THE ECOSYSTEM BENEFIT INDEX

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Pretoria
October 2019

CONSERVATION INTERNATIONAL

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OUTLINE

- Introduction
- Data and methods
- Scenarios and applications
- Discussion and conclusion

INTRODUCTION

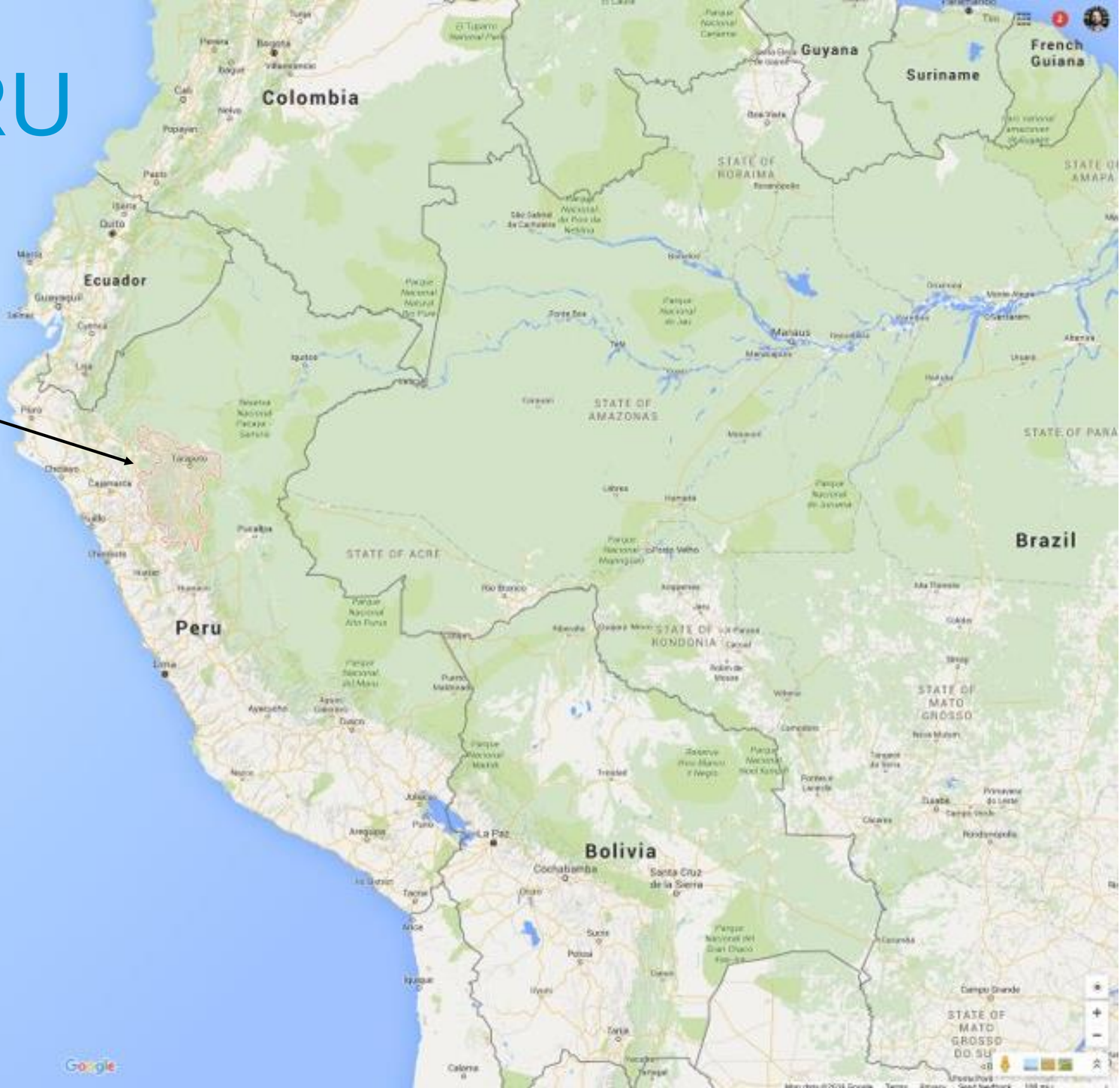
- The objective of this presentation is to present an in-depth review of the Ecosystem Benefit Index (EBI)

- The EBI is a spatially explicit tool that maps the relative benefit that ecosystem provide within San Martin, based on the information generated in the Ecosystem Account

- The combination of benefits and importance of those benefits within the EBI is determine based on the stakeholders involved and the policy objectives that will be achieved

SAN MARTIN, PERU

- San Martin is a department located in Northern Peru
- Sitting at the interface of the Andes Mountains and the Amazon Rainforest it is a hotspot of biodiversity
- There are a mix of people and industries in San Martin that are highly dependent on nature



DATA AND METHODS

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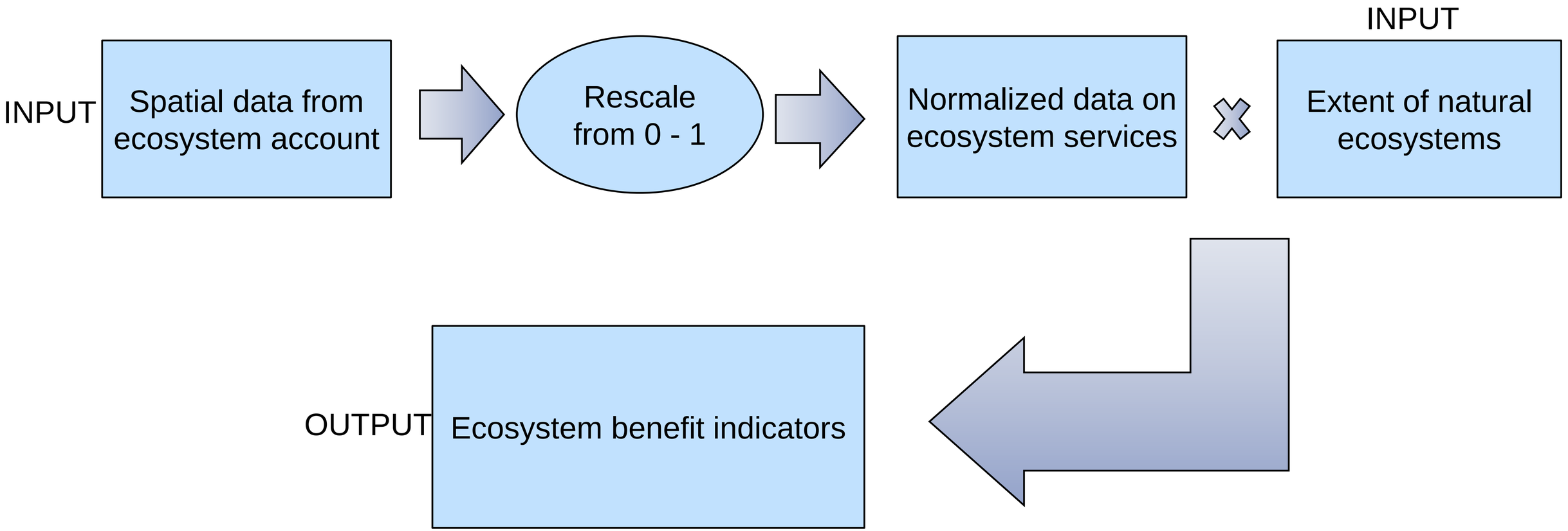
THE BENEFITS INCLUDED IN THE EBI

Key indicator	Measured benefit
Loss of natural ecosystems	Places with the highest forest type loss provide most benefits.
Intactness	Least fragmented in configuration of forest cover provides most benefits.
Biodiversity composition	Most unique places of biodiversity composition provide most benefits.
Threatened species	Globally important sites for threatened species provide most benefits.
Water stress	Places of highest water dependence with least water yield provide most benefits.
Water balance	Places of highest water yield/potential provide most benefits.
Prevention of erosion	Places where natural ecosystems prevent erosion have the highest value
Carbon density (climate regulation)	Places with the highest carbon density values provide most benefits.
Location of sites for ecotourism	Presence of sites used for ecotourism provides most benefits.
Firewood provision	Places where people collect the most firewood from provide the most benefits

DEVELOPING THE BENEFIT INDICATORS

- Each indicator in the EBI represents the relative distribution of ecosystem service benefit across San Martin
- Each indicator was rescaled from 0 to 1 using a linear function
- The indicators are masked to the natural ecosystem extent in 2013
- Higher values represent areas that generate greater benefits; and therefore would be lost in a given cell was converted

