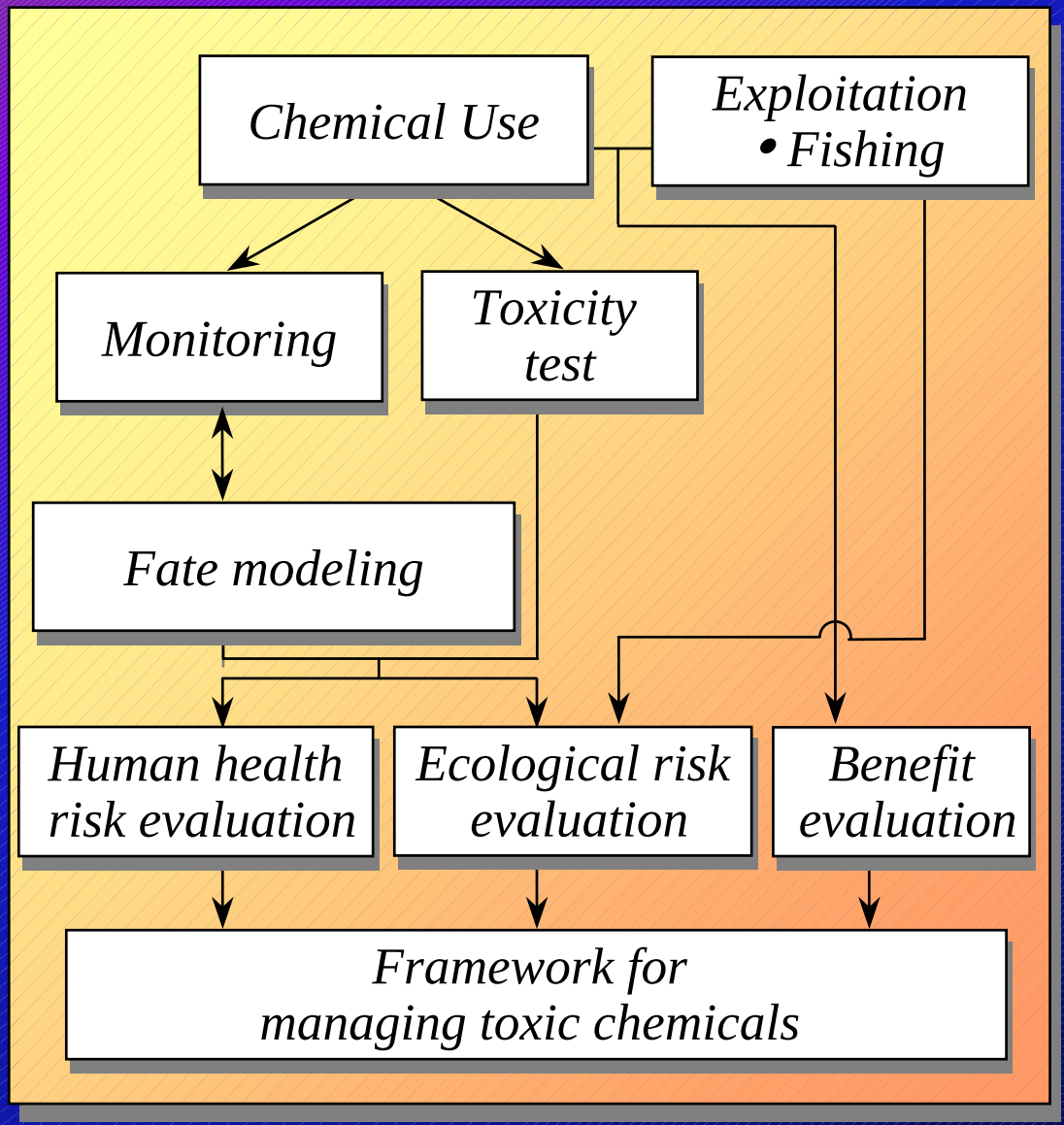
Establishment of a Scientific Framework for the Management of Toxicity of Chemicals based on Environmental Risk-Benefit Analysis:

Supported by the Japan Science and Technology Corporation from fiscal 1996 to 2000.

