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AN ENVIRONMENTAL ASSESSMENT FRAMEWORK FOR IMPACT OF COVID-19 PANDEMIC ON ARCHAEOLOGICAL SITES

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ABSTRACT

Pandemics like COVID-19 can have multifaceted impacts on the archaeological sites, encompassing social, economic and environmental impacts. Researches carried out previously, covered different aspects that positively or negatively impact the archaeological site in segregated way focusing only one-dimensional view to actual problem. Present study was carried out to develop a criterion based interactive and comprehensive framework for evaluation of impacts of COVID-19 on archaeological sites. Findings revealed that impacts of pandemics on archaeological sites are dynamic in nature and depends largely on non-pharmaceutical interventions including travel restriction and closure of archaeological sites taken by the government to control the pandemic. These interventions are not constant; government intervenes in accordance with dynamics of pandemics in the country and at global levels. Thus, to study the impact of COVID-19 on archaeological sites, social, economic and environmental factors should be considered in relation to epidemiological factors and consequent government intervention. Therefore, there is a need to develop context specific indicator against these criteria to evaluate the impact of COVID-19 on archaeological sites.

INTRODUCTION

In the realm of human history of diseases, infectious diseases becoming pandemic are the worst case scenario (Agustina, 2021; Kilbourne, 2008) due to its widespread social, economic and environmental impact for societies. Emergence of pandemic is not a new phenomenon in the history of human

civilization. The pandemics like bubonic plague, small pox, cholera, and Spanish flu had transformed the economies and civilizations in the past (Kilbourne, 2008). Pandemics are central to the history of world and can be traced back through its traces on the sustainability of civilizations, role of expertise, social codes and behavioral norms. The study of archaeological remains of the skeletons document pandemics as old as human being as species (Huremovic, 2019). However, with human civilization, cities have become larger with high population densities and increase commutation for tourism and trade which resulted in spreading infectious diseases at much faster rate as compare to primitive societies (Bostan et al., 2020; Lepan, 2020). With the inception of the 21st Century, epidemics like SARS in 2003, Influenza (H1N1) in 2009, MERS in 2012, Ebola in 2014, Zika virus (2016) and now COVID-19 had impacted many people causing widespread deaths. The remaining population faced high anxiety levels, avoidance behaviors, loss of livelihood and disruption of social life due to measures taken to curtail the spread of epidemic (Bostan et al., 2020).

The current COVID-19 pandemic has marked its anchor point by hitting more than 200 countries and infecting more than 67 million people over the globe. COVID-19, which has now become a pandemic has affected the every walk of life of societies including the way they live and do their businesses (Brammer et al., 2020). The pandemic has not only affected economic activities like mining, banking, manufacturing, jobs, tourism (Brammer et al., 2020; Rutynskyi & Kushniruk, 2020; United Nation, 2020) but also affected social sectors like traveling, gatherings and lifestyle changes (Bostan et al., 2020). Lockdown and restrictions imposed to control the spread of diseases are altering life of people by impacting education, training, businesses, livelihoods, entertainment and recreational activities.

There are evidences that show that COVID-19 has resulted in loss of productivity, reduced labour, business closures, and social distancing and consequent decline in supplies (Bostan et al., 2020). Demand side is also adversely affected by loss of income, unemployment, reduced household consumption, and investments. The pandemic is now impacting national economies due to high financial flows required to prevent and treat the disease, restricted trade and other income generating activities like hospitality and tourism (Bostan et al., 2020). The major concerns arise from the situation of uncertainty regarding duration, magnitude and the impacts of COVID-19.

