Restoring Employment and Rural Landscapes

Can Ecological Restoration Usher Rural Economic Revival in the 'Post-pandemic' Period?

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The national lockdown unleashed an unprecedented economic crisis on millions of poor urban migrants who lost their employment and were forced to "reverse-migrate" to their homes on foot over vast distances. However, the rural areas—from where they originated—were already reeling under severe and rapid economic and ecological degradation and were ill-equipped to deal with this sudden increase in the demand for livelihood opportunities. In this paper, we demonstrate the potential of "ecological restoration" of primarily rural landscapes in India to generate rapid and high-volume employment along with other co-benefits.

Part of this work was supported by the preparatory phase project of the National Mission on Biodiversity and Human Well-being, which is catalysed and supported by the Office of the Principal Scientific Adviser to the Government of India.

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The COVID-19 pandemic has had a huge impact on human health and economy globally, infecting over 52 million and killing over 1.28 million.[1] With the pandemic still going strong as of mid-November 2020, and several countries still in full or partial lockdown mode, the collateral damage on the global economy has been devastating. According to the International Labour Organization, over one billion workers worldwide are at a high risk of pay cuts or losing their job currently. Gross domestic product (GDP) growth in 2020 is expected to decline by 6% globally.[2] In India, such economic disruption is set to double the number of people who are facing acute food insecurity (IPC/Phase 3 or worse)[3] from 135 million in 2019 to a staggering 265 million in 2020, primarily because of losses in their sources of income, livelihood and employment during the lockdown (UNWFP 2020).

The recent analysis by Goodman et al (2020) suggested that the disruption in economic activities, the resultant hunger and malnutrition may end up being a bigger killer than the pandemic itself. Among the worst affected are the "poor"—precariously employed migrants in countries where surprise lockdowns were announced without providing any prior, anticipatory economic relief, as in the case of India. The acuteness of lockdown's huge economic impacts was ultimately felt and distributed as per the employment status of people: those who could retain employment faced little or no impact. On the contrary, they supposedly enjoyed their extended time with near and dear ones while indulging in and exhibiting their sophisticated baking skills on social media (Kundal 2020). For the rest, whose employment and livelihood evaporated almost overnight, it was nothing short of a nightmare. Thus, the pandemic is as much a crisis of employment as it is about human health. Unlike the serious intent that state agencies in India displayed towards tackling the health crisis, restoring and creating new sustainable employment opportunities unfortunately did not receive the attention it deserved.

This paper addresses the well-documented case of lockdown-induced reverse-migration of millions to their native homes to enquire about the employment opportunities that may await them there. To this end, we first briefly touched upon the drivers and causes of the large scale and abundant supply of rural labour for precarious and undignified city-based jobs. Following that, we critically examine if and how rural India—the great source of cheap labour—can rapidly transform itself as an employment hub, following the huge surge in demand for village-based

jobs. Finally, we explore the potential of ecological restoration, with the reclamation of structural and functional biodiversity as an explicit goal, to meet this sudden demand. Beyond its employment opportunities, we also ask if the restoration of rural ecology and biodiversity can restore the dignity that the city robbed them off, each and every time they landed on its shores, to escape the economic and ecological distresses, caste hegemony and social immobility of Indian villages. The loss of dignity, which the pandemic merely amplified through the sheer scale of reverse migration, ultimately became an enduring, grand spectacle of human misery (Gill 2020; Parth 2020).

Pandemic, Lockdown and the Precariat

India's first national-level response to arresting the pandemic was a total lockdown beginning on 24 March 2020, which resulted in the overnight loss of employment for over 55 million in the informal sector alone (Gupta et al 2020). Over three phases, the 75-day-long lockdown ultimately led to the reverse migration of an estimated 140 million workers from the cities to their homes under sub-human conditions (Dandekar and Ghai 2020). A "pre" and "post" COVID-19 analysis indicated a 30% fall in employment[4] in April 2020 (282.2 million) vis-à-vis April 2019 (403.7 million), and 75% of this share was attributed to the small traders, hawkers and daily wage labourers (Vyas 2020). Overall, the number of farmers and farm labourers rose by 14.9 million, as of July 2020, which is barely one-tenth of the estimated people who moved back to their villages, indicating that ~90% of the reverse migrants still remain unemployed (Pandit 2020; Vyas 2020).[5]

