SICT 2022 – DOCTORAL SCHOOL ON SUSTAINABLE ICT

Rethinking the Roles of Information and Communication Technologies in the Anthropocene: Towards a Post-Growth World?

From futureless growth to growthless futures

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Reflexions on economics and technology for post-growth societies

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What are the limits of technological innovation and what role can it play in a pathway to sustainable societies?

- Ecological crisis and green growth promises: what can we expect from technological innovation ?

- What kind(s) of research and innovation do we need for a post-growth era?

Ecological crisis and green growth promises: what can we expect from technological innovation ?

*« Green growth means **fostering economic growth and development**, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. To do this, it must catalyse **investment and innovation** which will underpin sustained growth and give rise to new economic opportunities.* »

(OCDE 2011)

$\Rightarrow$ Environnement seen as a « resource » to be optimized, with economic growth being the end

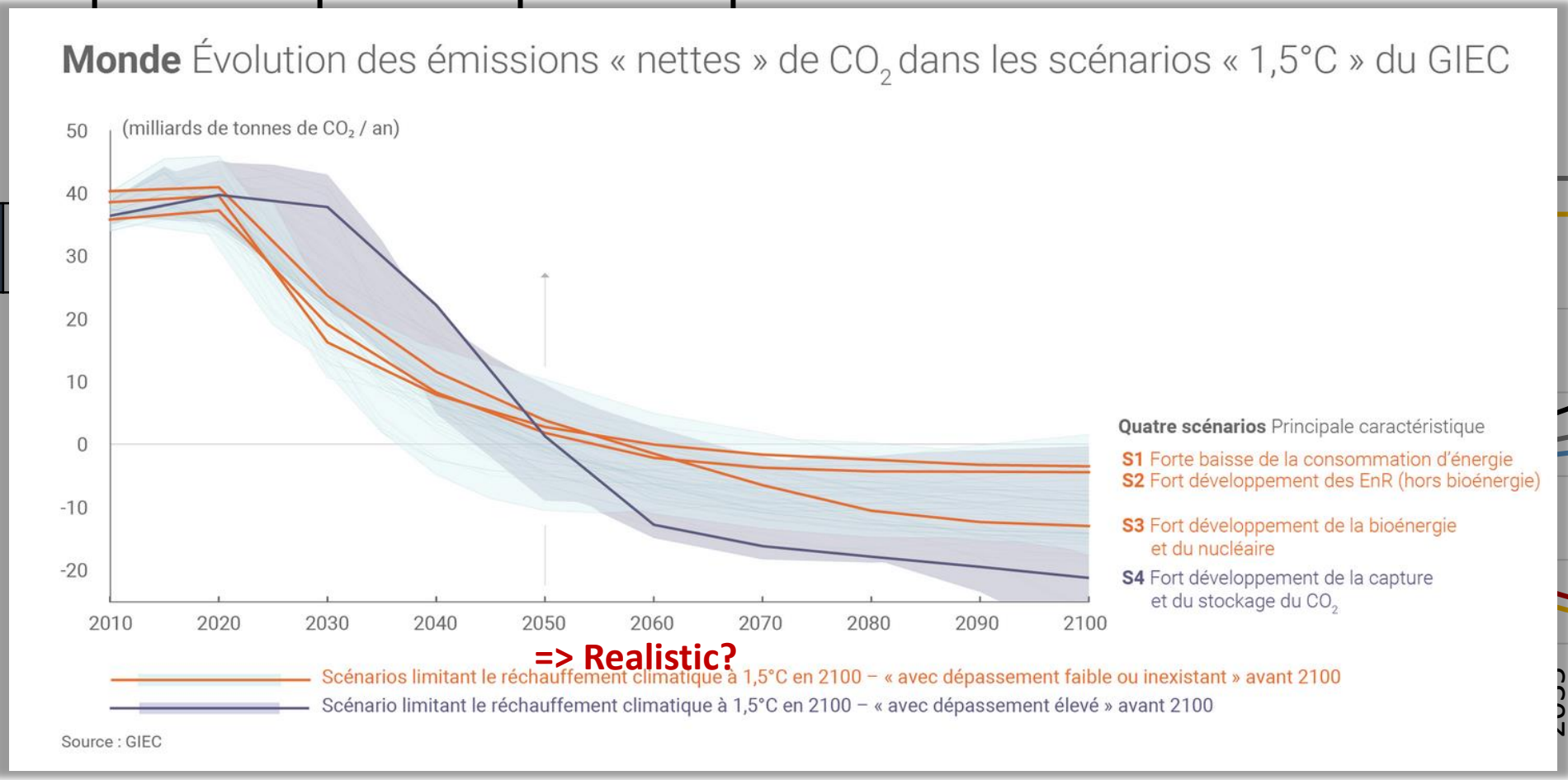
$\Rightarrow$ Pivotal role given to technological innovation and market mechanisms

➢ Some elements of context

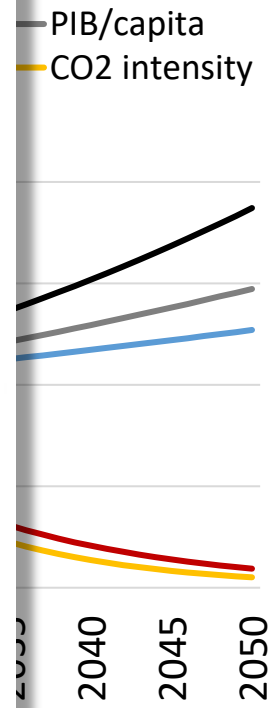
An example: climate change (global scale):

$$Population \times \frac{GDP}{Population} \times \frac{CO_2}{GDP} = CO_2 Emissions$$

2020-2050



=> Realistic?



