

**Figure 33.** Creative videos for attracting supporters for second hand furniture

On the second challenge, the students from traffic engineering analyzed, mapped and modeled the garbage trajectory and congestion points, using an Integrated Waste Management approach, and offered solutions for addressing it, cross-fertilizing from traffic engineering solutions for green waves, congestion resolution and regular flow of garbage disposal and management

• **ИНТЕГРИРАН** систем за управување со отпадот

- Регулаторна рамка и компензација на трошоци
  - Преглед и категоризација
  - Проценка на ризик
  - In-place управување



**Figure 34.** Integrated waste management system - TFB



**Figure 35.** Garbage route, analysed as traffic congestion



**Figure 36.** Using AI for route traffic and intelligent containers to address the garbage congestion in the analyzed region

On the third challenge, an app solution as information system for car-sharing and transportation of passengers who travel between Bitola and Prilep on daily basis, for different reasons (businesses, faculties, personal) on a regular basis or occasionally the involved parties made the preliminary analysis of needs, number of passengers, frequency of travel, budget, interested parties, preferences, and tried to onboard with the existing transportation companies, private taxis, individual drivers. This is work in progress.



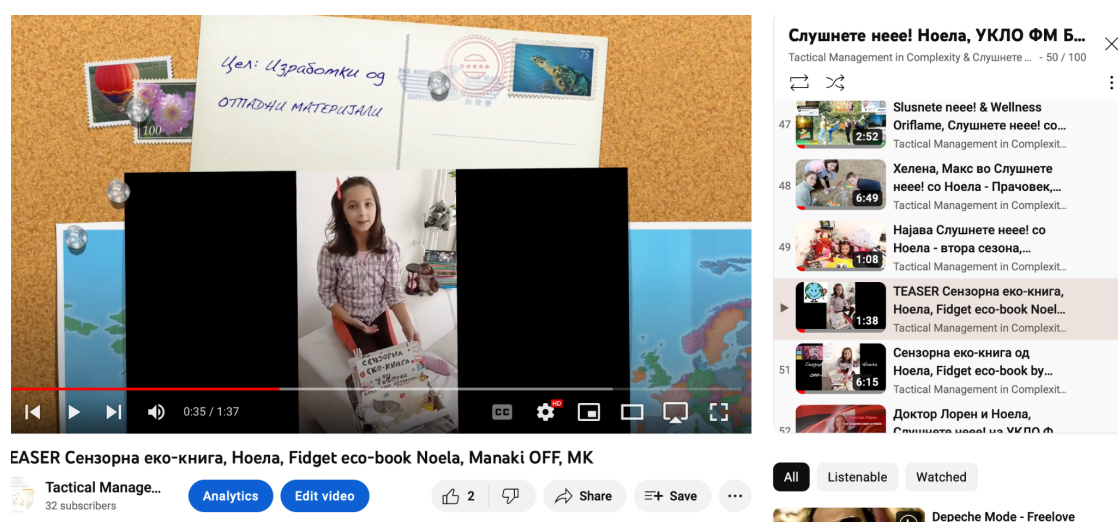
**Figure 37.** Route for car-sharing application needs



## From young age

Within the continuous activities in the North Macedonian context, on the side of education, raising awareness and engagement, we can enlist several modalities towards CE performed by the primary school children.

- **Sensory eco-fidget book!** by Noela<sup>39</sup>, a complete sensory book with all the sensory teasers, devised by household waste such as wrappings, card board paper containers, plastic bags, textile leftovers etc. to replace the plastic pop-its, fidgets, squishies, ... which have been overproduced, over-priced and piled up. The child has complete instructions how to make one from any random household waste, and can serve children of all age - typical and atypical. Both the process and the book are worthwhile engaging and learning



**Figure 38.** Sensory eco-fidget book, made from household items

- **Moto: “I can - we can do this together”** created within the radioshow “Listen to ussss!”<sup>40</sup> with Noela, at the university radio station UKLO FM Bitola. The moto has been reworked multiple times by the school-children who engaged in the projects about CE<sup>41</sup>

