

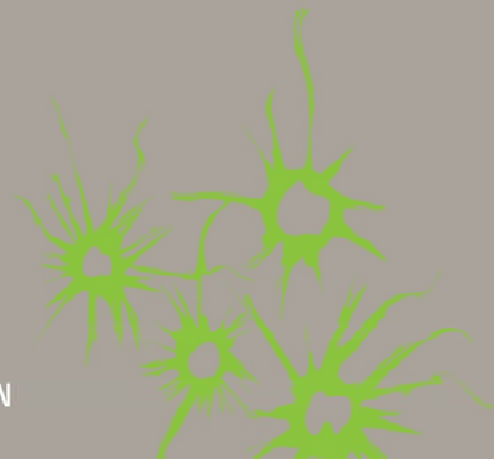
UNIVERSITY OF TWENTE.

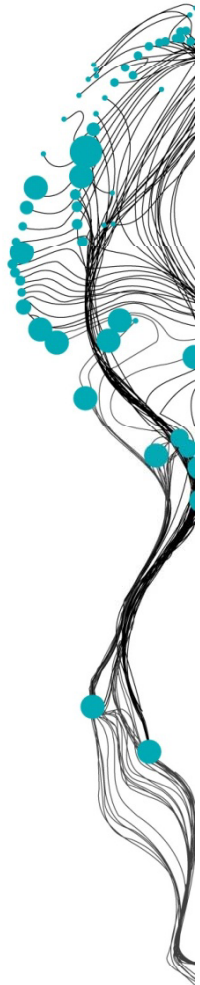
# RESEARCH WORK PLAN DEVELOPMENT AND SCIENTIFIC WRITING

JANNEKE ETTEMA EN DINAND ALKEMA



FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION

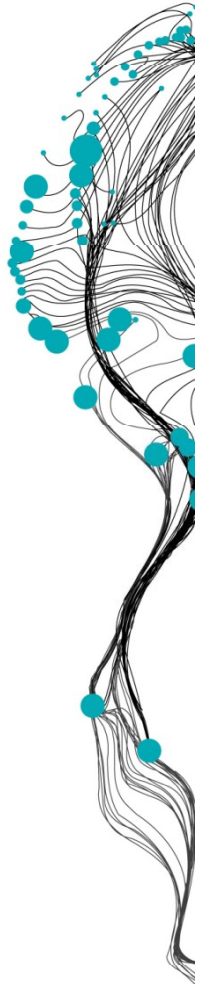




## PROFESSIONAL SKILLS

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1. Research work plan, development and scientific writing
2. Research ethics
3. Valorization of scientific results
4. Dissemination of scientific results to the public
5. Writing research grant proposals
6. Project management



## LAYOUT AFTERNOON

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- Introduction – Science characteristics (Janneke)
- Research – Research proposal (Janneke)
- Research – Research skills (Dinand)
- Information – Literature review, scientific writing (Janneke)



# CHARACTERISTICS OF SCIENTIFIC KNOWLEDGE

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- Self-criticism

- **Never “complete”**
- Built-in mechanism to **check and revise**
- **Self-consistent**, same methods used to reach conclusions can be used to challenge or revise them

# CHARACTERISTICS OF SCIENTIFIC KNOWLEDGE

---

- Self-criticism
- Evidence based
  - Knowledge is built up step-by-step from **experience**
  - Not deduced from abstract ideas how the world “should” work or “wisdom”

Science knowledge advances by **accumulating more evidence**



# CHARACTERISTICS OF SCIENTIFIC KNOWLEDGE

---

- Self-criticism
- Evidence based
- Theory based
  - Science is not a disorganized collection of facts
  - Explaining the world
  - So, must construct **theories** (so called **models**) that explain available evidence

Scientific knowledge advances by **constructing better theories** from the available evidence



# CHARACTERISTICS OF SCIENTIFIC KNOWLEDGE

---

- Self-criticism
- Evidence based
- Theory based
- Transparent
  - All **methods** used in scientific investigation ...
  - And all **results** of applying the methods ...
  - Must be unambiguously **specified** and **communicated**

