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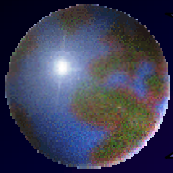
Department of Agriculture, Fisheries and Forestry



Emerging infectious diseases – how can epidemiologists make a real difference?

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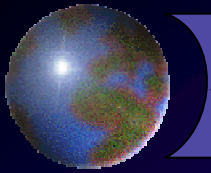




Outline of presentation

Talking mostly frameworks rather than detail

- Relevance of topic
- Introduce some concepts
 - With examples
- Where to from here?

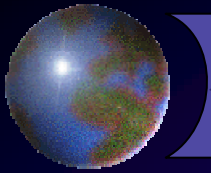


EID definition

Infections that have newly appeared in the population or

Existed, but rapidly increasing incidence or geographic range

Morse SS (1995) 'Factors in the emergence of infectious diseases', *Emerging infectious diseases*, vol. 1, pp. 7–15.

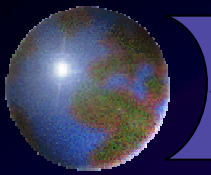


We need to know

- That 75% emerging human pathogens are zoonotic
- Role of wildlife reservoirs and human activity (ecological, demographic or social change) etc important

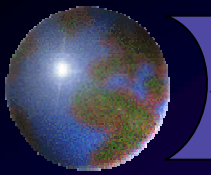
So

- Need multidisciplinary teams and approach



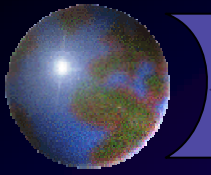
Profile of 'typical' emerging human pathogen

- An RNA virus that is vector borne with zoonotic potential (reservoir host range that is taxonomically and ecologically broad)
- Potentially transmissible between humans
- Found in areas undergoing ecological, demographic or social change



Relevance of topic

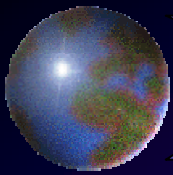
- EID – Not going away
- Lots of attention (why?)
 - HIV, Ebola, Hendra, Nipah, SARS, AI, WNV plus others.
- CRC for EID
 - Diagnostics
 - Surveillance
 - Ecology of disease



