

***Water and climate challenges: the path of dialogue between
actors and across borders***

December 6th, French Pavilion, COP24, Katowice, Poland

Water challenges for Mexico City under climate change and the role of Basin Councils

Fabiola S. Sosa-Rodriguez

Director of the Research Area on Environment & Growth

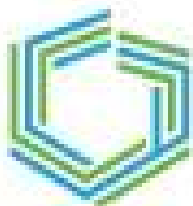
Department of Economics

Metropolitan Autonomous University

Mexico

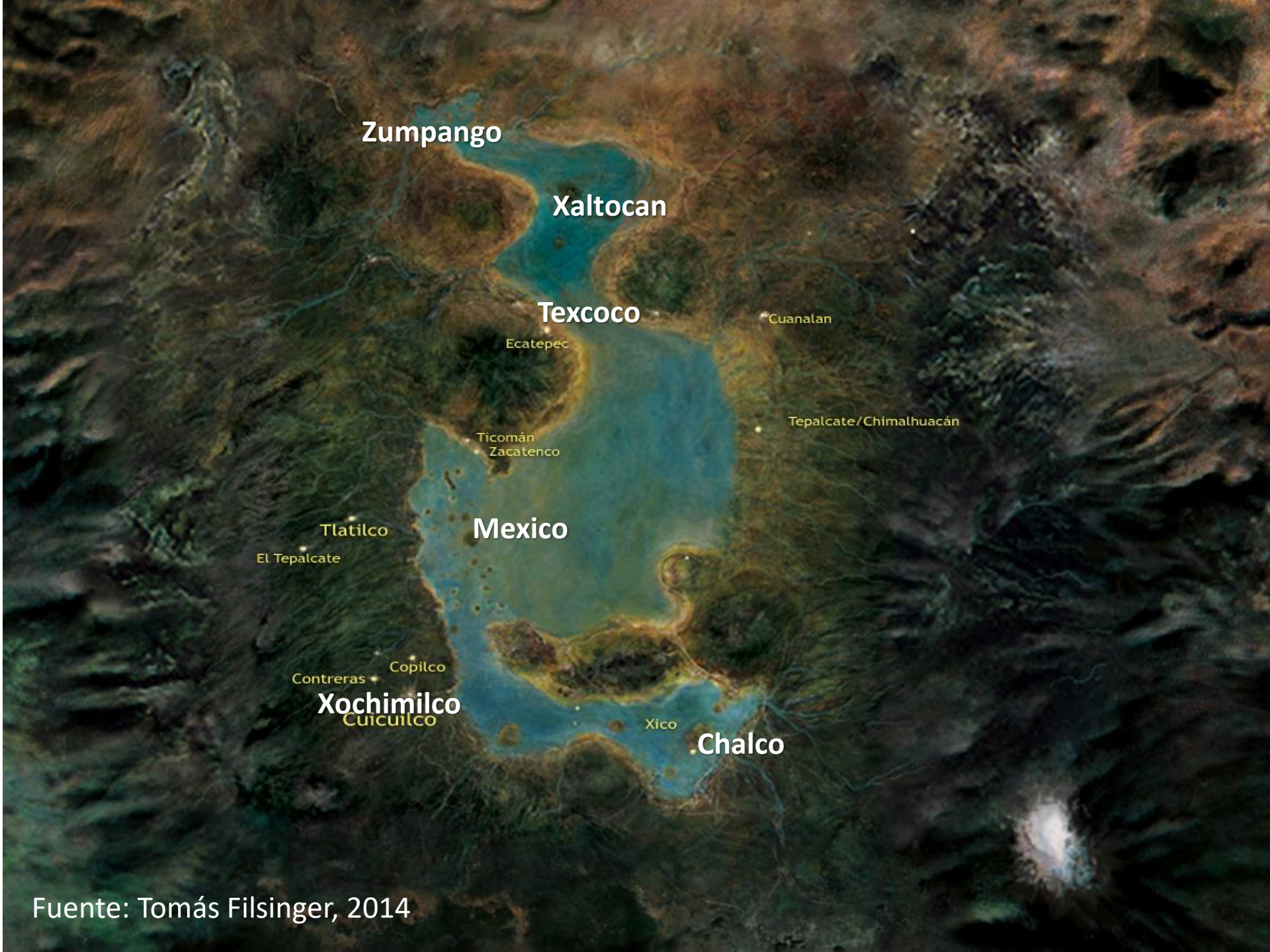
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1. Climate variability and change in the Basin of Mexico





