Proyecto de apoyo
Gestión del cambio climático
Fase 2

Actualization of national climate classification map of Peru

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A project led by:

PERÚ Ministerio del Ambiente

Senamhi SERVICIO NACIONAL DE METEOROLOGÍA E HIDROLOGÍA DEL PERÚ

With the financing of:

Schweizerische Eidgenossenschaft
Confédération suisse
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Confederaziun svizra

Embassy of Switzerland in Peru

Swiss Agency for Development and Cooperation SDC

Implemented by:

libélula Gestión en Cambio Climático y Comunicación

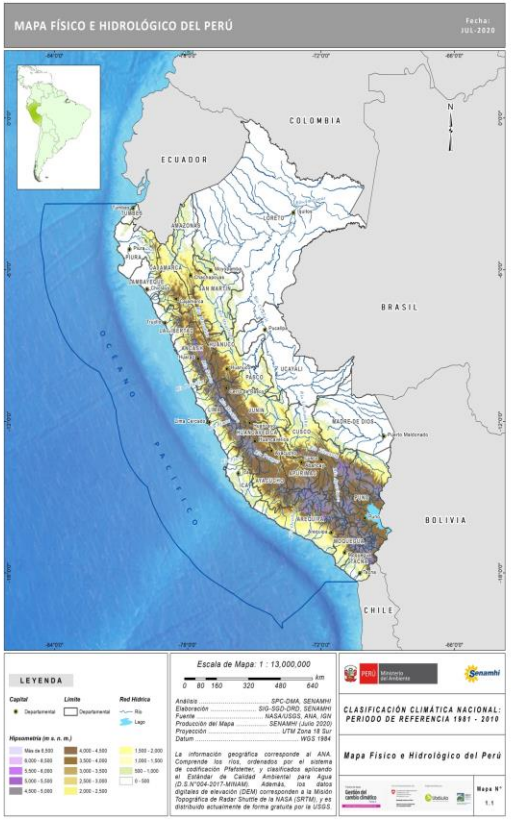
SOUTH SOUTH NORTH TOWARDS CLIMATE RESILIENCE

