

Modern slavery, environmental degradation and climate change: Fisheries, field, forests and factories

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Abstract

In this commentary paper, the current state of research on the tightly connected and bi-directional relationships among modern slavery, environmental degradation and climate change is critically assessed and reviewed. An emerging branch of research has begun to conceptualize linkages between slavery and environmental change. Responding to a gap in the extant literature, this paper synthesizes and makes sense of this emerging research base and proposes a future research agenda for exploring the slavery–environment nexus. Through an exploration of 19 key texts which explicitly examine the relationship between slavery and environmental change, spanning across diverse disciplines and spatial scales, we draw out two key arguments that can be adopted in proposing a future research agenda. Firstly, we identify the sectoral emergence of the nexus,

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forming primarily around four key sectors: (i) *Fisheries*, (ii) *Fields*, (iii) *Forests* and (iv) *Factories*. The review suggests that a sufficient exploration of slavery–environment linkages needs to transverse these sectoral boundaries. Secondly, the paper highlights the bi-directional interactions among modern slavery, climate change and environmental degradation. Accordingly, we argue for a holistic lens which explores how slavery practices and environmental change are continually shaping one another. Existing research has provided initial understandings of the relationship among modern slavery, environmental destruction and climate change. However, there remains considerable scope for the connections between the three to be further interrogated and unpacked. Based on the review, the paper sets out three key research agendas, highlighting the need to move beyond a spatially and sectorally confined exploration of slavery–environment interactions towards an integrated and sophisticated interrogation of the nexus. Additionally, we propose the future examination of the deep underlying drivers of slavery–environment interactions and to situate these within contemporary capitalist social and economic relations.

Keywords

Climate change, climate-induced migration, environmental degradation, modern slavery, labour exploitation

Introduction

Research and policy interest in the issue of modern slavery has become increasingly prominent over the past two decades. Notably, Bales (2012, 2016) has driven the emergence of research on contemporary slavery since the late 1990s. Modern slavery is understood through the idea of ‘control’, both physical and psychological (Bales, 2012, 2016). Notably, the Bellagio-Harvard Guidelines (2012: 2) define modern slavery as ‘constituting control over a person in such a way as to significantly deprive that person of his or her individual liberty, with the intent of exploitation through the use, management, purchase, sale, profit, transfer or disposal of that person’. Central to understandings of modern slavery are loss of free will, immobility, the use of violence (or the threat of violence) and economic exploitation, emerging primarily through debt-bondage and ‘contract slavery’ in hazardous manual labour (Allain and Bales, 2012; ILO, 2017). Research has increasingly sought to uncover the causes of this form of extreme labour exploitation (Brace and O’Connell Davidson, 2018).

Current estimates from the Global Slavery Index (2016) suggest that approximately 40.3 million people are trapped in some form of modern slavery. The distribution of modern slavery practices is uneven with the highest prevalence reported in South and Central Asia and Sub-Saharan Africa. There has emerged a broad commitment to end slavery practices in the international policy community, notably through Sustainable Development Goal (SDG) 8.7, to

Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025 end child labor in all its forms. (UNDP, 2018)

In exploring its drivers, a flourishing body of work has highlighted the ways in which contemporary capitalism forges and strengthens forms of modern slavery, most prominently

debt-bondage (LeBaron, 2014; Lewis and Waite, 2015; McGrath and Watson, 2018; Strauss, 2012; Strauss and McGrath, 2017). Yet, within this emerging scholarship, there remains little attention to how extreme labour exploitation is entangled with the most profound global challenges that we face: anthropogenic climate change and multiple environmental crises, ranging from tropical deforestation to air pollution. Despite having been well discussed separately in scholarly and policy debates, an emerging branch of research has only recently begun to interrogate the interactions between slavery practices and forms of environmental degradation. This commentary seeks to begin to address this lacunae, through synthesizing, reviewing and critically assessing the current state of emerging research on the slavery–environment nexus and, subsequently, suggesting a future research agenda for exploration of the topic. In doing so, we seek to respond to a number of research questions:

1. To what degree has environmental change been studied as a driver of, or impacted by, slavery activities?
2. What are the trends and gaps in research which has investigated slavery–environment interactions?
3. How should future examinations of slavery–environment interactions be directed?

Scope and methods

This desk-based review covers both academic literature and grey literature (e.g. NGO and inter-governmental agency reports, media investigations). Comprehensive and systematic literature searches were conducted on multiple academic search engines (e.g. Scopus, Science Direct) using keywords that were relevant to the three stands of the nexus and that made linkages between these, e.g. ‘climate change and debt bondage’, ‘brick kilns and child labour’. Additionally, grey literature was accessed through searches carried out in databases of relevant, renowned sources, e.g. *Anti-Slavery International*, *Friends of the Earth*, *Amnesty International*. The texts were sifted through and selected based on their relevance to the review. Additionally, literature was accessed through citations in the selected texts.

