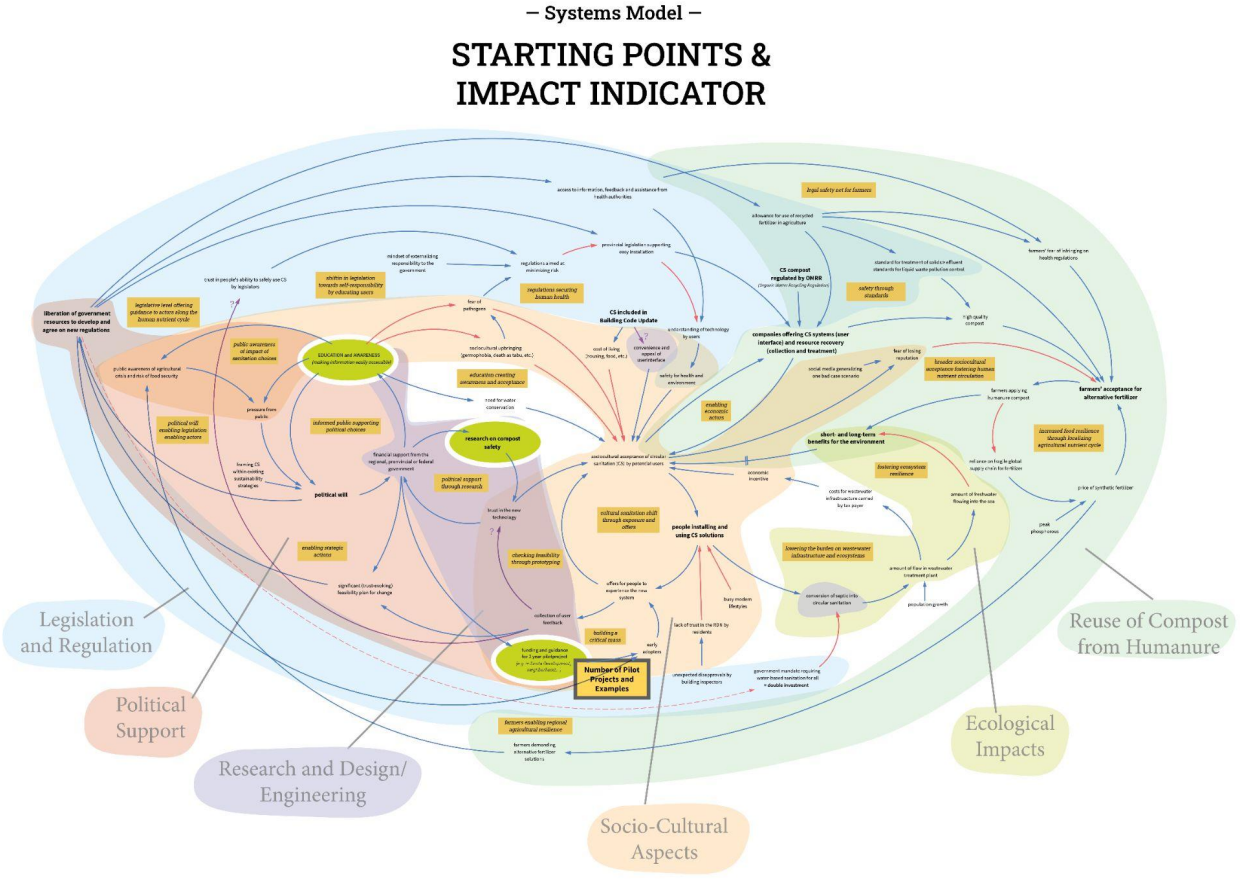
Pathways to Implementing Circular Sanitation in the Mount Arrowsmith Biosphere Region

// EVALUATION WORKSHOP REPORT



A research project that engages critical actors along the human nutrient cycle to identify Starting Points for Action and Impact Indicators for measuring progress towards reaching the goal of establishing circular sanitation on a regional scale for the Mount Arrowsmith Biosphere Region.

Workshop report compiled and edited by

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› DISCLAIMER & INTENTION ‹

Please see the information in this report as preliminary (!) results. *The approach is to have a conversation and through engaging in a conversation increase knowledge. The approach can be compared to modern days' open source software development. To build open source software (and hardware) different people contribute by openly sharing the code (or building plans), this way the knowledge can be used and tailored to the specific needs of a place or community.*
By this more insights are gained and learnings can flow freely. Comments on this document are welcomed!

The methodological approach *is solution-oriented and situated between systems thinking, interventional research, and transformative research. The researcher is seen as embedded within the systems they seek to observe and recognized as an intervener in the system, by implicitly expressing their perception, understandings, values, norms etc. In this process it is crucial that the researcher is transparent about their intentions and possible bias.*

The author of this report herewith clearly states her intention of applying the above mentioned approaches for solving the how-to of implementing solutions that foster regenerative practices, *as this approach to research acknowledges that there is little time to address and prepare for the impacts that climate change is having on the planet and her inhabitants.*

The intention of this research stems from the author's connection to the natural living world and the creative powers of the human spirit.

Jenni Ottilie Keppler

OVERVIEW

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– ACKNOWLEDGEMENTS –

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Pathways to Implementing Circular Sanitation in the Mount Arrowsmith Biosphere Region

1. // How this research evolved

Guiding Question for the Research Project:

> **Why is water-based sanitation still the norm in the Mount Arrowsmith Biosphere Region despite a daunting water crisis and risk of food insecurity?**

The research project was set out to identify pathways and barriers to implementing circular sanitation solutions in the Mount Arrowsmith Biosphere Region (MABR).

Guiding Question for Inquiry to the Actors of the "ecosystem":

> **What is needed for 20% of the human 'waste' generated in the Mount Arrowsmith Biosphere Region to be disposed of, treated and recycled through water-free resource recovery solutions* by 2030?**
>
> ** now referred to as Circular Sanitation*

What is Circular Sanitation?

The term Circular Sanitation has been introduced by the researcher with the purpose of simplifying the communication of a system that aims at circulating nutrients through water-free sanitation and resource recovery. These systems refer to technologies such as composting toilets, where excretions are either (a) mixed with organic matter and cured and sanitized through a thermophilic composting process or (b) separated at the source by diverting and collecting urine to recover solids and liquids separately through different curing and sanitation processes.

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2. // Why is this research relevant to the Mount Arrowsmith Biosphere Region?

Implementing composting toilet systems and recycling of humanure on a larger scale could increase regional resilience by helping address future water and nutrient shortages driven by climate change, population growth and disruptions in the global supply chains for food and fertilizer.

›› Increase in awareness for ecological processes and soil resilience

It may increase individual environmental awareness of what can be put down the drain, and awareness around the miracles of natural organic decomposition processes. Where applied, bringing nutrients back into the soil can help plant growth, improve water retention of the soil and through that help aquifers replenish more easily.

›› Decrease in Water-use

Using composting toilet systems has the potential to decrease the amount of freshwater that is currently introduced into the ocean through the wastewater treatment plants (instead of the groundwater).

›› Decrease in costs for infrastructure for waste water services

It may also reduce the pressure on the current sanitation system and treatment plants, keeping costs for infrastructure updates at bay.

›› Increased resilience during Emergency Preparedness

It may also be of help to keep sanitation safe when the water and waste-water system gets disrupted by larger events, e.g. earthquakes.

›› Implementing globally trending concepts, e.g. Circular Economy and Zero Waste

The idea of circular sanitation practices links right into globally (and provincially) trending concepts of Zero Waste, Circular Economy, and water conservation. Regionally it would support the idea of a Regional Doughnut Economy as it contributes to staying within the ecological boundaries.

›› Less dependence on global supply chains for food and fertilizer

Enabling regional nutrient circulation can foster local agriculture and food self-sufficiency.

›› Supporting local agriculture

Independence from depleting resources, such as phosphorus, which is used for synthetic fertilizers and sold at a high price to farmers, could enable the farming community.

Clearly there are several enabling or disabling factors for these benefits to become a real outcome, as by picking one element in the system it will always be found linked to other elements in the system.

3. // SUMMARY of OUTCOMES

The preliminary results show that with investments in the **Starting Points** *» Education and Awareness, » Demonstration Projects, and » Research on (Compost) Safety,* the system would be able to move towards achieving the goal of having 20% of human waste in the Mount Arrowsmith Biosphere Region be disposed of, treated and recycled through circular sanitation solutions by 2030. The starting points give us a first idea for possible next steps in the next research process.
For measuring whether these investments have been beneficial to achieving this goal the **Impact Indicator** *» Number of Pilot Projects and Examples* can be used as a tool. Since this research is focussed on the possibility of something (versus something that is already implemented), at this stage of the modeling of the system the emphasis is on education and research to create an environment that is open and welcoming towards the idea. Once an enabling and supportive environment has been created the system model would speak more to the decisions around technical aspects of nutrient recovery. However, **without investments in the Starting Points which would enable a change in mindset, the system and its actors will unlikely be activated and the system will not be able to achieve its main purpose of circulating human nutrients and conserving water.**

4. // ON THE PROCESS OF THE WORKSHOP

Workshop Overview

- **Hello and Check-In**
- Intro to Topic, Method and Miro
- Familiarizing with the model
- Finding Starting Points
- Finding Impact Indicators
- AHA-Moments, Announcements, Outlook

———————————

Breaks around 10:30 and 11:30

The workshop included a presentation of a system model that integrates the responses and individual system models of 12 stakeholders along the human nutrient cycle and the current water-based sanitation system that were interviewed beforehand.

