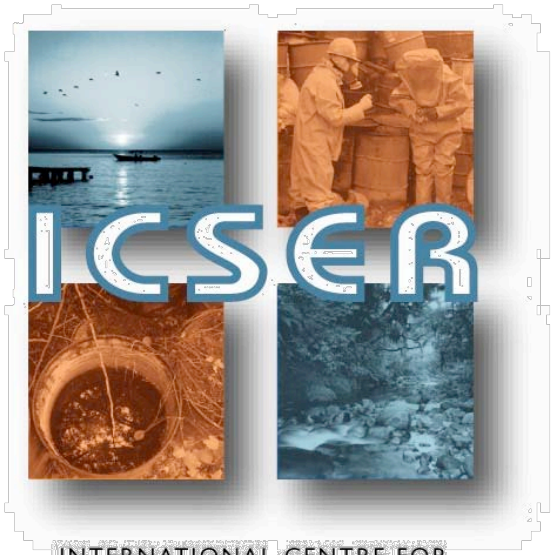
towards

System Innovation

for

Sustainability



Fisher&Paykel
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THE UNIVERSITY OF AUCKLAND
NEW ZEALAND

by

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Department of Civil and Environmental Engineering
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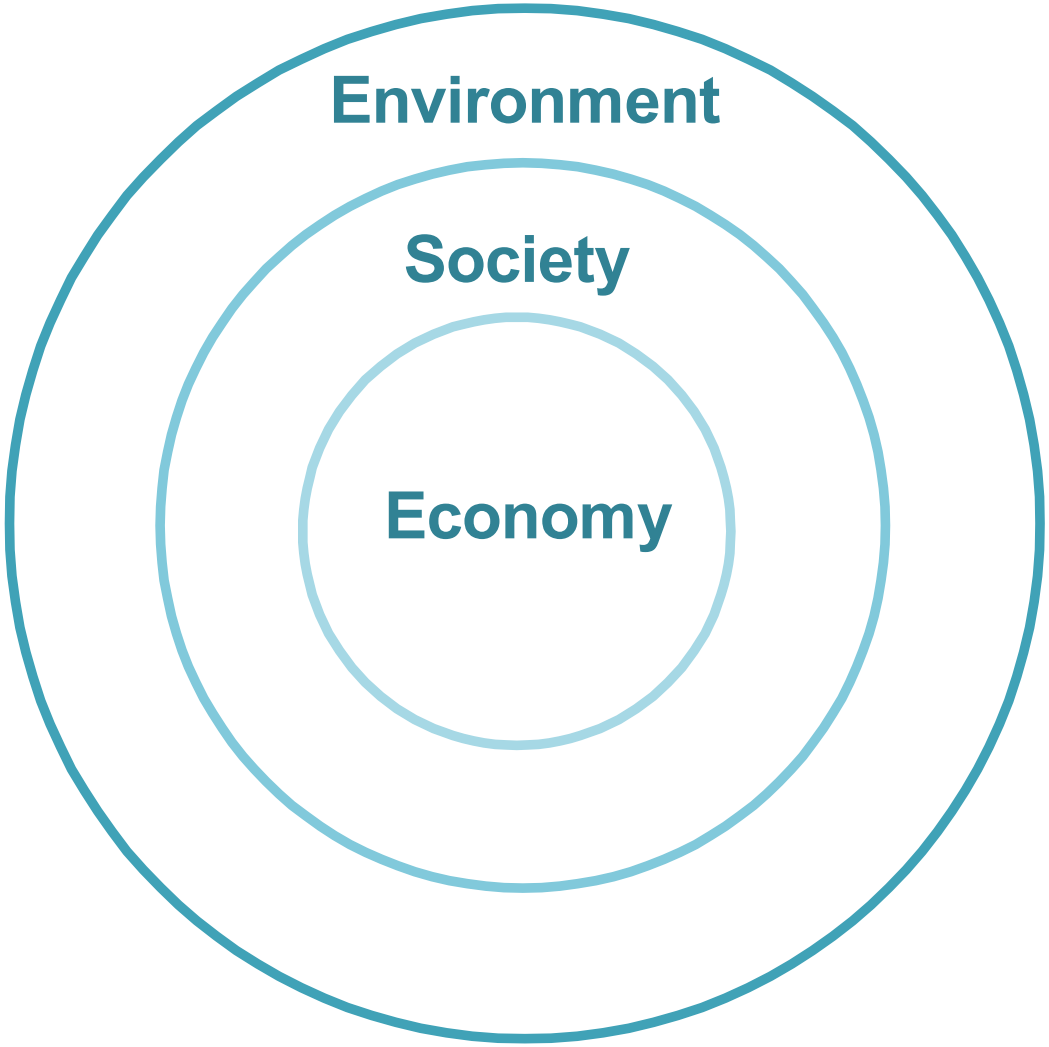
29 February 2008

INTRODUCTION: Sustainability

Sustainable Development

is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

INTRODUCTION: Sustainability



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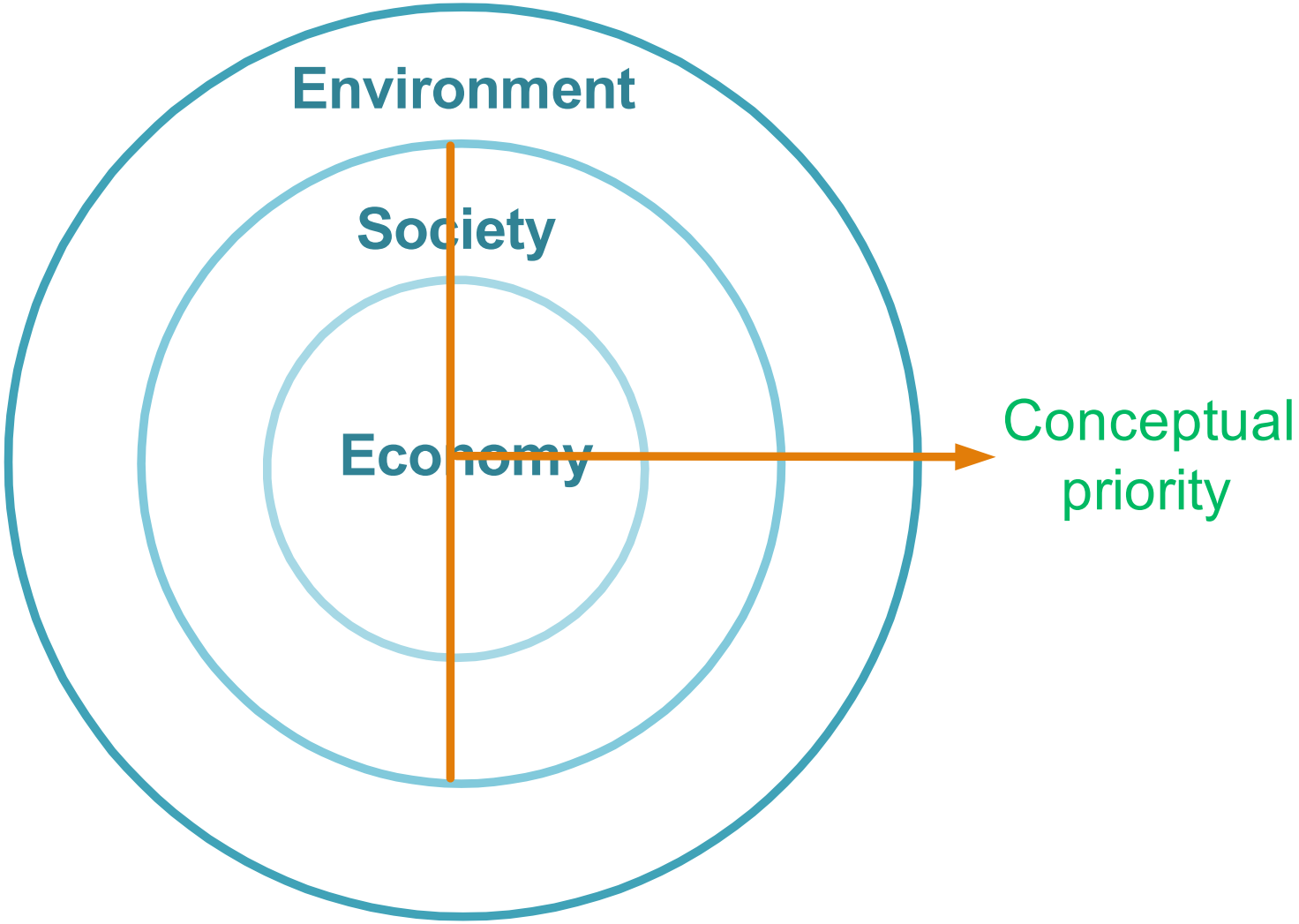

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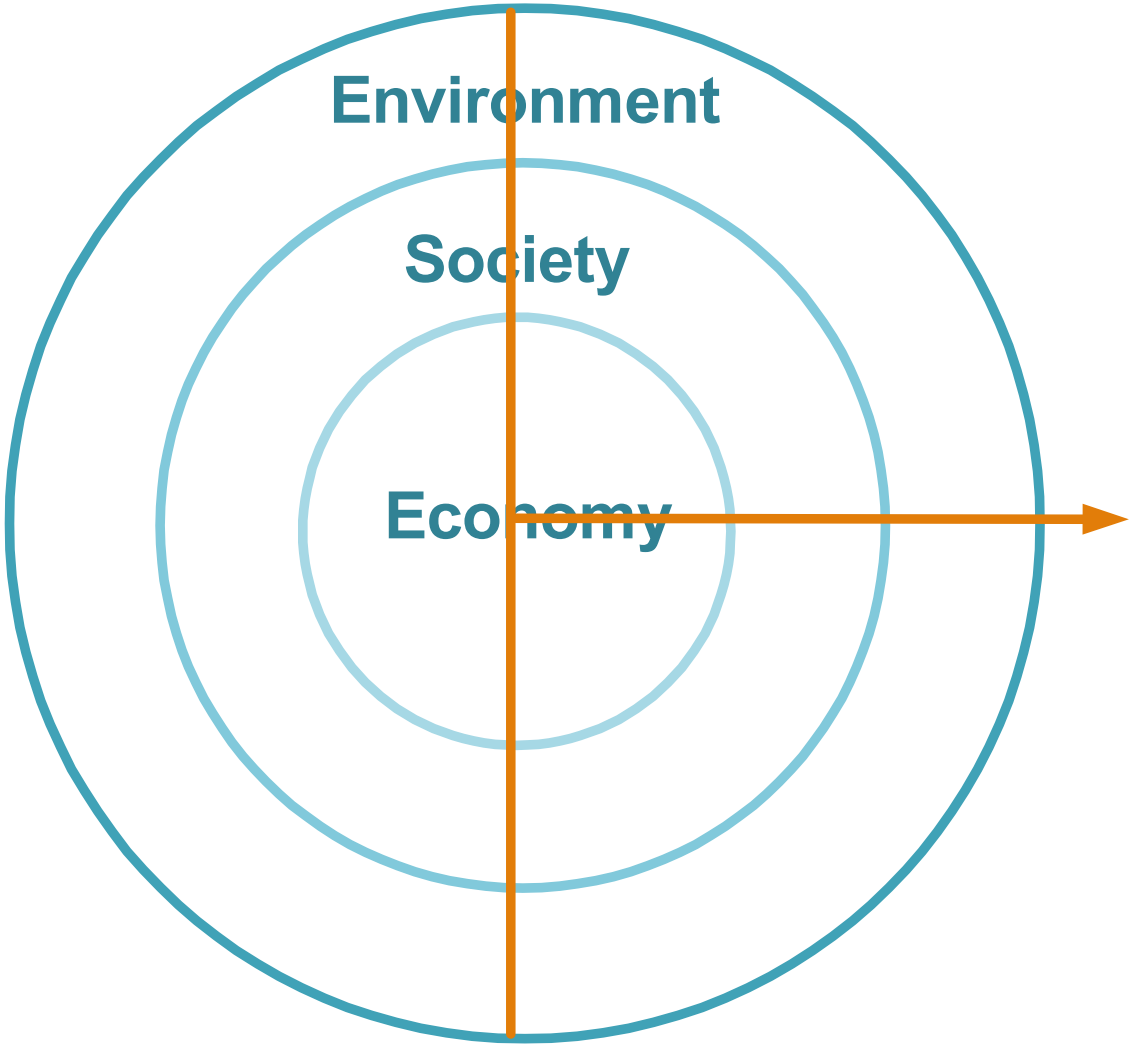
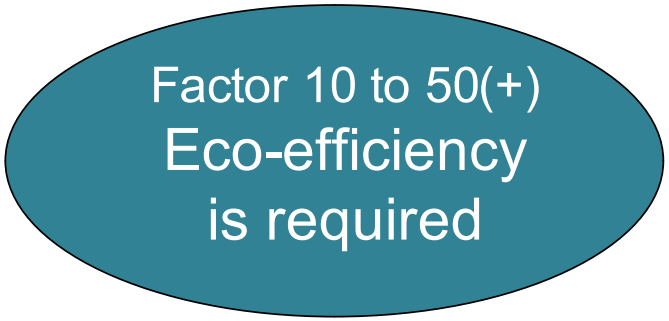


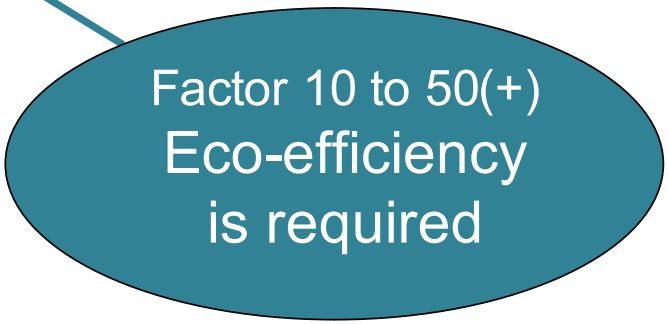
Operational priority

INTRODUCTION: Radicalism



INTRODUCTION: Radicalism

Only Factor 2 to 3 improvements possible through changes in established technologies



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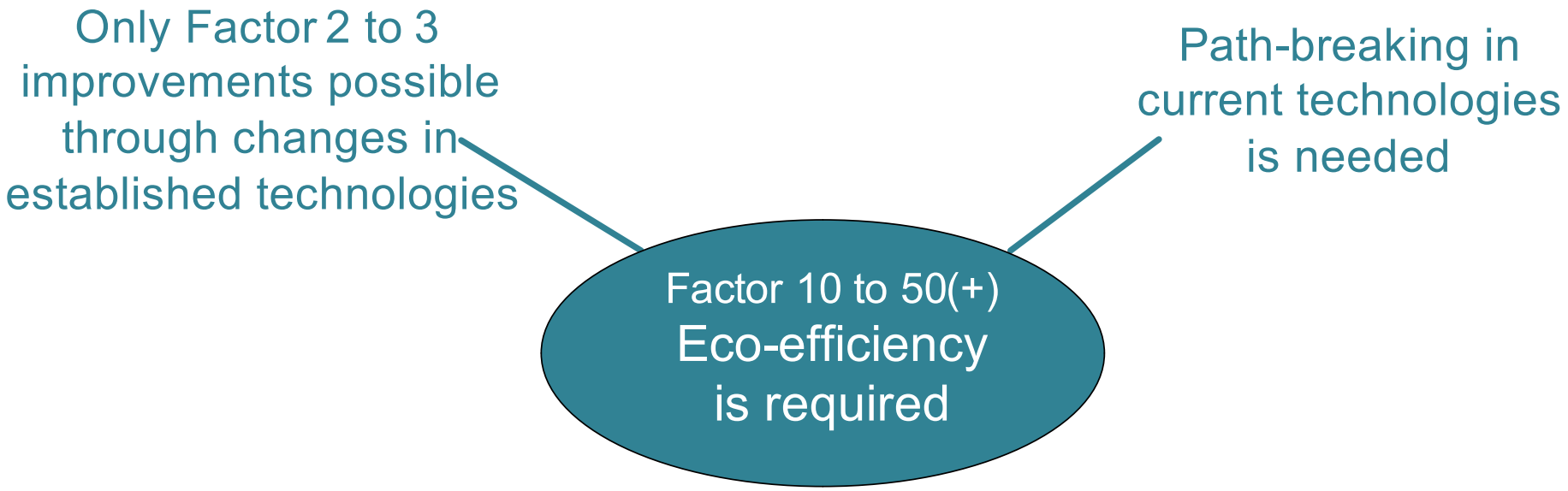

