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A Conceptual Framework for Heritage Impact Assessment: A Review and Perspective

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Abstract: Heritage Impact Assessment (HIA) has recently emerged as a conflict-solving tool to improve World Heritage (WH) conservation in line with sustainable development policies. The increasing number of requested HIAs for affected WH properties over the last years reveals that more attention is being paid to HIA as a practical tool to adequately support the protection and management of historic monuments and sites against new constructions and development. However, the application of integrated and systematic impact assessment methods within HIA still remains a key challenge in different HIA projects. Therefore, this paper contributes to the further development of a transparent and systematic procedure of HIA in accordance with Environmental Impact Assessment (EIA). It also explores different standard methods of impact assessment in EIA and discusses their applicability to cultural World Heritage properties. Finally, the paper emphasizes a need for developing integrated impact assessment methods to address the multiple impacts of development projects. Such methodological enhancement can further contribute to mitigation strategies and decision-making to protect World Heritage properties within the context of sustainable development.

Keywords: Heritage Impact Assessment (HIA); Environmental Impact Assessment (EIA); cultural world heritage; sustainable development; impact assessment methodology

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1. Introduction

Impact assessment is defined as the "process of identifying the future consequences of a current or proposed action" [1]. Particularly, Environmental Impact Assessment (EIA) is recognized as a tool to support the decision-making process [2,3] through assessing the effects of development proposals and projects on numerous components of the environment. EIA is described as a proactive tool with the aim of "identifying, predicting, evaluating and mitigating the biophysical, social and other relevant environmental effects of development proposals prior to major decisions being taken and commitments being made" [2]. Moreover, EIA has been introduced as an effective formal and systematic assessment tool to protect the environment and support sustainable development [4–6].

EIA has been recognized as a comprehensive assessment tool which is a cornerstone of other IA tools [7,8]. It has been acknowledged as a productive assessment tool to provide a transparent process—"clear [and] easily understood requirements for EIA content"—[2,9,10] as well as a systematic and integrated methodology [11] that enhances environmental awareness and protection [7,12–15]. Among the different receptors of impact, cultural heritage is mentioned in the EIA directives as one of the sensitive components. However, the assessment of cultural heritage within EIA has been a critical issue [16–19]. On the one hand, the continuously inadequate consideration of the specific requirements of cultural World Heritage properties in EIAs (namely of their Outstanding Universal Values (OUV), authenticity, and integrity)and on the other hand, the increasing number of affected properties, has led to the development of Heritage Impact Assessment (HIA) within the

framework of EIA by ICOMOS [16]. Recently, an ever-increasing number of HIA requests within the State of Conservation (SoC) reports [20] have shown that more attention is being paid to HIA as "a conflict solving tool to enhance the cultural heritage conservation" [21].

Heritage Impact Assessment (HIA) was developed to identify and evaluate human-induced impacts on cultural World Heritage properties with the aim of maintaining a balance between World Heritage protection and the needs of development towards sustainability [21]. The underlying argument is that World Heritage properties constitute invaluable and extraordinary assets which need to be protected at the national and international levels for further generations "as part of the world heritage of mankind as a whole" [22] (Preamble and article 4). The OUV as a basic notion of the World Heritage Convention [22] summarizes the significance, values, and key attributes of heritage that need to be sustained, safeguarded, and managed over time [23]. Therefore, the identification and assessment of the various threats and potential impacts on the OUV constitute a baseline for the management and protection of WH properties.

However, identifying, predicting, and assessing the potential impacts of development projects on WH properties remains challenging. There is only limited literature dedicated to the procedure and methodology of HIA. A need to develop impact assessment methodologies has been admitted by scholars and organizations engaged in this area [17,24–27]. Even though EIA as a backbone of HIA benefits considerably from various impact assessment methods, such methodological options have not been adequately addressed within the HIA-related literature. Therefore, further research is needed to explore the specific impact assessment methods applicable to the cultural World Heritage properties and to address the multiple impacts.

Against this background, this paper contributes to the further development of a clear procedure of HIA according to the EIA procedure. It also discusses the key role of the "impact assessment" phase in the overall HIA procedure and seeks to explore the several common EIA impact assessment methods and their applicability to the cultural World Heritage properties. Thus, although cultural heritage constitutes the general target of this paper, we specifically focus on WH properties to address their specific requirements in HIA.

2. Role of Environmental Impact Assessment and Heritage Impact Assessment in the Sustainable Development

The environment has been recognized as one of the three main pillars of sustainable development [28–30] (i.e., "economic development, and social development and environmental protection" [30]); it is seen as "the dominant concern of sustainable development" [31]. First and foremost, the United Nations Conference on Environment and Development in 1992, known as the Rio 92 Conference or the Earth Summit Agenda 21, underlined the key role of impact assessment and particularly EIA, Principle 4 and 17, in sustainable development [29]. Following this, the United Nations Conference on Sustainable Development in 2012, Rio+20 [32] adopted green economy policies and emphasized the implementation of EIA [4]. In this context, the International Association for Impact Assessment stated that one of the primary objectives of EIAs was to "promote development that is sustainable and optimizes resource use and management opportunities" [2]. The IA's main concern is "to ensure more sustainable and low environmental and social risk solutions" [1]. Altogether, the EIA has been considered as a proactive assessment tool that supports sustainable and balanced decision-making in spatial planning and development.

