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A review of peer-reviewed published research on corruption and disasters in the built environment

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Abstract

This paper presents the findings of a review of academic literature concerning the degree to which corruption worsens naturally-triggered disasters in the built environment. The research employed a 'systematic literature review' methodology to analyse leading academic databases, resulting in a detailed analysis of 59 peer-reviewed, published papers. It was found that while much of the literature focuses on earthquakes (relating to building and infrastructure collapse), the quality of governance and the drivers of corruption, there is presently limited scholarship concerning the general scope, reach and scale of how disasters are worsened by corruption.

Introduction

It is well known that there is no such thing as a 'natural disaster'. The natural hazard – the earthquake, windstorm or flood – is only half the picture. Disasters occur when the natural hazard meets vulnerability, which in the case of the built environment is largely human made. Decisions which affect vulnerability within the built environment such as where to site a settlement and how to manage it are within the purview of societal choice. So too is the design of the infrastructure and buildings within that settlement and the way that they are built and subsequently maintained.

Vulnerability itself is a complex and contested term. Developments in disaster response and recovery - as well as pre-disaster mitigation and preparedness - have evolved the significance of the social and political dimensions of vulnerability, alongside those of physical (such as site location and construction) and economic factors. The social dimensions of vulnerability include the impacts on people and societies of, among other things, culture, wealth and poverty, access to services such as healthcare, access to employment and discrimination.

The importance of the social dimensions of vulnerability and risk are well recognised, for instance in the Sendai Framework for Disaster Risk Reduction 2015-30 (UNDRR 2015). They are also recognised in many current understandings of the application of the concept of resilience, which often seeks to

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embody a more holistic and people-centred understanding of withstanding, responding to and recovering from disasters (IFRC 2016).

Corruption

A substantial factor influencing vulnerability, risk and resilience is corruption. The World Bank defines corruption as ‘a form of dishonesty or criminal offense undertaken by a person or organization entrusted with a position of authority, to acquire illicit benefit or abuse power for one’s private gain’. The European Commission (2014) defines corruption as any ‘abuse of power for private gain’. Private gain ranges from taking bribes and kickbacks, to currying favour and peddling influence. The European Corruption Observatory Database identifies 40 kinds of corruption problems including clientelism/patronage, cronyism, conflict of interest, blackmail, trafficking, vote-buying, forgery and fraud (Transparency International 2016).

The concept of corruption is complex, nuanced and is often embedded deeply in society. Alexander (2017) notes that corruption ‘is difficult to define, hard to measure and difficult to separate from other issues, such as excessive political influence and economic mismanagement’ (p.1). The investigative journalist Roberto Saviano’s 2006 book ‘Gomorra, Italy’s other mafia’ describes the extensive corrupt practices of the Camorra, ‘an organized crime network with a global reach and large stakes in construction, high fashion, illicit drugs and toxic-waste disposal’. Alexander (2017) further notes that, ‘In essence, corruption subverts public resources for private gain, to the damage of the body politic and people at large. It is often associated with political violence and authoritarianism and is a highly exploitative phenomenon’ (p.1).

Corruption and the built environment

The construction and infrastructure industries (as primary contributors to the built environment) have been consistently labelled the most corruption industry in the world (Kenny 2007; Transparency International 2011). Large amounts of public funding injected into infrastructure and construction projects are frequently syphoned off into private hands, which can be up to 40% in some countries (Kenny and Musatova 2010; Hostetler 2011; KPMG 2012). According to the OECD, half of bribes paid are in industries with the largest spending on infrastructure, namely the extractive (19%), construction (15%) and transportation (15%) sectors (OECD 2014). The Global Infrastructure Anti-Corruption Centre provides many examples of corruption in infrastructure

projects around the world including bribery, extortion, fraud, cartels, abuse of power, embezzlement, and money laundering (GIACC 2020). Other corruption opportunities include the fragmented nature of the construction industry, the difficulties in monitoring complex procurement processes and supply chains, unethical taken-for-granted business practices and the large amounts of money changing hands makes corruption the norm in many countries and easy to cover-up (Le, Shan et al. 2014; Brown and Loosemore 2015; Chan and Owusu 2017).