Such massive unemployment could have been pre-empted if the lockdown were to be preceded by well-thought-out strategies to sustain employment of the economically most vulnerable groups. Even though the proponents might argue that the sudden and surprise lockdown was a necessity and therefore there was not enough time to plan alternative employment strategies, however, in retrospect, the lockdown seems like an unplanned knee-jerk response by the state, which reflected lack of adequate understanding of India's poverty and employment. In a scenario where if the state was adequately appraised of the magnitude of its precariat class and was sufficiently willed to prepare alternate income/employment strategies before imposing a total lockdown, penury and suffering associated with the massive unemployment could have been avoided. For instance, well-planned employment policies in Chile not only prevented the poor from falling into poverty traps during the economic "adjustment" crisis of the early 1980s, but also reduced the proportion of poor from 45% in 1986 to 28% in 1994. On the other hand, poverty rates rose from 17.3% in 1985 to 54.7% in 1990 in Peru, where no such policies were in place (Graham 1997, 2001).

Cities and Employment during the Pandemic

In India, employment strategies could not be possibly planned in cities during the pandemic because the most congested urban cores were among the zones of highest economic activity. Unfortunately, they emerged as the first hotspots of the disease and, till date, remain among the worst hit. However, high vulnerability to disease pandemics and a massive but highly fragile unorganised economy was clearly not the way urban centres were imagined during the framing of the economic liberalisation policy of India of 1991 (Nagaraj 2017). In fact, cities were envisaged as mass generators of employment, which would attract labour from low productivity farm-based activities to high-productivity industrial manufacturing (Ahluwalia 2016). In the last 30 years, the construction sector absorbed the labour, providing a third of the total jobs across all other sectors. However, the industrial manufacturing sector never took off as planned. As a result, over 92% of the total workforce in cities are in the informal jobs, which lack clear terms of fair work contract and are effectively casual wage earners. Such workers often survive in sub-human, unhygienic conditions in the cities (Babu et al 2017).

The economic liberalisation policies led to a spurt in the growth of urban economies, whose contribution to the GDP grew from 45% in 1990 to almost 70% in 2020 (*Business Standard* 2014). This increased demand of labour spurt by such rapid urbanisation was mainly supplied by the villages where the liberalisation had a completely opposite impact. Liberalisation was expected to create a favourable shift in the terms of trade for Indian agriculture and augment surplus. Such surpluses could be reinvested to improve land and allied resources, ultimately boosting the agricultural productivity and growth rate (De Roy 2017). But contrary to expectations, terms of trade for agriculture did not improve; instead it went through a phase of rapid decline. The GDP share of agriculture output declined from 25.2% in 1990 to 11.8% in 2014 when the total GDP grew from 1.06% in 1991 to 8.5% in 2016. According to De Roy (2017: 67), the decline was further intensified due to "reduction in capital formation in agriculture, inadequate expenditure on irrigation and extension services in rural areas, and a dearth of cheap institutional credit." As a result, farmland in India, which steadily grew from 1.75 million sq km in 1965 to 1.82 million sq km in 1991, started shrinking from 1992 onwards to 1.79 million sq km in 2010.[6] Detailed case studies such as Kar et al (2018) showed that the rural area in just one district of Maharashtra reduced to one-sixth of its initial size.

Such a decline resulted in huge rural unemployment and pauperisation, thereby intensifying livelihood insecurity, decline of agriculture-driven economy, which ultimately had a trickle-down effect on the non-farm jobs (Karthikeyan 2019). Change in land use from farm to industry and real estate were ecologically unsustainable as they were accompanied by loss of biodiversity, mismanagement of the water resources and deterioration of the soil quality due to intensive farming practices (Kumar 2019).

Recent studies indicate at "commodification," and "capitalist accumulation" of agricultural land. Real estate, industrial zones, extractive mining blocks and special economic zones (Levien 2018; Patil and Purushothaman 2020; Silva et al 2020) have been identified as important ultimate drivers of degradation and massive changes in land use of rural landscapes, although the pathways are complex and entangled (Chakraborty and Ray 2017; Goswami and Ganesh 2019). For example, "commodification of land" displaces a variety of production systems, ranging from small-scale farming to "unused" land, such as forests and savannas on which local communities often depend for

multiple ecosystem services. Such "unused" non-farm natural ecosystems, including water resources, often provide ecological services critical for maintaining farm health and productivity. Land use change from farm to real estate, industries and mining often leads to appropriation or degradation of water resources and thereby has a negative impact on local and downstream farmers. Even within agriculture, the impacts of liberalisation and markets typically shift small, subsistence-scale food cropping to intensified cash crop farming (D'Odorico et al 2017).