In advocating the need for a new research agenda around how modern slavery is inter-related to environmental change, this review explores 19 key texts that identify explicit links between these two phenomena, spanning diverse disciplines from environmental science to human geography, spatial scales and sectors of the economy. We identified the sectoral emergence of the nexus and in relation to geographically specific locations, with only 2 of the 19 papers not having a sectoral or geographic focus of some kind. Primarily, the following sectors were dominant in reviewing the extant research on slavery–environment interactions: ‘fisheries’, ‘field’, ‘forests’ and ‘factories’.

The review incorporates research that has both explicitly examined and implicitly touched upon the relationship between modern slavery, environmental degradation and climate change. These papers are not seen to represent all existing scholarship on slavery–environment linkages. For example, literature on agrarian change has long highlighted how climate change and its impacts on rural production drives the increase of labour exploitation (Byres, 1999; Lerche, 2011). However, these papers do represent novel attempts to think through the different ways in which the environment and modern slavery are interrelated. Rather than evaluating the quality, credibility and success of the existing research on the slavery–environment nexus, this review aims to offer insight into existing trends and gaps in the literature and to highlight potential future research directions. Other papers are also

included in this commentary to provide wider (social, economic or environmental) context for the slavery–environment interactions.

This paper is structured as follows. Firstly, there is a critical assessment and evaluation of the trends and gaps in examinations of slavery–environment interactions in the identified papers. In line with the findings of the review, this section is organized by four key sectors: (i) *Fisheries* (ii) *Fields* (iii) *Forests* and (iv) *Factories*. Secondly, there is a discussion of the overall state of research on the slavery–environment nexus. Drawn from the review, three research agendas are proposed for future examinations of the linkages between modern slavery, climate change and environmental degradation. Finally, conclusions are drawn on the overall contributions made by the paper.

Sectoral findings

Fisheries

Driven by unsustainable and intensified production practices, there is a global trend towards ecosystem decline in fisheries and reduction in fish stocks (e.g. the FAO estimates over 31% of global fish stocks to be unsustainably caught) (Clark et al., 2018; FAO, 2016). Climate change is predicted to further exacerbate pressures on fish stocks, as well as reducing the biodiversity of marine life, primarily through ocean acidification and increased prevalence and severity of storms (Couper et al., 2015). Aquaculture or ‘fish farming’ has grown rapidly in recent years in response to declining wild fish stocks and now produces up to half of all seafood globally; however, it relies heavily on fishmeal, particularly for those species higher in the aquatic food web (e.g. salmon) (Clark et al., 2018; Couper et al., 2015).

The Environmental Justice Foundation (EJF) (2015) has highlighted the increasing economic pressures that are being exerted on fisheries in response to fish stock decline, with fishing vessels forced to extend their operations, both geographically and temporally, for ‘ever diminishing returns’ of fish catches. Research has begun to make connections between these economic pressures and the increasing prevalence of slave labour in the fishing sector (EJF, 2015; Marschke and Vandergeest, 2016; Sylwester, 2014). Thus far, literature on the nexus in this sector has been dominated by examinations of the complex connections between overfishing, illegal fishing practices and debt-bonded labour in the context of Thai fisheries. Fishing operations in Thailand are today catching 14% of what they were in the mid-1960s (EJF, 2015). Based on first-hand evidence, the EJF (2015) found that economic pressures are fuelling the use of debt-bonded labour in the Thai fishing industry.

It has been identified that many of the workers exploited and coerced in the Thai fishing industry are migrants from neighbouring countries, primarily Cambodia and Myanmar, who have been recruited by middlemen under false pretences and through fraudulent contracts (Chantavanich et al., 2016; EJF, 2015; Human Rights Watch, 2018; Marschke and Vandergeest, 2016). As has been well documented, migrant workers in Thailand are particularly vulnerable to abusive labour conditions (ILO, 2017; Lewis et al., 2017). Indeed, it is detailed by Couper et al. (2015) how young men from rural Cambodia often arrive in the Thai fishing sector through dangerous, exploitative and informal migratory channels.

