OBSERVARE
Universidade Autónoma de Lisboa
e-ISSN: 1647-7251
VOL15 N2, DT3
Thematic Dossier – *Climate and Security*
April 2025

JANUS.NET
e-journal of International Relations

CLIMATE CHANGE AND SEA LEVEL RISE IN THE SOUTH PACIFIC: PROSPECTS FOR THE FUTURE OF SMALL ISLAND DEVELOPING STATES

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Abstract

This article analyses the relationship between environmental security and sea level rise, and its impacts on Small Island Developing States (SIDS), particularly in the case of Tuvalu. Specifically, it discusses the existential threat this phenomenon poses to island states, concluding with the importance of adaptive capacity in a holistic approach. Throughout the article, the legal regimes of islands and artificial islands are analysed, and various ways in which disappearing states can seek to prolong their existence are identified. The article also reflects on the importance of the territorial element in recognising a state and discusses the development of the idea of virtual sovereignty proposed by Tuvalu.

Keywords

Artificial islands, Climate change, Sea level rising, SIDS, Tuvalu.

Resumo

Este artigo analisa a relação entre a segurança ambiental e a subida do nível do mar, e os seus impactos nos Pequenos Estados Insulares em Desenvolvimento (PEID), particularmente no caso de Tuvalu. Especificamente, discute a ameaça existencial que este fenómeno representa para os Estados insulares, concluindo com a importância da capacidade de adaptação numa abordagem holística. Ao longo do artigo são analisados os regimes jurídicos das ilhas e das ilhas artificiais, bem como são identificadas diversas vias pelas quais os Estados em vias de desaparecerem podem procurar prolongar a sua existência. O artigo reflete ainda sobre a importância do elemento territorial para o reconhecimento do Estado e coloca em discussão o desenvolvimento da ideia de uma soberania virtual proposta por Tuvalu.

Palavras-chave

Alterações climáticas, Ilhas artificiais, SIDS, Subida do nível do mar, Tuvalu.

How to cite this article
Costa, Amélia Almeida & Simões, João Carlos Marques (2025). Climate change and sea level rise in the south pacific: prospects for the future of small island developing states. *Janus.net, e-journal of international relations*. VOL15 N2, TD3 – Thematic Dossier – Climate and Security. April 2025, pp. 5-23. DOI https://doi.org/10.26619/1647-7251.DT0225.1.

Article received on December 19, 2024 and accepted for publication on March 16, 2025.

JANUS.NET, e-journal of International Relations
e-ISSN: 1647-7251
VOL15 N2, DT3
Thematic Dossier – Climate and Security
April 2025, pp. 5-23
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1. Introduction

Small island states, especially developing states, also known as SIDS, such as São Tomé and Principe[1], are often regarded as "canaries in the mines". A metaphor that seeks to demonstrate their susceptibility to the effects of climate change and global warming (Simões, 2024). Despite the increased vulnerability of this group of states, it is worth mentioning that others in other latitudes, such as Mozambique and others in Africa (Brito, 2023), are equally vulnerable to the effects of climate change and, in particular, to the effects of rising sea levels. Despite the value of also studying these other cases, we will focus exclusively on the island states of the South Pacific.

It is relevant to note that islands are different by nature, having geological and geomorphological differences, as different processes are involved in their creation, thus affecting their geography, resources and topography, which in turn affect their human communities, fauna and flora (Simões, 2024; Yamamoto & Esteban, 2014).

The term SIDS refers to small island territories that are geographically remote, have small populations and scarce human resources, a limited economic base dependent on external support, are vulnerable to natural disasters and extreme events and find it difficult to participate fully in the dynamics of international relations (Betzold, 2010; Simões, 2024).[2] While there are various lists of what is or is not considered to be a SIDS, the UN has adopted a list of around 51 states, mainly spread between the Caribbean and

[1] São Tomé and Principe is a paradigmatic case of the effect of rising sea levels on a state's territorial security.
[2] Despite this apparent difficulty in participating effectively in international relations, SIDS have in fact had the necessary capacity to organize and mobilize as a potential pressure group in various international arenas such as the UN. In addition, this group of states has established various international institutions such as the Alliance of Small Island States (AOSIS), the Secretariat of the Pacific Regional Environment Programme (SPREP) and the Caribbean Community Climate Change Centre (CCCCC), which provide opportunities to gain the support needed to obtain funding, develop strategic partnerships, develop cooperation efforts and build networks, while sharing resources and responsibilities (Simões, 2024; Ratzer, 2018).

the Pacific. However, it should be noted that, "*some of the names listed do not necessarily represent the realities of small islands, developing nations or states*" (Simões, 2024: p.72).