Among the most affected sectors, the cultural heritage and archaeology are notable. The archaeological and heritage sites are facing physical closure in many countries. Archaeological sites and heritage serves as resource for economic and social development, however, it depends on the demand pose by society (Labadi S., 2017). Stakeholders like local communities, governments, and archaeologist play significant role in promoting and contributing the archaeological and cultural heritage sites to attract the tourists. As a result of non-pharmaceutical intervention to control the pandemic, many heritage and archaeological sites were closed for tourists for varying duration. In some parts of the world, site maintenance work as well as exploration work for newly identified archaeological sites was also halted. The archaeological sites

have witnessed the greatest financial loss during the COVID-19 period. The employees are now working from home though the temporary and freelancers are in the way of unemployment or furloughed. However, beside economic aspects assessing the impact of COVID-19 on heritage sites has many other dimensions too, that should be taken into account. United Nation's report on the sustainable development goals published in 2020 revealed 6% drop in global greenhouse gases but natural disasters frequency will continue to increase (United Nation, 2020). Therefore, there is a need to look into these factors in totality instead of providing one dimensional and linear view to ensure sustainability of this sector.

In this context, present study tried to list down factors that influence the scale and magnitude of impact of pandemic like COVID-19 and develop a comprehensive evaluation framework to assess the impacts of such pandemics on archaeological sites. The purpose of the study was to develop a comprehensive environmental assessment framework based on the epidemiological, social, economic and environmental criteria to evaluate the impacts of COVID-19 on the sustainability of the archaeological sites. The framework will pave the way to develop country specific and site-specific indicators based on these criteria for comprehensive evaluation of impacts.

METHODOLOGY

The study employed a qualitative research approach and completed in two steps. In the first step, extensive literature review was carried out related to the work done and already published in literature on social, economic and environmental factors that influence archaeological and heritage sites to develop a comprehensive environmental assessment framework to study impacts of pandemic on archaeological sites (Elo & Kyngäs, 2008; Iqbal et al., 2020). For the purpose literature published with specific reference to COVID-19 as well as literature published with reference to other pandemics in past was studied and analyzed. The content analysis helped to prepare a list of factors that can adversely or positively impact the archaeological sites.

In the second step, based on the list of factors generated from the content analysis, the environmental assessment evaluation framework was developed through three consecutive consultation sessions with experts' groups. The evaluation framework employed social, economic and environment criteria in relation to characteristics of pandemic. First two sessions helped in providing orientation and developing the understanding of all stakeholders. This was necessary keeping in view the cross-cutting nature of issue under study to decipher the interlocking relationship between social, economic and environmental factors on archaeological sites and the ways these factors can be influenced by the pandemic. For the purpose of developing an evaluation framework and selecting social, economic and environmental criteria, an online mapping exercise was carried out in third consultative session to reach consensus of experts. Based on the online mapping exercise, a framework was developed and presented in the result section of this paper while role of each criterion in the framework was discussed in discussion section.

RESULTS AND DISCUSSION

World heritage contribute to sustainable development. In this context, "The Budapest Declaration, 2002", in 2012 demanded from the "World Heritage Committee" to design policy on the integration of sustainable development into the framework of the World Heritage Convention (Labadi S., 2017). Findings revealed that pandemics like COVID-19 have multifaceted impacts at micro and macro levels which needs to be addressed (Agostino et al., 2020; Bostan et al., 2020; Iqbal et al., 2020). The pandemics like COVID-19, where cause loss of income and stress on societies, also relieve stress on resources due to less industrial and transportation activities (United Nation, 2020). Though COVID-19 is a recent pandemic, first case emerged in November 2019 in China, it became pandemic in only four months period. In March 2020, World Health Organization (WHO) declared COVID-19 as pandemic (Rutynskyi & Kushniruk, 2020). As a result, substantial number of papers appeared in 2020 that describe the biological, clinical and epidemiological details of this disease. Some papers also illustrates the impact of COVID-19 on economy (Gössling et al., 2020), society (Bostan et al., 2020; Brammer et al., 2020) and environmental factors (United Nation, 2020).

