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Introduction (Purpose):

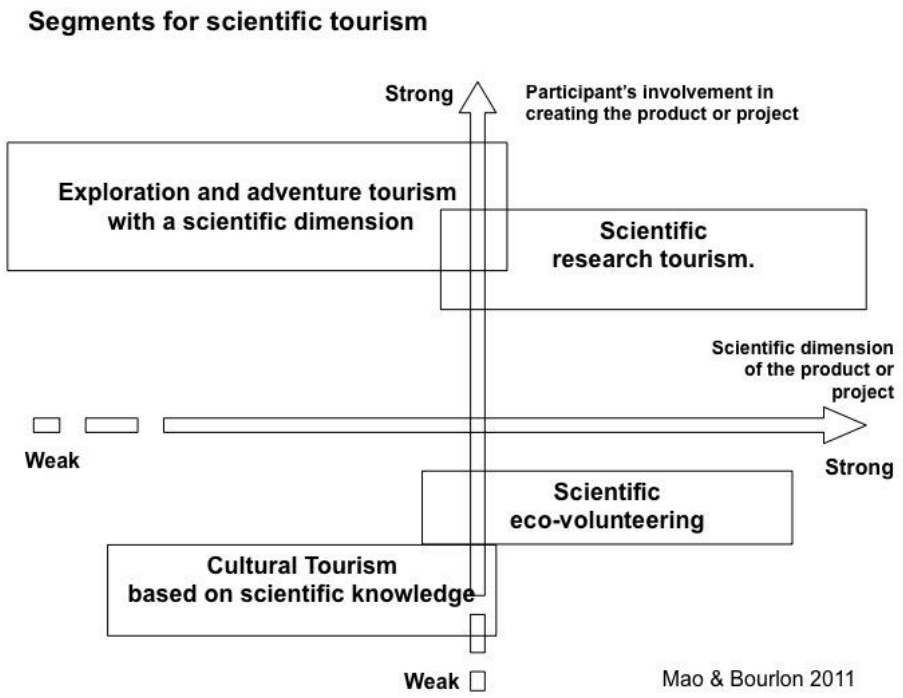
The Center for Research in Patagonian Ecosystems (Centro de Investigación en Ecosistemas de la Patagonia, CIEP) was created in 2005 as part of the Chilean CONICYT research program to favor regional development. The present paper explores how CIEP, Universidad Austral de Chile (Chile) and the University Joseph Fourier (France) studied new knowledge, technology transfer and local development options with the support of "Scientific Tourism" (ST). With the collaboration of more than 20 public and 100 private entities, of Chile, South America and Europe, an international program supported research on cultural heritage and ecosystems in Patagonia to increase local understanding of environmental challenges and favor tourism development of isolated rural areas.

Scientific Tourism

Science, travel and tourism have been historically related. Surprisingly though the use of "scientific tourism" as a concept within the tourism industry is very recent and its signification still vague. Authors consider it as a part of ecotourism, voluntourism or adventure and nature based tourism. West (2008), Ilyina & Mieczkowski (1992), Laarman & Perdue (1989) or Hall & Saarinen (2010), see it as a niche within alternative forms of tourism. Others relate it to learning travel (Morse, 1997) and experiential tourism (Smith, 2005), where the traveler becomes an actor of his tourism experience and not just a consumer. This idea is supported by authors such as Stebbins & Graham (2004) in *Volunteering as leisure / leisure as volunteering,* Cushner (2004) in « teacher as traveler & travel as teacher » and, recently, in Slocum (2015) in *Researchers as Travellers*. It is relevant to see how these approaches are useful on an educational perspective. The Canadian Scientific Leisure Council (CSL Saguenay – Lac St Jean, 2005) sees Scientific Tourism as part of a « *learning travel" process* and a change in the traditional way of travelling that favors innovation and creativity in the field of education of science and tourism development.

Scientific Tourism can be summarized as a learning and recreational activity that generates new knowledge and disseminates results of previous research. It can be considered as a niche within special interest, learning and experiential tourism but has wider implications and benefits (Bourlon & al, 2012). Four forms of tourism practices that include science related issues were defined by Bourlon & Mao (2011): Exploration and Adventure Tourism with a scientific dimension, Cultural and Scientific Interpretation, Scientific Eco-volunteering and Scientific Research, as such. The different forms are defined by the importance of science (Scientific Dimension) within an initiative, strong or weak, and the level of involvement of the participant in enhancing the project, strong (actor) or weak (consumer).