In accordance with the EIA context, HIA has been established to identify and analyze significant impacts on cultural World Heritage properties, specifically to improve the cultural heritage protection within the sustainable development concept [21]. The role of cultural heritage and the necessity of cultural heritage protection as part of sustainable development is acknowledged in many documents. For instance, Article 3 of the *UNESCO Universal Declaration on Cultural Diversity* highlights the role of cultural heritage in the development process "as a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence" [33]. Preamble (Articles 1, 5, and 10) of the *Council of*

Europe Framework Convention on the Value of Cultural Heritage for Society also emphasizes the value of cultural heritage and cultural heritage protection "as a resource for sustainable development" [34]. Para 119 of *the UNESCO Operational Guidelines for the Implementation of the World Heritage Convention* underlines the significant contribution of WH properties in sustainable development [23]. Moreover, the *Paris Declaration on Heritage as the Driver of Development* emphasizes the necessity of heritage protection regarding "curbing the negative effects of globalization" [35]. It further highlights the crucial role of cultural heritage in enhancing sustainable development through supporting sustainable tourism, increasing local employment and quality of life, urban livability, sense of belonging, and so on.

Notably, the World Bank study in 2012 interpreted "heritage as cultural capital" [36] and indicates that the heritage investment has an economic rationale and "does have positive returns" [36] (p. xxi). In 2013, the *Hangzhou Declaration: Placing Culture at the Heart of Sustainable Development Policies* asserted the importance of protecting historic urban and rural areas in the promotion of "sustainable patterns of production and consumption and sustainable urban and architectural design solutions" [37]. In a similar vein, the European research project '*Cultural Heritage Counts for Europe (CHCFE)*' revealed that cultural heritage projects could positively impact Europe's economy, culture, society, and the environment as the four pillars of sustainable development [38].

Finally, the *UN 2030 Agenda for Sustainable Development* underlined the need to "strengthen efforts to protect and safeguard the world's cultural and natural heritage" in its target 11.4 [39]. It states that the "heritage conservation project builds upon the local area's historical and cultural heritage assets to heighten the sense of pride and to address the social and economic challenges and opportunities of urban development" [40]. Accordingly, applying HIA is underscored as a policy statement of Goal 11 [41]. Summing up, the protection of cultural heritage plays a pivotal role in sustainable development. Here, HIA as a decision-making support instrument can contribute to the mitigation of the adverse impacts on the World Heritage properties as an essential requirement for the protection and management.

3. Methods

In pursuit of these aims, the paper bases its analysis and argument on an extensive literature review on EIA and HIA, and in particular, those studies focusing on the overall assessment procedure. The literature review considered both scientific publications such as journal articles and scholarly books as well as policy documents such as conventions, guiding papers, and training manuals. Since the research explicitly focuses on the impact assessment methods, from a wide range of EIA literature, the literature that focuses on methodological aspects was mainly chosen. In particular, those that embody data based on the theory and practice from different sources were taken into account. Similarly, within the limited HIA literature, those that have introduced and discussed the assessment procedures and methods were mainly reviewed. These various sources of scientific, practical, and political–normative knowledge provide the ground to scientifically inform the development of the methodological perspectives for the HIA procedure, in particular for the impact assessment stage.

Therefore, the paper pursues two levels of methodological advancement: First, it develops a more systematic and transparent procedural framework for a HIA in accordance with the Environmental Impact Assessment (EIA). Secondly, it seeks to improve in particular the impact assessment methods within the HIA procedure. Following this, the paper discusses the several impact assessment methods in the EIA and their applicability to assess the various impacts on the cultural World Heritage assets.

Accordingly, the following research questions are addressed in this paper:

- How can the HIA procedure be improved in terms of transparency and systematic sequences within the framework of EIA?
- What are the impact assessment methods of EIA which could be applicable to HIA in particular?

In line with the research agenda, the paper is structured as follows: after a short reminder of the important role of EIA and HIA in sustainable development, it gives a brief review of the EIA procedure. Based on this, the HIA procedure is developed, while paying special attention to the "impact assessment" stage. Accordingly, the paper studies several standard EIA impact assessment methods and their applicability to cultural World Heritage. Some examples of concrete cases as empirical evidence are also mentioned to support the applicability of methods.

4. Theoretical and Conceptual Framework

4.1. Environmental Impact Assessment as a Starting Point for Other Impact Assessment Tools

Originally, EIA was established to protect the environment from rapid industrialization and urbanization in the 1960s through raising stakeholder and public awareness about the loss of natural resources. The USA was the first country to establish a legal framework for EIA within *the National Environmental Policy Act* [42]. Seventeen years later, the World Bank adopted the Environmental Assessment (EA) Policy in 1989 and approved it with the stakeholders' participation in 1991 [43]. Meanwhile, *The Convention on Environmental Impact Assessment in a Transboundary Context*, the so-called *Espoo Convention*, was adopted in 1991 and came into force in 1997 "to ensure international cooperation in assessing and managing environmental impacts of planned activities, in particular in a transboundary context" [44]. A research project in 2011 revealed that "191 of the 193 member nations of the United Nations either have national legislation or have signed some form of international legal instrument that refers to the use of EIA" [8].