In the absence of treatment and non-availability of vaccines, most countries preferred non-pharmaceutical measures to control the spread of infections. These measures include: lockdown (of varied duration and geographical coverage); social distancing; closure of public places like parks, religious places, archaeological and heritage sites; closure of non-essential businesses; ban on gatherings and social events (Gössling et al., 2020). These non-pharmaceutical interventions by the government at sub-national and national scale has consequent imprint for social, economic and environmental construct of an area. These imprints could result in positive or negative change at micro level as well as macro levels. Among other factors tourism related to archaeological sites and its nexus with pandemic and resultant national responses is crucial to understand the overall impact of pandemic on archaeological sites in terms of social, environmental and economic criteria. Findings revealed global flights dropping by more than half after travel restrictions and lockdowns, imposed. Similar trends can be observed on road transport sector within national borders. As a result, global greenhouse emission growth rate dropped and world ecosystems got relief to replenish themselves (United Nation, 2020), posing positive impact for natural systems and heritage sites.

Table 1 lists down the social, economic and environmental variables identified in published literature that impact the archaeological and heritage sites along with characteristics of pandemics that increase or decrease its adversity for communities, economy and environment. The findings describe that assessing impacts of COVID-19 on social and economic impacts is challenging due to its widespread non-linear and cascading impacts that spill over from one area to another area and from one sector to other sectors from micro levels to macro levels (Bostan et al., 2020; Gössling et al., 2020).

Table 1: List of Factors That Mediate the Impact of Pandemics on Archaeological Sites

Title	Reference	Year	Factors identified
Pandemics, tourism and global change: a rapid assessment of COVID-19	(Gössling et al., 2020)	2020	Restricted mobility social distancing restriction on international and local travel
Vulnerability of the Magersari Heritage Settlement Keraton Kasepuhan in Indonesia for Pandemics: The case of Covid-19	(Agustina, 2021)	2021	Loss on tourism-based income Loss of livelihood of local community
Underwater cultural heritage: policy safeguards for shipwreck and implications for Pakistan	(Muhammad et al., 2020)	2020	Treasure hunting of artefacts
Challenges of environmental governance for protection of world cultural and natural heritage Site	(Naseer et al., 2020)	2020	Legal and institutional framework to safeguard archaeological sites Integrating socio-environmental safeguards in heritage governance framework
Preservation of historic heritage in energy dependent Anthropocene: a challenge for climate compatible Development	(Iqbal et al., 2020)	2020	Impact of climate vulnerability, resilience and and increase on GHG flux on historic heritage sites Impact of urban infrastructure development on heritage sites
Spanish Archaeological Museums during Covid-19 (2020): An edu-communicative analysis of their activity on twitter through the Sustainable Development Goals	(Rivero et al., 2020)	2020	Developing virtual tourism opportunity as an opportunity during travel restriction in COVID-19
The Sustainable Development Goals Report, 2020	(United Nation, 2020)	2020	Impact of covid 19 on SDGs Challenges faced by countries for data gathering and reporting in COVID-19 Challenges faced by countries in mobilizing finances for sustainable development
Mapping the susceptibility of UNESCO World Cultural Heritage sites in Europe to ambient (outdoor) air pollution	(Spezzano, 2021)	2021	Corrosion of metal and stones work due to air pollution
Decaying of the marble and limestone Decaying of the marble and limestone	(Frank-Kamenetskaya et al., 2009)	2009	Impact of local urban environment on sulphation process of heritage and monuments made of marble