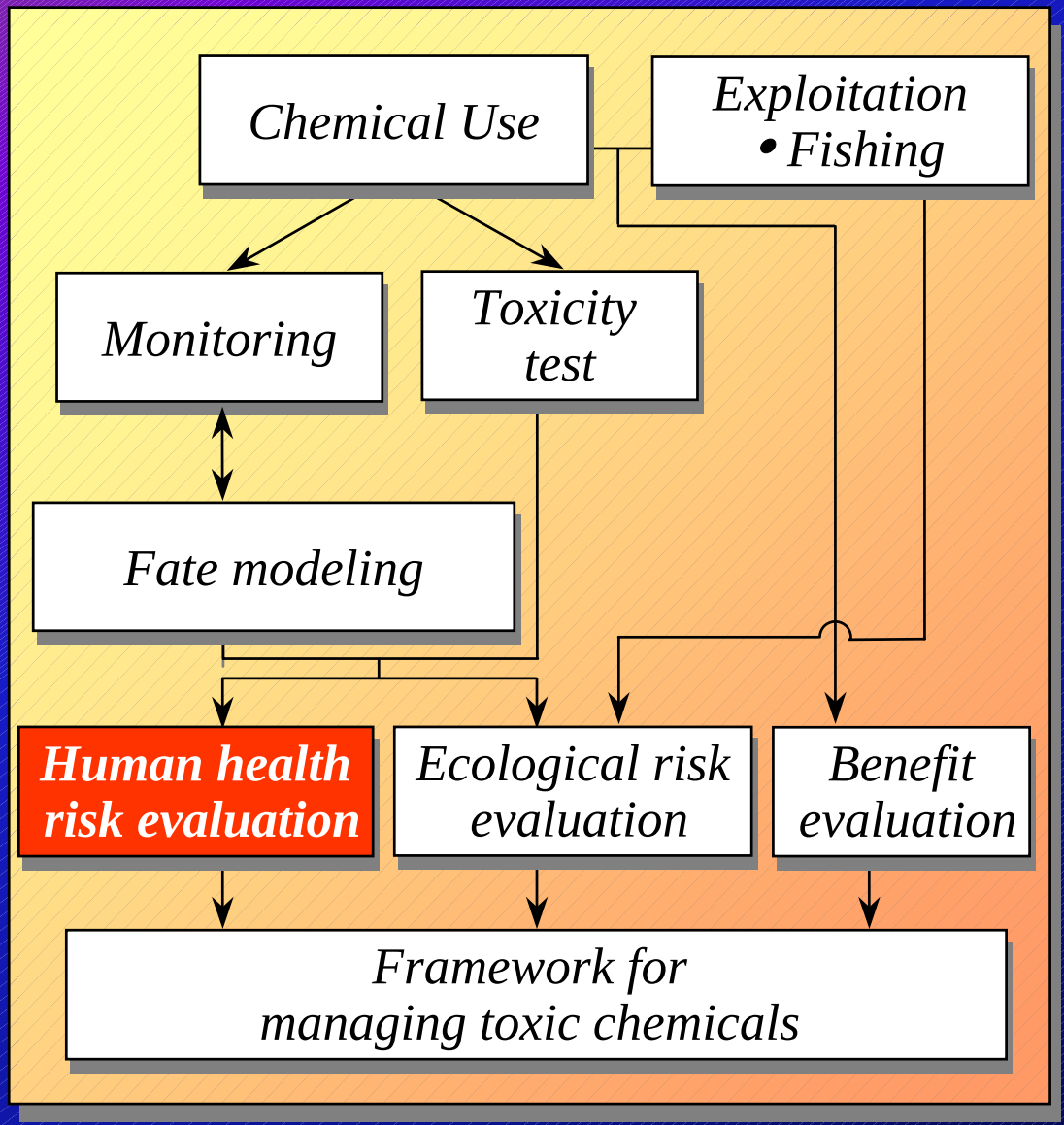
環境影響と効用の比較評価に基づいた化学物質の管理原則

科学技術振興事業団の支援
（平成８年度から１２年度まで）



- ***Monitoring:*** monitoring of chemicals targeted for the project, in various environmental media.
- ***Fate modeling:*** development of models for estimating the behavior of chemicals in various environmental media.
- ***Human health risk evaluation:*** development of methodologies to evaluate human health risks in terms of Loss of life expectancy (LLE).
- ***Ecological risk evaluation:*** development of methodologies to evaluate ecological risks in terms of probability of species extinction.
