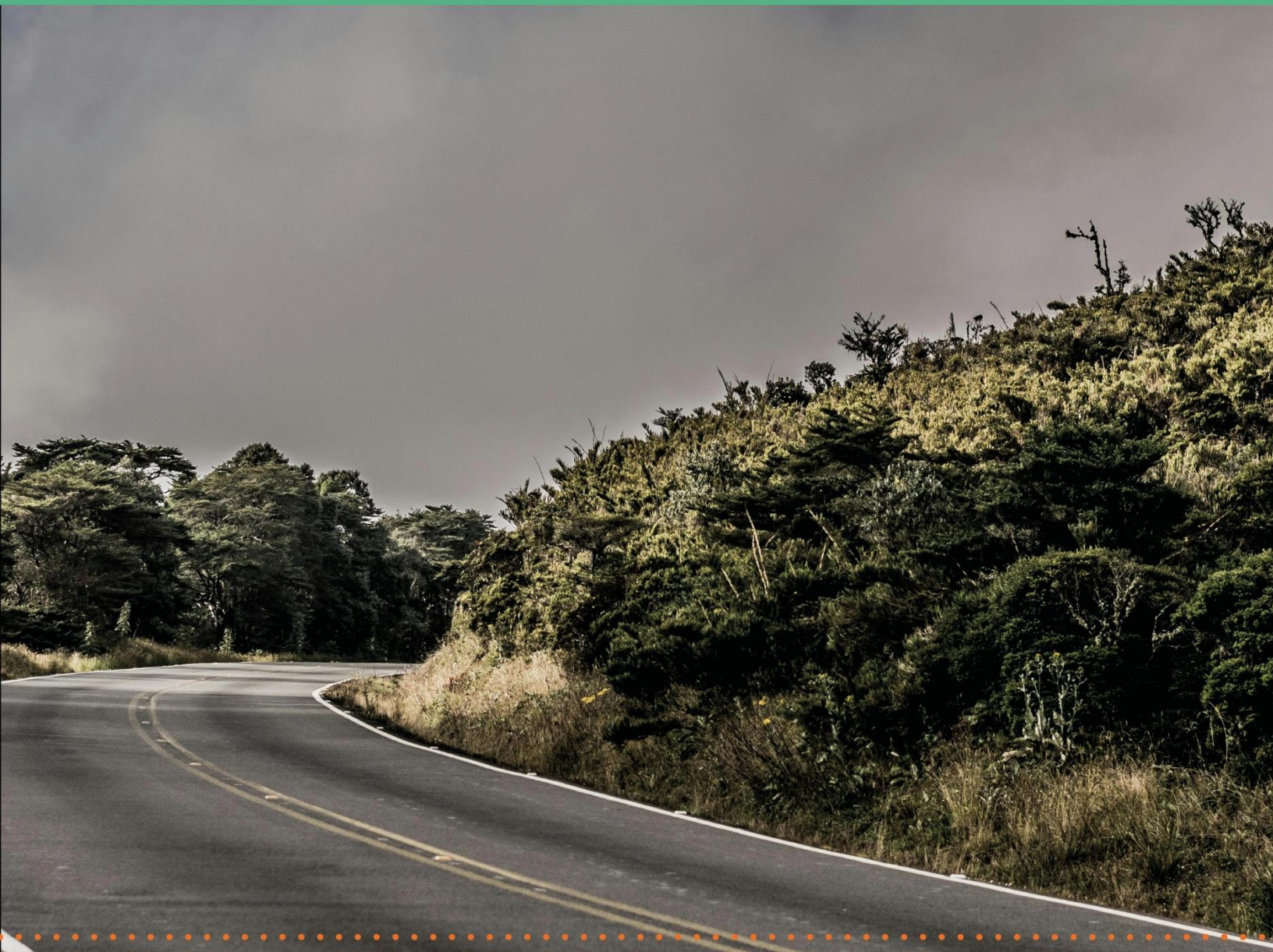




Risk Assessment and Capacity
Development in Costa Rica

Probabilistic Risk Assessment of National Route 2

January 2026

Prepared for:



Prepared by:



Global Risk Modelling Alliance

InsuResilience Solutions Fund

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Risk Assessment and Capacity Development in
Costa Rica.

Probabilistic Risk Assessment of National Route 2.

Product 7

(Deliverables 6b, 6c, 6d, 6e)

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January 2026

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1 INTRODUCTION

The Global Risk Modelling Alliance (GRMA), supported by the InsuResilience Solutions Fund (ISF), aims to strengthen the capacity of countries and cities to conduct climate and disaster risk analyses with a focus on financial decision-making. The initiative seeks to fill critical gaps in modelling and data, thereby enhancing climate and disaster risk assessments at both national and sub-national levels.

To achieve this goal, the GRMA works closely with local partners to identify and jointly define each country's specific needs, providing open-access risk management tools, data resources, and operational expertise in risk financing.

In Costa Rica, the GRMA has established a collaboration with the government—through its institutions under the leadership of SUGESE—to strengthen national capacities for climate risk management. This partnership will deliver relevant models and analytical tools to inform the country's national strategies for risk financing and disaster risk mitigation.

The program is being implemented in phases, beginning with the assessment of specific needs and culminating in the integration of advanced risk-modelling tools into public policy frameworks.

The project is funded by Germany's KfW Development Bank and administered by Frankfurt School on behalf of the GRMA.

The INGENIAR–CIMNE Consortium was selected to provide risk modelling services within the framework of the collaboration between the GRMA and the Government of Costa Rica, through an application focused on four risk assessment projects:

- Strategic Project: Demonstration of risk assessment methodologies for critical infrastructure in Heredia.
- Operational Project 1: Disaster and climate risk assessment for road infrastructure – National Route 2 (RN2), Pan-American Highway.
- Operational Project 2: Flood and drought risk analysis for small and medium-sized agricultural producers.
- Operational Project 3: Exposure and risk assessment for small and medium-sized hotels and lodges participating in the Fu-turismo program.

Implementation is carried out through the CAPRA-ROBOT modelling platform, developed by INGENIAR, which will also serve as an educational tool within the Training Program that runs throughout the entire duration of the consultancy.

This report corresponds to Product 7 (Deliverables of Task 6): Probabilistic Risk Estimation on National Route 2, and specifically addresses deliverables 6b, 6c, 6d, and 6e of the Terms of Reference for this consultancy. It is therefore a deliverable specifically related to Operational Project 1.

This report presents the results of the probabilistic risk assessment for National Route 2, considering the following hazards: earthquakes, volcanic eruptions, riverine and pluvial flooding, and landslides, the latter three influenced by climate change.

This assessment complements and builds upon aspects previously presented in earlier products: (i) Product 2 presents the pre-existing seismic, volcanic, and landslide hazard models used in this assessment; (ii) Product 3 of this consultancy contains the details of the exposure model and the vulnerability functions applied to the road asset portfolio; and (iii) Product 4 contains the details of the climate hazard models developed for riverine and pluvial flooding.

1.1 Scope of Operational Project 1

This project consists of the risk assessment of road infrastructure, specifically National Route 2 (Pan-American Highway), under multiple hazards, including: earthquakes, flooding, volcanic eruptions, and landslides.

The project is carried out through the activities presented in Table 1. The corresponding schedule is shown in Figure 1.

All aggregated values presented were agreed upon directly with the GTT of this project.

Table 1. Tasks of operational project 1

Activity	Description	Task in the ToR	Deliverable in the ToR
Climate model	Refers to the modeling of meteorological forcing and the incorporation of climate change projections.	T2.1, T2.2	D2.1a–f, D2.2a–e
National flood model	A national flood model will be developed to be applied in the modeling of the complete road asset portfolio.	T2.1	D2.1a–f
Landslide susceptibility model	A landslide susceptibility model will be developed, compatible with risk modeling, at the national level.	T3.1	D3.1a–b
Volcanic models	Available information will be reviewed and approximate probabilistic volcanic hazard models will be proposed.	T3.2	D3.2a–b
Seismic hazard model	Available information will be consulted in order to obtain the best available national seismic hazard model, allowing its direct application in catastrophe modeling, both for this project and for other projects involving seismic risk.	T3.3	D3.3a–b
National Route exposure	A database of exposed road segments will be compiled for risk assessment.	T6.1	D6a
Road network vulnerability	Road vulnerability models will be developed based on archetypes of road segments.	T4.2	D4a–d
Risk assessment	Application of the methodologies presented herein to assess risk through actuarial catastrophe modeling metrics.	T6.2	D6b–d
Deterministic evaluation (stress test)	Results of selected large simulated events will be reported to illustrate infrastructure performance under extreme events.	T6.3	D6b–d

Results calibration	The analytical loss exceedance curve calculated with the model will be compared with one constructed from historical event data to establish consistency.	T6.2	D6b–d
Investment curve	As added value, a set of risk management actions will be evaluated to determine the optimal combination for reducing risk under fixed and increasing investment levels.	Added value	
Resilience assessment	The resilience of road infrastructure will be evaluated by incorporating the country's capacity to absorb, respond to, and recover from adverse events.	Added value	

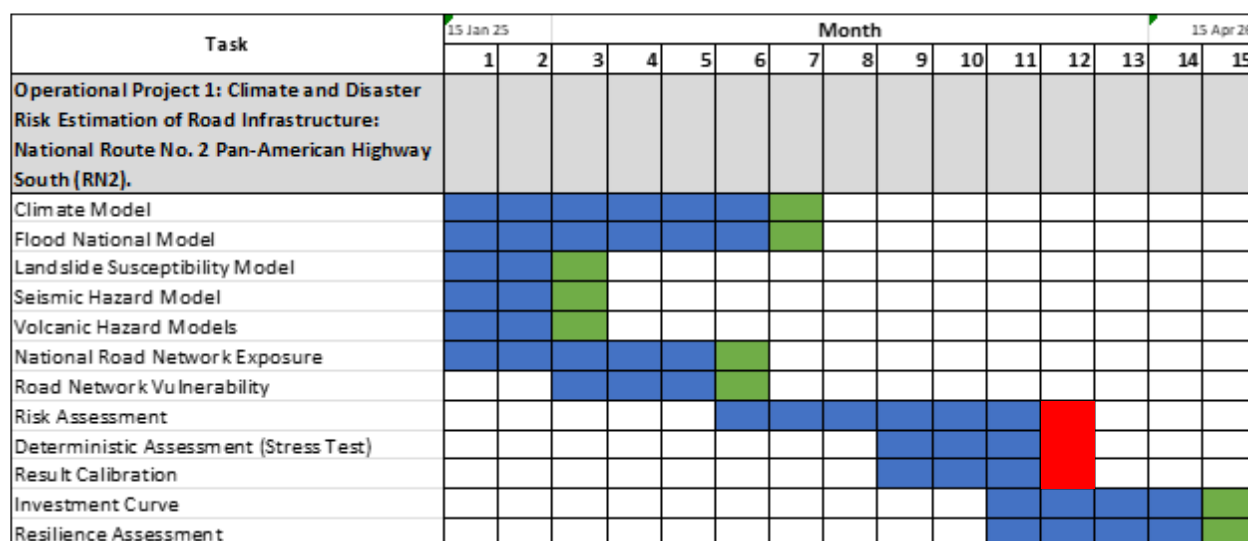


Figure 1. Schedule of activities for Operational Project 1. (Blue cells indicate implementation. Green cells indicate delivery of products. Red cells indicate this deliverable.)

Although the model is developed for National Route 2 (RN2), whose results are presented in this report, as added value technical support is being provided to the Technical Working Group of this project in order to model the risk of National Route 34, selected by Lanamme, for the hazards of flooding, earthquakes, and landslides. This work is not reported here, as it sits outside the scope of the GRMA program.

2 CATASTROPHE RISK MODELING METHODOLOGY

The objective of probabilistic catastrophic risk modeling is to estimate the probability distribution of losses that may occur within a set of exposed elements, following the occurrence of a hazard event (Cardona, 1986a;b;c; 1989; 1990, Bernal et al., 2021). Probabilistic modeling enables forecasting of future loss levels by accounting for the specific hazards present in the territory and the inherent uncertainties in their estimation, as well as the intrinsic vulnerability of the exposed elements and its respective uncertainty.

2.1 Conceptual Approach to Risk Modeling

Probabilistic risk modeling involves estimating the potential consequences that a set of exposed elements may suffer as a result of hazardous events. Robust risk modeling is fundamental for building a sustainable and resilient development process, as it enables the consideration of trade-offs between potential harms and benefits. In other words, such a process can only be effectively guided when supported by a risk model that is sufficiently robust, both in terms of credible impact estimations and in providing a sound technical foundation for decision-making without arbitrariness.

The general procedure for probabilistic disaster risk modeling—considering climate change—is illustrated in Figure 2.

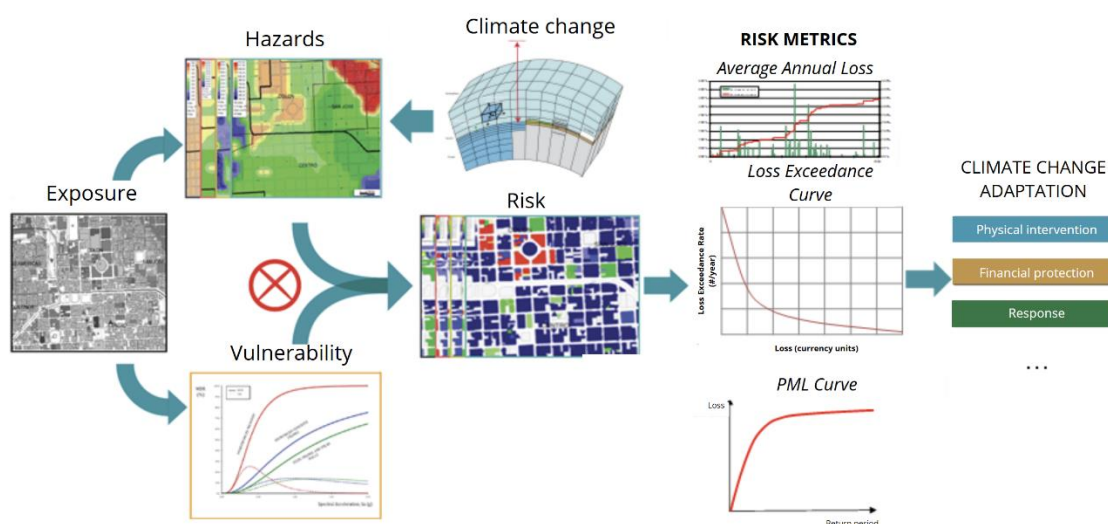


Figure 2. Components of Risk Modeling and Their Interrelation.

As illustrated in Figure 2, once risk has been evaluated using actuarial metrics, such as Expected Annual Loss, the Loss Exceedance Curve, and Probable Maximum Loss, it becomes possible to establish an objective relationship with risk management measures and their effectiveness. This means the model can be used to design intervention strategies composed of multiple measures, each with a quantifiable capacity to reduce risk.

Following this approach, risk in this study is evaluated based on three fundamental factors:

- *Hazard* is defined as a set of stochastically simulated events that are collectively exhaustive and mutually exclusive; that is, they cover all possible ways in which the hazard may manifest,

assuming independent events whose frequencies follow a natural power law (i.e., equivalent to a recurrence curve).

- *Exposed elements* refer to immovable assets, infrastructure, or agricultural production that are subject to hazards and susceptible to damage or disruption.
- *Vulnerability* refers to the propensity or predisposition of exposed elements to be adversely affected. Assessing vulnerability requires a specific model for each type of exposed element and each type of hazard—there is no unified representation. However, the modeling process results in a common impact metric (economic loss), which makes the different models additive and comparable in risk terms.

The first fully probabilistic approach to the risk problem from an actuarial perspective was proposed by Filip Lundberg in 1903 (Lundberg, 1903). In 1930, Harald Cramér formalized Lundberg’s theory into what is now known as Ruin Theory (Cramér, 1930). Lundberg defined an income-outcome model in which an insurance company begins operations with a given amount of capital, which increases over time as premiums are collected. Simultaneously, losses (which the company must cover) occur randomly over time. If, due to claim payments, the company’s capital falls below zero, it is considered bankrupt. Lundberg was interested in determining the probability of an insurance company’s insolvency.

Ruin Theory assumes that the occurrence of claims is not deterministic. Lundberg demonstrated that the occurrence of losses over time can be modeled as a Poisson process. Later, it was shown that any renewal process is valid within the framework of Ruin Theory (Andersen, 1957). A renewal process is a type of continuous-time, discrete-state stochastic process widely used across scientific and engineering disciplines to model the random occurrence of events. In this context, “events” refer to loss occurrences, regardless of their origin. This is why Ruin Theory—or insolvency theory—is well-suited to modeling the impacts associated with any type of phenomenon, whether natural or not, and is applicable to risk management beyond the insurance sector, including social, economic, environmental, and broader development contexts.

A renewal process is defined by a single parameter: its intensity or rate. In risk assessment, this parameter corresponds to the loss exceedance rate, which is the inverse of the average time between events that exceed a given loss threshold p . Therefore, when estimating the risk of a portfolio of exposed elements (i.e., the probability of exceeding a loss amount p within a time window), its exceedance rate $v(p)$ must be calculated based on the probability of occurrence of any hazard event capable of surpassing p . This defines a renewal process that enables estimation of the probability of loss p being exceeded within any given period.

2.2 Risk Quantification

From a mathematical standpoint, risk modeling aims to characterize a stochastic process of loss occurrence over time (i.e., a loss process). A loss process has key characteristics that shape the modeling approach adopted in this study, which is commonly used in actuarial catastrophic modeling, safety and reliability engineering, the aerospace industry, and other fields.

Risk is determined by the convolution of hazard and vulnerability, at the location of the exposed elements and for all such elements. In probabilistic loss modeling, both hazard and vulnerability are represented probabilistically. Hazard is characterized by both temporal and spatial probability distributions. The temporal occurrence of hazard scenarios is modeled as a renewal process, which entails fitting a probability model to the time between two consecutive events.

The uncertainties associated with hazard and vulnerability are defined by their own nature—temporal and spatial for hazard, and intensity-dependent for vulnerability. As such, the primary output of the model is a specific probability distribution of loss for each hazard event. The probability density function of loss for exposed element j , conditional on the occurrence of hazard event i (i.e., $f(p_j|E_i)$), is calculated as:

$$f(p_j|E_i) = \int_0^{\infty} f(p_j|s)f(s|E_i)ds \quad \text{Equation 1}$$

where the first term of the integral pertains to vulnerability ($f(p_j|s)$, the probability density of loss given an intensity s), and the second term relates to hazard ($f(s|E_i)$, the probability density of intensity given the occurrence of event E_i).

The total loss from event i is the sum of all individual losses (p_j) from the exposed elements. Since these are random variables, proper arithmetic must be used to determine the total event loss. The sum is computed over the probability moments of the variables p_j , as follows:

$$E(p|E_i) = \sum_{j=1}^{NE} E(p_j) \quad \text{Equation 2}$$

$$\sigma^2(p|E_i) = \sum_{j=1}^{NE} \sigma^2(p_j) + 2 \sum_{k=1}^{NE-1} \sum_{j=2}^{NE} \text{cov}(p_k, p_j) \quad \text{Equation 3}$$

where $E(p|E_i)$ is the expected loss of event i , $\sigma^2(p|E_i)$ is its variance, NE is the total number of exposed elements, $E(p_j)$ is the expected loss for element j , $\sigma^2(p_j)$ is its variance, and $\text{cov}(p_k, p_j)$ is the covariance between losses in two different exposed elements.

Using the probability moments of the total loss from an event, a Beta distribution is fitted, with the following probability density function (f_p):

$$v(p) = \sum_{i=1}^N \text{Pr}(P > p|E_i) \cdot F_A(E_i) \quad \text{Equation 4}$$

where $v(p)$ is the exceedance rate for loss p , N is the total number of hazard events, $F_A(E_i)$ is the annual frequency of event i , and $\text{Pr}(P > p|E_i)$ is the probability of exceeding p given that event i occurred. The summation includes all hazard events that can generate losses. The inverse of $v(p)$ is the return period of loss p (Tr), which is simply the expected time between events that exceed loss p .

$$Tr = \frac{1}{v(p)}$$

Equation 5

The loss exceedance curve contains all the necessary information to probabilistically characterize the loss occurrence process associated with hazard events. Figure 3 shows an example of a loss exceedance curve.

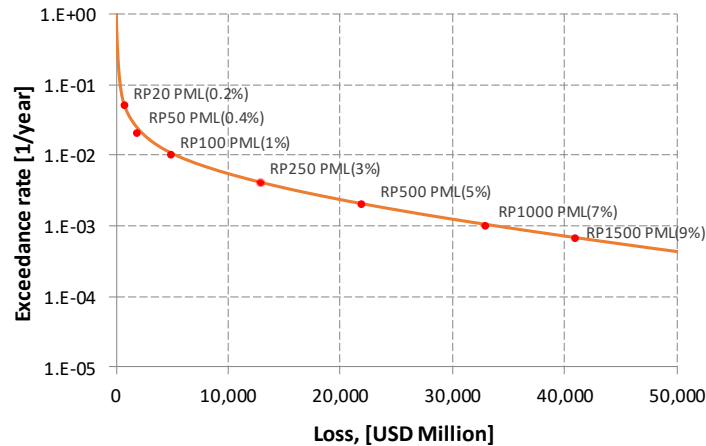


Figure 3. Example of a loss exceedance curve. The vertical axis shows the exceedance rate. The horizontal axis shows the associated loss. (RP = Return Period; PML = Probable Maximum Loss).