For example, in Kodagu, Karnataka, commodification driven by the global coffee market changed the land use and land cover patterns, ultimately resulting in land degradation in the small-scale rice paddies (Ambinakudige and Choi 2009). Similarly, in Meghalaya, which is considered as a resource frontier, liberalisation policies ultimately resulted in massive land use change from forest to limestone mining and associated cement industries (Goswami et al 2016), which polluted rivers, streams and the air and adversely affected small-scale orange and *jhum* farm productivity (Goswami et al 2012; Goswami and Jesudasan 2012). Markets ultimately also led to large-scale adoption of cash crops that resulted in further ecological degradation of land, loss of biodiversity (Goswami and Ganesh 2019) and livelihood, nutritional security (Behera et al 2016), which ultimately leads to a decline in the overall quality of life in the rural landscapes.

Such convergence of economic policies, environmental degradation and decline of farm-based economy and socio-economic aspiration drove massive migration from rural to urban India. Bulk of such migration has been distress-driven and often in search for employment and income opportunities in the cities. However, if the employment available in urban areas were gainful, they ought to have driven rural poverty down due to the expected remittances from the cities. Yet, latest data indicate that rural poverty rose nearly 4% points between 2011–12 and 2017–18 to 30% (Bhattacharya and Devulapalli 2019). Thus, at this critical juncture, can we try to take a critical look at how rural India should be allowed to handle this crisis? How will rural India, which continues to be in distress, handle the huge employment demand due to reverse migration? Can we design employment opportunities around investments earmarked by the state which use this crisis as an opportunity to reclaim and restore the rapidly degrading rural landscape?

Reclaiming the nature and restoring the rural landscape can have co-benefits in terms of creating future resilience against pandemics too. The COVID-19 pandemic was a result of zoonosis, that is, the highly contagious virus spilled over from animals to humans. Recent increase in the incidences of novel zoonotic diseases has been attributed to the anthropogenic destruction of biodiversity driven primarily by ecologically unsustainable economic growth measured through GDP (Gibb et al 2020; Quammen 2013). In fact, it may be far cheaper to invest in preventive measures, such as protecting existing biodiversity rich ecosystems and restoring degraded areas ($17–$26 billion) compared to overall economic and human cost of the next pandemic which could cost us about $16 trillion (Dobson et al 2020). Therefore, it is important that the reimagined development (planned beyond cities to create rural employment) must be modelled on refined ideas of Sustainable Development Goals (SDGs) and human well-being rather than mere GDP growth.

Ecological Restoration as an Employment Opportunity

Here, we examine the globally tested and proven proposition of ecological restoration, which will restore the degraded landscapes while providing an enduring source of employment, along with co-benefits tied to meeting climate and biodiversity conservation goals. Existing global studies indicate that restoration has the potential to emerge as a cost-effective opportunity for employment generation and carbon sequestration (Calderon 2017; Driver and Mukhadi 2019). In fact, landscape restoration in the United States (US) has been reported to be twice as effective at creating jobs per unit of investment in comparison to the oil and gas sector (Calderon 2017). Studies from South Africa reported that for every new job created for protecting biodiversity, five additional jobs are created in ancillary sectors that uses biodiversity (Driver and Mukhadi 2019).

India has a huge restoration potential given the rapid rate of degradation of its natural landscapes: it is estimated that 96.4 million hectares or 29.32% of India's total land area are in various stages of degradation (Kumar 2019). Degraded lands produce serious consequences such as decreased food security, degraded environment, enhanced migration and increased poverty. It also results in the loss of ecosystem services, livelihood opportunities and degradation of human health and other constituents of well-being. A study commissioned by the Ministry of Environment, Forest and Climate Change (MoEFCC), has estimated that land degradation in India has incurred monetary losses to the tune of 2.5% of its GDP in 2014–15 (Sharma and Chopra 2018).