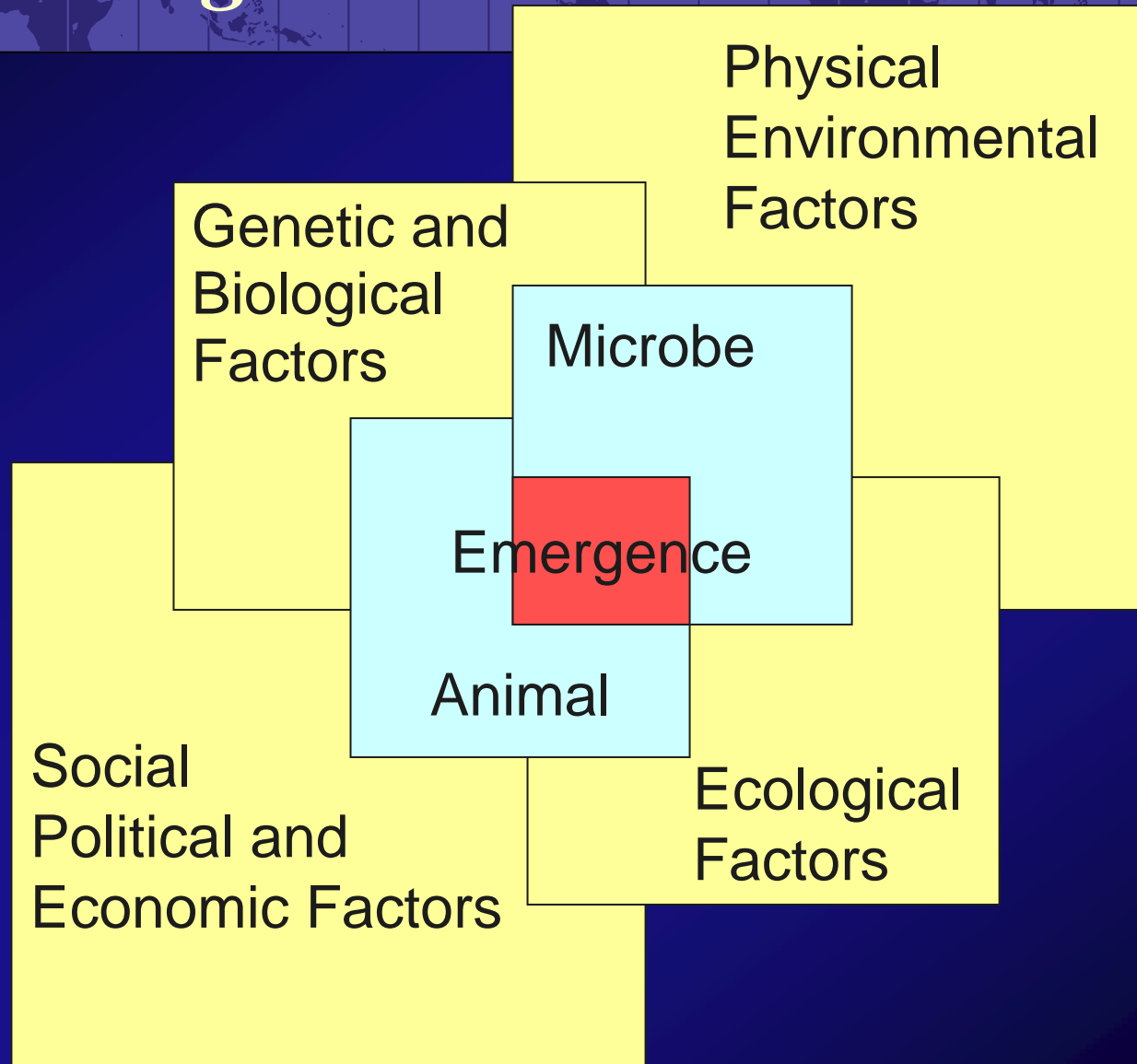
Veterinary epidemiologists role

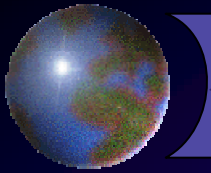
As per CRC for EID

- ⊕ Diagnostics
- ⊕ Surveillance
- ⊕ Disease ecology



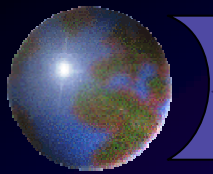
Convergence Model





The issue of context

- System boundaries and scales (in terms of convergence model or example)
- This period in human history is different
 - Anthropogenic influences that are affecting the future of life on earth
 - Discontinuities abound (complex systems)
 - Prediction alone is dangerous
 - Uncertainty is a given for many critical issues and consequences are big and long lasting
- Epidemiologists have an important role – but needs to expand in terms of breadth and depth

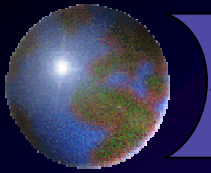


How to expand role?

- Breadth – ecological approach
 - 'contemporary discussion needs to incorporate a clearer understanding of infectious disease within an ecological framework'
 - A.J. McMichael 'Environmental and social influences on emerging infectious diseases: past, present and future'
Phil. Trans. R. Soc. Lond.(2004) 359. 1049-58.
 - Eg. Holling four box model and HPAI

- Depth – other approaches
 - Eg. Causal layered analysis and Nipah

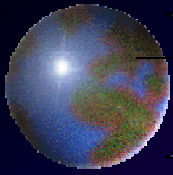
- Where we are not up to speed
- Why? Discipline problem?
- Analysis versus synthesis (not just in epi, science generally)



Causal layered analysis (CLA)

- ❖ Unpackage problems in layers
- ❖ Identify thinking, attitudes, perceptions, assumptions at a range of levels
- ❖ Not about facts, but why you seek certain facts and not others
- ❖ Contradictions, prejudices and paradoxes

Inayatullah S (1998) 'Causal layered analysis—poststructuralism as method' *Futures*, vol. 30, pp. 815–829.



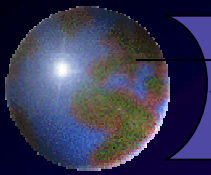
Causal layered analysis

Litany – quantitative trends, problems, news, media bites

Social causes – economic, cultural, political and historical
eg. Policy institutes, technical and academic analysis

Worldview/discourse – discerning deeper assumptions
behind the problem, structure that supports view

Myth/metaphor – deep stories , unconscious dimension of
the problem or paradox. More image based. More heart
than head



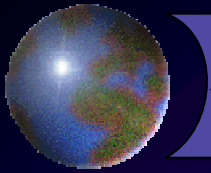
CLA - Nipah virus

Litany – increasing number novel disease agents, human deaths, pandemic warnings (Influenza , SARS), Culling pigs, flying foxes source of disease

Social causes – El Niño event, population growth, intensification agriculture, habitat degradation , human activity (Causal web thinking/ecological thinking)

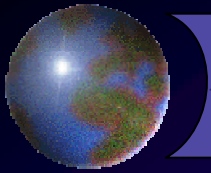
Worldview/discourse – Population growth or resource consumption; Intensification – why? Profit model, (politics), economic growth and consumption

Myth/metaphor – ‘West is best’, ‘Growth is good’, Technology will ‘save us’



What might we need to do?

- Build on responses to date
- Challenge assumptions
- Increase our capacity to deal with complex systems
- Accept that we alone do not have the answers
- Indeed, for many issues – there is no single answer , but a range of pathways



What might we need to do?