The calculation in Equation 4 corresponds to the estimation of the exceedance rate for all loss amounts across all exposed elements, for all events in the hazard model, and for all hazards. As shown in Figure 4, the probabilistic risk assessment can be summarized in the following steps: 1) For each hazard event, the loss for every exposed element is determined; 2) the total event loss is calculated as the sum of individual losses; 3) once all event losses are quantified, exceedance rates are calculated.

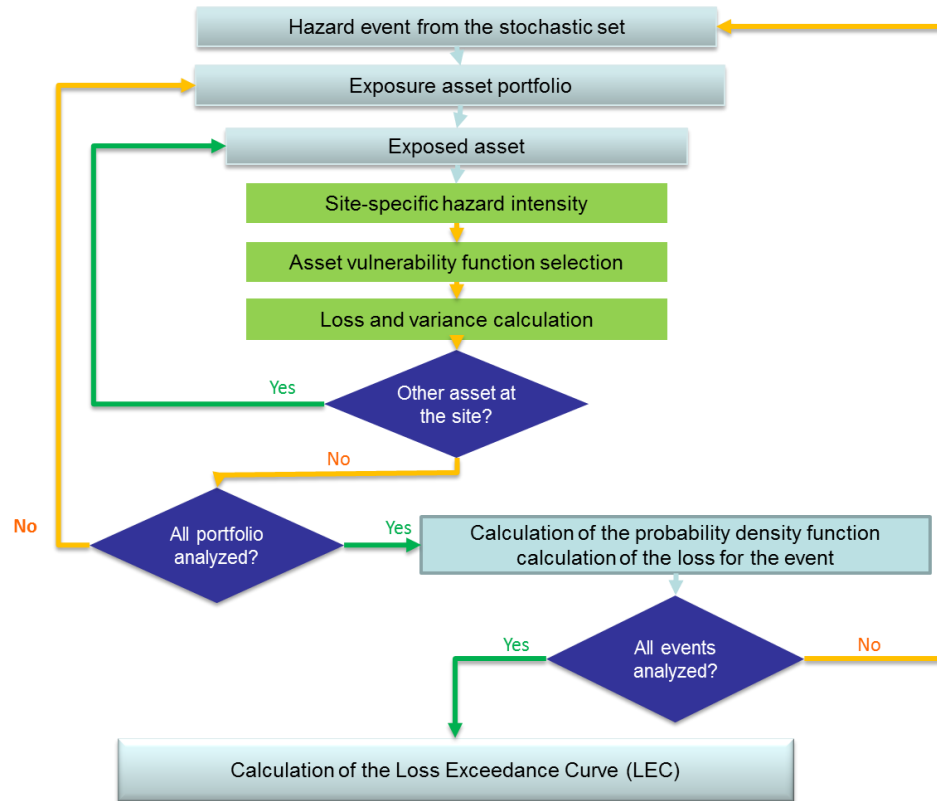


Figure 4. Flow diagram of probabilistic risk assessment

2.3 Risk Metrics

From the loss exceedance curve, several risk metrics can be derived, each serving different purposes in decision-making and risk management processes. These metrics offer a comprehensive representation of risk, typically condensed into one or a few indicators, rather than presenting the full set of event-specific losses or the entire exceedance curve.

2.3.1 Average Annual Loss (AAL)

The AAL represents the expected value of annual losses. It reflects the average annual amount which, when accumulated over time, would be equivalent to all future losses. Conceptually, the AAL corresponds to the fair pure premium required annually to cover all possible losses. It can be calculated as the area under the loss exceedance curve:

$$PAE = \int_0^{\infty} v(p) dp \quad \text{Equation 6}$$

Alternatively, based on event-specific loss data, AAL can also be calculated as:

$$PAE = \sum_{i=1}^N E(P|E_i) F_A(E_i)$$

Equation 7

Where $(P|E_i)$ is the expected loss from event i , and $F_A(E_i)$ is the annual frequency of occurrence of event i . The expected loss given the occurrence of a specific event depends on the vulnerability of the exposed elements.

AAL is a crucial risk indicator because it integrates into a single value the impact of hazardous events on vulnerable exposed elements. It is the most robust risk metric—not only because it summarizes the loss occurrence process in one number, but also because it is relatively insensitive to uncertainty, as it reflects the mathematical expectation of annualized losses.

2.3.2 Probable Maximum Loss (PML)

While the loss exceedance curve is the primary output of risk assessment, the PML curve is often preferred, as the concept of a return period is generally easier to interpret. As previously explained, the return period is the expected time between events that exceed a certain loss, and it is mathematically the inverse of the exceedance rate. The loss exceedance curve and the PML curve contain equivalent information.

From the PML curve, loss values can be determined for any selected return period. Choosing a return period to reference a PML value depends entirely on the risk aversion of the decision-maker. Figure 5 shows an example of a PML curve, where a selected return period of 400 years on the horizontal axis corresponds to a loss value on the vertical axis. This indicates that such a loss is expected to be exceeded, on average, once every 400 years.

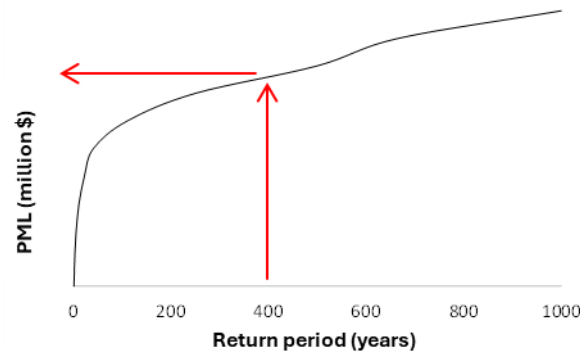


Figure 5. Example of a PML curve

2.4 Limitations of the Risk Assessment

This section presents several widely recognized limitations of probabilistic risk assessment, which are strongly related to the quality of the available data.

It should be noted that the limitations described here complement those previously indicated in all products of this consultancy, which addressed: the assessment methodology (Inception Report), the information on pre-existing geological hazard models (Product 2 “Review geohazard data and proposal on applying in risk assessment”), the exposure and vulnerability models developed by this consultancy (Product 3 “Exposure and Vulnerability Models”), and the hydrometeorological hazard models with climate change developed by the consultant (Product 4 “Climate Hazard Models”).

Therefore, this section does not seek to repeat what has already been stated in those previously submitted products, but rather to provide a general overview of the known limitations of probabilistic risk assessment.

Probabilistic disaster risk assessment critically depends on the availability and resolution of the information used to model hazards, exposure, and vulnerability. A common limitation is the insufficiency of historical records of extreme events, which makes it necessary to simulate the largest and most catastrophic events based on indirect information about the territory and the manifestation of the phenomena.

This limits calibration and validation processes, since there is no evidence of the occurrence of most of the simulated events, as they have not yet occurred. This is especially true under climate change conditions. Likewise, for modeling climate-related phenomena, hydrometeorological data in many contexts present temporal gaps, low spatial density of monitoring stations, or inconsistencies due to changes in measurement systems.

Table 2 summarizes the main limitations of the different modeling components, hazard, exposure, and vulnerability, and also provides some recommendations for reducing them.

Table 2. Summary of Identified Limitations in the Model Components

Component	Evaluated Condition	Limitation	Recommendation
Climate	Baseline climate and 36 future climates	It is not possible to anticipate the actual future climate. Only alternative possible futures can be considered and evaluated.	Deep uncertainty. Cannot be reduced.
Flood hazard	Meteorological forcing. Daily-scale simulations	Simulations were generated for 1,000 years at locations within a grid over Costa Rica. This grid has intermediate resolution at the scale of RN2. As a result, some spatial variations in rainfall patterns cannot be captured by the model.	Requires long-term investments in research, detection equipment, and sustained data collection.
Flood hazard	Basin response	The basin response model captures internal spatial variations that locally modify attenuation and accumulation conditions due to surface infiltration. However, the basins considered are highly intervened and transformed, with urban drainage routes not included in the model that alter response patterns. Minimal or no maintenance of basins and channels also affects the ability to appropriately represent hydrological response.	Requires major investments in research and channel monitoring.
Flood hazard	Hydraulic model	One-dimensional (1D) hydraulic model, with limitations in representing flooding in river overflow zones, especially in floodplains. The model response within the channel, particularly in deeper channels, is uncertain.	Requires investment in research and application of more complex hydraulic approaches.

Component	Evaluated Condition	Limitation	Recommendation
Seismic hazard	Earthquake occurrence. Strong ground motion	Seismic information is limited due to the relatively low frequency of earthquakes. Seismic hazard models must always be treated probabilistically due to uncertainty in timing, location, magnitude, and other event characteristics.	Requires time and significant investment in research.
Landslide hazard	Susceptibility	The susceptibility model was derived from a global model (GIRI-CDRI), which only approximately reflects local susceptibility conditions. The model is limited in the propensity factors it considers.	Requires major investment in subsurface research and susceptibility modeling.
Volcanic hazard	Occurrence of eruptions. Distribution of emitted material	Information on volcanic eruptions is limited due to their relatively low frequency. Much of the existing information is based on geological records of past volcanic effects. Although probabilistic models are used in this assessment for the volcanoes involved, probabilistic treatment of volcanic hazard is uncommon. Volcanic hazard models tend to be deterministic, which is also the case for those available for Costa Rica, except for the one used in this assessment (CAPRA model). Volcanic hazard models for catastrophic risk assessment should always be treated probabilistically due to uncertainty in the timing, magnitude, and other characteristics of eruptions.	Requires greater investment in probabilistic volcanic hazard models.
Exposure	Bridge exposure	Costa Rica, and particularly LanammeUCR, has very good information on exposed road elements. Detailed information is available, including bridge location and other characteristics. However, the information must be processed to transform it into an exposure database. Additional information is needed to allow future assessments to consider other relevant hazards, such as debris flows. Data on bridge clearance height, distribution of piers and supports in the substructure, and channel conditions are examples of relevant information for modeling other phenomena.	Requires investment in the generation and maintenance of exposure data, oriented toward risk assessment.
Exposure	Road segment exposure	Costa Rica, and particularly LanammeUCR, has very good information on exposed road elements. Detailed information is available, including location and other characteristics of road segments. However, the information must be processed to transform it into an exposure database.	Requires investment in the generation and maintenance of exposure data, oriented toward risk assessment.
Vulnerability	Bridge vulnerability	Vulnerability functions from international sources (HAZUS, CAPRA) are available and directly applicable to Costa Rica. Although these are not country-specific curves, they are considered acceptable. Special phenomena such as debris flows are not included, as they fall outside the scope of the study. These phenomena, which are particularly relevant for bridges, should be considered in the future. The validation of new vulnerability functions is analytically and technically complex and computationally demanding. Additionally, the model considers only direct losses to road segments, without accounting for variations in service performance or interdependencies with other systems.	Requires investment in research on vulnerability models.
Vulnerability	Road segment vulnerability	New functions for infrastructure elements were developed using an archetype-based approach. These functions are considered sufficient for the purposes of this assessment. The validation of new vulnerability functions is analytically and technically complex and computationally demanding. Additionally, the model considers only direct losses to road segments, without accounting for variations in service performance or interdependencies with other systems.	Requires investment in research on vulnerability models.

Although Costa Rica stands out in the region for having solid and well-structured information systems in terms of inputs for modeling, inherent limitations of the probabilistic approach remain.

The main challenge lies in the fact that modeling is based on the projection of future events that have not yet occurred, which implies reliance on analytical assumptions regarding the extreme behavior of natural hazards and the response of exposed elements to them.

Therefore, even in contexts with good data availability, such as Costa Rica, uncertainty cannot be completely eliminated; it can only be explicitly managed within the risk assessment process.

2.4.1 Recommendations for Future Assessments

Based on the inherent limitations of the assessment, several general recommendations are proposed to strengthen the future use of probabilistic risk assessment models:

1. Institutional governance and formal custodianship of risk data

It is recommended to establish formal governance and custodianship procedures for the inputs and outputs generated in the RN2 risk assessment, assigning clear institutional responsibilities for the management of hazard, exposure, vulnerability, and loss data.

Given that the results include probabilistic metrics and multi-hazard deterministic scenarios, their long-term sustainability requires version control mechanisms, document traceability, and structured data storage, thereby preventing inconsistencies arising from unrecorded modifications or loss of technical information.

2. Periodic updating of the road and structural exposure inventory

It is essential to implement a systematic scheme for updating the exposure of roads and bridges, considering that RN2 is subject to interventions, expansions, rehabilitations, and changes in the structural condition of its assets. The validity of the risk metrics depends directly on an up-to-date representation of the assessed portfolio; therefore, any relevant modification to the inventories must be incorporated before reusing the results or running new simulations.

3. Preservation and explicit documentation of methodological assumptions

It is recommended to systematically preserve all methodological assumptions and parameters used in the modeling, including the hazard models applied, the assigned vulnerability functions, and the climate configurations considered (GCM–SSP combinations). Future comparability of results requires consistency in the adopted approaches or, in the case of adjustments, explicit documentation that allows distinguishing between actual changes in risk and variations induced by methodological modifications.

4. Operational integration of probabilistic metrics and deterministic scenarios It is advisable to integrate the generated outputs into institutional planning, prioritization, and maintenance processes, understanding probabilistic metrics and deterministic scenarios as complementary tools. While the AAL (Average Annual Loss) characterizes average annual loss conditions, deterministic scenarios allow the assessment of concentrated impacts from specific events. Their coordinated use strengthens the technical basis for decisions related to operational continuity, investment management, and risk reduction along the corridor.

5. Capacity building for long-term model reproduction and maintenance

It is recommended to strengthen institutional capacities for the reproduction, recalibration, and eventual expansion of the risk model, including technical training in the interpretation of curves, maps, and metrics, as well as criteria for incorporating new climate, geotechnical, or structural information.

Given the dynamic nature of infrastructure risk, the sustainability of this work requires that responsible entities be able to maintain the analytical framework operational beyond the immediate timeframe of the consultancy.

3 RISK ASSESSMENT RESULTS

The risk assessment of the road asset portfolio (roads and bridges) along National Route 2 produced the results presented below, expressed in terms of Average Annual Loss (AAL) and Probable Maximum Loss (PML) for the following hazards: Riverine flooding (river overflow), earthquakes, volcanic eruptions, earthquake-triggered landslides, rainfall-triggered landslides

Pluvial flooding (surface water accumulation) was excluded from the results presented in this report, as in all cases and across all climate scenarios the results were extremely low¹ or exactly zero.

For earthquakes, volcanic eruptions, and earthquake-triggered landslides, losses are presented independently of any future climate condition. However, for flooding and rainfall-triggered landslides, climate change is incorporated, as it modifies or conditions the occurrence of the hazard and therefore alters the risk metrics.

Details on climate modeling and the incorporation of climate change into these hazards can be found in Product 4 of this consultancy (Deliverable of Task 2: Climate Hazard Models).

For riverine and pluvial flooding, three Global Circulation Models (GCMs), four greenhouse gas emission pathways, and three future target years were considered, resulting in a total of 36 possible future climate versions. The models, emission pathways, and projection years for riverine and pluvial flooding are summarized in Table 3, including an abbreviated name used throughout this document to reference results associated with each climate scenario.

Table 3. Future Climate Scenarios Considered for Riverine and Pluvial Flooding and Their Abbreviations

GCM	Pathway	Target year	Abbreviation	GCM	Pathway	Target year	Abbreviation
EC-Earth3	SSP1-2.6	2035	EC-SSP1-35	GFDL-ESM4	SSP3-7.0	2050	GFDL-SSP3-50
EC-Earth3	SSP2-4.5	2035	EC-SSP2-35	GFDL-ESM4	SSP5-8.5	2050	GFDL-SSP5-50
EC-Earth3	SSP3-7.0	2035	EC-SSP3-35	GFDL-ESM4	SSP1-2.6	2100	GFDL-SSP1-100
EC-Earth3	SSP5-8.5	2035	EC-SSP5-35	GFDL-ESM4	SSP2-4.5	2100	GFDL-SSP2-100
EC-Earth3	SSP1-2.6	2050	EC-SSP1-50	GFDL-ESM4	SSP3-7.0	2100	GFDL-SSP3-100
EC-Earth3	SSP2-4.5	2050	EC-SSP2-50	GFDL-ESM4	SSP5-8.5	2100	GFDL-SSP5-100
EC-Earth3	SSP3-7.0	2050	EC-SSP3-50	MPI-ESM1-2-LR	SSP1-2.6	2035	MPI-SSP1-35
EC-Earth3	SSP5-8.5	2050	EC-SSP5-50	MPI-ESM1-2-LR	SSP2-4.5	2035	MPI-SSP2-35
EC-Earth3	SSP1-2.6	2100	EC-SSP1-100	MPI-ESM1-2-LR	SSP3-7.0	2035	MPI-SSP3-35
EC-Earth3	SSP2-4.5	2100	EC-SSP2-100	MPI-ESM1-2-LR	SSP5-8.5	2035	MPI-SSP5-35
EC-Earth3	SSP3-7.0	2100	EC-SSP3-100	MPI-ESM1-2-LR	SSP1-2.6	2050	MPI-SSP1-50
EC-Earth3	SSP5-8.5	2100	EC-SSP5-100	MPI-ESM1-2-LR	SSP2-4.5	2050	MPI-SSP2-50
GFDL-ESM4	SSP1-2.6	2035	GFDL-SSP1-35	MPI-ESM1-2-LR	SSP3-7.0	2050	MPI-SSP3-50
GFDL-ESM4	SSP2-4.5	2035	GFDL-SSP2-35	MPI-ESM1-2-LR	SSP5-8.5	2050	MPI-SSP5-50
GFDL-ESM4	SSP3-7.0	2035	GFDL-SSP3-35	MPI-ESM1-2-LR	SSP1-2.6	2100	MPI-SSP1-100
GFDL-ESM4	SSP5-8.5	2035	GFDL-SSP5-35	MPI-ESM1-2-LR	SSP2-4.5	2100	MPI-SSP2-100
GFDL-ESM4	SSP1-2.6	2050	GFDL-SSP1-50	MPI-ESM1-2-LR	SSP3-7.0	2100	MPI-SSP3-100
GFDL-ESM4	SSP2-4.5	2050	GFDL-SSP2-50	MPI-ESM1-2-LR	SSP5-8.5	2100	MPI-SSP5-100

¹ With AAL values on the order of tens of colones.

3.1 General Results of RN2

3.1.1 Average Annual Loss (AAL)

Table 4 presents a summary of the AAL for the bridge portfolio, while Table 5 presents the corresponding results for the road segment portfolio. AAL values are shown by hazard, both in absolute monetary terms (Costa Rican colones) and in relative terms with respect to the total exposed value of the portfolio. Relative values are expressed per thousand (‰). The amount can be expressed in U.S. dollars (USD) using the average exchange rate for December 2025, equivalent to 1 USD = 490 CRC. To limit the length of the text and facilitate readability, not all climate scenarios considered are included. For climate-sensitive hazards, only the AAL values corresponding to the baseline climate and the future climate scenarios that produce the highest and lowest portfolio-level values are presented. All results can be found as part of the datasets.

As mentioned previously, the AAL represents the mean value of annual losses. In other words, it is the annual compensation amount that would be required to offset the accumulated losses caused by events over the long term. For example, in the case of rainfall-triggered landslides under the baseline climate, the absolute AAL for the road portfolio (Table 5) is ₡ 500 million. This means that, if it were possible to pay annually for all losses caused by this hazard on this route under current climate conditions, the annual payment would correspond to that AAL amount. This annual loss, when compared to the total exposed value of the portfolio, corresponds to 1.64 ‰. This means that, for every ₡ 1,000 of value in the road portfolio, an average of ₡ 1.64 is lost each year. This relative indicator helps contextualize the magnitude of the loss in relation to the actual size of the portfolio.

The results obtained fall within reasonable and expected ranges for these types of hazards and for the road portfolio considered.

Table 4. Average Annual Loss of bridges by hazard and climate. Values in Costa Rican colones (CRC).

Portfolio		Bridges		
VALFIS		66 788 258 800		
Hazard	Year	GCM	AAL (%)	AAL (CRC)
Earthquake			3.43	229,346,255
Riverine flooding	Baseline climate	—	0.05	3,395,320
	2035	EC-SSP3	0.05	3,227,097
		GFDL-SSP1	0.05	3,406,299
	2050	EC-SSP3	0.05	3,167,666
		GFDL-SSP1	0.05	3,371,250
	2100	EC-SSP5	0.04	2,884,537
GFDL-SSP1		0.05	3,398,583	
Earthquake-triggered landslides			0.18	12,010,647
Rainfall-triggered landslides	Baseline climate	—	0.50	33,079,709
	2035	EC-SSP3	0.43	28,975,838
		GFDL-SSP1	0.57	38,201,670
	2050	EC-SSP1	0.47	31,212,053
		GFDL-SSP1	0.61	40,788,419
	2100	EC-SSP1	0.46	30,655,101
GFDL-SSP1		0.68	45,205,579	
Volcanic ash			0.08	5,084,309

Table 5. Average Annual Loss of road segments by hazard and climate. Values in Costa Rican colones (CRC).

