The Global Risk Assessment Framework

Better decisions for a better future

Concept Note

The Global Risk Assessment Framework is a trusted space to broker, coordinate, harmonize and connect action to build a broader understanding of risk in all its dimensions for decision makers to apply at all scales, fuelling a shift to proactive, anticipatory behaviour to prevent risk creation and reduce existing risk. The Framework is focused on identifying and, coherently and effectively, leveraging and amplifying existing efforts, working across cultures and languages, harnessing emerging technologies, integrating science, dissolving barriers between silos within a framework of action and practice to propel positive impacts at all scales to achieve peace and security; enabling resilient futures of human, ecological, economic and political systems

The Challenge

The adoption of *The Sendai Framework for Disaster Risk Reduction 2015-2030* on 18 March 2015 (henceforth referred to as the *Sendai Framework*) created new requirements and new opportunities for those involved in building resilience to the shocks to which societies are exposed and articulated the need for improved understanding of risk in all its dimensions. Since 2005, the Hyogo Framework for Action (HFA) has been an important instrument for raising public and institutional awareness and generating political commitment, yet over the same ten year time frame, disasters have continued to exact a heavy toll: with more than 1.5 billion people affected and total economic losses of more than $1.3 trillion. Evidence indicates that exposure of persons and assets in all countries has increased faster than vulnerability has decreased, thus generating new risks and a steady rise in overall disaster-related losses and damage.

Furthermore, the decisions that are taken at all scales in ever more interconnected societies, reverberate across interdependent social, ecological, economic and political systems in increasingly diverse and correlated ways. Reflecting this, Member States adopted a scope for the Sendai Framework that was significantly broader than its predecessor, the HFA, to include man-made, as well as natural, hazards and risks. Hence the recognition that now is the time for urgent action to better understand the multi-dimensional nature of risk, to increase accountability for disaster risk creation and propagation, so as to be able to collectively identify the inter-dependent solutions that will enable the prevention of new risk, the reduction of existing risk and the strengthening of resilience at all levels[1].

The Response

In response to this challenge, the United Nations Office for Disaster Risk Reduction (UNISDR) – which has the mandate to support the achievement of the outcome and goals of the Sendai Framework[2] and the 2030 Agenda for Sustainable Development (henceforth referred to as the *2030 Agenda*) – was called upon by experts to establish a process to co-design and develop the Global Risk Assessment Framework (GRAF), so as to be able to inform decision-making and transform behaviour as never before. It is intended that the design and development of the GRAF will explicitly support, and enable other third parties to support, national and sub-national governments, as well as non-State actors, to achieve the global targets of all 2015 agreements[3]. It seeks to inform and focus action within and across sectors and geographies by decision-makers at local, national, regional and global levels on the four priorities for action as set out in the Sendai Framework[4].

This Concept Note is an open invitation for cooperation in the co-design and development of the GRAF to catalyse and facilitate the widest possible input of experts and users of risk information to support collective outcomes and explore open questions in relation to the implementation and alignment of the Sendai Framework, Paris Agreement, the New Urban Agenda and the 2030 Agenda for Sustainable Development (the 2030 Agenda).

This is the beginning of the process of creating the GRAF which, following the first meeting of the GRAF Expert Group in June 2018 in Geneva, will produce the *GRAF Implementation Roadmap 2019-2029*[5] (the GRAF Roadmap) for consideration at the Global Platform on Disaster Risk Reduction in May 2019 (the Global Platform).

We have identified the problems, we are now searching for the solutions in collaboration and engagement with key disaster risk reduction organizations and experts.

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[1] *Sendai Framework for Disaster Risk Reduction 2015-2030*, paragraphs 3-6
[2] *Sendai Framework for Disaster Risk Reduction 2015-2030*, paragraph 48(c)
[3] including inter alia the Sendai Framework, the 2030 Agenda, the Paris Agreement, the New Urban Agenda
[4] *Sendai Framework for Disaster Risk Reduction 2015-2030*, paragraphs 18 and 20
[5] Elucidating the iterative pathway to risk-informed systems-based approaches to sustainable development

The GRAF Vision

To transform behaviours and catalyse a proactive decision-making culture by democratizing everyone's understanding of the interactive nature of risk through time

The GRAF Objectives

1. To provide decision makers with **actionable insights and access to products, tools, demonstrations and scenarios at all scales** (spatial and temporal) to better understand systems impacts and consequences to prevent risk creation, manage and reduce existing risk, including systemic risk, transition risks and emerging risks
2. To **support national governments to maximise synergies** across the implementation and achievement of the targets and goals of the 2030 Agenda, the Paris Agreement, the New Urban Agenda and the Sendai Framework
3. To **increase trust and confidence in the multi-science foundation of risk assessments** in an inclusive, open process, building on existing processes and data to the greatest extent possible
4. To **foster a culture of inclusive, collaborative, and proactive behaviour** based on interdisciplinary systems thinking
5. To **mobilize finance and de-risk investments** to enable risk-informed sustainable development

The GRAF Principles

1. Open – open access, open source, open data, open platforms, analogue and digital access

2. Collaborative – co-creation, co-design, co-ownership, self-organizing, emergent learning

3. Universal – all scales, global-to-local, self-sustaining for all users, co-designed for the long-term

4. Trusted – credible, fair, accountable, reliable, with respect and integrity, user experience focus, an experimental space for innovation and iterative development

5. Practical – non-duplicative, re-usable, reproducible, scalable, maximising impact of resources

6. **Transparent** – explain all assumptions, "glass box", highlighting the unknown unknowns

7. Living with uncertainty – represent uncertainty in complex systems contexts

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Background

The UNISDR has been tasked to support both the implementation of the Sendai Framework and the follow-up to the 2030 Agenda, and in this context convened a gathering of 115 leading risk experts in Geneva on 20-21 November 2017. Participating experts included data providers, risk and hazard modellers, as well as experts on exposure, vulnerability and impact analysis, risk communication, application of risk information and end users of risk assessments.

All regions of the world were represented, bringing perspectives from high-, middle- and low-income countries wherein capacities for generating risk data and for risk assessment vary greatly. This enabled a broad examination of current practice and the use of risk information, and the identification of the demand and feasibility for the development of a GRAF that more comprehensively represents the scope of the Sendai Framework whilst facilitating coherence with the 2030 Agenda, the New Urban Agenda and the Paris Agreement.

An independent expert review of the current Global Risk Model, developed by the UNISDR for the UN Global Assessment Reports on Disaster Risk Reduction (GAR) 2013 and 2015 and the GAR Atlas 2017, found that whilst crucial in supporting the conceptual shift from managing disasters to managing risk (that was subsequently enshrined in the Sendai Framework), it does not reflect the full range of risks, including small- and large-scale, frequent and infrequent, sudden and slow onset disasters caused by natural or man-made hazards, as well as related environmental, technological and biological hazards and risks that the Sendai Framework has been adopted to address. The meeting provided an opportunity to build on existing practices established in the development of the Global Risk Model, leverage the wider body of work and expertise, and to bring forward new solutions, working practices and coordination and participation mechanisms.

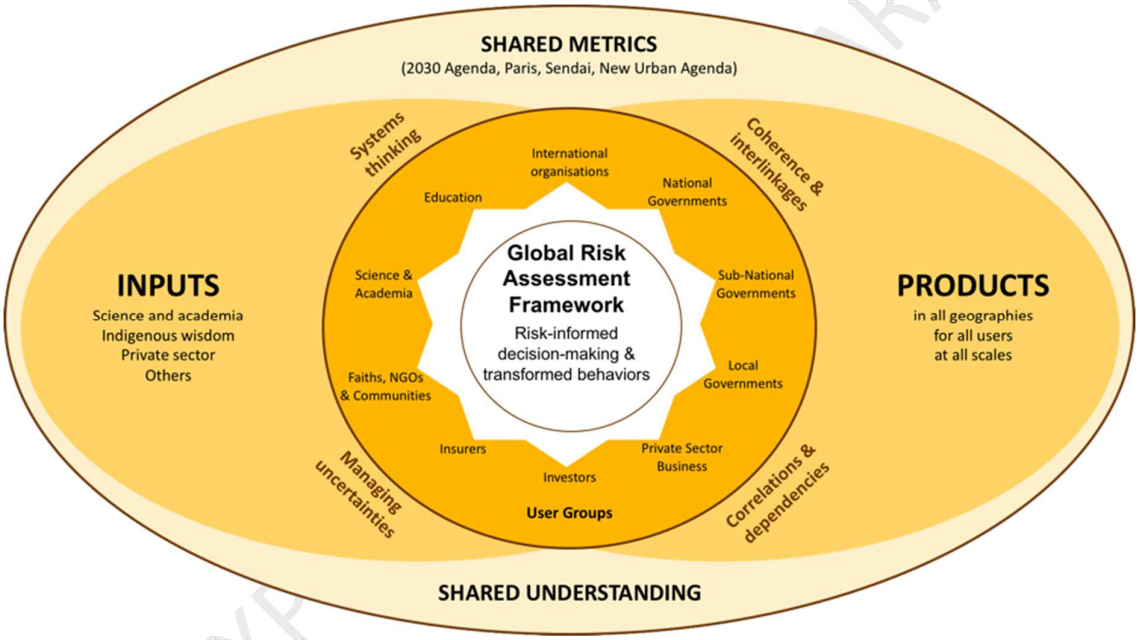
Principle recommendations from the GRAF Expert Meeting