- ***Benefit evaluation:*** evaluation of benefits associated with the use of each chemical such as economical benefits, convenience accruing from its use and conservation of resources.
- ***Final proposal:*** proposal of a framework for managing toxic chemicals based on risk-benefit analysis.

Figure 1. Project Overview



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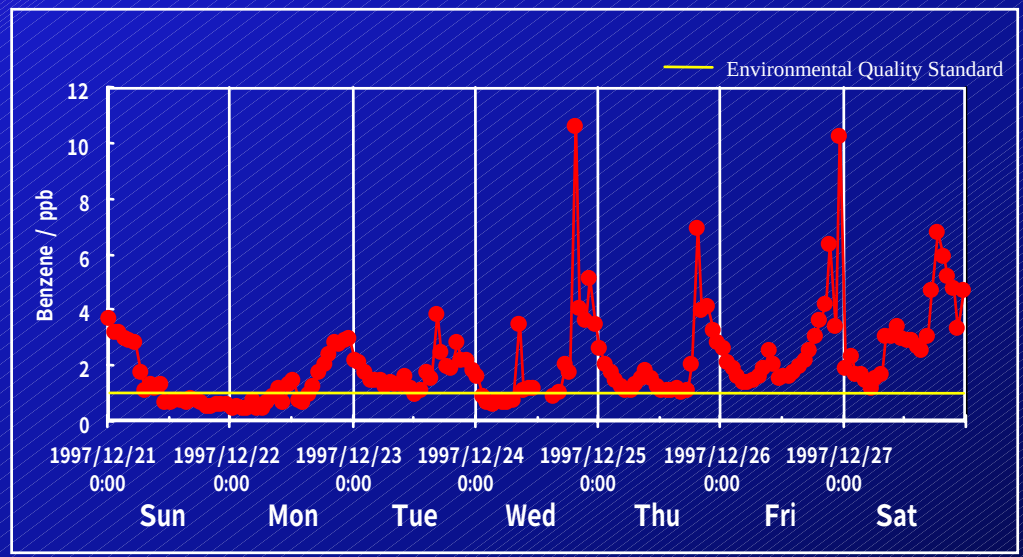
http://www.kan.ynu.ac.jp/whatsnew/index.html

Today's benzene levels(今日のベンゼン)



This month's dioxin deposition (under construction)