Slave labour has emerged in Thai fisheries primarily in the form of debt-bondage. Here, the workers incur an initial debt, tied to recruitment fees or travel and documentation costs, which is strategically maintained by fishing vessel operatives through false accounting and extortionate levels of interest (Couper et al., 2015; Derks, 2010; ILO, 2018). In order to pay off the debt, costs are taken from the workers’ earnings and often the workers cannot leave the job until the debt has been cleared. Accordingly, the labourers become locked into debt

bondage and may be forced to work on the fishing vessels for an undetermined length of time, effectively rendering them 'immobile' in Thailand (EJF, 2015). Multiple recent studies have also evidenced the abusive, violent and exploitative conditions on Thai fishing vessels, including 20 hour working days, physical abuse, coercion and the confiscation of documentation (Chantavanich, et al., 2016; Human Rights Watch, 2018; Miller, 2017; Sylwester, 2014).

The EJF (2015) highlights the strong links between ecosystem decline, debt-bonded labour and pirate fishing, whereby the majority of fishing vessels that make use of exploitative labour practices in Thailand are illegal operations. Illegal fishing vessels depend on cheap and debt-bonded labour in order to survive, masking the actual economic costs of ecosystem decline and of months-long, long-haul fishing operations (EJF, 2015; Lewis et al., 2017). Accordingly, the entanglement of illegal fishing and labour exploitation in Thailand acts to further perpetuate the decline of fish stocks and ecosystem collapse in the region. Illegal, overfishing practices occur in the context of a Thai economy that depends heavily on seafood exporting and growing international demand for cheap seafood produce (Hodal et al., 2014; Marschke and Vandergeest, 2016; Miller, 2017).

Similar linkages between exploitative labour practices and environmental destruction have also been located in the Sundarbans Reserve Forest (SRF) of Bangladesh. Despite being granted UNESCO protected status since 1997, due to its diverse and unique flora and fauna, and it being prohibited to undertake clearing of the mangrove forests, illegal deforestation has persisted in the area, primarily to serve the interests of fish-processing camps (ILO, 2017; Rahman et al., 2010). Forced and debt-bonded labour has been documented in fish-processing camps, shrimp factories and shrimp farms in the Bangladeshi Sundarbans, notably on the remote island of Dublar Char (Bales, 2016; Jensen, 2013). Enslaved children are being forced to work long hours in hazardous conditions in illegal operations to catch, clean, process and dry fish and shrimp, which are sold onto local and international seafood markets. The children are either kidnapped and taken to work on the fish camps, lured through false promises of paid work, or work to help their family pay off debts to local moneylenders. The slave labour in the fish camps is seasonal, with much of the forced labour shifting to proximal processing warehouses or ports during the off-season (Jensen, 2013).

Accordingly, slave labour in illegal fish-processing camps in the SRF is entangled with the clearing of the mangrove forests, which, given the importance of the Sundarbans, has significant local and global social-ecological implications. The destruction of the mangroves impacts on key ecosystem services (e.g. food production, forest products), and renders the local population living behind the Sundarbans more vulnerable to the frequent storm surges and cyclones in the area, likely to be accentuated by climate change (Ghosh et al., 2015; Gillis et al., 2017). Deforestation in the SRF also poses a threat to a large variety of unique flora and fauna, including the endangered Bengali tiger. Additionally, the forest-clearing associated with the fish camps is likely to restrict local livelihoods, which may exacerbate the population's existing vulnerabilities and ultimately increase their susceptibility to enslavement (Bales, 2016).

On a global level, the Sundarbans act as an important carbon sink (Ghosh et al., 2015; Gillis et al., 2017; Rahman et al., 2015). Given that mangrove forests store as much as four times more carbon than other types of forest, the Sundarbans are key contributors to regulating the Earth's climate. Accordingly, the clearing of the mangrove forests in the SRF associated with the fish-processing camps significantly reduces space for carbon sequestration and exacerbates the threat posed by climate change, notably the sea level rise that is predicted to particularly impact upon Bangladesh (Bales, 2016).

Future research needs. Existing research has begun to identify significant linkages between over-fishing, debt-bonded labour and illegal fishing practices in the context of Thailand. The complex and bi-directional relationship between environmental degradation and exploitative labour practices in the Thai fishing sector intersects with a range of other social, political and economic challenges (e.g. pirate/illegal fishing, corruption, migrants' rights issues), as well as a domestic economy that depends on a thriving seafood export industry. Elsewhere, the enslavement of children in fish-processing camps in the Bangladeshi Sundarbans is similarly driven by international demand for cheap seafood, with local and global social-ecological implications.

Emerging research from Thailand and the Bangladeshi Sundarbans has begun to provide an evidence base for the complex and potentially cyclical relationship between environmental degradation, climate change and labour exploitation in the fishing sector. However, there remains limited empirical research into the nexus emerging in fisheries outside of these contexts. Accordingly, it can be suggested that there is a need to scale-up existing examinations of the nexus to fisheries in other contexts and to consider the commonalities and distinctions across and between geographies.

