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# CIRCULAR ECONOMY RISK MANAGEMENT THROUGH THE LENS OF INSURTECH SOLUTIONS

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**Abstract:** This article examines barriers to the insurability of circular economy risks and identifies ways to overcome them through insurtech solutions. By analysing trends in the global insurtech investment market and the scale of the circular economy market, the study establishes a direct substantive link between proven technological tools in insurance—blockchain-based verification, IoT monitoring, and parametric insurance—and key barriers to insuring circular business models, including information asymmetry, moral hazard, limited affordability of insurance, and regulatory uncertainty. The regulatory approaches of the European Union and the United States to stimulating demand for insurance coverage of circular-economy risks are compared. Practical recommendations are proposed for adapting international experience to the Republic of Uzbekistan, taking into account the existing legal and regulatory framework. The article concludes that the development of insurance for the circular economy should be based on transferring mature insurtech solutions to a new applied context rather than creating a new insurance segment from scratch.

**Keywords:** circular economy; insurtech; risk insurability; risk management; digitalisation of insurance; blockchain; parametric insurance; insurance market of Uzbekistan

## INTRODUCTION

The relevance of the research topic stems from the convergence of two persistent global trends—the digital transformation of the insurance sector and the transition of national economies towards circularity. On the one hand, insurtech technologies are radically changing approaches to underwriting, risk assessment, and insurance portfolio management, offering tools capable of materially improving the accuracy and accessibility of insurance. On the other hand, the circular economy—a model aimed at maximising product life cycles and promoting the reuse and recycling of resources—creates a fundamentally new class of risks for which traditional insurance products are often inapplicable or insufficient.

For the Republic of Uzbekistan, this issue is particularly important in the context of the consistent state policy aimed at reforming the insurance market. Resolution of the President of the Republic of Uzbekistan No. PP-4412 of 2 August 2019, "On Measures to Reform and Ensure the Accelerated Development of the Insurance Market of the Republic of Uzbekistan," established the institutional foundations for modernising the sector [1]. Continuing this policy direction, Resolution of the President of the Republic of Uzbekistan No. PP-5265 of 23 October 2021, "On Additional Measures to Digitalise the Insurance Market and Develop the Life Insurance Sector," set out specific measures for introducing digital technologies into insurance activities [2]. At the same time, neither of these legal acts currently contains special provisions governing the insurance of risks associated with circular business models. This makes the present study significant not only theoretically but also practically, as a basis for subsequent proposals to improve national regulation in this area.

The state of research on the topic is characterised by significant asymmetry. The digitalisation of the insurance market and the development of insurtech solutions have been widely

examined in international research (Braun, Eling, Cortis, among others), as well as in Russian (Tsyganov, Bryzgalov, Spletukhov) and Uzbek (Quldoshev, Bakhriev, To‘g‘izova) academic literature. By contrast, the insurance of circular economy risks remains the subject of only a limited number of international publications and has scarcely been examined in the context of Central Asia. This creates a research gap that the present study seeks to address.

The object of the research is the system of economic relations arising in the process of managing circular economy risks. The subject of the research is the set of insurtech tools and institutional mechanisms that enable these risks to become insurable.

The purpose of the study is to identify barriers to the insurability of circular economy risks and to substantiate ways of overcoming them through the use of insurtech solutions, taking into account international experience and the prospects for adapting it to the conditions of Uzbekistan.

Achieving this purpose requires the following tasks: first, to analyse the dynamics and structure of the global insurtech investment market as a source of technological tools for risk management; second, to assess the scale and regional structure of the circular economy market as an emerging object of insurance; third, to systematise barriers to the insurability of circular economy risks and compare them with already proven insurtech solutions; and fourth, to analyse international regulatory experience in stimulating demand for insurance against circular-economy risks and formulate recommendations for adapting this experience to the legal and regulatory framework of the Republic of Uzbekistan, including the current provisions of Resolutions No. PP-4412 and No. PP-5265 [1, 2].

The methodological framework of the study comprises comparative and structural analysis, systematisation and generalisation of secondary statistical data from international organisations and specialised consulting agencies, as well as the method of analogy, applied when comparing barriers to the insurability of circular risks with challenges that have already been addressed in other segments of the insurtech market.

The scientific novelty of the study lies in substantiating a direct substantive relationship between mature insurtech tools that have been tested in traditional insurance segments and barriers to the insurability of the circular economy, which have not previously been examined in conjunction with one another in the national academic literature.

The practical significance of the study lies in the potential use of its recommendations in developing proposals to improve the regulatory environment of Uzbekistan’s insurance market by creating conditions for the development of insurance for circular business models.

