# Technology Dynamics MOT113a

## Workshop II Innovation Systems

May 15th & 16th, 2024

Dr. Claudia Werker

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TU Delft

# Skill: Citing, quoting, paraphrasing and summarizing sources

## Basics: short and full citation

short: for in the text: either Balconi, Brusoni & Orsegnio, 2010 or Balconi et al., 2010

long: for in the reference list: Balconi, M., Brusoni, S., & Orsenigo, L. (2010). In defence of the linear model: An essay. Research Policy, 39(1), 1-13. http://dx.doi.org/10.1016/j.respol.2009.09.013

**Advanced:** quote, paraphrase and summarize appropriately

- quote using "..." when words are particularly original
- paraphrase when you can state what you find in the reference more clearly in your own words
- summarize when details are irrelevant

# Skill: Looking for information and sources

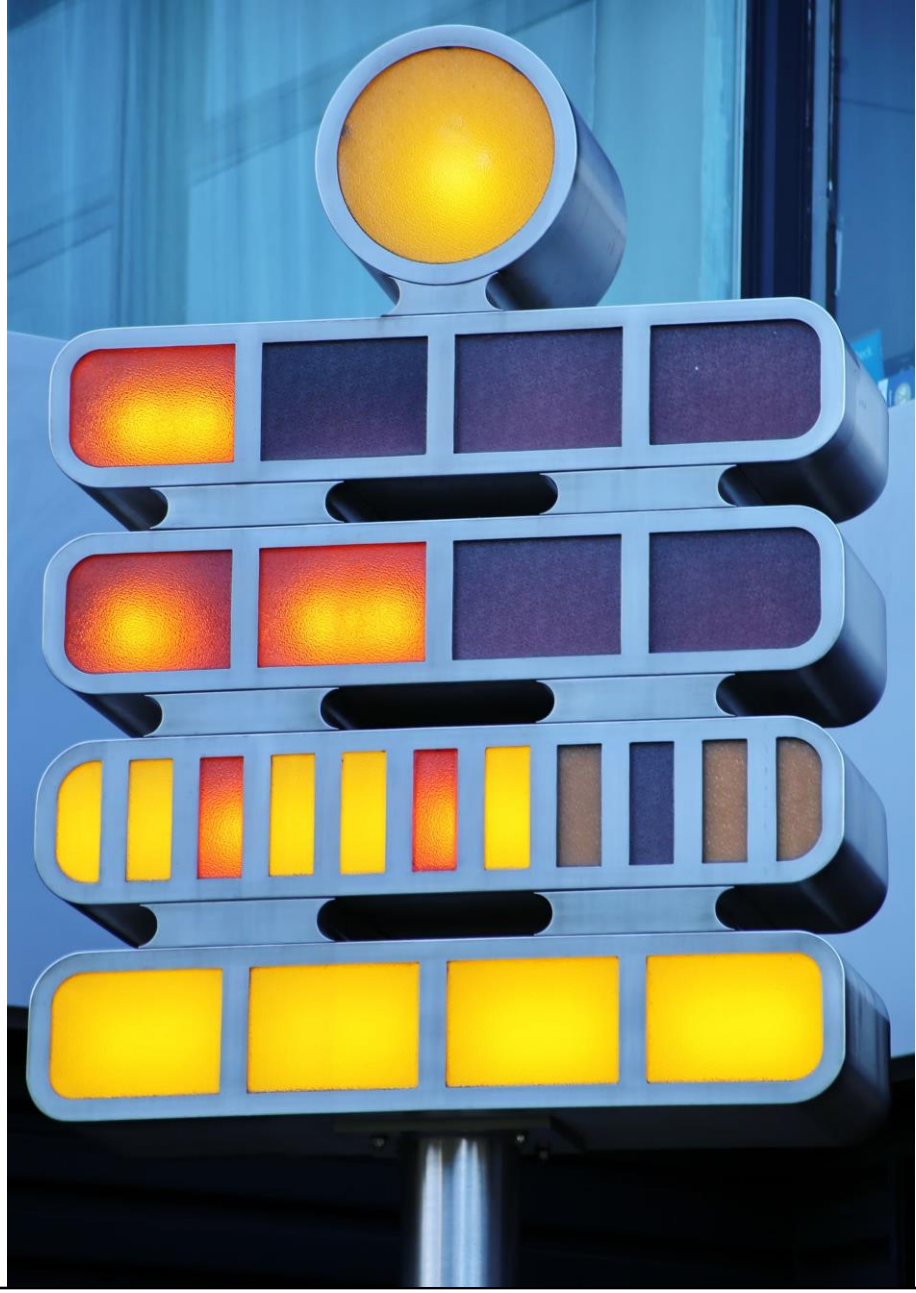
1. Where do you look for information?
2. Where do you find the best information?

For both questions the answers are:

A. Search engines, e.g. duckduckgo.com for general information
B. Google scholar and Library for scientific literature
C. Specialized webpages

# Workshop II: Innovation Systems

1. Innovation: Concept and Measurement (revisit)
2. Innovation Systems and Proximity (partly B/F)
3. Technological & Sectorial Innovation Systems (B/F)
4. Geographical Innovation Systems (B/F)
5. Responsible Innovation (lecture: TL)



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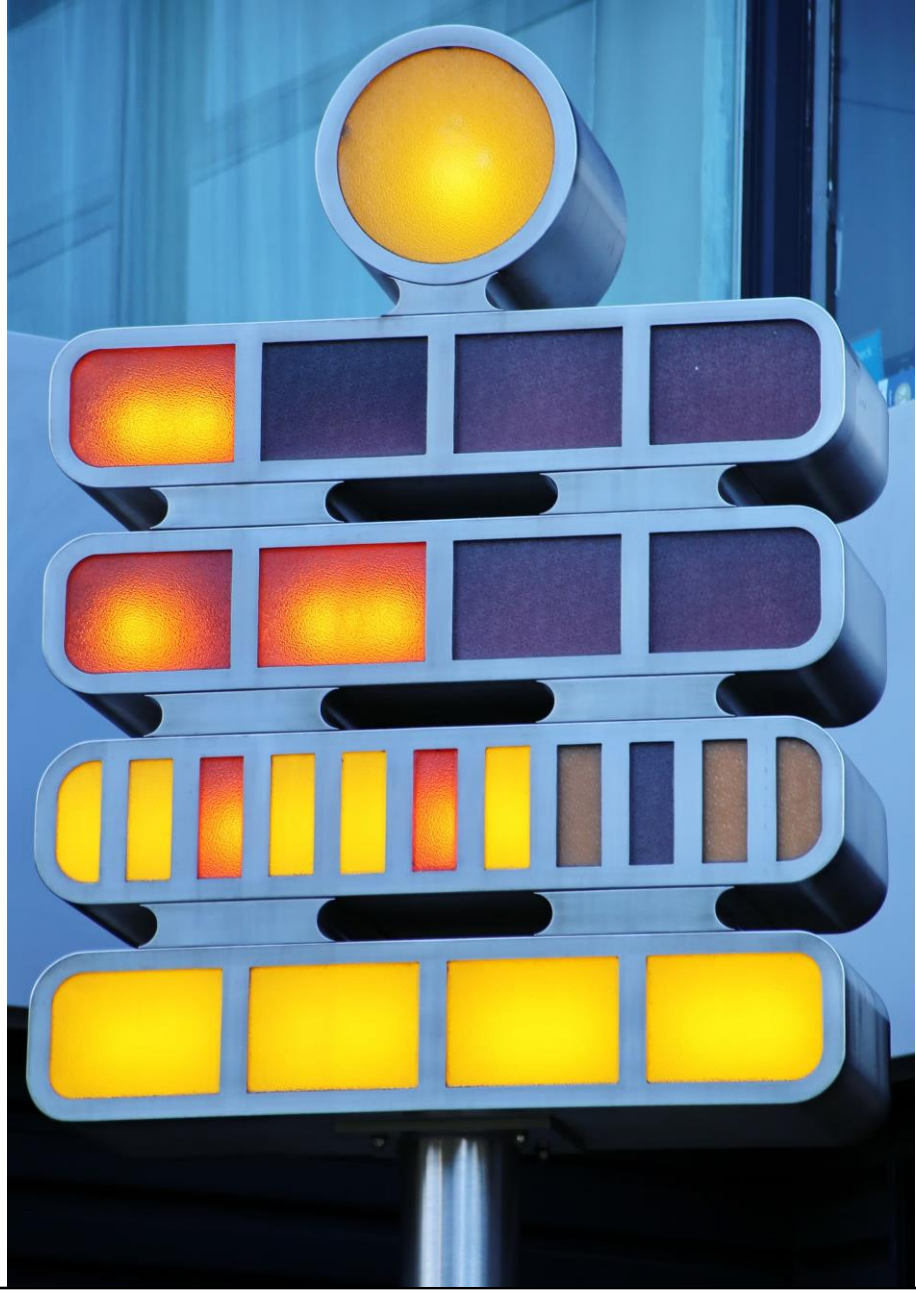
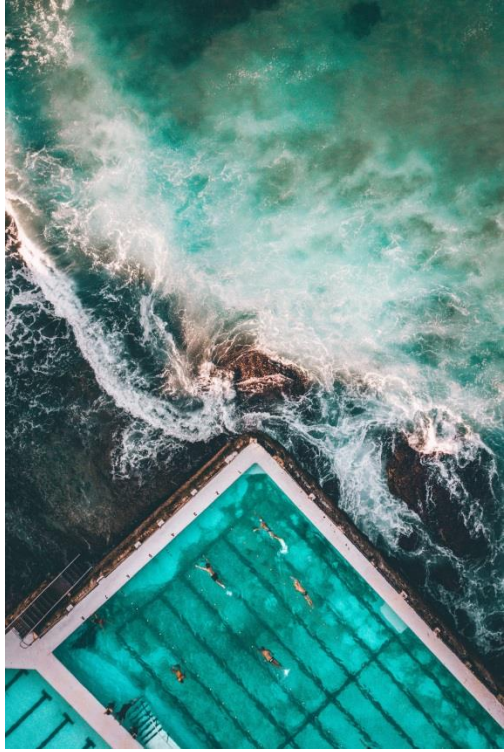


