

Infrastructure case study



Understand the interactions between optical fibers, humans and nature

1. Documents

In those documents, you will find informations to help you define the different interactions between this technical tool (optical fibers), humans (individual and global scale) and nature (fauna, flora, biogeochemical cycles). You are encouraged to focus on the main use of optical fibers, which is communications.

Please, do not read all the documents entirely. **You must specifically look for the informations you need :)**

Note : Some elements in the socio-historical domain are only available in French, because I did not find equivalents in English, I'm sorry. But the titles could help you investigate in the direction pointed by it - you may find what I did not!

General elements

- Presentation of optical fibers principle (video): [here](#)¹
- Presentation of optical fibers fabrication (video a bit outdated but gives an overall idea): [here](#)²
- Optical fibers (wikipedia article): [here](#)³
- Fiber-optic communication (wikipedia article): [here](#)⁴

Specifics on technical elements

- Life-cycle analysis (LCA) on optical fibers production: [here](#)⁵
- A bible on Sand mining: [here](#)⁶
- Germanium and its mineral commodity profile: [here](#)⁷
- Carbon footprint of networks: [here](#)⁸
- Ecological impact and sustainable development in FTTO (fibre to the office). Slides are really ugly, we're sorry: [here](#)⁹

¹ <https://www.youtube.com/watch?v=jZOg39v73c4>

² <https://www.youtube.com/watch?v=6CqT4DuAVxs>

³ https://en.wikipedia.org/w/index.php?title=Optical_fiber&oldid=989311477

⁴ https://en.wikipedia.org/w/index.php?title=Fiber-optic_communication&oldid=989407989

⁵ <https://drive2.demo.renater.fr/index.php/s/QrZICEA9j7moGNq>

⁶ <https://drive2.demo.renater.fr/index.php/s/kbm87Ds4Sji9yzY>

⁷ <https://pubs.usgs.gov/of/2004/1218/2004-1218.pdf>

⁸ https://www.arcep.fr/uploads/tx_gspublication/reseaux-du-futur-empreinte-carbone-numerique-juillet2019.pdf

⁹ <https://ecoinfo.cnrs.fr/wp-content/uploads/2015/01/2018-06-josy-ftto-ecoinfo.pdf>

Specifics on socio-historical elements

- Overall review of technical history of optical fibers: [here](#)¹
- Optical fibers at end of last century (the telecom boom, bubble, bust): [here](#)²
- The global challenges imbricated within sand use : [here](#)³
- Geopolitics of the submarine network of optical fibers: [here](#)⁴ & [here](#)⁵
- Economical activity linked to public investment in optical fibers: [here](#)⁶
- A bible on the sociology of the digital (at all scales!): [here](#)⁷
- Material socio-history of high frequency trading: [here](#)⁸

You can of course look for other sources of course to find information on optical fibers, but this should cover pretty much everything on the communication use of optical fibers. Good luck!

2. What to do

You don't have any lecture for this week. You only have some practical work to do with the previous lecture.

By project groups, try to build a little model of the interactions between human, nature and optical fibers along all the life cycle. It is a complementary point of view: last week, smartphones were a technical system with mostly complex internal structure and complex direct uses by individuals; this time, you'll work on a technical system with a quite simple internal structure and used mostly as an infrastructure for individual uses – which imply different HSN relations at different scales. You need to provide a table (the famous table you now know well!) with the different interactions.

2 mandatory rules to respect :

- Make sentences while completing the table (because when you only put words, I cannot always guess what you mean). Your table has to be understandable.
- Put sources for the different elements you add to the table.

¹ <https://drive2.demo.renater.fr/index.php/s/SB5BDqHKLJdozfR>

² <https://drive2.demo.renater.fr/index.php/s/2mMirqM4PrY4Kmj>

³ <https://drive2.demo.renater.fr/index.php/s/roCcdDQB34wcjg9>

⁴ <https://drive2.demo.renater.fr/index.php/s/HFQe84J8s896icp>

⁵ <https://drive2.demo.renater.fr/index.php/s/kK3Wkw3Rki987We>

⁶ <https://drive2.demo.renater.fr/index.php/s/DiLESwFPtY7GDnD>

⁷ <https://drive2.demo.renater.fr/index.php/s/NdXcqzaDGffpxSg>

⁸ <https://drive2.demo.renater.fr/index.php/s/AsEF2yHANWf9iBZ>

Here is an reminder of the table you need to fill in :

Technical system				S <=> N	N <=> H	S <=> H
Stages	Description	Cause / Consequence	Modeling scale			
First life cycle stage : Conception		Cause	Macro			
			Meso			
			Micro			
		Consequence / impacts	Macro			
			Meso			
			Micro			
...						

Table 1: human-system-nature interaction representation at different levels and along all the life cycle fo the technical system

Of course, in a few hours/days, it is very hard (not possible!) to model every interactions between optical fibers, nature and humans. Therefore, the aim of this work is not to construct an exhaustive table but to exercize yourselves, get a better understanding of the modeling process and help you being at ease with it. The system here being different of what you might have encountered before (with other tutorials and your project), it might help you take a new perspective on your project. Once I reviewed your work, I'll publish examples of interesting HSN tables (from this year or the previous one) for everyone. I'll highlight interesting elements , in order to help you for the final parts of your project.