Royal Veterinary College
University of London

Animal Health Decision Making in a One Health Context

Dirk Pfeiffer

Professor of Veterinary Epidemiology
Honorary Professor at London School of Health & Tropical Medicine

United Nations - Food and Agriculture Organisation
Reference Centre for Veterinary Epidemiology

Outline

- Science
- Interdisciplinary research
- Systems perspective
- Risk analysis
- Risk management
- Conclusions

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SCIENCE

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(adapted from Wilcox 2011)

From Reductionistic to Systems Thinking

- Biomedical sciences training largely based on
  - Promotes view that science of high quality achieved through reductionistic thinking
    - Focused on organism level and below
    - Underestimates effects due to system complexity
  - Collaboration between scientific disciplines involves working in parallel
- Current and future health challenges require
  - Need to consider human/animal within eco system -> systems thinking
  - Collaboration through interdisciplinary research

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Linking between Different Knowledge Perspectives

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adapted from: Parkes et al 2005 - EcoHEALTH

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INTERDISCIPLINARY RESEARCH

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Challenges to Interdisciplinary Research

- Disciplinary silos
- Different epistemologies
  - Epistemological silos
  - Need epistemological pluralism
- Link between disciplines via agreed conceptual frameworks outlining relevant elements in system
- Integration of quantitative and qualitative data and analysis approaches

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Quantitative *versus* Qualitative Approaches

Quantitative Approaches	Qualitative Approaches
aims to classify, count and construct statistical models to explain what is observed	aims for complete, detailed description
researcher knows in advance what they are looking for	researcher may only roughly know what they are looking for
collects numerical data using tools such as questionnaires *etc*	researcher is data gathering instrument
objective - seeks precise measurement & analysis of target concepts, e.g. uses surveys, questionnaires, etc.	subjective - individuals' interpretation of events is important, e.g. uses participant observation, in-depth interviews, etc.
quantitative data efficient, but may miss contextual detail	qualitative data is more 'rich', time consuming, and less able to be generalized
researcher objectively separated from subject matter	researcher tends to become subjectively immersed in subject matter
may force responses or people into categories which may not 'fit'	may focus too closely on individual observations

(from Tariq and Appleby)

SYSTEMS PERSPECTIVE (ECOHEALTH / ONE HEALTH)