## IMPLICATIONS OF THESE CHARACTERISTICS

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- Reproducible
- Traceability
- No occult (hidden) knowledge
- No appeal to authority
- Not prescriptive





## STRUCTURE OF RESEARCH

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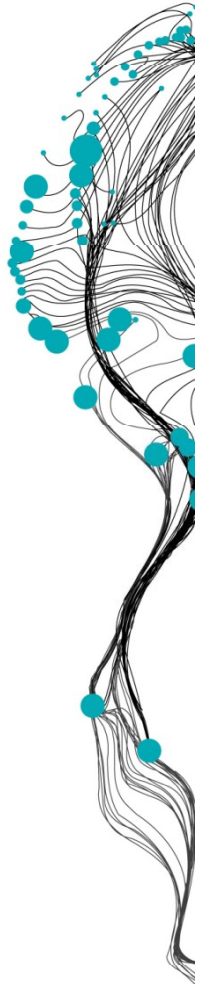
- Raising **questions**
- Providing **evidence** to answer these questions; appropriate **methods**
- Making **claims**:
- A **discussion** of the **reliability** and **relevance** of the claims

**Questions » Evidence » Claims » Context**

# RESEARCH STAGES

---

1. A **reconnaissance** stage of unstructured observations
2. A **reflective** stage, during which **hypotheses** are generated
3. A **testing** stage, where experiments or structured observations are designed to verify these hypotheses



# PHD PROPOSAL FORM AT ITC

---

## 1. Project description

- Topic
- Objectives
- Scientific importance
- Possible applications of anticipated results

## 2. Scientific objectives of this study

## 3. Innovativeness in proposed study

# PHD PROPOSAL CONT'D

---

## 4. Research description

- Problem definition, research objectives, research questions, research hypotheses
- Specific scientific significance and innovative aspects
- Study areas
- Research methodology and technical feasibility
- Cooperation with (inter)national universities/research groups and links with (inter)national research programmes
- (Potential) users of the results of the project and their involvement



## PHD PROPOSAL CONT'D

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5. Optional: Intentional use of satellite instruments or other space facilities yield data, and how to gain access to facilities
6. Intentional other data sets and how they will be acquired
7. List of anticipated ISI journal publications, book chapters conference presentations
8. Breakdown of funds (material, travel, etc.)
9. Motivation of requested funds



## PHD PROPOSAL CONT'D

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10. Brief *curriculum vitae* of yourself (as PhD candidate) indicating how your expertise fits the proposed project; strengths and weaknesses in relation to executing the project
11. List of courses you intend to take
12. Give list of potential MSc research topics that can be linked to the PhD project



# PROPOSAL

---

1. Project description
2. Scientific objectives of this study
3. Innovativeness in proposed study
4. Study description
5. Optional: Intentional use of satellite instruments
6. Intentional other data sets
7. Reference list
8. Breakdown of funds
9. Motivation of requested funds
10. Brief *curriculum vitae* of yourself
11. List of courses you intend to take
12. Give list of potential MSc research topics



# QUESTIONS SO FAR?





# DINAND - CONTINUE





## INFORMATION

---

“Information is power. The more one knows, the more one will be able to control events”

- Francis Baron (1597)

- Information has become a vital resource for world economies, and drives research.
- Information is highly **synergistic**; the more information one has, the more information one can generate

Information is certainly the basic component of any **research** project

# INFORMATION OVERLOAD

---

Many resources and in many formats

- Printed text
- Television
- Videos
- Library databases
- Websites

Question: How to avoid **information overload?**

Answer: with a clear **information strategy**





## LITERATURE REVIEW

---

When proposing a research project:

1. Establish its **originality**

- Prove that the proposed work has not been done before

2. To place the proposed work in **context** (related work)

- How it fits in the “big picture”
- Related work done by others that influence the choices made for this research

3. To compare and justify the choice of **research methods**

- Methods used in similar studies
- Why some methods are preferred or appropriate in this research

# INFORMATION SKILLS

---

- **Awareness** (that we need reliable information)
- **Access** (how to find it)
- **Evaluation** (how to decide what is most relevant and reliable)
- **Use** (how to use it in our work)
- **Generation** (how to produce new information)