EIA has been acknowledged as a comprehensive and "overarching" [7] tool that led to the formation of various other forms of impact assessment tools. For instance, in the 1980s and early 1990s, Strategic Environmental Assessments (SEAs) emerged as a tool for "the proactive assessment of alternatives" [45]. It also supports the decision-making process at the level of policies and planning rather than individual projects [5,46]. SEA was developed to overcome the limitations of EIAs [47,48], "the environmental assessments appropriate to policies, plans and programs are of a more strategic nature than those applicable to individual projects and are likely to differ from them in several important respects" [49]. Social Impact Assessment (SIA) is another impact assessment tool which has been developed due to the lack of adequate social dimensions in the EIAs [50,51]. Thus, SIA is defined today as "the process of identifying and managing the social issues of project development and includes the effective engagement of affected communities in participatory processes of identification, assessment and management of social impacts" [51].

Moreover, some IA tools were established to mainly target the "specific environmental receptors" [7] such as Landscape and Visual Impact Assessment (LVIA), which assesses the development impacts on the landscape and people's views, and Heritage Impact Assessment (HIA) with a specific focus on the World Heritage properties. These tools have been developed within the EIA's framework and correspondingly, follow a largely identical EIA procedure and have similar terminology. Moreover, they have been applied only at the level of individual projects and development proposals as EIA does. Hence, the HIA procedure roughly follows a similar EIA procedure including its major phases; thus, the study of the EIA procedure is essential in order to further develop the procedure of Heritage Impact Assessment.

4.2. Introduction to the Environmental Impact Assessment Procedure

EIA has been acknowledged as a rational approach that supports decision-making through a systematic and scientific process [12,52–54]. In other words, the purpose of the tool is to provide essential information to predict the significant future impacts concerning the decision-making process in a clear systematic manner. Importantly, the effectiveness of the tool is highly associated with the "quality of information" [46,55] and a rational, systematic, and structural assessment procedure [53,54].

Figure 1 gives an overview of the key stages of the EIA procedure [2,56,57]. The screening constitutes the first step. This is a primary assessment by the EIA authority to determine if the project or proposal has significant impacts or not. If so, the key potential impacts are identified to provide terms of reference in the scoping phase. Scoping is the formal step that defines the EIA report's purpose. Afterwards, the consideration of the planned projects' alternatives allows an examination of whether the impacts of the proposals or projects on the environment could be essentially lowered. It should be noted that the examination of the alternatives could be considered as a part of the scoping stage. Subsequently, the positive and negative impacts of the proposal or project are identified, predicted, analyzed, and evaluated at the impact assessment step. Consequently, the mitigation strategies can then be established to prevent, reduce, or offset the identified significant negative impacts of the proposal or project.