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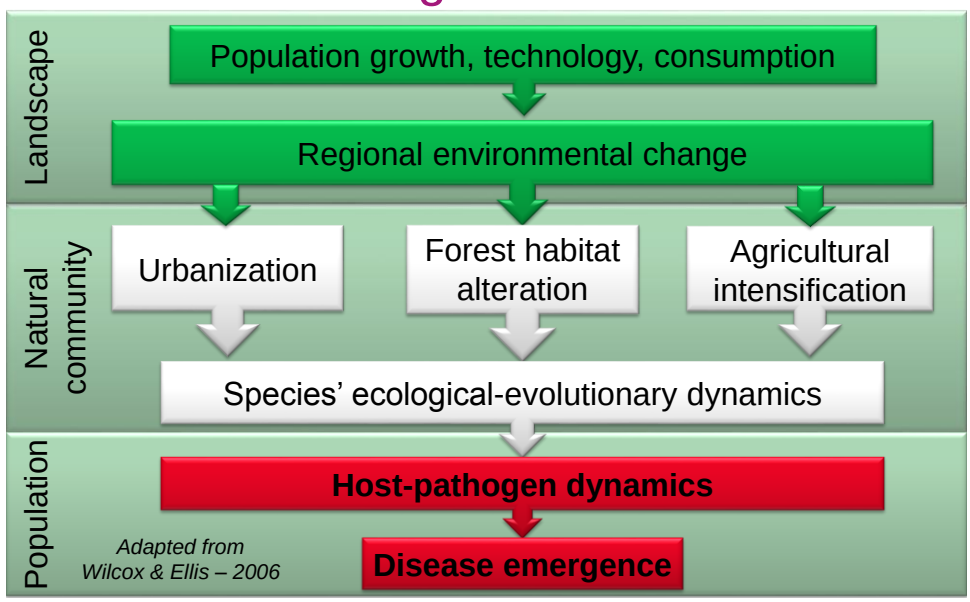
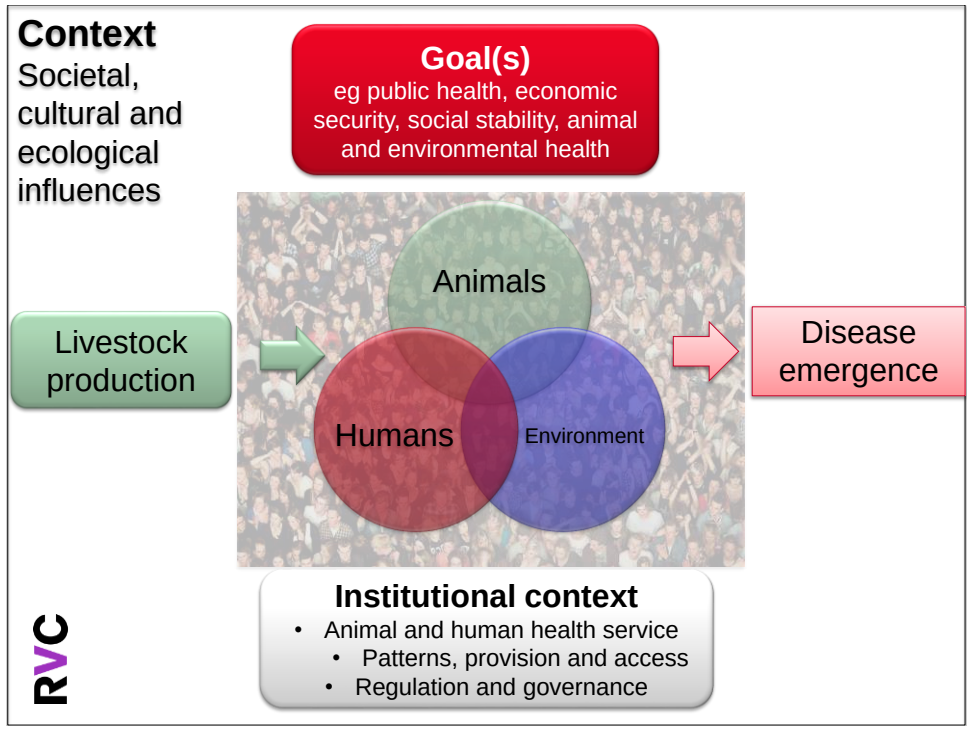
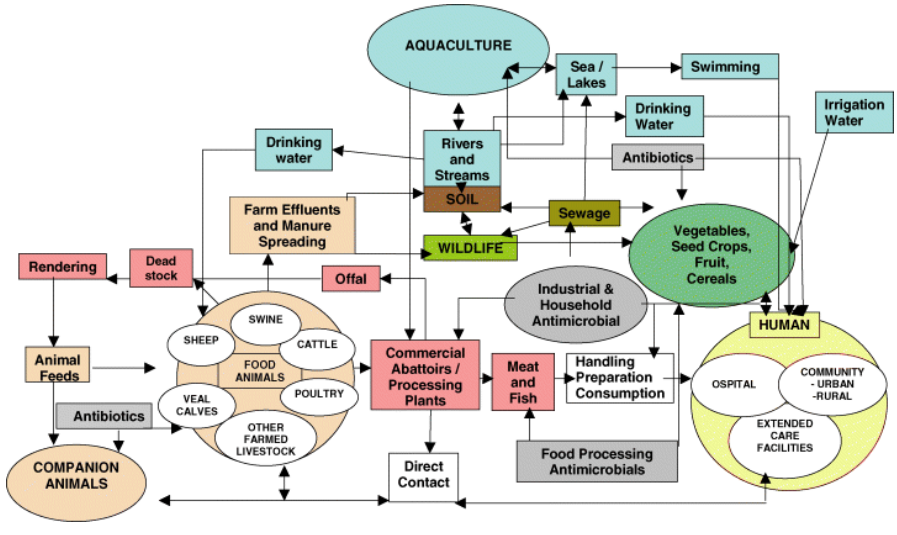
Ecosystem Perspective on Disease Emergence





Systems Perspective on AM Usage



From: **Comprehensive Reviews in Food Science and Food Safety - Antimicrobial Resistance: Implications for the Food System.** Pages 71-137, 2 AUG 2006 DOI: 10.1111/j.1541-4337.2006.00004.x

RISK

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Risk, Variation and Uncertainty

- risk -> likelihood of particular outcome combined with impact (consequences)
  - note - different from epidemiological definition of risk
  - influenced by variability and uncertainty
- variability -> variation in characteristics amongst entities or individuals
- uncertainty -> reflects lack of knowledge in relation to likelihood and risk pathways
  - more complex risk management, may decide to apply pre-cautionary principle

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Uncertainty and Black Swans

Uncertainty and Black Swans

Low uncertainty	Moderate uncertainty	Deep uncertainty
Strong knowledge	Some dominating explanations and beliefs	Poor knowledge
No black swans	Black swans may occur	?????

