

Article

Identification of Industrial Heritage and a Theoretical Framework for an Industrial Heritage Inventory System in Pakistan

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Abstract: Heritage studies and historical preservation in Pakistan, which have gained momentum in the past few decades, have been focused primarily on residential, commercial, and religious architecture dating to the British and Mughal eras, leaving aside an important layer of economic and urban history related to the industrialization of major cities. Most industrial buildings are left to decay or are demolished to make space for new development. Based on a literature review of Pakistan's industrial heritage and site surveys conducted in Pakistan between 2019 and 2021, several industrial facilities were identified that have social, cultural, and economic potential for reuse or retooling to address the problem of inadequate public amenities in urban areas. There is, however, no documentation regarding such sites that is available for use by potential stakeholders. An inventory system is proposed to establish an overview of the industrial heritage in Pakistan (types of sites, current properties, spatial characteristics, significance) and to facilitate the recognition and management of these sites. An "industrial site inventory record" (ISIR) form is proposed to record information about industrial buildings and sites. In addition, an "industrial site statement of significance" (ISSOS) is proposed for use in recording the description, heritage value, and important architectural elements of significant industrial buildings and sites. The proposed inventory system is a step toward the recognition of industrial heritage and its potential for adaptive reuse and contribution to urban regeneration.

Keywords: industrial heritage; heritage management; preservation; industrial archaeology; adaptive reuse; heritage inventory



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1. Introduction

Although industrial sites are recognized around the world as cultural heritage assets (the Nizhny Tagil Charter for Industrial Heritage, July 2003; the Dublin Joint ICOMOS–TICCIH Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes, 2011; and the Taipei Declaration for Asian Industrial Heritage, 2012) and their important role in sustainable urban regeneration [1], they are not yet recognized as potential heritage sites in Pakistan. Work has been conducted on heritage sites by organizations such as the National Heritage and Culture (NH&C) division of the Government of Pakistan, the Heritage Foundation of Pakistan, and the Heritage Cell, a research unit of the Department of Architecture and Planning of Nadirshaw Eduljee Dinshaw University of Engineering and technology (HC-DAPNED) in Karachi, Pakistan. The heritage laws and conservation work conducted to date have been related primarily to archaeological sites, such as the remains of the Indus Valley civilization and the Gandharan civilization in Pakistan. In addition to these sites, residential, commercial, religious, and institutional buildings from the Mughal and British eras have been the focus of attention. However, the term "industrial heritage" is still new in the context of Pakistan's heritage [2].

Industrial sites have different heritage values than other types of cultural heritage and are part of the development of the fabric and layers of urban areas. In addition to the fact that industrial heritage has universal value in terms of its impact on human civilization, unique industrial sites have social, architectural, and economic value because of their modern materials, exposed structures, large spans, and urban character. The motivation for protecting industrial heritage is that it is evidence of activities that have changed and are changing our way of life and have important historical consequences. In the history of manufacturing, engineering, construction, and distribution, industrial heritage is of technological and scientific value, as well as having possible architectural, planning, and aesthetic value. Industrial heritage provides a sense of identity by reflecting the life of the ordinary men and women of a society. The fabric, building, machinery, components, and setting in the industrial landscape carry the tangible values of industrial heritage; the written documentation, records, human memories, skills, and customs carry its intangible values [3]. Understanding the heritage value of industrial sites can enhance public and government appreciation, enable the effective interpretation and promotion of such sites and ensure the preservation of heritage values when incorporating new functions into such sites. The term “industrial heritage” is defined as follows:

“Industrial heritage consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted, and used, transport and all its infrastructure, as well as places used for social activities related to industry, such as housing, religious worship or education”. [3]

The industrialization and industrial heritage of Pakistan are related to the country’s colonial past. The industrial revolution in Pakistan and the major industrial sites and infrastructure of heritage value, such as seaports and railway infrastructure, can be connected to the British rule of the Indian subcontinent (see Figure 1). Figure 1 shows a timeline of industrialization in the West and the events on the Indian subcontinent. After the Industrial Revolution, abandoned sites of heritage value in the West were preserved and reintegrated into urban planning, mainly through the concept of adaptive reuse. The 2003 Nizhny Tagil charter, the 2011 Dublin principles for industrial heritage, and organizations such as the International Committee for the Conservation of Industrial Heritage (TICCIH) are working to preserve industrial heritage.

Unlike industrial sites in the Western world, industrial sites in Pakistan are not recognized as heritage sites and are usually ignored by the authorities. They are not currently considered to be potential sites for future city redevelopment, and the political instruments to offer new programs for such sites are limited. The industrial culture of Pakistan has evolved since the country’s creation in 1947. There are three main types of industries: state-led industries, private industries, and public–private partnerships. The industrial culture in Pakistan can be related to the prominent sociologist Bourdieu’s “sociology of practice,” i.e.,:

“a class structure in which individuals in different occupational systems also possess different economic and cultural capital and roughly differentiate between the dominant class (industrialists, executives), the working class (manual laborers, farmers), and the petty bourgeoisie as the overlapping class (small business owners, teachers, and others)”. [4]

The diverse culture of the major cities in Pakistan, such as Karachi, is attributable to industrialization, and even after the closure of some industries, the industrial culture remains there. However, after the closure of an industrial complex, the site is typically abandoned or demolished, which removes an important layer of the industrial culture of the region.