<sup>39</sup>

[https://www.youtube.com/watch?v=VpJqsNFmP3I&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=50](https://www.youtube.com/watch?v=VpJqsNFmP3I&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=50) and  
[https://www.youtube.com/watch?v=j5rCSvE9Hkg&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=51](https://www.youtube.com/watch?v=j5rCSvE9Hkg&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=51)

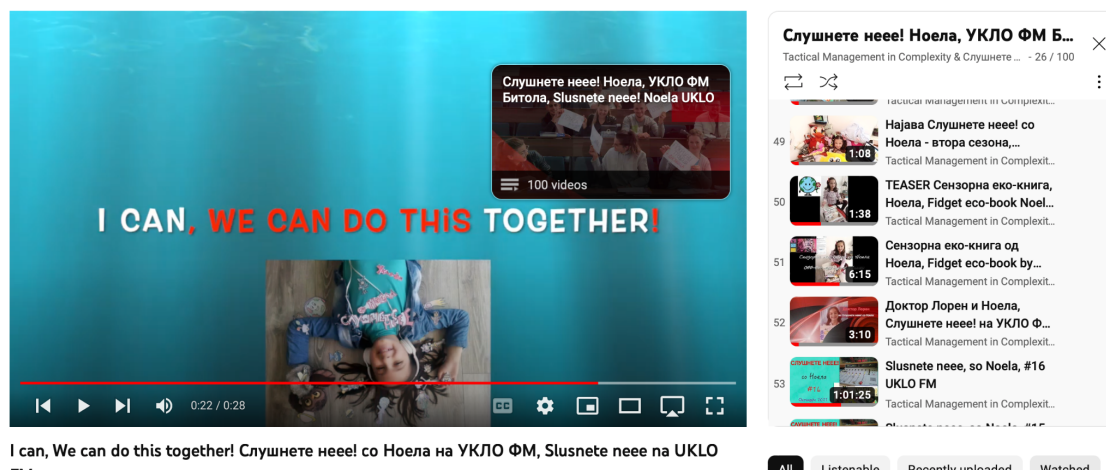
<sup>40</sup>

[https://www.youtube.com/watch?v=Q7TD7-GjNmo&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=26](https://www.youtube.com/watch?v=Q7TD7-GjNmo&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=26)

<sup>41</sup>

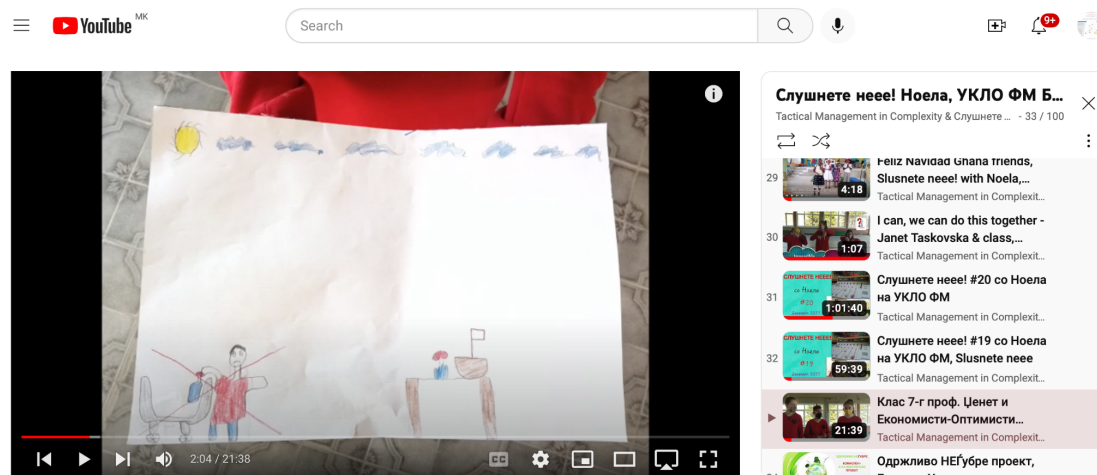
[https://www.youtube.com/watch?v=riZHGnzQfgM&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=30](https://www.youtube.com/watch?v=riZHGnzQfgM&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=30)