The effects of corruption in the location, design, construction and maintenance of buildings and infrastructure results in dangerous built environments which kill, maim and make homeless large numbers of people every year. Those living in poor quality buildings and using poor-quality infrastructure are often those more at risk. After all, when disasters occur, it is the building and infrastructure collapses that kills people. For example, in 2017, 228 people were killed during an earthquake in Mexico City due to poorly constructed buildings signed-off by private building inspectors hired and paid by developers, despite strict building codes (Linthicum, Lin II et al. 2017). Corruption also worsens vulnerability by increasing poverty: poorer people are almost always more vulnerable to disaster, often living in the worst conditions and having fewer resources to recover after a disaster strikes. Corruption among other things increases poverty by distorting markets and reducing economic growth. Corruption and poverty are also self-serving: as one analysis concluded, ‘corruption delays and diverts economic growth and deepens poverty. Alternatively, poverty invites corruption as it weakens economic, political and social institutions’ (Negin, Abd Rashid et al. 2010).

Ambraseys and Bilham (2011) drew a direct correlation between corruption, the built environment, poverty and disaster (UNDP 2008), when they calculated that 83% of all deaths from building collapse in earthquakes over the past 30 years occurred in countries that are ‘anomalously corrupt’. The same countries were also among the poorest. As they note, earthquake-resistant construction depends on responsible governance, but its implementation can be undermined by corruption using substandard materials and assembly methods, or through the inappropriate siting of buildings (This paper uses the definition of governance provided by the Oxford English Dictionary, which is ‘the activity of governing a country or controlling a company or an organization; the way in which a country is governed or a company or institution is controlled’).

Post-disaster recovery efforts also present considerable opportunities for corruption, which serve to build/rebuild vulnerability to future disasters. According to Imperiale and Vanclay (2021) a number of factors, including perpetuating ‘business-as-usual’, elite capture and organized crime ‘create

further environmental, social and human rights risks and impacts, exacerbate the social pre-conditions of disaster, create second disasters and a downward spiral of public debt, inequity, and vulnerability to future disasters' (p.2).

For example, the same authors closely studied recovery efforts after the 2009 earthquake that struck L'Aquila, Italy that led an enquiry by the European Parliament which was heavily critical of the misuse of funding. They concluded that 'many legal actions have been taken relating to allegations of fraud, corruption, bribery, inadequate public administration and Mafia infiltration, implicating national and local public officers and building firms' (Imperiale and Vanclay 2020) (p.543).

The focus of this paper

The concepts introduced and discussed above – disasters, vulnerability, corruption and the built environment (in particular construction and infrastructure) – are each and of themselves complex, each with a wide range of causes, drivers and consequences that cut across cultures and societies, as well as traditional academic disciplines.

Recognising the complexities of the issues discussed above, this paper aims to explore the current scholarship concerning the extent to which naturally-triggered disasters are worsened by the effects of corruption. The focus is on pre-disaster corrupt activities. Post-disaster corrupt actions that may worsen the scale of the next disaster, such as in L'Aquila discussed above, are also included. As acknowledged earlier, while a subject such as corruption is broad and complex even when narrowed to disasters in the built environment, this paper focuses on an assessment of the peer-reviewed scholarship at the explicit intersection of these fields. A review of this explicit peer-reviewed body of work and how it has been treated by scholars has important implications for the academic community unrelated to the wider body of literature, grey and non-explicit, surrounding corruption and its relationship to disasters in the built environment.

Methodology

This study employs a review of the extant peer-reviewed literature at the intersection of corruption, disasters and the built environment. The study employed a systematic literature review methodology (SLM) informed by Tranfield, Denyer et al. (2003) and Thorpe, Holt et al. (2005), given its demonstrated value in identifying relevant scholarship for policy makers, practitioners and

managers in understanding a focused subject. While there are multiple source for grey literature at the convergence of these fields, the limitations of this decision to conduct a focused review are acknowledged below.