- Combine both depth and breadth approaches

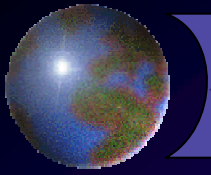
- Ecosystem health

 - Includes humans and their activities

'Ecosystem health and sustainability' Cambridge Uni Press 2004

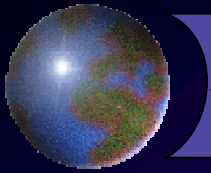
David Waltner-Toews





Post normal science

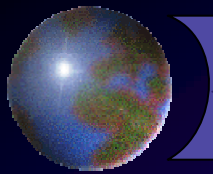
- 'it remains for scientists to suggest ways of mitigating and adapting to the inevitable surprises....',
- JJ Kay et al. 1999. An ecosystem approach for sustainability: addressing the challenge of complexity. *Futures* 31:721-742



Veterinary epidemiologist as scientist

- ❖ A scientist's role in decision making shifts from inferring what will happen, that is making predictions which are the basis of decisions, to providing decision makers and the community, with an appreciation of how the future might unfold.

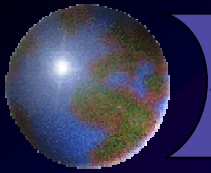
JJ Kay et al. 1999. An ecosystem approach for sustainability: addressing the challenge of complexity. *Futures* 31:721-742



Limits to growth?

- Growing human population and economics inevitably must butt against the resource limits of a finite planet. The increasing complexity and extent of society over hundreds of millennia must at some point reach the scale of the planet itself. That point is now'

Raskin, P; Banuri, T; Gallopin, G; Gutman, P; Hammond, A; Kates, R; and Swart, R. (2002). *Great transition- Promise and lure of the times ahead*, Stockholm Environment Institute, Boston

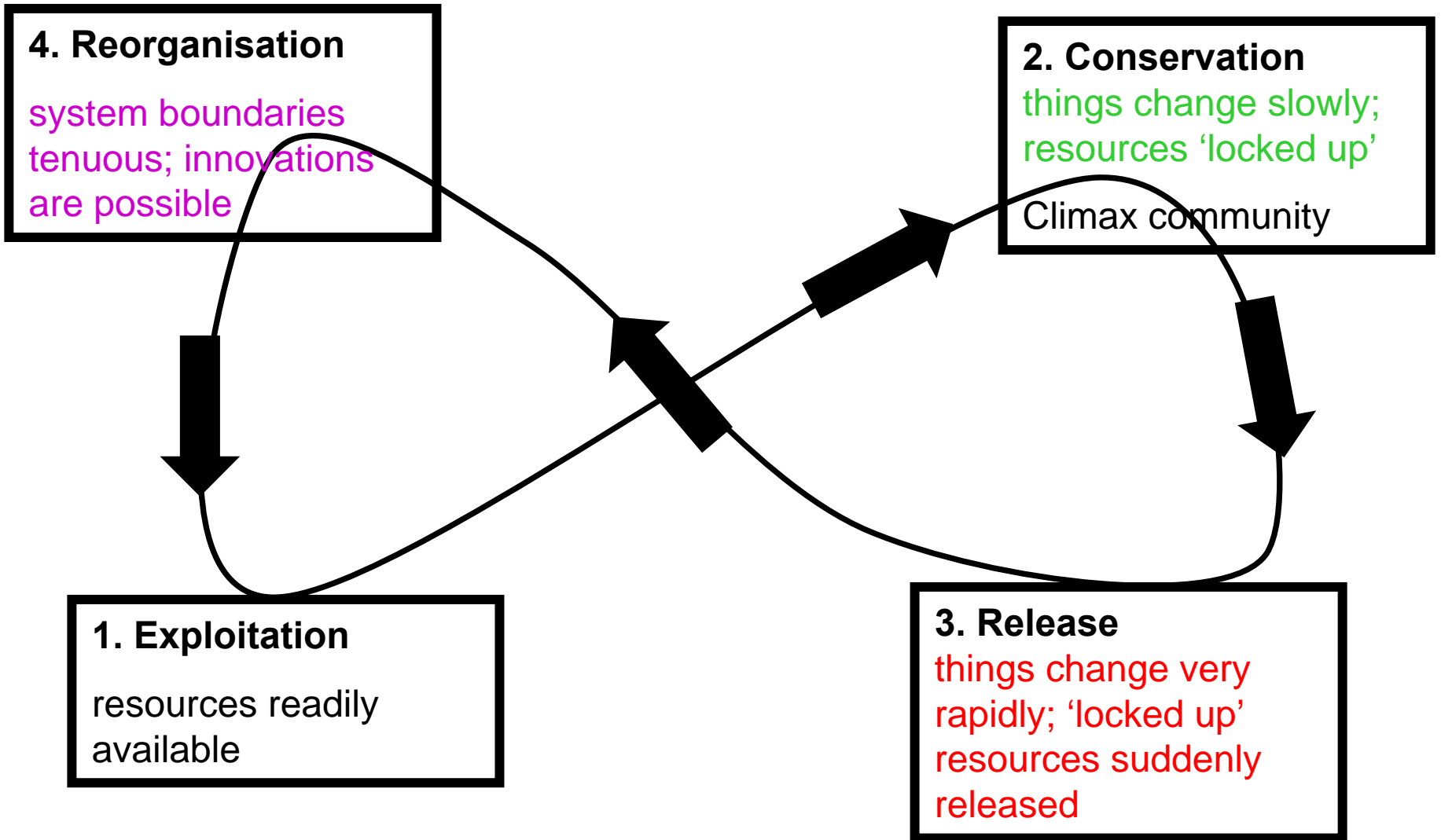


Ecological economics

"The economy is a wholly owned subsidiary of the environment, not the other way around."—Gaylord Nelson

