

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

التأمين البارامترى ضد المخاطر المناخية في الجزائر : الأسس النظرية وشروط الجدوى

KOKENE Camelia¹, Pr.TESSA Ahmed²

¹ Mouloud Mammeri University of Tizi-Ouzou, 15000, Laboratory for Development, Economics, Finance and Institutions (DEFI) (Algeria), camelia.kokene@ummtto.dz

² Mouloud Mammeri University of Tizi-Ouzou, 15000, Laboratory for Development, Economics, Finance and Institutions (DEFI),(Algeria), a.tessaahd@gmail.com

Received: 01/04/2026

Accepted: 09/06/2026

Published: 12/06/2026

Abstract:

Today, Algeria is facing a gradual intensification of climate hazards, including droughts, floods, and forest fires. The frequency and scale of these events have highlighted the limitations of the traditional insurance system, which struggles to cover increasingly complex and recurring risks. In this context, parametric insurance, based on predefined objective indices, represents a promising alternative. In this article, we will examine the theoretical basis for parametric insurance, provide an overview of its international development, and analyze the conditions for its implementation in Algeria across several dimensions: technical, institutional, regulatory, and sociocultural. The results show that, despite the existence of real opportunities, several obstacles remain to be overcome for its successful introduction. In conclusion, we will offer some recommendations.

Keywords: parametric insurance, climate risks, Algeria, basis risk, agriculture.

JEL Classification Codes: G22, Q54, Q14, D81.

ملخص:

تواجه الجزائر اليوم تفاقمًا تدريجيًا في المخاطر المناخية، لا سيما الجفاف والفيضانات وحرائق الغابات. وقد سلطت وتيرة هذه الأحداث وحجمها الضوء على محدودية نظام التأمين التقليدي، الذي يعاني من صعوبة في تغطية المخاطر المتزايدة التعقيد والمتكررة. في هذا السياق، يمثل التأمين البارامترى، القائم على مؤشرات موضوعية محددة مسبقًا، بديلًا واعدًا. في هذه المقالة، سندرس الأسس النظرية، ونقدم لمحة عامة عن تطوره على الصعيد الدولي، ونحلل شروط تنفيذه في الجزائر من خلال عدة أبعاد: تقنية، مؤسسية، تنظيمية، اجتماعية وثقافية. تظهر النتائج التي تم التوصل إليها أنه على الرغم من وجود فرص حقيقية، لا تزال هناك العديد من العقبات التي يجب تذليلها لإنجاح إدخاله. في الختام، سنقدم بعض التوصيات.

كلمات مفتاحية: التأمين البارامترى، المخاطر المناخية، الجزائر، المخاطر الأساسية، الزراعة.

تصنيفات JEL: G22, Q54, Q14, D81.

Introduction:

Climate change has always been part of the planet's history, formerly in the form of slow changes and infrequent extreme events. Since the industrial revolution, these climate changes have become more pronounced and their consequences are being felt : droughts, floods, heat waves, and storms, which were once exceptional events, are becoming increasingly recurrent (Masson-Delmotte & Zhai, 2022). A NASA report states that 2024 reached the highest average surface temperature ever recorded, an increase of 1.47°C since the mid-19th century (1850-1900). This warming is due to greenhouse gas emissions resulting from human activity. (Bardan, 2025)

In a context where weather anomalies have become much more frequent, traditional insurance has shown its limitations. Slow compensation, high costs, risks of information asymmetry. These shortcomings are well documented and weigh heavily on the populations most exposed to climate hazards (Tadesse et al., 2015, P2) . Parametric insurance, also known as index insurance, emerged precisely to correct these flaws. The principle is simple : compensation is paid when a predefined threshold, measured by an objective index, is reached. When this threshold is crossed, payment is automatic, without damage assessment or administrative delays (Atlas Magazine, 2022).

This product emerged in the 2000s and has gradually spread to the most vulnerable regions of the world. The results obtained in several countries are encouraging, both in sub-Saharan Africa and Asia. They confirm that this mechanism can be a credible response to climate risks, particularly in the agricultural sector (Leblois & Quirion, 2013, p.3 ; Weber, 2019, p.7) .

In Algeria, the situation is different. Climate hazards such as droughts, floods, and forest fires are on the rise. Parametric insurance is not well developed. The market remains largely dominated by traditional mechanisms, which are concentrated in the hands of public companies (CCR, 2023) . This delay can be explained by several factors, which this article will examine in depth: a weak insurance culture (Amellal & Tessa, 2024, p.265) , insufficient available climate data, and the absence of an appropriate regulatory framework. But this delay can also be seen as an opportunity. Introducing parametric insurance in Algeria has the potential to modernize a struggling insurance sector and provide a concrete response to growing climate vulnerability.