(From Aven 2013)

Different Types of Risk (Social Amplification of Risk)

- risk as analysis
- risk as feeling
- risk as politics

Kasperson RE, Renn O, Slovic P, Brown HS, Emel J, Goble R, Kasperson JX, and Ratick S. 1988. The social amplification of risk: A conceptual framework. Risk Analysis 8, 177-187.

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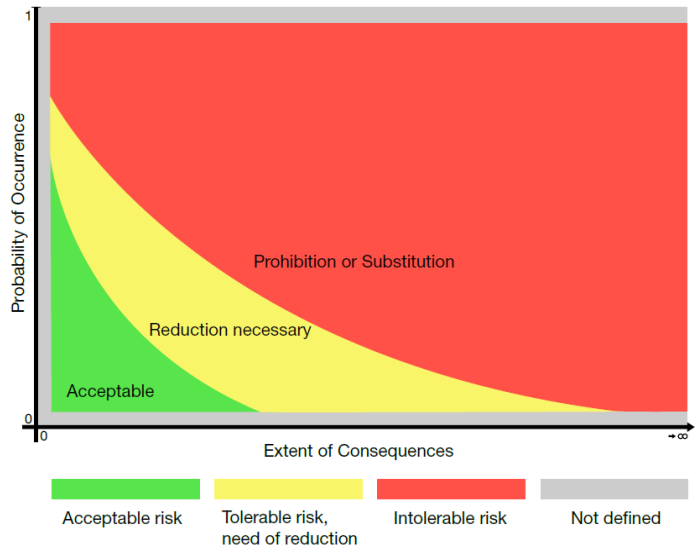
Acceptable, Tolerable or Intolerable Risks (from IRGC 2005)



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"Uncertainty Monster" at Science-Policy Interface

- uncertainty arising from ambiguities between phenomena
  - knowledge *vs* ignorance, objective *vs* subjective, facts *vs* values, prediction *vs* speculation, science *vs* policy
- coping strategies – monster metaphor
  - monster- exorcism (more science needed), monster- adaptation (quantify uncertainty), monster- embracement (accept uncertainty as a natural phenomenon), monster-assimilation (accept uncertainty, promote transparency)

from: van der Sluijs – Water Science & Technology - 2005

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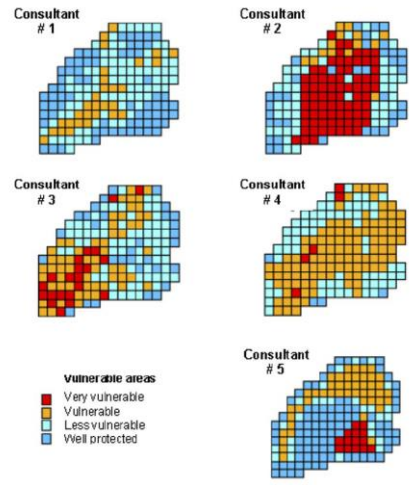
A hypothetical Example

Early detection of disease X:

5 scientific consultants addressed same question:

- "which parts of this geographical area are most vulnerable to introduction of disease X?"



(adapted from Refsgaard, Van der Sluijs et al, 2006)

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How to act upon resulting uncertainty as a decision maker?

- Bayesian approach: 5 priors. Average and update likelihood of each grid-cell being red with data (but oooops, there is no data and decisions needed now)
- Consensus approach: Lock 5 consultants up in room and don't release before consensus
- Nihilist approach: Dump science and decide on another basis
- Precautionary robustness approach: protect all grid-cells

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adapted from Refsgaard, Van der Sluijs et al, 2006

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How to act upon resulting uncertainty as a decision maker? *cont.*

- Academic bureaucrat approach: Weigh by citation index (or H-index) of each consultant
- Select consultant that you trust most
- Real life approach: Select consultant that best fits policy agenda
- Post normal: explore relevance of ignorance: working deliberatively within imperfections

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adapted from Refsgaard, Van der Sluijs et al, 2006

