HERITAGE TIME CAPSULE PROJECT REPORT NUMBER 2

FOR THE

INTERNATIONAL SOCIETY
FOR
SOIL MECHANICS
AND
GEOTECHNICAL ENGINEERING

(ISSMGE)

ROUNDTABLE WITH THE

|NORTH AND SOUTH AMERICA REGIONS|

UNDER THE AUSPICES OF THE

|TECHNICAL COMMITTEE 304 ON RISK|

soniahmmarques@gmail.com

REPORTER SÓNIA H. M. MARQUES

DISCOVERER FROM THE EUROPE REGION @ PORTUGAL

SYDNEY 20TH ICSMGE 1-5 MAY 2022

ISSMGE ROUNDTABLE WITH THE

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DISCOVERER FROM THE EUROPE REGION @ PORTUGAL

I AM THE REPORTER SÓNIA H. M. MARQUES

A DISCOVERER FROM THE EUROPE REGION @ PORTUGAL

I HAVE BEEN CONSTRUCTING QUESTIONS FOR A ROUNDTABLE

IN ORDER TO

PRESENT A REPORT

FOR THE

INTERNATIONAL SOCIETY FOR SOIL MECHANICS AND GEOTECHNICAL ENGINEERING

(ISSMGE)

BY THE

SYDNEY 20TH ICSMGE 1-5 MAY 2022

GOOGLE EARTH

EUROPE REGION @ PORTUGAL

THIS HERITAGE TIME CAPSULE PROJECT ROUNDTABLE REPORT

IS DEDICATED TO

THE NORTH AMERICA REGION @ CANADA

AND

THE SOUTH AMERICA REGION @ COLOMBIA

UNDER THE AUSPICES OF

THE TECHNICAL COMMITTEE 304 ON RISK

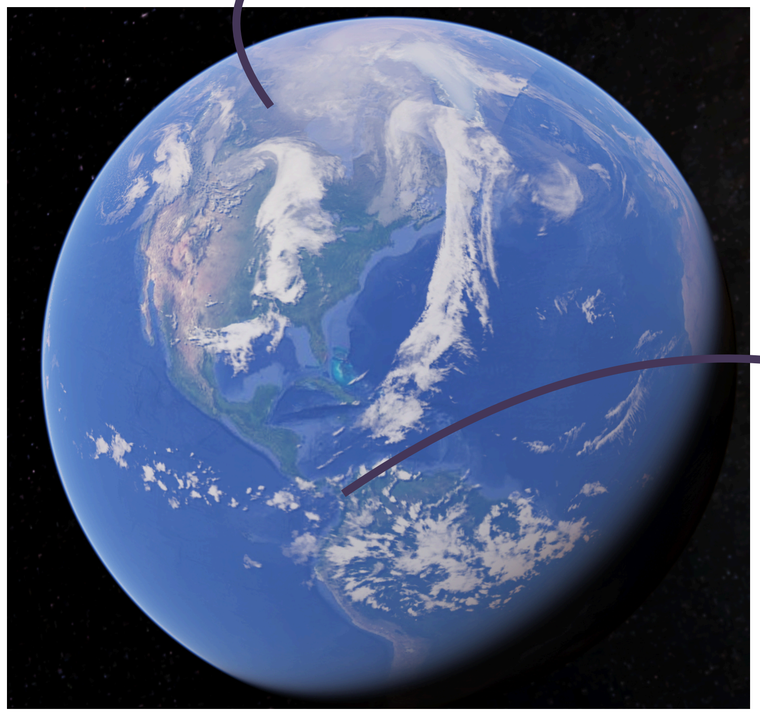
AND

IN THE FORM OF A SLIDESHOW I WILL REPORT

WHAT I FOUND MOST QUESTIONABLE AMONG THE CURRENT DATA ON THE

HERITAGE TIME CAPSULE PROJECT

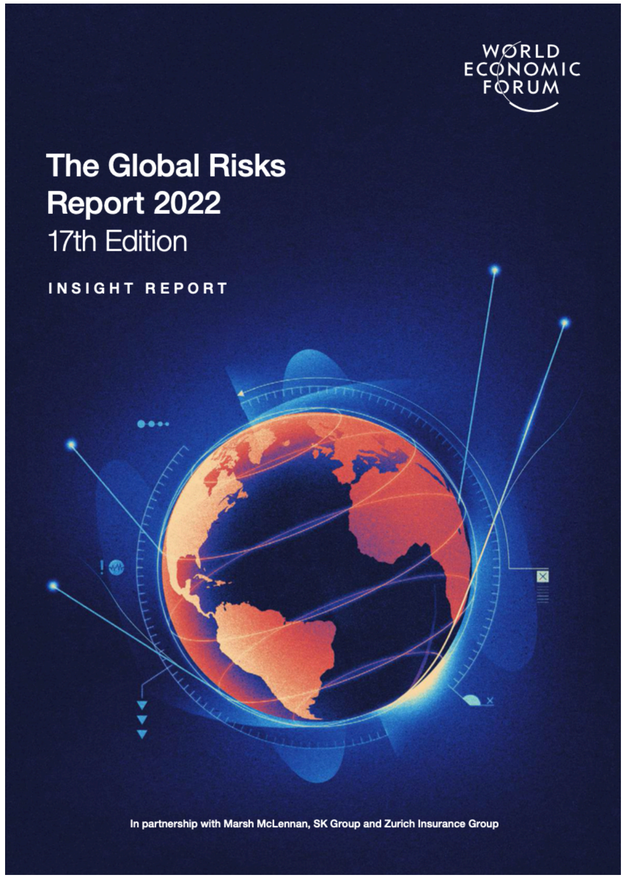
NORTH AMERICA REGION @ CANADA



SOUTH AMERICA REGION @ COLOMBIA

GOOGLE EARTH

A “global risk” is the possibility of the occurrence of an event or condition that, if it occurs, could cause significant negative impact for several countries or industries. For the purposes of this report, the scope is over the next 10 years.



APPENDIX A

Descriptions of Global Risks 2022

Environmental	**Biodiversity loss** and ecosystem collapse	Irreversible consequences for the environment, humankind, and economic activity, and a permanent destruction of natural capital, as a result of species extinction and/or reduction
	Climate action failure	Failure of governments and businesses to enforce, enact or invest in effective climate-change adaptation and mitigation measures, preserve ecosystems, protect populations and transition to a carbon-neutral economy
	Extreme weather events	Loss of human life, damage to ecosystems, destruction of property and/or financial loss at a global scale as a result of extreme weather events: cold fronts, fires, floods, heat waves, windstorms etc.
	Human-made **environmental damage**	Loss of human life, financial loss and/or damage to ecosystems as a result of human activity and/or failure to co-exist with animal ecosystems: deregulation of protected areas, industrial accidents, oil spills, radioactive contamination, wildlife trade etc.
	Major **geophysical disasters**	Loss of human life, financial loss and/or damage to ecosystems as a result of geophysical disasters: earthquakes, landslides, geomagnetic storms, tsunamis, volcanic activity etc.
	Natural resource crises	Chemical, food, mineral, water or other natural resource crises at a global scale as a result of human overexploitation and/or mismanagement of critical natural resources