今月のダイオキシン（準備中）

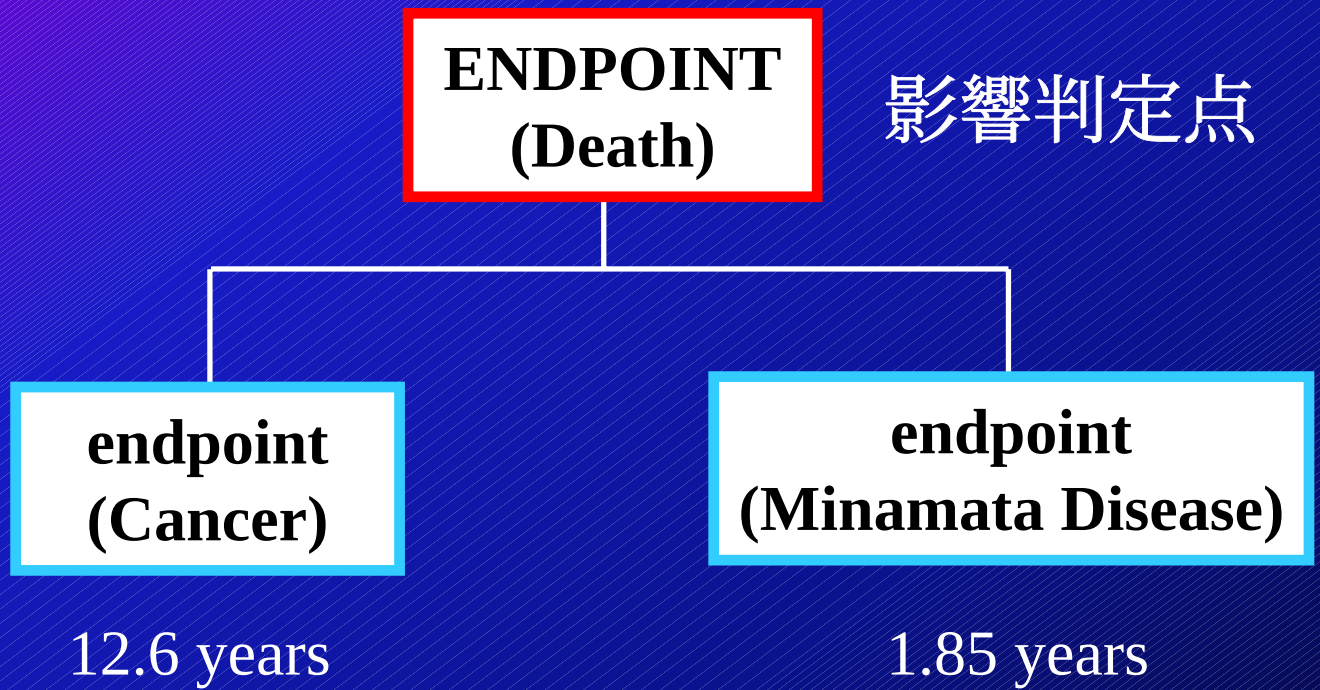