Zumpango

Xaltocan

Texcoco

Ecatepec

Cuanalan

Tepalcate/Chimalhuacán

Ticomán
Zacatenco

Mexico

Tlatilco

El Tepalcate

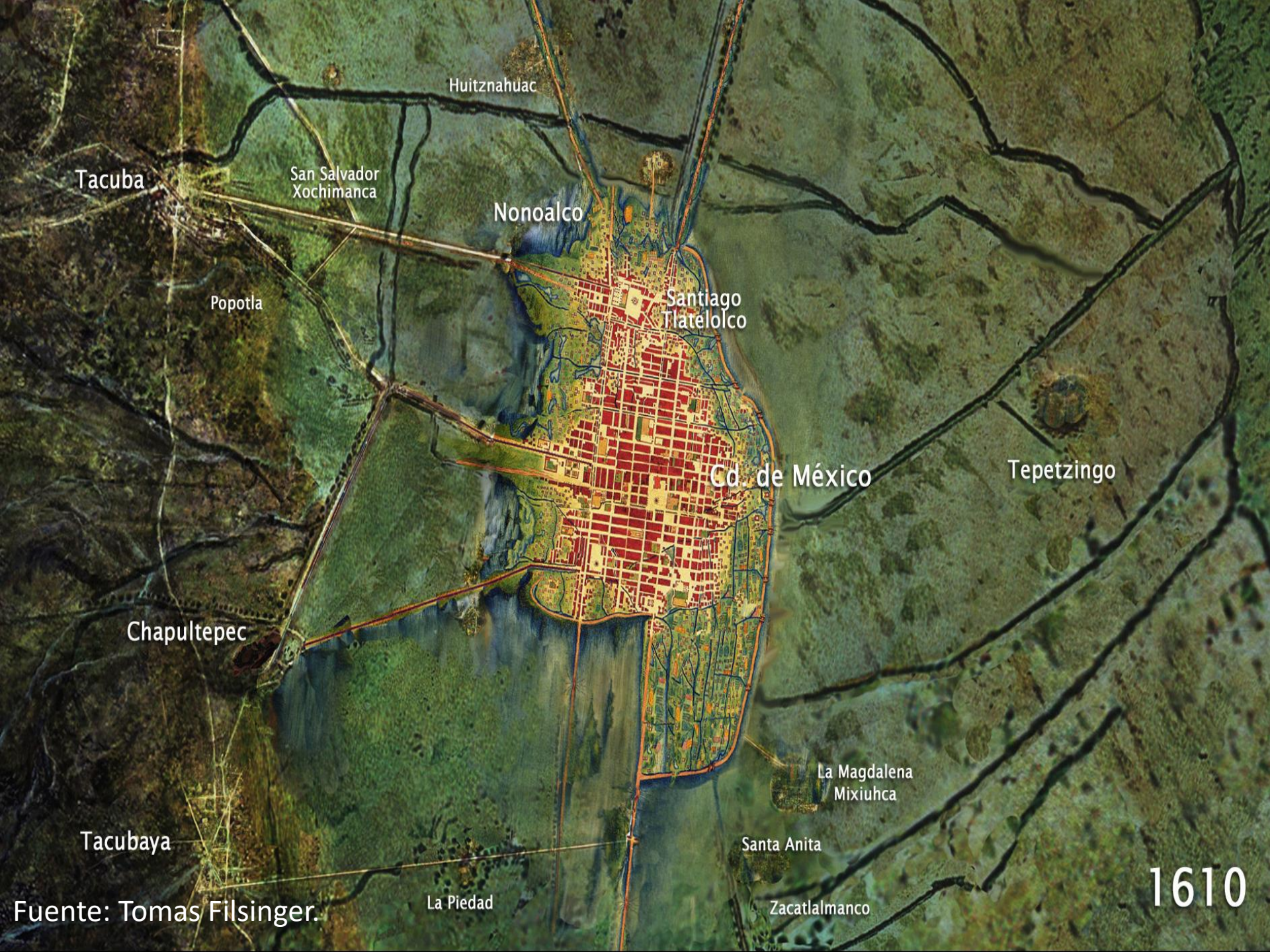
Contreras
Copilco

Xochimilco

Cuicuilco

Xico

Chalco



Tacuba

San Salvador
Xochimanca

Huitznahuac

Nonoalco

Santiago
Tlatelolco

Popotla

Co. de México

Tepetzingo

Chapultepec

La Magdalena
Mixiuhca

Santa Anita

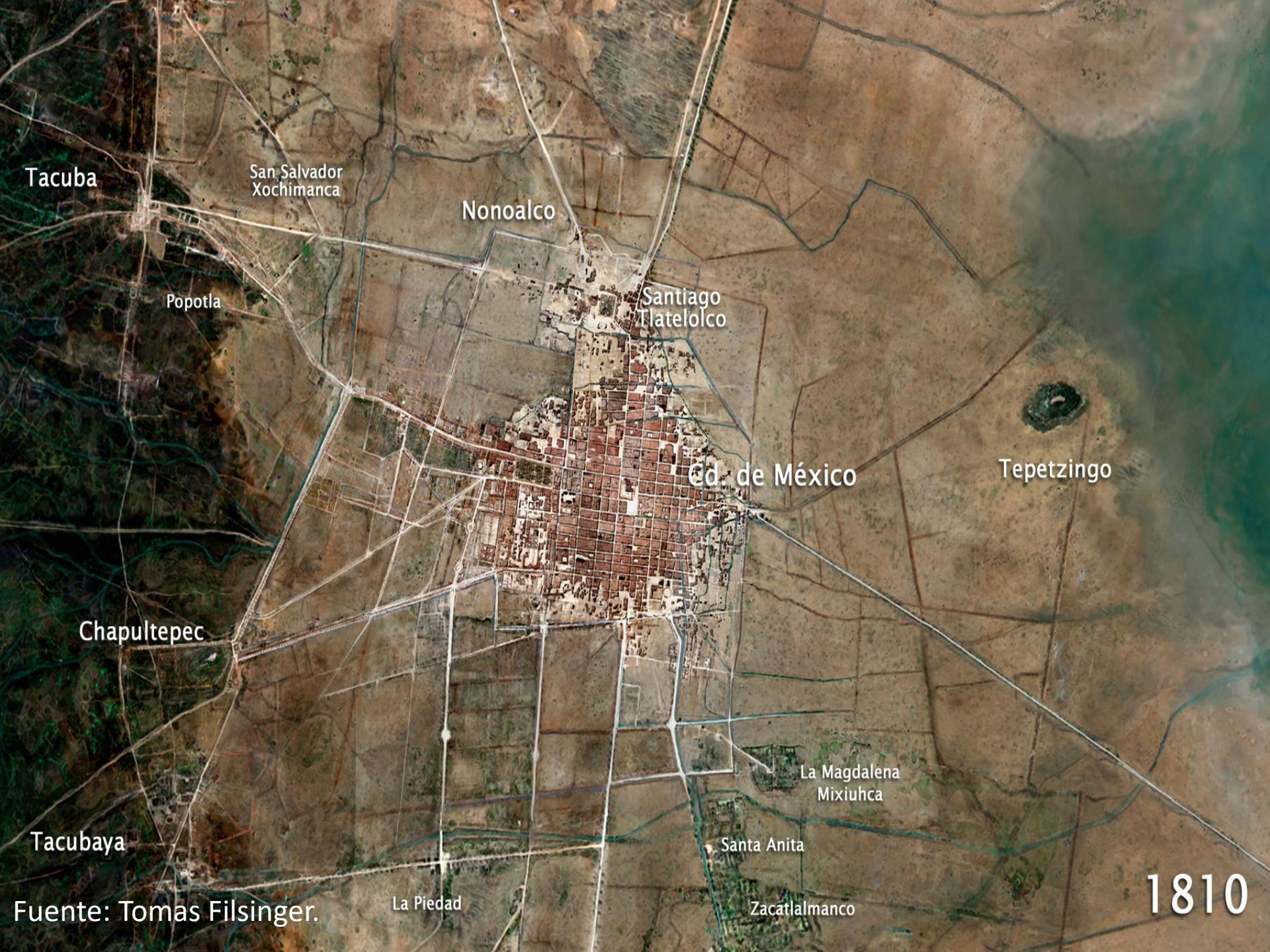
Zacatlalmanco

Tacubaya

La Piedad

1610

Fuente: Tomas Filsinger.



Tacuba

San Salvador
Xochimanca

Nonoalco

Santiago
Tlatelolco

Popotla

Cd. de México

Tepetzingo

Chapultepec

Tacubaya

La Magdalena
Mixiuhca

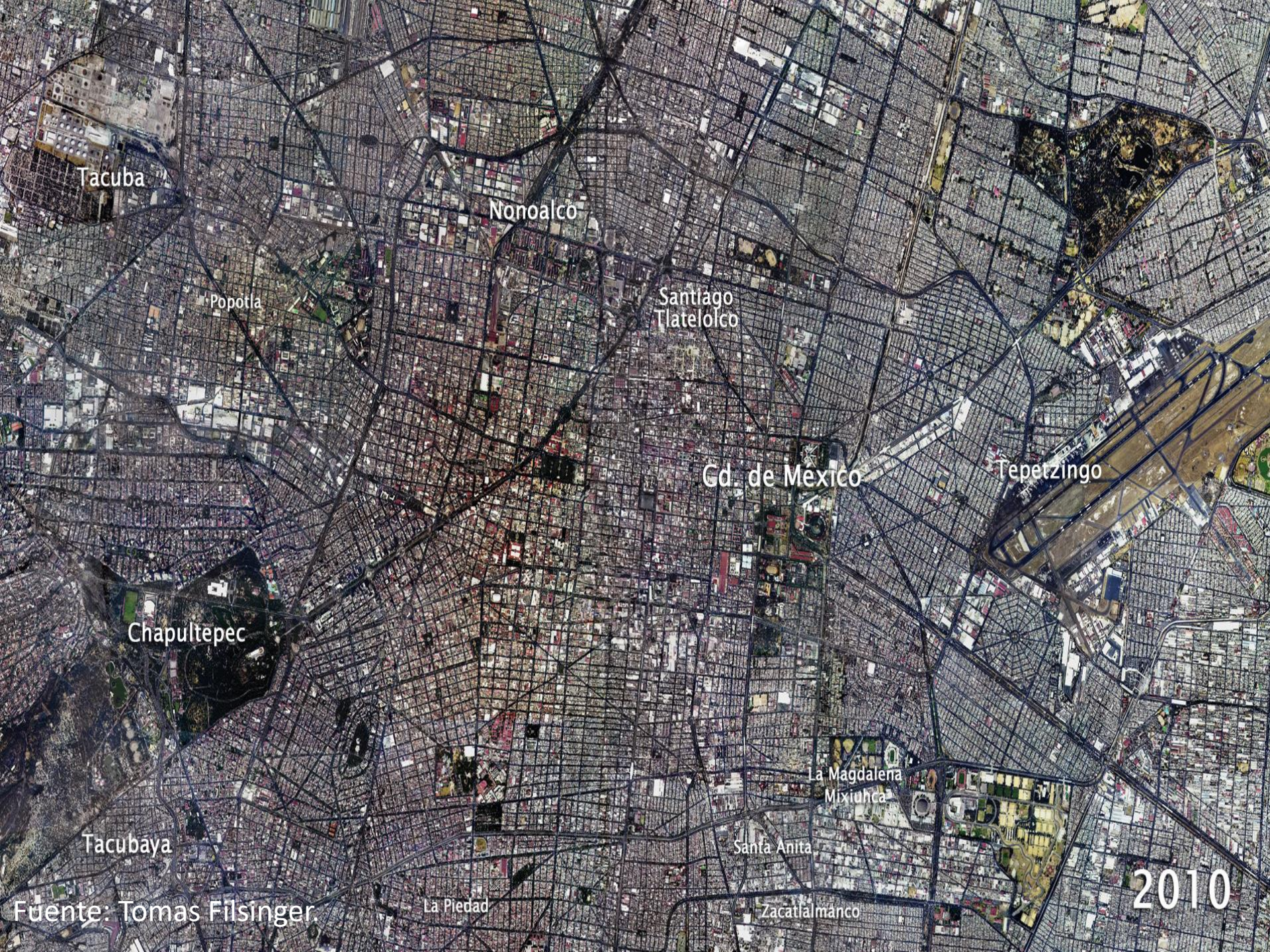
Santa Anita

Zacatlalmanco

La Piedad

Fuente: Tomas Filsinger.

