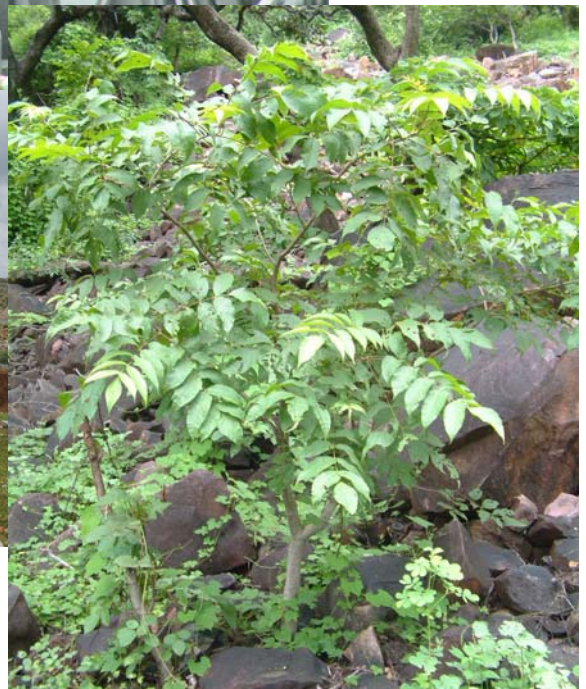


Options for interventions that mitigate social and environmental impacts of stone quarrying in Rajasthan: executive summary

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This report is an executive summary that integrates and presents the conclusions of three more detailed reports in the form of a concise statement of options for action. For more detailed justification for the recommendations set out here, please refer to the companion reports, comprising:

1. a systematic literature review of ecological restoration of sandstone quarry sites (Letheren, Healey and Sinclair, 2009);
2. a report on opportunities for ecological restoration of quarry sites around Kota, based on rapid biodiversity assessment in the area (Sinclair, Letheren and Healey, 2009);
3. a report on livelihood impacts of quarrying and restoration of quarry sites in Kota and Bundi districts, based on rapid rural appraisal (Ambrose-Oji, Riruyo and Sinclair, 2009).

These reports were, in turn, based on research by two MSc students at Bangor University Barnaby Letheren (ecological aspects) and Patrick Riruyo (social aspects) who were supervised by Dr John Healey and Dr Bianca Ambrose-Oji respectively. The students were supported in the field by three Indian field researchers: Pushpendra Jharwal and Upma Singh (botanical survey) and Manish Nagar (social survey) and through supervisory visits made to India by Dr Bianca Ambrose and Dr Fergus Sinclair during the fieldwork phase. Dr LK Dadhich and Dr Kapil Dev Sharma of the JDB College in Kota provided helpful local guidance on botanical and social aspects respectively. The MSc dissertations form part of the documentation that is passed on to the project sponsor, Marshalls plc, but they are written and submitted for assessment by the students. The data interpretation and views presented in the dissertations are, therefore, those of the student and not necessarily those of the University or the supervisory staff. They should not be used as a basis for action. In producing the three final reports listed above, supervisory staff have reformulated and reanalysed some of the data, resulting in modified interpretations and conclusions. These final reports represent outputs that can inform recommendations and have been used to underpin the suggestions set out in this report.

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1. CONTEXT

Sandstone quarry activity around Kota in Rajasthan is embedded within a landscape in which vegetation is heavily impacted by animal grazing and the collection of fodder and fuelwood, as essential elements of peoples' livelihoods. Human population density is relatively high considering the land productivity and people, whether or not they derive benefit from quarry employment, are heavily reliant on *de facto* common access to grazing areas and tree resources in the landscape. Quarrying uses land directly and attracts more people into the landscape, to benefit from the employment and other infrastructure associated with the quarry enterprises, exacerbating the human population pressure on land and vegetation.