**Figure 39.** Audiovisual content, moto for environmental action

- **Pupil engagement** in exploring the concepts, approaches and best practices within CE - in video clips, audios<sup>42</sup> with professor Janet Taskovska



**Figure 40.** Student works on the principles of CE

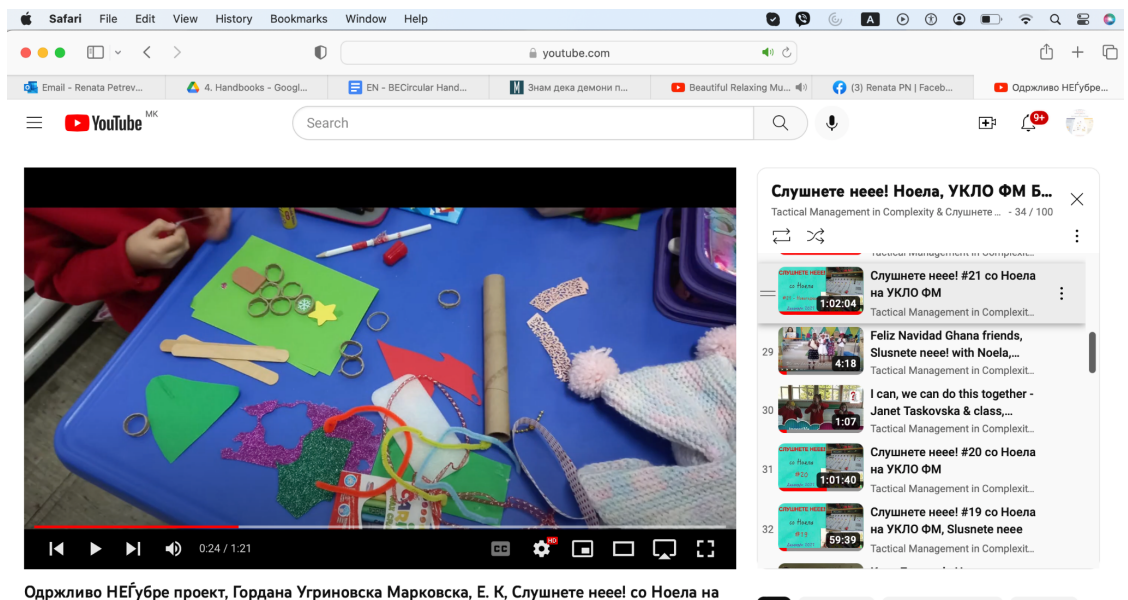
Youngest create their greeting cards from leftovers, saving their family budget and acting circular<sup>43</sup> with professor Gordana Ugrinovska

<sup>42</sup>

[https://www.youtube.com/watch?v=6l0KZjfd7Fw&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=33](https://www.youtube.com/watch?v=6l0KZjfd7Fw&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=33)

<sup>43</sup>

[https://www.youtube.com/watch?v=-y2snrQ18mM&list=PLuGD39XFPX9F5koAkd8g7wbKp\\_yV\\_JO54&index=34](https://www.youtube.com/watch?v=-y2snrQ18mM&list=PLuGD39XFPX9F5koAkd8g7wbKp_yV_JO54&index=34)



**Figure 41.** Youngest pupils contribution - greeting cards from household items

## **PDIA project: Worsening of the air quality in North Macedonia during the heating season**

Another bottom up project aiming to address the problem of environmental pollution in North Macedonia and assist one of the main stakeholders - the citizen - directly, both with managerial and technical solution has been the investigation of the problem of worsening of the air quality in North Macedonia during the heating season in a project carried out by participants of Ghent University Belgium, University St. Kliment Ohridski Macedonia within a Harvard University CSI module for Problem Driven Iterative Adaptation (PDIA) in the course of 12 weeks during the heating season of Autumn/Winter 2017<sup>44</sup>. The PDIA approach prescribes the strategy of addressing complex problems by decomposition into sub-causes, their formulation, investigation of authority, acceptance and ability and providing iterative search for solutions (best practices, positive deviations, ...) that may work in specific context, in our case North Macedonia, as initiation point for expansion across the region. The investigation resulted with proper identification of several main sub- causes to the problem. The tactical approach was to focus on the citizen as one of the main stakeholders, in a holistic manner but also contributors to the pollution