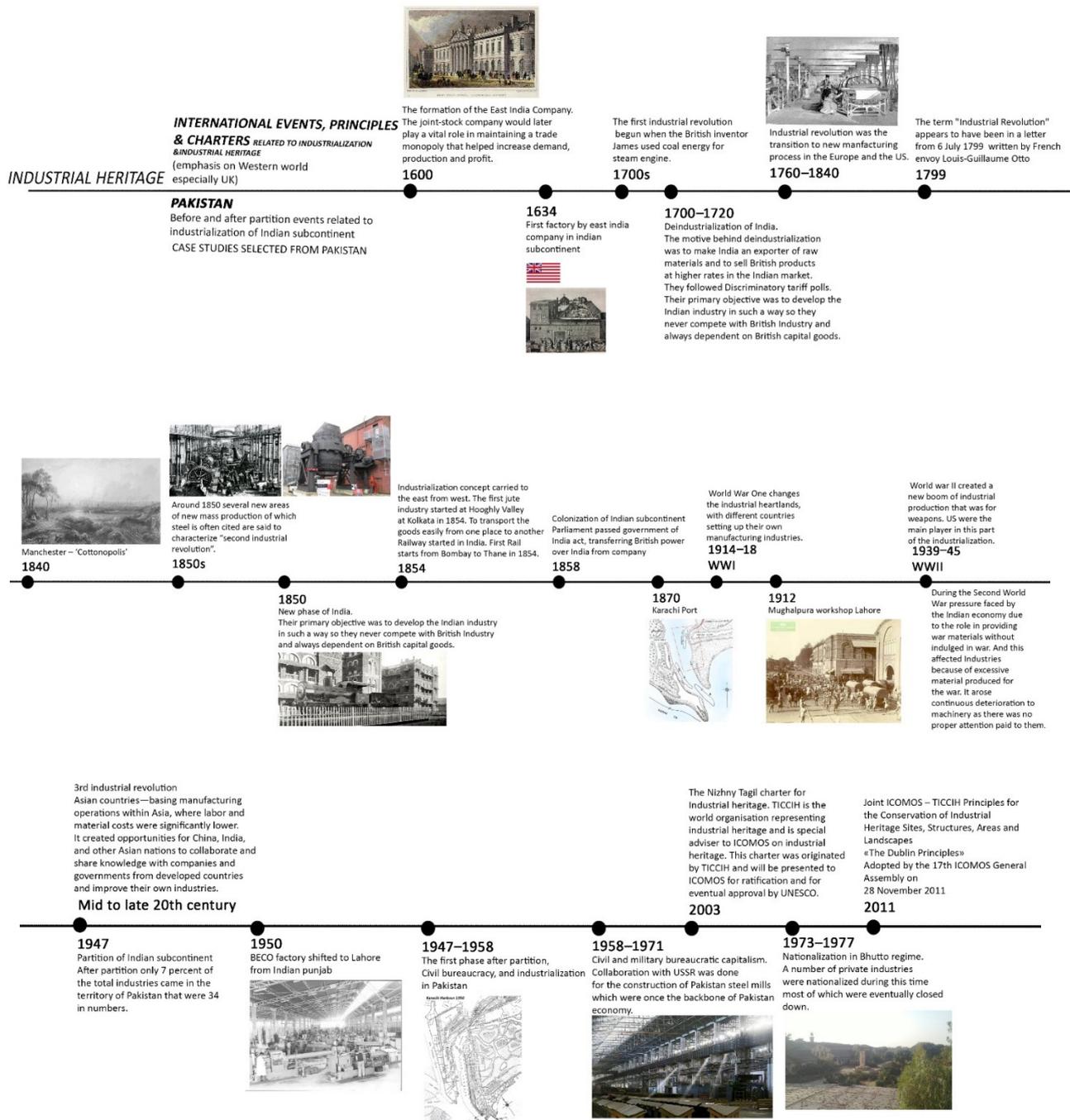


Figure 1. Timeline of industrialization on the Indian subcontinent and international events, compiled by Naveed Iqbal (first author).

The objectives of the study described in this paper were:

1. To identify specific industrial heritage sites, based on the definition provided in the "Nizhny Tagil Charter for the Industrial Heritage" [3].
2. To propose a systematic process for developing an inventory for use in assessing the historical, architectural, and urban regeneration significance of industrial buildings in Pakistan.

Surveys were conducted to assess the heritage value of four sites: the Karachi seaport, Karachi city railway sites, the Mughalpura railway workshop in Lahore, and the PECO engineering factory in Lahore. Based on international and national precedents for heritage

conservation in general, and industrial heritage in particular, criteria and a documentation framework are proposed that can be used to inventory industrial sites in Pakistan. The criteria and framework can be used in future research and by various stakeholders to add new sites and information to the inventory.

Industrial Sites in Pakistan with Significant Heritage Value

After the partition of the Indian subcontinent in 1947, mass migration from India to Pakistan and from Pakistan to India occurred on religious grounds. Some industries also shifted from India to Pakistan and became part of the civil bureaucracy and industrialization of Pakistan, between 1947 and 1958. An example of this is the Batala Engineering Company (BECO), the founder of which, Latif Batala, moved from Indian Punjab to Lahore. The period between 1958 and 1971 was a time of civil and military–bureaucratic capitalism, during which the Pakistani government collaborated with the USSR to construct steel mills in Karachi in the mid-1980s. Steel production became one of the largest industries in Pakistan and eventually became the backbone of Pakistan’s economy. The 1971 separation of eastern and western Pakistan resulted in dramatic changes in the politics of the country. A nationalization policy put forward during the period between 1973 and 1977 brought major private industries under the control of the government of Pakistan [5]. This nationalization policy produced negative results because of mismanagement and the withdrawal of private investment. Many industries suffered losses, and, eventually, some were shut down, including the BECO/PECO factory in Lahore (Figures 2 and 3). The nationalization policy coincided with the founding of Pakistan Steel Mills (PSM) in 1973 by the then-prime minister of Pakistan, Zulfikar Ali Bhutto, in a consortium with the USSR.



