

Shoreline evolution in Las Canteras urban beach (Gran Canaria, Spain)

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OBJECTIVES

This research analyses the shoreline evolution of a currently urban beach such as Las Canteras beach, located in Las Palmas de Gran Canaria (Canary Islands) (Figure 1), to know which areas are experiencing progradation or retrogradation.

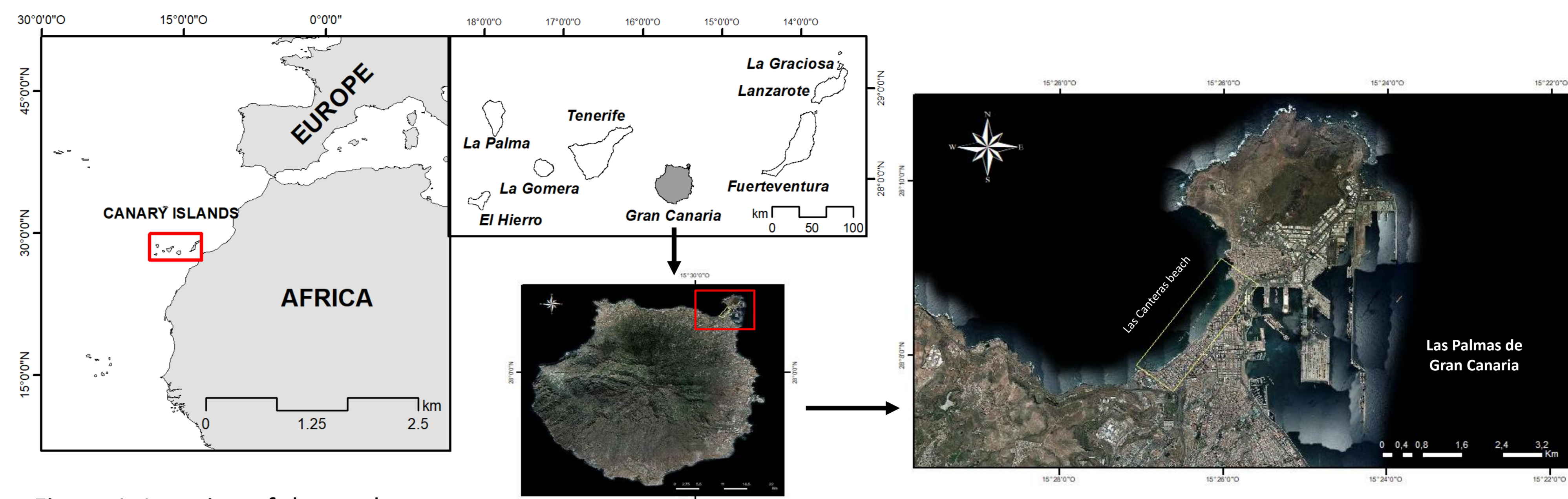


Figure 1: Location of the study area.

METHODS

The Digital Shoreline Analysis System (DSAS) tool has been used as an extension to the ArcMap GIS program, which enables to calculate rate of change statistics from multiple historical shoreline positions. For this, historical and current orthophotos from 1957 to 2021 have been used.

The first step of the methodology is the digitization of the shorelines (Figure 2) following these criteria:

- Wet shoreline
- High tide
- Autumn or spring season

Secondly, a baseline or reference line is made, which is necessary for the use of the DSAS. In the DSAS, the transects are automatically created (Figure 3, 4 and 5). Finally, the net shoreline movement (NSM) rate is chosen, which shows the distance between the oldest and most recent shorelines, regardless of whether they coincide with the most distant lines from each other (Martín-Prieto et al., 2018). The unit is in meters.



Figure 2: Map of shorelines per years (1957-2021) in La Puntilla.