# Follow-up Exercises Chapter 1



1. How did the groups‘ work and the take-away groups‘ work function?
2. How did you manage the individual tasks?
3. What did you learn
   a) content-wise
   b) skill-wise

from

- the webpage of European Innovation Scoreboard 2023 and
- paper by Edquist et al. 2018?

# The Fishbowl Method

# Fishbowl: Exercises Chapter 1

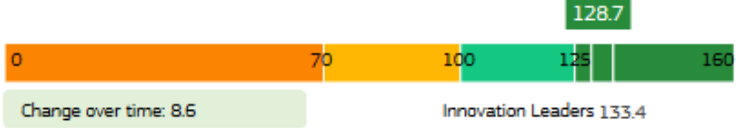
Please assess the use of the innovation indicators in the Innovation Scoreboard 2023 in the light of the paper by Edquist et al., 2018.

Dr. Claudia Werker

# Fishbowl: Exercises Chapter 1

Please assess the use of the innovation indicators in the Innovation Scoreboard 2023 (here p. 73) in the light of the paper by Edquist et al., 2018.

Dr. Claudia Werker




| Netherlands | Performance relative to EU in 2023 | Performance change 2016-2023 | Performance change 2022-2023 |
|---|---|---|---|
| **SUMMARY INNOVATION INDEX** | **128.7** | **8.6** | **1.0** |
| **Human resources** | **166.4** | **-3.9** | **-8.8** |
| Doctorate graduates | 85.2 | -11.4 | -22.9 |
| Population with tertiary education | 183.2 | 4.8 | 4.8 |
| Lifelong learning | 242.2 | -2.2 | -2.2 |
| **Attractive research systems** | **193.8** | **24.0** | **-3.5** |
| International scientific co-publications | 199.3 | 74.0 | -3.0 |
| Most cited publications | 146.1 | -19.8 | -10.9 |
| Foreign doctorate students | 281.7 | 77.6 | 13.2 |
| **Digitalisation** | **158.3** | **14.1** | **6.1** |
| Broadband penetration | 130.4 | 27.7 | 12.1 |
| People with above basic overall digital skills | 196.5 | 0.0 | 0.0 |
| **Finance and support** | **121.5** | **26.5** | **4.9** |
| R&D expenditures in the public sector | 96.9 | -3.2 | -4.8 |
| Venture capital expenditures | 127.9 | 80.5 | 7.5 |
| Government support for business R&D | 142.3 | 10.5 | 15.6 |
| **Firm investments** | **77.9** | **10.2** | **-0.5** |
| R&D expenditure in the business sector | 102.1 | 8.5 | -1.5 |
| Non-R&D Innovation expenditures | 38.3 | 0.0 | 0.0 |
| Innovation expenditures per employee | 86.7 | 21.2 | 0.0 |
| **Use of information technologies** | **162.2** | **43.1** | **25.3** |
| Enterprises providing ICT training | 138.5 | 70.1 | 33.8 |
| Employed ICT specialists | 186.7 | 17.2 | 17.2 |
| **Innovators** | **104.7** | **9.3** | **13.1** |
| Product innovators (SMEs) | 103.4 | -23.0 | 5.4 |
| Business process innovators (SMEs) | 105.8 | 43.7 | 21.3 |
| **Linkages** | **182.2** | **5.4** | **1.2** |
| Innovative SMEs collaborating with others | 161.9 | 6.8 | 44.0 |
| Public-private co-publications | 321.2 | 83.6 | -11.0 |
| Job-to-job mobility of HRST | 139.6 | -32.4 | -32.4 |
| **Intellectual assets** | **114.1** | **1.4** | **-3.5** |
| PCT patent applications | 124.4 | -12.9 | -1.2 |
| Trademark applications | 106.5 | 7.8 | -1.8 |
| Design applications | 107.5 | 14.4 | -7.8 |
| **Employment impacts** | **124.1** | **-15.5** | **0.0** |
| Employment in knowledge-intensive activities | 165.1 | 0.0 | 0.0 |
| Employment in innovative enterprises | 90.4 | -30.2 | 0.0 |
| **Sales impacts** | **86.3** | **-4.0** | **-3.5** |
| Medium and high-tech goods exports | 71.1 | 1.9 | -6.6 |
| Knowledge-intensive services exports | 131.5 | 3.9 | -2.7 |
| Sales of innovative products | 60.3 | -22.8 | 0.0 |
| **Environmental sustainability** | **123.2** | **4.4** | **-2.6** |
| Resource productivity | 192.0 | 32.3 | 0.0 |
| Air emissions by fine particulate matter | 111.4 | 6.1 | 1.0 |
| Environment-related technologies | 71.9 | -16.4 | -8.5 |

The second column shows performance relative to that of the EU in 2023. Colours next to the column show matching colour codes: dark green: above 125% of the performance of the EU in 2023; light green: between 100% and 125%; light orange: between 70% and 100%; dark orange: below 70%. The next columns show performance change over time between 2016 and 2023 and between 2022 and 2023, with scores relative to those of the EU in 2016. Positive (negative) performance changes are shown in green (red).

The **NETHERLANDS** is an **Innovation Leader** with performance at 128.7% of the EU average. Performance is below the average of the Innovation Leaders. Performance is increasing at a rate marginally higher than that of the EU (8.5%-points). The country's performance lead over the EU is becoming larger.

**Relative strengths**
Public-private co-publications
Foreign doctorate students
Lifelong learning
International scientific co-publications
People with above basic overall digital skills

**Relative weaknesses**
Non-R&D Innovation expenditures
Sales of innovative products
Medium and high-tech goods exports
Environment-related technologies
Doctorate graduates

**Strong increases since 2016**
Public-private co-publications
Venture capital expenditures
Foreign doctorate students

**Strong decreases since 2016**
Job-to-job mobility of HRST
Employment in innovative enterprises
Product innovators

**Strong increases since 2022**
Innovative SMEs collaborating with others
Enterprises providing ICT training
Business process innovators