Figure 2. Abandoned PECO factory hall in Lahore, image by Haroon Lahore based architect.

The project was completed in 1985 and became the largest industry in Pakistan, consisting of 20 different units [6] (Figures 4 and 5). The privatization of the mill in 2006 produced results contrary to those expected from the process, and the industry lost its way forward because of mismanagement by its private owners. Although the industry returned to government ownership in 2011 and its organizational and production infrastructure were reorganized, the fate of the mills remained unchanged. Eventually, the steel mills were abandoned, and some of the country’s economists declared the industry to be sick.



Figure 3. PECO factory in Lahore, image from google earth, edited by Naveed Iqbal (first author).



Figure 4. Pakistani steel mills iron making department; image from herald.dwan.com (accessed on 2 June 2021).



Figure 5. Soviet built machinery at Pakistani steel mills; image from [herald.dwan.com](https://www.herald.dwan.com) (accessed on 2 June 2021).

Another important site of industrial character and heritage value is Karachi harbor. The seaport has a rich history from social, architectural, urban planning, and economic perspectives. The port was one of the main reasons why the British took control of the city of Karachi. Upon doing so, they immediately started working to establish sea trade routes to and from Karachi. Within a few decades, what had been a small fishermen's village had been converted into a bustling city because of the port, which acted as a catalyst for various trade, manufacturing, and transportation activities [7]. The city of Karachi started growing around the port. City streets and railway tracks leading to the port were constructed. The seaport remained the hub of trade and transport for the city and for Pakistan as a whole. Most of the buildings constructed at the port during the British era are still in use for various purposes, but some have been abandoned.

The port is currently not open to the public because of changes in security protocols put in place after the attacks in New York on 11 September 2001, and the subsequent invasion of Afghanistan by the US. The abandoned buildings have the potential for reuse and reintegration of the port into the community, as the security situation in Pakistan is better now than it was after 9/11. Similarly, the city of Karachi, the cantonment railway station, and the Mughalpura railway workshop (Figures 6 and 7) in the city of Lahore each have a rich history and architecture that are part of the industrial heritage of Pakistan. Figure 8 shows the location of buildings with heritage value at the port site.



Figure 6. Mughalpura railway workshop's coal-fired generator, image by Naveed Iqbal (first author).



Figure 7. Mughalpura railway workshop generator room, image by Naveed Iqbal (first author).

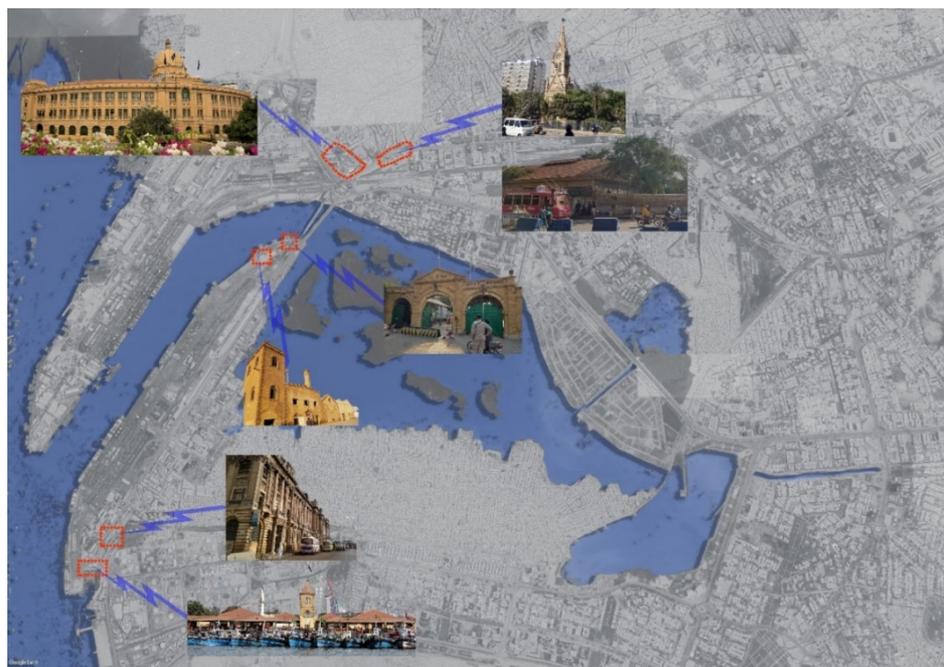


Figure 8. Karachi port map, by Naveed Iqbal (first author).

The industries that were constructed after the partition of the Indian subcontinent also played an important role in the development of the country, including sites such as the Pakistan Steel Mills in Karachi and the BECO/PECO factory in Lahore. Some of the abandoned sites have the potential for sustainable adaptive reuse, to help address the problems of inadequate public amenities, green spaces, affordable housing, educational institutes, and tourism [8].

2. Methodology for Documentation and Industrial Site Inventory in Pakistan

A systematic inventory of heritage sites is important as a precursor to the sites' conservation and management [9]. It is important to have a specific inventory system for industrial sites that have heritage value, to manage and preserve them for the future. To understand the meaning of industrial heritage and to establish a background for an inventory system for industrial sites in Pakistan, we reviewed the international literature [3,4,10,11]. This included the 2003 Nizhny Tagil charter, originated by TICCIH, which is the world organization representing industrial heritage and the special advisor to International Council On Monuments and Sites ICOMOS. The charter was later presented to ICOMOS for ratification and final approval by UNESCO. The Dublin principles (joint ICOMOS-TICCIH principles) for the conservation of industrial heritage sites, structures, areas, and landscapes, adopted by the 17th ICOMOS General Assembly in November 2011, were also reviewed.