Stakeholder groups that were represented during the workshop:

» community planners |
» provincial legislators |
» residents of the MABR |
» early adopters |
» composting toilet experts & long-term practitioners |
» community builders and coordinators of regional multi-stakeholder partnerships
» regional experts on water conservation |
» potential users of recycled fertilizer (farmers) |
» building & construction

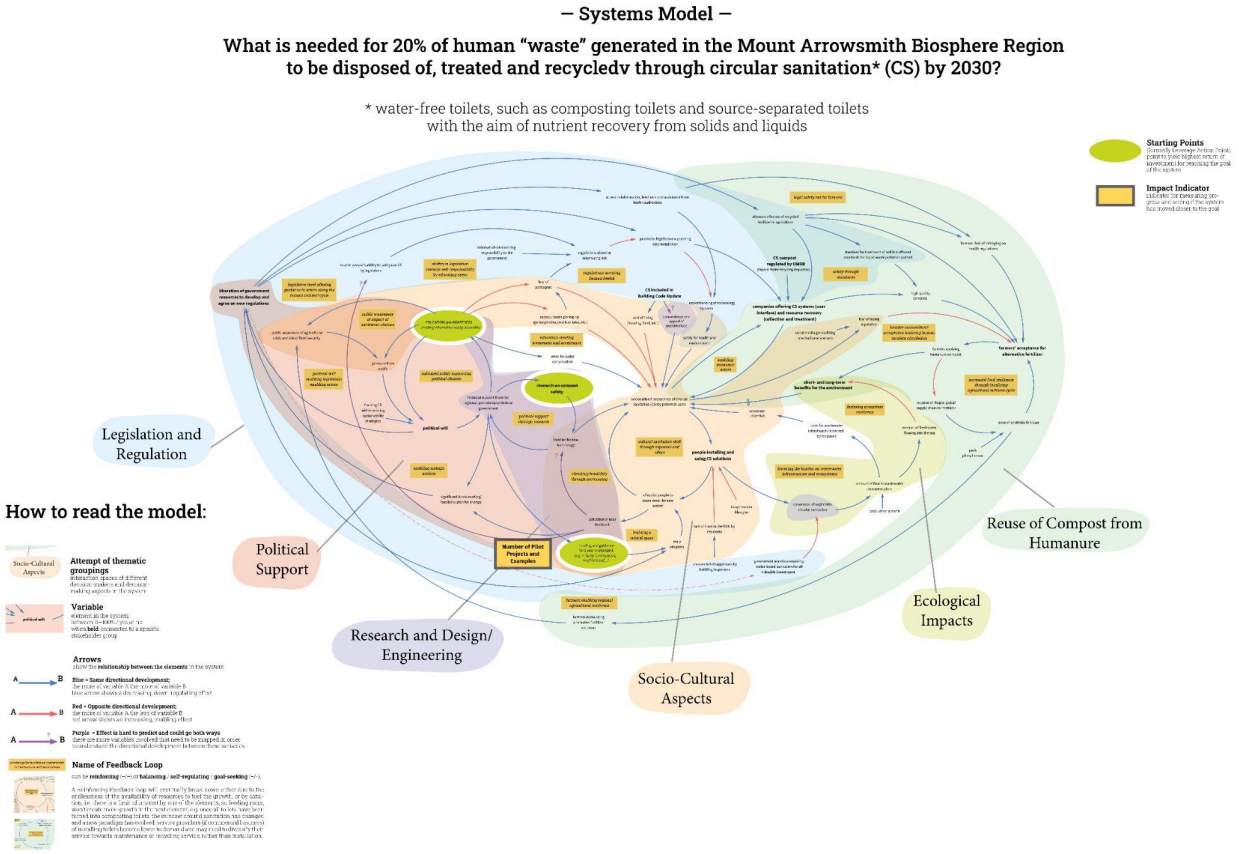
The workshop aimed at providing orientation on the feasibility of implementing circular sanitation solutions in the MABR. In the first work session participants were presented with the topic, the area and the method (see presentation slides) as well as the online tool Miro, which was used to navigate the model. Time was also shared to get to know each other and find orientation within the model and the group. The second and third work sessions were dedicated to identifying Starting Points and Impact Indicator(s), and to take time for a sharing of insights and debrief. See the links below for the information materials of the workshop:

» SLIDE PRESENTATION (PDF):
HTTPS://DRIVE.GOOGLE.COM/FILE/D/1MSIYQYFTDE5QKALS7ACALBLVC5EQYFRY/VIEW?USP=SHARING

» SLIDE PRESENTATION (MIRO):
HTTPS://MIRO.COM/APP/BOARD/UXJVPSYF0V4=/?MOVETOWIDGET=3458764534564390233&COT=14

» INTRO on HOW TO READ THE MODEL (MIRO):
HTTPS://MIRO.COM/APP/BOARD/UXJVPSYF0V4=/?MOVETOWIDGET=3458764534564777376&COT=14

5. // STARTING POINTS & IMPACT INDICATORS



›› VARIOUS VERSIONS OF THE SYSTEM MODEL

with and without Illustrations, with Starting Points, all Impact Indicators and Rationales (PDF):

HTTPS://DRIVE.GOOGLE.COM/FILE/D/1W0J55PAWHVIBYORG2VLYTQ8SXQWIDW_G/VIEW?USP=SHARING

STARTING POINTS:

›› INTERACTIVE SYSTEM MAP on MIRO:

HTTPS://MIRO.COM/APP/BOARD/UXJVPSYF0V4=/?MOVETOWIDGET=3458764534565410130&COT=14

It is HIGHLY RECOMMENDED (!) to use Miro Board link above for accessing in depth information on various variables in the system model.

| » *Education and Awareness*
| » *Demonstration Projects*
| » *Research on (Compost) Safety*

Identifying starting points for moving the system towards achieving the goal

After everyone had become familiar with the model the task was to find and decide on three variables that would yield a high return of investment by affecting the system in a way that actors were enabled to work towards the goal. You can find rationales for the top three starting points below. These points would address the main barriers of safety concerns, misperception and lack of access to information.
They would enable political will and public support to back up and request political decisions that foster more research and bring in the legislative level as a support and safety net. The gained trust in technology through research and experience would likely increase the overall socio-cultural acceptance of circular sanitation. Once this feedback loop is established, people may see composting toilet systems as just as normal as they see water-based toilets now.

The prompt for finding Starting Points was:

> **"If you had $ 9000,000 and you had to split it into three parts, where would you invest this money?"**

The answers from the workshop read as follows:

#1 | EDUCATION & AWARENESS (9 VOTES)

In any kind of research education and awareness is relevant, especially in a topic that is not very known about.

It's critical to creating the draw for change and technology, for providing information and developing awareness that gets in front of and dismantles misconceptions, fears and any taboos that might be blocking people from conceiving of this as an option. Once the public is educated the political choices are more likely to be supported.

"The regulators are going to want to regulate the crap out of it!"

Education would also be directed towards the political and regulatory bodies to enable a way of regulating that can help educate those who are interested in implementing parts of the human nutrient cycle. Familiarizing the political and regulatory bodies might also keep overregulation at bay that stems from fear and misconceptions. To address the legislators' lack of trust in people's ability to manage and

maintain a composting toilet system, it was suggested that there should be courses employed by regulating bodies, so that people who are operating the system are trained. This way education and research would bring confidence in the regulators that people can do it and it can be done.

Funding for this could potentially come from entities in the system that support research and education. During the workshop the Tri-Agency Council was mentioned.

#2 | DEMONSTRATION PROJECTS – A two-year pilot project at neighborhood-scale (7 VOTES)

Having a physical space, where people can use and learn about the system would accomplish different objectives, such as increasing exposure, socio-cultural acceptance, and the synthesis of research and education.

Demonstration sites have a really low barrier to entry, as a user does not need to buy or integrate a system, e.g. through retro-fitting their home, hiring a trained wastewater service engineer and going through a permitting process, instead they just go and use it. It becomes a very personal way of understanding circular sanitation and it becomes more trustworthy.

Increasing visibility would mean exposure of the topic to a larger audience and entering people's common thought patterns, which would foster socio-cultural acceptance.

Additionally, creating a pilot project would entail a lot of synthesis of existing research. In combination with the learnings from the pilot project this in return could produce more educational materials.
In order to be defendable the project needs support from government and academia. This way it becomes more trustworthy to a larger array of people.

