

Recipes for cooking a successful research paper

Preparing and publishing a manuscript for a peer-reviewed international journal

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What you might learn

- Common standards for scientific papers
- Guidelines for creating (more) professional MSs
- Techniques that help in writing
- Recommendations about the (mis)use of illustrations, tables, references
- Suggestions about how to make use of referees
- BUT this all is just “technology”

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What you will NOT learn here

- How to perform your research
 - I assume that there exist enough material for a peer-reviewed publication
- What exactly is important/hot/promising in your field
 - I assume you are good experts in what you are doing
- How to translate the MS from your language to English
 - I assume that you have good command of English
 - or a perfect friend among native speakers
- Though, there will be hints about the use of commonly accepted styles of scientific writing

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Going step by step

- Before you start writing
 - What is scientific publication? Who are its authors? Publishing ethics. Scholarly journals. Citing others. Impact factor. The story, message, carrier, target group.
- Writing: the simplest step of publication
 - Structuring the manuscript: IMRAD. Titles and subtitles. The role of and rules for Abstract, Introduction, Theory, Methods, Results, Discussion, Acknowledgements.
- Supporting and publishing the written message
 - Figures. Figure captions. Mandatory images. Design principles. Tables. Internal and external links & cites. Final formatting. Keywords. Highlights. Submission. Nasty and helpful referees. Proofs.

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Lecture 1

Before you start writing

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Peer-reviewed international publications

- The highest level of scientific output
- Some journals have better reputation than others
- Journal “impact factor” is now important
- Most have specialist topics

Choose your aim:

- Just to get a “listed” or “indexed” publication?
- To make maximum scientific impact?
- Earn a PhD and quit the academic world?
- Stay in science?

Relax: the amount of work to publish a paper is almost the same

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Publication and science in short

- Science (*scientia* = knowledge) – a **systematic** enterprise that builds and **organizes** knowledge in the form of testable explanations and predictions (Wikipedia)
- Aristotle: the body of **reliable** knowledge, of the type that can be logically and rationally explained
- Modern use: often refers to a **way of pursuing** knowledge, and not the knowledge itself.
- A scientific method seeks to explain the events of nature **in a reproducible way**
- Scientific journals **communicate and document** the results of research carried out in universities and various other research institutions, serving as an archival record of science.

Corollary: [science is]

- obtaining new, essential knowledge
- AND communicating it to others
- by reliable, well-documented means: research papers

The peers who review?

- People who are equal in such respects as age, education or social class etc., as in peer group
- A member of the peerage, a system of honours or nobility in various countries
- A variant of Peter (name) in Scandinavian and Dutch languages
- Partnership for European Environmental Research, a network of seven large European environmental research centres
- Public Employees for Environmental Responsibility, an organization of anonymous public employees promoting environmental responsibility
- Partnership for Economics Education and Research
- Peer, Belgium
- Peer Gynt, a play; and character by Henrik Ibsen
- PeerMade.info, an organization in India working on Nature Conservation
- Peer Leadership Program, an organization that promotes team building and easing school transitions
- Peer-to-peer computer network, (a participant of), in which participants act as both client and server
- a network entity with which one performs peering operations
- Shahar Pe'er, an Israeli professional tennis player
- Peer van der Burgh Dutch accordion player and singer

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The peers who review?

- **A member of the peerage, a system of honours or nobility** in various countries
- Two or three renowned **experts** in the narrow field to read your paper
- Free feedback, recommendations, suggestions for improvement
- Frequently substantial help:
 - proper interpretation of the results
 - removing errors
 - adding implications, potential applications
- [rarely nasty comments, unfair treatment]

The meaning of peer-review

- A quality control mechanism
 - MS sent to editor
 - Objective assessment from "anonymous" `peers`- usually 2, in some journals 3-5
- Reviewers normally unknown
 - You can recommend a suitable reviewer
 - Some journals: you can say who should not review

The Review Process

- Reviewers make recommendation
- Reviewers should be objective
- Some reviewers more dedicated than others
- Editors make the decision – normally follow the reviewers recommendation
- This process can take some time!

Time scales for planning

- [Research work: undefined]
- Planning, writing, drawing 2 months
- Sleep on it > 1 week
- Final polishing 2 weeks
- Language edit 1 week
- Submission, cover letter 2 days
- Review 2-4 months
- Revised version 1 month
- Acceptance 2 weeks
- Proofs 1 month
- Published on-line (optionally) 1-2 weeks
- Finally out of print 1-16 months

Eligible for the use in PhD thesis

Total: expect >1 year

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The eternal dilemma

To write or not to write

When to start writing?

