Weather Risk Assessment

- **Why Actuaries?**

- **Weather related events can adversely affect**
  - Property values, food/water supply, and infrastructure
  - Morbidity, mortality, and longevity
  - Market value of financial assets

- **Actuaries' Role**
  - Incorporate short and long-term climate risks into actuarial modelling
  - Creating/pricing insurance products to adapt to climate change (P&C, event cancellation cover)
  - Encouraging climate risk management in internal investment strategy
  - Sharing expertise in modeling extreme climate events (cat modeling)

Weather-Related Risks

- **Physical Risks**
  Impact on insurers

Mortality
Morbidity

Property damage and liabilities

Medical conditions due to disruption in health services

Business continuity risks

- **Transition Risks**

Policy Risk

Market risk

- **Legal and Reputation Risks**

Legal risk

Reputation risk

Regulatory/Corporate constraints

- **Net Zero**
  State in which the greenhouse gases going into the atmosphere are balanced by removal out of the atmosphere. State at which global warming stops. Paris Agreement (2015)

- **ESG Investors**
  ESG stands for Environment, Social and Governance. 'E' in ESG refers to reducing carbon footprint, greener technology usage. ESG investors tend to buy shares of companies which have demonstrated willingness to improve in these areas. There are ESG scores which rate companies on these fronts.

- **Rating Agencies**
  Rating Agencies have included climate and environmental risks as part of their ratings. This is not only for companies but rather sovereign governments as well.

Actuarial work affected

- **Actuarial Modelling**
  - General Modeling Considerations
  - Investment Assumptions
  - Mortality and Morbidity Assumptions
  - General Insurance Claims Considerations
- **Product Management**
  - Newer product designs and initiatives
  - Balance Stakeholders' needs
  - Balance increased pricing granularity with social risk pooling
  - Anticipate changing consumer behavior
- **Risk and Capital Management**
  - ERM Frameworks
  - Capital Adequacy
- **Investment Management**
  - Determine climate risk exposure of individual securities
  - Investment institution increased scrutiny of their 'carbon' investments
- **Climate-Related Risk Disclosures**
  - Prepare disclosures for the company actuaries work for/advise
  - Read disclosures of firms in which the actuaries' institutions invest

