Introducing AIR's Model Builder

Gayatri Natarajan
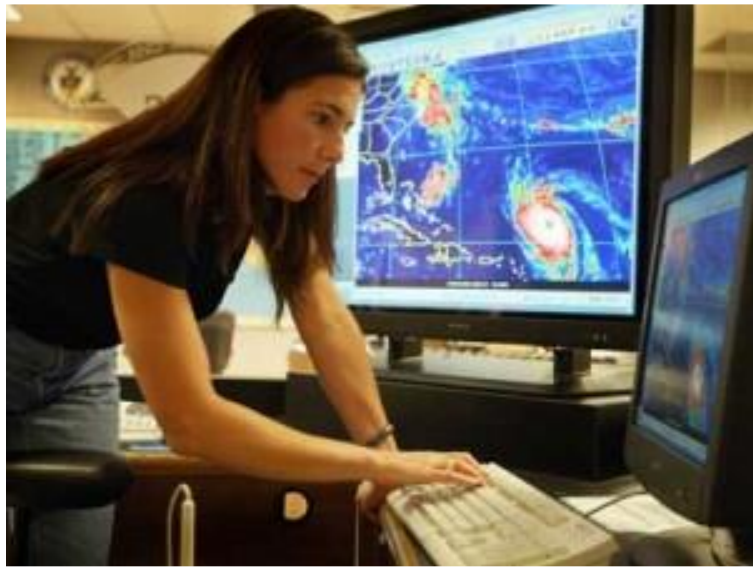**Luis Sousa, Ph.D.**

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Agenda

An Introduction to Model Builder™

Case Study for Model Builder

Demo of the Product

AIR

An Introduction to Model Builder

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Today, *Everyone* Wants Their Own View of Risk

Non-Modeled Regions and Perils Experience Their Share of Catastrophes

Volcanoes in Iceland

Earthquakes in Africa

Specialty Risks
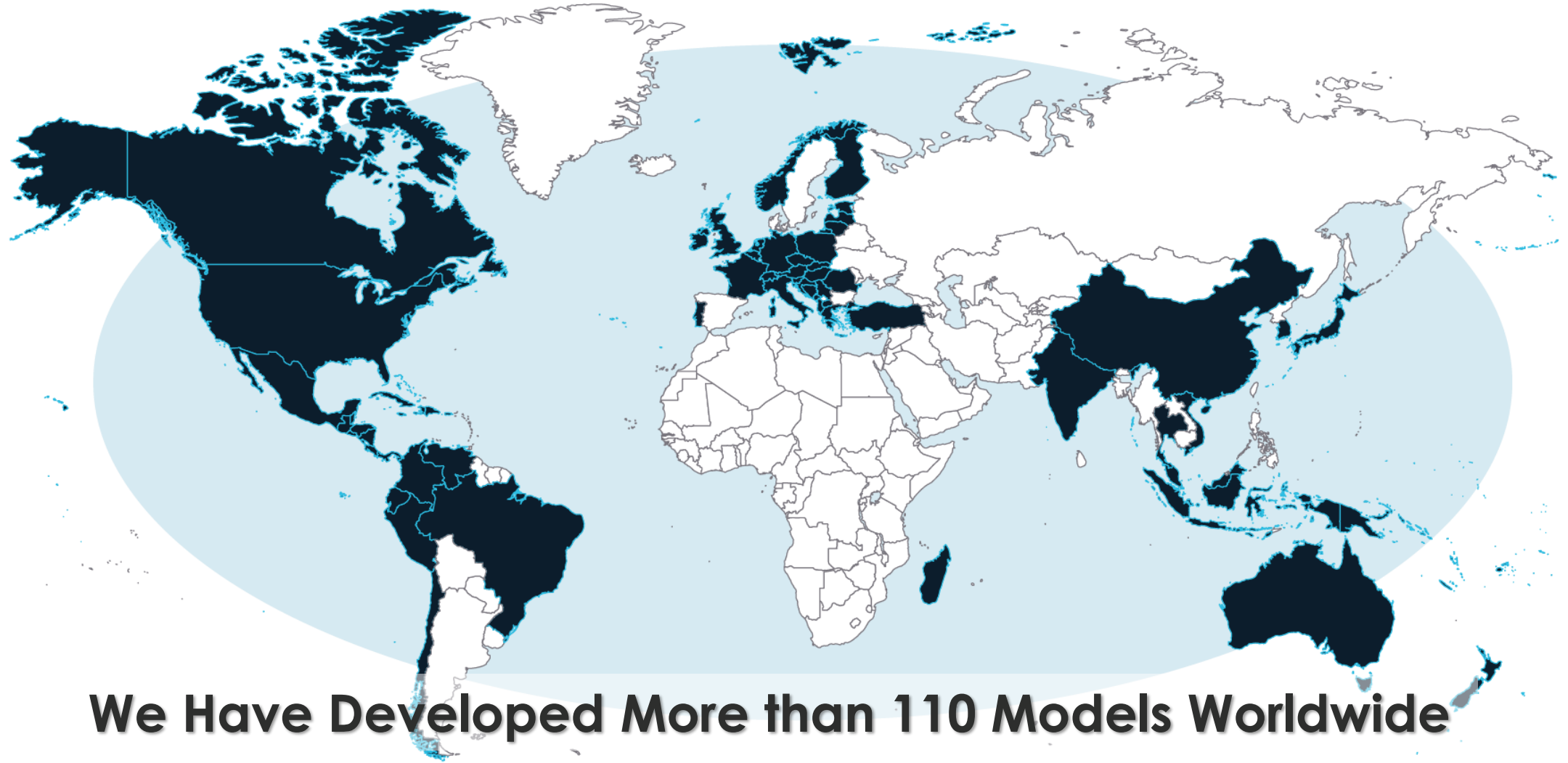(e.g., Earthquakes for Nuclear Plants)