This accords critical importance to restore these degraded lands, which will not only rejuvenate the flow of ecosystem services and augment biodiversity values but will also generate substantial employment opportunities. Many case studies showcase this. Consider, for example, Naganadhi Rejuvenation Project in Vellore district of Tamil Nadu. By utilising ₹5 crore ($6,67,000) over five years, it has restored and rejuvenated Naganadhi watershed, which had gone dry for 15 years. In the process, 20,000 women received employment, the water table rose by over 6 m, 9,000 ha of agricultural land was reclaimed and over 60,000 people were ultimately benefited (Chakrapani 2019).

With the Government of India (GoI) announcing multiple financial packages to rapidly boost the rural economy from the pandemic induced distress, we analyse and discuss the employment opportunities in and benefits of biodiversity-driven ecological restoration projects in selected sites of India. Our effort is consistent with the objectives of the National Mission on Biodiversity and Human Well-Being (NMBHWB) which aims to develop a comprehensive understanding of the impacts of climate change on ecosystems and ecosystem services and to assess the role of well-functioning and conserved ecosystems in increasing resilience to climate change. A key output would be comprehensive guidelines for a climate mitigation strategy that goes beyond a tree-planting carbon-centric focus towards biodiversity and

ecosystem service-friendly ecological restoration in diverse biomes and co-benefits for future adaptation options. In addition to that, we estimate the finances required to create economically viable, environmentally sustainable and an enduring form of employment through ecological restoration.

Literature classifies employment opportunities from restoration into four main categories: (i) direct: one-time employment generated during the period of restoration intervention, (ii) indirect: additional employment generated in ancillary sectors resulting from higher demand of inputs for restoration through backward linkages, (iii) induced: additional employment created due to increased consumer spending through multiplier effect (due to [i] and [ii]), and (iv) employment (or livelihoods) generated through augmentation of bioresources through restoration (BenDor et al 2015; Edwards et al 2013; Nielsen-Pincus and Moseley 2010). Direct employment is the easiest to estimate and involves deconstructing spending pattern (budgetary allocation) across restoration activities (Edwards et al 2013). Indirect and induced employment involves estimating of employment multipliers from input–output models or computable general equilibrium models (Ding et al 2017; Edwards et al 2013). However, very few studies estimate the employment (or livelihood) potential from local bioresource-based activities (Edwards et al 2013). The next section aims to provide some crude estimates of employment opportunities from ecological restoration in India. With limited data availability,[7] the current estimates are restricted to one-time direct local employment of immediate nature.

The main factors that determine the "potential" local employment opportunities from restoration include the choice of (i) restoration intervention, (ii) restoration activity, (iii) ecosystem type, (iv) extent of degradation, and (v) cost of restoration (Edwards et al 2013; Stanturf et al 2017; Ding et al 2017; Lewis et al 2019). It is also identified that trade-offs may exist between these choices. For instance, promoting interventions like overall agroforestry development can have a higher direct employment potential vis-à-vis intervention, such as natural forestry, which augments carbon store at a higher rate than the former (Lewis et al 2019). Also, a labour-intensive activity like removing invasive species creates more direct employment (with lower skill requirement and hence lower average wages) in comparison to capital-intensive activities like constructing fish passage; but the former in many cases prove to be more costly[8] than the latter (Nielsen-Pincus and Moseley 2010; Stanturf et al 2017). In order to limit such trade-offs and variations (across main factors), we focus on a few universally agreed labour-centric interventions (like reforestation, agroforestry, silvopasture development) that have been found to be common across multiple landscapes and ecosystem types (Ding et al 2017; Edwards et al 2013).

Employment Potential in Restoration: An Estimate

Given (inter- and intra-country) the variations in landscape characteristics and degradation type, utilising employment estimates of interventions directly from global studies for Indian context might be questionable and inaccurate. Instead, this paper adopts an alternate method that involves deconstructing restoration per se into separate components or activities. In the process we identify specific activities based on the nature/characteristics of degraded spaces in India. It is followed by the estimation of direct employments against such activities. The estimates only consider labour days and activities that are undertaken during the period of restoration.[9] The focus is purely on the supply of jobs across degraded spaces, whereas the actual number might vary based on allocated budget and/or economic viability.