Throughout this paper, we will attempt to answer the following question: To what extent could parametric insurance improve climate risk management in Algeria?

In this article, we will attempt to:

- Assess the limitations of the Algerian insurance system in the face of growing climate risks
- Present the mechanisms of parametric insurance and the lessons learned from international experiences.
- Evaluate the conditions under which this type of system could be introduced in Algeria, identifying both opportunities and constraints.

To carry out this research, we will adopt a qualitative, exploratory, and prescriptive approach. We are not seeking to test hypotheses or produce statistics, but rather to understand

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

the conditions under which parametric insurance could work in Algeria, a context for which we currently have very little empirical data.

To achieve this, we have drawn on two complementary types of sources. On the one hand, international academic literature in the form of peer-reviewed articles on insurance economics, agricultural economics, and applied climatology published between 2000 and 2023 to provide theoretical rigor. On the other hand, we used more operational institutional literature, namely reports from the IPCC, the World Bank, the ARC, and the CCRIF, as well as Algerian sectoral and legislative documents from the CNA and the ONM to anchor our study in the reality on the ground.

Our analysis is carried out in two stages; initially, we will establish the conceptual framework for parametric insurance in order to draw lessons from international experiences. These partial conclusions will be compared with the Algerian case through the following four dimensions:

- Technical dimension
- Institutional dimension
- Regulatory dimension
- Sociocultural dimension.

The convergence between these different sources (documentary triangulation) lends weight to the conclusions.

As there is no clear and reliable data available for Algeria, the historical series available do not allow us to perform actuarial modeling. The results will therefore be an analytical diagnosis based on the context. In the future, we will attempt to consolidate the results obtained through quantitative studies.

1- Climate situation and insurance context in Algeria

Since the economic reforms undertaken by the public authorities (1990-2025), Algeria has experienced an increase in climatic hazards (droughts, floods, snow). These climatic phenomena have had a negative impact on infrastructure and agriculture, impoverishing the population. Faced with this multitude of hazards, insurance mechanisms are struggling to evolve; they are poorly adapted to the real and changing needs expressed.

1-1 Climate risks in Algeria

In Algeria, the geographical and climatic diversity of the territory exposes the country to several forms of meteorological hazards. These phenomena vary from region to region. Among the main climate risks observed are:

1-1-1 Rising temperatures: For several decades, Algeria has been facing a gradual increase in average temperatures. A recent study (2024) by the ONM shows that the national average temperature rose by 1.2°C between 1990 and 2023. However, the decade 2014-2023 saw particularly high temperatures, with an increase of 0.63°C compared to the annual climatological norm of 19.37°C. This steady increase observed over the last 10 years has resulted in more intense and longer heat waves.

The first biennial transparency report (BTRI) states that this warming will continue and intensify in the coming years. Experts predict a temperature increase of between 1 and 1.75°C for the period 2021-2040, depending on the season.

The most optimistic scenarios estimate that by the end of the 21st century, the increase could exceed 3.9°C, while the most pessimistic estimate an increase of between 7 and 9°C. These figures suggest an increasingly harsh climate, with repeated heat waves , longer dry periods and increasingly scarce water resources (Ministère de l'Environnement et de la Qualité de la Vie, 2024, p.38).

1-1-2 Droughts and rainfall deficits: we note that drought has a persistent negative impact on Algeria's climate. By examining the rainfall data collected, we see a decline in seasonal precipitation, particularly in the northwestern part of the country, where some weather stations have recorded an estimated 10-20% decline in precipitation since the end of the 20th century. This rainfall deficit jeopardizes the availability of water resources and weakens agriculture, making rural areas vulnerable. (Yerou et al., 2022, p.153)

We note that the Mediterranean region is severely affected by the decline in rainfall caused by drought. (Zellou et al., 2023, p.3543)

1-1-3 Wildfires and forest fires: Poor climatic conditions (rising temperatures) lead to consequences such as wildfires and forest fires. For example, 2021 was marked by fires that destroyed more than 100,000 hectares of vegetation and forests in several regions in the wilaya of Tizi-Ouzou.(Boulghobra & Merdas, 2022, p.60)

These major fires destroyed vegetation, weakened the soil, and endangered biodiversity. Human and material losses were recorded. We would say that the living conditions of the population have been completely affected.

1-1-4 Floods: Floods are a recurring phenomenon that threaten flood-prone areas, including villages and towns. One example is the rainfall episode of November 9-10, 2001, in Bab El Oued (Algiers), which caused massive mudslides and destroyed entire neighborhoods.(Menad et al., 2012, p.399-340) . We note that the inventory of hazards in Algeria is varied and multiple (drought, fires, floods, forest fires), affecting all regions of the country.

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

1-2 State of insurance in Algeria.