Floods in Peru

AIR Can Connect Model Developers and Consumers

Bespoke Applications or Consulting

TOUCHSTONE®

Model Developers

Model Consumers

AIR Knows Model Development

We Have Developed More than 110 Models Worldwide

... And Our Platform Makes It Easy to Add More Models

TOUCHSTONE®

Loss Analytics w/ Uncertainty

Access to Multiple Models

Comparative Analytics

Underwriting

re

Touchstone Re™

Data Quality Analytics

Loss Grouping

Hazard Analytics

Geospatial Analytics

Non-Cat Analytics

Analyze Re

Model Builder Helps You Put Together Your Own Models

Model Builder Supports Multiple Workflows

Producers

(Re)Insurers

Brokers

Third-Party model providers (or) Universities

Consumers

TOUCHSTONE®
Use your models across organization

TOUCHSTONE®
Provide your models to clients

TOUCHSTONE®
Provide models to (Re) Insurers

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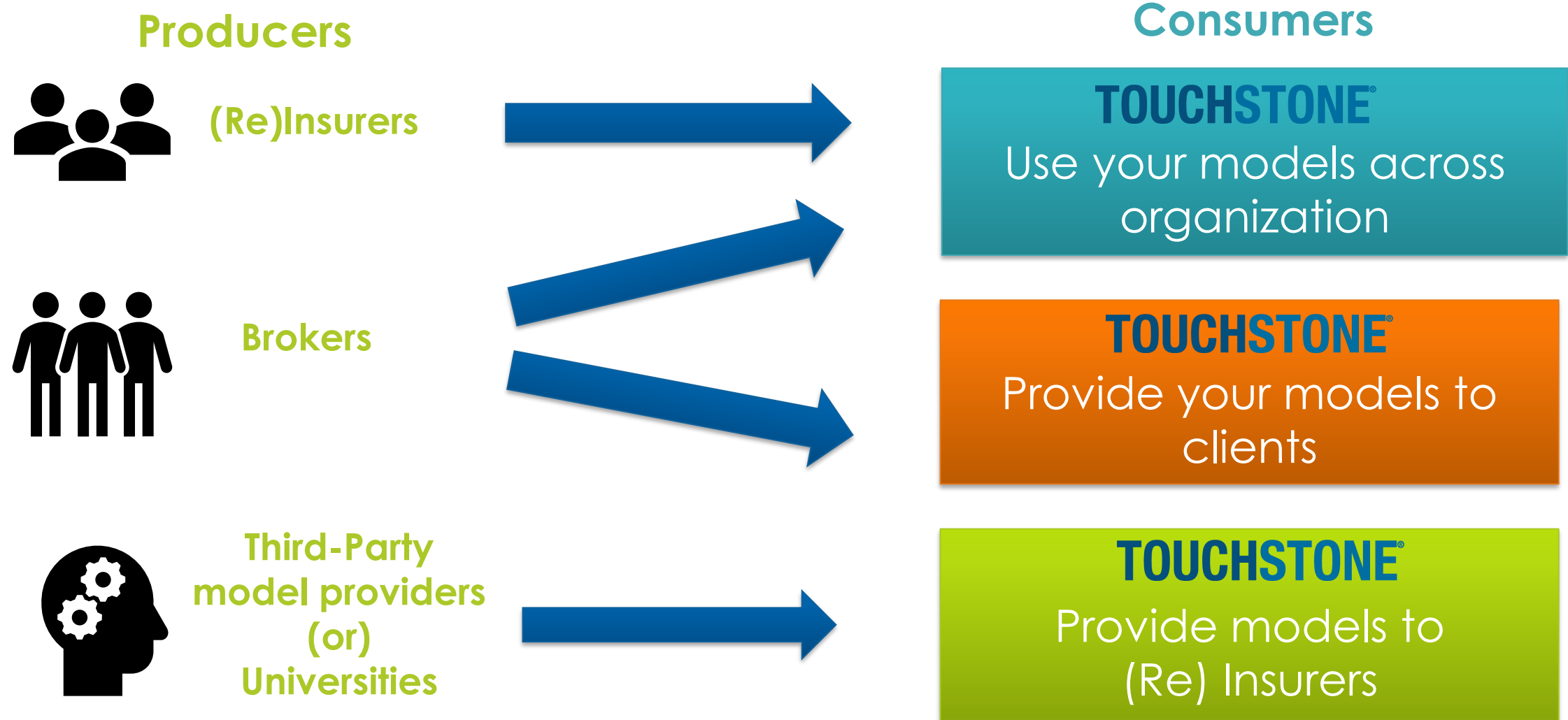
Build on AIR's Modeling Architecture

User Inputs

Hazard

Event Generation

Intensity Calculations

Exposure Information

Engineering

Damage Estimation

Policy Conditions

Custom Event Engine

Financial

Insured Loss Calculation

Build on AIR's Modeling Architecture

① Define Metadata — ② Provide Catalog — ③ Configure Intensities — ④ Specify Damage — ⑤ Create Model