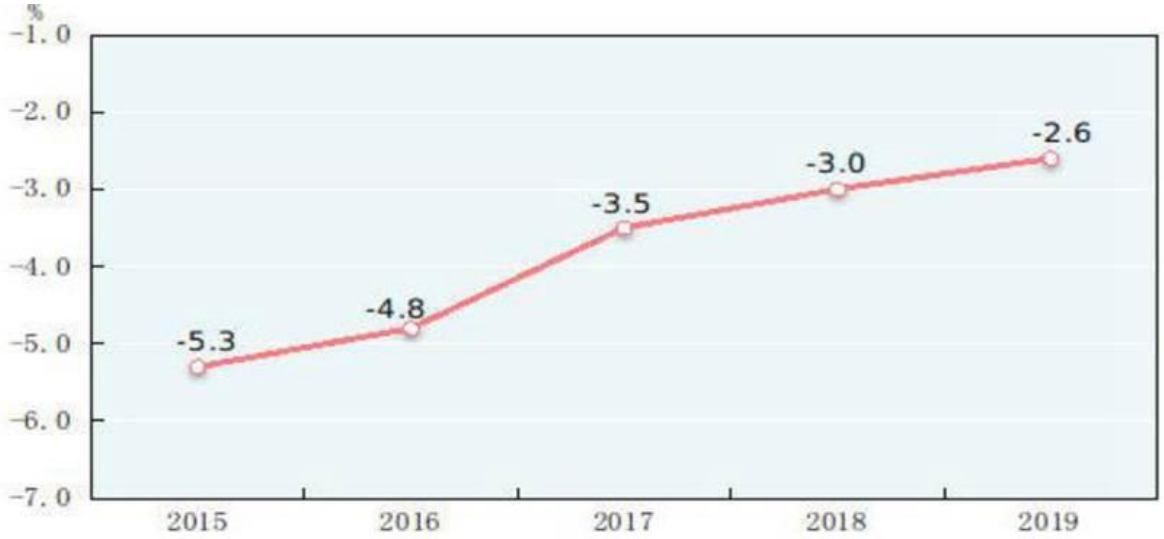
Technological innovation : myths and limits?

➢ Declining marginal gains from technological innovations

- « Reaping the low hanging fruits » : simplest solutions implemented first, then only remains the most costly, complex, least applicable (unless « technology leaps » happens..-> rare!)

- Absolute physical limits: eg. applies to energy efficiency
  ex: theoretical yield of a thermodynamic cycles, etc.

Ex: Annual improvements in energy intensity, China, 2015-19 (Unit. %)



Source. IEA based on National Bureau of Statistics of China

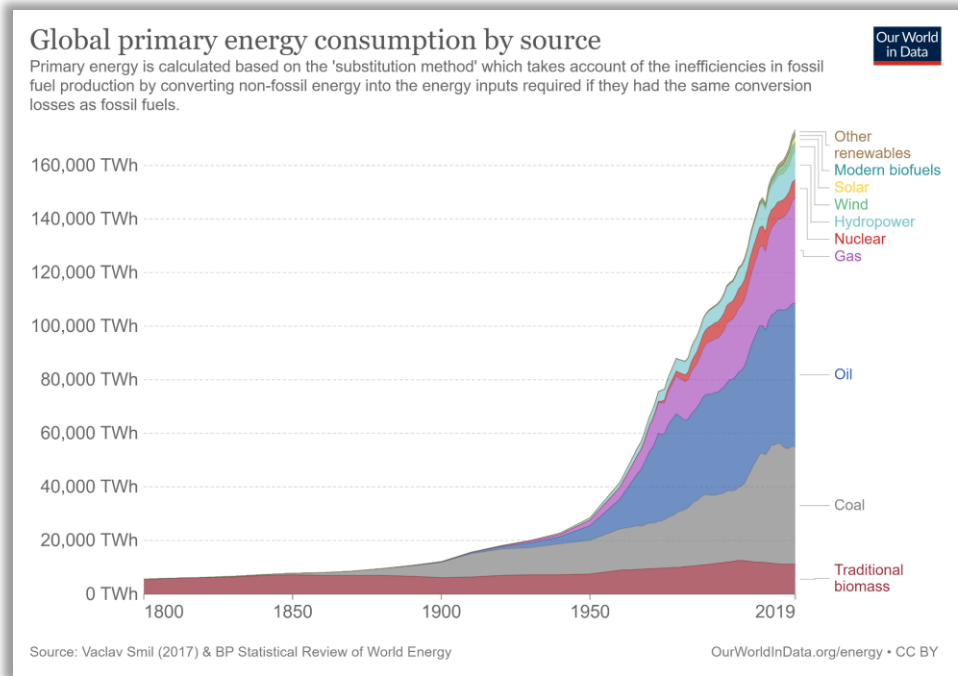
➢ Limited disruption potential in key sectors

- Spreading of innovation VS. Inertia of infrastructures and technical systems
  - Power: powerplant lifetime ~40 years
  - Buildings: >60 years , heating equipements: 15-25 years
  - Transport : cars 12-15 years, planes 25-30 years, etc.
  - Industrial equipment, etc

- Push&pull / innovation & exnovation strategy (Kimberly , 1981) possible but costly (stranded assets…)

- Substitution or addition of technologies?