Fields

A growing body of literature has explored the human trafficking–natural disaster nexus in the 'field'¹ sector (Gerrard, 2016; IOM, 2016; Jaspardo and Taylor, 2008). Here, it is suggested that following natural disasters and environmental shocks, the compounded vulnerabilities of farming communities mean that they are more likely to use informal, dangerous or risky migratory channels and are more susceptible to being exploited by criminal traffickers. Given their dependence upon natural resources, the livelihoods of agrarian communities are particularly sensitive to climate variability and environmental shocks (Molinari, 2017; ODI, 2017). As with conflicts or other crises, natural disasters exacerbate victims' existing vulnerabilities (IOM, 2015, 2016).

Current research proposes that the impacts of climate change will amplify existing pressures on the most vulnerable sections of agrarian communities to migrate to domestic urban centres or neighbouring countries (Bylander, 2015; Oudry et al., 2016; Poncelet et al., 2010). Empirical findings have demonstrated increases in occurrences of human trafficking following natural disasters, notably in the aftermaths of the Indonesian tsunami, the typhoon Haiyan in the Philippines and Bangladeshi cyclones (Bowersox, 2018; IOM, 2015; Jaspardo and Taylor, 2008). The use of informal and dangerous trafficking networks is likely to rise as the impacts of climate change become clearer, agrarian populations become increasingly desperate and nations in the Global North begin to increasingly fortify borders and limit inward migration (Molinari, 2017).

Research from Cambodia has highlighted the climate-induced vulnerabilities of farming communities (Bylander, 2015; Oudry et al., 2016; Touch et al., 2016). Due to a number of factors, the country is indicated to be one of those most vulnerable to the impacts of climate change (Oudry et al., 2016; Touch et al., 2016). In recent years, shifting rainfall patterns, increased unpredictability of floods and droughts and a rising number of short-term environmental shocks have been recorded in Cambodia. Climate change adaptation strategies are financially and materially intensive and, accordingly, some agrarian communities in Cambodia have been forced to migrate elsewhere in search of alternative income sources (Bylander, 2015; Diepart, 2015; Oudry et al., 2016).

For marginalized rural populations, migration through informal and risky channels may be the only option, in which they are vulnerable to trafficking and exploitative labour

practices (IOM, 2016; Molinari, 2017). Notably, migration from Cambodia to Thailand has increased in recent years, driven, at least partially, by climate-induced exacerbated environmental stressors in the region. As outlined in the previous section, it is this group of migrants that are being coerced, through illegal and unsafe migratory channels, to work on Thai fishing vessels under debt-bonded and abusive labour conditions.

There is also limited research that has examined the risks of exploitative labour practices for vulnerable agrarian communities that do not migrate and remain in rural areas. There is evidence of exploitative labour practices emerging in India, in response to exacerbated social–ecological pressures in marginalized rural communities, partly driven by the impacts of climate change. Notably, Taylor (2013) highlighted the complex interactions between climate-induced exacerbated water stress and debt-bondage that have emerged in Andhra Pradesh in India. Elsewhere, research has indicated the use of child labour in Sub-Saharan Africa as a financial coping mechanism for agrarian communities that are dealing with ‘climate shocks’ or climate-induced events (Boutin, 2014; Guarcello et al., 2008). However, the evidence for the relationship between child labour and environmental shocks remains currently limited.

Future research needs. The extant literature on the slavery–environment nexus in the ‘field’ sector has highlighted linkages between climate-induced migration, vulnerable rural populations and susceptibility to human trafficking and exploitative labour practices in the Global South. The vulnerabilities and insecurities of agrarian communities are seen to be compounded by natural disasters and environmental shocks, as well as the more long-term, slow-onset impacts of climate change. Notably, emerging research has interrogated a human trafficking–natural disaster nexus.

However, the abusive and exploitative labour practices that may be bound up with the trafficking that follows environmental shocks in climate-vulnerable regions has thus far been insufficiently examined and require further assessment and exploration. Pertinently, the linkages between climate-induced environmental stressors in Cambodia and the prevalence of debt-bonded labour in Thai fisheries has thus far only been inferred and touched upon in the extant literature; this requires an explicit and empirical interrogation, as we move towards a more holistic framing of the nexus. Additionally, while climate-induced migration and vulnerabilities have been well outlined in the extant literature, scholars have tended to largely ignore climate change as an underlying driver behind vulnerability to trafficking (Molinari, 2017).