**RESEARCH METHODOLOGY**

The study is based on an integrated combination of general scientific and specialised research methods applied consistently at three levels of analysis: global, regional, and national. Analysis and synthesis were used to examine individual barriers to the insurability of circular economy risks and subsequently integrate them into a unified system in relation to the insurtech toolkit; the method of analogy was used to transfer proven technological solutions from mature segments of the insurance market to the emerging segment of insurance for circular business models; comparative analysis was applied to compare the regulatory approaches of the European Union and the United States to stimulating demand for insurance against circular risks and to assess regional heterogeneity in the circular economy market; statistical analysis of time series was used to evaluate the pace and sustainability of growth in insurtech financing and the circular economy market over time; classification was used to systematise insurability barriers by risk category and to typologise regulatory mechanisms; and scientific abstraction and generalisation were used to formulate conclusions on the structure of the relationship between technological and institutional

factors and to develop practical recommendations for the regulatory environment of the Republic of Uzbekistan.

## LITERATURE REVIEW

The academic literature relevant to this study lies at the intersection of two relatively independent research streams: studies of the digital transformation of the insurance market (insurtech) and studies of the circular economy as an object of risk management. The first stream is represented by a substantial body of international, Russian, and Uzbek publications covering the technological architecture of insurtech solutions, the dynamics of venture financing, and the institutional response of traditional insurers to digital challenges. The second stream, by contrast, is represented by a much narrower body of research, predominantly international, and only in isolated cases addresses the insurance dimension of circular business models. The key sources used in the present study are systematised below, together with their contribution to the development of the topic.

| No. | Author / source | Year | Main contribution to the topic | Relevance to the present study |
|---|---|---|---|---|
| 1 | Braun A., Häusle N. | 2025 | Systematisation of digital insurance business models and the role of insurtech in transforming the insurance value chain | Theoretical foundation for Section 1 of the analytical part |
| 2 | Braun A., Schreiber F. | 2017 | Classification of insurtech start-up business models and assessment of their disruptive potential | Methodological basis for classifying insurtech tools |
| 3 | Eling M., Lehmann M. | 2018 | Analysis of the impact of digitalisation on risk insurability and the structure of the insurance value chain | Rationale for the relationship between digitalisation and barriers to insurability |
| 4 | Cortis D., Debattista J., Debono J., Farrell M. | 2019 | Review of the insurtech technology toolkit and its application in underwriting | Systematisation of technologies applicable to circular economy risks |
| 5 | Scientia et Societas | 2025 | Insurance as a catalyst for implementing ESG principles and the circular economy; systematisation of barriers to the insurability of circular risks | Key source for Section 3 of the analytical part |
| 6 | Journal of Cleaner Production | 2021 | Empirical assessment of the risks of transition to circular practices from a supply-chain perspective | Empirical confirmation of barriers to insurability |
| 7 | Tsyganov A.A., Bryzgalov D.V. | 2020 | Analysis of the tasks and challenges of digitalising the Russian insurance market | Comparative context for analysing insurtech in the post-Soviet space |

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|---|---|---|---|---|
| 8 | Bryzgalov D.V., Gryzenkova Yu.V., Tsyganov A.A. | 2020 | Systematisation of trends and drivers of digitalisation in insurance | Supplement to the theoretical basis of Section 1 |
| 9 | Spletukhov Yu.A. | 2020 | Directions for expanding the use of digital technologies in insurance | Refinement of the technological typology of insurtech solutions |
| 10 | Loskutova M.A. | 2020 | Development of the insurance market under digitalisation and consolidation | Context of the institutional transformation of the insurance market |
| 11 | Quldoshev Q. | 2022 | Analysis of the development directions and challenges of Uzbekistan's insurance market | National context for formulating recommendations |
| 12 | Bakhriev D.R. | 2023 | Directions for the development of Uzbekistan's insurance market | Supplement to the national context of the study |
| 13 | To'g'izova M.S. | 2023 | Opportunities for developing Uzbekistan's insurance market based on the experience of India | International comparative context for country-level analysis |
| 14 | Muminova A.U. | 2026 | Improvement of reinsurance activities under the digital transformation of the sector | Updated national context of digitalisation |
| 15 | OECD | 2017 | Catalogue of insurtech technologies; analysis of financing and regulatory responses to insurance innovation | Primary source of statistical data for Section 1 of the analytical part |
| 16 | OECD | 2025–2026 | Global insurance-market trends and current statistical data | Update and verification of the statistical base |
| 17 | Swiss Re Institute | 2023–2025 | Analysis of circular economy insurance risks, including fire safety at recycling facilities | Key data source for the table of insurability barriers |
| 18 | EIOPA | 2023 | Report on the digitalisation of the European insurance sector | EU regulatory context |
| 19 | National Agency for Prospective Projects of the Republic of Uzbekistan | 2025 | Statistics on the state of Uzbekistan's insurance market | Empirical basis for the national context |
| 20 | Ahbor-Reyting | 2024 | Analysis of Uzbekistan's insurance services market | Additional statistical base |
| 21 | Zion Market | 2025–2026 | Estimates of the scale and | Basis for Tables 1–2 of |

| | | | | |
|---|---|---|---|---|
| | Research, DataM Intelligence, Global Market Insights, MarketIntelo, etc. | | dynamics of the circular economy market under different methodological approaches | the analytical part |

