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Scientific tourism, a tool for tourism development in Patagonia.

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Abstract:

Since 2007 the Center for Research in Patagonian Ecosystems (*Centro de Investigación en Ecosistemas de la Patagonia*, CIEP) has implemented Scientific Tourism (ST) to foster research programs, technology transfer, and scientific mediation in order to strengthen sustainable tourism development in remote mountainous areas of Patagonia. Public and private institutions of Chile, South America, USA and Europe participated in this process and supported new research on cultural heritage and natural processes of southern Chile. Scientific Tourism is a niche within alternative forms of tourism that shares specificities of learning, adventure, cultural, and experiential tourism. It is described as a tourism that generates and shares acquired knowledge, but has wider implications and benefits. This paper analyzes how scientific tourism fosters research, local development through pilot projects, and a network of local operators and research institution in the Chilean Patagonia. Linking science and tourism seems to meet the challenge of improving socio-economic growth of the local communities and potentially improve the conservation of highly fragile ecosystems.

Key Words: territorial management, socio-economic development, scientific tourism, networking

Résumé en Français:

Depuis 2007, le Centre de recherche sur les écosystèmes de Patagonie (Centro de Investigación en Ecosistemas de la Patagonia, CIEP) a mis en œuvre un tourisme scientifique (TS) pour favoriser les programmes de recherche, de transfert de technologie et de médiation scientifique, afin de renforcer le développement du tourisme durable dans des zones montagnardes reculées de Patagonie. Des institutions publiques et privées du Chili, d'Amérique du Sud, des États Unis et d'Europe ont participé à ce processus et appuyé de nouvelles recherches sur le patrimoine culturel et les processus naturels du sud chilien. Le tourisme scientifique est une niche au sein du tourisme alternatif qui partage des spécificités avec le tourisme expérientiel, éducatif, aventureux et culturel. Il se définit comme un tourisme qui génère et partage des connaissances scientifiques, mais ses répercussions et des retombées positives sont plus larges. Cette communication explore la manière dont le tourisme scientifique favoriser la recherche et le développement local grâce à des projets pilotes et un réseau d'opérateurs et instituts de recherche. L'association de la recherche et du tourisme semble permettre de relever le double défi de l'amélioration des conditions socio-économique des communautés locales et de la conservation d'écosystèmes fragiles.

Mots clefs: gestion du territoire, développement socio-économique, tourisme scientifique, réseaux d'acteurs

Context: Nature based resource development in Chilean Patagonia

The South Pacific region of Aysén in Chilean Patagonia, with only 91,000 inhabitants and 110,000 km2 of forests, rivers, lakes, glaciers, and wild prairies is a rich understudied ecosystem. 83% of the territory is state owned and 49% under theoretical protection of the Chilean state. The Laguna San Rafael National Park and surrounding areas was declared a Man and Biosphere Reserve in 1974 while a procedure to declare *Patagonian Archipelagos and Patagonian Ice Fields* a UNESCO World Heritage site, started in 2005.

Rapid increase of human activity: extensive grazing, fires, salmon industry, industrial fishing, hydroelectric and mining projects and related road construction or navigation have provoked large debates about development strategies (Grenier, 2003). The anthropic impacts have generated uncontrolled fires, sewage discharge, increase of solid litter, biological and fuel contamination of once pristine ecosystems. Natural disasters such as volcanic eruptions, underwater seismic activity and climatic changes, causing glacier melting, glacier lake outburst flows (GLOFs), landslides and avalanches, have generated numerous impacts on communities, villages, grazing lands, forests, coasts and fresh water resources. Political priorities have been set on improving infrastructure to favor multinational extractive economical development and few public funds have been assigned to mitigate impacts of productive activities or support global research. Local non-governmental organizations strive to study and generate awareness to protect the ecosystems. As tourism development slowly grows new pressure is put on this world heritage site, demands rise from local communities, non-governmental organizations and entrepreneurs for authorities to tackle risk issues and bring solutions.

Through the analysis of a Scientific Tourism project in the Aysén region of Chile, this paper studies how a network of scientific research organization and local tourism initiatives generates innovating territorial dynamics. Closely linking research programs to tourism operations and tourism capacities seems to generate positive outcomes. Tourism development seems to be more sustainable than other industrial developments in Chilean Patagonia.