# INFORMATION SKILLS

---

- Find **relevant** and **accurate** information on research topic
- Relate these in a **literature review**



## STARTING POINTS FOR SEARCH

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- Keywords in **electronic resources**
- Content of **recent** issues of relevant **ISI journals**
- Reference lists in **research papers** in recent issues of **ISI journals**
- **Review papers**; each reference is placed in **context** with indication of **importance**
- Well-known **authors** in the field
- Reference lists in **textbooks, lecture notes, theses**



# JUDGING THE RELIABILITY OF WEB PAGES / RESEARCH

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- **Accuracy**
- **Authority**
- **Objectivity**
- **Currency**
- **Coverage**

To evaluate papers: use citation counts to evaluate papers  
(ScienceDirect, ISI Web of Science)







## 3-STEP APPROACH TO READING

---

### 1. **Comprehension** of what authors are saying

- Why was research done?
- What is new?
- What methods are used?
- What is result?
- Any case studies?
- What conclusions do they draw
- What are their recommendations

### 2. **Evaluation** of their claims

### 3. **Synthesis** and motivation for own research

## 3-STEP APPROACH TO READING

---

1. **Comprehension** of what authors are saying
2. **Evaluation** of their claims
  - How significant is research problem?
  - How significant is their contribution in solving the problem?
  - How valid is the approach? Assumption and limitations
  - How valid are the claims of success?
3. **Synthesis** and motivation for own research

## 3-STEP APPROACH TO READING

---

1. **Comprehension** of what authors are saying
2. **Evaluation** of their claims
3. **Synthesis** and motivation for own research
  - Put paper in broader context (a lot of reading and comparing)
  - What is essential research problem, and how well is it addressed?
  - Could research be improved?
  - Are there other approaches to the research problem?
  - Could deeper analysis give additional insights?
  - Can you think of stronger argument for the claims made?
  - Can you make argument against it?
  - Are results valid in wider context?
  - What are unsolved problems related to this research

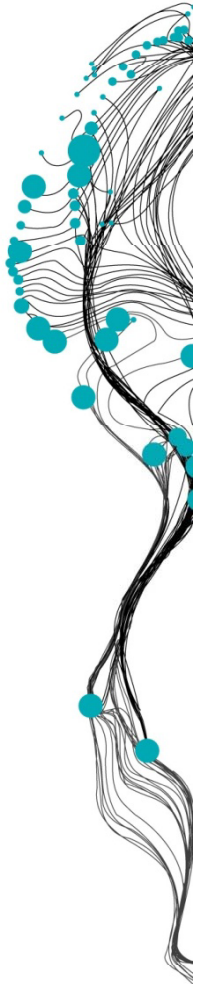
## 3-STEP APPROACH TO READING

---

1. **Comprehension** – time consuming but it is straight-forward
2. **Evaluation** – requires strong background and critical reading
3. **Synthesis** – directly motivates your own research

Note: your readers do approach your paper accordingly





## CRITICAL READING - ASSIGNMENT

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- What is your strategy to “attack” a paper?
  - What would you read first?
  - Would you read the full article?

5 minutes for yourself

5 minutes to compare with neighbor

# CRITICAL READING

---

## 1. First **skim**

- **Purpose** of the research paper >> its relevance
- Read title, keywords, authors, abstract, figures and structure

## 2. Then **go deep** as necessary

- Extract the information you need, evaluate it
- Read introduction and identify objectives and questions
- Read conclusions, methods, results

## **Climate change impact on flood hazard in Europe: An assessment based on high-resolution climate simulations**

Rutger Dankers<sup>1</sup> and Luc Feyen<sup>1</sup>

Received 17 December 2007; revised 16 June 2008; accepted 23 June 2008; published 8 October 2008.

