

Towards a Dematerialized Sovereignty: The Tuvalu Case and the Challenge of Digital Statehood

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Abstract

This article examines the Government of Tuvalu's plan to transform itself into a digital nation as a legal strategy to preserve sovereignty in the face of the potential loss of its physical territory due to rising sea levels. The analysis focuses on the digital migration of state functions, archives, and collective identity, with particular attention to the Digital Ark project, conceived to ensure institutional continuity and the international legal personality of the State. The article assesses the compatibility of this model with the classical criteria of statehood, integrating historical precedents such as governments in exile and non-territorial subjects of international law. The article argues that the Tuvalu case represents a systemic challenge to international law, requiring an evolutionary reinterpretation of sovereignty in functional and digital terms, as well as a redefinition of the relationship between territory, identity, and international legal personality.

Keywords

Tuvalu, Digital State, Sovereignty, International Law, Climate Change, Digital Ark, Governments in Exile, ICJ Advisory Opinion, Falepili Union.

1. Introduction

Tuvalu, a small island State comprising nine atolls in the Pacific Ocean, has become one of the most emblematic cases of global climate vulnerability. With an average altitude of less than two meters above sea level and

a maximum altitude of only 4.6 meters, its territory is increasingly exposed to coastal erosion, saltwater intrusion into freshwater lenses, and, above all, progressive sea level rise. According to widely accepted projections from the Intergovernmental Panel on Climate Change (IPCC) and the United

Nations Development Programme (UNDP), a substantial part of Tuvalu's land could become uninhabitable by the end of the 21st century, with some scenarios suggesting complete territorial loss within a few decades [1,2].

This scenario raises a crucial legal question: can a State

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continue to exist under international law in the absence of its physical territory? The question is not merely academic. It undermines the Westphalian conception of statehood that has characterized international relations since 1648 and calls into question the fundamental assumptions embedded in the architecture of international law. While international law has historically been shaped by territorial assumptions – that is, the notion that sovereignty is exercised over a defined space and the population within it – climate change is now destabilizing the material foundations on which these assumptions are based.

In response to this threat, Tuvalu has adopted a remarkable innovative strategy based on the digitalization of statehood. Through its “Digital Nation Initiative”, officially announced in 2022 and progressively implemented thereafter, the government has undertaken a systematic effort to migrate key elements of the State to digital infrastructures. A central element to this strategy is the Digital Ark, a comprehensive framework designed to perpetually preserve state archives, legal identity, governance mechanisms, and

cultural heritage, regardless of the physical fate of the islands.

This Tuvaluan approach challenges the traditional understanding of sovereignty as anchored to territory and calls for a reconsideration of statehood as a functional and relational construct. Thus, it sits at the intersection of international law, technological innovation, and climate justice, raising questions that go far beyond the immediate circumstances of a small Pacific nation.

This article aims to analyze the legal implications of Tuvalu’s digital transition, assessing its compatibility with established doctrines and its potential to reshape the international legal order. The analysis is structured in several stages: first, it examines the classical criteria of statehood and their application to cases of territorial loss; second, it considers historical precedents; and finally, it analyzes the specific mechanisms of digital statehood and emerging international responses, including the 2025 Advisory Opinion of the International Court of Justice [3] and the 2023 Falepili Union agreement between Australia and Tuvalu (2023 Falepili Union).

2. Statehood in International Law: The Montevideo Framework and Its Limits

The classical definition of statehood is codified in Article 1 of the 1933 Montevideo Convention on the Rights and Duties of States [4], which identifies four essential criteria: a permanent population, a defined territory, an effective government, and the capacity to enter into relations with other states. Although the Convention was a regional instrument adopted by American states, its criteria have gained near-universal acceptance, as they reflect customary international law on statehood.

Traditionally, these elements have been considered cumulative and indispensable prerequisites for the existence of a state. Among these, territory has often been considered the most fundamental, as the spatial basis for the exercise of sovereignty, the delimitation of jurisdiction, and the identification of the population subject to government authority.

However, international practice reveals a more complex reality than the Montevideo Convention criteria might suggest. These criteria have never been applied with mechanical precision, and con-

siderable flexibility has been demonstrated where one or more elements are contested or ineffective in practice [5,6]. Specifically, the temporary loss of effective control over a territory or government functions does not necessarily entail the extinction of statehood, especially where such loss arises from illegitimate situations such as occupation or annexation.

The case of Estonia, Latvia, and Lithuania provides a particularly telling example. Following their annexation by the Soviet Union in 1940, many Western states maintained a consistent policy of non-recognition, and these entities were not generally considered as having ceased to exist. Their re-emergence as independent states in 1991 was widely treated not as the creation of new states, but rather as the restoration of pre-existing states whose legal continuity had persisted throughout the period of occupation.