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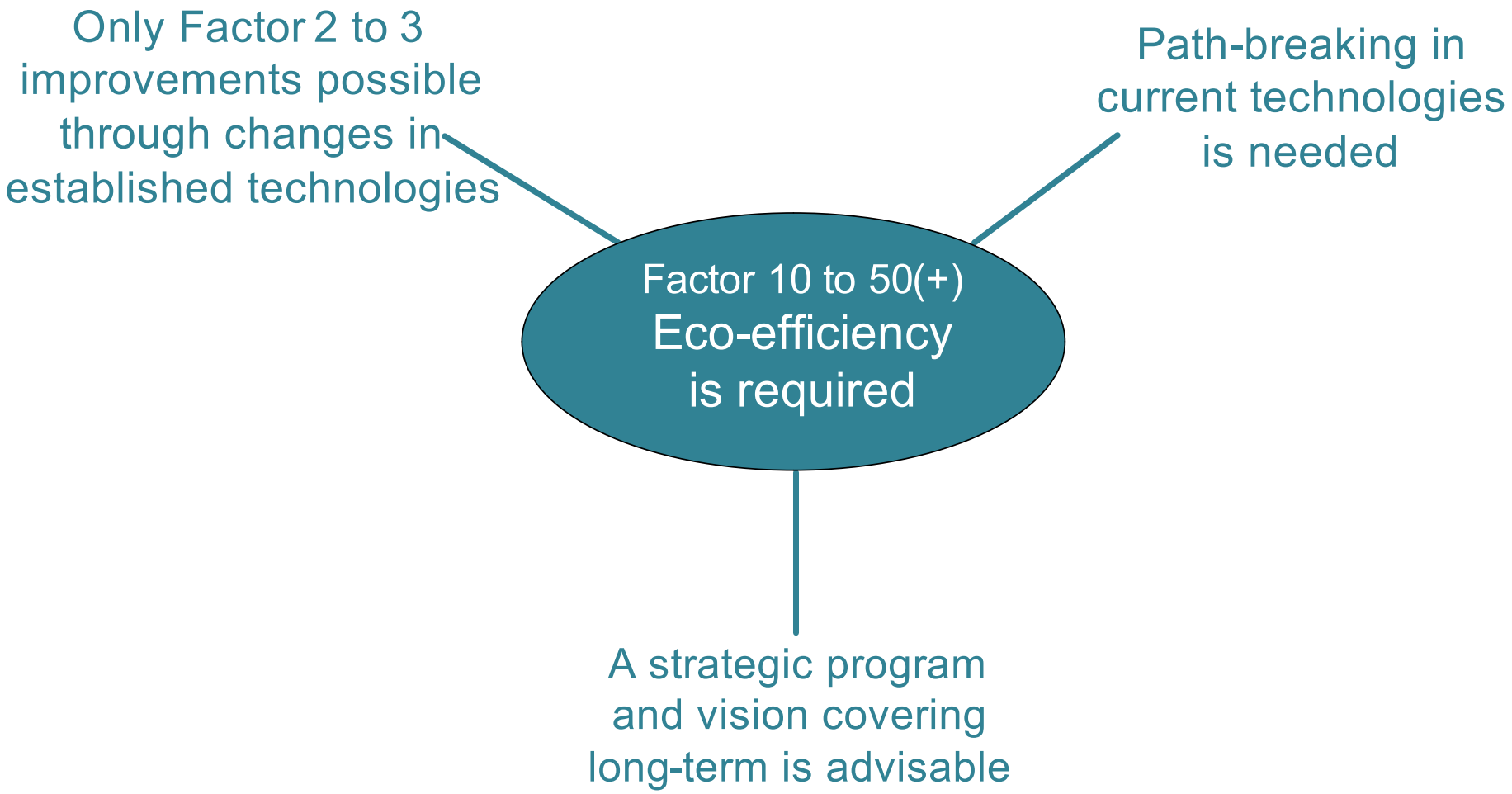

Technology: Levels of Innovation

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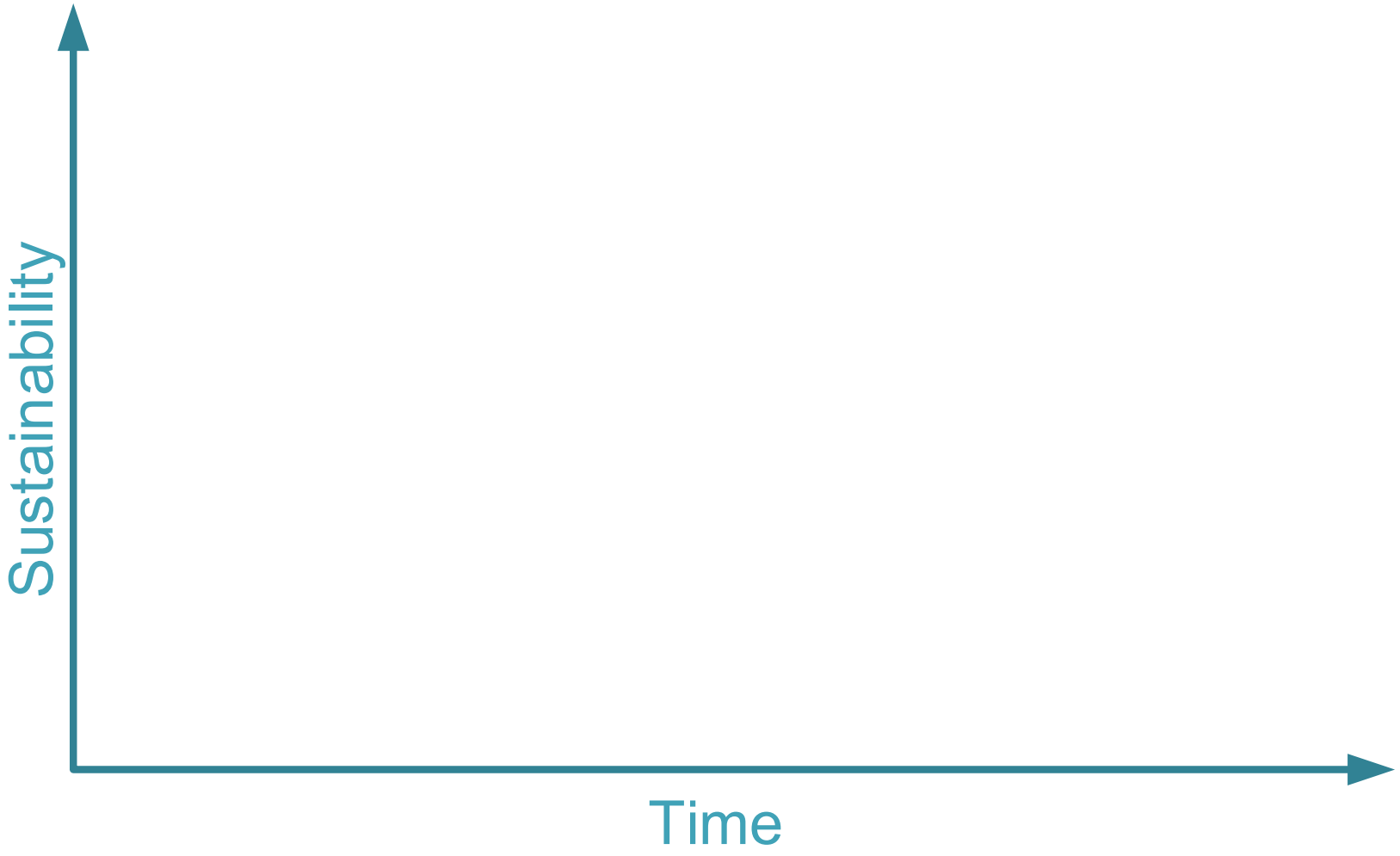

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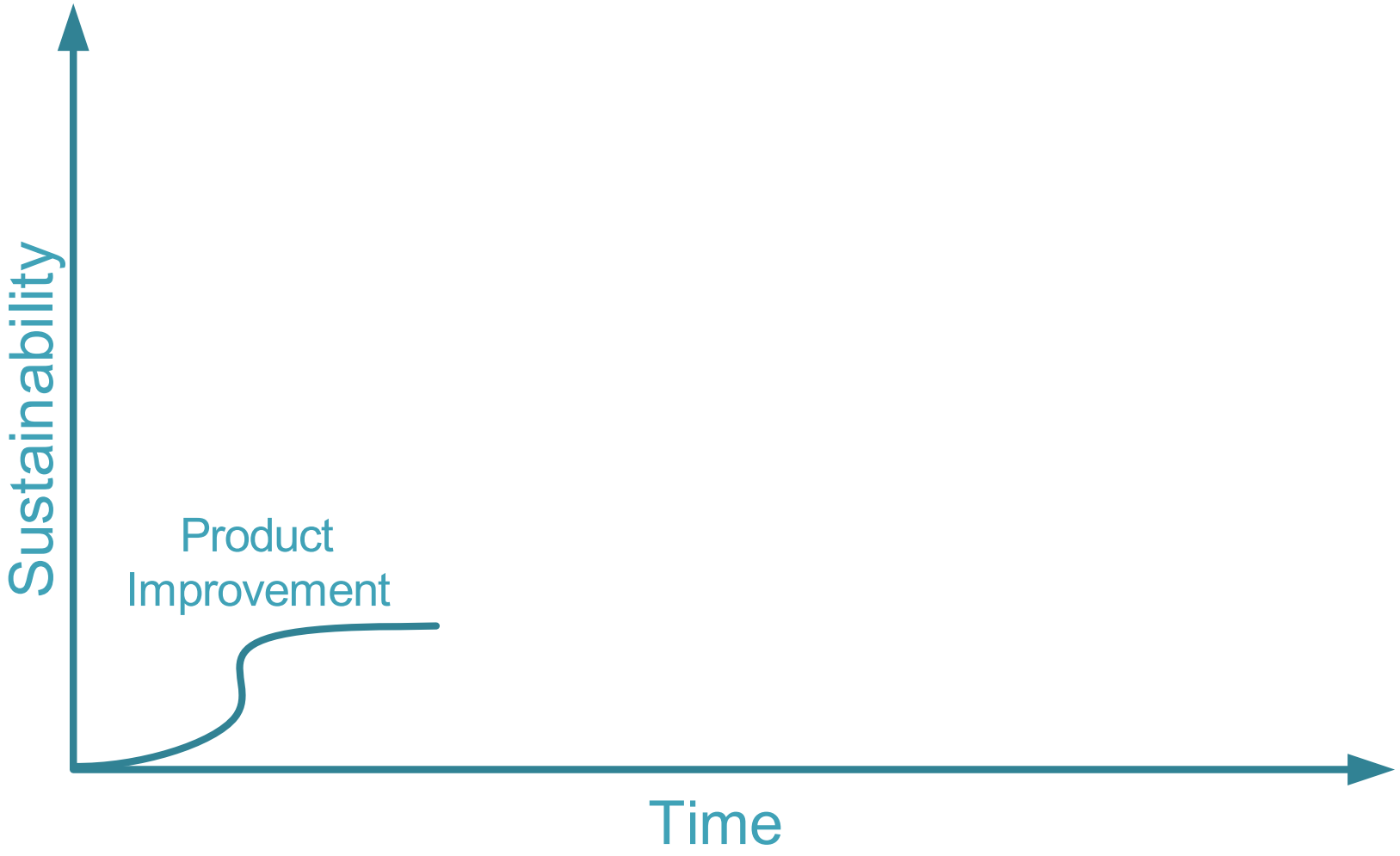

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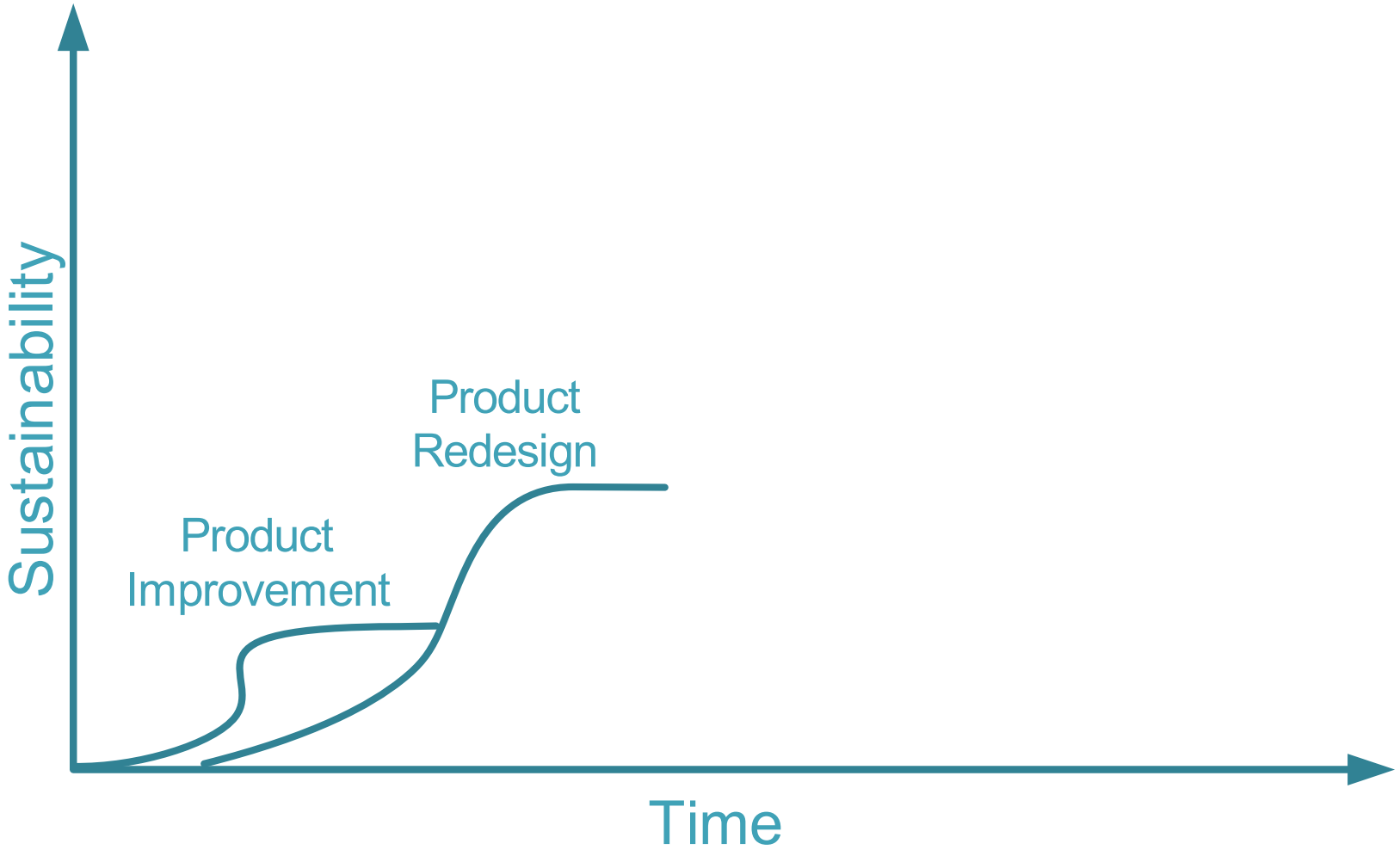