Following Moustaghfir (2008), a systematic search of three leading databases - PubMed, JSTOR, and Proquest - was undertaken of extant English language research in the fields of corruption, built environment (design, construction, planning) and disasters. The PubMed, JSTOR, and ProQuest databases were used as they were determined to likely hold the highest amount of peer reviewed literature at the convergence of these three topics, allow a reproducible search with advanced search term methodology and remain efficient at returning relevant publications.

To check this, a Google Scholar search was trialed as well. Using a standardized search term approach did not find any papers that were either not already duplicated in our database searches or would have met the inclusion and exclusion criteria. This search engine was abandoned in favor of database searches given their strengths in conducting a reproducible and efficient systematic search over Google Scholar which has a number of limitations (Gusenbauer and Haddaway 2020). While delineating a set number of databases for this paper has its limitations, the databases included allow more effective and efficient searches while still capturing a wealth of peer-reviewed, published literature.

The search was limited to publications from the years 1990 to 2020 to encompass the last 30 years of scholarship. This was determined by the authors to adequately represent the meaningful modern study on the topic and most of the publications.

Importantly, as can be noted in the search terms, either the built environment related terms or the disaster related terms were combined with corruption related terms using a single 'AND' function to keep the search as wide as possible and find any publications that related either the built environment or disasters to corruption. The search was carried out in January 2020 using stem keywords. The list of keywords is provided in the annex.

Initially, 316,956 papers were found using the broad search terms in all fields. Selection then followed multiple stages by using automatic filtering into title searches.

Stage 1: Auto-filtering using advanced search functions:

Stage 1a: Filtered by only peer-reviewed articles left 3,094 publications PubMed (104), JSTOR (922), ProQuest (2068).

Stage 1b: Filtering by search terms occurring in title only reduced the numbers further in JSTOR (40) and ProQuest (30) for a total of 174.

Stage 2: Manual selection applying inclusion and exclusion criteria:

The following inclusion and exclusion criteria were applied by a single author (SP) on the title and abstract or full text as needed and sent to a second author if there was any uncertainty:

- A. Inclusion criteria: 1) original peer-reviewed research, and 2) implicit discussion of corruption, built environment (design, construction, planning) and disaster.
- B. Exclusion criteria: Any publication that refers to corruption in the humanitarian system/relief process.

The most common reason for filtering out was that the publication met exclusion criteria, followed by not meeting inclusion criteria number 2.

Additionally, the references of the selected studies and requested references were searched to find any other papers that may have been missed by the search strategy.

In the final count, 59 papers qualified for full content extraction and analysis.

One author then manually extracted data from each paper onto a form agreed to by all the authors and designed on Google Docs to input, store, organize and display the findings for later analysis by all the authors. The form used the 40 'corruption problems' identified in Transparency International's taxonomy of corruption which was used for the European Corruption Observatory Database (Transparency International 2016). The keywords in the form (which also includes disaster types and other terms) is included in the annex. The following data was extracted from each paper a) title b) year of publication, c) summary (including design and measures used if any), d) countries discussed, e) disasters types, f) forms of corruption discussed, and g) key findings including any specific narrative text or quantitative data.

All of the authors then each independently performed a critical review, as described by Grant and Booth (2009), of the summary findings table generated by the data extraction process. This well-described and often-used review methodology allows the authors to identify any findings, emerging hypothesis and lessons, and propose new lines of inquiry as a platform for future research. Through a series of online meetings (the authors are located in Australia, India and the USA respectively), the authors then sorted through each individual critical review to reconcile and synthesize interpretations of the extant literature for final inclusion in this paper. A PRISMA flow diagram of the data collection and analysis steps can be found in the annex.

Limitations

Arguably the major limitation is the decision to exclude non-peer reviewed literature. The authors readily acknowledge the large contribution in this area of international and national NGOs, thinktanks, governmental and inter-governmental organisations (indeed, all of the authors have collectively worked in this area across a number of decades). The purpose of this paper however is to focus on academic peer-reviewed literature, and to employ a validated systematic search process to critically appraise this specific body of scholarship. A review of non-academic literature also would undoubtedly be of high value, and forms one of our suggestions for future research.