1810



Tacuba

Nonoalco

Santiago
Tlatelolco

Popotla

Cd. de México

Tepetzingo

Chapultepec

Tacubaya

La Magdalena
Mixiuhca

Santa Anita

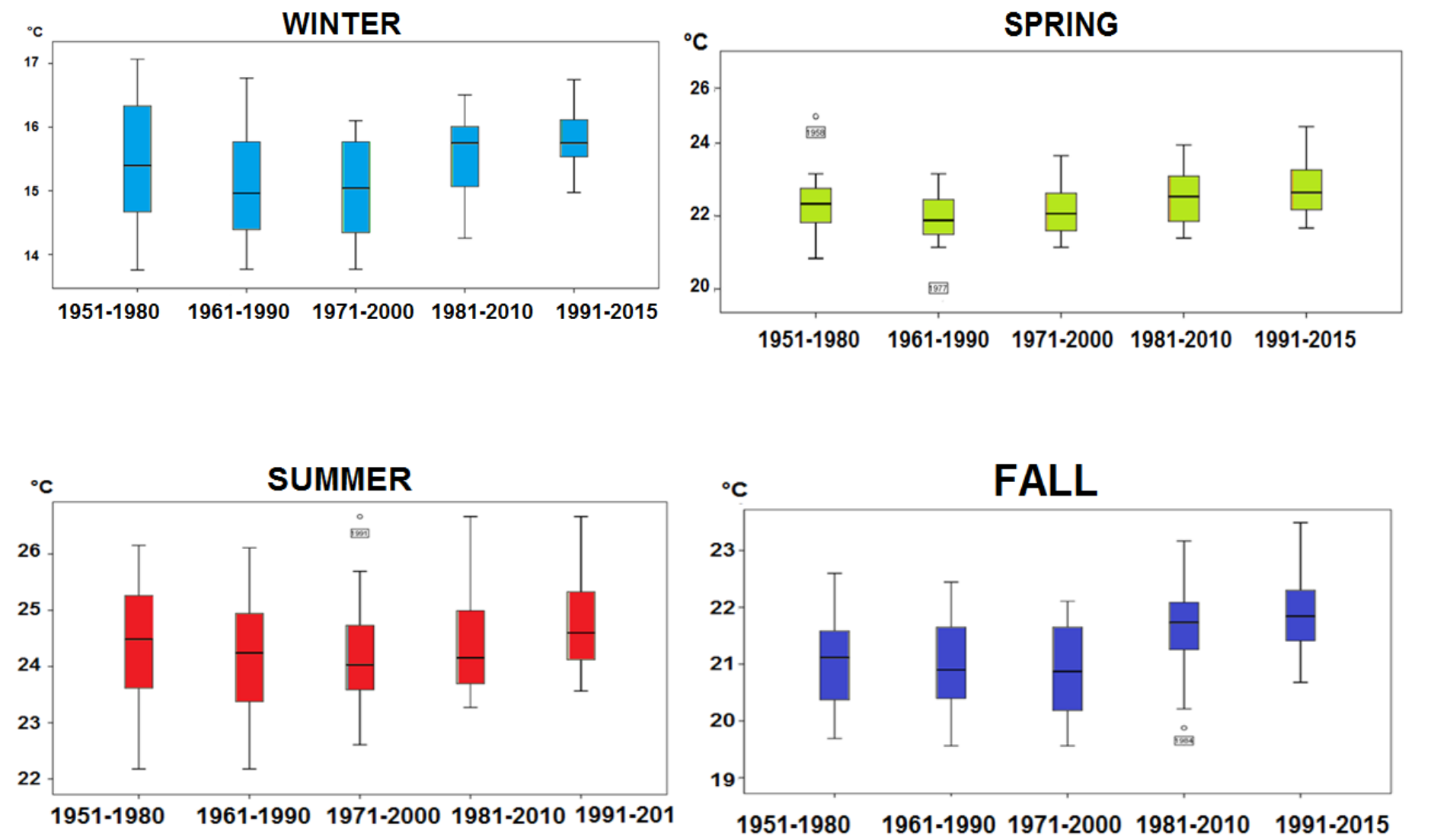
La Piedad

Zacatlalmanco

2010

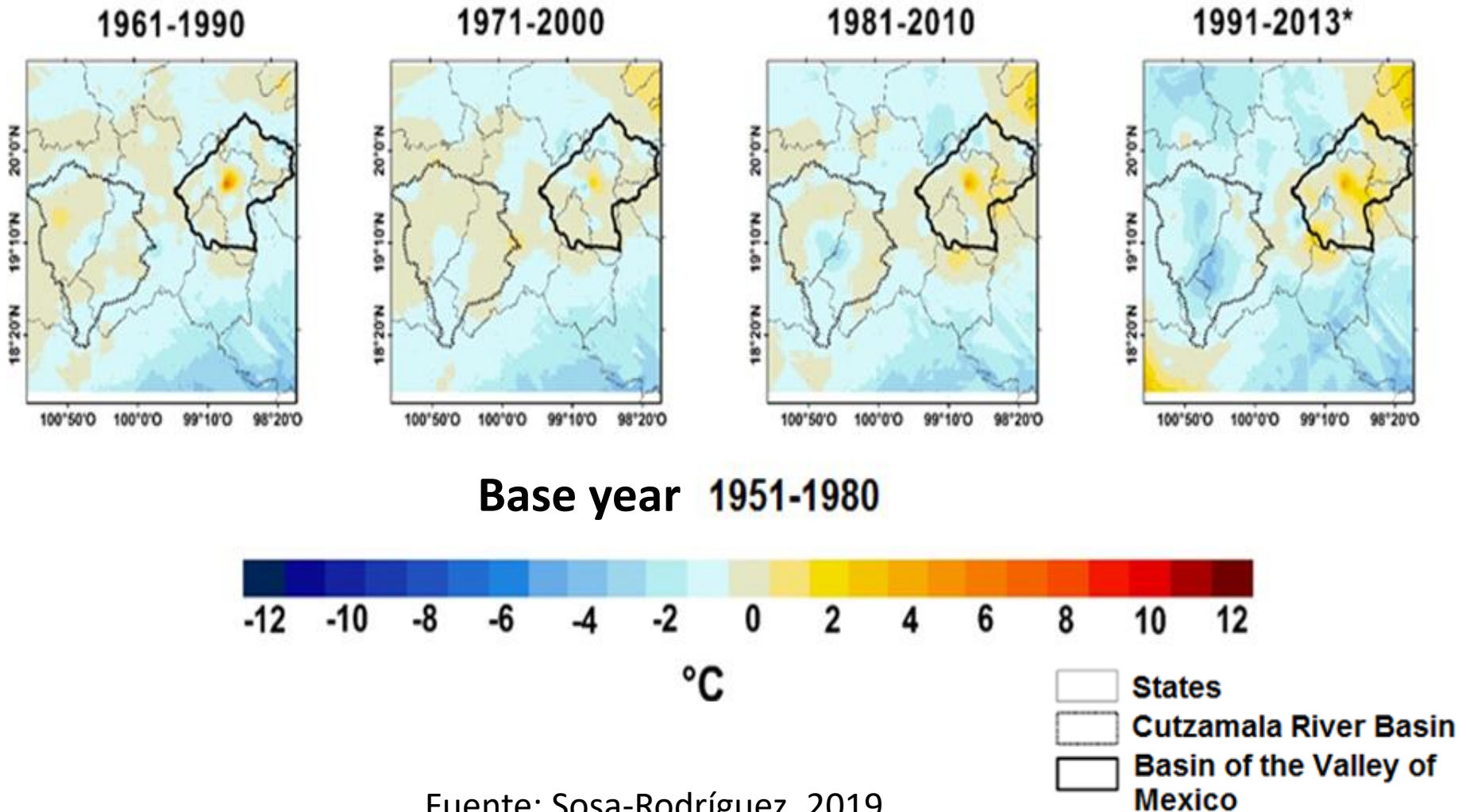
Fuente: Tomas Filsinger

Historical Climate Data Analysis



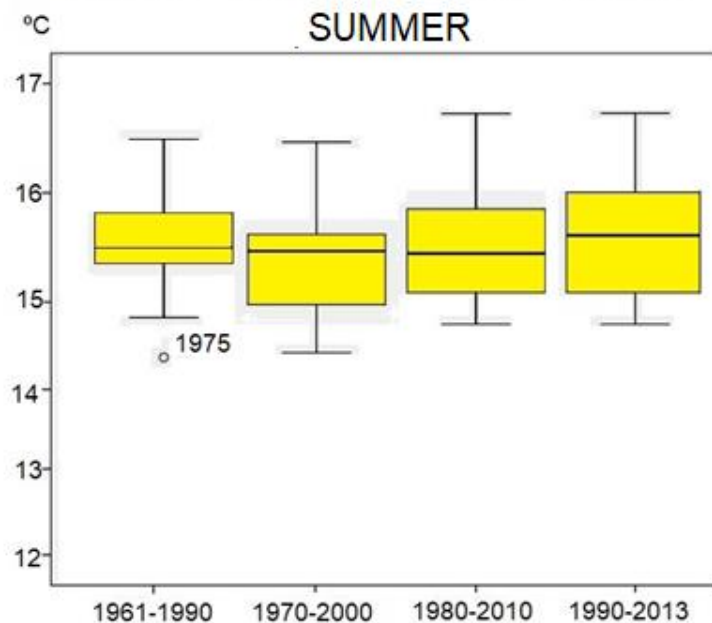
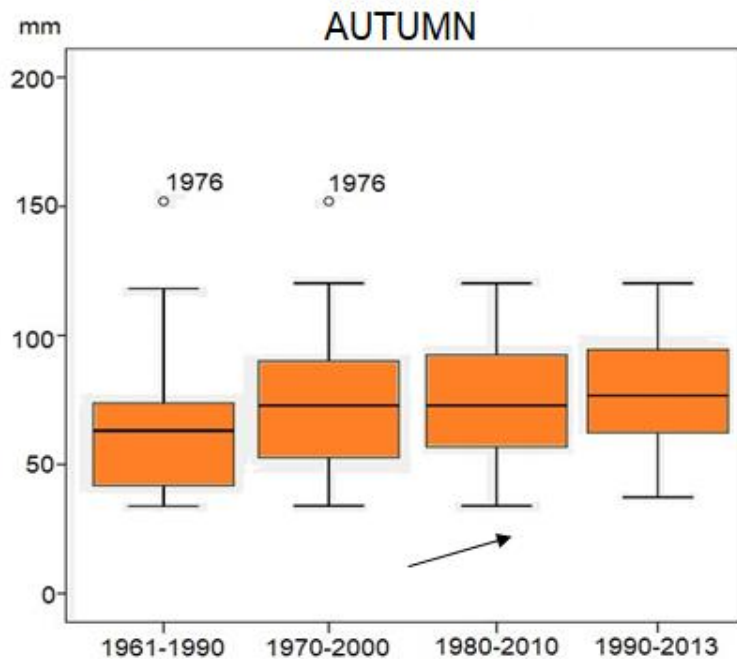
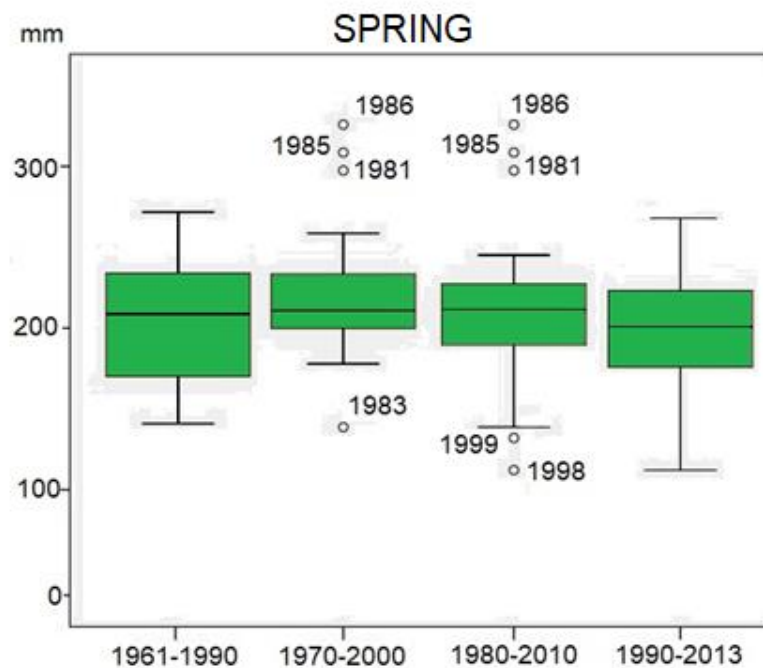
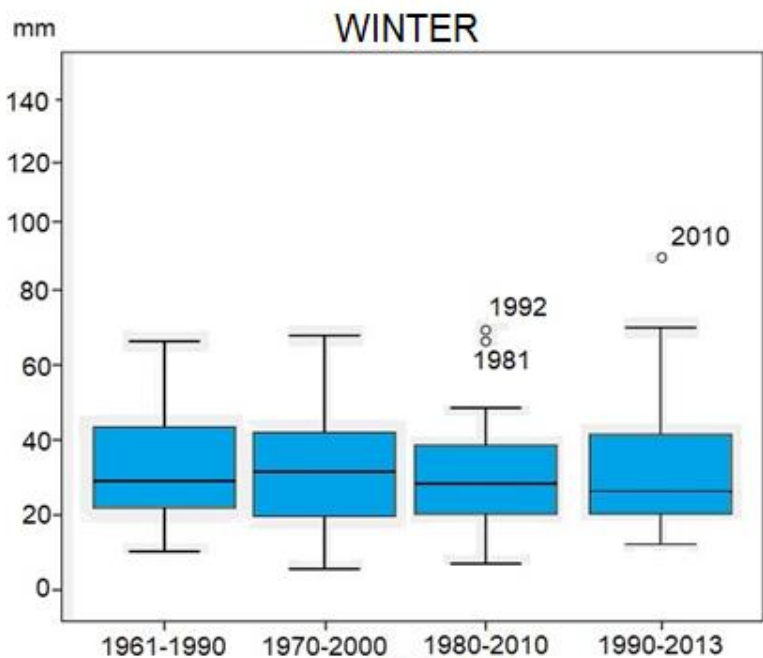
Fuente: Sosa-Rodríguez, 2019.

Historical temperatura variations in the Basin of Mexico and the Cutzamala River, 1951-2013



Fuente: Sosa-Rodríguez, 2019.