I. Scientific Tourism (ST), bridging tourism and science

Tourism, like other human activities, has important impacts. Yet it has become the main strategic axis for the development of lowly populated and remote regions with limited infrastructure. These remote and unexplored areas usually have fragile wilderness and are often threatened by extractive industrial initiatives. In Chilean Patagonia Scientific Tourism emerge as an alternative development strategy that could meet the challenge of enhancing local communities socio-economic growth and potentially improving conservation options of fragile ecosystems.

Science, travel, and tourism have been historically related but surprisingly the use of scientific tourism within the tourism industry is recent and its signification still vague. Authors consider it as a part of ecotourism, voluntourism or adventure and nature based tourism. West (2008), Laarman & Perdue (1989) and Hall & Saarinen (2010), see ST as a niche within alternative forms of tourism. Some relate it to learning travel (Morse, 1997)

and experiential tourism (Smith, 2005). The traveler becomes an actor of his tourism experience and not just a consumer. He consumes an experience (Holbrook, Hirschman, 1982) with a personal appropriation of visited places and request thus specific services to meet his expectations. This idea is supported by authors such as Stebbins & Graham (2004) in *Volunteering as leisure / leisure as volunteering or* Cushner (2004) in *Teacher as traveler / Travel as teacher*. It is relevant to see how these approaches are useful on an educational perspective. CSL Sagueney – Lac St Jean (2005) sees ST as part of "learning travel" and the expression of a change in the traditional way of travelling that could favor innovation and creativity in tourism development.

Mao & Bourlon (2011) investigate the forms of scientific tourism in Chilean Patagonia and in their essay of a definition of Scientific Tourism, based on a worldwide research, they define it as special interest tourism that generates and shares acquired knowledge (Mao, 2011). They describe four forms: 1) Exploration and adventure Tourism with a scientific dimension, 2) Cultural Tourism based on scientific knowledge, 3) Scientific eco-volunteering and 4) Scientific research tourism.

These four theoretical forms can be diversified since each dimension; "exploration and adventure", "scientific research", "Education and Learning" or "Culture and Interpretation" can be mixed in a variety of ways within specific recreational activities.

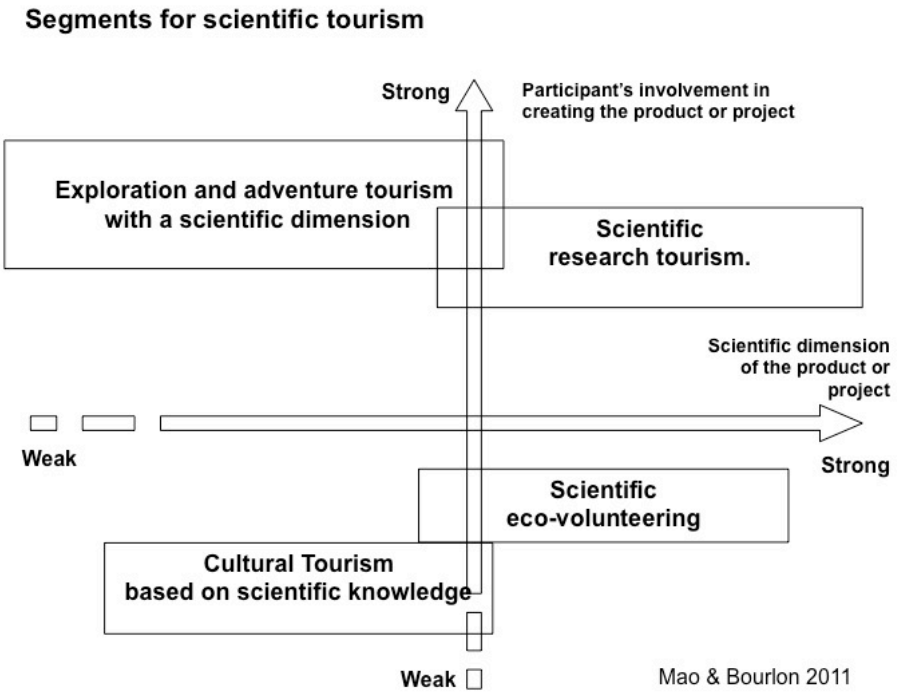

Figure 1. Segments of Scientific Tourism

II. Articulating a network of scientific and tourism projects

Bourdeau analyzes the challenges related to tourism destinations as a "relational process both material, cultural and identity related, between an individual, a social group and a territory" (Bourdeau, 2003). But tourism development is also based on valuing resources