1. Experts agreed that state-of-the-art risk information in a global risk assessment framework, across the full spectrum of hazards and risks covered by the Sendai Framework, with emphasis on vulnerability, exposure and impact, at relevant and appropriate scale across sectors and geographies, is desirable to enhance risk-informed decision-making.
2. There is a need to develop clear near- and long-term deliverables that serve the purpose of assessing and identifying risk, and which ultimately can be made applicable to the accelerated reduction and prevention of risk at national and sub-national level.
3. Focus should be on the collective responsibility to optimize existing data in open support of the global public good, to realise the collective aspiration to connect systems, understand inter-dependencies and collectively identify solutions at scale.
4. Data or information on vulnerability (social and environmental) is recognised as severely under-developed and is recommended as a priority area for expanded work. Real reductions in risk will be through understanding and addressing issues of vulnerability and exposure.
5. The GRAF must reach the city level, where the impact and consequence of risk preventative / risk reducing action, or inaction, is most keenly felt; this is mirrored by the increased prominence that is accorded to Mayors in international efforts to realise the 2030 Agenda and the other 2015 agreements, goals and outcomes.
6. It is recommended that the GRAF is introduced in the GAR in 2019, showing the changes in global risk assessment post-2015, the evolution in approach to reflect more accurately risk in society, and describing the data and outputs that will be provided and how these could be used for improved decision making.

1.0 GRAF Process

The work to co-design and develop the GRAF recognises that the 2030 Agenda, the Paris Agreement and the New Urban Agenda have enormous potential as a framework for engaging Member States on the risks they face, and where they lag most on reaching the goals. The GRAF is intended to be a crucial component of a comprehensive UN risk assessment and analysis framework in support of the 2030 Agenda and will contribute to the Secretary-General's vision to support decision-making for an Integrated Platform on Prevention as well as within the UN Resilience Framework.

The GRAF co-design will be an evolutionary, emergent process focused on the needs of decision makers – both current and anticipated – and will offer a space for contributions to build a comprehensive assessment across geographies, sectors and scales of the determinants and drivers of risk in all its dimensions. It is a collaborative framework in which risk modelling and assessment capabilities, impact and consequence analyses, risk knowledge and tools can be braided together and made available, providing information for decision making and action by users everywhere.



The GRAF aims to improve the understanding of current and future conditions on Earth, at all scales and across all relevant time periods, to better manage uncertainties and mobilise people, innovation and finance by:

- Fostering interdisciplinary systems thinking, at all scales, with a *shared methodology.*
- Enabling the identification of anomalies and precursor signals, as well as the interlinkages, relationships, correlations and dependencies across systems to build a *shared understanding* and enable decision makers to act.

By providing actionable insights, tools and demonstrations at relevant scales to decision makers on a timely basis the GRAF can build collective intelligence to steer societies towards the *shared metrics* of the 2030 Agenda, the Sendai Framework, the Paris Agreement and the New Urban Agenda.

1.1 Developing interdisciplinary systems thinking

The development of a multi-user, open and inclusive collaborative *shared methodology* for all stakeholders to both contribute to and become users of the GRAF is a fundamental enabler of the interdisciplinary systems behaviours required for transformative action. Shared systems and working practices, guidance on data standards and protocols, and communication must all be developed employing representative users' stories to guide the process of co-design (see Annex 3 for examples of User Stories).

Approaching risk from a systems perspective to build a comprehensive three dimensional topological map of risk through time, on a foundation of multi-science (natural, social, indigenous), revealing the interactions between hazards or shocks, exposure, and importantly vulnerabilities, across human, ecological and economic and financial systems.

To identify systemic risks and unravel their DNA, one has to look at everything. Since no one organisation or institution can capture all of the relevant perspectives, systemic risks must be assessed through consultations and co-design with multiple parties, which ultimately converge on an understanding of the most important risks and risk drivers, and the communication of relevant information, including scenarios and options on which users can focus their efforts.

The aim is to be able to consider, through the use of all relevant research, observations and data sources and the connecting and harmonizing of the best available modelling and assessment, correlations between direct and indirect risk factors to improve understanding of the drivers of risk creation. This must include risks derived from, and interacting with, natural systems behaviour and human agent behaviour and provide actionable insights on the potential impacts and consequences on all sectors of society, at all scales through time.

In this way, the cascading and interactive effects of changing decision making behaviour on risks can be better understood and mitigated through the lens of preventing large-scale suffering, to societies, ecosystems and economies, to steer towards and beyond the 2030 Agenda, the Sendai Framework, the Paris Agreement and the New Urban Agenda.

Universal facilitation of this *shared methodology* will initially be under the auspices of the UNISDR as the custodian agency of the Sendai Framework. Leadership and direction from across the United Nations system will be transmitted through the UNISDR, supporting the work of the GRAF Expert Group which will play an important role in the early stages of co-design and development of this *shared methodology* leading up to the 2019 Global Platform.

1.2 Developing a shared understanding of risk

The GRAF will work with all stakeholders to build a *shared understanding* by:

- Creating a framework and global community for the understanding and sharing of risk data, information, models and metrics, risk communication modalities and decision-making support.
- Reducing the information load on decision makers by focusing outputs on the identification of anomalies and precursor signals, including the provision of decision friendly scenarios and options at relevant geospatial and temporal scales (including city-region and national scale), that incorporate sensitivities to change for the identified risk conditions, as well as an understanding of systems reverberations, bleed-over and feedback loops.
- Building collective intelligence on how to prevent discontinuities of progress in critical systems (including human health, ecosystem functioning, economic development, etc.) through a combination of artificial intelligence and collective human intelligence, and by adopting a systems-based approach, create the potential to transform behaviours, enable self-organisation and emergent learning pathways focused on local processing of information by relevant stakeholders on the impacts and consequences of decisions across the *shared metrics*.

1.3 GRAF Delivery Plan

The GRAF Delivery Plan is an evolving and dynamic presentation of the phases of activity to achieve the GRAF vision and objectives. At the 1st preparatory meeting for the GRAF Expert Group held in Geneva on 16-17 April 2018, experts representing many of the dimensions of the GRAF co-design and development challenges provided detailed feedback and participated in extensive discussion on the development of the GRAF, including this Concept Note. A key outcome of this preparatory meeting was the need to determine immediate priorities and tangible actions for the Expert Group to consider at the 1st meeting of the GRAF Expert Group in June 2018.

Following further consultations at the Understanding Risk Forum 2018 in Mexico City, a consensus emerged around the need to think big but to focus effort at this time on the design and development of the process as well as the articulation of a preliminary GRAF Delivery Plan, with tangible activities and deliverables, rather than on the ultimate end product of the GRAF. This so as to build confidence and trust with potential collaborators, supporters and users of the GRAF.

As set out in the Theory of Change (see Section 1.3.1), the co-design and development of the GRAF is expected to continue until 2029 in three broad phases of activity:

Phase 1: Design and set up – 2018-2019

Comprising foundation activities to understand the activities and potential projects to be established in Phases 2 and 3 as well as establishing the initial practical demonstrations and pilots to test and present what GRAF is aiming to achieve. Working Groups focusing on fostering interdisciplinary systems thinking and communications (both communication of risk information as well as the communications strategy for GRAF) will also be launched as critical enablers for subsequent activity.

During this phase, which will include both sequential and parallel activities, there is an intention for prioritization to be 'directed' towards key areas for the establishment of priority GRAF Working Groups' activities (as recommended by the GRAF Expert Group with the support of the GRAF Secretariat). This 'directed' approach is considered to be the most appropriate to catalyse initial efforts for rapid scale-up, rather than to adopt a 'self-organising' approach (across a wide range of pilot projects addressing a variety of problems at various scales). This approach will be supported with powerful feedback and learning loops to then enable rapid scale-up in Phases 2 and 3 when the intention will shift towards facilitation of an experimental, failure and learning, 'self-organising' modality and mobilization across networks.

Phase 2: Building the framework – 2019-2023

Based on the findings of Phase 1 activities, Phase 2 will focus on building the elements and dimensions of the Framework as depicted in the GRAF Impact Cube (see Section 1.3.3) along the three Causal Pathways[6] set (the People Pathway, the Systems Pathway, and the Science Pathway) as set out in the Theory of Change to work towards achieving the objectives and outcomes of GRAF, including establishing a range of Working Groups and initiation of a range of demonstrations and pilot projects. In Phase 2 the enabling elements for emergent learning and experimental innovation in a developing interdisciplinary systems thinking context will be established.

[6] The Causal pathways are intended to clearly and explicitly define the questions to be addressed and the elements to be tested and established. They are useful in identifying pivotal linkages, dependencies and correlations between various activities in a complex process environment such as the GRAF.