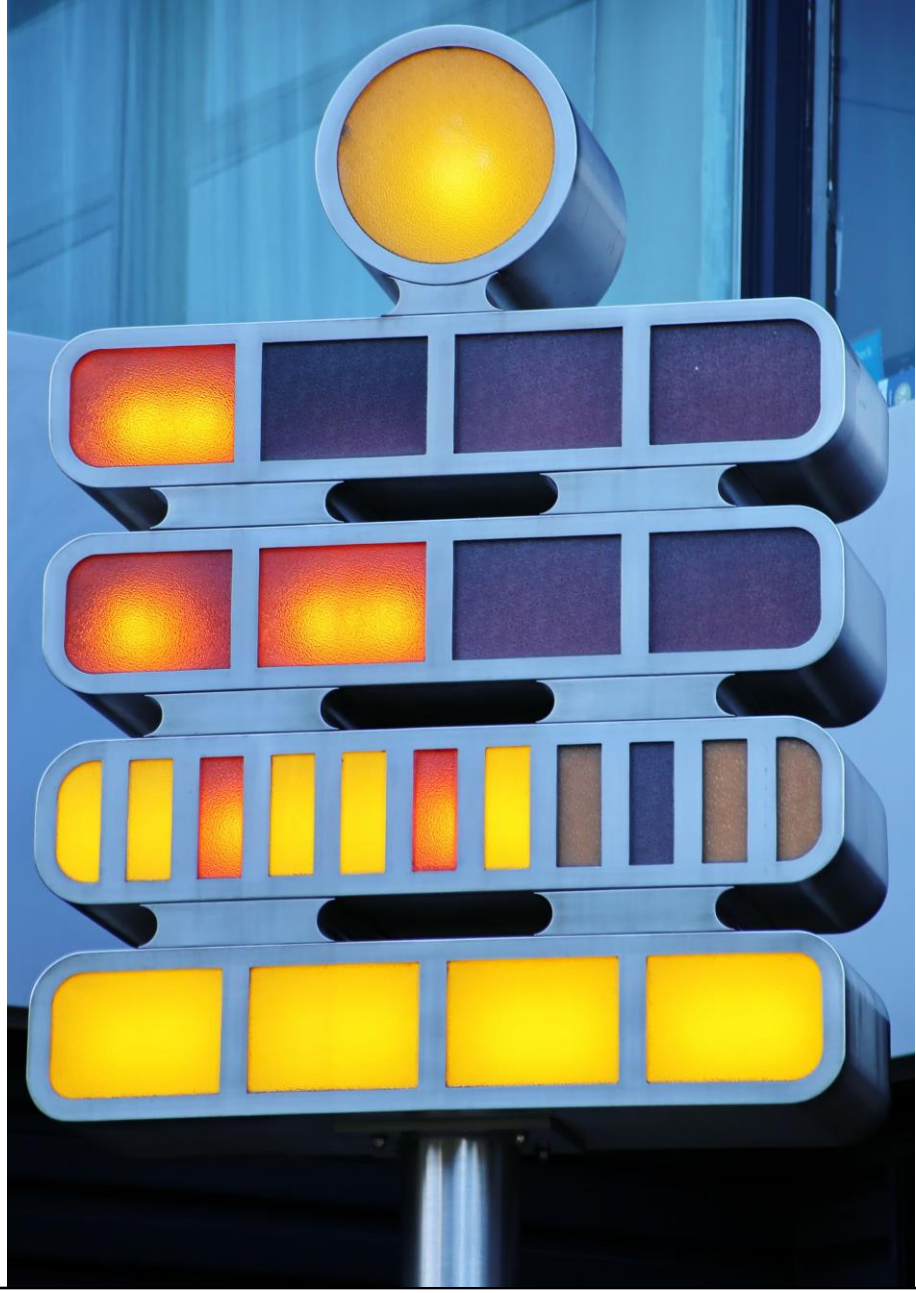
**Strong decreases since 2022**
Job-to-job mobility of HRST
Doctorate graduates
Public-private co-publications

# Learning Goals: Chapter 1 REVISITED

- define innovation
- recognize and identify different types of innovation
- characterize different kinds of innovation indicators
- explain their advantages and disadvantages
- critically assess the use of innovation indicators
- read texts using speedy reading
- use references according to the standards of social sciences

# Workshop II: Innovation Systems

1. Innovation: Concept and Measurement (revisit)
2. Innovation Systems and Proximity
3. Technological & Sectorial Innovation Systems
4. Geographical Innovation Systems
5. Responsible Innovation (lecture)



# Learning Goals Chapter 2

- define an innovation system
- identify innovative agents and other stakeholders
- define and identify important relationships using the proximity approach
- define and identify relevant informal and formal institutions
- analyse an innovation system by pointing at its weaknesses and strengths

# Lecture II

## 2. Innovation Systems and Proximity

2.1 The Linear Model of Innovation (B/F+)

2.2 Defining Innovation Systems (TL)

2.3 Agents and Stakeholders (TL)

2.4 Proximity (TL)

B/F blended learning/flipped classroom

B/F+ introduced by the professor

TL traditional lecture

# Lecture II

## 2. Innovation Systems and Proximity

2.1 The Linear Model of Innovation (B/F+)

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B/F blended learning/flipped classroom

B/F+ introduced by the professor

TL traditional lecture

# 2.1 The Linear Model of Innovation I (blended learning/flipped classroom +)

*Figure 1: The linear model of innovation inspired by Godin (2006)*

# 2.1 The Linear Model of Innovation II

1. **discuss the linear model of innovation,** making sure everyone understands what the concept contributes to understanding research and innovation processes in technological development.
2. **identify the questions** that need to be answered to fully understand the concept and its limitations
3. **brainstorm** what you already know about the questions
4. **analyse and structure** the results of the brainstorming session
5. **formulate learning objectives** for the knowledge that is still lacking

# 2.1 The Linear Model of Innovation III

## FOLLOW-UP

6. **do independent study**, e.g. by individually reading the literature in the reader in detail
7. **discuss** your findings in your group in between workshops II and III

# Chapter 2. Multiple-choice question

Please go to Brightspace and follow the steps below:

- Go to **Content** in the navbar of the course
- Click on the **Multiple-choice question** module
- Click on the quiz **2. Innovation Systems and Proximity**
- Enter **password**: hsuxyfx
- Click on **Start quiz**

# Chapter 2. Multiple-choice question

Which of the following does the linear model of innovation NOT take into account:

1. inter-linkages between stages and roles
2. clear cut stages
3. specific roles

# Lecture II

## 2. Innovation Systems and Proximity

2.1 The Linear Model of Innovation (B/F+)

2.2 Defining Innovation Systems (TL)

2.3 Agents and Stakeholders (TL)

2.4 Proximity (TL)

B/F blended learning/flipped classroom

B/F+ introduced by the professor

TL traditional lecture

# 2.2 Defining Innovation Systems

- Institutions
  - Formal (e.g. written laws)
  - Informal (e.g. codes of conduct)
- Innovative agents from industry, government, universities, public and private research agencies
- Relationships between innovative agents

# Lecture II

## 2. Innovation Systems and Proximity

2.1 The Linear Model of Innovation (B/F+)

2.2 Defining Innovation Systems (TL)

2.3 Agents and Stakeholders (TL)

2.4 Proximity (TL)

B/F blended learning/flipped classroom

B/F+ introduced by the professor

TL traditional lecture

# 2.3 Agents and Stakeholders: Differences I

Agents versus other stakeholders:

- agents can act and influence
- other stakeholders are subject to changes

# 2.3 Agents and Stakeholders: Differences II

Agents: who takes the lead?

- Industry, in particular firms
- Government, in particular via specific policy fields (e.g. military sector, health)
- Universities:
  - research, teaching and valorisation
  - basic and applied research

# 2.3 Agents and stakeholders: types

2.3.1 Academic agents & stakeholders: mainly universities

2.3.2 Industrial agents & stakeholders, i.e. companies

2.3.3 Governmental agents & stakeholders: e.g. city councils, ministries

# 2.3.1 Universities: Basic Research and Beyond

1. The mission of universities
2. Universities as regional knowledge providers
3. Universities' potential to foster and generate human capital and entrepreneurship
4. Universities as nodes of intra- and inter-regional linkages
5. Regional outcomes of universities' relationships

See Fromhold-Eisebith & Werker, 2013, for details.

# 2.3.2 Industry: Applied Research and Beyond

Entrepreneurship

Motivation to become an entrepreneur

Some facts about entrepreneurs

# Entrepreneurship

"… **entrepreneurship** is the process by which new enterprises are founded and become viable …

**way of measuring entrepreneurship** is to look at new firm formation, i.e. at entry rates (either gross or net, that is entry flows minus exit flows)"

(Vivarelli, 2013, p. 1456, bold by me)

Alternatively: agents creating innovation

includes **intrapreneurship** of large firms, governm.

# Motivation to become an entrepreneur

- Progressive factors such as profitability, demand, technological opportunities, innovative potential
- Regressive factors such as low wages / unemployment
- Personal traits such as previous work experience, ethnic background, financial status, and motivation
- Firm characteristics such as age, size, human capital
- Environmental factors: see e.g. government

# Some facts about entrepreneurs

- opportunity entrepreneurs motivated by progressive drivers versus
- necessity entrepreneurs pushed by defensive and regressive drivers
- Stylized fact: entry and exit rates are highly correlated ⇒ revolving door
- Developing countries often dominanted by traditional and low-tech sectors

⇒ turbulence more likely

⇒ opportunity entrepreneurs more exceptional

(For details see Vivarelli, 2013)

# 2.3.3 The Government: Knowledge Infrastructure and Beyond

- Traditionally government provides knowledge infrastructure
- Subsidies for research and development
- Procurement
- Governmental agents as advisors
- Governmental agents as guardians of stakeholders‘ interests

# Lecture II

## 2. Innovation Systems and Proximity

2.1 The Linear Model of Innovation (B/F+)

2.2 Defining Innovation Systems (TL)

2.3 Agents and Stakeholders (TL)

2.4 Proximity (TL)

B/F blended learning/flipped classroom

B/F+ introduced by the professor

TL traditional lecture

# 2.4 Proximity between innovative agents collaborating

| Kind of prox. | Distinct attributes |
|---|---|
| **Geographical** | Location (pure physical distance) |
| **Institutional** | Formal and informal rules & regulations |
| **Social** | Embeddedness in knowledge fields, profess. associations or social comm. |
| **Organizational** | Organizational objectives and organization-specific formal and informal rules & regulations |
| **Cognitive** | Knowledge areas of expertise and experience as well as reputation |
| **Personal** | Personal features, personal character traits and behavioural patterns |

# Introduction: Exercises Chapter 2 I

## Exercise 2a

- Every student quick-reads the paper by Werker et al., 2017 (see Chapter 3.2 in the Reader) individually, taking notes in the process. (15 minutes)
- Please - as a group - figure out the differences between the innovation systems approach and the Triple Helix approach. (15 minutes).
- Please summarize your findings on the differences between the innovation systems approach and the Triple Helix approach on a slide and upload the document on Brightspace. (10 minutes).