RESULTS AND DISCUSSIONS

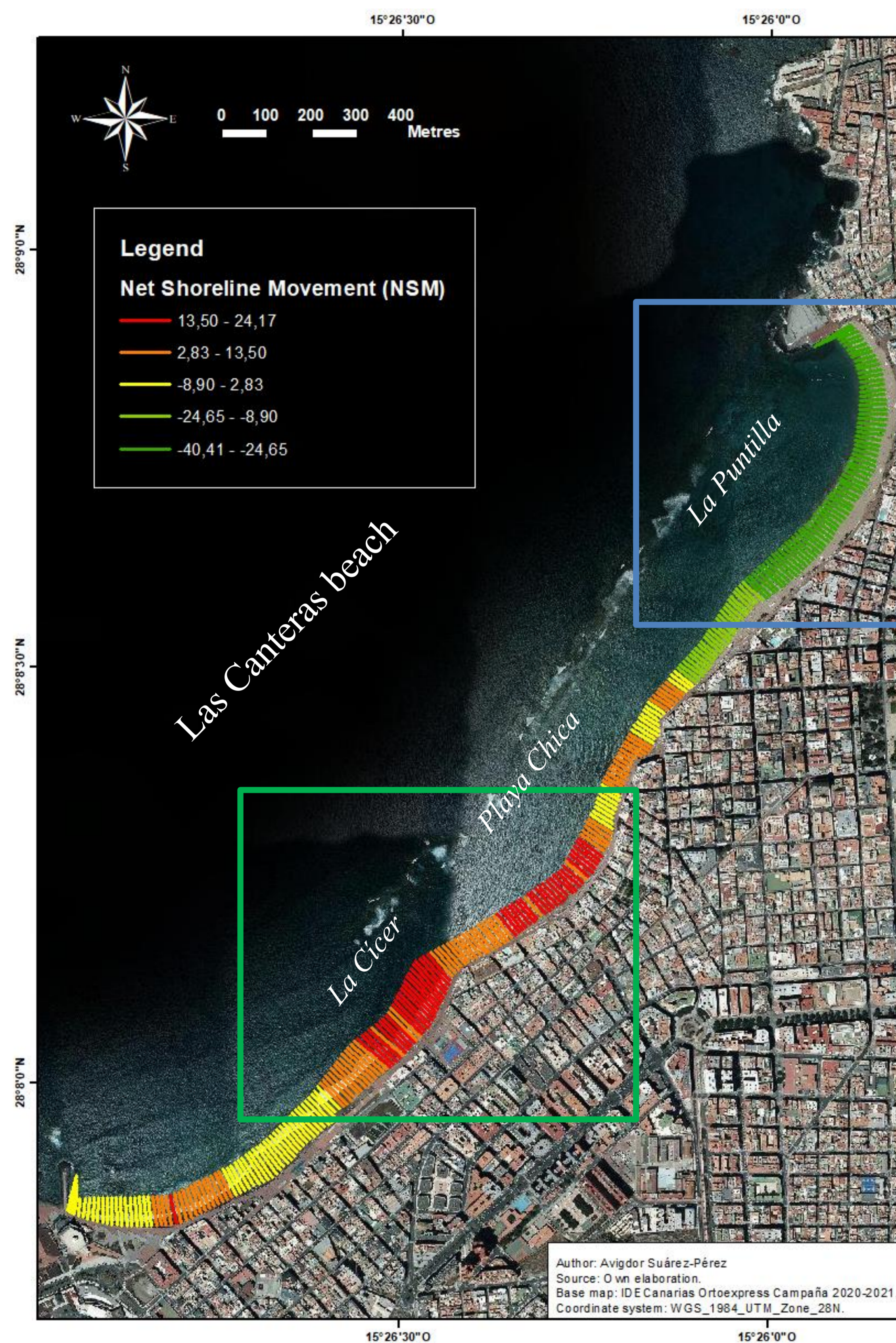


Figure 3: Map of NSM of the overall study area.