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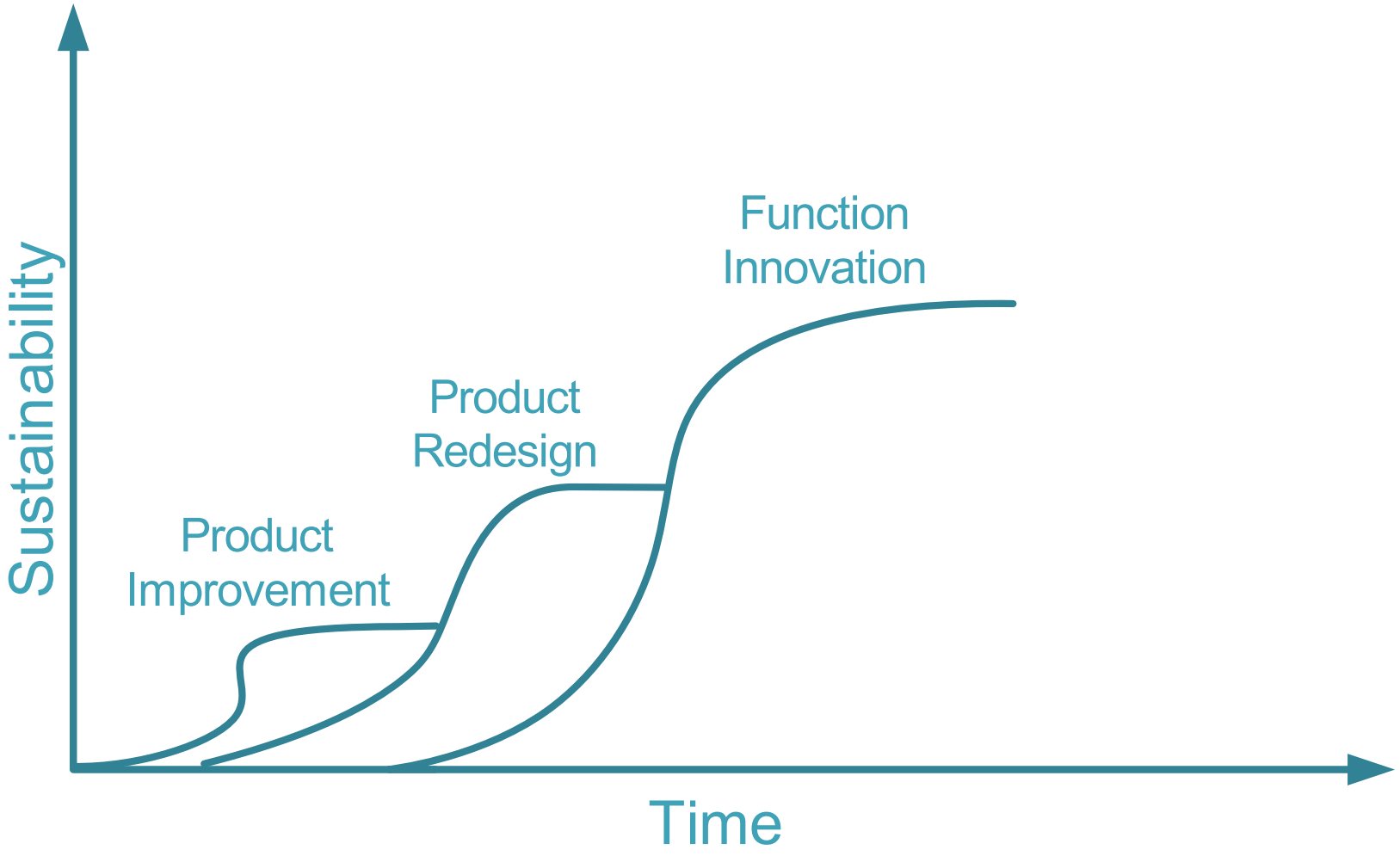

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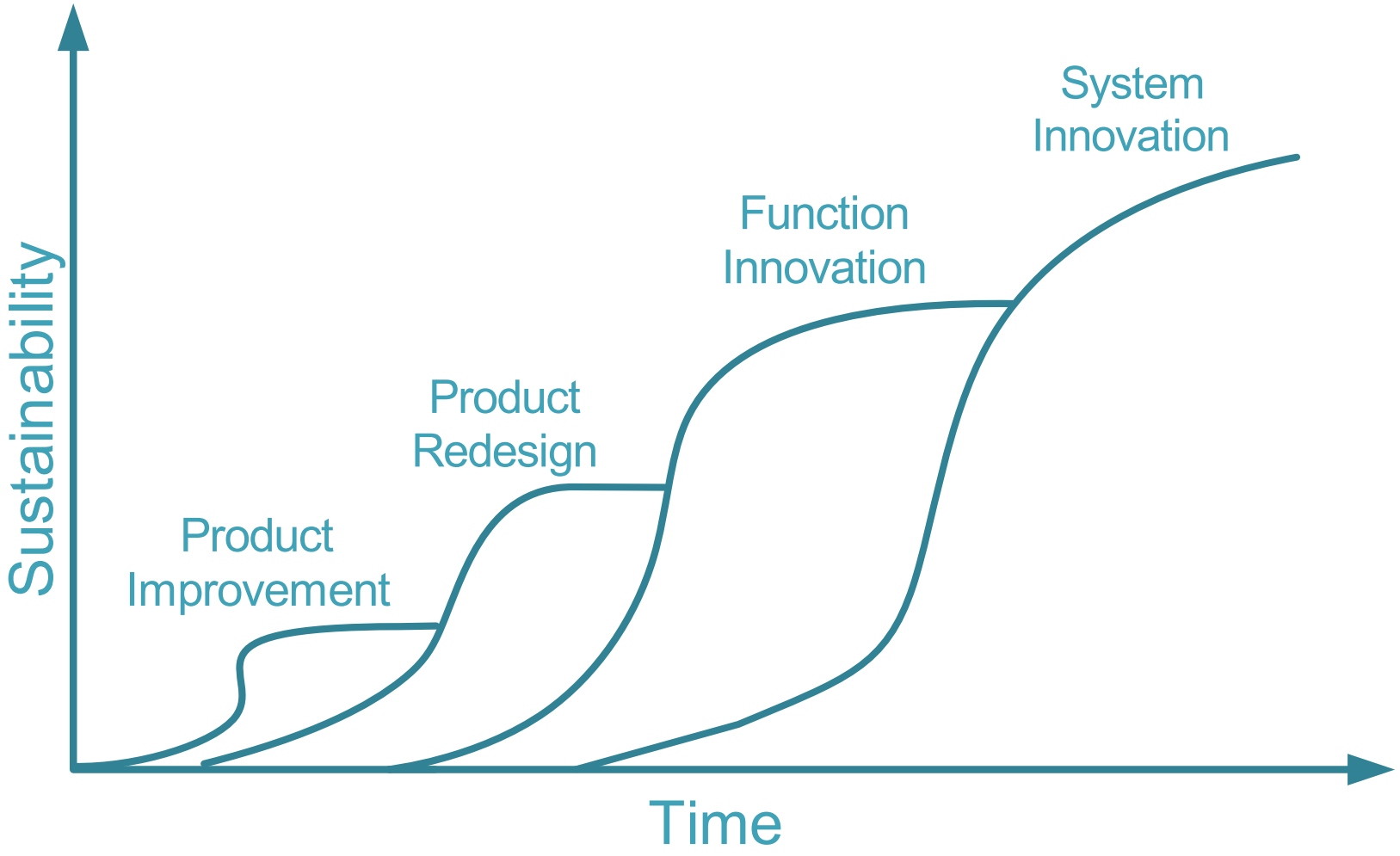
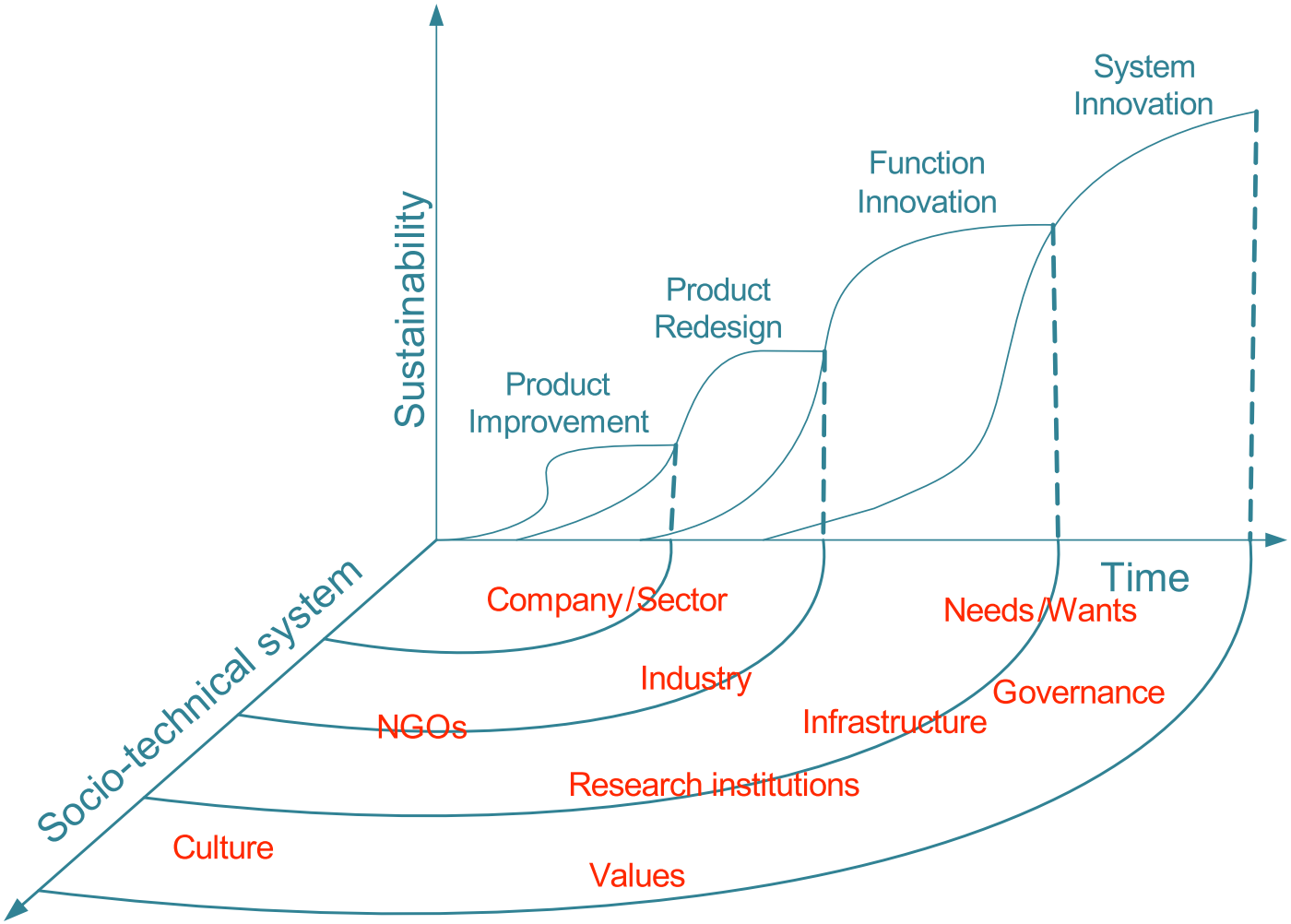
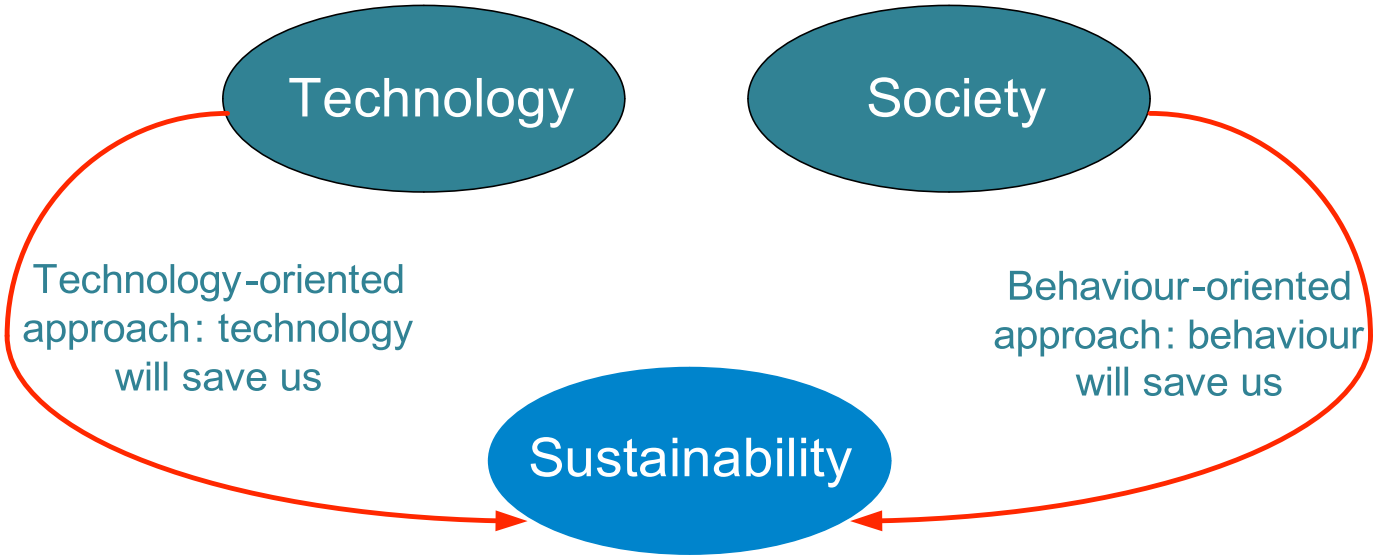


Technology: Third Dimension



Technology: Co-evolution



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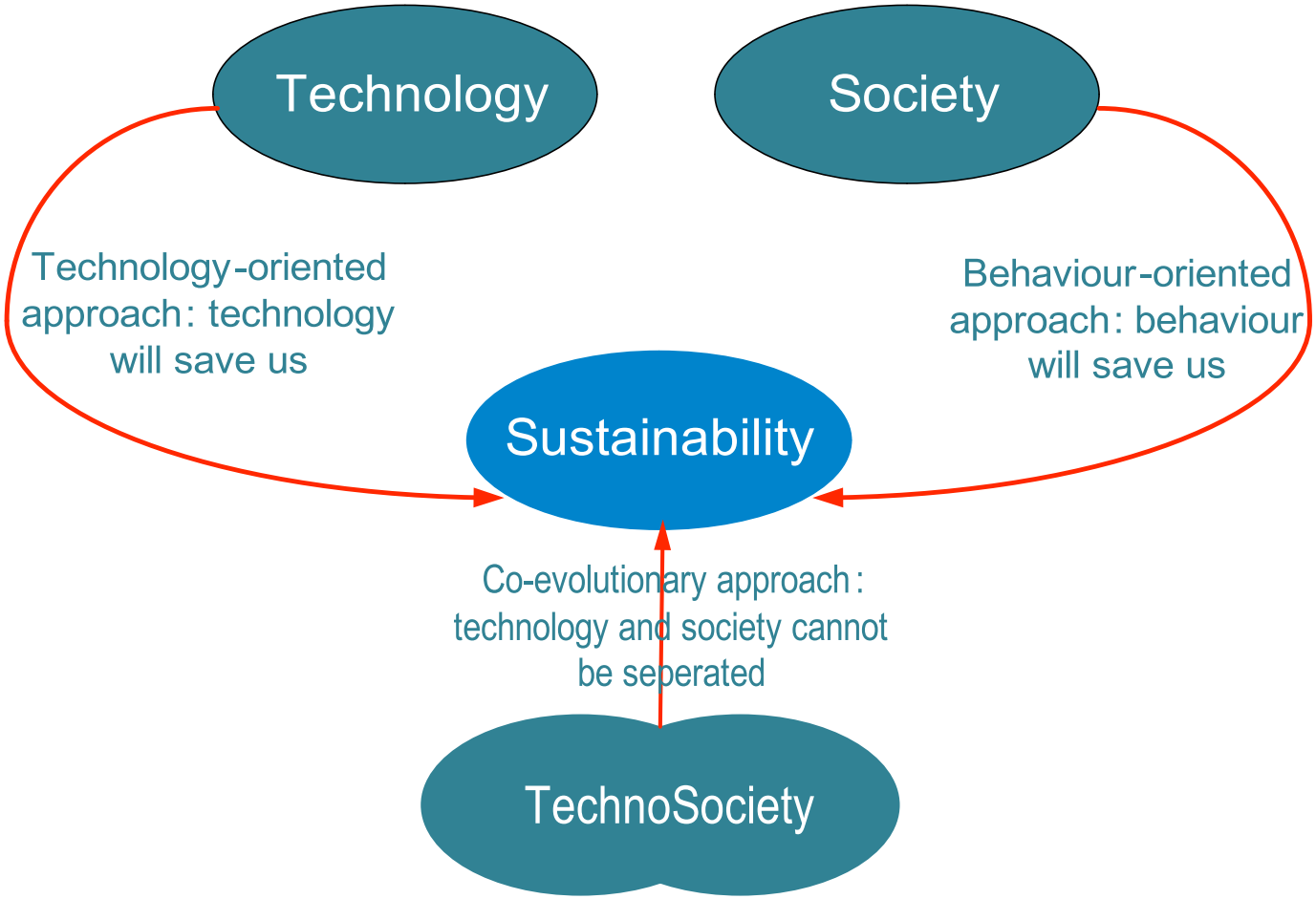

Co-evolutionary Theories: Critique

Sociological approaches:

- Social construction of technology;
- Socio-cognitive approaches;
- Domestication;
- Social mechanisms;

Socio-technical approaches:

- Actor-network theory

Economic approaches:

- Technology life-cycle approach;
- Economic path-dependence perspective;
- Technological substitution models;
- Economic substitution approaches; and
- Evolutionary economics.