[1] Global warming is generally expected to increase the magnitude and frequency of extreme precipitation events, which may lead to more intense and frequent river flooding. This work assesses the implications of climate change for future flood hazard in Europe. Regional climate simulations from the HIRHAM model with 12-km horizontal resolution were used to drive the hydrological model LISFLOOD, and extreme value techniques were applied to the results to estimate the probability of extreme discharges. It was found that by the end of this century under the Special Report on Emission Scenarios (SRES) A2 emissions scenario in many European rivers extreme discharge levels may increase in magnitude and frequency. In several rivers, most notably in the west and parts of eastern Europe, the return period of what is currently a 100-year flood may in the future decrease to 50 years or less. A considerable decrease in flood hazard was found in the northeast, where warmer winters and a shorter snow season reduce the magnitude of the spring snowmelt peak. Also in other rivers in central and southern Europe a decrease in extreme river flows was simulated. The results were compared with those obtained with two HIRHAM experiments at 50-km resolution for the SRES A2 and B2 scenarios. Disagreements between the various model experiments indicate that the effect of the horizontal resolution of the regional climate model is comparable in magnitude to the greenhouse gas scenario. Also, the choice of extreme value distribution to estimate discharge extremes influences the results, especially for events with higher return periods.

**Citation:** Dankers, R., and L. Feyen (2008), Climate change impact on flood hazard in Europe: An assessment based on high-resolution climate simulations, *J. Geophys. Res.*, *113*, D19105, doi:10.1029/2007JD009719.

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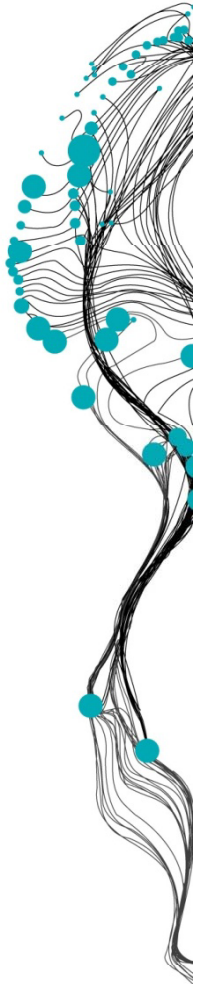
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<sup>1</sup>Institute for Environment and Sustainability, Joint Research Centre, Ispra, Italy.

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## SCIENTIFIC WRITING - ABSTRACT

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### Importance of abstract:

- The abstract is often the only part of your work that will be read
  - Availability
  - Limited time of reader
  
- The abstract is used by many readers to decide whether to read the whole paper
  
- Some readers only need the most important information from the paper – main results or methods

# AUDIENCE FOR ABSTRACT

---

- Colleague researchers in the same research field
- Colleague researchers in related fields

Not:

- Policy makers
- General audience



## COMMON ABSTRACT STYLE – MINIATURE PAPER

---

- Everything that is important in the paper goes in the abstract
- Abbreviated
  - No room for detailed reasoning
  - No room for justification
- Compact writing:
  - Omit: “the results show that ...”, “the analysis reveals”, etc
  - Sentences from the paper are generally condensed
- Be specific
  - Not: “accelerated soil erosion is recognized as a serious problem in many of the world’s poorer areas”
  - Instead: “accelerated soil erosion in the Shiyan watershed has doubled since the abandonment of tradition cultivation practices in the late 1980s”

# FORMAT ABSTRACT

---

Usually:

- One continuous paragraph
- Limit of 250 to 300 words, depending on journal;
- No citation
- No formulas

Check journal prescriptions in Authors instructions



# STRUCTURE OF ABSTRACT

---

- Rationale (motivation, context) – 5%
- Hypothesis and objectives – 15%
- Methods – 25%
- Results and discussion – 40%
- Conclusions – 15%

These are not labeled as such in the abstract



# STYLE POINTS

---

- Compact writing:
  - Omit: “the results show that ...”, “the analysis reveals”, etc
  - Sentences from the paper are generally condensed
  
- Be specific
  - Not: “accelerated soil erosion is recognized as a serious problem in many of the world’s poorer areas”
  - Instead: “accelerated soil erosion in the Shiyang watershed has doubled since the abandonment of traditional cultivation practices in the late 1980s”



# STYLE POINTS

---

- Compact writing:
- Be specific
- The abstract must stand alone
  - No references to main text
  - No references to tables or figures
- Limit use of abbreviations
- Do not include citations, unless main purpose is to discuss another work

