



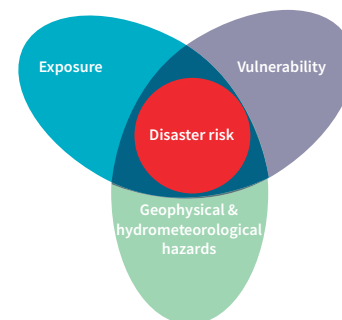
Understanding the Climate Risk Equation

Risk is defined as (n): a situation involving exposure to danger.

When we as an industry talk about risk, we think about it in the context of the following equation:

$$\text{Risk} = f(\text{Hazard, Exposure, Vulnerability})$$

We need to clearly define what we mean by each component and contemplate the complicated non-linear relationship that exists between these components to understand risk now and in the future.



When we talk about Hazard, we are referring to the peril or event that has the capacity to damage or destroy a particular asset. The peril here could be tropical cyclone, wildfire, earthquake, or flood, to name a few.

Exposure is defined as the amount of an asset that is exposed to the hazard in a given space and time. This refers to the properties, vehicles or other assets that form part of a portfolio of assets

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that we (re)insure. A key aspect of exposure is the numerous characteristics relating to the particular asset that are important to understand in order to try to model the interactions that exist between the hazard and vulnerability. Some examples of these might be: method of construction, materials used, roof types, roof geometry, deck construction and materials. These building attributes are all important aspects of exposure that allow a more holistic picture of the risk to be modelled.

Vulnerability is defined as the susceptibility or damageability of an asset to a given intensity of the hazard. The extent to which an asset is vulnerable to a hazard is also intricately linked to the characteristics of the asset (as mentioned above), further highlighting the importance of capturing and understanding all key aspects related to the exposure in order to accurately estimate vulnerability to assess the risk.

The relationship between these 3 variables is non-linear, it is also not additive or multiplicative, rather it is a complicated interaction that is non-stationary and is evolving over time. Risk modelling will continue to gain importance, within and outside the industry, as we seek to understand how assets are likely to be impacted in a changing climate. It is for these reasons that we need to ensure that we communicate clearly within the industry and beyond how we think about risk and ensure that this definition is used consistently.

Having a clear definition of how we model risk is key when we discuss the risks and opportunities we face as a (re)insurer when it comes to climate change. Frequently in discussions around a changing climate we see the word Risk used where Hazard is more relevant. The importance of getting this right is to ensure that when focusing on risk we face as a (re)insurer we are understanding and investigating all aspects of the risk equation and not just focusing on the hazard. Focusing on one aspect of the risk equation and neglecting the others gives an incomplete picture of how risk is going to change in the future.

Understanding how each component changes along with how the relationship between all three components change allows us to get a clear picture of how Risk is going to evolve.

A changing climate is going to impact the hazard, both positively and negatively, and over the timeframes that hazard changes emerge there will equally be changes in both underlying exposures and vulnerabilities. Understanding how each component changes along with how the relationship between all three components change allows us to get a clearer picture of how Risk is going to evolve.

By defining risk this way, we are also able to effectively discuss the societal risks that we are facing from a changing climate. Population growth is a key driver of exposure growth, along with urbanization and the accumulation of assets in areas exposed to hazards. Whilst these are big drivers in increasing risk, we know technological advances will help communities improve their adaptability and become more resilient to the hazards they are likely to face in the future which will hopefully reduce the risk they face over time.

Risk is a complicated problem, but we as (re)insurance professionals are best placed to understand and communicate what Risk is and how the key components can potentially interact in the future.

About the Author

Andrew MacFarlane has a BSc. Hons Actuarial Science & Statistics and FIA. He is Head of Pricing & Analytics for London & Bermuda for Reinsurance at AXA XL and a Partner on AXA XL's Leadership Council. In his Head of Pricing & Analytics role he manages the actuarial team across London and Bermuda supporting underwriters across a broad range of business lines and products. Andrew was involved in setting AXA XL's CSR strategy and is a member of the AXA XL CSR Steering Group. Andrew plays an instrumental role in looking to expand AXA XL's involvement in closing the protection gap and leads the Public Sector Partnership practice group at AXA XL. The aim of the group is to strengthen partnerships with the public sector in order to bring socially impactful insurance solutions to the market. Andy is based in Bermuda and can be contacted at andrew.macfarlane@axaxl.com.