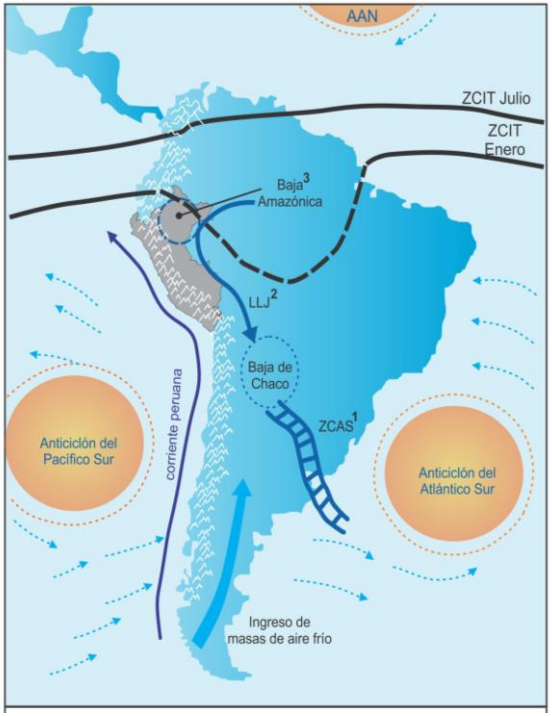
Introduction

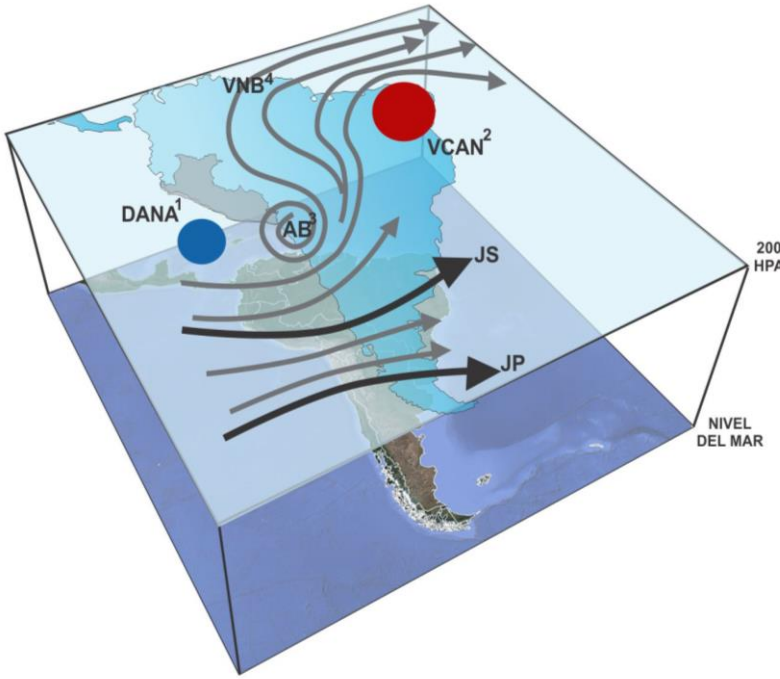
Climate Change Management Support Project – AGCC	**Component 2: Better climate information for decision making**
Background	**The first Climate Classification Map of Peru in 1988**
Aim	**Update the map of climate classification of Peru**
Utility	**climate management tool**

Climate Controllers of Peru

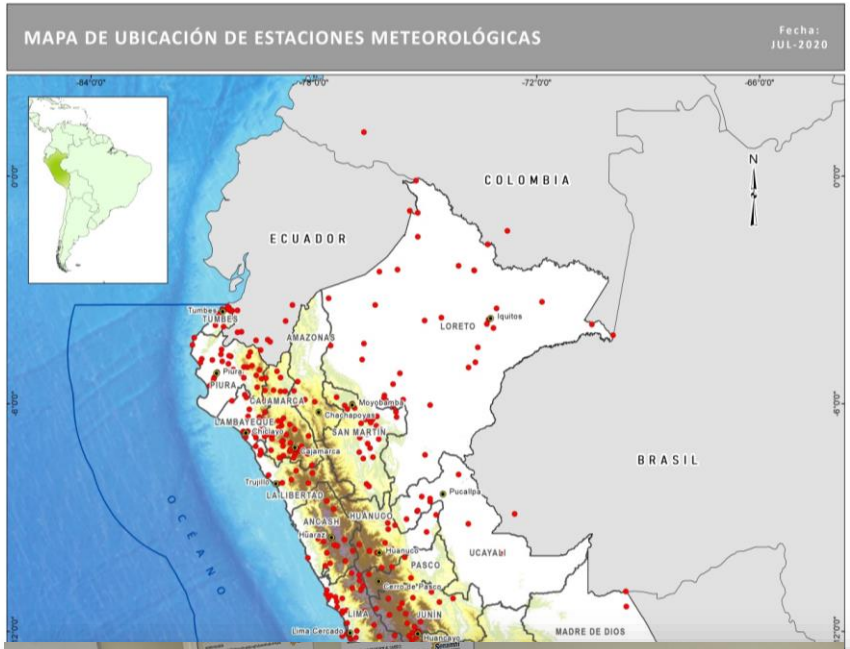
The variaty of climates in Peru is the result of a combination of meteorological, oceanic and continental controllers







Meteorological Data



COUNTRY	INTITUTION	N° WEATHER ESTATIONS
PERU	NATIONAL METEOROLOGY AND HYDROLOGY SERVICE- SENAMHI	483
ECUADOR	NATIONAL INSTITUTE OF METEOROLOGY AND HYDROLOGY OF ECUADOR- INAMHI	11
COLOMBIA	INSTITUTE OF HYDROLOGY, METEOROLOGY AND ENVIRONMENTAL STUDIES OF COLOMBIA- IDEAM	3
BRASIL	CENTER FOR WEATHER FORECASTING AND CLIMATE STUDIES- CPTEC	3
BOLIVIA	NATIONAL METEOROLOGY AND HYDROLOGY SERVICE- SENAMHI	4

Criterias to calculate monthly climatological normals

Meteorological Variable	Percentage of missing data
Precipitation	Calculation of the accumulated monthly precipitation with missing data of less than 10% (3 days).
Maximum Temperature	Monthly average with missing data less than 15% (5 days).
Minimum Temperature	Monthly average with missing data less than 15% (5 days).