The Algerian insurance market is characterized by low penetration and a lack of diversification. According to the Swiss Re Institute, the sector's penetration rate in 2023 reached barely 0.5% of GDP, while the global average is 6% and the regional average (MENA) is around 3%. This situation can be explained by: the concentration of the market on a few traditional branches with an archaic insurance culture among the population (Malambo, 2023, p.89 ; Swiss Re Institute, 2024, p.49)

This situation is confirmed by the following indicators: the insurance sector's contribution to national GDP is still less than 1%, despite an increase in overall turnover (2024/2025). The market remains largely dominated by property and casualty insurance, accounting for more than 80% of premiums written. On the other hand, life and health insurance remains marginal. It should be noted that motor insurance still ranks first and accounts for nearly half of total premiums, followed by fire and miscellaneous risks insurance, which represents a significant share of the insurance portfolio at 48.5 billion DA, or approximately 34% of non-life insurance (Boulahlib, 2025; L'écho d'Algérie, 2026).

On the other hand, agricultural, home, and natural disaster insurance remain marginal, accounting for less than 10% of the overall market. These segments suffer from a lack of public incentives, low awareness among potential policyholders, and a limited range of products adapted to local climatic realities (Beddiar et al., 2025, P433) . We note that this unbalanced insurance portfolio structure illustrates the sector's dependence on a few traditional lines of business, which are slow to adapt to various risks. (Allam & Bougarne, 2021, p.2006-2007).

1-3 Limitations of traditional insurance mechanisms

The Algerian insurance system remains largely dominated by traditional mechanisms based on post-loss compensation, with a centralized administrative approach. This model, characterized by a low level of openness to innovation, is now proving unsuited to the diversification of economic needs (He & Faure, 2024, p.1) .

The limitation of information asymmetry in a traditional compensation system. We encounter two problems: adverse selection and moral hazard. These two mechanisms tend to make the insurance market inefficient and unsustainable for a certain category of risks (Mahul & Stutley, 2010 , p.4).

Another limitation to be raised is the slowness of compensation procedures (lack of reliable data and slow risk assessment). Individual claims assessment requires expertise and inspections, in accordance with administrative procedures that increase the insurance burden (Beddiar et al., 2025, p.433). This situation results in a particularly low satisfaction rate and a growing lack of interest among the population in taking out insurance policies, particularly in rural areas.

Furthermore, in Algeria, the insurance market, with its limited product diversification, mainly covers motor and industrial risks, while agricultural, climatic, and natural risks remain largely excluded from coverage (Amellal & Tessa, 2024, p.264-265) . This historical focus on

profitable lines of business has limited the sector's ability to fulfill its role as an economic stabilizer in the face of increasingly frequent natural disasters.

In the absence of computerization (lack of digitization and innovation), insurance companies do not have climate risk modeling tools or integrated information systems that enable data-based pricing. This dependence on traditional methods makes products costly, inflexible, and unsuited to the realities of smallholder farmers or vulnerable households (Mahul & Stutley, 2010, p.40).

2- Literature review and basic concepts

In this section, we will present the basic concepts related to parametric insurance, define how it works, explain how it differs from traditional insurance based on compensation for actual losses, and then provide a brief overview of its development around the world.

2-1 Definition and functioning of parametric insurance

Parametric insurance marks a significant evolution from traditional mechanisms. For three decades, insurers have been attempting to correct the shortcomings encountered by conventional compensation systems (Bros, 2023, p.1). Its principle is simple and structuring; the payment of compensation depends solely and exclusively on exceeding a predefined threshold measured on a quantifiable index. This means that the assessment and evaluation of actual losses are not up-to-date and objective. (Hao et al., 2025, p.3093).

How does it work in practice?

Parametric insurance is based on measurable and non-manipulable variables. The amount of compensation is set in advance; payment is triggered automatically as soon as the threshold is reached on the exogenous variable, without having to prove the damage (Clement et al., 2018, p.846) .

The relevance of this process is based on the following four requirements:

- The first requirement concerns the correlation between the index and the actual loss incurred in order to limit what is known as "basis risk," which represents the risk of payment without loss, or loss without payment. Clement et al. (2018) show that basis risk depends on the quality of statistical modeling, spatial granularity², and the choice of climate variables, as all of these factors influence the effectiveness of the index (Clement et al., 2018, p.847).
- The second requirement is that this insurance mechanism must be based on reliable and independent data from satellites, weather sensors, or connected sensors. However, even with reliable data, effective protection for policyholders cannot be guaranteed, so it is recommended that indices be evaluated using "relative benefit" (Kenduiywo et al., 2021, p.10).
- The third requirement is that the spatial dimension is also critical; geographically diversifying stations and integrating multi-source data significantly reduces the gap

² Level of geographic accuracy with which data or variables are measured and used

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

between the triggered payment and the extent of damage, as the distance between the station and the insured area can cause errors and inconsistencies (Gao et al., 2026, p.4).