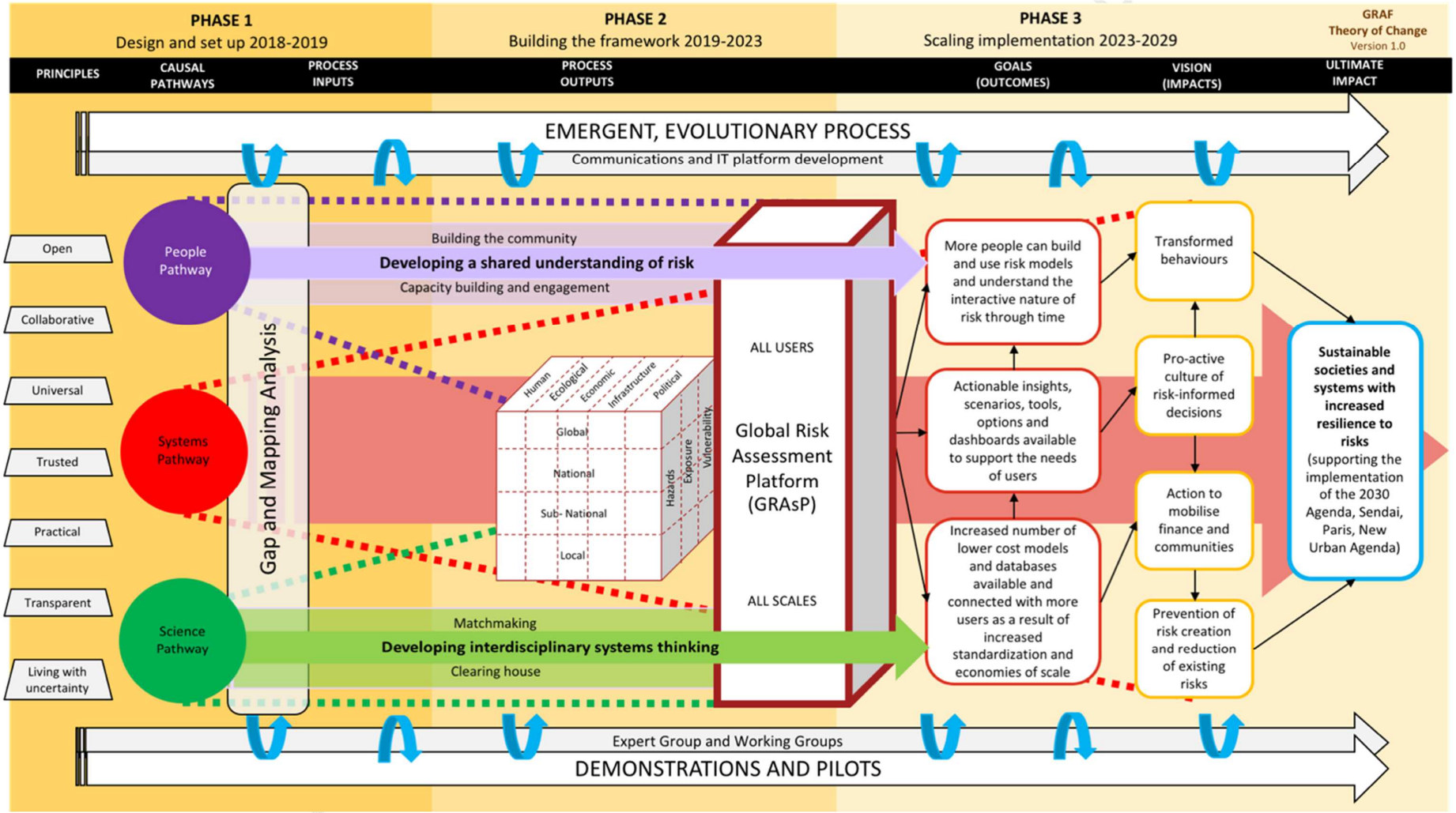
Phase 3: Scaling implementation – 2023-2029

Building on the establishment of the activities initiated in Phase 2 to realise the full aspiration and achieve the ultimate impacts as set out in the GRAF vision. At this stage it is too early to articulate the exact nature of the Working Groups and projects that will be operational in Phase 3 as these will be determined through the process outcomes and results of the projects undertaken in the earlier phases, with much of the activity in this final phase of the establishment of the GRAF being self-organised, locally-owned and managed and organically scaled with limited to no intervention from a centralised management structure.

1.3.1 Theory of change and the GRAF Implementation Roadmap 2019 – 2029

The Theory of Change is designed to clearly articulate and determine the characteristics of the inputs, outputs, outcomes and impacts GRAF is designed to achieve between now and 2029. The continuing co-creation of this important document will be facilitated by the GRAF Secretariat with approval by the Expert Group.

The preliminary Version 1.0 is included below to illustrate the early stage thinking about the development and implementation of key elements of the GRAF. This includes the Causal Pathways (people, systems and science) and the importance of the foundational Gap and Mapping Analysis (see Section 1.3.2.1) in the context of the multi-dimensional nature of the GRAF represented in the GRAF Impact Cube (see Section 1.3.3) and the development of the Global Risk Assessment Portal (GRAsP). All of which will build on the foundation activities initiated in *Phase 1: Design and set up* (see Section 1.3.2) and the subsequent activities identified as priorities from the Gap and Mapping Analysis and the learnings from the initial demonstrators and pilots.


PHASE 1
Design and set up 2018-2019
PHASE 2
Building the framework 2019-2023
PHASE 3
Scaling implementation 2023-2029
GRAF
Theory of Change
Version 1.0
PRINCIPLES
CAUSAL PATHWAYS
PROCESS INPUTS
PROCESS OUTPUTS
GOALS (OUTCOMES)
VISION (IMPACTS)
ULTIMATE IMPACT
EMERGENT, EVOLUTIONARY PROCESS
Communications and IT platform development
Open
Collaborative
Universal
Trusted
Practical
Transparent
Living with uncertainty
People Pathway
Systems Pathway
Science Pathway
Gap and Mapping Analysis
Building the community
Developing a shared understanding of risk
Capacity building and engagement
Human
Ecological
Economic
Infrastructure
Political
Global
National
Sub- National
Local
Hazards
Exposure
Vulnerability
ALL USERS
Global Risk Assessment Platform (GRAsP)
ALL SCALES
Matchmaking
Developing interdisciplinary systems thinking
Clearing house
More people can build and use risk models and understand the interactive nature of risk through time
Actionable insights, scenarios, tools, options and dashboards available to support the needs of users
Increased number of lower cost models and databases available and connected with more users as a result of increased standardization and economies of scale
Transformed behaviours
Pro-active culture of risk-informed decisions
Action to mobilise finance and communities
Prevention of risk creation and reduction of existing risks
Sustainable societies and systems with increased resilience to risks (supporting the implementation of the 2030 Agenda, Sendai, Paris, New Urban Agenda)
Expert Group and Working Groups
DEMONSTRATIONS AND PILOTS

1.3.2 Immediate priorities: Phase 1 – Design and set up

The four immediate priorities for the establishment of Working Groups listed in this section are based on the extensive consultations noted above in Section 1.3 and refined through the discussions in the 1st meeting of the Expert Group in June 2018.

Note that this list of four Working Groups does not preclude the establishment of additional Working Groups, or Projects within these four Working Groups, within Phase 1 subject to approval by the Expert Group.

1.3.2.1 Gap and Mapping Analysis

The Expert Group members are strongly in favour of the immediate formation of a Working Group to develop the scope and terms of reference for a comprehensive Gap and Mapping Analysis exercise, for roll-out from Q3 2018 to Q1 2019. This Analysis will be an important foundation activity to inform the level of effort and focus on a range of different topics key to the further development of the GRAF in Phases 2 and 3.

The analysis will be guided by the dimensions of the GRAF Impact Cube (notably the different scales including global, national, sub-national and local; hazards, exposure and vulnerability; and the different dimensions of impact and consequence including human/ societal, ecological, economic, infrastructure and political).

The short-term Working Group will aim to complete the preliminary analysis for review at the 2nd Expert Group meeting in November 2018, with a final report of findings issued in advance of the 3rd Expert Group meeting in April 2019 to include in the GRAF launch at the Global Platform 2019.

The Working Group will determine the specific areas of focus of the analysis in the context of the three Causal Pathways articulated in the Theory of Change, with the following topics[7], as articulated in the Expert Meeting on the GRAF in November 2017, the various consultations since, and the 1st meeting of the Expert Group in June 2018, to be considered in confirming the final scope for the analysis:

People Pathway

1. Identification and mapping of **existing initiatives** that are focused on improving the understanding of risk, including identification of **key organisations and individuals** for GRAF to collaborate with for future development
2. Extension and elaboration of existing **user stories** to develop a representative understanding of potential **user needs and user profiles of decision makers**, including research and mapping of current initiatives to address known gaps and leveraging the networks of the Expert Group and beyond. This with the purpose to develop a comprehensive and inclusive understanding of the profiles of potential users of GRAF and their needs (existing and anticipated) in terms of building risk literacy and moving towards a pro-active culture of decision making, with both a meta-analysis and direct engagement process to develop a broader set of user-centric metrics
3. Mapping of current **capacity building, engagement and training** approaches including identification of gaps and mapping of current initiatives to address known gaps and mapping of current approaches to building communities of practice

[7] Note that the list of potential topics is limited by the nature of the consultations undertaken to date by the GRAF Secretariat and is, by definition, non-exhaustive.