former U.S. senator and governor of Wisconsin

**Emerging infectious diseases -
seems to be another reminder?**



Holling four box model - drawing based on Holling 2004

'From complex regions to complex worlds', Ecology and Society 9 (1) :11

4. Reorganisation

system boundaries
tenuous; innovations
are possible

2. Conservation

things change slowly;
resources 'locked up'
Climax community

1. Exploitation

resources readily
available

*Increasing size and
number of intensive
chicken and duck
production systems*

3. Release

things change very
rapidly; 'locked up'
resources suddenly
released



Sector 1: commercial, industrial, integrated, high level of biosecurity, marketed commercially



Sector 2: commercial, non-integrated, moderate to high biosecurity, marketed commercially



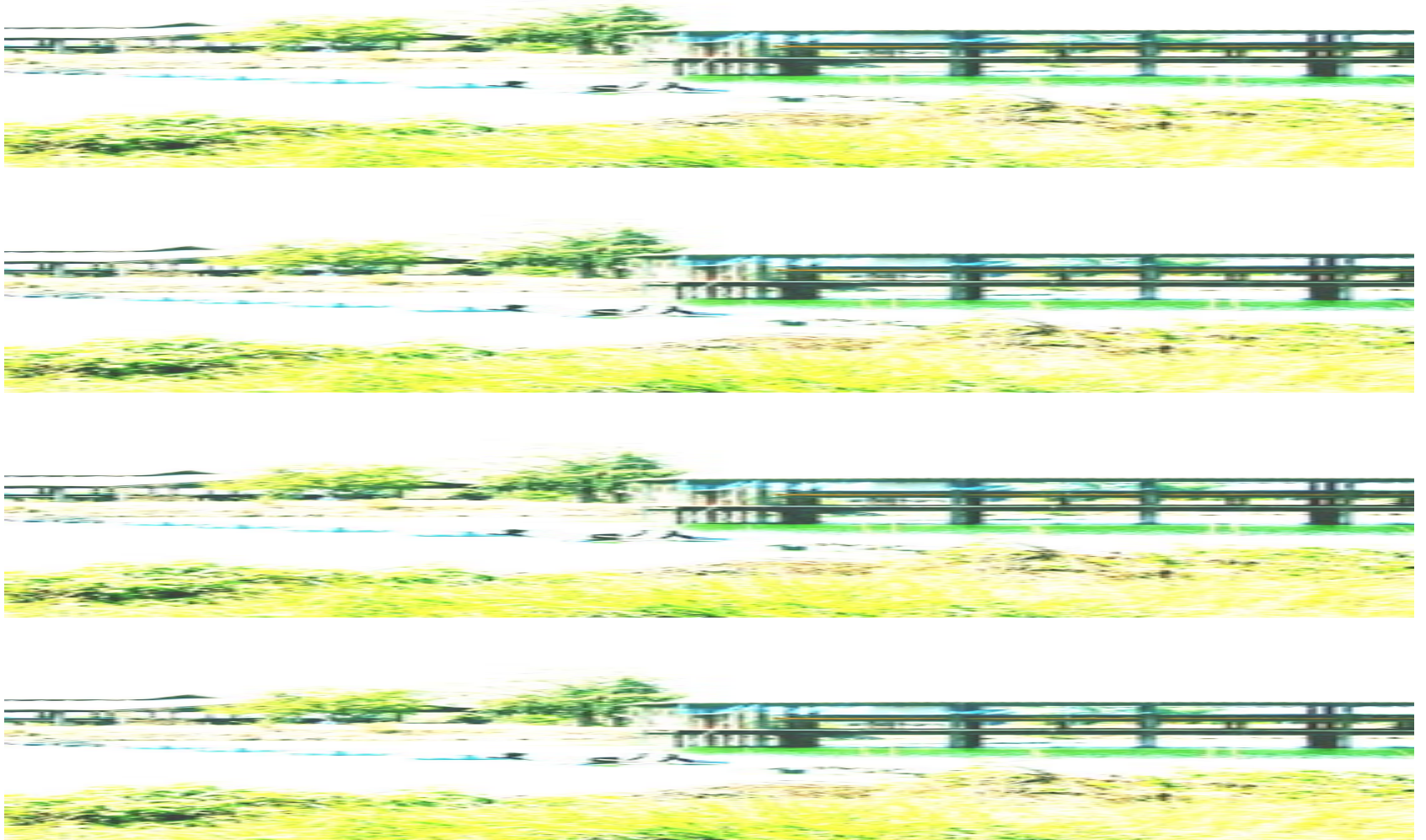
Sector 3: commercial smallholder, minimal biosecurity, marketed in live bird markets



