

Co-developing Climate Services with local agents: The INDECIS* Snow Tourism Index

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1) Approaches to Climate Services on Tourism

Meteorological conditions determine the viability and competitiveness of the socio-economic activities of any territory for many sectors, such as tourism, making it necessary to co-develop climate services with local agencies.

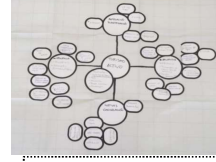
Cerdá, E.; Quiroga, S. (2018); Quiroga, S.; Martínez, P. (2018); Briley, L. et al (2015); Clements, J. et al (2013); Scott, D. et al (2010) Scott, D. et al (2011); Frei, T. (2010); De Freitas, C. R (2003)



2) Co-developing and user engagement methodology



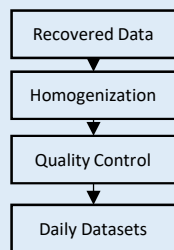
Focus Groups with local agents



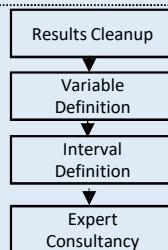
Example of Results

3) From qualitative to quantitative: Exploiting the work of INDECIS Project

INDECIS Project Work



Workshop Results



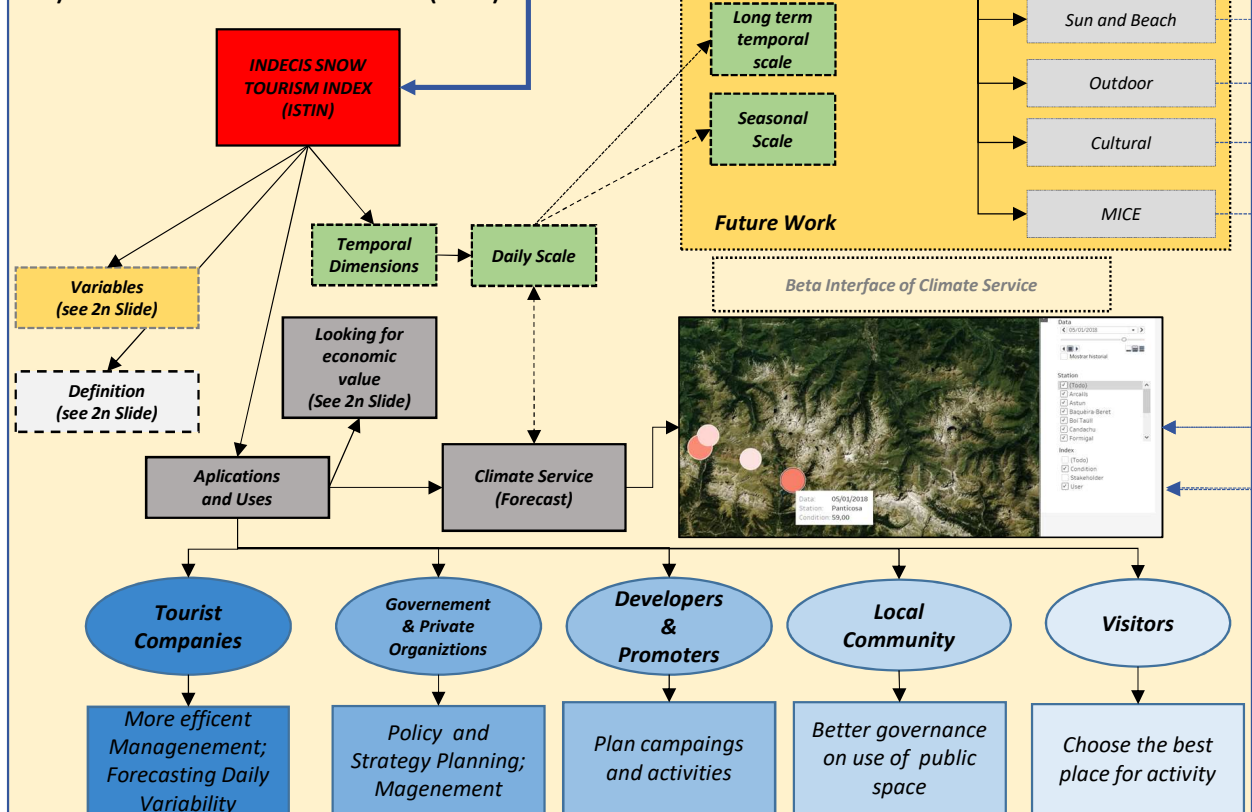
Sectorial Tourism Indices

4) Theoretical Approach to INDECIS Snow Tourism Index

Tourism needs a daily scale analysis for forecast and, also, for the past tests (Kovacs 2014). However, other researchers apply tourism indices according to **specific areas** or **specific tourism activities** (Martínez et al 2019; Alvarez Diaz et al 2010; Matzarakis 2004; Ren 2004; Morgan et al 2000).