•Co-evolution of two or three aspects (e.g. science/ technology, technology/culture, technology/users);

•Not sufficiently broad (Geels, 2005)

Co-evolution: Multi-Level, Dynamic

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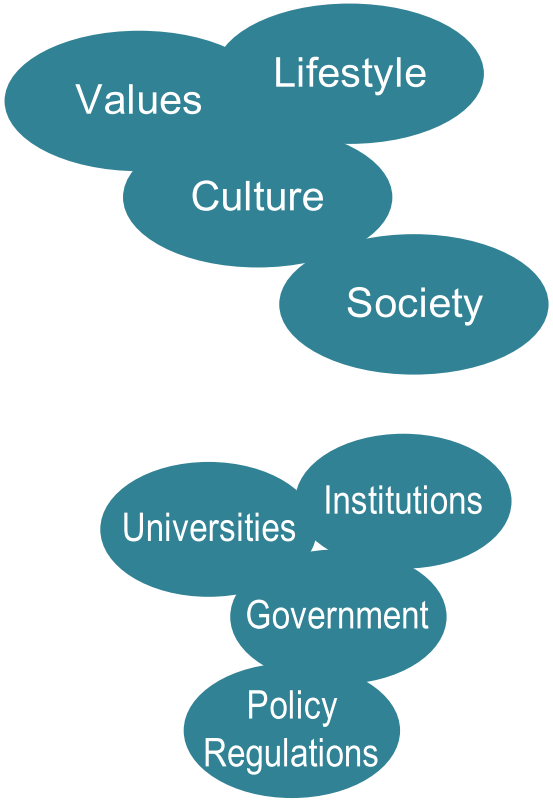
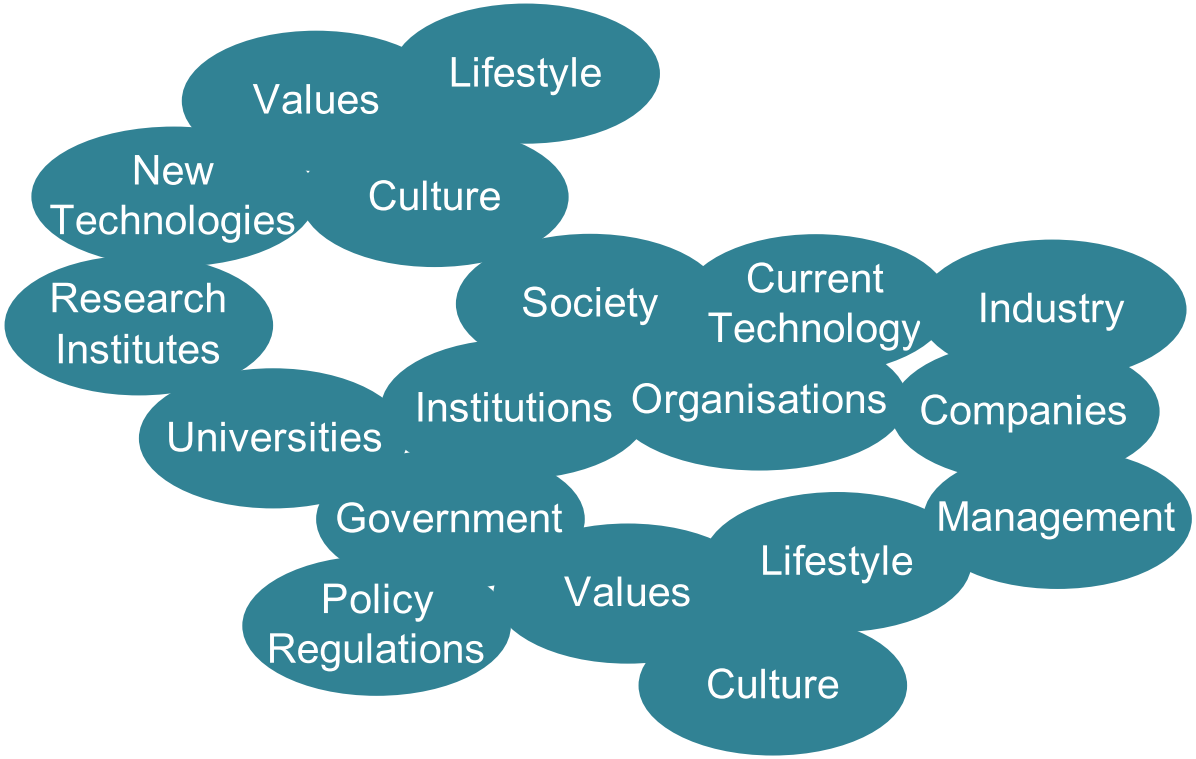
Co-evolution: Multi-Level, Dynamic



Co-evolution: Multi-Level, Dynamic



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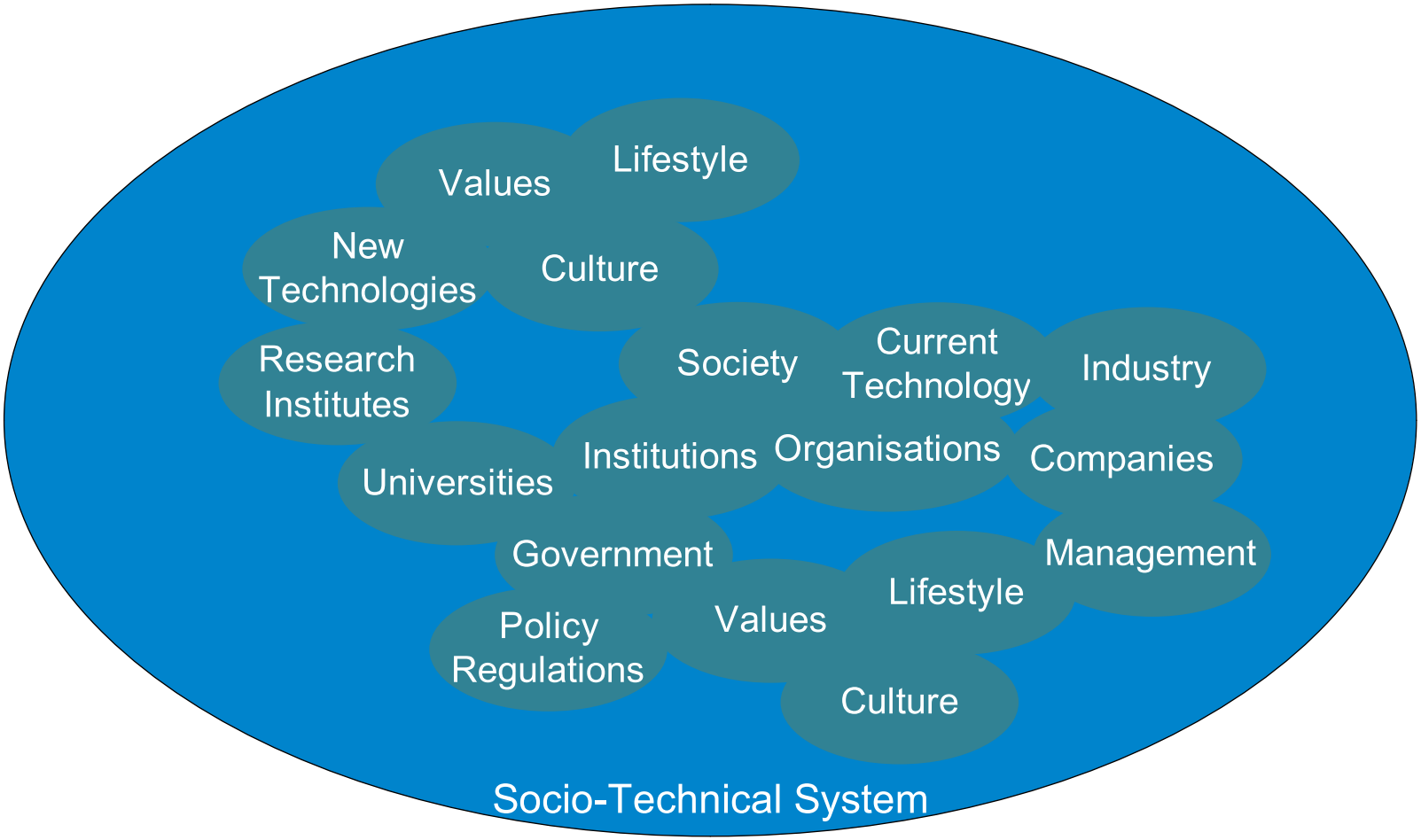

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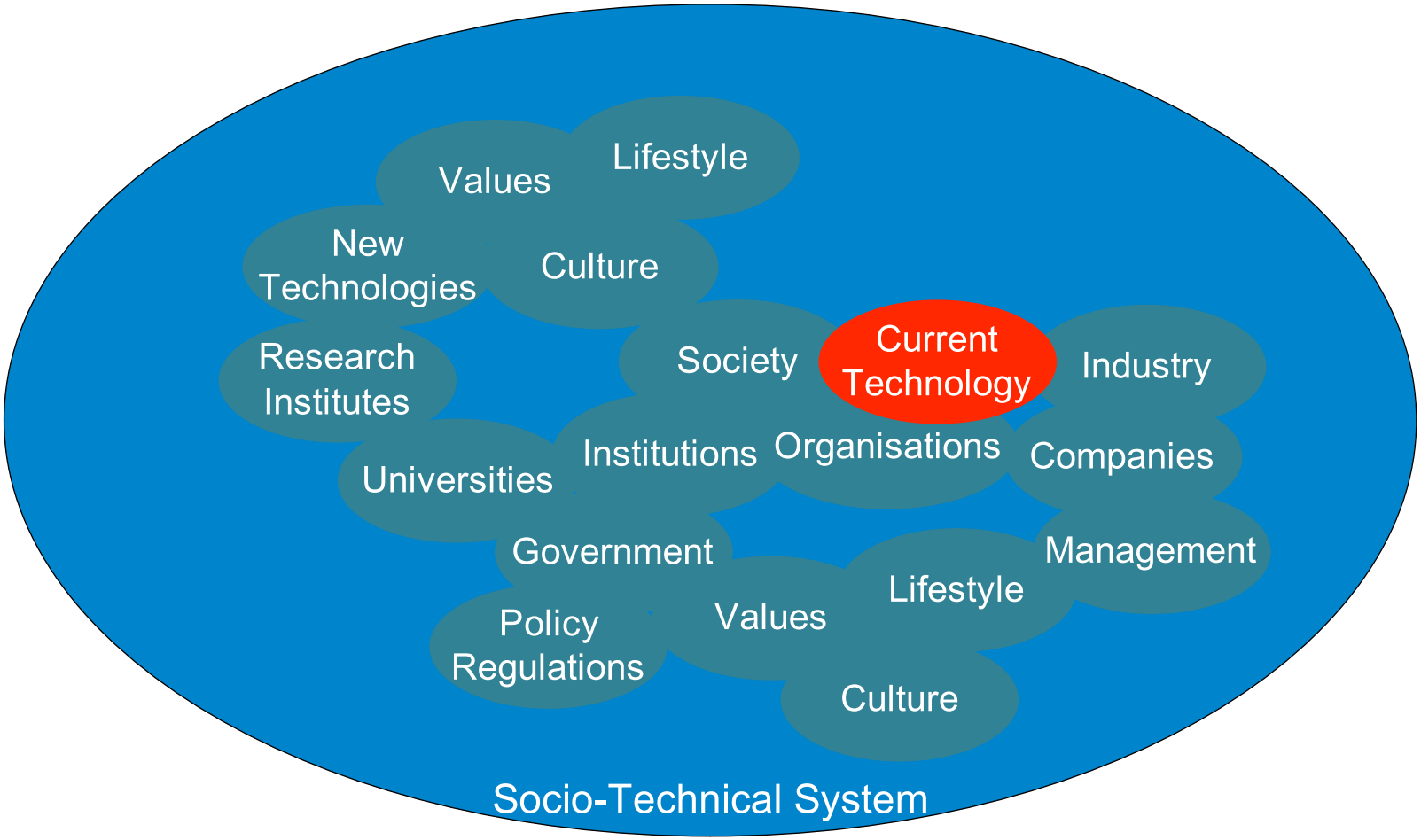

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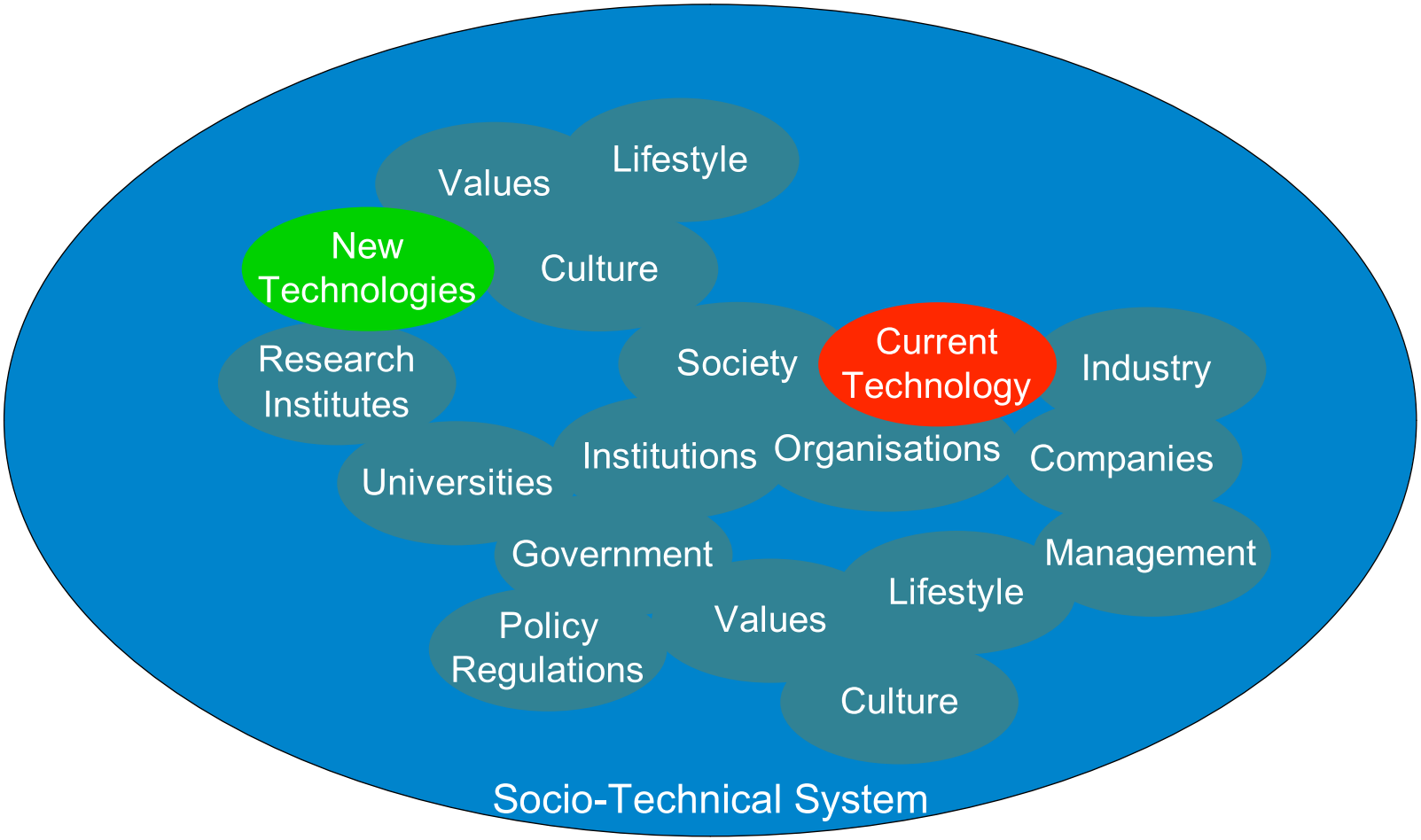
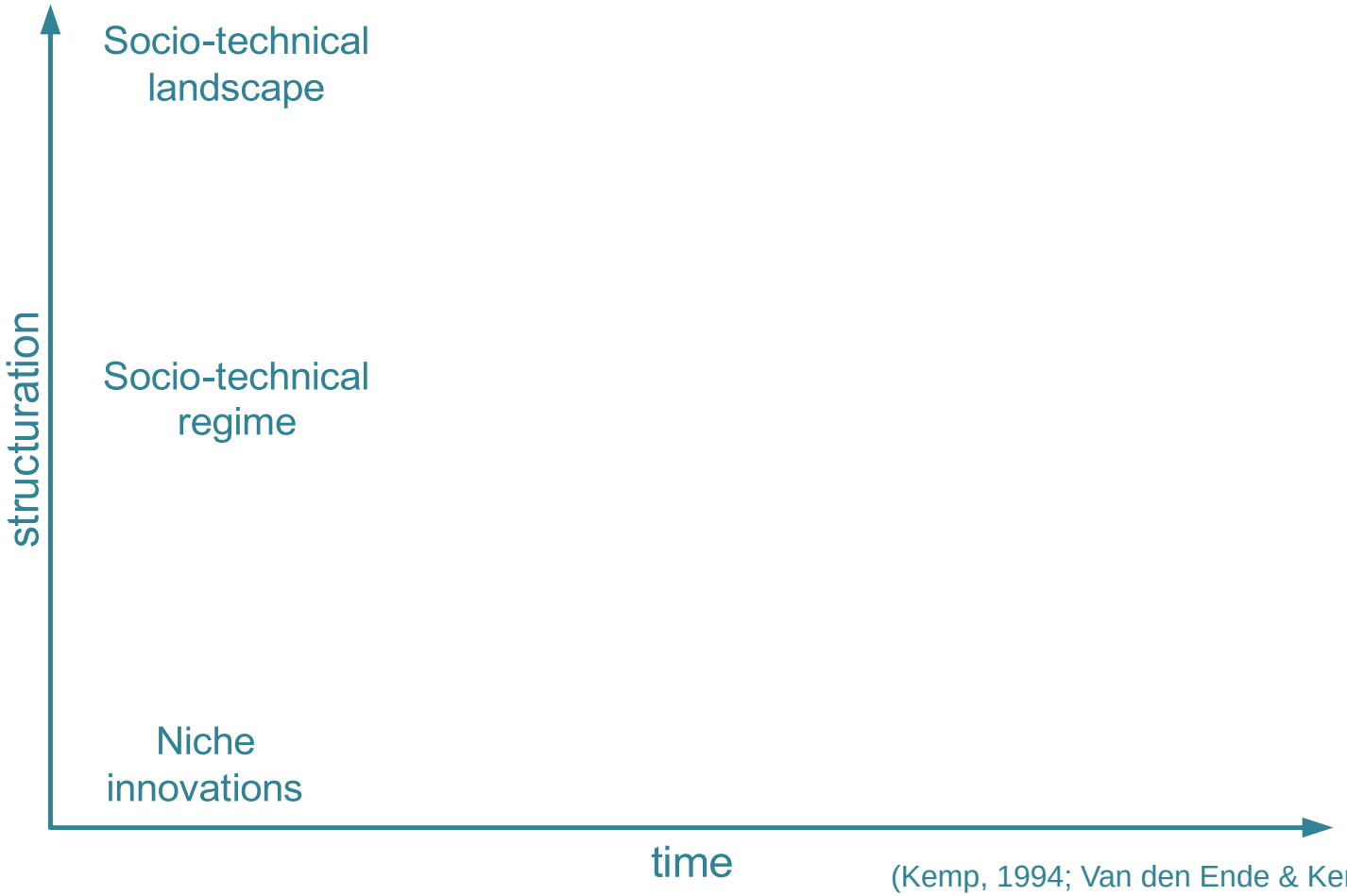