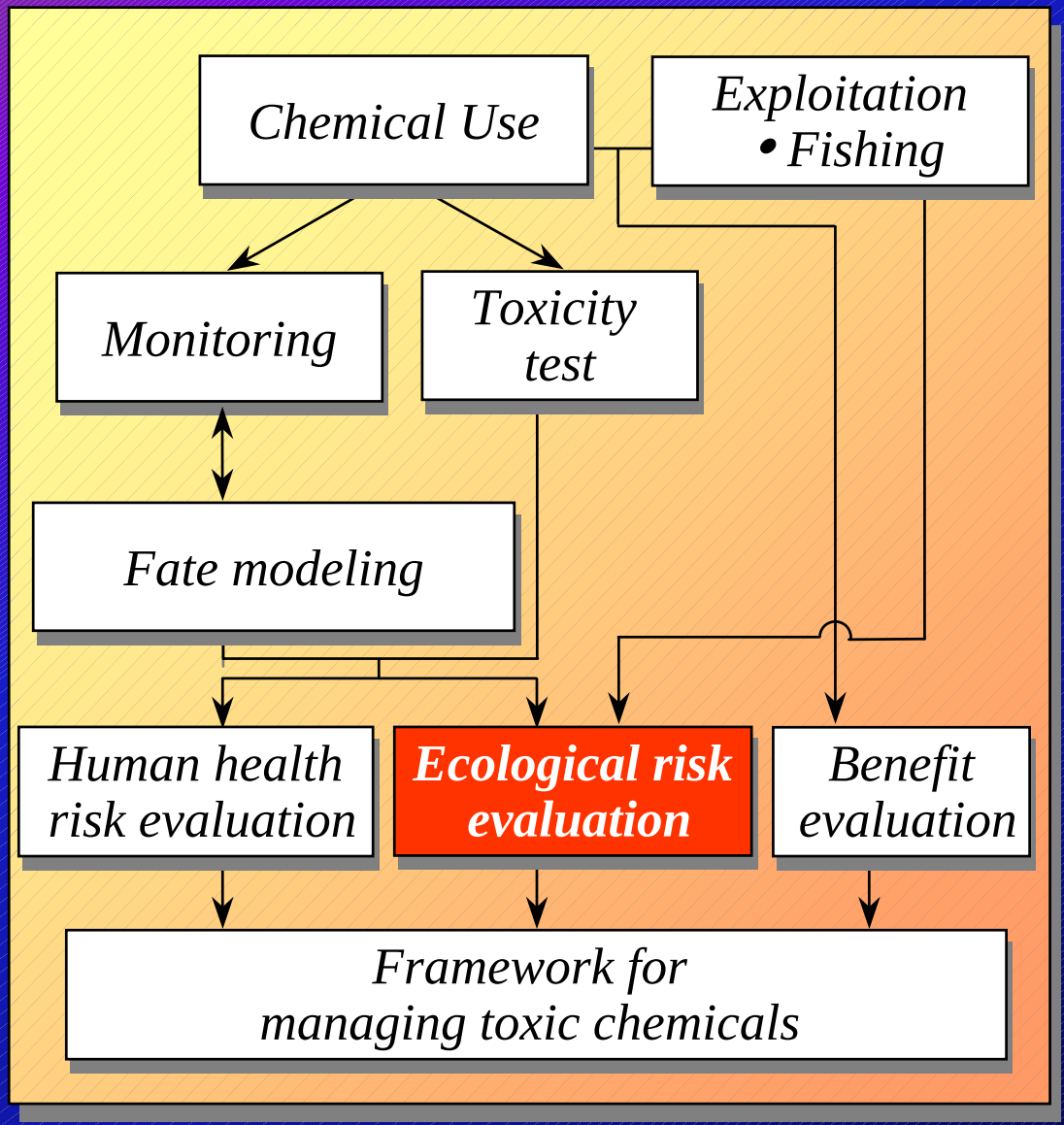


