridors inside and outside of the building must be guaranteed (in those "known" areas bats are not using their ultrasonic orientation)
- supplementing and compensatory roosting and resting sites are very much recommended and must respect species needs (relevant factors are size, form and structures of these elements), some examples[48] are given below:

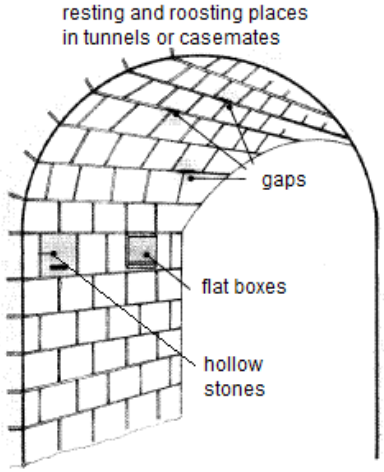


Picture 2: resting places outside or inside of walls, © Schulenburg

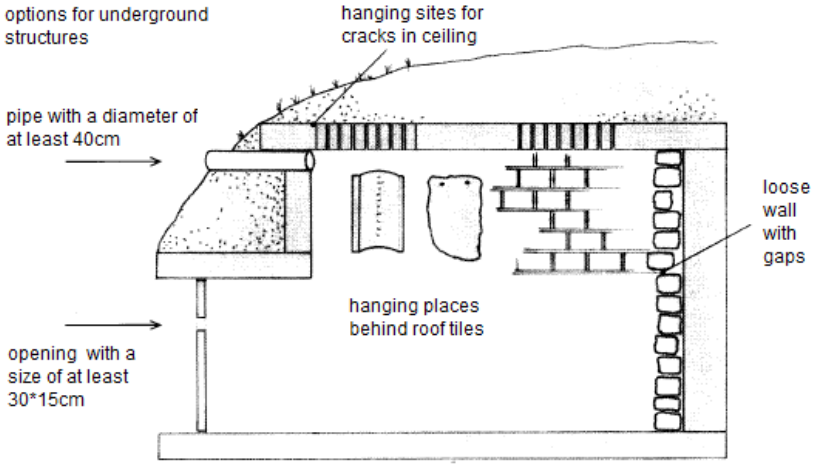
[48] acc. to Schulenburg et al.(2001) https://publikationen.sachsen.de/bdb/artikel/11718/documents/12307



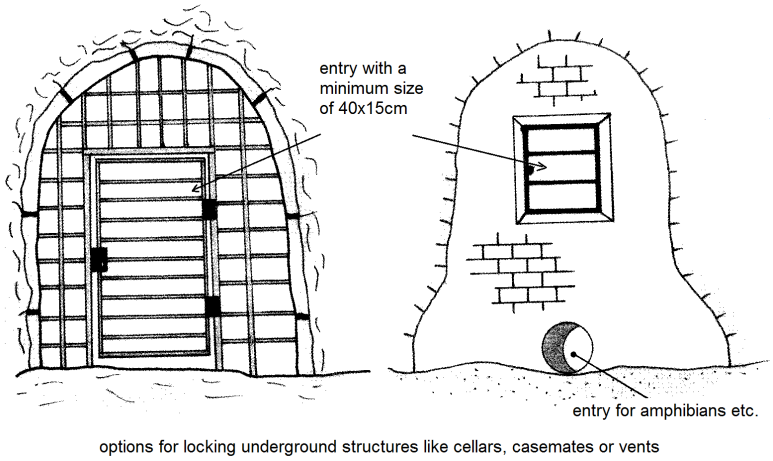
Picture 3: pigeon safe entry structure for bats into corridors, © Schulenburg



Picture 4: possible structure in tunnels or casemates, © Schulenburg



Picture 5: options for transformations of underground structures into bat resting or roosting places, © Schulenburg



Picture 6: options and requirements for underground and window locking, © Schulenburg

Lizards

Whereas bats use underground elements, reptiles like lizards are sticking to surface structures, especially those with a southward exposition. Basic principles which shall be followed during reconstruction are listed below, if sites are habitats of these animals:

- time-lagged and extensive constructional activities, especially if FFH relevant species are affected
- no complete filling of gaps or cracks, reconstruction only of structural relevant spots, avoidance of aesthetic driven reconstruction
- maintenance of sufficient remaining gaps and hiding places
- reasonable and well dosed intervention into vegetation covers of walls, ramparts etc.
- adaption and creation of supplementing habitats which provide shelter, food and climatic diversity
- adjustment of construction activities to reproduction aspects, reconstructions are recommended during late summer or autumn
- installation or maintenance of vegetation buffer zones (at least 1m width) at the bottom of walls
- professional support if structural threaths are existing and overriding interest of public safety is likely

Picture 7: common wall lizard (*Podarcis muralis)* at Forte San Mattia, Verona (IT), © Junghans

