



## **The Smart Infrastructure Planner**

Mapping and Quantifying Infrastructure-related Risk to Habitat

**Project Objective:** To improve the capacity and tools available to land use planning departments and development banks to evaluate the impacts of potential land uses on wildlife habitat and ecosystem services.

### **Background**

Infrastructure and other resource extraction projects financed by development banks, private financial institutions, and governments have often resulted in harm to critical wildlife habitats and ecosystem services. Many wildlife species, like tigers, orang utans and large hornbills are indicators of intact ecosystems that also sustain ecological services such as provision of clean water and air, and stable soils. These ecological services underpin national and regional development aspirations, and support the lives and livelihoods of billions of people.



**Figure 1. Roads and mines, among other infrastructure types, negatively impact species habitat throughout Asia.**

The Smart Infrastructure Planner, a GIS toolkit, allows GIS practitioners in development banks and land use planning departments to evaluate the compatibility of proposed economic developments with essential requirements for the conservation of wildlife and their habitat in a landscape context, and mitigate adverse impacts, especially through Smart Green Infrastructure designs.

Although originally designed for tigers, the Smart Infrastructure Planner can be used for endangered wildlife species, suites of species, or habitat types for better management and conservation of biodiversity, sustainability of important ecological services, and long-term viability of economic investments in development projects. The tool helps planners map and assess impacts to habitat from existing infrastructure and proposed development projects; while also highlighting individual projects' level of risk to the conservation target, with mitigation recommendations provided.

The complete software package will:

- 1) provide government planning departments, development banks and private financing institutions, with a science-based tool to evaluate the cumulative impact of a suite of projects or sector plan on landscapes, including important wildlife populations, habitat, and ecological services;
- 2) provide guidance to countries and financial institutions to make development projects "green and smart" by incorporating appropriate mitigation measures aligned to their safeguard policies;
- 3) make projects more sustainable and viable because of conservation of the environmental parameters that underpin and support the projects through ecosystem services;
- 4) help governments incorporate conservation priorities into national economic development, individual sector plans and land-use plans.

### **Work Completed (June 2009 to May 2012)**

The World Wildlife Fund has completed the following work to date: (1) developed methods in GIS to evaluate the impacts of land use proposals on tiger landscapes, to make this tool transferable across landscapes and created a user guide to accompany dissemination of the tool; (2) tested these methods in five pilot landscapes, in the Nilgiris in southwest India; in the Dry Forest/Annamites landscape of eastern Cambodia, southern Laos, and adjacent parts of Vietnam; in the Dawna-Tenasserims landscape in southern Thailand on the border of Myanmar (Burma); and in Sumatra in both the Tesso-Nilo and Bukit Barisan Selatan landscapes (3) conducted stakeholder workshops for the Sumatran landscapes and in the Nilgiris and Dry Forest/Annamites landscapes.

## Smart Infrastructure Planner Details

Although there are many habitat modeling methods available, there are few tools that can answer further questions about changes in a landscape from one time step to the next. The Smart Infrastructure Planner aims to *quantify* change and risk to habitat as a result of all planned infrastructure in the landscape.

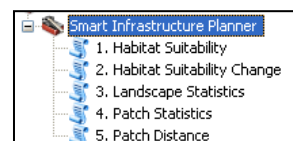


Figure 2. The toolbox, as seen in ArcGIS 10.

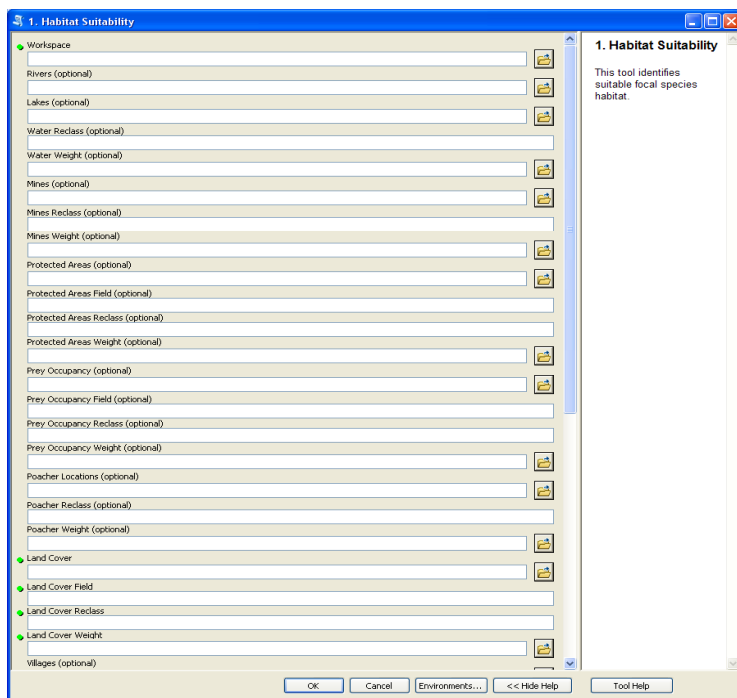


Figure 3. The interface of the Habitat Suitability Tool.

The Smart Infrastructure Planner is compatible with ArcGIS versions 10 and 9.3 (Figures 2 and 3). Required inputs include minor and major roads, towns and cities and land cover. Water sources, mines, villages, prey occupancy, poacher locations and protected areas are optional inputs. The user is required to score layers according to habitat quality, and provide a minimum area for the target being assessed that is consistent with ecological requirements or conservation goals. Outputs include habitat quality maps that represent current habitat quality, future habitat quality with the addition of new infrastructure, and habitat quality change between the current and future scenarios. These maps allow the user to examine the distribution of ‘good’, ‘moderate’ and ‘poor’ habitat in both scenarios. Statistics produced by this tool include total habitat area, number of core areas, size of core areas, and number of connected patches (within a maximum dispersal distance).

By assessing and comparing landscape characteristics between two time steps, users can determine whether use of the landscape by the focal species will change post-infrastructure development. If the user provides a landscape zonation map as an input, he/she will also receive an output map of infrastructure projects and landscape units by the level of risk imposed, as well as mitigation recommendations aimed at minimizing negative impacts on habitat. These are based on the project’s location in the landscape and the type of infrastructure or land use (Figure 4).

## Next Steps

- Complete portion of tool that enables user to assess infrastructure project risk and see mitigation recommendations based on type and position in the landscape
- Extend user group to those without extensive GIS training such as government land use planning and infrastructure development departments, development banks, and private financial institutions.
- Create a geowiki where new data can be uploaded for analysis. This will help consolidate planning data often located at disparate sources.