An important element of the Pacific is its Ring of Fire or Circum-Pacific Belt, which is a region of the Pacific Ocean characterized by intense internal terrestrial dynamism, i.e. intense volcanic and seismic activity (Simões, 2024).

This region, which stretches for around 40,000km, is home to the majority of volcanoes (75%, which is equivalent to more than 450 volcanoes) and is the scene of the majority of earthquakes (90%) on the planet. The region crosses several tectonic plates: (i) the Pacific Plate; (ii) the Juande Fuca Plate; (iii) the Cocos Plate; (iv) the Indo-Australia Plate; (v) the Nazca Plate; the North American Plate; (vi) and the Philippine Plate (BBC News Brasil, 2011; "Ring of Fire," n.d.; Simões, 2024).

In this region we find the entire Pacific coast of the American continent, Japan, the Philippines, Indonesia, New Zealand and the South Pacific islands (figure 1). According to Simões (2024: p.72),

> *"the great internal terrestrial activity is due to the dynamics of plate tectonics. In most of the Ring of Fire, the various tectonic plates overlap in regions of convergence known as subduction zones. The only significant exception to the subduction regions is at the border of the Pacific Plate and the North American Plate, where a transformation zone is established".*

The same author also states that "*the Pacific Ring of Fire is a point of extreme importance due to its natural disaster-prone nature, as well as its susceptibility to climate change*" (Simões, 2024: p.73).

Figure 1 - Pacific Ring of Fire

Source: Wikipedia contributors. (2009)

This article is divided into three parts. In the first part, the fundamental components of the state are analyzed, as well as the legal regimes for islands and artificial islands. In the second part, the impacts of climate change on the security of the South Pacific are discussed, as well as the relationship between climate change and rising sea levels. The second part also identifies some of the possible ways in which island states at risk of disappearing can seek to continue their existence. Finally, the third part analyses the specific case of the impact of rising sea levels in Tuvalu, trying to relate its impacts to the ideals of human security and identify some of the main measures adopted to mitigate these impacts.

2. Islands' legal status and the elements of the State

Islands are often imagined as a parcel of land above sea level completely surrounded by water. But what makes them states? Why can't a drifting boat declare itself independent and establish an autonomous state? Or why do projects to build artificial islands, for example in the case of the Republic of Minerva, fail to constitute a real state?

First of all, let's analyse what constitutes a state. According to the Montevideo Convention on the Rights and Duties of States, a state requires the existence of four elements: (i) a people; (ii) a territory; (iii) political power; (iv) and the ability to establish and mantain relations with other states.

By people, we mean the group of individuals who, in order to guarantee themselves a situation of justice, security and well-being, establish their private political power in a given territory (Silva, 2012). In addition, as Pinto et al. (2013) mention, the people is the group of individuals who establish a link with the state through citizenship or nationality.

Territory refers to the area in which a people establishes itself and regulates itself, exercising its power without the intervention of other politically organised communities. The territory is comprised by the soil, the subsoil, the space above the ground up to the Kármán line, as well as the territorial waters, the continental shelf and the inland waters in the case of a coastal state (Pinto et al., 2013; Silva, 2012). It should also be noted that a state can also take on different forms of organisation, but we won't go into a detailed analysis of this subject here.

Political power, for its part, refers to the people's ability to set up bodies dedicated to governing the territory and to impose their legal rules on it (Silva, 2012). In other words, it is what Marques Guedes, quoted by Pinto et al. (2013: p.147), defines as '*the power to outline the structures and directions of common life and to impose compliance with the directives and rules established for both*'.

With regard to the ability to engage with other states, it should first be noted that in order to do so, a state needs to be recognised as such by other states. Miranda (2009: p.222) begins by saying that

> *'recognition can be constitutive or declarative in nature (...) According to one way of looking at it, it is only through recognition that the state can exist', in other words, recognising the state is what allows it to be constituted. On the*

> *other hand, from a declarative point of view, 'the state would exist as long as the conditions for its existence were effectively met'* (Miranda, 2009: p.222).

In addition, the ability to engage with other states derives to a large extent from the condition of sovereignty, which must be maintained both internally and externally, and can therefore be seen as the ability of a state to be independent and autonomous internally and to assert its will externally (Pereira & Quadros, 1997; Pinto et al., 2013; Silva, 2012). Consequently, the ability to interact with other states also depends on the degree of independence of the state.

Having made the necessary observations about the constituent elements of the state, let's now take a closer look at the legal status of island states. Firstly, are they islands that are states, or states that by chance, due to their geographical location and the conditioning of natural forces, have the condition of insularity?