  Ex: energy system



➢ Problem shifting

- Technological « solutions » often tend to transform or shift problems, not just to solve them

ex. of « solutions » for GHG emissions:

– Nuclear	Waste, risk of accident, dissemination and military security, etc.
– Biofuels	Competition with food crops, land-use, intensive monocultures and their impact on biodiversity, etc…
– Wind	Landscape, waste (blade recyclability), etc.
– Hydro	Water conflicts, methane emissions, biodiversity, population displacement, etc.
– EVs	Production phase impacts: mining impacts (cobalt, lithium, manganese, Class1 nickel) + charging infrastructures -> new geopolitics of resources
– Geoengineering	??
– Etc.	

➢ Problem shifting

- Technological « solutions » often tend to transform or shift problems, not just to solve them

And the environmental crisis is multidimensional:

Climate change, land erosion, deforestation, artificialisation et imperméabilisation des sols, destruction des habitats, biodiversity loss, nitrogen cycles, phosphorus cycle, water salination, insecticides and pesticides pollutions, fine particulate matters, troposphérique ozone pollution, stratosphérique ozone depletion, acid deposits, hazardous chemical waste, heavy metal bioaccumulation, asbestos, nuclear waste, ocean acidification, hormonal pollution in water, landscape degradation, noise pollution, uncertainties and new sanitary risks (nanotechnologies, GMOs, etc.)
Etc.

=> Technological innovations and « high-tech » solutions often end up widening the spectrum of environmental risks and impacts – between which the arbitrage becomes more delicate as we get closer from ecological limits.

➢ Rebound effect

- « *Increase in consumption resulting from the reduction of obstacles and limits to the use of a technology – these obstacles can be financial, time-related, social, physical, related to hassle, danger, organisation,…* » (F. Schneider, 2003)

- Economic mechanisms:
  - Re-spending / reallocation of savings generated by a greater efficiency
  - New practices and productions made economically viable

1st order / direct rebound	Efficiency savings are re-spent in the same consumption	Ex: A car consuming less fuel can be driven more for the same price
2nd order / indirect rebound	Efficiency savings are re-spent in the consumption of other products or services	Ex: Fuel economies on everyday commute spent on a long distance plane ticket for holidays
3rd order / structural rebound	Structural transformations and impacts on the general economy	Ex: Private car deployment influences urban planning, modifies the system of needs, favours periurban malls vs. small shops in city centers, etc.

➢ Rebound effect

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- Economic mechanisms:
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  - New practices and productions made economically viable

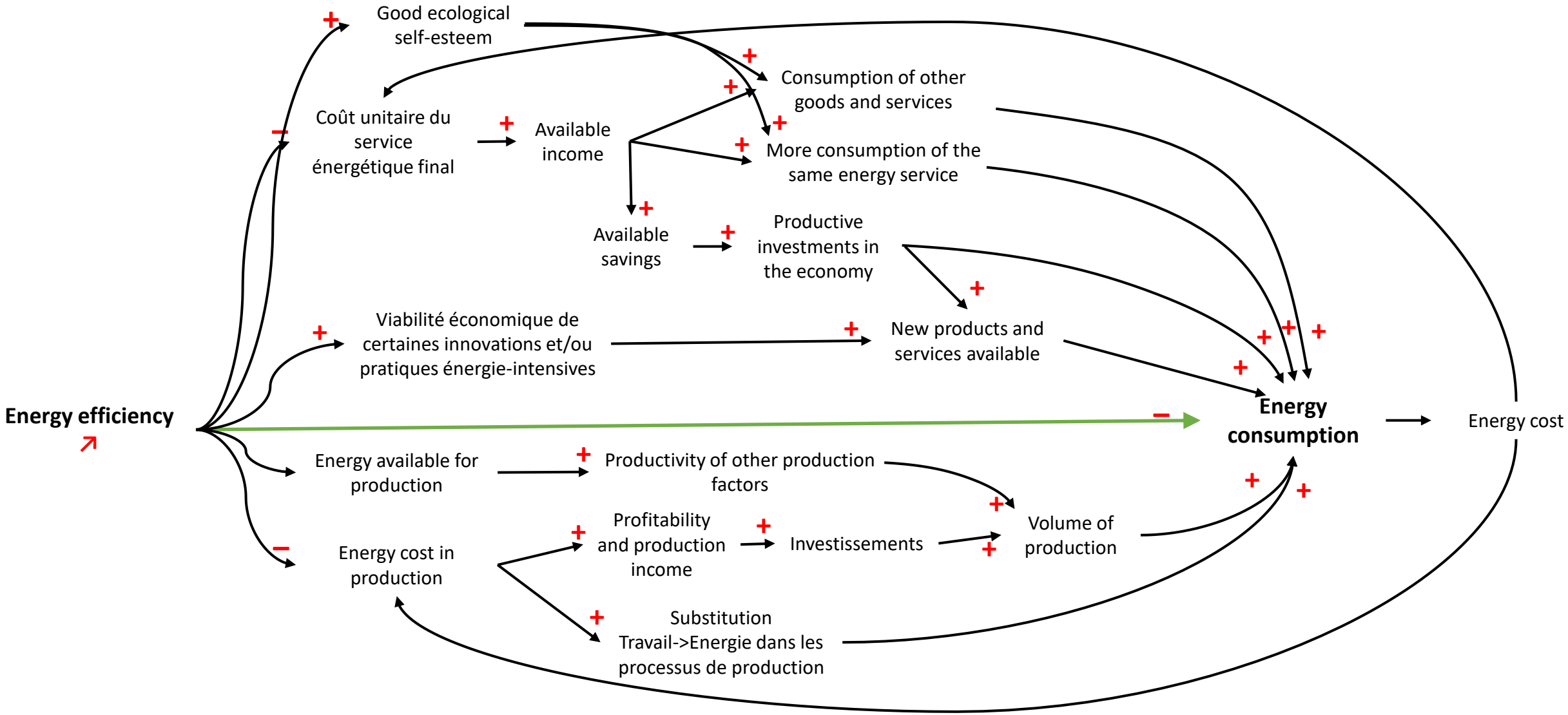
- Psycho-sociological mechanisms:
  - Cognitive bias (interpretation, judgement, reasonning, etc.)