The human population in the landscape comprises an ethnically complex mixture of stakeholder groups who have different relationships to the quarry locations and access to resources. There are settled and migrant communities, each of which can be further subdivided in terms of their access to land locally, and in the case of migrants, their place of origin (which may be elsewhere in Rajasthan, Madhaya Pradesh or Gujarat). The migrant community comprises short and long cycle migrants, while the settled community comprises long-time village residents and people who have more recently relocated from close-by villages or further afield.

There are regulations for the quarrying sector that stipulate soil storage from initial excavation and ecological restoration of quarry sites post excavation but they are not generally enforced. The state strategy in the quarry sector has been to increasingly allocate smaller scale quarry concessions but restoration work was more evident in the older, medium and large scale enterprises rather than the smaller scale extraction sites. Forestry-based restoration projects are undertaken in conjunction with the Government of Rajasthan Forest Department which is charged with extending the forest estate by planting new plantations or through reforestation and wasteland reclamation schemes. Under the Rajasthan State Forest Strategy there are annual targets, by district, that range from 10 000 to 100 000 trees to be planted. In Bundi and Kota districts these targets are met through collaborative working with quarry enterprises. Targets for tree planting are not sufficient for monitoring and evaluation of restoration efforts because survival rates may be low (see section on monitoring below).

2. OVERALL STRATEGY

It is clearly possible to make interventions that combine ecological restoration of quarry sites with enhancement of local livelihoods. More coherent and collective approaches to doing this within the quarry sector could undoubtedly have major positive impacts on the environment, economy and society of the region.

2.1 Scope

Quarry activity has a wide impact on people and the environment in Rajasthan and reaches into other states from which migrant workers are drawn. This means that corporate social and environmental responsibility needs to do the same. Restoring particular excavated sites, while important, has to be done within a broader framework of action to help develop a sustainable relationship between people and natural resources in the region. On a quick reconnaissance it appears, at least for quarries that Marshalls has particularly engaged with, that there has been considerable progress in provision of healthcare, schooling and other infrastructure around quarry sites. While this is commendable, it is associated with dangers of dependency developing on resources associated with short to medium term quarry enterprises and does nothing to address longer term livelihood and environmental sustainability. There is a need for investment in developing sustainable use of water, land and tree resources in the region appropriate for the high population pressures contributed to by quarrying activity. This calls for investment in:

- schemes to reclaim degraded land and vegetation within and beyond land directly affected by quarry activity and to develop sustainable management of the restored resources;
- better protection of existing wildlife reserves and protected forest areas to preserve examples of the natural vegetation of the area, and
- rainwater harvesting schemes to provide groundwater recharge, domestic and irrigation water.

It also calls for collective action across the quarry sector as well as individual initiatives and collaborative working with local and national government and the plethora of NGOs that have appropriate expertise and experience in the sector (specific government agencies and NGOs

are mentioned in respect of particular areas of expertise below). Because the quarry sector in Rajasthan is moving towards granting smaller concessions, support for restoration in the small scale quarry sector is vital.

2.2 Inclusion

Our rapid social assessments were focussed around a few typical quarry sites and, because of their timing and the composition of the interview team, were not able to reach as many women or migrants as would be desirable in the longer term, nor were we able access some key ethnic groups, notably tribals, such as the Gujars, due to the proximity of political unrest. This is an area that requires further investigation and action. If poorer migrants, disadvantaged caste groups, children and women, are to be a particular focus of attention, new partnership working is required with NGOs and researchers with specialist knowledge and understanding of these sections of the community. These groups are typically difficult to reach and to sustain engagement with, and this is exacerbated in the specific context of quarry working. If social mitigation measures are to focus on need, to link with restoration schemes, and to ensure that actions are sustainable rather than creating new dependencies or social exclusions, support from experienced organisations is needed. International development organisations with Indian branches such as Save the Children India, Oxfam India or Practical Action; national NGOs which have expertise that integrate social development, building institutions for the poor and the management of water and forest resources; and research institutions with experience of social inclusion in quarry and wasteland forest restoration schemes such as the Centre for Social Forestry and Eco-Rehabilitation, in Allahabad and members of the Indigenous People's Restoration Network such as ATREE in India would be helpful partners. Keeping a watch on the success in engaging with these vulnerable groups should be a key element of a monitoring and evaluation strategy for corporate social and environmental responsibility in the quarry sector.