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RISK ANALYSIS

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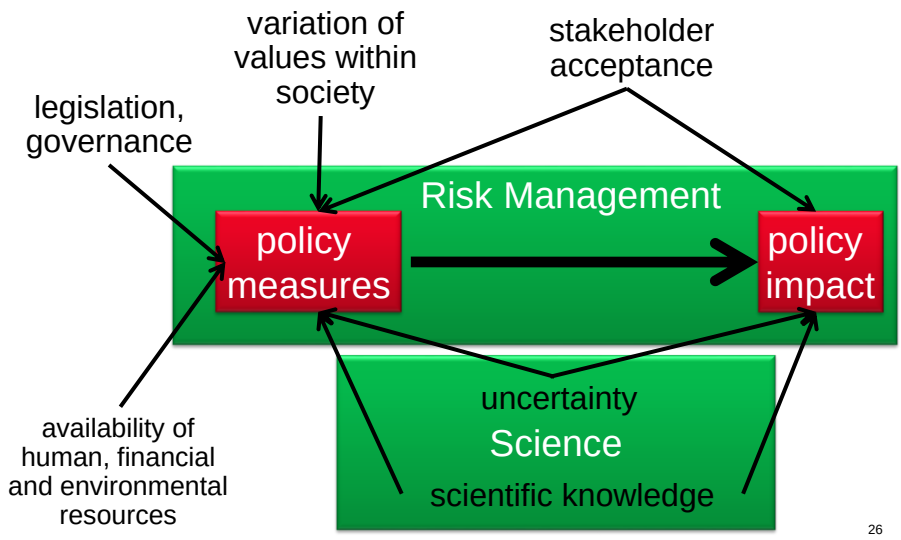
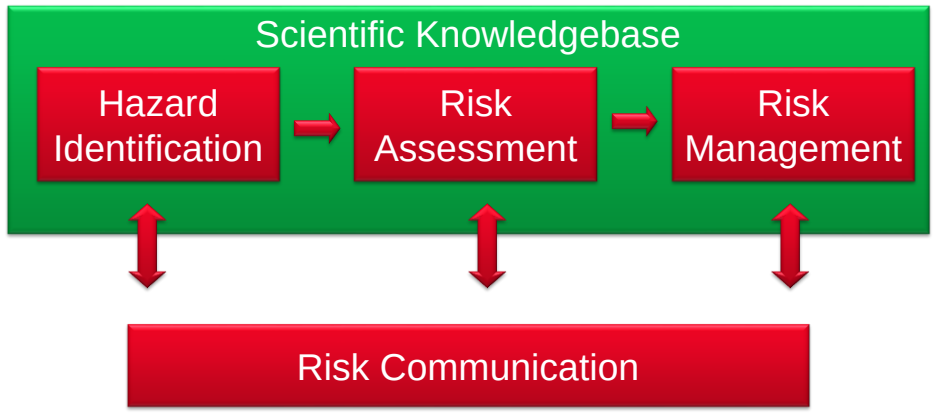
Policy, Uncertainty and Science



OIE Framework for Risk Analysis



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after OIE Animal Health Code

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RISK MANAGEMENT

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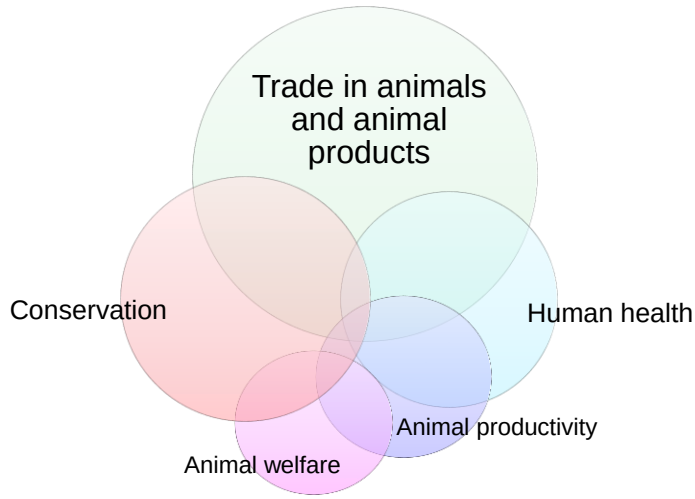
Purpose of Risk Management