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The importance of planning or the difference between a human and monkey?

- No field of research is superior to other fields
 - Forget the eternal fight between basic and applied research
- There is only good research and poor research
- A good research has a good plan
 - A premise (=an assumption that something is true)
 - Developing a theory
 - Designing of experiments (field/device/computer)
 - To prove or disprove the premise
 - in a reproducible way
- This completes a STORY: a printed paper is a good story you tell to your remote friends and colleagues
- A story has an essence or message or moral
- A good paper is written to express a message that exist before you start writing

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The importance of the message

- A scientific publication = making public something important and new
- This means: the authors understand what they do; and
 - are able to express it properly
- A paper = proof that the story is true

Formulating THE MESSAGE

- Make sure that the material has (some) impact
- Formulate clearly WHY you write this paper
 - Maximally 3-4 lines
 - Oversimplify if necessary – but make the point very clear
 - Hint: Think of one sentence to describe this paper after 10 years
- Estimate where the impact could be
 - (is there at least one potential reader in the world?)

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Example of a good message

While the subject is not new (transfer of offshore wave information to a more coastal location),

we have done a keen analysis of the accuracy involved in the process, **focused** on the transfer of information at the border.

The analysis **shows** that the commonly used practice of [...] is prone to lead to a non negligible underestimate of the conditions at the coast.

The use of 2D spectra as boundary information is highly recommended. At a lower rate, also using 1D spectra may lead to underestimate. This is also true if the offshore information is provided by a model different by the one locally used.

You have to know what you are doing

The key outcome: why do you write

Why this is important? How it can be used?

L. Bertotti and L. Cavaleri, Journal of Marine Systems

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The appearance of the message may vary

We develop a modified measure of compressibility of sea surface

reflecting clustering of tracers

and calculate compressibility maps for the Gulf of Finland in a systematic manner

Kalda et al., Journal of Marine Systems, on-line

A new measure to quantify something what we can commonly observe

The key outcome: maps of this measure calculated

A new measure is always important

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AIMS of scientific publication or how can you exploit the message?

- To prepare a manuscript for international publication
- To get maximally wide distribution == readership
- To make maximum scientific impact
- Consequently: to publish in a right place
- Based on (i) message, (ii) target audience

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The Journal

DO:

- Select the journal appropriate to the publication matter
- Seek widest readership for your research
- Seek journal with best impact factor in your specialty
- (Check page fees if you are on low budget)

Do NOT:

- Publish serious results in sub-standard sources

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Features of serious journals

- International publisher and distribution
- Present at many libraries
- (Tough selection procedure)
- The outcome:
 - Read by many
 - Used by many in their research = impact
 - Cited by many = large Impact Factor
- (and your paper will be eventually read and used by many)

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Measuring Impact Factor

- A research paper cannot contain everything about the past
- It relies on results of previous studies
- The existing pools of knowledge is depicted using citing of earlier research papers and monographs
 - (More about citing in Lecture 3)
- Doing so
 - saves space & efforts
 - credits the earlier research
 - makes possible to measure the impact of earlier studies

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Impact Factor: what you need for counting

- Major databases
 - ISI Web of Science (US-biased)
 - Used in Estonia by default for ranking
 - SCOPUS (from 1996 onwards)
 - Used in Australia by default
- Link the research papers & monographs with their citations
- Count #citations for each paper, researcher, year, institute, country, etc.
 - There are similar tools such as *Publish or Perish*
 - Formal numbers are different
 - But the overall (normalised) ranking of journals, publishers, institutes, etc., is very stable

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The benefit of using /being in/ a database

- **Visibility first!**
 - Your research headlines (message, short story) will be available in search engines
 - Easy to find similar papers
 - A MUST today
- Easy to find appropriate journals
 - Papers on topic similar to your message
- A superb source of information about existing research
 - A serious paper is unthinkable without an extensive search in ISI, SCOPUS, INSPEC, etc., depending on the field
 - Google Search contains a lot of noise

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ISI Impact Factor

- Calculated on annual basis
- Accounts for two previous years
- IF 2010:
 - A = Counts papers published in 2008-2009
 - B = Counts citations to these papers in 2010
 - IF=B/A
- Example: *Journal of Marine Systems*, IF2010
 - 208 papers in 2008, 192 in 2009; total 400
 - Cites in 2010 to papers in 2008 & 2009: 355+447
 - Impact Factor 2010: (355+447)/400=2.005