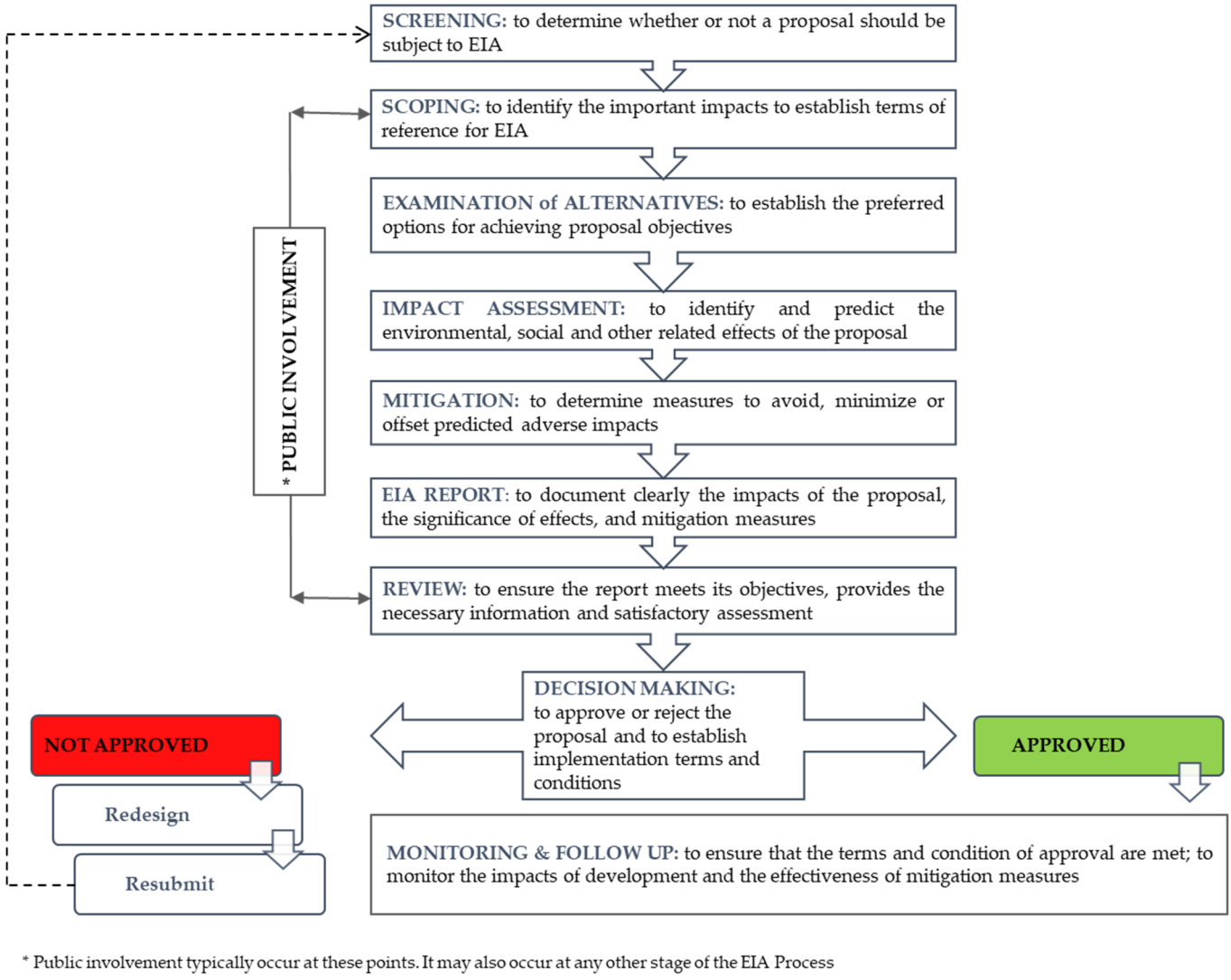

Figure 1. The main steps of the EIA procedure adapted from [2,56,57].

In the subsequent step, the EIA report is developed to document and summarize the assessment and mitigation phases for public hearings. The EIA report is further reviewed to determine that the provided information meets the terms of reference and is adequate for decision-making. Finally, the EIA authority decides whether the proposal or project should be approved or not. The approved proposal or project should be monitored to control and verify the implementation of mitigation strategies and measures. Nevertheless,

the rejected proposal or project can be modified and redesigned in order to resubmit for the new assessment procedure.

Considering the scheme of an EIA procedure, it is important to clarify that Figure 1 emphasizes the main steps of the procedure, although "not every development project requires each element of the EIA process" [3]. Moreover, public involvement—"public input, review, and participation" [58], (p. 198)—is an integral element to the EIA process that also acquires an accurate and effective assessment [59–61]. Public involvement could arise at any stage of EIA, but it must be considered as an essential part of the scoping and reviewing stages [2,56,57]. Besides, the involvement of further external reviewers is noteworthy "to obtain an impartial judgement of the particular, and often conflicting, interests of various parties involved and to avoid unnecessary costs and delays" [62], since the credibility of the EIA report is thus strengthened.

However, EIA may reveal some challenges in practice such as the trade-off between negative and positive impacts for decision-making [6], lack of sufficient data and quality of information [5,6,63], difficulties in public participation [5,6,64], challenges of implementation [5,65], and time and cost effectiveness [65,66]. Despite these challenges, EIA's basic objectives as well as the key elements are broadly agreed upon [13] and it is still a well-established tool which is recognized as one of the more consistent [67], widely practiced [68], and clearly beneficial [13] environmental management instruments.

4.3. The Procedure of Heritage Impact Assessment

Alongside the insights into the EIA overall procedure, cultural heritage protection has been addressed in various EIA frameworks such as the *Antiquities and Monuments Ordinance, in Hong Kong Law (Cap.53)* in 1976 [69], *Environmental Assessment Update No.8: Cultural Heritage in Environmental Assessment* by the World Bank in 1994 [70], as well as *Principles of EIA Best Practice* by International Association for Impact Assessment (IAIA) and UK (IEA) in 1999 [2]. Initially, the International Network for Cultural Diversity (INCD) [71] established a framework for cultural impact assessment in order to better address both the tangible and intangible values of "cultural aspects of environment". Finally, guidance on *HIA for Cultural World Heritage properties* was developed by ICOMOS in 2011, because the EIA "is not clearly and directly tied to the attributes of OUV" [16]. This guidance centers cultural World Heritage properties as autonomous and prominent characters in the environment that need to be considered separately [11].

As outlined in Section 4.1, HIA follows roughly the similar terminology and assessment steps of EIA. Nevertheless, HIA still suffers from a transparent and systematic procedure. Even the existing HIA guidelines and reports reveal confusion regarding the sequence of the different steps and interconnections between them [72].

To highlight this shortcoming, Table 1 summarizes the key steps of HIA procedures and the main sources that explicitly strive for a better consideration of culture and heritage in the impact assessment process. The impact assessment procedure by INCD is based on the impact assessment on cultural variables which are broadly categorized into the three main groups of "cultural life", "cultural institutions and organizations", and "cultural resources and infrastructure" [71]. This guidance mostly addressed the socio-cultural impacts of the development projects on local communities.