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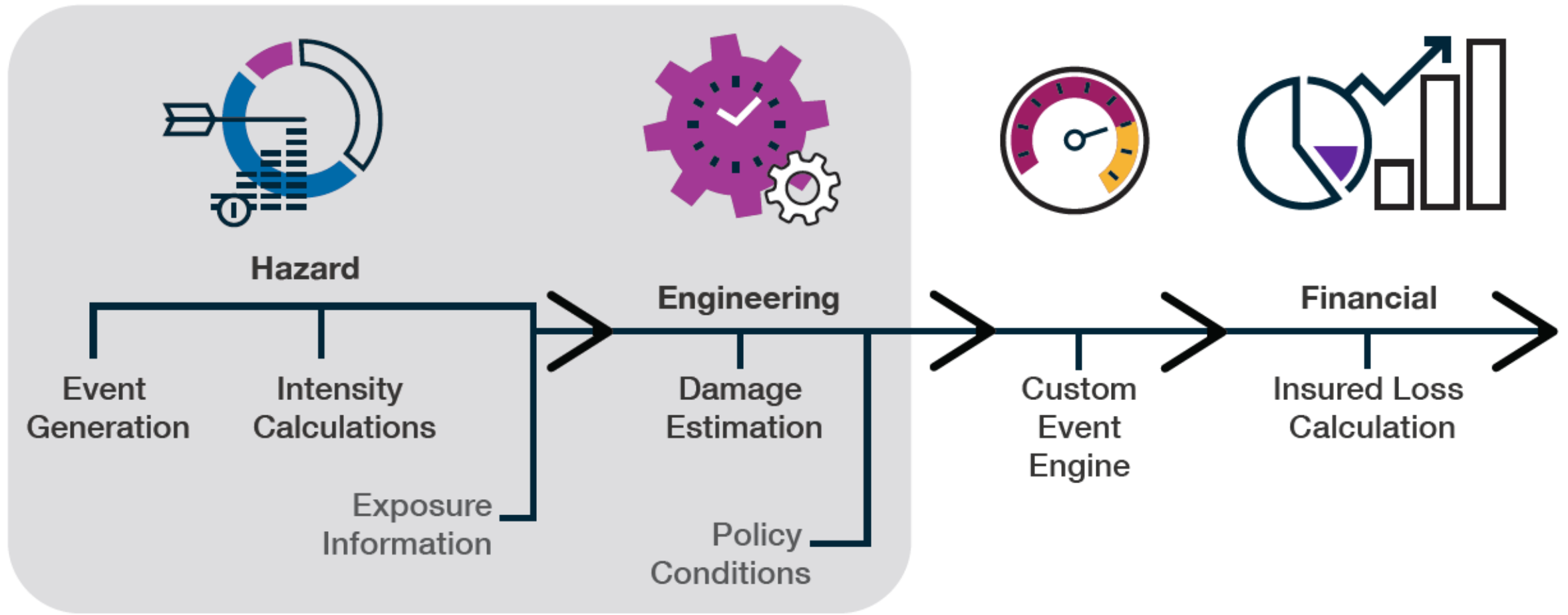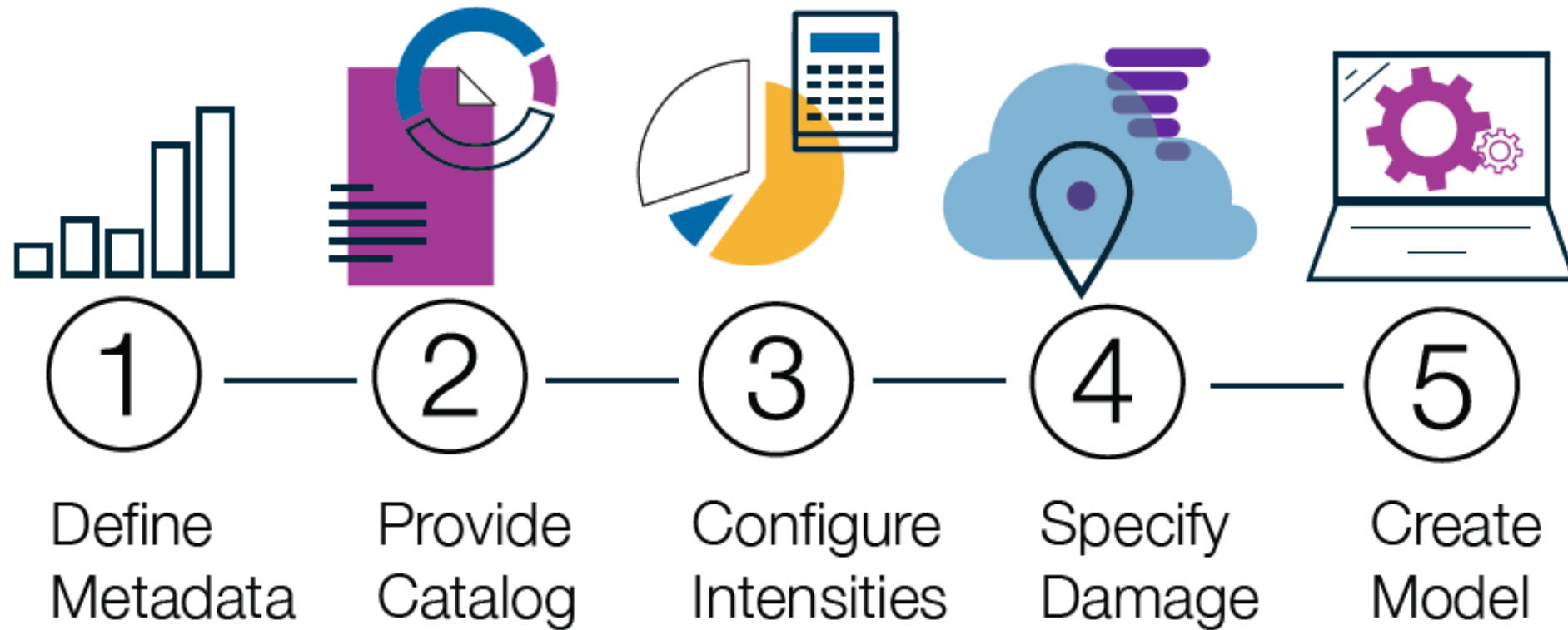
Case Study for Model Builder

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Hazard: Defining the Event Catalog

Event occurrence

- Event frequency: how often?
- Event size: how severe?
- Event location: where?

Types

- Stochastic event catalog
- Historical catalog
- Custom events

Create Your Events

Earthquake Events Greater than Magnitude 5.0

Historical

Simulated

Model Components: Defining Local Intensity

Local intensity is calculated based on "source" parameters and distance from the "source"

Earthquake

- Peak ground acceleration (PGA)
- Spectral acceleration (Sa)