- Finally, technological developments are attempting, with varying degrees of success, to improve the reliability of indices. The use of Bayesian algorithms³ and machine learning models makes it possible to calibrate thresholds, anticipate contingencies, and reduce payment uncertainty. (Pang & Choi, 2022, p.1).

2-2 Distinction between parametric insurance and traditional insurance.

Parametric insurance differs from traditional insurance in how it operates and how claims are settled. To better understand these differences, we will compare the two models. The following table outlines the main differences between them.

Table (1): Key Differences Between Parametric Insurance and Traditional Insurance

Analytical dimension	Indemnity/traditional insurance	Parametric insurance
Contractual variable	Realized losses, observed ex post	Exogenous observable index, defined ex ante
Link between payment and damage	Direct - causal	Indirect – probabilistic Basis Risk
Nature of the information used	Private information revealed by the expert assessment	Public information independent of the parties
Information asymmetry	Moral hazard and adverse selection	Very low asymmetry (observable indicators)
Temporality of settlement	Deferred payment	Rapid, near-immediate payment
Specific risks	Risks of expert error	Basis risk
Cost structure	High costs (expertise, management)	Reduced costs (no expertise)
Predictability of payment	Variable, uncertain	Predictable
Suitable for	Complex individual risks	Climate/natural risks

Source : Prepared by us based on (Avanzi et al., 2026; Barnett et al., 2008; Bros, 2023; Diop, 2019)

This table summarizes the structural differences between conventional indemnity insurance and parametric insurance. Indemnity insurance is based on the assessment of losses incurred, while parametric insurance is based on predefined objective parameters. This

³ A statistical method derived from Bayes' theorem, it allows an estimate or probability to be updated based on recent observed information.

fundamental difference gives rise to other differences between indemnity and parametric insurance.

2-3 The state of parametric insurance: The cases of sub-Saharan Africa and India

Parametric insurance as an innovative approach to risk transfer has attracted the interest of researchers, with the potential of this mechanism having been revealed since the 2000s. Researchers emphasize its effectiveness and speed in bypassing the loss adjustment stage (Cummins & Mahul, 2008, p.100).

To illustrate its adoption around the world, it is interesting to mention certain initiatives such as Africa Risk Capacity (ARC), which was launched in 2012 by the African Union. This initiative is one of the most successful; it protects farmers against droughts in sub-Saharan Africa through rainfall indices. In 2014, during the drought that affected West African countries, ARC paid out \$26 million to Senegal, Mauritania, and Niger in just a few weeks, a feat that would have been difficult to achieve with a traditional compensation system (African Risk Capacity Group, 2015).

In the Caribbean, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) has been operating since 2007, offering coverage against hurricanes and earthquakes. Between 2007 and 2021, CCRIF made more than 50 payments totaling approximately \$245 million (World Bank, 2022). A more recent source in the trade press indicates that the number of payments reached 63, totaling more than \$266 million (Reinsurance News, 2023).

In India, the Pradhan Mantri Fasal Bima Yojana (PMFBY) program launched in 2016 illustrates the potential of this mechanism, which has reached more than 55 million insurance claims registered since its launch and several million farmers compensated each year. However, challenges in terms of underlying risk and claims settlement delays have highlighted the importance of designing robust and reliable indices (Bhadoriya et al., 2022, p.594; IBEF, 2025).

In Kenya, Cornell University and the Livestock Research Institute developed the Index-Based Livestock Insurance (IBLI) project. This project initiative has shown that index-based insurance using satellite vegetation indices is a viable option for protecting pastoralists against drought (Jensen et al., 2016, p.1).

Based on these experiences, we can conclude that adopting this mechanism can significantly improve resilience to climate risks. However, its success depends on several factors.

3- Conditions for the viability of parametric insurance in Algeria

In order to introduce a mechanism such as parametric insurance, the existence of climate risks is not sufficient. Indeed, international experience shows us that certain technical and institutional requirements must be met. Research emphasizes that these mechanisms only work when the environment is capable of producing reliable information, raising awareness of risk culture, and mobilizing sufficient financial capacity. In other words, this innovation alone is

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

insufficient; it must be accompanied by a comprehensive risk management framework (Cummins & Mahul, 2008, p.89).

3-1 Reliable climate data

The availability of reliable climate data is a prerequisite for the introduction of index-based insurance into a country's economy. This is because parametric models rely entirely on measurable exogenous indicators. If the indicators are unreliable, the entire system loses credibility (Skees, 2008, p.9). Based on this data, we could design a robust index with well-calibrated trigger thresholds and a statistically valid correlation between the index and the actual loss. Indeed, the reduction in basis risk depends directly on the density of weather stations, the quality of historical series, and the spatial accuracy of the data (Hill et al., 2011, p.15).

