



Australian Government
Department of Health and Ageing
Office of the Gene Technology Regulator

META-UNCERTAINTY – EXPLORING THE BIG PICTURE OF UNCERTAINTY & RISK

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Office of the Gene Technology Regulator

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META-UNCERTAINTY – Some examples

This statement is false

**The barber shaves every man in town,
who doesn't shave himself**

“Few are able to see what isn't there.”

“If in doubt, don't. If still in doubt, do what's right.”

D. Rumsfeld



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INTRODUCTION

- Background
- Uncertainty
- Meta-uncertainty
- Relevance of meta-uncertainty to the regulation of GMOs



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BACKGROUND – Regulation of GMOs

OBJECT OF THE LEGISLATION

‘To protect the health and safety of people,
and to protect the environment,

by **identifying risks**

posed by, or as a result of, gene technology

and by **managing those risks**

through regulating certain dealings with GMOs’



UNCERTAINTY

- The role of uncertainty in risk analysis
- Applying uncertainty in a regulatory context



UNCERTAINTY – Taxonomy

*There are two types of uncertainty,
uncertainty and variability - USEPA*

- **Epistemic (incertitude, uncertainty)**
 - **measurement errors, data gaps, quality of evidence**
- **Stochastic (variability, intrinsic, noise)**
 - **variability, true randomness, incoherence**
- **Physical**
 - **atomic (eg quantum state), macro (eg complex systems)**
- **Descriptive (linguistic)**
 - **linguistic, models, mathematics, logic**
- **Cognitive**
 - **sensory, mental, emotional, memory**
- **Meta-uncertainty**



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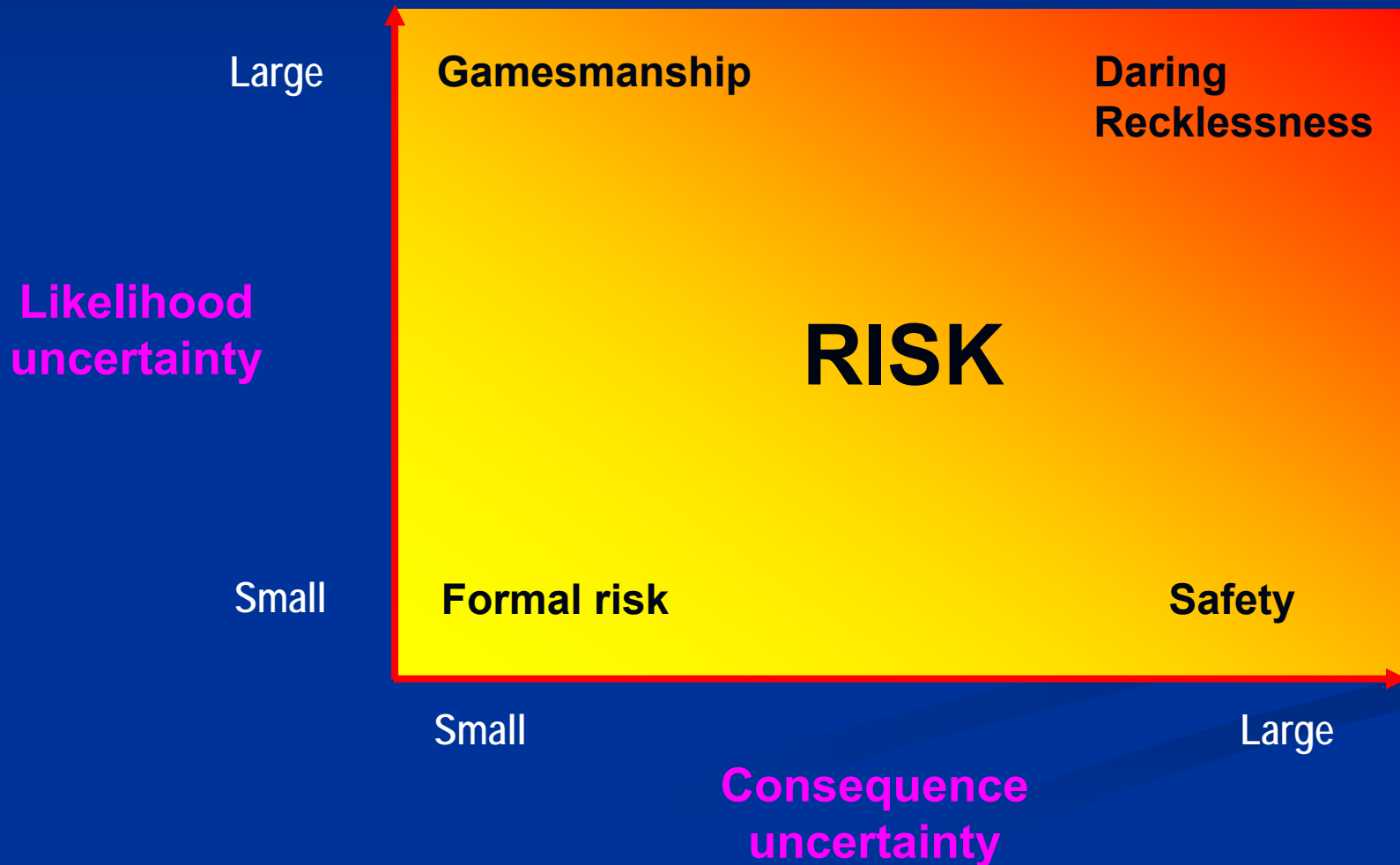
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META-UNCERTAINTY