USGS ShakeMap : SOUTH AFRICA
Apr 3, 2017 03:08:51 UTC M 5.2 S26.91 E26.80 Depth: 5.0km ID:us10008e0f
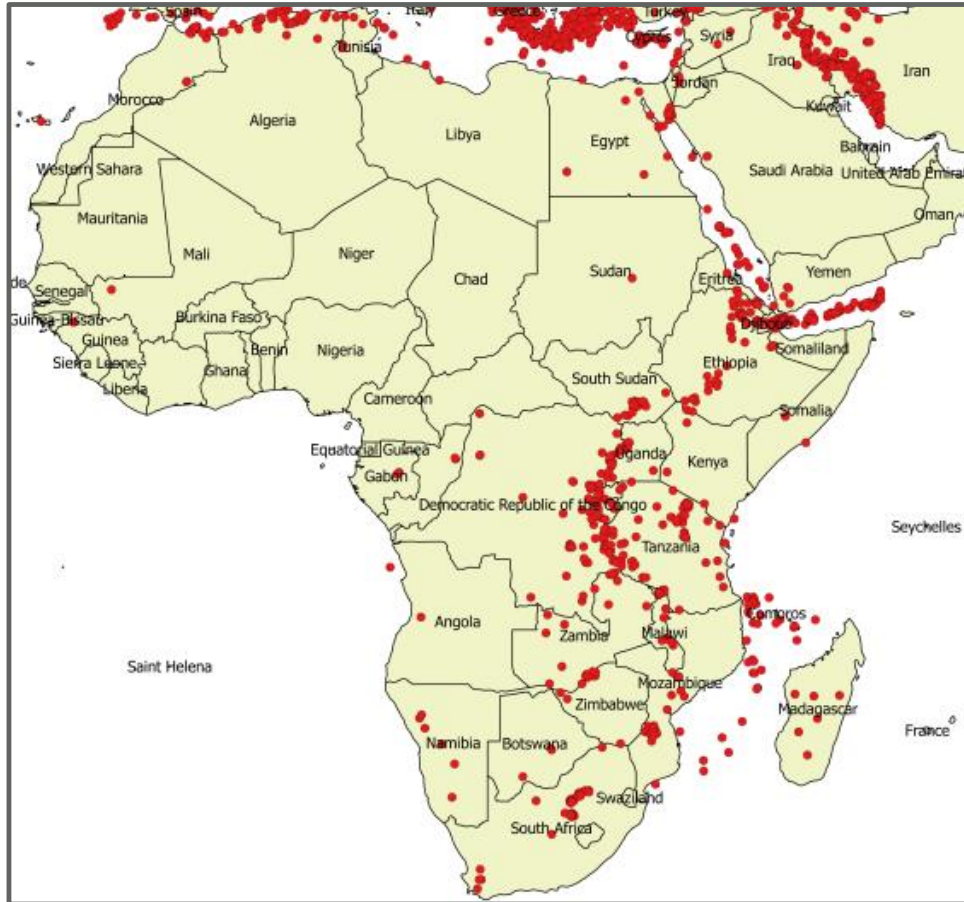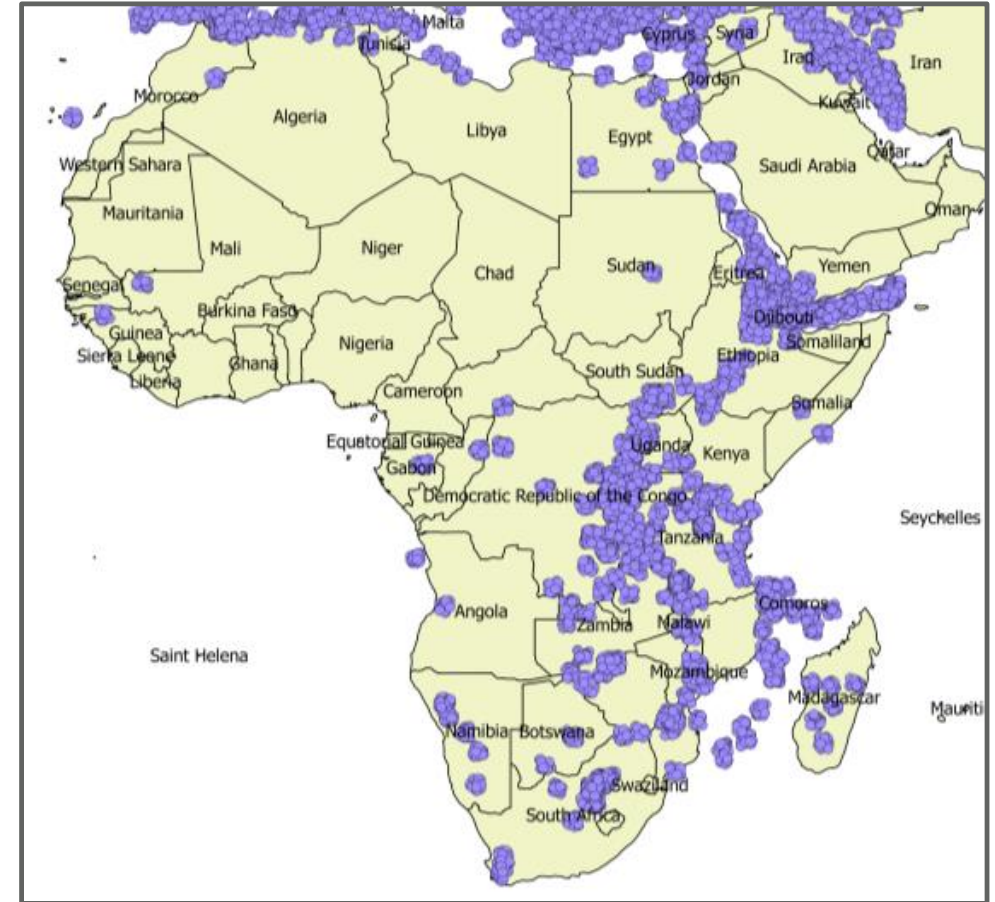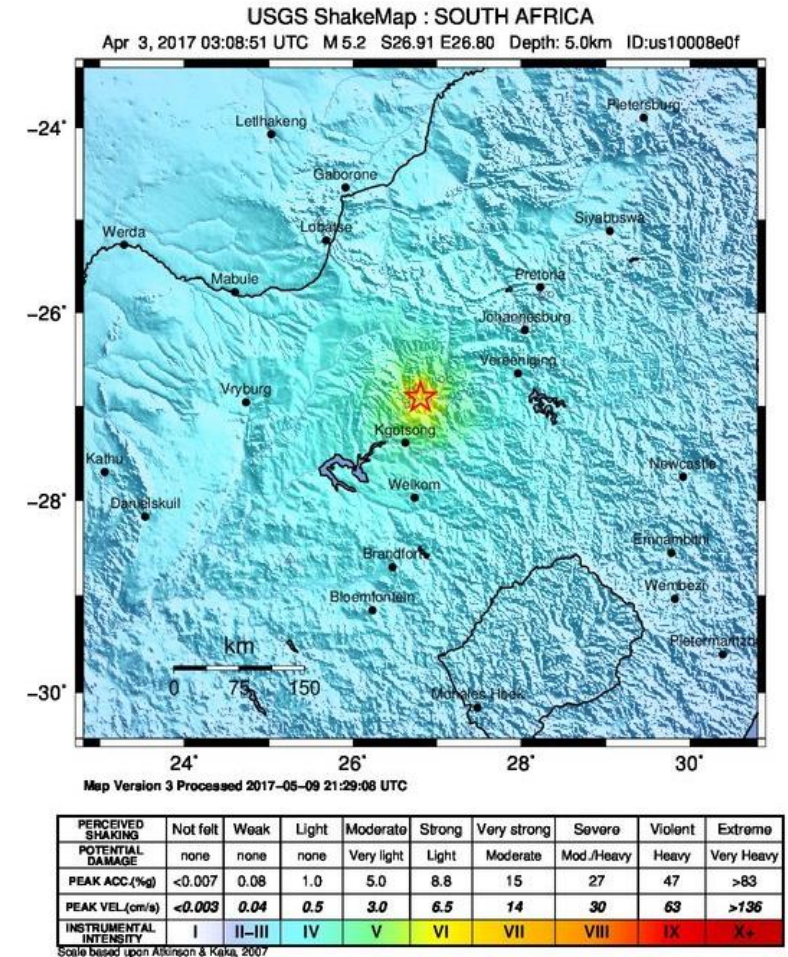
Map Version 3 Processed 2017-05-09 21:29:08 UTC

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.007	0.08	1.0	5.0	8.8	15	27	47	>83
PEAK VEL.(cm/s)	<0.003	0.04	0.5	3.0	6.5	14	30	63	>136
INSTRUMENTAL INTENSITY	I	II–III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Atkinson & Kaka, 2007