MOUNT POLLEY MINE, 2014

GOOGLE EARTH

NORTH AMERICA REGION @ CANADA

TAILINGS DAMS

AND

ALTERNATIVE TAILINGS TECHNOLOGIES

REUTERS GRAPHICS

2020

REUTERS GRAPHICS

2020

TAILINGS DAMS

ARE CONSIDERED

HIGH RISK

IF THE RUPTURE WOULD CAUSE

CATASTROPHIC DANGER

TO NEARBY ENVIRONMENT

INCLUDING

MASS FATALITIES ON COMMUNITIES

REUTERS GRAPHICS

2020

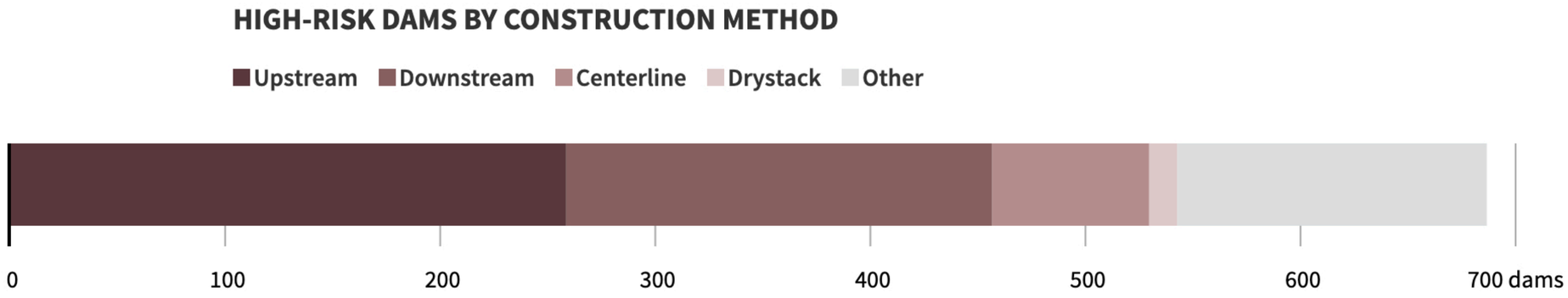
REUTERS GRAPHICS

2020

687

DAMS ARE CLASSIFIED AS

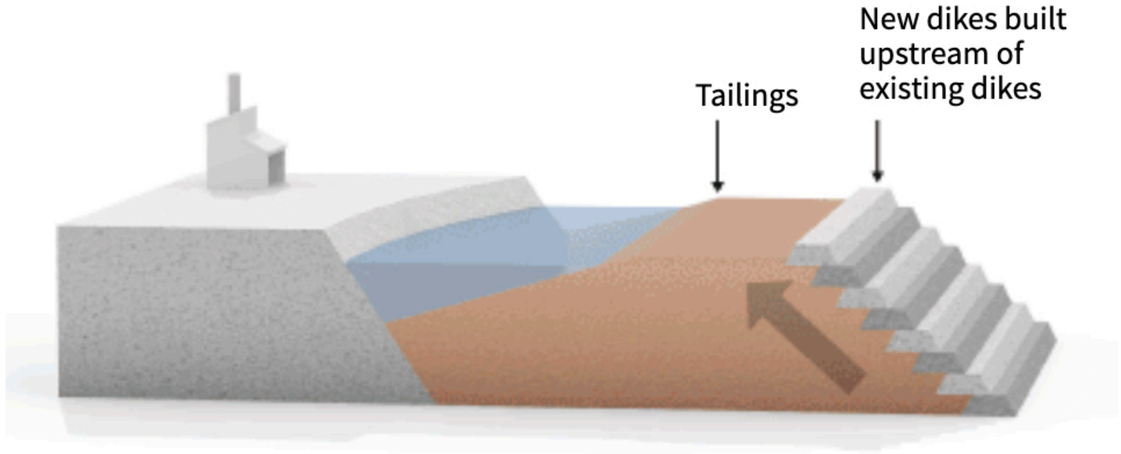
HIGH RISK



Note: Other includes not raised, hybrid and single step construction methods.

REUTERS GRAPHICS

2020

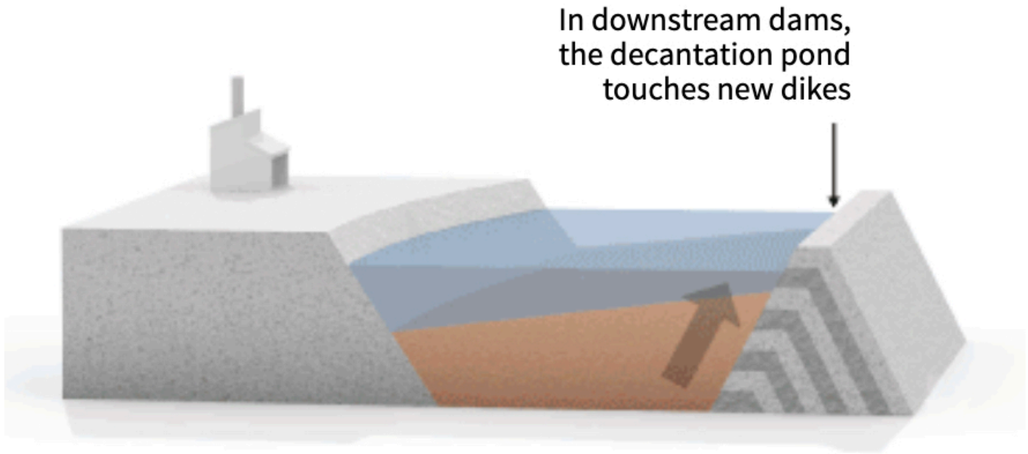


UPSTREAM

Considered the cheapest method, upstream dams are also the most troublesome. They are extremely vulnerable to liquefaction when the tailings behind the dam are saturated with water. The liquid mixture erodes the structure of the dam and increases the potential for a rupture.