Forests

Deforestation in Brazil is persistent and pervasive. Despite significant institutional measures being put into place to curb deforestation, forest-clearing practices in the country have largely continued through illegal channels to serve the interests of the key industries in the country (Bales, 2016; Francelino-Gonçalves-Dias and Mendonca, 2011; GSI, 2016). For instance, Greenpeace International (2009) found that in 2006–2007, 90% of deforestation in the Amazon had been illegal. Moreover, the current Brazilian government, led by Jair Bolsonaro since January 2019, is actively promoting increased deforestation of the Amazon, as part of an expansive industrial mining and farming strategy. Satellite imagery has evidenced a 20% increase in rates of forest loss between August 2018 and April 2019, driven by uncontrolled logging and land invasion (Amazon Watch, 2019). Illegal deforestation practices in Brazil are bound up with exploitative forms of labour. As well as being implicated in the large-scale clearing of the Amazon, the expansive cattle, soy and charcoal

industries in the country have depended and built upon slave labour to a significant extent (Bales, 2016; ILO, 2009; McGrath, 2013).

Slave labour tends to emerge through debt-bondage in Brazil. A vulnerable and impoverished landless population in rural Brazil, primarily in the North-east, are often preyed upon by exploitative middlemen known as ‘gatos’ (Francelino-Gonçalves-Dias and Mendonca, 2011; ILO, 2009). As Bales (2012) describes, these have become a ‘disposable’ people for the key rural industries in Brazil which can recruit them with minimal associated risks and costs. The workers are often recruited by ‘gatos’ under false pretences, being enticed to work illegally and informally in distant charcoal camps and cattle ranches through up-front payments, accruing a debt in the process (McGrath, 2013). Here, the workers find it almost impossible to pay off the debt and face immobilities and abusive labour conditions in their daily lives (Campbell, 2008; Fearnside, 2008; ILO, 2009).

Thus, it can be proposed that the clearing of forests and other environmentally destructive activities in the Amazon are entangled with debt-bonded labour. The ILO (2009) highlights a distinct and clear correlation between slave labour practices and forest-clearing in rural Brazil, primarily in the ‘deforestation arch’ in the North of the country. Although not explicitly tying the two together, Greenpeace International (2009) indicated that those companies engaging in environmentally destructive activities in the Amazon are also those which tend to operate using exploitative labour practices. As well as reducing space for carbon sequestration, the charcoal camps and cattle ranches that make use of slave labour are also responsible for emitting further greenhouse gases (GHGs) and pollutants.

The close linkage between large-scale deforestation and debt-bonded labour in Brazil is underpinned by illegal practices (Bales, 2016; Fearnside, 2008; ILO, 2009). Many of the illegal forest-clearing activities are facilitated by exploitative and unregulated labour practices. The GSI (2016) suggests that up to half of illegal deforestation globally is dependent on slave labour. Deep into the Amazon and out of sight of the authorities, these twinned and mutually destructive illegal practices can prevail, compromising both environmental sustainability and human rights (Bales, 2016; Fearnside, 2008; Francelino-Gonçalves-Dias and Mendonca, 2011). Notably, Bales (2016) estimated that slave labour-driven deforestation practices are responsible for the emission of 2.54 billion tons of CO₂ each year, a lower amount globally than only China and the United States.

Overlapping findings on the slavery–deforestation nexus have emerged in other contexts. Notably, research has demonstrated the dependence of the ecologically destructive palm oil industry in Indonesia on exploitative and coercive labour practices (Amnesty International, 2018; Skinner, 2013). While the environmental degradation associated with palm oil extraction in Indonesia has been well documented (e.g. loss of biodiversity, destruction of habitats for the Sumatran tiger and orangutans), recent research has begun to investigate the exploitative labour practices that have emerged in the country’s palm oil industry.

As in Brazil, slave labour in the palm oil sector in Indonesia has largely emerged in the form of debt-bonded labour and abusive working conditions. In a recent investigation of Wilmar’s (the world’s largest palm oil processor and seller) supply chains in Indonesia, Amnesty International (2018: 5) identified ‘serious human rights abuses’ in its plantations, including, ‘. . .forced labor and child labor. . .as well as exploitative and dangerous working practices that put the health of workers at risk’. It can be suggested that the considerable rise in palm oil production and exports from Indonesia since the 1990s (producing around 35 million tons of the oil per year) and associated destruction of the Bornean and Sumatran rainforests has been enabled, at least in part, by an exploited and coerced workforce (IOM, 2016; Skinner, 2013).

Future research needs. In the forests sector, the research focus has been upon the mutually destructive relationship between slave labour and deforestation. The nexus has primarily emerged in relation to the slave labour-driven clearing of the Amazon rainforest in Brazil, with similar occurrences also noted in the palm oil industry in Indonesia. In these contexts, debt-bonded labour forms part of the ‘story’ of deforestation, entangled with the large-scale clearing of forests, which has both local and global environmentally destructive consequences.