Thornthwaite Climate Classification System (1931)

Effective Precipitation Index (IPE)

$$PE = \sum_{n=1}^{12} 115 * \left(\frac{P}{T-10}\right)_n^{10/9}$$

ANUAL VALUE (IPE)	CLIMATE	SYMBOL	REFERENCE ZONES
>4.86	Very rainy	A	Jungle
4.17 a 4.85	rainy	B	Forest
3.50 a 4.16	Medium dry	C	Pastureland
2.84 a 3.49	Semiarid	D	Steppe
Under 2.84	Arid	E	Desert

Index of Seasonal Concentration of Moisture (ICEH)

SYMBOL	MEANING
r:	Abundant humidity in all seasons of the year.
i:	With dry Winter.
p:	With dry spring.
v:	With dry summer.
o:	With dry autumm.
d:	Moisture deficiency in all seasons of the year.

Thermal Efficiency Index (IET)

$$IET = \sum_{n=1}^{12} \left(\frac{T-32}{4}\right)_n$$

ANUAL VALUE (IET)	CLIMATE CHARACTER	SYMBOL	REFERENCE ZONES
>127	Warm	A’	Tropical
64 a 127	Tempered	B’	Mesothermal
32 a 63	Cold	C’	Microthermal
16 a 31	Semifrigid	D’	Taiga
1 a 15	Frigid	E’	Tundra
0	glacier	F’	Perennial ice

Validation of the Statistical Interpolation Model

Multiple linear regression equations

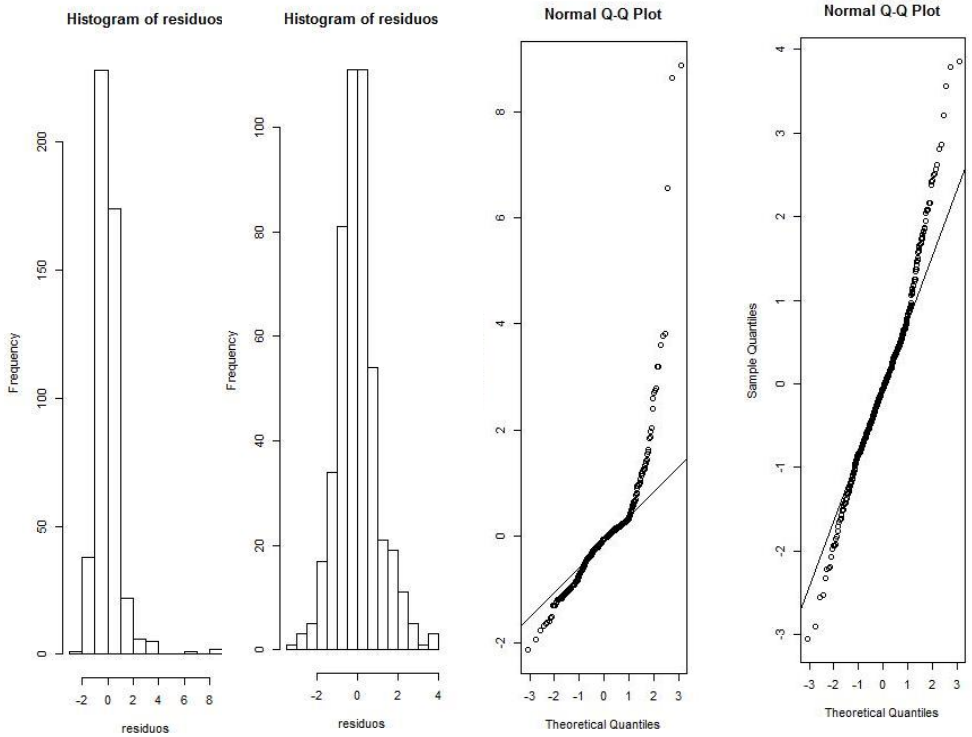
$$Log(IPE + 1) = \theta_0 + \theta_1(Altitude) + \theta_2(Latitude) + \theta_3(Longitude) + \theta_4(Nat.Region)$$