Actuarial Rôle in Weather Risk Assessment

Physical Risk Modelling

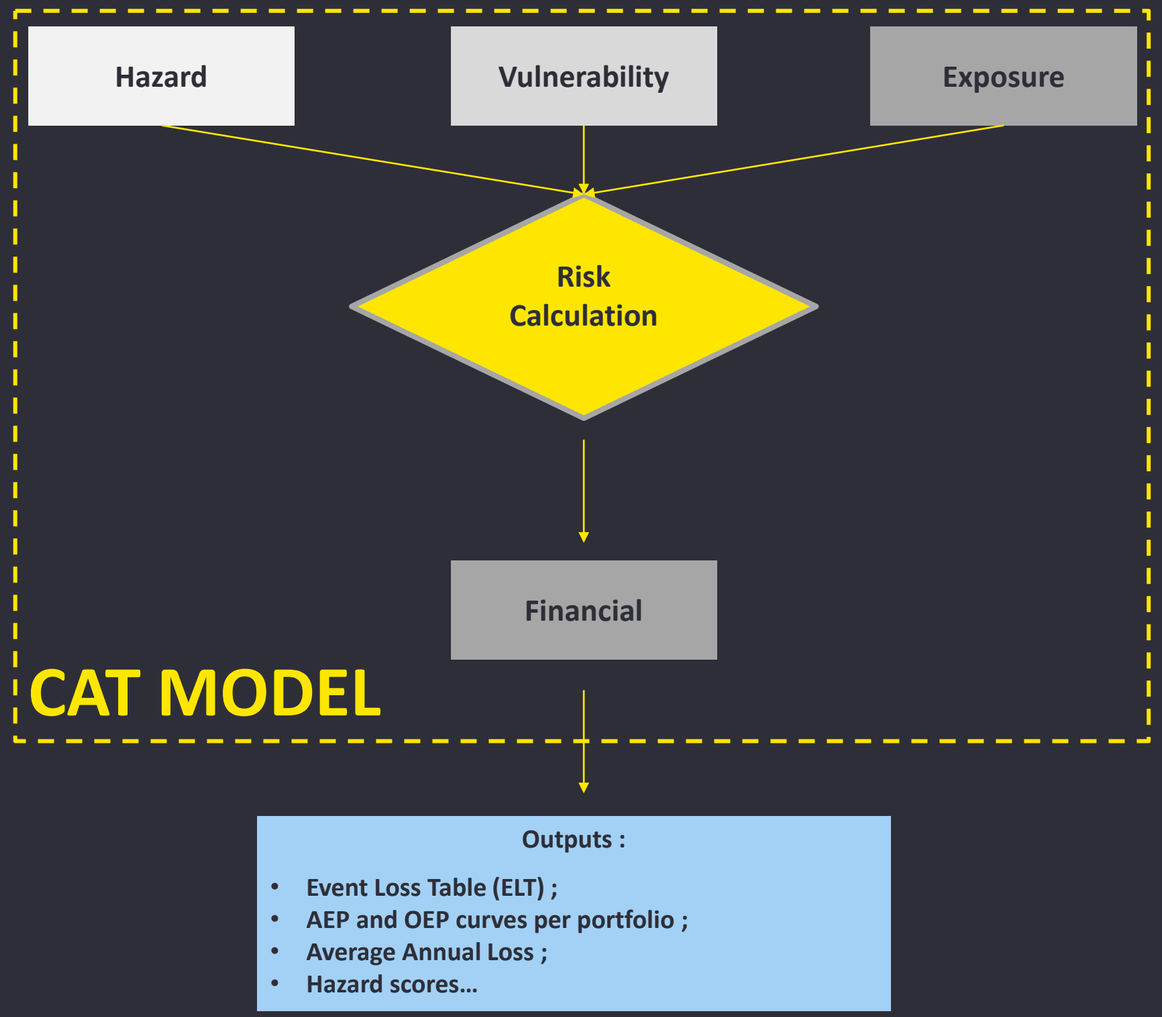
25th April 2024

EY

Building a better working world

Cat Nat Model definition: Models based on a modular approach allowing for an assessment of the underlying risk, for various purposes

- Catastrophe Model



Use Cases in Insurance

- **Management of GI Underwriting :** Reinsurance purchase, Development of UW risk appetite and identification of uninsurable risks, pricing insurance policies ;
- **Risk / Second Line :** Stress testing, ORSA, management actions ;
- **Mitigation** : to individuals and some to communities ;
- **Disclosure :** TCFD, Transition plan ect.

Advantages

- Simulate events, comprehensive database, calibrated frequency;
- Updated regularly and often;
- Encourage sensitivity testing;
- Several catastrophe models available to the insurance industry.

Limitations

- Significant uncertainties exist around model estimates, with large ranges of output values among different models;
- Changes occur with software updates;
- Complexity is a factor;
- Requires some technical knowledge.

The Physical Risk Model Types: Various approaches and methodologies available in the market to support physical risk modelling for various assets and portfolios

Catastrophe Models

Baseline Catastrophe Model

Catastrophe models with climate adjustment

Climate-conditioned catastrophe model

Climate-adjusted catastrophe model spectrum

Climate Models

Downscaled Climate Model

What is the model?