3-2 Need to modernize the regulatory framework

Beyond having reliable data, this mechanism cannot be integrated without the existence of an appropriate legal framework. Indeed, Law No. 06-04 of February 20, 2006, which governs insurance activities, as well as the resulting ordinances and decrees, contain no provisions relating to index-linked or parametric products. This does not prohibit such products, but this uncertainty discourages insurers from investing in their development.

3-3 Insurance culture and stakeholder awareness

When users understand the logic behind the product or mechanism, they are better able to appreciate its benefits and usefulness (speed of payment, financial predictability, reduction of uncertainty). Without an educational approach, this mechanism may seem complex or unrepresentative of the reality on the ground. It is important to emphasize that the success of index-based insurance depends on a gradual process of institutional and social learning. Understanding of the mechanism by economic stakeholders is also a significant condition for its success. This mechanism requires special attention. Unlike traditional insurance, parametric insurance is not based on a visible assessment of damage and may seem abstract. Its adoption depends heavily on training, communication, and support for policyholders (Barnett et al., 2008, p.1779).

International experience shows that this challenge is not insurmountable. For example, in India, financial education programs have been set up to explain how insurance works to farmers in simple terms, accompanied by practical demonstrations to facilitate understanding. This initiative has yielded satisfactory results, with a significant increase in the take-up rate (Lampe & Würtenberger, 2019, p.2-3)

3-4 International partnerships and financing

Major climate risks often exceed the absorption capacity of a national market. For this reason, the ability to mobilize technical and financial partners is an important pillar for the integration of index-based insurance into an emerging market. To this end, many countries have developed their programs in collaboration with international organizations such as the World

Bank, which can provide expertise in risk engineering and financial structuring (Cummins & Mahul, 2008 , p.92).

Major international reinsurers such as Swiss Re play an important role; they enable part of the risk to be transferred to international markets and provide innovative and advanced disaster modeling tools. Thanks to this type of cooperation, it becomes possible to cover extreme risks that cannot be borne by a single country. These partnerships prove their indispensability, particularly in the initial phases, as they combine international expertise with national ownership. We would say that the objective is not to mimic an exogenous (foreign) model, but to adapt it to local realities (Clarke & Dercon, 2016 , p.91-92).

4- Opportunities and challenges of introducing parametric insurance in Algeria

Parametric insurance has significant potential for climate risk management in Algeria. However, its implementation faces several structural, technical, and institutional obstacles. In the following paragraphs, we will examine these different dimensions using a critical approach.

4-1 Opportunities for the Algerian insurance market

In this section, we will examine the concrete and multidimensional positive aspects of introducing this mechanism in Algeria.

On the demand side, parametric insurance can reach populations that are currently excluded from the formal system. Small farmers in the highlands, herders in the steppes, and SMEs in peri-urban areas exposed to flooding are often left behind. Traditional insurance is too expensive, too complicated, or too slow for them. With affordable premiums and rapid compensation, parametric insurance could offer them a gateway to the formal market (Clarke & Grenham, 2013, p.91).

On the supply side, Algerian insurance companies can benefit. They could reduce the costs associated with claims assessment and management, gain easier access to international reinsurance, and diversify their portfolios into high-potential segments. Together, these factors represent concrete economic incentives for the development of these products (Cummins & Mahul, 2008, p.106).

From a macroeconomic perspective, parametric insurance can contribute significantly to reducing the burden of public aid that the state must pay out after a disaster and to strengthening the financial resilience of the economy as a whole (Mahul & Stutley, 2010, p.4 ; Pleterski, 2025, p.1)

4-2 Obstacles to overcome

There is no denying that parametric insurance has real potential, but we must remain realistic. The obstacles are also real, and underestimating them would be a misdiagnosis.

The main challenge inherent in this mechanism remains the underlying risk. The Algerian context in particular is characterized by its spatial climate variability. Meteorological variables vary significantly from one plot to another, sometimes within very short periods of time, particularly in the transitional regions between the Tell and the high plateaus. Under such conditions, there may be a discrepancy between the index constructed from data from a distant weather station and the actual losses incurred (Jensen et al., 2016, p.8)

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

The availability and quality of historical climate data is a major technical constraint. To calibrate reliable and economically viable indices, long, consistent, and representative climate time series are needed

This constraint is accentuated by the structure of the meteorological observation network. The National Meteorological Office (ONM) operates a network of 80 surface stations spread across the country. The density of this network is insufficient to accurately capture climate variations. The spatial resolution of the indices is a determining factor, and the reliability of parametric products depends directly on the quality and detail of the data (ONM, 2022).