2.3 Working at multiple time and spatial scales

Advocating a broad approach to resource development in the region, reaching out to disadvantaged groups on the margins of quarry activity and collective action across the industry, does not mean that there should not be immediate restoration activity on the local scale of currently active quarry sites. Indeed, getting on with what individual quarry firms can do at key sites in the short term, with their own resources, is vital to pump prime larger scale action. Successful engagement of local communities in establishment and sustainable

management of vegetation on quarry sites, or other degraded land nearby, can become important exemplars from which a community of practice can be developed. While there are a range of generalised techniques for restoration available from the literature and some specific proposals for ways forward in the specific context of Rajasthan (detailed in the ecology report), there are no well documented quarry restoration trials for the region from which replicable guidelines for cost-effective restoration can be obtained (see next section). Ensuring that there is baseline information against which to measure the performance of pilot projects and a scheme for their monitoring and evaluation is vital if they are to contribute to our understanding of what practical measures work well in what circumstances. Clearly, where there are opportunities to network pilot restoration projects across sites, opportunities for collective learning are increased. Investment in fora at which this sort of networking across the industry can take place is a high priority.

3. CONTEXT-SENSITIVE RESTORATION

Our rapid assessments have shown that both the social and natural environment vary considerably amongst quarry sites around Kota, so that a general prescription for restoration of either quarry sites or other degraded areas is not appropriate. What is required are context sensitive plans that are developed site-by-site to suit local conditions in terms of which stakeholder groups are present, what their priorities and preferences are in terms of restoration goals and the characteristics of the surrounding vegetation that helps predict what is likely to regenerate naturally and what may grow well at the particular site. Restoration is a process that needs to be planned and to start from the beginning of the quarry activity rather than be left until the end of the excavation cycle. All quarry sites should have an active restoration strategy in place. Where quarry activity is ongoing without an active restoration strategy then a restoration plan taking into account the stage of the excavation cycle that has been reached can and should be developed and implemented. Where there are a large number of small concessions in an area then a collective strategy taking a whole landscape and community approach is likely to be more workable than individual initiatives at each small quarry.

3.1 Tools to facilitate information gathering and restoration choices

Implementing a context sensitive approach to restoration requires a framework for making decisions on what actions to take at a specific site. Simple tools to facilitate asking the right

questions, conducting rapid botanical and social surveys, and, then selecting appropriate restoration choices, should be developed and deployed. Appropriate tools would involve codified checklists of questions and tabulated options mapped to the answers from the question checklist. These can be drawn up from the experience of the rapid survey work already completed in the region and then iteratively refined through deployment.

3.1.1 Accommodating multiple restoration goals

There may often be a need to set up more than one restoration effort to cater for the different requirements of stakeholder groups within the vicinity of the quarry. While there is a premium on consensus, where it can be reached amongst groups and result in a single initiative that can meet everyone's requirements, given the divergent livelihood strategies of different people in the area, we can anticipate that in many cases several different restoration efforts will be required with different species choices and governance models appropriate for the timescale and products desired.

3.1.2 Priorities for water, firewood and fodder

We should not, however, over stress divergence, there were clear priorities expressed in the social survey for water, firewood and fodder from restoration activity. These three requirements can be readily accommodated as restoration goals, although addressing rainwater harvesting and storage will often require development of water capture systems in other parts of the landscape than the quarry site itself (dependent upon the position of the quarry site in relation to the local topography). The Sector Review Report of Rajasthan, in the National Forest Action Programme identifies fuelwood and grazing resources as important and shows that over the state as a whole in 2006 there was a shortfall in the supply of fuelwood of 2 Mt predicted to rise to 7 Mt by 2016, and a fodder gap in 2006 of 20 Mt predicted to rise to 22 Mt by 2016. Species choices for firewood and fodder are set out in the companion ecology report and a combination of fast growing exotics with coppicing or pollarding ability for harvest early on and slower growing native or naturalised species for longevity would be recommended (see below).

