

## 5. Local Climate Change in Trujillo City, Peru

**Dr. Carlos Alfredo Bocanegra Garcia**

Universidad Nacional de Trujillo, Peru

**ORCID iD:** <https://orcid.org/0000-0001-9063-7600>

**Prof. Dr Bilmia Veneros Urbina**

Universidad Nacional de Trujillo, Peru

**ORCID iD:** <https://orcid.org/0000-0001-7367-3239>

**Translator**

**Prof. Juan Antonio Garay Montes**

Full Professor, Researcher

International Project Development & Cooperation, University Researcher, Peru

**ORCID iD:** <https://orcid.org/0000-0001-9730-4446>

### **Abstract:**

*Results of climatic changes occurred in the city of Trujillo, Peru, attributed to the influence of the coastal irrigation Project, which transformed the desert ecosystem through a carpet of crops. We observed strong increases environmental temperature, humidity and evapotranspiration, changes that mean to leave the denomination Project Chavimochic the city of "Eternal Spring" to Trujillo.*

### **Keywords:**

*change climate, Ecosystems, Environment, Biodiversity, El niño –Phenomenon*

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## Introduction

It is surprising to us that the alert launched by the UN that in 2050 the planet will live a "climate hell" (ABC SOCIEDAD, 2016). The weather is more extreme and disturbs the established patterns. This implies more disasters, more uncertainty. " But alterations are not only due to the increase in the consumption of fossil fuels and the generation of greenhouse gases, but also by the transformations of the ecosystems that man makes in his desire to satisfy needs not always justified. In this context, it arouses curiosity to know what have been the environmental impacts of the project of coastal irrigation of Chavimochic mainly referred to the climatic aspect, the same that depends the 100% of the water coming from the holy River (Chavimochic, 2011) and this one of the Glaciers of the White Mountain of Huaraz. It is by the decade of the 50 that the politicians of that time conceived the project Chavimochic, like the great work that would lead to the "development of Trujillo and the region of the Freedom", the project of irrigation in the coast implies, traditionally, to transfer water from the eastern slope of the Andes (Cordillera Blanca in Huaraz). The project meant the transformation of the desert ecosystem by an impressive vegetation cover for artificial crops, which has generated changes in biodiversity, loss of native flora and fauna (Rodriguez, 2008), disappearance of dunes, reservoirs of sand for the beaches (Bocanegra, 2012), all these changes have impacted directly in the city of Trujillo, demonstrating not only in an increase of the population migration, dynamics of the economy but also in the variability Climate that I consider to be a local climate change. There are diverse and numerous studies that realize that the transformations of the natural ecosystems generate local climatic alteration (Greenfacts, 2005).

## Material and Methods:

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The research consisted of the collection of historical data of climatic variables referred to ambient temperature, relative humidity, evapotranspiration, rainfall in the city of Trujillo (Peru), influenced by the development of a coastal irrigation project (Chavimochic) that transformed the desert ecosystem into artificial crops Results Variation of climatic factors (Environment Temperature, humidity, rain).

The multiannual variation of the ambient temperature in the city of Trujillo according to the records, from the year 1950 to 1970 it remained in the range of 16 to 25 °c, with high values at 27 °c in 1952 and 1973 and a low value of 12 °c in the year 1950. From the decade of the 80, the maximum and minimum temperature range varied significantly, moving to the range of 15 °c to 28 °c on average, with maximums of 32 °c in 1983 and 1998 during the phenomenon "El Niño" This shows a variation of-1 in the minimum and 3 °c in the maximum (Corporación Peruana de Aeropuertos y Aviación, 2016).

The information as of 2004, if we take the temperatures recorded by the Chavimochic Project from the year 2004 to 2010 ( Chavimochic, 2011), it can be observed that they remain in the range of 10 to 32 °c (Fig. 1)

Relative humidity also recorded a strong change, from 90 to 80 %, from 1980 to 1990 to 98 to 95% after the year 2000 (Fig. 2). In the climatic station of Virú and Moche The values recorded, the show ranges between 1082 a1230 and 1200 to 1400 mn of evapotranspiration on average respectively (INEI, 2017).