$$IET = \theta_0 + \theta_1(Altitude) + \theta_2(Latitude) + \theta_3(Longitude)$$

The following assumptions must be met

Assumption 1: Normality of errors
Assumption 2: Homoscedasticity
Assumption 3: Independence
Assumption 4: No Multicollinearity
Assumption 5: Linearity

Transformation of the dependent variable

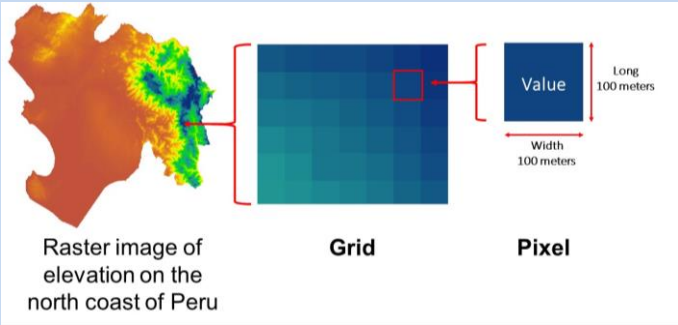


Cross Validation of the Statistical Interpolation Model

MONTH	RMSE	R^2	MAE
JANUARY	0.47	0.79	0.34
FEBRUARY	0.49	0.76	0.37
MARCH	0.48	0.77	0.37
APRIL	0.45	0.77	0.35
MAY	0.4	0.8	0.31
JUNE	0.37	0.79	0.27
JULY	0.38	0.75	0.28
AUGUST	0.37	0.74	0.28
SEPTEMBER	0.44	0.72	0.34
OCTOBER	0.51	0.73	0.41
NOVEMBER	0.5	0.75	0.38
DECEMBER	0.48	0.79	0.35