44

<https://conference.unt.edu.mk/wp-content/uploads/2019/03/TSD-ABSTRACT-2018-TZP-05.03-FINAL.pdf>

and/or solution, using the Denica method, based on the Sense-and-Respond framework. The contribution aims to bridge scientific solution and reality in practice, to guide and help various stakeholders to obtain a helicopter view and draft strategy for this complex problem, along with a system of roles and accountabilities that will support the citizen's adaptable behavior towards reducing his/her own participation in the air pollution, on tactical level. The methodology that involves scientists and practitioners and combines strategy and tactics for complexity can be replicated in the Western Balkans, enabling proper context capture and effective addressing of the problem, for the benefit of all.

We will showcase the logic of reasoning within the PDIA guidelines, in order to reach proper problem resolution.

**Why does it matter? (and how would you measure this or tell stories about it?)**

- Health of citizens – oncology patients, respiratory diseases, ...
- Environmental degradation and pollution – PM10 particles, quality of soil, presence of pollutants in milk, wine, wheat
- Reproduction of the population – fertility, in vitro increase, having first child aged 35+
- Deforestation happens (legal and illegal) – as main resource for heating is wood, ...,

**To whom does it matter? (who else cares?)**

- Citizens in this geographic location
- Animals, plants, future generations, ... the ones to whom we initiate change and cannot do anything in return, except adapt
- Healthcare professionals

**Incorporated sub-question: Who doesn't give a damn?**



## **Who needs to care more and how will you get them to give it more attention?**

- Individual citizens who live in this geographic region, within their possibilities (heating alternatives, transportation, Reuse, Recycle, Reduce)
- Government (infrastructure, subsidizing, facilitation, regulations and evaluations of discrepancies, biggest pollutant businesses emphasis on proper solving, waste management, ...)
- Business (the business model shouldn't be just profit; big picture gives/takes, ...)
- International community (this pattern of doing stupid things because of lack of money, knowledge, consciousness, capability and proactivity on individual and collective level) exists in at least half of the global developing countries, if not all)
- EU and International community

The attention and dedication needs to be captured on various levels (mostly mentioned in brackets in the bulleted answers of this question): individuals need to start thinking that there are some things they can do to improve the situation by themselves within their possibilities and not use the excuse – 'it is not worth it, it is just one drop in the ocean'. The government should have systems design of projects towards purpose and identify proper roles and accountabilities, and as next step populate those roles with various agents. The international community should exemplify economies that lead the way and facilitate functional exchange of information and resources towards co-evolving together; EU should step towards big picture system design of a project with a purpose of reducing pollution and making sure the ones who populate the roles are accountable and fulfill their accountability in the system, ...)

## **WHAT WE DID - COMBINE STRATEGY AND TACTICS FOR COMPLEXITY**

Project team of Ghent University Belgium, University St. Kliment Ohridski Macedonia (bachelor and master students: Mihaela Atanasovska, Damjan

Chkatroski, Martin Trajkovski - supervised and coordinated by Asst. Prof. dr. Renata Petrevska Nechkoska) within a Harvard University CSI module for Problem Driven Iterative Adaptation (PDIA) in the course of 12 weeks during the heating season of Autumn/Winter 2017<sup>45</sup>.

Strategy for complexity: Problem Driven Iterative Adaptation (PDIA) (Building State Capability, Evidence, Analysis, Action; Andrews, Pritchett, Woolcock, 2017)

Tactics for complexity: the Denica method (Petrevska Nechkoska, 2017), based on the Sense-and-Respond framework (Haeckel, 1999)