  Ex : *« The product being recyclable, it's not a big deal if I consume many… »*

  - « *Moral licensing* » : people allowing themselves immoral or problematic behaviours on the basis of moral actions accomplished elsewhere or in the past. The self-esteem deriving from their positive actions enables them to sustain their moral self-perception by offseting negative feelings associated with problematic behaviours.

  Ex: *« I already made efforts to use less water when showering last month, so I can allow myself to fly for a WE trip»*

➢ Rebound effect : a *system* of feedback mechanisms



➢ Rebound effect

- Increasing efficiency in the use of a resource does not guarantee a reduction in its total consumption

- Results from the economic and cultural context: without sufficency or « enoughness » norms , there is no guarantee that environmental gains theoretically made possible by technological progresses will effectively be achieved

➢ Dematerializing growth with services and digital technologies?

- BUT: the « immaterial » economy does not replace the material economy

  ⇒ **It superimposes onto it** (does not replace food, housing, mobility, etc.)

  ⇒ **It relies on it:**
  - Intermediate consumptions
  - Travels of contractors and customers (flux + infrastructures & vehicules)
  - Materiality of commercial spaces (buildings…)
  - Materiality of technical tools (IT, servers, …)

  => **It often leverages it**: ex. finance, marketing, e-commerce, R&D which accelerates obsolescence (softwares and hardwares, etc.)



➢ Orientation of the innovation under liberal capitalism

- Innovations are primarily motivated by profit opportunities: aim to maximize profitability for a maximum of « production factors »

  => savings of L (&K?), not necessarily of natural resources

- A few eco-innovations, but in the meantime, many more impactful technologies are deployed

  (ex. horizontal drilling & hydraulic fracking, SUV, 5G, bitcoin, driverless cars, tablets and connected devices, etc.)

- Driving innovation and markets towards environmental protection via regulations and economic incentives ?

  => yes, possible, but the corollary is a substantial modification of price systems, compromising the economic viability of many productions

  => implies a deep shift in social organization, economy, and most likely a contraction of GDP

To sum up:

- Inappropriate orientation of technical innovation under liberal capitalism
- Limited disruption potential due to inertia of diffusion in key sectors
- Declining marginal gains from technical innovation
- Problem shifting
- Rebound effects
- Limited perspectives for dematerialization (impact of services too)
- Etc.

$\Rightarrow$ **Appropriate decoupling is unlikely , green growth = extremely risky bet**

+ (« even if ») => economic growth mechanisms have major adverse effects on societal well being, culture diversity, democracy, etc. (cf. cultural critique of growth)

$$Population \times \frac{PIB}{Population} \times \frac{Environmental\ Impact}{PIB} = Environmental\ Impact$$

$\Rightarrow$ Need to act on GDP/capita => frugality, sufficiency, degrowth

$\Rightarrow$ Not « less of the same », but rather *doing differently*

$\Rightarrow$ **Necessary to re-think socioeconomic organisations and lifestyles**

What could a post-growth / degrowth pathway look like?

One example of degrowth scenario for France

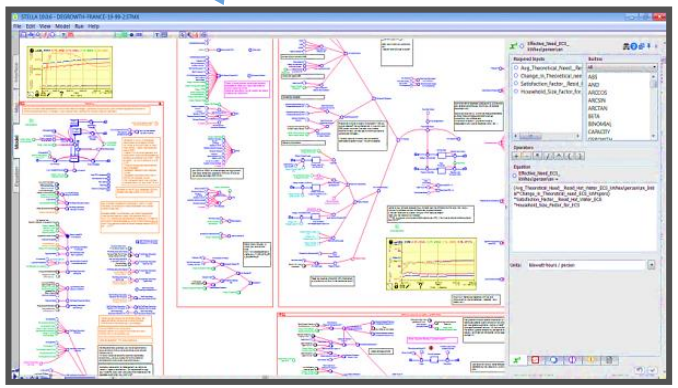
- Participative scenario building : based on semi-directed interviews (Briens, 2015)