Historical variability of precipitation



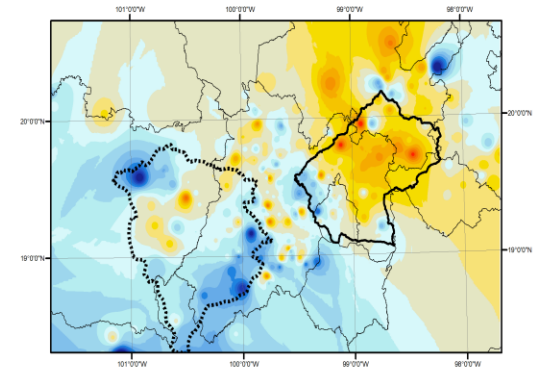
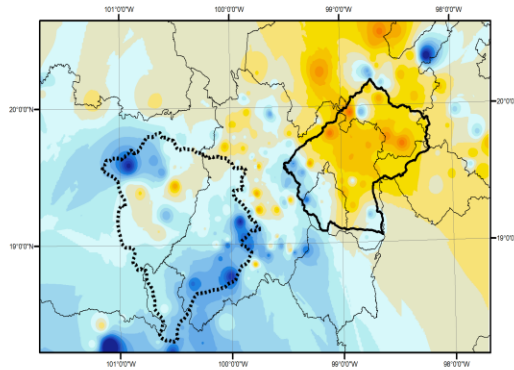
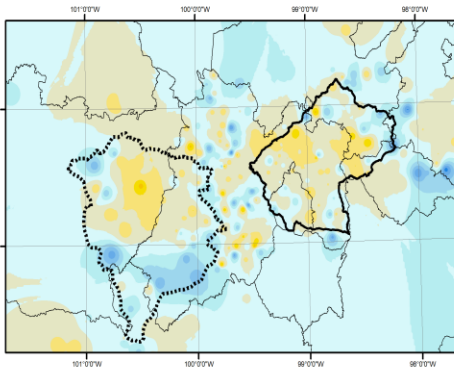
Fuente: Sosa-Rodríguez, 2019.

Historical precipitation variations in the Basin of Mexico and the Cutzamala River, 1961-2013

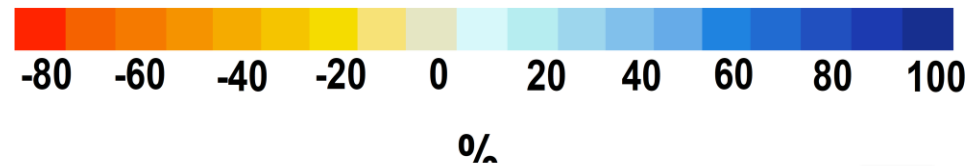
1971-2000

1981-2010

1991-2013



Base year 1961-1980



-  States
-  Cutzamala River Basin
-  Basin of the Valley of Mexico

3. Climate scenarios

- 24 RCM

GCM		RCP	HORIZONTE
CNRMCM5	France, National Center for Meteorological Research	RCP4.5	2015-2039
GFDK_CM3	United States, Geophysical Fluid Dynamics Laboratory	RCP8.5	2045-2069
HADGEM2_ES	Hadley Center, UK		2075-2099
MPI_ESM_LR	Germany, Max Planck Meteorological Institute		

- Scenarios validated by the IPCC
- RCP: Representative Green House Gases concentration trajectories
- RCP4.5 is related to economies that could decouple their growth from Green House Gases emissions.
- RCP8.5 are related to the scenarios business as usual.

Mean Temperature

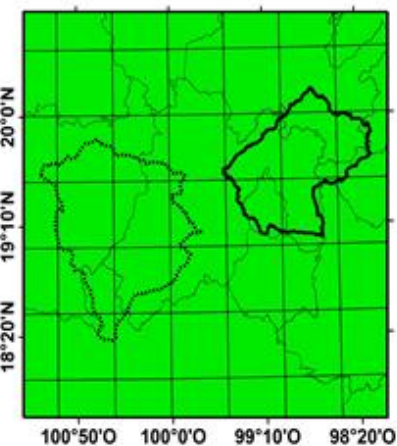
2015-2039	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	1.12906768	1.41525438	1.52087323	1.31574468	1.34523499
Max	1.384696	2.028031	2.436497	1.651607	1.745816
Min	0.659450	0.611815	0.867938	0.826983	0.754108

2045-2069	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	2.45652809	2.87271219	2.84297696	2.54658912	2.67970159
Max	3.26509883	4.08303996	4.40219454	3.30180879	3.64557243
Min	1.48785896	1.49383758	1.56874688	1.40704154	1.48937124

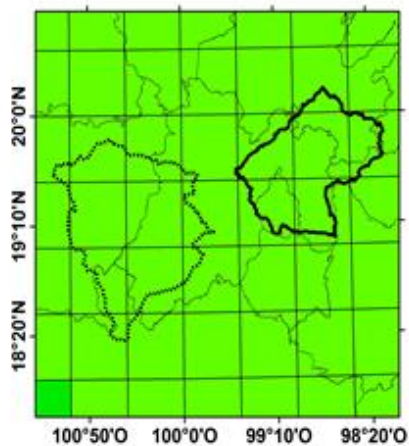
2075-2099	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	3.49113068	4.03752584	3.83935278	3.58369723	3.73792663
Max	5.58611363	6.12645829	6.61594542	5.25217004	5.51360035
Min	1.87938063	2.03176304	1.89772592	1.65730888	1.86654461

Fuente: Sosa-Rodríguez, 2019.

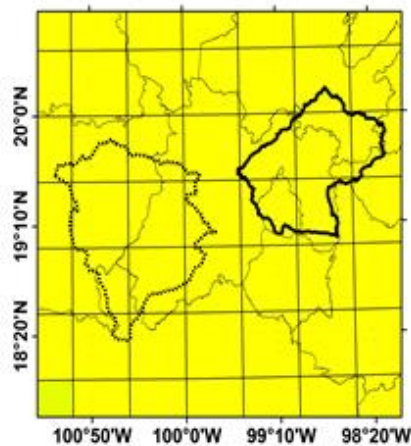
CNRMCM5 RCP4.5



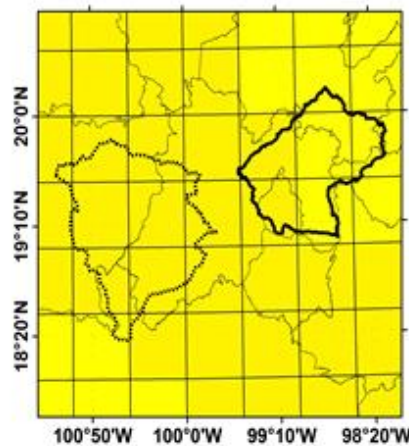
CNRMCM5 RCP8.5



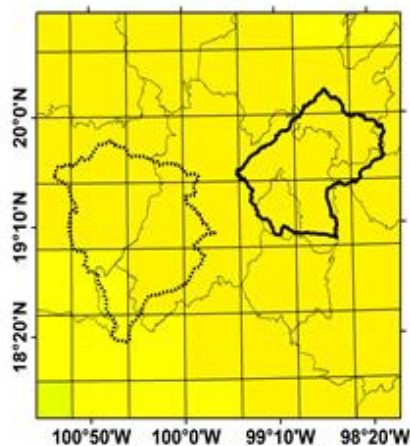
MPI_ESM_LR RCP4.5



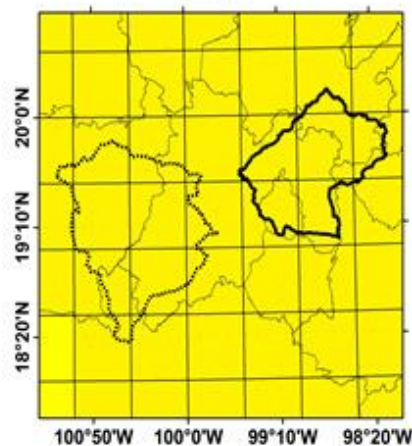
MPI_ESM_LR RCP8.5



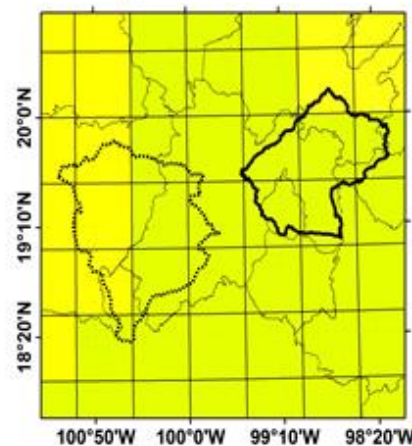
HADGEM_2_ES RCP4.5



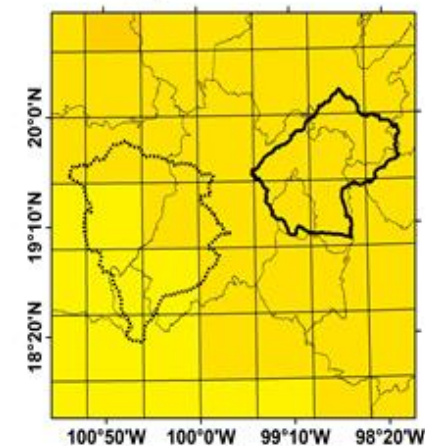
HADGEM_2_ES RCP8.5



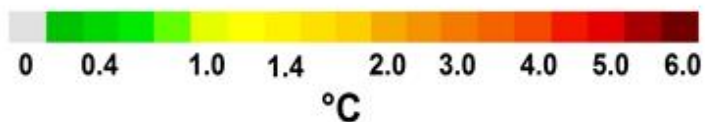
GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5

