

Analyzing and mapping cultural ecosystem services with multiple approaches in Peru

Session T4: Mapping ecosystem services:
Comparing methods. October 21, 2016

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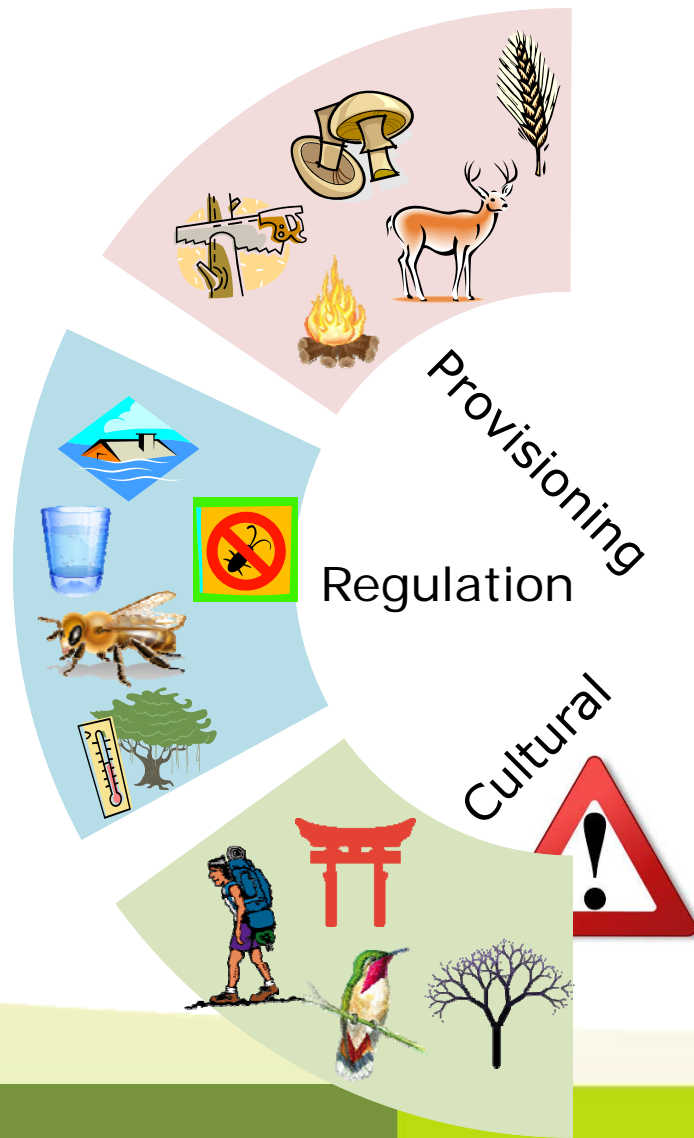
Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

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Healthy Ecosystems for Resilient Societies



18-21 October 2016
Call, Colombia

Modeling and mapping multiple ecosystem services



PROYECTO DE INVESTIGACIÓN:

Evaluación y modelación de servicios ecosistémicos en la cuenca del río Mariño, Apurímac, Perú

Problems for modeling and mapping:
Limited data; Multidimensional (what values?); Subjective (whose values?).

Cultural services

Recreation



(experiential)

Scenic beauty



(visual)

Others



Heritage and legacy.
Spiritual and religious.
Inspiration and creativity.
Identity and sense of place.
Social relationships.
Education and knowledge.
(intellectual)



Questions:

What cultural ecosystem services are produced and used? Where? Why there? Who use them?