### **PROBLEM DRIVEN ITERATIVE ADAPTATION - COMPONENTS**

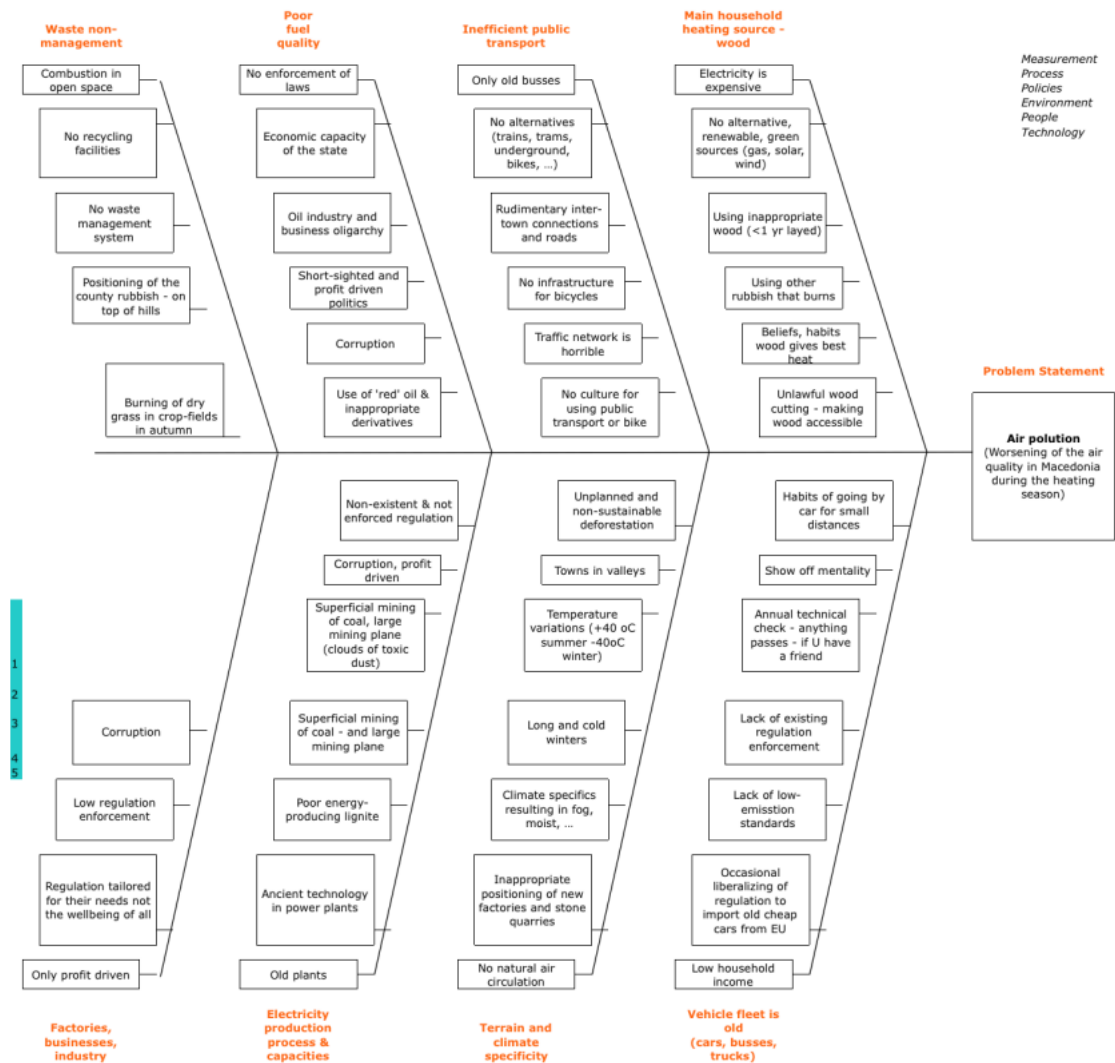
#### **1. Needed authority – Key stakeholders**