  « What is your vision of a transition towards a desirable and sustainable society ? »
- Perimeter : France
- Time horizon : 2060

Interviews

Scenarios

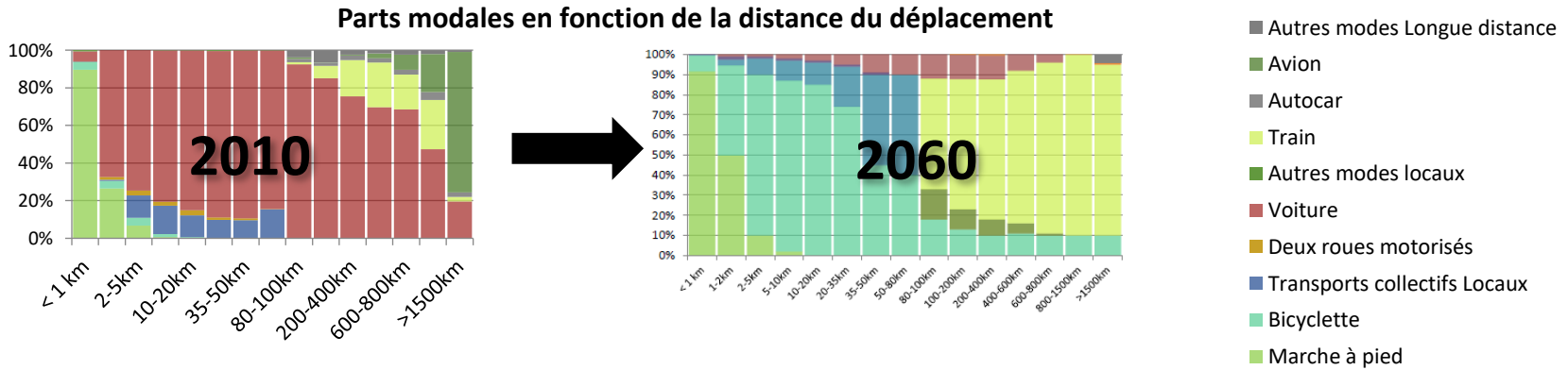
Numerical simulation model of the french economy (Extended input-output modelling)



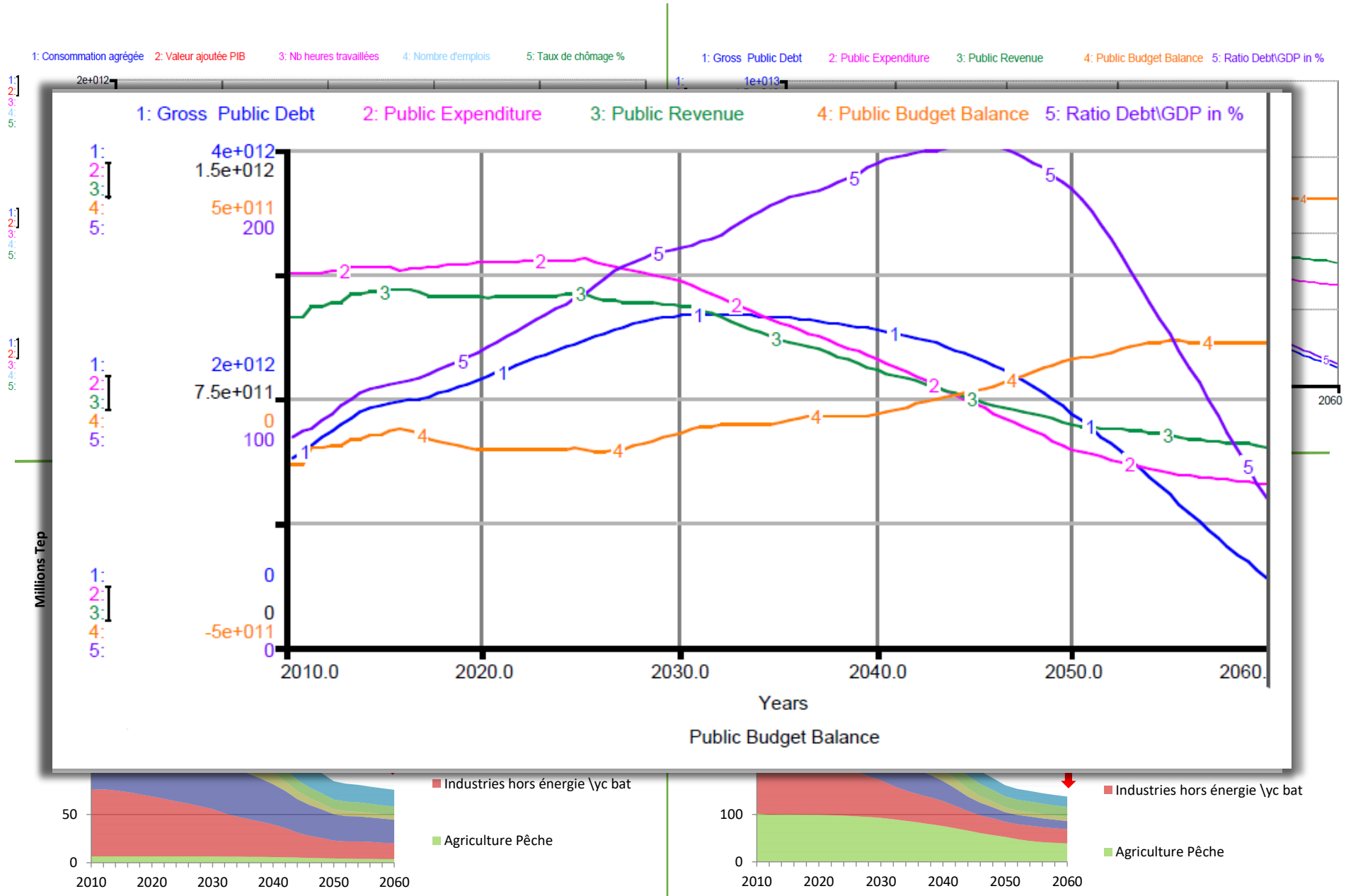
ONE EXAMPLE OF DEGROWTH SCENARIO FOR FRANCE