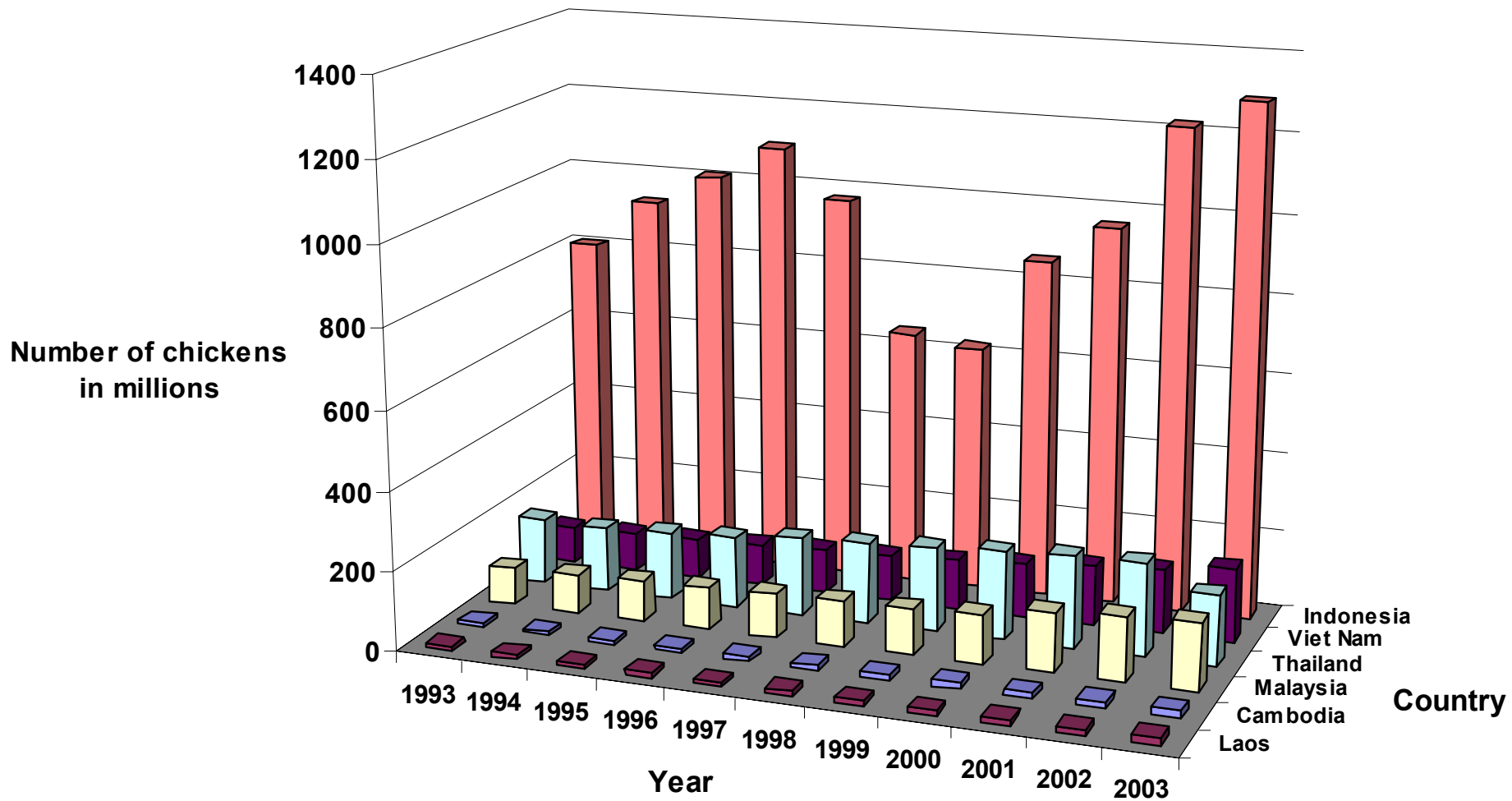
Sector 4: village or backyard, little/no biosecurity, informal marketing