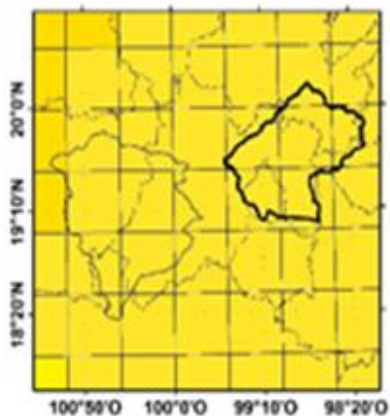


**Mean temperature
variations (°C)
2015-2039**

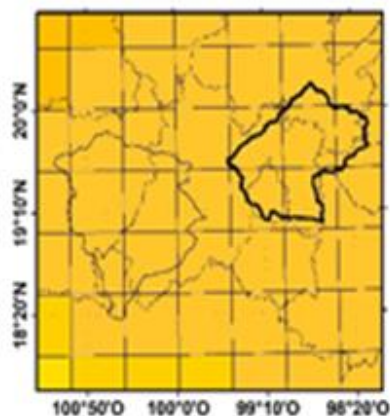


-  States
-  Cutzamala River Basin
-  Basin of the Valley of Mexico

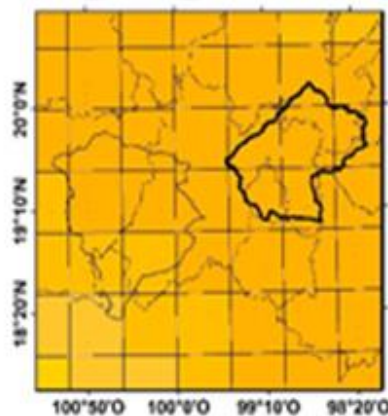
CNRMCM5 RCP4.5



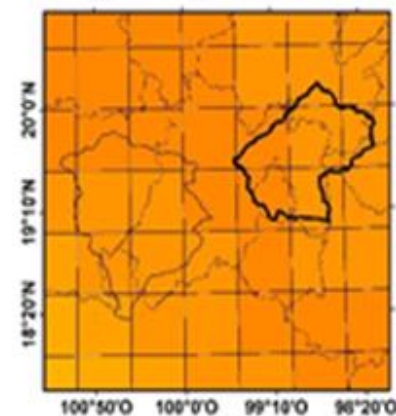
CNRMCM5 RCP8.5



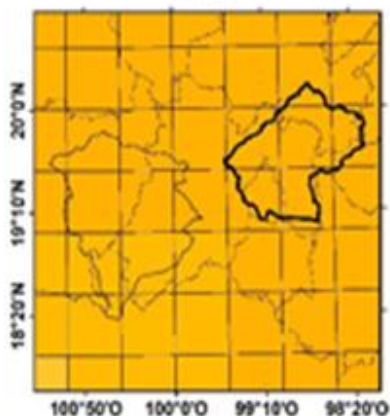
MPI_ESM_LR RCP4.5



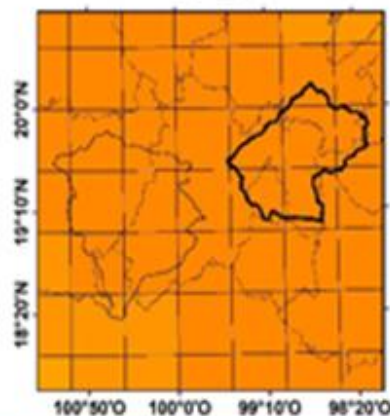
MPI_ESM_LR RCP8.5



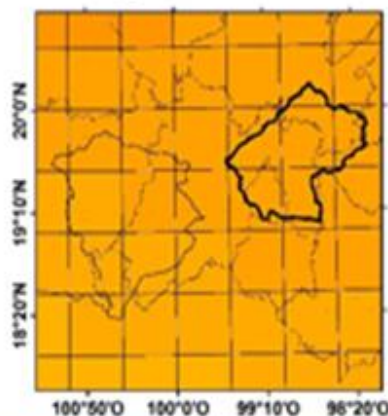
HADGEM_2_ES RCP4.5



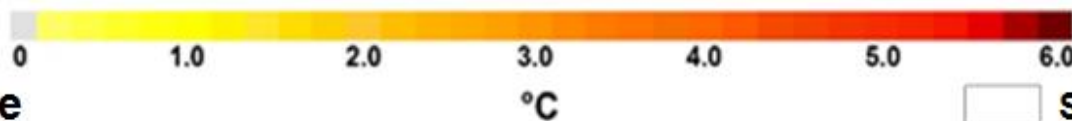
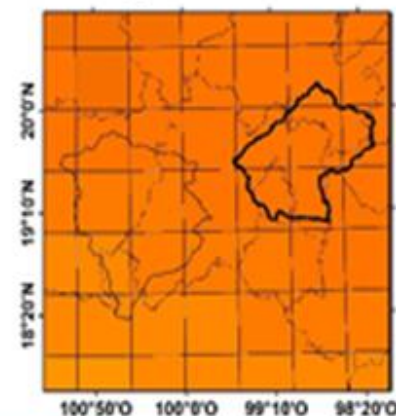
HADGEM_2_ES RCP8.5



GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5

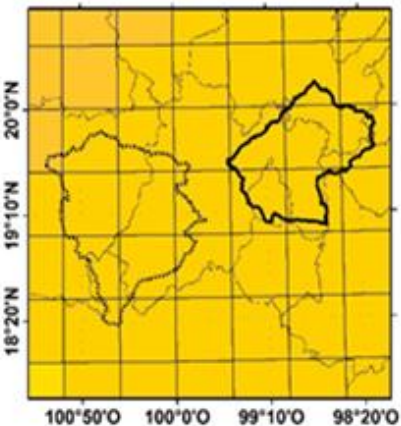


**Mean temperature
variations (°C)
2045-2069**

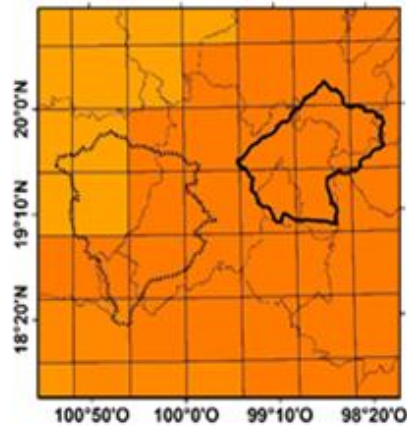
-  **States**
-  **Cutzamala River Basin**
-  **Basin of the Valley of Mexico**

Fuente: Sosa-Rodríguez, 2019.

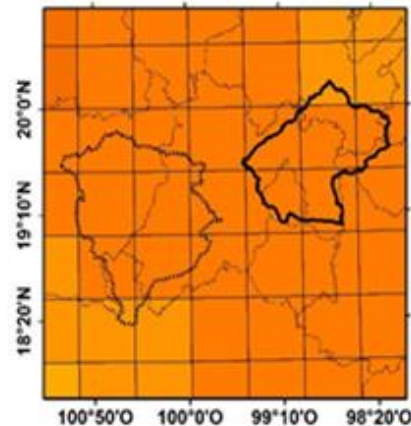
CNRMCM5 RCP4.5



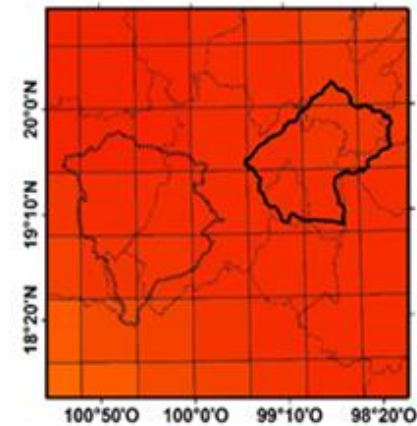
CNRMCM5 RCP8.5



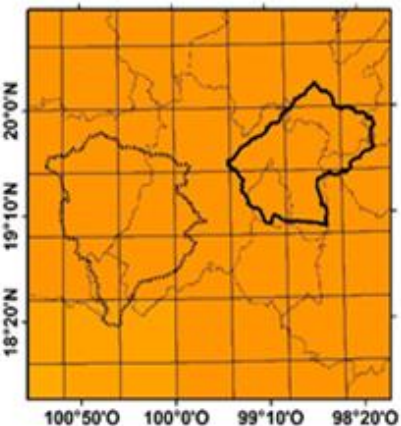
MPI_ESM_LR RCP4.5



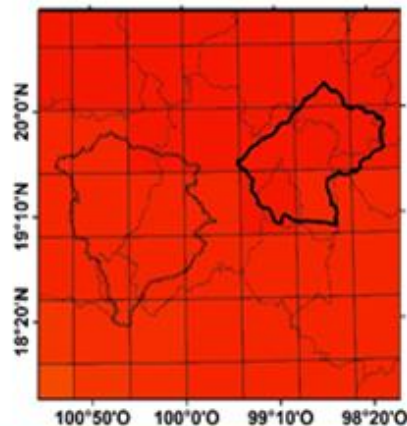
MPI_ESM_LR RCP8.5



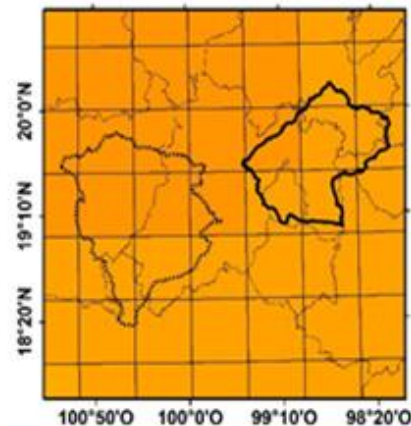
HADGEM_2_ES RCP4.5



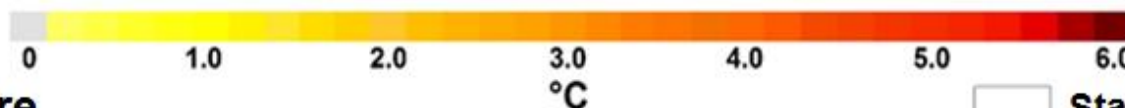
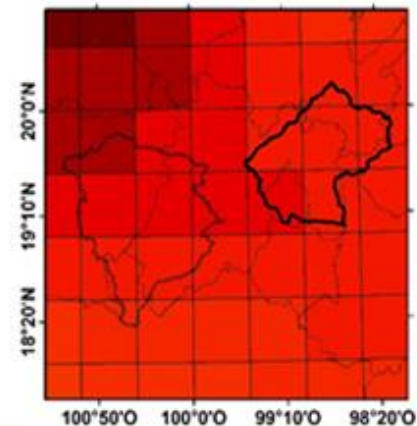
HADGEM_2_ES RCP8.5



GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5



**Mean temperature
variations (°C)
2075-2099**

States
Cutzamala River Basin
Basin of the Valley of Mexico

TOTAL PRECIPITACIÓN

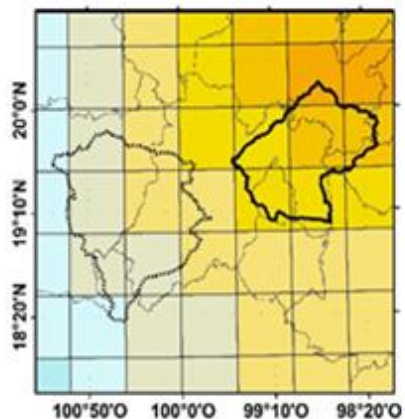
2015-2039	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	-3.2502409	-1.3860371	-5.5747461	1.18388699	-2.2567843
Max	3.19682467	4.014102	9.09163446	10.278756	1.68231588
Min	-8.8755412	-12.913565	-16.459476	-6.7271468	-5.8365234

2045-2069	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	-5.3764338	-3.2025033	-12.31303	3.64849849	-4.3108673
Max	-0.5372073	9.02040629	-7.2171848	12.690021	0.56732301
Min	-8.8011928	-12.64404	-21.128597	-0.5780902	-8.9941203

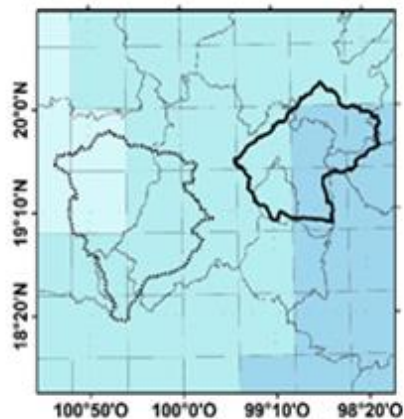
2075-2099	WINTER	SPRING	SUMMER	FALL	ANNUAL
Promedio	-8.701952	-3.2250827	-14.761395	10.089138	-4.149823
Max	-3.6056277	10.1108693	3.65435508	29.8505483	6.147046
Min	-17.15253	-19.070923	-25.702641	-1.9797382	-15.976458

Fuente: Sosa-Rodríguez, 2019.