So far composting toilets are mostly being installed in private homes. In interviews leading up to the workshop, several ideas on who to approach for becoming part of such a pilot project were gathered. To increase exposure the focus for a pilot project may rather involve public institutions, such as a school, BC Parks, or hall or office building of the municipal government, communal living setups, such as a strata development, a neighborhood or an ecovillage.
This might enable buy-in from users, architects, engineers, builders, politicians, health authorities, the research community and investors.

A pilot project would benefit from simple and easy-to-understand regulatory standards, which can then be integrated. Lowering this barrier could enable several smaller follow-on pilot projects to emerge.
To enable this, the government would need to develop standards that are a scaled-down version of the current regulations around biosolids, tailored to a more decentralized setups on neighborhood and community scale, rather than commercial treatment or composting facilities. Certain aspects would need to be changed in order to make it easier and less restrictive to employ testing of the finished compost.

These regulatory barriers can be broken down through a combination of funding and guidance and awareness-raising.

On the other hand, a high profile project that complies with a really stringent regulatory system with clear and safe guidelines for processing based on research does two things: it provides a clear pathway for startup projects to emerge and it addresses critiques of the most conservative voices.

Creating demonstration projects would entail the question around the end-use of the composted humanure: for figuring out a sort of "supply chain system" for where the solids would be cured and recycled and applied potential actors for collaboration on research need to be identified.

A dual system

Considerations were brought up of deciding on the end-use for the composted humare according to its source, e.g. solids and liquids coming from hospitals or nursing homes that have higher amounts of pharmaceutical residuals would go through a different treatment stream than those from residential areas. This precautionary system is even in a very decentralized setting not expensive to implement.

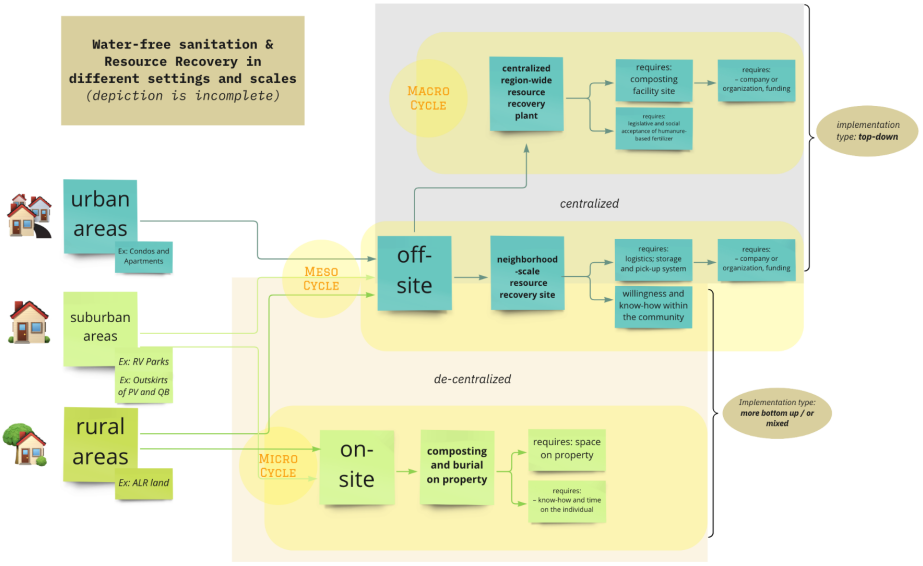
The next steps for implementing a pilot project tie into Starting Point #3:

#3 | RESEARCH ON (COMPOST) SAFETY (& END-USE) (6 VOTES)

In order to have buy-in from all stakeholders there needs to be certainty around the safety of the practice and the application of humanure compost as agricultural fertilizer.

A team of researchers could identify and approach actors, who are interested in becoming part of this research, e.g. by providing a testing site for composting humanure on a larger scale or tailoring existing research and synthesizing it to this geography, and social system as well of the area. Research by monitoring testing sites for the agricultural use of recycled fertilizer would help to fill in knowledge and safety gaps and help farmers, political leaders, legislators and users gain trust. Otherwise the finished compost might end up being applied in forests, as currently done with biosolids.

Overview (preliminary) of considerations for different settings



Flow-Chart based on insights from stakeholder interviews by Jenni Ottilie Keppler (2022)

IMPACT INDICATOR

›› INTERACTIVE SYSTEM MAP on IMPACT INDICATORS on MIRO:
HTTPS://MIRO.COM/APP/BOARD/UXJVPSYF0V4=/?MOVETOWIDGET=3458764534565837671&COT=14

| ›› *Number of Pilot Projects and Prototype Examples*

Identifying Impact Indicator(s)

The third work session focussed on deciding on an Impact Indicator to measure progress. Four indicators were pre-selected and presented with a rationale. This was followed by an invitation to the participants to suggest any missing indicators.
For the decisions, two anonymous voting rounds were needed to receive a distinguished result. The first round allowed for one vote per person. Here 4 out of 5 indicators received an equal number of votes. The second round allowed for two votes per person.
The results were that Number of Pilot Projects and Prototype Examples received 7 votes, closely followed by **Number of Installed Toilets** with 5 votes, **Visibility and Quality of Information offered by Health Authorities** with 3 votes, **Number of Businesses and/or Services based on Resource Recovery from Humanure** with 2 votes. The additionally suggested indicator **Amount of Water Availability** received one vote, mainly due to the many variables included in measuring any impact on the actual water availability. Also it seemed challenging to identify a baseline against which to measure.

IMPACT INDICATOR | 'Number of PILOT PROJECTS and PROTOTYPE EXAMPLES'

Rationale:

The presence of Pilot Projects (prototypes at different scales and environments) would be a significant first step towards implementing circular sanitation on a broader scale. It would imply the backing from across levels of decision-making: individual, communal, municipal, regional, provincial and possibly even federal. It would also mean a strong stepping stone for further developments in these directions will be laid, as it will increase exposure of the topic and enable collecting valuable feedback for users and sociocultural acceptance.

How to measure the actual impact of the projects:

» impact scale; number of people involved across all levels

» user surveys

» matrix for rating impact (power) of the outreach that each collaborator of the pilot projects has, e.g. if mayor was part of it, or journalist, or influencer etc.

» social media resonance of the projects?

6. // RECOMMENDATIONS

Finding a middle ground for regulation through space for exploration, exchange and communication

In the conversation it became clear that there are different perspectives on what and how much of the practice needs regulation:

Safety through Regulation –
The benefit of regulation can be that those who have a more conservative mindset and tend to be skeptical of new solutions, and fearful of potential harmful consequences can feel safe when stringent regulations are applied.

Guidance through Regulation –
For actors along a neighborhood-scale or regional-scale human nutrient cycle to develop any service or business, they will need clear guidelines and permissions for what they do to avoid creating health risks and infringement on regulations.

Paralysis through overregulation –
The downside of too much regulation is the disabling of actors who would like to implement elements to enable circular sanitation, and nutrient circulation, e.g. farmers. More people implementing the system would enable collecting feedback for refining and improving the technology.

Suggested solutions and preliminary recommendations to address the above:

Short feedback loops and space for dialog among stakeholders —
In order to gather feedback on what amount of regulation is suitable and in order for skeptical stakeholders to gain trust, there needs to be space for dialogue between legislators, regulators and practitioners to share insights and recommendations and

feedback. Here the feedback cycle needs to be short, to enable a flow of progress and learning.

Pilot projects as a place for dialog and learning to gain trust and knowledge —

This space could develop around what was mentioned for the main Starting Points: Developing a two year pilot project as a demonstration project.

Overview of key barriers

Key barriers identified in the workshop are socio-cultural acceptance, lack of clarity for end-use of finished compost and regulations. Regulations affect the options for end-use, the installation of toilet systems, and the development of a pilot project, which would tie together government support through legislation and political leadership, as well as researchers, engineers, economic players, such as startups for developing composting services, and the toilet users. Thus addressing the barrier of regulation appears to yield most leverage. For weaving these actors together a systems approach is recommended. The question about who in the system may be able and willing to fund such a project remains open to further research. Part of this research would be collaboratively evaluating how far the starting points for action are at this point in the process, and identifying enabling resources.

CONCLUSION

The results from this workshop suggest, that without investments in education and awareness, demonstration projects and research on safety to enable a change in mindset, the system and its actors will unlikely be activated and the system will not be able to achieve its main purpose of circulating human nutrients and conserving water.

7. // ANNOUNCEMENTS: Upcoming Events on Circular Sanitation

/ ZIRKULIERBAR COLLOQUIUM „BACK IN THE CYCLE“: Adapting human excrement to a circular nutrient bioeconomy – future scenarios, perspectives for retailers and research access in Sweden

The zirkulierBAR colloquium series starts in November. Exciting lectures on the subject of sanitary and nutrient transformation are regularly offered here (approx. every 2—3 months). We want to investigate the whole process chain of a circular economy with dry toilets and gain insights into the science and practitioners' perspectives.