The lack of coordination between public actors is also a constraint that should not be overlooked. The ministries concerned (Finance, Agriculture, Environment) often work separately, making it difficult to implement clear policies to support this type of insurance. Added to this is a lack of technical and actuarial capacity, with insurers lacking specialists capable of modeling climate risks, designing products based on reliable indices, and processing meteorological data correctly. These two factors complicate the prospect of introducing parametric products (Mahul & Stutley, 2010, p.45) .

Sociocultural factors are a major obstacle to the adoption of insurance in Algeria. Religion is a particularly decisive factor, with some products being perceived as incompatible with Islamic principles. The cost of insurance is also a significant barrier, especially for low-income households, while a lack of trust in insurance companies limits consumers' willingness to take out policies. These factors combined explain why the uptake of insurance products remains low and uneven across the country (Mahdjour & Benhabib, 2017, p.6)

Conclusion

Our analysis shows that parametric insurance is a serious and relevant option that would fill the gaps in the Algerian insurance system, particularly in the face of intensifying climate risks. Its theoretical advantages (speed of payments, elimination of information asymmetry, reduction of transaction costs) respond precisely to the dysfunctions identified in traditional indemnity insurance. Converging international experiences, from the ARC in Africa to the Indian PMFBY and the Caribbean CCRIF, all confirm the operational maturity of this mechanism.

However, the introduction of this product in Algeria should not be taken lightly. It must be accompanied by concrete solutions to the multidimensional constraints that hinder it, namely: improvement of climate data infrastructure, modernization of the regulatory framework, development of an insurance culture, and mobilization of international partnerships. The basic risk, in particular, requires rigorous design of robust and reliable indices.

This study has limitations inherent to its qualitative methodology: the lack of primary empirical data and local econometric studies makes it impossible to quantify the market potential or statistically validate the correlation between the available indices and the losses observed. Future research should fill these gaps, in particular through surveys of agricultural stakeholders, actuarial analyses, and controlled field experiments.

Ultimately, parametric insurance alone cannot provide a sufficient response to Algeria's climate vulnerability. It must be part of a comprehensive climate risk management strategy that includes financial instruments, adaptation policies, infrastructure investments, and institutional strengthening. Only then can it reach its full potential.

Based on the points discussed in this article, we offer the following recommendations:

- Before rolling out such a mechanism on a large scale, it is recommended to first develop targeted pilot projects, such as flood coverage in suburban areas. These projects could be carried out in partnership with international institutions that already have solid experience in this field. These would allow for testing the indices and adjusting them as needed before deploying them on a large scale.
- It is also important to clarify a legal framework to regulate parametric products and address current regulatory ambiguities. Indeed, legislative reform is necessary to establish adequate supervisory mechanisms.
- At the same time, it is essential to establish training and educational programs to raise awareness among policyholders. These programs must include simple modules and qualified instructors to explain to policyholders how parametric insurance works and the concept of Basic Risk.
- Finally, it is essential to invest in the ONM's climate measurement network and in data analysis. This will ensure the reliability and robustness of the indices, and consequently the success of this mechanism.

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

Bibliography List:

- African Risk Capacity Group. (2015). *Sovereign disaster risk solutions*. <https://www.arc.int/news/risk-pool-i-20142015>, accessed on February 22, 2026.
- Allam, A., & Bougarne, N. (2021). Tax Concession in Life Insurance in Algeria. *Journal of Economics, Finance and Management Studies*, 04(10), pp. 2003-2011.
- Amellal, S., & Tessa, A. (2024). Les réformes économiques algériennes: Quel impact sur le secteur des assurances? *Revue Alafak des Études Économiques*, 8(2), pp. 256-269.
- Atlas Magazine. (2022, janvier 25). *Comment fonctionne l'assurance paramétrique?* Atlas Magazine, <https://www.atlas-mag.net/article/comment-fonctionne-l-assurance-parametrique>, accessed on February 24, 2026.
- Avanzi, B., Falden, D. K., & Steffensen, M. (2026). *When Indemnity Insurance Fails: Parametric Coverage under Binding Budget and Risk Constraints* [Preprint]. <https://doi.org/10.48550/arXiv.2512.21973>, accessed on January 29, 2026.
- Bardan, R. (2025, janvier 10). *Temperatures Rising: NASA Confirms 2024 Warmest Year on Record*. NASA. <https://www.nasa.gov/news-release/temperatures-rising-nasa-confirms-2024-warmest-year-on-record/>, accessed on February 24, 2026.
- Barnett, B. J., Barrett, C. B., & Skees, J. R. (2008). Poverty Traps and Index-Based Risk Transfer Products. *World Development*, 36(10), pp. 1766-1785.
- Beddiar, R., Khettabet, A., & Elamine Cheriet, H. (2025). The Reality of Agricultural Insurance Implementation in Algeria and Its Role in Agricultural Development. *Science, Education and Innovations in the Context of Modern Problems*, 8(5), pp. 431-441.
- Bhadoriya, S., Gupta, S., Mishra, Y. D., & Rathour, S. S. (2022). Attitude of Farmers Towards Pradhan Mantri Fasal Bima Yojana. *Biological Forum – An International Journal*, 14(2), pp. 594-599.
- Boulahlib, S. (2025). *Marché algérien des assurances au 30 septembre 2025* | Atlas Magazine. <https://www.atlas-mag.net/fr/articles/marche-algerien-des-assurances-au-30-septembre-2025>, accessed on February 25, 2026.
- Boulghobra, N., & Merdas, S. (2022). Evaluation et cartographie des feux de forêts généralisés d'août 2021 à Bejaia et Tizi Ouzou: Approche géomatique. *Journal Algérien des Régions Arides*, 14(2), pp. 60-67.
- Bros, S. (2023). L'assurance paramétrique en assurance de dommages. *Bulletin Juridique des Assurances (BJDA)*, (Dossier n°6), pp. 1-12.
- Caisse Centrale de Réassurance (CCR). (2023). *État du marché des assurances en Algérie: Contraintes et opportunités liées aux aléas climatiques* (Rapport d'information Bulletin N°2). Caisse Centrale de Réassurance (CCR). https://ccr.dz/images/bulletin/ALGEREASS_2023_N2.pdf, accessed on February 12, 2026.

