

Appendix 4. Detailed qualitative results.

1. ES Beneficiaries

Agricultural production benefited four stakeholder types, all at the local scale: urban populations (for subsistence), rural populations (for subsistence and income generation), rural communities (for incomes from collective plantations) and agro-industries (for profit).

Similarly, medicinal plants benefited to four stakeholder types from local scale: plant traders (for personal use and income), emolienteros (herbal beverage sellers with mobile stalls) (for profit), rural population (personal use) and ecotourism business (as some visitors are eager to learn about medicinal plants).

Water quality benefited several stakeholder types: rural and urban populations (health benefits), communities, companies or organizations providing drinking (EMUSAP in urban areas, JASS in communities) and irrigation water (JUDRAB) for the reduced cost of water treatment, as well as stakeholders from the business sector using water their economic activities (fish farmers, water-related businesses, hotels and restaurants, agro-industries) for the better quality of water and the reduced cost of additional water-treatment operations they implement.

Water quantity benefited diverse stakeholder types, including rural and urban populations, communities, companies or organizations providing drinking and irrigation water, and businesses using water for their activities (e.g. fish farms, agro-industries, hotels and restaurants).

Mass erosion benefited many stakeholders from different scales (local to national): Urban and rural populations, communities, tourists and ecotourism associations, as well as companies or organizations providing drinking and irrigation water (their water infrastructures are often destroyed during landslides), businesses such as fish farmers, transport companies or Electro Sur Este (infrastructures), public institutions in charge of civil defense after hazard, such as INDECI, Regional government, Provias (cost of intervention).

Sheet erosion benefited rural population and communities (conservation of soil for agricultural production), businesses using water for their activities, such as fish farmers, Electro Sur Este and agro-industries (sediments in water negatively impact their business) and companies or organizations providing drinking and irrigation water (extra cost of water treatment).

Global climate regulation benefited to urban and rural population (heat and droughts control, maintenance of agricultural production), companies or organizations providing drinking water (regulation of water availability), stakeholder from business sector using water for their activities (fish farmers, water-related businesses, hotels and restaurants, agro-industries), stakeholders from business sector that are dependent on water availability for their activities (plant traders, ecotourism businesses and SERNANP), as well as public institutions in charge of civil defense after hazard (including droughts or heat waves), such as INDECI and the regional government (cost of intervention).

Ecotourism benefited tourists, local hiking or biking clubs, as well as businesses and individuals providing services to tourists (nature guides, tourism and transportation companies, hotels,

restaurants, and communities or individuals providing housing and food services) and the National Service of Natural Protected Areas for the incomes generated by entrance fees

2. ES managers

Table A4.1. Examples of management activities for each of the eight selected ES. This list is not exhaustive, but rather illustrative.

	Direct: Act directly	Indirect: Coordinate and supervise (CS), Provide finance (PF), Provide knowledge and skills (PK), Provide supplies and materials (PS), Regulate ES flows (RF), Restrict ES degradation (RD)
Provisioning services		
Agricultural production		
Ecosystem level	Rural population creates new agricultural lands, sows crops or plants trees.	Agriculture Ministry services train farmers (PK). Municipalities control activities that negatively affect croplands (e.g. urbanization) (RD).
Service level	Farmers cultivate and harvest crops and raise cattle.	Regional government services in charge of agriculture train farmers (PK). NGOs provide breeds of small stock to farmers (PS). Communities with customary laws on communal pastures and the National Protected Area Service restrict grazing in some areas (RF).
Use level	Rural population transport and market products.	NGOs organize fairs and create labels (PK). National Agrarian Sanitary Service controls product quality (RF).
Medicinal plants		
Ecosystem level	National Protected Area Service protect wild medicinal plant populations.	-
Service level	Plant traders or the rural population collect medicinal plants in the wild. They also cultivate them.	National Protected Area Service and National Forest Service, in association with police and public prosecutor restrict and control plant extraction (RF). Communities control who extract medicinal plants in their territory through customary laws (RF). NGO provide trainings about plant cultivation (PK).
Use level	Plant traders transport and sell medicinal plants in urban markets.	National Forest Service control and sanction plant commercialization in the markets (RF).