User-provider climate information as CS a **collaboration between decision-makers and scientist** is a **key to serve problem solving** (Briley et al., 2015; Golding, et.al, 2017)

5) The INDECIS Snow Tourism Index (ISTIN)



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DATA

I. CLIMATE VARIABLES AND OPTIMAL INTERVAL

Indices	Variable	Optimal	Source
Snow I1	Depth	60 cm	Stations/ AEMET
	Type	Powder	Stations
	Temperature (°C)	-5° > < 5°	ECAR, AEMET
	Radiation (UVB)	6 > 8 <	ECAR, AEMET
	Rain (>0°) (mm)	< 2mm	ECAR, AEMET
Conditions I2	Rain (<0°) (cm)	> 10cm < 30cm	ECAR, AEMET
	Lightning (Yes/No)	No	ECAR, AEMET
	Wind (km/h)	< 10	ECAR, AEMET
	Avalanches (Danger Level)	< 2	ECAR, AEMET
	Visibility (Fog, Good)	Good	ECAR, AEMET
	Time since last snow (hours)	< 12	Own from ECAR & AEMET
	Slopes (% Open)	> 75%	Stations
	Lifts (% Open)	> 75%	Stations
	Km (% Open)	> 75%	Stations
	SnowPark (Open)	Yes	Stations
Infrastructures I3			
DayType I4	Day Type	Weekend	Own
	HolyDay	HolyDay	Own
Season Time I4	Days from 1st season day		

I. HOSPITALITY PERFORMANCE DATA

Hospitality data has been provided by STR (<http://www.str.com>)

Occupancy: % Occupied Rooms

RevPar: Revenue per Available Room

ADR: Average Daily Rate of Revenue

Demand: Total person who travel

Revenue: Total Income

INDECIS SNOW TOURISM DEFINITION

I. THREE DIMENSION INDEX

StakeHolders	$INSTIN_{Stakeholders} = (I1 + I2 + I3) * I4 * I5$
Users	$INSTIN_{Users} = (I1 + I2 + I3)$
MeteoConditions	Conditions = I2

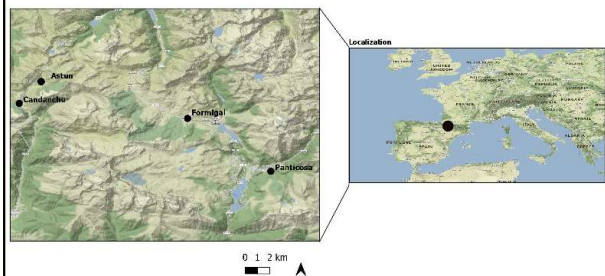
II. QUALITATIVE INTERPRETATION

INSTIN_STAKEHOLDERS	INSTIN_USERS	Descriptive Categories
161-200	41-50	Ideal
121-160	31-40	Excelent
81-120	21-30	Good
41-80	11-20	Marginal
1-40	1-10	Unfavourable
0	0	Impossible

ISTIN User Index has been standardized multiplying by two (x2) thus remaining on the same scale of TCI and HCI

LOCALIZATION OF PILOT TEST

Ski stations in Aragon's area of Jacetania



STUDY CASE: Testing value of INSTIN and economic value.

INSTIN User Index

1) has recognized better good days for ski activities (Figure 1) and 2) has better relation with hospitality economic performance (Figure 2)

Figure 1. Good Days* for Snow Tourism Activities by year

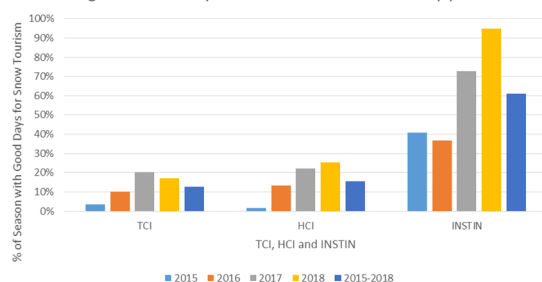
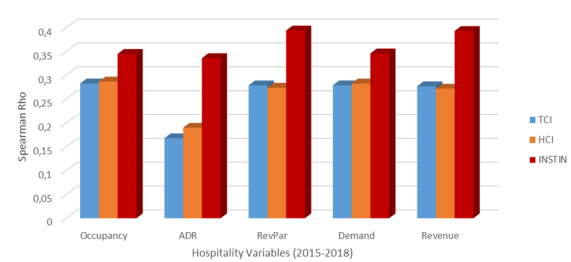


Figure 2. Spearman Rho between Good Days for Snow Tourism Activity* and Economic Performance



*Good Days for Snow Tourism are the days with more than 60 points in TCI, HCI and INSTIN User Index

All correlation coefficients are significant at 99,9% level ($p < 0,01$)