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Defining Event Footprints

Simulated

Resolution

1 km²

5 km²

10 km²

Intensity at Multiple Resolutions
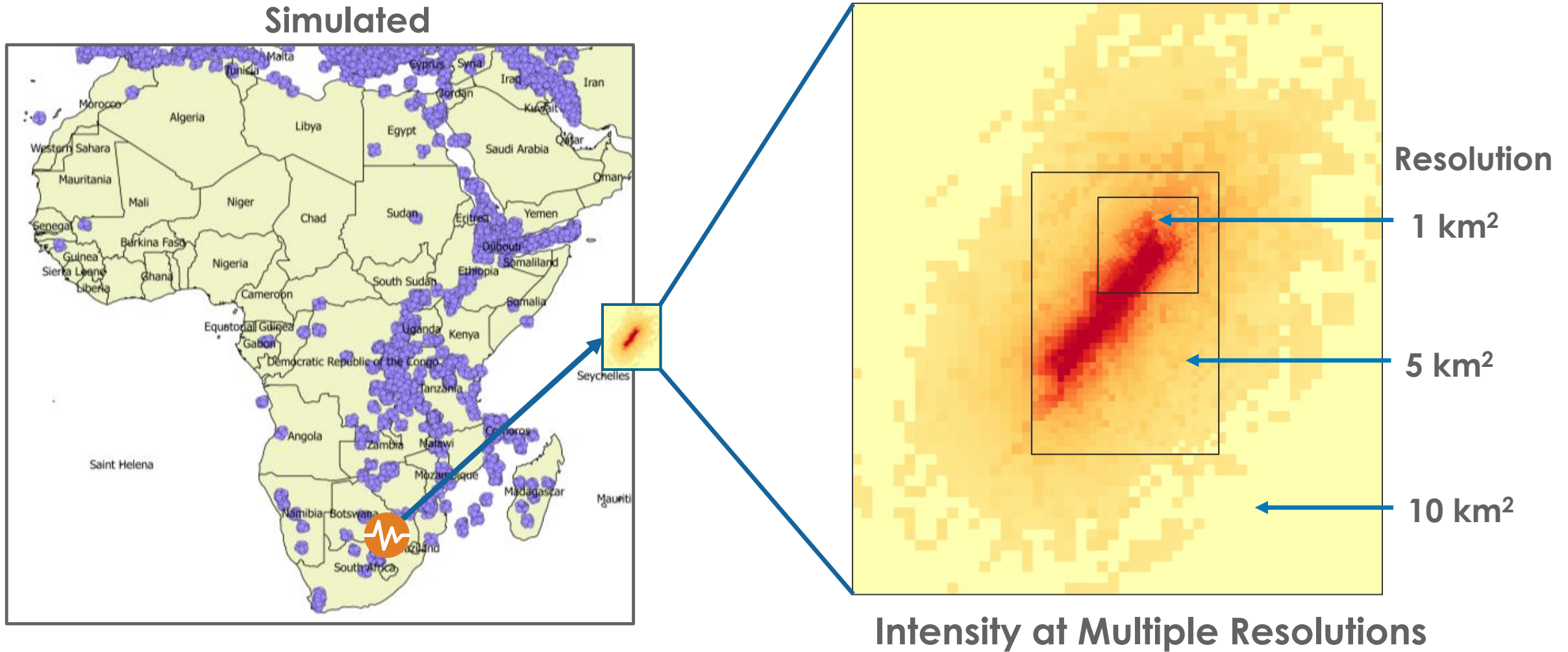
Sample Earthquake Damage Function

Damage Ratio

Peak Ground Acceleration

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Constructing the Vulnerability Module

Damage Mapping File by Peril

Construction	Occupancy	Height Band	Age Band	DF_ID Coverage A	DF_ID Coverage B	DF_ID Coverage C	DF_ID Coverage D
101	301	0	0	1001	1001	1001	1001
111	301	0	0	1002	1002	1001	1002
131	301	0	0	1003	1003	1001	1003
101	311	0	0	1004	1004	1001	1001
111	311	0	0	1005	1005	1001	1002
131	311	0	0	1006	1006	1001	1003

Damage Function File by Peril and Coverage

PGA → Damage ID	0.40	0.41	0.42	0.43	0.44	0.45
1001	0	6.04E-06	1.29E-05	2.07E-05	2.94E-05	3.94E-05
1002	0	6.64E-06	1.42E-05	2.28E-05	3.23E-05	4.33E-05
1003	0	7.31E-06	1.56E-05	2.5E-05	3.56E-05	4.77E-05
1004	0	8.04E-06	1.72E-05	2.76E-05	3.91E-05	5.24E-05
1005	0	8.84E-06	1.89E-05	3.03E-05	4.30E-05	5.77E-05
1006	0	9.73E-06	2.08E-05	3.33E-05	4.73E-05	6.35E-05