Real life: not always so simple



Number of chickens by year and country

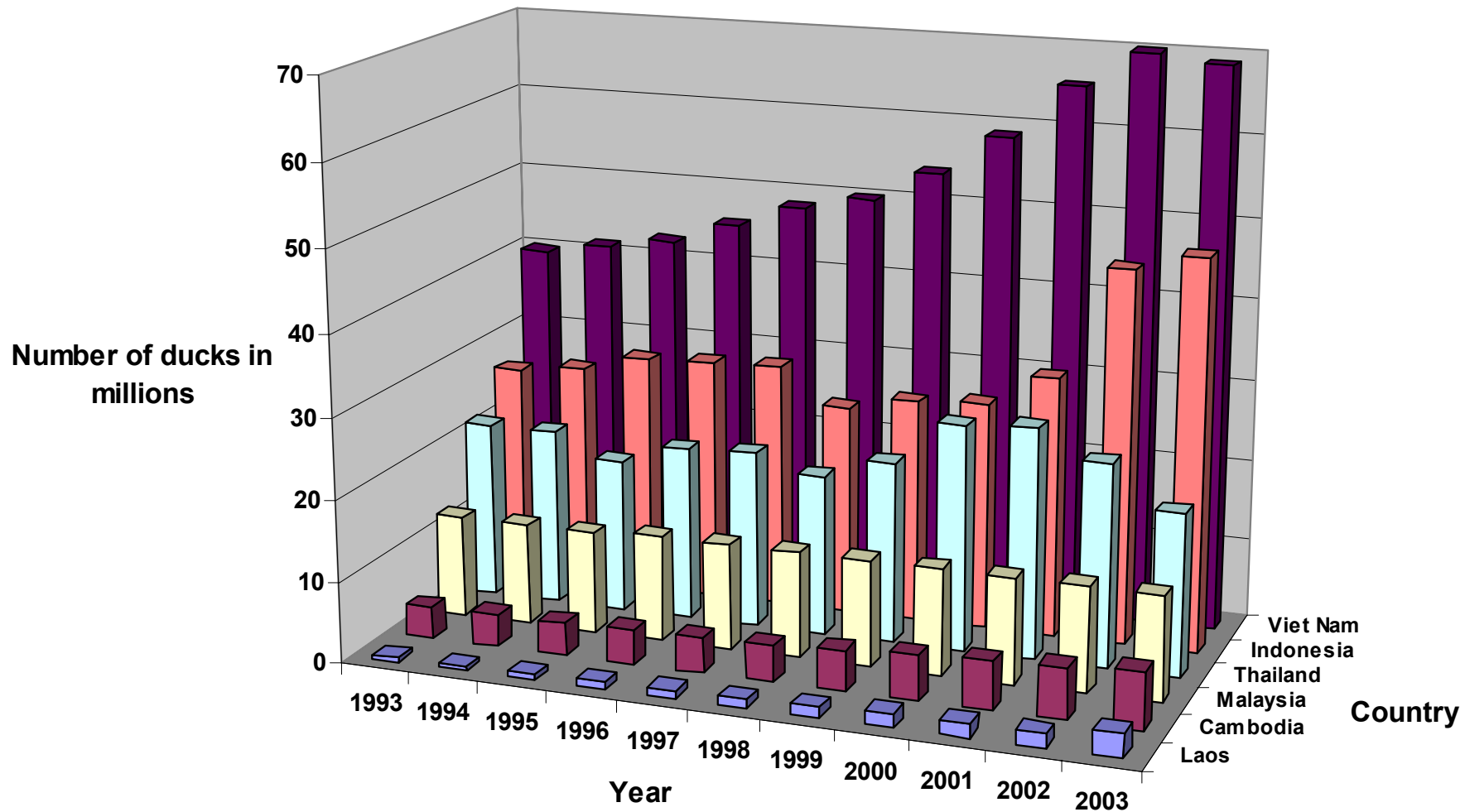


Source: FAOStat Agricultural data



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**Department of Agriculture,
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Duck numbers by year and country