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Top 15 journals

		Citations in 2010	Impact factor
1	CA-CANCER J CLIN	9804	94.333
2	ACTA CRYSTALLOGR A	13946	54.333
3	NEW ENGL J MED	227679	53.486
4	REV MOD PHYS	29872	51.695
5	ANNU REV IMMUNOL	16100	49.271
6	NAT REV MOL CELL BIO	26838	38.650
7	NAT REV CANCER	26729	37.184
8	NAT GENET	76301	36.377
9	NATURE	511248	36.104
10	NAT REV IMMUNOL	21080	35.196
11	LANCET	155736	33.633
12	CHEM REV	88391	33.036
13	NAT REV GENET	18519	32.745
14	CELL	167591	32.406
15	SCIENCE	469815	31.377

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The range is enormous

		Citations in 2010	Impact factor	Papers
8000	WOCHENBL PAPIERFABR	52	0.021	91
8002	ACTA BIOETH	17	0.020	
8002	REV ECUAT NEUROL	9	0.020	0
8002	REV FAC CIENC AGRAR	17	0.020	17
8005	POWER ENG-US	37	0.018	74
8006	PCI J	269	0.017	6
8007	J I TELECOMMUN PROF	1	0.016	8
8008	COMPUT GRAPH WORLD	16	0.014	66
8009	TCE-THE CHEM ENG	20	0.010	76
8010	RUSS J CARDIOL	1	0.006	103
8011	NAV ARCHIT	16	0.005	189
8012	ACTA MEDICA MEDITERR	2	0.000	0
8012	B STOR SCI MAT	12	0.000	4
8012	CARDIOVASC THER PREV	2	0.000	132
8012	CONNECTOR SPECIFIER	3	0.000	
8012	HYLE	27	0.000	6
8012	INT J OPHTHALMOL-CHI	1	0.000	68
8012	J HOPKINS APL TECH D	192	0.000	74
8012	MINERVA ORTOP TRAUMA	14	0.000	49
8012	NUCL PLANT J	17	0.000	34

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Iteration process towards a right journal: Example of a paper about coastal engineering

- Go to ISI Web of Knowledge **Additional Resources**
- Choose **Journal Citation Reports**
- View a group of journals by **Subject Category**
- Select one or more, e.g. **Engineering, Civil**
 - Resulting list: 115 journals
 - Sort by **Impact Factor**

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Top 15 in Civil Engineering

1	EARTHQ SPECTRA	3.744
2	J HAZARD MATER	3.723
3	J CIV ENG MANAG	3.711
4	COMPUT-AIDED CIV INF	3.170
5	J HYDROL	2.514
6	BALT J ROAD BRIDGE E	2.436
7	IEEE T INTELL TRANSP	2.258
8	WATER RESOUR MANAG	2.201
9	BUILD ENVIRON	2.131
10	TRANSPORT RES B-METH	2.091
11	ENERG BUILDINGS	2.046
12	TRANSPORT RES E-LOG	1.954
13	TRANSPORTATION	1.875
14	STOCH ENV RES RISK A	1.777
15	STRUCT SAF	1.770

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Time for remarks

- Impact Factor 2 is already quite high?
- A local journal (Baltic J Road Bridge Eng) may be a top journal
- *Civil Engineering* (115) has an equal number of journals with, e.g. *Applied Physics* (118)
- 2x more than *Water Resources* or *Analytical Chemistry*, 2.5x more than *Oceanography*
- The IF of the 20th best *Civil Engineering* journal is much higher than the 20th of *Oceanography*

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Iterating further

- View Category Summary List
 - Rankings should be normalised
 - Median value gives some flavor about the “typical” journal **in the category**
- Median Impact Factor = 0.63
 - A good journal is with $IF > 1$
 - Journals with $IF < 0.5$ are close to substandard
 - But not always, e.g. *Journal of Coastal Research*
 - Hands off from journals with $IF < 0.3$!
 - (often mentioned negatively in reviews of proposals)

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High-quality journals

- Many sponsors require the core publications to be in the top 1/4 of the journals in a category
 - Calculate the threshold roughly from the list
 - Find the journal and check the rating:
 - E.g. *Ocean Engineering* – click on the name
 - Click Journal Ranking

Category Name	Total Journals in Category	Journal Rank in Category	Quartile in Category
ENGINEERING, CIVIL	115	38	Q2
ENGINEERING, OCEAN	15	4	Q2
OCEANOGRAPHY	59	38	Q3
WATER RESOURCES	76	43	Q3

Facit: generally a good journal, IF well over the median, ranked as average (Q2-Q3); for the field of ocean engineering well above average

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Ready with a list of journals?