WHAT

WHERE

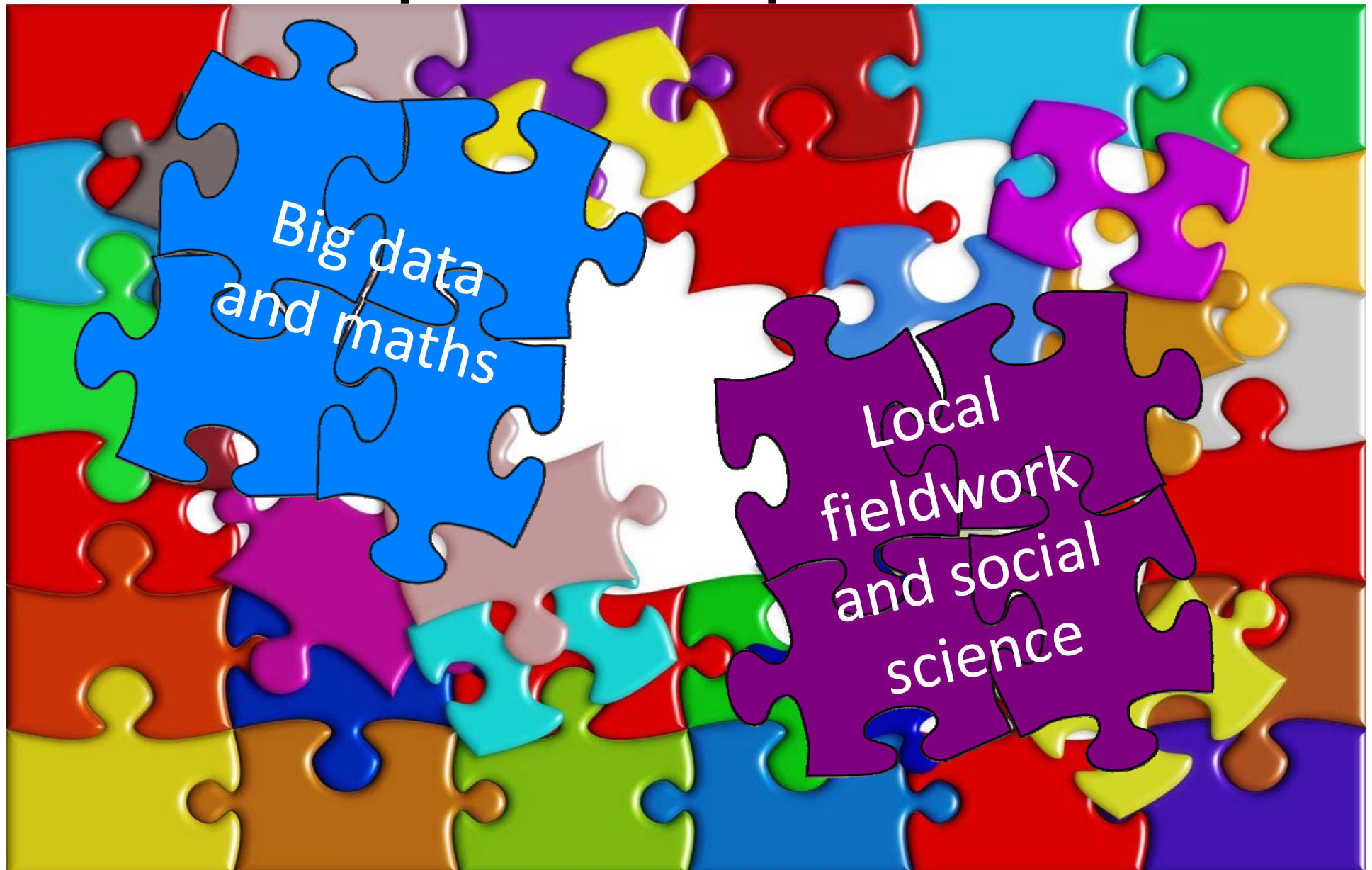
WHY

WHO

Case study:



Multiple methods: Each one provides a piece of the puzzle





Density of online landscape picture databases

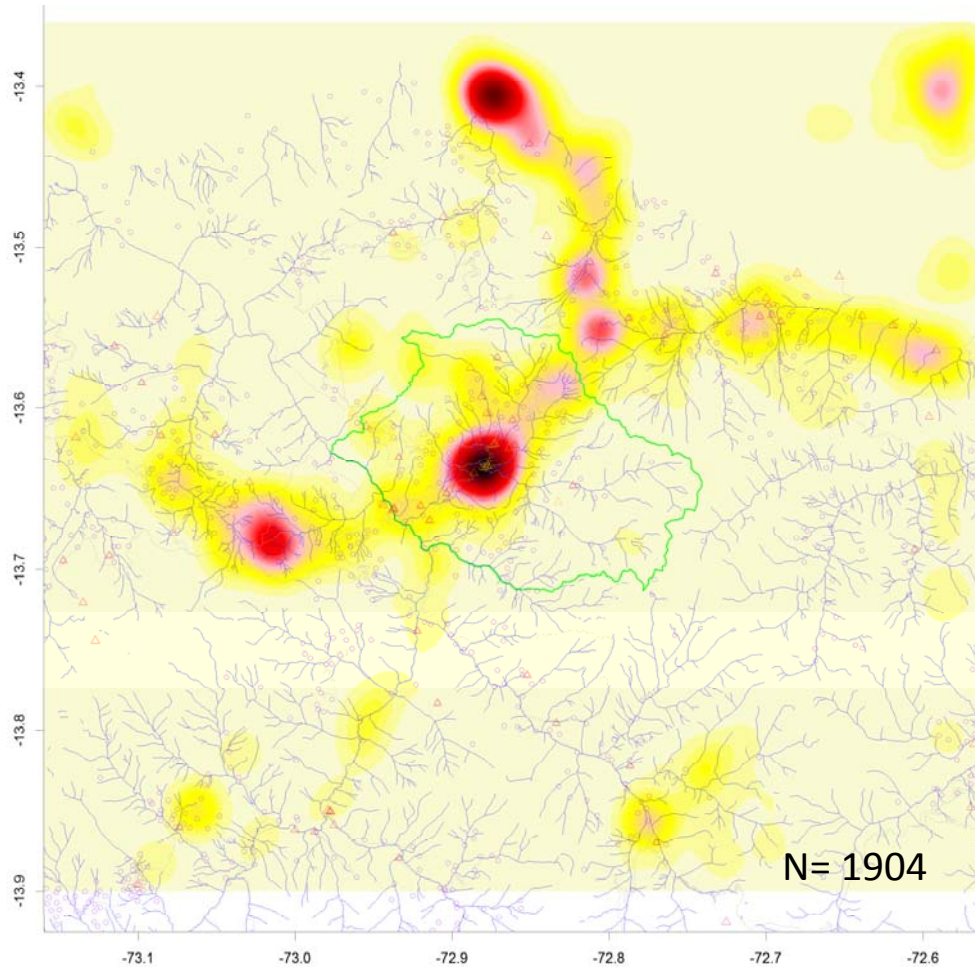
■ Method:

- Automatically download online pictures georeferenced in the region
 - Already filtered by Panoramio for Google Earth
 - No pizzas or parties
 - Mostly landscapes (natural, rural, urban)
- Analyze and map density

Panoramio | Google Maps



Results



Area = 50 km x 50 km

WHERE

Good representation of
where ecosystem
services are "used"



Picture content analysis

- Method:
 - Observe all online pictures and classify them according to landscape elements and human activities
 - What cultural ecosystem services?



Results

Visual



Landscape elements:

27% rural areas (mosaics of cropland, grassland, etc.)

18% water (river, lake, waterfall, etc.)

18% mountains and canyons

Etc.

Experiential



Activities:

14% recreation (hiking, relaxing, watching, biking, etc.).

Associated with elements (trails, rivers, lakes, etc.)

Intellectual

Heritage, legacy.

Spiritual, religious.

Inspiration and creativity.

Identity and sense of place.

Social relationships.

Education and knowledge.



??

WHAT

*This approach captures few services.
Focus on landscape beauty.
Some info on recreation.*



Identifying who post pictures on Panoramio



- Method:
 - Automatically download all pictures by all photographers having pictures in the region
 - Determine whether they take pictures locally (region), nationally (Peru) or internationally
 - Compare map density between local, national and international photographers

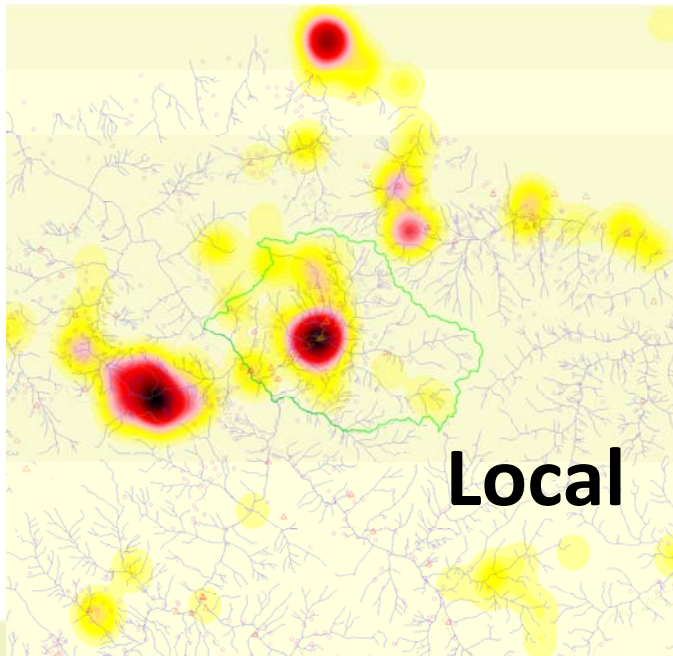
Results

327 photographers with 95,211 posted pictures.

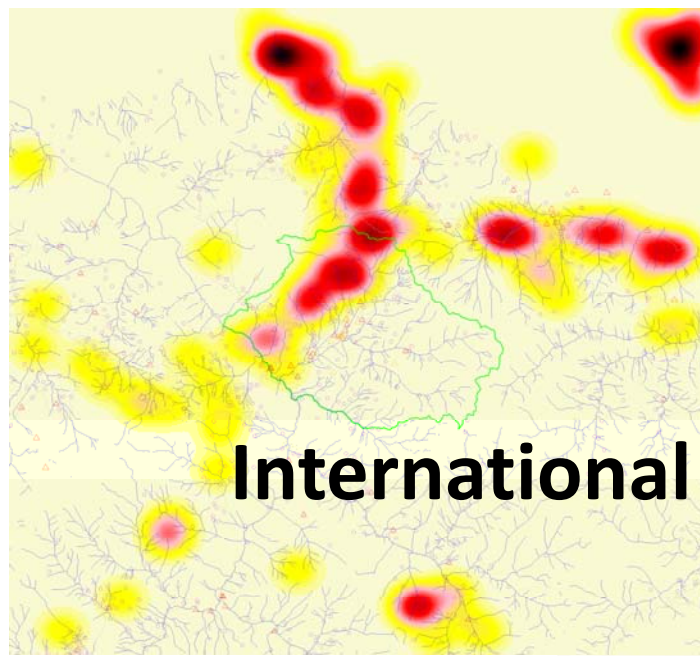
9% local, 32% national, 25% international.

WHO

Limited information on actors.
More national/international than local.