Plant communities of ramparts, walls, bastions, glacis and earth covers

Dependent from used soil material, exposition and climatic conditions substantially different plant communities can establish themselves by secondary succession or can be initiated. Nature protection focussing on these natural elements in fortifications shall

- be oriented on the establishment or the maintenance of high quality communities
- be planned as mid to long-term activities
- respect as well undisturbed development in specific parts
- integrate agricultural or farmland maintenance activities in an extensive way
- develop sites and habitats which are of high value for the specific region, if possible
- respect, that hazardous situations are avoided
- offer a diverse internal topic structure
- avoid that deep-rooting plants destroy structural elements

facades of stone – and brickworks

Aesthetically cleaned and plastered façades offer at a first glance the skills of craftsmen and conservators and are indeed attractive architectural subjects for many tourists. Activities, which are aimed to establish those situations cost enormous amounts of money, and are as well from a conservational point of view questionable. Often those activities substantially destroy an irreplaceable patina, often lead as well to structural losses by the use of wrong technologies and materials, in a long-term perspective increase as well gaps in brick- and stoneworks and of course have to be carried out periodically after a while, since nature often re-colonises these walls fast and climatic conditions as well exert pressure on these elements. Reducing costs and facilitating biodiversity at the same time is not impossible and may lead to a different attractivity and gain.

- Annually reduce juveniles of trees and bushes at walls and control them as well at other relevant spot
- Reconstruct lagged in space and time
- Focus on the reconstruction and stabilisation of structural endangered parts
- avoid aesthetical cleaning and abrasive techniques
- if necessary or wanted try to use vine or climbers with thorns *(Rosa spec.)*, tendrils *(Clematis spec.)* or natural adhesive pads *(Parthenocicccus spec.),* replace ivy and regularly check and control expansion and growth
- respect individual sensitivity of plant communities of walls and rocky habitats during local construction activities
- promote herbaceous and graminaceous plant communities

Biodiversity increasing activities on public greens

- avoid intensive maintenance, such as cuts in a high frequency
- increase floweriness and internal meadow biodiversity through the choice of specific seed mixtures
- increase of internal structural diversity
- offer bushes, trees and artificial elements for nesting and roosting
- attract birds of prey though maintenance, installation and planting of bushes, trees or artificial elements if necessary to control rodents

Case example Fort Hahneberg Berlin-Spandau

Fort Hahneberg was constructed as a brickwork Biehler Fort between 1882 and 1886. After 1945 the Fort was almost completely abandoned and maintenance of structures or regular greenery maintenance was not carried out. Bricks of walls and other buildings have been used for a town renewal and reconstruction after Second World War, in which the fort was not exposed to any damage. Secondary succession occurred, especially after the fort and its glacis was integrated into the border zone around around West-Berlin, with the result that glacis, moats and curtain walls and as parts of well inner courtyards were almost covered by forest like structures in 1990. During 2005 and 2014 several field surveys have observed and described the situation of plant communities and biotopes and changes at this fort. Examples of found biotopes and plant communities are given in table 5.

Between the year 2000 and 2005 maintenance activities inside of the fort have cut many trees and shrubs and established almost a sandy and blank situation. As in table 5 can be seen, that the majority of all inner parts of the courtyard, the flanks of the *Kapitalpoterne*, the *Kehlreduit* or other exposed elements are still in succession and mainly forms of ruderal vegetation patterns and vegetation patterns of anthropogenic raw soils occur. These patterns has been surveyed in 2005 as fragments or initial stadiums of higher vegetation forms. Due to their nature these specific vegetation pattern are diverse, always “incomplete” and instable in their inner structure. From a nature protection point of view these sites are often found and allocated to ruderal aspects or disturbed sites, which are especially in the context of the fort of high abundance. Some of them, even though they are ruderal vegetation patterns, need regular maintenance otherwise they are expanding (any form of real ruderal meadows) or they are disappearing over time. Recent surveys state an ongoing process of successional transformation, as especially frequency and abundance from 2014 show. Similar changes of vegetation patterns of grasslands of dry and sandy soils, as they have been found in 2005, can be observed in 2014. Habitats of forest-alike structures naturally don't change fast and therefore all initially described patterns persisted.

As additional conducted surveys and interviews stated, the loss of ruderal vegetation patterns and the net loss of grasslands of dry and sandy soils (which are best suited to reduce any remaining soil moisture e.g. above casemates) is mainly caused by wrong maintenance. In addition to this spatial loss, the abundance of allocated red list plant species has decreased from 2005 to 2014 and a complete loss of these at this site is likely, if specifically grassland maintenance activities are not carried properly. Specifically the ruderal meadow has increased and all other areas have decreased because obligatory mowing and cutting 2 times per years at fixed dates (End of July and end of September) was reduced to one time per year or has not been carried out at all.