## Discussion

The transformation of the desert ecosystem from the environment of the city of Trujillo by an impressive vegetation cover (artificial crops), has generated various changes particularly in the climatic conditions to which it calls change Local climate.

Fig. 1, shows two scenarios of ambient temperature defined, the first with range from 16 to 25 until the decade of 90, condition that allowed the denomination of "Trujillo, City of Eternal

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Spring” [And another with a range of 11 to 32 degrees Celsius, which shows the expansion of the temperature range, which meant losing the denomination of Spring [Deperu, 2016].

The results of the increase of the relative humidity (Fig. 2), shows a strong increase, the due transformation of the dry forest (desert ecosystem) by crops that change the evapotranspiration (ET), which is only the process by which the water is transferred from the Earth's surface to the atmosphere. It includes both water evaporation in solid and liquid form directly from the soil or surfaces of living or dead vegetables (dew, frost, rain intercepted by vegetation) and water losses through plant surfaces, particularly the sheets. If we take as reference the fact that the ET, which is expressed in mm. of the water height, which is equivalent to 10 m<sup>3</sup>/ha, considering that the two stages of the project have won 66 075 ha, then it has meant 660 750 m<sup>3</sup> of evapotranspiration. In addition, if we assume that evapotranspiration, constitutes the total transfer of water from a vegetative surface to the atmosphere. According to the results in the year 1990 La ET in the Moche valleys, Virú, (Fig. 3), was on average 80 mm/month and varied significantly to 132 mm/month to year 2006, which means that in 16 years the ET was increased at a rate (Rodriguez, 2008). This increase could be adjusted to the "biotic bomb" hypothesis of Douglas Sheil Who maintains that forests or plants play an important role in the determination of the rains by creating atmospheric winds that extend the humidity of the continents (Betteridge, 2013).

## Conclusion

According to the analysis of the existing historical climatic data for the city of Trujillo, and considering as main factor the transformation of the desert ecosystem by crops of the Chavimochic project, it is concluded that there has been registered a Noticeable increase in ambient temperature, especially at maximum and minimum temperatures, as well as relative humidity due to increased evapotranspiration.

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**Figures:**

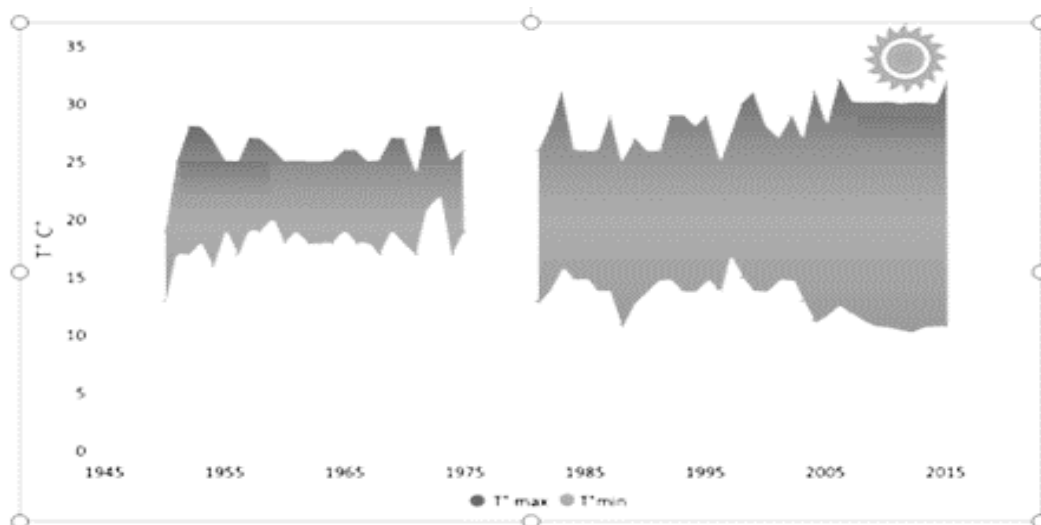


Fig. 1. Ambient temperature Variation (° C) in the city of Trujillo, from 1950 to 2014. Source: CORPAC data [Corporación peruana de aeropuertos y aviación 2016 ]