The case of Tuvalu presents a qualitatively different challenge. Unlike situations of occupation or annexation, in which the loss of territorial control is typically understood as temporary and reversible – the threat Tuvalu faces con-

cerns the potential permanent disappearance of its territory due to environmental factors beyond the state's control. This raises the fundamental question of whether the territorial criterion should be interpreted strictly, as requiring the continued existence of a physical territory, or more functionally, as referring to a state's capacity to exercise authority rather than the mere existence of a territory [7,8,9].

A growing body of scholarship, particularly in the context of climate change and its impact on small island states, suggests that statehood should be understood as a dynamic and constant evolving concept, rather than a static legal status determined at a single point in time [10,11]. From this perspective, the essence of the state lies not solely in its physical attributes, but also in its ability to perform core functions – governance, representation, and provision of services to its population – and to maintain recognition as a subject of international law by other states and international organizations. The principle of continuity, well established in international law, supports the view that once a State has come into existence, it benefits a strong

presumption of continuity, which can only be rebutted in exceptional circumstances.

In this context, Tuvalu's digital strategy may be understood as an attempt to preserve the functional elements of statehood in the face of existential environmental threats. Rather than completely replacing physical territory, these initiatives seek to maintain governance structures, national identity, and international legal personality through digital means, while preserving the traditional indicia of statehood – namely, a defined population, an organized government, and the capacity to engage in international relations, as reflected in the Montevideo Convention.

3. Governments in Exile and Non-Territorial Subjects: Historical Precedents

Historical precedents provide useful, though imperfect, analogies for understanding the legal status of a potentially deterritorialized Tuvalu. The most frequently cited examples are those of the governments in exile during World War II, when several European states saw their territories occupied by the Axis powers [12,13].

The governments of Poland, Norway, Netherlands, Belgium, Luxembourg, and Greece operated from London and continued to exercise a range of governmental functions, including diplomatic relations and military organization, while maintaining recognition by Allied states and, in some cases, neutral States. The Free French movement led by Charles de Gaulle further illustrates the complexity of state representation in a context of competing claims to legitimacy.

These precedents support the principle that the loss of effective territorial control does not necessarily entail the extinction of statehood, particularly where international recognition and claims to continuity are maintained. The continued legal personality of these states was generally accepted during the conflict, and the restoration of territorial control after the war was widely understood as a reestablishment of normal governmental authority rather than the creation of new states.

Another notable example is the Sovereign Military Order of Malta, a unique subject of international law that maintains diplomatic relations with numerous states despite lack-

ing a conventional sovereign territory. Its status reflects an exceptional historical and diplomatic evolution, rather than a general model of deterritorialized statehood.

However, these precedents are only partially applicable to the case of Tuvalu. Governments in exile were conceived as temporary arrangements tied to the expectation of territorial recovery, while the Order of Malta constitutes a highly exceptional entity whose legal status cannot be easily generalized. Tuvalu, on the other hand, raises the unprecedented question of whether a state may maintain continuity in the face of potentially permanent territorial loss due to environmental change, thus challenging the traditional assumption that territoriality is an indispensable element of statehood.

4. The Digital Ark and Institutional Continuity

The Digital Ark is a central component of Tuvalu's broader digital statehood strategy. Officially launched in 2023 and progressively developed thereafter, it is conceived as a comprehensive digital ecosystem aimed at preserving key government and societal functions

in the context of existential climate risks.

The scope of the Digital Ark extends beyond simple archival storage and includes civil registries, legislative and judicial records, administrative proceedings, and selected elements of cultural heritage and customary land tenure systems. These components are intended to ensure the continuity of essential state functions and the preservation of institutional memory.

Technically, the system relies on a secure and distributed digital infrastructure, designed to enhance resilience and data integrity. While these features contribute to robustness, they are not in themselves a determining factor in the state's legitimacy.

From a legal perspective, the Digital Ark can be understood as an attempt to strengthen institutional continuity by preserving documentation and administrative capacity. This includes the preservation of records relating to citizenship, legal rights, and governmental decisions, which are relevant to the continued functioning of state institutions.

The initiative also contributes to the ongoing debate on

the evolving nature of sovereignty. While sovereignty has traditionally been closely associated with territorial control, it also includes functional dimensions such as governance, the regulation of nationality, and participation in international relations. These functions may, in certain respects, be supported by digital means.