DEVELOPING THE INDICATORS: DIAGRAM



DESCRIPTION OF INDICATORS

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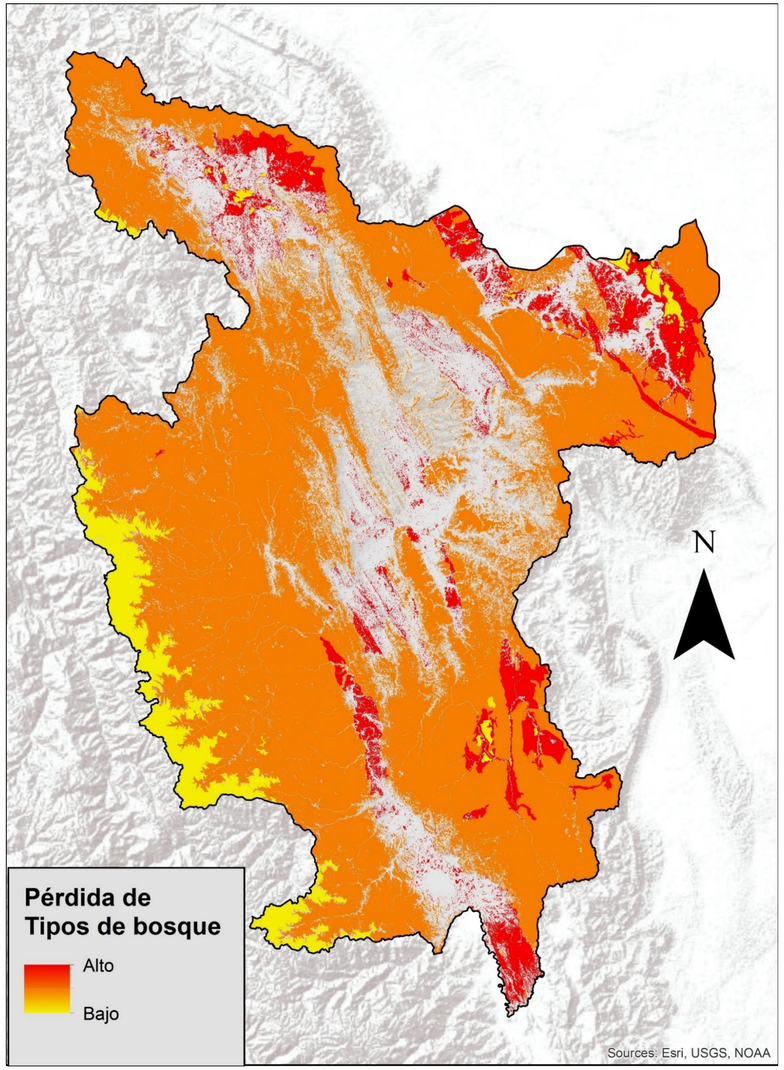
LOSS OF NATURAL ECOSYSTEMS

- Represents the current status of ecosystems based on historical extent; higher values represent ecosystems that have lost a greater proportion of the historical extent

- The ecosystems provide the greatest benefit if the remaining habitat is unique and diverse

- Apply greater weight to this indicator to capture the importance maintaining unique habitats in the EBI

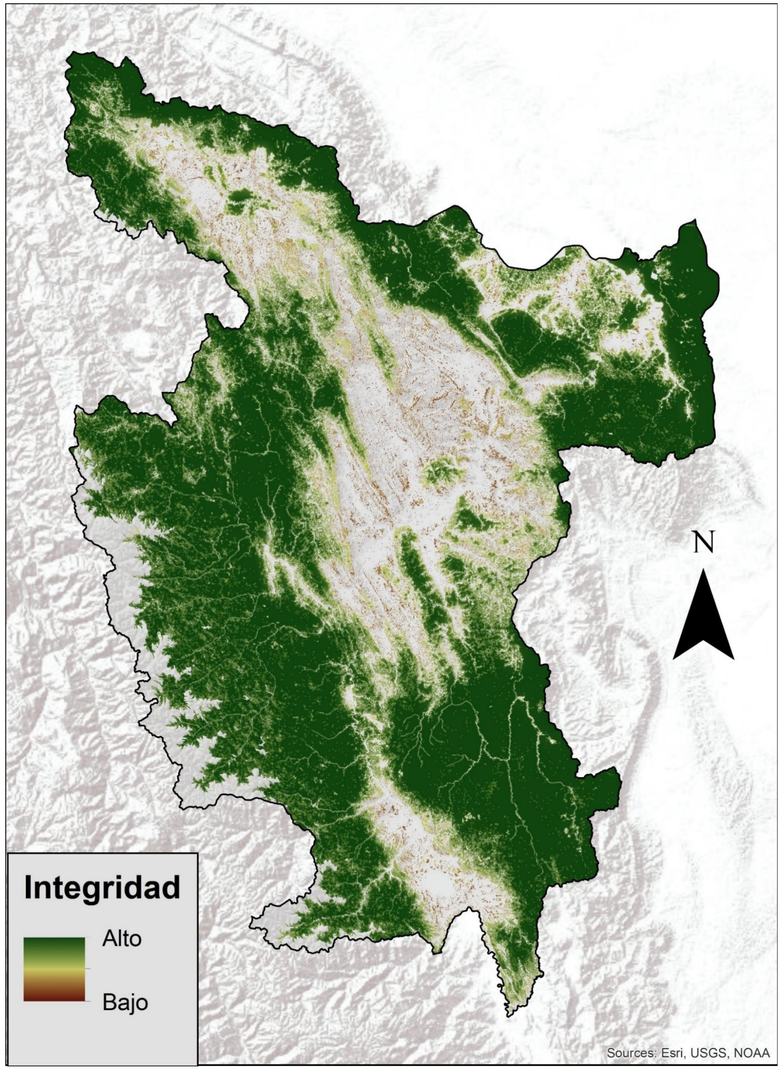


INTACTNESS

- Represents the level of fragmentation on the landscape; higher values represent areas with less fragmentation of natural ecosystems

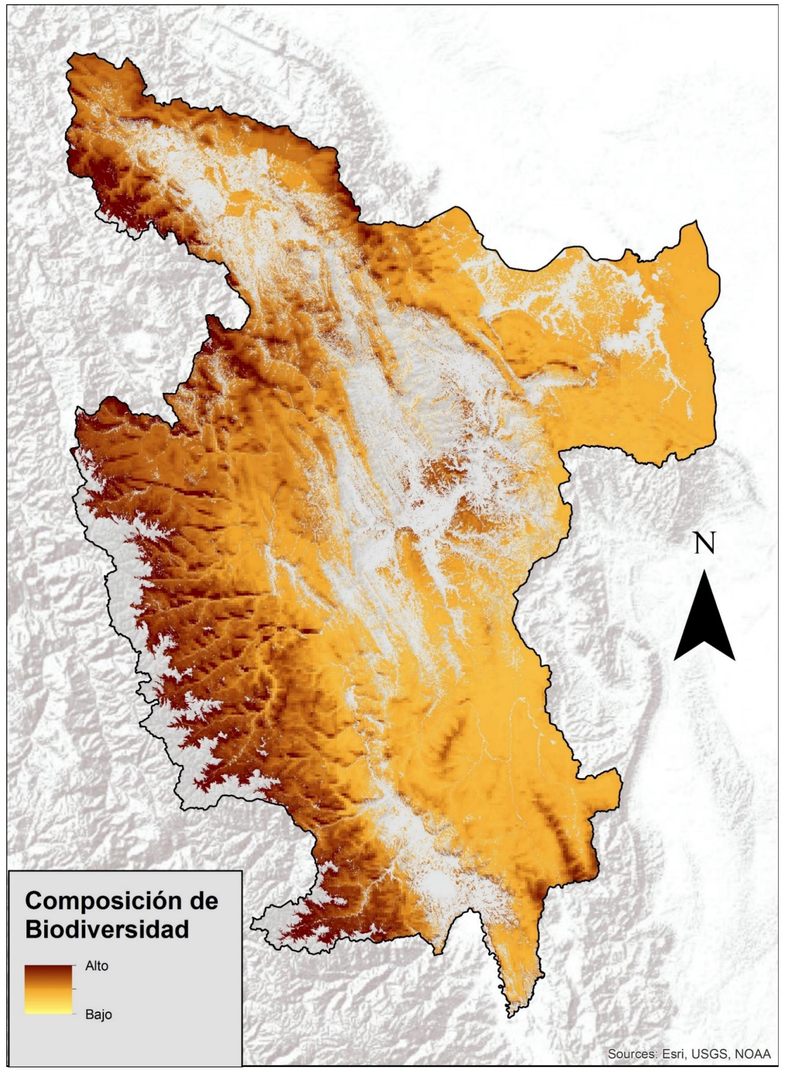
- Ecosystems that are less fragmented function better and therefore provide greater benefit that more fragmented ecosystems