Science Pathway 4. Identification of gaps in current approaches to **hazard, exposure and vulnerability data and modelling**, including modelling coverage and maturity (and identification of existing data and models that could be better used if they were to be compatible with GRAF objectives and principles) , interoperability and standards, availability and access to data and models and the methods and approaches of determining physical/ economic, social and ecological vulnerability functions) 5. Identification of gaps in current approaches to **impact and consequence analysis**
Systems Pathway 6. Identification and mapping of current approaches adopting and fostering **interdisciplinary systems thinking and behaviours** including approaches focusing on interlinkages, coherence, correlations and dependencies across and between systems 7. Identification and understanding of gaps in current approaches to **managing uncertainty** in complex systems contexts
Organisational design and development 8. Identification of **funding models and resources** currently in use for large scale, collaborative network initiatives 9. Identification and understanding of leading practices for **governance and organisational design/ structure** for large scale, collaborative network initiatives 10. Identification and understanding of leading practices and potentially relevant **IT systems, platforms, communication approaches and interfaces**

1.3.2.2 Fostering systems thinking: understanding and modelling risk creation

With exposure and losses continuing to rise faster than vulnerability decreases, it is important for GRAF to explore the opportunities for nurturing and fomenting systems thinking and systems-based approaches to enhance understanding and modelling of risk creation and the determinants of risk, and the identification of the inter-dependent solutions that must follow.

The Expert Group recommended the establishment of a standing Working Group to support the Systems Pathway to ensure systems-approaches are incorporated into the iterative development of the GRAF. Based on the inputs from the 1st meeting of the GRAF Expert Group, this Working Group will initially explore establishing a number of projects to better understand:

i. The level of **understanding and competence** in systems thinking and systems based approaches to understanding and managing risk, and the challenges and opportunities inherent in the wider scope of hazards and risks as represented in the Sendai Framework (including in Paragraph 15). This set of activities will include exploring the different methods of understanding the various hazards and risks (including probabilistic modelling, expert opinion, bow-tie analysis and more) as well as the development of a phased approach to incorporating them into the GRAF

ii. The basis of **decision making** which does not incorporate systems thinking and which leads to increasing risk creation, including exploring the **incentives and information typologies** used by different types of influential decision makers and the nature of **silos and barriers** to transdisciplinarity/ interdisciplinarity and operating in a systems thinking context

iii. The opportunities for **alignment and synergies** across the 2030 Agenda, the Paris Agreement, the New Urban Agenda and the Sendai Framework by adopting and fostering a systems thinking paradigm

iv. The **drivers of risk creation** (societal, ecological, financial and political)

v. **Systemic risk and transition risks**, potentially using the global financial crisis of 2008 as an exemplar to understand gaps in the current processes and approaches to identifying systemic risk

vi. The opportunities for **systemic innovation**, including the impacts and consequences of fostering interdisciplinary systems thinking

1.3.2.3 Demonstration and pilot projects

Establishing a Working Group to identify and initiate practical demonstration projects of the GRAF principles and objectives is considered an important tangible step to build trust and confidence in the potential of the GRAF in the lead up to the Global Platform in May 2019.

An early example of a demonstration or pilot project has been brought forward by a number of the members participating in the 1st meeting of the Expert Group, as detailed below in the proposed case study.

The 2nd meeting of the Expert Group in November 2018 will consider proposals and determine the need and interest for additional demonstration projects in conjunction with this Working Group.

Proposed case study: the GRAF Risk Index (Q3 2018 – Q2 2019)

This project aims to broker and connect the combined efforts of a range of pre-eminent organisations to build a new global and regional risk index (the GRAF Risk Index) based on a modification to a proven composite indicator methodology. The risk index will assign a risk score to all countries between 0 and 10 based on their hazards, vulnerability and coping capacity. The pilot will start from the INFORM Index for Risk Management[8] - a well-established risk index - and modify it to make it fit-for-purpose for Sendai Framework monitoring, according to the GRAF principles and with GRAF added value. In particular, the demonstrator will:

- Build on INFORM: replace, delete and add components according to the GRAF objectives
- Integrate the Global Earthquake Model Foundation's (GEM) earthquake model. GEM will convert their risk knowledge into an index from 0 to 10, compatible with INFORM requirements
- Integrate multiple flood models. The Global Flood Partnership (GFP) will provide output of at least two flood models in an index from 0 to 10, compatible with INFORM requirements
- Use a standard exposure layer, if possible. The Global Human Settlements Layer (GHSL) exposure layer is used in most hazard components.
- Integrate a new experimental biological hazard layer. To be completed by the European Commission Joint Research Centre (JRC).
- Integrate a new landslide layer, to be provided by NASA
- Integrate SDG information on vulnerability and/ or a coping capacity component
- Integrate available Sendai Monitor information

[8] http://www.inform-index.org/

- Register all contributing models according to GRAF metadata, and release the underlying models onto the Oasis Loss Modelling Framework platform – which can then be used by multiple actors, e.g. insurance, but also those looking at a range of hazard outputs. This will also create an opportunity for country CAT Bonds to improve access to funds after disasters.
- If time and resources permit, the intention is to be able to demonstrate dynamic or seasonal socio-economic data

1.3.2.4 Communication and organisational design

Communication of risk information for better decisions

Increasing the sophistication and availability of risk information, even in the context of a better understanding of the needs of decision makers, will not support the achievement of the GRAF vision and goal without a new approach to communicating risk. The need to move from numbers to stories and scenarios and ability to conduct their own "what if" analysis will need to be achieved as the GRAF aims to provide actionable insights and reduce the information load on decision makers. Communication and dialogue is an integral component of engagement with decision makers.

This Working Group will bring together the multiple dimensions of communication and dialogue with decision makers as a foundation element for the widest possible engagement with the GRAF through subsequent phases of activity.

The Working Group will explore and develop ways to get decision makers to understand their risk and to take appropriate action, including:

- Involving decision makers in the development of risk models, data, information, etc.
- Giving decision maker the tools to experience and play with so that they can run "what if" scenarios for themselves and build their capacity to understand through doing
- Creating dialogue on risk between experts and decision makers (when they are different people), the process of which can help producers of risk information to better understand end-user or decision-maker needs
- Communicating examples of success stories (and failures) of action based on risk information.

The terms of reference for this Working Group will also potentially include exploring aspects of communication to build capacity in understanding what risk information can be used for what decision, and the range of decisions that are advisable given the uncertainty in future trajectories of climate change impacts and our ability to model them.