A further limitation could be that the research method employed may be thought to be overly-mechanistic, i.e. that the research approach does not adequately capture the complexities and nuances of the issues under review. We acknowledge that a systematic approach of this nature may miss nuance or subtlety. These subjects are discussed in various scholarship that would not have met these specific search and selection criteria. The intent however is to specifically identify and appraise the academic literature aimed explicitly at the convergence of these fields by academics. We submit that the exercise is a beneficial contribution to research in this area and has yields a number of insights.

This review only considered publications written in English (it is acknowledged for instance that there is a literature on corruption and disasters in Spanish and Portuguese from Latin America). As with the choice of language, there were other limitations to the work. We looked at papers between 1990-2020. In focusing on scholarship, the review chose three leading databases (PubMed, JSTOR and Proquest as noted earlier) in order to capture as much breadth as possible given limitations of

time. More databases could have been searched. However we believe our Google Scholar check, discussed above, validates our approach.

Findings

As noted above, of 3,094 peer-reviewed papers initially found, 59 papers met the criteria for inclusion. Of these, 20 papers were published between the year of 2015 to 2019. Among the 40 'corruption problems' used for the review, terms correlating with 'corruption' were found in the following countries: Australia, Bulgaria, China, Haiti, Indonesia, Iran, Italy, Japan, Liberia, Nigeria, New Zealand, Pakistan, Philippines, Sri Lanka, Thailand, Turkey, USA and Venezuela. Most papers included the term corruption when the authors discussed it with disasters, while bribery and mismanagement of public funds were frequently and specifically discussed in multiple publications. China and Indonesia were the two countries which were discussed most frequently in the literature (88% of the papers). While this does not mean that these are the most corrupt countries (research interest may be especially high and developed for these countries), it does raise some interesting questions about why this is the case. It may be that the construction industries in these countries are particularly corrupt. However, there is a large body of research which suggest this is not the case (Chan and Owusu 2017).

A narrow disaster focus

One third of papers reviewed (34%) focused in particular on earthquakes. Earthquakes studies had the strongest links to the construction sector. In earthquake-related studies, papers suggested that public and private sector corruption was connected to lives lost to disaster impacts which could have been avoided (Anbarci, Escaleras et al. 2005; Escaleras, Anbarci et al. 2007; Ambraseys and Bilham 2011). For example, Ambraseys and Bilham (2011) found that poor construction was exposed during earthquakes, citing examples from Haiti, China, India, Japan, Indonesia, Iran, and New Zealand, which led to lives lost and economic costs. Escaleras, Anbarci et al. (2007) analysed 344 earthquakes occurring between 1975 and 2003 and found that public sector corruption was found to be positively related to earthquake deaths. Corruption was also seen in the compromises made to earthquake preparedness in buildings due to lax, deficient, or absent building codes and laws in low- and middle-income countries, which amplified poor standard of building construction (Crowley and Elliott 2012). In Turkey, several papers discussed how buildings were unsafe prior to the earthquakes (Özerdem and Barakat 2000; Green 2005; Kenny 2012; Gunduz and Önder 2013). For example,

Özerdem and Barakat (2000) found that bribes and political favours were common practice in Turkey to obtain building permissions. These papers about earthquakes in Turkey converge on the idea on how fraud and lack of regulation were institutional failures within the government system.

The inequity of corruption impacts

Most of the publications reviewed suggested that three key drivers that lead to opportunities for corruption are economic development, inequality and poverty, eg. abuse of power (Weinstein, Fletcher et al. 2007; Kharas, Salehi-Isfahani et al. 2009; Lewis 2017), poor governance (Crowley and Elliott 2012; Alamgir, Campbell et al. 2017; Lewis 2017), and government wages (Green 2005; Loh 2005; Gros 2011).

Mochizuki, Mechler et al. (2014) looked at past methodologies, modelling, understandings of economic risk, vulnerability, resilience, adaptive capacity and development as it relates to disasters. The authors found a causal relationship between levels of economic development, quality of institutions (including corruption levels), and disaster impacts. These three drivers, economic development, inequality and poverty, are complex and reflect systemic societal systemic issues from which is difficult to disentangle the degrees of corruption – if any - involved. Nonetheless, the ‘playing out’ of these issues in worsening disasters remains a factor.