accordingly with the external eye set on the destination by visitors (Urry, 2002). Nevertheless adding value to products depends on the capacity of local actors to make use of available resources. "The territory becomes the place of coordination between actors" (Landel & Pecqueur, 2011), but requires a structured, organized and institutionalized coordination to exist as a productive system.

1. A network of science and tourism organizations

In 2007 the Center for Research in Patagonian Ecosystems (Centro de Investigación en Ecosistemas de la Patagonia, CIEP, www.ciep.cl) chooses to implement Scientific Tourism to foster research programs, technology transfer and scientific mediation in order to strengthen a sustainable tourism development. More than a hundred public and private entities of Chile, South America, USA and Europe have collaborated in a participatory process, supporting research on cultural heritage and natural processes. Starting 2012 a scientific tourism network of local entrepreneurs, travel operators, agencies, accommodation, transportation companies and non-governmental organizations, is created (CIEP, 2012). Scientific and culture stakeholders, such as national and international universities, researchers and students, public institutions in charge of environment, culture and common heritage, as well as private organizations and foundations involved in education, conservation and culture joined business related actors. The latter composed mainly by national and international tourism entrepreneurs, public institutions in charge of economical development, and tourism promotion. The articulation and networking carried out by CIEP gave way to a Scientific Tourism Platform to support and enhance research that could foster tourism development. Regardless of the potential implications of the findings of the research programs, most regional actors showed keen interest in sharing scientific knowledge.

2. Implementing Scientific Tourism through Pilot projects

Aysén has a wide variety of natural and cultural resources relevant to science and visitors. Some highlights are: the second largest fresh water reserve on the planet, massive Patagonian Ice Fields, archeological remains of the presence of nomadic "Tehuelche" indigenous group, pioneers and settlers' livelihoods and the historical visit of numerous famous explorers such as Darwin. To bridge science and tourism the ST network chose to support pilot projects, divers in terms of scientific fields and geographical areas of application. Each initiative fits one of the segments of Scientific Tourism, as previously defined. They all include non-governmental, cultural and conservation organization, tourism entrepreneurs, university or research group, and community or regional public services (mainly in tourism, environment, culture, and park management).

The implementation of these pilot projects usually follows three phases: 1) a prospective scientific and adventure exploration, 2) the formulation of a research program, establishment of human and logistical needs, related to possible volunteer or learning programs and 3) the creation of ST products to be commercialized. The following examples of Scientific Tourism pilot projects show the dynamics involved.

The « Laguna Caiquenes » project led by Aumen, a private conservation organization, aims at creating a small visitors center an interpretation trail within the temperate rain forest of the coastal mountain, in an isolated area of the southern end of the Carretera Austral. A series of field trips undertook in 2010 and led by researchers from both the Natural History

Museum of Santiago and the Universidad Austral de Chile have carried out investigations on topics such as vascular plants, bryophytes, amphibians, carnivores (pumas and wild cats) and endemic deers (Huemul and Pudu). In 2012 the local community from the town of Tortel is invited to take part in field works and participatory educational activities. These studies have set the baseline of the management program for the fragile ecosystem of the evergreen forest of the South Pacific range. Today travelers can support, visit the park and take part in eco-volunteering programs, such as the implementation of a suspended walkway. It is now one of the few possible treks into the dense forest and wetlands of southern Aysén (www.aumen.cl).