Local



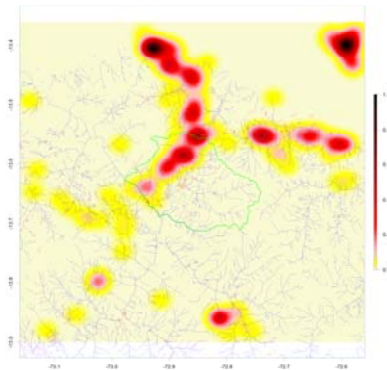
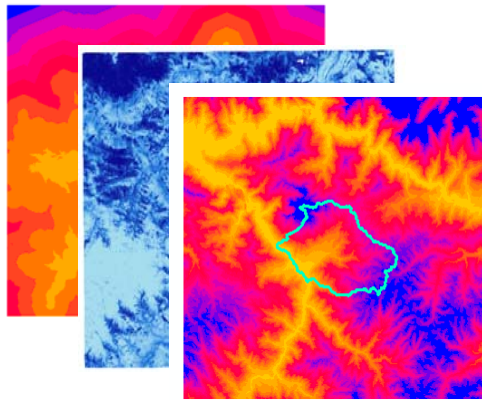
International

Different locations.
But strong effects of population and access.

WHERE
WHO



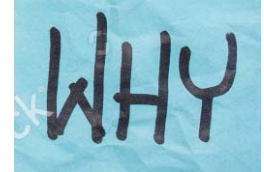
Explaining picture density



- Method:
 - Model the effect of landscape (land use, topography, hydrography, etc.) and human factors (accessibility, population density) on picture density
 - with Random Forest models

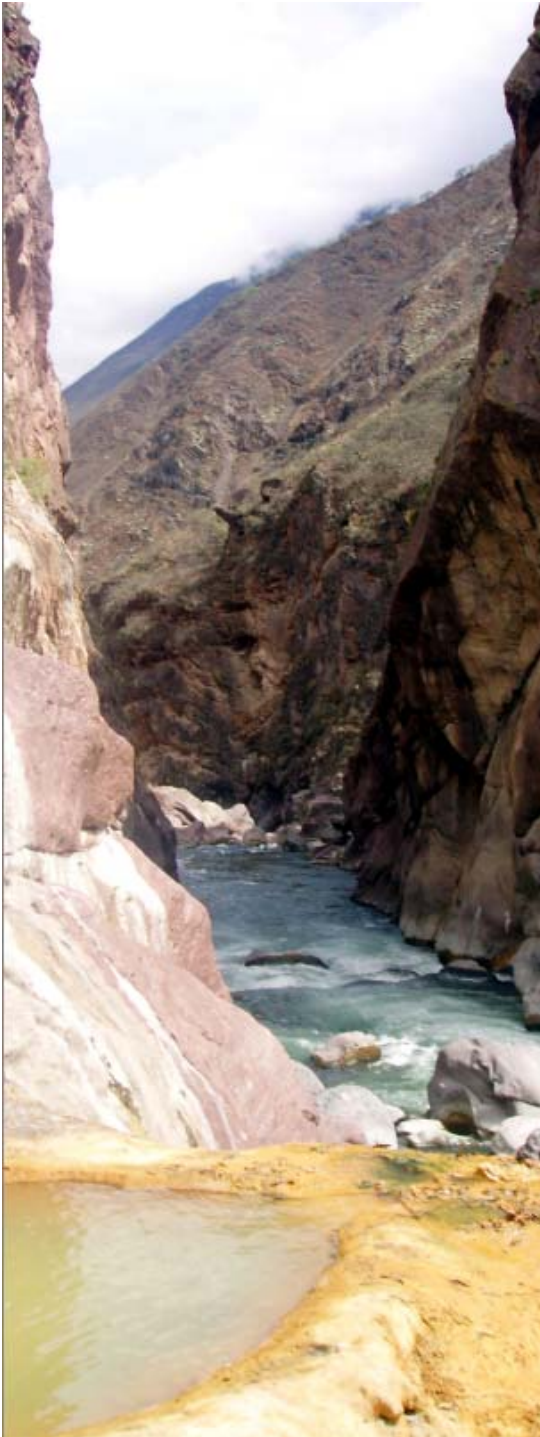
Results

- Good model performance
 - (explains 68% of variance)



- Three best predictors of picture density:

- For international photographers:
 - Distance to airport (**accessibility**)
 - Distance to protected area, Distance to wetlands (**landscape**)
- For local photographers:
 - Population density, Distance to regional capital city (**accessibility**)
 - Distance to glacier (**landscape**)