In examining the power structures, injustices, corruption and inequalities which remained from Hurricane Katrina in the USA, Voigt and Thornton (2015) reviewed 10 years of media, court cases and public documents related to post-Katrina and disaster-related human rights violations and corruption. Belkhir and Charlemaine (2007) found that Hurricane Katrina heightened the existing social crisis within communities. This social crisis was seen in the race, gender and class inequalities which manifested in disaster management decisions to initially protect property and wealthier regions over lower income areas where the hurricane’s impact was most severely felt. As discussed earlier in relation to L’Aquila, the decisions made in post-disaster recovery undoubtedly contribute to future societal vulnerabilities.

Societal vulnerabilities also related to corruption with human rights violations, and opportunities for local officials to supplement low-paying salaries (Özerdem and Barakat 2000; Özerdem 2006; Smith 2007; Weinstein, Fletcher et al. 2007; Schultz and Søreide 2008; Brown and Brown-Murray 2010; Gros 2011; Alamgir, Campbell et al. 2017). Lewis (2012) examined the long-term vulnerability and

risk of disasters in Turkey, China, Indonesia, and India, and found that impoverishment was an active threat to communities, especially with the changing culture, denial of access of resources, and siphoning of public money. In a follow up paper, Lewis (2017) found that almost half of all deaths due to disasters that occurred in low-income countries from 1996 to 2015 were tied to a country's level of poverty. The authors suggested that poverty was closely connected to commercial mismanagement and corrupt politicians.

Corruption and construction

Owusu, Chan et al. (2019) carried out a review on factors causing corruption in construction and found that 44 causes of corruption can be found in the construction cycle across several countries. Causes included too-close relationships, poor professional ethical standards, negative industrial and working conditions, negative role models and inadequate sanctions throughout the phases of construction. No country's construction industry appears to be immune from corruption. For example, in Indonesia, van Klinken and Aspinall (2010) found the tendering process of construction was especially prone for corruption, despite noting that corruption "is woven into the very fabric of social and political life in the regions" (p.162).

The acceptance of corruption and attitudes towards safe construction also displayed differences by education and income level. The perception of construction practices and corruption were examined in a cross-sectional survey in 12 Latin American and Caribbean countries. Levitt, Gawronski et al. (2019) explored the differences in attitudes toward code enforcement and safer construction practices. The authors found that higher-income respondents placed a greater value on honest construction practices than lower-income respondents. Education was also found to be a strong predictor for a respondent to expect corruption to occur, despite the authors finding that more educated respondents placed lower value on safer construction practices. These findings may highlight the importance of education and knowledge in the acceptance of corrupt practices, but also the inequity of that knowledge and the role that socio-economic status, education and poverty plays in leaving many without a choice but to accept corruption within everyday life.

This review finds that inequity seems apparent at all levels. At the micro-level the beneficiaries of corruption appear to be the wealthy and well-connected, while the brunt of disaster impacts is borne by more vulnerable people, who are usually poorer. Similarly, at a macro-level, wealthier cities can compensate for corruption-induced vulnerability to disasters through more effective and

well-resourced disaster management and response. Specifically, the current literature points to further inquiry towards this inequity and moves this issue beyond simply the realms of accountability, efficiency and governance and places this topic firmly in the social justice arena.

Governance matters

Almost every publication discussed the quality of governance in relation to corruption and disasters. Issues included limited government oversight, incompetence, weak controls, low capacity, limited budgets and weak, if any, preparedness planning, or after disaster, competency in recovery efforts (Schultz and Søreide 2008; Rumi 2010; Ambraseys and Bilham 2011). Concerning governance post-disaster recovery, Jha, Barenstein et al. (2010) note that, 'In countries with "good governance," citizens respect the government because, among other reasons, those in authority manage public resources effectively. Where governance systems are not working effectively and transparency and accountability mechanisms are weak or lacking, corruption in the use of public resources often increases. One of the predictable outcomes under these circumstances is that poor people's needs are marginalized and development outcomes suffer. During disaster recovery, citizens often perceive that public resources are not being managed well and that corruption is rampant' (Jha, Barenstein et al. 2010) (p.285).