# Introduction: Exercises Chapter 2 II

## Exercise 2b

- Have about half of the group focus on the Lochem case and the other one focus on Aardwarmte Den Haag as described and analysed in Werker et al., 2017. Please answer the following questions (20 minutes):
  - Who are the agents, who are the stakeholders of the cases? Are they academic, entrepreneurial, governmental or civic actors?
  - What are their interests and motivations?
  - Which agents and stakeholders are close to each other and in which respect (consider the different kinds of proximity for this)?

# Introduction: Exercises Chapter 2 III

## Exercise 2b

- …
- As a group compare the two cases. Summarize your findings on minimum one page and upload the document on Brightspace (25 minutes).

# Allocation of groups to classrooms

| Classroom | Groups |
|---|---|
| TPM-Hall B | 1-6 |
| TPM-Hall C | 7-12 |
| TPM-Hall D | 13-17 |
| TPM-Hall E | 18-22 |
| TPM-Instruction Room D1 | 23-26 |
| TPM-Instruction Room D2 | 27-30 |

# Chapter 2, Exercise 2
## Innovation Systems versus Triple Helix approach

What are the similarities of and differences between

- the innovation systems and
- the triple helix approach?

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# The Fishbowl Method

# Chapter 2, Exercise 2

## Lochem / Aardwarmte Den Haag

- **collect** answers to questions on agents/ stakeholders, interests/motivations, proximity
- **compare** the answers
- **analyse and structure** the results

## FOLLOW-UP

- **formulate questions** still open
- **do independent study**, individually or within your group
- **discuss** the findings in your group

# Chapter 2, Exercise 1, Part IV: EXAMPLE

Werker et al. 2017
on Dutch energy system, p. 21

**Table 3** Characteristics of entrepreneurs and their relationships

| | Private entrepreneurs | | Public entrepreneurs | Academic entrepreneurs |
|---|---|---|---|---|
| | Profit-oriented firms | Civic entrepreneurs | | |
| Goals | Private goals | Private and public goals | Public goals | Public goals |
| Incentives (examples) | • Profit or self-employment<br>• Using engineering in creative ways<br>• Being the most important player in the industry | • Profit *and* energy sustainability in local communities<br>• Local job creation | • Energy sustainability in local communities | • Societally and economically applicable research solutions |
| Examples of entrepreneurs | Eneco; Alliander; E.On Benelux | LochemEnergie | Municipality of The Hague | Research institute TNO; Universities: Technical University of Twente; University of Nijmegen |

# Learning Goals Chapter 2 REVISITED

- define an innovation system
- identify innovative agents and other stakeholders
- define and identify important relationships using the proximity approach
- define and identify relevant informal and formal institutions
- analyse an innovation system by pointing at its weaknesses and strengths

# Workshop II: Innovation Systems

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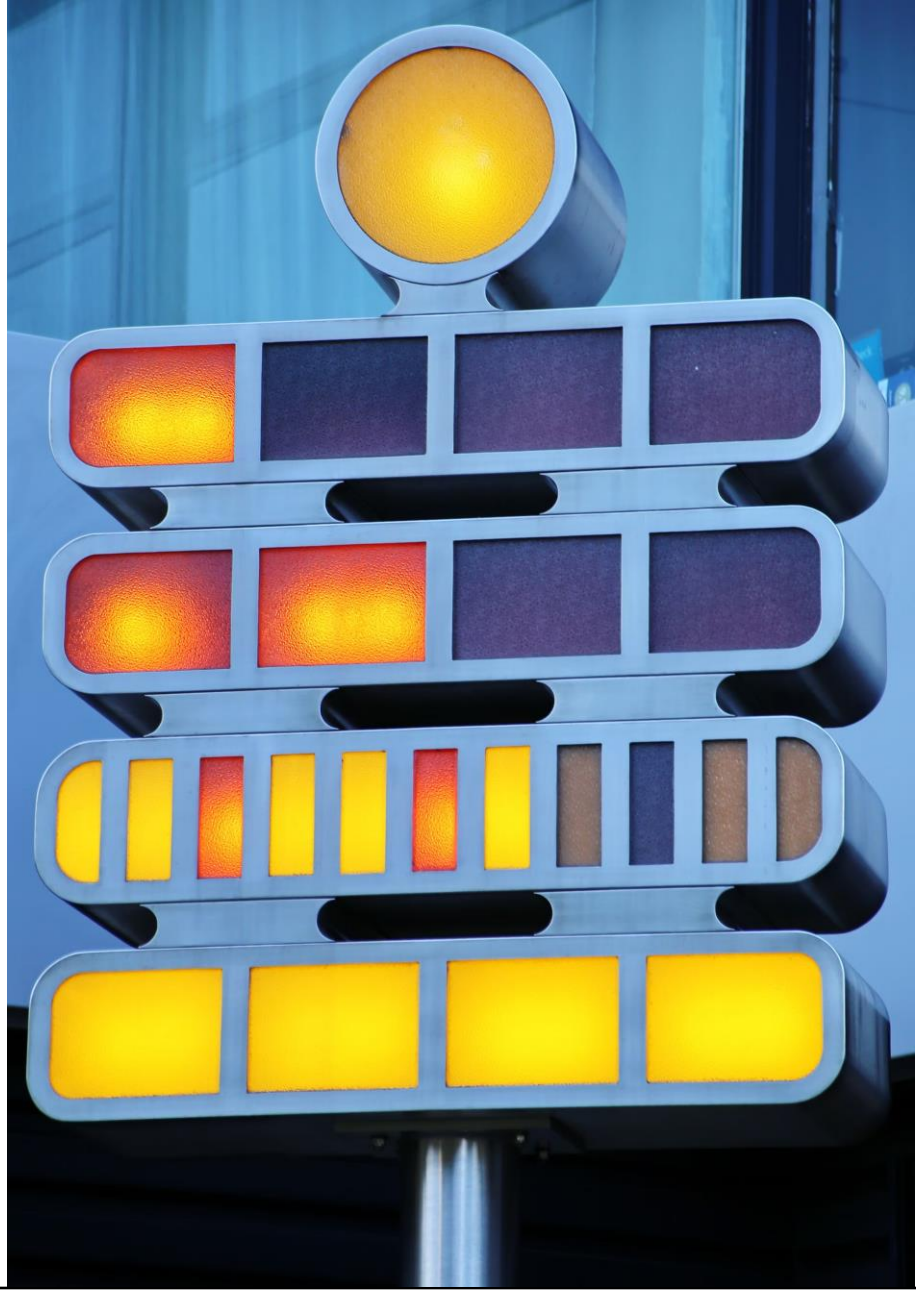


# Chapter 3: Learning Goals

- describe a technological innovation system (TIS)
- distinguish te. from sectors, industries and markets
- identify the context structures of the TIS
- identify a TIS including its innovative agents, other stakeholders, their relationships and the institutions
- analyse a TIS by pointing at weaknesses and strengths

# Chapter 3. Multiple-choice question

Please go to Brightspace and follow the steps below:

- Go to **Content** in the navbar of the course
- Click on the **Multiple-choice question** module
- Click on the quiz **3. Technological and Sectorial Innovation Systems**
- Enter **password**: qlrszwd
- Click on **Start quiz**

# Chapter 3. Multiple-choice question

Which of the following do Technological Innovation Systems (TIS) capture:

1. agents and institutions
2. functions of the technology
3. all the above

# 3. Technological and Sectorial Innovation Systems I

1. **discuss technological and sectorial innovation systems,** making sure everyone understands what the concept contributes to understanding research and innovation processes.
2. **identify the questions** that need to be answered to fully understand the concept and its limitations
3. **brainstorm** what you already know
4. **analyse and structure** the results of the brainstorming session
5. **formulate learning objectives** for the knowledge that is still lacking

# 3. Technological and Sectorial Innovation Systems II

Please explain the muddiest point you identified!