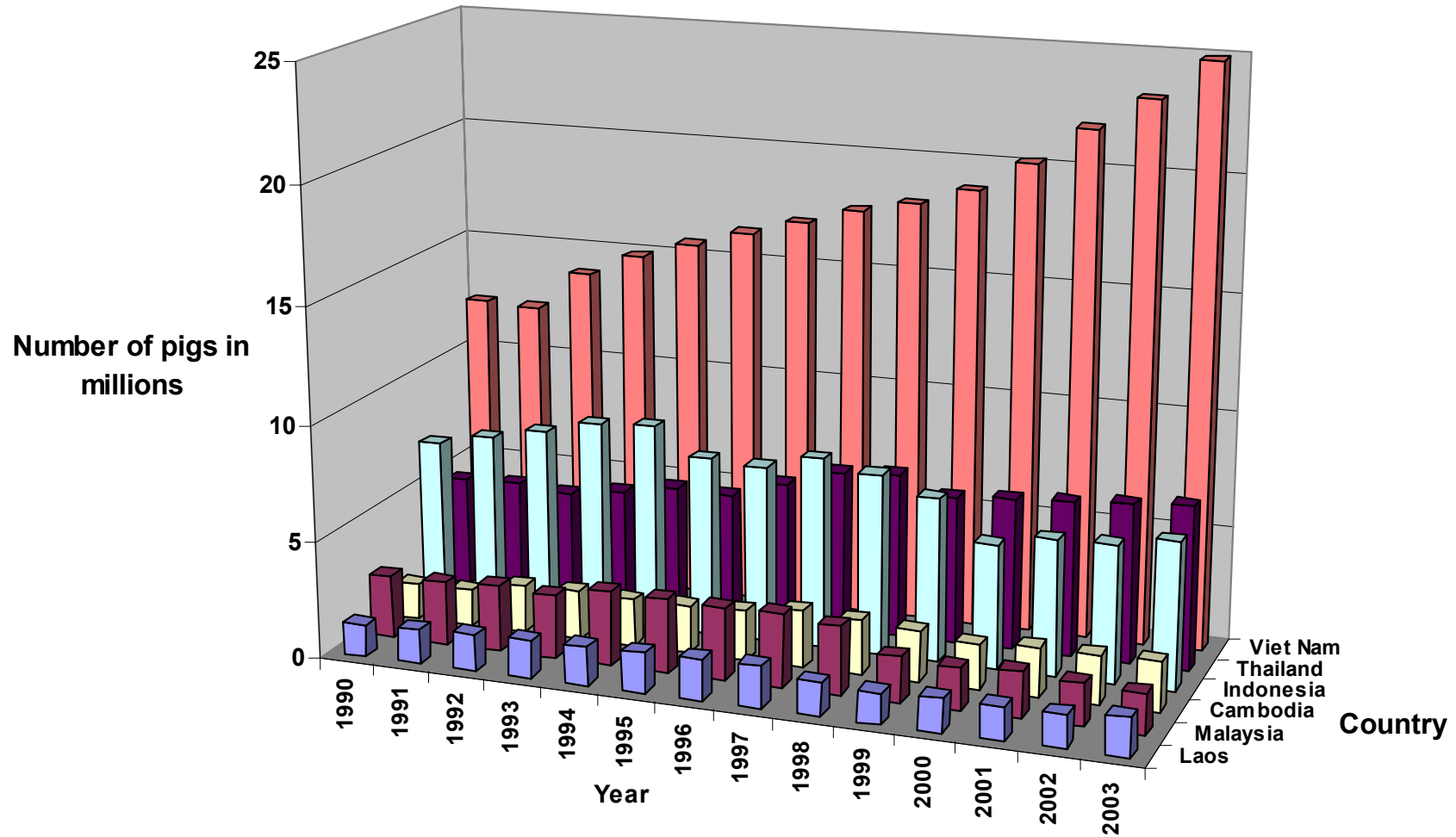


Source: FAOStat Agricultural data



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Number of pigs by year and country



Source: FAOStat Agricultural data



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Department of Agriculture,
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Change in numbers per ag person

Duck and chicken per ag person	1990	2000	% increase
Laos	2.55	3.66	44
Cambodia	1.59	2.25	41
Malaysia	14.85	33.59	126
Indonesia	6.44	9.51	48
Thailand	4.05	8.47	109
Vietnam	2.28	3.73	63
China	2.90	4.96	71

Calculated from FAOStat Agricultural data



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4. Reorganisation

system boundaries
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2. Conservation

things change slowly;
resources 'locked up'

*Climax community of
chicken and duck
production*

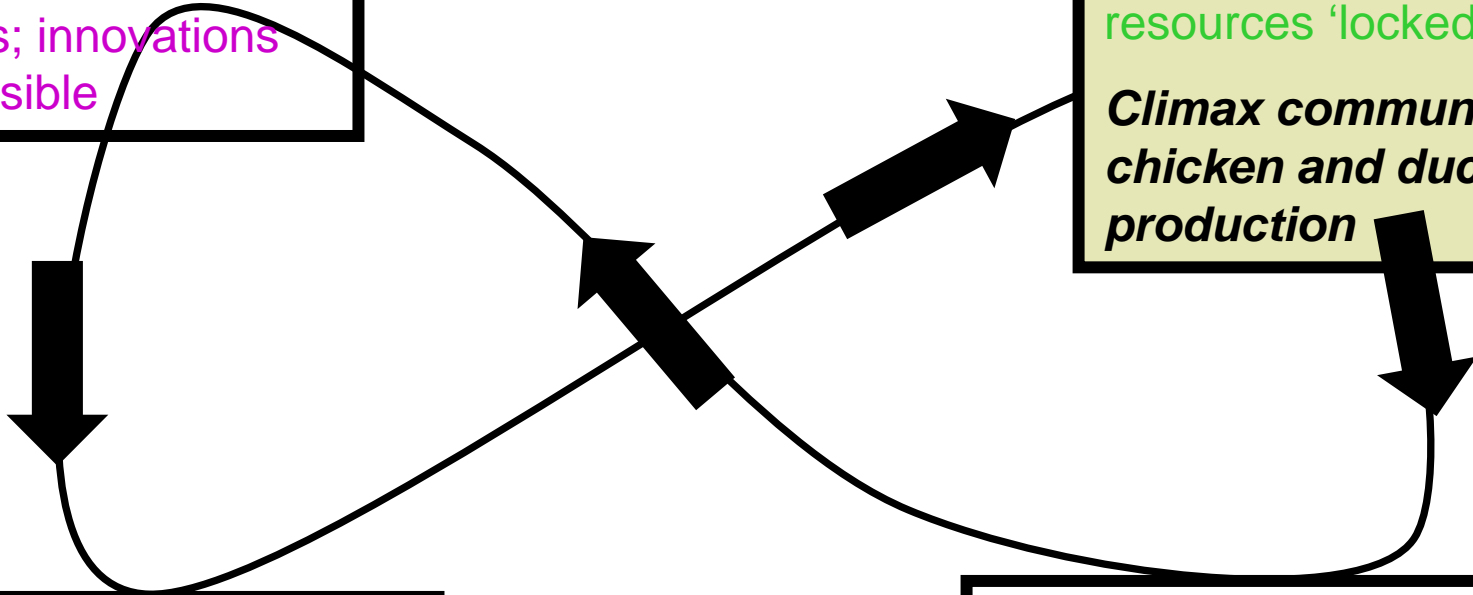
1. Exploitation

resources readily
available

*Increasing numbers
birds and complexity
of chicken and duck
production systems*

3. Release

things change very
rapidly; 'locked up'
resources suddenly
released



4. Reorganisation

system
ten
are

Paradox - More effective system is at consuming energy, i.e. the more self organised it is → the more likely it is to be consumed by another self organising process → like a disease outbreak