3.1.3 Water within the landscape

Water is clearly a critical resource in the dry context of Rajasthan and at a specific quarry site the excavated area may represent a store of water that people access, it may also represent a hazard for health and safety. This means that a water inventory is required at a landscape scale, as part of the restoration planning process. It would be good practice for this to be done

at the onset of quarry activity so that adequate water resources are developed to cater for the population in the vicinity of the quarry, including any likely increase due to the quarry attracting people to the site. Where quarry activity is already ongoing or close to termination, plans to develop water resources should anticipate likely population projections.

While in some circumstances developing water storage in the excavated site may be appropriate, it is more likely that other parts of the landscape will be more effective for rainwater harvesting. This will depend upon the lie of the land and the location of housing and agricultural fields where domestic and irrigation water are required. In many landscapes in Rajasthan there may already be ancient water storage features, such as *johads*, that can be rehabilitated as part of a water development and site restoration strategy (see ecology report for details), with soil from dredging the *johad* being transported to the quarry site and used as topsoil. Clearly such activity needs to be costed on a site by site basis.

3.1.4 Trees within the landscape

Immediate conservation priorities lie in better protection of existing wildlife reserves and protected forest areas and it would be appropriate for quarry companies to contribute to this. There are clear opportunities for this not only to contribute to conserving the biodiversity of the area but also associate companies with positive landscape features and outcomes that, as tourism develops in the region, a lot people may visit. Association with flagship conservation projects and areas, would provide opportunities for positive public engagement. Support for the reserves themselves and the underpinning science to understand and manage natural vegetation in the area, would be of direct relevance to developing and maintaining functioning landscapes in the region.

The restoration goals in the vicinity of quarry sites will necessarily focus on site restoration (including on degraded land in the quarry landscape not necessarily directly affected by excavation), and meeting livelihood needs. These imperatives, the variation in botanical composition of surrounding vegetation and the participation of local stakeholder groups (see next section) in species choice, will result in different species mixtures developing in different restoration efforts. However, there are some general principles that should be followed in deciding on which species are promoted. Firstly, a risk assessment in terms of invasive species should be done. This should consider both invasive species in the surrounding landscape and the invasive potential of any species that are introduced through seeding or transplanting.

Where species with invasive potential are used, and this may be desirable in early phases of site reclamation, then clear strategies for containment and control should be in place. Other general principles that should be followed include the use of native and naturalised species over exotics where practicable (for example planting the native *Prosopis cineraria* rather than the naturalised *Prosopis juliflora*) and the inclusion of long lived native timber species such as *Tecomella undulata* and trees with long held cultural values such as *Ficus bengalensis* that are likely to be maintained in the landscape by people once they are established. These trees should be included in mixtures with fast growing firewood and fodder species to provide the basis for sustainable forest cover into the future. Fast growing firewood and fodder species should be screened, not only for their invasive potential, but also for their water use characteristics. Some fast growing trees, notably eucalypt species, may have profound impacts on water availability in the medium term and should generally be avoided. There is an opportunity to explore pilot projects on biofuel production as a restoration strategy associated with the network on *Jatropha* and *Pongamia* co-ordinated by ICRISAT (see ecology report). Caution is required here, while there is potential for biodiesel production that is not competitive with food production, as part of reclamation strategies, there is considerable controversy surrounding the biofuel sector. Pilot projects that contribute to the understanding of options for the use of biofuel crops in quarry restoration would be appropriate, large scale implementation at this stage would be risky.