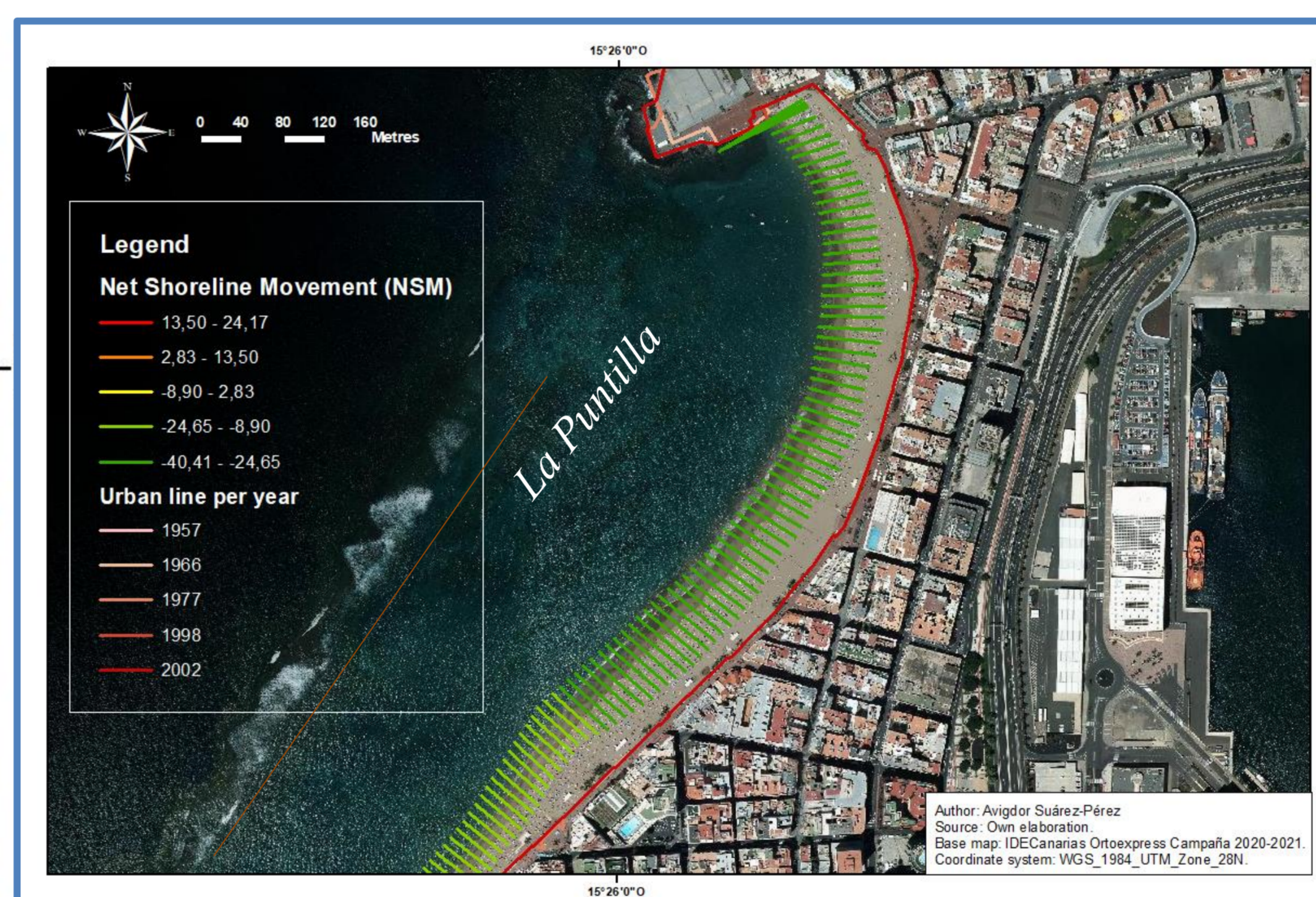


Figure 4: Progradation of La Puntilla zone.



Figure 5: Retrogradation of La Cícer zone.

Results shows that the beach does not behave in a homogeneous way (Figure 3). From La Puntilla zone (north of the beach) to Playa Chica (central zone of the beach), a recovery of the sandy coastline has been detected (progradation) (Figure 4) while the rest of the beach, especially in La Cícer zone (south of the beach), a severe loss of the coastline has been detected (retrogradation) (Figure 5).

It is discussed about variables could be affecting to the positive evolution of the beach (progradation), such as the protection offered by the Las Canteras bar (Figure 4, brown line). However, there are zones also protected by the Las Canteras bar which show retrogradation, perhaps where the protection of the Las Canteras bar is not so effective (Figure 5, brown line), or urban narrowing may be affecting beach maintenance, (Figure 5, see urban line evolution in front of the main retrogradation zone).

This research raises questions if where shoreline progradation is detected, these could be potential areas of landward beach transgression (a process that would occur naturally) (Bruun, 1962), in response to sea level rise. In this sense, it would be interesting for beach management to address the opportunity provided by the interrupted progradation zone of La Puntilla (for example) to maintain the beach in the face of imminent threats, such as sea level rise or more frequent cyclonic storms. In this sense, it is currently not possible to experience this process because the beach is surrounded by rigid contours, which do not favour beach recovery (Santiago et al., 2021).

REFERENCES

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ACKNOWLEDGEMENTS:

Special thanks to the environment and climate change research group of IOGAG and to the University of Las Palmas de Gran Canaria for giving us the opportunity to carry out this study through new current tools that will be useful for future research. Leví García Romero is beneficiary of a Postdoctoral contract of the Ministry of Universities and ULPGC (Margarita Salas program) supported by the European Social Fund (ESF).

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