Imperiale and Vanclay (2020) identified three 'strategies' relating to activities that may fuel corruption in post-disaster recovery. The first is institutional, eg use of emergency powers and derogations from public procurement. Secondly, financial, eg awarding no-bid contracts and direct assignments. The third is physical planning, risk management and participation strategies, eg relocating new construction in dangerous locations, non-adherence to risk management procedures and a lack of genuine participation with affected communities.

The results also indicate that in countries where democratic institutions are strongly developed, there was a higher quality of government associated with substantially lower numbers of people affected by naturally-triggered disasters (Persson and Povitkina 2017). For example, in an examination of risk financing and disaster mitigation of tsunamis affecting Southeast Asian countries, Loh (2005) found that good governance is the key element for reducing corruption in post-reconstruction countries for the long term. The papers reviewed also discussed the failures

within political context, local institutions and established built environment in communities (Konadu-Agyemang and Shabaya 2005; Rodolfo and Siringan 2006; Smith 2007; Calgaro and Lloyd 2008; Kharas, Salehi-Isfahani et al. 2009; Bamidele, Olaniyan et al. 2015; Porteria 2015).

While these studies clearly identify governance and the quality of governance with disaster impacts, this apparent link requires more in-depth study given the critical role that it plays. For example, while most indices and measures reflect corruption at the national level, one study pointed out that corruption at the local level may be the most impactful at inducing vulnerability to disasters and heightening this impact (Calgaro and Lloyd 2008). In Thailand, Calgaro and Lloyd (2008) found local level corruption concerning tsunami planning regulations and development approvals. Marks (2015) uncovered similar findings from analysing the causes and local government decisions of the 2011 floods in Thailand. These findings match known principles in disaster studies that disaster outcomes are primarily a function of local processes and management. This work similarly suggests that local level corruption is most important in contributing to disaster impacts.

Institutional and cultural factors

Several scholars discussed the institutionalization of corruption within various business and government processes as the cost of doing business, un-resourced public departments and poorly paid officials, along with normalization and public consignment. For example, (Lewis 2012) gave seven examples of realities of long-term vulnerability and risk from disasters, and the impoverishment and access to public funds as the spoils of positions for self-seeking public expenditure were found as a normalizing behavior. The authors argued that changing that culture would allow reallocating existing funds from processes that impede development (ie corruption) to building resilience to disasters. This sentiment was also echoed in (Brown and Brown-Murray 2010), where in discussion about the Haiti earthquake, one of the significant prompted changes was a reason for cultural change around corruption post-disaster. In Australia, Brown and Loosemore (2015) also argued that while formal technical and procedural solutions to corruption in construction are important in addressing the problem they are likely to be undermined by strong cultures and informal institutions which dictate the “rules of the game” on the ground. There is they argue, a clear need to better understand how these informal institutions work to constrain formal rules devised to bring about reform.

In Turkey, Özerdem and Barakat (2000) found that it is common knowledge that some contractors 'economise' on cement and iron bars to increase beyond reasonable profit margin. This common knowledge represents a level of consignment by others to this practice. Bribes and political favors in Turkey to obtain building permission was tied to the paucity of educated, fairly paid civil engineers as inspectors that could be easily influenced. In Istanbul, (Kenny 2012) noted that weak and underfunded engineering and planning departments were a source of corruption through a common practice of adding unaccredited staff and making them prone to bribery and under-resourced to enforce codes.

These practices can have a more direct causal relationship to disaster impacts than the associations of economic activity and poverty identified earlier in the review. They may also lend themselves more readily to more focused experimental research. Further research should add to this nascent work to identify further drivers and understand their relative impact.

In parallel, the review also noted several countering strategies and safeguards against corruption in the scholarship including the role of independent judiciaries and investigative journalism along with community-based monitoring strategies. These were not investigated directly however and only receive anecdotal or passing mention in this literature. As these can counter some of the drivers above, they may be the most readily available areas on which further empirical research studies on interventions can be designed.