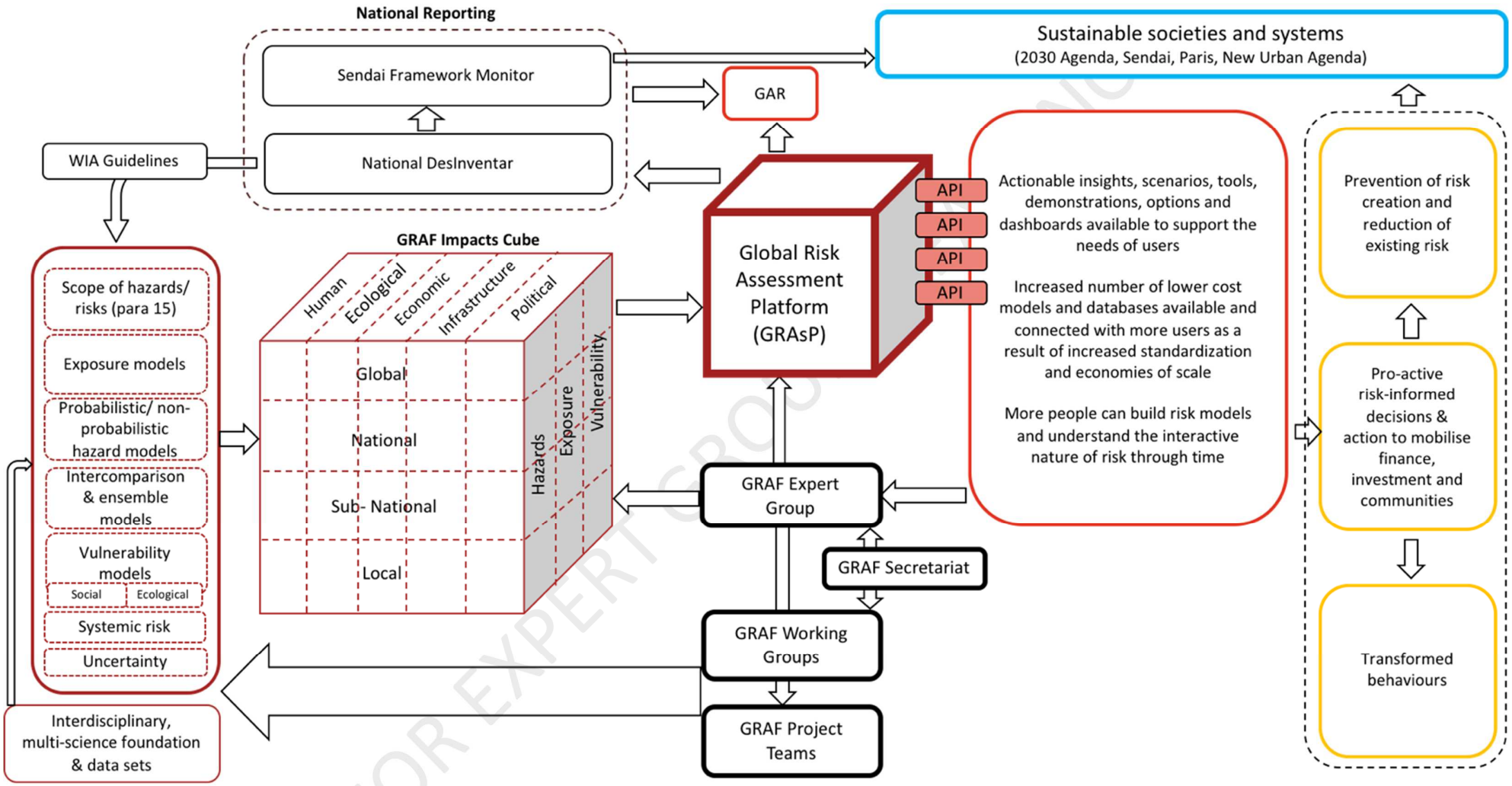
Organisational design

This Working Group will also focus on the development of the **GRAF Operating Model**, potentially including developing:

- The communications strategy and activities for GRAF, including the various digital and print channels to communicate GRAF project activity, key meetings and events and other relevant information necessary for advocacy, building a broader understanding of what GRAF is, engagement and outreach
- The funding and resource mobilisation approach for GRAF in the context of the known Working Group and Project activities and developing capacity for future activities
- The GRAF IT Collaboration platform, including summarizing the understanding of GRAF expectations, challenges and requirements for the supporting IT platform and depicting an approach and methodology to identify relevant technology options and definition of a high-level solution design in terms of the overall Operating Model.

1.3.3 GRAF Schematic

The GRAF Secretariat has developed a provisional multi-dimensional frame for the many activities expected to be undertaken in building the GRAF. At the heart of this representation of the interaction of the GRAF with decision makers, the governance structure and the ultimate impact, Sustainable societies and systems, is the GRAF Impact Cube. The Cube is a three-dimensional representation of the matrix of dimensions that GRAF is aiming to make progress on including the range of scales (global, national, sub-national and local), the five impact dimensions (human/ societal, ecological/ environmental, economic/ financial, infrastructure/ physical and political), and the dimensions of risk (hazards, exposure and vulnerability).

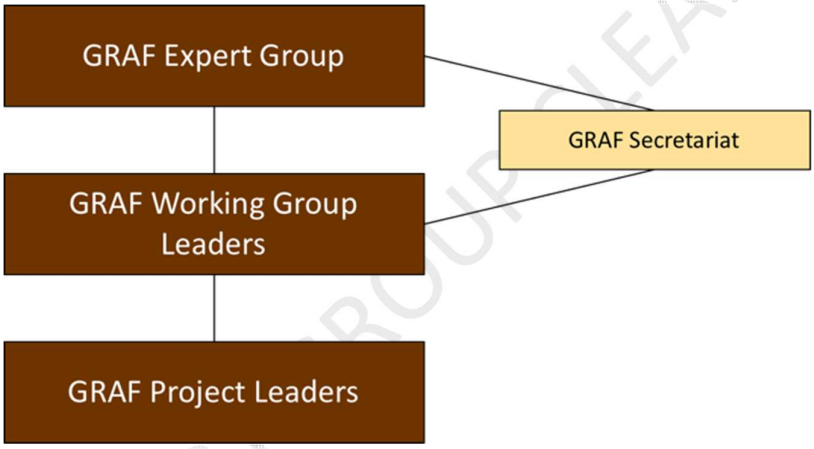


2.0 GRAF governance and management

Two principles guide the governance and management structure of the GRAF:

1. Governance structure should facilitate and not impede collaboration
    a. *A lean and flat structure with a coordination layer that ensures better collaboration between all GRAF contributors*
2. Empower GRAF contributors to achieve the objectives with requisite oversight but minimal intervention
    a. *Accountability for GRAF activity, outputs and objectives is allocated to the relevant level and type of GRAF contributor*
    b. *A robust but simple reporting framework to facilitate oversight and intervention on an exceptions basis*

Summary Governance and Management Structure[9]



2.1 Expert Group

The initial remit of the Expert Group is to provide guidance and direction in the co-design and collaborative development of the GRAF, including strategic, technical, functional and operational aspects.

The Expert Group will guide the development and co-creation of the GRAF Implementation Roadmap, including the definition and possible composition of the GRAF Working Groups that will need to be established to support the co-design and development process and the execution of the GRAF Delivery Plan.

The members of the initial Expert Group have been selected from the responses to the Call for Expressions of Interest (as recommended by the Expert Meeting of November 2017). The 1st meeting of the GRAF Expert Group was convened by Mami Mizutori, the Special Representative of the Secretary-General for Disaster Risk Reduction in June 2018. The members of the Expert Group are expected to be in position until the 4th meeting of the Expert Group in November 2019, a period of approximately 18 months - equivalent to the co-design and initial development phases of the GRAF – whereupon members may be considered for reselection. The Expert Group will meet twice a year in

[9] Refer to Annex 4 for more comprehensive Governance and Management Structure diagram

April/ May and October/ November (consistent with cycles for Global Platforms for Disaster Risk Reduction and the UN General Assembly).

During this initial tenure it is expected that the Expert Group will consider future governance requirements. Members of the Expert Group will have the option to re-nominate.

All subsequent terms for Expert Group members will be for a period of two (2) years commencing in November. This term is to ensure that the appropriate blend of experts is able to contribute to each stage of the design and implementation of the GRAF between 2019 and 2029, which will by the nature of the tasks and challenges at each stage require a diverse range of skills and experience.

It is intended that Expert Group members will be in this position for approximately 18 months prior to each of the Global Platforms, and 6 months post. This is to ensure that they have:

- Adequate time to deliver substantial contributions to the specific design and implementation elements of the GRAF to be released at respective biennial Global Platform and annual HLPF events, and
- A period of consolidation and review prior to the change of composition approximately 6 months after the Global Platform.

Further details in relation to the Expert Group are included in Annex 1.

2.2 Working Groups and Working Group Leaders

The Expert Group is mandated to consider the establishment of Working Groups to address, leverage and stimulate activity in areas that are identified as critical, at each stage of the co-design and development process of the GRAF.

The Working Groups are expected to cover a wide range of topics which may require only short-term project activity (for example, gap and mapping analysis or a pilot project demonstration) or to be established to explore complex, longer-term challenges (for example, drivers of systemic risk). This will necessitate different life cycles of Working Groups including some which may be very short-term and other operating in some format for the majority of the process through to 2029. In the latter case the individuals and organisations present in a Working Group may change over time depending on the specific needs as defined in updates to the Terms of Reference for the Working Group – the definition of which rests with each Working Group.

For each Working Group there will be a call for expressions of interest for nominations for membership, to be approved by the Expert Group. Once Working Group members have been selected – based on the terms of reference approved for the Working Group by the Expert Group – a Working Group Leader will be appointed (in most cases, at least within Phase 1, this is likely to be a representative of the Expert Group). The Working Group will meet on a recurring basis (in person and/ or virtually) with the frequency dependent on the nature and needs of the particular Working Group.

The Working Groups will identify and support the elaboration and execution of GRAF projects, which must be aligned with the overall GRAF vision, objectives and principles. Selection of projects (and alignment of existing projects that are compatible with the GRAF principles) will initially follow a transparent process against established criteria that is publicly communicated and available prior to project selection, and will be supported by a Project Steering Group established by the Working Group. The project selection process will be supported by the GRAF IT Collaboration Platform (refer to separate document: *GRAF IT Collaboration Platform Strategy*).

