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The cost of invasive species bears heavy on Indian economy, finds study

by Sahana Ghosh on 3 May 2022

- *India has lost \$127.3 billion (Rs. 8.3 trillion) in the last 60 years to invasive alien species, making the South Asian nation the second most invasion-cost bearing country after the United States, a study has said.*
- *The costs incurred to the Indian economy across multiple sectors are available only for 3% of the known invasive species and unavailable, masked or underrepresented for the rest 97% of invasive species in India.*

- *The analysis shows that in India, as much as 35% of all costs are caused by animals, 15% by plants, 1% by fungi and bacteria, and the rest attributed to diverse or unspecified species.*
- *Researchers say that simple tweaks to national policies and setting up institutions to exclusively deal with invasive species as a biosecurity issues, both from research and management perspectives, would go a long way.*

As many as 10 invasive alien species (IAS), out of 330 that are known to be invasive in India, have cost the economy \$127.3 billion (Rs. 8.3 trillion) in the last 60 years, according to a recent analysis that points to glaring knowledge gaps in costs incurred by these species to the Indian economy.

As many as 330 species are declared invasive out of more than 2,000 alien species in India and the costs of \$127.3 billion as documented in the study (<https://link.springer.com/article/10.1007/s10530-022-02780-z>) comes from only 10 of these 330 species, making India the second topmost invasion-cost bearing country after the United States. These costs are likely to be a "gross underrepresentation" of the actual costs based on the authors' global analysis (https://www.researchgate.net/publication/349964574_Global_economic_costs_of_aquatic_invasive_alien_species_of_112_countries).

"The negative economic impacts are documented and available only for 3% of the known invasive species and unavailable/masked/underrepresented for the rest 97% of invasive species in India. That's a huge knowledge gap," evolutionary biologist and study lead author Alok Bang told Mongabay-India. For comparison, the annual budget of India's environment ministry is currently \$0.4 billion.

The costs of IAS in India are severely underestimated — by anywhere between 20 and 10,000 times less — compared to what

would be expected considering all other countries with invasion costs. "Based on this global analysis, going by India's GDP, we must have spent about \$3.4 trillion on invasive species in the last six decades; going by India's population, we must have spent about \$1,700 trillion in the last six decades," Bang elaborated, referring to the link between the human population and the GDP of a country with the invasion costs borne by that country. Highly-fragmented data and wide knowledge gaps, which contribute to the underestimated costs, mainly arise because many invasive species, regions and affected sectors are underrepresented. The costs were pooled from Google Scholar for peer-reviewed literature and Google Search for popular articles, news items and official documents, and through dialogue with 20 researchers and stakeholders across the country who have been working on invasive species.

Semi-aquatic and aquatic species cause heavy monetary burden

The analysis finds that invasions by semi-aquatic and aquatic taxa have been causing a greater monetary burden to the economy compared to taxa inhabiting terrestrial ecosystems. The semi-aquatic costs were driven solely by a single species, the yellow fever mosquito, reflecting the substantial human healthcare costs associated with this taxon, the authors note in the study.

While there are synergies in tackling the spread of invasives with climate action, the authors bat for simple tweaks in national policies. For example, the need to include certification, quarantine, post-entry monitoring and early response programmes in national policies and guiding principles.

"The development of protocols of impact risk assessment is essential because it assists in

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(<https://india.mongabay.com/2021/04/exotic-animal-trade-carries-risks-of-disease-outbreak-and-introduction-of-invasive-species/>)

classifying species based on different risk categories, from low to high risk of invasion, as has been practiced in island nations such as Australia and New Zealand," said Bang.

Adopting a 'whitelist' approach to import any living species—every non-native species is considered potentially dangerous till proved to be safe by a risk profiling—as in effect in the island nations is more stringent and hence more effective in controlling potential invasions, it is also more logical as the assessment would need to be done only for species considered for the industry.

"In contrast, the more widely implemented approach of a 'blacklist', wherein every species is acceptable for import unless specifically banned, relies on scientists needing to prove that a species is problematic, with all the associated caveats when it would go against economic pressure," Bang added.