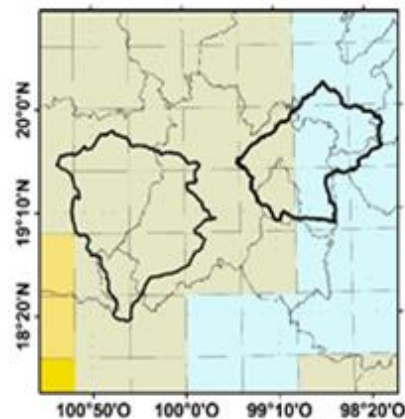
CNRMCM5 RCP4.5



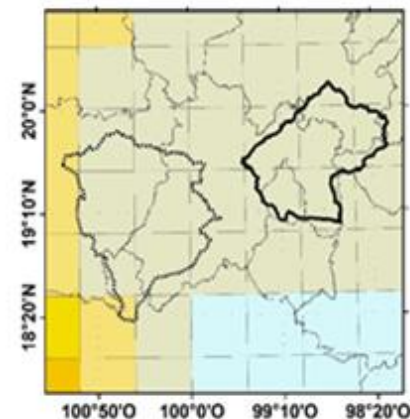
CNRMCM5 RCP8.5



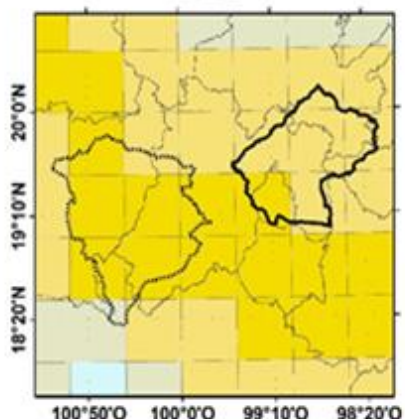
MPI_ESM_LR RCP4.5



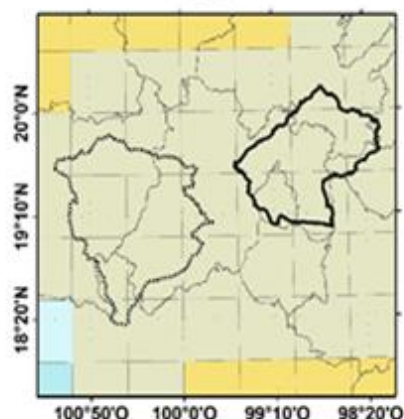
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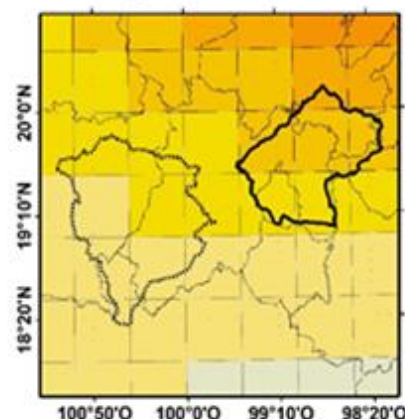
HADGEM_2_ES RCP4.5



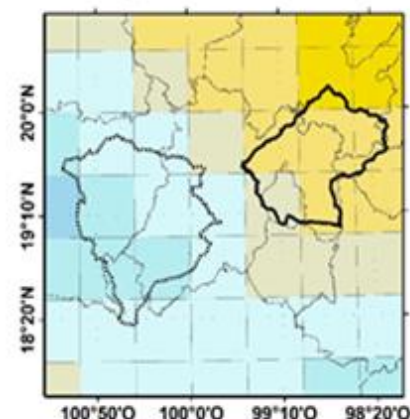
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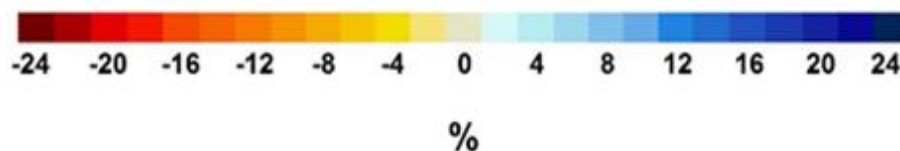
GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5



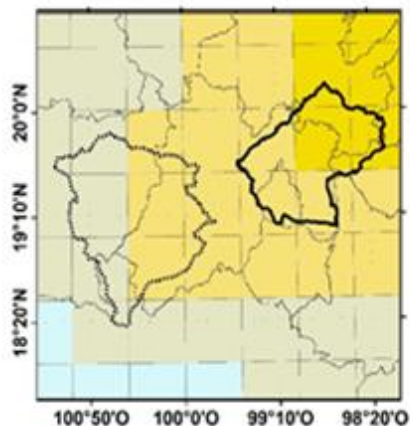
**Annual precipitation
variations (%)
2015-2039**



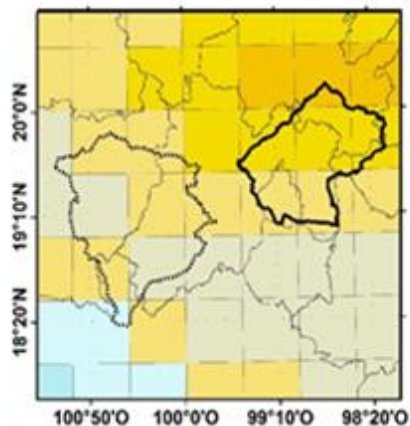
-  States
-  Cuzamala River Basin
-  Basin of the Valley of Mexico

Fuente: Sosa-Rodríguez, 2019.

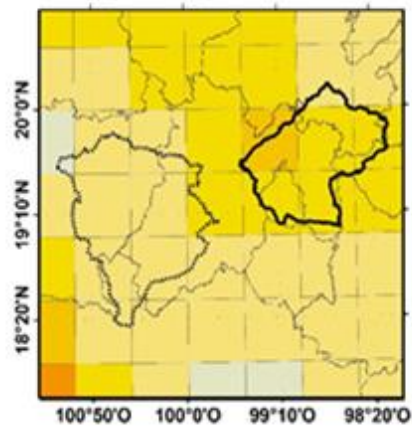
CNRMCM5 RCP4.5



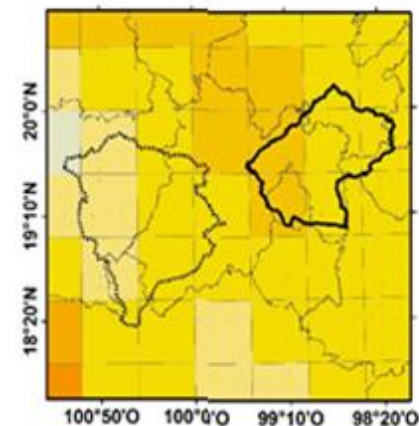
CNRMCM5 RCP8.5



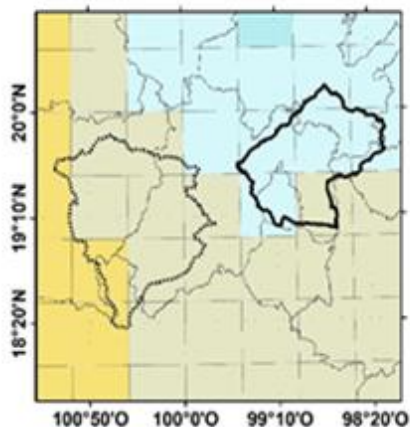
MPI_ESM_LR RCP4.5



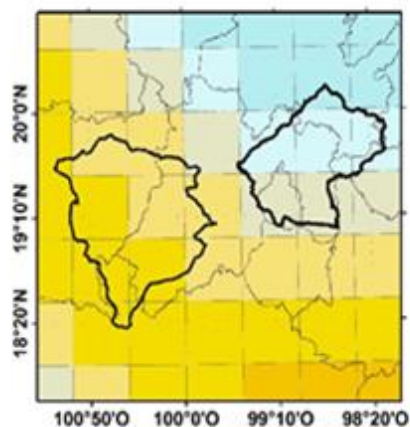
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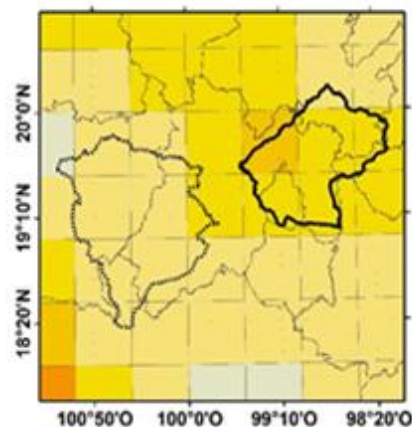
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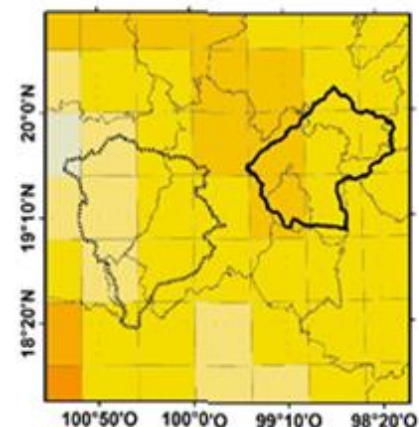
HADGEM_2_ES RCP8.5



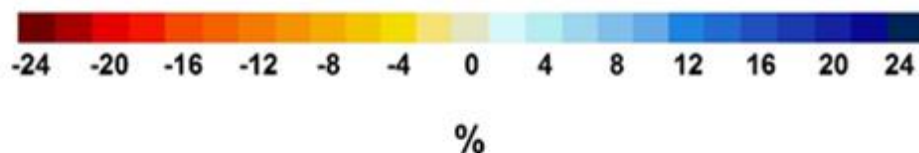
GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5



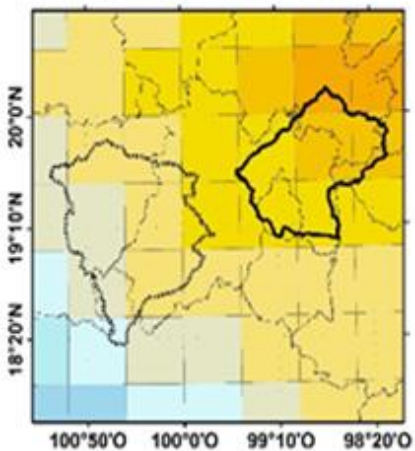
**Annual precipitation
variations (%)
2045-2069**



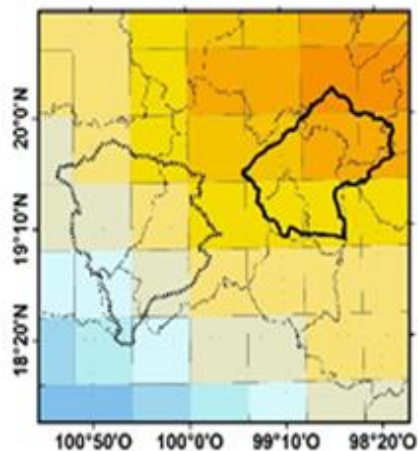
-  **States**
-  **Cuzamala River Basin**
-  **Basin of the Valley of Mexico**

Fuente: Sosa-Rodríguez, 2019.