The review indicates that, despite the substantial body of knowledge accumulated within each of these two research streams separately, work at their intersection—that is, the study of insurtech tools specifically as a means of overcoming barriers to the insurability of the circular economy—remains fragmented. It is represented mainly by individual practice-oriented publications from consulting and industry organisations (Swiss Re, Scientia et Societas), rather than by systematised academic knowledge. The gap is even more pronounced in the national context of Uzbekistan and Central Asia as a whole, where the insurance of circular risks has not yet become the subject of independent academic analysis. This circumstance defines the research niche of the present study and substantiates the need for the synthesis of the two streams undertaken in the analytical section.

**ANALYSIS AND RESULTS**

The emergence of insurtech as a distinct area of financial technology dates to the early 2010s and coincided with a broader increase in venture capital interest in the digitalisation of the financial sector. According to OECD data compiled from aggregated CB Insights statistics, global funding for insurtech start-ups increased from USD 0.14 billion in 2011 to USD 2.67 billion in 2015—almost a nineteen-fold increase over five years.

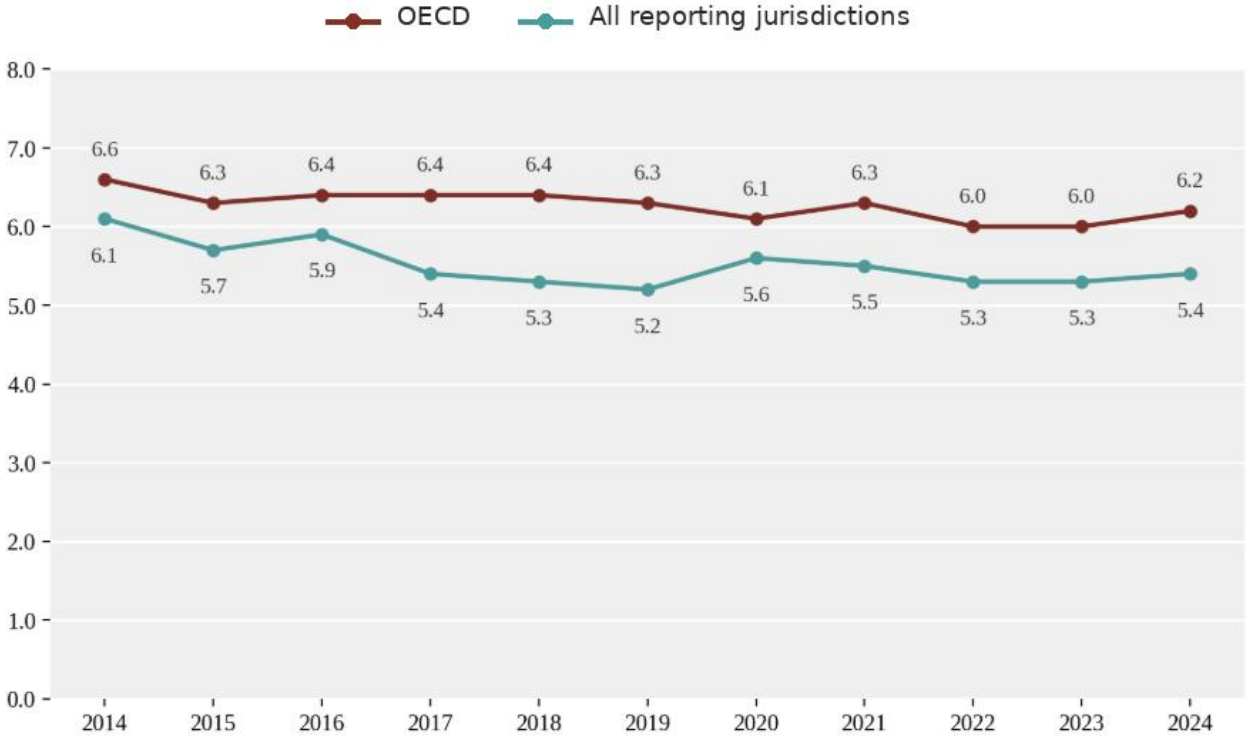



**Figure 1.1. Insurance penetration, average among reporting jurisdictions, 2014-2024** [1]

The peak recorded in 2015 can largely be explained by a single major transaction: the Chinese online insurer ZhongAn raised USD 937 million with the support of Alibaba Group Holding, accounting for almost one third of total annual funding. This illustrates an important

[1] OECD Global Insurance Statistics

methodological feature of insurtech industry statistics: aggregate indicators are highly volatile because of mega-deals, a factor that must be considered when interpreting funding dynamics as an indicator of the maturity of the risk-management market as a whole. Nevertheless, the steady increase in the number of transactions—from 28 in 2011 to 173 in 2016—points not to a temporary surge in interest but to a structural trend involving a broader range of institutional and venture investors willing to finance the technological transformation of insurance underwriting and risk management.