Many Features Available to Develop Complex Vulnerability Modules

Damage functions based on damage or intensity

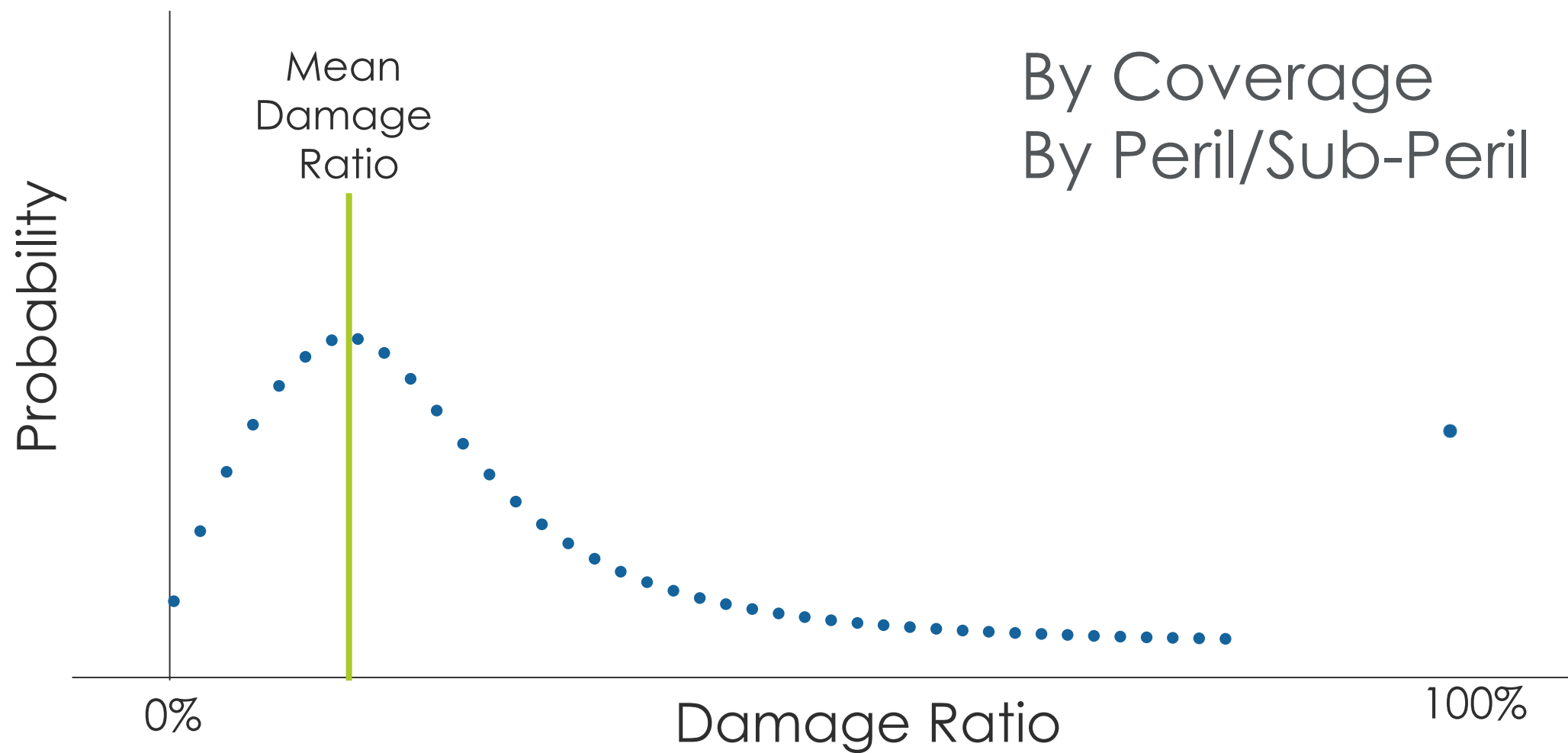**Account for regional modifications or other damage modifiers**

Ability to define your own age and height bands

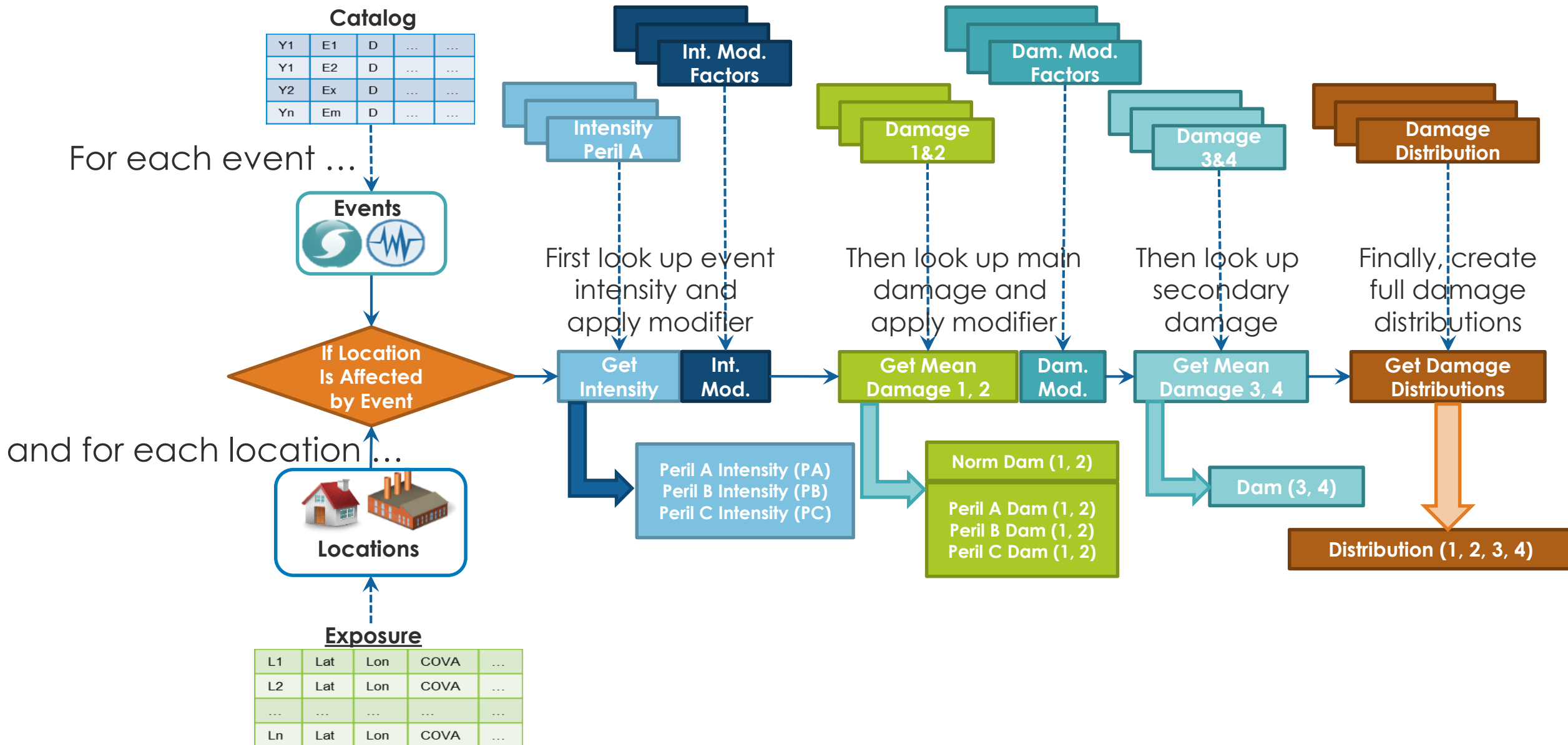# Damage Functions Capture the Variability in Damage for a Given Intensity

Mean Damage Ratio (MDR)