Innovation Model:

Multi-level Socio-technical System



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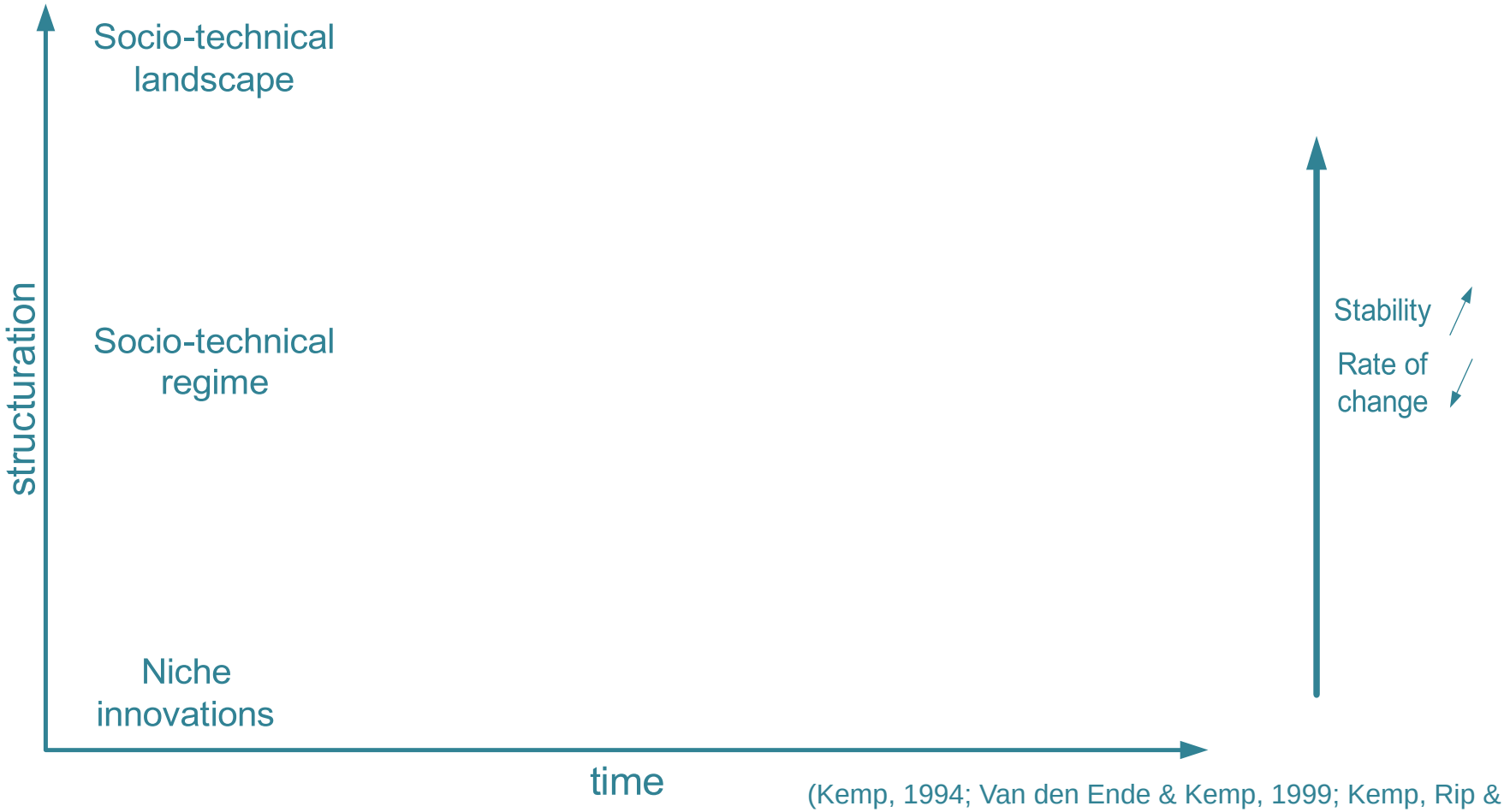

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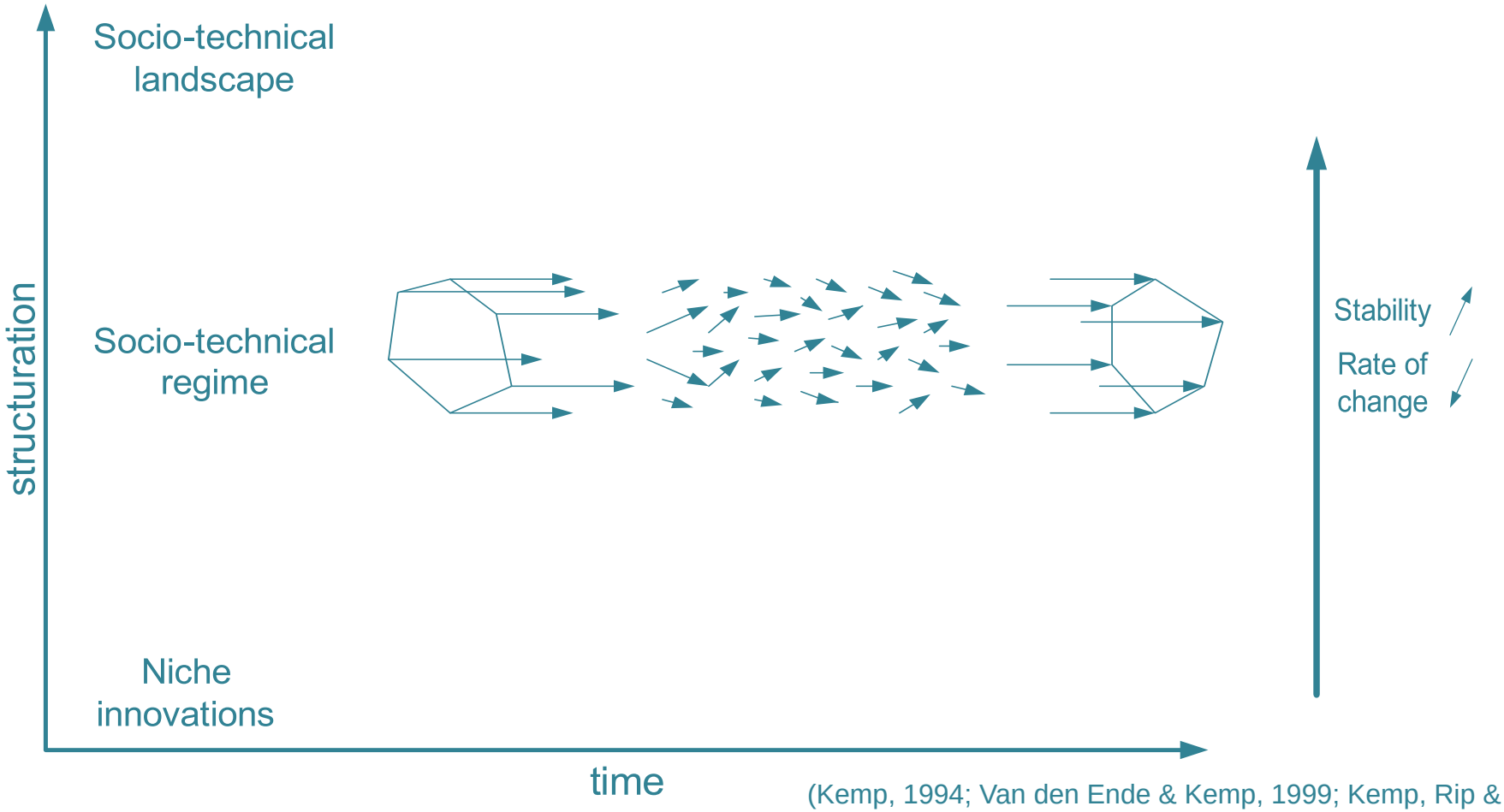

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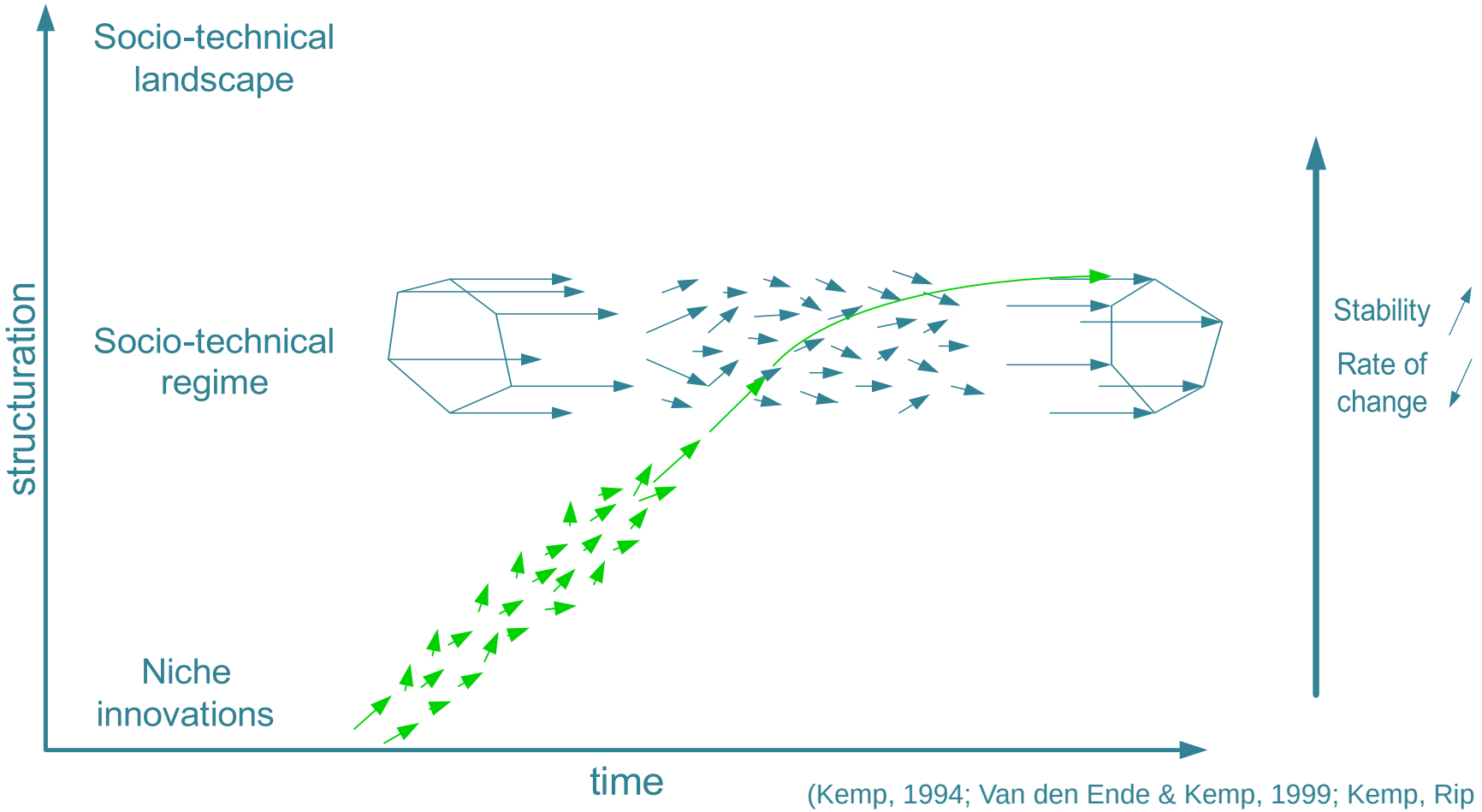

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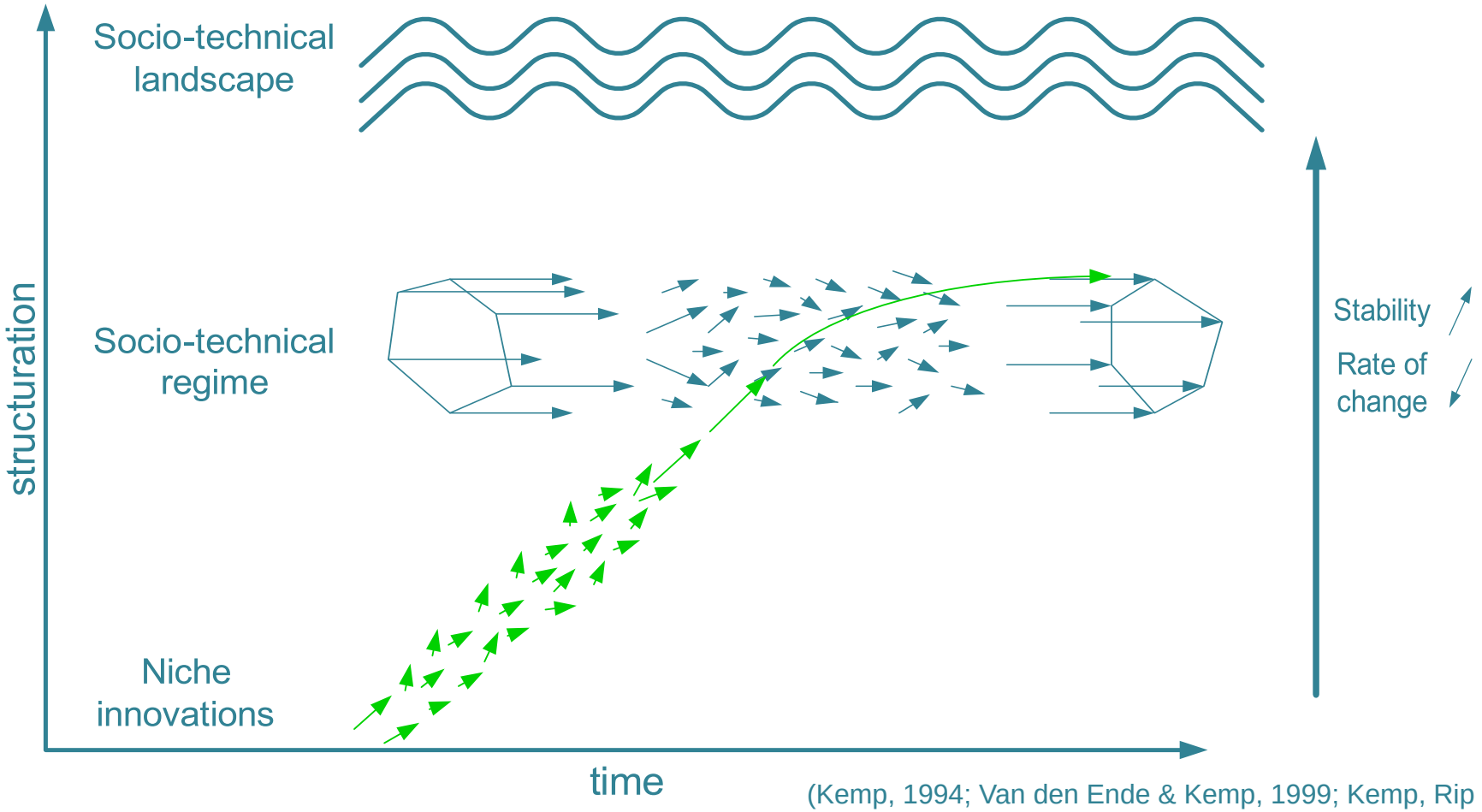