Working Group Leaders will be expected to actively participate in the oversight of selected projects that are relevant to their Working Group mandate and to support the Project Leader and Project Team, together with the GRAF Secretariat, as required, including:

- Supporting the Project Leader in creating a Project Steering Group (see Annex 4)
- Supporting the Project Leader with the relevant leading practices, learning from other previous projects, use of approved templates, etc.
- Reviewing project progress on an intermediate basis
- Intervening directly into the delivery of the project (only if requested by the Project Leader)
- Taking note of the Project Close Report documentation and transmitting learnings for future GRAF projects to the GRAF Secretariat

2.3 Project Leaders

Once a project has been selected, the Project Leader is tasked with constituting a Project Team to be communicated to the GRAF Secretariat and the relevant Working Group Leader. The Project Leader is responsible for drafting and managing the project in line with the Project Plan, this includes:

- Project objectives and scope
- Benefits and performance measures
- Project approach
- Project task plan
- Project organisation and resource plan
- Assumptions and dependencies
- Stakeholder engagement and communication
- Project controls – QA, version control & change control

The Project Leader is also responsible for:

- Proposing the composition of the Project Steering Group, which will govern the project and issuing progress reports to the relevant Working Group Leader and to the GRAF Secretariat
- Completing the Project Close Report highlighting achievements, deviations in scope, performance metrics, and key learnings for future GRAF projects

The Project Steering Group will maintain the Project Risk and Issues Register which documents all risks to project delivery, an assessment of their impact and probability of occurrence and the mitigation strategy in place. It will also document all issues that happened in the project, an assessment of their impact and how they were addressed/ remediated. It is anticipated that all project documents will be established as forms and templates accessible on the GRAF IT Collaboration Platform

2.4 GRAF Secretariat

UNISDR will host the GRAF Secretariat throughout the co-design and development phases of GRAF and perform an executive management and coordination role across all GRAF activities. The key role of the GRAF Secretariat is to facilitate an organizational structure for change, creating and facilitating the trusted space rather than owning the GRAF.

The GRAF Secretariat will, to the greatest extent possible, act as a trusted broker to leverage existing efforts and will provide the administrative and operational functions to support the activities of the Expert Group including facilitating the collaborative working environment and supporting the activities of the Working Groups and the effective implementation and execution of projects. The GRAF Secretariat will also be responsible for communication with the UNISDR Support Group, the

Senior Leadership Group on Disaster Risk Reduction (SLG on DRR) and the Executive Office of the Secretary-General. A review of the hosting arrangements of the GRAF Secretariat could be anticipated at the mid-point of the Implementation Roadmap 2019 – 2029.

The Expert Group identified key functions of the GRAF Secretariat, and recommended that the required resources be dedicated to the GRAF Secretariat by the time of the Global Platform 2019. These functions are expected to perform the following tasks:

- GRAF coordination
- Communications
- Funding and resource mobilisation
- IT management
- Science and technology support

The GRAF Secretariat will welcome secondments of personnel from partner organisations[10] and funding contributions to enable the appropriate resources to be available. The Expert Group estimated resource costs for the GRAF Secretariat to be in the range of USD 1 - 1.5 million per annum.

2.5 Reporting framework

In line with the governance and management principle that there should be a robust but simple reporting framework to facilitate oversight and intervention on exception basis, the following are proposed as the minimum reporting requirements:

- **GRAF Expert Group Meeting reports**
  - Bi-annual (April/ May and October/ November)
  - Responsibility of the GRAF Secretariat with input from the Expert Group
- **GRAF Annual Update**
  - Annual (May)
  - Responsibility of the GRAF Secretariat with input from the Working Group Leaders and Expert Group:
    - *A two –three page document that would form part of UNISDR's Annual Report, to include in reporting for the biennial Global Platform and the annual High Level Political Forum*
    - *The report will highlight key GRAF achievements and each of the Working Groups over the past year including any significant challenges / opportunities*
    - *Plan of action proposed for the next phase (1 to 3 years)*
    - *Funds spent and expenditure forecasted*
- **Working Group progress reports**
  - Bi-annual (April and October)
  - Responsibility of Working Group Leaders with input from GRAF Secretariat and Project Leaders as required:
    - *A one page excel based reporting tool which serves as a snapshot of the status of all projects in each of the Working Groups/ Sub-Working Groups*
    - *The report will form the basis of discussion during the bi-annual GRAF Expert Group meetings*

[10] Subject to further examination with regards to conformity with UN Rules and Regulations

- **Project progress reports**
  - Periodic with content to be based on the Project Plan
  - Responsibility of the Project Leader with input from the Project Steering Group and Project Team:
    - *A one page excel based reporting tool which serves as a snapshot of the status, activities completed, activities forecasted, outcomes and impacts, and major risks and the mitigation strategy*
    - *The report will form the basis of discussion during Working Group meetings*

All reports to be converted into forms and templates with the GRAF IT Collaboration platform.

2.6 Building the collaboration by informal and formal processes

A critical early phase of activity in developing the governance and management of the GRAF will be the commitment to informal processes to lay the foundation for future developments[11] through extensive engagement and discussion with relevant stakeholders (across the Stakeholder Groups - see Annex 2) to gather support and feedback, and advance.

Building on these informal processes, and with the principle of co-design and development driving the evolution of the GRAF, there are innovative, inclusive collaborative contracting approaches that offer potential. One such approach that merits consideration is the Framework Alliance Contracting for projects across all GRAF delivery partners[12]. This is a new, yet proven type of contracting arrangement developed by King's College London that fosters a collaborative and innovative approach to partnership working.

This type of contract integrates a team into an alliance supported by joint objectives, success measures, targets and incentives. Teams can improve value under a framework or alliance, using a pipeline of work over an extended period of time to build on their experience and establish more efficient working practices, without the need to re-procure a new team for every project.

https://www.kcl.ac.uk/law/research/centres/construction/FAC-1-Briefing-Paper.pdf

[11] This might for example borrow from *nemawashi* principles, i.e. the informal process of laying the foundation for some proposed change or project, by talking to the people concerned, gathering support and feedback, and so forth to efficiently achieve decisions satisfactory to all or most stakeholders.
[12] Subject to further examination with regards to conformity with UN Rules and Regulations

3.0 GRAF Timeline

With the intention to launch the GRAF at the Global Platform in May 2019, the following timeline sets out the timing of activities to be undertaken by UNISDR, in the role of GRAF Secretariat, and the GRAF Expert Group, and supporting experts to ensure that appropriate co-design and development and initial project activity has been completed and that endorsement and support from key stakeholder groups has been secured.

20-21.11.2017 **Expert Meeting** *on the Global Risk Assessment Framework in support of the Sendai Framework for Disaster Risk Reduction 2015-2030, the 2030 Agenda for Sustainable Development, and the Paris Agreement* – report distributed on 28.03.2018

16-17.04.2018 **1st preparatory meeting for the GRAF Expert Group, Geneva**

14-18.05.2018 **2nd preparatory meeting for the GRAF Expert Group at the World Bank Understanding Risk Forum 2018 (UR2018), Mexico City**

Including two consultation meetings:

14.05.2018 1630-1800

Risk Information needs from the end user perspective – concept-testing the Global Risk Assessment Framework in support of the implementation of the Sendai Framework and related SDG targets (formal side-session in UR2018, 40+ participants)

16.05.2018 0830-1230

Preparatory Consultation Meeting on the Global Risk Assessment Framework (external session at Hotel Le Méridien, 45 participants) including discussion groups providing input on 5 key areas for co-design and development:

1. Users: user-centric design and development (user perspectives, user groups and risk communication)
2. Providers: data, models and model outputs, assessment, exposure, vulnerability, impact / consequence analysis
3. Interoperability and standards
4. Organisation and working modalities: Sub-Working groups, IT and information systems
5. Initial priorities and phasing

25.05.2018 **3rd preparatory meeting for the GRAF Expert Group, Geneva**

31.05.2018 **GRAF Concept Note FOD completed and distributed to GRAF Expert Group**

13-14.06.2018 **1st meeting of the GRAF Expert Group, Geneva**

31.07.2018 **GRAF Concept Note with Delivery Plan to be finalized following approval from GRAF Expert Group**

06-11.2018 **Broadcasting and consultation on co-design and development of the GRAF with UNISDR regional offices and programmes, including invitation to contribute additional user profiles and identification of potential Working Group members**

08-10.2018 **Establishment of initial Working Groups**

11.2018 **2nd GRAF Expert Group meeting, TBC**

Provisional agenda:

1. Review of activities and initial tangible deliverables against the GRAF Delivery Plan
2. Stocktake of the establishment and progress of the Working Groups
3. Agreement on action plan through to Global Platform May 2019
4. GRAF communications
5. Review of updated draft GRAF Implementation Roadmap

04.2019 **3rd GRAF Expert Group meeting, TBC**

Provisional agenda:

1. Review of activities and delivery of identified priority activities and outcomes against the GRAF Delivery Plan, including progress assessment of action plan to establish the GRAF by Global Platform
2. Stocktake of the progress of the Sub-Working Groups and consideration of establishment of additional Working Groups post-launch
3. Agreement on GRAF Implementation Roadmap to be presented at the Global Platform (and High Level Political Forum)
4. Choreography of GRAF launch at Global Platform

05.2019 **GRAF Global Launch, Global Platform on Disaster Risk Reduction, Geneva**

Annex 1: Expert Group

Expert Group Selection Criteria

The following criteria are used for the selection of the Expert Group to the greatest extent possible:

- Technical and operational relevance to the design and development of the GRAF
- Updated and scientifically sound experience and topic excellence, in the following disciplines:
    - Risk/ hazard modelling
    - Exposure
    - Vulnerability
    - Natural hazards
    - Environmental risks
    - Technological risks
    - Biological risks
    - Human-induced risks
    - Risk communication
    - Disaster-related statistics
    - Uncertainty understanding, management and communication
    - Organisational development
    - Work on the SDGs, Paris Agreement or the New Urban Agenda
- Global geographic experience:
    - County of origin
    - Geographic area of focus
        - Africa
        - Americas
        - Arab States
        - Asia-Pacific
        - Europe
        - Global
- Representation of major stakeholder groups:
    - International organizations
    - National governments and institutions
    - Regional and local authorities
    - Science and research
    - Private sector
    - Civil society
    - Youth
- Gender balance

The UN places no restrictions on the eligibility of men and women to participate in any capacity and under conditions of equality in its principal and subsidiary organs.