- **Main hypotheses for this scenario**

Housing	Shared-housing => ↗in avg household size ; multifunctionality of buildings
Consumption of goods and services	soberty, *DIY*, equipment ownership rates↘ (sharing/commoning), Product lifetime↗ (quality, repairing) ⇨ Final consumption↘
Agriculture & food	Agriculture 100% organic by 2060 (small farms & permaculture…), meat consumption↘
Transport	Longue distance mobility↘ (++); relocalisation living spaces – working spaces; Modal shift : marginal share for cars=> active mobility, public transport; train for long distance
Production	Re-localization, short circuits (Imports&Exports↘ ; IC of transport ↘) Working time ↘ (≈-25/-30%); Limited productivity gains, sometime negatives in certain subsectors
Public services and budget	Basic income replaces most social protection spendings by 2025, and evolves partly towards a non-monetary allowance (↘ to 1/3 of initial monetary value)
Technological progress, etc.	Improvements in energy efficiency and CO2 intensity↘ (no improvements beyond 2050) ; modest refurbishments ; relaxation of thermal comfort norms; Limited efficiency gains in equipments; innovation is mostly *low-tech*



PROSPECTIVE EXPLORATION OF DEGROWTH - SCENARIO EXAMPLE

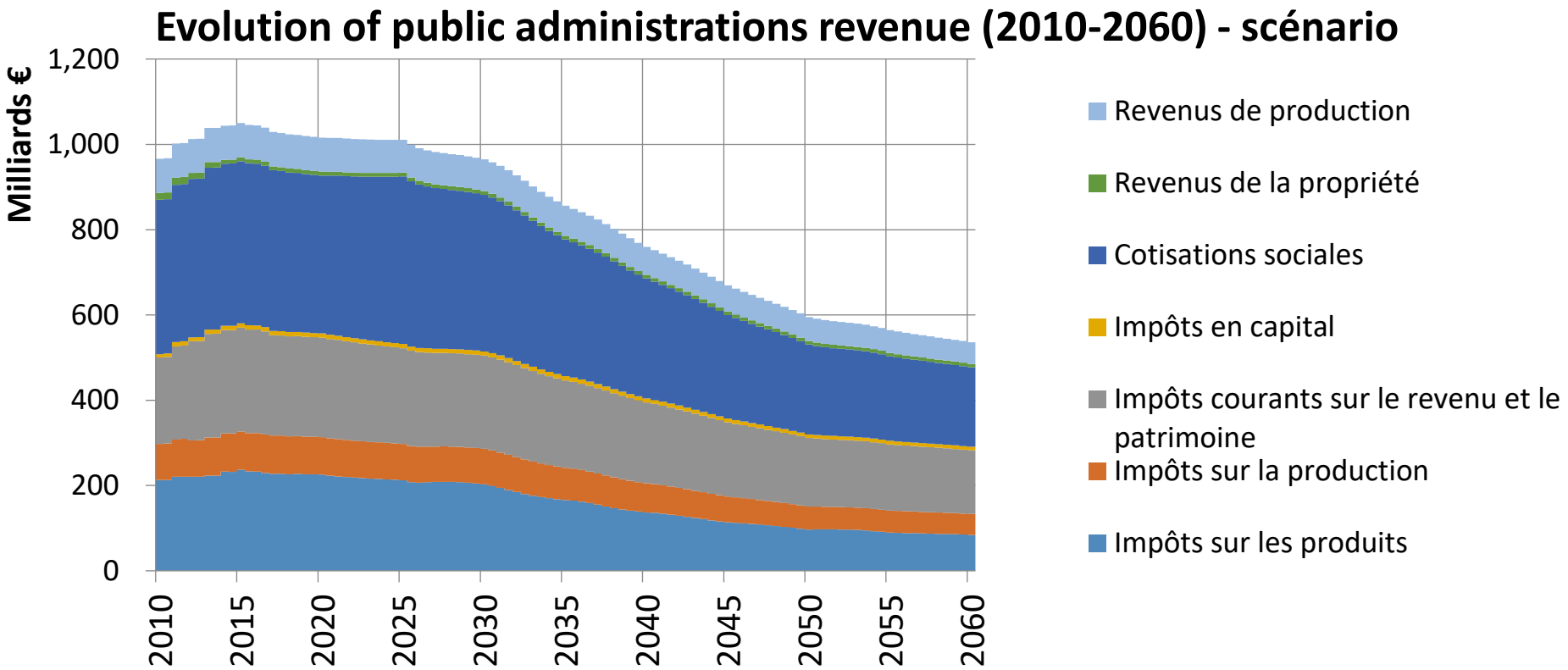


PROSPECTIVE EXPLORATION OF DEGROWTH - SCENARIO EXAMPLE

- Now: are the scenario hypotheses achievable? And how?