The zirkulierBAR colloquium will start with a lecture by the scientist Genevieve Metson on possible future scenarios for a circular economy with dry toilets. In her scientific work, Genevieve Metson examined how nutrient flows between urban and rural areas can be made sustainable and what possible drivers are for the transformation towards a circular and sustainable future. The lecture will be held in English.

- Time: **11/09/2022,** 4 p.m (CET)
- Speaker: Genevieve Metson
- Title: **Adapting human excrement to a circular nutrient bioeconomy – future scenarios, perspectives for retailers and research access in Sweden**

›› ZOOM Link to participate

›› INFORMATION about ZirkulierBAR, a multi-stakeholder project in Germany pioneering regional human nutrient circulation:
HTTPS://ZIRKULIERBAR.DE/WP-CONTENT/UPLOADS/2022/07/FLYER-ZIRKULIERBAR-EN_WEB.PDF

/ REGENERATIVE LIVING: Composting Toilet Workshop with Gord Baird

October 6th, 2022 – November 24th, 2022, online

Who is this workshop for?

» **Anyone** who wants to decrease their water usage;

» **Regulators** who are seeking to learn more about alternative waste management trends;

» **Professionals** working remotely who have moved to their summer cottages and now need to address their lack of water;

» **Permaculture designers** and educators;

» **Homeowners** who are thinking about building;

» **Temporary camps** seeking a responsible method to deal with otherwise harmful wastes;

» **Architects & Waste Water Designers**, or professional associations seeking a course to meet annual training needs;

» folks who build or use **Tiny homes on wheels** that want to ensure their systems are **mobile**; and

» **Home Builders / contractors** (timberframe, loghome, natural builders) working on remote islands.

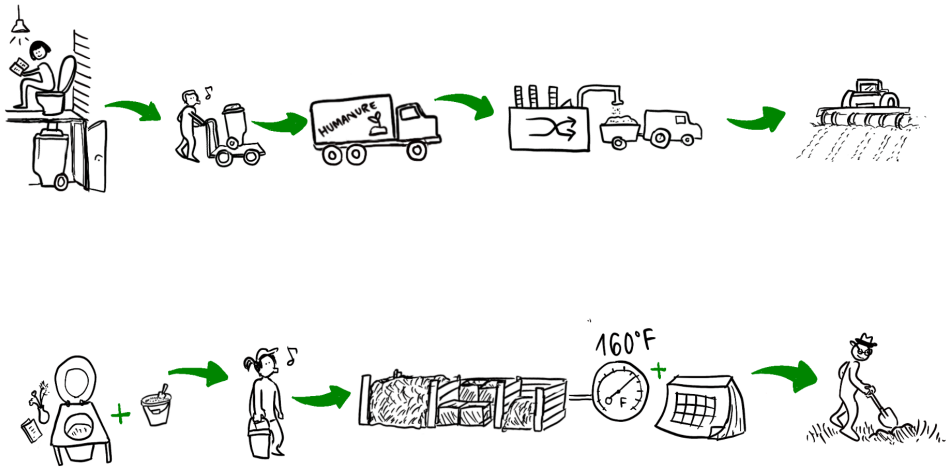
NOTE: No previous knowledge of compost toilets is required to attend this workshop.

» DETAILS & SIGN UP LINK:
HTTPS://WWW.REGENERATIVELIVING.ONLINE/COURSE/COMPOSTINGTOILETS

Code for DISCOUNT: **CSS2022**
Valid until **30.09.2022**.

8. // SPECIAL CONTRIBUTIONS: Reflections on a New Normal

How to live in the LOO:P* –
Gaining Perspective(s) on Society's Norms



Top: Example of Off-site Resource Recovery | Regional Scale
Bottom: Example of On-site Resource Recovery | Individual Scale
Illustrations by Joanna Mitchell @textularia

Pet owners regularly take care of the poop of their dogs and cats by putting it into bags and getting it out of the cat litter – another opportunity for rethinking, as rotting organic matter put in landfills creates off-gassing as methane, a potent greenhouse gas.
In the workshop it was mentioned that about ¾ of all people in the world do not use toilet paper. In Italy BD's are very common. For children growing up on Lasqueti Island, composting (and non-composting pit) toilets are part of everyday life. What's normal here may be confusing to someone from the other side of the globe or simply backwards to another generation. Bringing in the dimension of time shows how short the window of exposure to a certain way of doing things actually is. If held against the age of the planet, a human lifespan becomes miniscule and so much can change within a life span. So when introducing a new technology the question is:
How and why does something become normal? Is it a conscious choice or the structures around us? And how does a new technology affect people's everyday life? The way each individual relates with each other, with themselves and their environment, their sense of responsibility and their sense of impact they have on a place? Is the technology enabling connection or alienating? How does it change society as a whole?

– Curious questions by the researcher herself Jenni Ottilie Keppler

** Phrase credited to Ann Baird*

'The Massive Dump' –

A perspective from someone who transitioned to using a composting toilet (commode batch system) in their community

Above: Image of humanure compost pile system as suggested in J. Jenkins' "The Humanure Handbook"

"One of the first details to work out when establishing a post wildfire research station was what to do with our poop. Eventually we settled on a nifty system described in the pages of 'The Humanure Handbook.' It works like this:
Our toilet moves our waste into a five gallon plastic container which is layered with saw dust (from local mills) between each deposit. When a container is full we put a lid on it and replace it with an empty one. It's easy, simple and odor free.
Anyway, once 20 of our containers are full it's time for what we colloquially refer to as the 'massive dump.' That is, we empty our containers into the compost bin, clean our containers and add all water used for cleaning into the compost. We take great precautions to keep all materials in the compost bin. Massive dumps require an hour's worth of work every three months to compost the waste of four full time members plus guests. After a year of using this system I can now say that it is easy, simple and in time becomes an inoffensive task. What is best about it is how it brings us together. When you live and work with others, social tensions come forward every now and then. Somehow coming together to literally deal with each other's shit brings forward a relieving sense of forgiveness and fellowship. I can't explain why but it always happens. What else can I say? At this point dry toilets are cleaner and more comfortable for me. Pooping in water now strikes me as an ever so slightly irreverent act."

–A requested contribution gratefully received from Robin Woolner

9. // RESOURCES

» LOOP THE POOP – Blog for this Research Project by Jenni Ottilie Keppler
https://www.ottilie.cc/loop-the-poop/

» EVALUATION WORKSHOP REPORT – Interactive Miro Board with System Maps
https://miro.com/app/board/uXjVPSyF0V4=/?share_link_id=728987916806

Relevant Documents

» BC Manual for Composting Toilets and Greywater Practice
https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/provincial-composting-toilet-manual.pdf

» Liquid Waste Management Plan (LWMP)
https://www.rdn.bc.ca/liquid-waste-management-plan

» Organic Matter Recycling Regulation (OMRR)
https://www2.gov.bc.ca/gov/content/environment/waste-management/food-and-organic-waste/regulations-guidelines

// APPENDIX

» **Integrated System Model** with different overlays of information
» **Visual Recording** of the Workshop by Joanna Mitchell – ***please feel free to share!***

HOW TO ACHIEVE 20% CIRCULAR SANITATION IN THE MABR* BY 2030?

*MT. ARROWSMITH BIOSPHERE REGION

A SYSTEM MODEL WORKSHOP

24/9/22

by JENNI OTTILIE KEPPLER
www.ottilie.cc/loop-the-poop/

IDENTIFYING BARRIERS & LEVERAGE POINTS

TABOOS & MISCONCEPTIONS

SAFETY CONCERNS

EDUCATION & AWARENESS

USER-FRIENDLY STANDARDS

ACCESS TO INFORMATION

HIGH PROFILE DEMONSTRATION PROJECTS

PILOT PROJECTS AS LOW-BARRIER ACCESS

RESEARCH ON SAFETY

FOSTERING SOCIOCULTURAL ACCEPTANCE

DISMANTLING FEARS & PHOBIAS

BUILDING TRUST

INTERCULTURAL EXCHANGE

NORMALISATION

creating FINANCIAL INCENTIVES

MONITORING END-USE IN AGRICULTURE

DUAL SYSTEMS to ensure HEALTH MONITORING

GOVERNMENT & ACADEMIC FUNDING to create a PUBLIC DISCOURSE & VISIBILITY

WIDENING INFRASTRUCTURE

SUPPLY CHAIN MANAGEMENT

VISUAL SCRIBING by JOANNA MITCHELL
textularia

— An integrated Systems Model on How to implement Circular Sanitation in the Mount Arrowsmith Biopshere Region —

Guiding Question
for collecting the perspectives was:

What is needed for 20% of human “waste” generated in the Mount Arrowsmith Biosphere Region to be disposed of, treated and recycled through circular sanitation* (CS) by 2030?