Name	Role	Why are they important?	Rank (where in the matrix?)	Current attitude	What we would like them to do?	Key messages	How (Tactics?)	When	Who
<i>Intellectuals</i>	Support the cause without political background (gather personal network of intellectuals from all ranges, profiles, political or no political background, MKD and diaspora, to recognize and support the cause)	To exemplify that smart, wise, engaged and proactive people do care and want to make a difference to a common purpose of quality of life for all	A	Segmented and individualized – no collective purpose nor facilitator to guide them. Only sporadic scattered efforts which are usually colored in one or the other political party	(1) Support the project (and get involved in dissemination) as individual intellectuals (otherwise groups, institutions, NGOs, leaders, ... are all going to be considered politicized) and (2) act in line with the project through personal example	If not now – when? If not us – who?	Activate the personal network and initiate a meeting, check for support climate and see if it can spread more and how – social media, personal discussions, workshops, interviews, ...	January 2018	Renata & (Martin, Damjan, Mihaela)
<i>Model PR citizens</i>	Support the project with own	To act as referrals to the common	B	Each fighting their own battles, but with	(1) Invest some of their recognizable	If not now – when? If not us –	Persuade one by one by getting contact,	February 2018	Renata & team (Martin, Damjan,

Intellectuals,  
Model PR citizens,  
Media,  
Ministries -  
Of transportation,  
Of environment,  
Of finance,  
Of economy,  
Of internal affairs,  
Of law;  
Commercial businesses and banks,  
Neutral citizens and households,  
Municipal government,  
Transport companies,  
External investors,  
EU

**Figure 42.** Problem Driven Iterative Adaptation, Influencers and Enablers

<sup>45</sup> <https://bsc.cid.harvard.edu>



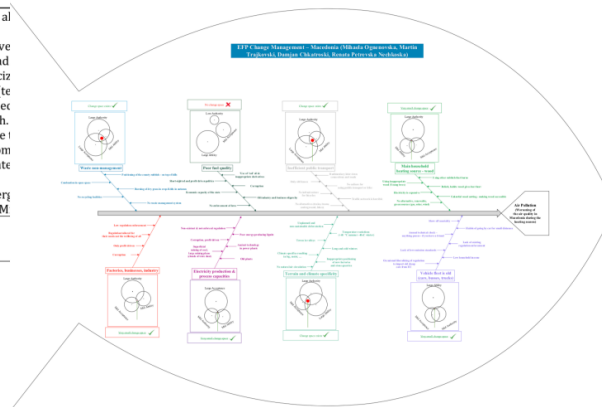
**Figure 43. Fishbone diagram - the problem of Air pollution - Worsening of the air quality in North Macedonia during the heating season**



	Use the questions provided to help you reflect	AAA estimation (low, mid, large)	Assumptions																				
<b>Cause # 1</b>	<b>Main household heating source - wood</b>																						
	Overall, how much Authority do you think you have to engage?	Large	<b>Supportive:</b> Government: Ministry of transport, Ministry of economy – electricity price); Ministry of environment (alternative green solutions), Ministry of law, Ministry of internal affairs (unlawful wood cutting) <b>Non-supportive:</b> Citizens (change of behavior and mentality) <b>Neutral:</b> Commercial businesses (they will seek for profit anyway)																				
	Overall, how much Acceptance do you think you have to engage?	Mid	<table border="1"> <thead> <tr> <th>Agents</th><th>Engagement</th><th>Influence</th><th>Acceptance</th></tr> </thead> <tbody> <tr> <td>Ministries</td><td>5</td><td>9</td><td>Mid</td></tr> <tr> <td>Citizens</td><td>2</td><td>6</td><td>Low</td></tr> <tr> <td>Commercial businesses</td><td>6</td><td>6</td><td>Mid</td></tr> <tr> <td><b>Total estimate:</b></td><td></td><td></td><td><b>Mid</b></td></tr> </tbody> </table>	Agents	Engagement	Influence	Acceptance	Ministries	5	9	Mid	Citizens	2	6	Low	Commercial businesses	6	6	Mid	<b>Total estimate:</b>			<b>Mid</b>
Agents	Engagement	Influence	Acceptance																				
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Citizens	2	6	Low																				
Commercial businesses	6	6	Mid																				
<b>Total estimate:</b>			<b>Mid</b>																				
	Overall, how much Ability do you think you have to engage?	Mid	<b>Time:</b> Short time because the adverse effects are already putting heavy risk on quality of life <b>Agents (HR):</b> Collaborators in all spheres – in governmental institutions, especially higher managers; in NGOs to have broad support regardless of the political party (main danger to become politicized project on two-player political arena); reputable academic staff (teachers, professors, students, researchers, ...) to support the cause; Media attention and support; Own example – practice what you preach. <b>Money:</b> 1) Our financial needs as project team are to establish contacts, persuade, coordinate action, disseminate and promote via different means (social media, forums, presentations, debates, leaflets, ...). In this sense, the necessary funds are EUR 5.000+ 2) If the projects of infrastructure, renewable energy and electricity price are undertaken, then the funding is expressed in Millions EUR.																				
	What is the change space for cause # 1 (large change space, some change space or no change space) – AAA Venn diagram	Some small change space																					