# 3. Technological and Sectorial Innovation Systems III

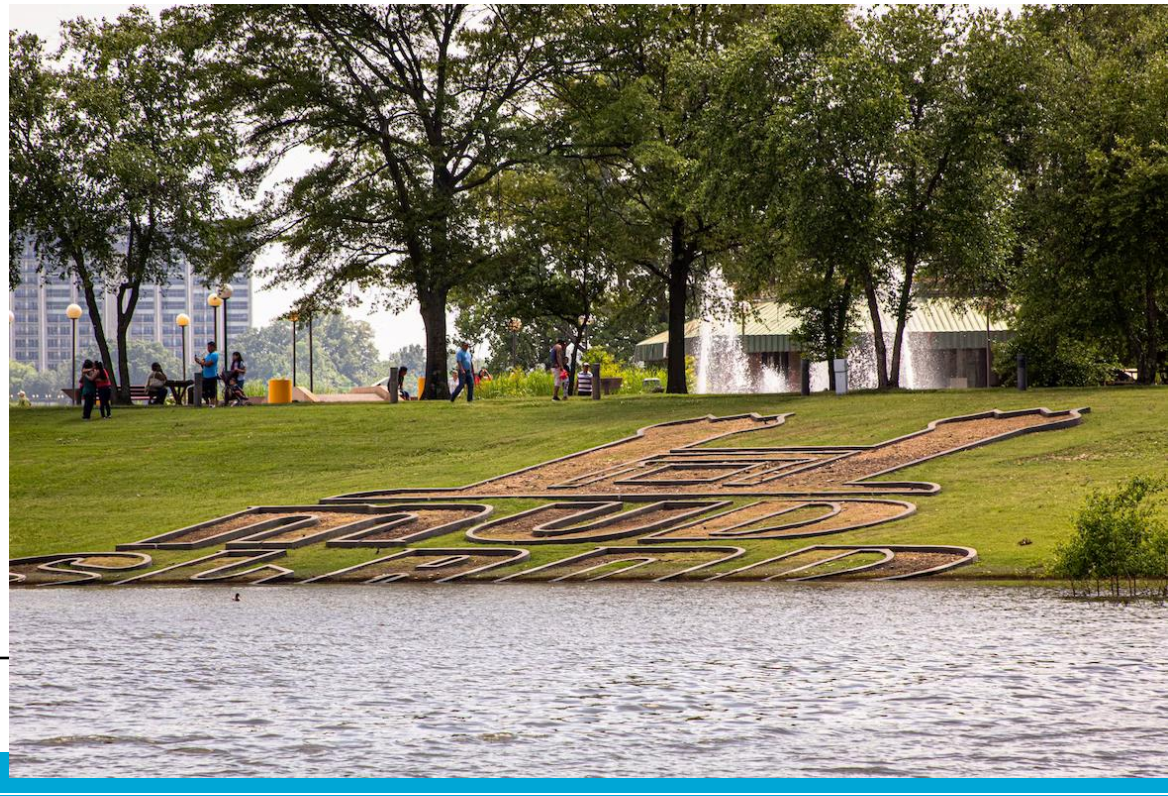
## FOLLOW-UP

6. **do independent study**, e.g. by individually reading the literature in the reader in detail
7. **discuss** your findings in your group in between workshops II and III

# Please fill in the mud cards (1 minute) and return them to us!

1. What are the three things you learned today?
2. What are the two things you are still curious about?
3. What is the one thing you did not understand?

LOOKING FORWARD TO SEEING YOU TOMORROW

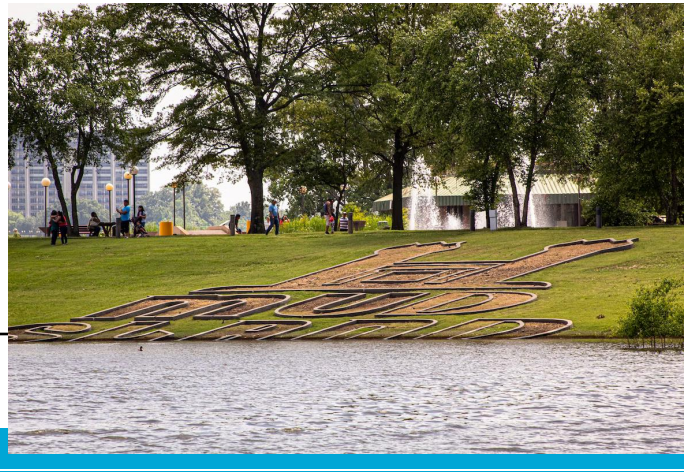


# Following-up on most unclear discussion (mud)cards I

1. Please follow-up within your group and if necessary ask me about during the groups‘ work on differences between
   a. Organizational and institutional proximity
   b. Triple Helix and innovation system approach
   c. Formal and informal institutions
   d. Innovative agents and stakeholders
2. Objective of the course

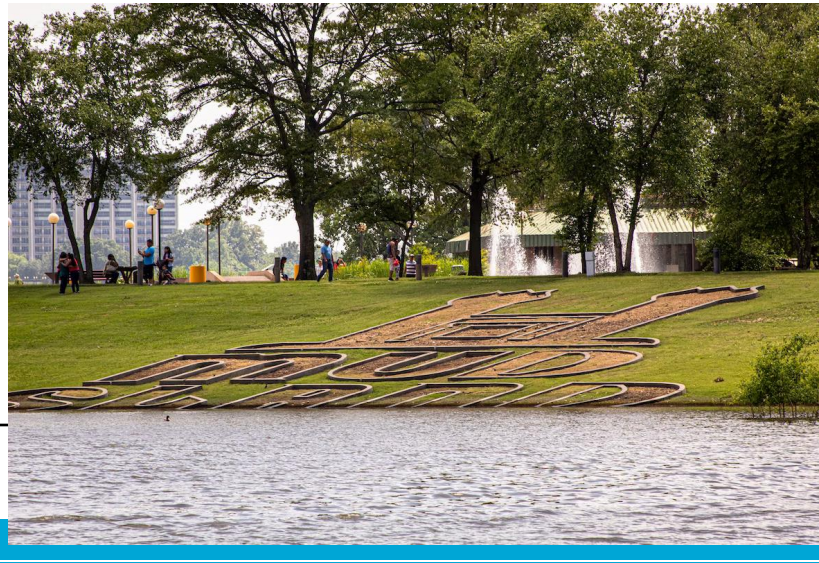
Content: How innovative agents can contribute to (responsible) innovation to serve the purposes of own organization and all.

Skills: How to find solutions to questions still needing specification?



# Following-up on most unclear discussion (mud)cards II

3. Specification of innovation system approach
   a. TIS, context structures, sector: multiple TIS
   b. Geographical proximity:
4. Role of social sciences and humanities in technologial research projects
5. Reader, workload and assignments, exam



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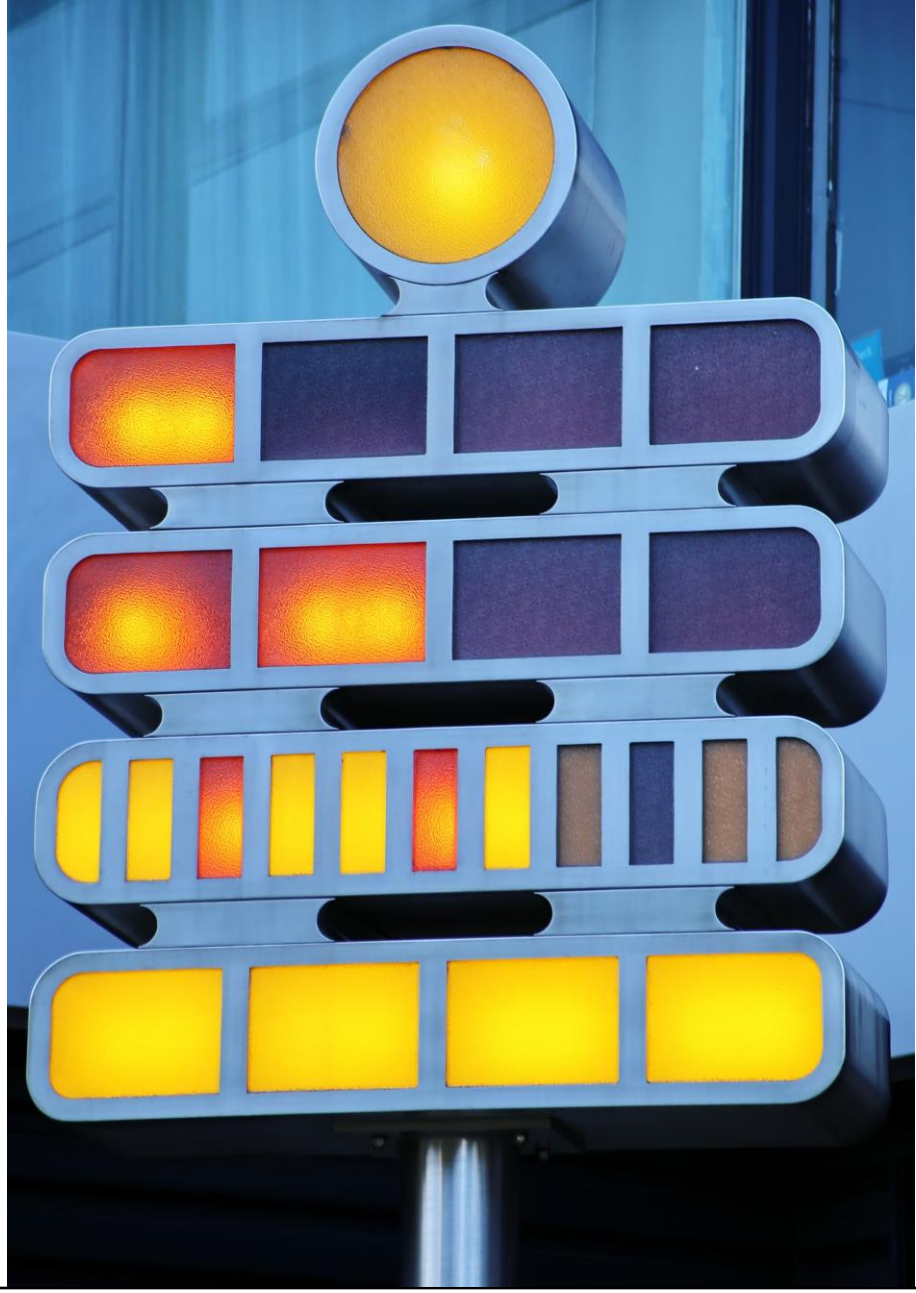