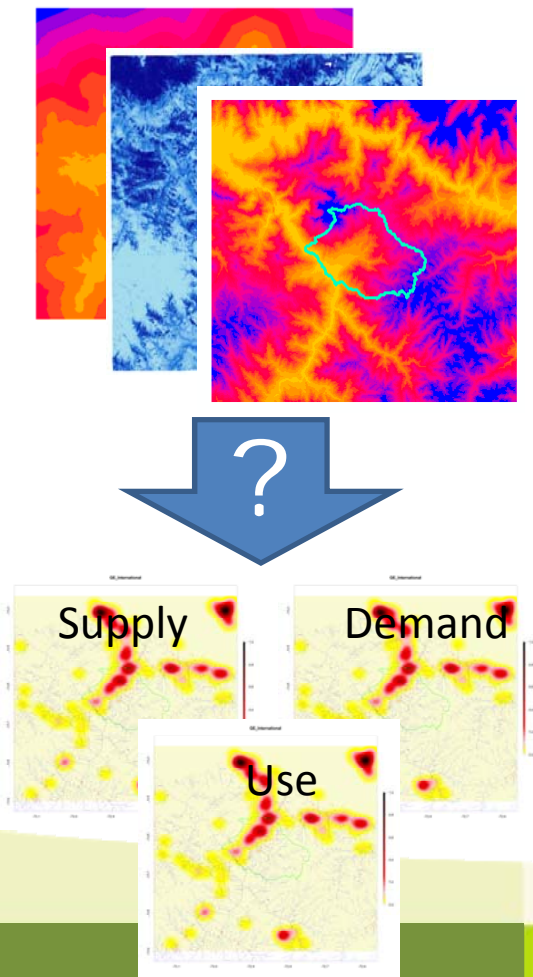




Analyzing supply and demand of cultural services

■ Method:

- Density shows service "use"
 - function of supply (by ecosystem)
 - and demand (by people)
- Supply = model output without human factors
- Demand = model output without natural factors



Results

Demand
(by people)

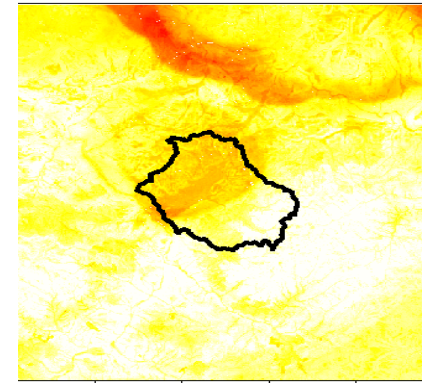
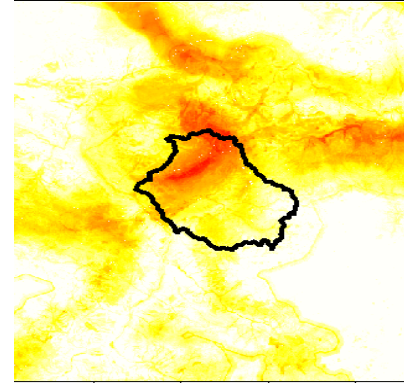
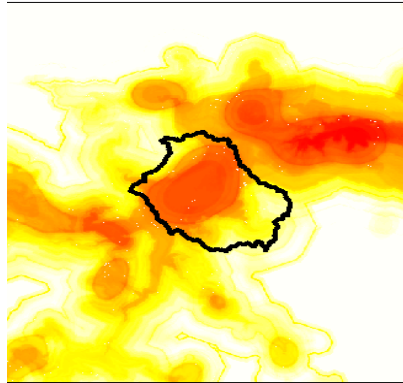


Use
(service)

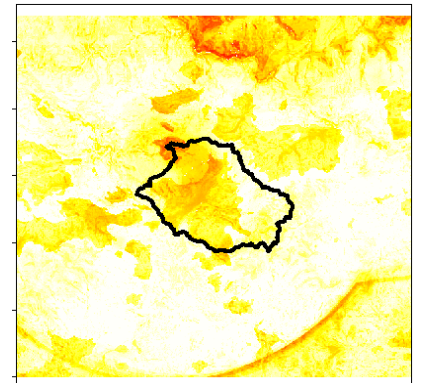
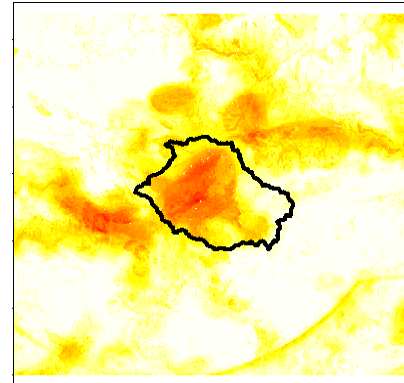
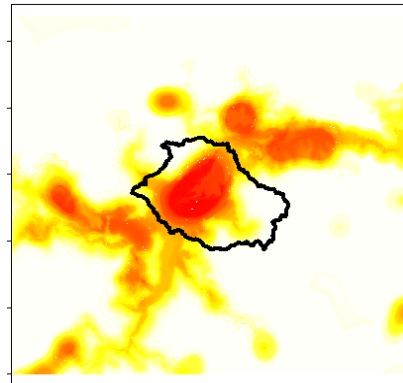


Supply
(by ecosystem)