Another initiative consisted in Eco-volunteering activities where visitors, students and amateurs shared their time, ideas and professional knowledge to support ongoing research to gain new insight of the life of the nomadic indigenous peoples of the oriental part of the Patagonian Andes. In 2009 and 2010 two eco-volunteering programs in the Chacabuco valley and Patagonia private park program enabled to co-fund up to 30% of the total cost of this scientific exploration. In 2011 and 2012 a second program, "Archaeology in the mountainous valleys and steppe of Aysén in the Río Ibáñez valleys", consisted in a "travel abroad" and "learning course" of the University of Montana. Commercial programs where later implemented by local operators (Exploraysen and GeoSur Expeditions) and new scientific groups (University of Montana, Idaho, Michigan, CIEP, and other Chilean researchers).

In 2014, an adventure scientific exploration was carried out in a remote area of the Laguna San Rafael National Park, the Istmo de Ofqui, to explore the Patagonian Northern Ice field and South Pacific coasts. CIEP, Universidad Austral de Chile, University Joseph Fourier de Grenoble, Universidad Arturo Prat and the Sociedad Ornitológica de Chile gathered fifteen participants during eighteen days in March 2014. Geography, geology, glacier geomorphology, wildlife, botany and anthropology where some of the scientific topics tackled as they could produce valuable information for the ongoing management plan of the park. Five local tourism entrepreneurs offered logistical support, due to their interest in working side-by side with scientists and gaining new knowledge. The main lesson learned from this exploration is that further research is needed on this highly fragile area before authorizing new tourism activities. A research station should be implemented with the park management service (CONAF) to carry out long-term wildlife studies, ocean dynamics and impacts of climate changes.

3. The Scientific Tourism projects cycle

In three years more than a hundred local operators and tourism service providers and some 200 scientists have been involved in projects and expeditions involving research and recreational activities. This has generated about 3000 overnight stays of some 800 researchers, students, volunteers and adventure visitors (CIEP, 2016). Numerous scientific tourism initiatives have occurred. Some examples of recent events include:

- The Patagonian Archaeology International Meeting (Jornadas de Arqueología de la Patagonia) led by CIEP, Chilean and Argentinean universities (five days and 150 participants, November 2014)

- A Kayak & Archaeology Expedition in the Patagonian Fjords, led by the Guiding School and CIEPs' researchers: an eight day expedition, with eight participants and fifty community members of Puerto Aysén and Puyuhuapi in April 2014.
- A community based whale census program led by the local group "Censo comunitario de cetáceos", in the northern fiords of Aysén, involving more than thirty persons during six weeks, in February and March 2015.
- A Learning and Eco-volunteering program organized by a tourism operator, EMTREX and the Geography and Architecture departments of the Pontificia Universidad Católica de Chile in the Exploradores Bay, involving more than twenty-five personas during ten days, during summer 2014 and 2015.
- A cultural and interpretation tour led by El Puesto Hostel & Expedition with the support of CIEP for the Inter-American Development Bank, involving some twenty five visitors, seven scientists and five guides and logistic specialists during four days in November 2014.
- The Huwans - Club Aventure "Special Patagonia Tour", led by Azimut360 TO, with the scientific support of CIEP and Universidad de Concepcion. A cultural and interpretation that involved ten clients and four scientists during seventeen days, in November 2014.
- A Geography and Ecotourism Learning Course in Patagonia led by Montana University with the logistical support of GeoSur expeditions, involving fifteen students, three professors and a team of three logistics specialists, during fifteen days in the mountain range of San Lorenzo, in January 2015.

The implementation of these pilot projects has been instructive for the engineering of ST products and their operational implementation. It appears that scientists know how to lead a research and tourism operators know how to satisfy the customer's demands, but none can do both. Scientists must understand visitor's needs and expectations to gain their support. Tourism entrepreneurs must adapt their offer and not only focus on demand but also consider the specific needs of researchers and the importance of scientific interpretation. Upstream coordination was essential to clarify priorities and understand each other's requirements. When expectation met with reality and challenging scientific and ecological issues, the expressed satisfaction was reported as high.