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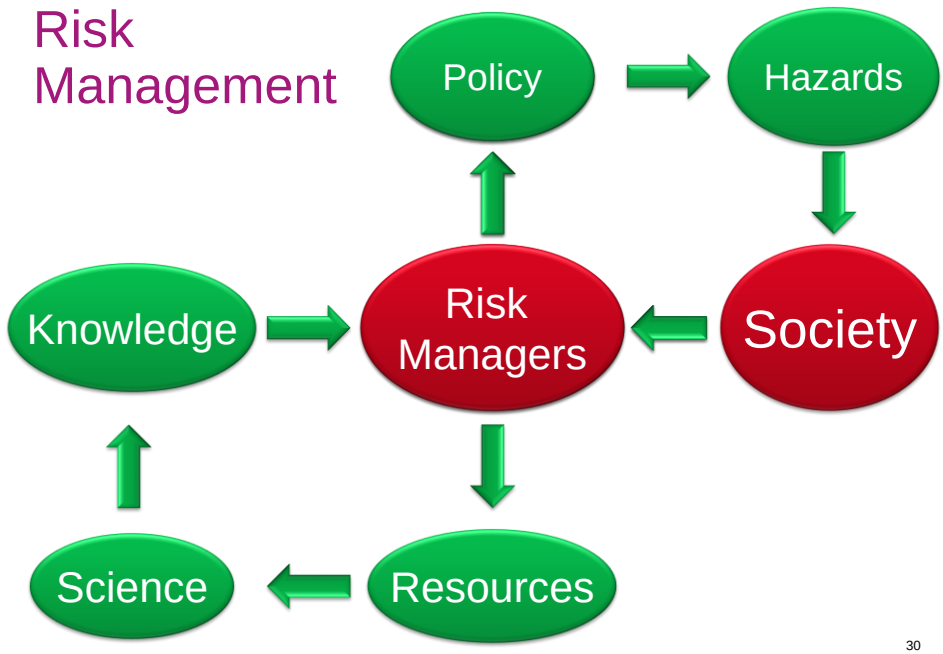
Risk Management



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Policy Makers need to acknowledge different Knowledge States for Event Occurrence and Consequences

Knowledge about	Likely consequences	
Likelihood of occurrence	Greater	Lesser
Greater	**Risk**	**Ambiguity**
Lesser	**Uncertainty**	**Ignorance**

Adapted from: Miles Parker – Defra UK and Stirling – Nature - 2010

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Examples for Different States of Knowledge about Event Occurrence and Outcomes

Risk Flooding (normal); Endemic diseases	**Ambiguity** Global warming
Uncertainty Flooding (under climate change); Exotic diseases	**Ignorance** Novel chemicals; BSE in 1986

Adapted from: Miles Parker – Defra UK and Stirling – Nature - 2010

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Suitable Approaches for different Knowledge Situations

Risk Quantitative risk assessment; "Normal "science	**Ambiguity** Expert opinion; Open debate; Comparative processes – analogies
Uncertainty Expert opinion; Modelling and scenarios; Open debate	**Ignorance** Observational & Descriptive approaches; Open debate; Values play important role

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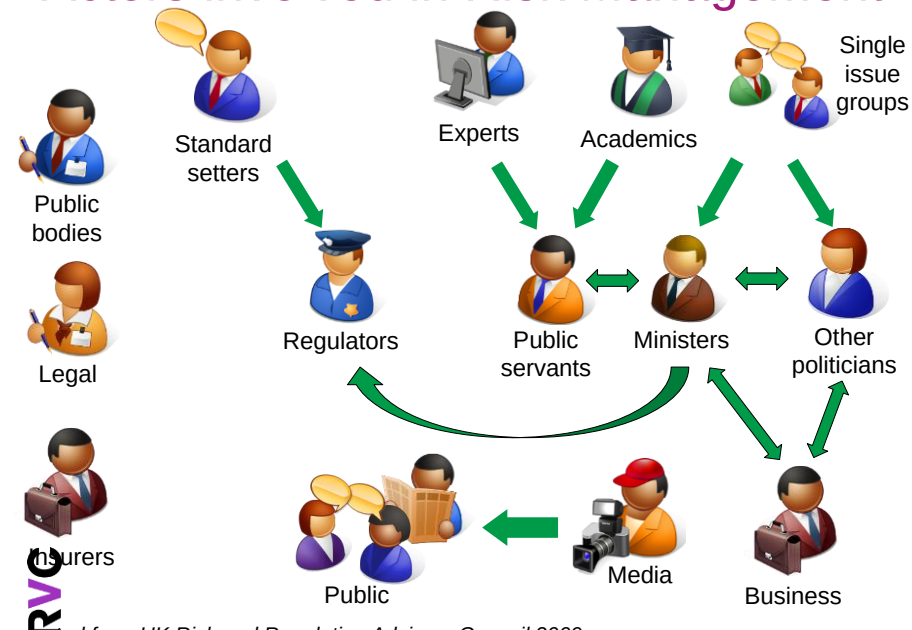
Adapted from: Miles Parker – Defra UK and Stirling – Nature - 2010