- Clarke, D. J., & Dercon, S. (2016). *Dull Disasters? How Planning Ahead Will Make a Difference*. Oxford University press.
- Clarke, D. J., & Grenham, D. (2013). Microinsurance and natural disasters: Challenges and options. *Environmental Science & Policy*, 27, pp. 89-98.
- Clement, K. Y., Wouter Botzen, W. J., Brouwer, R., & Aerts, J. C. J. H. (2018). A global review of the impact of basis risk on the functioning of and demand for index insurance. *International Journal of Disaster Risk Reduction*, 28, pp. 845-853.
- Cummins, J. D., & Mahul, O. (2008). *Catastrophe Risk Financing in Developing Countries: Principles for Public Intervention* (1st ed). The World Bank.
- Diop, A. N. (2019). Agricultural Risk Pricing in Senegal, *Journal of Mathematical Finance*, 09(02), pp. 182-201.
- Gao, H., Yang, S., & Liu, X. (2026). Managing basis risks in weather parametric insurance: A quantitative study of diversification and key influencing factors, *The Geneva Papers on Risk and Insurance - Issues and Practice*, 51(1), pp. 84-111.
- Hao, M., Qian, K., & Chau, S. C.-K. (2025). Privacy-preserving Blockchain-enabled Parametric Insurance via Remote Sensing and IoT. *IEEE Transactions on Services Computing*, 18(5), pp. 3093-3105.
- He, Q., & Faure, M. (2024). Strengthening Resilience and Sustainability for Post-Disaster Recovery: A Comparative Law and Economics Analysis on Smart Mixes Between Mechanisms. *Sustainability*, 16(21), article 9534.
- Hill, R. V., Hoddinott, J., & Kumar, N. (2011). *Adoption of Weather Index Insurance: Learning from Willingness to Pay among a Panel of Households in Rural Ethiopia* (Working Paper ESSP II Working Paper No. 27). International Food Policy Research Institute (IFPRI).
- IBEF. (2025). *Pradhan Mantri Fasal Bima Yojana—PMFBY Scheme* | IBEF. India Brand Equity Foundation (IBEF). <https://www.ibef.org/government-schemes/fasal-bima-yojana>, accessed on february 27, 2026.
- Jensen, N. D., Barrett, C. B., & Mude, A. G. (2016). Index Insurance Quality and Basis Risk: Evidence from Northern Kenya, *American Journal of Agricultural Economics*, 98(5), pp. 1450-1469.
- Kenduiywo, B. K., Carter, M. R., Ghosh, A., & Hijmans, R. J. (2021). Evaluating the quality of remote sensing products for agricultural index insurance. *PLOS ONE*, 16(10), article e0258215.
- Lampe, I., & Würtenberger, D. (2019). *Loss aversion and the demand for index insurance* (Working Paper Working Papers on Finance No. 2019/07). Swiss Institute of Banking and Finance (S/BF – HSG), University of St. Gallen.
- Leblois, Antoine., & Quirion, P. (2013). Agricultural insurances based on meteorological indices: Realizations, methods and research challenges. *Meteorological Applications*, 20(1), pp. 1-9.