- Apply a greater weight to the intactness indicator to capture the importance of ecosystem function and contiguity in the EBI



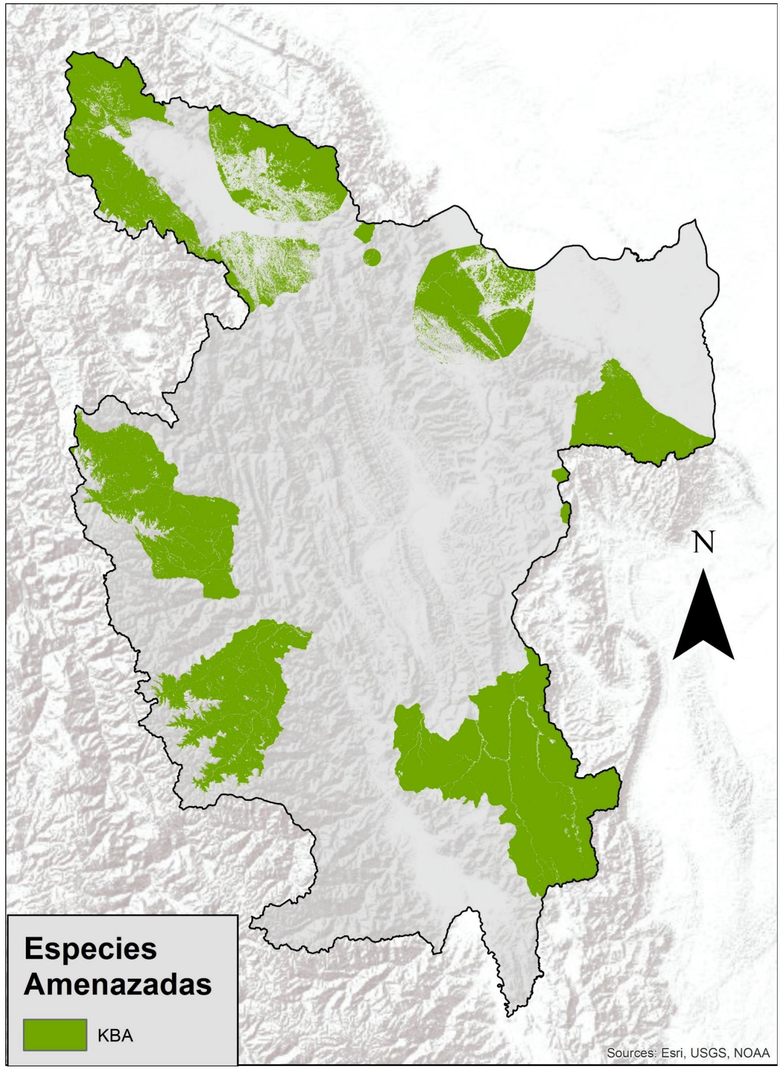
BIODIVERSITY COMPOSITION

- Represents a measure of local and regional biodiversity; higher values represent greater levels of biodiversity
- Ecosystem which support a greater level of biodiversity provide more benefits
- Apply a greater weight to this indicator to capture the importance of species composition and biodiversity to ecosystems and people



THREATENED SPECIES

- Represents areas that are critically important for the maintenance of global biodiversity based on the Key Biodiversity Areas (KBA)
- Area with support key threatened species provide the benefit, while areas that don’t support key species do not
- This indicator is binary, representing presence/ or absence, therefore low weight should be assigned to it to avoid over influencing the EBI

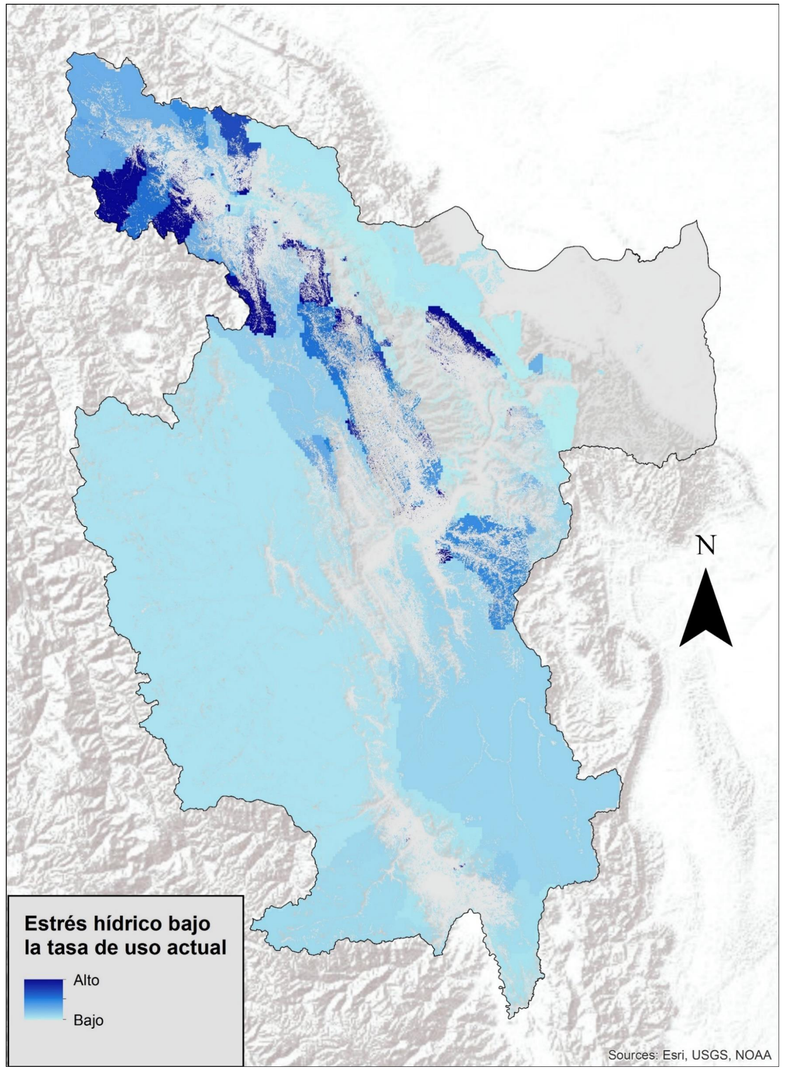


WATER STRESS AT CURRENT RATE OF USE

- Represents the amount of water that is being used divided by the amount of water that is being generated by natural ecosystems (water balance)

- Ecosystems where a greater proportion of the freshwater generated is being directly used have higher values

- The indicator represents a realized service; assign a higher weight to represent the ecosystems that are heavily utilized for freshwater