An analysis of the composition of insurance-related transactions in the United States shows a consistent shift in investment towards health insurance. Whereas health insurance technology accounted for 62% of transactions in 2013, its share had risen to 70% by 2014. This reflects both the objectively higher frequency and predictability of data in health insurance and growing investor interest in products that use biometric and wearable-device data to personalise risk profiles.

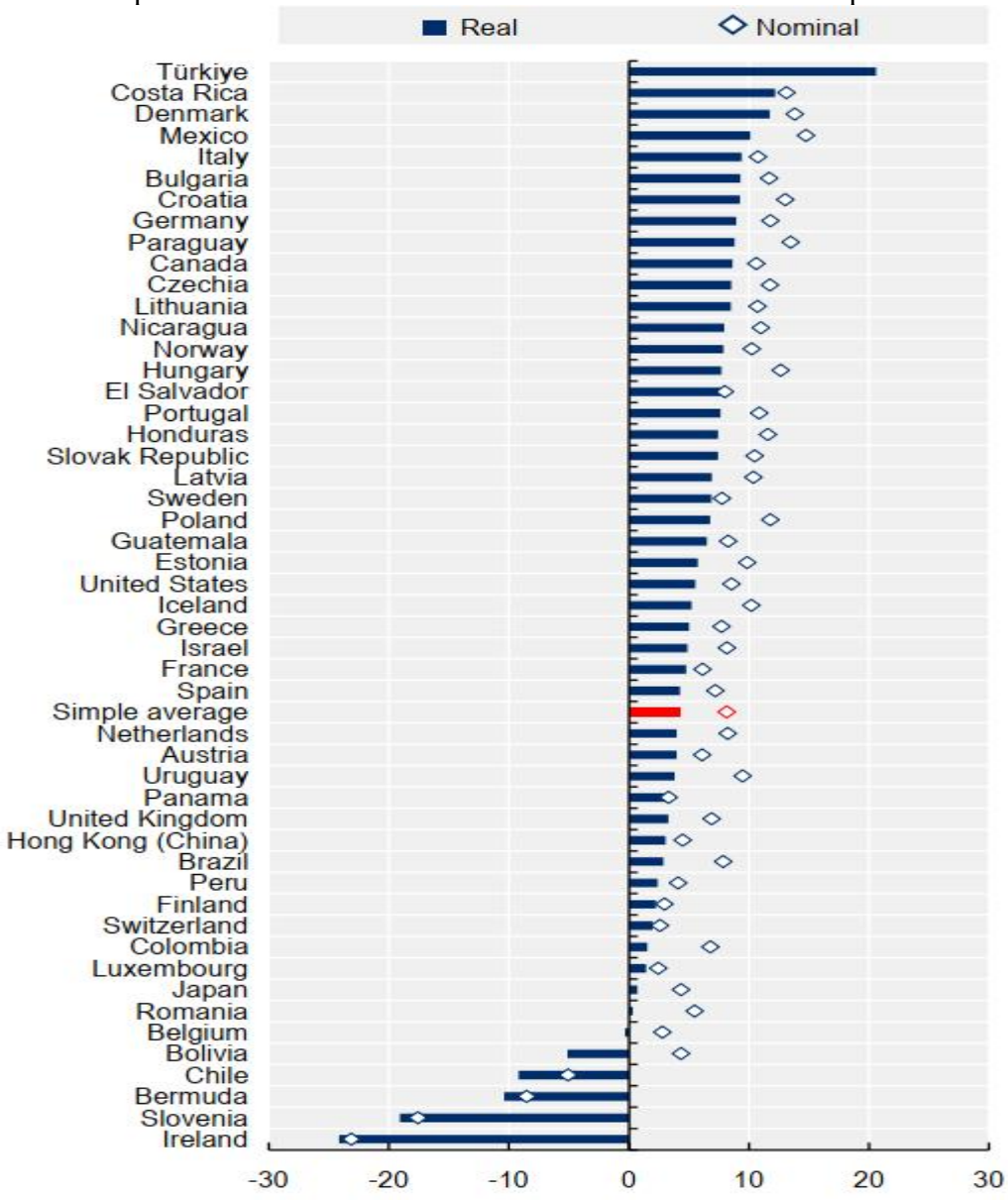


**Figure 2. Annual growth rates of direct gross premiums written in the non-life sector in 2024**[2]

Of particular relevance to this study is the fact that this logic of specialisation may apply not only to health insurance but also, potentially, to the insurance of circular economy risks. The more granular and verifiable the data on the condition of the insured object—whether the human body or a batch of secondary raw materials—the greater investors' willingness to finance the corresponding technological solutions. This observation underpins one of the key hypotheses of the third section of the analytical part: that data-verification models already developed in health insurtech can be applied to the insurance of circular business models.