Annex 2: Stakeholder focus

There are seven (7) major groups of stakeholders that have been initially identified for the design, development and implementation of the GRAF:

1. **UN system**, with a focus on establishing a process whereby they work together to identify regional risks and emerging threats, and to develop regional prevention strategies, focusing on transboundary issues and cross-country issues.
2. **International organisations**
3. **National institutions**, relevant parties at National scale.
4. **Local authorities**, with a focus on engaging with aggregators of mayors and relevant city authorities.
5. **Private sector**, with a focus on aggregations of insurance, investment and businesses operating in the private sector
6. **Civil society**, including women, youth, indigenous people, NGOs, workers and trade unions, farmers and faith communities
7. **Science and research**, with a focus on networks of science, including both physical and social science, with broad geographical representation and including transdisciplinary and interdisciplinary groupings

A number of user stories have been created to bring the collaborators and users across the seven major groups of stakeholders of the GRAF to life, these are included in Annex 3

Annex 3: User Stories

Sample user stories and perspectives have been drafted to inform the user-centric co-design process for the GRAF.

In designing the GRAF it is important to acknowledge that all metrics are user-specific, user-dependent and must resonate with users' narratives. In meeting users' needs, they will need to evolve subject to the dynamic environment in which users operate.

National governments and institutions

Government Chief Scientist.
I and my team provide advice on science issues to the Government. These largely relate to hazardous events that may impact on population (internationally). The information I require has to be timely – usually delivered in hours to days, in order to stimulate appropriate response. Information usually focuses on the exploration of possible likely and 'worst-case' scenarios. Examples would be: the repercussions of a volcanic eruption on health, travel, the economy; the residual risks of future events following an earthquake – including the likelihood of secondary events – such as landslides; or the health and economic impacts of a pandemic disease. I require the GRAF to allow multiple, inter-connected, risks to be assessed rapidly.

Warning system operator in developing country.
Lufti is a tsunami warning system operator in a developing country that is dominated by islands with high earthquake and tsunami risks. Tsunami warning is problematic because the warning time for tsunamis may be as little as 5 minutes. In many cases it is not possible to evacuate local populations in time, and most buildings and infrastructure are highly vulnerable. The warning system receives some data from a national seismic system, but must rely on earthquake locations coming from international sources. Some limited amount of tsunami inundation analysis has been done, but it is very crude, so the uncertainties in scenario planning are large. Emergency communications are made via mobile phone, radio or TV. Some warning exercises have been conducted, but only sporadically and with limited success. How can GRAF enable Lufti to provide reliable warnings and to save lives? Where should the warning system invest in order to reduce loss of life? Are there other ways to reduce risk that should be considered in order to complement the warning system? How can the community gauge the benefit of a better warning system versus changes in land use?

Financial regulator.
Hans is a hard working regulator based in Bonn and has been trying to get an under resourced team to be able to give value to his jobs team of evaluating the risk management procedures of the Insurance Industry. At the moment they are using what are often called "black box models" which are very complex and hard to understand. Hans hopes that GRAF will be a base for open models that will give a greater insight into the complexity of so called catastrophe models. He is also aware that many in the Insurance industry don't have models available for some parts of the world and hopes that this new initiative will be able to fill some of these gaps. He does think that this will be tough as the organisations he meets are already complaining of the amount of work to meet the existing regulation and hopes that whatever is done is consistent to merging standards of data, schemes and technology. In the mean time, Hans realises that he and the team will have to work late again to meet all the deadlines.

Development agency-backed ILS cat-Bond.
Aakriti is responsible for designing a new World Bank backed parametric based 3-year catastrophe bond against flooding in her country to protect the poorest section of the population against losses to their property and livelihoods from the apparently increasing number of river and flash floods. She needs to decide how much the losses will potentially be from future floods in the next 1-3 years at various probabilities and return periods, what level of risk to protect against (e.g. 1 in 5, 1 in 20 or 1 in 100) and the limit, and access to high-resolution real-time data on which to trigger payouts.

Regional and local authorities

Mayor of well-resourced and well-connected city.
I have a Chief Resilience Officer and have signed on to the various City Agreements in support of the SDGs, so I support your efforts. My IT folks tell me that we have good data on environmental conditions and city infrastructure investments. I am afraid that risks reflecting my region/nation will need data covering areas other than what is under my control, but the city consultants have developed data sets that are "proprietary" and my staff tell me that I need to spend more money in order to be able to compare. Is this true? can you help? and what should I change to avoid this problem in the future?

Mayor of under-resourced city.
We just experienced a massive flood and many neighbourhoods were impacted. Everything in city hall is gone. I need to establish new plans and help my residents rebuild in safer places. Can you help? When? PS Bring money, please- it is needed to rebuild our infrastructure and new ways to plan!

Local Government Technical advisor.
I require a picture of risks that may affect my municipality over a 30 year period to inform decisions about investments I make for taxpayers. I do not have easy access to science or data, or specialist technical equipment, but want to understand the relative risks related to hazards that operate over widely varying timescales (e.g. annual minor flooding to large-scale earthquakes). I need to understand how these will change in time (e.g. with climate change, with economic growth and with population expansion). I want the GRAF to provide me with tools that allow me to demonstrate to residents why the analysis I undertake is sound, and that the decisions I make on the basis of this is 'optimal'.

Urban Planner.
Julio is an urban planner in a large city in South America. The city is growing rapidly, but the city is not able to keep up with the demand for services nor assure compliance with regulation. Risks to natural disasters (mainly flood, earthquake, landslide) are increasing, as 70% of new construction is informal and located in places of relatively high hazard (e.g. on unstable soils, in flood plains). The city has invested funds into retrofitting some critical infrastructure in order to mitigate risks and also to develop a master plan for future infrastructure growth. They have census data that provides some information about buildings, and they have an asset database for critical infrastructure, but very little is known about the typology of buildings or their vulnerability, their distribution, or replacement costs. Julio wants to know how the city can optimize the investment in improving critical infrastructure in order to improve the day-to-day performance, how to maintain the infrastructure over time, how to reduce the impacts of natural disasters for current urban infrastructure as well as the risks 20 years into the future, and how to have funds in place in order to recover from natural disasters that may occur. Julio would also like to know how much to invest in developing better control mechanisms such as building codes, and enforcement of code compliance. How can the GRAF help?

Private sector

Investor (Asset Manager).
White Asset managers wants to know the economic impacts of climate change on the companies which they invest in. Their focus is on large multinational corporations, as well as on smaller companies who may be domiciled in a single country serving their domestic market or exporting their goods to other countries in the region or further abroad. They want to be able to compare companies and estimate what the future value of companies will be with and without the impact of climate change in the next 25 years. This way they can ascertain and compare how much of the value is at risk from climate change. They are interested in the impact of changes in extreme events as well as weather such as mean temperatures and extreme heat cold. They want to know things like the impact of climate change on physical locations/facilities, production & export capabilities, operating/energy costs (e.g. cooling/heating) and factors such as workforce supply, and the economy of the country they are operating in and selling to needs to be accounted for. They are aware that some companies may be more willing or able to adapt to climate change than others, and would like to know what mitigating impact this could have.

Insurer.
CCAT insurance company provides insurance for households and businesses against the risks of catastrophic loss from extreme events such as cyclones, floods, earthquakes in a low-income country. Only 4% of the population currently takes out insurance, and after a major cyclone/flood event two years ago, many people had to take out high-interest loans in order to re-open their businesses, and the government had to finance the rebuilding of 10,000s properties, a process which is still underway. There is now support from the multilateral development agencies to increase insurance penetration against climate risks in the country. However, previously claims have been much larger than expected and one of the other 8 insurance companies in the country went bust. CCAT wants to understand what its potential losses might be from its growing portfolio, what level of risk they can afford to take on and at what price, what perils they will cover, and how much reinsurance they need to purchase in order to remain solvent in a worst case scenario.

SVP Overseas Business Development for a major Japanese multi-national corporation,
My name is Hiroyuki Sato, I am responsible for major investment decisions in relation to where to locate the next manufacturing plant for our robotics division which we expect to be in operational production for at least 10-15 years, our key considerations are low cost access to land, availability of highly skilled labour and an ability to secure Japanese finance, all of which we are very confident of achieving. We do not consider that we need further risk information as we purchase risk analysis from trusted Japanese service providers and any tail-risk that is beyond our standard risk-financing will always be covered by the Japanese Government.