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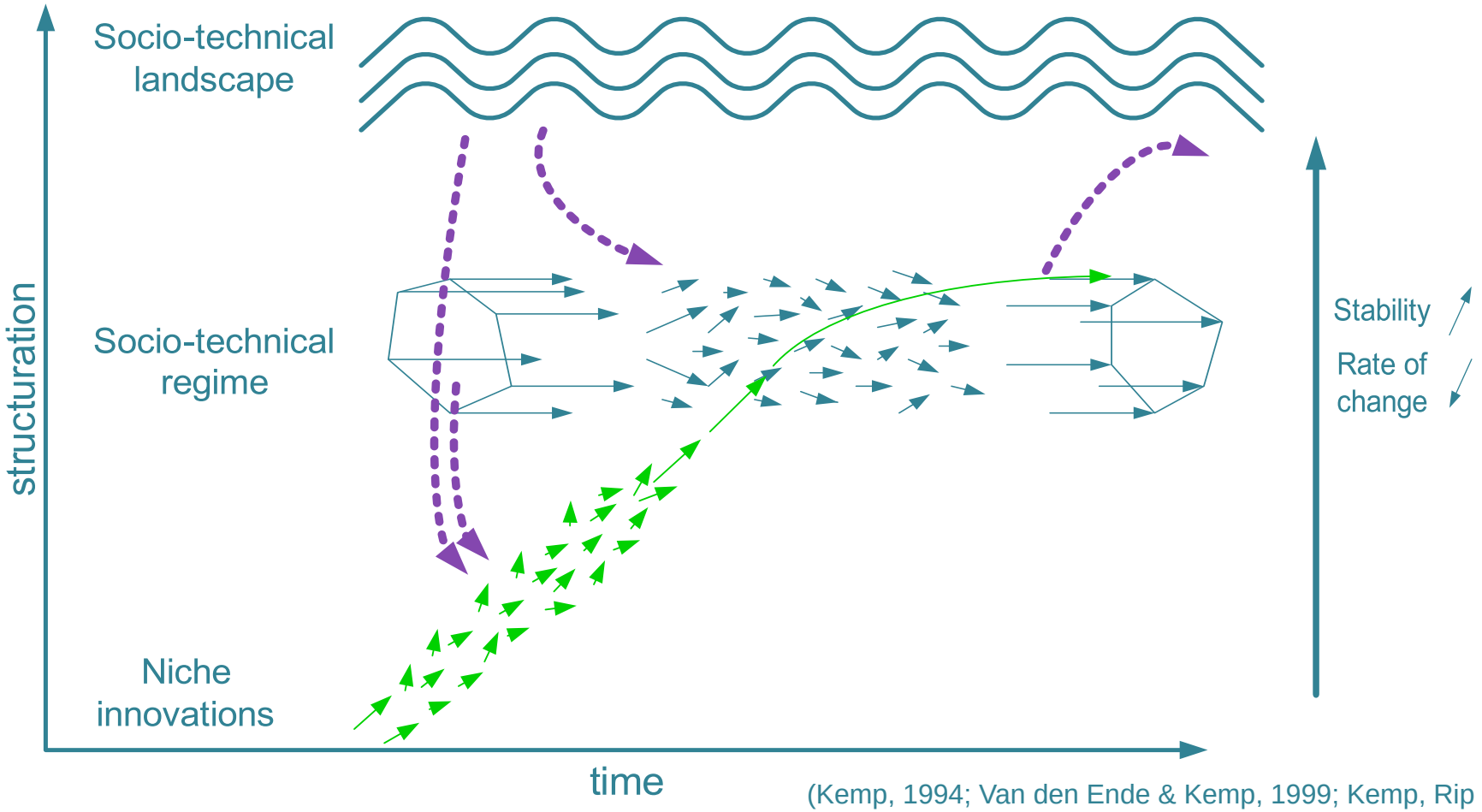

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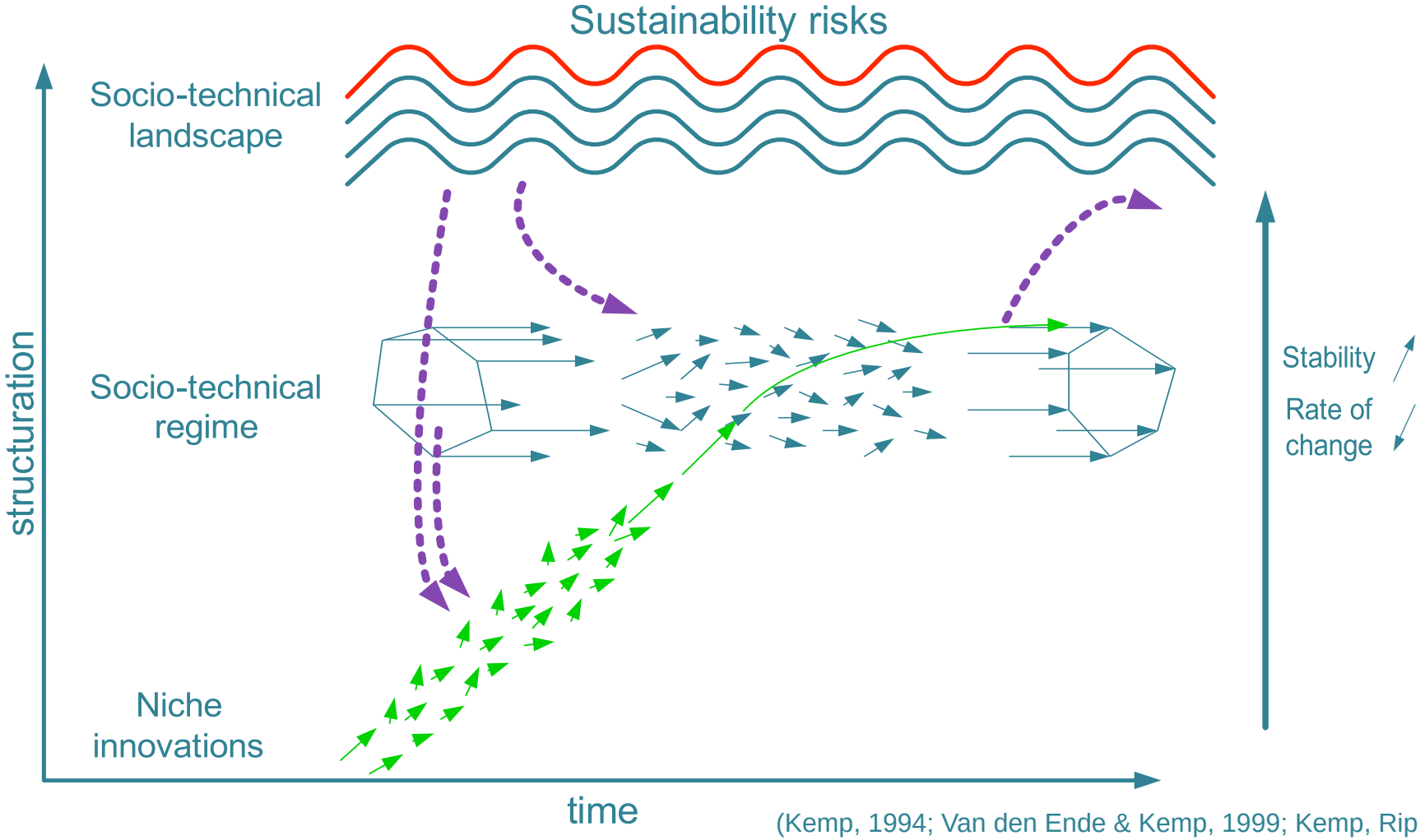

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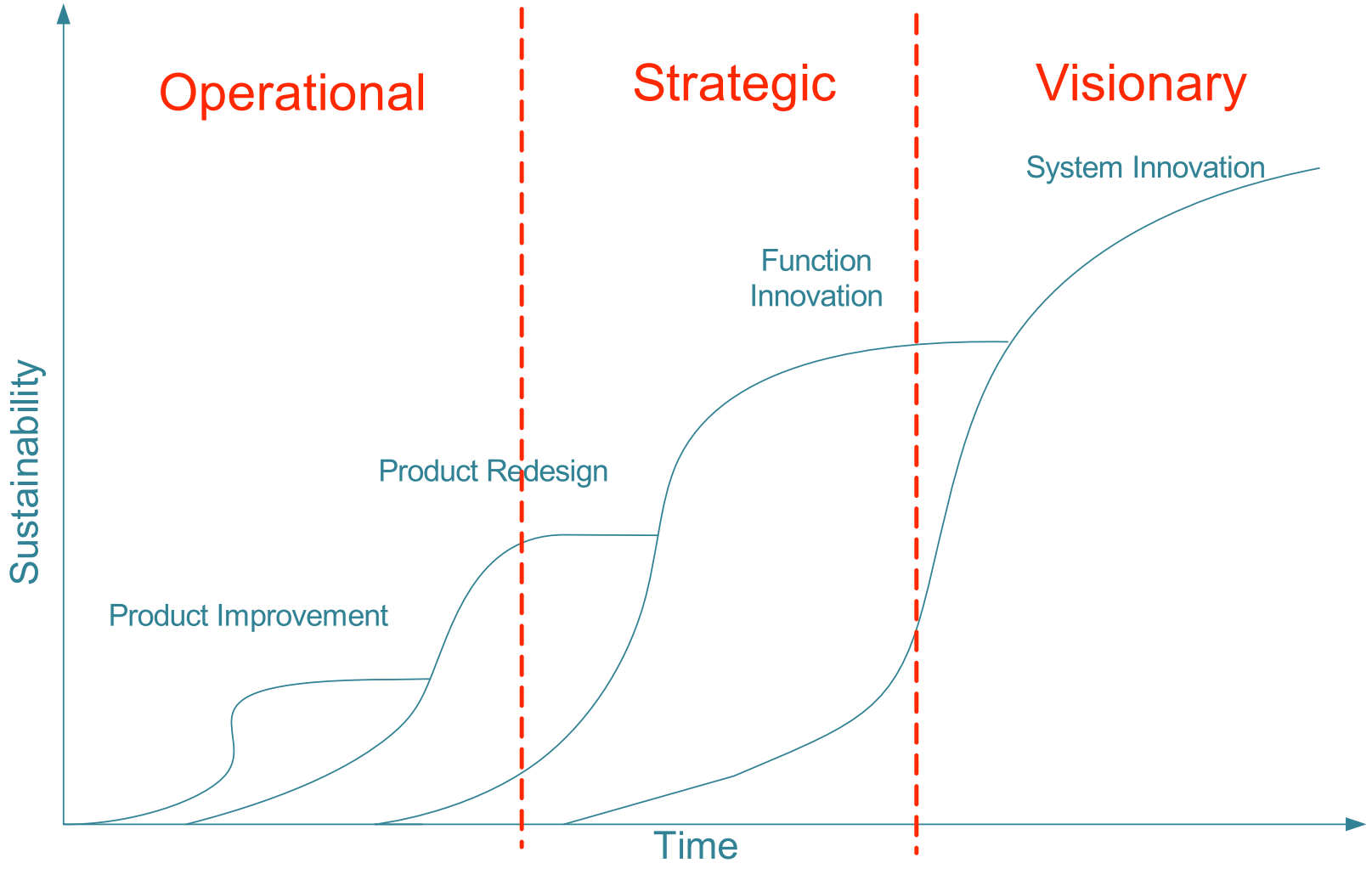
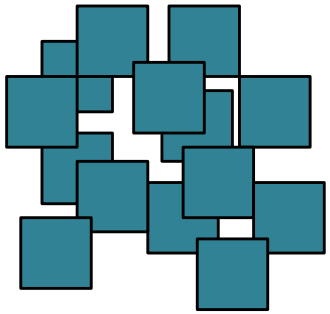
Technology: Levels of Innovation



QUESTION CONCERNING FUTURE

Future
50+ years

Desirable → Sustainability
but also
Possible → Technology Development



?

Present

Known and understood and will be changed by the actors

Future

Unknown and cannot be understood and will be created by the actors

SCENARIO TOOLS

- Socio-Technical Scenarios (STS);
- Foresighting-Backcasting (FB); and
- Scenario Network Mapping (SNM).

SOCIO-TECHNICAL SCENARIOS

Background:

- Based on multi-level model of system innovation;
- Scenarios flow from present to future;
- Sustainable energy and transport projects in EU;

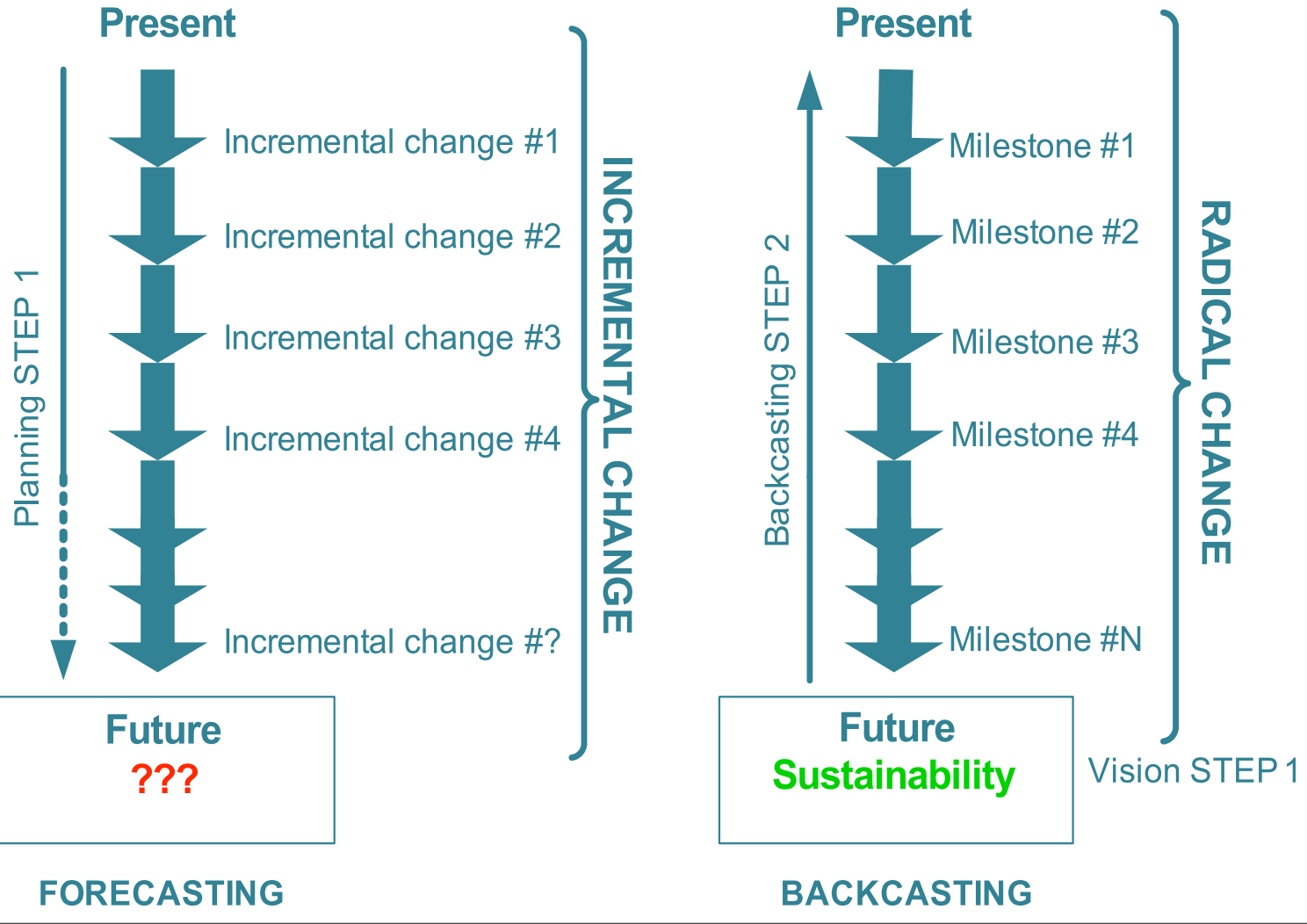
Strengths:

- Systems approach, strong co-evolutionary understanding;
- Acknowledges complexity and dynamism;
- Good understanding about how technology is developed and diffused;

Weaknesses:

- Has no measure for sustainability;
- Simplistic causality;
- Limited time period (20 years);
- Does not address creativity.

