1. INTRODUCTION

Every year billions of dollars are spent on development programs, with the aim of improving the lives of millions of people around the world. However, the impact of climate change translated to financial risk on these interventions is generally not measured or clearly known.

With good cause: the financial experts assume that by the end of this century investment assets worth 43 trillion US Dollars are at risk from climate-change (TCFD Recommendations, 2017 – https://www.fsb-tcfd.org/publications/final-recommendations-report/)

This is the case for sea level rise, which is complicated by interactions with extreme weather events like windstorms, sea-surges, floods, droughts and heat waves. An increasing number of occurrences are leading to failure in meeting the development programs objectives as a result of extreme weather events in many regions.

Dry regions will likely face increasing drought, whereas traditionally wet regions are expected to get even wetter with unforeseen impacts on the life of millions of people.

Regardless of future scenarios, it is expected that the frequency and/or severity of these natural hazards will continue in increasing.

Financial institutions are compelled to gauge the scale of these risks in order to mitigate them to ensure the success of these development programs.

To do this, financial institutions will have to derive the financial risks from scenario analysis with the aim of putting in place resilience strategies that address imminent challenges from climate impacts.

What climate risks require immediate attention from financial institutions, and what scientific information is available? This project aims to highlight climate risks that require the immediate attention of financial institutions.

Taking a starting point in the existing science, the project will categorize climate change risk according to timeframe and probability by region, coupled with a gap analysis on available information for financial institutions.

2. APPROACH

Assessing climate risks require methodologies based on forward-looking scenarios, on complex causes and effect linkages derived from very large sets of observed data. (Big Data).

Such models are at their infancy, and require the use of advanced mathematics simulation to develop them. This project provides a possible venue of the sets of building blocks that such models will be built on.

To derive the financial risk from the impact of climate change for a given development program, the following possible methodology with three stages is put forward:

1. Defining climate scenarios:
The translation of climate change into financial risk relies first on the definition of physical scenarios for climate change.

These scenarios define how climate change will impact the variables that are relevant for economic activities, which procedures are used to mitigate these impacts and which measures are added to steer the given development program to meeting their objectives.

2. Estimating economic and financial impacts:
Once the impact of climate change on the variables relevant for economic activities has been estimated, its consequences must be translated into economic terms though simulations.

This step basically assesses the direct and indirect repercussions of climate change in economic terms and identifies which factors are affected by them and by how much.

Once the economic effects on factors have been identified, the next step is to translate the impact of these effects into monetary terms.

3. Translating financial impacts into financial risk measures:
Based on this assessment of financial impacts for the development program, the next step is to compute how changes in monetary terms will affect the achievement of the objectives for which the development program was initiated for in the first place.

3. **DELIVERABLE**

Artificial Intelligence:

Predicting financial risks, a plethora of variables must converge at just the right moment in just the right way, invariably.

Advances in artificial intelligence (AI) methodologies have enhanced the robustness of such predictive models by introducing schemes based on Inference Engine that extract vertices and edges from an initial graph and algorithms that prune unlikely outcomes by sifting through hundreds of thousands of factors to match shapes to known prototypes.

Artificial intelligence, which incorporates machine learning and data science, places data within a context through pattern recognition and iterative learning.

What is new about the latest incarnation of the AI framework is that its draws on many disciplines, such as statistics and computer science, and game theory, and employs a myriad of techniques, including:

1. Rules-based systems that set parameters and conditions to enable scenario testing;
2. Machine learning that applies algorithms to decipher patterns and linkages in the data by continuously updating "learning" through an iterative process;
3. Neural networks that identify interconnected nodes through multi-layered data to derive meaning;
4. Deep learning that leverages pools of high-dimensional data to identify patterns of patterns; and
5. Pattern recognition that uses tools, such as natural language processing to classify and interpret data.

Software Platform:
Climate change data is regarded as Big Data, hence the call for the use Artificial Intelligence to model scenarios.

The aim is to design an integrated software to calculate key indicators that reflect the financial risks associated with climate change in projects funded by financial institutions.

The calculated indicators will be presented in dynamic dashboards that can be included in studies or project terms of reference, and/or be used in monitoring and operating reports after the project goes into production.

To achieve the above the project will attempt the use of Inference Engine.

The Inference Engine will be a generative model, which will capture complicated features from observed data, and it will be used to train a non-linear classifier.

The method will be tested in a real-world financial risk prediction task, and the empirical results will attempt to open new avenues in the use of Artificial Intelligence to gauge financial risks for financed projects with social impact.

6. TARGET AUDIENCE

The target audience for this project will be all financial institutions on national or international levels involved in funding development programs with social impact.
Among the majors, the World Bank, The European Investment Bank, and The European Bank for Reconstruction and Development.

National and international non-profit organizations when funding projects with social impact can also be the targeted audience of such integrated software.
Among these: PNUD, OMS and the UNICEF.