**Figure 44.** PDIA - Identifying possibility for initiating change - Authority, Acceptance, Ability (AAA)

	Use the questions provided to help you reflect	AAA estimation (low, mid, large)	Assumptions																				
<b>Cause # 1</b>	<b>Main household heating source - wood</b>																						
	Overall, how much Authority do you think you have to engage?	Large	<b>Supportive:</b> Government: Ministry of transport, Ministry of economy – electricity price); Ministry of environment (alternative green solutions), Ministry of law, Ministry of internal affairs (unlawful wood cutting) <b>Non-supportive:</b> Citizens (change of behavior and mentality) <b>Neutral:</b> Commercial businesses (they will seek for profit anyway)																				
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What is the change space for cause # 1 (large change space, some change space or no change space) – AAA Venn diagram		Some small change space																					



**Figure 45.** PDIA - Identifying possibility for initiating change - Authority, Acceptance, Ability (AAA) for all causes in the fishbone diagram

#### 1. Needed authority – Key stakeholders

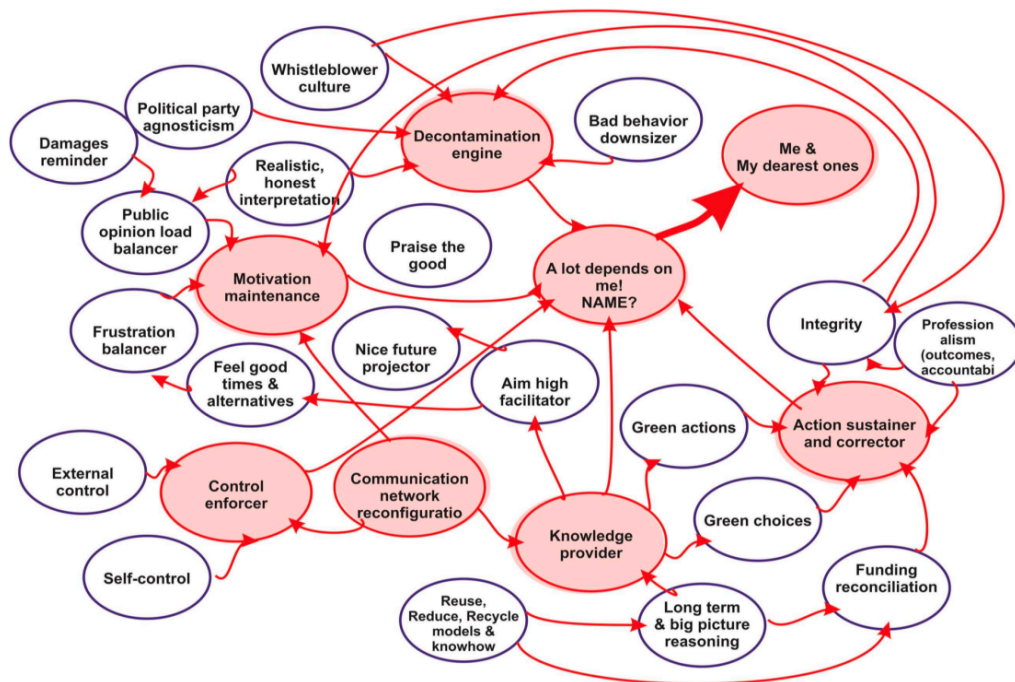
Name	Role	Why are they important?	Rank (where in the matrix?)	Current attitude	What we would like them to do?	Key messages	How (Tactics?)	When	Who
<i>Intellectuals</i>	Support the cause without political background (gather personal network of intellectuals from all ranges,	To exemplify that smart, wise, engaged and proactive people do care and want to make a difference to a common purpose of quality of life	A	Segmented and individualized – no collective purpose nor facilitator to guide them. Only sporadic scattered efforts which are usually colored in one or the	(1) Support the project (and get involved in dissemination) as individual intellectuals (otherwise groups, institutions, NGOs, leaders,	If not now – when? If not us – who?	Activate the personal network and initiate a meeting, check for support climate and see if it can spread more and how – social media, personal	January 2018	Renata & (Martin, Damjan, Mihaela)