International
photographers



Local
photographers



WHERE

WHY

WHO

Good approach for decomposing supply and demand

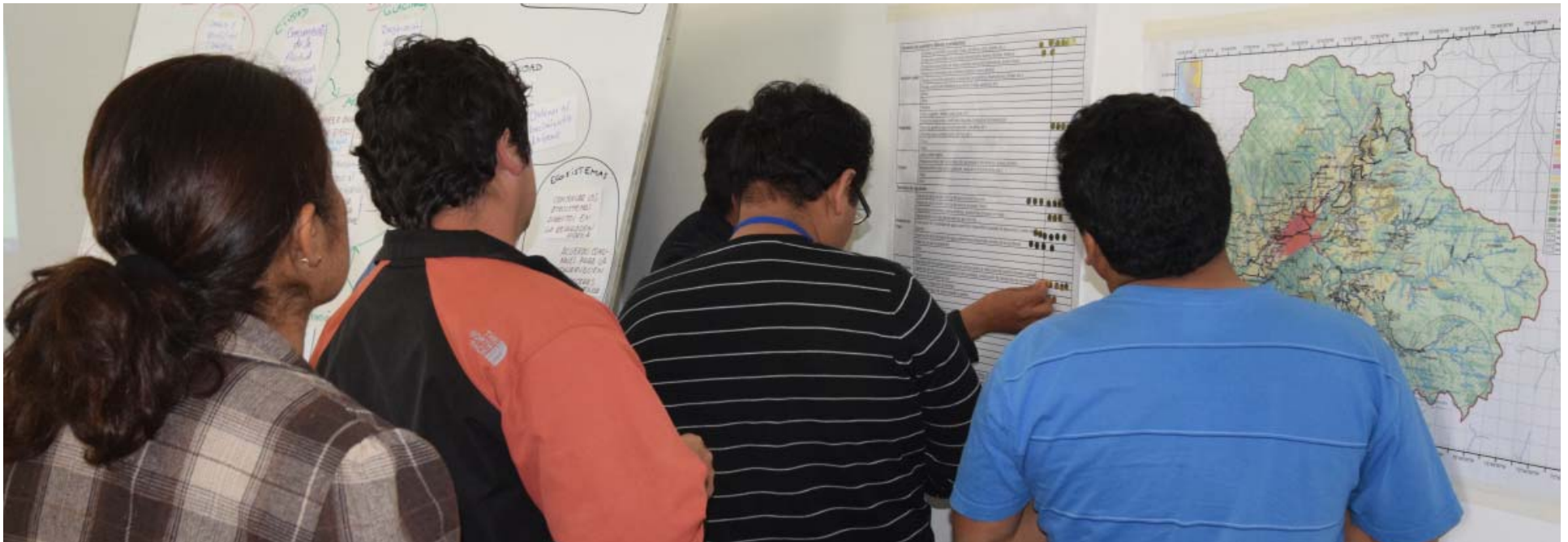
Supply by ecosystem depends on users: landscape beauty
attributes are different for every person



Asking local experts

■ Method:

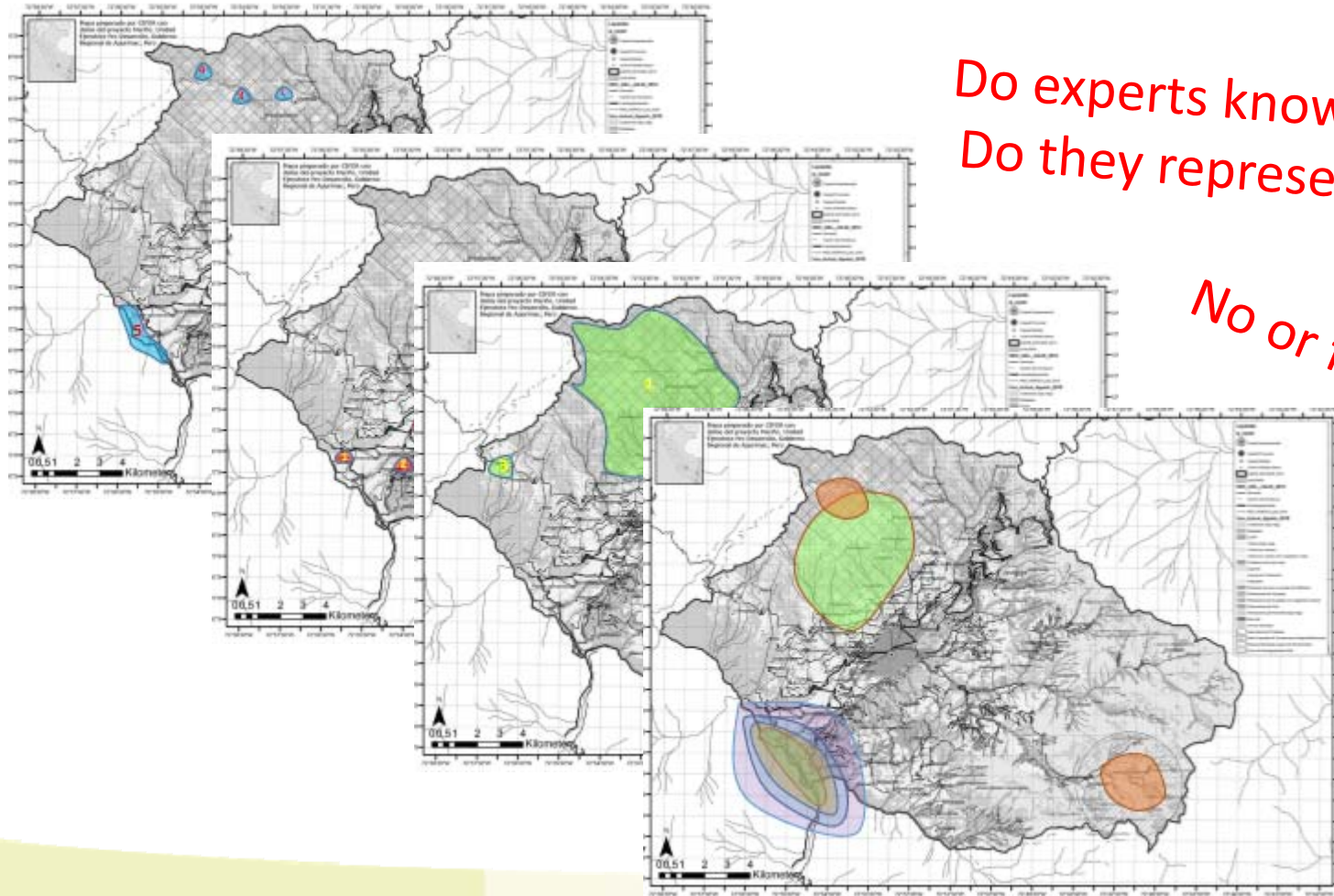
- Asking workshop participants to draw maps of where cultural services are used