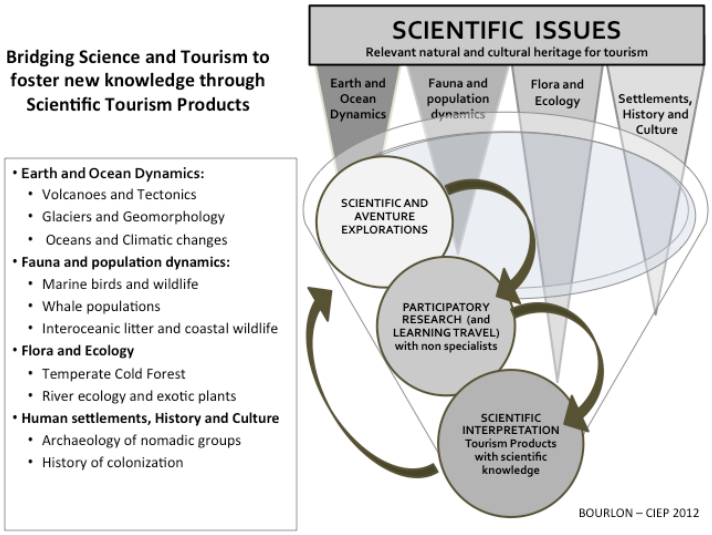

Figure 2: The Scientific Tourism Projects Cycle

Beyond the mere importance of each particular project a relevant outcome is that a new dynamics is created on the territory. Scientific tourism forms are interrelated and complementary. Therefore a cycle within Scientific Tourism can be observed. Scientific or adventurous exploration can lead to participatory research program and later generate cultural and interpretative tours. As the figure shows each of these phases or thematic project can create numerous tours, activities and relevant socio-economical dynamics. This is what Landel & Pecqueur (2011) define as a territorial dynamic and Courlet (2002) as a "local productive system". These pilot projects have created a new and specific tourism offer.

III. Scientific Tourism: favoring innovative local development

A territory may base its socio-economic development on the extraction of available resources to respond to an existing demand from the globalized market or seek to differentiate their offer relative to other territories with similar primary resources. As Flagestad & Hope (2001) express it, two competitive approaches exist "the resource based view (and) the industrial organization [...] focuse[d] on purposeful differentiation". Peyrache-Gadeau (2004) argues, "It is possible to capitalize, preserve or exploit [the heritage resource] for private or collective interests". She claims that this heritage is a "sort of hybrid concept between public property and private property, which implies the idea of mutual support and intergenerational responsibility, and can allow a compromise between economic problems, associated with exploitation of natural resources, and ecological and conservation perspective".

1. Tools for Scientific Tourism

ST strengthens participatory process for the cultural construction and identity of a place. This process is made possible by a wide range of interpretation documents and field guides collaboratively produced by the Scientific Tourism network. The travel guide called "La Ruta Archipiélagos Patagónicos" is the first known guide for scientific tourism. This guide is a selection of fifty seven topics chosen by the actors of ten local communities with the support of scientists on natural, cultural and environmental issues. The guide is now a useful tool for local operators and data is clearly relevant for tourists interested in exploring out of the way issues and areas of the territory. The section called "A look at Aysén Today" raises issues of the moment, such as; the impact of the salmon industry, the Aysén's social movement in 2012, the creation of private conservation areas, the melting of glaciers and the climate change.

"Field Guides for Scientific Tourism in Aysén" on the other hand seeks to support the identification of iconic species, inform of conservation status, provide basic guidelines for appropriate animal observation and data acquisition and promote networking through the sharing of collected data. Furthermore "scientific tourism maps", posters and factsheets for scientific tourism, covering a wide range of scientific issues support the spatial representation of key data.

These Scientific Tourism tools have been widely shared during local workshops, meetings, Internet (www.turismocientifico.cl), and social medias such as twitter, Facebook and Fan Page. Important events such as the "Encuentros de Turismo y Ciencias", organized every year, include seminars, expositions, and practical field words, which supports local education and scientific knowhow. They have been the meeting point for research

specialists, universities, NGOs, schools and local actors interested in sharing their traditional knowledge. It has also been the place to inform of ongoing research, pilot projects and new scientific programs.