- Stochastic models for hazards, vulnerability and for financial loss.
- Catastrophe models with out of model perturbations/adjustments
- Established natural catastrophe models which are developing "climate-conditioned" versions of their baseline risk models
- Based on downscaling of Global Circulations Models (GCM) and Regional Circulation Models (RCM)

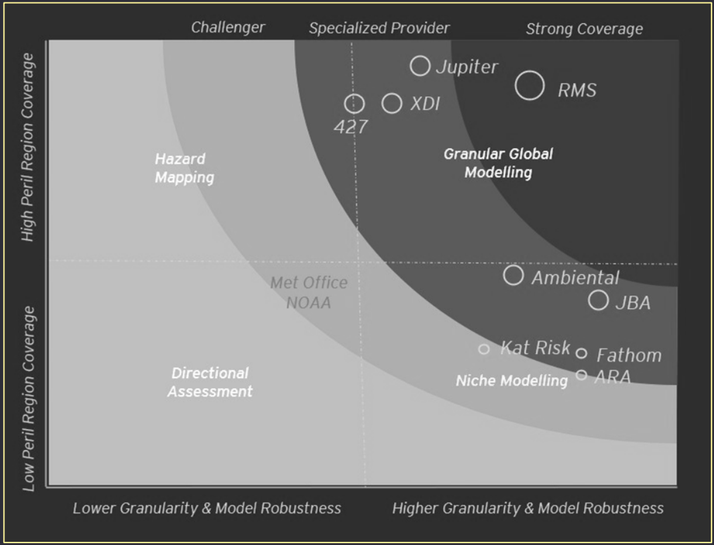
Example of Vendors

ARA, KatRisk

Internal stress testing models from banks and insurers

FATHOM, JBA risk management

XDI Cross Dependency Initiative, CLIMATE X

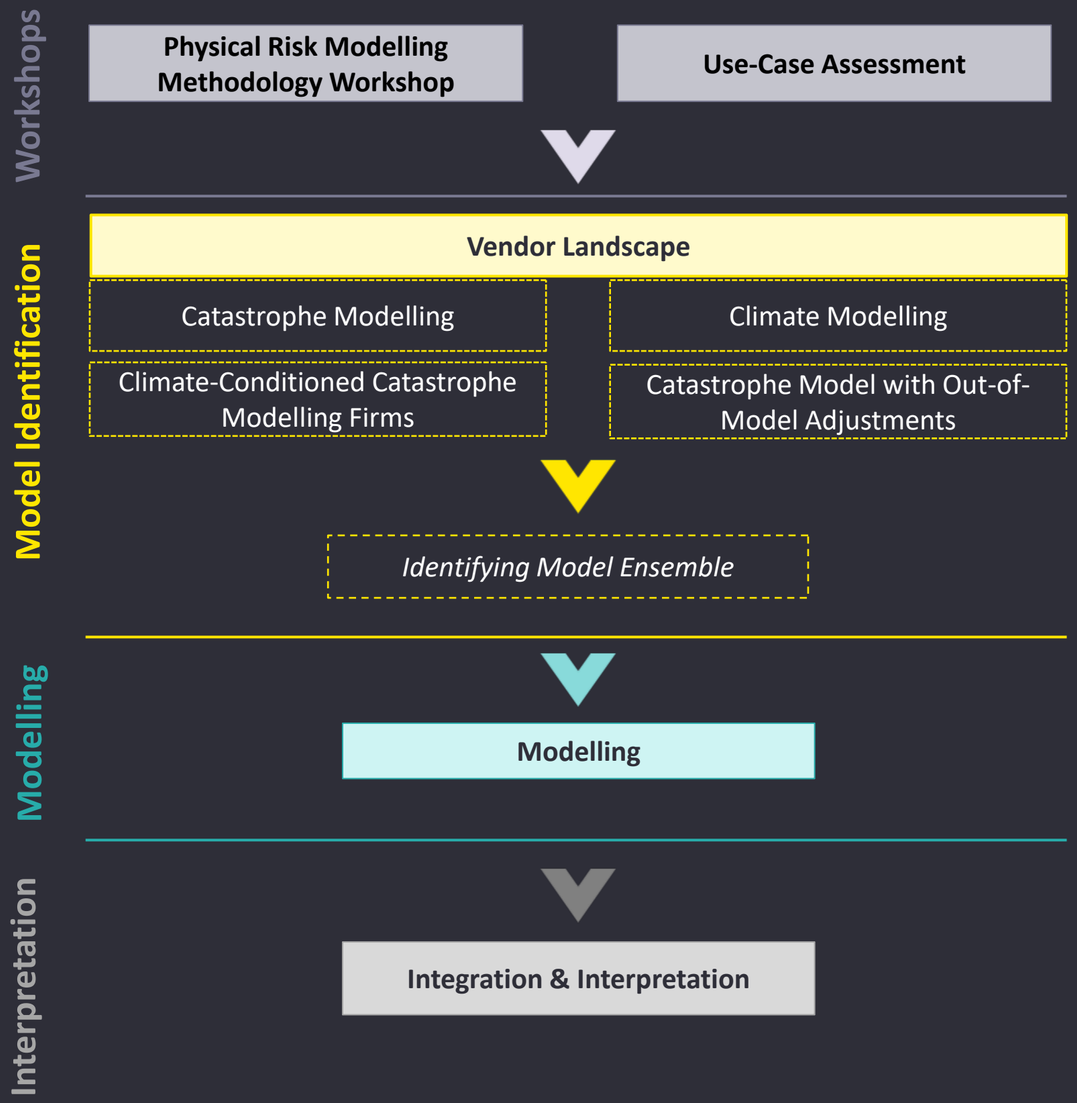


Key areas of Model Differences

1	**Peril Region Coverage**	Multiperil vendor can cover everything, but a specialist will do one peril extremely well - Global coverage is good for complete picture, but localised vendors include more detail
2	**Granularity & Robustness**	The model resolution and validation that has been undertaken to the model. Lower resolution models are easier to run and communicate to stakeholders, but only provide directional guidance. Higher resolution models are more complex but provide a more accurate view of risk at the asset level.
3	**Scenarios**	RCP's track temperature impacts, but SSPs are more advanced, taking social factors into account
4	**Time Horizons**	Some vendors cover all years, but others only isolated years (2030, 2050, 2080)

Actuarial role:

Physical Risk Modelling:



Role of Actuaries

- ***Benchmarking the vendor***
- ***Adapting the model***
- ***Model validation***
- ***Integration***