Figure 2. A hierarchical structure of endpoints.



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Why ecological risk is evaluated in terms of species extinction probability?

1) **Not the fate of individual organism , but effects on population or ecosystem are important.**
   個々の生物の生死ではなく、生物集団や生態システムへの影響が問題

2) **This method is available for the evaluation of , not only risks from chemicals use but also, risks from exploitation or fishing.**
   開発の生態影響も同じ尺度で評価できる

3) **The endpoint, namely species extinction, can be understood and accepted as undesirable effects by the public.**
   種の絶滅という目標は、多くの人に理解される

4) **This method can avoid controversies regarding the intergenerational distribution of resources and risks.**
   世代間の分配問題を解く方法となる。

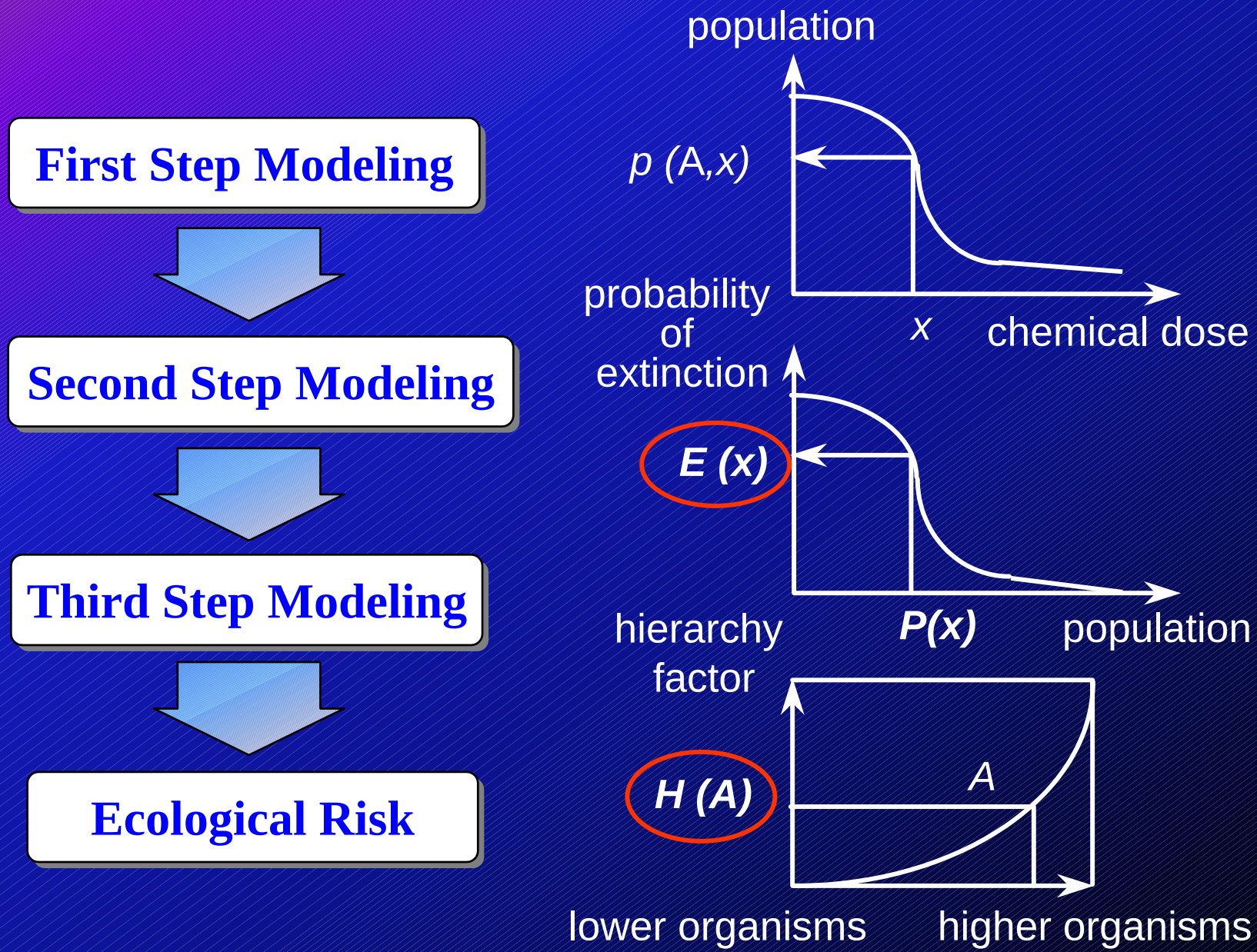


Fig 3. Basic concept of the method of evaluating ecological risks in terms of the species extinction.