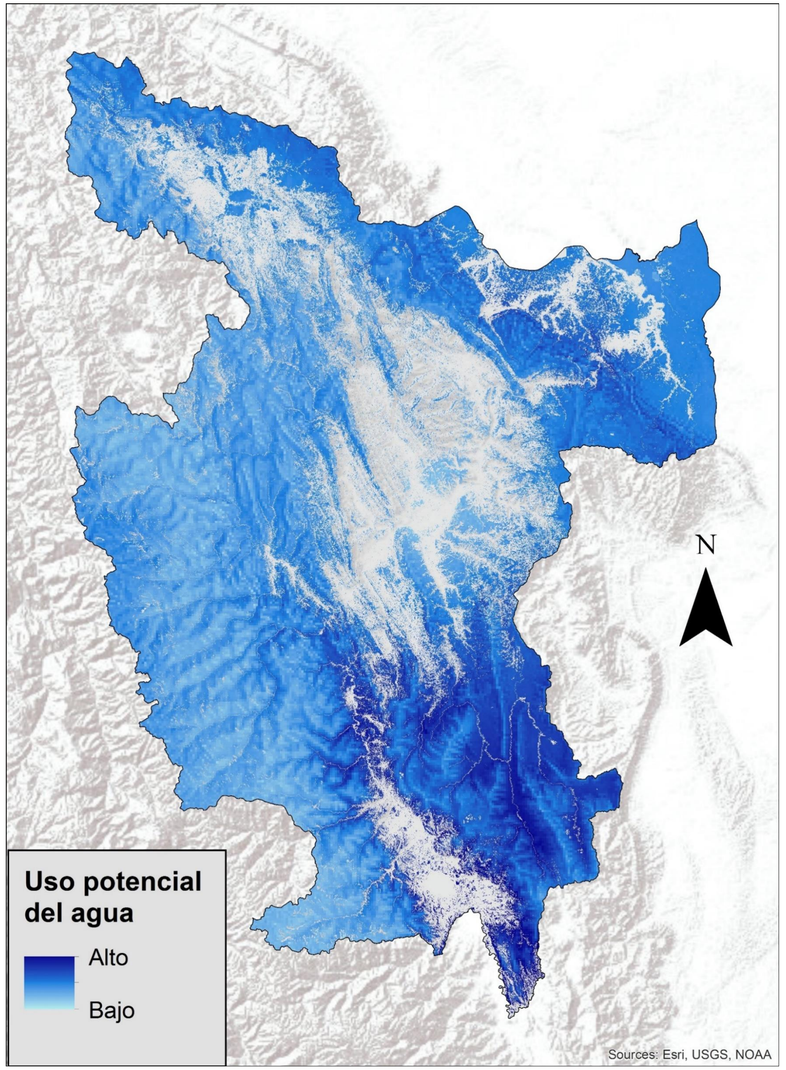


WATER BALANCE

- Represents the amount of freshwater that is generated by natural ecosystems; higher values represent areas that generate more freshwater

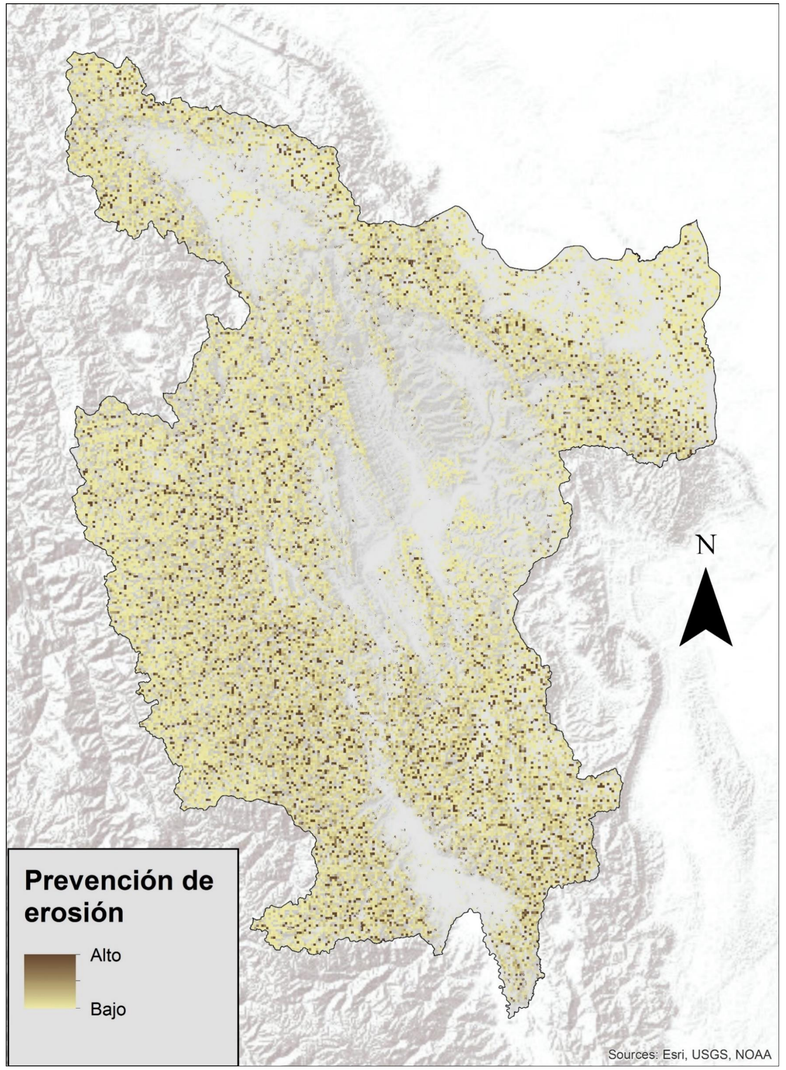
- Ecosystems which generate the most freshwater generate provide more benefit regardless of whether it is currently being utilized

- Apply a greater weight to this indicator to represent the potential freshwater benefits that ecosystems provide



PREVENTION OF EROSION

- Represents the role that ecosystems provide in reducing soil erosion
- Higher values in the indicator represent areas that contribute more to the prevention of erosion, compared to a scenario without those ecosystems
- Apply a greater weight to this indictor to capture the important role that ecosystem play in reducing erosion, especially in areas of high slope

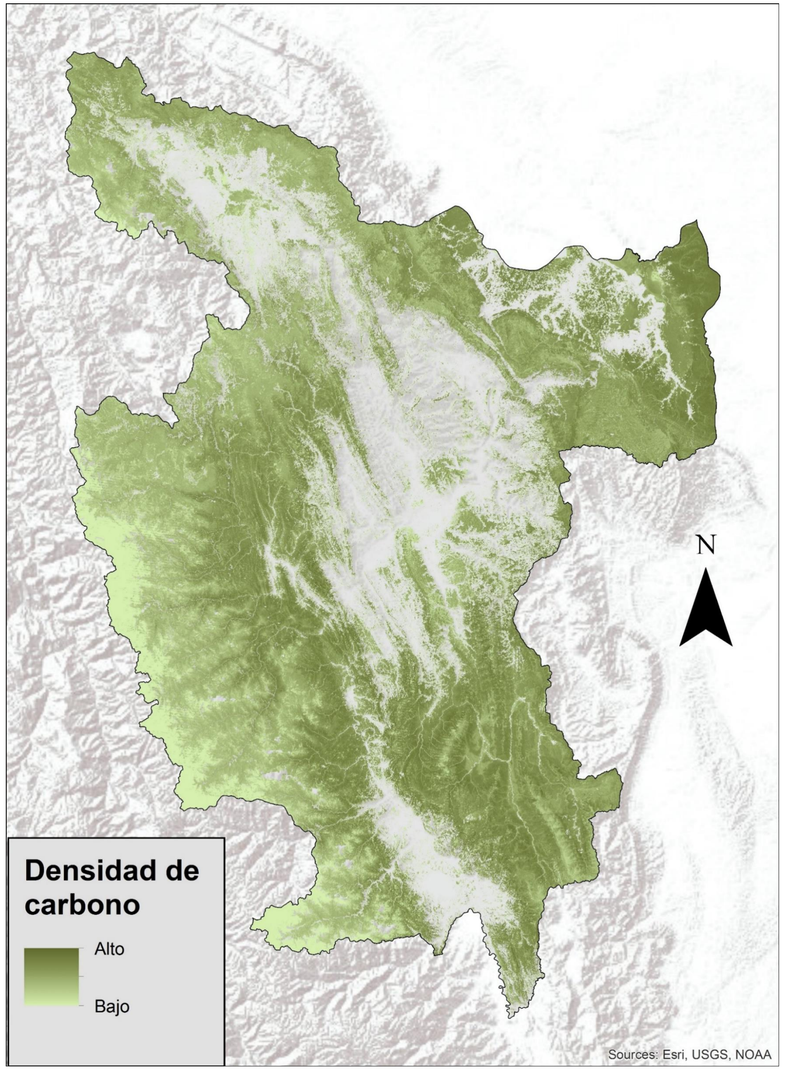


CARBON DENSITY (CLIMATE MITIGATION)

- Represents the density of above ground biomass in natural ecosystems; higher values represent greater carbon storage

- Ecosystems which store more carbon provide greater global benefit for regulating climate; if those ecosystems were lost it would result in greater emissions

- Apply a greater benefit to this indicator to capture the important roles that ecosystems, particularly forests, play in storing carbon