Actuarial Role in Climate Risk Assessment

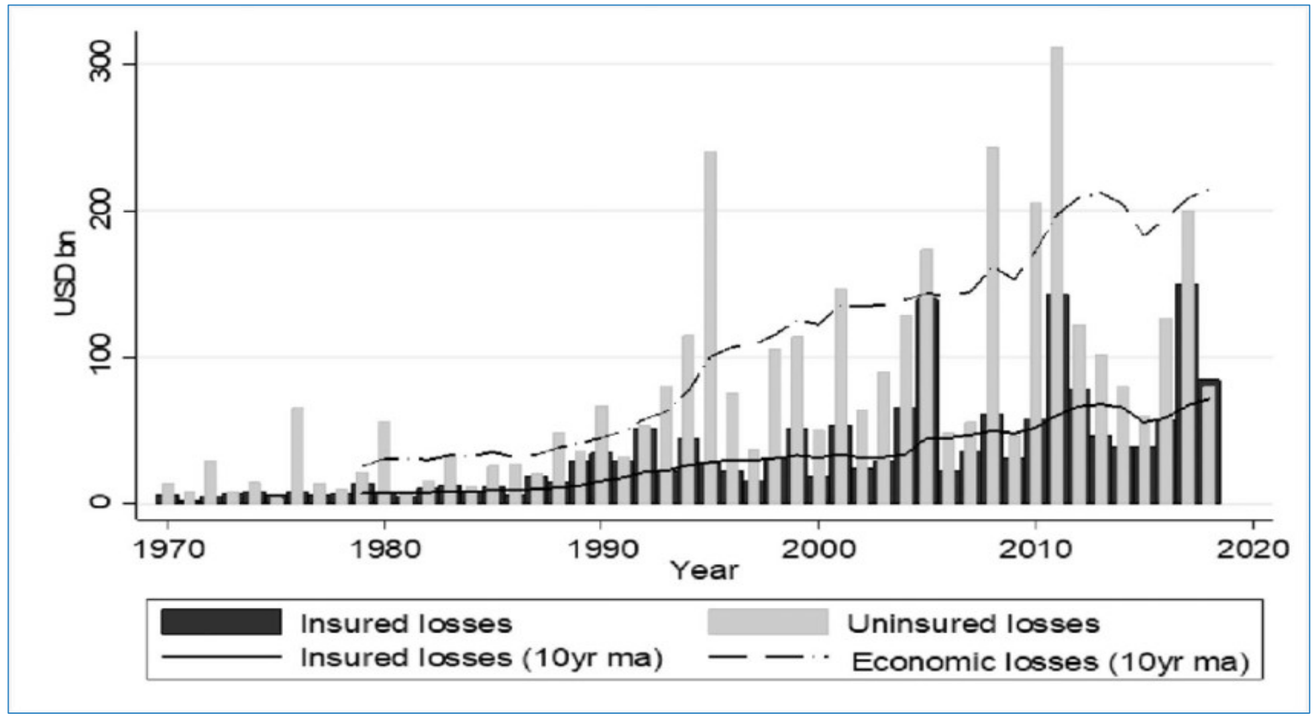
Arpita Das

Agenda

- Climate Risk and the Insurance Protection Gap
- Closing the Gap: A Risk-Layered Approach
- Actuarial Roles: Expansion and Emergence

Climate Risk and the Insurance Protection Gap

Disaster and natural catastrophe insurance protection gap
1970–2018



Note: Economic loss = insured loss + uninsured loss. Data in 2018 prices.
Source: Swiss Re Institute

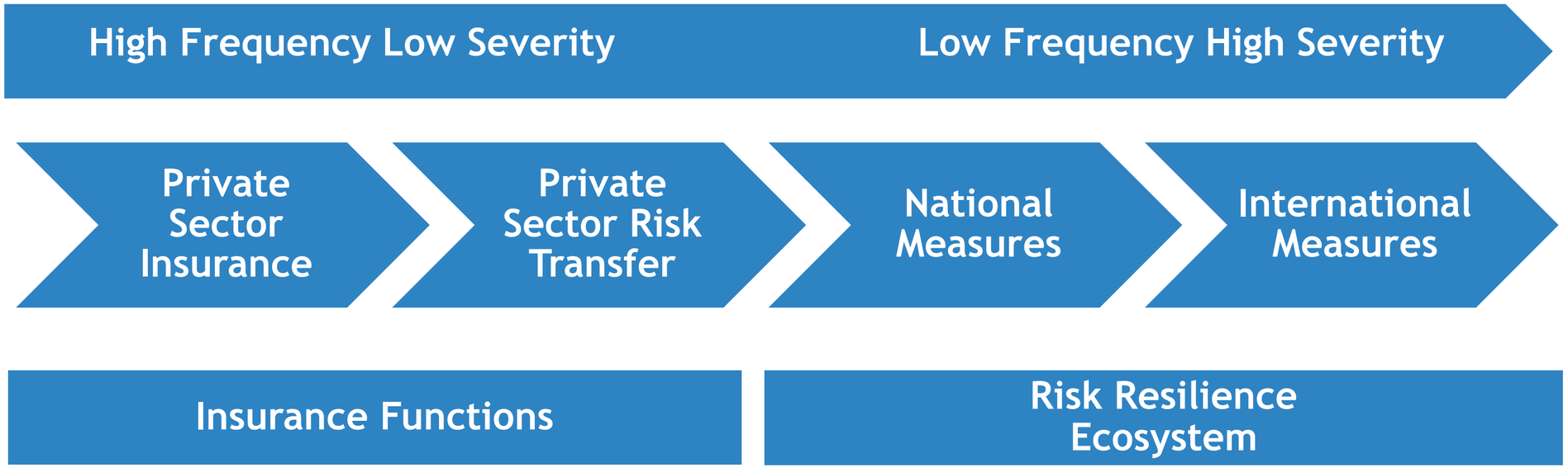
In 2022, total global insurance protection gap was at an all-time high of USD 1.8 trillion.