The dynamics of direct investment by insurers and reinsurers in technology start-ups merit separate analysis, as they differ fundamentally in nature from venture financing. Such investment represents strategic rather than speculative capital and reflects the industry's perception of the long-term value of insurtech solutions for its own risk management. The number of transactions concluded by insurers and reinsurers rose from a single deal in 2012 to 100 deals in 2016—a one-hundred-fold increase in only five years.

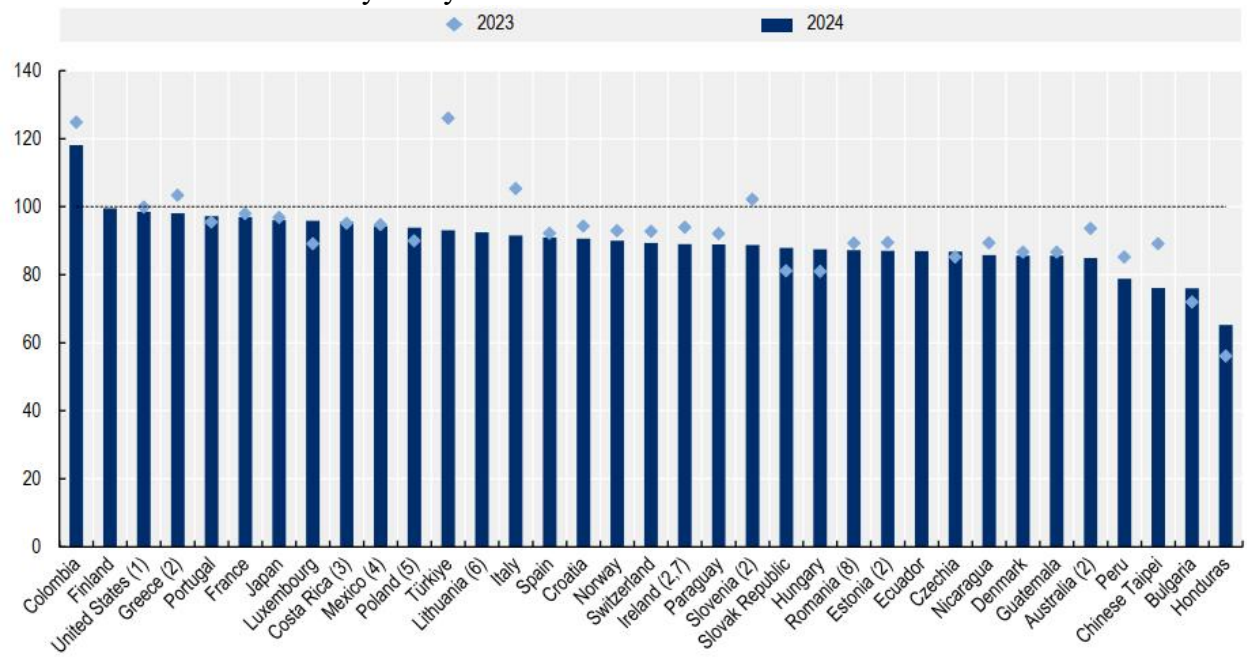



**Figure 3. Combined ratio for the non-life sector in 2023 and 2024** [3]

**Table 1**

**Scale and Dynamics of the Circular Economy Market, 2023–2035 (by Segment)**

Notably, the largest number of transactions was carried out by the corporate venture arms of major global insurers and reinsurers—Ping An Ventures and AXA Strategic Ventures—each of which completed more than 20 deals. This institutionalisation of insurtech, meaning the transition from isolated experiments to systematic corporate venture programmes, provides an important precedent for the subsequent analysis. A similar logic of institutionalising technological risk-management solutions can and should be extended to the insurance of the circular economy, where,

[2] CB Insights (2017b), InsurTech Connect 2016 (October) https://www.cbinsights.com/reports/ITCinsurance-tech-deck.pdf

[3] Danish Financial Supervisory Authority (Denmark); MNB (Hungary); IVASS (Italy); KNF (Poland); ASF (Portugal); ISA (Slovenia); FINMA (Switzerland); NAIC (United States); answers to the qualitative questionnaire of the OECD Global Insurance Statistics exercise (all other jurisdictions)

as shown in Section 3, comparable barriers of information asymmetry and moral hazard have not yet received equally systematic technological solutions. The circular economy is a fundamentally broader and methodologically more heterogeneous object of analysis than the insurtech market, as reflected in the substantial variation in market estimates depending on the sectors covered.