September 2022

— **Systems Model** (illustrated) —

What is needed for 20% of human "waste" generated in the Mount Arrowsmith Biosphere Region to be disposed of, treated and recycled through circular sanitation* (CS) by 2030?

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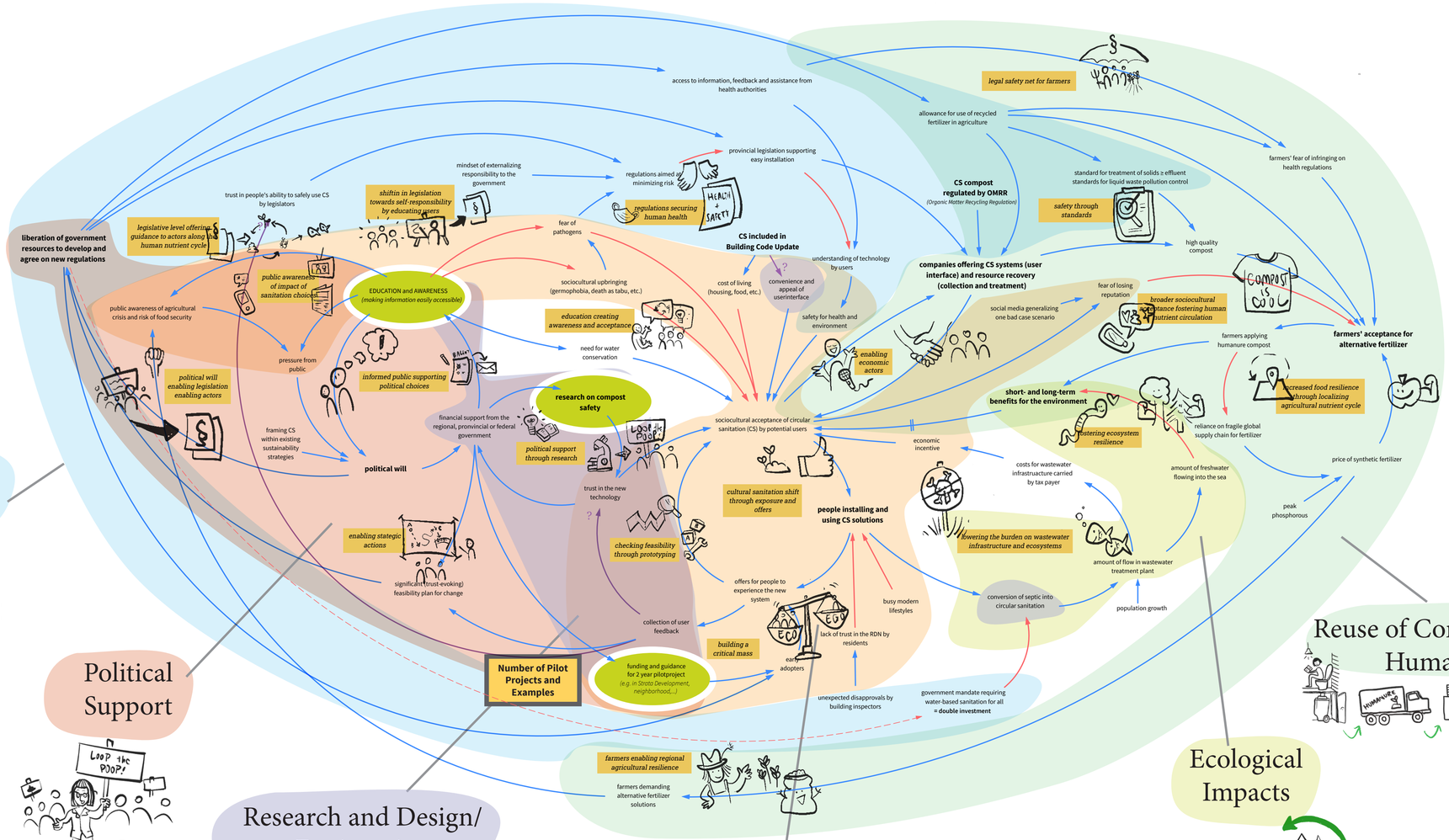

Legislation and Regulation

REGULATORY AUTHORITY

Political Support

POLITICS

Research and Design/ Engineering

ENGINEER

SCIENTIST

Socio-Cultural Aspects

COMMUNITY

Reuse of Compost from Humanure

Ecological Impacts

ECOLOGY

YUM!

Starting Points
(formerly Leverage Action Point) point to yield highest return of investment for reaching the goal of the system

Impact Indicator
indicator for measuring progress and seeing if the system has moved closer to the goal

How to read the model:

Socio-Cultural Aspects

Attempt of thematic groupings
interaction spaces of different decision-makers and decision-making aspects in the system

political will

Variable
element in the system, between 0—100% / yes or no when **bold**: connected to a specific stakeholder group

Arrows
show the **relationship between the elements** in the system

A → B **Blue = Same directional development;**
the more of variable A the more of variable B
blue arrow shows a decreasing, down-regulating effect

A → B **Red = Opposite directional development;**
the more of variable A the less of variable B
red arrow shows an increasing, enabling effect

A —?→ B **Purple = Effect is hard to predict and could go both ways**
there are more variables involved that need to be mapped in order to understand the directional development between these variables

lowering the burden on wastewater infrastructure and ecosystems

Name of Feedback Loop

Feedback loops can be **reinforcing** (+/+) or **balancing** / **self-regulating** / **goal-seeking** (+/-),

A Reinforcing Feedback loop will eventually break down either due to the endlessness of the availability of resources to fuel the growth, or by satiation, i.e. there is a limit of interest by one of the elements, so feeding more, won't create more growth in the next element, e.g. once all toilets have been turned into composting toilets, the mindset around sanitation has changed and a new paradigm has evolved; service providers (if commercial business) of installing toilets become lower in demand and may need to diversify their service towards maintenance or recycling service, rather than installation.

Evaluation Workshop on Implementing Circular Sanitation in the MABR | Illustrations by Joanna Mitchell |
Systems Model integrating different stakeholder perspectives designed by Jenni Ottilie Keppler | September 2022

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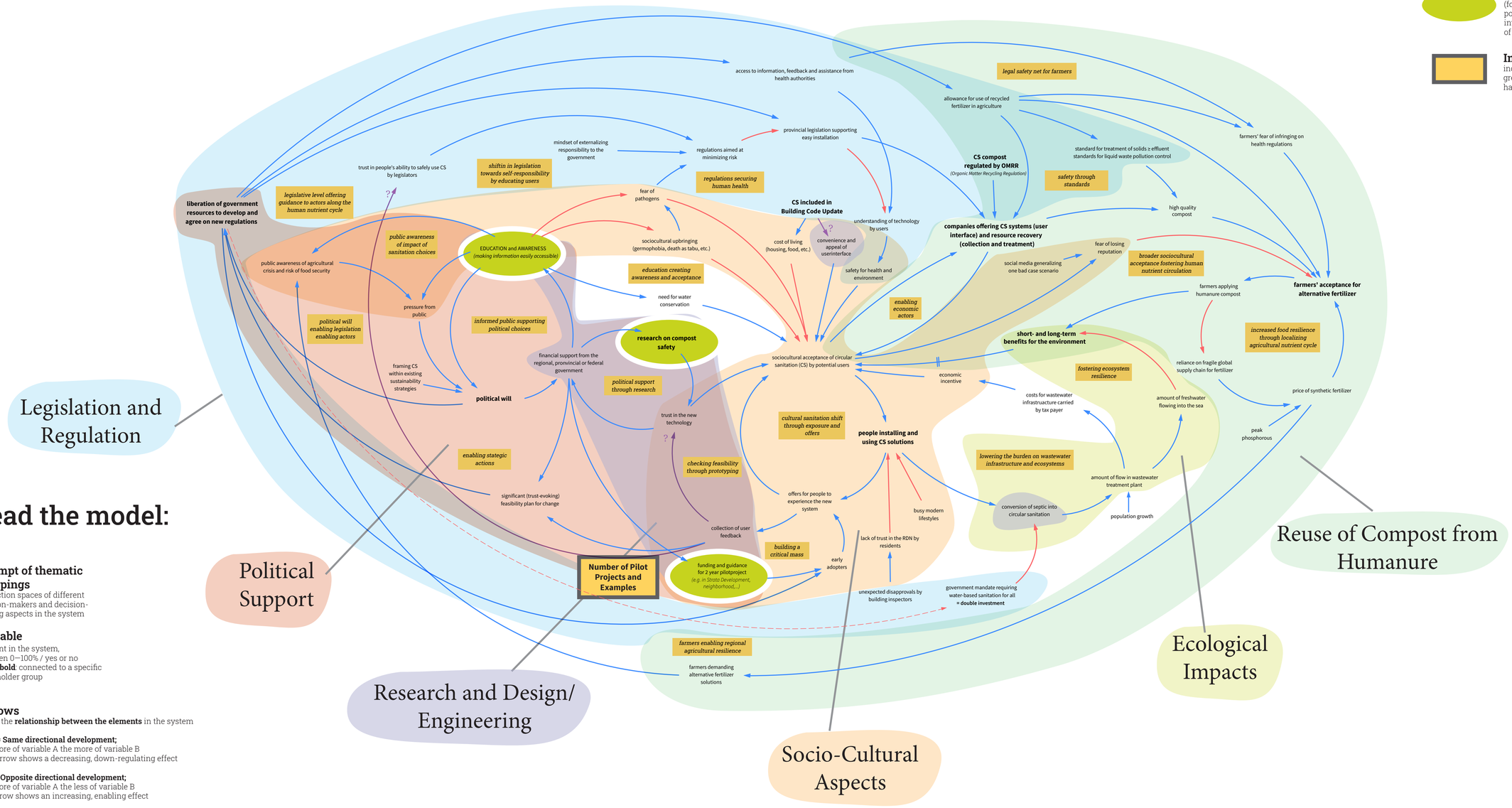