While multiple sources like Restoration Opportunities Atlas (Chaturvedi et al 2018), Desertification and Land Degradation Atlas of India (Space Applications Centre–Indian Space Research Organisation 2016) provide estimates of degraded spaces, the Wasteland Atlas of India (Department of Land Resources 2019) (henceforth Atlas) provides the most recent and official data on degraded spaces. However, it is important to mention that the definition of the term "wasteland" employed by the Atlas is based on an outdated colonial classification that focuses merely on economic returns while completely discounting ecological and other non-monetary values. For instance, categories like waterlogged land, ravinous land and glacial land from the Atlas actually provide multiple services to augment biodiversity, regulate water flow and sequester carbon. In consideration with this, only a subset of categories (9 of 23) that indicate degraded spaces by definition have been considered.

For identification of intervention, the specific nature/characteristics of these nine degraded spaces have been reviewed. This is because, historically, with the aim to make land more productive, interventions have promoted conversion of degraded grasslands (one of the nine categories) into forest/plantation ecosystems. This has reduced the area and ecological functions from grassland ecosystem (Gidwani 1992; Tian et al 2014). In this paper, instead of the so-called productive interventions, ecologically accepted practices to improve the condition of (degraded) grasslands like silvopasture intervention have been prescribed for restoration. Such nuanced considerations have been followed in all the other categories of degraded spaces as well.

This is followed by identification of common restoration activities that are not specific to or dependent on ecosystem type and extent of degradation from available local and global studies (Ministry of Water and Environment 2016; Paudyal et al 2017; Stanturf et al 2017). For instance, land with dense scrub can be restored to silvopasture lands by undertaking common activities like (i) removal of alien species, (ii) site preparation, (iii) tree seedling transplanting, and (iv) planting fodder shrubs.

The next step involves identifying labour requirement per hectare across each activity. With limited data availability on these variables from Indian or South Asian context, data from similar developing countries like Kenya, Tanzania and Zambia practising labour-intensive agriculture like India have been considered (Franzel 2005; Laborde 2018; United Nations 2015). To ensure consistency, labour days per hectare across activities were selected from one specific intervention[10] (agroforestry-based interventions in this case). Some of these estimates (two out of six) for which corresponding Indian figures were

available, indicated a variation of less than two labour days per hectare (Babu et al 2009, 2017; Baliyan and Kumar 2014).[11]

Such back-of-the-envelope benefit-transfer method is only aimed at providing an indicative estimate of labour days per activity or intervention (collection of activities) for degraded spaces in India as shown in Table 1.

While the actual interventions and activities will be dependent on the cost of restoration and state-specific characteristics, the estimates indicate a high employment potential from restoration activities. The demand for labour per unit of land, in labour days per hectare ranges from 28.8 for mining wastelands to 50.8 for degraded and abandoned shifting cultivation land. In terms of the total land available, the highest potential employment opportunity in such restoration activities is approximately 1,058 million labour days.[12] With the goal to provide 200 days per person under the new Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) reforms (Meghana and Ramesh 2020), ecological restoration-based activity can potentially employ about 5.2 million people towards an inclusive economic recovery. A substantial component of the employment generated through restoration would continue over several years and would include maintenance, protection, and management of the restored land. As indicated by studies in South Africa, investment in restoration for the recovery of biodiversity could additionally provide five time the employment in ancillary sectors, with income and livelihood benefits through availability of bioresources (Driver and Mukhadi 2019). However, lack of data in India prevents making such estimates on the long-term employment potential at this stage. Nonetheless, it is a long-held view from the ground (Oza 2012) that programmes like MGNREGA can be customised for the poor, not only for employment, production and income generation, but also for restoring their pride.

The finances required for sustaining such schemes would include several factors, depending on the nature and duration of the activity. At the least, labour cost alone could be estimated at the minimum rate of wages. The minimum wage for unskilled workers employed in the agriculture sector in rural areas is ₹362 per day which can give a crude estimation of labour costs in each restoration intervention.[13] As a first estimate, the investment will be ₹38,300 crore, which is within the rural relief package announced by the GOI to recover the economy from COVID-19 slump.[14]

Co-benefits of Restoration

In the COP14, India has pledged to restore 26 million hectares of land by 2030.[15] This target is lower than the 29 odd million hectares land available for restoration as per Table 1. Therefore, the target is potentially within the reach, provided clear action plans, sound strategies and financial outlays are designed and followed up by a strong-willed execution plan. However, while prioritising sites, adequate precautionary steps would be required while restoring sensitive ecosystems, such as open natural habitats (grasslands, savannas, etc), wetlands and riparian habitats, such as not replacing native species with exotic ones or leaving alone sites with potential for natural restoration.[16]