PROSPECTIVE EXPLORATION OF DEGROWTH - SCENARIO EXAMPLE

Zoom on public budget



NB=> Question: *what budget do we want to dedicate to public research?*

ONE EXAMPLE OF DEGROWTH SCENARIO FOR FRANCE

- Key conditions for a sustainable degrowth:
  - Mutualisation of resources, infrastructures, tools
  - Worktime reduction and work sharing
  - Reduction of inequalities and redistribution of wealth
  - Guaranteeing the economic security and serenity of people
  - Democratic planning of degrowth
    - For investment visibility and financial viability of projects
    - To adapt public budget to declining public revenue
    - To anticipate social needs
  - Direct citizen participation: continuous direct democracy (avoiding bureaucratism)

- A few proposals:
  - Political control of prices for basic needs (ex. **housing rent**, health,…)
  - Unconditional autonomy allowance and income ceiling
  - Partial « demonetization » of public services (time-currencies, etc.)
  - Sharing, commonning and reciprocity economy
  - (Re-)development of organic solidarity
  - Increased socialized share of wealth
  - Development of commons
  - An « economy of savings »

=> How can research contribute ?

What kind(s) of research and innovation do we need for sustainable societies?

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

- Beyond technical innovations : need to re-think and re-design lifestyles, socioeconomic relations, spatial and temporal organisation in our societies => will require experimentations (time & resources)

- The good news: ecological reconstruction and sustainable societies are already conceivable with existing technologies and knowledge

  ex: RE, bikes, public transit systems, permaculture, bio-sourced materials for insulation, etc…(cf. Briens (2015))

  … but the scale and pace of diffusion needed calls for a full mobilization of the economy and society

- Technological innovation and research, inc. ICT, could help, eg. to facilitate democratic cultural and social transformations

- Innovation can yield social and ecological progress provided several conditions are met…

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

A few points to consider:

- Innovations must allow for **systemic sufficiency** / sobriety / frugality. Need to:
  - Anticipate and avoid problem shifting => think « life-cycle » and multi-criteria analysis
  - Anticipate and avoid rebound effect => think innovations in relation with their cultural and socioeconomic environnement, over the longer term => prospective thinking
  - Shortcut « technological detours »

Ex: concept of « *generalized speed* » (I. Illich(1973), *Energie et équité*)

*V=D/**T*** => *In addition to the time spent driving the car, let's account for the time spent working to pay it, to maintain and repair it, to pay parking and insurance, etc.*

Generalized speed for selected transport technologies

Socio-professional category	Bike	2CV	Simca 1301	DS21
Senior executive. (Paris)	14	14	14	12
Employee (medium-size city)	13	12	10	8
Factory worker (medium-size city)	13	10	8	6
Agricultural worker (rural area)	12	8	6	4

Source: J.P. Dupuy & J.Robert, La trahison de l'opulence, Seuil, Paris,1976

⇒ Acceleration generates inequalies

⇒ Bike = optimal transport technology?

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

Technological detour / counter-productivity

=> Need to question what is the ultimate goal?

Micro-reductionism vs. Systemic thinking

** « If these idiots had taken the bus, I would already be home »*

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  - Shortcutting and suppressing technological detours
  - Facilitating commonning and mutualization of tools and resources

$\Rightarrow$ Need to **collectively question our needs** and hierarchize/prioritize our wants

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

- **NB: Needs ≠ Satisfiers!**

Max-Neef (1991) : <u>Fundamental human needs</u>

Subsistance, Protection, Affection, Understanding, Participation, Idleness, Creation, Identity, Freedom.

×

Being
Having
Doing
Interacting

- Different types of satisfiers:

  - singular
  - synergetic
  - inhibitors
  - pseudo-satisfiers
  - violators

Manfred A. Max-Neef, *Human Scale Development* (1991)

Needs according to existential categorbe / Needs according to axiological categories	*BEING*	*HAVING*	*DOING*	*INTERACTING*
IDENTITY	29/ Sense of belonging, consistency, differentiation, self-esteem, assertiveness	30/ Symbois, language, religion, habits, customs, reference groups, sexuality, values, norms, historical memory, work	31/ Commit oneself, integrate oneself, confront, decide on, get to know oneself, recognize onesetf, actualize oneself, grow	32/ Sociat rhythms, everyday settings, settings which one belongs to, maturation stages
FREEDOM	33/ Autonomía, self-esteem, determination, passion, assertiveness, openmindedness, boldness, rebelliousness, tolerance	34/ Equal rights	35/ Dissent, choose, be different from, run risks, develop awareness, commit oneself, disobey	36/ Temporal/spatial plasticity