It is logical that the focus in the literature has thus far been upon the Amazon and Sumatran, given that these are among the largest forests globally. Nevertheless, research on the slavery-environment nexus in the forests sector has tended to be strictly geographically specific and it can be suggested that future research is directed towards identifying and assessing connections across and between contexts. Commonalities across the cases can be suggested, notably the entanglement of debt-bonded labour with the unsustainable extraction and production of commodities, in order to meet the global demand for cheap produce, whether this be mobile phones, charcoal, beef or palm oil.

Additionally, research is yet to consider the possibility of the nexus between slave labour and deforestation forming in the opposite direction. Here, the environmental degradation and deforestation caused by extractive industries and industrialized agricultural processes may result in the loss of livelihoods for rural communities. Around the world, many communities depend on forests (and associated produce) for their everyday survival and livelihoods; without these, they may become more vulnerable, impoverished and be ultimately pushed towards exploitative labour conditions.

Factories

In meeting countries’ economic development and infrastructural needs, the production of bricks is prevalent in South Asia. Evidence from India, Pakistan (making up part of the ‘brick-belt’) and Cambodia has indicated that traditional brick-kilns, notably Bull’s Trench Kilns (BTKs), contribute significantly to environmental degradation, primarily through localized air pollution, black carbon and GHG emissions (Bales, 2016; Croitoru and Sarraf, 2012; Maheshwari and Jain, 2017). Making use of either coal (usually low-grade), firewood or other combustible materials (such as tyres) to fire the clay bricks, BTKs tend to be much more energy intensive and polluting than mechanized, modern kilns (Boyd et al., 2018; Rajarathnam et al., 2014). While developed countries have generally moved away from BTKs to cleaner, modern and more energy-efficient brick-kilns, those in the ‘brick-belt’ continue to make use of BTKs (Gomes and Hossain, 2003).

It was calculated that BTKs are among the largest consumers of coal in India, responsible for approximately 35 million tons of coal annually (Maheshwari and Jain, 2017). As well as contributing to climate change, BTKs also produce black carbon that leads to worsening local air pollution. Additionally, Tahir and Rafique (2009) demonstrated that, in addition to releasing approximately 525,440 tons of CO₂ per year, the burning of biomass in brick kilns in Pakistan contributes to exacerbated deforestation in the region, thereby reducing space for carbon sequestration. Accordingly, a shift away from BTKs in South-Asia towards cleaner, less polluting and more energy-efficient kilns has been recommended by researchers (Croitoru and Sarraf, 2012; Rajarathnam et al., 2014).

However, while the environmental degradation associated with brick-kilns in South Asia has been well assessed and outlined, less has been written about how this is entangled with debt-bonded labour. A significant body of literature has detailed the debt-bonded forms of labour prevalent in South-Asian brick kilns, particularly in India, Pakistan and Cambodia

(Anti-Slavery International, 2015; Bales, 2016; Boyd et al., 2018; ILO, 2005; LICADHO, 2017). Debt-bondage in brick kilns tends to involve the exploitation of seasonal migrants, whereby labourers incur an initial debt that they are forced to repay over an indeterminate period of time.

In the case of India, the neo-bonded labourers in the brick-kilns are often smallholder farmers from the surrounding rural areas (Bhukuth, 2005; Guérin et al., 2012). As previously detailed, without adequate rights and resources and often indebted, vulnerable rural–urban migrants are susceptible to exploitative practices in urban centres, including in brick-kilns. In some cases, contractors from brick-kilns arrive into impoverished and marginalized villages to recruit labourers in the off-season (Bhukuth, 2005; Guérin et al., 2012; IOM, 2016). Following recruitment, the labourers become indebted from an initial advance payment given for food and other essentials. In such a way, the brick-kiln owners can secure an underpaid workforce each season (Anti-Slavery International, 2015; Bhukuth, 2005; Guérin et al., 2012).

Research has indicated the prevalence of informal channels in the brick-kiln sector across South Asia (Benson et al., 2014; Blackman, 2000). Brick-kilns tend to set up on the outskirts of large cities in South Asia and are generally unregulated, run informally and geographically dispersed (Gomes and Hossain, 2003; Rajarathnam et al., 2014). BTKs and other traditional kilns tend to be significantly more used in the informal sector (Boyd et al., 2018; LICADHO, 2017). Accordingly, the lack of regulations and protections present in the informal brick production sector may facilitate environmentally destructive activities alongside exploitative labour practices. It is also offered that the more labour-intensive nature of BTKs lends itself to the use of exploitative labour practices in comparison to the more efficient and mechanized brick kilns (Bales, 2016; LICADHO, 2017).