Apart from the huge employment potential, restoring 350 million hectares of only degraded forestlands globally could create $2–$9 trillion as net benefits over a 50-year period (or approximately $170 billion per year) when accounted for the value of public benefits alone (Ding et al 2017). Well-designed and planned restoration projects can also boost landscape productivity,

Table 1: Estimate of Labour Days Potential from Landscape Restoration in India

No	Degraded Spaces [A]	Area (in million hectare) [B]	Main States [C]	Restoration Intervention [D]	Restoration Activity [E]	Labour Days Per Hectare [F]	Number of Labour Days (in million) [G]
1	Land with dense scrub	7.40	Maharashtra (14%); Rajasthan (23%); Gujarat (12%)	Silvopasture	I, II, VI	37.7	279
2	Land with open scrub	9.96	Madhya Pradesh (14%); Maharashtra (12%); Rajasthan (17%)	Silvopasture	I, II, VI	37.7	375.5
3	Shifting cultivation–current jhum	0.39	Nagaland (25%); Odisha (22%); Mizoram (18%)	Agroforestry	II, III, IV, V	34.8	13.6
4	Shifting cultivation–abandoned jhum	0.46	Mizoram (22%); Arunachal Pradesh (26%); Odisha (18%)	Afforestation, Improved Fallow	I, II, III, IV, V	50.8	23.4
5	Underutilised/degraded forest (scrub dominated)	8.64	Madhya Pradesh (15%); Rajasthan (12%); Maharashtra (11%)	Reforestatio, Agroforestry	I, III, VI	30.1	260
6	Underutilised/degraded forest (agriculture)	2.17	Jammu and Kashmir (14%); Madhya Pradesh (16%); Telangana (14%)	Agroforestry, Improved fallows	I, III, IV, VI	34.5	74.9
7	Degraded pastures/grazing land	0.65	Uttarakhand (10%); Himachal Pradesh (10%); Rajasthan (49%)	Silvopasture	I, II, VI	37.7	24.5
8	Degraded land under plantation crop	0.035	Gujarat (24%); Haryana (14%); Jammu and Kashmir (16%)	Agroforestry, Silvopasture	I, IV, V	29.1	1
9	Mining wastelands	0.23	Karnataka (18%); Madhya Pradesh (16%); Tamil Nadu (14%)	Afforestation Rehabilitation	II, III, VI	28.8	6.6

[A] Categories of degraded spaces (categories, from here on) in India as per "Wasteland Atlas of India" (Department of Land Resources–Government of India 2019).
[B] Area under the different categories for 2015–16 as per "Wasteland Atlas of India" (Department of Land Resources–Government of India 2019).
[C] Top three states for each category; Value in '( )' indicates the percentage share of area in the corresponding state against each category for 2015–16 as per "Wasteland Atlas of India" (Department of Land Resources–Government of India 2019).
[D] Potential intervention that can be performed in each category as per Ministry of Water and Environment–Uganda (2016); Paudyal et al (2017); Stanturf et al (2017).
[E] The list of activities under each intervention (details of activities are mentioned in Annexure 1B) as per Ministry of Water and Environment–Uganda (2016); Paudyal et al (2017); Stanturf et al (2017).
[F] Labour days per hectareduring the restoration phase across interventions, or, summation of labour days per hectare against all interventions (details of labour days per hectare are mentioned in Annexure 1B).
[G] Conservative estimate of total number of labour days through restoration across each degraded by multiplying [B] and [F].

improving food and water security (Groot et al 2013), and improve climate change resilience by facilitating carbon sequestration (von Holle et al 2020).

Ecological restoration of natural landscapes and watersheds can help restore ecological processes, such as pollination, a critical service for food production apart from enriching and augmenting biodiversity. A richer biodiversity, containing insectivore birds and bats, for example, may control invertebrate pests, thereby providing pest control services. In addition, restoration-aided biodiversity enrichment may improve the prospects of the bioeconomy by increasing the yield and availability of bioresources (Groot et al 2013).