In reality, the term island state represents the combination of the term state and the term island or insular, which individually represent legal terms in themselves. However, the term island state is not in itself a legal term, so in answer to the question posed above, we are talking about islands that fulfil the conditions to be considered states (Crawford, 1989).

The legal regime of islands is elaborated in the Law of the Sea Convention (LOSC/UNCLOS). Article 121 is particularly relevant as it clarifies the legal regime of islands, as well as their maritime rights and distinguishes an island from a rock (Evans & Lewis, 2023; Rothwell, 2022). In this sense, it is relevant to look at Article 121:

> *Article 121º*[3]
>
> *1º. An Island is a naturally formed area of land, surrounded by water, which is above water at high tide.*
>
> *2º. Except as provided for in paragraph 3, the territorial sea, contiguous zone, the exclusive economic zone and the continental shelf of an island are determined in accordance with the provisions of this Convention applicable to other land territory.*
>
> *3º. Rocks which cannot sustain human habitation or economic life of their own shall have no exclusive economic zone or continental shelf.*

With regard to the provisions of Article 121, a few points should be emphasised: firstly, islands must be formed by natural forces, so artificial islands are excluded from the scope of this article. In addition, the island must be made up of natural materials, in other words, regardless of its size, the island's territory must essentially be made up of natural matter (Rothwell, 2022). We say essentially, because as Rothwell (2022: p.11) points out, "an island which has been reinforced or enlarged by reclamation through gravel, rocks, and sand from the adjacent sea-bed or relocated from an island quarry would still

[3] This article can be found on page 63 of the United Nations Convention on the Law of the Sea (UNCLOS).

constitute land for these purposes". Finally, the islands must be above sea level at high tide, helping to distinguish between islands and low-tide elevations. This does not mean, however, that the size of the island cannot vary according to the flow of the tides, but part of the island must always be above sea level at high tide (Rothwell, 2022).

Inevitably, this issue raises challenges with regard to the effects of climate change and rising sea levels. We will develop this issue further below.

3. Environmental security and rising sea levels in the South Pacific

In the case of island states, rising sea levels constitute an existential threat that jeopardizes the territorial integrity of several states.

Climate change has profound impacts on the Ring of Fire region, mainly on two levels. Firstly, the melting of polar ice caps and glaciers, responsible for rising sea levels, not only exposes coastal regions to tsunamis, cyclones and other storms, but can also lead to the partial or total loss of island territories (Simões, 2024). Secondly, global warming also has an impact on the intensity of volcanic activity, since the increase in temperature also causes an increase in the instability of volcanic systems (McGuire, 2016; Simões, 2024).

The increase in volcanic activity contributes to a vicious cycle, since the release of greenhouse gases into the atmosphere as a result of volcanic activity contributes to the intensification of the climate crisis. In addition, it is important to note that this type of activity is often accompanied by seismic phenomena, contributing to a greater regional risk of natural disasters and, consequently, greater political and social instability (Simões, 2024).

In addition, major natural disasters such as earthquakes and cyclones can have both immediate and long-term effects. In the short term, these include fatalities, injuries and the destruction of infrastructure. On the other hand, the long-term effects can include population displacement, disease outbreaks; disruption of the health system affecting the most critical patients such as the chronically ill.

Another important natural risk concerns the rise in average sea levels. Global warming contributes to this rise in three main ways (Nath & Madhoo, 2021): (i) melting of glaciers and ice caps; (ii) increase in the volume of water in the oceans; (iii) reduction in underground water resources, rivers, lakes and reservoirs.

Sweet (2017 apud Nath & Madhoo, 2021: p.191) states that

> *"the rise in sea level during the twentieth century was more rapid than that experienced in the past 2800 years and the rate of increase in the last quarter century has been almost double that of the twentieth century mean".*

As we will see below, the rise in the average sea level and the position of the Small Island Developing States establish an important relationship between survival and extinction. In addition, as we will see below, some states have already reached the stage of virtual extinction.

It is worth noting that international law has long sought to better accommodate the loss and expansion of territory, which can occur through various means, including natural events (Rothwell, 2022). According to the same author "*while international law assumes the continuity of States, state- hood may be extinguished under a number of circumstances and a State may no longer exist and enjoy sovereignty over territory*" (Rothwell, 2022: pp. 243-244). The possibility of losing territory, and even of some states disappearing, leads us to reflect on the absolute necessity of the territorial requirement for the existence of a state, or whether there can be a deterritorialised state.