The 2003 charter and the Dublin principles provide a definition of industrial heritage, identification of what constitutes industrial heritage, and a brief discussion of how to ensure, protect, conserve, present, and communicate the heritage dimensions of industrial sites, areas, and landscapes. "What is industrial culture, anyway?" is an article that discusses the material aspects, values, identities (from a Bourdieusian perspective), skills, norms, experience, and stories related to industrial culture. The publications *A Handbook on Pakistan's Coastal and Marine Resources and Karachi Port, Golden Gateway to Pakistan* provide a detailed description of the seaport history and its value in the development of Karachi. *RE-USA 20: American Stories of Adaptive Reuse* is a book on successful adaptive reuse projects for industrial sites in the cities of Pittsburgh, New York, and Detroit. The case studies show how adaptive reuse preserves the legacy of the industrial past while playing an important role in the process of urban regeneration [12]. The concept "old is the new new: architecture and the adaptive reuse of the industrial legacy" has been applied to projects such as an

electronics factory, a meat-processing plant, and a railway line (Figure 9) to make existing facilities fit for new functions, with an eye to preserving the spirit of the space at the same time. *Sustainable Lina* is another book on the adaptive reuse concept that touches on the concept of adaptive reuse through the lens of suitability in architecture. The book discusses the adaptive reuse projects of Lina Bo Bardi, an Italian-born Brazilian architect. One of the most notable of such projects was the SESC Pompéia Complex in the working-class district of Pompéia in São Paulo, Brazil [13], in which disused factory buildings were converted into a leisure center (Figure 10).



Figure 9. New York skyline and an elevated rail line converted into a park; image from traveller.com.au, accessed on 10 December 2021.



Figure 10. SESC Pompéia Factory, São Paulo, factory buildings converted into a leisure center; image from arquitetura viva.com, accessed on 10 December 2021.

Based on this review, criteria were developed that can be followed to identify and recognize industrial heritage in Pakistan. The international literature was studied to form an understanding of the process of proposing heritage inventories [9,14–17]. The Canadian documents that were reviewed were useful in understanding the concept of proposing heritage building inventories and giving protected status to them. The inventory system implemented in India was also reviewed, as Pakistan and India share not only cultural and social norms but also historic archaeological sites and architectural monuments. The

national inventory system proposed in the province of Sind in Pakistan [18,19] provided a well-established theoretical basis for the framework proposed in this research.

The main outcome of the literature review was a set of criteria for the recognition of industrial heritage in Pakistan and an initial inventory form that was used during the surveys conducted by the first author in 2019 and again in 2020–2021, to document certain industrial sites in Pakistan. During the documentation and surveys, the first author visited various sites, updating the inventory form as needed for different cities in Pakistan, to identify potential sites that could be part of the inventory.

Along with the site visits and surveys, various archives were reviewed to search for historical maps, photos, and documents concerning the surveyed sites. These archival data sources were very useful in finalizing the industrial heritage inventory. To assess the level of understanding of industrial heritage among professionals and the public in Pakistan, the authors conducted semi-structured, qualitative interviews in the cities of Karachi and Lahore. Before the interviews were conducted, specific sites (such as the Port of Karachi, the Karachi city railway station, the Mughalpura railway workshop in Lahore, and the PECO factory in Lahore) were selected for visits, based on their architecture, history, and role in economic and urban development, to gain a better understanding of the sites prior to discussing them in the interviews. The interviewees included employees and managers at the surveyed sites, along with professors, architects, students, heritage conservationists, industrialists, and members of the public (Table 1).

Table 1. List of interviewees (the interviews were conducted by Naveed Iqbal (first author) during research visits to Pakistan in 2019 and 2020–2021).

No.	Profession	Date of Interview
1	Architect, heritage conservationist, Karachi	29 January 2019
2	Architect, social activist, Karachi	9 January 2019
3	Architect, Professor at NED Karachi University	8 January 2019
4	Architect, Professor at UMT Lahore	-
5	Architect, Professor at COMSATS Lahore	6 February 2019
6	Architect, Professor/Dean SAP UMT Lahore	-
7	Divisional superintendent of the Karachi Railway	8 December 2020
8	Architect, Professor at SUET Karachi	7 January 2019
9	Supervisor, Karachi Port, east wharf	17 January 2020
10	PRD Karachi Port Trust	18 January 2020
11	Former worker at the Port of Karachi	19 January 2020
12	Karachi Railways employee	24 January 2020
13	Port of Karachi chief marketing manager	26 January 2020
14	Karachi Railways employee	26 January 2020
15	Karachi Railways engineer	26 January 2020
16	Architect, president of IOCOMOS Pakistan	3 February 2019

The questions used in the interviews were open-ended and were based on the literature review, conducted for the ongoing Ph.D. research of the first author, and a broader study of heritage inventory systems.

Among the questions asked were the following: What do you think about industrial heritage in Pakistan? Are industrial sites with heritage value recognized as a separate heritage category? Do industrial heritage sites need preservation? What are the heritage values of industrial sites? What do you think about the adaptive reuse of abandoned industrial sites? Does the Antiquities Act of Pakistan cover modern and industrial heritage? Will a separate heritage inventory of industrial sites be useful in Pakistan? These questions were compiled after studying the inventory system proposed by Dr. Anila Naeem in the Sindh province of Pakistan [18,19], as well as the Indian documents [16].