The ICOMOS Heritage Impact Assessment guidance was developed to assess the impact of large-scale development projects or proposals particularly on four World Heritage asset categories: "Archaeological attributes, Built heritage or Historic Urban Landscape attributes, Historic landscape attributes, and Intangible Cultural Heritage attributes or Associations" [16]. As listed in Table 1, this guidance proposes a HIA procedure with 16 stages. The procedure is an ambiguous and incoherent sequence [72]. For instance, the guidance provides broad information about the scoping stage and the scoping report contents (see Appendix 2 of ICOMOS guidance), but it fails to explain which steps (Table 1) belong to the scoping stage.

Table 1. Overview of the terminologies and procedures of HIA.

Heritage Impact Assessment Process	Definition of HIA	Steps in the Procedure
(INCD) Sagnia, 2004 [71]	A process of identifying, predicting, evaluating, and communicating the probable effects of a current or proposed development policy or action on the cultural life, institutions, and resources of communities, then integrating the findings and conclusions into the planning and decision-making process, with a view to mitigating adverse impacts and enhancing positive outcomes.	Ref. [71] Sec. V pp. 28–36: Develop an effective Public Involvement Plan, so that all affected interests will be involved; describe the proposed action or policy change and reasonable alternatives; define baseline conditions; identify and define the significant impacts; investigate the significant probable impacts; predict the response of the affected communities to the anticipated impacts; consider indirect and cumulative impacts; recommend new alternatives as needed and feasible; develop a mitigation Plan; develop a monitoring plan and program
ICOMOS, 2011 [16]	"To offer guidance on the process of commissioning Heritage Impact Assessments (HIAs) for World Heritage (WH) properties in order to evaluate effectively the impact of potential development on the Outstanding Universal Value (OUV) of properties."	Ref. [16] Appendix 1: Initial development and design; early consultation; identify and recruit suitable organizations to undertake works; establish the study area; Establish scope of work; Collect data; collate data; characterize the heritage resource, especially in identifying attributes that convey OUV; model and assess impacts, direct and indirect; draft mitigation—avoid, reduce, rehabilitate, or compensate; draft report; consultation; moderate the assessment results and mitigation; final reporting and illustration—to inform decisions; mitigation; dissemination of results and knowledge gained
WHITRAP and ICC"ROM, 2012 [73]	"(Cultural) Heritage Impact Assessment is a process of identifying, predicting, evaluating and communicating the probable effects of a current or proposed development policy or action on the heritage values (including Outstanding universal value in the case of World Heritage Properties), cultural life, institutions, and resources of communities, then integrating the findings and conclusions into the planning and decision-making process, with a view to mitigating adverse impacts and enhancing positive outcomes." (adopted from IAIA, n.d.)	Screening; scoping; commissioning; assessment; mitigation; monitoring and evaluation of mitigation; archiving / register
Rogers, 2017 [72]	"HIA is a planning tool that provides decision makers with an understanding of the potential effects that human actions may have on the cultural heritage environment."	Screening and scoping, commissioning (identifying need/defining study/appointing practitioners); desk-based study, additional data collection (collecting data to establish existing conditions); significance evaluation, threat identification, impact assessment (what needs protection/where threats come from/nature and extent of threats); modelling/evaluation of option mitigation and monitoring plan (scenarios for action/mitigating impacts); report/review/approval (formalizing compromise); mitigation monitoring, monitoring report (ensuring compliance), archiving of HIA (providing public record)

The other procedures that were proposed by other scholars, namely WHITRAP and ICCROM [73] as well as Rogers [72], strove for a better structured and more coherent HIA procedure. However, some stages, such as decision-making, need further clarification when it comes to the approval or rejection of a project. Thus, the HIA procedures still need further development in terms of HIA content to be more understandable and more transparent, to make it easier to trace the steps, and to illustrate the interaction between the steps of the procedure.

5. Developing a Framework for Heritage Impact Assessment

Against the insights into the overview and comparative HIA procedures (see Table 1) as well as the different phases of EIA (see Figure 1), a HIA procedure (Figure 2) is further developed to clarify the overall procedure in a more transparent way.