- Uncertainty of uncertainty
- Compilation of uncertainties
- Tool to model uncertainty
- Undecidability



META-UNCERTAINTY- model of uncertainty





META-UNCERTAINTY – undecidability

“Insect resistant GM cotton is good for farmers and the environment because of reduced pesticide use”

‘To **protect** the **health and safety of people**,
and to **protect** the **environment**,
by identifying risks
posed by, or as a result of, gene technology
and by managing those risks
through regulating certain dealings with GMOs’



META-UNCERTAINTY – undecidability

“GM foods are as safe as their non-GM counterparts”

‘To protect the health and safety of people,
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META-UNCERTAINTY – risk assessment



Canola (Brassica napus)

Genetic modification →



Weed Risk Assessment

Seed set

High (>1000 seeds/m²)

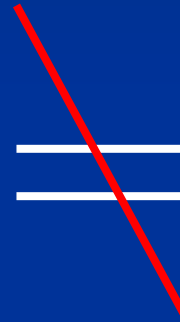
Low (<1000 seeds/m²)

None



META-UNCERTAINTY – risk communication

**PUBLIC
PERCEPTION
OF RISK**



**RISK ANALYST
PERCEPTION
OF RISK**

$$\sum_i^j R_{\text{GMO}} = k(\sum_i^j C * \sum_i^j L_U)$$

Where: R = Risk, C= Consequences, L = Likelihood, U = Uncertainty



META-UNCERTAINTY – risk communication





META-UNCERTAINTY – risk communication



disease



car transport



air transport



lightning



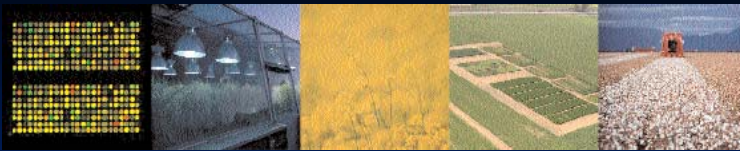
venomous
creatures

Probability of death



META-UNCERTAINTY – Decision-making





META-UNCERTAINTY – Decision-making





META-UNCERTAINTY – Decision-making



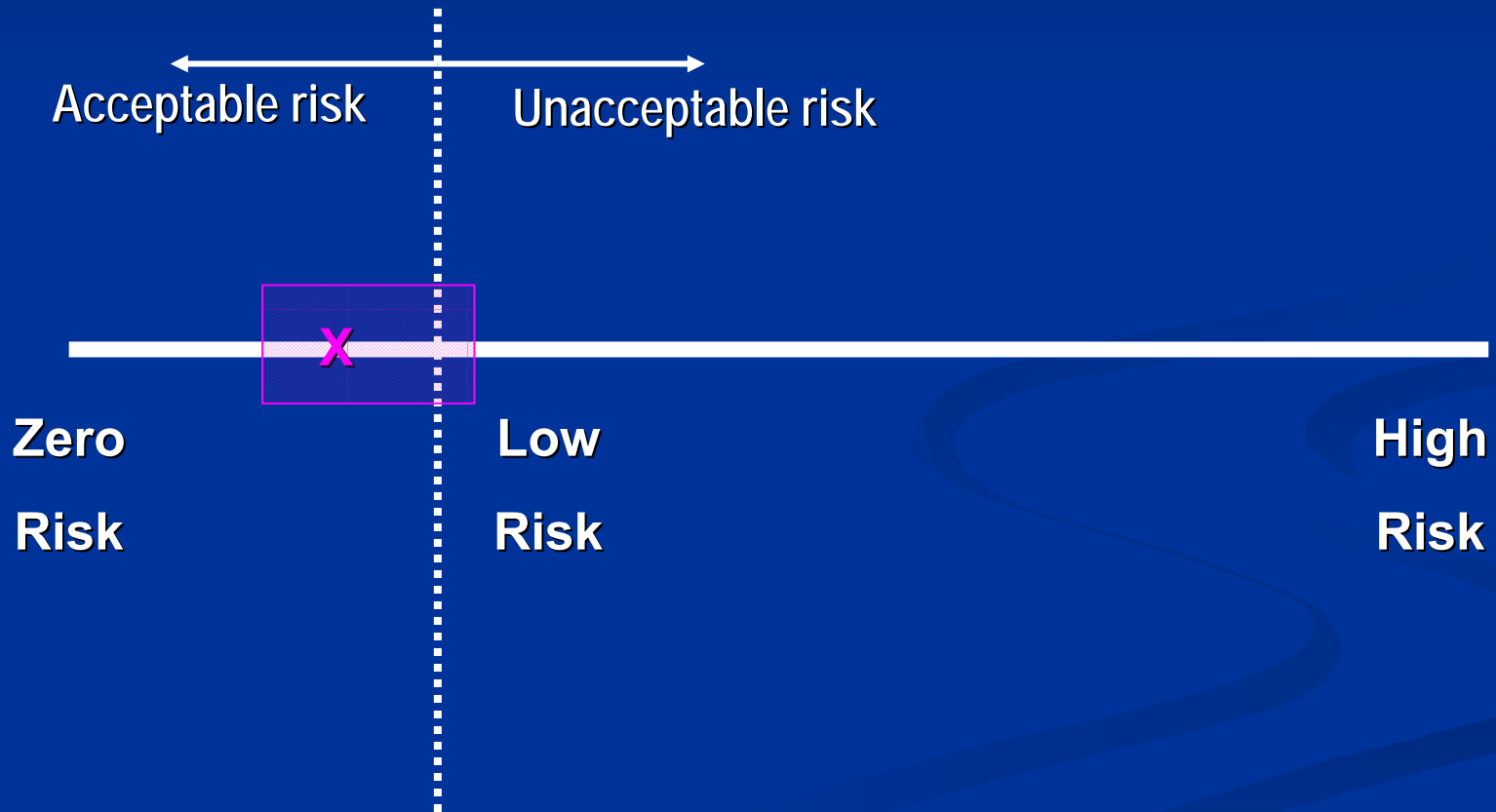


META-UNCERTAINTY – Decision-making





META-UNCERTAINTY – Decision-making





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