The question of a state disappearing is not necessarily a new one, in fact perhaps one of the best examples of the disappearance of a state is the myth of Atlantis. It's not certain that Atlantis ever existed, but as we've been saying, a very similar fate hangs over several island states. In the next 50 to 100 years it is possible that countries like Nauru, Kiribati, the Maldives or Tuvalu will disappear completely beneath the waves of the sea. Furthermore, there are real examples of the extinction of states, and this process has usually occurred by "*the disappearance of sovereign political power, or by incorporation into another state, or by conventional merger, or by division of its territory into new sovereign states*" (Pereira & Quadros, 1997: p.334), examples include the incorporation of the German Democratic Republic into the German Federal Republic, the conventional merger of Tanganyika and Zanzibar to form Tanzania, and the dissolution of the USSR.

In this sense, perhaps the novelty lies in the fact that the extinction of a state due to loss of territory as a result of natural disasters may increasingly be a reality. Therefore, and given the current international legal and regulatory framework, one possibility for their future may lie in the mechanisms of state succession.

The succession of states can be understood, along the lines of the Vienna Conventions on the Succession of States in the Matter of Treaties and the Vienna Convention on the Succession of States in the Matter of Property, Archives and State Debts, as '*the substitution of one state for another in the responsibility for the international relations of a territory*' (Pereira & Quadros, 1997: p.336).

In this regard, it is important to take note of what Miranda (2009: p.228) tells us,

> *'everything consists of knowing what the implications of the change in the legal-political status of the territory and the community existing in it, on the condition of people and goods and on the condition of the community itself in international relations (...) the passage of power from one state to another necessarily determines more or less intense legal effects'.*

Although our aim here is not to analyse the problem of the succession of states in detail, we cannot fail to identify some important aspects of this process. Firstly, the process of changing sovereignty also implies a change in citizenship, while respecting the individual right to hold a given nationality. Similarly, there are no changes to state borders and the successor state automatically takes possession of the properties and assets of the predecessor state without the need for compensation or indemnity (Miranda, 2009).

We mentioned earlier that one possibility for their future could lie in the mechanisms of state succession, in that a group of states at risk of losing their territory to the sea could choose to merge in the form of a federation or confederation (Ker-Lindsay, 2016; Teles & Santolaria, 2022). We will then analyse other possible ways of giving continuity to the 'life' of the state, but it is important to emphasise that,

> *"while this would certainly be a rather more traditional form of state death, and could presumably be fairly easily accommodated, the problem is that the legal situation would by no means be certain. Indeed, it could quite possibly be challenged, either legally or militarily, by neighbouring states"* (Ker-Lindsay, 2016: p.7).

Another possibility concerns the use of artificial islands to relocate the population and maintain a well-defined physical presence. Several states have already explored the construction of artificial islands either as a substitute for natural territory or as a tool to protect themselves from rising sea levels (Ker-Lindsay, 2016). Examples include Kiribati, the Maldives and Singapore.

However, artificial islands raise a number of questions regarding compliance with the territorial criterion for the existence of a state. Their status is defined by Article 60 of the LOSC and, according to this article, artificial islands, as well as other structures and installations, do not have a status equivalent to that of islands, nor do they have their own territorial sea (Anderson, 2017).

> *Article 60º*[4]
>
> *1. In the exclusive economic zone, the coastal State shall have the exclusive right to construct and to authorize and regulate the construction, operation and use of:*
>
> *(a) Artificial islands;*
>
> *(b) Installations and structures for the purposes provided for in the article 56 and other economic purposes;*
>
> *(c) Installations and structures which may interfere with the exercise of the rights of the coastal State in the zone.*
>
> *2. The coastal State shall have exclusive jurisdiction over such artificial islands, installations and structures, including jurisdiction with regard to customs, fiscal, health, safety and immigration laws and regulations.*
>
> *3. Due notice must be given of the construction of such artificial islands installations or structures, and permanent means for giving warning of their presence must be maintained. Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization. Such removal shall also*

[4] This article can be found on page 41 of the United Nations Convention on the Law of the Sea (UNCLOS).

> *have due regard to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed.*
>
> *4. The coastal State may, where necessary, establish reasonable safety zones around such artificial islands, installations and structures in which it may take appropriate measures to ensure the safety both of navigation and of the artificial islands, installations and structures.*
>
> *5. The breadth of the safety zones shall be determined by the coastal State, taking into account applicable international standards. Such zones shall be designed to ensure that they are reasonably related to the nature and function of the artificial islands, installations or structures, and shall not exceed a distance of 500 metres around them, measured from each point of their outer edge, except as authorized by generally accepted international standards or as recommended by the competent international organization. Due notice shall be given of the extent of safety zones.*
>
> *6. All ships must respect these safety zones and shall comply with generally accepted international standards regarding navigation in the vicinity of artificial islands, installations, structures and safety zones.*
>
> *7. Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation.*
>
> *8. Artificial islands, installations and structures do not possess the status of islands. They have no territorial sea of their own, and their presence does not affect the delimitation of the territorial sea, the exclusive economic zone or the continental shelf.*

