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## Need for targeted education programme for preparedness and formulating adaptive strategies in the Indian Himalayan region

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*The Indian Himalaya continues to face increasing anthropogenic stressors despite numerous conservation actions. Further, climate change has the potential to negatively affect this biodiversity rich region. To counteract the changing climatic variables, targeted education programmes could act as a strategy and assist in protecting the floral/faunal species requiring urgent intervention, and benefit communities and ecosystems at large.*

With the accelerating anthropogenic stressors on ecosystems and changing climatic variations, including extreme events, the importance of developing innovative and more pragmatic approaches to deal with these threats is widely acknowledged<sup>1</sup>. The need to responsibly inform the society about current status of the environmental challenges<sup>2-4</sup> through a range of resources such as print and electronic media<sup>4</sup>, broadly grouped under targeted education programmes<sup>5,6</sup>, is also felt by the governments and policy makers.

Targeted education programmes<sup>5</sup> have the potential to act as a tool for awareness and adaptive capacity building, enhance the process of shaping human behaviour for a positive response<sup>7,8</sup> and empower people to behave more responsibly<sup>6</sup>. Awareness on climate sensitivity of an endangered species could help construct a positive association with that species<sup>9</sup> and ultimately benefit the species and the overall protection and conservation of ecosystems<sup>10</sup>. For instance, local communities resolving to abstain from hunting tragopan (*Tragopan blythii*) in Khonoma Tragopan Sanctuary, Nagaland, and the protection of riverine biodiversity by the villagers of Kanalsi, Haryana<sup>11</sup> have helped in the conservation of these species. These community-based approaches set a good example of what is achievable with persuasive seriousness. More importantly, knowledge of

local stakeholders about species and their habitats could be helpful in formulating appropriate area-specific management strategies and in mitigating negative human-wildlife interactions<sup>1</sup>.

There is also recognition of targeted educational programmes and their importance<sup>12,13</sup> among a number of reputed organizations in India such as the Ganges River Dolphin Conservation; the International Snow Leopard Trust; WWF-India; the Wildlife Institute of India; Centre for Environment Education; C.P.R. Environmental Education Centre and the Nature Conservation Foundation, who have successfully conducted community awareness programmes.

Despite these potential benefits to the society, educating citizens outside the scientific community in ways that can assist them in becoming well-informed citizens<sup>14</sup> is perhaps a big challenge. There is a limited understanding of a measurable impact of education among citizens on species conservation<sup>15</sup> due to the lack of environmentally conscious behaviour<sup>16</sup>, despite having a good understanding of a particular species. Additionally, the implementation of effective educational programmes is sometimes negatively influenced by group size and demography of target audience<sup>17,18</sup>.

It is not surprising that there is often an inadequacy in the design of programmes oriented for spreading conser-

vation education among the local communities, especially in remote parts of India such as the Himalaya. Most of the community-based initiatives lack clarity of objective, time frame and expected outcomes. Community targeted initiatives through workshops of short duration from one to a few days of field training invariably leave limited impact on local communities. As most programmes are project based with limited funding and duration, there is scarcity of long-term monitoring of implemented initiatives posing serious sustainability issues.

There are numerous strategies which could be utilized to overcome the challenges associated with targeted educational programmes. To begin with, such programmes should be addressed in the national curriculum at the school level, where more focused information should be provided to students regarding ecosystem and its services. The current environmental science course across India needs to be revised and up-scaled to nurture interest among graduates. This is especially vital due to the increasing anthropogenic threats faced by key biodiversity hotspots of India, including the Indian Himalayan region.

There is a growing pressure in the Indian Himalayan region due to increasing population and rapid urbanization, unsustainable exploitation of natural

resources and pollution from point and non-point sources<sup>19</sup>. Numerous existing and proposed barrages and dams have greatly modified the flow of perennial rivers and have affected millions of local people<sup>20</sup>. Construction of roads near rivers resulting in siltation, illegal sand and boulder mining, destructive fishing practices and unscientific introduction of invasive fish species have created havoc for the rivers here<sup>19,21</sup>. The demand for agricultural land, fodder and fuel wood, and resulting forest fires has degraded vast patches of forests and riparian habitats<sup>21</sup>. Threats from poaching of wildlife species, retaliatory killings of wild mammals and competitive exclusion of wild ungulates by increasing domestic livestock are further taking a toll<sup>22</sup>. Unregulated tourism is another major stressor which continues to aggravate the above-mentioned threats. India's greenhouse gas emission continues to increase<sup>23</sup> despite the best practices and efforts of policy planners to reduce such emission. The conservation of degrading ecosystems and threatened species has now become a national priority in the wake of the changing climatic variables.

It is widely acknowledged that the outcome of any targeted education programme depends on the assistance of local communities, and for an educational initiative to be successful it has to be in the context of long-term local benefits, climate change vulnerabilities and potential adaptive strategies. Personal communications with non-governmental organizations have revealed non-availability of conservation funds for such an approach. There is a general criticism of a lack of long-term monitoring opportunities for completed projects and programmes which only target 'charismatic' floral/faunal species rather than multiple species. Reluctance among policy planners to involve local stakeholders in conservation approaches also constrains the conservation efforts.

These concerns have now been partly addressed by the Ministry of Environment, Forest and Climate Change (MoEF&CC) under the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) schemes. Recently, a respectable amount of money has been allocated to the Wildlife Insti-

tute of India (WII) for the protection and conservation of the critically endangered Great Indian bustard (*Ardeotis nigriceps*), the endangered sangai deer (*Rucervus eldii*), the vulnerable dugong (*Dugong dugon*) and the endangered Gangetic dolphin (*Platanista gangetica gangetica*) through local stakeholder involvement. Nature education is an important component of this species recovery programme. The State Departments of Education and Forests can further assist in this initiative and allocate funds for additional species conservation on similar lines.

The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is a programme under the National Action Plan on Climate Change (NAPCC) and one of the lead projects that is being implemented by WII. This project aims to understand the complex processes affecting the Himalayan ecosystem due to climate change and evolve suitable management and policy measures for sustaining and safeguarding Indian Himalayan species, ecosystems and communities. Mitigation and adaptation strategies propagated through targeted educational programmes among the most vulnerable communities and long-term ecological monitoring are few of the many targeted outputs of this project.

The 'Wildlife Watch' citizen science initiatives launched under this project aims to educate and spread awareness regarding ecologically and socio-economically important floral/faunal species among citizens. Presently 13 species from the various taxonomic groups have been selected under this initiative. These are positive steps which could potentially benefit local communities and the ecosystem at large.

One can always argue that the assessment of the effectiveness of targeted education programmes and their benefits might take years, if not decades in remote mountain areas such as the Himalaya. However, the authors believe that the effective planning and execution of targeted education programmes will have potential long-term ecological benefits of ensuring awareness among public of the issues and opportunities surrounding their ecosystems<sup>17</sup>. At the same time such programmes would also provide an opportunity to assist in the protection and

conservation of the fragile Indian Himalayan region.

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