Portfolio		Roads		
VALFIS		304 447 000 000		
Hazard	Year	GCM	AAL (‰)	AAL (CRC)
Earthquake			0.06	16 929 147
Riverine flooding	Baseline climate		0.37	113 584 527
	2035	EC-SSP3	0.36	108 104 332
		GFDL-SSP1	0.37	113 914 737
	2050	EC-SSP3	0.35	106 183 896
		GFDL-SSP1	0.37	112 775 785
	2100	EC-SSP5	0.32	96 848 139
GFDL-SSP1		0.37	113 914 737	
Earthquake-triggered landslides			1.27	386 412 038
Rainfall-triggered landslides	Baseline climate		1.64	500 017 195
	2035	EC-SSP1	1.47	446 313 180
		GFDL-SSP1	1.97	600 079 555
	2050	MPI-SSP3	1.44	437 606 165
		GFDL-SSP2	2.15	655 462 551
	2100	EC-SSP1	1.47	447 775 583
GFDL-SSP1		2.39	726 512 223	
Volcanic ash			0.07	20 616 961

For bridges, the total assessed physical value is approximately ₡ 66.8 billion, and seismic hazard represents the main component of expected loss, with a relative AAL of 3.43‰ and an annual loss on the order of ₡ 229 million. In contrast, hazards such as riverine flooding show substantially lower levels, with values close to 0.05‰, while the contribution of volcanic ash remains around 0.08‰, representing a secondary but quantifiable component within the multi-hazard balance.

In the case of road segments, the portfolio has a considerably higher physical valuation (approximately ₡ 304.4 billion) and exhibits a different risk pattern. The AAL associated with earthquakes is relatively low (0.06‰), while gravitational processes dominate the probabilistic results. In particular, rainfall-triggered landslides reach relative values of approximately 1.64‰ under baseline climate conditions, with expected annual losses exceeding ₡ 500 million. Under future climate scenarios, these values increase to around 2.39‰ and ₡ 726 million by the year 2100 in some GCMs.

This indicates that, within the road portfolio, hydrometeorologically induced slope instability accounts for a significant fraction of the expected annual risk.

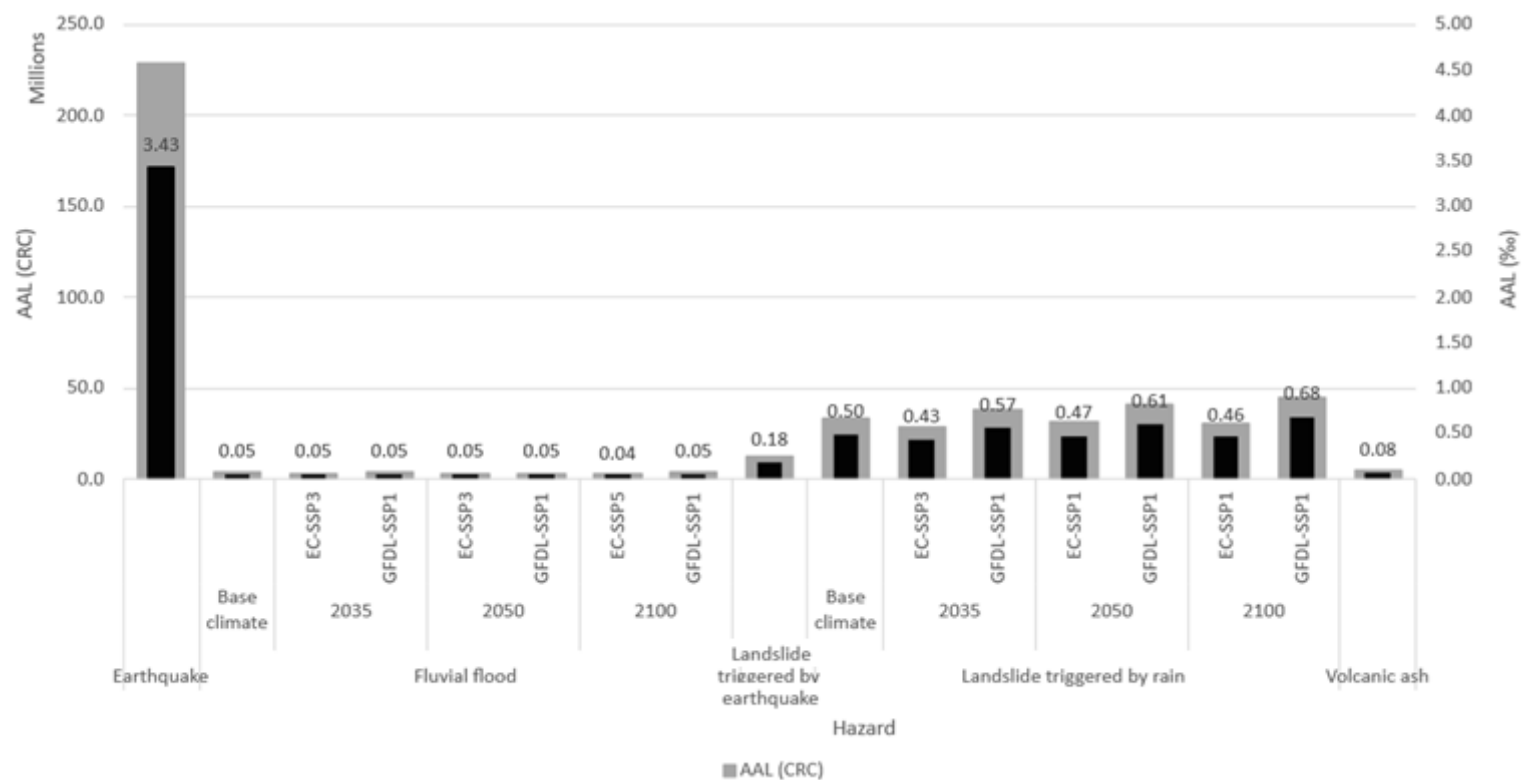


Figure 6. Average Annual Loss. Bridges portfolio

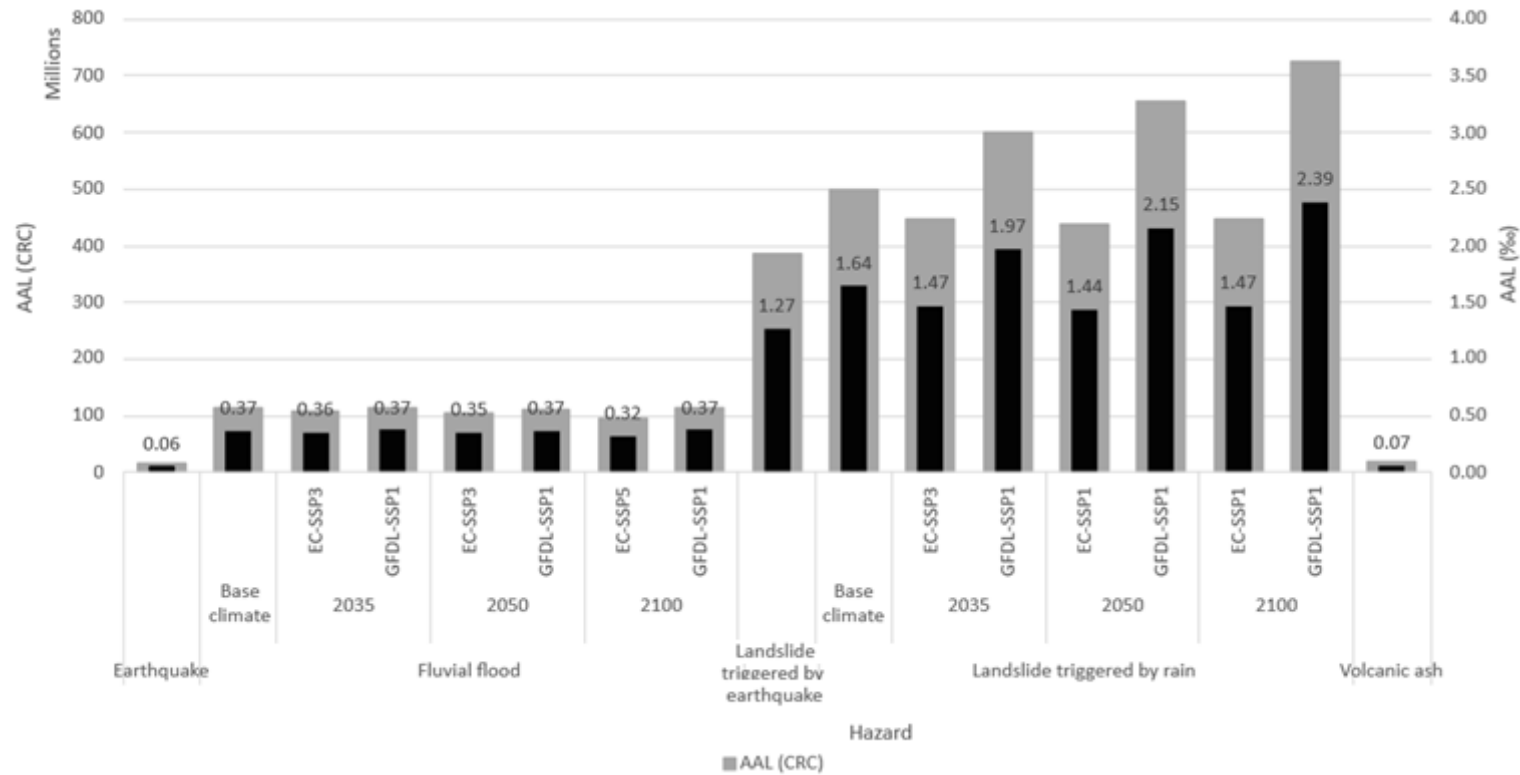


Figure 7. Average Annual Loss. Roads portfolio

As explained previously, although Figure 6 presents the full set of results for earthquakes, earthquake-triggered landslides, and volcanic eruptions, only the baseline climate and two future climate scenarios are shown for riverine flooding and rainfall-triggered landslides. However, it is useful to review the consolidated total AAL results for these two hazards, including all climate scenarios under which they were evaluated. Figure 8 and Figure 9 show the AAL as a function of time. Each line represents a different climate projection, that is, a specific combination of GCM and emission pathway. This allows visualization of the temporal evolution of risk under different climate modeling assumptions.

As observed, although fluctuations in AAL values occur across the years considered, these variations do not follow a strictly increasing pattern over time or in relation to emission pathways. In other words, risk does not necessarily increase with higher emissions, nor does it systematically grow toward the future. This behavior is entirely normal and expected, as the relationship between greenhouse gas emissions and risk is highly nonlinear. Higher emissions do not automatically imply higher risk. The outcome depends on the specific interaction between hazards, exposure, and vulnerability, which together mediate how hydrometeorological phenomena translate into losses under each climate condition evaluated.

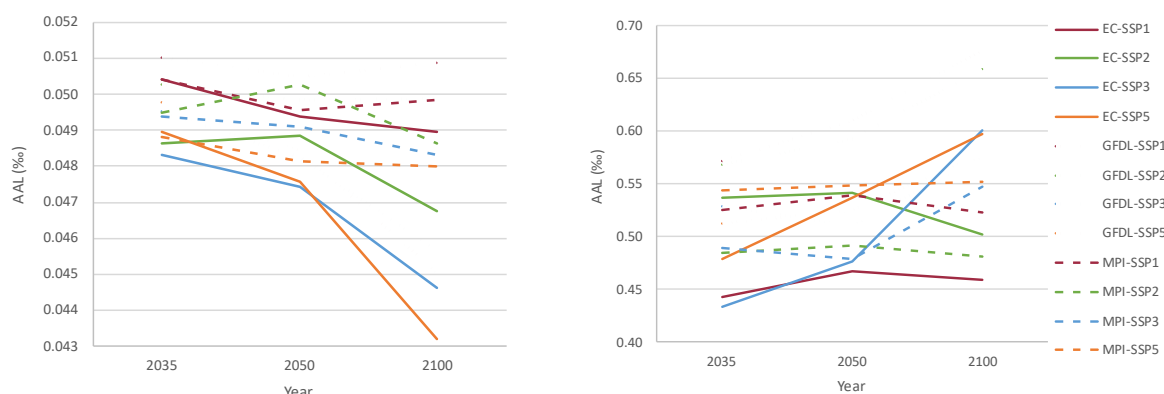


Figure 8. Average Annual Loss in the bridge portfolio due to riverine flooding (left) and rainfall-triggered landslides (right) under the climate change scenarios considered.

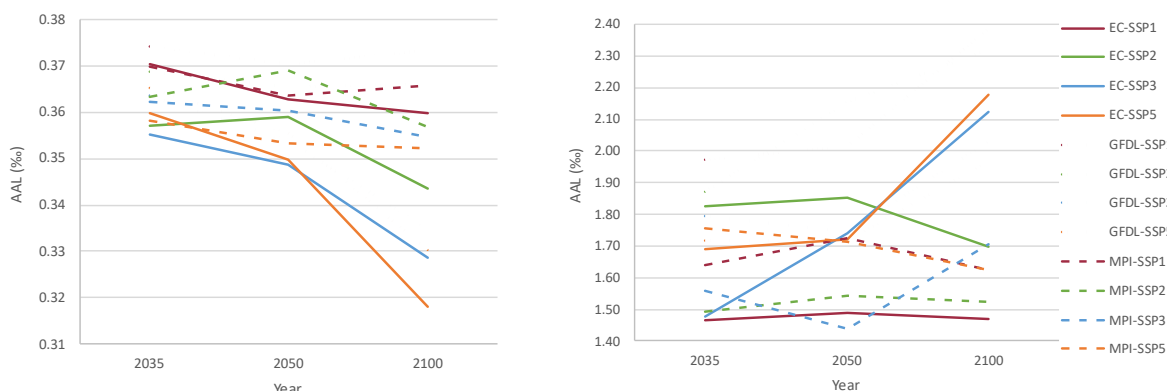


Figure 9. Average Annual Loss in the road segment portfolio due to riverine flooding (left) and rainfall-triggered landslides (right) under the climate change scenarios considered.

Although the AAL amounts differ notably between the bridge and road segment portfolios, the way AAL varies over time is very similar in both cases, since the climate component simulates the same meteorological changes for both portfolios.

In the case of riverine flooding AAL, projected values fall within a relatively narrow range (approximately between 0.32‰ and 0.37‰ for road segments), with moderate differences among combinations of Global Climate Models (GCMs) and emission pathways.

For the year 2035, most curves cluster around 0.35–0.37‰. By 2050, a slight reduction or stabilization is observed in several projections. Toward 2100, some combinations show more pronounced decreases, reaching values close to 0.32‰ in specific scenarios, while others maintain more stable levels around 0.36–0.37‰, reflecting dispersion among models in the magnitude of the projected change.

The curves associated with different GCMs exhibit differentiated behaviors: some trajectories show a progressive decrease throughout the time horizon, while others remain nearly flat or display only minor variations between 2035 and 2100.

In particular, certain combinations under high-emission scenarios show more pronounced reductions toward 2100, whereas other realizations maintain an AAL close to the initial level.

Overall, the figure indicates that the projected change signal for riverine flooding manifests primarily as gradual adjustments within a bounded range, with notable variability depending on the climate model considered.

For rainfall-triggered landslides, projections show a much wider range and a more pronounced temporal evolution.

AAL values are around 1.45–1.95‰ in 2035, but several combinations increase substantially toward 2050 and especially toward 2100, in some cases exceeding 2.3‰ (for road segments). Some curves display sharp increases after 2050, while others show more stable patterns or even decreases toward the end of the century.

This behavior indicates that, for rainfall-induced landslides, dispersion among climate models and emission scenarios translates into wider differences in projected average annual loss, both in absolute magnitude and in temporal trend.

Figure 8 and Figure 9 illustrate the very high level of uncertainty inherent in risk modeling that incorporates climate change projections. Each line shown represents one possible trajectory of change in risk. However, it is impossible to know which of these trajectories will materialize in the future—or even whether the actual risk in 2035, 2050, or 2100 will fall within the set of projections analyzed. This is referred to as *deep uncertainty*, as defined in Section 5.5 of the Inception Report.

When risk is treated under conditions of deep uncertainty, point metrics such as AAL become interval metrics; that is, they are inherently imprecise.

In imprecise risk metrics, it is not possible to define a probability distribution within the range of variation of the metric, but only to establish the bounds of that interval. As shown in Figure 8 and Figure 9, the

maximum and minimum AAL values generated for each projection year—resulting from different combinations of GCMs and emission pathways—represent the bounds of the metric for those years.

These bounds define the interval of variation of the AAL. As this interval evolves over time, it reflects how projected greenhouse gas concentration pathways influence the range of possible future risk outcomes under the multiple scenarios considered.

3.1.2 Probable Maximum Loss (PML)

As mentioned in Section 2.3.2, PML curves are an alternative way of presenting loss exceedance curves. They provide a complete representation of portfolio risk, incorporating both frequent events with relatively low losses and catastrophic events with very low probabilities of occurrence.

The PML curve format, expressed in terms of return period, allows for clearer communication of the level of risk associated with events across the full frequency spectrum—from very frequent events to rare, low-probability events.

Figure 10 presents the PML curves for all hazards and climate scenarios considered for the bridge portfolio. Figure 11 presents the corresponding curves for the road segment portfolio. These curves illustrate the increasing nature of loss as a function of return period, that is, how losses grow as events become less frequent.

Two general patterns can be observed in the PML curves: i) Curves with slow growth as return period increases, without clear stabilization, typical of low-frequency hazards such as earthquakes and volcanic eruptions, and ii) curves with rapid growth at short return periods and a clear stabilization, showing nearly constant values at long return periods, typical of high-frequency hazards such as riverine flooding.

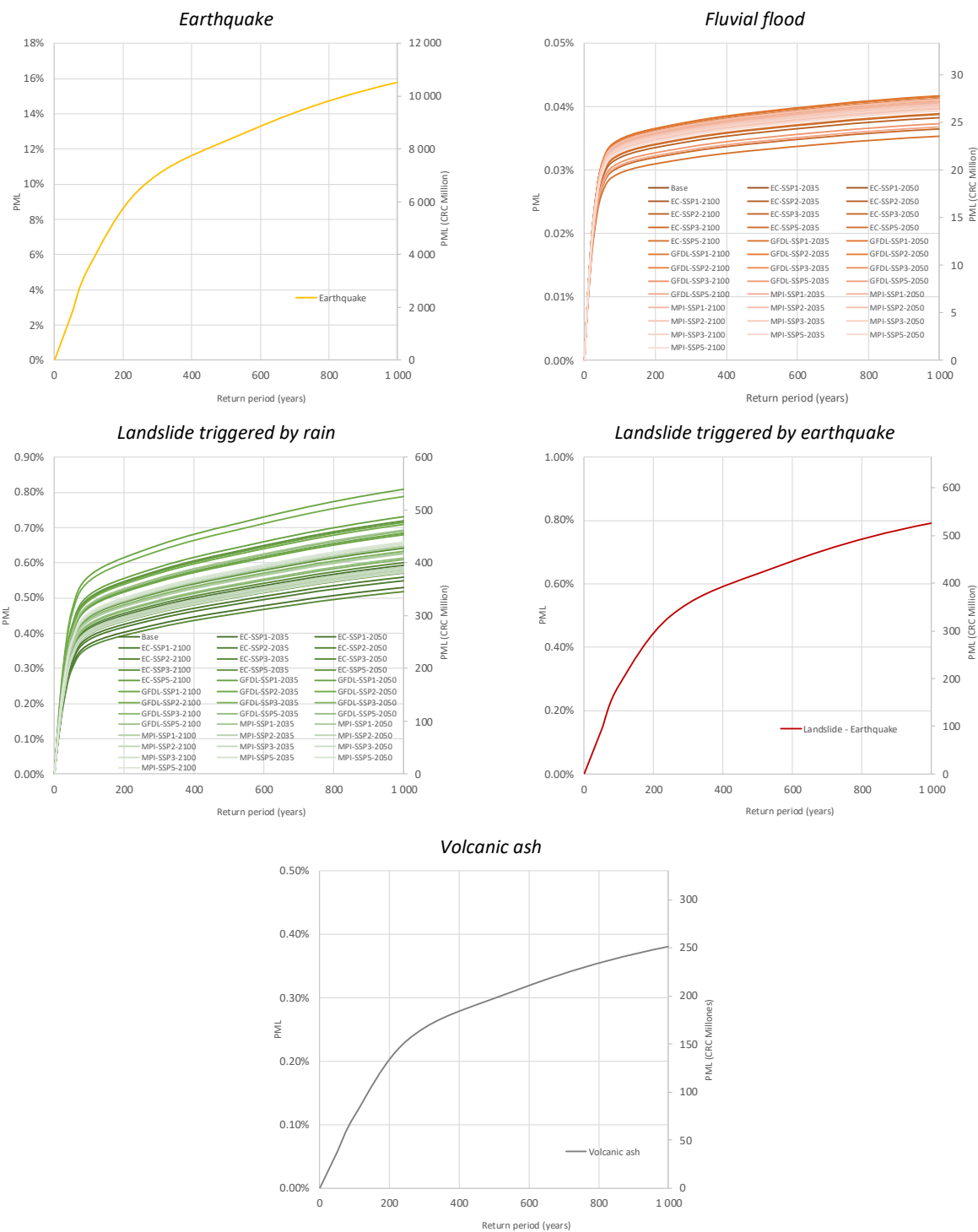


Figure 10. PML curves for bridges under all hazards and all climate scenarios considered.