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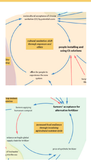

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— Systems Model —

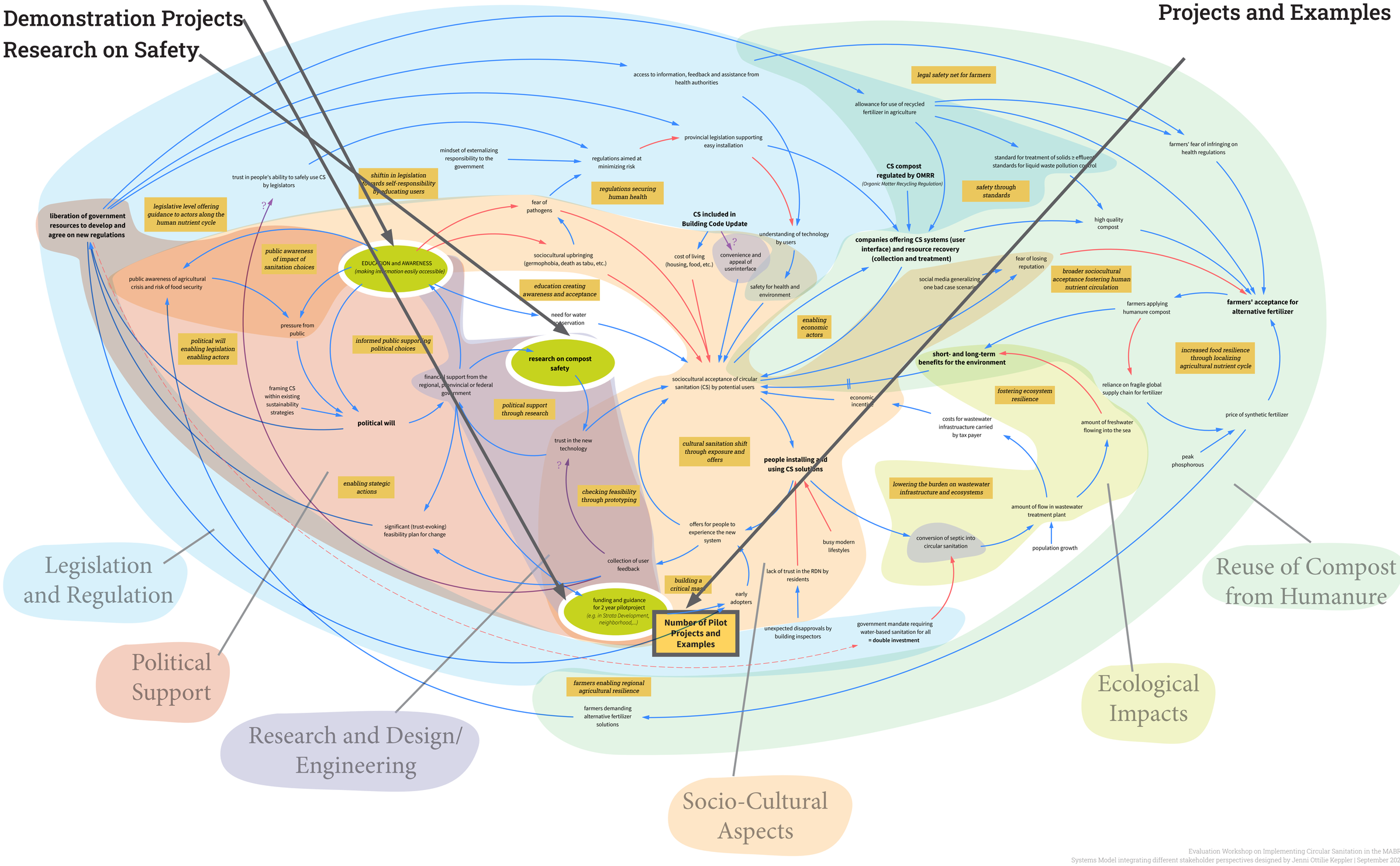
STARTING POINTS & IMPACT INDICATOR

Starting Points:

1 Education & Awareness
2 Demonstration Projects
3 Research on Safety

Impact Indicator

Number of Pilot Projects and Examples



Systems Model for Implementing Circular Sanitation in the Mount Arrowsmith Biosphere Region

Starting Points for Action (green)

The prompt for identifying Starting Points:
„If you had $ 900,000, where would you invest it? Looking for the first step of action that we need to take in order to move the system towards the goal."

Implementing Circular Sanitation Solutions in the Mount Arrowsmith Biosphere Region
– WORKSHOP REPORT 2021 –

|> Education and Awareness
|> Demonstration Projects
|> Research on (Compost) Safety

Identifying starting points for moving the system towards achieving the goal

After everyone had become familiar with the model, the task was to find and decide on three variables that would yield a high return of investment by affecting the system in a way that actors were enabled to work towards the goal. You can find rationales for the top three starting points below. These points would address the main barriers of safety concerns, misperception and lack of access to information.
They would enable political will and public support to back up and request political decisions that foster more research and living in the legislative level as a support and safety net. The gained trust in technology through research and experience would likely increase the overall socio-cultural acceptance of circular sanitation. Once this feedback loop is established, people may see composting toilet systems as just as normal as they see water-based toilets now.

The prompt for finding Starting Points was:

> "If you had $ 9000,000 and you had to split it into three parts, where would you invest this money?"

The answers from the workshop read as follows:

#1 |
EDUCATION & AWARENESS (9 VOTES)

In any kind of research education and awareness is relevant, especially in a topic that is not very known about.

It's critical to smoking the draw for change and technology, for providing information and developing awareness that gets in front of and dismantles misconceptions, fears and any fallacies that might be blocking people from conceiving of this as an option. Once the public is educated the political choices are more likely to be supported.

"The regulators are going to want to regulate the crap out of it"

Education would also be directed towards the political and regulatory bodies to enable a way of regulating that can help educate those who are interested in implementing parts of the human-nutrient cycle. Familiarizing the political and regulatory bodies might also keep overregulation at bay that stems from fear and misconceptions. To address the legislators' lack of trust in people's ability to manage and maintain a composting toilet system, it was suggested that there should be courses reimplanted by regulating bodies, so that people who are operating the system are trained. This way education and research would bring confidence in the regulators that people can do it and it can be done.

Funding for this could potentially come from entities in the system that support research and education. During the workshop the Tri-Agency Council was mentioned.

#2 |
DEMONSTRATION PROJECTS – A two-year pilot project at neighborhood-scale (7 VOTES)

"Show, don't tell." Where people can see and learn about the system would accomplish different objectives, such as increasing exposure, socio-cultural acceptance, and the synthesis of research and education.

Demonstration sites have a really low barrier to entry, as a user does not need to buy or integrate a system, e.g. through retro-fitting their home, being a trained wastewater service engineer and going through a permitting process, instead they just go and use it. It becomes a very personal way of understanding circular sanitation and it becomes more trustworthy.

Increasing visibility would mean exposure of the topic to a larger audience and enticing people's common thought patterns, which would foster socio-cultural acceptance.

Additionally, creating a pilot project would entail a lot of synthesis of existing research, in combination with the learnings from the pilot project this in return could produce more educational materials.
In order to be defendable the project needs support from government and academia. This way it becomes more trustworthy to a larger array of people.

So far composting toilets are mostly being installed in private homes. In interviews leading up to the workshop, several times on who to approach for becoming part of such a pilot project were gathered. To increase exposure the focus for a pilot project may rather involve public institutions, such as a school, DC Parks, or hall or office building of the municipal government, communal living setting, or as a strategy [illegible] school or an [illegible]

This might enable buy-in from users, architects, engineers, builders, politicians, health authorities, the research community, and investors.