REUTERS GRAPHICS

2020

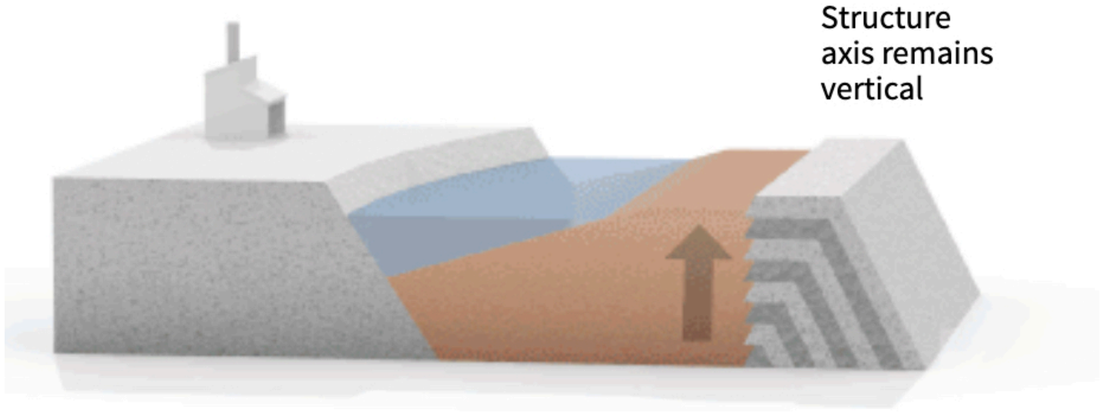


DOWNSTREAM

Developed to minimize the risks of rupture, downstream dams create structural stability by not storing wet tailings underneath the dikes. It is also the most expensive construction method because it requires a larger area and more material.

REUTERS GRAPHICS

2020



CENTERLINE

Centerline dams are an intermediate solution in terms of costs and volume. In this method, successive dikes are constructed by placing construction material on the beach and on the slope downstream of the previous dike. The central lines of the dikes coincide as the dam is built upwards.

REUTERS GRAPHICS

2020

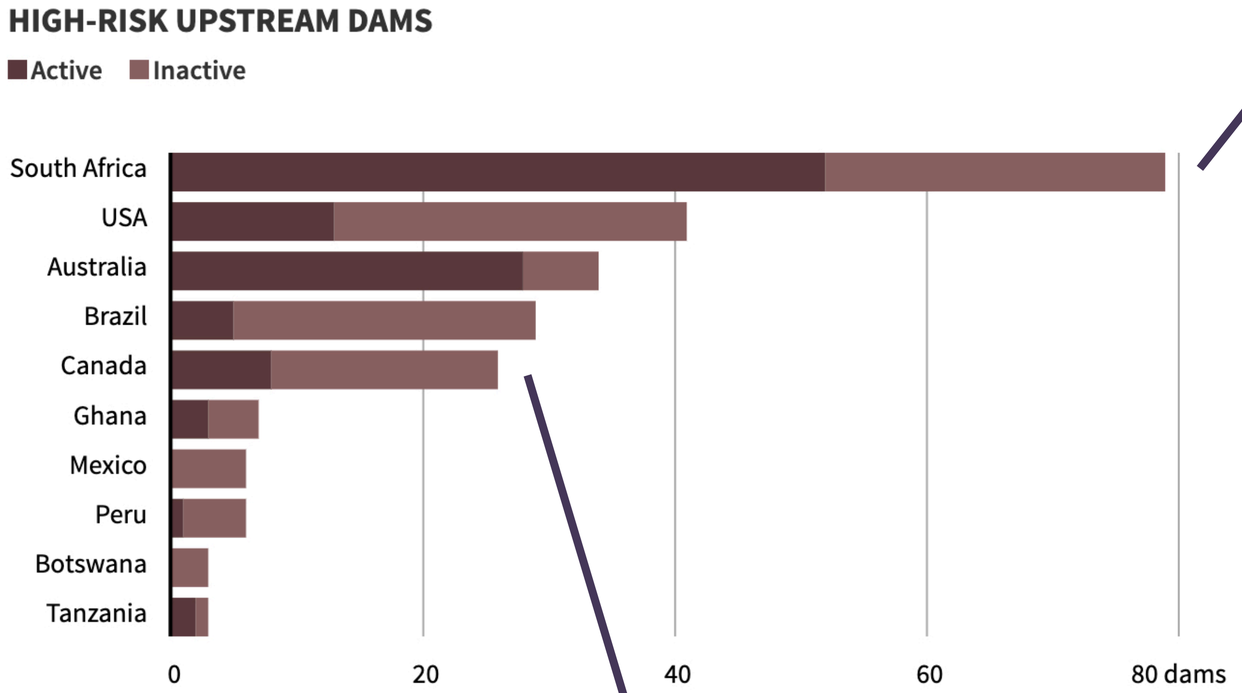
DRYSTACKING

Dry-stack tailings suck water from mine waste so that it can be stored safely, effectively as dry dirt. Expensive and limited to smaller mines, the approach holds potential to boost water recycling in arid climates while also substantially reducing the footprint and geo-technical risks of massive dams that store wet tailings.

REUTERS GRAPHICS

2020

AFRICA REGION @ SOUTH AFRICA



NORTH AMERICA REGION @ CANADA

Co-convened by the International Council on Mining and Metals (ICMM), United Nations Environment Programme (UNEP) and Principles for Responsible Investment (PRI), the Global Tailings Review has established a robust, fit-for-purpose international standard for the safer management of tailings storage facilities.