FORESIGHTING-BACKCASTING



FORESIGHTING-BACKCASTING

Background:

- Scenarios flow from future to present;
- EU funded Sustainable Technology Development and Sustainable Households (etc.) projects;
- Factor X efficiency for sustainability;

Strengths:

- Influences creativity;
- Suitable for long-term planning;

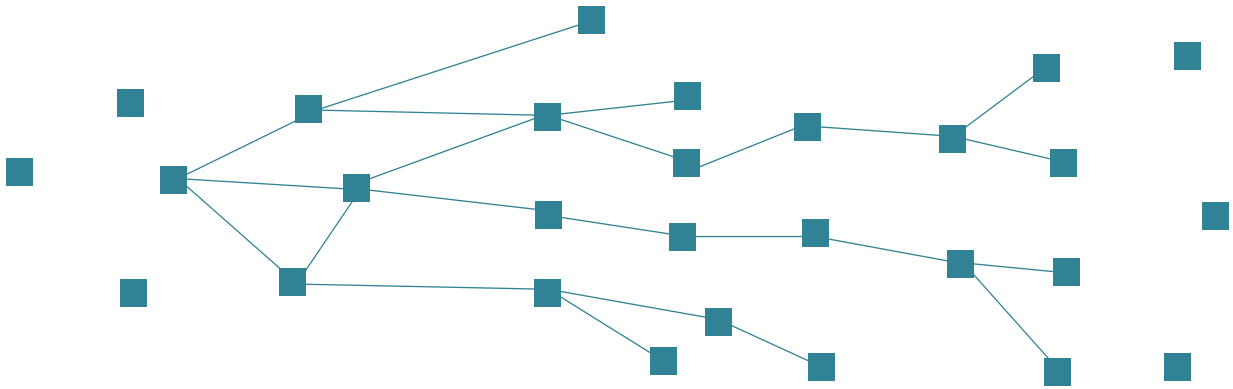
Weaknesses:

- Weak (linear) co-evolutionary approach, does not acknowledge how technology develops and diffuses in reality;
- Only resource efficiency improvements (Factor X).

SCENARIO NETWORK MAPPING

Background:

- Generic scenario development method, can be applied to any context (i.e. technology development, policy development, etc.);
- Developed in Australia by Dr. Dennis List in 2005;
- “Nothing ever happens for a single reason, and an event rarely has only a single outcome” (List, 2007)



SCENARIO NETWORK MAPPING

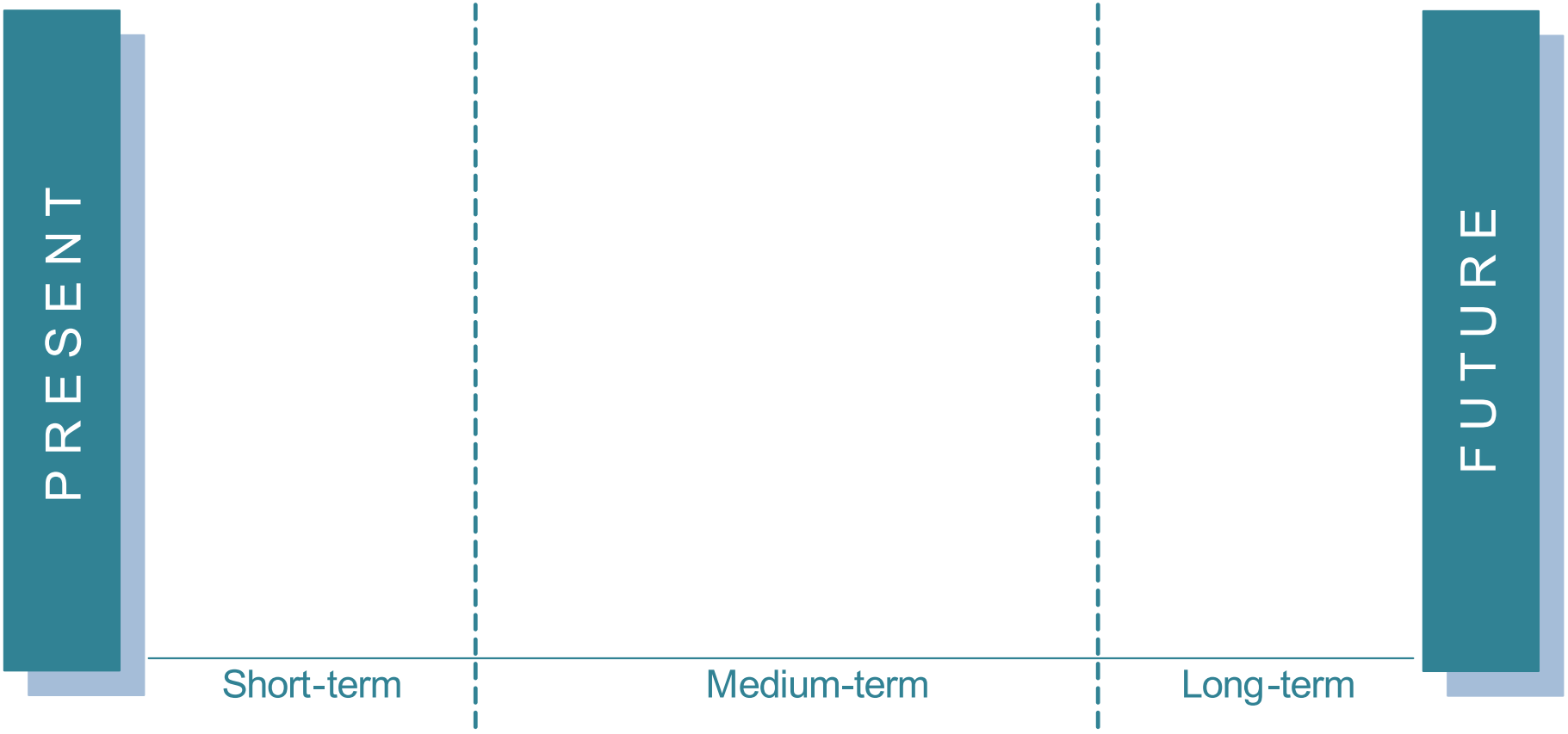
Strengths:

- Multiplistic causality;
- Shows many possible innovation paths;
- Suitable to work in a layered structure (multi-level innovation model);
- Suitable for both scenario flows (i.e. present to future, future to present)

Weaknesses:

- Has not yet been used in any sustainability related project;
- May not be suitable for long-term planning (causal relationships are not easy to follow in long-term, uncertainty is high)

A TAILORED SCENARIO METHODOLOGY



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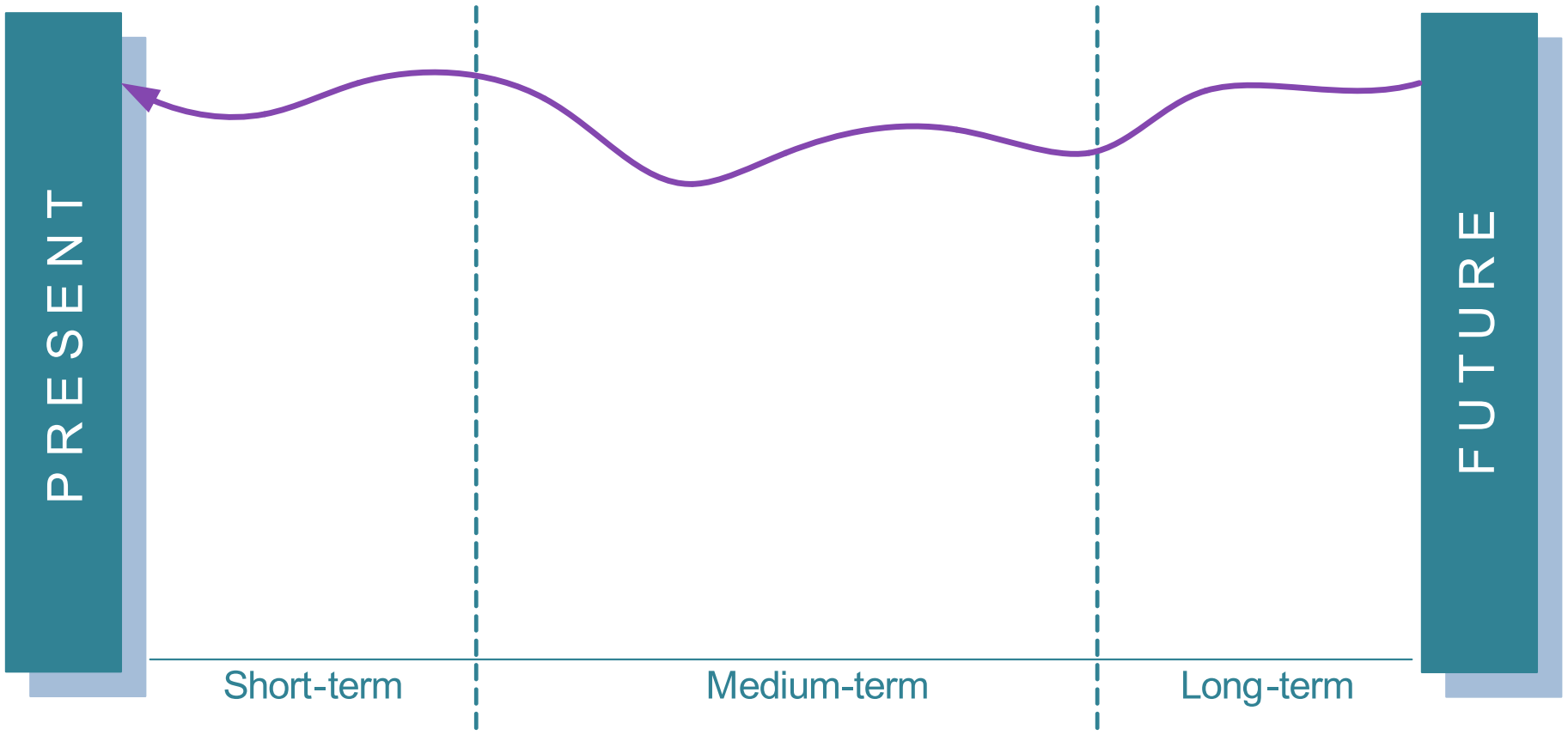

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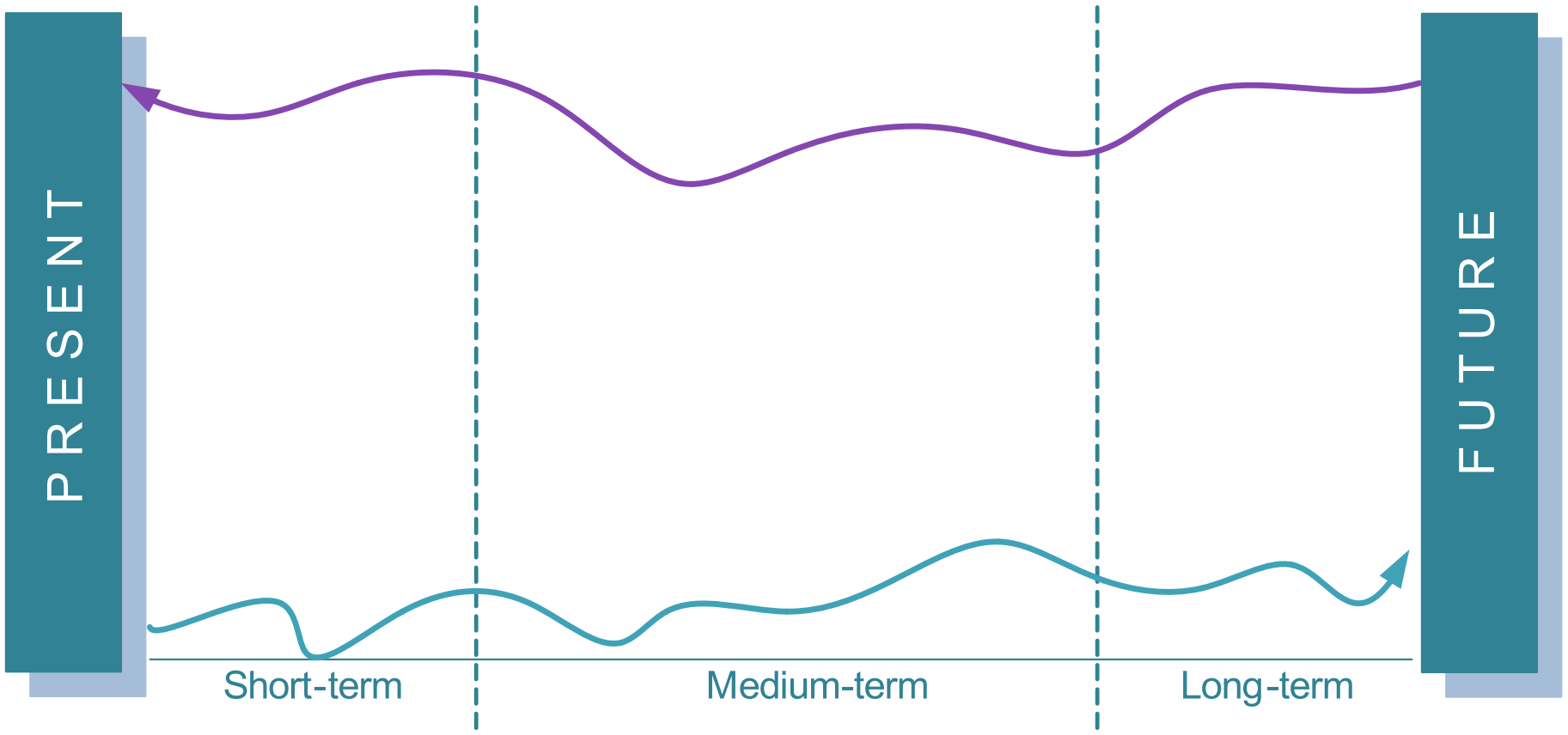

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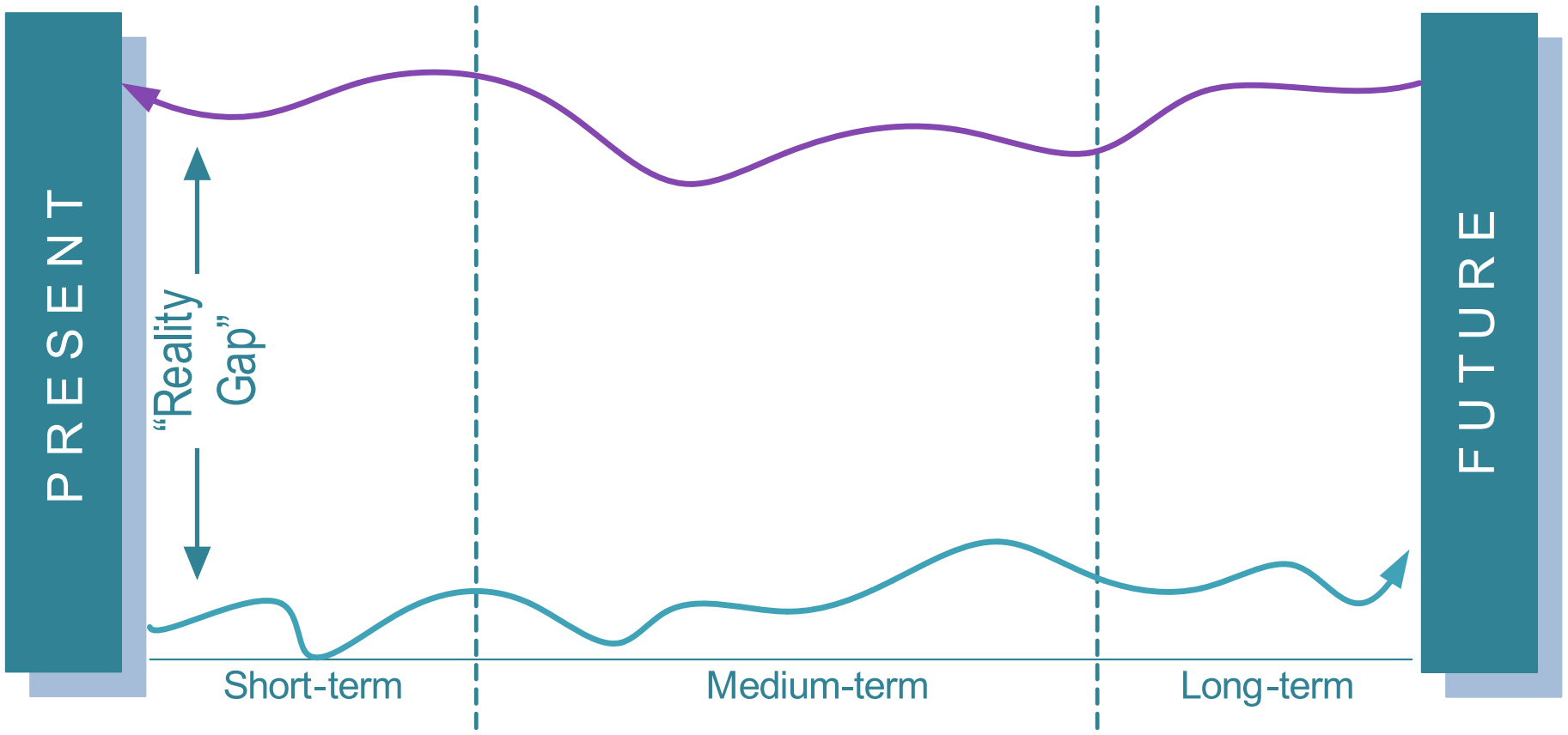