2. Conservation

things change slowly;
resources 'locked up'

Climax community of chicken and duck production

HPAI

1. Exploitation

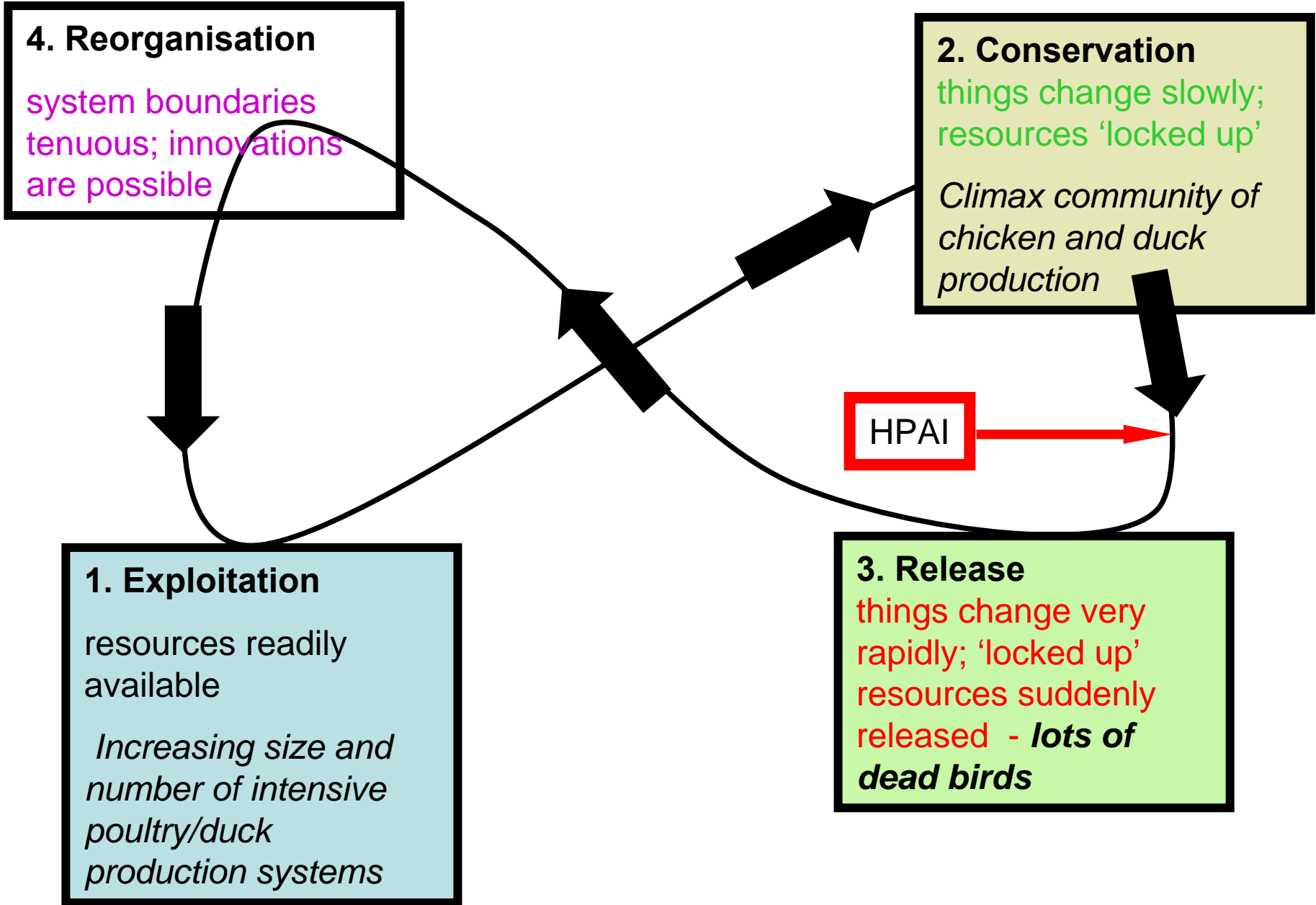
resources readily available

Increasing size and number of intensive chicken and duck production systems

3. Release

things change very rapidly; 'locked up' resources suddenly released





4. Reorganisation

system boundaries
tenuous; innovations
are possible

2. Conservation

things change slowly;
resources 'locked up'

*Climax community of
chicken and duck
production*

HPAI

3. Release

things change very
rapidly; 'locked up'
resources suddenly
released - **lots of
dead birds**

1. Exploitation

Re-evaluation of how to restructure
industry in affected countries

Biodiversity (genetic diversity)

Resilience issues

STEEP



Relevant questions

- **What are the appropriate chicken and duck production systems for the future in SE Asia?**
- **How many resources should be allocated to maintaining particular production systems?**
- **Who decides?**
 - **(within STEEP – P with input from E?)**