Ecological Risk

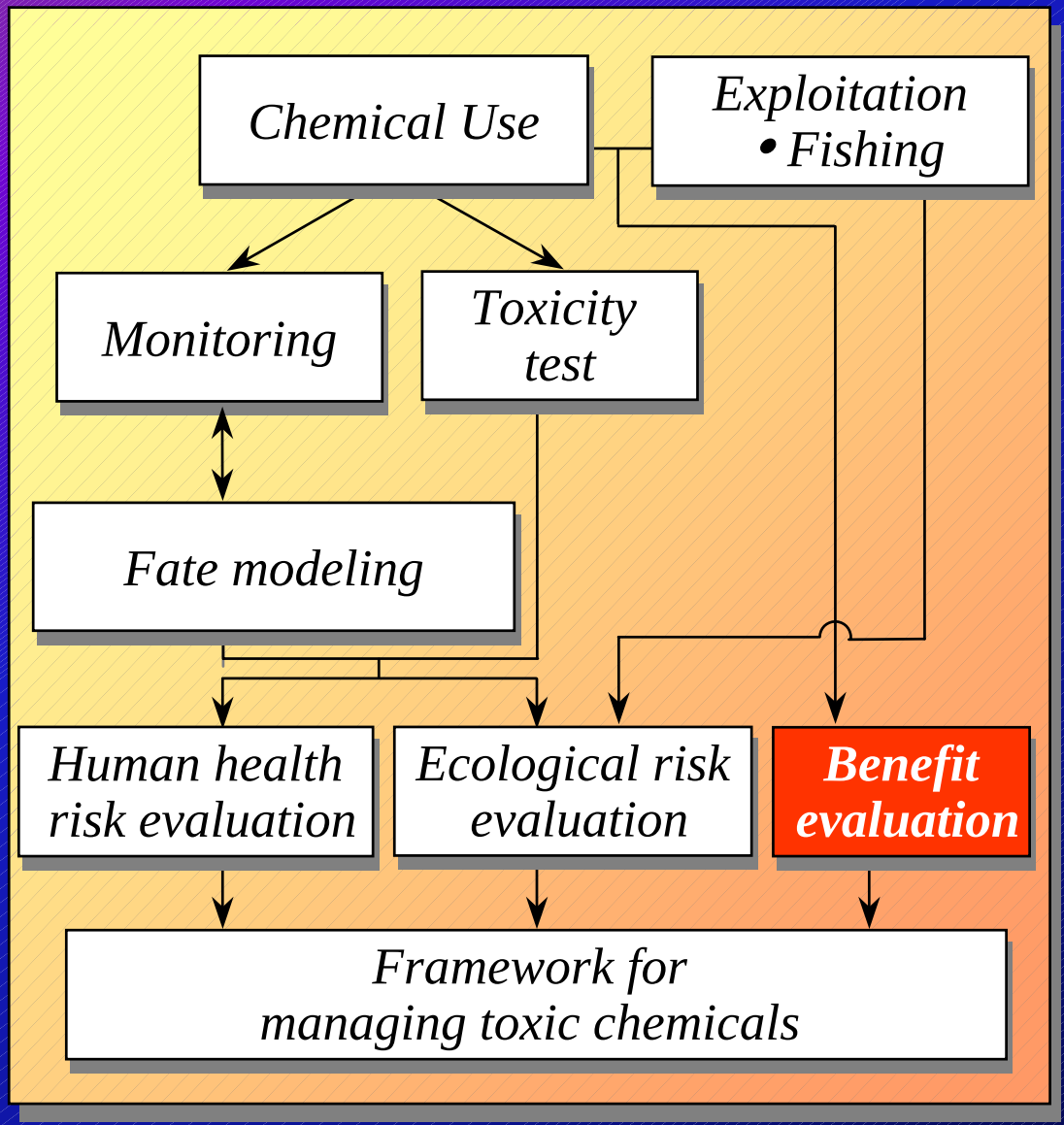
= E(x)×H(A)×(area at risk)

：in terms of *ha*

生態リスク

＝（その種の絶滅確率）×（ヒエラルキー因子）×（影響を受ける面積）

：生態リスクの単位は面積（*ha*）



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In the risk-benefit analysis:

Benefit-risk ratio (BRR)

= (the benefit at the expense of the risk) ／ (the magnitude of the risk)

= (the costs of reducing the risk) ／ (the magnitude of the risk reduced)

BRR（ベネフィット・リスク比）

$$= \frac{\text{（リスクを受忍することによって得られるベネフィット）}}{\text{（リスクの大きさ）}}$$

$$= \frac{\text{（リスク削減費用）}}{\text{（リスク削減量）}}$$

Project Members

	Engineering	*Biology*		*Modeling and Management*
		Field	*Theory*	
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*1 National Institute for Resources and Environment
*2 Core Research for Evolutional Science and Technology, Japan Science and TechnologyCorporation.
*3 Hokkaido Univ. after 1997.8
*4 National Institute of Materials and Chemical Research after 1997.4

Target Chemicals for this study

Benzene (air)

Dioxin (sediment, air, deposition, fish, birds)

Indoor air pollutants

Mercury (in Japan and in the Amazon)

Ecological risk evaluation