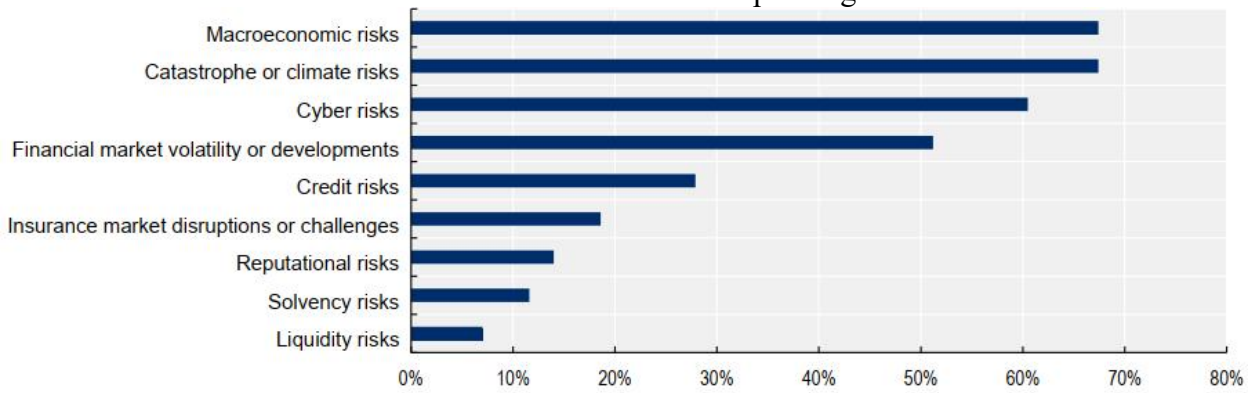



**Figure 4. Risks and vulnerabilities that national authorities saw as relevant or potentially relevant for insurers in their jurisdiction**

The estimates presented in Table 1 differ by almost an order of magnitude—from USD 55.73 billion for the narrow waste-recycling segment to USD 2.7 trillion for a broad range of circular solutions encompassing repair, remanufacturing, and product-as-a-service models.

| Segment / scope | Market size (base year) | Year | Forecast market size | Forecast year | CAGR, % | Source |
|---|---|---|---|---|---|---|
| Circular economy (broad definition) | USD 553 billion | 2023 | — | 2030 | 13.19 | MarkNtel Advisors (2025) |
| Circular economy (broad definition) | USD 638.57 billion | 2024 | USD 2,204.39 billion | 2034 | 13.20 | Zion Market Research (2025) |
| Circular economy (by business model) | USD 166.95 billion | 2025 | USD 491.35 billion | 2035 | 11.40 | DataM Intelligence (2026) |
| Circular solutions (broad scope, incl. waste) | USD 2.7 trillion | 2024 | USD 5.8 trillion | 2034 | 8.2 | Global Market Insights (2025) |
| Waste recycling and circular economy (narrow segment) | USD 55.73 billion | 2024 | USD 108.9 billion | 2033 | 7.8 | Business Research Insights (2025) |
| Industrial reuse platforms | USD 648.1 billion | 2024 | USD 1,668.4 billion | 2034 | 9.8 | MarketIntelo (2026) |

Such methodological heterogeneity is typical of emerging markets and is itself an indicator of the immaturity of the object of insurance: in the absence of a consensus on the boundaries of the circular economy as an economic sector, standardising insurance products for its participants is also difficult. At the same time, consistently high growth rates—with CAGR ranging from 7.8% to 13.2% across almost all methodological approaches—indicate that market expansion is structural

rather than cyclical, creating objective preconditions for the development of specialised insurance offerings.

**Table 2**

**Regional Structure of the Circular Economy Market**

| Region | Market share / position | Growth drivers | Waste recycling level | Source |
|---|---|---|---|---|
| Europe | Largest region; leader in regulatory initiatives (56% contribution to global circular-economy policy) | Circular Economy Action Plan, PPWR, ecodesign policies | CMUR (EU): 11.8% (2023), with a target of 23% by 2030 | Business Research Insights (2026); DataM Intelligence (2026) |
| North America | 34.6% of the industrial reuse-platform market | Extended Producer Responsibility (EPR) policies in the United States and Canada | Developed but fragmented recycling system | MarketIntelo (2026); Intellectual Market Insights (2025) |
| Asia-Pacific | Fastest-growing region: 8.9% CAGR for circular-economy solutions | Industrialisation of China and India; government recycling and waste-to-energy policies | High variation (China: active technology development) | Global Market Insights (2025); PRNewswire/Pheonix Research (2024) |
| Latin America | 6.8% of the industrial-platform market | Limited regulation; early stage of development | Brazil: approximately 4% | MarketIntelo (2026); DataM Intelligence (2026) |
| Middle East and Africa | 5.4% of the industrial-platform market | Early stage of infrastructure development | Australia (for comparison, outside the region): 12.5% for plastics | MarketIntelo (2026); DataM Intelligence (2026) |

In addition to methodological heterogeneity, the circular economy market is characterised by substantial geographical differences in both growth rates and institutional maturity.