In this sense, the Digital Ark can be seen as an innovative attempt to adapt state functions to new technological and environmental conditions. However, the question remains open in international law whether such developments can replace territoriality as a constitutive element of statehood: the place where sovereignty and jurisdiction apply and which requires, in our established understanding, a physical reality; a physical space operating as the ambit and the limit for their application.

5. Toward Digital Citizenship: The National Digital ID

A central component of Tuvalu's digital transformation is the introduction of a national digital identity system (National Digital ID), one of the most innovative elements of

the broader Digital Nation Initiative. The system is designed to enable Tuvaluan citizens to access certain government services, manage their administrative data, and preserve their legal status as citizens regardless of their location.

The National Digital ID is more than a simple form of digital identification. It functions as a platform for accessing selected rights and administrative services in a partially deterritorialized context. Through the system, citizens can obtain official documents, register vital events, and interact with public authorities through digital channels, thus strengthening the administrative relationship between individuals and the state.

Digital citizenship, as embodied in this system, represents an evolution in modes of political belonging [14,15]. While classical theories of citizenship have traditionally emphasized participation within a territorial political community, contemporary developments in digital governance increasingly allow certain aspects of citizenship to be exercised beyond the physical state [16]. The Tuvaluan model partially decouples citizenship from territorial residence, reframing

it as a continuing legal relationship supported by digital infrastructures.

This development has implications for democratic participation, particularly in relation to diaspora engagement and remote access to public services. However, the extent to which digital platforms can support full electoral participation remains dependent on domestic constitutional arrangements and the integrity of electoral safeguards.

At the same time, the model raises significant challenges. Ensuring the security and integrity of digital identities is essential, especially where systems are connected to electoral or sensitive administrative processes. Robust authentication mechanisms and protection against identity fraud are necessary conditions for legitimacy. Furthermore, disparities in access to technology may lead to exclusion, particularly among vulnerable populations or individuals displaced by climate change with limited access to digital technology.

Addressing these challenges requires appropriate legal and institutional frameworks governing digital identity, as well as sustained investment in infrastructure and capac-

ity-building. It also raises broader questions about the extent to which citizenship can be effectively exercised in dispersed populations without undermining the principles of equality and democratic inclusion.

6. International Recognition and the Evolution of Statehood

International recognition plays a significant role in the evolving discourse on Tuvalu's digital statehood. While the theoretical debate on recognition remains divided between constitutive and declaratory approaches, its practical importance for legitimacy and participation in the international community is particularly evident in contexts of climate vulnerability. In such situations, recognition does not replace traditional criteria for statehood, but it can help sustain a state's international legal personality under conditions of existential environmental stress.

The 2025 ICJ Opinion, namely paragraph 363, is particularly relevant in this regard. The Court confirmed that international law does not provide for the automatic extinction of statehood as a

consequence of territorial loss, including that resulting from climate change. It also reiterated that the continuity of the State constitutes a strong presumption in international law, and that the loss or transformation of territorial conditions does not, in itself, necessarily entail the termination of statehood.

It is important to emphasize, however, that the Court did not establish a new rule on deterritorialized statehood, nor did it suggest that recognition alone could replace the traditional elements of statehood. Rather, it left open the question of how the criteria of statehood should be applied in extreme environmental scenarios, emphasizing the continuity and legal stability within the existing framework of international law.

Against this background, the 2024 Declaration of the Alliance of Small Island States (AOSIS) reflects a coordinated political position affirming the determination of climate-vulnerable states to preserve their statehood and sovereignty in the face of climate change. Although not legally binding, such declarations may be relevant as expressions of state practice and political commit-

ment to the broader development of international law.

Similarly, the 2023 Falepili Union establishes a bilateral framework for cooperation on climate mobility and security, expressly reaffirming Tuvalu's continued statehood and sovereignty. While this agreement does not alter the legal criteria for statehood under international law, it contributes to emerging practices in managing climate-induced displacement and preserving state continuity.

Taking together, these instruments reflect an evolving international debate on the relationship between climate change and state continuity. However, it remains to be seen whether they are sufficient to crystallize a new rule of customary international law.

7. Cyber Sovereignty, Technological Risks, and Data Jurisdiction

The digitalization of state functions introduces new and important dimensions to the exercise of sovereignty which deserve careful analysis. In a digital context, control over data, digital infrastructure, and communication networks is increasingly important for the functioning of the state, com-

plementing, rather than replacing, the traditional importance of territorial control. The concept of cyber sovereignty captures the growing assertion of state authority over digital spaces and data flows, particularly in contexts where essential governance functions are mediated by digital systems.