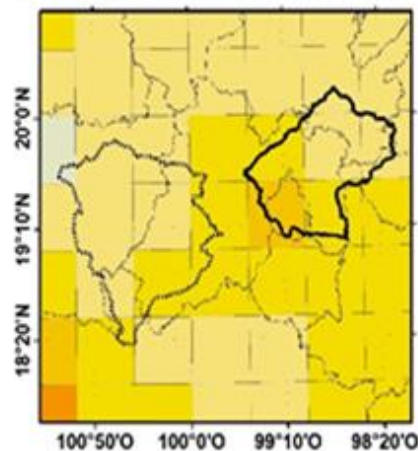
CNRMCM5 RCP4.5



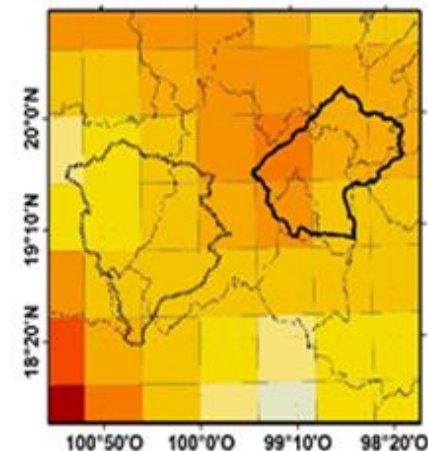
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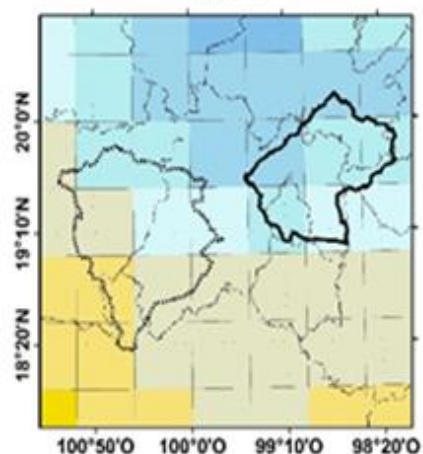
MPI_ESM_LR RCP4.5



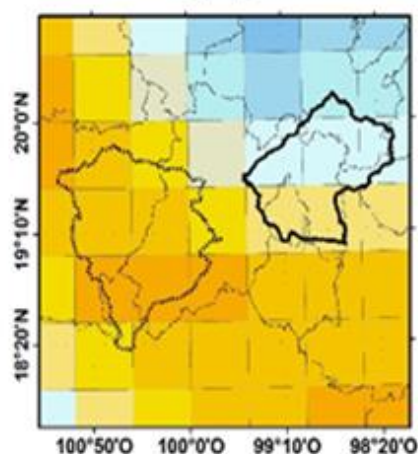
MPI_ESM_LR RCP8.5



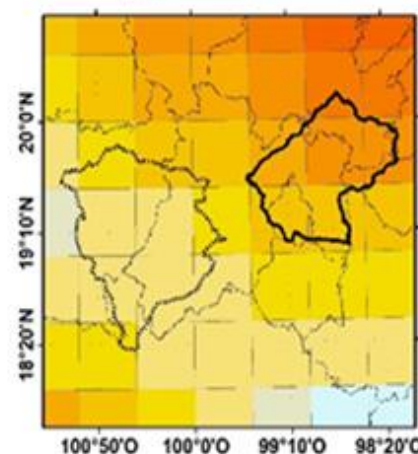
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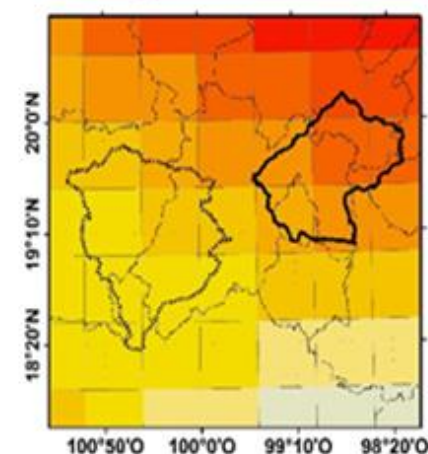
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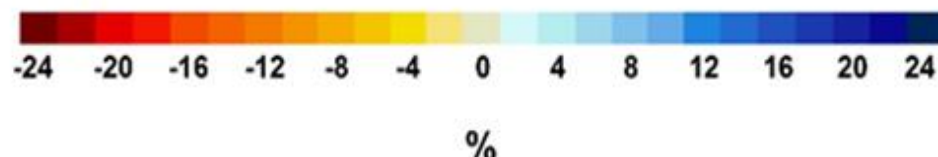
GFDL_CM3 RCP4.5



GFDL_CM3 RCP8.5



**Annual precipitation
variations (%)
2075-2099**



- States
- Cutzamala River Basin
- Basin of the Valley of Mexico

Fuente: Sosa-Rodríguez, 2019.

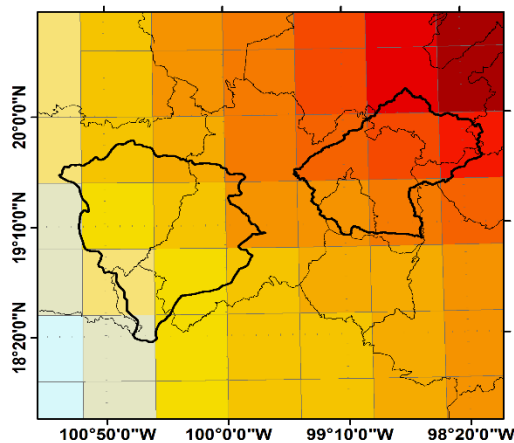
Water Availability Scenarios in the Basin of Mexico

Variations in Water Availability (%)

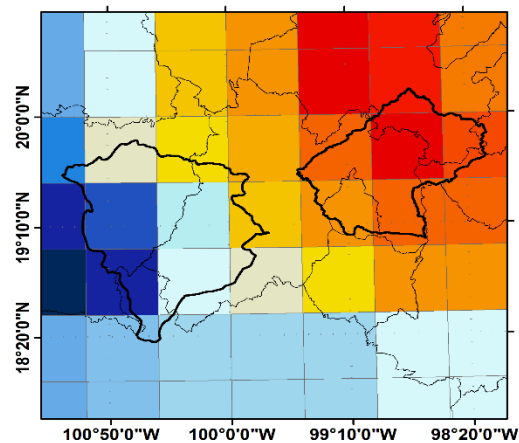
Scenario	Minimum	Average	Maximum
2015-2039	-6.55	-10.67	-33.76
2045-2069	-9.46	-18.73	-34.24
2075-2099	-5.04	-23.93	-42.72

Analyzed methods: Turc, Coutagne and NOM-011-CONAGUA-2015

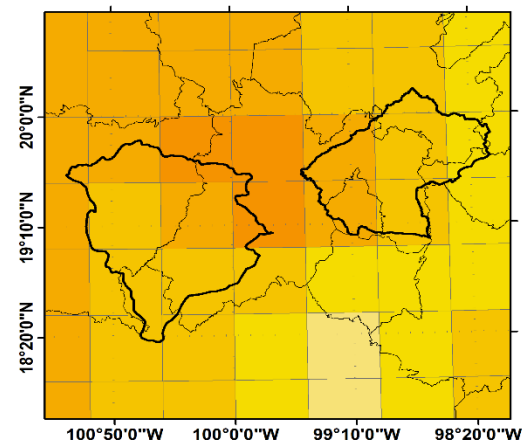
CNRMCM5 RCP4.5



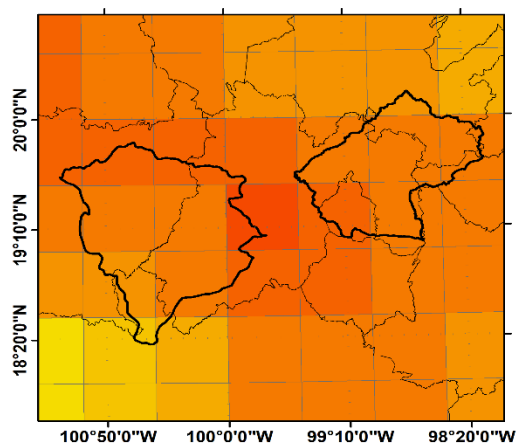
GFDL_CM3 RCP8.5



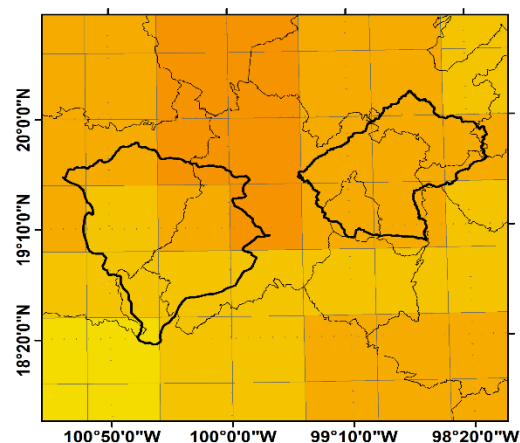
MPI_ESM_LR RCP8.5



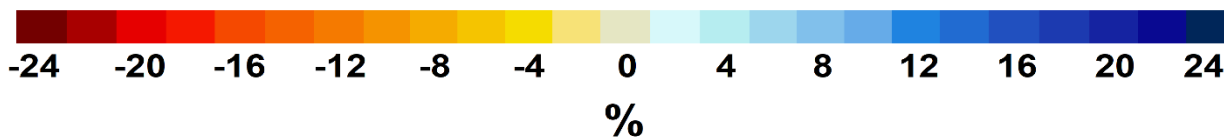
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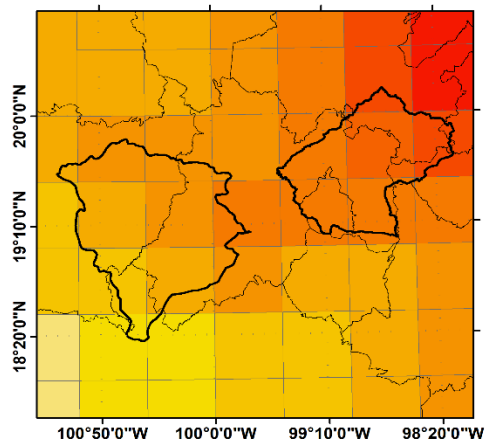
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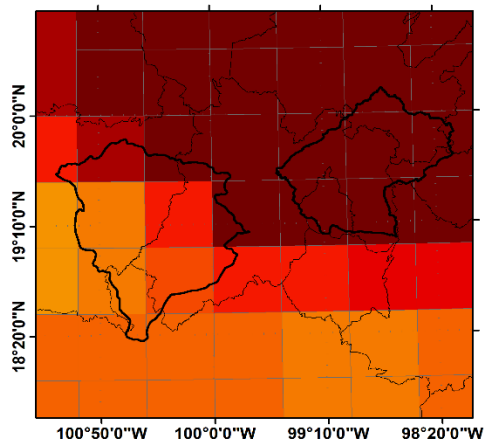
Water availability variation (%): 2015-2039