Damage Ratio

Intensity (e.g., earthquake ground motion)
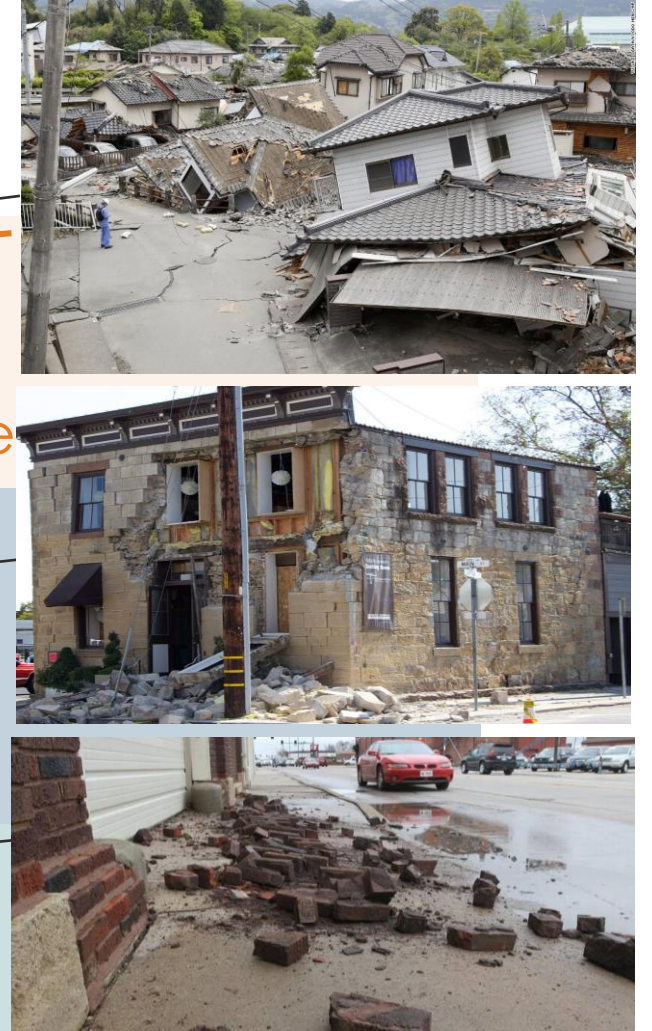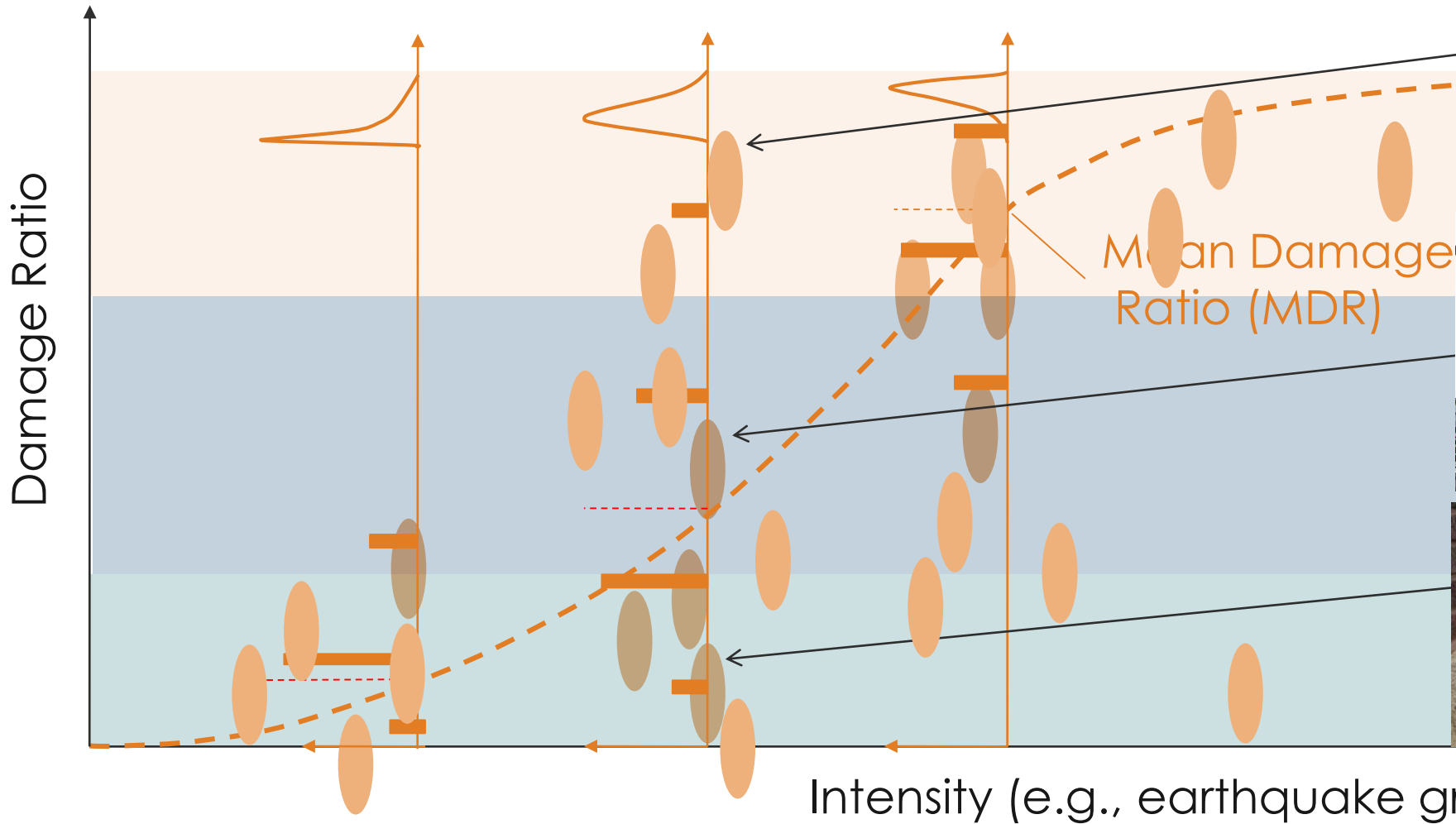
Sample Damage Distributions Around Each Mean Damage Ratio (MDR)