Discussion

This paper sought to critically review the existing peer-reviewed academic found in leading databases on corruption and disasters in the built environment. The research uncovered and reviewed in this study was focused on just a few countries. For the most part the literature does not identify the causes of the problem and reflect its broad international scope, especially in more corrupt and disaster-prone countries.

This low level of academic attention to the impact of corruption in driving disaster impacts in the built environment is also mirrored at a policy and practical level. For example, the Sendai Framework for Disaster Risk Reduction fails to mention corruption, as do numerous other high-level reports. Raju and da Costa (2018) argue that this has particular relevance under the Sendai Framework's

Priority Area 4 that refers to 'Build Back Better', where corruption can undermine this process, as noted earlier in the example provided from L'Aquila.

As a further reflection, most of the research found relates to earthquakes, and the role of corrupt practices in construction that led to buildings collapsing. Several papers highlighted corrupt practices in construction, but no studies linked this to impacts on disaster outcomes. This focus on earthquakes is perhaps not a surprise given the visible and visceral outcome of poor construction following such disasters. After the 1999 earthquakes in Turkey, builders were chased down the street; after the Weiguan Jinlong high-rise building collapse in Taiwan in a magnitude 6.4 earthquake in 2016 there was outrage against the builder and those involved, finally leading to the prosecution of the builder.

Research into the impacts of construction corruption in other disaster contexts such as storms and floods is also needed, given the different affects it is likely to have. Floods and landslides can affect settlements placed in poorly located sites, the decisions for whose location may have resulted from corrupt practices of decision-makers which include land deals where substandard land in flood zones is developed for living on. Informal settlements can be especially badly affected, due to vulnerable locations and the low quality of constructed houses and infrastructure. While examples such as this do not offer the same simple and obvious causal pathway as a collapsed building due to poor construction, they are important nonetheless.

The research also emphasises that corruption impacts are unequal. At a micro level, the benefits of corruption may more often be enjoyed by the wealthy, but the consequences are borne by the poor. Well-resourced governments and elites can cover up and compensate for corruption with a more effective disaster response than poorer and lower capacity ones. This is an important social justice issue.

This area of study is still nascent and should garner more attention from researchers. Researching corruption however can place those doing so in danger: investigative journalism into corruption has cost journalists their lives and threatened the lives of others (such as Robert Saviano, referred to earlier in this paper). Concerning building scholarship in this area, which is the focus of this paper, the authors acknowledge that there are difficulties – proving for instance to a degree acceptable for a peer-reviewed journal that earthquake damage was worsened by corrupt practices might take years to achieve, leading to a long timeframe between a catastrophe and such results emerging. Part

of this observation therefore is that grey literature, discussed earlier and intentionally omitted from this paper, may have an additional weight of value placed on it in subsequent research and policy formulation.

Acknowledging therefore these challenges in undertaking any form of research into corruption in construction and especially linking construction corruption to disaster outcomes, our results point to the need for more empirical research in this area and the development of innovative methodologies to gather such evidence. As Tromme (2016) notes there are no single methodologies or datasets that help researchers address the issue of corruption adequately. While many researchers have relied on traditional measurement techniques, often in the form of country-level corruption perception surveys of ordinary citizens, business people or experts (such as the World Bank's Governance Indicators), their cultural and contextual limitations are widely recognised. Survey responses and self-reported instances of corruption can also suffer from recall issues and underreporting, and because there is no single definition of corruption and it takes many forms it cannot be easily measured within one single instrument. Corruption is also by nature invisible, informal, under-the-surface and secretive and often cannot easily be observed and measured directly.

To conclude, researching corruption's role in worsening disasters presents all kinds of research challenges – attribution, veracity, degrees of certainty, etc. It also calls for multidisciplinary research that cuts across a wide-range of research interests. This complicates things further. And, exploring corruption throws up all manner of ethical, legal and personal security-related issues. These may all serve as reasons why peer-reviewed, academic research in this area appears to be so low, relative to its scale of impact. Yet, this is no reason not to push further and to devise approaches and strands of research that ultimately contribute to a wider public understanding that disasters are not indeed natural, but that disasters could in the future be considered as crime scenes as much as they are naturally-triggered.