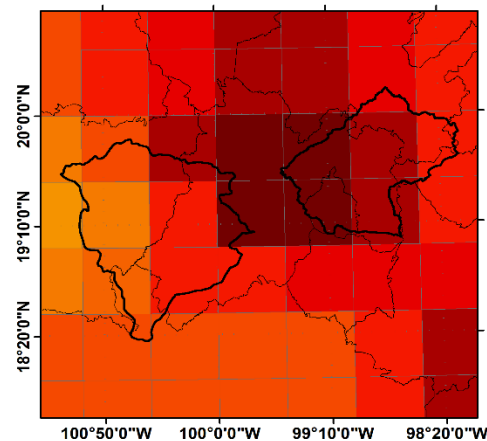
CNRMCM5 RCP4.5



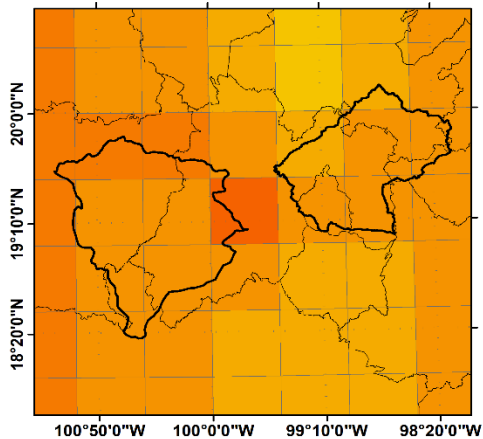
GFDL_CM3 RCP8.5



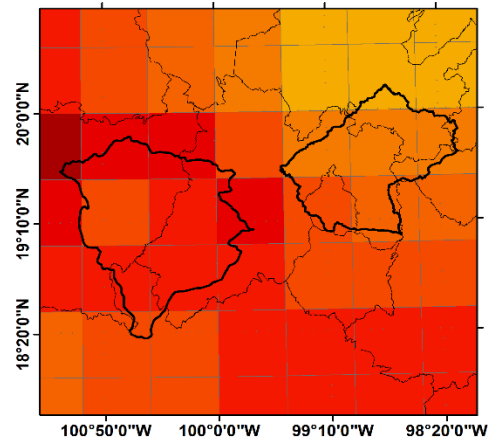
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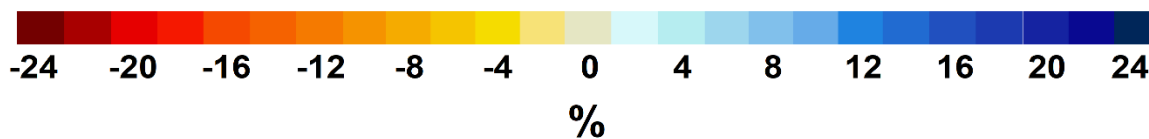
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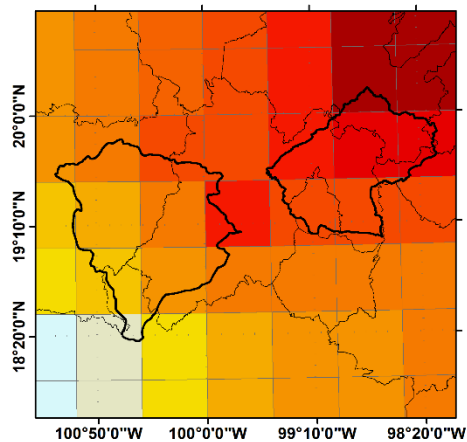
HADGEM_2_ES RCP8.5



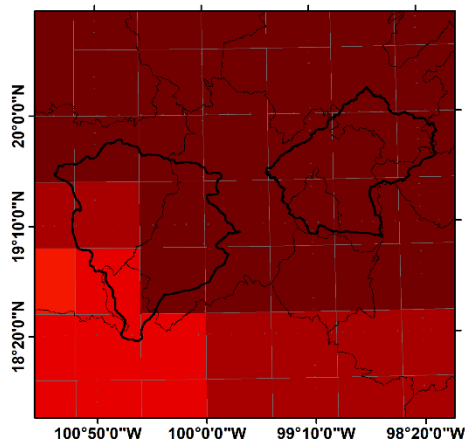
Water availability variation (%): 2045-2069



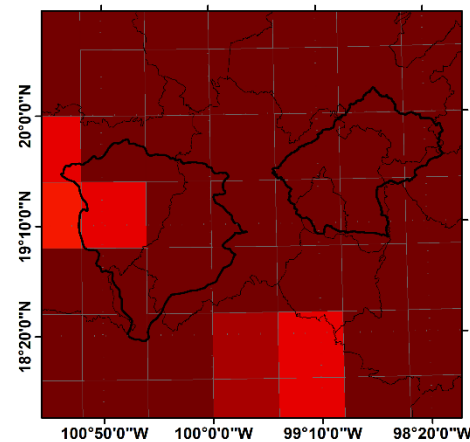
CNRMCM5 RCP4.5



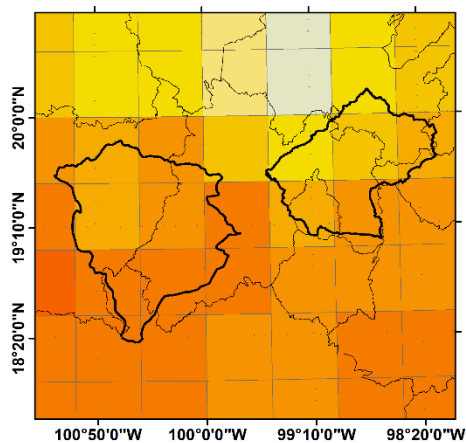
GFDL_CM3 RCP8.5



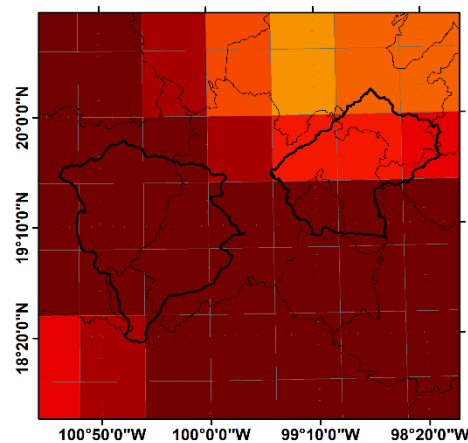
MPI_ESM_LR RCP8.5



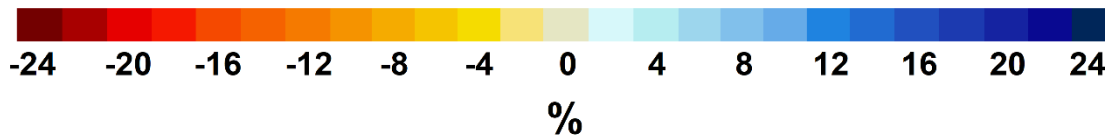
HADGEM_2_ES RCP4.5



HADGEM_2_ES RCP8.5



Water availability variation (%): 2075-2099



4. Conclusions

IWRM IMPLEMENTATION: coordination, planning, decision-making process, monitoring, citizen's participation, transparency, accountability and effective legal and institutional framework.

Key actors interviews

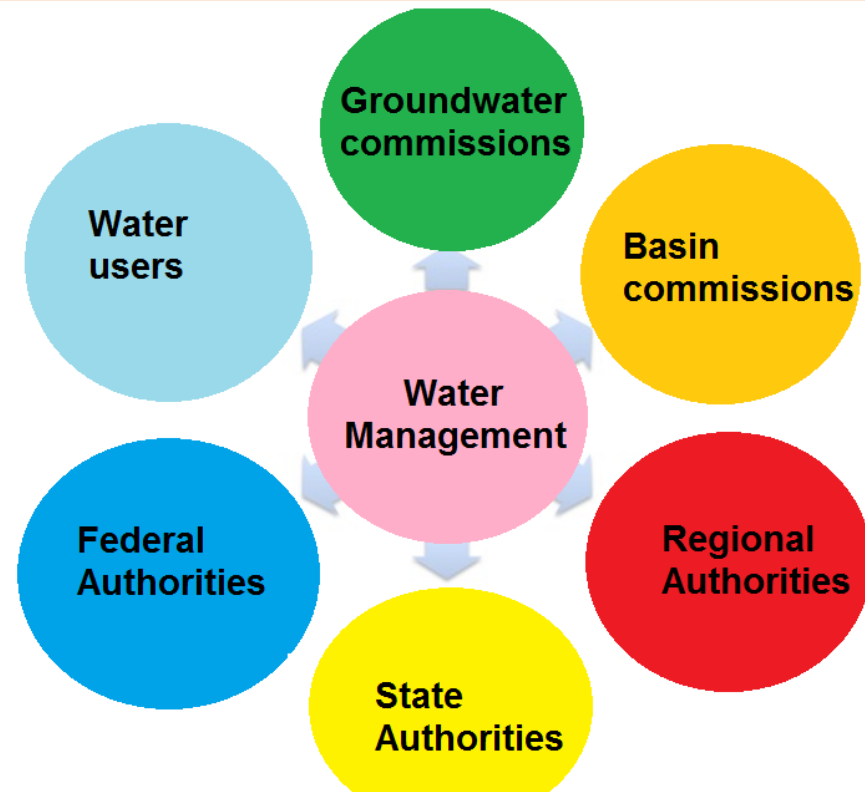
Federal Authorities

Regional Authorities

State authorities

Basin and groundwater commissions

Water Users: agricultural, livestock, aquaculture, forestry*, industrial, services, public-urban, academia...



**GOVERNANCE AS AN
ALTERNATIVE FOR ADAPTATION**

4. Conclusions

- Think of innovative strategies that strengthen the adaptation capabilities
 - Importing water from more distant basins with enormous environmental, economic and social costs (conflicts)
- Basin councils: key actors to enhance and foster adaptation strategies



Thanks for you attention

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