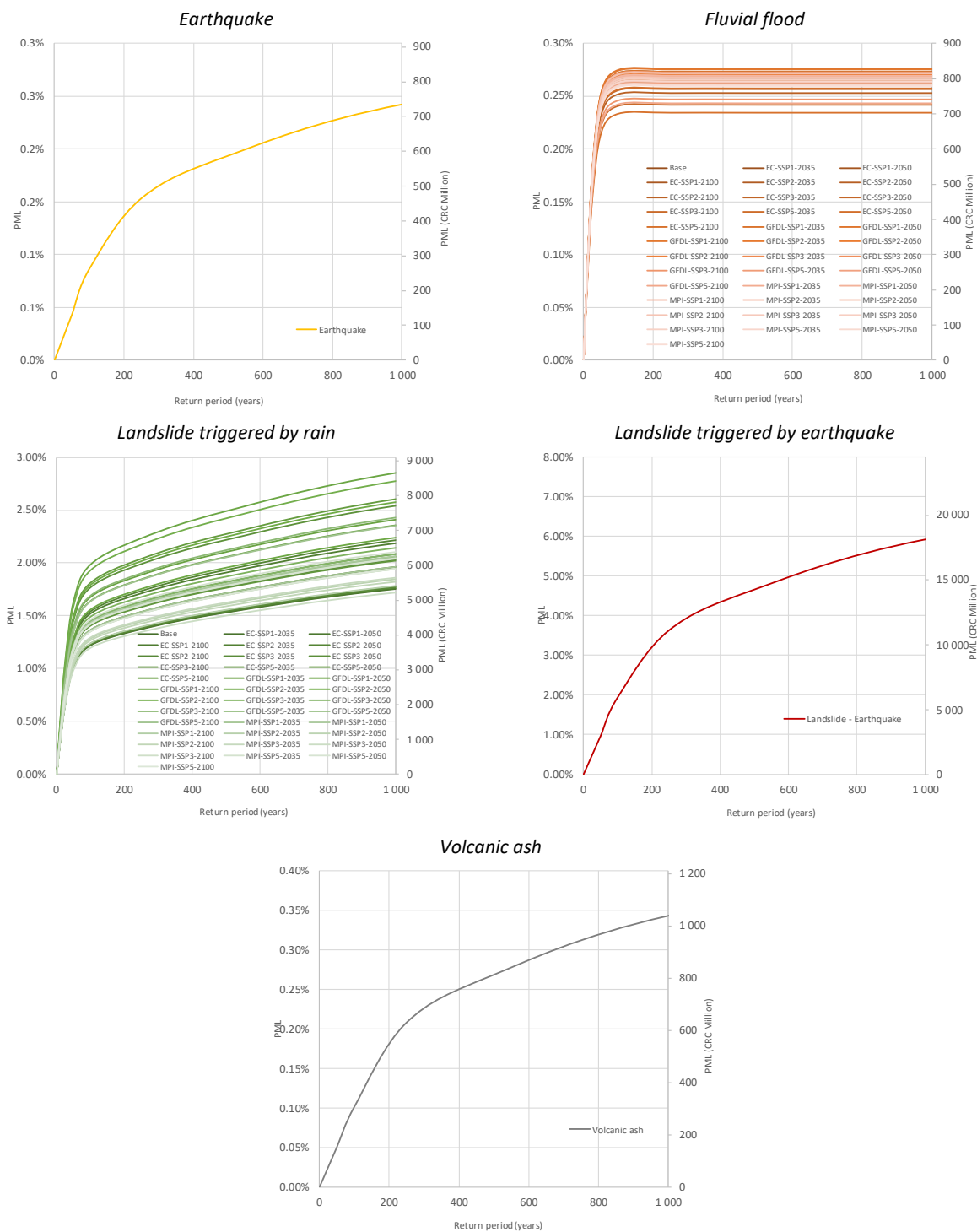


Figure 11. PML curves for road segments under all hazards and all climate scenarios considered.

For the road portfolio, the aggregated curves show differentiated trajectories depending on the type of hazard, reflecting not only the expected annual loss but also the potential for low-frequency extreme events. The simultaneous inclusion of earthquakes, riverine flooding, rainfall- and earthquake-triggered landslides, as well as volcanic ash, allows observation of the relative hierarchy of risk within the catastrophic range.

For road segments, comparison across hazards shows that landslides—particularly rainfall-triggered ones—tend to produce steeper curves and higher losses at long return periods, consistent with their previously observed strong probabilistic contribution in terms of AAL. Riverine flooding appears as a mechanism of moderate losses, while earthquakes and volcanic ash generally occupy a lower range, except at extreme return periods where dispersion may increase.

For bridges, the PML curves exhibit a different profile, with seismic hazard playing a more dominant role in the maximum loss range. This is consistent with the greater structural vulnerability and concentration of losses in discrete elements such as bridges, compared to the distributed nature of the road inventory. Landslides and volcanic ash appear as additional contributors, but their curves are generally subordinate to seismic risk at high return periods, allowing differentiation of predominant damage mechanisms according to asset typology.

Figure 12 and Figure 13 present a comparison of the PML curves for road segments and bridges, respectively, showing only the climate scenarios that produce the highest AAL in each future projection year for rainfall-triggered landslides and riverine flooding. This approach is adopted because including all 36 future climate scenarios for these hazards in a single figure would prevent an appropriate comparison.

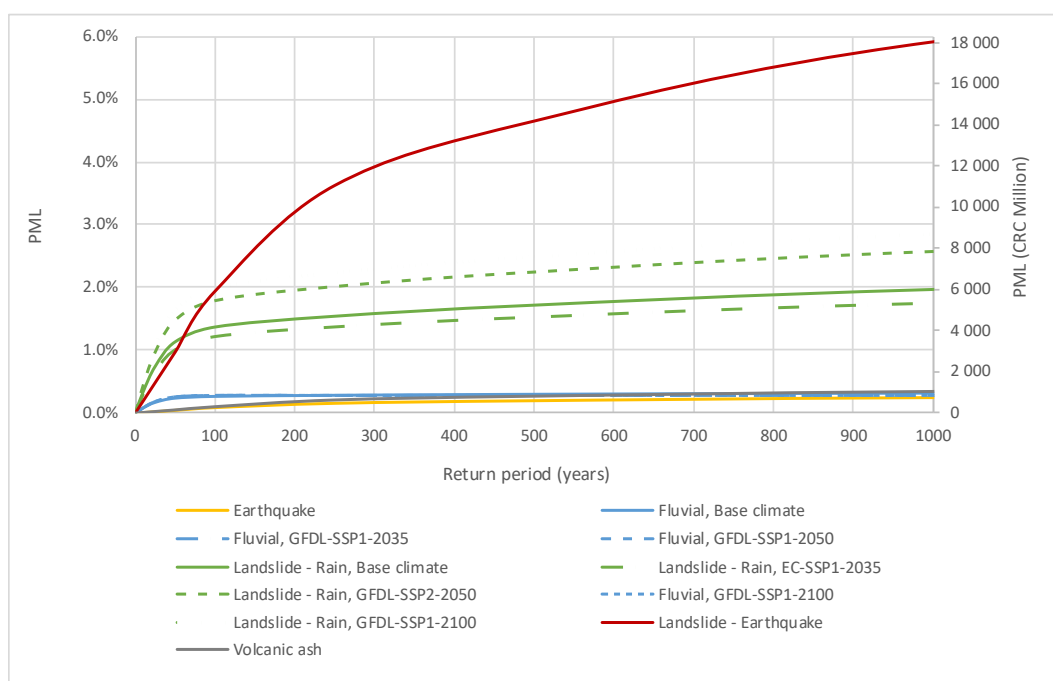


Figure 12. Comparison of PML curves for the hazards considered and selected climate scenarios for roads segments.

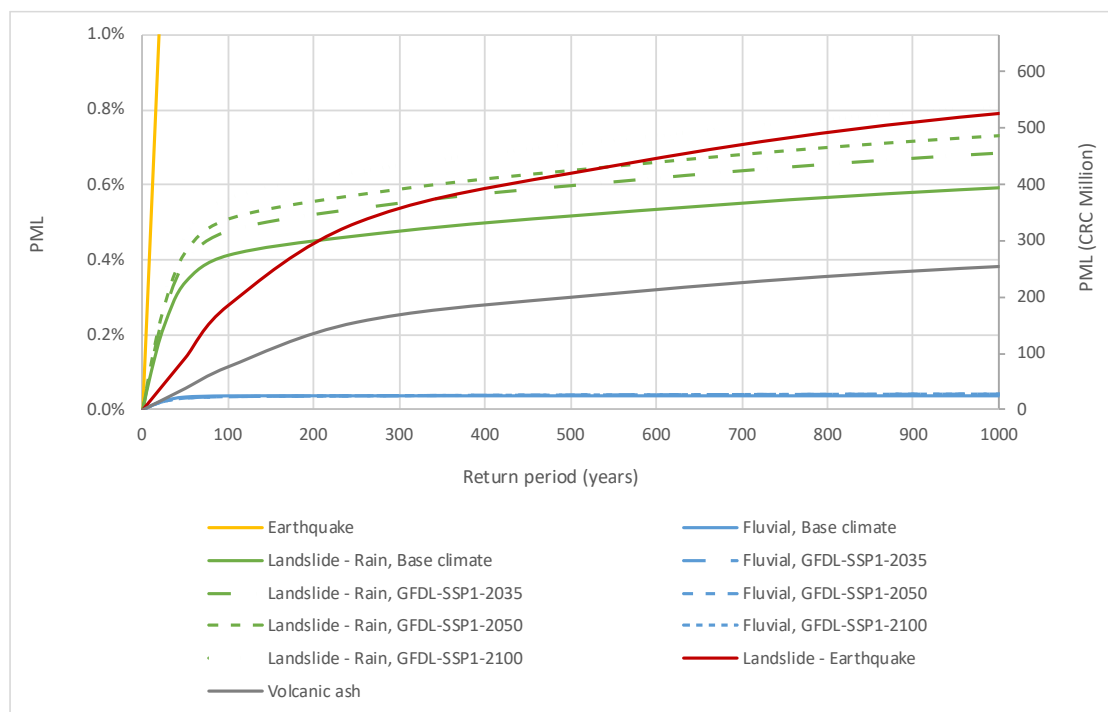


Figure 13. Comparison of PML curves for the hazards considered and selected climate scenarios for bridges.

The comparative figures also allow selected climate scenarios to be contrasted, showing that climate change primarily affects riverine flooding and rainfall-induced landslide hazards by modifying the tail of the loss distributions.

This behavior is reflected in vertical upward shifts of the curves toward higher losses under certain GCM scenarios, particularly at longer time horizons, and can be observed in Figure 12 and Figure 13. The comparative PML curves illustrate the different behavior of rainfall-induced landslides and riverine flooding under the evaluated climate model–scenario combinations. Rainfall-induced landslides show higher loss levels and greater variability between climate scenarios, reflected in the wider spacing of the curves. This indicates that landslide losses are more sensitive to climate variability and to the selected GCM scenario. In contrast, riverine flooding presents lower variability between scenarios, with curves remaining more closely grouped and showing smaller differences in losses across future projections. These results highlight the importance of explicitly modeling climate variability in hydrometeorological hazards within PML analyses.

3.2 Location-based results

The results presented above are useful for quantifying the risk of National Route 2 from a portfolio perspective, supporting sector-level risk management decisions and informing the design of financial protection instruments intended to cover the entire corridor.

However, portfolio-level results do not show what occurs at the individual level for each road segment or bridge in terms of the risk they face. For each element in the exposure model, risk is evaluated in terms of Average Annual Loss (AAL). Only AAL is presented at this level, as it is the only risk metric that can be disaggregated to individual locations².

The maps presented in Figure 14 through Figure 18 show the spatial distribution of AAL (expressed per thousand, relative to the exposed value of each element) for all road segments and bridges included in the assessment. For space considerations, AAL results are shown for all hazards, but only under baseline climate conditions for climate-sensitive hazards. Nevertheless, the full set of results is included in the project dataset.

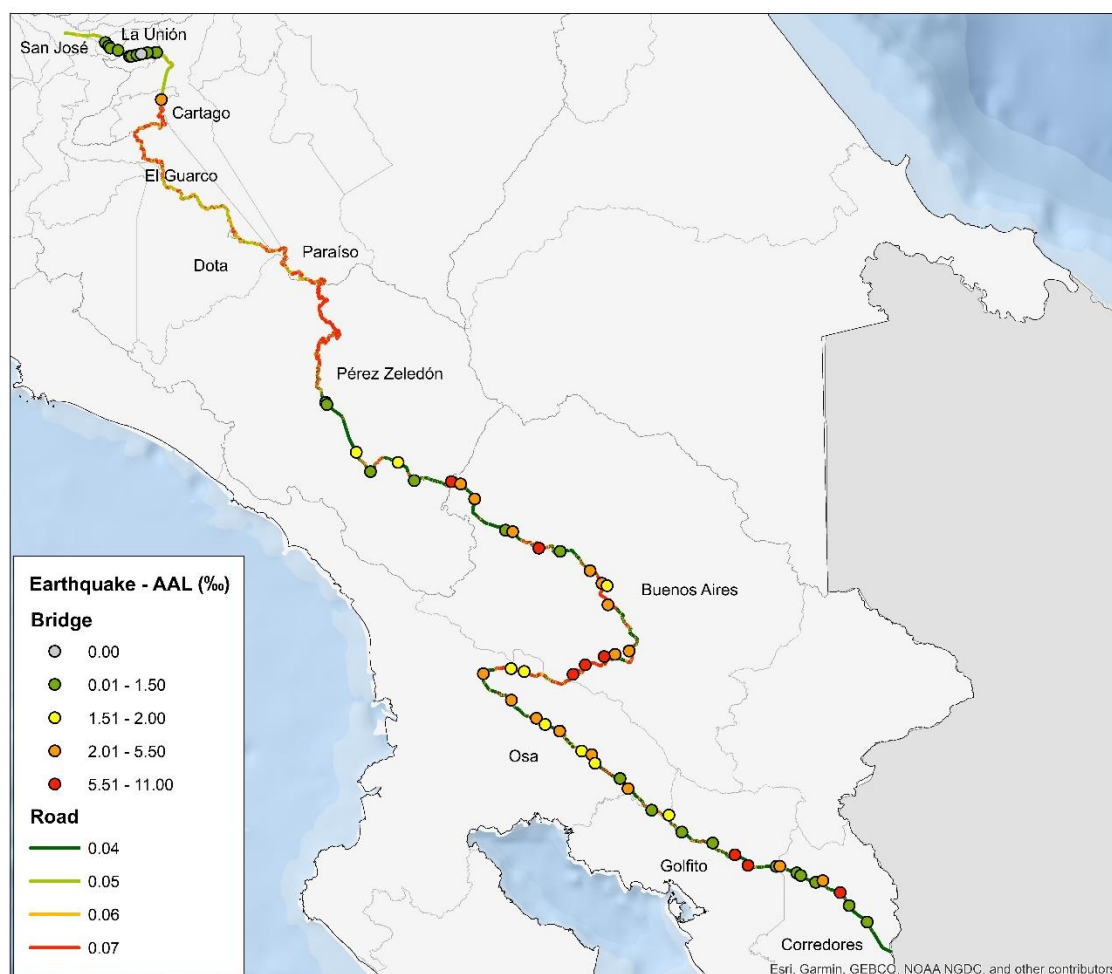


Figure 14. Average Annual Loss due to earthquakes. Values expressed per thousand (‰).

²Although it is mathematically possible to disaggregate PML by location, the uncertainty associated with such estimates is too high; therefore, this disaggregation is not performed. Portfolio-level PML, on the other hand, benefits from a reduction in overall uncertainty due to the law of large numbers, as it aggregates many exposed elements into a single result. For this reason, PML is reported only at the portfolio level.

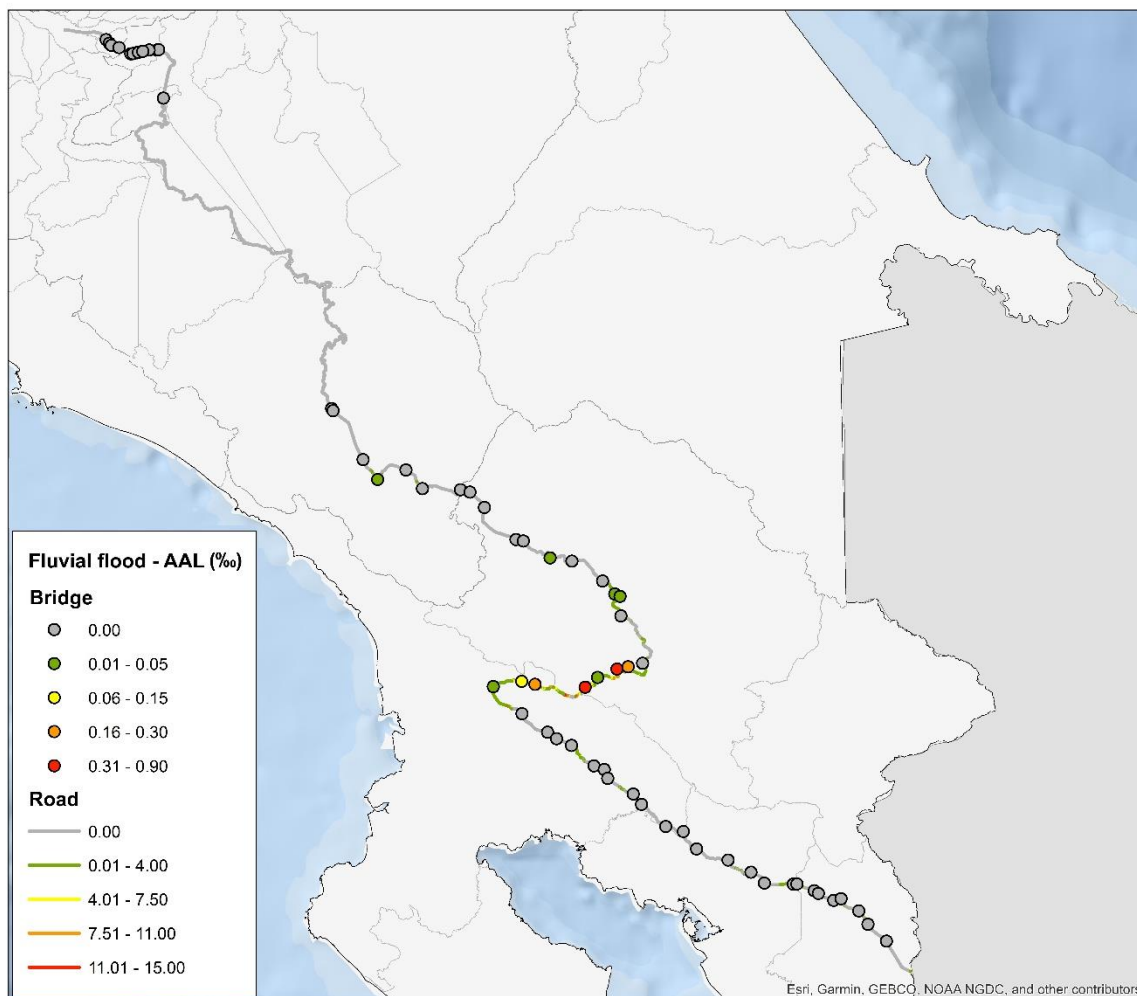


Figure 15. Average Annual Loss due to riverine flooding. Values expressed per thousand (‰).