- Go to webpage of each journal
- Look for two items:
 - Scope
 - Guide for authors
- Two decisions to be made:
 - The journal
 - The authors

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Defining authorship is a part of publishing ethics

http://www.elsevier.com/wps/find/intro.cws_home/publishing

- The publication of an article in a peer-reviewed journal is an essential building block in the development of a coherent and respected network of knowledge.
- It is a direct reflection of the quality of the work of the authors and the institutions that support them.
- Peer-reviewed articles support and embody the scientific method.
- It is therefore important to agree upon standards of expected ethical behavior for all parties involved in the act of publishing:
 - the author,
 - the journal editor,
 - the peer reviewer,
 - the publisher and
 - the society of society-owned or sponsored journals.

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Authorship of the paper (Elsevier)

- Limited to those who have made a *significant contribution* to the conception, design, execution, or interpretation of the reported study.
- All those who have made *significant contributions* should be listed as co-authors.
 - Where is the difference?
 - Others who have participated in *certain substantive aspects* of the research project should be *acknowledged* or listed as contributors (see Acknowledgements in Lectures 2/3)
- The first/senior/corresponding author ensures that:
 - all appropriate co-authors (and no inappropriate co-authors) are included on the paper
 - all co-authors have seen and approved the final version of the paper and
 - have agreed to its submission for publication.

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Authorship issues: not always simple

- Normally first listed = “senior author”
 - => did most of the work and intellectual input
 - Sometimes: he/she needs it for PhD or CV
 - Some fields: the last author is the leader of the entire project
- Department Rule – include supervisor as author
 - controversial but frequently used:
 - Somebody takes care that there are funds for your salary/fellowship
 - A few words from a smart person save 100s of hours of work
 - The new funds depend on the length of CV of the project leader
- All authors must agree to be listed as author
- Always give all listed authors the MS to review and add additional intellectual input

(The sequence of authors: will be discussed later)

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Last-but-not-least items before you start writing: reporting standards and basics of ethics

- Research papers should present an **accurate account** of the work performed
- as well as an **objective discussion** of its significance.
- **Underlying data** should be represented accurately in the paper.
- A paper should contain **sufficient detail** and **references** to permit others **to replicate the work**.
- Fraudulent (**intentional deception**) or **knowingly inaccurate** statements constitute unethical behavior and are unacceptable.

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Other points of basics publication ethics (Elsevier)

- **Avoid multiple, redundant or concurrent publication**
 - Do NOT publish manuscripts describing essentially the same research in more than one journal or primary publication
 - (Conference proceedings are sometimes not considered as primary publication)
- **Acknowledge your sources**
 - Proper acknowledgment of the work of others must always be given.
 - Authors should cite publications that have been influential in determining the nature of their manuscript.
- **Thinking in terms of unique Message and Story** of the paper is helpful
 - Whether the publication is multiple or concurrent: visible from the difference of their Message and Story

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Ready to start?

Organise the tools

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The first/senior author (in ideal case)

- Obligations similar to a small project leader
- Has an overview of the entire material, message, story
- Divides & coordinates work between the authors
- Makes sure the conventions of the journal (formatting, citing, etc.) and ensures that they are kept
- Keeps the deadlines
- Produces the final "clean" version of the manuscript according to the journal guidelines (up to smallest details!)
- Learns how to submit the manuscript, creates additional material (highlights, Letter to the Editor, csv files for interactive images, etc.)
- Submits the MS and keeps track on the processing
-
- **HINT:** This is a LOT OF WORK

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Zoomed table of responsibilities

	PI	PII	PIII	PIV	PV	PVI
Original idea	KK	KK	KK	KK	DP, TK	KK
Study design	KK, PY, JP	KK	KK, TH, JP	KK, SK, JP	TK, KK, DP	KK, PH, UMH, TP
Data gathering	KK, PY	KK	KK, TH, JP, TH, TP	DP, AR	UMH, KK	
Data analyses	KK, JP, PY	KK	KK, TK, TH, JP, JV	KK, SK, JP	TK, DP, AR, SS	KK, PH, JA, SK
Responsible for manuscript preparation	KK, JP	KK	KK	KK, JP	DP, TK, LT	KK