Actors involved in Risk Management



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adapted from UK Risk and Regulation Advisory Council 2009

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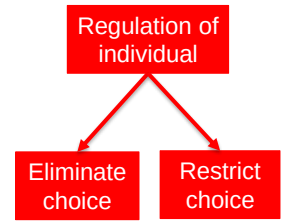
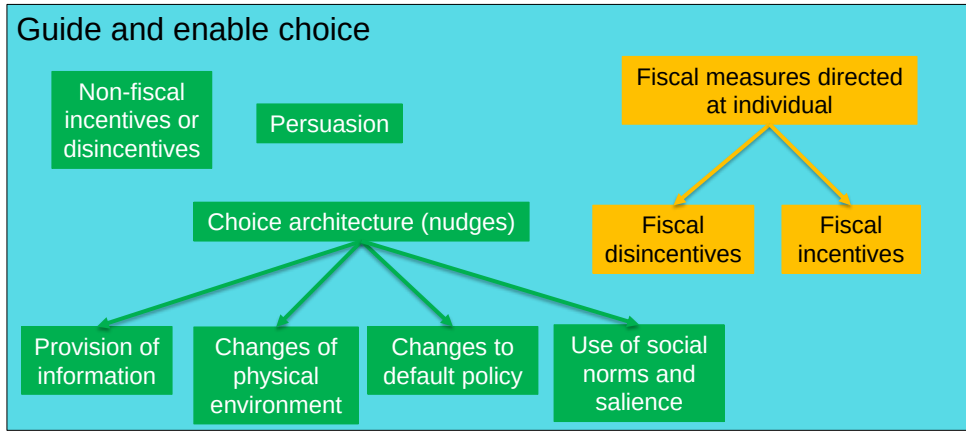
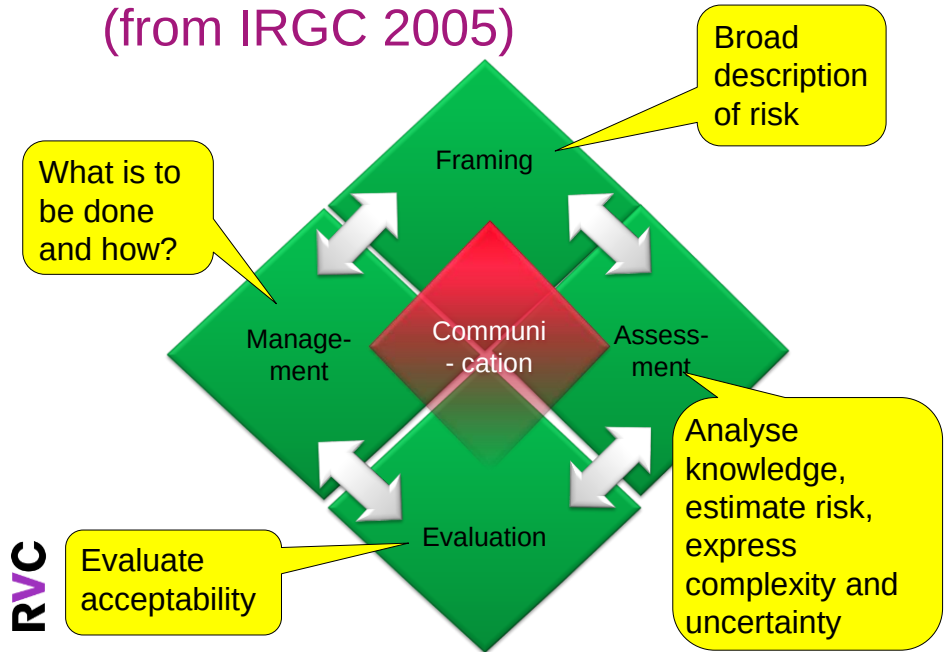
Typology of Policy Interventions directed at Individual's Behaviour





adapted from UK House of Lords 2011 – Behaviour Change

Risk Governance Framework (from IRGC 2005)



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CONCLUSIONS

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Conclusions

- Science
  - Needs to embrace systems thinking and integrated research approaches
  - Link biological and environmental with social sciences
- Risk assessment
  - Need to move beyond dominance by biomedical disciplines
- Animal health policy development
  - Recognise limitations of relying purely on evidence generated by biomedical science
  - Conscious choice of appropriate policy tools for different knowledge states

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