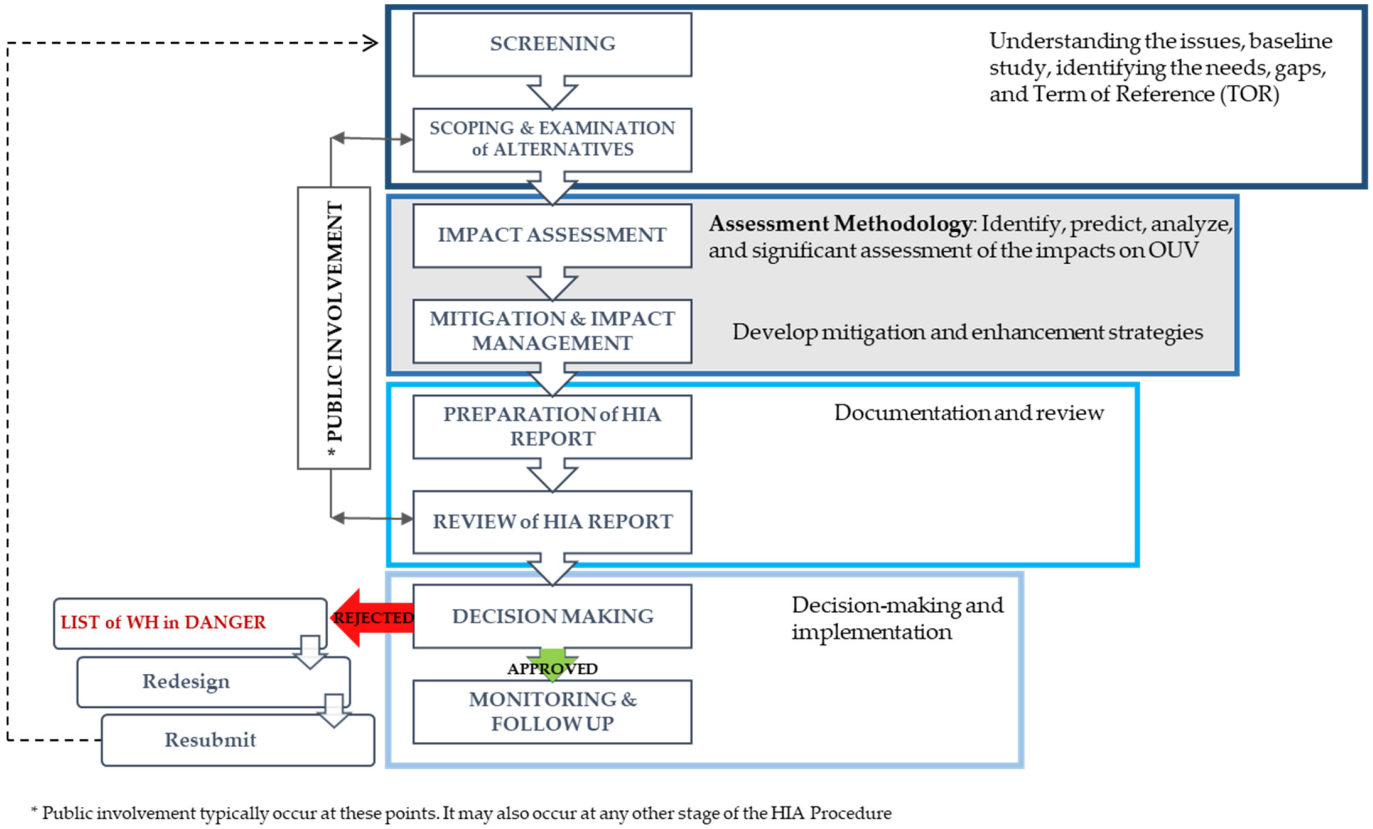

Figure 2. The main steps of the HIA procedure (Ashrafi, 2021 developed based on Figure 1 and Table 1).

As indicated in Figure 2, the entire procedure consists of four main phases. The first phase focuses on understanding the potential impacts, needs, and existing gaps. It mainly includes the screening as well as the scoping and the examination of different alternatives stages. It should be noted that the examination of different alternatives as one of the main operating principles for the EIA is mostly neglected in all above-mentioned HIA procedures. However, it has been combined occasionally within the HIA scoping report especially when the projects are in the proposal and planning phases. In addition, the ICOMOS guidance considers "alternative development" as a part of the scoping reports [16] (Para 2-2-6). Therefore, the examination of alternatives is added to the proposed procedure for the HIA (Figure 2) within the first phase. Obviously, the combination of the scoping report and consideration of the alternatives would improve the assessment procedure to establish the most sustainable objectives for Terms of References.

The second phase is the impact assessment which is a key step of the procedure. It focuses on identifying and predicting the threats and their related significant impacts that might affect the attributes of OUV, the authenticity, and the integrity of the World Heritage properties. The potential significant impacts are evaluated due to the very high value of the World Heritage properties. The assessment should be carried out by a multidisciplinary team of specialists including skilled professionals in HIAs. As a result of the impact assessment phase, mitigation strategies and impact management need to be proposed to avoid, minimize, or compensate the potential adverse impacts as well as to enhance the positive effects.

All gathered information, including impacts of the project, the significance of the impact, and mitigation measures, is documented and reviewed at the third phase. The HIA report is prepared to be the subject of the subsequent step of critical and technical reviewing (by external experts and ICOMOS). Ultimately, the final phase includes the final decision-making, implementation, and monitoring. The approved proposal or project (by the World Heritage Committee) needs to be monitored and followed up to ensure that the mitigation strategies during the implementation meet the HIA report. In case the project is rejected, the WH property potentially can be placed in the list of World Heritage in danger under WH Convention, Article 11 [22] to encourage the state parties to produce a quick reaction to redesign and submit more sustainable and heritage-friendly proposals. Otherwise, if the state parties do not react properly and at the proper time, the World Heritage property can be delisted from the WH List.