Figure 1: Forms of Scientific Tourism

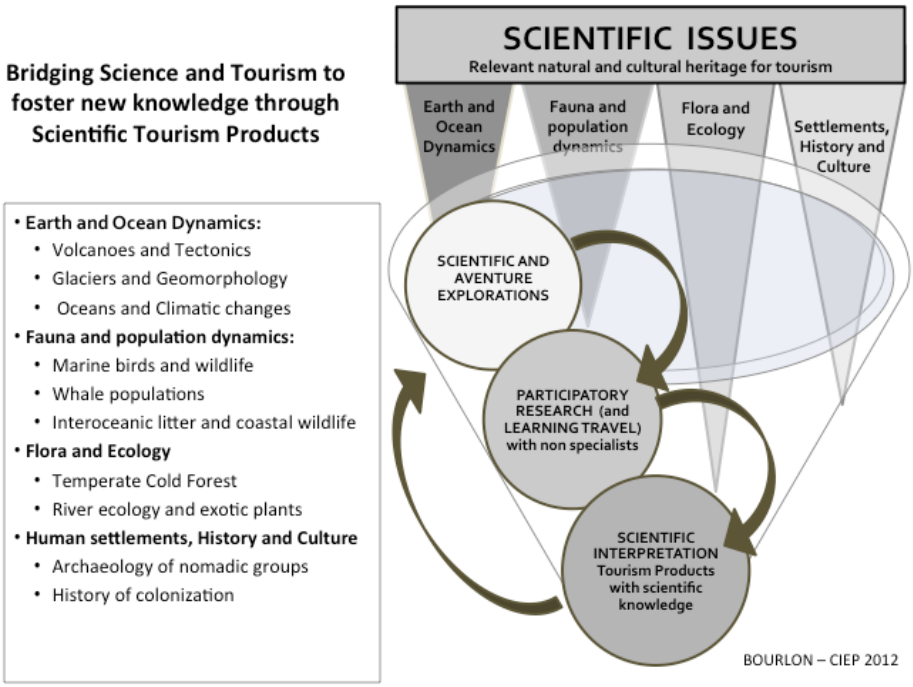


Implementing Scientific Tourism projects

Patagonia, due to its variety of natural and cultural resources, relevant scientific issues and attractiveness for visitors appears as an ideal place to foster Scientific Tourism. Some scientific highlights relate to: Lake General Carrera (the second largest fresh water reserve on the planet), the temperate evergreen forest, the complex marine and coastal ecosystem, the Patagonian Ice Fields, the archeological remains of the "Tehuelche" (a nomadic indigenous group), the specific culture and life style of the first pioneers and settlers, the historical visits of famous explorers, scientists and mountaineers, amongst others.

Through the implementation of multiple pilot projects in Chilean Patagonia, from 2009 to 2015, CIEP supported and analyzed how scientific tourism works and how relevant it can be for local development. Those initiatives bridged science and tourism in different scientific fields and geographical zones and involved non-governmental cultural and conservation organizations, tourism entrepreneurs, universities and research groups, community organizations and regional public services (tourism, environment, culture or park services). The implementation of these pilot projects usually followed 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.

Figure 2: The Scientific Tourism Projects Cycle



A few examples of pilot projects and initiatives supported by CIEP include:

1. An international Patagonian Archaeology Meeting, with Chilean and Argentinean universities, involving 150 participants during 5 days of seminar and 2 days of field visits (November 2014)
2. A Kayak & Archaeology Expedition in the Patagonian Fjords, led by the Patagonian Guiding School, involving 50 participants during 7 days in Puerto Aysén and Puyuhuapi (April 2014)
3. A community based whale counting program in the northern fiords of Aysén, led by the local group "Censo comunitario de cetáceos", involving more tan 30 persons during six weeks (February and March 2015)
4. A Learning and Eco-volunteering program organized by a local tourism operator, and the geography and architecture departments of the Pontificia Universidad Católica in the Exploradores Bay, involving more than 25 personas during 10 days (summer of 2014 and 2015).
5. A cultural and interpretation tour led by a local operator for the Inter-American Development Bank, involving some 25 visitors, 7 scientists and 5 guides and logistic specialists, during 4 days (November 2014).
6. A "Special Patagonia Tour", led by national operators for international tourists, with cultural and scientific interpretation that involved 15 participants and 4 scientist during 17 days (November 2014).
7. A Geography and Ecotourism Learning Course in the mountain range of Cerro San Lorenzo, led by the Montana University with the logistical support of local operators, involving 20 participants, students, professors, scientists and local guides, during 15 days, (January 2015).

Beyond the specific importance of each particular initiative, what is highly relevant is that they all reinforce other efforts and create new local dynamics on the territory. Lessons learned through the implementation of pilot projects are that scientists know how to lead research programs while tourism operators have the capacity to manage logistics and satisfy customer's demands, but that none can do both. Scientists must understand visitor's needs and expectations to gain their support. Tourism

entrepreneurs must adapt and not only focus on visitors theoretical demand but also consider the importance of science, researchers and students, as a potential market or way to improve the quality of their offer.

To implement Scientific Tourism projects, upstream coordination is essential, involving tourism operators, travelers, researchers and students. All stakeholders need to clarify their priorities and understand each other's requirements.