Future research needs. Research has detailed the concurrent prevalence of debt-bonded labour and environmental degradation in South-Asian brick-kilns. Rapid infrastructural and economic development in cities such as Phnom Penh and Mumbai has been enabled to some extent by the cheap and large-scale production of bricks, associated with both debt-bonded labour practices and environment degradation. However, while the two trends have been separately well discussed, with exceptions (Bales, 2016; Boyd et al., 2018), connections have not generally been made between them. It can be proposed that, considering their close interrelatedness, debt-bonded labour and environmental damage in South-Asian brick-kilns should be conceptualized and tackled as mutually destructive practices, in the context of a prevalent informal brick-building sector.

The debt-bondage occurring in South-Asian brick-kilns should be placed within the context of climate-induced rural–urban migration that is occurring within the region, given that the exploited labourers often tend to be displaced smallholder farmers. Explicit linkages between rural–urban climate-induced migration and urban-based labour exploitation in brick-kilns in South-Asia have not sufficiently been made thus far. Considered more holistically and across rural–urban spaces, it can be tentatively proposed that there is a two-way relationship between environmental degradation and debt-bondage in the South-Asian brick-building sector that requires further attention and examination.

Thus far, literature on modern slavery and the environment has focused almost entirely on brick-kilns in the factories sector. Accordingly, there is a need for future research to examine slavery–environment interactions in the context of other manufacturing industries. These may be highly polluting industries which are involved in the production of global and regional commodities. Researchers must closely investigate the extent to which slavery practices and environmental degradation interact in other manufacturing contexts outside

of the brick-kiln and the extent to which the brick-kiln is unique in its evidence of slavery–environment interactions.

Discussion

The review draws out two key arguments that we can adopt in proposing a future research agenda. Firstly, we identified that research on the nexus between modern slavery, environmental degradation and climate change has tended to emerge sectorally, forming primarily around four key sectors: fisheries, fields, forests and factories. While much of the existing scholarship is confined to one of these four sectors, exploring the links between modern slavery and environmental change highlights the need to transverse these boundaries. The review suggests that these sectors are connected both geographically (i.e. connections between climate-induced migration and extreme forms of labour exploitation across geographic spaces) and structurally (i.e. individuals may be driven into bonded labour in different sectors by the same factors). The complex links between labour exploitation and environmental change span space and sector, thus we suggest that any future agenda looking to explore these links needs to cut across sectors spaces.

Secondly, the review highlights that the interrelations between modern slavery and environmental change are bi-directional. Here, on the one hand, modern slavery practices may be entangled with localized environmental and ecological degradation (e.g. air pollution) and increased levels of GHG emissions, thereby exacerbating climate change. On the other hand, the increasing environmental pressures associated with climate change in the Global South (e.g. rising sea levels, increasing prevalence and severity of droughts) act to exacerbate existing vulnerabilities and inequalities of local populations that may render them susceptible to trafficking and exploitative labour practices. To that end, we caution against approaches which privilege man or nature, to argue instead for a holistic lens which explore how the two are continually shaping one another.

Current research has provided initial understandings of the nexus between modern slavery, environmental degradation and climate change and can offer a knowledge base upon which researchers can build. However, there remains considerable scope for slavery–environment interactions to be further empirically and conceptually interrogated. Drawn from identified trends and gaps in the extant literature, three key research agendas can be proposed. Firstly, the review has highlighted the bi-directional relationship between slavery and environmental change. The review suggests it to be vital for researchers to understand and examine the global challenges surrounding slavery and environmental change as interconnected issues that continually shape one another and tackle these as part of holistic and integrated strategies. This can engender a movement beyond silos of knowledge and practice, allowing us, for instance, to understand and respond to the SDGs as interconnected challenges, building on scholars (Le Blanc, 2015; Nilsson et al., 2016) that have begun to map the connections between the SDGs. Such movement could incorporate the establishment of a new interdisciplinary network of researchers driven by the need to expand knowledge on the slavery–environment nexus.

Secondly, the review suggests that it would be beneficial to bring the sectoral strands of the nexus together and to conceptualize these geographically specific issues as part of a broader, multiscalar framework, whereby the nexus goes *beyond* the sectoral. Here, there is a need to draw out the commonalities and distinctions between contextual emergences of the nexus. We propose a move towards understanding the specific sectoral and geographic emergences of the nexus within a complex systems framework. In other words, we suggest a research agenda which cuts across space and sectors in making sense of slavery–environment

linkages, drawing on inspiration from recent scholarship on social–ecological systems (Fischer et al., 2015; Folke et al., 2016; Leach et al., 2012), planetary boundaries (Rockström et al., 2009; Steffen et al., 2015; O’Neill et al., 2018) and doughnut frameworks (Raworth, 2017). This would provide a powerful analytic frame for advancing understanding the dynamics of slavery–environment interactions in the Anthropocene across multiple, interlinked scales.