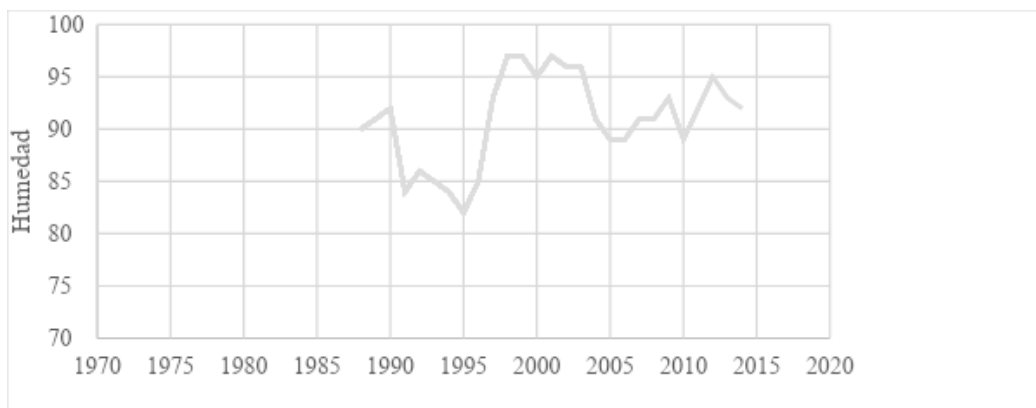


Fig. 2. Relative humidity variation in Salaverry district. Source: INEI [Instituto Nacional de Estadísticas e Informática, 2017]

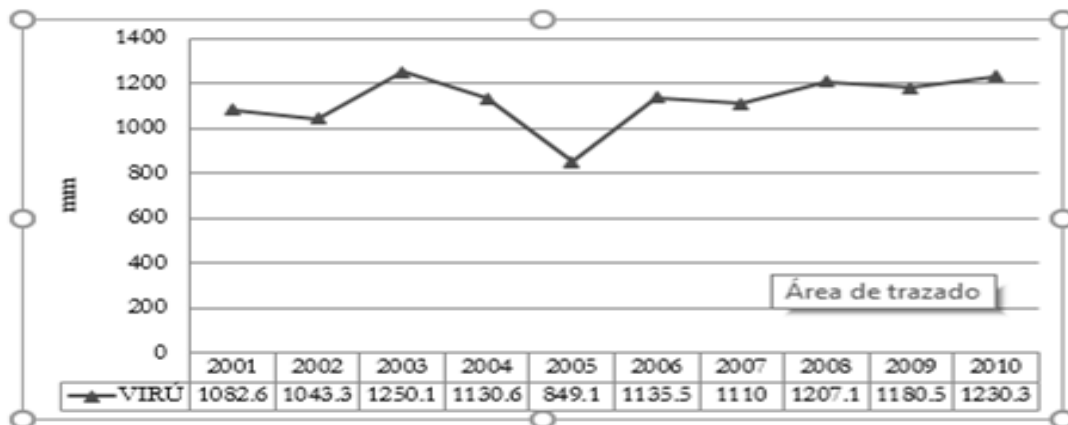


Fig. 3. Evapotranspiration Variation (mm), in Viru from 2001 to 2010. Source: Project Chavimochic [Chavimochic, 2011]



Image 1. Chavimochic Project coverage representation ( Chavimochic, 2011).

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