## Climate change impact on flood hazard in Europe: An assessment based on high-resolution climate simulations

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# CRITICAL READING

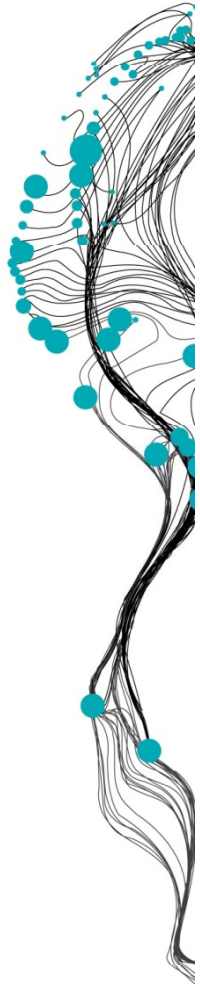
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## 1. First **skim**

- **Purpose** of the research paper >> its relevance
- Read title, keywords, authors, abstract, figures and structure

## 2. Then **go deep** as necessary

- Extract the information you need, evaluate it
- Read introduction and identify objectives and questions
- Read conclusions, methods, results



# STRUCTURED TECHNICAL WRITING

---

Example: stereotypical research letter

1. Abstract
2. Introduction
3. Material & methods
4. Results
5. Discussion
6. Conclusions

Not rule: e.g. in a *Nature* letter the main conclusion comes first

# EXPANSION IN RELEVANCE

---

1. Abstract
2. Introduction
3. Material & methods
  - 3.1 sampling design
  - 3.2 field methods
    - 3.2.1 ...
  - 3.3 ....
4. Results
5. Discussion
6. Conclusions



## SECTIONS VERSUS PARAGRAPHS

---

- Sections go deeper into a topic than a paragraph
- Sections consider several closely related aspects of a topic; a paragraph makes one point only
- Sections usually require several paragraphs

There are different ideas on the maximum length of a paragraph, and what constitutes “one” point; finally it is a matter of style and opinion

# HOW WOULD YOU STRUCTURE YOUR INFORMATION?

---

- Where do you start?
- How to get to the actual text?



# WRITING PARAGRAPHS BY TOPIC SENTENCES

---

- Each paragraph has a narrow-defined topic
- The topic sentence technique is to
  - Write a sentence that introduces the topic of the paragraph, and
  - Leave the details of that paragraph for following sentences

Note: readers will skim the document exactly this way



## EXAMPLE TOPIC SENTENCE

---

This text is adapted from Leisz *et al.*, *Agricultural Systems* 85:340; the original text has citations where appropriate.

“In large areas of the Vietnamese uplands, swidden agriculture (also known as slash-and-burn or shifting cultivation) is thought to constitute the most serious threat to the natural environment.”

This sentence already tells us the area, landuse, and problem which will be further worked out in following sentences.

Note the phrase “thought to constitute”, this is key to the topic; compare the topic if this were “constitutes”.



## EXAMPLE FILLING SENTENCES

---

“This viewpoint is found in many places throughout the world and across all of Southeast Asia, causing the practice to be outlawed at various times in almost every country in the region.”

“The Vietnamese government has subscribed to this belief and has repeatedly attempted to prohibit its practice through a major program intended to ‘sedentarize’ upland populations.”

“Despite heavy expenditures, this program has enjoyed little success, because it is unable to provide the swiddeners with alternative methods of earning livelihoods that are commercially viable, culturally acceptable, and ecologically sustainable.”



## STRUCTURE OF SENTENCES WITHIN THE PARAGRAPH

---

Sequence of filling sentences, which build the argument:

**viewpoint >> action >> consequence of that action**

The reader is now prepared for the next paragraph; topic sentence;

“The composite swiddening agriculture system is an alternative farming system that appears to overcome these problems.”



## SUMMARY

---

- Scientific papers and proposals has a clear and logical structure
  - Problem statement, objectives, research questions methods, results, discussion, conclusions, recommendations
- Literature reading
  - First skim, than into detail, but also stop when not relevant
- Scientific writing
  - Make sure it the reader easy as possible
  - Write condense and structured, the more is not always better

## SOME FINAL COMMENTS

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- Learn from other authors (good and back things)
- For most of us: writing is not natural, so practice as much as possible
- Good luck with writing papers and your proposal!!!