How will GRAF be able to better inform our decisions in the context of my current situation and the current information sets that I already have access to? I am interested in understanding more about how global phenomena, such as changes in extreme precipitation events (as we had previously experienced towards the end of 2011 on our operations outside of Bangkok) or access to water and even potential regional drought or desertification will potentially impact on both our specific potential asset locations as well as on the direct connections to our supply chain, the functioning of critical lifeline infrastructure, what measures are in place by local authorities and the relevant national governments to mitigate risks and reduce any potential business interruption (as we learned the hard way in Thailand in 2011) and importantly our ability to confidently and at low cost compare the risk across very different locations in different regions of the world and most importantly our ability to maintain access to both conventional risk-financing instruments and the ultimate support from the Government of Japan that we had to rely on in 2011?

SME in the informal sector in Tanzania.
My name is Winnie and I operate one of the busiest vegetable markets on the outskirts of Dar-es-Salaam. I have no reserves and at least 3-4 times every rainy reason my entire stock gets wiped out and at least half a dozen more times each season most of my suppliers who are small farmers have their harvest wiped out – even though many of them are now starting to use something called "We Farm" that provides them with I think a bit more information - which interrupts my ability to sell to my customers which causes real health issues for people who then don't have basic access to food.

I work 7 days a week, 12-14 hours a day and never take leave so I just don't have time to even understand whether there is any way to make sure I don't live with the constant stress of being completely wiped out. I rely on my family and the goodwill of my customers and the other small businesses like mine to work together to support each other to manage through the bad times and have no access to banks for loans or insurance companies for support.

I rely on our local knowledge of the seasons but they seem to be getting less reliable as the years go by, increasingly I try to learn what I can from weather forecasts and news on crop forecasts on my most precious possession, my smart phone, and am fortunate to have pretty good 4G access and I do try to read as much as I can to plan – but there is just so much information I don't really know which to trust and where to go to help me make sure I can have more reliable access to vegetables throughout the year but I would love to have access to something that would improve my understanding and potentially help me to be able to build a case to be able to access finance and even hopefully insurance.

How can what you are suggesting help me and the other small vulnerable businesses in my city as we provide the food and basic services to most of the people who live in the outer areas of Dar?

Senegal Farmer growing groundnut[13].
Youssouf's family income is dependent on selling his crop, and they are in the bottom 10% of income level of all farmers. His farm is approximately 5 hectares.

His groundnut yield varies on average by 30% year to year and in extreme years he can have complete loss in a catastrophic year or a bumper harvest of 120%+ of his previous years yield. Catastrophe losses are caused by drought, flood and pests/locusts. Since 2005 he has had 3 complete losses of his harvest.

At the beginning of the growing season he wants to know what rainfall he will have and when, so that he can plan his planting within the planting window.

If it is not enough he will delay planting until there is sufficient rainfall for his seeds to germinate. He also wants to know if there will be intense rainfall which will wash his seeds away or cause flooding/standing water once his crop is growing and established. For the rest of the growing season he wants to know if it will be a drought year or a good year so he knows what seed to buy. There is a short-cycle seed available which germinates more quickly (and costs more), but if there is no rain in the germination period, it would be better to have the traditional slower growing variety.

[13] Groundnut is the major export / cash crop of Senegal, about 7% of the population of Senegal grows groundnut

Civil society

NGO worker in Somalia.
Ayaan has been working in Somalia for 6 months. While dealing with many issues her main concern is dealing with the social impact of the extreme weather on agriculture and crop yields which have life and death implications. Most of the time the dry weather can produce severe lack of water to local crops which can fail if knowledge of the rainy seasons is not known and whether it will fail. At other times the rains can be so severe that they and combined flood waters can devastate crops and poor housing. She has started working with local village elders to try and get some planning into the system and she knows that this knowledge has to be dealt with by them. She believes that there is data available that may help with forecasts and wants to see some simple info that she thinks may be available from Satellites. She realised that whatever data is available needs to be available on a mobile phone which is mostly the only way to get outside data. She is aware that Droughts usually occur every two to three years in the Dayr and every eight to ten years in both the Dayr and the Gu. The locals say this is changing but she wants to find any reliable information that backs this up.

NGO in the remote hill communities of Nepal.
The NGO supports community owned projects which build and run health posts and schools in villages away from roads/networks at around 3,000 to 4,000m elevation.

They have no mains electricity, no wifi (only mobile data which is v expensive), no TV, no heating, no running water and no drinking water, almost no books etc. Some of the children walk up to 2 hours to get to school and its very cold in the winter in the classrooms so sometimes they don't go. Doug (the head of the NGO) wants the communities running their projects to be able to understand the risks connected with their physical location and how they are changing compared to historical norms for the village in order to choose locations and building and site design practices which keep their buildings and people safe. For example, space for building a school might be very limited due to the need for a large flat area, but what design features can they incorporate to the site in order to protect against landslips and mudslides washing into the site (playground/buildings) during the monsoon season. (e.g. retaining walls, or natural/bamboo planting). They want to know about rainfall patterns so they can build communal water storage tanks for irrigation through their dry season in the winter. Each farmer has 2-3 fields of wheat and 2 or 3 cows of goats. They want to know how to build EQ resilient structures, e.g. classrooms with locally available materials (locally cut wood, and the local stone). Because of the ethos of the NGO, Doug wants the community to be able to access and understand this information themselves and take their own risk-informed decisions.

Science and research

Research Council Scientist.
I seek areas of science that require the development of novel research that has a positive impact on society. I want to understand where analysis or technical development of a problem (usually around processes, be it natural, or engineered (including technical) is required that can be undertaken and the problem 'solved' in about 3-5 years. Novelty is important; this is where my scientists gain most reward. I need to understand in the risk modelling world – and GRAF – where this is most likely to be found (less novel research is often delivered by consultants). In the GRAF I am interested in developing applications – probably around theoretical concepts that have the potential to have a big impact on society.

Scientist.
Peter S. is a scientist leading a group on flood risk modelling, including a global flood model. He follows the work of other global flood modelling groups, and they've discussed that model intercomparison would help them all to improve their models, but they don't get around to it. Now the GRAF provides an ideal context for doing this, so it becomes interesting to participate in the intercomparison exercise. Not only will the work be useful (because the UN asks for it), but it will

provide visibility to the model and the scientists working on it (in a UN publication and in a peer reviewed publication). The GRAF sub-working group on floods provided a detailed intercomparison protocol, so that with minor tweeks to the output format the flood model can produce the necessary output quickly. Once the data is ready, he uploads it in the GRAF (keeping the IPR). This work helped Peter's reputation (and career) as a scientist, and he is willing to stay engaged with GRAF to improve the models further. As he keeps his IPR, maybe one day he can commercialise his model in a spin-off company to build local models in region R: after all, his model performed particularly well in region R.

Scientist.
Daniela D. is a scientist involved in compiling scientific input for the National Risk Assessment of country X. She is struggling to demonstrate to her management that probabilistic risk maps provide a more objective and spatially explicit way of looking at risk compared to an expert panel. She doesn't have the resources to develop such maps. Daniela uses the AAL from the global models in GRAF, available in the GRAF country profile. Following GRAF guidelines for national risk assessment, she combines this with an old dataset on hazard "G" from a university, to create a rough picture of the risk in her country, enough to convince her government to invest in a national probabilistic model for hazard "H" (contracted to a university). When the model is ready, she'd like to feed it back into the GRAF to replace the global data of lower quality. It is an in-kind contribution from Country "X" to the GRAF. Daniela still relies on GRAF data for transboundary risk of hazard "Q", and she is also keenly following GRAF's work on systemic risk and emerging risks. Who knows if this will become important in her country too? Maybe she can convince her bosses to invest in a new national model for emerging risk "E"?

International organisations

UN Resident Coordinator.
As a resident coordinator, I hope the GRAF will improve the availability and usefulness of information on risk. Firstly, I would like it to provide a shared evidence base of risk, which I can use in my discussions with government counterparts and UN agencies and partners. Having this shared evidence base will help us align our activities to manage risk. Secondly, I would like it to help me as a service provider. Having access to an already curated and reliable set of risk information will help UN organisations undertake analysis that can support our joint work and inform the UN Development Assistance Framework. Lastly, I would like GRAF to oversee a series of basic risk information products that can be used in all countries, even with low capacities, are credible and are presented in such a way as to be easily-understandable for decision-makers.

Annex 4: Governance and Management Structure

This is an example of the functioning of Project Steering Groups for the GRAF in the case where there are three Working Groups established, each with a Working Group Leader reporting back into the Expert Group. In this example, Working Group 1 has initiated two projects, each of which has a Project Steering Group. The Project Steering Group for Project 1.1 is comprised of the Working Group 1 Leader and the Project 1.1 Leader, and potentially members of the Project 1.1 Team. Project 1.2 has a similar Project Steering Group structure with the Working Group 1 Leader and the Project 1.2 Leader.
Working Group 2 has initiated one project in this example (Project 2.1) and has denied one proposed project (Project 2.2), the Project Steering Group for Project 2.1 is similar in structure to Projects 1.1 and 1.2.
Working Group 3 has also established one project, however, for the Project Steering Group, due to the nature of Project 3.1, it was determined that it is appropriate for the Working Group 3 Leader, the Project 3.1 Leader and the GRAF Secretariat participate. This example structure illustrates a small number of the variations that are possible within the flexible Governance and Management structure that is explained in the Concept Note in Section 2.0