Nitya Mohanty, who has studied the spread of the Indian subcontinent-native Indian bullfrog (*Hoplobatrachus tigerinus*) and spotted deer, to the Andaman islands, and was not associated with the study, says assigning monetary value to the damages incurred through invasive species helps in drawing comparisons because invasions are complex processes affecting local livelihoods and

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ecosystems.

For example, *Lantana camara*, a tropical American shrub with pretty flowers is considered one of the top 10 worst invasive species by the IUCN; escaping manicured gardens it has stealthily made its home in India since its introduction (<https://ecologicalprocesses.springeropen.com/articles/10.1186/s13717-021-00354-w>) in 1809 with an estimated cost of \$70 per hectare for its control. Spreading across forests, agricultural fields, fallow areas and roadsides, it competes (<https://india.mongabay.com/2020/08/lantana-invasion-threatens-40-percent-of-indias-tiger-habitat-reports-study/>) with native plants for space and resources, and also alters the nutrient cycle in the soil. This invasion has resulted in the scarcity of native forage plants for wild herbivores; it has invaded more than 40% (<https://india.mongabay.com/2020/08/lantana-invasion-threatens-40-percent-of-indias-tiger-habitat-reports-study/>) of India's tiger range.



Lantana camara, a tropical American shrub with pretty flowers is considered one of the top 10 worst invasive species by the IUCN. Photo by Narayana Swamy Subbraman/Mongabay.

"Standardising and assigning a value across such diverse types of impact across different ecosystems, makes it useful for policies. India doesn't spend a lot on managing invasive species overall. There are some specific programs like the *Lantana camara* management or *Parthenium* management in some forests," Mohanty told Mongabay-India, stressing on investing in institutions that can sustain long-term research and long-term management-oriented research and on a nodal institution on biosecurity.

"If we have a nodal institution on biosecurity then that that can coordinate efforts between research, ongoing management, using that management to create feedback, because management strategies for invasive species generally need to be dynamic. You may need to revise your plans based on research and so on. So, I think investing in institutions that are responsible for biosecurity overall, as in other countries, rather than focusing on just single

species, can mitigate the challenges with invasives," Mohanty added.

Policymakers will take note of the analysis because it shows the magnitude of the cost burden on India from invasive species and it will also encourage researchers to go for economic impact valuations for invasives, says T.V. Sajeev, the national focal point (technical) for the Asia-Pacific Forest Invasive Species Network (APFISN), who was not associated with the study.

"We have been waiting for this kind of analysis. When it comes to allocating funding to a variety of actions, policymakers have to prioritize and assigning a monetary value to the problem of invasives will help them allocate adequate funding to management actions," Sajeev, Senior Principal Scientist, Kerala Forest Research Institute (KFRI), told Mongabay-India.

Silent impacts and knowledge gaps

The authors raise concern over the "unexplored and silent impact" of invasive species in central India, east India and northeast India's biodiversity-rich regions for which not even a single cost report is available.

"More than 99% of costs are reported at the country level. Reporting the cost at the country level is useful, as a preliminary statistic, but useless if one wants to devise a management plan. Out of less than 1% of costs that are reported at specific sites/regions within India, are reported only in south, west and north India," Bang at the Society for Ecology Evolution and Development, Wardha, said.

The authors reckon that western and southern India's ties to travel, trade, and commerce – providing opportunities for IAS to hitch a ride

into the country — may be a contributor to the 1% regional costs. "Alien species might arrive in India via these two regions and then spread in the rest of the country, causing maximum damages first here, and then as a delayed response in other regions of the country after spreading," Bang elaborated.

The analysis shows that in India, as much as 35% of all costs are caused by animals, 15% by plants, 1% by fungi and bacteria, and the rest attributed to diverse/unspecified species-trends that are quite unusual when compared to the global cost distribution.

"All animal costs were caused by insects. Not a single mammal, bird, fish, reptile or amphibian species, or none of the spiders, worms, crabs, snails and other gastropods are represented in these costs. Although the number of invasive plant species (173 species) outnumber invasive animals (157 species) in India's invasive species list, the cost of invasive plants was 1,000 times less compared to invasive animals," said Bang.