A pilot project would benefit from simple and easy to understand regulatory standards, which can then be integrated. Lowering this barrier could enable several smaller follow on pilot projects to emerge.
To enable this, the government would need to develop standards that are a scaled-down version of the current regulations around biosolids, tailored to a more decentralized setups on neighborhood and community scale, rather than commercial treatment or composting facilities. Certain aspects would need to be changed in order to make it easier and less restrictive to employ testing of the finished compost.
These regulatory barriers can be broken down through a combination of funding and guidance and awareness-raising.

#3 |
RESEARCH ON (COMPOST) SAFETY (6 (NO-USE) & 4 VOTES)

In order to have buy-in from all stakeholders there needs to be certainty around the safety of the practice and the application of humanure compost as agricultural fertilizer.

A team of researchers could identify and approach actors, who are interested in becoming part of this research, e.g. by providing a testing site for composting humanure on a larger scale or tailoring existing research and synthesizing it to this geography, and social system as well of the area. Research by monitoring testing sites for the agricultural use of recycled fertilizer would help to fill in knowledge gaps for farmers, gardeners, farmers, political leaders, legislators and many open fronts. Otherwise the finished compost might end up being applied in forests, as currently done with biosolids.

The next steps for implementing a pilot project lie into Stanley Park #3 |

On the other hand, a high profile project that complies with a really stringent regulatory system with clear and safe guidelines for processing based on research does two things: it provides a clear pathway for startup projects to emerge and it addresses critiques of the most conservative voices.

Creating demonstration projects would entail the question around the end-use of the composted humanure, for figuring out a sort of "supply chain system" for where the solids would be cured and recycled and applied. potential actors for collaboration on research need to be identified.

A dual system

Considerations were brought up of deciding on the end-use for the composted humanure according to its source, e.g. solids and liquids coming from hospitals or nursing homes that have higher amounts of pharmaceutical residuals would go through a different treatment stream than those from residential areas. This precautionary system is even in a very decentralized setting not expensive to implement.

Overview (preliminary) of considerations for different settings

Four Chart based on insights from stakeholder interviews by Jenni Dale-Kapale (2022)

Main Impact Indicator (black)

The prompt for identifying Impact Indicators:
In the year 2030 what variable(s) can tell us that we have come closer to the goal?

As suggested by Jenni:

#4 | Number of PILOT PROJECTS and PROTOTYPE EXAMPLES

IMPACT INDICATOR

Rationale:
The presence of Pilot Projects (prototypes at different scales and environments) would be a significant first step towards implementing CS on a broader scale. It would imply the backing from across levels of decision-making: individual, communal, municipal, regional, provincial and possibly even federal. It would also mean a strong stepping stone for further developments in this directions will be laid, as it will increase exposure of the topic and enable collecting valuable feedback for users and sociocultural acceptance.

How to measure the actual impact of the projects:
- **impact scale; number of people involved across all levels**
- **user surveys**
- **matrix for rating impact (power) of the outreach that each collaborator of the pilot projects has, e.g. is mayor was part of it, or journalist, or influencer etc.**
- **social media resonance of the projects?**

HIghland Park Example:

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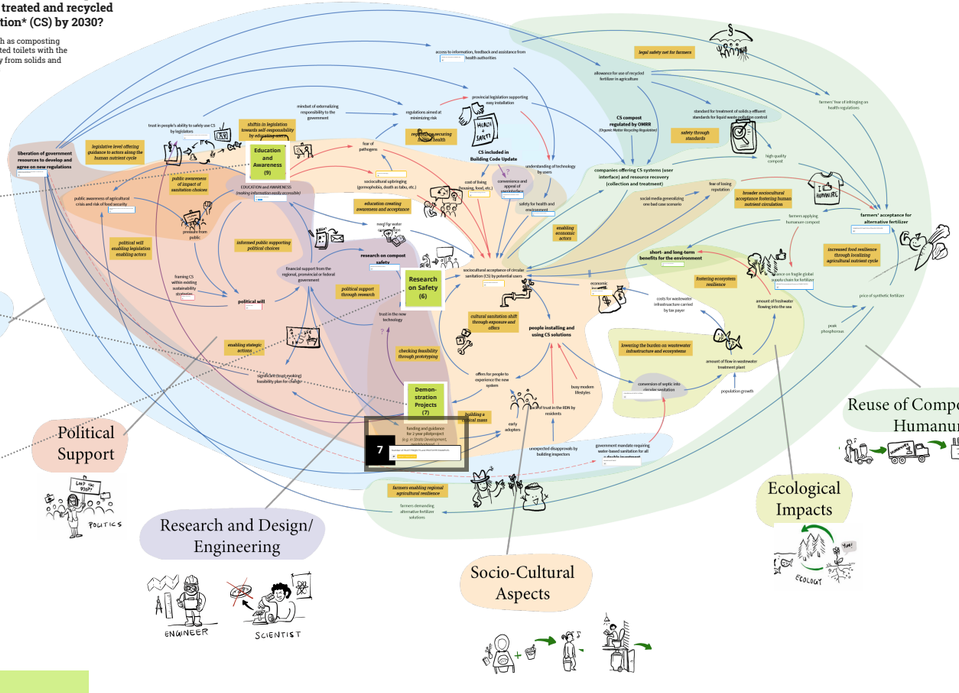
Legislation and Regulation
REGULATORY AUTHORITY
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ECOLOGY
Reuse of Compost from Humanure
Research on Safety (6)
Demon-stration Projects (7)
Education and Awareness (9)
CS included in Building Code Update
CS compost regulated by OMRR
Legislative level offering guidance to actors along the human nutrient cycle
Liberation of government resources to develop and agree on new regulations
Shifts in legislative mindsets and responsibility to re-governments
Public awareness of agricultural crisis and risk of food prices
Political will enabling legislation enabling actors
Informed public supporting political choices
Framing CS within existing sustainability objectives
Enabling strategic actions
Financial support from the regional, provincial or federal government
Political support through research
Research on compost safety
Sociocultural acceptance of circular sanitation (CS) by potential users
Cultural sanitation shift through exposure and others
People installing and using CS solutions
Checking feasibility through prototyping
Trust in the new technology
Funding and guidance for 1 year pilot project (e.g. at Public Developments, Schools, Hospitals, Parks)
Building a critical mass
Offers for people to experience the new system
Early adopters
Trust in the RDN by residents
Unexpected disagreements by building inspectors
Government mandate requiring water-based sanitation for all (e.g. Nanaimo Incentives)
Farmers enabling regional agricultural resilience
Farmers demanding alternative fertilizer solutions
Investing the burden on wastewater infrastructure and ecosystems
Conversion of septic into chloride-mediation
Amount of fine-treatment treatment plant
Population growth
Costs for wastewater infrastructure carried by tax payer
Amount of freshwater flowing into the sea
Fostering ecosystem resilience
Increased food resilience through localizing agricultural nutrient cycle
Price of synthetic fertilizer
Peak phosphorous
Farmers' acceptance for alternative fertilizer
Farmers applying humanure compost
Broader sociocultural acceptance fostering human nutrient circulation
Short- and long-term benefits for the environment
Safety for health and environment
Enabling assistant actors
Social media-generating one-bad-case-scenario
Low of losing reputation
Safety through standards
Standard for treatment of public effluent standards for liquid [illegible] control
Farmers' fear of infringing on health-regulations
High-quality compost
Companies offering CS systems (user interface) and resource recovery (collection and treatment)
Cost of living (housing, food, etc.)
Low of losing reputation
Safety for health and environment
Social media-generating one-bad-case-scenario
Low of pathogens
Socio-political uprisings (xenophobia, death or fake, etc.)
Mindset of externalizing responsibility to the government
Regulations aimed at minimizing risk
Regulations/necessity/ health
Trust in people's ability to safely use CS by legislators
Provincial legislation supporting easy installation
Access to information, feedback and assistance from health authorities
Input safety-net for farmers
Allowance for use of recycled fertilizer in agriculture
Understanding of technology by users
Education creating awareness and acceptance
Public awareness of agricultural crisis and risk of food prices
Education and Awareness campaigns (reading collection/media accessible)
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Regulations/necessity/ health

Starting Points for Action
(formerly Leverage Points)