**Table 3**

**Barriers and Risks in the Transition to a Circular Economy (Relevant to the Insurance Sector)**

| Barrier / risk | Description | Risk category | Role of insurance as a mitigation tool | Source |
|---|---|---|---|---|
| Fire risk at recycling facilities | Historical evidence of frequent fires at recycling facilities | Property / operational | Specialised property insurance policies with enhanced preventive requirements | Swiss Re Institute (2023–2025) |
| Moral hazard | Incentives for opportunistic behaviour when | Behavioural | Deductible provisions in contracts; IoT monitoring | Scientia et Societas (2025) |

| | | | | |
|---|---|---|---|---|
| | using secondary materials | | | |
| Information asymmetry (data asymmetry) | Insufficient data on the origin and condition of secondary assets | Information | Blockchain for tracking asset provenance; insurtech data platforms | Scientia et Societas (2025) |
| Insurance affordability | High cost of coverage for SME recyclers | Financial | Microinsurance; pooled insurance for industry associations | Scientia et Societas (2025) |
| Regulatory uncertainty | Absence of uniform standards for circular business models | Regulatory | Development of standardised industry insurance products jointly with the regulator | Scientia et Societas (2025) |
| Greenwashing risk | Misleading ESG claims by market participants | Reputational / legal | Verification of ESG reporting as an underwriting condition | Scientia et Societas (2025) |
| Fragmented reverse logistics | Difficulty tracking goods throughout all stages of the cycle | Operational | Parametric insurance based on sensor data | Scientia et Societas (2025); OECD (2017), by analogy with parametric insurtech |
| High initial investment | Barrier to the transition from a linear to a circular model | Investment | Political- and investment-risk insurance for circular-transformation projects | Business Research Insights (2026) |
| Fragmented infrastructure and standards | Lack of unified accounting and certification methods | Institutional | Standardisation of insurance products in line with international ESG frameworks | DataM Intelligence (2026) |

The European Union's leading position is driven less by market factors than by systematic regulatory support—most notably the Circular Economy Action Plan and the Packaging and Packaging Waste Regulation (PPWR). By contrast, the Asia-Pacific region is recording faster growth (8.9% CAGR), primarily because of the industrialisation of China and India and the associated expansion of recycling infrastructure. The wide variation in waste-recycling rates within a single methodological category—from 4% in Brazil to 12.5% in Australia—is noteworthy. It indicates that the regional heterogeneity of circular economy risks is institutional rather than purely economic in nature and is directly determined by the maturity of national regulation, including mechanisms for mandatory liability insurance for recycling operators. This observation provides a methodological basis for the subsequent comparison of Uzbekistan's regulatory environment with international practice.

**Table 4**

**Regulatory and Institutional Drivers (Comparison of the EU and the United States)**

| Jurisdiction | Initiative | Insurance-related requirements | Economic effect |
|---|---|---|---|
| European Union | Circular Economy Action Plan | Evidence of financial security for recycling-facility operators, including environmental liability insurance | 0.5% increase in EU GDP by 2030 (forecast) |
| European Union | Clean Industrial Deal | Indirectly expands insurance demand through employment growth in remanufacturing | Up to 500,000 new jobs in remanufacturing |
| European Union | PPWR (Packaging and Packaging Waste Regulation) | Packaging-design requirements affect the structure of insurable logistics risks | Reduction in packaging waste |
| United States | EPA policies on recycling and environmental justice | Insurance-coverage requirements for recycling operators | Expansion of the recycling-facility insurance market |
| United States / Canada | Extended Producer Responsibility (EPR) | Places financial responsibility for product disposal on producers, creating potential demand for liability insurance | Stimulates the development of collection and recycling systems |

Comparing the barriers to insurability with the findings of the insurtech market analysis reveals a direct logical continuity between the available tools and the problems to be addressed. For example, information asymmetry, identified as one of the key barriers to the insurability of circular assets (Scientia et Societas, 2025), is structurally similar to the challenge of verifying risk-profile data, which health insurtech addresses through the aggregation of biometric and behavioural data. Accordingly, blockchain-based verification of the origin of secondary materials and structured data platforms, already tested through insurtech investment, constitute not merely hypothetical but practically feasible technological solutions to this barrier. Likewise, fragmented reverse logistics can be addressed through parametric insurance based on sensor data—a model conceptually identical to telematics-based motor insurance, which has already demonstrated commercial viability within the insurtech market. Thus, overcoming barriers to the insurability of the circular economy does not require fundamentally new technological development. Rather, it involves transferring mature insurtech solutions to a new applied context, which substantially reduces the technological risks of such a transformation while simultaneously increasing the importance of the institutional and regulatory conditions under which it is implemented.