3.2 Governance models and participation

The greatest concern that local people had about restoration projects in our survey, was who would have access to the tree and grazing resources that would be developed through the restoration effort. This places the development of appropriate governance models at the heart of restoration efforts. Since it is people who impact most on vegetation in the area, restoration efforts without agreed local governance are unlikely to be effective. The development of inclusive restoration options should draw on the experience of Joint Forest Management in Rajasthan, as well as on the successes and limitations of current community involvement in restoration projects and previous tree planting work sponsored by Marshalls. There is a need to work with the relevant local government agencies and NGO players with experience of successful community participation (e.g. BAIF Institute for Rural Development in Bundi). The best partners will vary according to site, the key is a track record of successful participation with key target groups. Potential risks should be considered and monitored, such as the regulation

of resources by the Forestry Department reducing access, the 'capture' of access to resources by elites and the better-off sections of society, and even potential conflict around grazing rights.

3.2.1 Participation at different stages of restoration projects

Restoration projects involving development of water resources and tree establishment will follow five key phases (with some overlap in time): planning; nursery production of seedlings; site preparation and planting; management of growing vegetation and its utilisation, and monitoring and evaluation. In general, the participation of the local communities within the context of the governance model in all these stages is desirable but it is most critical in the planning and management phases. While there may be opportunities for employment of people from target groups in the site preparation and planting phase, nursery production is already efficiently done within the forestry sector and if they can be contracted or partner, to produce seedlings of the species that are wanted, then it is unlikely to be cost effective to set up community nurseries. Niches for nursery development may arise where particular species that are difficult to propagate are required. Monitoring and evaluation is discussed in the next section.

3.3 Monitoring and evaluation

It is critical that restoration efforts and landscape function as a whole are monitored so that the impact of quarrying and the mitigation steps taken can be understood and reported. There is a need to monitor impacts on both the environment and livelihoods. A participatory approach is recommended where stakeholder groups set out what they consider appropriate indicators of landscape and livelihood function and agreed means to measure these are then drawn up and implemented. It is critical that a baseline is established at the outset and that other drivers impinging on indicators, beyond the control of the restoration projects and quarry activity, are recognised (e.g. climate change, underlying population growth). Where measurement of indicators is done in a participatory manner using labour and expertise from local communities then it is necessary to adequately remunerate people for their efforts and to ensure quality control by the appointment of an independent consultant who can ensure credibility of the monitoring and evaluation strategy. Independence here needs to be in relation to both the local communities involved and the quarry company. As highlighted above, there is need to specifically monitor impacts on vulnerable groups.

4. SUMMARY OF KEY ACTIONS

Here, some key steps that should be taken to develop an integrated landscape and community scale approach to site restoration and livelihood enhancement are summarised.

1. Engage appropriate international and national partners (see details above) to fill knowledge gaps especially regarding vulnerable groups that are difficult to access.
2. Try to develop an industry wide forum on landscape restoration and livelihood support in the region. The first step could be a regional workshop in Rajasthan. Employ an independent consultant to set up this process in collaboration with local, regional, national and international organisations active in India (details of these organisations are above and in the companion reports).
3. Develop tools to facilitate context sensitive design of restoration strategies as outlined above.
4. Start restoration efforts associated with active quarries that supply stone to Marshalls – using the tools mentioned above (this will involve local level stakeholder workshops at quarry sites). These restoration efforts will focus on water, fuelwood and fodder resources. Ensure that this activity encompasses a landscape scale approach and includes small scale quarries as well as the one or two large quarries that have been the focus of efforts in the past.
5. Pilot projects that combine rainwater harvesting with sustainable tree establishment and management should be a priority since we know this addresses locally perceived issues. Establishing a network of pilot projects that can serve as a community of practice to inform future efforts should be a priority.
6. Ensure that baseline information on key environmental and livelihood indicators are collected at the outset and that a monitoring and evaluation strategy overseen by an independent consultant is in place for each restoration project or suite of connected projects as appropriate.
7. Invest in wildlife reserves and protected forest areas in the region to contribute to the highest habitat and species conservation priorities in the region.