The results of these events, pilot projects, expeditions and research studies have been published in specialized journals and mass medias. Because the shared information is relevant, innovating tourism marketing occurs, through numerous scientific publications, radio and TV programs, press articles, web sites of NGOs and universities as well. The wide range of impact can be seen by a high number, more than a hundred, of specialized and mass media articles. A few examples are: Revista Enfoque and Revista Destinos (Chile February and January 2015), Revista Muy Interesante (Argentina, June 2015), CELAC-European Union web site (Brussels, June 2015), The Ecotourism Society newsletter (USA, January 2013).

Scientific publications take part in promoting the region, through research networks and social medias, an audience that can later buy travels services or tours. A few significant scientific publications that support this strategy are: "*Explorando las Nuevas Fronteras del Turismo*", edited by Bourlon & al in 2012, "*Une destination « non touristique » à la mode: la région d'Aysén, en Patagonie chilienne* » by Franck Michel in 2015, *Scientific Tourism: Researchers as Travellers*, edited by Slocum in 2012, "*Tourisme Scientifique en Patagonie chilienne; Un essai géographique sur les voyages et les explorations*", by Mao & Bourlon in 2015.

2. Building new tourism dynamics

The Scientific Tourism dynamics has supported the creation of new and original commercial products based on specific scientific topics and local initiatives.

In February 2016, twenty-three operators of the 103 members of the network of scientific tourism produced a catalog of Scientific Tourism products. Visitors can book field activities while travelling on the "Ruta de los Archipiélagos Patagónicos" (The Patagonian Archipelago Route). Thirty travel proposals with relevant services are offered to scientists, students, volunteers and visitors in general. A visitor raveling through the cordillera and coastal areas can visit the Patagonian canals and nearby mountain ranges, from Melinka and Puerto Raúl Marín Balmaceda in the North all the way down to Tortel and Villa O´Higgins.

Although the marketing and commercialization of Scientific Tourism products is still new its economical impact has been evaluated in $500.000 US for the 2013 – 2016 period. Some 3000 days of stays, involving 200 scientists and more than 800 scientific tourism clients, have been registered (CIEP, 2016). More than 5000 persons are actively involved through social networks and about 1000 people have taken part in "Science and Tourism" meetings and field activities organized by the network.

Conclusion and directions for new research

Guided by the idea of "acquiring knowledge in order to value and protect", the "Scientific Tourism" network has brought together numerous local operators, public institutions, non-profit organizations, and scientists. Researchers, tourism operators, volunteers, professors, students and independent travellers have taken part in multidisciplinary, participatory and co-constructed scientific actions to enhance a new tourism development strategy that gives value to understudied ecosystems and patrimony. Actors have shared their perceptions and knowledge to support expeditions and dissemination of research results. The creation of a

scientific travel guide, field observation tools and “scientific knowledge” maps, an online data base with spatial references to “hot spots” for scientific tourism (Mao, 2015), and a product brochure for travelers, are some of the results produced by the collaboration of researchers and non specialist (CIEP, 2016).

A local operator and network leader, a research and development institution (CIEP), facilitated the identification and selection of scientific resources to build an alternative, appropriate and empowered tourism destination. A global process has emerged with a group of stakeholders valuing and protecting natural resources for tourism. Tourism companies, scientists, organizations and public servants have united and empowered to create a new “local productive system” (Courlet, 2002).

Scientific Tourism is a way forward in appropriate development strategies because it builds new productive systems based on the value of local cultures and identities, ecological assets and an effective appropriation of science and technology (Leff & al, 2002) by local actors.

Scientific tourism offers an opportunity to diversify human activities in areas stressed by the antagonism of exploitation and conservation of natural resources. It appears as relevant development tool for socially marginal and environmentally fragile destinations. Nevertheless its effectiveness lies in the generation of participatory processes and collective actions that fully "involve trust building, solidarity and cooperation within a group (Contreras, 2000). Further studies should evaluate specifically how local actors change their understanding of scientific knowledge, how a network of scientific tourism operators is strengthened in time and to comprehend in which way «a new environmental rationality” (Leff & al, 2002) spreads within a community. Overall, in the light of other extractive and industrial development initiatives in Patagonia –such as salmon industry, hydropower and mining –nature tourism and particularly ST offer a truly sustainable way of development in a context of unique ecosystems and valuable cultural heritage.

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