It is worth highlighting that, as mentioned also in Section 4.2, public participation is an essential element of the assessment process that could occur in each step of HIA. Public involvement is defined as "the involvement of individuals and groups that are positively or negatively affected by a proposed intervention (e.g., a project, a program, a plan, a policy) subject to a decision-making process or are interested in it" [74]. However, public involvement particularly is an integral part of scoping and reviewing stages which increases the effectiveness of the assessment [2,56,57]. For instance, the public plays an important role in identifying the priorities for the assessment in scoping step and in gathering data for predicting the impacts in the impact assessment phase. Furthermore, the public contribution has a prominent role in evaluating and reviewing the quality and acceptance of the report before decision-making [5,74].

6. A Need for Developing Impact Assessment Methodologies

6.1. Importance of the Impact Assessment Stage

Looking at the various single steps of a HIA procedure, the stage of impact assessment comes to the fore as an especially important and challenging step. Moreover, the impact assessment step is often considered as the "technical heart" [57] (p. 255) of the EIA or HIA procedure. As noted in the EIA and HIA definitions, the crucial terms of "identifying", "predicting", and "evaluating" the impacts signify the major objectives of both EIA and HIA. All of these terms are summarized predominantly at the impact assessment step.

Recognizing the importance of the methods of impact assessment, the adequate IA methodology for cultural heritage has been debated [17,75–79]. In addition, the ICOMOS guidance [16] notes that the impact assessment methodology is required to be "fit-for-purpose", i.e., to ensure its applicability to the attributes conveying OUV that might be impacted; moreover, it should be "a clear, transparent and practicable way" [16] (Para 2-1-3 and 2-1-7).

Meanwhile, the HIA ICOMOS guidance [16] (Section 5) proposes a qualitative scaling system for assessing the magnitude of the impacts on the World Heritage properties. It also proposes a matrix method for evaluating the significance of impacts based on the very high value of the WH properties. However, the other applicable impact assessment methods to cultural heritage are indeterminate in this guidance. Moreover, the guidance does not address the applicable methods for identifying and predicting the impacts.

Besides, impact identification and prediction are critical in the HIA practice. The study of the various HIA reports for World Heritage properties revealed that the HIAs have predominantly addressed the visual impacts of the development projects on the World Heritage properties. However, focusing only on particular types of impacts may cause some other potential significant impacts to be overlooked. Consequently, it can impair the efficiency of the assessment and decision-making. Recognizing this methodological and practical gap, this research strives towards the integrated and transparent impact assessment methods in the HIA procedure. Therefore, the following section discusses the need for impact assessment methods as well as the characteristic of various methods which developed in the EIA context.

6.2. Impact Assessment Methods Applicable to HIA

Over the last five decades, both theoretical and practical developments in EIA have provided impressive methodological knowledge for the purpose of impact assessment. The impact identification and analysis methods have improved the objectives of EIA to provide the core information and to predict the further impacts regarding decision-making as well as enhance the sustainable development in the long-term perspective [57] (p. 105). However, the impact prediction has been recognized as the most challenging step of the assessment because "the direct impacts are usually relatively easy to identify, but accurate prediction of indirect and cumulative impacts can be much more problematic" [80].

The observation of scholars on the EIAs over time reveals that despite various systematic impact identification methodologies, "in practice relatively simple methodologies and tools are applied to impact identification" [57] (p. 257). These methods include checklists, matrices, flowcharts and networks, maps, and GIS [6,57,80] as well as quantitative/statistical methods [6,80] and professional judgement [62]. It is noteworthy that the impact identifications methods can be also applied to "other stages of EIA" [6] especially the evaluation of the impacts. Therefore, based on the insights into the impact assessment methods in the EIA, Table 2 summarizes the aforementioned impact assessment methods which are applicable to the cultural World Heritage properties as well as their benefits and drawbacks for HIA. Moreover, some concrete examples are also mentioned to support the ideas.

Primarily, the checklist technique is a simple list of questions and factors [6,80] that defines which characteristics and attributes of the WH properties could be affected. Hence, it could be practical principally in the screening and scoping steps to categorize and identify the potential direct impacts on the attributes of the WH property. For instance, the Ontario Ministry of Tourism and Culture provides a checklist for the screening step to identify whether a project may impact cultural heritage resources [81]. Additionally, this method would be applicable for identifying the attributes conveying the OUV and in the final stage for reviewing the HIA report.

The matrix method mainly is applied not only to identify and predicate the direct and indirect impacts but also to evaluate the significance of the impacts [80]. The matrices are clearly understandable and represent an ample opportunity for focusing on the specific development threats on the WH components as well as including quantitative data exclusively in impacts evaluation. For example, the HIA procedure for the World Heritage property of Masjed-e Jame of Isfahan in Iran introduced an impact identification matrix by focusing on the urban development threats and developed a quantitative ranking matrix for evaluating the significance of the impacts on the WH property [11].

Following this, the flowchart and network models establish the relationship between threats and impacts as well as the primary and secondary impacts [6,57,80]. This is rather more complicated, but it is helpful to identify the cumulative impacts in particular [57]. The research study *"Multi-hazard disaster risk identification for World Cultural Heritage sites in seismic zones"* [82] used the Bowtie risk assessment tool for the identification and evaluation of direct and indirect impacts on the WH properties which can be applicable to HIAs.