Regulating services

Water quality

Ecosystem level	Rural population and communities protect wetlands with fences. Communal organizations providing drinking and irrigation water reforest upper watershed.	Municipality protect upper watershed through legislation (RD). NGOs and local institutions provide supplies and materials to reforest upper watershed or protect wetlands (PS). International cooperation and national programs provide finance to NGOs and local institutions (PF). NGOs, national programs, and public institutions provide technical supervision and trainings to rural population (PK).
Service level	Rural population, fish farmers, communities and companies or organizations providing drinking water clean bodies of water (lakes, rivers).	Municipality, National Water Authority and regional government in association with police and public prosecutor control, monitor and sanction water contamination (RD). Community enforce customary law (RD). NGOs provide supplies and materials to build infiltration ditches (PS) as well as technical supervision and trainings (PK). National Water Authority and regional government raise awareness about solid wastes and wastewater management (PK).
Use level	NGOs and regional government build water treatment infrastructures. Companies or organizations providing drinking water treat water and distribute it.	Municipalities and regional government supervise communal organizations providing drinking water (CS) and train them (PK). Companies or organizations providing drinking water and regional government monitor water quality and restrict uses depending on quality (RF). National Water Authority and regional government give permits to some specific water uses (RF).

Water quantity

Ecosystem level	Rural populations or irrigation committees reforest upper watershed. Communities protect wetlands with fences.	NGOs train rural populations and communities to wetland management (PK). Municipalities define protected areas to protect water resources (RD).
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Service level	Communities build traditional small-scale dams to improve water regulation.	NGOs train communities and rural populations to construct dams (PK) and provide materials for the construction of dams (PS).
Use level	Irrigation committees manage canals to transport water. Regional government and NGOs build water infrastructure for water distribution.	National Water Authority grants water licenses (RF). Companies or associations charge fees for irrigation and drinking water (RF). Environment Ministry supervises stakeholders using water (CS).

Mass erosion

Ecosystem level	Public institutions in charge of transportation infrastructure reforest along roads.	NGOs provide training about public inversion to prevent natural hazards (PK). Police and public prosecutor sanction illegal activities that generate mass erosion (deforestation, mining, etc.) (RD)
Service level	-	-
Use level	-	Municipality and regional government control city expansion through zoning and construction licenses (RF). National Water Authority identifies dangerous river margins (RF). National and regional institutions in charge of civil defense monitor mass erosion events (PK). NGOs, municipalities as well as national and regional institutions in charge of civil defense raise population awareness (PK). Regional government animate a platform on risk management (CS).

Sheet erosion

Ecosystem level	-	National programs and regional government bring supplies and materials to improve vegetation cover (PS) and train communities and rural farmers to sustainable land cover management (PK).
Service level	Farmers adopt soil conservation agricultural practices (spray or drip irrigation, terraces, etc.)	NGOs and national programs provide trainings and technical assistance for the construction of terraces, infiltration ditches, soil management in agriculture (PK).
Use level	-	-

Global climate

Ecosystem level	Urban population and civil society associations plant trees for mitigating climate change.	Municipalities and regional government monitor and sanction CO ₂ emissions (RD). Regional government and businesses bring supplies and materials to reforest areas (PS). National Protected Area Service, National Forest Service and regional government raise population awareness about climate change and train rural population to climate change mitigation (PK). NGOs and regional government finance reforestation programs (PF).
Service level	-	-
Use level	-	-

Cultural services

Scenic beauty and recreation

Ecosystem level	Urban populations reforest city streets.	Municipalities provide tree seedlings (PS). Municipalities and National Protected Area Service control settlements in protected areas (RD).
Service level	Tour operators or associations clean sites.	National Protected Area Service controls activities that may degrade scenic beauty (e.g. trash disposal) (RF).
Use level	National Protected Area Service creates hiking trails or installs trail signs. Tour operators guide or host tourists. Taxis offer transport services.	A public organization funds studies to create new hiking trails (PF). NGOs train rural populations to guide and host tourists (PK). Hotels and restaurants distribute information about tourist attractions (PK). National Protected Area Service restricts tourist activities and access to protected areas through entrance fees and supervision (RF).