Audience Question

With increasing frequency and severity of climate events, insured risks are becoming prohibitively expensive i.e., uninsurable.

How can actuaries help close the insurance gap?

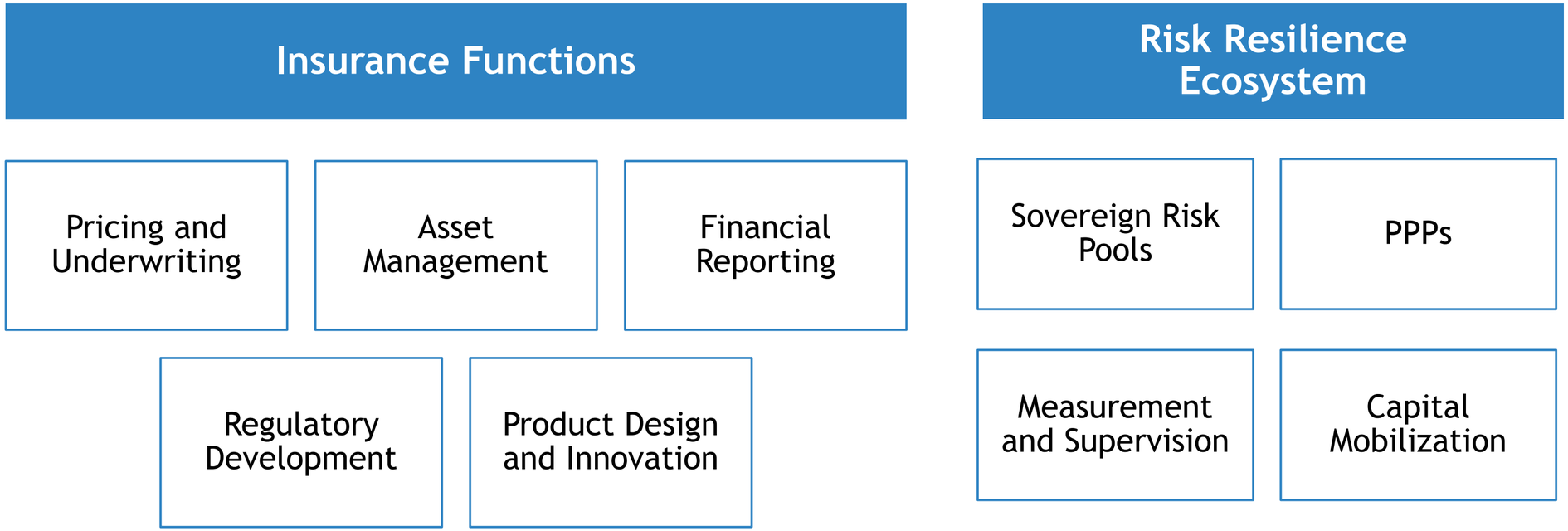
Closing the Gap: A Risk-Layered Approach



Adapted from A Ladder Approach to Catastrophe Insurance, ECB-EIOPA Discussion Paper

Actuaries are well-positioned to play key roles in quantifying and implementing measures reflecting the principles of risk-layering.

Actuarial Roles: Expansion and Emergence



Source: Impact Actuarial

Climate-related risks and opportunities are leading to the expansion of traditional actuarial roles and the emergence of new roles.