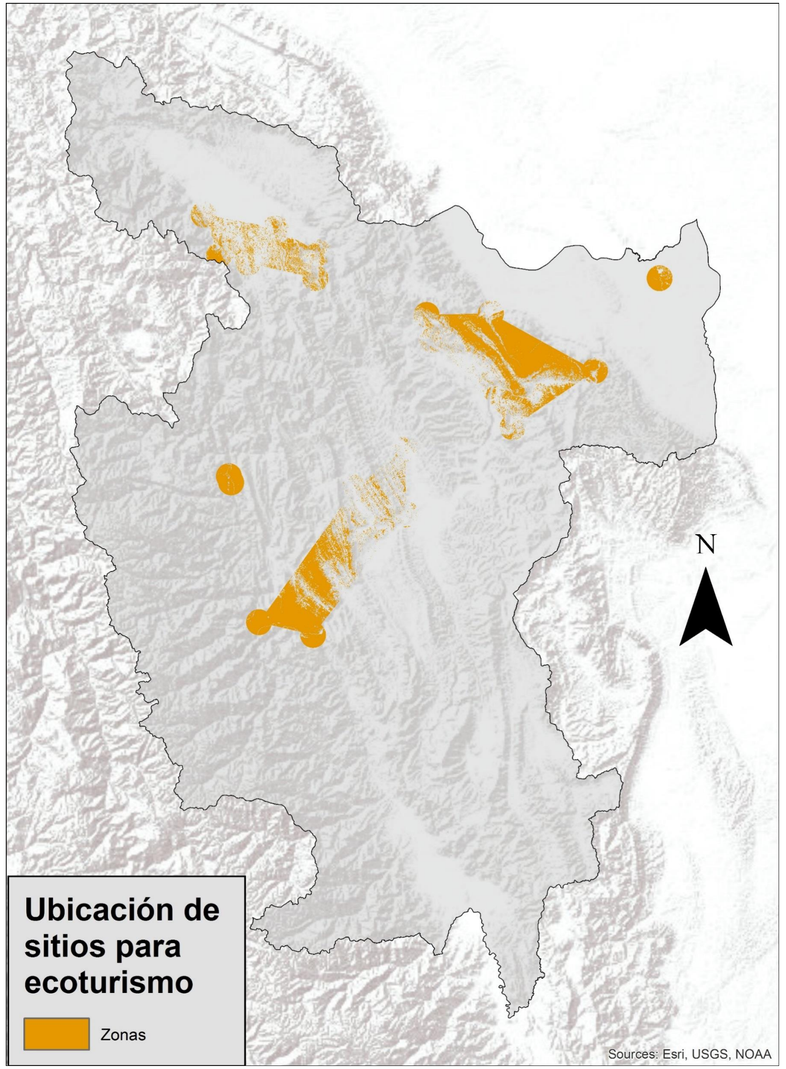


LOCATION OF SITES FOR ECOTOURISM

- Represents the location of existing ecotourism hotspots in San Martin; natural ecosystems around ecotourism sites provide benefits

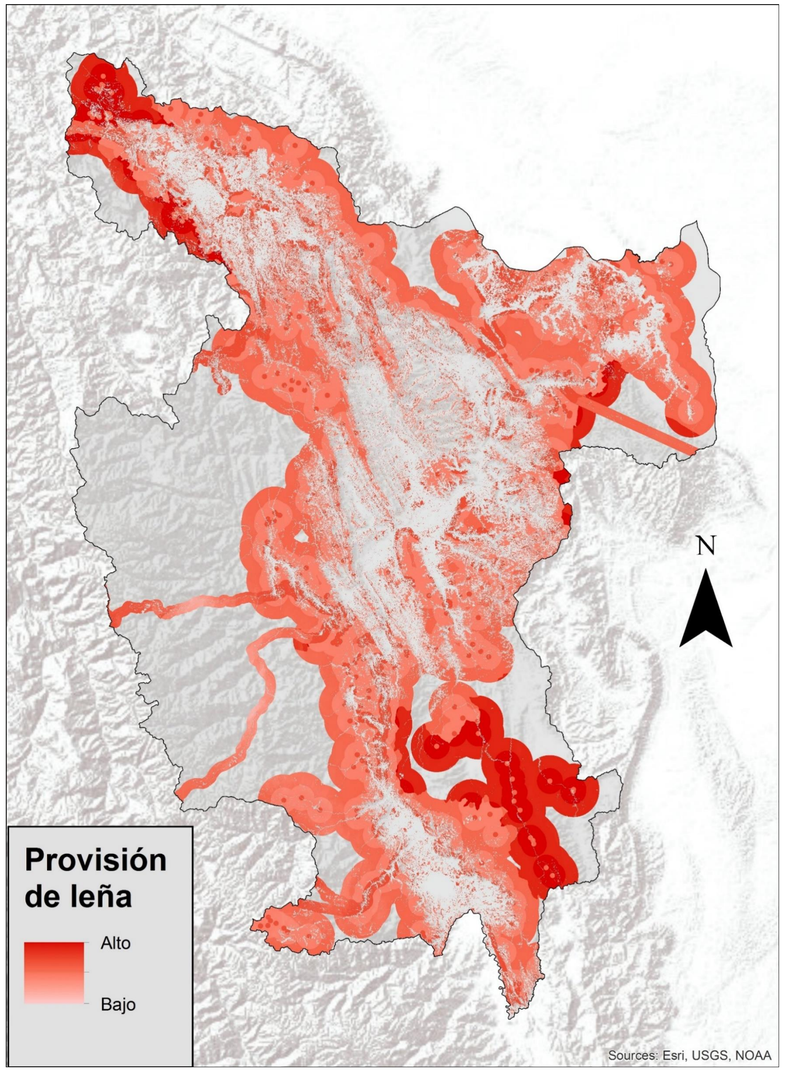
- Natural ecosystem around current ecotourism sites provide benefits for those sites, while those not near ecotourism sites do not provide benefits

- This indicator is binary; therefore, low weight should be given to the indicator so that it does not over-influence the EBI



FIREWOOD PROVISION

- Represent the role of natural ecosystem for firewood provisioning; a critical service in San Martin
- Higher values represent ecosystem that are more likely to provide firewood for people, based on demand, accessibility, and capacity
- Apply greater weight to this indicator to represent areas that have the greatest potential to provide firewood for people



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BASIC STEPS

1. Identify and preprocess input variables
2. Determine weights
3. Combine input variables
4. Add ancillary data (risk, opportunity cost, land-use/zoning) (optional)
5. Revie outputs and refine results

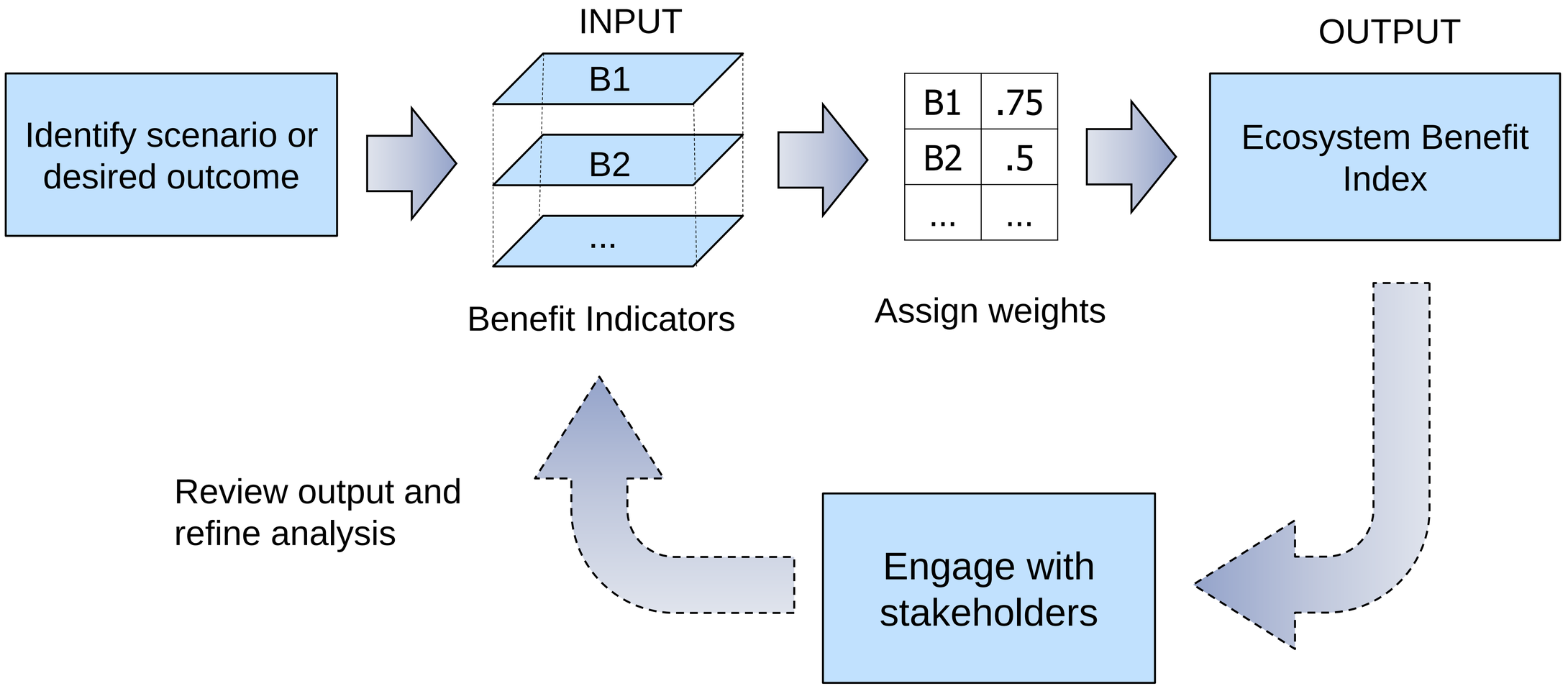
DEVELOPING SCENARIOS

- It is important to define the objective of the scenario, the benefits that will be included and any addition information that may need to be considered