Creating a Scientific Tourism destination

To upscale the effect of scientific tourism, in 2013 CIEP initiated the project "Archipelagos of Patagonia, a world class destination for scientific tourism". The chosen area is a remote, wild and historically relevant area; the intricate maze of fjords, canals and islands of the South Pacific and coasts of Aysén (Chile). Here nomadic hunter-gatherers canoed the waterways of this territory for millenniums, prior to the arrival of explorers, missionaries, traders and the setting of transnational energy, fishing and salmon industries (Grenier, 2003). With the financial support of the Multilateral Investment Fund (MIF - IDB) and CIEP a network of more than 100 local operators implements a scientific tourism destination to improve socio-economic growth of local communities while supporting the conservation of highly fragile ecosystems (CIEP. 2012).

Guided by the idea of "acquiring knowledge in order to value and protect", with clear environmental engagements and through a participatory process, partners define 5 "cultural zones" for the destination. More than 50 relevant issues are chosen and classified in 5 global thematic topics: 1) History, colonization, 2) Earth and Ocean Science, 3) Flora and Ecology, 4) Fauna and population dynamics, and 5) Productive issues and management of human activities. By establishing the "state of the art" of scientific and local knowledge, some 23 pilot projects are described with proposals to carry out scientific research (Mao, 2015). Later, according to specific local logistical capacities, a set of 30 tourism products and services are defined to meet identified local, national and international demand (researchers, tourism operators, volunteers, professors, students and independent travellers). All products of the Scientific Tourism brochure carry the "The Patagonian Archipelagos Route" network brand. More than half of these receive the Scientific Tourism label, assigned by a scientific committee, to highlight the more scientific and educational proposals (Bourlon & al, 2013).

To support the marketing of the destination a travel guide is created, "The Patagonian Archipelagos Route" (Ibook version: *La Ruta de los Archipiélagos Patagónicos de Aysén, una guía para el turismo científico en la región de Aysén*). It informs of scientific data and local knowledge and maps the "hot spots" for scientific tourism (Mao, 2015). It invites visitors to discover "off the beaten path" and relevant regional issues. To enhance participatory research, specialized field guides (related to marine fauna, birds and archaeological remains of Patagonia, amongst others), workshops and public debates are elaborated. A web site and a Fan Page (Face Book) enables exchanges of news and experiences while favoring debates amongst members of the Scientific Tourism network. Today more than 5000 friends form the CIEP scientific tourism community. Thanks to this communication, scientific interpretation, local knowledge and social networking, Aysén has become a relevant special interest and sustainable tourism destination (Michel, 2015).

In the past three years more than 60 scientific initiatives involved more than 200 scientists and 70 local entrepreneurs. More than 800 participants generated some 500.000 US$ of business (Bourlon & al, 2016). Post tour enquiries show that some visitors find offered programs too specific and are not sure to repeat the experience. Nevertheless a wide majority feels that Scientific Tourism is challenging and unique. They are ready to renew such tours and are willing to adapt their travel habits to scientific and ecological considerations. Each form of Scientific Tourism attracts travellers with specific requirements and each offered project or product needs unique previous preparations. But when expectation meets with a fulfilling scientific or ecological goal, satisfaction is high.

Conclusions and proposals:

Scientific Tourism is based on innovation and local involvement. It is challenging because initiatives enable closer links and real collaboration between researchers, guides, entrepreneurs and local community leaders. The Patagonian experience shows that scientific tourism generates participatory research program and generates new relevant cultural and interpretative tours. Based on a set of thematic issues, pilot projects, exploration, research, volunteering or interpretation, creates relevant new socio-economical dynamics. This is what researchers such as Landel & Pecqueur (2011) define as a innovative territorial dynamic. It can also be seen as a new local productive system (Courlet, 2002) or a *"Global Production Network"* as defined by Ernst & Kim (2002). It seems clear that scientific tourism, by transforming science as a resource (François & al, 2006), generates opportunities to "mobilize environmental potentials through self-managed projects to meet needs, aspirations and wishes of the people" (Leff & al., 2002). It confirms the idea that "the principles of sustainability are taking root locally through the construction of new productive rationalities, grounded in cultural values and meanings, in natures' ecological potentials and the social appropriation of science and technology" (Leff & al., 2002). The Scientific tourism project has strengthened awareness on the need linking knowledge, conservation and socio-economical development in Chile. In 2014 the regional government of Aysén, Chile, has assigned new regional funds for the next 3 years to enhance the work done focusing on training, networking and scientific interpretation.

It now seems relevant to study ways to replicate this experience in other Latin American regions. By fostering participatory science and tourism programs, institutionalizing a network of researchers' and specialized tourism operators of EU and Latin America, bi-regional integration of systems for scientific research, technology and innovation, could be strengthened. Through a set of pilot projects led by a diversity of specialists and researcher, educational, community based and development organizations, it is possible to increase cooperation between Higher Education Institutions (HEI) and the productive sectors. The scale of supported projects should be of at least 5 years span and primarily focus on empowerment of local actors and ties to globalized national and international networks.

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