# Chapter 4: Learning Goals

- describe a regional, national or global innovation system
- distinguish them
- identify the (de-)agglomeration factors leading to geographical (de-)concentration of economic activities
- identify a geographical innovation system, innovative agents, other stakeholders, their relationships and the institutions
- analyse a geographical innovation system by pointing at weaknesses and strengths

# The Fishbowl Method

# Fishbowl: Chapter 4

**Discuss geographical innovation systems,** particularly **agglomeration and deglomeration effects**

Dr. Claudia Werker

# 4. Geographical Innovation Systems I

1. **discuss geographical innovation systems,** particularly **agglomeration and deglomeration effects**
2. **identify the questions** that need to be answered to fully understand the concepts and their limitations
3. **brainstorm** what you already know
4. **analyse and structure** the results of the brainstorming session
5. **formulate learning objectives** for the knowledge that is still lacking

# Chapter 4. Multiple-choice question

Please go to Brightspace and follow the steps below:

- Go to **Content** in the navbar of the course
- Click on the **Multiple-choice question** module
- Click on the quiz **4. Geographical Innovation Systems**
- Enter **password**: bzkrcqq
- Click on **Start quiz**

# Chapter 4. Multiple-choice question

Which of the following innovation systems is most challenging to analyse?

1. national innovation systems
2. global innovation systems
3. regional innovation systems

# 4. Geographical Innovation Systems II

Please explain the muddiest point you identified!

# 4. Geographical Innovation Systems III

## FOLLOW-UP

6. **do independent study**, e.g. by individually reading the literature in the reader in detail
7. **discuss** your findings in your group in between workshops II and III

# Introduction:

**Chapter 3, Exercise 2 (60 minutes)**

Please

- quick-read the paper by Nevzorova, 2022, individually;
- determine as a group which parts to read in detail to answer the following questions:
  - What is the focal TIS of the Russian biogas industry?
  - What is the sectoral context?
- do the reading individually;
- answer the questions jointly on half a page and
- upload the document on Brightspace

# Introduction: Chapter 4,

## Exercise 3a (30 minutes) I

Please split up the two cases, i.e.

- the case of the Bangalore software industry as analysed in Chamiade and Vang, 2018, and
- the case of the Swiss national innovation system as analysed in Marxt and Brunner, 2013,

between the group members.

…

# Introduction: Chapter 4, Exercise 3a (30 minutes) II

Please

- individually quick-read the paper of the case you are assigned to;
- as a group figure out what the major concepts used, the research questions and resolutions of the papers are;
- as a group discuss how you can analyse the two cases using the knowledge you obtained in chapter 0 to 4;
- individually solve the case you are assigned to accordingly;
- as a group discuss the findings & compare the two cases

# Allocation of groups to classrooms

Group's work on **May 16th, 2024**

| Classroom | Groups |
|---|---|
| TPM-Hall C | 7-12 |
| TPM-Hall D | 13-17 |
| TPM-Hall E | 18-22 |
| TPM-Hall H | 1-5 |
| TPM-Hall I | 6 & 23-26 |
| TPM-Instruction Room D2 | 27-30 |

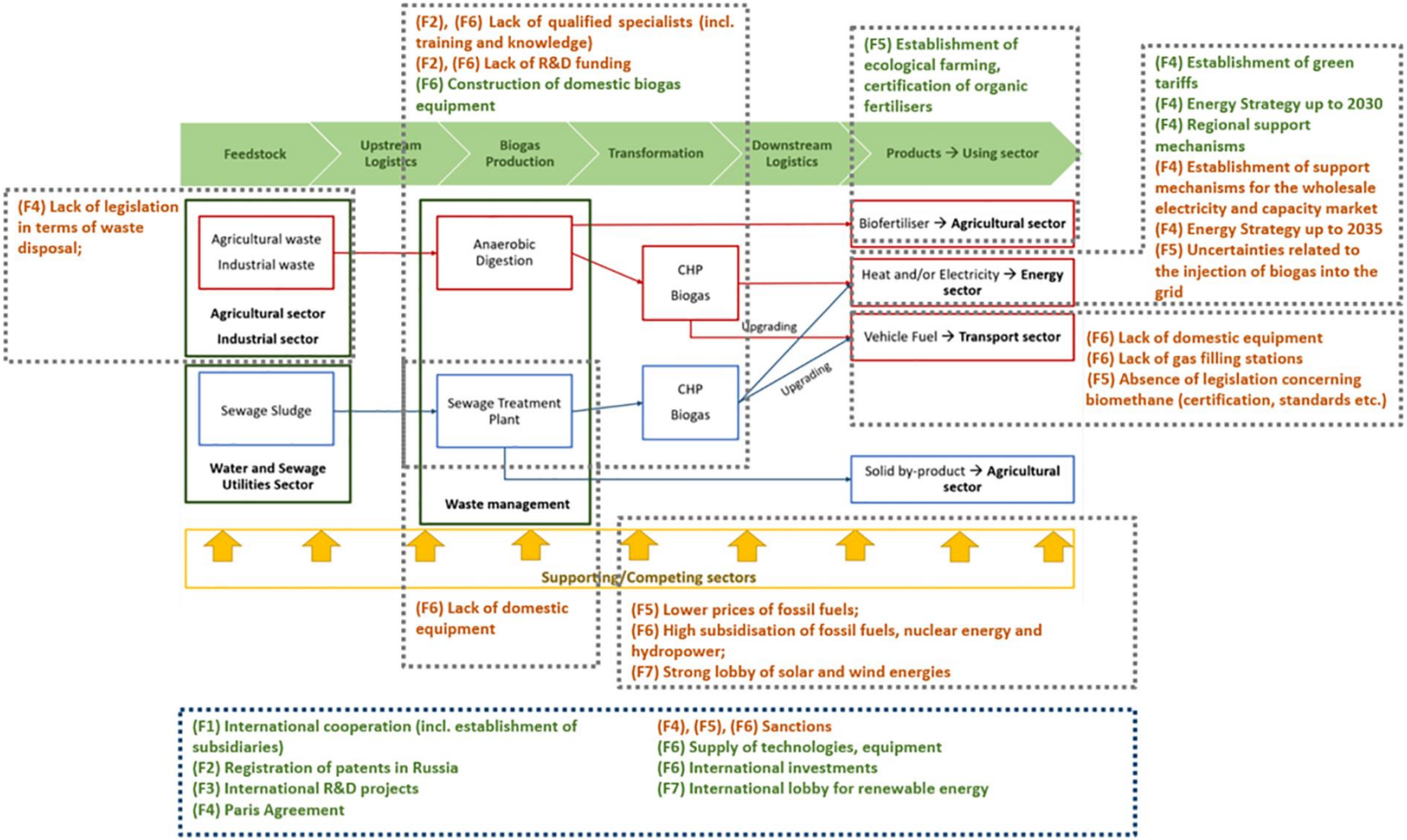
# Chapter 3, Exercise 2: Russian biogas industry: Focal technological and geographical dimension I

What is

- the focal technological dimension and
- the focal geographical dimension

of the Russian biogas industry?

# Chapter 3, Exercise 2: Russian biogas industry: Focal technological and geographical dimension II




Nevzorova, 2022, p. 244

# Chapter 3, Exercise 2: Russian biogas industry: Use of indicators and their interpretation III

Which innovation indicators have been used by Nevzorova (2022) to analyse the Russian biogas industry?

Do you agree with the findings of the paper Nevzorova (2022)? Please particularly discuss the reliability of the indicators used?