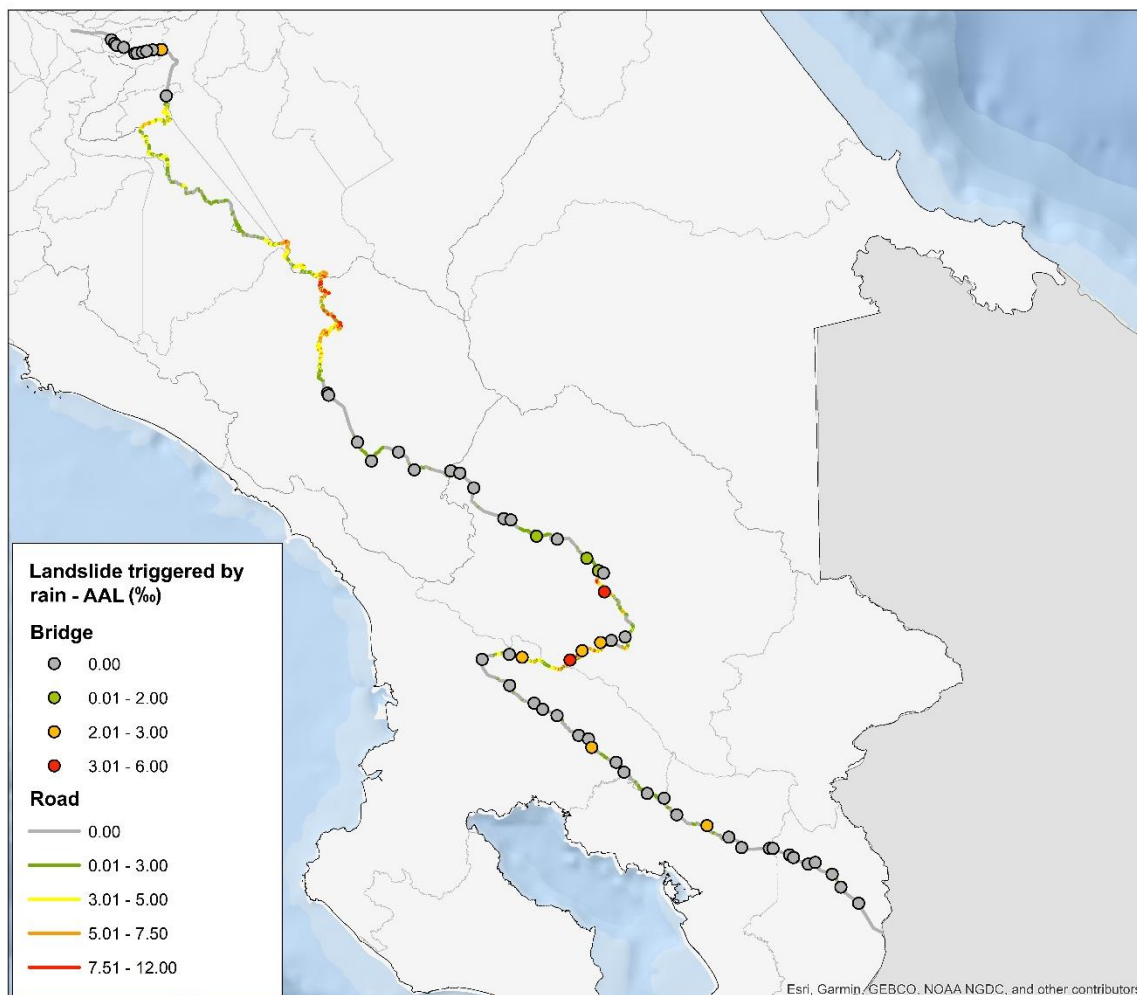


Figure 16. Average Annual Loss due to rainfall-triggered landslides. Values expressed per thousand (%).

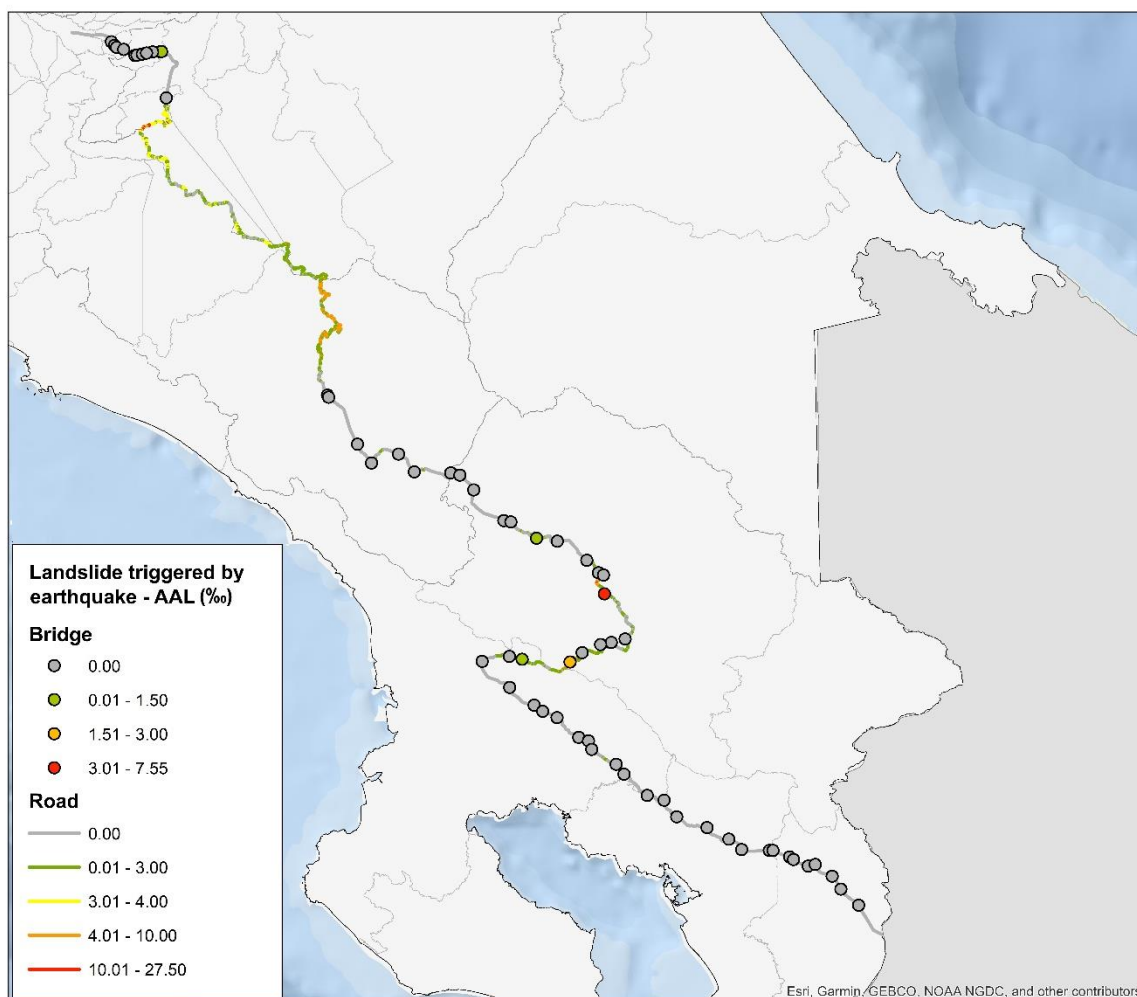


Figure 17. Average Annual Loss due to earthquake-triggered landslides. Values expressed per thousand (‰).

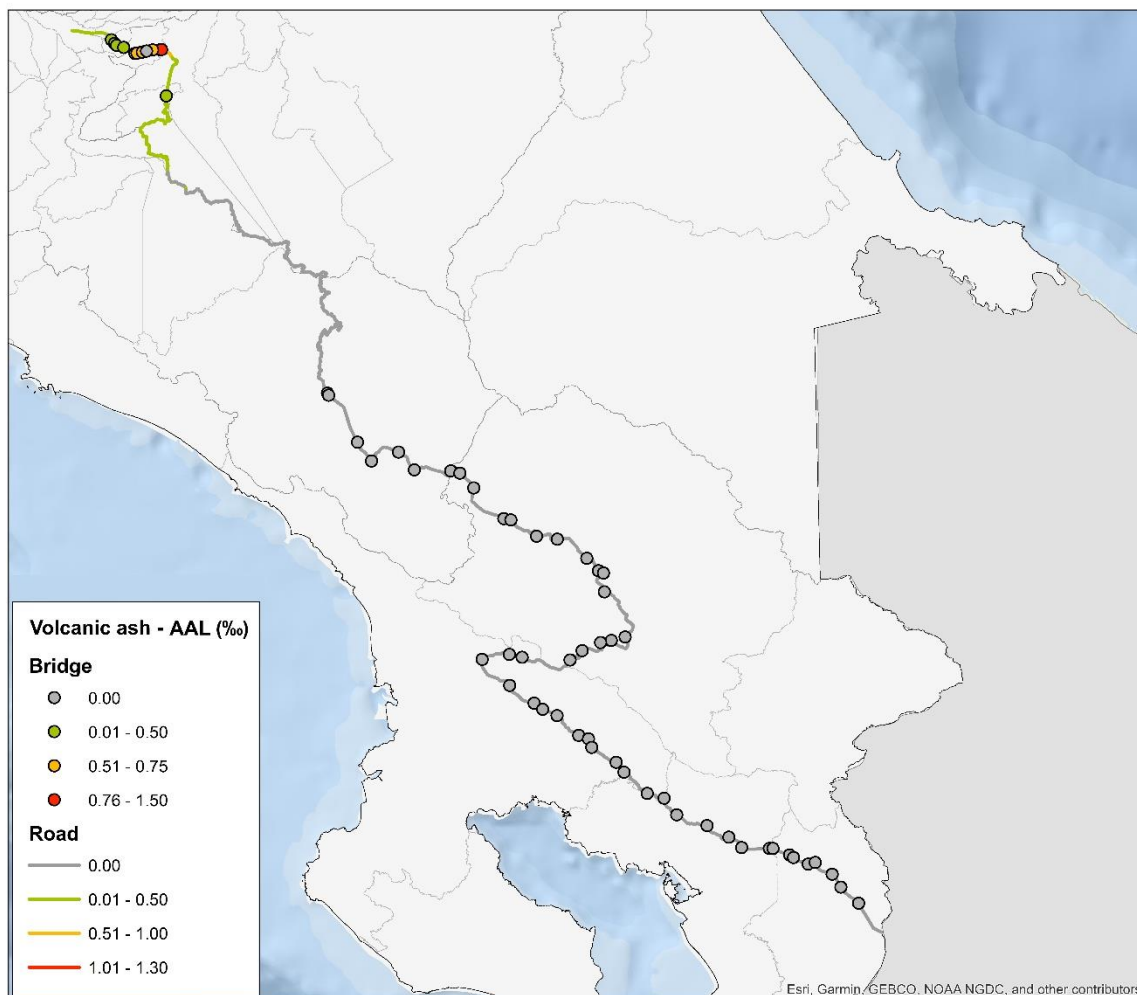


Figure 18. Average Annual Loss due to volcanic ash. Values expressed per thousand (‰).

The AAL map for earthquakes reflects the pattern of tectonic hazard and structural vulnerability, highlighting segments within the corridor where relative annual loss is higher. This result captures both the expected ground motion intensity and the accumulated exposure in critical assets, particularly bridges.

In contrast, riverine flooding shows a more localized distribution, associated with river crossings and alluvial plains, where expected annual impacts are concentrated at specific points rather than continuously along the corridor.

The maps of rainfall-triggered and earthquake-triggered landslides display a more extensive and dominant spatial pattern, consistent with their relevance in the aggregated metrics. In particular, relative annual loss due to rainfall-induced landslides is widely distributed across mountainous and steep-slope areas, reflecting the regional character of this hazard along the corridor.

Earthquake-triggered landslides, although generally contributing less on an annual basis, appear concentrated in zones where the interaction between seismicity and gravitational susceptibility increases the potential for losses.

Finally, the volcanic ash map incorporates an eruptive component that is typically omitted in traditional road risk assessments. Although its expected annual contribution is lower compared to dominant hazards, the spatial representation identifies sectors where exposure to ashfall could generate recurrent losses associated with functional disruptions or service degradation.

3.3 Aggregated Results by Administrative Units

Risk results are typically presented at the portfolio level and by location, as shown previously. However, it is important to identify the regions of the country where risk is concentrated by aggregating results across administrative geographic units. This enables comparison of risk levels within specific jurisdictions and supports sectoral or territorial decision-making within disaster risk management.

Below, total Average Annual Losses (AAL) are presented aggregated at the canton level. Since National Route 2 crosses only a limited number of cantons, the corresponding AAL values are presented numerically in Table 6 through Table 9. A graphic map representation would be less informative given the small number of geographic units involved.

Both absolute AAL values (in Costa Rican colones) and relative values (per thousand, ‰) are included. The amount can be expressed in U.S. dollars (USD) using the average exchange rate for December 2025, equivalent to 1 USD = 490 CRC. As in previous sections, for climate-sensitive hazards only baseline climate AAL values are shown. Nevertheless, the complete set of results is available in the project dataset.

Table 6. Average Annual Loss of bridges by canton and hazard. Values in Costa Rican colones (CRC).

Province	Canton	AAL Earthquake (CRC)	AAL Riverine flooding (CRC)	AAL Earthquake triggered landslides (CRC)	AAL Rainfall-triggered landslides (CRC)	AAL volcanic ash (CRC)
San José	Curridabat	542 074	0	0	0	828 627
	Pérez Zeledón	3 597 401	34 404	0	0	0
Cartago	La Unión	2 464 941	0	351 499	1 023 875	4 227 096
	El Guarco	3 129 085	0	0	0	28 586
Puntarenas	Buenos Aires	123 239 563	2 827 109	10 926 469	25 190 181	0
	Osa	50 669 946	533 806	732 679	4 256 408	0
	Golfito	26 882 537	0	0	2 609 244	0
	Corredores	18 820 708	0	0	0	0
TOTAL – National Route 2		229 346 255	3 395 319	12 010 647	33 079 708	5 084 309

Table 7. Relative Average Annual Loss of bridges by canton and hazard. Values per thousand (‰).

Province	Canton	AAL Earthquake (‰)	AAL Riverine flooding (‰)	AAL Earthquake triggered landslides (‰)	AAL Rainfall-triggered landslides (‰)	AAL volcanic ash (‰)
San José	Curridabat	0.18	0.00	0.00	0.00	0.28

Province	Canton	AAL Earthquake (‰)	AAL Riverine flooding (‰)	AAL Earthquake triggered landslides (‰)	AAL Rainfall-triggered landslides (‰)	AAL volcanic ash (‰)
	Pérez Zeledón	0.44	0.00	0.00	0.00	0.00
Cartago	La Unión	0.39	0.00	0.06	0.16	0.67
	El Guarco	4.23	0.00	0.00	0.00	0.04
Puntarenas	Buenos Aires	5.38	0.12	0.48	1.10	0.00
	Osa	3.76	0.04	0.05	0.32	0.00
	Golfito	4.03	0.00	0.00	0.39	0.00
	Corredores	3.35	0.00	0.00	0.00	0.00
TOTAL – National Route 2		3.43	0.05	0.18	0.50	0.08

Table 8. Average Annual Loss of road segments by canton and hazard. Values in Costa Rican colones (CRC).

Province	Canton	AAL Earthquake (CRC)	AAL Riverine flooding (CRC)	AAL Earthquake triggered landslides (CRC)	AAL Rainfall-triggered landslides (CRC)	AAL volcanic ash (CRC)
San José	San José	301 572	0	0	0	954 848
	Desamparados	357 191	0	11 199 489	12 562 589	48 469
	Montes de Oca	145 822	0	0	0	752 846
	Dota	734 727	0	15 806 102	24 618 184	8 994
	Curridabat	284 749	0	0	0	1 668 774
	Pérez Zeledón	3 797 387	479 914	196 985 376	157 459 375	0
Cartago	Cartago	729 626	0	1 583 610	4 009 502	5 368 772
	Paraíso	586 359	0	18 052 892	36 143 857	219
	La Unión	823 803	16 069	238 588	4 728 625	11 427 190
	El Guarco	1 682 883	0	55 896 683	56 367 503	386 648
Puntarenas	Buenos Aires	3 449 126	80 751 618	71 930 601	141 999 153	0
	Osa	2 130 916	32 093 896	14 103 744	49 473 193	0
	Golfito	1 095 438	88 023	390 812	9 587 724	0
	Corredores	808 635	155 006	224 142	3 067 490	0
TOTAL - National Route 2		16 928 234	113 584 527	386 412 038	500 017 195	20 616 760

Table 9. Relative Average Annual Loss of road segments by canton and hazard. Values per thousand (‰).

Province	Canton	AAL Earthquake (‰)	AAL Riverine flooding (‰)	AAL Earthquake triggered landslides (‰)	AAL Rainfall-triggered landslides (‰)	AAL volcanic ash (‰)
San José	San José	0.05	0.00	0.00	0.00	0.15
	Desamparados	0.07	0.00	2.14	2.40	0.01
	Montes de Oca	0.05	0.00	0.00	0.00	0.25
	Dota	0.06	0.00	1.32	2.05	0.00
	Curridabat	0.05	0.00	0.00	0.00	0.28
	Pérez Zeledón	0.06	0.01	2.97	2.37	0.00
Cartago	Cartago	0.05	0.00	0.11	0.27	0.37
	Paraíso	0.07	0.00	2.07	4.14	0.00
	La Unión	0.05	0.00	0.01	0.29	0.71

Province	Canton	AAL Earthquake (‰)	AAL Riverine flooding (‰)	AAL Earthquake triggered landslides (‰)	AAL Rainfall-triggered landslides (‰)	AAL volcanic ash (‰)
	El Guarco	0.06	0.00	2.11	2.13	0.01
Puntarenas	Buenos Aires	0.06	1.33	1.19	2.34	0.00
	Osa	0.05	0.81	0.36	1.25	0.00
	Golfito	0.05	0.00	0.02	0.43	0.00
	Corredores	0.05	0.01	0.01	0.18	0.00
TOTAL - National Route 2		0.06	0.37	1.27	1.64	0.07

The territorial aggregation of AAL by canton reveals a highly heterogeneous spatial distribution of risk along National Route No. 2, with clear concentrations in cantons located in the southern section and mountainous areas of the corridor.

For bridges, cantons such as Buenos Aires, Osa, and Golfito show high absolute seismic AAL values, reaching tens of millions of colones annually. This reflects both accumulated structural exposure and interaction with regional tectonic conditions. For example, Buenos Aires concentrates more than ₡ 123 million per year in expected seismic losses, along with relevant contributions from landslides and rainfall-related hazards.

In relative terms, bridge AAL shows particularly high values in specific cantons. Buenos Aires reaches 5.38‰ for earthquakes, while El Guarco registers 4.23‰, highlighting areas where the expected annual loss relative to exposed value is substantially higher. Likewise, hazards such as volcanic ash are concentrated in cantons such as La Unión, where the relative value reaches 0.67‰. This suggests that, although globally secondary, this hazard may acquire localized importance depending on proximity to volcanic sources and asset distribution.

For road segments, canton-level disaggregation confirms that landslides are the primary driver of expected losses. Cantons such as Pérez Zeledón present extremely high values for earthquake-triggered landslides (approximately ₡ 197 million) and rainfall-triggered landslides (approximately ₡ 157 million). Meanwhile, Buenos Aires concentrates riverine flood losses exceeding ₡ 80 million and rainfall-induced landslide losses close to ₡ 142 million.

This pattern indicates that losses are spatially associated with segments exhibiting greater geomorphological susceptibility and continuous road exposure, where multiple hazards overlap territorially.

3.4 Deterministic Scenarios

In addition to the results presented above, a deterministic assessment was conducted for selected events with an approximate 50-year return period, in order to visualize risk under specific scenarios.

The following individual events were modeled:

- Riverine flood event in the Térraba River basin, in the southern region of the country. This event involves overflow of the Térraba, Grande de Térraba, General, and Coto Brus rivers. The affected

road section is located along the right bank of the General, Térraba, and Grande de Térraba rivers (in sequence).

- Mw 7.5 earthquake, occurring in the Costa Rican Pacific subduction zone at an approximate depth of 10 km. The earthquake generates peak ground accelerations near the road corridor on the order of 250 cm/s² (0.25 g). This is a multi-hazard event, for which both the impact of ground shaking and the losses from earthquake-triggered landslides were evaluated.

The RN2 exposure associated with the fluvial flooding event comprises approximately 55 km of roadway infrastructure and includes a total of 11 bridges, located within the Buenos Aires and eastern Osa cantons. The exposed segments extend from the area south of the urban center of Buenos Aires district to the urban area of Palmar district.

The results are presented in Figure 19 and Table 10 for the riverine flood scenario, and in Figure 20 and Table 11 for the earthquake scenario. Losses are shown spatially in map format by location, along with total loss figures for each event, disaggregated by subportfolio (road segments and bridges). The estimated losses correspond exclusively to direct physical damage and do not include losses associated with service interruption or indirect economic impacts.