ICMM
International Council on Mining & Metals

UN environment programme

2020

PRI Principles for Responsible Investment

GlobalTailingsReview.org

GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT

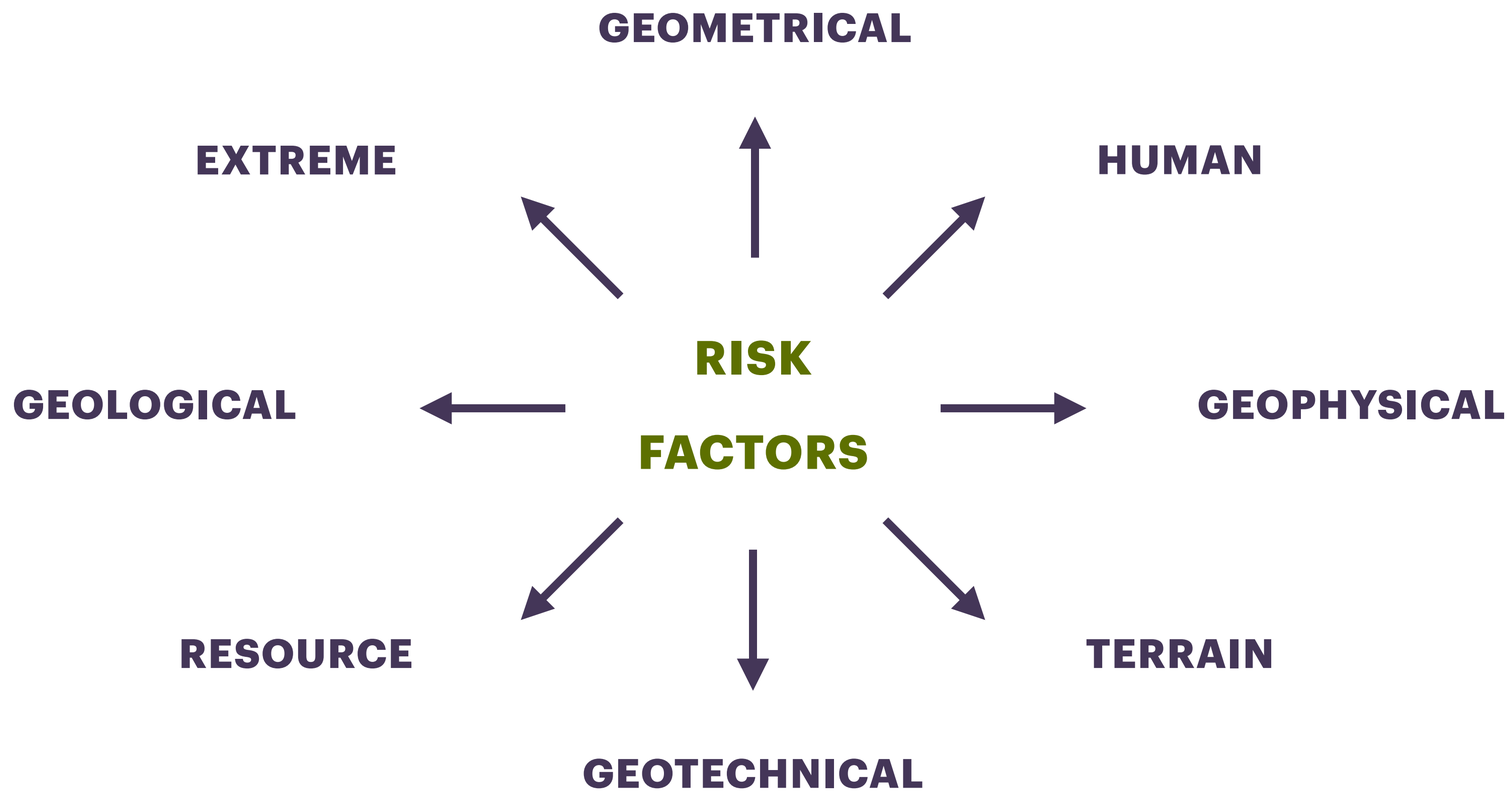
AUGUST 2020

ICMM International Council on Mining & Metals

UN environment programme

PRI Principles for Responsible Investment

CONTENT


GEOMETRICAL
EXTREME
HUMAN
RISK
FACTORS
GEOLOGICAL
GEOPHYSICAL
RESOURCE
TERRAIN
GEOTECHNICAL

THE CONSTRUCTION OF THE NEXT

ARTICLE IN <PRESS>

FOLLOWS

WORLWIDE EVENTS

PREVIOUSLY NOTICED AROUND

IN ORDER TO

FIND QUESTIONS FOR THE PARTS

NORTH AMERICA REGION @ CANADA

<PRESS>

Failure of tailings dams doubled in this century. The trend for increased amounts of waste is also factoring into the increase in accidents. It was also found a relationship between catastrophic collapses and increased production or reduced operating costs. Therefore poorly understood geotechnical characteristics and extreme rainfall are paired with management practices. A global industry standard on tailings management was published in 2020 providing global guidelines. Recommendations also include changing to drystack tailings or at least reducing the quantity of water in the waste in order to further reduce the footprinting.