monuments in the urban environment. Case studies from Saint Petersburg, Russia			and limestone
City scale assessment model for air pollution effect on the cultural heritage	(D. de la Fuente et al., 2011)	2011	Impact of selected air pollutants (SO_2, NO_2, O_3 and PM_{10}) on cultural heritage
Mapping air pollution effect on atmospheric degradation of cultural heritage	(Daniel De la Fuente et al., 2013)	2013	Impact of selected air pollutants (SO_2, NO_2, O_3 and PM_{10}) on cultural heritage
Mapping the corrosion impact of air pollution on the historical peninsula of Istanbul	(Karaca, 2013)	2013	Impact of air quality and seasonal variation on (SO_2, NO_2, O_3) on heritage sites
Mapping recession risk for cultural heritage stone in Mexico City due to dry and wet deposition of urban air pollutants	(Castillo-Miranda et al., 2017)	2017	Impact of acid deposition on heritage sites made of calcareous material
COVID-19, Societalization, and the future of business in society	(Brammer et al., 2020)	2020	Impact of COVID-19 on role of business in society
The impact of quarantine due to COVID-19 pandemic on the tourism industry in Lviv (Ukraine)	(Rutynskyi & Kushniruk, 2020)	2020	Loss of tourism flow and consequent financial losses
Psychiatry of Pandemic	(Huremovic, 2019)	2019	Impact of pandemic on mental health (anxiety)
The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility	(Kramer & Kramer, 2020)	2020	Micro and macro shifts in the work and occupation
Identification and Analysis of Problems in Selected European Historic Gardens during the COVID-19 Pandemic	(Hodor et al., 2021)	2021	Social, economic and environmental factors influencing situation of historic gardens
COVID-19 pandemic impacts on conservation research, management, and public engagement in US national parks	(Miller-Rushing et al., 2021)		Reduced funds availability for research and conservation

At the macro level factors like globalization, information communication, exchange of global data set, transfer of technology and financial resources play a moderating role in reducing the socio-economic impacts at country level. At the micro level, COVID-19 has also affected individual of the society due to practices like social distancing, lock downs, closing down of businesses, restrictions on travelling within and outside countries, tourism (Bakar & Rosbi, 2020; Qiu et al., 2020) and social interaction and

entertainment (Bostan et al., 2020). On one side, fatality and hospitalization cause stress and anxiety in the individuals while on the other hand pandemic induced livelihood losses exacerbate the social conflicts and crime. Travel restrictions at international, regional or national levels had destructive impacts on tourism industry and associated segment of businesses like hotel, café and transport (Gössling et al., 2020). Thus, the situation has not only resulted in loss of livelihood of local communities but also had devastating impacts on revenue generation from tourist visits and consequent reduction in funds available for maintenance. At the same time, sites experienced reduced amount of solid waste generation, reduction in emissions and GHG flux (Hodor et al., 2021). During consultative session, factors identified after thorough literature review were shortlisted to act as criteria in context of impact of pandemic on social, environmental and economic situation of a country and its impact on archaeological sites. For the purpose criteria identified were grouped in five categories (table 2). Citeria 1 addresses epidemiological factors of the disease including spread, magnitude and severity of infection. Criteria 1 is important as governmental and community response to a pandemic depends on these factors. Criteria 2 deals with governance factors, including government response to control the pandemic including travel restrictions, lockdowns, closure of archaeological sites, and related responses. These restrictions then impact the economic factors (Criteria 3) and environmental factors (Criteria 4). Beside these four criteria, fifth criteria illustrate community mindset during a pandemic. Brammer et al., (2020) emphasized the impacts of covid 19 on the communal life. Bakar & Rosbi, (2020) emphasized that pandemics create panic among societies and result in reduced demand for tourism.

Table 2: Criteria for Evaluating Impacts of Pandemic on Archaeological Site

Criteria 1: Epidemiology Geographical coverage of the epidemic Levels of severity (fatality) Rate of infection in a country Modes of infection (air borne, water borne, contact, contaminated surfaces) Level of immunity
Criteria 2: Governance Measures adopted by the government to control the spread of disease • Lockdown • Physical closure of archaeological sites • Travel restriction for foreigners • Travel restriction within country • Permit/license-based tourism (restricted number of tourist) Legal framework in place to protect the archaeological sites Adoption of innovative mechanism to like virtual tours to attract the audience
Criteria 3: Economic Loss of revenue from tourism restrictions Financial resources allocated to maintenance of archaeological sites during and before pandemic Unemployment

Criteria 4: Environmental
Air pollution
Climate change related vulnerabilities to disasters
Fuel consumption at archaeological sites and related tourism
GHG flux
Solid waste generation at the archaeological sites
Criteria 5: Social Factors
Level of anxiety
Level of social cohesion

However, these criteria (table2) operate through an interlocking dynamic mechanism as shown in figure 1. Pandemics do not spread on a constant rate in a community, rather take several booms before it gets lapsed either due to availability of medicine or achieving the herd immunity. However, the severity and scale of the spread could be controlled by effective government policies. Policies are targeted to control the exposure of individuals and adopt intervention based on scientific knowledge regarding mode to transmission of the disease and its severity. These interventions by the government are relaxed or executed in accordance with the cycle of the pandemic.