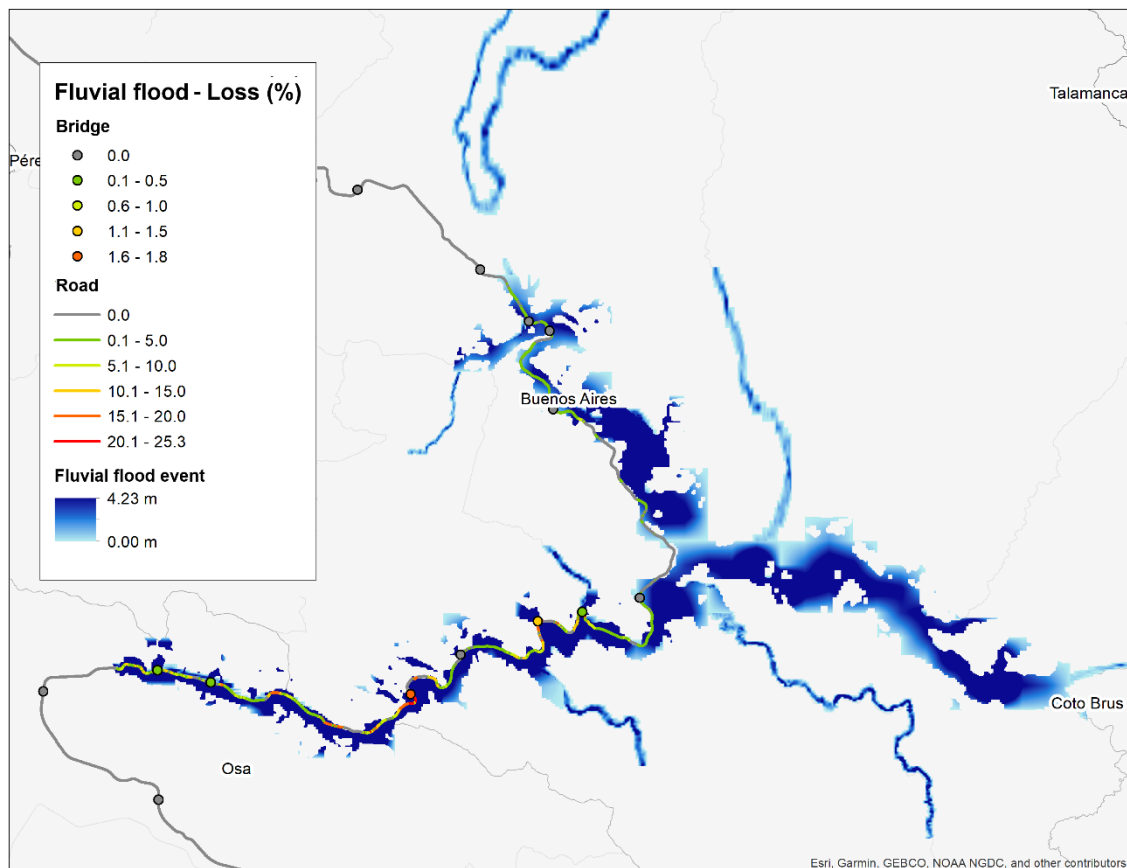


Figure 19. Losses under the deterministic scenario – riverine flooding.

Table 10. Riverine flood scenario loss. Values in Costa Rican colones (CRC).

Portfolio	Economic value (CRC)	Loss (CRC)	Loss (%)
Bridges	66 788 258 800	49 933 275	0.07
Road	304 447 000 000	1 626 928 173	0.53

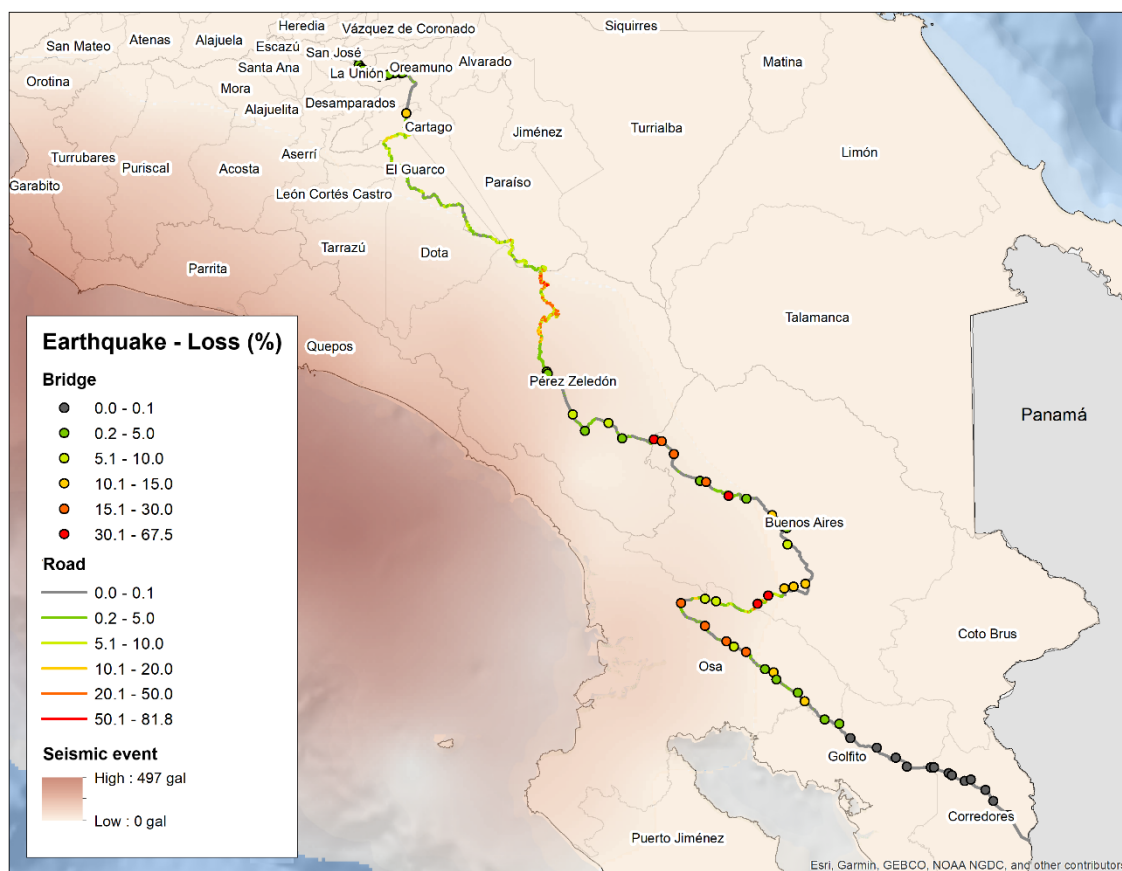


Figure 20. Losses under the deterministic scenario – earthquake.

Table 11. Deterministic earthquake scenario loss. Values in Costa Rican colones (CRC).

Event	Portfolio	Economic value (CRC)	Loss (CRC)	Loss (%)
Earthquake	Bridges	66 788 258 800	7 491 088 684	11.22%
Earthquake	Road	304 447 125 000	342 840 870	0.11%
Earthquake-triggered landslides	Bridges	66 788 258 800	213 551 320	0.32%
Earthquake-triggered landslides	Road	304 447 125 000	9 296 317 929	3.05%
Total	Bridges	66 788 258 800	7 704 640 004	11.54%
Total	Road	304 447 125 000	9 639 158 799	3.17%

The results of the deterministic riverine flood scenario show a differentiated impact across asset typologies.

For the bridge portfolio, with an approximate economic valuation of ₡ 66.8 billion, the estimated direct loss under this event reaches about ₡ 49.9 million, representing only 0.07% of the exposed value.

In contrast, for the road segment portfolio, with a much higher exposure (approximately ₡ 304.4 billion), the deterministic loss amounts to roughly ₡ 1,627 million, equivalent to 0.53% of the exposed value.

This quantitative difference indicates that, under a hydraulic event of this nature, impacts are more significantly concentrated in surface road infrastructure than in discrete structures such as bridges. This interpretation should be considered within the limitations of the assessment outlined in Section 2.4, including, for example, the exclusion of debris flow impacts on the bridge portfolio.

The spatial distribution of flood-related losses further suggests a localized pattern associated with river crossings and flood-prone sectors, where specific segments of the corridor concentrate the majority of economic damage. In this sense, the deterministic scenario does not represent a homogeneous loss along the entirety of National Route No. 2 but rather point impacts on sections conditioned by the interaction among hydraulic geometry, road exposure, and the relative location of the event with respect to the network.

A combined interpretation of the map and the table allow the aggregated loss figures to be linked to particular zones of the corridor where the event generates the most significant direct impacts.

In contrast, the deterministic earthquake scenario shows a substantially higher order of magnitude of losses for bridges compared to the flood scenario.

For the bridge portfolio, direct losses due to ground shaking reach approximately ₡ 7,491 million, equivalent to 11.22% of the exposed value. Additionally, when incorporating the component of earthquake-triggered landslides, approximately ₡ 213.6 million (0.32%) is added, resulting in a total combined loss of ₡ 7,705 million, corresponding to 11.54% of the bridge portfolio.

This indicates that, within the deterministic seismic scenario, bridges experience a proportionally high level of impact compared to other assets along the corridor.

For the road segment portfolio, the seismic scenario exhibits a different composition. Direct losses due to ground shaking are relatively moderate (approximately ₡ 343 million, or 0.11%), whereas earthquake-triggered landslides constitute the dominant component, reaching approximately ₡ 9,296 million, equivalent to 3.05% of the exposed value. The combined total road loss therefore amounts to ₡ 9,639 million (3.17%).

3.5 Result Verification

Probabilistic catastrophe risk modeling is based on integrating available information on hazard, exposure, and vulnerability, combined with technical assumptions that allow complex phenomena to be represented in the absence of complete observations. The purpose of this approach is to stochastically characterize the potential consequences of future events that are scientifically plausible but may not yet have occurred in the assessed territory.

In this sense, the results obtained do not constitute a direct extrapolation of historical experience, but rather an analytical construction aimed at estimating low-frequency, high-severity impacts that exceed the range typically documented in disaster records.

Under these conditions, strict validation of risk results—understood as the ability to statistically compare simulated losses against a sufficiently large set of empirical observations to evaluate model fit—is not feasible. Robust validation would require extensive and detailed loss databases covering a wide spectrum of hazard intensities, with systematic information at the individual asset level, including specific construction typologies and exact demand levels experienced during each event.

Such evidence does not exist, nor is it expected to exist in the future, as it would imply the repeated occurrence of severe events under comparable conditions and a level of instrumentation and documentation that has historically not been available, even in the most advanced risk management contexts.

Given this reality, an alternative procedure is proposed to verify the assessment results, based on the concept of the hybrid risk curve (Velázquez, 2014). The hybrid curve is a loss exceedance curve composed of two segments: The first segment is obtained empirically, based on documented information from historical disaster databases, providing a retrospective view of risk for the evaluated portfolio. The second segment corresponds to the analytical loss exceedance curve, estimated through catastrophe modeling such as that implemented in this study, providing a prospective view of disaster risk. The envelope of these two curves constitutes the hybrid risk curve. Figure 21 illustrates these curves.³

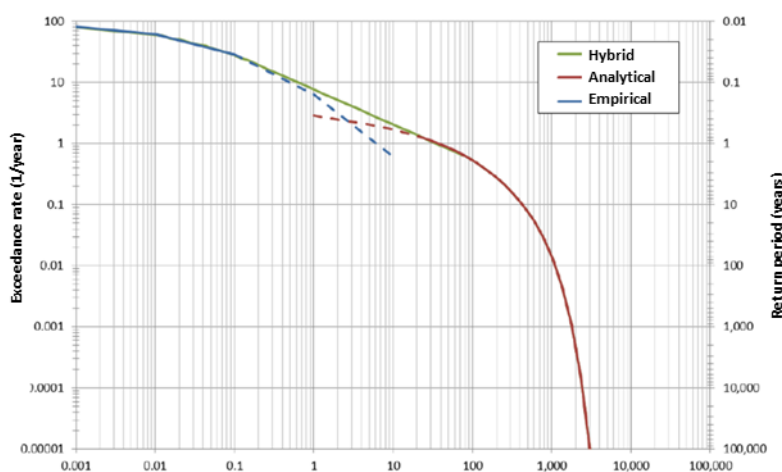


Figure 21. Illustration of analytical, empirical, and hybrid loss exceedance curves. Adapted from Velázquez (2014).

The hybrid risk curve has been used in the past as a complement to analytical risk modeling, with the purpose of capturing losses from very frequent events that may fall outside the scope and resolution of

³ Throughout this section of the document, the loss exceedance curves are presented in graphical format using a logarithmic scale, in order to facilitate visualization.

catastrophe models. At the same time, this approach provides insight into the analytical model's ability to describe historically recorded losses.

As illustrated in Figure 21, the empirical model has limited capacity to correctly represent exceedance rates of large losses, while the analytical model may have limited capacity to adequately represent exceedance rates of smaller, more frequent events. As a result, it is common for both curves to overlap (although this is not a necessary condition). The overlap zone provides information about the extent to which the analytical model is capable of describing at least a portion of the historical losses. This characteristic can be used as a validation process, given the limitations previously discussed.

Figure 22 presents two hypothetical cases of hybrid exceedance curves. In the first case, the analytical curve matches the empirical curve reasonably well, indicating that the catastrophe model has some ability to represent historically recorded losses. In contrast, the second hybrid curve shows a situation where the catastrophe model fails to appropriately reproduce the exceedance rates observed in the historical record. In this example, the model does not adequately capture risk in the overlap zone (and, specifically, underestimates it).

This does not necessarily imply a deficiency in the analytical model, since such models are designed primarily to capture information about events that have not yet occurred. Rather, it illustrates the model's capacity—or lack thereof—to reproduce historical experience. It is important to recognize that, in catastrophe modeling, reproducing historical losses is never the primary objective of the model.

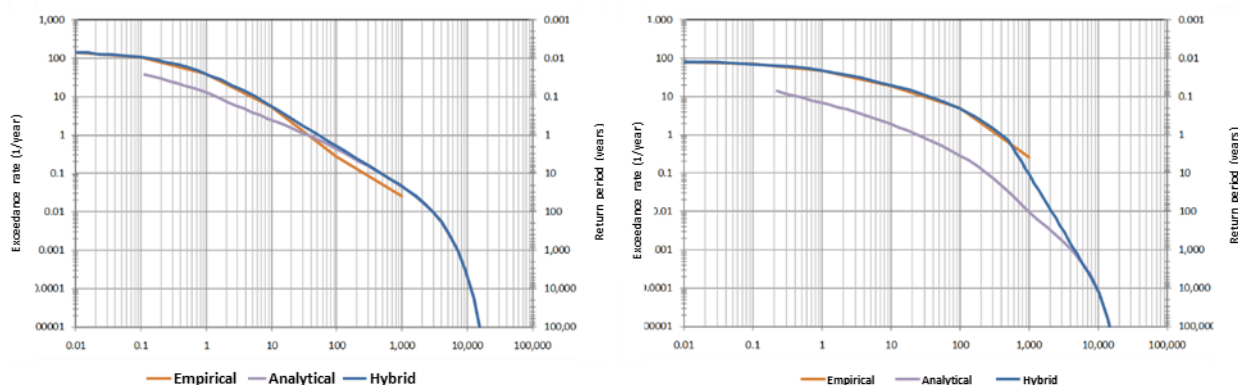


Figure 22. Examples of hybrid risk curves. The curve on the left corresponds to a valid analytical model, while the one on the right corresponds to a non-valid model in terms of its ability to reflect historical losses.

As is evident, this alternative validation procedure can only be applied if a reliable and comprehensive loss record exists, providing sufficient historical information to construct the empirical risk curve.

If such a record does not exist, or if the available data is insufficient or unreliable, this type of verification cannot be carried out.

3.5.1 Costa Rica Disaster Loss Database

Three potential sources of retrospective information on historical losses caused by natural events were reviewed: the international EM-DAT database, the regional DesInventar system, and the national loss module administered by the Ministry of National Planning and Economic Policy (MIDEPLAN).

Based on this review, it was determined that, for the specific case of Costa Rica, the institutional source maintained by MIDEPLAN provides the most complete and systematic record in terms of territorial coverage, sectoral disaggregation, and consistency in the documentation of losses associated with officially declared emergencies. It therefore constitutes the most robust repository currently available for characterizing historical economic impacts of disasters in the country.

Information on losses associated with natural events is structured within MIDEPLAN's Module of Losses Caused by Natural Phenomena. This system consolidates historical records of direct damage and economic losses associated with events that have required official emergency declarations, incorporating information since the late 1980s.

The database allows for disaggregated queries and analyses by territorial unit and economic sector, serving as an institutional repository for the systematization of impacts from natural hazards such as floods, landslides, droughts, earthquakes, and other relevant phenomena within the national context.

3.5.2 Evaluation of the Empirical Risk Curve

The empirical loss exceedance curve is derived directly from the information recorded in the MIDEPLAN database, based on counting the exceedance of arbitrary loss thresholds.

The historical record can be understood as an observation of a loss process, as illustrated in Figure 23. By defining an arbitrary economic loss value p , it is possible to identify in the record all events whose losses exceed that p threshold.

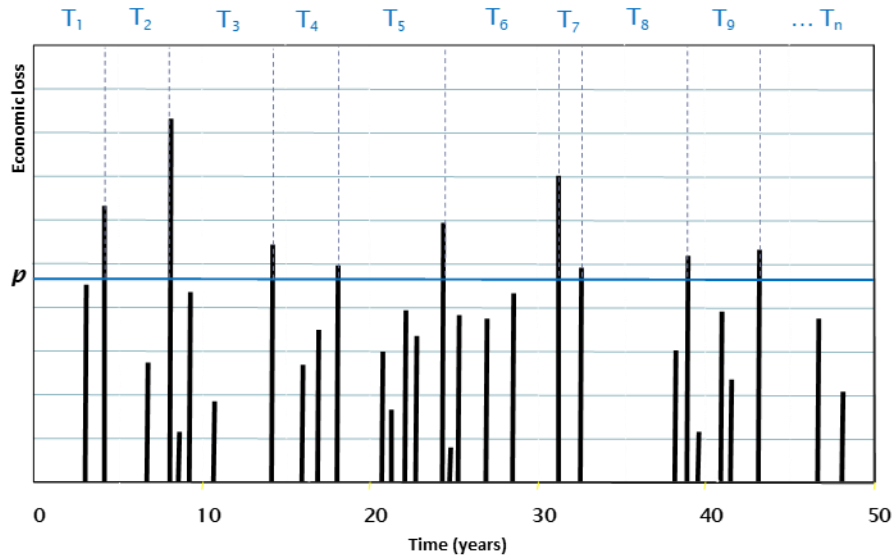


Figure 23. Hypothetical loss process.

For the specified loss level p , the exceedance rate ($v(p)$) can be estimated as follows (Bernal et al., 2021):

$$v(p) = \frac{n - 1}{T} \quad \text{Equation 8}$$

where n is the number of events that exceed loss level p , and T is the total number of years in the record.

As observed, this estimator of the exceedance rate depends on the number of times the evaluated loss level p is exceeded. This implies an inverse relationship between the uncertainty of the estimate and the number of exceedances. A small loss level will be exceeded many times and, therefore, its estimated exceedance rate will have lower uncertainty than that of a larger loss level, which is exceeded fewer times.

Bernal et al. (2021) determined how the coefficient of variation⁴ (CV) of the exceedance rate changes as a function of the number of exceedances in the record, following the relationship shown in Figure 24.

⁴ The coefficient of variation of a random variable is defined as the ratio of its standard deviation to its mean.

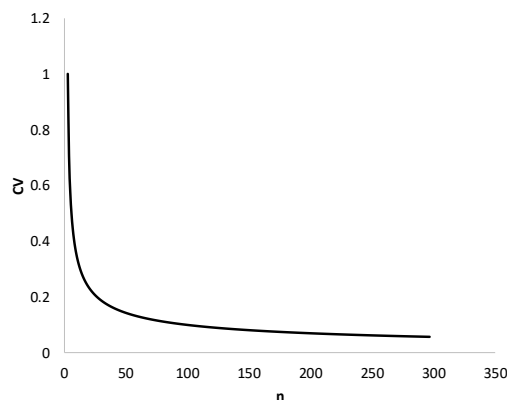


Figure 24. Variation of the coefficient of variation of the exceedance rate as a function of sample size.

The behavior described above shows that, for events involving large losses (catastrophic events), the estimation of the exceedance rate based on the historical record is highly uncertain—that is, there are few events exceeding that loss level, regardless of the quality of the information or even the number of years covered by the record.

This is precisely why analytical loss models are required. By explicitly relating hazard, exposure, and vulnerability, such models allow for a more appropriate estimation of exceedance rates at high loss levels, where historical information is generally insufficient.

Based on this approach to estimating the exceedance rate, constructing the loss exceedance curve becomes straightforward. The process consists of defining different reference loss levels p and calculating the corresponding exceedance rate for each one. Figure 25 presents a diagram summarizing this procedure.