**Figure 46.** PDIA - Identifying and profiling the Key stakeholders

Structuring your first iteration		
case note: You will need to actually take these action steps this week		
Sub cause from our fishbone diagram	Our idea of what to do	Action steps * this should be something that can be completed in the next five days.
Terrain and climate specificity (sub-causes of the sub-cause: unplanned and unsustainable deforestation; fog; inappropriate positioning of factories and stone quarries; natural air circulation; temperature variations; long and cold winters)	Investigate the project plans (from 1980) (if can be found) of the electricity power plant that incorporate use of the warm water for mass heating of the town Bitola; and make stakeholder analysis in order to see whether and how it can be implemented today. Also see how the same plants are organized in neighboring Greece that are located along the same plane of Pelagonia.	-Find the plant plans and projections for the hot water supply to the town of Bitola - Consult with some professors, engineers, specialists on what that means in technical and economic terms - Investigate how electricity plants throughout Pelagonia plane are organized in Greece
Waste non-management (sub-causes that create this macro sub-cause are: Combustion in open space, no recycling facilities, positioning of the country rubbish – on top of the hills, burning dry grass in crop-fields, no waste management system)	Create a detailed plan on how and where to start. Analyse the main waste disposal facilities and explain how they should be renovated. There are several solutions for this idea.	- Find all disposal plants on the map - Consult with some employees there and see the key reasons why waste management is nonexistent. - Present the idea in short to the employees. How they will react and is this idea possible to fulfill its plan.
Main household heating source - wood (sub-causes that create this macro sub-cause are: expensive	Meet and interview households that use wood as the primary source	-Find households that use wood as their main heating source -Interview them on why they use wood and go through all the details behind their

**Figure 47.** PDIA Iterating to initiate change and manage it





**Figure 48.** PDIA tactics using the Denica managerial method, System of roles and accountabilities for the Citizen within the Circular Economy, with regards to the air pollution

## BeCircular Business Ideas

Within the BeCircular project, all the learnings from within the project meetings, coaching, mentoring and training, have been designed to be extended to a broad audience from all helices within an economy - academia, civil sector, business sector etc. They all had to integrate in their design the CE frameworks, principles, approaches, mechanisms and components, and have been shaped within the CBMC, emphasizing the value to society, value to the planet and the take-back system as well as the internal and external adoption factors.

Here, we would enlist a few of the numerous business ideas which have been outlined to be shaped and carried out further more, to make tangible impact within the region.

- Remanufacturing plastic utensils from household plastic waste
- Production of household items (furniture, jewelry, decorations) or interior solutions (walls, mosaics) from glass waste
- School paper recycling (with all stages for children to learn from) to be used for greeting cards, gift wrapping, paper bags, ...
- Reuse and repurpose of old clothes, with addition of details, upcycling to be functional
- Adaptation and repurposing of old clothes
- Production of clothes from organic materials in spray tube (which can be reused, refilled)
- Freon reuse
- Reuse for refill of metal/plastic paint buckets
- Reuse of plastic buckets for UV-connection to be refilled
- Medical waste management within hospital departments, on institutional level, on regional scale
- Repair and reuse of household electrical items
- Repurpose of styrofoam from student model crafts in faculties of architecture, to be used for bean bag filling
- Repurpose and reuse of PVC waste materials from student model crafts in faculties of architecture
- Repurpose and reuse of paper and cardboard waste materials from student model crafts in faculties of architecture
- Remodeling of old furniture to be upcycled and for extended lifetime by introducing personalized design items (memory from clothes, personal belongings etc.)
- Repairing old furniture, from vintage to functional, emotional value