NORTH AMERICA REGION @ CANADA

<QUESTION>

In which extent the worldwide governments need to firm up legislation to comply with the guidelines for tailings management?

<QUESTION>

The disaster simulation is part of the emergency plan in the worldwide practice of tailings management?

<QUESTION>

Which alternative tailings technologies may be applied worldwide in projects of considerable size changing from the most troublesome upstream dams in order to reduce the footprinting?

TECHNICAL COMMITTEE 304 ON RISK

<QUESTION>

Which risk analysis procedures are feasible and comparable for the design in the practice of tailings management?

ARMERO, 1985

GOOGLE EARTH

SOUTH AMERICA REGION @ COLOMBIA

LANDSLIDES

AND

PREVENTION OR MITIGATION TECHNOLOGIES

MODELING AND REPORTING LANDSLIDES

THE

LANDSLIDE HAZARD ASSESSMENT FOR SITUATIONAL AWARENESS (LHASA)

GLOBAL MODEL

WAS DEVELOPED TO PROVIDE

SITUATIONAL AWARENESS OF LANDSLIDE HAZARD

FOR A RANGE OF USERS REGARDLESS OF LOCATION

MODELING AND REPORTING LANDSLIDES

THE GLOBAL MODEL COMBINES

NEAR REAL TIME PRECIPITATION DATA OF THE GLOBAL PRECIPITATION MEASUREMENT (GPM)

WITH

A LANDSLIDE SUSCEPTIBILITY MAP OVERLAID BY THE GLOBAL LANDSLIDE CATALOG (GLC)

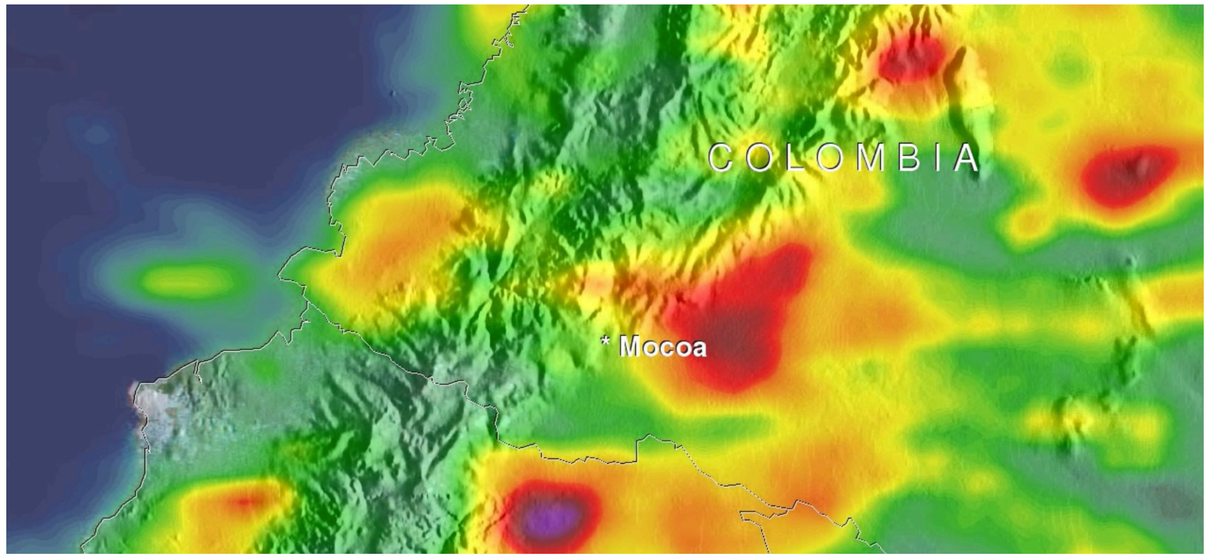
TO GENERATE ESTIMATES IN EVERY 30 MINUTES OF WHERE AND WHEN