However, this transformation also generates new forms of dependency that can compromise the effective exercise of sovereign functions. Many digital infrastructures rely on systems located outside the state's territorial jurisdiction or operated by private entities, including cloud services, undersea cables, satellite networks, and Internet governance structures. This raises complex issues of jurisdictional control and regulatory dependency, particularly for small, climate-vulnerable states like Tuvalu.

Cybersecurity considerations further complicate this picture. Attacks on digital infrastructure can disrupt administrative continuity, compromise sensitive data, or impact democratic processes. While these risks are not exclusive to digitally oriented states, they acquire particular significance where key governmen-

tal functions are increasingly dependent on digital systems. Consequently, resilience, redundancy, and international cooperation in cybersecurity emerge as important safeguards.

In this context, sovereignty may increasingly be understood in functional and relational terms, reflecting the interdependence of global digital infrastructures. This, however, does not displace the traditional foundations of statehood under international law, which continue to be based on established criteria such as territory, population, government, and the capacity to enter into international relations.

8. Maritime Rights and Exclusive Economic Zones

The potential disappearance of Tuvalu's land territory raises complex issues regarding the law of the sea, particularly with respect to maritime entitlements under the United Nations Convention on the Law of the Sea (UNCLOS). Under UNCLOS, maritime zones such as the territorial sea, the exclusive economic zone (EEZ), and the continental shelf are generally defined by baselines drawn along the coast, typically the low-water line.

According to a strict interpretation of this framework, the submergence of coastal features could raise questions about the validity of baselines and, consequently, the spatial reference for maritime entitlements. However, the legal consequences of long-term sea-level rise for existing maritime zones remain unsettled in international law.

In response to these uncertainties, Tuvalu and other small island states have advocated a more stable approach to maritime entitlements, often referred to in the literature as the mobile baseline versus fixed baseline debate. According to the latter approach, maritime zones would remain legally stable despite physical changes in coastal geography.

This position has received increasing attention in regional legal doctrine and practice, including within the Pacific Islands Forum and the Alliance of Small Island States. These developments reflect concerns that a purely ambulatory interpretation could produce inequitable outcomes for states that have contributed minimally to climate change.

From a functional perspective, the preservation of maritime entitlements is important

for the exercise of rights and jurisdiction over marine resources, including fisheries and environmental protection. However, under international law, such entitlements derive from and are legally distinct from territorial sovereignty, and their existence does not in itself determine the statehood or legal personality of a state.

9. Human Rights, (Limited) Sovereignty and Climate Justice

The transformation of Tuvalu into a more digitally oriented state raises significant human rights implications, relevant to the design and implementation of the Digital Nation Initiative. The gradual or eventual displacement of the population affects a range of rights, including access to public services, participation in political life, preservation of cultural identity, and continuity of social and family ties under international human rights law. Population displacement also affects the exercise of sovereignty by citizens residing in different states, where different and even conflicting rules may apply simultaneously [17], raising the issue on which rule should prevail.

Digital citizenship can help mitigate some of these challenges by maintaining administrative and legal ties between the state and its dispersed population. Through systems such as national digital identification platforms, citizens residing abroad may continue to access certain government services and participate in aspects of civic life, thus fostering the continuity of relations between the state and its citizens in a transnational context.

However, digital mechanisms cannot completely replace the cultural, historical, and social significance of territorial ties. The islands of Tuvalu constitute not only a physical space, but also a place of collective identity, cultural heritage, and historical memory, which could be significantly affected by environmental degradation.

The Tuvaluan case also raises broader questions of climate justice and responsibility under international law. Tuvalu has contributed only marginally to global greenhouse gas emissions, yet it faces disproportionately severe consequences of climate change. This asymmetry is widely acknowledged in international environmental law and underpins

the principle of common but differentiated responsibilities.

Mechanisms such as the “loss and damage” within the climate regime increasingly recognize the need to address climate impacts to which full adaptation is not possible. In this context, they provide a legal and political framework for international cooperation and assistance, including financial support, capacity building, and measures to facilitate adaptation and relocation of affected populations.

While these developments may support broader claims for international assistance in addressing the consequences of climate change, they do not in themselves determine questions of statehood or legal personality under international law.

10. Systemic Challenge: Climate Change and the Future of Statehood

Tuvalu is not an isolated case. Several small island developing states face similar risks from sea-level rise, including Kiribati, the Marshall Islands, the Maldives, and other low-lying coastal territories. The systemic nature of this phenomenon raises complex questions for international law regarding

the legal consequences of severe and potentially irreversible territorial changes.