Given that the topic of industrial heritage is new in Pakistan, the semi-structured interviews were intended to allow the interviewees to answer the questions in as broad a fashion as they desired. Most of the interviewees responded that industrial sites are not

usually considered to be heritage sites in Pakistan and that there are no special means to recognize them as special or separate heritage sites, according to the Pakistan Antiquities Act. The interviewees did not consider most of the sites to be architectural masterpieces or of sufficient age to be considered heritage, except for the railway sites in Pakistan. This is probably because the policies, laws, and practices related to heritage in Pakistan are mostly focused on archaeological artifacts and ancient monuments.

3. Industrial Heritage Inventory of Pakistan

3.1. Critical Derivation

The history and development of a community are always linked to its places and buildings and they are valued for that reason. They define the community, exhibit the uniqueness of its past, and contribute to the sense of space. Historic buildings, archaeological sites, industrial landscapes, religious and cultural sites, landscapes, and streetscapes can all be part of the uniqueness and significance of the society.

Pakistan, as a country, was created after the partition of the Indian subcontinent in 1947, when British rule ended. In addition to its historical heritage, one of the forms of immovable heritage that we can preserve for future generations is industrial heritage. The Antiquities Act of 1975 serves in Pakistan as a guiding document for giving protected status to immovable heritage, but it does not emphasize and categorize sites of an industrial nature [2,20,21]. As in the Western world, industrial buildings/sites of value are referred to by a specific term, “industrial heritage,” and are preserved (mostly by adaptive reuse for suitable functions, if abandoned) because of their unique heritage value and architectural, structural, and spatial features. The industrial heritage of Pakistan can be brought to general attention through the development of an industrial heritage inventory.

3.2. Proposed Inventory

Based on the review of national and international literature, insights gained from attending lectures and workshops on industrial heritage, and site surveys and visits to Pakistan, an initial framework for the development of an industrial heritage inventory for Pakistan is proposed as an outcome of this research. This development process is presented in the steps described below.

3.2.1. Step 1: Why and How?

a Vision statement and purpose:

No specific resource can be utilized to its full potential if it is not well understood. Inventories are crucial to understanding heritage and its future utilization potential [9,15]. The purpose of the proposed inventory is to highlight the industrial heritage of Pakistan so that its potential and value in terms of urban regeneration can be utilized in the future. This inventory will contribute to the recognition of industrial heritage in Pakistan. It will be useful as a reference in identifying additional industrial heritage sites in different parts of Pakistan in the future.

An industrial site inventory can be a tool for informed decision-making. It can improve the understanding of a site’s heritage value among the community and government authorities, and it can also help in the following ways:

- Identification and protection of important industrial sites;
- Identification of suitable reuse for abandoned/underused heritage buildings;
- Conservation, management, and reintegration of important industrial sites in the community and in regional planning;
- Underscoring how these sites can best contribute to tourism and urban regeneration.

An industrial heritage inventory can provide historical records; it can be an important reference source and tool for researchers, educators, the authorities, and others who have an interest in industrial heritage and seek to refer to and build upon existing knowledge. Such an inventory can also help owners and designers to adapt structures for new functions,

generating civic pride in the community by stimulating interest in local history and the development of the city.

b Scope of the inventory

The successful establishment of an industrial heritage inventory is highly dependent on the available materials and resources. The aim is to build the inventory step by step, adding properties in the future as opportunities arise and resources allow. Part of the approach is to begin with familiar sites for which historical information and data are already available. Another part of the approach is to start with sites that meet the predefined criteria for heritage in Pakistan, such as industrial sites of a certain age, sites within a certain geographical area, and sites associated with certain functions and events. The sites and buildings that have already been designated as heritage areas provide a reasonable starting point. For example, the case study of the Port of Karachi provides an appropriate starting point, as the site has different types of buildings and infrastructure, and one of the administrative buildings, i.e., the KPT head office, is on the national heritage list.

c Future use and upkeep of the inventory

To ensure the long-term relevance of the inventory, provisions must be made for its management. The addition of new places that are of value and changes to the existing data must be undertaken if the inventory is to remain relevant. Heritage and community organizations, local libraries, and the archives departments of organizations such as the Karachi Port Trust, Railway Pakistan, and Heritage Cell NED can be the custodians of the inventory. Furthermore, the research described in this paper can be continued in collaboration with any of the mentioned or other related organizations.

3.2.2. Step 2: Analysis and Selection of Sites for the Inventory

The process of analysis started with an online survey of possible industrial heritage sites in Pakistan, followed by site surveys in the cities of Karachi, Lahore, Faisalabad, and Swabi to identify places of interest. The site surveys were conducted in January 2018. The survey identified some potential industrial sites, such as the Port of Karachi, the PECO factory in Lahore, the Pakistan steel mills in Karachi, the Karachi railway stations, and the Mughalpura railway workshop, among others. To narrow the selection, state-led heavy industries were targeted as a starting point.

During the second round of site visits, conducted from December 2019 to January 2020, the selection was further narrowed down to a single case study of the Port of Karachi. This port is a complex consisting of several types of structures, including railroads, bridges, ramps, administrative buildings, sea routes, harbors, dockyards, cranes, and a residential building. The site was selected to test the usefulness of the inventory in showing the value and status of industrial heritage in Pakistan.

In addition to the interviews conducted, the surveys included the gathering of pictures and archival data collection from the archives department of the Karachi Port Trust and the Sindh archives in Karachi.