As for the sectors impacted by IAS, more than 99% of costs are attributed to multiple sectors without a proper break-up. Among the 1% costs which specify afflicted sectors, most costs come from anthropocentric sectors such as fisheries, agriculture, health, social welfare, and administration. The costs related to forests and other non-anthropocentric ecosystems are almost absent. Because of these knowledge gaps, one can't be sure "who the worst offenders are in terms of their economic impacts and the geographic regions where they are causing maximum economic offense and the ecosystems that require urgent attention."

T.V. Sajeev says the analysis serves as a stepping stone for scaling-up research on the levels of impacts by invasives in India.

"Invasive species have cascading impacts on an ecosystem- they can displace native species and this can lead to human-wildlife conflicts. So we need to assess the levels of this kind of cascading impacts as well," he added.

Vernacular data of invasive species

Complicating the issue of reporting invasive species is India's linguistic diversity.

The authors scoured sources published in English for the study although there were two published cost sources in Hindi, but they had to be omitted from the final analysis because both were newspaper reports and their reliability could not be confirmed.



Prosopis juliflora is one of the most silent invaders that has spread across the country. Photo by P. Jeganathan/Wikimedia Commons.

"In a linguistically diverse country like India, even if the costs are available, they might be in regional languages, which is difficult to search online. Moreover, with the lack of appropriate search terms for "invasive species", "biological invasions" or common names of invasive species in regional

languages, it becomes even more difficult to search for relevant cost sources. For example, in Hindi, if you carry a search with *आक्रामक विदेशी प्रजातियाँ* as a synonymous search term for invasive alien species, nothing relevant comes up. Even more difficult to find search terms in regional languages," he added.

To leverage India's linguistic diversity to properly report invasives, Bang suggests coining vernacular words of common terms in invasion ecology and their universal usage in vernacular language reportage.

Climate change and spread of invasive species

While an economic lens is applied to measure climate impacts, the same treatment for taking stock of the impacts of invasive species is still underexplored. With *Aedes* mosquitoes causing some of the world's most deadly diseases, for example, the focus has always been on the effect (health) than on the cause (invasive species). The dialogue on fall armyworm (*Spodoptera frugiperda*) is centred on an agricultural perspective, but not as an invasive species problem.

Additionally, the effects of climate change are more tangible than invasive species and both issues are often lumped together.

"The effects (of invasive species) are not less in magnitude, but less in intensity, which is why maybe less explored. Climate change and global warming are the biggest calamities, no doubt, but people forget that there are other environmental concerns too, that are distinct from the climate crisis. The climate crisis is, in turn, driving the biodiversity extinction crisis, but there are other drivers of the biodiversity crisis, such as invasive species, deforestation, pollution, desertification, etc. Using climate crisis as an umbrella term for all environmental crises is neither useful nor effective," points

out Alok Bang.



A fall armyworm moth. Photo by Andy Reago and Chrissy McClarren/Wikimedia Commons.

However, synergies do exist between climate action and tackling the spread of invasives. "One of the main reasons why invasive species can spread so fast to foreign lands is planetary warming. Places that were cut off for certain species from occupying them because those places were inhospitable are now becoming hospitable due to a change in the climate. So, any action on the climate crisis will inadvertently also help the problem of invasive species. On the other hand, tackling the problem of invasive species will help in arresting the climate crisis as well. Tackling invasive species will help in retaining/creating more resilient ecosystems that can help stagger the effects of climate crisis," Bang elaborated.

While COP15, the UN Biodiversity Conference, seeks to finalise a post-2020 global biodiversity framework and goals, and the Convention on Biological Diversity (CBD) has had a strong emphasis on invasive species, more teeth is needed to implement actions

centred on invasive species. "In the era of liberalisation, many national economic policies are formed or influenced by international agencies such as the World Trade Organization. Many of their policies are in direct conflict with the policies of the CBD, such as the unrestricted movement of international goods, which also aid biological invasions. In such conflicting policy matters, more clarity and strength by the CBD would be welcome," Bang added.

Banner image: *Aedes aegypti* in Dar es Salaam, Tanzania. Photo (https://en.wikipedia.org/wiki/File:Aedes_aegypti.jpg) by Muhammad Mahdi Karim/Wikimedia Commons.

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