RAINFALL TRIGGERED LANDSLIDES ARE LIKELY TO OCCUR AROUND THE WORLD

COLOMBIA, AMERICA

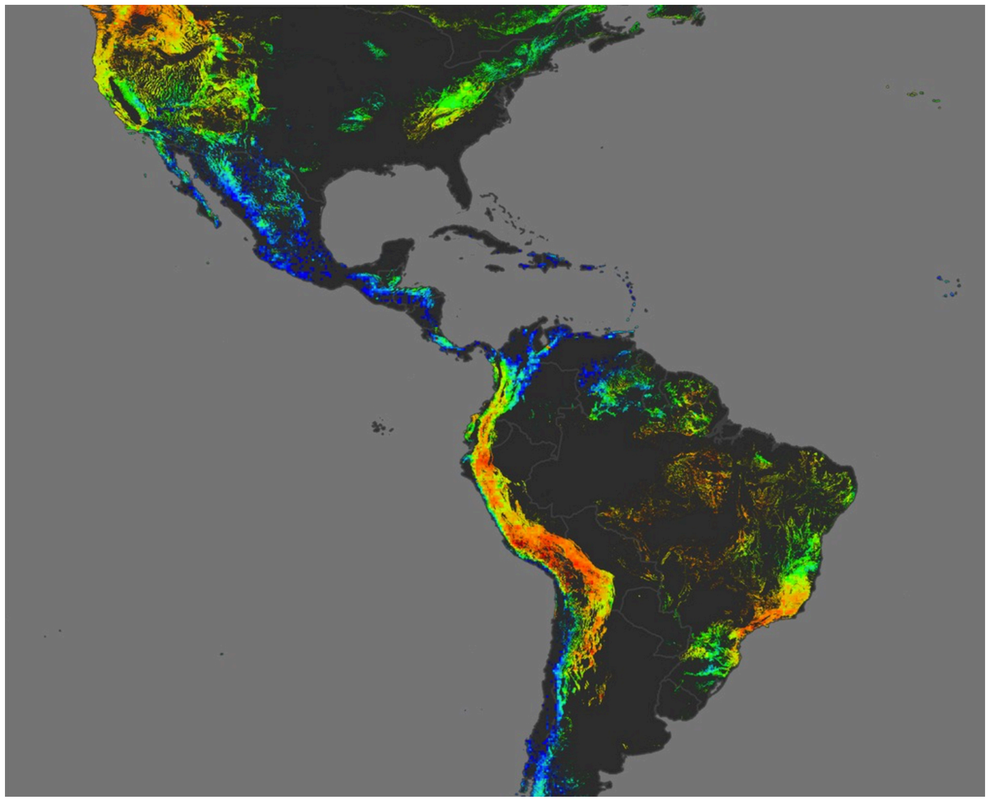
GLOBAL LANDSLIDE CATALOG (GLC)

COLOMBIA, AMERICA



GLOBAL PRECIPITATION MEASUREMENT (GPM)

AMERICA



LANDSLIDE HAZARD ASSESSMENT FOR SITUATIONAL AWARENESS (LHASA)

WORLD

THE SECOND VERSION IS A
MACHINE LEARNING BASED MODEL
THAT ANALYZES A COLLECTION OF
INDIVIDUAL VARIABLES
AND
SATELLITE DERIVED DATASETS
TO PRODUCE
CUSTOMIZABLE NOWCASTS AS A
PROBABILISTIC ESTIMATE
OF
LANDSLIDE HAZARDS

LANDSLIDE HAZARD ASSESSMENT FOR SITUATIONAL AWARENESS (LHASA)

Fatal landslides in Colombia (from historical times to 2020) and their socio-economic impacts

Landslides
DOI 10.1007/s10346-022-01870-2
Received: 6 September 2021
Accepted: 18 February 2022