The information recorded during the site surveys included the following:

- The date and name of the recorder;
- The current name of the place;
- The current and original functions of the place and other uses;
- The current and original owners of the site;
- The construction material of the buildings;
- The architectural style of the buildings;
- Any alteration, intervention, or subtraction from the site;
- The current physical condition of the site;
- Observations on current potential and threats;
- Comments on the local surroundings and geographical setting of the site;
- Photos from a variety of angles to show the current state of the buildings in the surroundings.

(a) Evaluation of the data.

The data collected from the surveys were evaluated to determine the heritage values of the sites, investigate the importance of each site, and learn the stories that people relate about the site that need to be preserved and passed on to future generations.

The aspects of an industrial site that can be related to its heritage value include its age and connection to the people of Pakistan, as well as important events in the community's history and city development. Studies of such sites can further our understanding of the past and the development of the city.

Research that can be conducted on candidate sites includes the following:

- Oral history;
- Site analysis;
- Document review;
- Map review;
- Reviews of newspapers and local history books;
- Examination of historical photographs, drawings, and paintings;
- Examination of building plans and architectural drawings.

Data can be collected from archives, libraries, heritage organizations, government ministries, and the Internet.

3.2.3. Step 3: Industrial Site Inventory Record (ISIR)

A detailed inventory of a site can be conducted using the standard "core data index form-CDIF" proposed by Dr. Anila Naeem for the province of Sindh. This form provides information regarding the function, history, physical condition, and architectural merits of buildings. This form also records the ownership details of the buildings as well as the socio-economic data of building owners and users [18]. A review of the heritage documentation and inventory system that is followed in India revealed the importance of mapping the basic physical and functional attributes of buildings and categorizing the important architectural elements of buildings [9,15]. These two inventory systems provided the basis for the proposed "Industrial Site Inventory Form" (Figure 11). Completing this form is the first step in developing an inventory of industrial heritage and will be used during the initial surveys of different sites. This form will be used as a fixed general format to record a building's historic references, usage, construction/style information, ownership, and location within the urban fabric during the surveys. The purpose of the data collected through this form is to guide a detailed study of the site, assess its significance, and determine whether it should be added to the inventory. The form will also serve as a tool to help architects, designers, users, and building owners in maintaining the building in question or in proposing a new function for it. These two inventory systems will also be useful in identifying those characteristics that should be considered criteria for designating a site as industrial heritage.

3.2.4. Step 4: Eligibility Criteria

Criteria are proposed in Table 2 for the selection of sites and for assessing their eligibility to be included under the umbrella of industrial heritage, based on the definition given in the Nizhny Tagil Charter, 2003. The data collected during site surveys were processed according to the existing Pakistan heritage inventory forms so that they could be used with the proposed industrial heritage inventory form.

3.2.5. Other Characteristics That Can Be Considered When Assessing Suitability

In addition to the criteria in Table 3, a study of the guidelines established by the Canadian government for heritage inventories [14,17] and the guidelines proposed in Sindh, Pakistan [18,19] suggest some additional characteristics that should be considered when determining whether to designate a site as industrial heritage in Pakistan. These guidelines include questions such as the following: How well does the site represent a particular

heritage value? Is it the finest or the only remaining site example of its type, in terms of architecture, history, and typology? Does it represent an important era or innovation? Does it possess multiple heritage values? Did it make a significant contribution to the development and historic character of the neighborhood, district, or city? How well are the character-defining elements of the site preserved? Is the integrity of the site preserved? A potential site can have more than one heritage value, but if the site is altered to the degree that it cannot convey its historic value, then its integrity is lost.

INDUSTRIAL SITE INVENTORY RECORD	
Name of the Site _____	Property # _____
Municipality _____	Entry Date _____
Other Name 1 _____	
Other Name 2 _____	
Photos 	
Construction Date _____ Construction date circa _____	
Important Dates _____	
Enlistment No. _____	
Building Type _____	Occupancy _____
Building height _____	Builder _____
Associated People _____	
Associated Events _____	
Ass. Organizations _____	
Architect _____ Materials _____	
Alterations/Codition _____	
Setting _____	
Architectural Features _____	
Present Status _____	
Usage _____	
Owner Name _____ Phone # _____	
Owner Adress _____	

Figure 11. Proposed industrial site inventory form.

Table 2. Criteria based on the 2003 Nizhny Tagil Charter.

Industrial Archaeology	Types		Value
Documents	Processing	Machinery, workshops, mills, factories, sites for processing and refining	Historical
Artifacts	Manufacturing		Technological
Structures	Storage	Warehouses, stores, storage areas (locally known as godowns)	Social
Human settlements	Transportation	Railways, bridges, stations, aqueducts, canals	Architectural
Urban landscape	Infrastructure		Scientific
	Social activities structures	Housing, religious buildings, markets, education	

Table 3. Proposed industrial site statement of significance, based on international precedents.

S.NO.	Canada	India	Proposed for Pakistan
01	Description	Significance	Building and Context
02	Heritage Value	Integrity	Heritage Value and Integrity
03	Character-Defining elements	Context	Important Architectural Elements

3.2.6. Industrial Site Statement of Significance (Industrial Site SOS)

A statement of significance (SOS) is a useful tool for summarizing the results of a historic site evaluation. A statement of significance is a brief description of a place/building that summarizes its value, why it is important, and what are its most important features [21]. The data collected using the industrial site inventory record (ISIR) will be used to develop an industrial site statement of significance. The “Guidelines for Heritage Inventories by the Canadian Government” [14,17] and Indian heritage inventory documents [16] were reviewed in developing a statement of significance form for industrial sites in Pakistan. In both Canada and India, during the heritage site inventory process, a heritage site statement of significance is recorded. In both cases, the SOS addresses three key points that are considered important for understanding the heritage value of a site/building. Based on these points, an industrial site statement of significance is proposed for the industrial heritage inventory in Pakistan (Table 3).