# Chapter 3, Exercise 2: Russian biogas industry: Use of indicators and their interpretation IV

**Table 3**
Overview of data collection used in the study.

| Data collection method | Collected Data | Primary proxies of TIS system functions |
|---|---|---|
| Semi-structured interviews | Nine extended personal interviews with experts, the CEO of Russian biogas companies, chief engineers, program managers, and other relevant actors. | (F1) Entrepreneurial Activities<br>(F6) Resource mobilization |
| Participant observation | The author carried out observations during the conferences dedicated to the Russian renewable energy industry.<br>Approximately 20 h of participant observation;<br>Extensive informal communication;<br>Field notes, i.e. audio notes, PowerPoint presentations, handouts. | (F4) Guidance of the Search.<br>(F7) Creation of Legitimacy |
| Patent data | The final database results in 964 patents | (F2) Knowledge development<br>(F3) Knowledge diffusion |
| Literature review | eLIBRARY.RU database. The total volume of scholarly literature reached 2027 publications. | (F2) Knowledge development |
| Additional methods | Official reports, publications, presentations, and newsletters;<br>Policy and legal documents;<br>Publications by industry associations and non-governmental organizations,<br>Newspaper articles and specialized journals<br>Reports and analyses (incl. annual reports)<br>Press releases, information on websites<br>Online interactive seminars, interviews, workshops, and conferences | (F4) Guidance of the Search.<br>(F5) Market Formation<br>(F6) Resource mobilization |

Nevzorova, 2022, p. 236

Indicators:

- quantitative (e.g. number of patents or patent citations)
- qualitative (e.g. answers to interview answers)

# **Skill:** Asking for description, analysis, and opinions in exam questions I

Description: give definitions, depict a situation

Analysis: choose a framework of analysis and study the situation accordingly

Opinion: give your own judgement based on the analysis!

**Examples from questions about Russian biogas industry**

What is the focal technological dimension and the focal geographical dimension of the Russian biogas industry?

Which innovation indicators have been used by Nevzorova (2022) to analyse the Russian biogas industry?

Do you agree with the findings of the paper Nevzorova (2022)? Please particularly discuss the reliability of the indicators used?

# **Skill:** Asking for description, analysis, and opinions in exam questions II

Description: give definitions, depict a situation

Analysis: choose a framework of analysis and study the situation accordingly

Opinion: give your own judgement based on the analysis!

**Examples from questions about Russian biogas industry**

What is the focal technological dimension and the focal geographical dimension of the Russian biogas industry? + time

Which innovation indicators have been used by Nevzorova (2022) to analyse the Russian biogas industry? + time

Do you agree with the findings of the paper Nevzorova (2022)? Please particularly discuss the reliability of the indicators used? + t.

# Chapter 4, Exercise 3a I

1. Discuss the major concepts used, the research questions and resolutions of the papers on
   a. Bangalore software industry
   b. Swiss national innovation system
2. Identify the questions that need to be answered to fully understand the geographical and technological delineations of the two inn. Systems
3. Brainstorm what you already know
4. Analyse and structure the results of the brainstorming

# Chapter 4, Exercise 3a II

5. Formulate learning objectives

FOLLOW-UP

6. Do independent study, i.e. by individual reading of literature in the reader or looking for additional information via Google Scholar
7. Discuss your finding in your group in between workshops II and III

# Chapter 4, EXCURSION:

## What is the right geographical delineation?

Werker et al. 2017, p. 16 on case Aardwarmte Den Haag

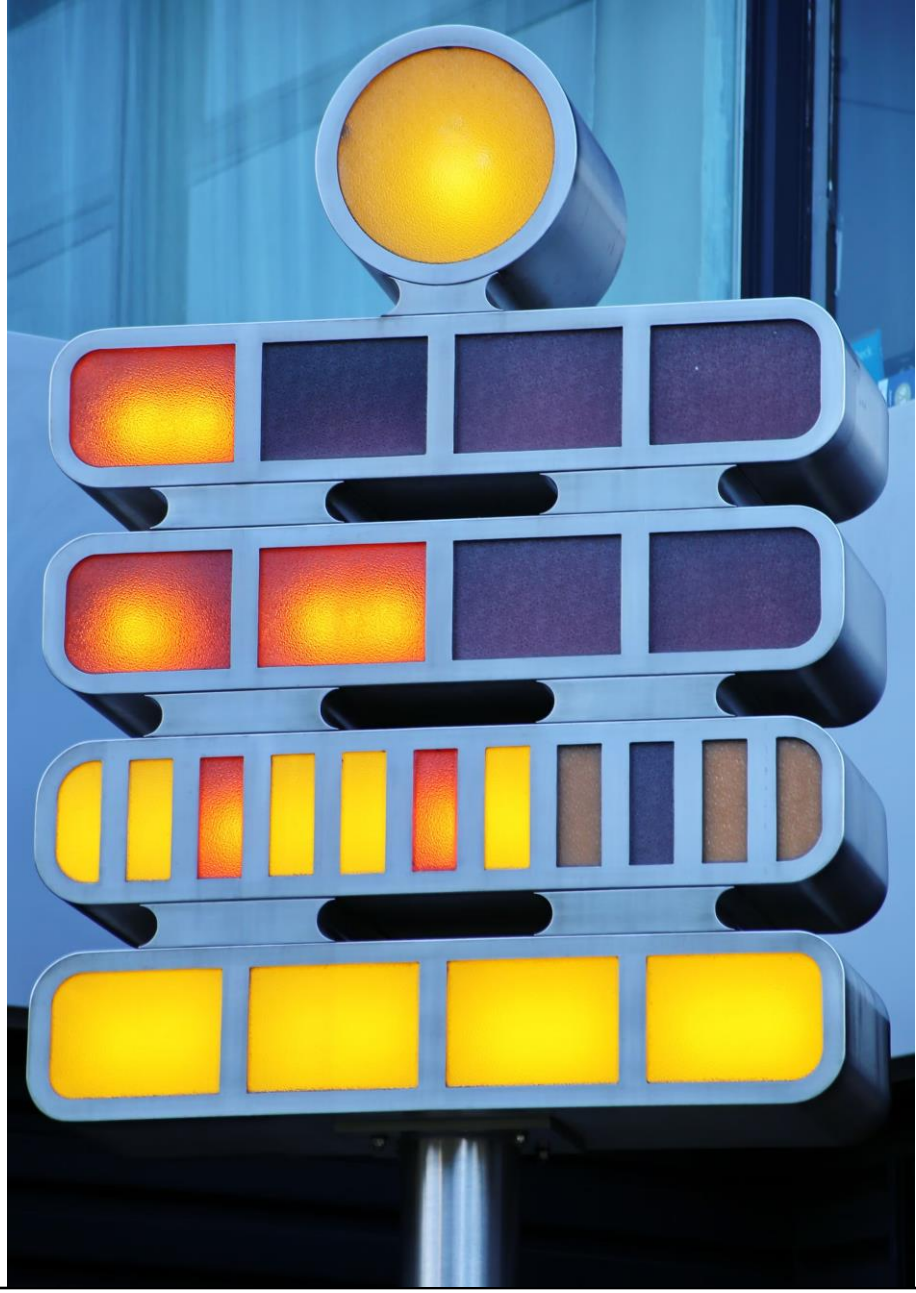
- **look at innovative agents and their relationships**
- **look at relevant institutions**
- **Look at agglomeration factors**

**Table 1** The actor network of Aardwarmte Den Haag (2008–2013) and Haagse Aardwarmte Leyweg (2016–)

| | Private entrepreneurs | Public entrepreneurs | Academic entrepreneurs |
|---|---|---|---|
| Local | Local housing corporations | Municipality of The Hague/ The Hague Energy Fund | |
| Regional | Distribution system operator: Eneco, regional housing corporation | | |
| National | Technical advisories and venture funds | Mining Authority, Ministry of Economic Affairs | TNO |
| International | E.On Benelux | | |

# Workshop II: Innovation Systems

1. Innovation: Concept and Measurement (revisit)
2. Innovation Systems and Proximity
3. Technological & Sectorial Innovation Systems
4. Geographical Innovation Systems
5. Responsible Innovation (lecture)



# Chapter 5: Learning Goals

- explain responsible research and innovation (RRI)
- reflect on the responsibility of engineers
- explain the so-called “control dilemma“
- distinguish between process and outcome oriented approaches of RRI

# 5. Responsible Research and Innovation

5.1 Responsibility of research and innovation

5.2 RRI: process versus outcome

5.3 Accountability frameworks
for active responsibility of engineers

Dr. Claudia Werker

# 5.1 Responsibility of research and innovation

- Responsibility of engineers:
  - According to the linear model of innovation
  - National Rifle association “guns do not kill people, people do”
- While engineers share responsibility for the use of technology they are not responsible for all negative results of its applications: Collingridge control dilemma

# 5. Responsible Research and Innovation

5.1 Responsibility of research and innovation

5.2 RRI: process versus outcome

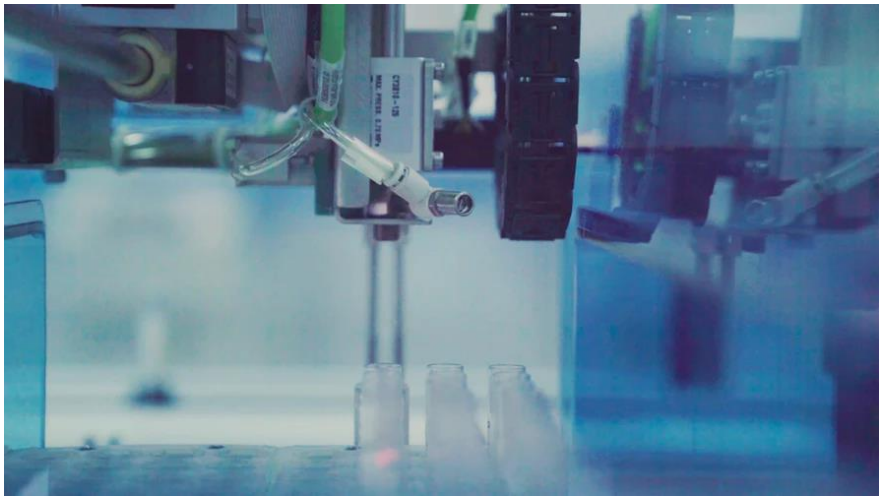
5.3 Accountability frameworks
for active responsibility of engineers

# 5.2 RRI: process versus outcome

"[I]n an ideal situation, responsible innovation can best be conceptualized as an endorsement of the relevant values during the innovation process" (Taebi et al., 2014, p. 118).