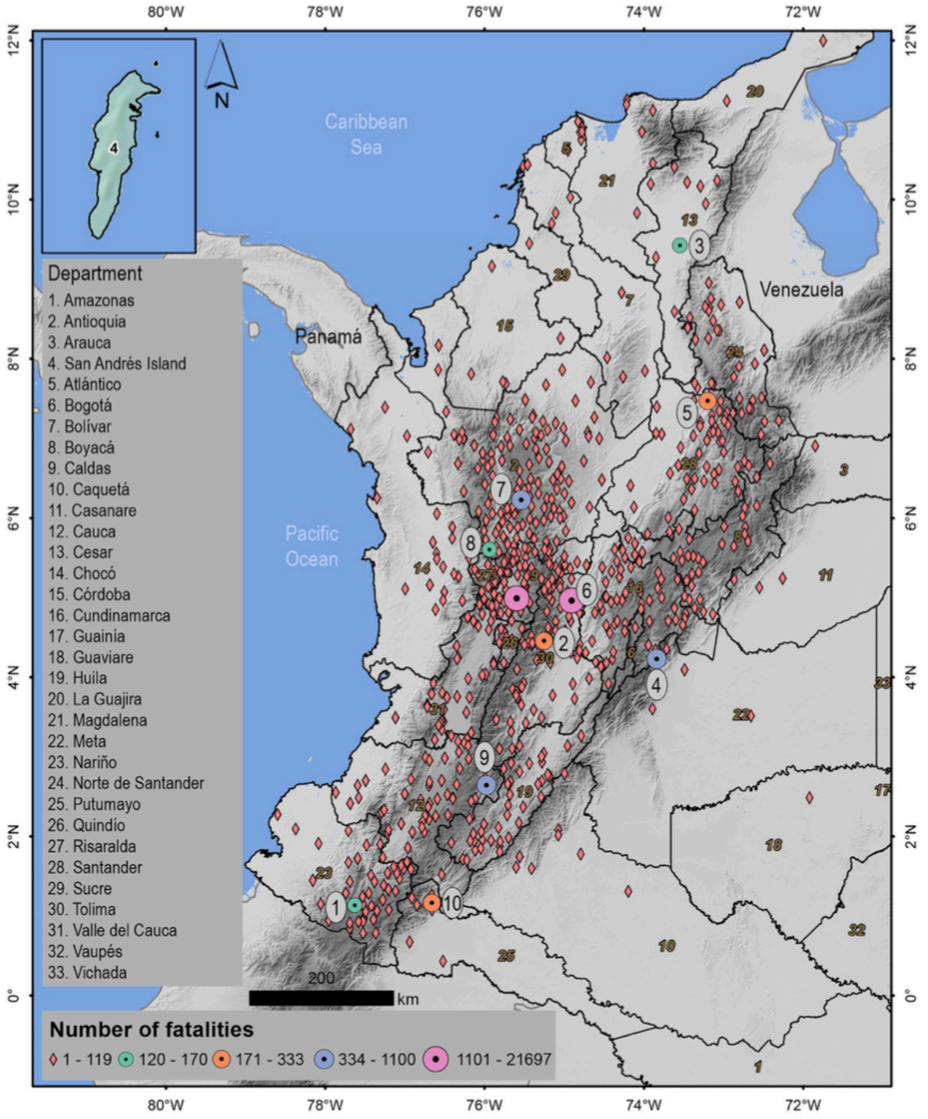


Fig. 2 Administrative division of Colombia (by departments) with the spatial distribution of fatal landslides represented as red markers. Circle markers and numbers in white boxes spot the top 10 deadliest landslide-related events for the period 1912–2020 in chronological order. (1) Túquerres (9 January 1936; $n=170$ fatalities); (2) Ibagué (29 June 1959; $n=250$); (3) Chiriguaná (10 November 1970; $n=123$); (4) Quebrada Blanca–Guayabetal (28 June 1974; $n=400$); (5) El Playón (25 November 1979; $n=300$); (6) Armero (13 November 1985; $n=23{,}084$) and Chinchiná (13 November 1985; $n=1387$); (7) Villatina–Medellín (28 September 1987; $n=562$); (8) Andes (26 April 1993; $n=120$); (9) Páez (6 June 1994; $n=1100$); and (10) Mocoa (31 March 2017; $n=333$)

THE CONSTRUCTION OF THE NEXT

ARTICLE IN <PRESS>

FOLLOWS

WORLWIDE EVENTS

PREVIOUSLY NOTICED AROUND

IN ORDER TO

FIND QUESTIONS FOR THE PARTS

SOUTH AMERICA REGION @ COLOMBIA

<PRESS>

Countries like Colombia in South America are hotspots for landslide hazards. From the analysis of the catalogue of landslides it is concluded that the events are frequent in the central western Colombia in South America. The increase in the number of events in this century with upward trends in these areas show that fatal landslides are far from being effectively prevented or mitigated. Findings suggest a correlation between fatal landslides and climate variability. Despite the rainfall being the most common trigger for fatal landslides a trend for anthropogenic causes is identified and in most cases vulnerable people are more affected by fatal landslides.

SOUTH AMERICA REGION @ COLOMBIA

<QUESTION>

The NASA model LANDSLIDE HAZARD ASSESSMENT FOR SITUATIONAL AWARENESS (LHASA) has been applied on landslides in the South America region and particularly in Colombia?

<QUESTION>

Which anthroponegic causes may be advanced in the South America region and particularly in Colombia beyond the major cause of climate variability and the rainfall focused by the NASA model?

<QUESTION>

In which extent it is required to firm up the government support to vulnerable people to comply with the prevention or mitigation technologies in the South America region and particularly in Colombia?

TECHNICAL COMMITTEE 304 ON RISK

<QUESTION>

Which risk analysis procedures are feasible and comparable to produce customizable nowcasts of landslide hazards in the context of the brand new prevention or mitigation technologies?

<THE ROUNDTABLE REPORT IS BASED ON THE PAIRED EXPLORATION REPORT>

<THANKS>