The industrial site SOS is structured in three parts:

(a) The building and its context.

This part briefly describes the building and consists of a picture of the building, along with its context and two to three sentences related to the setting of the site within its surroundings.

(b) Heritage value and integrity.

This part includes a few paragraphs that explain the value of the site to the community. It only needs to focus on the historical facts and events that support the statement of significance.

(c) Important architectural elements.

These are the elements that define and convey the character and heritage value of the building/site. This is a brief explanation of the important components that convey the spirit of the site. To ensure the retention of heritage value, contractors need to be aware of the elements that affect those values when intervening in the site for any purpose.

The “Industrial Sites Statement of Significance (Industrial site SOS)” of Pakistan can guide owners, builders, occupants, government ministries, architects, designers, and anyone else who will be making interventions, alterations, or reusing the site for other purposes. It can also be a useful source of information for promotional and educational purposes. The industrial site SOS can act as a decision-making tool for government officials, heritage management organizations, and other property managers.

3.2.7. Application of the Industrial Heritage Inventory Form

The industrial heritage inventory form was developed by considering the experience of the CTU Prague workshop, the NED University Heritage Cell inventory system, and the guidelines for heritage inventory systems developed by the Saskatchewan Ministry of Tourism, Parks, Culture and Sports, and Canada’s historic places. Figure 12 illustrates the process, while Figure 13 illustrates the use of the inventory form in assessing the significance and information for one of the sites at the Port of Karachi, i.e., the Napier Mole boat-wharf gate at the Port of Karachi. This form can be replicated for potential industrial sites in Pakistan, to identify them and assess their heritage potential as a step toward their preservation, reuse, and inclusion in the heritage list of Pakistan.

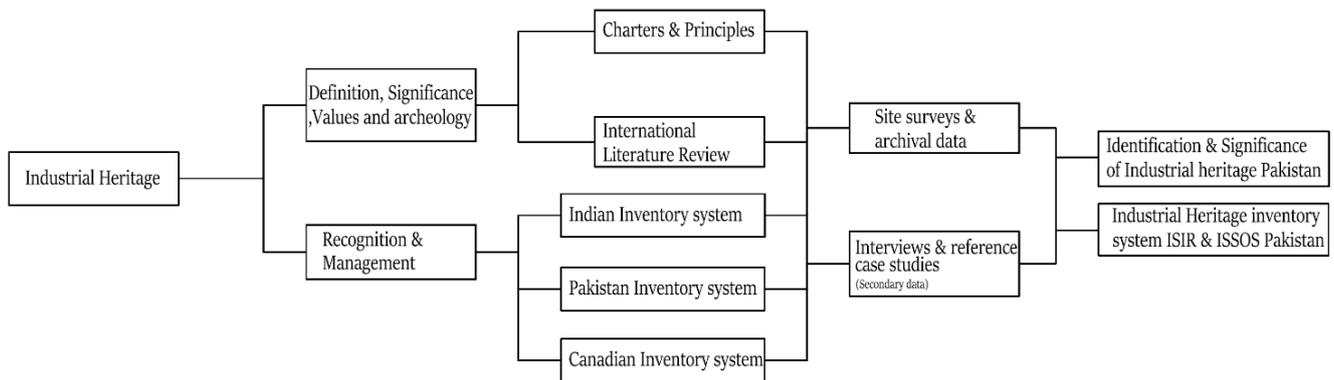


Figure 12. Diagram of the process for the identification of industrial heritage and the derivation of the inventory system; diagram by Naveed Iqbal (first author).

INDUSTRIAL SITE INVENTORY RECORD			
Name of the Site	Napier Mole boat wharf Karachi port	Property #	Nil
Municipality	Kemari	Entry Date	December 2020
Other Name 1	East wharf gate		
Other Name 2	Boat wharf gate		
Photos			
Construction Date	1914	Construction date circa	
Important Dates	1914, 2011		
Enlistment No.			
Building Type	Entrance gate of port	Occupancy	occupied by Port security
Building height	Aproximately 25 feet	Builder	British Empire
Associated People	Napier Mole		
Associated Events	Act as security check point after 9/11 incident in the US		
Ass. Organizations	Karachi Port Trust		
Architect	George Wittet	Materials	Gizri Stone
Alterations/Codition	The gate main structure is in original condition with addition on both sides to accommodate the security personnels and an entry barrier. Steel gates were added afterwards for the new function as security entrance checkpoint.		
Setting			
Architectural Features	Colonial Architecture		
Usage	Security entrance gate	Present Status	In good condition
Owner Name	Karachi Port Trust KPT	Phone #	+92 21 99214530
Owner Adress	Karachi Port- Napier Mole Rd, East Wharf, Karachi, Karachi City, Sindh, Pakistan		

Industrial Sites Statement Of Significance ISSOS	
Building and Context	<p>The structure acts as an entry gate to the east wharf of Karachi port. it is the point from where the territory of port activities starts. Behind the gate you can see the hustle and bustle of the port activities. Behind the gate there is an open space which act as a buffer zone to the rest of the port heavy activities. Behind the gate a little far is the berth 15 & 17A that were once storage but now most of the building is abandoned.</p> <p>The design of gate is in neoclassical architecture style with three arches and a pediment on top of it in the center. The material of construction is local gizri stone with natural yellow shade.</p>
Heritage Value and Integrity	<p>The gate marks a new era of Karachi port development. Its the point from where east wharf starts which was the first and only wharf from where the port developed. It create the sense of space of the port through its monumental design which is standing there for more than 100 years.</p> <p>The people who are working and use to work in the port passes through this gate on daily basis. The labors get there passes from this gate to start and end there work.</p> <p>After the change of security protocol this gate acts as barrier to the public as from this point onwards only the people who works there are allowed.</p>
Character Defining Elements	<p>Arches, Pediment , colour and texture of the gizri stone</p> <p>The three arches and the pediment holds the character of the structure. you can see through the porosity of the structure the scenario of the industrial infrastructure in the background. The pediment completes the symmetry and frame of the structure. The shade of yellow that is the natural texture of the gizri stone (local material) resonate the rest of the architectural style and materiality of that time.</p>

Figure 13. Sample industrial site inventory form-ISIR, for the “Napier Mole boat-wharf, Karachi port”, based on the proposed methodology/process outlined in Section 3.