By Coverage
By Peril/Sub-Peril

Add the Newly Created Model to an Event Set in Touchstone and Use Seamlessly

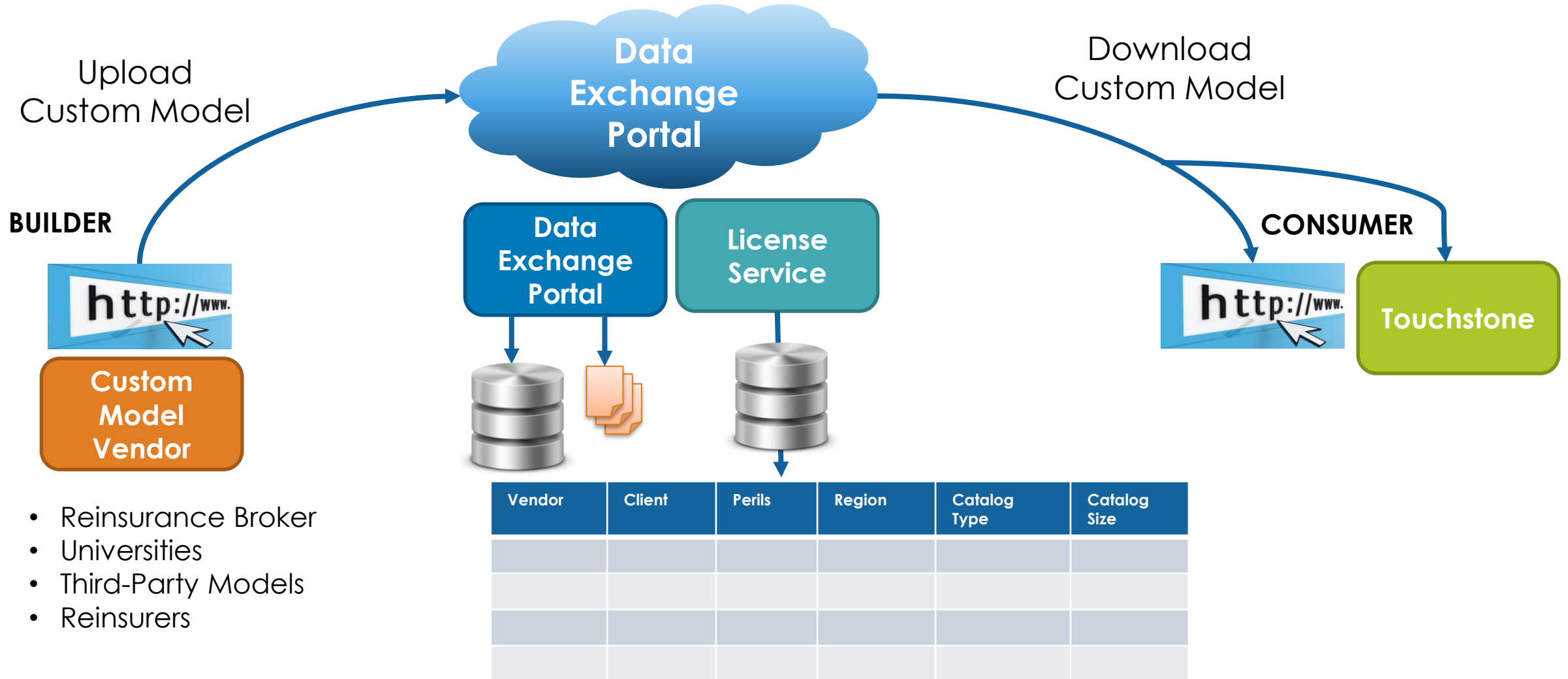# Illustration of Custom Model Development Process

Model Builder Toolkit Includes Everything You Need to Get Started

Demo

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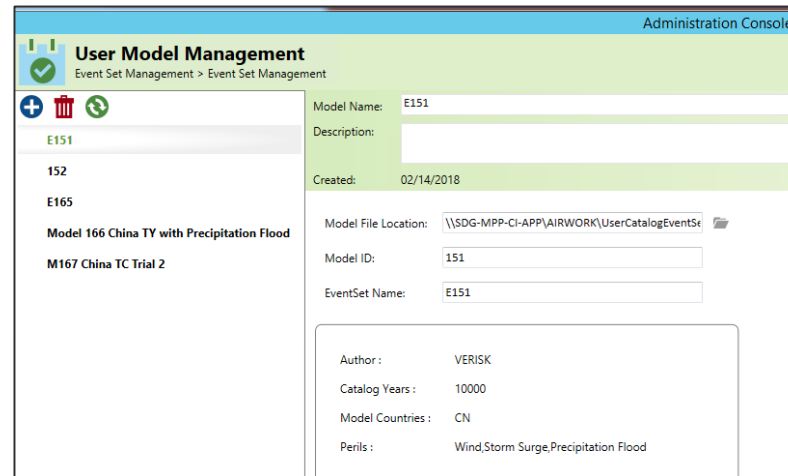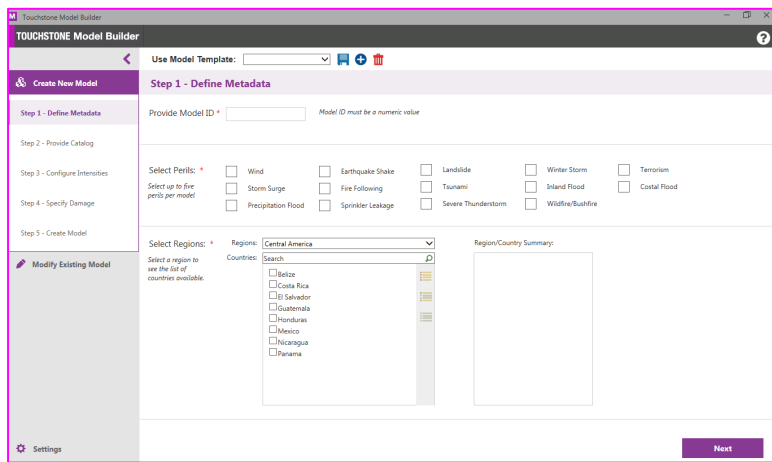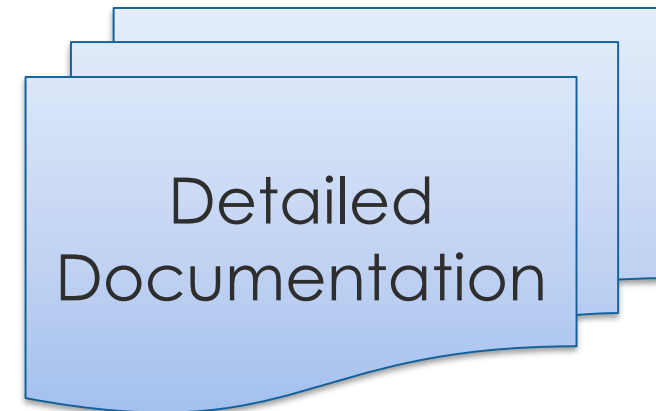
In the Future, We Envision a Centralized Place to Manage and Share Custom Models

Upload Custom Model

Data Exchange Portal

Download Custom Model

BUILDER

CONSUMER

Custom Model Vendor

Data Exchange Portal

License Service

Touchstone

- Reinsurance Broker
- Universities
- Third-Party Models
- Reinsurers

Vendor	Client	Perils	Region	Catalog Type	Catalog Size

Summary

AIR offers you easy, flexible ways to create your own view of risk.

Touchstone fuels business agility and innovation by enabling you to bring together internal and external views of risk on one holistic platform.

Model Builder is designed to make it easier than ever to create and share independent, transparent views of risk.

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Questions?

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