- The weights applied during scenario development should be based on input from stakeholders and the desired outcomes

- Results should be reviewed and refined with feedback

EBI METHOD: DIAGRAM



EXAMPLE OF SCENARIOS DEVELOPMENT

Exploring how the EBI can be used for to inform policy

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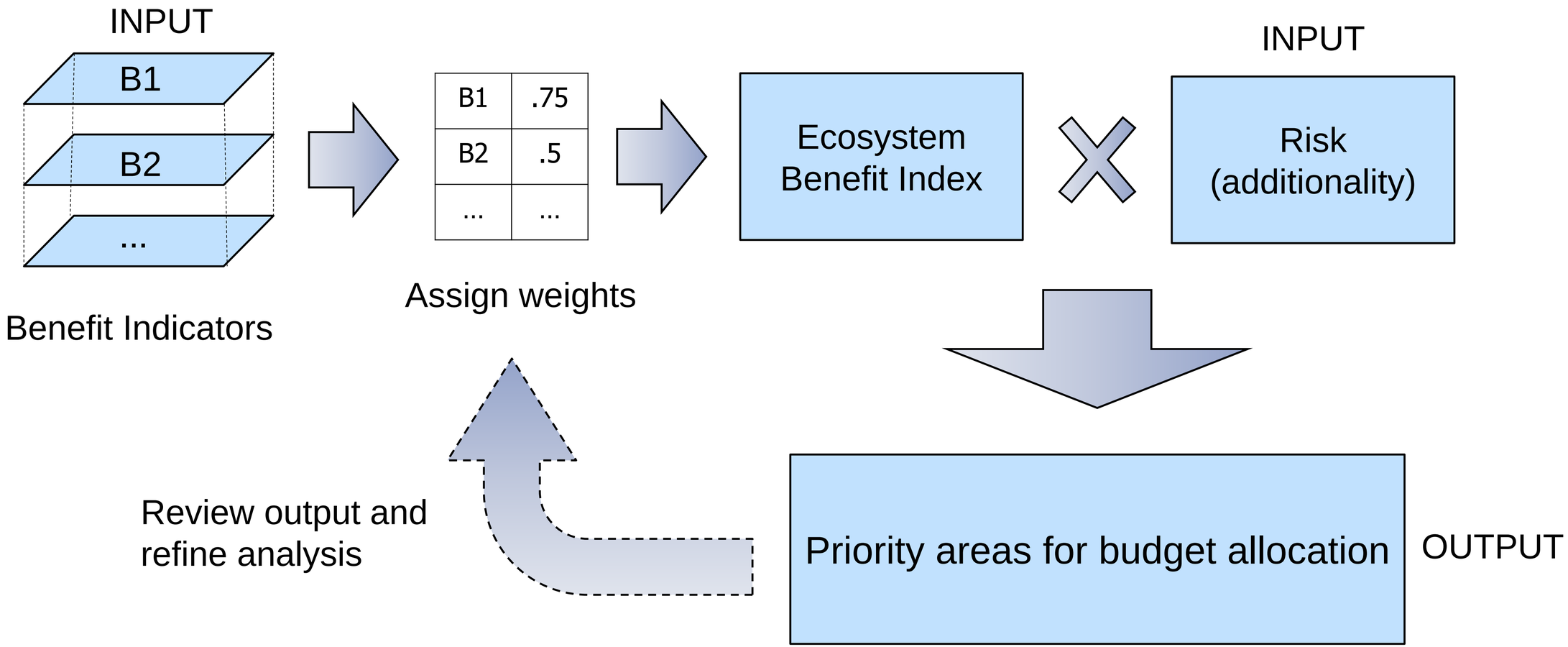
ADDITIONAL DATA AND TOOLS FOR SCENARIO DEVELOPMENT

To illustrate the flexibility of EBI three scenarios with slightly different objectives will be presented:

- A budget allocation scenario – Department planning ministry wants to allocate funds to protect natural ecosystems
- A PES suitability scenario – water managers want to know which districts they should focus on for PES schemes
- A conservation planning scenario – national park service wants to expand protected areas but where to grow