Results

Maps of location of the use of different services
(hiking, "nice" forest landscapes, sacred places, etc.)

WHERE



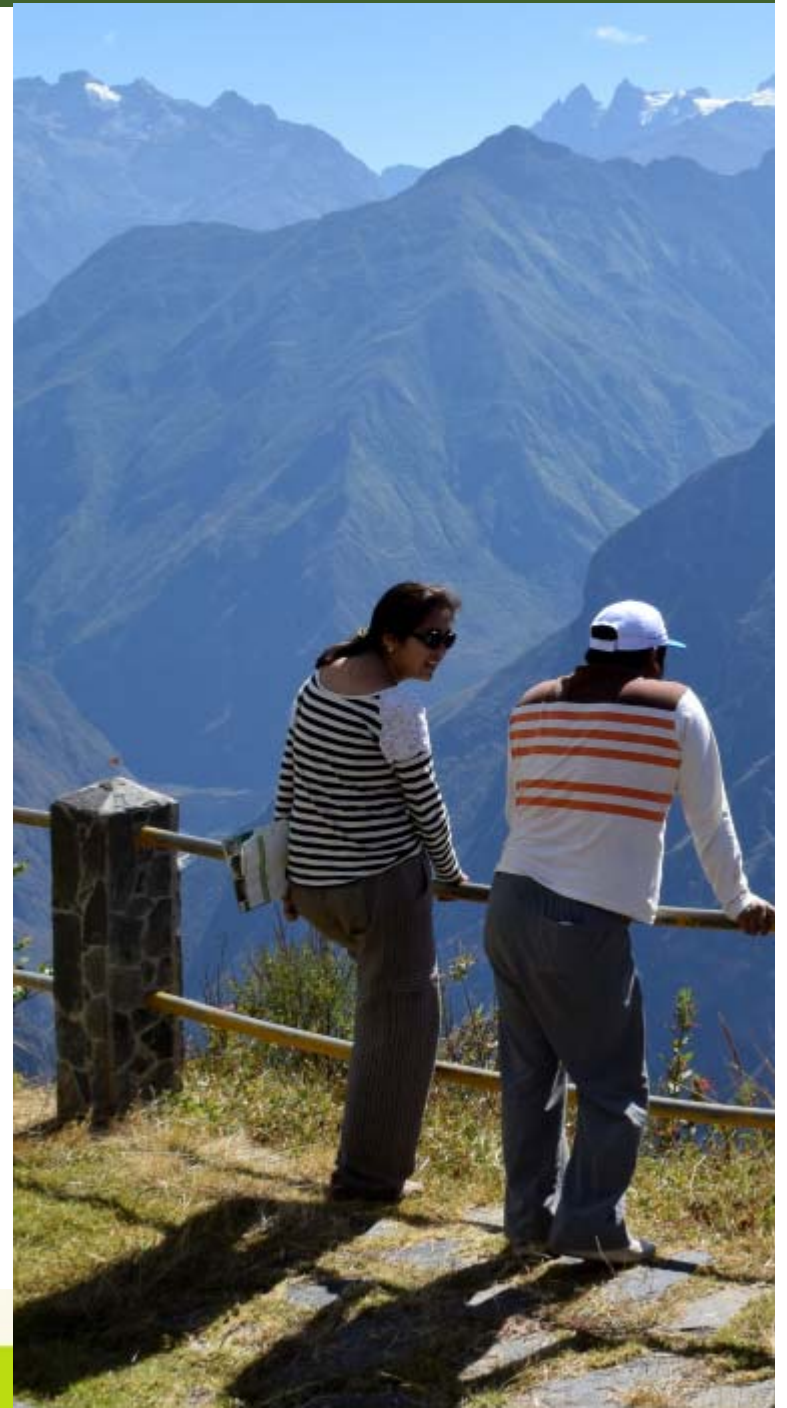
Do experts know everything?
Do they represent all views?