Table 5: plant communities and their degree of establishment in Fort Hahneberg (D) in the year 2007[49] in comparison to 2014[50]

site	community	type	status of protection	status 2007/ size	status 2014/ size
left inner courtyard	*Dauco-Melilotion*	perennial ruderal vegetation pattern		pre stadiums < 25m²	fragments >25m²
left inner courtyard	*Sisymbrietea officinalis*	annual ruderal vegetation pattern		fragments < 25m²	fragments >25m²
left inner courtyard	*Polygono arenastri – Poetea annuae*	ruderal vegetation pattern		fragments < 25m²	fragments >25m²
left inner courtyard	*Agropyretea repentis*	perennial ruderal vegetation pattern		fragments < 50m²	fragments > 50m²
right flank of *Kapitalpoterne*	*Berteroetum incanae*	biennial or short living ruderal vegetation pattern		well established <25m²	not found
top and flanks of left escarpe wall	*Tanaceto vulgaris – Arrhenatheretum elatioris*	ruderal meadow		fragments < 500m²	fragments > 500m²
left flank of the *Kapitalpoterne* and *Kehlreduit*	*Corynephorion canescentis*	dry and sandy perennial grassland	worth	fragments < 100m²	fragments < 50m”
left flank of the *Kapitalpoterne* and *Kehlreduit*	*Armerion elongatae*	dry and sandy perennial grassland	regional	well established < 50m²	fragments < 25m²
left flank of the *Kapitalpoterne* and *Kehlreduit*	*Koelerion glaucae*	dry and sandy perennial grassland	regional	fragments < 10m²	fragments < 5m²
left flank of the *Kapitalpoterne* and *Kehlreduit*	*Festucetalia valsiacae*	dry and sandy perennial grassland	regional	basic elements < 25m²	fragments < 15m²
left moat	*Chelidonio – Robinietum*	forest		well established > 500m²	well established > 500m²
right moat	*Anthrisco – Aceretum platanoidis*	forest		well established > 500m²	well established > 500m²
glacis	*Carpinion betuli*	forest		fragments > 500m²	fragments > 500m²

Similar vegetation patterns can be found in many fortifications in the continental but as well in the pannonian biogeographic region. The example shown above shall stimulate and convince practitioners and conservators to integrate correct and regular maintenance and management activities of natural areas of fortifications into their overall planning. Especially grasslands of the Class *Festuco-Brometea* include a huge variety of classes and ecological variations of vegetation patterns of Eurosiberian steppes and are providing if maintained properly as all grassland do aesthetic and ecological benefits to European fortifications.

As well for instance *Festuco-Brometea* or *Festuco-Brometalia,* a specific FFH Annex 1 habitat[51], and monetary options for a development and maintenance can be obtained.

[49] According to Issbrücker (2007)

[50] own data

[51] http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6210_Seminatural_dry_grasslands.pdf

5. Summary and conclusion

This publication has tried to provide background informations on topics practitioners and scientists of fortress reconstruction and monument protection are often confronted with. The authors tried to explain the complex matter of European frameworks of nature and environment protection and their links to other programs and frameworks as short and simple as necessary.

One aim of this publication was to increase the level of understanding and acceptance for the relevance of nature and environmental protection attempts and their implications for fortresses, especially regarding associated reconstruction and maintenance of physical structures. But as well the publication has tried to promote the idea that natural and cultural heritage at this specific point very much meet, especially if aspects of landscape management and a management of natural resources are focussed

Another aim of this publication was to increase trans-national communication, knowledge exchange, cooperation on this specific academic field. The authors hope that in a near future the situation for the urgency of nature protection has decreased and the as well irretrievable men-made cultural heritage of fortifications as a common heritage is getting the same attention and legal background as the common heritage of the natural capital. In addition this publication is aimed as an stimulus towards a necessary scientific and public discussion about the effectiveness of actual nature protection regulations and frameworks and their underlying concepts.

This paper tried to explain why constructional activities in fortifications shall be realised according to results of observational survey of nature and landscape elements and why its results are obligatory to be linked, correlated and extended with a complementary landscape conservation and management plan. It is recommended in this sense to use this plan, the findings of the survey and the reconstruction itself as a chance to improve the ecological baseline condition substantially and not only to equalise adverse effects on abiotic and biotic aspects.

Ecological diversification inside of fortifications can lead to an aesthetic diversification, especially at those place where visitors, tourists and citizens are overwhelmed by architecture and/or history and of course where natural or semi-natural places are rare goods. Having learnt from many numerous visits of the past those places increase the attractiveness of a town substantially not only for tourists and are providing many beneficial aspects to human health as well.