Process versus outcome-oriented approaches of RRI:

- Process orientated approach:
  - Anticipatory
  - Reflective
  - Deliberative
  - responsive



- Outcome orientated approach about public values that need to be 'designed' into the technology

# 5. Responsible Research and Innovation

5.1 Responsibility of research and innovation
5.2 RRI: process versus outcome
5.3 Accountability frameworks
for active responsibility of engineers

Dr. Claudia Werker

# 5.3 Accountability framework for active responsibility of engineers

- Accountability structure guiding engineers in their design choices
- Active care about our shared world
- Active responsibility of individual actors embedded in innovation systems prepared to undergo change

# Chapter 5. Multiple-choice question

Please go to Brightspace and follow the steps below:

- Go to **Content** in the navbar of the course
- Click on the **Multiple-choice question** module
- Click on the quiz **5. Responsible research and innovation**
- Enter **password**: bogztrd
- Click on **Start quiz**

# Chapter 5. Multiple-choice question

What does the responsibility of engineers and designers entail according to Responsible Research and Innovation:

1. the 'discovery' of new technology only
2. providing the right solutions for posed problems only
3. question the origin of the problem and the application of the solution

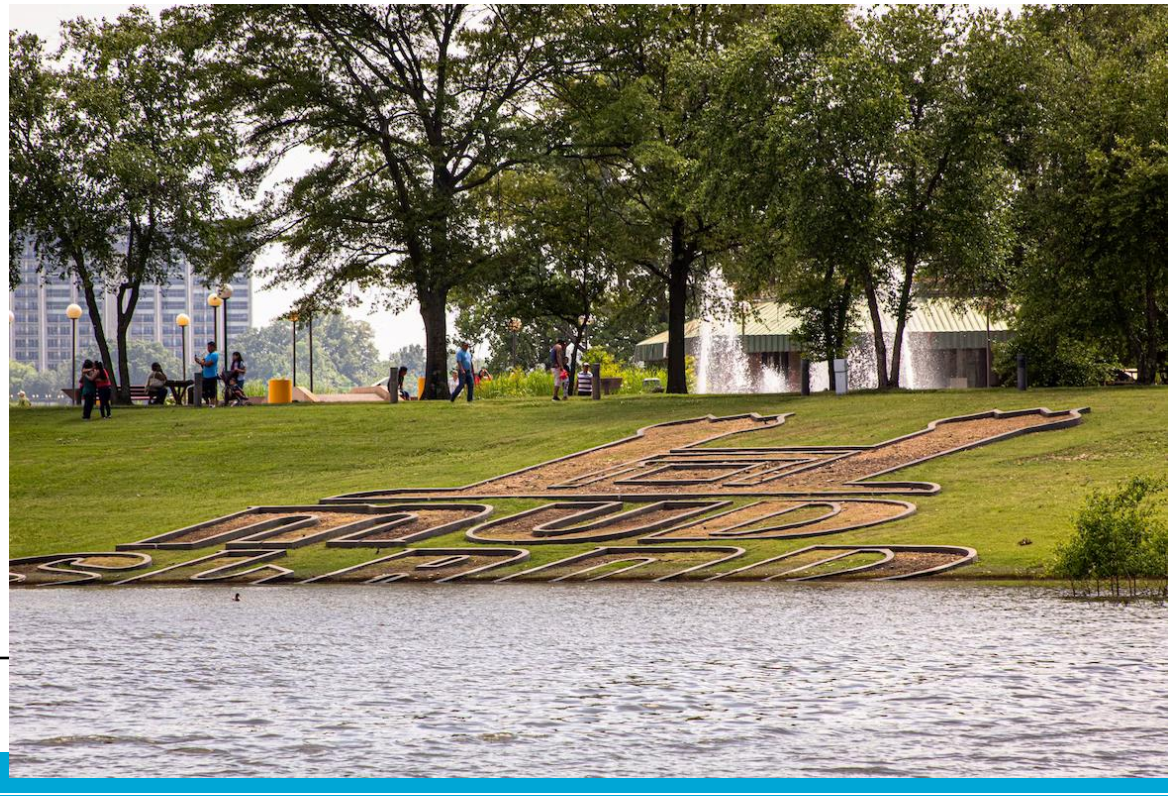
# 5. Responsible Research and Innovation

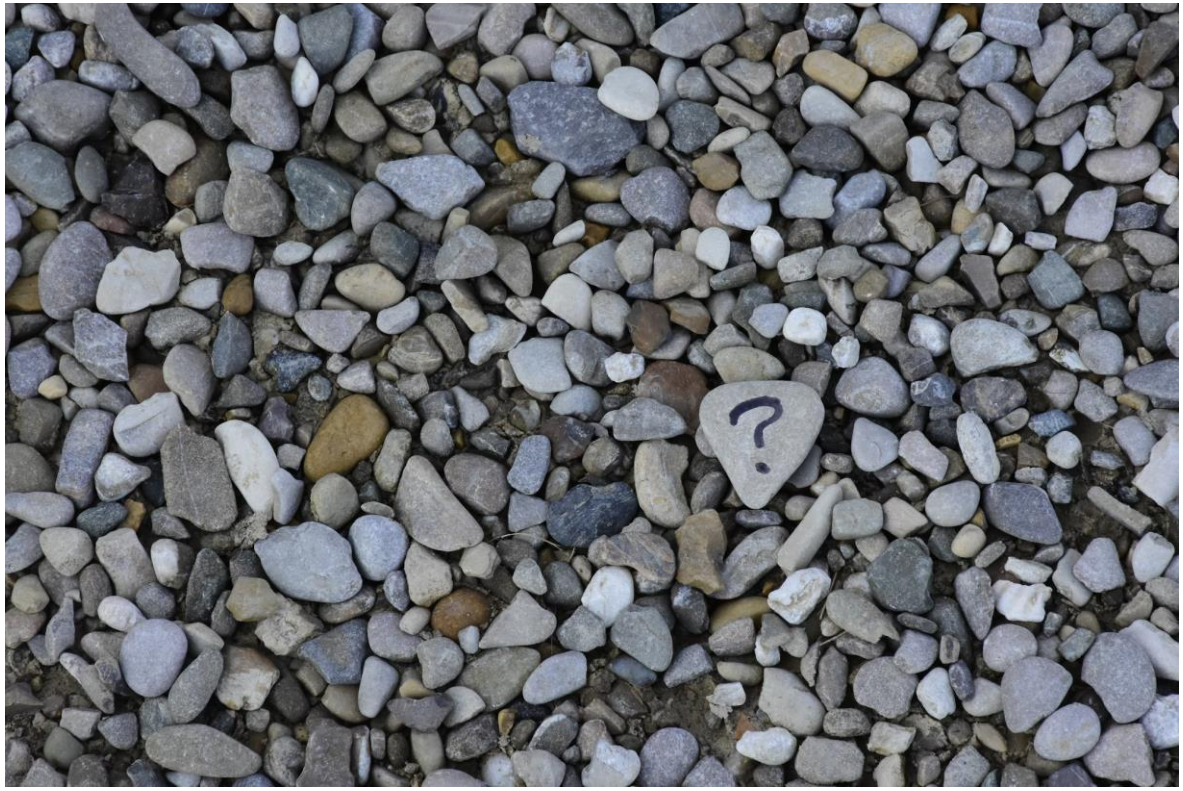
Please explain the muddiest point you identified!

# Please fill in the mud cards (1 minute) and return them to us!

1. What are the three things you learned today?
2. What are the two things you are still curious about?
3. What is the one thing you did not understand?

LOOKING FORWARD TO SEEING YOU AT WORKSHOP III





We answer your questions during the workshops.