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Annexes

Keywords used in database searchers

For PubMed: (*"Construction Industry"[Mesh] OR "Financing, Construction"[Mesh] OR "Construction Materials"[Mesh] OR "Construction"[All Fields] OR "infrastructure" [All Fields] OR "Built Environment"[Mesh] OR "Built Environment"[All Fields] OR "disasters"[MeSH Terms] OR "disasters"[All Fields] OR "disaster"[All Fields] OR humanitarian[All Fields] OR ("Crisis"[Journal] OR "crisis"[All Fields]) OR "humanitarian"[All Fields] OR ("emergencies"[MeSH Terms] OR "emergencies"[All Fields] OR "emergency"[All Fields]) OR crises[All Fields] OR ("earthquakes"[MeSH Terms] OR "earthquakes"[All Fields] OR "earthquake"[All Fields]) OR ("floods"[MeSH Terms] OR "floods"[All Fields] OR "flood"[All Fields]) OR storm[All Fields] OR ("tsunamis"[MeSH Terms] OR "tsunamis"[All Fields] OR "tsunami"[All Fields]) OR ("cyclonic storms"[MeSH Terms] OR ("cyclonic"[All Fields] OR "storms"[All Fields]) OR "cyclonic storms"[All Fields] OR "cyclone"[All Fields]) OR ("cyclonic storms"[MeSH Terms] OR ("cyclonic"[All Fields] OR "storms"[All Fields]) OR "cyclonic storms"[All Fields] OR "hurricane"[All Fields]) OR ("cyclonic storms"[MeSH Terms] OR ("cyclonic"[All Fields] OR "storms"[All Fields]) OR "cyclonic storms"[All Fields] OR "typhoon"[All Fields]) AND ("corruption"[All Fields] OR "corrupt"[All Fields] OR "bribe"[All Fields] OR "bribes"[All Fields] OR "cronyism"[All Fields] OR "nepotism"[All Fields] OR "embezzle"[All fields] OR "embezzlement"[All Fields])*)

For JSTOR: (*construction OR infrastructure OR disaster OR humanitarian emergency OR crisis OR earthquake OR flood OR storm OR tsunami OR cyclone OR hurricane OR typhoon*) AND (*corrupt OR bribe OR cronyism OR nepotism OR graft OR embezzle*)

For Proquest: (*disaster OR humanitarian crisis OR humanitarian emergency OR crisis OR crises OR earthquake OR flood OR storm OR tsunami OR cyclone OR hurricane OR typhoon*) AND (*corruption OR corrupt OR bribe OR cronyism OR nepotism OR graft OR embezzle*).

Extraction form terms

1. Author
2. Journal/ Publisher
3. Publication Year
4. Countries discussed?
5. Disasters discussed?

Earthquake

Flood

Humanitarian crisis

Hurricane

Storm

Tsunami

Typhoon

Other...

6. Corruption label

Abuse of power

Blackmail

Bribery

Clientelism/Patronage

Conflict of Interest

Corruption

Cronyism

Election Fraud

Embezzlement

Facilitating Tax Evasion

Facilitation Payment

Favouritism

Forgery

Fraud

Fraud/False Accounting

Gift Giving

Illegal Lobbying

- Inefficiency/Red Tape
- Kickback
- Lack of Transparency
- Mismanagement of Public Funds
- Misuse of Insider information
- Misuse of Public Position
- Money laundering
- Nepotism
- Peddling influence
- Revolving Door
- Sexual Favours
- Tax Evasion
- Tax Fraud
- Theft
- Trafficking
- Trafficking of Influence
- Vote-buying
- Welfare Fraud
- Whistleblower Retaliation
- Whistleblowing
- Withholding of Public Information
- 7. Summary
- 8. Key Takeaways
- 9. Notes
- 10. Formatted APA reference

PRISMA flow diagram of the data collection and analysis steps