Table 2. Standard methods of impact assessment in EIA that are applicable to HIA (Ashrafi, 2021 adapted from [6,57,80]).

EIA Methods Applicable to HIA)	Advantages for HIA	Difficulties and Drawbacks for HIA	Empirical Evidence / HIA Examples
Checklists	- Identifying and categorizing key impacts on attributes of the WH property - Recognizing information gaps such as data requirements and study alternatives - Mainly suitable for screening and scoping steps as well as value assessment and defined the attributes but not the detailed HIA report - Helpful for reviewing the HIA report	- Not generally appropriate for detailed analysis - Do not usually include direct cause–effect links between threats and attributes of the site - Cannot reveal indirect impacts of developments	- Screening for Impacts to Built Heritage and Cultural Heritage Landscapes [81]
Matrices	- Setting cause–effect links between threats, attributes of the site, and associated impacts - Identifying the impacts based on the specific threats and characteristics of the site - Predicting and evaluating significance based on the value of the CH and severity of the impacts - Good method for displaying the HIA result	- Difficult to classify direct and indirect/cumulative effects of developments - No clear indications on the techniques used for impact prediction - The grading system is subjective and open to bias	- Applying Heritage Impact Assessment to Urban Development: World Heritage Property of Masjed-e Jame of Isfahan in Iran [11]
Flowchartsand Networks	- Identifying cause–effect relationships between: Threats Threats and impacts Primary and secondary impacts (direct and indirect) - Helpful for identifying potential impacts of projects with high potential indirect/cumulative impacts on WH assets	- Complexity of networks in determining the outputs - Do not specify the significance of interrelationships between the components	- Multi-hazard Disaster Risk Identification for World Cultural Heritage Sites in Seismic Zones [82]
Maps and GIS	- Providing a common understanding among WH stakeholders via visualization - Easy to understand - Useful for spatial analysis for: - Identifying and comparing between different alternatives of proposed projects - Assessing large scale developments projects	- Do not give a detailed description of potential impacts - Do not address indirect impacts - Need adequate/reliable data (might not be available or can be expensive)	- Cultural Landscape Compatibility Study Upper Middle Rhine Valley—A Pro-Active Tool for Preventive Monitoring of Complex World Heritage Landscapes [83]
Professional judgement	- Based on the know-how knowledge and experience - Involving WH stakeholders and local communities actively through the workshops and interviews	- Reliance on knowledge and data - Expensive - No clear indications on the techniques used for impact prediction	- Study of the Visual Impacts of the Proposed Expansion of the Port of Budva in Montenegro on Cultural Heritage [84]

Maps are easily understandable and reasonably practicable, especially in combination with analytic tools such as 3D modeling and GIS (Geographic Information Systems). These tools can provide various data and information through integrating and analyzing different components, threats, and impacts [6,57,80]. As an example, the GIS and a 3D model were applied for *a Cultural Landscape Compatibility Study for WH site Upper Middle Rhine Valley* to improve the assessment of "the World Heritage compatibility of larger planning and construction projects" [84].

Conclusively, professional judgement or expert opinions are broadly applicable methods to HIAs e.g., *Study of the Visual Impacts of the Proposed Expansion of the Port of Budva in Montenegro on Cultural Heritage*. The impacts have been identified and predicted mainly based on the experts' knowledge and experience as well as collected data [57] through field works, interviews, workshops, historic maps, pictures, and documents. Although the EIA and HIA must be carried out by experts in order to provide the credibility basic principle,

this technique could suffer from a lack of adequate information and limited knowledge of experts.

The integration of the above-mentioned methods which are relevant to the threats and associated impacts on the World Heritage properties could help to provide the necessary information required in different dimensions. For instance, a simple checklist can identify key impacts which could be developed via a matrix to predict the secondary and cumulative impacts in both quantitative and qualitative approaches. Afterwards, the supplied data can be illustrated on the various layers of the maps to indicate different features of both WH attributes and impacts. Eventually, the GIS or matrix could analyze the input data to evaluate the significance of the impacts.

7. Conclusions

The establishment of Heritage Impact Assessment within the EIA framework was a significant step forward regarding the conservation and protection of the cultural World Heritage values in relation to the sustainable development objectives. This paper contributed to the further development of a more transparent and systematic HIA procedure in accordance with EIA. It further emphasized that the impact assessment methods have not been adequately addressed through a systematic methodology in the HIA procedure.

According to the review of the EIA standard impact assessment methods applicable to cultural World Heritage, the paper underscored that a triangulation of multiple methods can establish a basis for identifying and evaluating the multi-dimensional impacts in a more systematic and integrated approach. This also stressed that conducting a comprehensive HIA requires an interdisciplinary professional team to provide broad information and in-depth assessment through various methods in different dimensions related to the threats and receptors of impact. Such a multi-dimensional and interdisciplinary approach can further enhance the decision-making process, and consequently the heritage protection within sustainable development policies. Further research is needed to enhance the impact assessment methodologies that focus on the specific threats that cultural World Heritage properties are exposed to.

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