Artificial islands, although they may differ in form, share three fundamental characteristics. Firstly, they are the exclusive product of human action, secondly, they are surrounded by water and thirdly, they are used to fulfil a certain function in a fixed location (Heijmans, 1974; Saunders, 2017). In other words, they are human-made structures, constantly surrounded by water and raised above sea level during high tide, located in a more or less fixed place and with a specific purpose. However, artificial islands do not fulfil the Montevideo criteria in terms of territoriality (Crawford, 1989).

A third option that should be identified here concerns the purchase of territory in another state. Although this idea has currently been put on hold, the Maldives has considered purchasing land in Sri Lanka, India or Australia. Another example concerns the purchase of land in Fiji by Kiribati (Ker-Lindsay, 2016). This option also raises a number of questions that need to be discussed and taken into account, not least because it seems unlikely that a state would be willing to sell part of its territory, but fundamentally because this purchase is, after all, equivalent to a purchase made by a private party, so

it is assumed that the citizens of the state that bought the land will still need a residence permit and other documentation.

Finally, a fourth way, which has already been identified, concerns the possibility of the existence of deterritorialised states, or what Burkett (2011) calls ex-situ states. The author then argues that, it

> *"would be a status that allows for the continued existence of a sovereign state, afforded all the rights and benefits of sovereignty amongst the family of nation-states, in perpetuity. It would protect the peoples forced from their original place of being by serving as a political entity that remains constant even as its citizens establish residence in other states"* (Burkett, 2011: p.346).

There are several potential critiques of Burkett's argument: firstly, the transition from a formal state to an ex-situ state will necessarily require the support of the UN, the recognition of the international community and, even eventually, as Burkett (2011) points out, funding from that same community. In addition, another critique that can be made of Burkett's (2011) argument concerns the redefinition of the criteria for defining what constitutes a state, since this redefinition could raise other challenges, such as the possibility of groups like the Kurds claiming the status of a deterritorialised state and starting to issue passports, for example.

4. Climate refugees and the perspectives on Tuvalu

The idea that climate change has the potential to generate climate refugees has been much discussed since the beginning of the 21st century, when environmentalist Norman Myers argued that "*climate change will cause up to 200 million more migrants by 2050. According to Myers, the vast majority of these forced migrants will come from low-lying deltas in Asia and drought prone areas of sub-Saharan Africa, but others, he states, will come from small island states*" (Myers, 2002 apud Campbell & Barnett, 2010: p.171).

However, the term "climate refugee" continues not only to receive a lot of resistance in the scientific community, disputing the idea that climate change is a real driver of population displacement (Black, 2001; Castles, 2002). Furthermore, there is still no international legal-normative framework that provides a clear and specific status for this type of phenomenon.

It is difficult to distinguish between pull and push factors in migration decision-making processes, i.e. the factors of repulsion and attraction at the points of departure and arrival. For example, how permanent the migratory displacement can be and to what degree the decision to move is a truly free decision (Campbell & Barnett, 2010).

The same authors point out that "*in the literature on climate change and migration it is assumed the climate change will force people to move by causing rapid or slow onset changes in conditions which 'force' people to move*" (Campbell & Barnett, 2010: p.171). Separating the environmental factors from the political, economic and social factors that

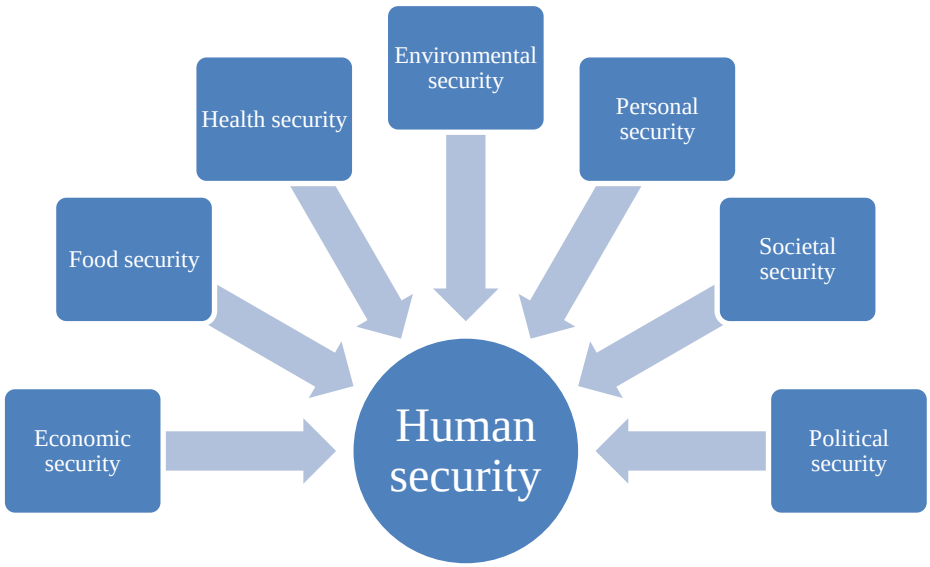
can lead to the decision to migrate, however, is a complicated, if not impossible task (Barnett & Webber, 2009), so to a large extent, climate migration is a multi-causal phenomenon dependent on environmental factors and political, social and economic factors.