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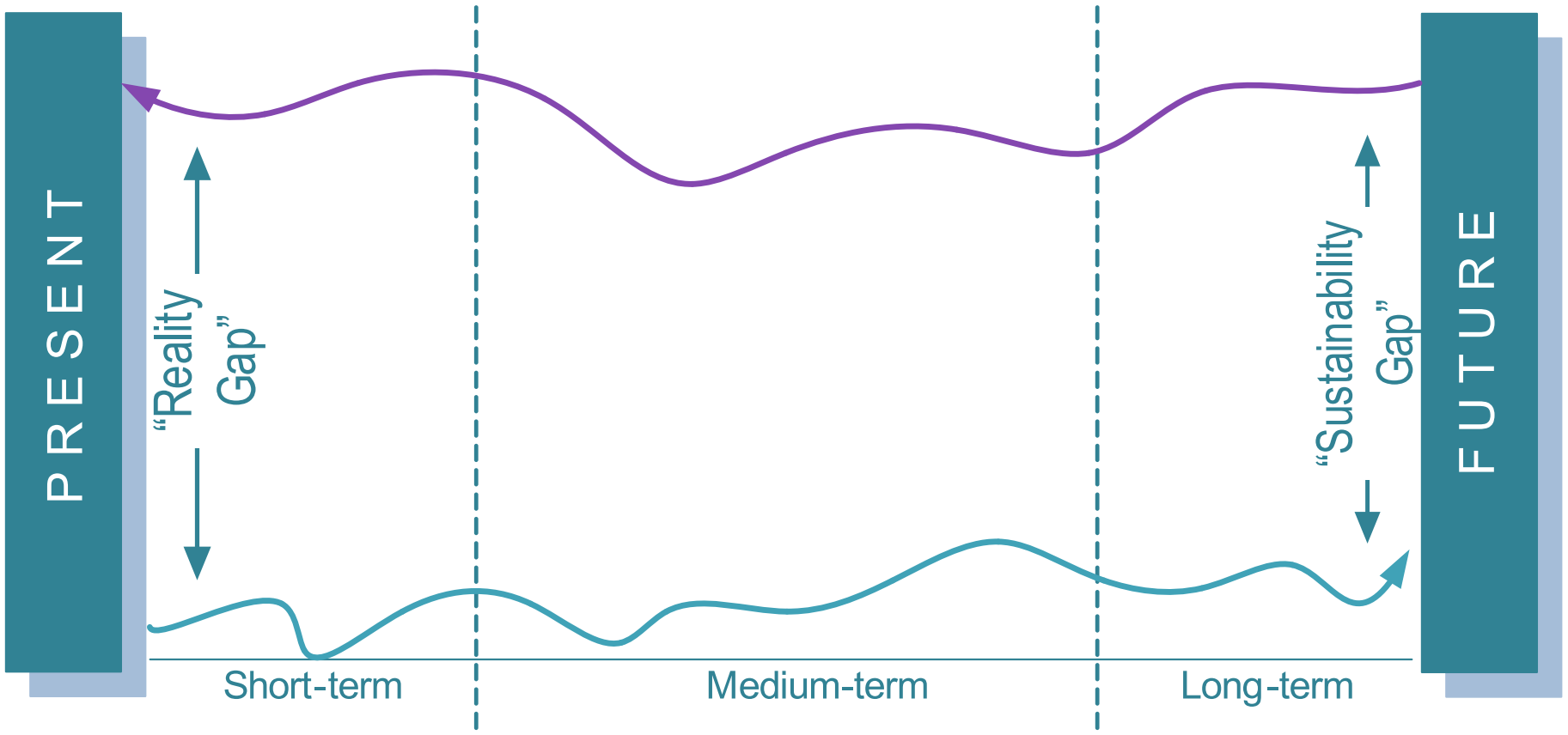

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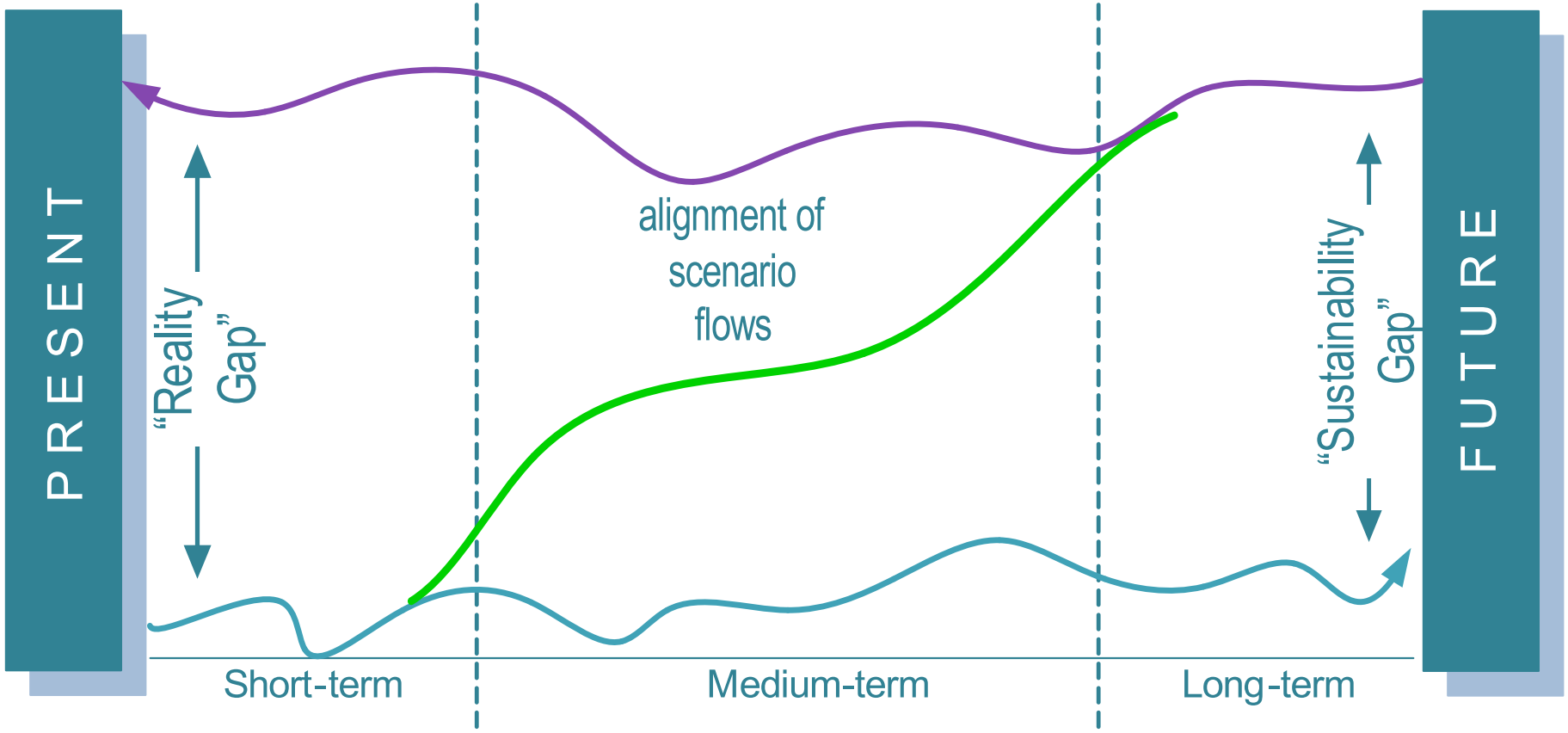
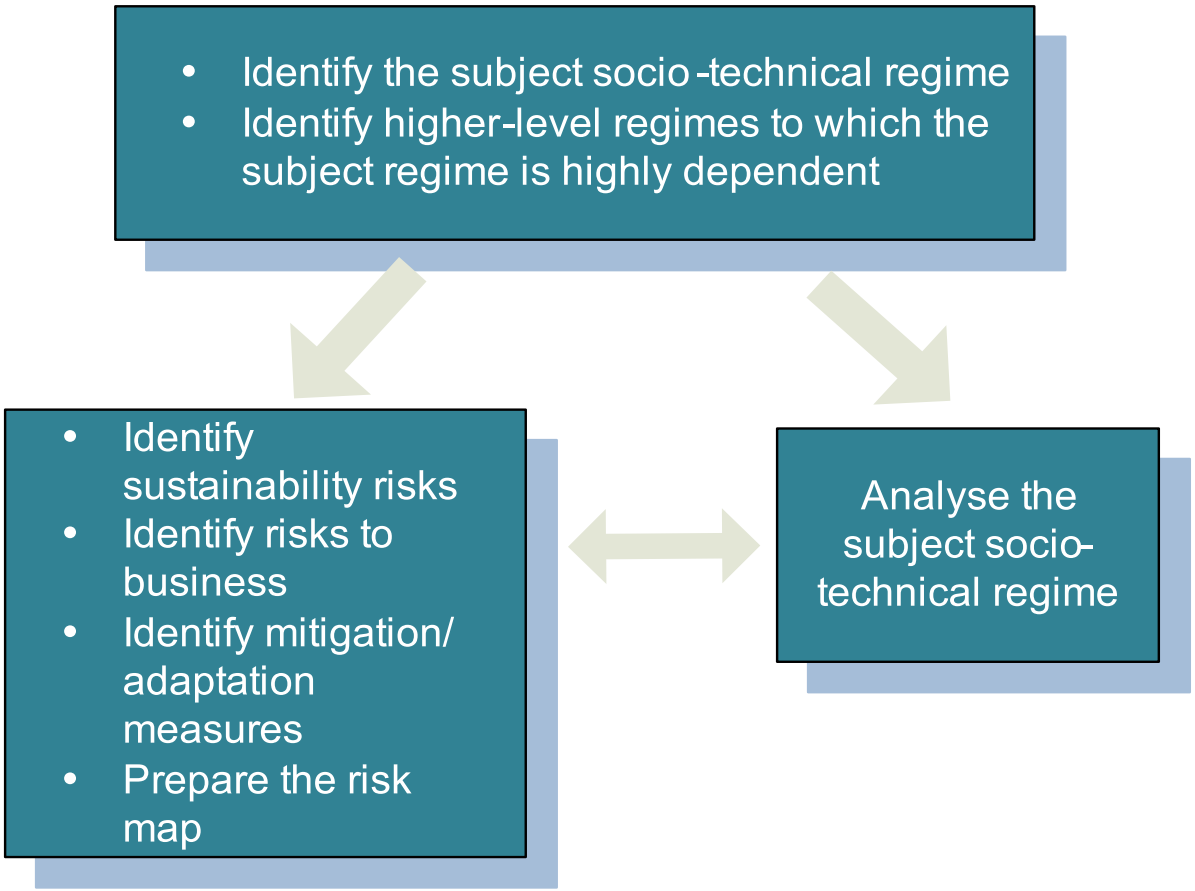
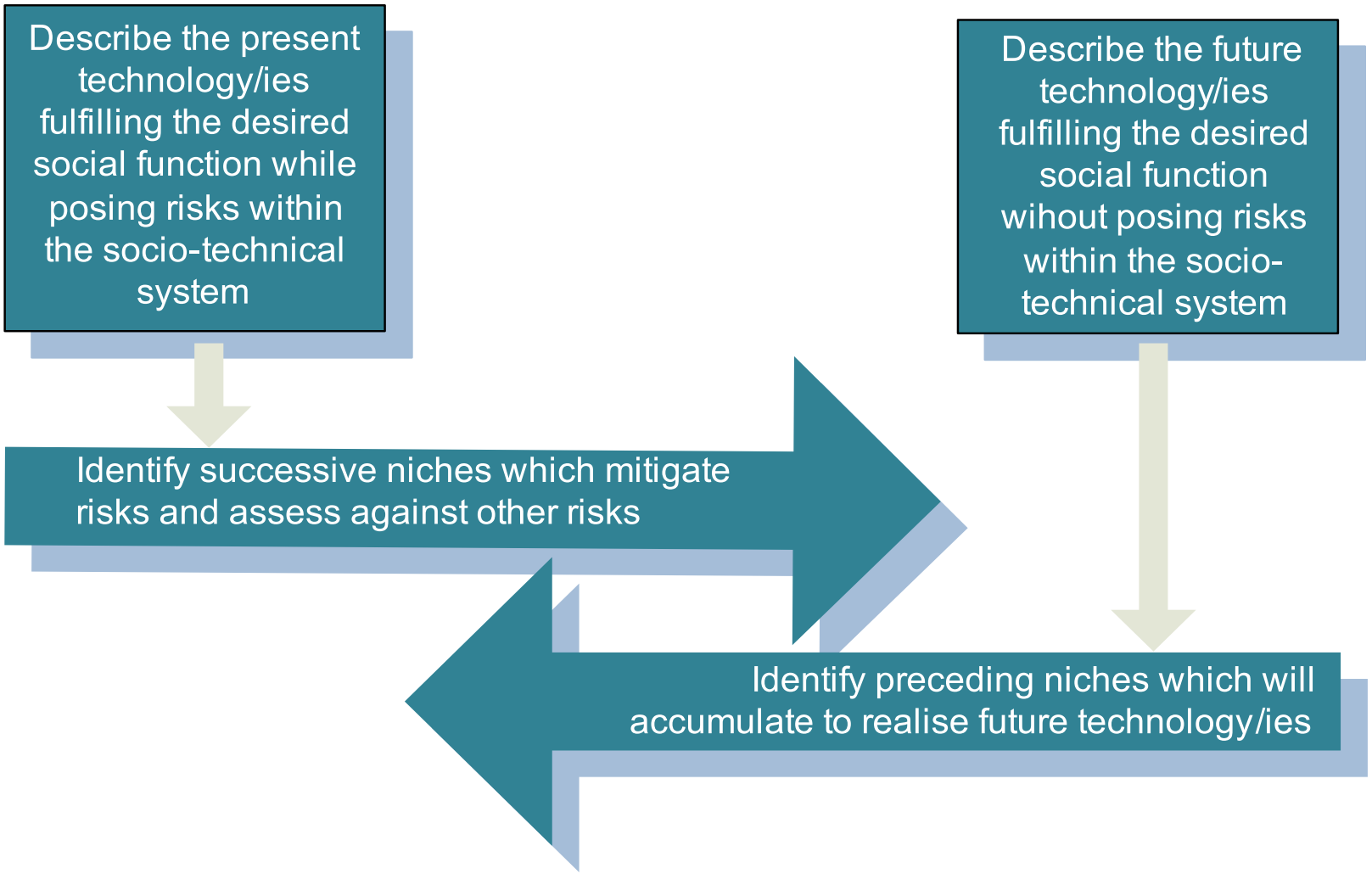


PREPARATION



MID-PHASE


Describe the present technology/ies fulfilling the desired social function while posing risks within the socio-technical system
Describe the future technology/ies fulfilling the desired social function wihout posing risks within the socio-technical system
Identify successive niches which mitigate risks and assess against other risks
Identify preceding niches which will accumulate to realise future technology/ies

FINAL PHASE

Develop foreward and backward scenarios to identify aligning alternative paths between present and future

Develop strategy or action plan

Thank you!

Questions…