As the figure 1 show, basically the government response adopted to control pandemic are the factors that contribute on overall impact of social, economic and environmental impact of pandemic on the archaeological site. Therefore, these impacts can vary from one country to another country and from one archaeological site to another archaeological site, against the criteria given in table 2; however, frame of evaluation can be kept constant. Discussions during the consultative meeting construe that criteria given in table 2 should be applied and interpreted in relation to context specific details of the archaeological sites. In the face of this challenge, individuals, organizations and institutions responsible for cultural heritage must evolve from mere custodians of the past to become an integral part of the modern construct for socioeconomic development and environmental management (Arazi, 2011).

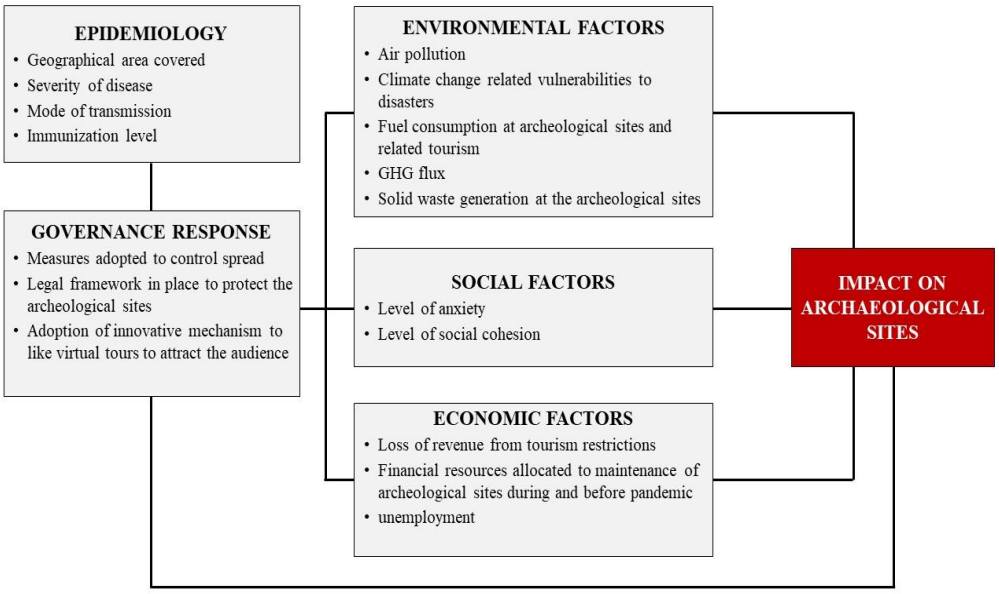

Figure 1: Criteria Based Evaluation Framework For COVID-19 Impact on Archaeological Sites

CONCLUSION

COVID-19 has profound impacts on almost all aspects of economic and social life globally as well as at individual levels. Governments have closed borders, banned mass gatherings, and enforced social distancing, generating a new normal for businesses and individual citizens. However, these impacts are not constant, rather show a dynamic pattern influenced by multiple factors. Among other sectors, archaeological and historic heritage sites are the one, facing severe challenges due to pandemic induced government restrictions and availability of funding for exploration, research and conservation of archaeological assets. At the same time, archaeological sites might face lapse in deterioration induced by tourism activities, climate change and reduced air pollution levels. The interactive and dynamic evaluation framework for environmental assessment provides comprehensive criteria to evaluate the impact of pandemic on archaeological sites. The study also provides a baseline to develop context specific indicators against these criteria to carry out situational analysis.

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