In the Pacific island states, migration tends to be motivated by push factors, such as the search for access to better education and employment and better healthcare. And although climate change, largely due to rising sea levels, is not traditionally a cause of migration in island states (Morton, 2002), we can currently identify three migration trends also associated with climate change (Simões, 2024): (i) inter-island migrations; (ii) intra-island migrations; (iii) island-continent migrations.

Although traditionally climate change has not necessarily been a direct and autonomous cause of migratory flows, "we are entering a new era in which environmental degradation in many parts of the world, particularly in developing countries and not just on islands, is increasingly likely to cause livelihoods to deteriorate, if not fail altogether, and people will be increasingly driven to move" (Campbell & Barnett, 2010: p.172; Connell, 2018).

Human security is a multidimensional concept with a high degree of comprehensiveness and subject to different interpretations, being frequently associated with the ideas of freedom from fear and freedom from want. Human security encompasses seven important areas: (i) economic security; (ii) food security; (iii) health security; (iv) environmental security; (v) personal security; (vi) societal security; (vii) political security. These different areas of security and their respective threats interact with each other in a very dynamic way (figure 2).

Figure 2 – Human security areas



Source: own authorship

It should be noted that climate change affects several of these dimensions, particularly food, environmental and economic security (table 1), even leading, as we have mentioned, to the forced displacement of populations. The case of Tuvalu exemplifies how climate change is forcing nations to rethink sovereignty, identity, and governance.

Table 1 - Human security, climate change and Tuvalu

Human security	Vulnerabilities	Climate change impacts	Measures adopted by Tuvalu
Economic security	Shifts in the global economy	Disruption of professional activities such as tourism, agriculture and fishing; Extreme events and rising sea levels can jeopardise infrastructure and increase economic vulnerability.	Reclaiming land strips and protecting them to ensure the safety of critical infrastructure.
Food security	Changes in production patterns	Soil degradation; Loss of crops; Droughts and food shortages; Disruption of supply chains due to extreme events.	Environmental cooperation within the Falepili Union.
Health security	Pandemics	Rising temperatures and natural disasters contribute to the spread of diseases such as malaria and dengue fever.	Health cooperation within the Falepili Union.
Environmental security	Pollution and environmental degradation	Loss of biodiversity; Scarcity of resources; Extreme events; Rising sea levels; Desertification.	Environmental cooperation within the Falepili Union.
Personal security	Natural disasters and conflicts	Forced displacement.	Security cooperation in the event of natural disasters within the Falepili Union.
Societal security	Cultural globalisation	Forced migration can lead to cultural and social erosion, as well as the loss of cultural identity.	A living digital archive curated by Tuvaluans preserves the nation's cultural heritage.
Political security	Instability, war and conflict	Weakening of government institutions due to exhaustion of resources; Political instability.	Redefining statehood through constitutional amendments and bilateral agreements.

Source: own authorship

Tuvalu is often cited as the country most at risk of disappearing due to rising sea levels. Currently, 40% of the territory of its capital (Funafuti) is regularly submerged during high tide (figure 3). Even more worrying are the predictions that by the end of the century its entire territory could be submerged.

Figure 3 - Tuvalu map

Source: WorldAtlas (2023)

In addition to the risks of destroying agricultural plantations, the forced displacement of populations, and the risk of seawater seeping into the islands' soils, we must emphasize that the risk of losing territory also corresponds to the risk of losing its rights as a sovereign state.

Under international law, (Anderson, 2017; Crawford, 1989; Heijmans, 1974; Saunders, 2017), as we have seen the existence of a state presupposes a well-defined physical territory. This is why the risk of Tuvalu's de-territorialization due to rising sea levels gives grounds for the hypothesis that this small island state could become the first to lose its sovereignty due to climate change.[5]

This not only has implications for the protection and relocation of its population, but also for its maritime borders, its participation in international forums and its voice in the international system.