J. Aitila (JA), T. Hannonen (TH), U.-M. Hyytiäinen (UMH), P. Härmä (PH), K. Kallio (KK), S. Koponen (SK), T. Kutser (TK), D. Pierson (DP), J. Pulliainen (JP), T. Pyhälähti (TP), A. Reinart (AR), S. Sobek (SS), L. Tranvik (LT), J. Vepsäläinen (JV), P. Ylöstalo (PY)

Corollary: at least PhD students have to specify and remember their role (and ensure that the co-authors agree with their viewpoint)

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The to-do list before writing

- Download several papers from the target journal
 - written by prominent scientists - native speakers
 - this helps keeping the journal conventions
- Make a compendium of the basic recommendations of the journal
 - Distribute it to all co-authors
- Convert the **message** to a **story**
- Create nomenclature and glossary

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After the choice of the journal:
Journal Format and Conventions

- Ensure familiarity with journal format and style **in all aspects**
- Follow journal convention for annotation and institution
- Do not expect the reviewers/editors to reformat your ms – especially references –
 - you will annoy them
 - you will be seen as lazy
 - Your chances will be smaller

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Convert the message to a story

- Start from the 3-4 line message
- Make a roadmap
 - write down a list of topics/themes/points
 - to be presented or proved consecutively
 - These themes/points will serve as starting points of sub-sections
- Separate
 - what other experts probably know
 - what is, technically, new but easy-to-reproduce or learn
 - e.g. wind speed or temperature tomorrow
 - **where is the key development**
- Make copies of the basic literature to be cited and keep them at hand during the writing process
- Do NOT
 - try to start writing the text as one piece from the beginning to the end

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Make a glossary;
keep track for **nomenclature**

- Good scientific English: less is more
 - Use always the same word for a particular item
 - Limit the use of synonyms
 - Define everything, and keep it!
- Many journals request a glossary of terms
- Highly recommended: create it anyway
 - Especially handy for multi-authored papers
 - Use short, concise explanations
 - If taken from somewhere, add exact reference
 - You need it for the list of keywords, literature search, etc.

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An example of glossary

Glossary A. Räämet, PhD thesis, 2010

Bathymetry. The description of water depths in oceans, seas and lakes. Bathymetric charts usually show seafloor relief by contour lines called isobaths.

Diurnal. A cycle that recurs after each 24 hours.

Fetch. The area over which waves are generated by the wind.

Fetch length. The horizontal distance in the direction of the wind over which wind waves are generated.

Frequency of the wave. The number of waves that pass a fixed point in a given time. The unit of frequency is Hertz, which means waves per second.

Fully developed sea. The sea state that forms under suitable conditions when the wind blows for a sufficient time over the open sea. The waves reach their maximum possible height for a given wind speed, fetch length and duration of the wind.

Geostrophic wind. The wind which results from the balance between the Coriolis force and the pressure gradient force above the friction layer. Blows parallel to air pressure isobars.

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Nomenclature and glossary

Nomenclature	
a	significant wave amplitude (resp. half of the significant wave height)
A, A_1	cross-sectional area of the river flow and of the upper layer, respectively
$A_w (= v/\omega)$	wave-induced bottom excursion amplitude
B_0	dimensionless upstream-section specific energy, $B_{0L} = B_0(L)$
b, b^*	bottom and interface elevation, respectively
dF_{drag}	boundary drag force per unit mass
D	undisturbed water depth

Laanearu et al., Nordic Hydrology 2007

- Nomenclature: description of the symbols
- Optionally with short explanations
- Sometimes merged with glossary

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Exercises at home:

1. Formulate a "message" for your next manuscript
 - No more than 400 characters
2. Identify 2-3 suitable journals for the MS
3. Build a roadmap for writing a full research paper
 - Approximately 10-15 sentences or bulleted points, each describing the key aspect to be presented or proved
 - Do not enter details, figures, formulae, etc.
 - Do not think in terms of subsection titles. Try to very shortly formulate the content of what you have to do. Estimate whether you need an image or table to support your point.
 - Try to keep the subsections of more or less equal length
 - Estimate how much work each point will take to be expanded into a subsection of ~1 page, <4000 characters
 - Sum up the result and multiply by a factor of 4. This will give you an estimate of work to be done until the first full draft.

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