Thirdly, a future research agenda must interrogate the deep underlying drivers and implications of the slavery–environment nexus, with particular reference to its situation within the contemporary formation of capitalism. Slavery–environment interactions can be understood as being closely tied up with social and environmental relations under late-stage capitalism; in other words, the degradation of the environment and of labour rights are both grounded in broader contemporary capitalist modes of production and upon the need for continual capital accumulation. A future research agenda on the slavery–environment nexus could build upon critical scholarship which conceives of modern slavery as existing along a continuous spectrum of capitalist labour exploitation and not isolated from overlapping, complex ‘unfreedoms’ (LeBaron, 2014; Le Baron and Ayers, 2013; Lerche, 2011; Lewis and Waite, 2015; Strauss and McGrath, 2017), as well as research which has foregrounded capitalist modes of political economy and extractivist relations with nature in interrogating, and seeking solutions for, the climate crisis and ecocide (Collard et al., 2015; O’Hara, 2009; Swyngedouw, 2010). A critical framework which places labour exploitation and environmental degradation in the context of contemporary socioeconomic relations and systemic factors could allow us to better understand how and why these simultaneously emerge in specific contexts.

Relatedly, the nexus can be interrogated and unpacked as part of a broader, integrated examination of sustainable production and consumption and international supply chains. Given that slavery–environment interactions are entangled with commodity extraction, the primary sector and international production–consumption networks, there is space for the systematic and purposive examination of the nexus through a Global Production Network analysis (e.g. McGrath, 2013), or through a ‘telecoupling’ framework (e.g. Liu et al., 2013). In such a way, responses to the nexus become not simply about removing modern slavery from the equation, but about transitioning communities, regions and sectors towards green forms of development that incorporates both decent jobs and environmentally sustainable practices.

Conclusion

In this commentary paper, the current state of research on the tightly connected and bi-directional relationship between modern slavery, environmental degradation and climate change has been critically assessed and reviewed. While having been separately well established in policy-led and academic debates, an emerging branch of research has begun to conceptualize linkages between slavery and environmental change. Responding to a gap in the extant literature, this paper synthesized and made sense of the emerging research base focused on interrogating slavery–environment linkages, bringing together previously disparate literature and offering a research agenda for future exploration of slavery–environment agendas.

Through an exploration of 19 key texts, spanning across diverse disciplines and spatial scales, we drew out two key arguments that can be adopted in proposing a future research agenda. Firstly, we identified the sectoral emergence of the nexus, forming primarily around four key sectors: (i) *Fisheries* (ii) *Fields* (iii) *Forests* and (iv) *Factories*. Secondly, the review

indicated a bi-directional relationship between modern slavery and environmental change. Existing research has provided initial understandings of the relationship between modern slavery, environmental destruction and climate change. However, there remains considerable scope for the connections between the three to be further interrogated and unpacked.

Based on the review, the paper sets out three key research agendas. Firstly, we highlight the need to move beyond a spatially and sectorally confined exploration of slavery–environment interactions towards a sophisticated research agenda which transverse these boundaries. Secondly, we argue for the need to holistically interrogate the ways in which slavery practices and environmental change are continually shaping one another. Thirdly, we propose that a future research agenda should examine the deep underlying drivers of modern slavery, climate change and environmental degradation, specifically situating slavery–environment interactions within contemporary capitalist social and economic relations.

Highlights

- The current state of research on the relationship between modern slavery, environmental degradation and climate change is assessed and reviewed.
- The review finds that extant research on slavery–environment linkages forms primarily around four key sectors: *Fisheries*, *Fields*, *Forests* and *Factories*.
- Based on the review, the paper sets out three key research agendas for future examinations of slavery–environment interactions.
- We highlight the need to move beyond a spatially and sectorally confined exploration of slavery–environment interactions.
- We also propose the future examination of the deep underlying drivers of modern slavery, climate change and environmental degradation.

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Note

1. The term ‘field’ pertains here to the farming sector, given that the field is not a sector in and of itself. As a number of scholars have highlighted in recent decade (Ellis, 2000; Reardon, 1997), rural income sources are increasingly diversified away from traditional agricultural labour as a form of livelihood strategy. Income generation in rural landscapes in the contemporary Global South now depends on multiple sources, comprising both farm and off-farm activities. Nevertheless, what we refer to in the ‘field’ section of the paper relates specifically to farming activities, and to communities that derive a proportion of their income from farm production.

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