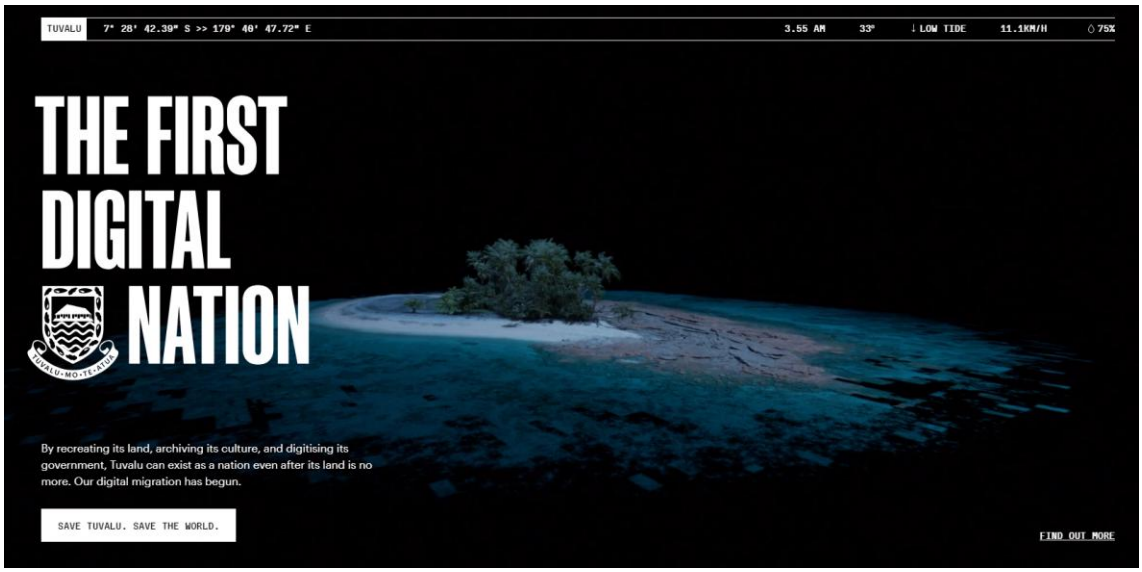
The Tuvalu authorities have adopted various measures in an attempt to adapt to and mitigate the effects of climate change. We can group these measures into structural measures and institutional measures. The former refers to the set of measures aimed at creating material and digital structures to preserve Tuvalu's identity. The latter, on the

[5] In the same vein, in September 2024, the AOSIS member states presented a declaration at the UN entitled "Declaration on Sea Level Rise and Statehood", in which they argued that a state's sovereignty could not be challenged by climate change. Also in 2021, AOSIS leaders had declared that legal maritime zones are immutable and cannot be affected by rising sea levels, thus reinforcing their position on defending the preservation of their territorial sovereignty in a context of growing environmental threat (AOSIS, 2024).

other hand, relate to legal-political measures aimed at safeguarding the sovereignty of this small island state (table 1).

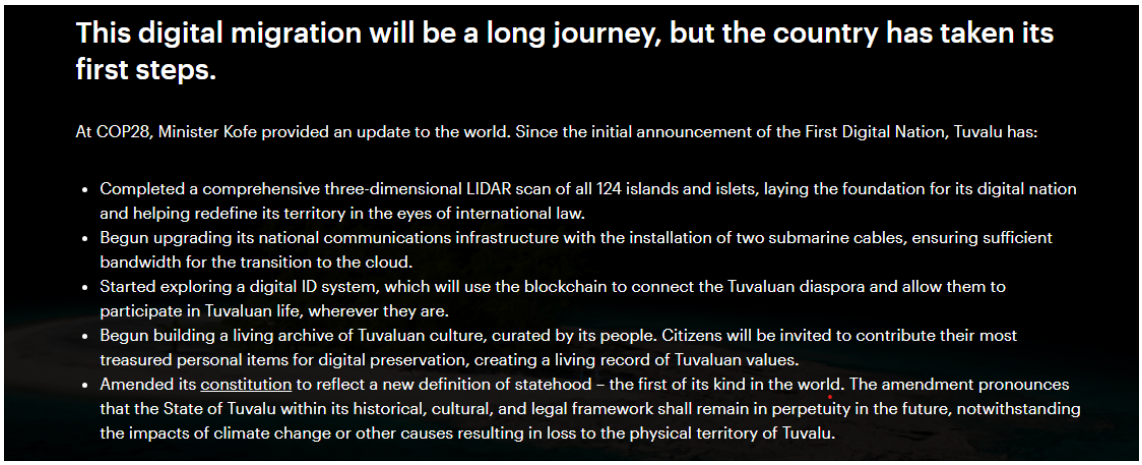
The first digital structural measures were introduced in 2022 with the announcement of the initiative to digitalise the state in order to recreate and safeguard its history and culture. In 2023, a set of measures developed to promote the state's digital transition were presented, which can be found on the digital portal 'Tuvalu, The first digital nation' (figures 4 and 5).