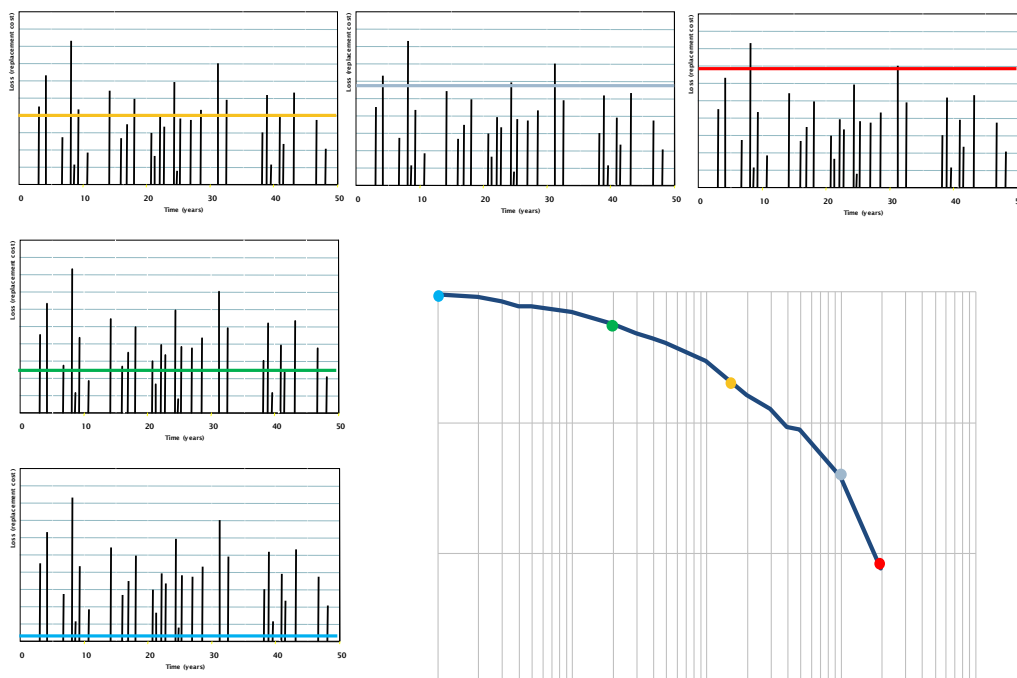


Figure 25. Illustration of the empirical loss exceedance curve evaluation process.

3.5.3 Comparison of the Risk Curve

The procedure described above was applied to the multi-hazard risk results for National Route RN2 presented in the previous sections. A total PML curve was obtained and subsequently converted into an analytical loss exceedance curve, in accordance with the methodology described earlier.

The empirical curve was derived by applying the outlined procedure to the loss records from the MIDEPLAN database⁵ corresponding to road infrastructure within the cantons crossed by RN2.

Figure 26 presents the comparison between the empirical and analytical risk curves.

⁵ The access link to the MIDEPLAN database is:
https://delphos.mideplan.go.cr/DelphosPortal_Eventos/DefaultPortal.aspx

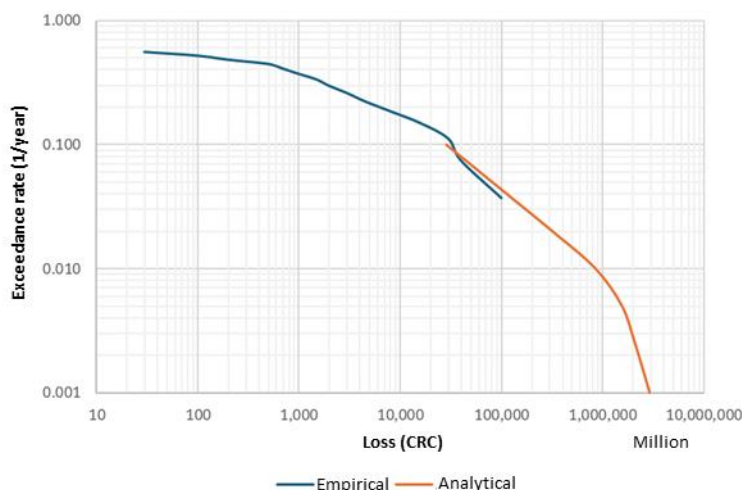


Figure 26. Empirical and analytical loss exceedance curves for RN2.

It can be observed that the curves overlap, as expected, indicating a very close agreement between them. This suggests that the catastrophe risk model is capable of projecting losses from events that have not yet occurred in a manner consistent with the losses recorded historically.

It should be emphasized that this should not be interpreted as a strict validation of the results, such validation is not feasible in catastrophe modeling for the reasons previously discussed. Rather, it constitutes a comparison that demonstrates the analytical model developed here provides a reasonable extension of risk metrics when contrasted with observed historical losses.

4 TRAINING PROGRAM

As part of Operational Project 1 under the initiative *Risk Assessment and Capacity Development in Costa Rica*, implemented within the framework of the Global Risk Modelling Alliance (GRMA), Ingeniar Risk-Intelligence and CIMNE developed a capacity-building process aimed at supporting Lanamme and colleagues from the University of Costa Rica (UCR) in the application of quantitative risk analysis for road infrastructure, with emphasis on National Route No. 2 – Pan-American Highway South (RN2).

This capacity development component responds to the provisions established in the project's Terms of Reference, which highlight the need to strengthen understanding and application of probabilistic approaches for natural hazard risk estimation, as well as to provide guidance enabling the autonomous and replicable implementation of risk analyses on open platforms.

In this context, the *Probabilistic Disaster Risk Modeling Course* constitutes the main instrument for transferring technical capacities, complemented by technical support and coordination activities with the Lanamme team.

4.1 Development of Activities

The capacity-building component associated with Operational Project 1 has been structured primarily through the *Probabilistic Disaster Risk Modeling Course*, which provides participants with the conceptual, methodological, and operational foundations required to conduct quantitative risk analyses for road infrastructure, with emphasis on event-based probabilistic approaches and the use of the CAPRA-ROBOT platform.

Within the framework of the project, the risk assessment of National Route No. 2 (RN2) considers multiple natural hazards, including earthquakes, riverine and pluvial flooding, landslides, and volcanic eruptions. These hazards and their associated methodological components are addressed progressively and in an integrated manner throughout the different modules of the course.

In Module 1, participants develop a solid foundation in the fundamental concepts of probabilistic risk assessment, including the definition and role of hazard, exposure, and vulnerability, as well as key metrics for estimating economic losses. This module introduces essential tools for interpreting risk results, such as the Loss Exceedance Curve, Average Annual Loss (AAL), and Probable Maximum Loss (PML), which constitute core inputs for financial risk evaluation in road infrastructure.

Module 2 focuses specifically on the modeling of multiple natural hazards relevant to transport infrastructure, including earthquakes, riverine and pluvial flooding, landslides, and volcanic activity. In this module, participants learn to integrate linear infrastructure exposure databases—such as road networks—with hazard and vulnerability models using specialized tools available in the CAPRA-ROBOT platform. These contents are directly aligned with the needs of Operational Project 1, as they enable the estimation of economic losses resulting from direct damage and service disruption in strategic road corridors such as RN2.

Module 3 deepens the interpretation and application of risk results in real decision-making contexts, incorporating approaches such as holistic risk assessment, infrastructure system resilience, and decision-making under uncertainty.

In addition, as part of the technical support process, targeted exchanges were conducted with the Lanamme working group to reinforce the practical application of course content. This support included the provision of initial guidelines and procedures for structuring the road infrastructure exposure model, as well as technical meetings to explain the overall risk modeling process—from the construction of the exposure database to the generation of probabilistic results.

Within this framework, the Lanamme team has been concurrently developing a risk modeling exercise for National Route No. 34 (RN34), applying the methodological guidelines presented in the course and discussed during technical exchanges. This exercise reinforces the project’s capacity development objective by demonstrating the feasibility of replicating risk analyses on other strategic road corridors in the country.

4.2 Participation Summary

The list below presents the participants who have completed Module 1 of the Probabilistic Disaster Risk Modeling Course to date and who reported being linked to Operational Project 1, along with their respective institutions. It is important to note that individuals who are members of the technical working groups are not necessarily enrolled in the Course.

Name	Institution	email
Pablo Agüero Barrantes	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	pablo.aguerobarrantes@ucr.ac.cr
Warner Alberto Mata Gutiérrez	Comisión Nacional de Prevención de Riesgos y Atención de Emergencias	wmata@cne.go.cr
Ana Monge Sandí	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	ana.mongesandi@ucr.ac.cr
Paul Vega	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	paulantonio.vega@ucr.ac.cr
Roberto Villalobos	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	roberto.villalobosherrera@ucr.ac.cr
María Rodríguez	Escuela de Geología, Universidad de Costa Rica	maria.rodriguezcorrales@ucr.ac.cr
Alejandro Rodriguez Solís	Superintendencia General de Seguros	RODRIGUEZSD@Sugese.fi.cr
Roy Barrantes	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	roy.barrantes@ucr.ac.cr
Viviana Solís Valverde	Comisión Nacional de Prevención de Riesgos y Atención de Emergencias	vsolis@cne.go.cr
Julián Trejos	Laboratorio Nacional de Materiales y Modelos Estructurales, Universidad de Costa Rica	julian.trejosvillalobos@ucr.ac.cr

Among these participants, Pablo Agüero Barrantes, Ana Monge Sandí, and Alejandro Rodríguez Solís have completed Module 2 in at least one of the hazards offered in the course.

4.3 Participants Feedback

Participant feedback and the evaluation of capacity development associated with Operational Project 1 will be carried out through the final capacity development questionnaire of the *Probabilistic Disaster Risk Modeling Course*, to be administered once the last module of the course has been completed.

The objective of this questionnaire is to assess, both qualitatively and quantitatively, the learning outcomes achieved, the level of assimilation of key probabilistic risk assessment concepts, and the perceived usefulness of the tools presented for professional application.

In particular, the questionnaire includes questions aimed at:

- Identifying the main learning outcomes perceived by participants regarding probabilistic risk assessment and the use of open modeling platforms.
- Evaluating the level of understanding and familiarity with key risk metrics, such as the Loss Exceedance Curve, Average Annual Loss (AAL), and Probable Maximum Loss (PML).
- Verifying comprehension of the probabilistic approach and the general workflow of the modeling tools used.
- Exploring participants' perceptions regarding the relevance of these tools for road infrastructure risk management and their potential application in future national-level analyses.

The questionnaire includes both open-ended and multiple-choice questions, designed to assess conceptual understanding as well as practical application capacity of the course contents. The questions considered are as follows:

1. What key learnings did this training provide regarding probabilistic risk assessment and the use of CAPRA Robot?

Question type: Open-ended.

Objective: Identify perceived achievements and meaningful learning outcomes reported by the participant.

2. After the course, which of the following options best describes your current level of familiarity with concepts such as the Loss Exceedance Curve (LEC), Average Annual Loss (AAL), and Probable Maximum Loss (PML)?

Question type: Single-choice selection.

- I do not yet understand them.
- I partially understand them.
- I have a general understanding and know when they are applied.
- I feel comfortable using them with guidance.
- I can explain and apply them confidently.

Objective: Measure the level of understanding and technical appropriation of key risk indicators.

3. How would you now describe the main function of CAPRA Robot within the CAPRA platform?

Question type: Multiple-choice (single answer).

- a. Generate visual reports on social vulnerability.
- b. Estimate risk by calculating losses from hazards using a probabilistic approach.
- c. Record geographic information of exposed assets.
- d. Send automatic notifications during extreme events.

Correct answer: b.

Objective: Verify understanding of CAPRA Robot's technical purpose.

4. Do you consider that your skills in using risk modeling tools have improved as a result of the course? Please justify your answer.

Question type: Open-ended.

Objective: Explore the development of technical capacities resulting from training experience.

5. Have you identified how you will apply what you have learned in your professional activities? Please describe a possible application scenario.

Question type: Open-ended

Objective: Assess the projection of learning into the participant's professional context.

6. Which of the following options best describes your current perception of the importance of tools such as CAPRA Robot for risk management?

Question type: Single-choice selection.

- Not important at all.
- Slightly important.
- Moderately important.
- Important.
- Very important.

Objective: Evaluate the participant's perception of the relevance of these tools at the end of the training.

7. Which of the following options best describes the probabilistic approach used by CAPRA Robot to calculate risk?

Question type: Multiple-choice (single answer).

- a. Uses historical data to predict future events without considering uncertainty.
- b. Calculates expected losses based on the frequency and severity of possible events, allowing estimation of the probability of exceeding certain loss levels.
- c. Applies deterministic rules based on observed damages from past events.
- d. Requires only the location of exposed assets to calculate risk.

Correct answer: b.

Evaluates: Understanding of the probabilistic model and its advantages over deterministic approaches.

8. What is the general process followed by CAPRA Robot to generate the Loss Exceedance Curve (LEC)?

Question type: Multiple-choice (single answer).

- a. Estimate population, apply damage statistics, and calculate exposure rate.
- b. Obtain insured value data, simulate historical events, and calculate damage distribution.
- c. Integrate hazard, vulnerability, and exposure data to calculate losses under multiple scenarios and derive the exceedance curve.
- d. Evaluate census quality, apply hazard maps, and plot damage curves.

Correct answer: c.

Evaluates: Understanding of the technical workflow and key model variables.

9. How does CAPRA Robot handle loss aggregation in a multi-hazard scenario, and why is this useful for risk management?

Question type: Multiple-choice (single answer).

- a. Calculates losses individually by hazard and reports only the highest to avoid duplication.
- b. Sums estimated losses for all hazards without considering correlation, resulting in more conservative scenarios.
- c. Aggregates losses considering possible interactions among hazards and allows estimation of consolidated risk, supporting more comprehensive planning.
- d. Evaluates each hazard separately and does not aggregate to avoid loss of precision.

Correct answer: c.

Evaluates: Applied understanding of the multi-hazard approach and its usefulness for decision-making.

The results of the final questionnaire will allow documentation of the impact of the capacity-building process, in line with the project's objective of equipping Lanamme and the University of Costa Rica to conduct quantitative risk analyses for road infrastructure in an autonomous and replicable manner.

5 REFERENCES

- Andersen, E. Sparre. (1957). On the collective theory of risk in case of contagion between claims. Trans. XVth Int. Congress Actuaries. Vol. 2. No. 6. 1957.
- Bernal, G., Cardona, O.D., Marulanda, M., Carreño, M. L. (2021). Dealing with Uncertainty using Fully Probabilistic Risk Assessment for Decision Making. Chapter 14 in: Eslamian, S., & Eslamian, F. (Eds): Handbook of Disaster Risk Reduction for Resilience. Springer.
- Cardona, O.D. (1986a). Análisis de vulnerabilidad y evaluación del riesgo sísmico. Seminario Nacional sobre Prevención y Manejo de Catástrofes Naturales, Asociación de Ingenieros Estructurales, octubre 1986, Medellín.
- Cardona, O.D. (1986b). Estudios de vulnerabilidad y evaluación del riesgo sísmico: Planificación física y urbana en áreas propensas. Simposio International sobre Neotectónica y Riesgos Volcánicos, Revista CIAF No. 11, diciembre 1986, Bogotá.
- Cardona, O.D. (1986c). Estudios de vulnerabilidad y evaluación del riesgo sísmico: Planificación física y urbana en áreas propensas. Asociación Colombiana de Ingeniería Sísmica. Reporte AIS-33. diciembre 1986, Bogotá.
- Cardona, O.D. (1989). Enfoque metodológico para la evaluación de la amenaza, la vulnerabilidad y el riesgo sísmico. Sociedad Mexicana de Ingeniería Sísmica. No. 37, diciembre 1989, México, DOI: 10.18867/ris.37.304
- Cardona, O.D. (1990). Términos de uso común en manejo de riesgos. Reporte AGID No. 13. 1er Simposio Andino de Geología Ambiental, 1ª Conferencia Colombiana de Geología Ambiental. Pag 587-593. Medellín. Cardona, O. D. (2001). Estimación holística del riesgo sísmico utilizando sistemas dinámicos complejos. Barcelona: Universidad Politécnica de Cataluña. CD: Premios de Investigación Social sobre protección civil, para tesis doctorales, 2002. Dirección General de Protección Civil, Ministerio del Interior, España.
- Cramér, H. (1930) On the Mathematical Theory of Risk, Skandia Jubilee Volume, Stockholm. Cruz, M. G., Alexander, M. E., & Wakimoto, R. H. (2003). Assessing canopy fuel stratum characteristics in crown fire prone fuel types of western North America. International Journal of Wildland Fire, 12(1), 39-50.
- Lundberg, F. (1903) Approximerad Framställning av Sannolikehets-funktionen. Återförsäkring av Kollektivrisker (Producción aproximada de la función de probabilidad. Reaseguro de Riesgos Colectivos), Almqvist & Wiksell, Uppsala.

A.1 DATA FOR GENERATING THE EMPIRICAL RISK CURVES

The characteristics of the events presented herein are taken directly from the data source, and therefore, the names, categories, and other properties are presented in Spanish.

Historical losses in road infrastructure in the cantons along RN2.

Source: Ministry of National Planning and Economic Policy

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
1988	Hidrometeorológico	LLUVIAS INTENSAS		HURACAN JUANA	117 Dota	821,928,067.25
1988	Hidrometeorológico	LLUVIAS INTENSAS		HURACAN JUANA	119 Perez Zeledón	1,825,466,664.17
1988	Hidrometeorológico	LLUVIAS INTENSAS		HURACAN JUANA	605 Osa	3,913,051,618.58
1988	Hidrometeorológico	LLUVIAS INTENSAS		HURACAN JUANA	607 Golfito	1,216,977,776.11
1988	Hidrometeorológico	LLUVIAS INTENSAS		HURACAN JUANA	610 Corredores	2,130,647,244.95
1988	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	HURACAN JUANA	119 Perez Zeledón	335,136,956.81
1988	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	HURACAN JUANA	603 Buenos Aires	335,136,956.81
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	119 Perez Zeledón	100,513,736.94
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	605 Osa	66,078,475.18
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	605 Osa	18,846,325.63
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	607 Golfito	66,078,475.18
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	607 Golfito	12,564,217.12
1993	Hidrometeorológico	LLUVIAS INTENSAS		TORMENTA TROPICAL GERT	610 Corredores	40,950,040.95
1993	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL GERT	119 Perez Zeledón	150,770,605.41
1993	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL GERT	603 Buenos Aires	50,256,868.47
1993	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL GERT	605 Osa	24,570,024.57
1993	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL GERT	610 Corredores	49,140,049.14
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	119 Perez Zeledón	691,031,941.36
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	603 Buenos Aires	207,309,582.39
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	605 Osa	125,642,171.17
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	605 Osa	50,256,868.47
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	607 Golfito	132,156,950.37
1993	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	TORMENTA TROPICAL GERT	610 Corredores	25,128,434.23
1994	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 31	301 Cartago	3,420,955.40
1994	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 32	303 La Unión	12,315,439.46

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
1994	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 33	303 La Unión	47,893,375.66
1994	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 34	303 La Unión	32,156,980.80
1994	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 49	607 Golfito	123,154,394.56
1994	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 15	301 Cartago	8,894,484.05
1994	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 17	302 Paraíso	75,261,018.90
1994	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 18	303 La Unión	65,682,343.76
1994	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 16	303 La Unión	6,841,910.81
1994	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	INUNDACIONES EN EL TERRITORIO NACIONAL CAUSADAS POR LA DEPRESION TROPICAL NO. 18	605 Osa	47,893,375.66
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	HURACAN CESAR	119 Perez Zeledón	17,211,622,664.20
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	HURACAN CESAR	603 Buenos Aires	3,088,522,619.11
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	HURACAN CESAR	607 Golfito	15,029,307.15
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	HURACAN CESAR	607 Golfito	33,295,551.33
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR PARA LA RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE CARIBE CAUSADAS POR EL TEMPORAL DEL 12 AL 14 DE FEBRERO DE 2001	302 Paraíso	336,067,742.79
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR TORMENTA TROPICAL LILI	103 Desamparados	14,150,554.13
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR TORMENTA TROPICAL LILI	103 Desamparados	48,464,846.92
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR TORMENTA TROPICAL LILI	605 Osa	45,043,907.98
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR TORMENTA TROPICAL LILI	605 Osa	46,116,583.09
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR TORMENTA TROPICAL LILI	605 Osa	14,505,070.41
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	610 Corredores	651,269,976.45
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	603 Buenos Aires	50,097,690.50
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	605 Osa	50,097,690.50
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	607 Golfito	551,074,595.46
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	610 Corredores	110,214,919.09
1996	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	RECONSTRUCCION DE LOS EFECTOS DE LAS INUNDACIONES EN LA VERTIENTE PACIFICO	610 Corredores	75,146,535.74
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	117 Dota	522,758,509.54

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	119 Perez Zeledón	2,299,336,205.60
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	119 Perez Zeledón	9,678,236,800.91
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	308 El Guarco	522,758,509.54
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	603 Buenos Aires	4,314,169,151.60
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	605 Osa	2,613,792,547.62
1996	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	HURACAN CESAR	607 Golfito	1,520,257,848.91
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	119 Perez Zeledón	584,093,001.22
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	119 Perez Zeledón	584,093,001.22
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	603 Buenos Aires	1,118,521,136.69
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	603 Buenos Aires	1,118,521,136.69
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	605 Osa	1,094,025,327.02
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	605 Osa	1,094,025,327.02
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	607 Golfito	184,495,395.38
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	607 Golfito	184,495,395.38
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR HURACAN MITCH	610 Corredores	145,654,259.51
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 2005	302 Paraíso	145,073,863.34
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 2006	302 Paraíso	123,435,526.47
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 2007	302 Paraíso	525,417,621.88
1998	Hidrometeorológico	LLUVIAS INTENSAS		PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 2008	302 Paraíso	4,751,327.40
1998	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 1998	302 Paraíso	36,624,815.39