Since ecological communities are diverse and very much site dependent and European fortifications are as well diverse and almost never do have a twin solutions how nature protection can be carried out have to developed at the specific spot, respecting abiotic and biotic conditions and as well plans for the fortification itself. In most cases complex situations are matter of complex and integrated solutions. Therefore the authors did not wanted to provide panaceas since specific ecological requirements of regions, towns, peri-urban or rural areas are diverse and landscape management plans or corresponding plans seldom completely reflect and integrate these needs.

Advice and often as well budgetary assistance can be obtained by European, national and regional programmes and of course by all relevant bodies and authorities which deal with environmental issues on a professional basis. For the development and the management of specific habitats of the FFH Directive, of which some in many fortifications can occur, specific funds are existing. But as well other habitats can provide high ecological values or sometimes already do so. Fortifications are offering due to their construction a huge variety of abiotic conditions of different spatial extension. Discovering and developing these potentials shall be subject of any reconstruction. Hints for possible directions of developments are at the most places already at the spot.

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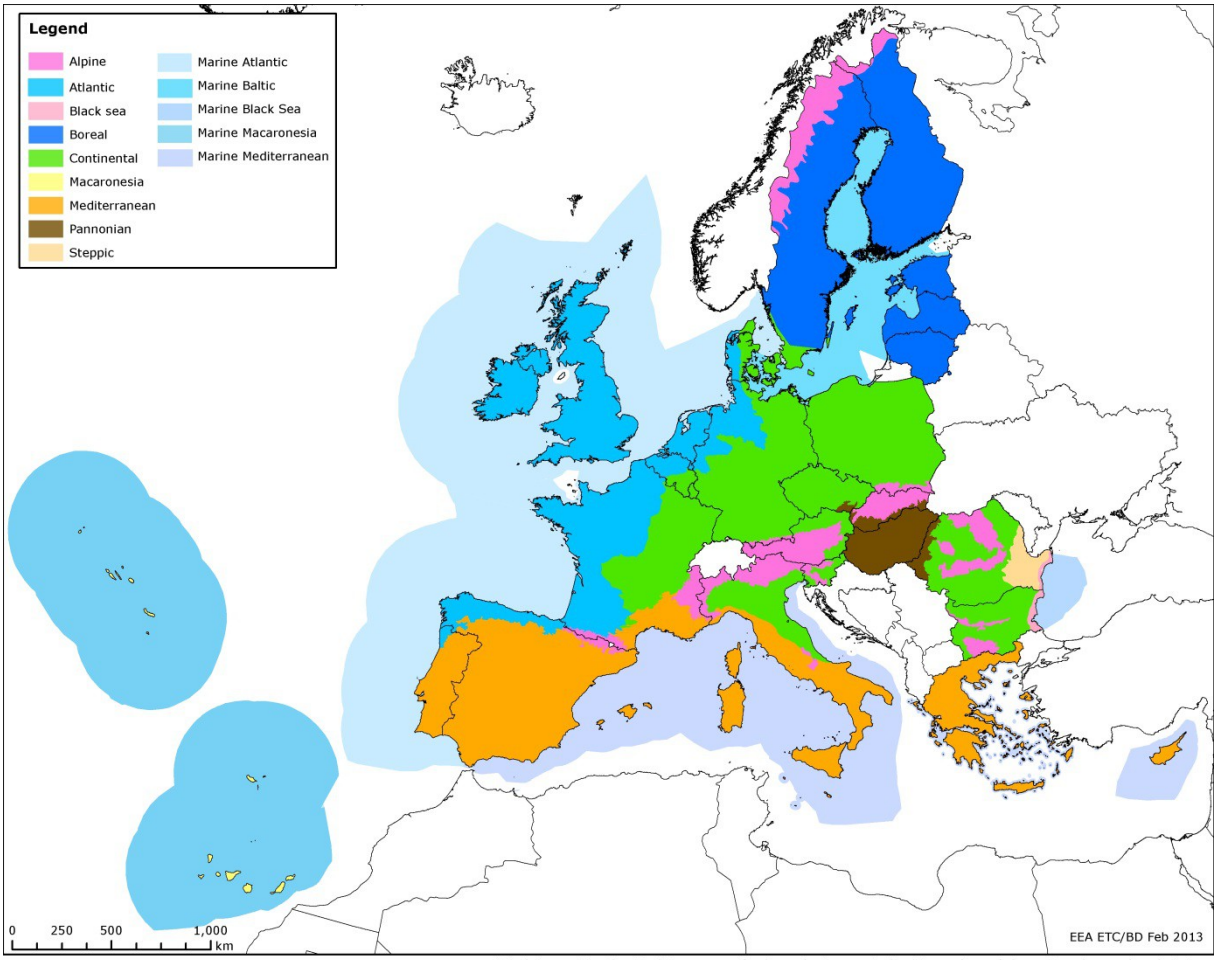
Annex



Picture I: Biogeographic regions of Europe according to article 17 Flora-Fauna-Habitat Directive 92/43/EEC