Thornthwaite Index Map Algebra

Apply the function to each pixel

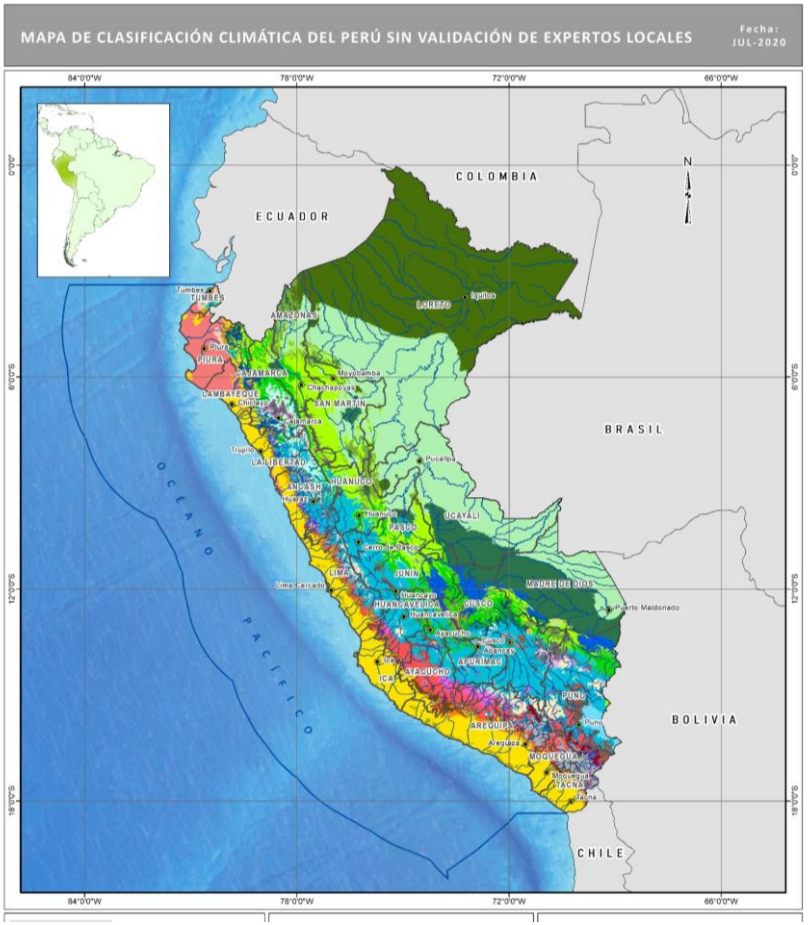


IPE

ICEH

IET

Preliminary Climate Classification Map



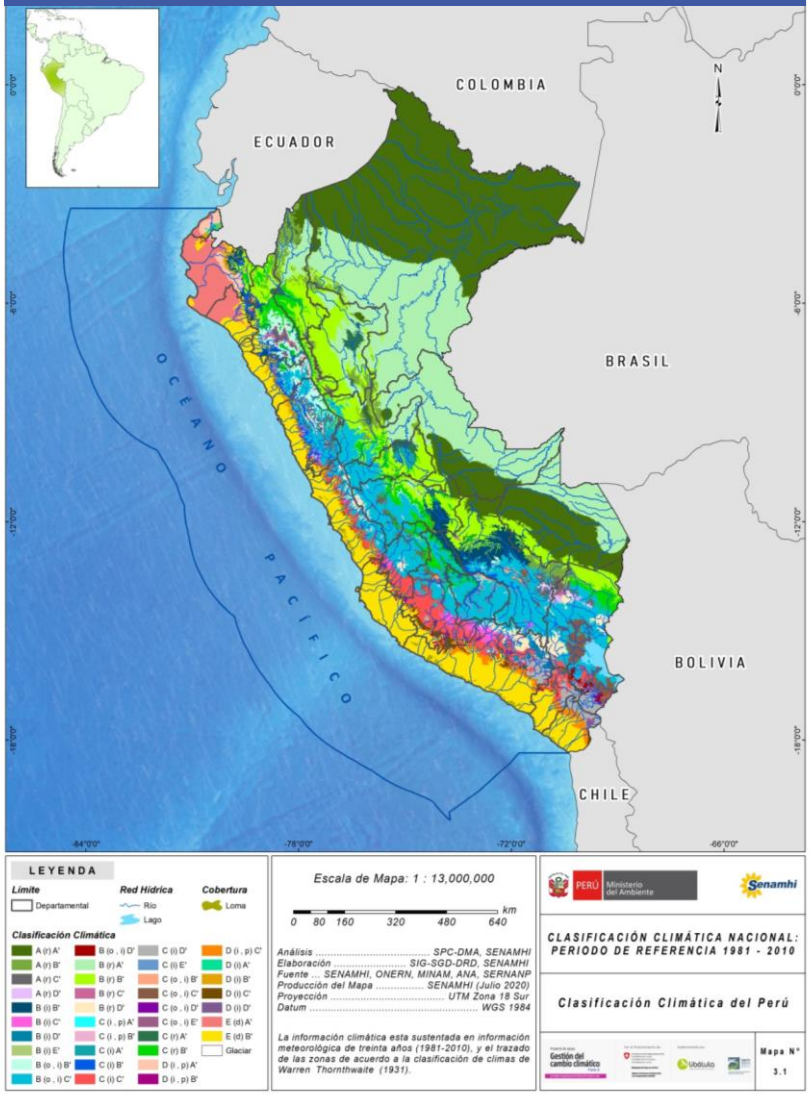
Validation of the Climate Classification Map