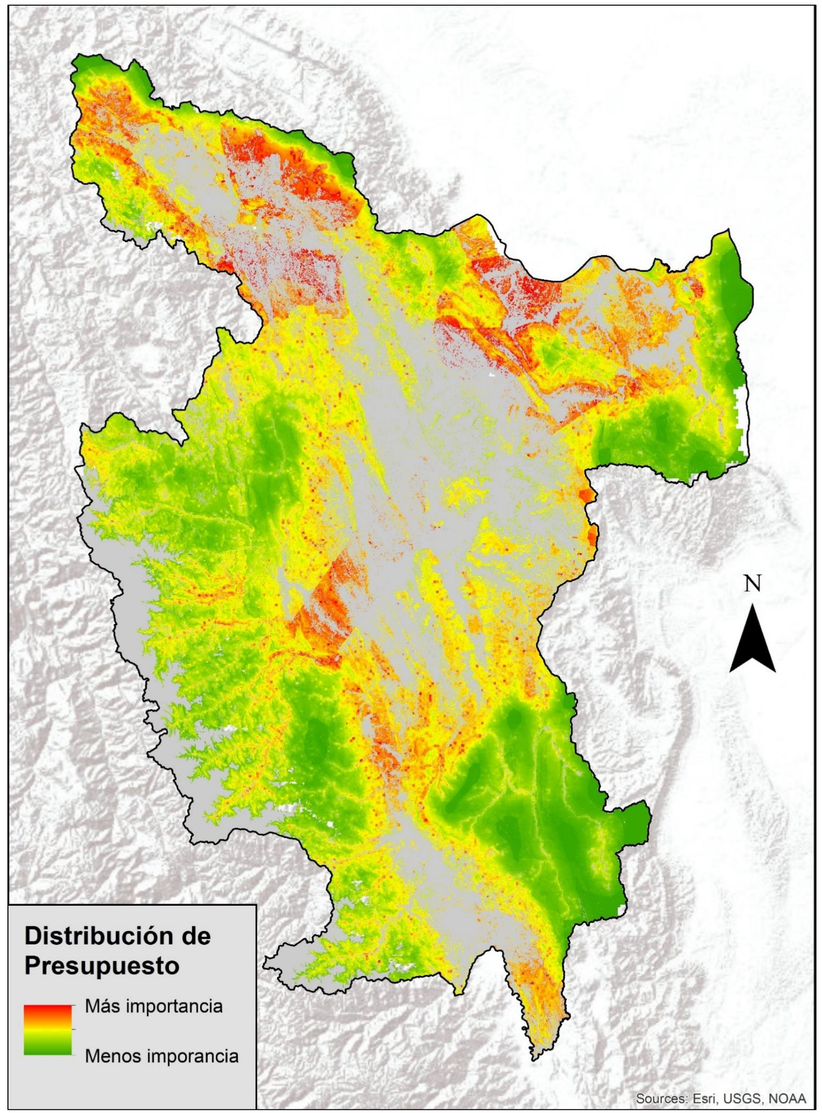
SCENARIO 1: BUDGET ALLOCATION



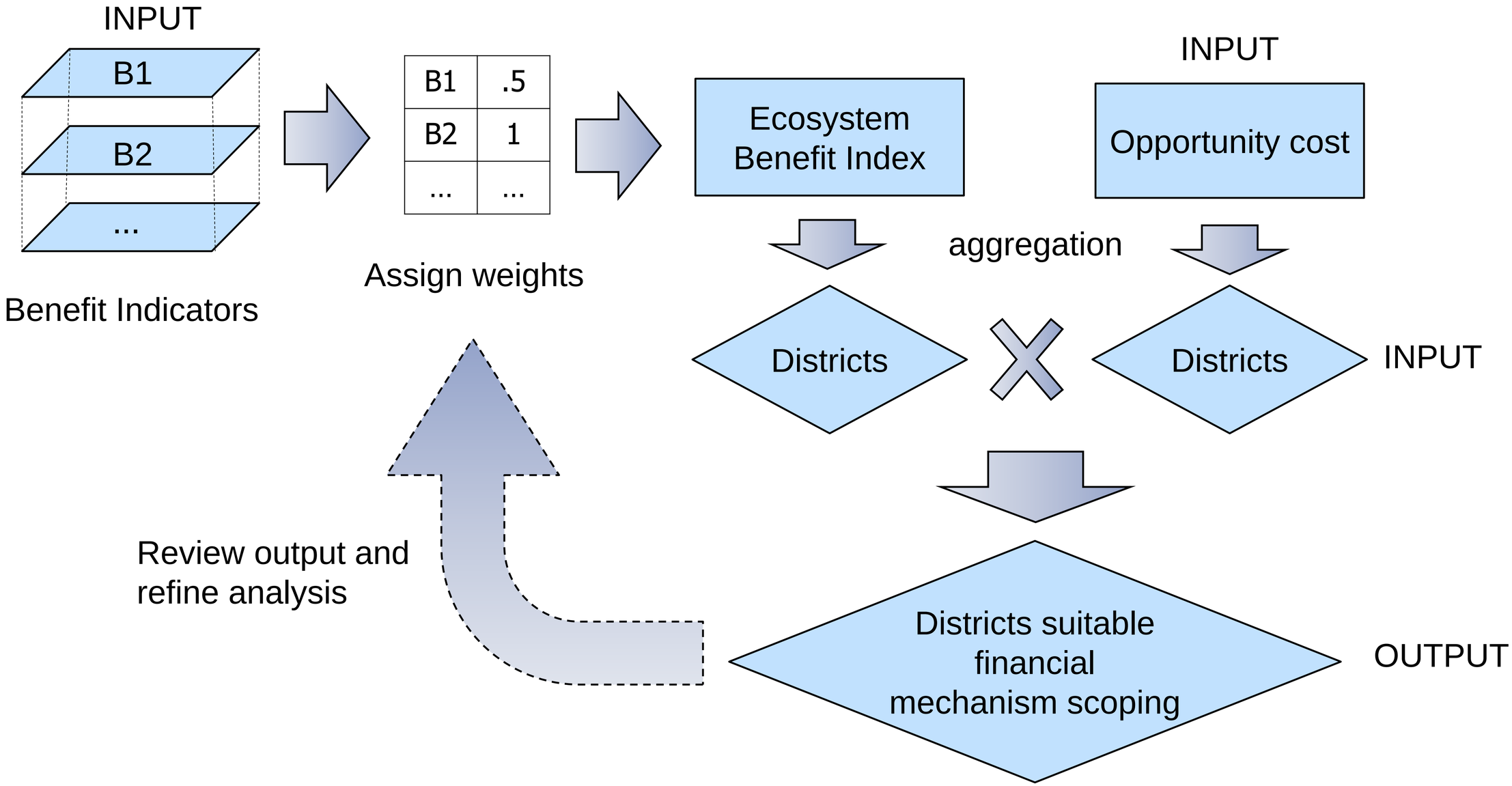
RESULTS – BUDGET ALLOCATION SCENARIO

Indicator	Weight
Loss of natural ecosystems	0.5
Intactness	0.5
Biodiversity	0.75
Threatened species	0.25
Water stress	1
Water balance	0.5
Prevention of erosion	1
Carbon density	0.5
Ecotourism	0.25
Firewood provision	0.5

- In the final map, the budget allocation EBI is multiplied by risk for additionality