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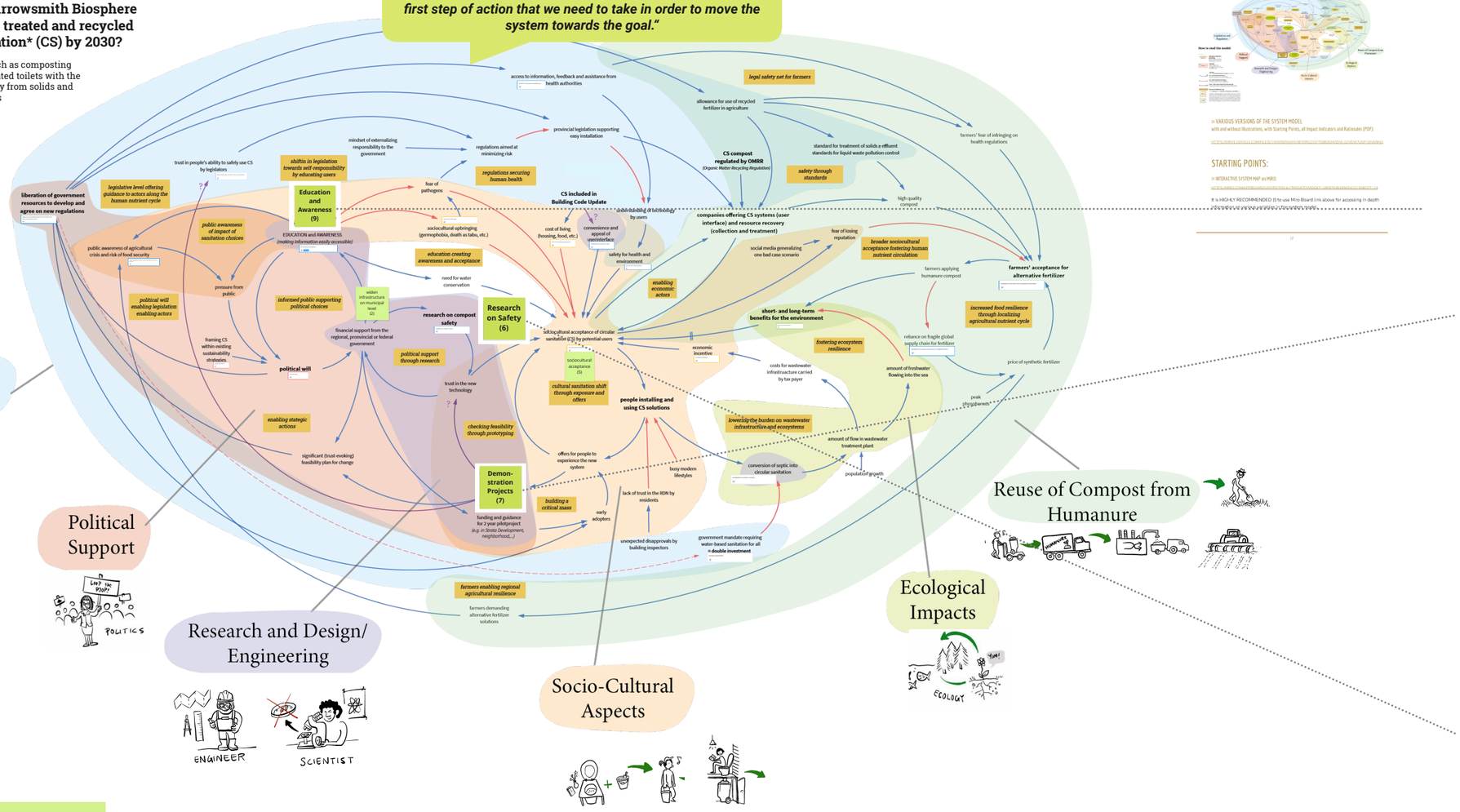

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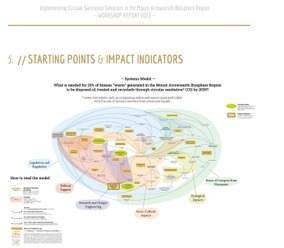
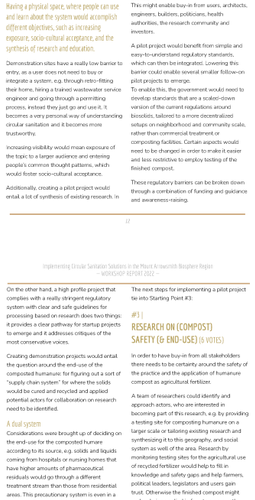
All Illustrations by Joanna Mitchell @textularia

EDUCATION AND AWARENESS:





Impact Indicators
How to measure progress

For seeing the rationale for each point zoom in to the card and click on the icon

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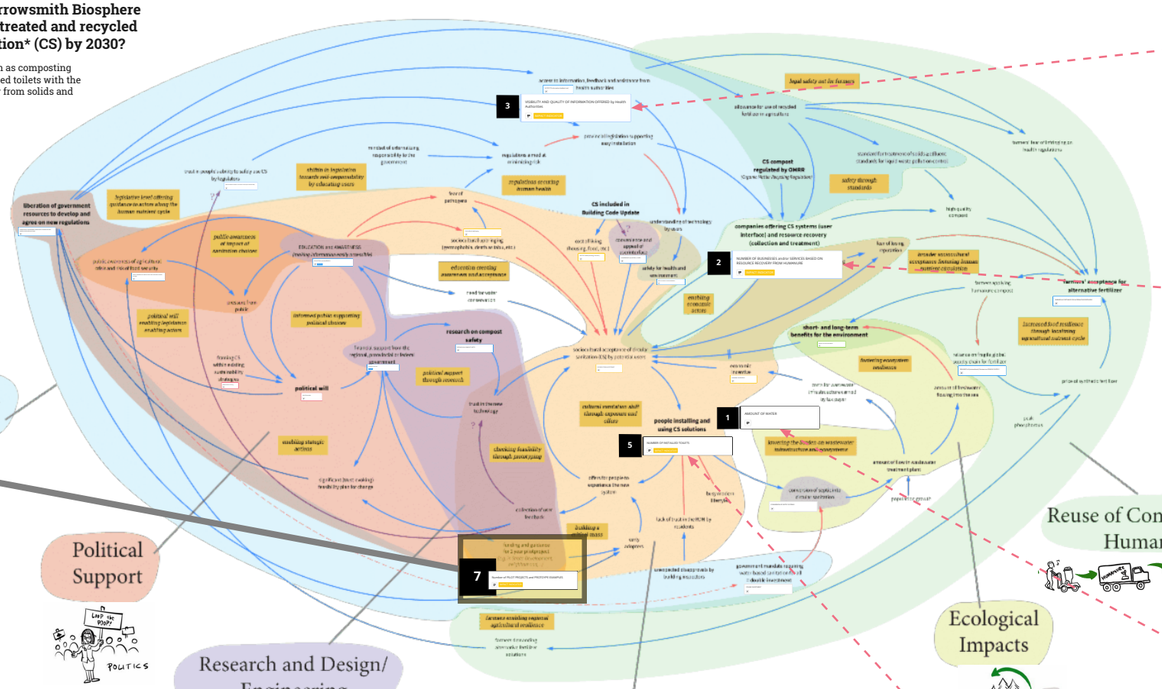

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- **social media resonance of the projects?**

HIghland Park Example:

As suggested by Jenni:

#1| VISIBILITY AND QUALITY OF INFORMATION OFFERED by Health Authorities

IMPACT INDICATOR

Rationale:
- if provincial legislation has taken action on informing the public on the topic, it shows that the topic has reached higher decision making levels and gained support from politicians and public

Possible Criteria:
- accessibility of information:
  - e.g. ***where can I find it*** (how many clicks away)?
    - web, print, social media
- activity of spreading information
- ***what services are offered by the government:***
  - handbooks, workshops, trainings for engineers, etc.?
- user-friendliness of material:
  - high amount of visual information vs. text blocks

As suggested by Jenni:

#2| NUMBER OF BUSINESSES and/or SERVICES BASED ON RESOURCE RECOVERY FROM HUMANURE

IMPACT INDICATOR

Rationale:
- if there are businesses or services making money or being funded to offer the service of collecting, treating humanure and distributing finished compost as a product, it means that legislation has **passed laws** as well as installed **regulations that secure this process to be safe** to humans and their environment, also there has been an **increase in awareness and acceptance among the public (*sociocultural acceptance*)** and the narrative of human waste has started to change towards seeing human waste as a valuable resource, which points to a change in mindset in leading actors of the system and the beginning of a shift in the paradigm towards circular thinking.

Possible Criteria:
- ***# of organic matter and liquids*** processed in the facilities

As suggested by Jenni:

#3| NUMBER OF INSTALLED TOILETS

IMPACT INDICATOR

Rationale:
- number of toilets can be counted (!) in theory...
- assumption that data on toilet installation in **new homes (rather than in retrofits)** would be collected by housing & building sector

Hurdle to measuring it:
- private owners unlikely to share information of toilet installation

Ideas for possible proxy indicators
- health authorities documenting # of filings for compost toilets
- building permits? difficult, as processing for permits is different for indoor implementation

Added during workshop:

#5| AMOUNT OF WATER

Indicator:
- measure water from point of installation
- different municipalities have different measuring of water an wastewater use
- need a baseline, e.g newly installed home

Hurdle
- has a lot of variables coming in
- more applicable for municipal use, where composting toilets are currently less likely to be installed
- people who conserve water are already low in water-use

Could be overcome with BASELINE (moment of installation)
- Compare per capita overall use in the region v.s. household with composting toilet

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