These developments could stimulate further reflection on existing legal concepts, including sovereignty, jurisdiction, and liability. Sovereignty, traditionally associated with territorial authority, may need to be increasingly understood in functional terms that also take into account governance capacity and international legal personality, while remaining anchored in the established framework of statehood under international law. Jurisdiction, which has historically relied on territorial connections and nationality, may need to be adapted to address situations involving transnational populations and digitally mediated governance. Liability, both in terms of state responsibility for environmental damage and collective responsibility for climate adaptation, continues to evolve within existing principles of international environmental law.

The international legal order has demonstrated a significant capacity for adaptation in response to structural changes, including decolonization, the development of international organizations, and the emer-

gence of human rights law. Climate change represents a further challenge to this adaptive capacity, raising complex issues of legal continuity and institutional response, while reinforcing the need to preserve stability and predictability in international relations [18,19].

11. Theoretical Implications: From Territorial to Functional Sovereignty

The emergence of digital statehood invites a broader theoretical reflection on the nature of sovereignty and the state in international legal discourse. The Westphalian model, which has shaped international relations for centuries, conceives sovereignty as fundamentally tied to territory, understood as the spatial basis for the state's exclusive authority within defined borders and the correlative principle of non-interference by other states. Despite significant developments in international law, including the rise of international organizations, globalization, and human rights regimes, this territorial conception remains a central point of reference point in contemporary legal scholarship.

Climate change and the prospect of severe territorial loss in low-lying states pres-

ent a significant challenge to this framework. The question therefore arises as to whether the traditional link between territory and statehood should be understood as strictly constitutive, or whether international law allows for greater flexibility in situations of extreme environmental change. In doctrinal terms, this has led to a renewed debate on functional approaches to statehood, which emphasize the continued relevance of governance, the persistence of a political community, and international recognition, while acknowledging the structural importance of territory in the classical statehood criteria.

Different currents in international legal theory offer partial support for this functional perspective. Legal realist approaches emphasize the importance of effectiveness and recognition in the operation of international law, while constructivist interpretations highlight the socially mediated nature of state identity. At the same time, prevailing doctrine generally recognizes that the Montevideo criteria have never been applied in an entirely mechanical manner and that international practice has taken into account situations of par-

tial or temporary interruption of territorial control.

The 2025 ICJ Opinion contributes to this debate by confirming that international law does not provide for the automatic extinction of statehood following the loss of territory. However, the Court did not establish a new category of deterritorialized statehood, nor did it suggest that territory has ceased to be a relevant factor in determining statehood. Rather, its reasoning reinforces the importance of continuity and legal stability within the existing framework of international law.

Within this context, Tuvalu's experience may be seen as a case study of how states are experimenting with technological and institutional mechanisms to preserve administrative continuity and maintain ties with dispersed populations. These developments highlight the adaptability of international law in responding to new environmental and technological conditions, while remaining anchored to its founding principles. It remains to be seen whether these practices will contribute to a broader evolution of the concept of sovereignty, a question still open in contemporary international legal scholarship.

12. Future Scenarios and Conclusions

The case of Tuvalu illustrates the emerging challenges that climate change poses to existing categories of international law. It highlights how states, faced with existential environmental risks, are developing innovative legal and institutional responses aimed at preserving the continuity of governance, political identity, and international legal personality under increasingly complex conditions.

The long-term sustainability of these approaches will depend on a range of interconnected factors. These include the continued recognition of statehood by other states, the effectiveness of digital governance infrastructures, such as the Digital Ark, in maintaining administrative continuity, the ability of digital citizenship systems to support political participation and social cohesion among dispersed populations, the legal treatment of maritime entitlements under international law, and ongoing international cooperation.

The 2025 ICJ Opinion, along with agreements such as the 2023 Falepili Union, contribute to an evolving legal and political context in which questions of state continuity under climate

stress are increasingly being addressed. However, these developments do not define a fully articulated legal framework for deterritorialized statehood, and significant normative and institutional questions remain.

More broadly, the Tuvalu case invites reflection on the relationship between territory, identity, and legal personality in international law. It suggests that, while territoriality remains a foundational element of the state system, contemporary developments may require a more flexible understanding of how state functions are maintained in conditions of environmental transformation and technological change. Sovereignty, in this sense, continues to operate as a central organizing principle of international law, but is increasingly challenged by new forms of vulnerability and interdependence.

It is not yet certain whether international law will be able to develop sufficiently coherent responses to these challenges. What is clear, however, is that climate change is already putting pressure on traditional legal categories, requiring careful adaptation to preserve both the stability of the international legal order and its ability to respond to new forms of risk.

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