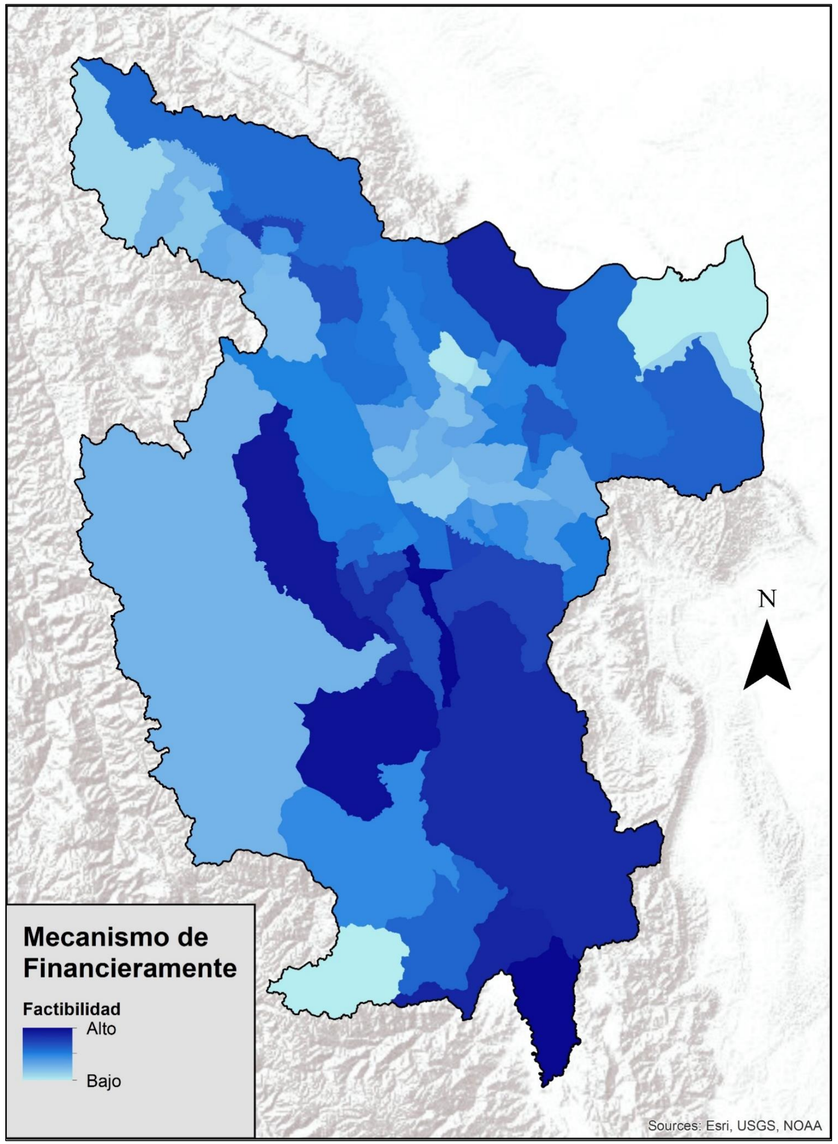
SCENARIO 2: SUITABILITY FOR PES



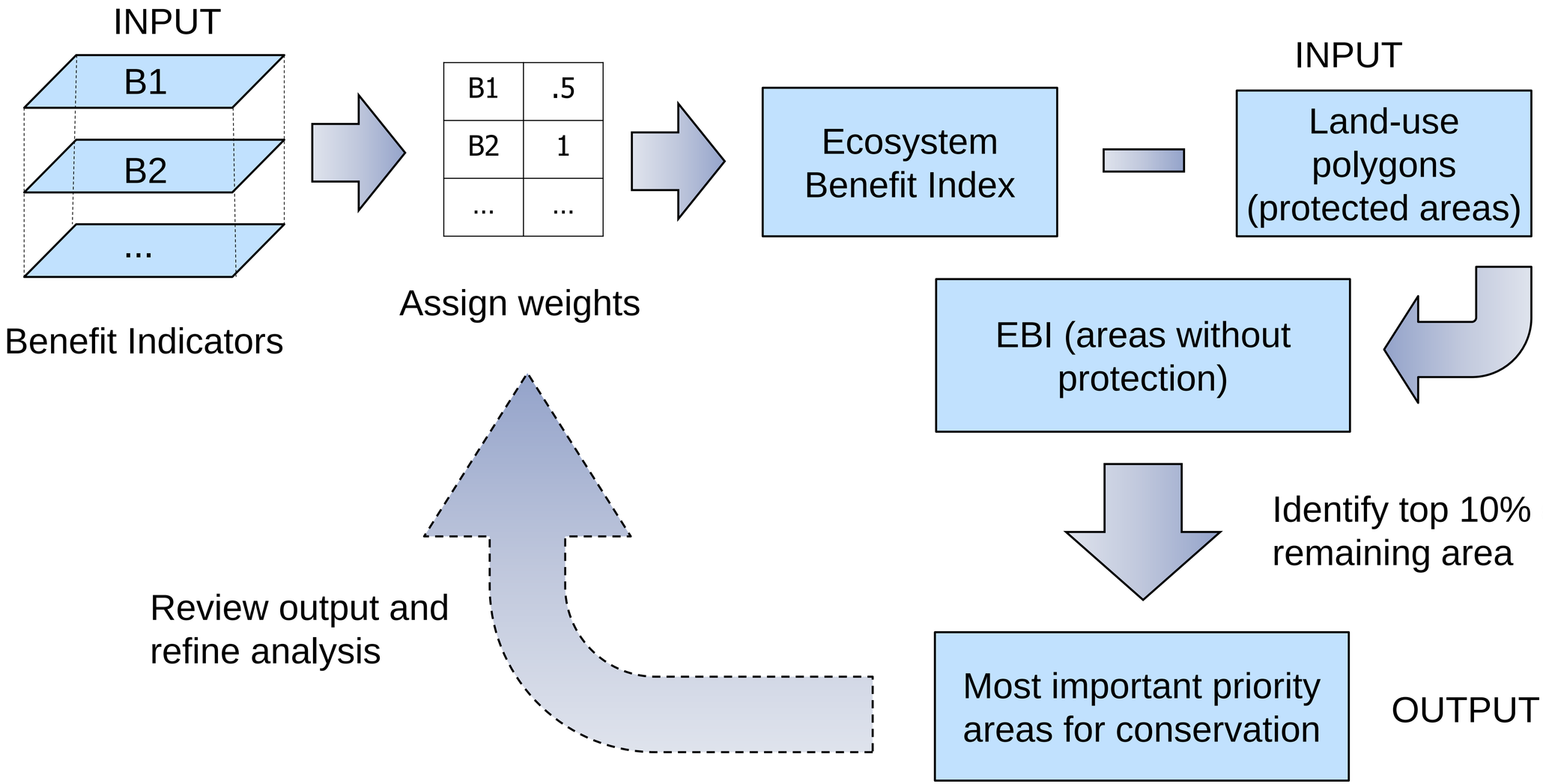
RESULTS – FINANCIAL MECHANISMS

Indicator	Weights
Loss of natural ecosystems	0.25
Intactness	0.25
Biodiversity	0.25
Threatened species	0
Water stress	1
Water balance	1
Prevention of erosion	1
Carbon density	1
Ecotourism	0.25
Firewood provision	0.5

- The EBI is aggregated to the district level and is multiplied by opportunity cost per district



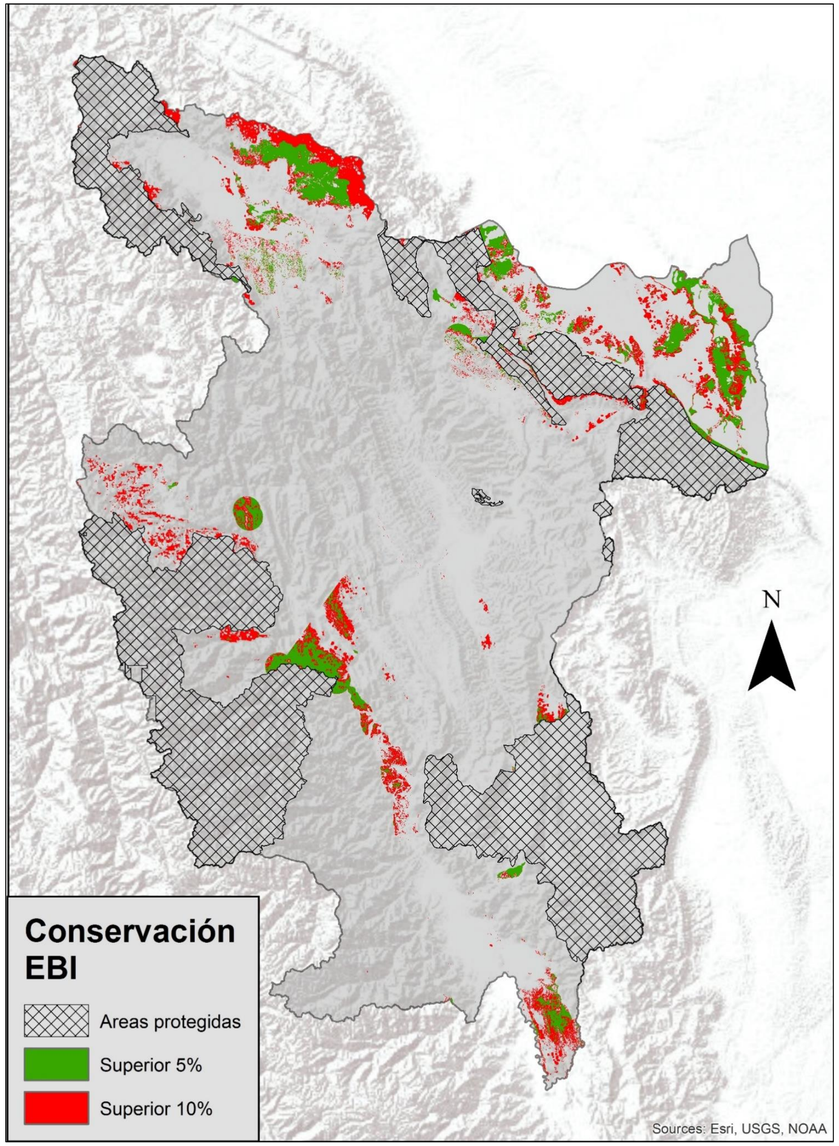
SCENARIO 3 – NEW PROTECTED AREAS



RESULTS – NEW PROTECTED AREAS

Indicator	Weights
Loss of natural ecosystems	1
Intactness	1
Biodiversity	1
Threatened species	0.25
Water stress	0
Water balance	0.25
Sediment retention	0
Carbon density	0.25
Ecotourism	0.5
Firewood provision	0

- The EBI is constrained to areas outside of protected areas and the most beneficial areas are identified



CONCLUSIONS

- The EBI is an extremely useful and flexible tool for decision making
- The results presented are examples of how the EBI could be applied to address particular policy objectives – there are many other applications that could be developed
- Determining the appropriate weights for the EBI requires engagement with stakeholders at the national, regional, and local level

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INSTRUCTIONS

- Break into groups
- Each group will be given a land-use planning scenario to apply the EBI
- Each group will identify the relevant stakeholders and adopt their “persona”
- Use the AHP priority calculator to generate the indicator weights (https://bpmsg.com/ahp/ahp.php)
- Combine the data in ArcMap to create an EBI output
- Report back to the broader group and explain your scenario, stakeholders, and decisions

SCENARIOS

- Prioritize areas for rural development
- Identify areas for climate mitigation investment (such as REDD+)
- Develop a plan for a “green economy” in San Martin
- Identify “unique and ecologically significant areas” for conservation and research

LIST OF STAKEHOLDERS AND THEIR PRIORITIES

- **National Association for the Management of Protected Areas:** Management of protected areas, safeguarding biodiversity, developing education programs, conducting research and promote ecotourism (cultural services).
- **Ministry of Environment:** Safeguard Peru's wealth and unique environment for current and future generations through stakeholder commitments. Implement the UN Sustainable Development Goals (SDGs) (cultural services and climate regulation through avoided emissions and carbon sequestration)
- **Department of Rural Development:** Develop and implement policies for sustainable agriculture, food security, and alleviation of poverty (growing food for food)
- **National Water and Sanitation Authority:** Water provision for domestic use and industry. Improvement of access to clean water and sanitation for population (water provision and regulation services)
- **Hydropower Industry:** Water provision for energy generation (water provision and regulation services)
- **Rural communities:** Access to potable water, food security, productive agriculture and economic development (water regulating service, access to land and natural resources, preservation of cultural identity)
- **Rice farmers associations:** Water provision for irrigated agricultural production (water provision/regulating services)
- **Coffee farmers associations:** pollination services for coffee production, pet control, access to markets
- **National Tourism Board:** Ecotourism (cultural services, education)
- **Conservation NGO:** Conservation and sustainable landscape management (conservation of natural ecosystems for their intrinsic and economical value)
- **Academia:** Research and education (access to natural ecosystems to study them)

DISCUSSION

- How was the EBI used in each scenario?
- How does adjustment of the weights affect the EBI?
- Are there additional scenarios in which the EBI could be applied?
- What additional data would be useful to incorporate in the EBI?

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