No or few repetitions



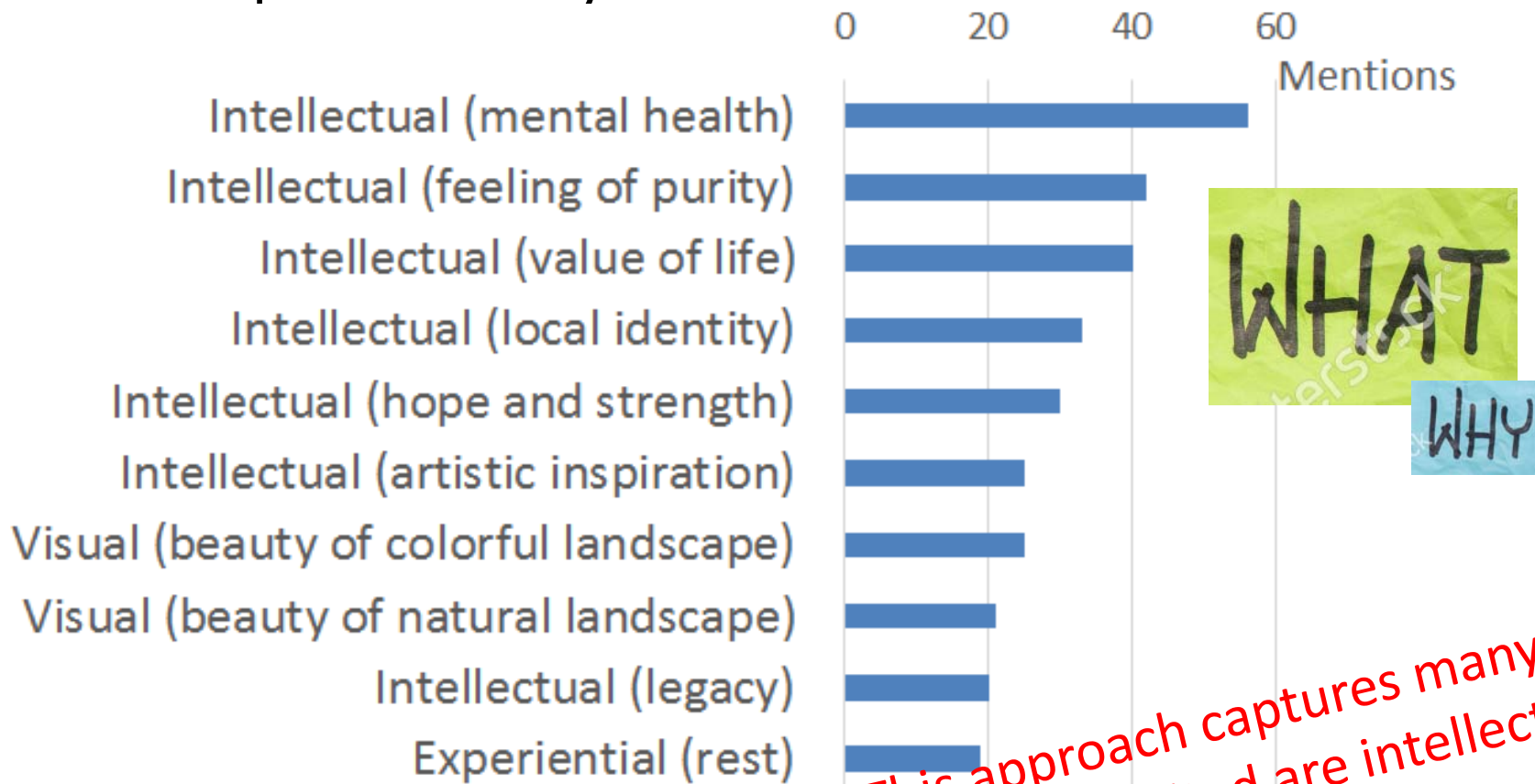
Interviewing local people

- Method:
 - Open interviews with people in the area (n=28)
 - With pictures (selected by interviewees) to prompt discussion
 - Discourse content analysis



Results

- People cited 40 different cultural ecosystem services and explained why



This approach captures many services. Most cited are intellectual.



Survey people

■ Method:

- 211 people, balanced between:
 - Urban / Rural / Tourists ; Men / Women ; Young (<20), Adults (20-40), Senior
- 6 pictures presented
- For each, 8 statements on ecosystem services:
 - Recreation, Beauty, Purity, Identity, Peace, Tradition, Harmony and Production (not cultural)
- Response on Likert scale
 - "full disagree" to "fully agree"
- Linear Model:
 - Response as a function of picture, ecosystem service, and people



Results

Many significant predictors of responses at $p < 0.01$

WHERE



Rural



Lake



Grassland



Glacier

Rural degraded



Urban

WHAT

Beauty

> Peace, Recreation, Purity

> Harmony

> Tradition

> Identity

> Production

WHO

Non local > Local

Urban = Rural

Men = Women

Newcomer > Long-term resident

Old > Young people

Conclusion

- Different approaches for assessing cultural ecosystem services for different research questions



WHO

Number of people studied:

+

– (cost)

Details on people:

–

+

WHAT

Number of services studied:

–

+

Details on services:

–

+

WHERE

Location of use, supply, demand:

+

–

WHY

Drivers of use, supply, demand:

+ (quantitative)

+ (qualitative)

Thank you!

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