Workshops

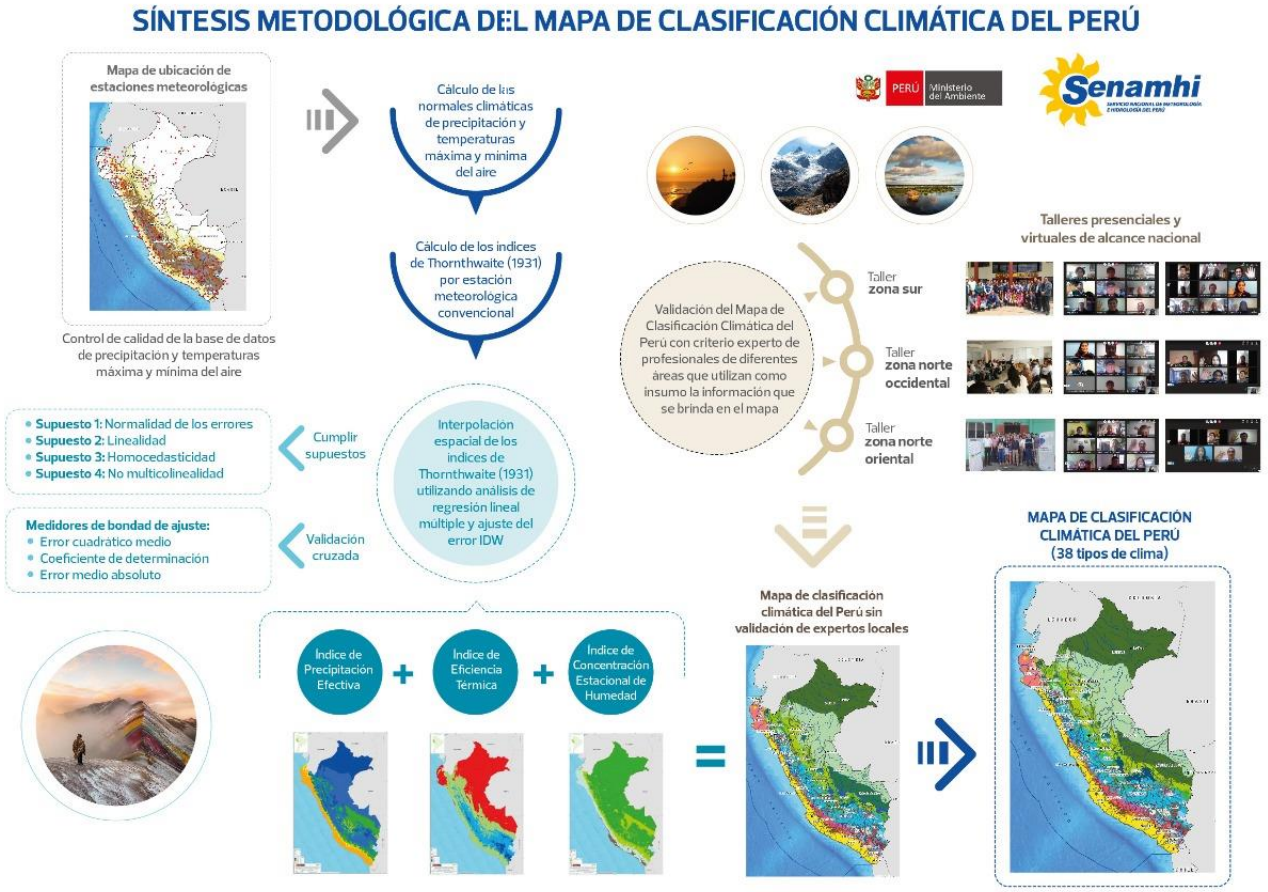
Presential

Virtual

Final Climate classification Map of Peru



Conclusion



Peru presents a range of 38 climates spread over the vast national territory, with extreme climates such as very humid and warm all year round; the hot desert; and the glacial.

The variety of climates are made up of four very rainy, eleven rainy, thirteen semi-dry, seven semi-arid, two arid and one glacier.

Thanks!

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