The final element of the analytical section is a comparison of the regulatory mechanisms through which the state transforms barriers to insurability into actual market demand for insurance products. Regulatory influence on demand for circular-risk insurance follows two fundamentally different approaches. In the European Union, a direct regulatory mechanism is used: the Circular Economy Action Plan requires operators of recycling facilities to demonstrate financial security, including environmental liability insurance, thereby creating institutionally guaranteed demand. In the United States and Canada, by contrast, an indirect mechanism predominates: the principle of Extended Producer Responsibility (EPR) places financial responsibility for product disposal on producers, creating derived demand for liability insurance without a direct regulatory mandate to

purchase a policy. This distinction is crucial for formulating recommendations for Uzbekistan's regulatory environment, because the choice between direct and indirect mechanisms for stimulating circular-risk insurance determines not only the speed of market formation but also the allocation of the financial burden among the state, businesses, and the insurance sector.

In summary, the results of the analytical section indicate that the maturity of insurtech's technological infrastructure, combined with a growing yet methodologically and institutionally heterogeneous circular economy market, creates objective preconditions for specialised insurance offerings. In practice, however, the realisation of this potential depends primarily not on technological readiness but on institutional readiness—above all, the existence of clear regulatory requirements for insurance comparable to the mechanisms examined in the European Union and the United States.

## CONCLUSION

The analysis makes it possible to formulate a number of practical approaches to addressing the problems identified in the study, both at the level of technological tools and at the level of institutional and regulatory design.

**Addressing information asymmetry.** Since the lack of verifiable data on the origin and condition of secondary assets is structurally similar to the already addressed health-insurtech challenge of aggregating biometric data, it would be appropriate to initiate the creation of an industry-wide data platform for circular economy operators in Uzbekistan, modelled on centralised insurance databases (for example, Estonia's system for recording compulsory motor third-party liability insurance policies). Such a platform could consolidate data on the origin, composition, and circulation history of secondary raw materials, thereby reducing underwriting costs and enabling insurers to offer differentiated rates instead of uniformly high premiums that reflect current uncertainty.

**Addressing moral hazard.** Because incentives for opportunistic behaviour among participants in circular supply chains are structurally similar to misconduct risks in peer-to-peer (P2P) insurance, as examined in international practice, the solution lies in transferring proven contractual mechanisms—group liability and refundable deductibles—to insurance contracts for recycling operators. An additional tool is the introduction of IoT-based monitoring at recycling facilities, enabling continuous verification of compliance with declared technological processes as a condition for maintaining insurance coverage.

**Improving insurance affordability for small and medium-sized recyclers.** Since the high cost of individual coverage is recognised as one of the key barriers, the most realistic solution is the development of pooled insurance through industry associations of recycling companies. Such a mechanism would spread risk across multiple participants and thereby reduce individual premiums. This approach should be considered in conjunction with microinsurance, which has already demonstrated effectiveness in developing insurance markets through mobile distribution platforms.

**Addressing regulatory uncertainty.** A comparison of the European Union and the United States shows two alternative paths for creating regulatory demand for circular-risk insurance: a direct mandate (the Circular Economy Action Plan) and the indirect mechanism of Extended Producer Responsibility (EPR). For Uzbekistan, a phased transition from an indirect to a direct mechanism appears more realistic. It could begin with voluntary incentives for liability insurance among recycling operators through tax benefits, followed by a gradual move towards mandatory insurance for large industrial facilities as sector-specific loss statistics accumulate. Such a phased approach is consistent with the existing legal framework—Resolutions of the President of the Republic of Uzbekistan No. PP-4412 and No. PP-5265 on the digitalisation of the insurance

market—which could be supplemented with specific provisions governing the insurance of circular economy facilities.

**Addressing greenwashing risk.** Since unreliable ESG claims by market participants create reputational and legal risks for insurers, the solution is to introduce verification of ESG reporting as a mandatory underwriting condition, a practice already used by a number of European insurers in the context of CSRD requirements. In Uzbekistan, the introduction of such a requirement should be synchronised with the development of national sustainability-reporting standards, which would also support harmonisation with international practice.

**Addressing fragmented reverse logistics.** Since this problem is structurally similar to a challenge already addressed in telematics-based motor insurance, the most promising direction is the development of parametric insurance based on sensor data that track the movement and condition of reused materials throughout the entire cycle. With relatively low implementation costs compared with conventional underwriting, such products can provide automated and objective risk assessment without the need for labour-intensive manual verification.

More broadly, the findings show that barriers to the insurability of circular economy risks are neither unique nor technologically insurmountable. They systematically reproduce barriers that the insurance industry has already overcome in other segments through insurtech tools. The key practical recommendation of this study is that the development of circular economy insurance in Uzbekistan should not be approached as the creation of an entirely new insurance industry from scratch, but rather as the targeted transfer of mature insurtech solutions into a new applied context, supported by the gradual strengthening of regulatory requirements in line with international practice. This approach can minimise the technological risks of transformation while maintaining realistic implementation timelines consistent with the current maturity of the national insurance market.

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