Table 1: MATRIX OF NEEDS AND SATISFIERS*

Needs according to existental categories / Needs according to axiological categories	*BEING*	*HAVING*	*DOING*	*INTERACTING*
SUBSISTENCE	1/ Phíasical health, mental health, equilibrium, sense of humor, adaptability	2/ Food, shelter, work	3/ Feed, procreate, rest, work	4/ Living environment, social setting
PROTECTION	5/ Care, adaptatability, autonomía, equitibrium, solidarity	6/ insurance systems, savings, social securitía, health síastems, rights, family, work	7/ Cooperate, prevent, ptan, take care of, cure, help	8/ Living space, social environment, dwelling
AFFECTION	9/ Self-esteem, solidarity, respect, tolerance, generositía, receptiveness, passion, determination, sensuality, sense of humor	10/ Friendships, family, partnerships, relationships with nature	11/ Make love, caress, express emotions, share, Cake care of, cultivate, appreciate	12/ Privacy, intimacy, home, space of togetherness
UNDERSTANDING	13/ Critical conscience, receptiveness,curiosity, astonishment, discipline, intuition, rationality	14/ Literature, teachers, method, educational policies, communication policies	15/ investigate, study, experiment, educate, analiaze, meditate	16/ Settings of formative interaction, schools, universities, academies, groups, communities, family
PARTICIPATIÕN	17/ Adaptabilitía, receptiveness, solidaritía, witlingness, determination, dedication, respect, passion, sense of humor	18/ Rights, responsibilities, duties, privileges, work	19/ Become affiliated, cooperate, propose, share, dissent, obeía, interact, agree on, express opinions	20/ Settings of participative interaction, parties, associations, churches, communities, neighborhoods, family
IDLENESS	21/ Curiositía, receptiveness, imagination, recktessness, sense of humor, tranquility, sensuality	22/ Games, spectacles, dubs, parties, peace of mind	23/ Daydream, brood, dream, recall old times, give waía to fantasies, remember, relax, have fun, play	24/ Privacy, intimacy, spaces of closeness, free time, surroundings, landscapes.
CREATION	25/ Passion, determination, intuition, imagination, boldness, ration	26/ Abilities, skilis, method, work	27/ Work, invent, build, design, compose, interpret	28/ Productive and feedback settings, workshops, cullural groups, audiences, spaces for expression, tem-

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⇒ Need to **collectively question our needs** (and hierarchize/prioritize our wants)

⇒ Need to **re-design our social system of satisfiers**

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

A few points to consider:

- Assessment criteria for technologies and innovation should include not only environmental impacts, but also socio-cultural dimensions:

  - **Social autonomy/** technology conviviality: Can we ensure technology understanding and appropriation by all? What is the appropriate scale for development, production and relocation? Local craftsmanship vs. industry? Low-tech versus high-tech?

  - **What societies and what kind of humanity are produced by technologies** (in particular for ICT and digital technologies, cybernetics, etc.)? Does the technological system generates inequalities? Heteronomy and dependance? Power concentration? Is it compatible with democratic processes and organizations? Etc.

WHAT KIND(S) OF RESEARCH AND INNOVATION DO WE NEED?

… How to ensure that innovation yields social progress?

- « Progress » = coordinated evolution towards pre-defined ends*: who defines the ends?*
- Problem shifting : *who arbitrates/juges the trade-offs between impacts of different nature?*
- Social relevance: which & whose social or individual needs is the innovation meeting?

⇒ **Need for democratization - i.e. citizen reappropriation - of scientific and technical choices**

- E.g.: *citizen conventions* : *process of participation which combines : a preliminary training (during which citizens study) ; active interventions (during which citizens interview and question experts and stakeholders) ; and a collective deliberation and positionning (where citizens deliver an advice or take a decision).*

[Sciences Citoyennes]

⇒ Possible applications: Marketing autorisations for technologies,
Orientation of public research strategies and fundings,

Nb: initiative **Horizon TERRE** (Sciences Citoyennes, ISF, ATECOPOL) : Collective project to develop concrete alternative proposals to the EU research strategy in the field of health, agriculture, energy, housing, mobility, ICT, etc. and submit them to public debate (https://sciencescitoyennes.org/ht/ ; https://decidim.sciencescitoyennes.ovh/)

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  [Sciences Citoyennes]
- Developping **participative research**, where citizens are involved in the entire process, from the definition of the problem to the assessment of results (not just data collection : ≠contributive science)

Eg. *Science shops* = facility attached to a university that provides independent participatory research support in response to concerns experienced by civil society => community-based & -driven research

To sum up…

TAKE AWAY

- Technological innovation alone can't solve the environmental crisis : **innovation needs to be mostly social and political** (lifestyles, social organization, etc.) and need to be **compatible with degrowth** pathways.

- For innovation to turn into progress, it must be subordinated to social and ecological purposes
  - ⇒ Need to collectively question our <u>needs</u>: *what do we want to produce and consume? For whom? For what purpose? How?*
  - ⇒ Need to imagine desirable and enthusiastic post-growth narratives and visions, and question research and innovation needs in relation with such pathways (key role of arts, literature, cinema, etc. to revive social imaginary)
  - ⇒ Need to **re-politize and democratize the orientation of research and innovation** : against eco-techno-totalitarianism, urgent to put scientific and technological choices under direct & continuous democratic citizen guidance and supervision *(eg. citizen conventions and participatory research).*

- Need to debunk and de-sacralize « la Technique » (cf. Ellul) and to develop a culture of technology critique, building on the prospective anticipation of systemic impacts of technological systems on society and the environment

Thanks for your attention

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