4. Findings and Discussion

Industrial heritage management is limited in Pakistan and does not identify potential sites for urban regeneration in terms of their value and capacity. Similar to the work in heritage management in Karachi by Dr. Anila Naeem [18,19], this paper focused on the industrial heritage of Pakistan, its management, and its identification by developing criteria for industrial archaeology (Table 4) along with a system for inventorying industrial sites of heritage value.

Table 4. Other potential industrial heritage sites in Pakistan, based on the fieldwork performed by Naveed Iqbal (first author).

No.	Name	Construction Date	City	Location Coordinates
1	Cantonment Railway Station	1864	Karachi	24.843971453221542, 67.0411928471272
2	Pakistan Steel Mills (PSM)	1981	Karachi	24.8123350120352, 67.34213825133841
3	Karachi Port Trust storage areas (locally known as godowns)	-	Karachi	24.84649190727869, 66.99837385263066
4	Mughalpura Railway Workshop	1861	Lahore	31.56398662976902, 74.36476164188643
5	Pakistan Engineering Company (PECO)	1947	Lahore	31.451241225015515, 74.33053041990523
6	Golra Sharif Railway Station	1881	Islamabad	33.67059000501834, 72.9476278330179

Pre- and post-partition industrial sites in Pakistan are an important aspect of Pakistan's development history and have made great contributions to urban development. Industrial sites are currently the focus of efforts at renewal and the urban regeneration of cities and towns, but in Pakistan, the social meaning of industrial heritage and the value of its preservation and adaptive reuse have not as yet been explored. Criteria for its identification and classification have not been developed, and the existing heritage laws and conservation practices are only focused on a specific era and typology of buildings and archaeological sites. The vastness and potential of this typology of heritage can be exploited if put in perspective and researched systematically.

The proposed industrial heritage inventory can be used to identify sites with heritage potential by recording the heritage value, character-defining elements, location, and current condition using the "Industrial site inventory record-(ISIR)" and "Industrial site SOS" forms. These forms can be replicated for different industrial sites. The inventory can guide stakeholders in the reuse of abandoned or underused sites for suitable functions that contribute to the urban regeneration of such areas in cities while preserving the spirit of the sites.

The term "industrial heritage" covers a vast scope, and the management of industrial heritage has the potential to not only ensure the preservation of tangible and intangible heritage but also to play a role in sustainable urban redevelopment and the regeneration of cities. A recent example of such conservation and adaptive reuse can be seen in the cities of Beijing, Shanghai, and Chongqing in China, when certain industries shifted from the centers of the cities to suburban areas. The abandoned buildings were converted into cultural precincts, with various use strategies (progressive, creative class, and entrepreneurial) [22]. Another example is the cotton mills of Mumbai, India, for which a redevelopment plan was put forward by Charles Correa (1930–2015). Although the plan was not entirely successful, the city of Mumbai learned a lesson that led to the area belonging to the Mumbai Port Trust, being managed sensibly by putting public interest above private gain [23].

The management and adaptive reuse of the industrial heritage of Pakistan must begin with its identification, as explained in Lee's book *"Things Don't Really Exist Until You Give Them A Name"* [24]. Although the term "industrial heritage" is widely used in the Western world, it is still a new concept in developing countries such as Pakistan. Introducing the concept in Pakistan can open up a spectrum of possibilities, in terms of sustainable urban development, regeneration, and the revival of important areas in major cities, as this field of heritage consists of huge areas and complexes compared to other residential, religious, and cultural heritage sites.

5. Conclusions

The identification and promotion of industrial heritage can be achieved by locating the potential sites and their characteristics in an inventory system. Along with other heritage management, industrial heritage can play a vital role in city regeneration. These sites can be the lungs and breathing spaces of densely populated cities in Pakistan, such as Karachi and Lahore. Instead of demolition, architects, planners, and heritage conservationists around

the world are reusing, retooling, and sustainably regenerating such sites to ensure their heritage value, while benefiting the surroundings.

The criteria and framework developed in this research can be used as tools for industrial archaeology in Pakistan. They can serve as a starting point for the systematic management of industrial heritage in Pakistan and can be used by different stakeholders to build upon in the future. It must be pointed out that for such a vast and complicated field of heritage, beyond the architectural and urban planning fields, political, social, and economic factors related to the choice of suitable projects, public participation, and the vision of government will play important roles in the sustainable adaptive reuse and preservation of industrial sites in Pakistan. More research and innovation are needed to maintain and upgrade the inventory over time. Promoting the inventory process in the related organizations, such as the Karachi Port Trust (KPT), Pakistan Railways, and local government, then developing online maps and databases, can be the next step in promoting industrial sites digitally in Pakistan. Following the example of the Czech Technical University Faculty of Architecture and Arts in documenting the industrial topography of Prague using Google Maps and GIS software [25], industrial site location data can be linked to texts and pictorial information for each site.

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