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
1998	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 1999	302 Paraíso	9,502,654.80
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	117 Dota	116,523,407.61
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	119 Perez Zeledón	584,093,001.22
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	603 Buenos Aires	1,118,521,136.69
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	605 Osa	1,094,025,327.02
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	607 Golfito	184,495,395.38
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR HURACAN MITCH	610 Corredores	145,654,259.51
1998	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR PARA LA ATENCION, REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR LLUVIAS INTENSAS EN CACHI Y OTRAS COMUNIDADES DE PARAISO DE LA PROVINCIA DE CARTAGO EL 26 DE JULIO DE 1998	302 Paraíso	7,918,879.00
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2001	103 Desamparados	184,098,289.41
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2019	119 Perez Zeledón	184,098,289.41
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2022	301 Cartago	1,937,146,108.00
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2025	302 Paraíso	1,937,146,108.00
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2028	303 La Unión	1,937,146,108.00
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS	308 El Guarco	1,937,146,108.00

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
				PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2040		
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2118	603 Buenos Aires	50,058,715.94
1999	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA RECONSTRUCCION DE LOS DANOS CAUSADOS POR FENOMENOS HIDROMETEOROLOGICOS PRESENTADOS ENTRE EL 12 DE AGOSTO AL 5 DE OCTUBRE DE 2124	607 Golfito	50,058,715.94
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	119 Perez Zeledón	14,278,738.10
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	119 Perez Zeledón	112,621,005.17
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	119 Perez Zeledón	3,076,356,979.90
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	603 Buenos Aires	199,902,333.43
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	603 Buenos Aires	42,375,296.64
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	603 Buenos Aires	875,843,516.42
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	605 Osa	72,107,627.42
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	607 Golfito	59,599,452.84

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	610 Corredores	108,518,409.58
2001	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	610 Corredores	163,777,126.06
2001	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	119 Perez Zeledón	26,801,191.42
2001	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	603 Buenos Aires	51,874,655.53
2001	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	605 Osa	91,798,007.26
2001	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	607 Golfito	23,088,719.51
2001	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL PARA LA REHABILITACION Y RECONSTRUCCION DE LOS DANOS CAUSADOS POR EL EFECTO INDIRECTO DEL HURACAN MICHELLE	610 Corredores	42,836,214.31
2002	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL ATENCION DE DANOS CAUSADOS POR INTENSAS LLUVIAS DURANTE EL 29 DE AGOSTO DEL 2008	302 Paraíso	39,743,311.20
2002	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL ATENCION DE DANOS CAUSADOS POR INTENSAS LLUVIAS DURANTE EL 29 DE AGOSTO DEL 2009	302 Paraíso	5,299,108.16
2002	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN REGULADOR GENERAL ATENCION DE DANOS CAUSADOS POR INTENSAS LLUVIAS DURANTE EL 29 DE AGOSTO DEL 2002	302 Paraíso	132,477,704.00
2002	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN REGULADOR GENERAL ATENCION DE DANOS CAUSADOS POR INTENSAS LLUVIAS DURANTE EL 29 DE AGOSTO DEL 2002	302 Paraíso	13,247,770.40
2003	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL CARIBE Y ZONA NORTE	302 Paraíso	27,348,471.89
2004	Geotectónico	SISMO		SISMO DE PARRITA	605 Osa	31,426,512.24
2004	Geotectónico	SISMO		SISMO DE PARRITA	607 Golfito	48,187,318.77

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2004	Geotectónico	SISMO		SISMO DE PARRITA	610 Corredores	35,616,713.88
2004	Geotectónico	SISMO	Movimiento de Masas	SISMO DE PARRITA	607 Golfito	31,426,512.24
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	103 Desamparados	29,460,353.45
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	103 Desamparados	74,583,173.29
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	103 Desamparados	65,633,192.50
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	117 Dota	12,492,681.53
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	117 Dota	40,274,913.58
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	117 Dota	10,012,060.10
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	119 Perez Zeledón	449,550,077.01
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	119 Perez Zeledón	1,940,572,433.31
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	603 Buenos Aires	6,339,569.73
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	603 Buenos Aires	265,516,096.91
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	603 Buenos Aires	1,965,943,840.74
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	605 Osa	348,852,819.43
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	605 Osa	539,933,509.10
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	605 Osa	1,257,775,409.55

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	607 Golfito	457,223,333.72
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	607 Golfito	353,728,226.37
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	607 Golfito	478,744,410.92
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	610 Corredores	429,748,244.50
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	610 Corredores	637,762,057.30
2005	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES EN LA VERTIENTE DEL PACÍFICO Y ZONA NORTE (ONDA TROPICAL E INFLUENCIA INDIRECTA HURACÁN RITA Y VILMA)	610 Corredores	410,953,284.83
2005	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	INUNDACION EN LAS PROVINCIAS LIMON, HEREDIA, CARTAGO Y ALAJUELA	302 Paraíso	121,935,853.61
2005	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	INUNDACION EN LAS PROVINCIAS LIMON, HEREDIA, CARTAGO Y ALAJUELA	302 Paraíso	70,228,954.89
2005	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	FLUJO DE LODOS CUENCA RIO JUCO	302 Paraíso	999,613,567.80
2005	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	FLUJO DE LODOS CUENCA RIO JUCO	302 Paraíso	79,759,715.39
2006	Hidrometeorológico	LLUVIAS INTENSAS			103 Desamparados	14,085,080.68
2006	Hidrometeorológico	LLUVIAS INTENSAS			103 Desamparados	833,225,856.81
2006	Hidrometeorológico	LLUVIAS INTENSAS			103 Desamparados	33,939,953.43
2006	Hidrometeorológico	LLUVIAS INTENSAS			103 Desamparados	585,803,613.25
2006	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	LLUVIAS INTENSAS ASOCIADAS A UN SISTEMA DE BAJA PRESION	103 Desamparados	301,726,186.03
2006	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	LLUVIAS INTENSAS ASOCIADAS A UN SISTEMA DE BAJA PRESION	103 Desamparados	213,821,706.64
2006	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	DESIZAMIENTOS Y FLUJO DE LODOS	303 La Unión	10,784,223.25
2006	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	LLUVIAS INTENSAS ASOCIADAS A UN SISTEMA DE BAJA PRESION	103 Desamparados	188,366,741.56
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	103 Desamparados	2,079,494,482.08
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	117 Dota	151,211,907.67

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	657,261,191.97
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	171,197,542.72
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	7,815,914,007.68
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	301 Cartago	353,510,978.02
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	303 La Unión	47,646,729.57
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	603 Buenos Aires	711,521,665.38
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	603 Buenos Aires	2,073,927,987.13
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	605 Osa	226,668,907.66
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	605 Osa	912,072,509.38
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	607 Golfito	2,272,856,938.00
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	610 Corredores	1,143,058,920.04

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	LLUVIAS INTENSAS ASOCIADAS AL PASO DE UNA ONDA DECRETO 33834-MP	301 Cartago	98,168,027.56
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	LLUVIAS INTENSAS ASOCIADAS AL PASO DE UNA ONDA DECRETO 33834-MP	301 Cartago	52,183,457.37
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	LLUVIAS INTENSAS ASOCIADAS AL PASO DE UNA ONDA DECRETO 33834-MP	308 El Guarco	692,525,076.61
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	103 Desamparados	205,978,816.48
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	103 Desamparados	1,412,440,268.12
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	117 Dota	291,431,452.70
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	4,197,229.71
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	100,998,730.96
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	301 Cartago	112,871,864.22
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	301 Cartago	197,371,565.85
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	303 La Unión	47,106,609.94
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	303 La Unión	61,216,024.72
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO	603 Buenos Aires	310,343,842.86

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
				CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP		
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	603 Buenos Aires	21,124,925.41
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	605 Osa	510,390,533.57
2007	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	607 Golfito	1,850,358,429.85
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	103 Desamparados	308,393,071.64
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	117 Dota	133,665,267.08
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	119 Perez Zeledón	24,766,430.80
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	301 Cartago	500,676,151.81
2007	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR TEMPORAL Y PASO DE UNA ONDA TROPICAL EN EL PACIFICO CENTRAL, NORTE, SUR Y CORDILLERA DE GUANACASTE, DECRETO 34045-MP	607 Golfito	516,558,395.00
2008	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	117 Dota	73,986,850.58
2008	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	119 Perez Zeledón	2,355,533,190.02
2008	Hidrometeorológico	LLUVIAS INTENSAS		INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	603 Buenos Aires	544,280,916.24
2008	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	117 Dota	10,691,741.41
2008	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	119 Perez Zeledón	1,331,763,311.93

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2008	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	119 Perez Zeledón	14,255,655.22
2008	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	603 Buenos Aires	151,537,614.97
2008	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	117 Dota	87,387,166.49
2008	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	119 Perez Zeledón	549,200,259.17
2008	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	INUNDACIONES Y DESLIZAMIENTOS ASOCIADOS AL PASO DE LA TORMENTA TROPICAL ALMA	603 Buenos Aires	214,262,497.93
2008	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR INFLUENCIA DE LA DERPRESION TROPICAL Nº16 OCTUBRE 2009	103 Desamparados	24,593,739.27
2008	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	PLAN GENERAL DE LA EMERGENCIA POR INFLUENCIA DE LA DERPRESION TROPICAL Nº16 OCTUBRE 2013	117 Dota	5,144,135.22
2010	Hidrometeorológico	LLUVIAS INTENSAS		CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	119 Perez Zeledón	44,446,964.85
2010	Hidrometeorológico	LLUVIAS INTENSAS		CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	301 Cartago	7,801,013.77
2010	Hidrometeorológico	LLUVIAS INTENSAS		CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	308 El Guarco	41,602,769.03
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	103 Desamparados	1,249,668,467.60
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	117 Dota	39,708,802.12
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	117 Dota	24,065,940.68
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	3,970,880.21
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	246,254,737.98
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	301 Cartago	408,281,691.84
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	302 Paraíso	30,082,425.85
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	302 Paraíso	132,362,673.73

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	302 Paraíso	29,480,777.33
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	302 Paraíso	12,032,970.34
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	303 La Unión	360,989,110.16
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	303 La Unión	395,884,724.14
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	252,692,377.11
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	2,075,687,383.43
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	7,800,373,022.08
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	72,197,822.03
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	252,692,377.11
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	32,489,019.91
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	60,164,851.69
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	1,591,360,327.30
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	610 Corredores	117,923,109.32
2010	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	119 Perez Zeledón	27,166,809.86
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	103 Desamparados	685,879,309.31
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	103 Desamparados	2,217,676,433.43
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	117 Dota	12,032,970.34
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	122,014,319.23
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	221,165,994.83
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	81,463,209.19
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	301 Cartago	66,181,336.86

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	308 El Guarco	36,098,911.02
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	77,011,010.17
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	1,684,615,847.42
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	7,219,782.20
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	829,071,656.34
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	37,903,856.57
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	610 Corredores	3,970,880.21
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	610 Corredores	119,126,406.35
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	60,134,769.27
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	66,301,666.57
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	303 La Unión	132,362,673.73
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	308 El Guarco	18,049,455.51
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	307,923,710.97
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	103 Desamparados	18,482,679.39
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	103 Desamparados	284,153,830.05
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	117 Dota	44,418,050.52
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS	119 Perez Zeledón	11,815,359.64

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
				TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)		
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	301 Cartago	13,441,948.65
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	301 Cartago	89,572,345.44
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	303 La Unión	29,625,968.22
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	308 El Guarco	97,354,631.28
2010	Hidrometeorológico	LLUVIAS INTENSAS	Movimiento de Masas	CONDICIONES HIDROMETEOROLOGICAS EXTREMAS, QUE HAN AFECTADO EL PACIFICO CENTRAL, NORTE, SUR, VALLE CENTRAL Y GUANACASTE Y ONDAS TROPICALES A NIVEL REGIONAL EN EL MAR CARIBE (TORMENTA TROPICAL NICOLE)	610 Corredores	12,169,328.91
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	103 Desamparados	12,032,970.34
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	103 Desamparados	1,720,714,758.44
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	117 Dota	333,313,278.38
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	35,557,427.35
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	230,672,041.39
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	119 Perez Zeledón	1,882,798,868.90
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	301 Cartago	9,425,690.39
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	302 Paraíso	271,945,129.66
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	303 La Unión	571,566,091.09

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	308 El Guarco	963,840,924.13
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	603 Buenos Aires	2,322,964,923.89
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	156,428,614.40
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	4,211,539.62
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	605 Osa	509,596,293.85
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	607 Golfito	4,179,050,598.64
2010	Hidrometeorológico	LLUVIAS INTENSAS		TEMPORAL POR LOS EFECTOS INDIRECTOS DEL PASO DEL HURACAN TOMAS	610 Corredores	133,565,970.76
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	815,406,732.76
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	756,850,028.95
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	1,273,433,263.96
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	772,003,830.48
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	607 Golfito	855,364,009.81
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	607 Golfito	915,422,439.49
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	607 Golfito	1,847,393,197.20
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	114,739,712.29
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	2,348,694,042.47
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	6,109,580,844.73

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	568,789,597.00
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	321,651,034.76
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	1,145,929,822.59
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	5,025,797.42
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	55,283,771.60
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	607 Golfito	14,072,232.77
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	9,277,253,162.81
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	607 Golfito	984,546,295.85
2016	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	135,953,839.24
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	605 Osa	100,515,948.36
2016	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA ANTE LA SITUACIÓN PROVOCADA POR EL PASO DEL HURACAN OTTO POR TERRITORIO COSTARRICENSE	610 Corredores	398,076,667.53
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	103 Desamparados	2,219,035,176.47
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	103 Desamparados	682,704,492.10
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	103 Desamparados	392,923,448.69
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	103 Desamparados	98,230,862.17
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	103 Desamparados	81,682,101.82
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	117 Dota	179,271,323.46
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	117 Dota	609,031,345.47
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	117 Dota	475,437,372.91
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	860,404,121.77
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	3,539,168,161.65

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	333,984,931.39
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	2,549,120,415.32
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	5,500,928.28
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	301 Cartago	154,813,571.91
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	301 Cartago	400,774,066.03
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	301 Cartago	1,942,129,704.23
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	308 El Guarco	255,400,241.65
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	308 El Guarco	1,504,405,654.17
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	308 El Guarco	47,150,813.84
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	603 Buenos Aires	672,881,405.88
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	603 Buenos Aires	15,327,943,733.36
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	603 Buenos Aires	4,911,543.11
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	603 Buenos Aires	10,159,723,381.89
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	605 Osa	10,073,315,973.32
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	605 Osa	2,156,167,424.73
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	605 Osa	176,815,551.91
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	605 Osa	1,651,442,909.74
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	607 Golfito	61,038,428.90
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	607 Golfito	597,243,642.01
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	607 Golfito	484,025,458.34
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	610 Corredores	322,141,791.46
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	610 Corredores	2,358,356,018.11
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	610 Corredores	7,817,783,142.33
2017	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL NATE	119 Perez Zeledón	1,054,729,324.86
2017	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL NATE	603 Buenos Aires	147,346,293.26
2017	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	TORMENTA TROPICAL NATE	605 Osa	599,208,259.25
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	103 Desamparados	5,883,143,266.24
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	117 Dota	1,587,656.31
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	119 Perez Zeledón	1,227,259,064.25
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	301 Cartago	13,682,505.17
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	302 Paraíso	2,538,060,333.40
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	308 El Guarco	3,356,955,518.91
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	603 Buenos Aires	3,268,258,661.51
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	605 Osa	266,205,636.49
2017	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	TORMENTA TROPICAL NATE	607 Golfito	5,992,082.59
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	103 Desamparados	11,609,646,426.54

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	117 Dota	672,537,597.86
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	119 Perez Zeledón	601,799,589.39
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	308 El Guarco	7,912,469,558.50
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	308 El Guarco	157,169,379.48
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	605 Osa	1,144,375,823.12
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	605 Osa	5,936,282,232.00
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	607 Golfito	1,467,488,158.94
2017	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	TORMENTA TROPICAL NATE	607 Golfito	219,036,900.91
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	119 Perez Zeledón	97,052,091.83
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	308 El Guarco	130,248,581.17
2017	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	TORMENTA TROPICAL NATE	610 Corredores	98,230,862.17
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	103 Desamparados	541,704,243.02
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	40,188,472.67
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	23,474,575.16
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	889,583,110.32
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	603 Buenos Aires	643,203,359.31
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	603 Buenos Aires	14,097,890,856.37
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	603 Buenos Aires	3,974,718,797.64
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	605 Osa	1,471,405.15
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	605 Osa	488,271.16
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	605 Osa	282,620,034.89
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	607 Golfito	504,412,281.15
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	607 Golfito	1,464,406,505.07
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	607 Golfito	851,612,426.31
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	1,828,857,201.34
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	1,349,061,298.69

Year	Type of event	Category	Subcategory	Event	Canton	Constant value in colones
2020	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	52,451,590.73
2020	Hidrometeorológico	LLUVIAS INTENSAS	Aumento de Caudal	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	94,428,394.56
2020	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	117 Dota	1,163,972.42
2020	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	657,119,087.46
2020	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	603 Buenos Aires	913,949,719.34
2020	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	607 Golfito	10,193,051.78
2020	Hidrometeorológico	LLUVIAS INTENSAS	Derrumbe	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	2,827,903.82
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	103 Desamparados	83,552,127.27
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	140,847,450.94
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	119 Perez Zeledón	144,603,382.97
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	605 Osa	1,386,336,576.58
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	607 Golfito	277,053,593.74
2020	Hidrometeorológico	LLUVIAS INTENSAS	Deslizamiento	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	1,637,269,972.64
2020	Hidrometeorológico	LLUVIAS INTENSAS	Inundación	PLAN GENERAL DE LA EMERGENCIA SITUACION PROVOCADA POR LOS EFECTOS DEL HURACAN ETA	610 Corredores	1,536,850,435.03

A. 2 RISK ASSESSMENT DATASET FOR RN2

As part of the products included in this deliverable, a web repository (Drive) was established to host the risk results for the National Route 2 Panamerican Highway (RN2) project. This repository compiles deliverables .6b, 6c, 6d, 6e.

Below is a list of the files that comprise this dataset.

The link to access the dataset is:

<https://onedrive.live.com/?redeem=aHR0cHM6Ly8xZHJ2Lm1zL2YyYy85ZjZmNTQ4ZGFkMDc1MzQzL0VyTWNDRIFZV3psTmdaZ0k2YTk5eWdNQIBINERfYThVTFV4QnN3Y2RFZi1ta3c%5FZT1qQ2RlZzU&id=9F6F548DAD075343%21sccf8df48baac40a59fd8363a877c3b79&cid=9F6F548DAD075343&sb=name&sd=1>

Vulcano Ash

This directory contains the risk results for National Route 2 associated with volcanic ash hazard.

File	Format
Puentes_Ceniza_CR-SIRGAS	.shp
Puentes_Ceniza_WGS84	.shp
Vias_Ceniza_CR-SIRGAS	.shp
Vias_Ceniza_WGS84	.shp

The *.shp files used in this project are available in vector format and require a Geographic Information System (GIS) for visualization.

Landslide triggered by rain

This directory contains the risk results for National Route 2 associated with rainfall-triggered landslide hazard.

File	Format
Puentes_Desliz-Lluvia_CR-SIRGAS	.shp
Puentes_Desliz-Lluvia_WGS84	.shp
Vias_Desliz-Lluvia_CR-SIRGAS	.shp
Vias_Desliz-Lluvia_WGS84	.shp

Landslide triggered by earthquake

This directory contains the risk results for National Route 2 associated with earthquake-triggered landslide hazard.

File	Format
Puentes_Desliz-Sismo_CR-SIRGAS	.shp

Puentes_Desliz-Sismo_WGS84	.shp
Vias_Desliz-Sismo_CR-SIRGAS	.shp
Vias_Desliz-Sismo_WGS84	.shp

Fluvial Flood

This directory contains the risk results for National Route 2 associated with fluvial flooding hazard.

File	Format
Puentes_Fluvial_CR-SIRGAS	.shp
Puentes_Fluvial_WGS84	.shp
Vias_Fluvial_CR-SIRGAS	.shp
Vias_Fluvial_WGS84	.shp

Earthquake

This directory contains the risk results for National Route 2 associated with earthquake hazard.

File	Format
Puentes_Sismo_CR-SIRGAS	.shp
Puentes_Sismo_WGS84	.shp
Vias_Sismo_CR-SIRGAS	.shp
Vias_Sismo_WGS84	.shp

RDLS Metadata

This directory contains the metadata following the Risk Data Library Standard, providing structured information to describe, organize, and ensure the consistency of the datasets used in the project.

File	Format
Loss_RN2	.json

The *.json file may contain information related to hazard, exposure, vulnerability, or loss, depending on the type of data being represented within the project.