Figure 4 - Digital portal for Tuvalu's digital transition



Source: Tuvalu, The first digital nation (n.d)

Figure 5 - Measures adopted for the digital transition



Source: Tuvalu, The first digital nation (n.d)

Among the structural measures, some of which are covered in figure 4, we highlight the realisation of a comprehensive three-dimensional LIDAR scan of all 124 islands and islets, laying the foundations of its digital nation and helping to redefine its territory in the eyes of international law, the upgrading of its national communications infrastructure with the installation of two submarine cables, ensuring sufficient bandwidth for the transition to the cloud, the exploration of a digital identification system, which will use the blockchain to connect the Tuvaluan diaspora and allow them to participate in Tuvaluan life wherever they are, and the construction of a living archive of Tuvaluan culture, curated by its people (Tuvalu, The first digital nation, n.d.).

Still within the scope of structural measures, the Coastal Adaptation Project should also be highlighted. The aim of this project is to reclaim land from the sea, allowing strips of land to be reclaimed and protected so that both housing and critical infrastructure can be built free from flooding (Rothe et al., 2024).

As far as institutional measures are concerned, it is worth highlighting the amendment of the constitution to reflect a new definition of statehood and to declare that the state of Tuvalu will remain in perpetuity in the future, regardless of the impacts of climate change or other causes that result in the loss of physical territory. It is also worth noting the various bilateral agreements that Tuvalu has entered into in order to obtain recognition of its virtual sovereignty, with around 26 states already recognising this sovereignty (Tuvalu, The first digital nation, n.d.).

Finally, the conclusion of the Falepili Union agreement between Tuvalu and Australia should be emphasised as an innovative agreement in terms of cooperation on environmental and health security. This agreement provides that from 2025 onwards 280 Tuvaluans will be able to travel to Australia, both to reside and to work. The agreement also includes a commitment to support and promote environmental, natural disaster and health security (Lowy Institue, 2024).

5. Final remarks

Rising sea levels pose a serious and existential threat to island states, so the ability to adapt is fundamental to their survival. In fact, the question of statehood for islands, particularly in the face of environmental threats such as rising sea levels, presents significant legal and practical challenges. The Montevideo Convention's criteria for statehood provide a clear framework, but the evolving realities of climate change and the potential disappearance of island territories push the boundaries of traditional legal interpretations.

The legal status of islands as established by the Law of the Sea Convention ensures that only naturally formed landmasses can claim full maritime rights. Therefore, this limitation excludes artificial islands from being recognized as independent states, which complicates efforts by island nations to itigate the loss of their physical territory. Furthermore, state succession mechanisms, while useful in cases of political transitions, do not adequately address the existential threat posed by rising sea levels.

It is our understaning that, the potential solutions explored – merging with other states, constructing artificial islands, purchasing new land or establishing ex-situ states – each present unique legal and diplomatic hurdles. While merging with other states might offer continuity, it risks the loss of national identity. Artificial islands and land purchase face recognition issues under international law. The concept of deterritorialized states, though innovative, challenges the foundational definition of statehood and sovereignty.

Thus, ultimately, the survival of island states in a changing climate may depende on the willingness of the artificial community to adapt legal frameworks and provide support.

The case of Tuvalu exemplifies the growing challenges that SIDS face due to climate change, particularly rising sea levels. While migration has traditionally been driven by political and socio-economic factors, climate change is increasingly becoming an unavoidable force shapping displacement patterns. Both legal and political uncertainties surrounding climate-induced migration underscore the urgency of establishing an international framework to address the status of climate refugees.

Tuvalu's response, which includes both structural and institutional measures, highlights the innovative approaches that vulnerable states are adopting to preserve their sovereignty. The digitalization of the nation, territorial adaptation projects, constitutional reforms, and international agreements are all strategies aimed at ensuring Tuvalu's continued existence – whether physically or virtually.

Notwithstanding the issues that may arise in the face of a possible transformation of the concept of sovereignty due to Tuvalu's initiatives. This is precisely why it is necessary to adopt an integrated or holistic approach to adaptive capacity, involving the academy, the authorities and civil society.

Despite these efforts, the broader question remains: can a state exist without physical territory?

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