In this paper, we used the COVID-19 lockdown, the massive loss of employment and large-scale reverse migration from cities to the hinterland as an entry to interrogate the already economically distressed rural India's lack of employment opportunities except low-profit or loss-making farming, usually carried out in very small landholdings. Following that, we explored the employment potential based on data of restoration opportunity available in the public domain. Our initial analysis suggests the initiation of large-scale restoration-based activities in the areas identified as degraded lands, which would not only generate large scale employment benefits, but would also improve the biodiversity and help India reach its global targets, such as the Bonn Challenge 2030 and India's pledge to restore 26 million ha degraded land by 2030. Beyond providing economic opportunities for the distressed migrants with their own rural landscapes, our proposed restoration framework also offers ecological and social co-benefits, such as augmenting biodiversity, improving quality of rural environment and restoring dignity.

NOTES

1 John Hopkins University Coronavirus Resource Center, https://coronavirus.jhu.edu/map.html; data retrieved on 12 November 2020.

2 The UniCredit Economics Chartbook Quarterly, Macro Research (UniCredit Research 2020); https://go.nature.com/2UoUYWK.

3 The Integrated Food Security Phase Classification (IPC) is the international standard for classifying food insecurity and malnutrition. Phase 3 represents a crisis state of food insecurity, http://www.ipcinfo.org/.

4 Vyas (2000) does not distinguish between formal, informal and seasonal employment.

5 See Annexure 1A for disaggregated details.

6 Agricultural land (sq km)—India Food and Agriculture Organization, https://data.worldbank.org/indicator/AG.LND.AGRI.K2?end=2016&locations=IN&start=1961&view=chart.

7 Unlike countries, such as the US, there is limited to no input–output data for the restoration activities in India. The higher share of informal sector and the seasonal nature of employment might be reasons for their unavailability.

8 However, natural regeneration is considered as one of the most cost-effective restoration interventions for forest ecosystem, as labour seems to be the largest cost across all activities (Forest Landscape Restoration Opportunity Assessment for Uganda 2016).

9 While monitoring and maintenance is an important activity in restoration intervention creating significant employment, it has not been considered due to limited information and its dependence on project timeline, local property rights regime.

10 As noted earlier, "labour hours per activity" varies based on the choice of intervention, but with limited data availability across interventions, only one intervention has been considered.

11 Refer to Annexure 1B for details.

12 Summation of labour days employed in restoration activities across degraded spaces and extrapolated for the total area available (estimated in Column G of Table 1).

13 However, due to huge variation of minimum wages across sectors depending on the skill of the workers and geographical location, such estimation has been avoided, https://factly.in/explainer-the-complexity-around-minimum-wage-rates/.

14 The budget for the MGNREGA would be raised by ₹40,000 crore over and above the 2020–21 budget allocation of ₹61,500 crore (Palepu 2020).

15 Prime Minister Narendra Modi made the announcement on 9 September 2019, when he opened the ministerial segment of the 14th session of the Conference of the Parties (CoP) to the United Nations Convention to Combat Desertification in New Delhi, https://www.unccd.int/news-events/world-leaders-call-global-action-restore-degraded-land.

16 Therefore, the area available for restoration might reduce if we take open natural habitats into consideration.

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Annexure IA: Overview of Employment in India Pre- and Post-COVID-19

	Unemployment Rate (UNR)	Labour Participation Rate (LPR)	Employment Rate	Reason for Increased LPR/ Decreased UNR
March 2020	8.8%	41.9%	38.2%	
April 2020	23.5%	35.6%	27.2%	
May 2020	23.5%	38.2	29.2%	56% increase in year-on-year comparison of MGNREGS person-days. The 8-core index reversed from its sharp fall in April with a 30% increase in May over April
June 2020	11%	40.3	–	Doubling of MGNERGS employment and kharif sowing compared to previous year
July 2020	7.4%	40.7%	–	

Source: Vyas (2020).

Annexure 1B: Restoration Activities and Their Labour Requirement

No	Restoration Activity [A]	Labour Days Per Hectare [B]	Verification, if any [C]
I	Removal of invasive species	16	16.6–25 days/ha [a]
II	Site preparation	14.6	14 in the case of agriculture land preparation in Bihar [b]
III	Tree planting/seedling transplanting	7.1	–
IV	Interplanting	4.3	–
V	Pruning	8.8	–
VI	Fodder shrubs planting	7.1*	–

[A List of activities considered using Franzel (2005).
[B] Respective labour days per hectare taken from Franzel (2005).
[C] Labour day per hectare estimates in Indian context.
[a] Estimated using cost data from Babu et al (2009).
[b] Agriculture land preparation estimate taken from Baliyan and Kumar (2014).
* Assumed to be same as tree seed planting (III).