Parametric Insurance Against Climate Risks in Algeria: Theoretical foundations and conditions for viability

- L'écho d'Algérie. (2026, mars 2). *Assurances: Le marché national en hausse de 7,3% à fin septembre 2025: 142,9 milliards de dinars de production, tirés par les assurances de dommages et le Takaful* | L'Echo d'Algérie. <https://lechodalgerie.dz/assurances-le-marche-national-en-hausse-de-73-a-fin-septembre-2025-1429-milliards-de-dinars-de-production-tires-par-les-assurances-de-dommages-et-le-takaful/>, accessed on March 2, 2026.
- Mahdjour, M., & Benhabib, A. (2017). A Study of the Socio-Cultural Factors That Influence Algerian Consumer Attitude towards Insurance Products. *Journal of Accounting & Marketing*, 06(02), article 1000242.
- Mahul, O., & Stutley, C. J. (2010). *Government Support to Agricultural Insurance: Challenges and Options for Developing Countries* (1st ed). The World Bank.
- Malambo, M. (2023). Insurance Penetration in Africa—A Systematic Literature Review. *Journal of Financial Risk Management*, 12(01), pp. 87-94.
- Masson-Delmotte, V., & Zhai, P. (2022, août 18). *Tendances régionales des phénomènes extrêmes dans le rapport 2021 du GIEC*. Organisation Météorologique Mondiale. <https://public.wmo.int/fr/media/magazine-article/tendances-regionales-des-phenomenes-extremes-dans-le-rapport-2021-du-giec>, accessed on February 24, 2026.
- Menad, W., Douvinet, J., Beltrando, G., & Arnaud-Fassetta, G. (2012). Evaluer l'influence de l'urbanisation face à un aléa météorologique remarquable: Les inondations des 9-10 novembre 2001 à Bab-el-Oued (Alger, Algérie). *Géomorphologie: Relief, Processus, Environnement.*, 18(3), pp. 337-350.
- Ministère de l'Environnement et de la Qualité de la Vie. (2024). *Premier rapport biennal de transparence (BTR1): Soumission au titre de la Convention-Cadre des Nations Unies sur les changements climatiques (CCNUCC) et de l'Accord de Paris*. Gouvernement de la République Algérienne Démocratique et Populaire. <https://unfccc.int/sites/default/files/resource/BTR1-Alge%C3%81rie-DZ.pdf>, accessed on February 22, 2026.
- ONM. (2022). *À propos de MétéoAlgérie – ONM BLOG*. Office National De La Météorologie. <https://onm-blog.meteo.dz/a-propos-de/>, accessed on February 23, 2026.
- Pang, S., & Choi, C. (2022). *Data-driven Parametric Insurance Framework Using Bayesian Neural Networks*. <https://doi.org/10.48550/arXiv.2209.05307>, accessed on January 31, 2026.
- Pleterski, N. (2025). Parametric Insurance for Sustainable Disaster Risk Finance: Legal, Data, and Governance Pathways in Slovenia and Croatia. *Sustainability*, 17(21), article 9643.
- Reinsurance News. (2023, décembre 27). *CCRIF SPC pays out \$4.9m for 2023 Atlantic storms—Reinsurance News*. ReinsuranceNews. <https://www.reinsurancene.ws/ccrif-spc-pays-out-4-9m-for-2023-atlantic-storms/>, accessed on February 22, 2026.

- Skees, J. R. (2008). Innovations in Index Insurance for the Poor in Lower Income Countries. *Agricultural and Resource Economics Review*, 37(1), pp. 1-15.
- Swiss Re Institute. (2024). *World insurance: Strengthening global resilience with a new lease of life* (Sigma report No. 3/2024). <https://www.swissre.com/dam/jcr:2d26776f-20e4-4228-8ee0-97cec2ddb3c4/sri-sigma3-2024-world-insurance.pdf>, accessed on February 22, 2026.
- Tadesse, M. A., Shiferaw, B. A., & Erenstein, O. (2015). Weather index insurance for managing drought risk in smallholder agriculture: Lessons and policy implications for sub-Saharan Africa. *Agricultural and Food Economics*, 3(1), article 26.
- Weber, E. J. (2019). *Weather Index Insurance in Sub-Saharan Africa* [Discussion Paper]. University of Western Australia, Department of Economics.
- World Bank. (2022). *Risk insurance builds climate and disaster resilience in Central America and the Caribbean* [Text/HTML]. World Bank. <https://www.worldbank.org/en/results/2022/04/21/risk-insurance-builds-climate-and-disaster-resilience-in-central-america-and-the-caribbean>, accessed on February 22, 2026.
- Yerou, H., Zoghalmi, M., Meskini, Z., Homrani, A., & Yerou, W. (2022). Epigenetic effects of climate on dairy parameters of Prim'Holstein breed in west coast Algeria. *Genetics & Biodiversity Journal*, 6(2), pp. 152-160.
- Zellou, B., El Moçayd, N., & Bergou, E. H. (2023). Review article: Towards improved drought prediction in the Mediterranean region – modeling approaches and future directions. *Natural Hazards and Earth System Sciences*, 23(11), pp. 3543-3583.