

Sustainability Living Lab for Food – Water – Energy in Urban Environments



Documentation of Stakeholder and Expert Workshops in Pune



FUSE in a nutshell

FUSE (Food-water-energy for Urban Sustainable Environments) is a transdisciplinary 3-year research project (2018-2021) involving the Food-Water-Energy Nexus (FWE) in Pune (India). The project will develop a long-term systems model that can be used to identify viable paths to sustainability. It brings together scientists, engineers, economists, and stakeholder engagement experts from Stanford University in California, USA, IIASA (International Institute for Applied Systems Analysis) in Laxenburg, Austria, UFZ (Helmholtz Centre for Environmental Research) in Leipzig, Germany, and ÖFSE (Austrian Foundation for Development Research) in Vienna, Austria. The project is a not-for-profit research effort and is part of the Sustainable Urbanisation Global Initiative of JPI Urban Europe and the Belmont Forum. Each of the national teams is supported individually by its own national science funding agency.

More information: <https://fuse.stanford.edu/>

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Context:

The provision of food, water and energy (FWE) resources is crucial for human well-being. Population growth, industrialization and urbanization increase the demand for those resources. To secure their provision, a long-term integrated approach is needed that takes into account natural and human factors, anticipates trade-offs and identifies synergies. The design and implementation of long-term strategies to achieve FWE-sustainability is a challenging task for all actors – including policy makers, civil society, the private sector and academia – and can only be achieved by working together.

The city of Pune is located in a growing metropolitan region in the Indian state of Maharashtra. More than 5 million people currently live in this region and it is foreseeable that it will grow significantly in the

future. Intermittent freshwater and energy supply and competition between urban areas and agriculture for water and energy characterize key elements of the region's stressed FWE systems.

FUSE is a transdisciplinary research project that aims to contribute to identifying solutions for long-term FWE sustainability in the Pune region. Building on the expertise of local stakeholders, FUSE will construct a long-term, multi-agent urban-FWE system model that captures connections and feedbacks among users, producers, distribution mechanisms, and resources. It integrates narratives of future changes in climate, demographics, land use, and economic development, and considers the behaviour of a wide range of actors. The model will be used to evaluate policy interventions and innovative governance forms in order to identify implementable sustainability options.

Sustainability Living Lab Approach

To integrate knowledge, expertise and views of local actors, FUSE adopts a Sustainability Living Lab (SLL) approach. The SLL approach includes a stakeholder analysis and two series of workshops, at the beginning and the end of the project period, respectively. In the first set of workshops (spring 2019), stakeholders and policy experts shared visions, challenges, coping strategies, and potential policy solutions. Based on the results of the workshops, interviews and surveys are carried out to further deepen the findings. The information gathered is then processed and integrated into the system model. In a second set of workshops (end of 2020), the results of the modelling exercise will be presented to the participants of the first workshops, and feedback will be elicited. Between the two series of workshop, further exchange with the stakeholders takes place.

Key points:

- The potential of the Pune region is its cooperative culture, the tradition of low and efficient resource use and the engagement of its citizens to improve sustainability.
- Ecological deterioration and climate change make life in rural areas more difficult.
- Competition for water between rural and urban areas rises due to the increasing water use by the growing city.

FUSE Living Lab Approach

1

Get stakeholder ideas about future challenges. Experts add ideas and propose solutions.

2

FUSE team develops a policy-evaluation model incorporating all ideas.

3

Get stakeholder and expert response to the results.



Workshops in Pune – February 2019

In Pune, the first set of workshops took place from 18-21 February 2019 at the premises of the local partner organisation, the Gokhale Institute of Politics and Economics. Two one-day and one half-day workshops were organised: the first workshop with stakeholders from different fields of FWE, the second workshop with experts from the public and private sector and academia, and the third workshop with modelling experts. This report documents the first two workshops.

1. Stakeholder Workshop (February 18, 2019)

- **What:** Share and discuss FWE challenges stakeholders are confronted with, their coping strategies, and ideas / solutions for the future.
- **Who:** 30 participants from farmers' organisations, citizens' associations, NGOs working on environmental and urban issues, and small companies
- **How:** After an introduction to the project, the participants formed groups and discussed current and future challenges, coping strategies and solutions.



Step 1: Collect current challenges and coping strategies

“Lower yields combined with decreasing farm sizes make survival from agriculture more difficult”

Challenges:

Primary FWE-challenges brought up by the participants were related to the deteriorating quality of soil, food and water, and to increasingly difficult living conditions in rural areas. For these areas, participants were concerned about changing rainfall patterns, water scarcity, including groundwater depletion, increasing siltation of dams, water pollution due to insufficient sewage systems, fertilizer use and high salinity – resulting in harder and contaminated soils and therefore lower agricultural yields. Consequently, lower yields, combined with decreasing farm sizes (due to heritage rules), make survival from agriculture more difficult and reduces the attractiveness for young people to stay in rural areas. Issues raised also concerned the different regulations for water-intensive sugarcane (where minimum prices are guaranteed) and other crops that exclusively depend on market prices. This disincentivizes farmers from growing more nutritional and water-saving crops.

For the city of Pune, FWE-challenges linked to the rapid growth of the city and a changing lifestyle were brought up. Main issues were: increased water and electricity consumption (and intermittent supply) due to population growth and industrial development, proliferating settlements in fringe areas without building the correspondent water infrastructure, hence the provision of water via expensive and sometimes illegal water tankers, excessive and unregulated groundwater extraction, and pollution of rivers due to insufficient sewage treatment systems.

“Create farmer cooperatives to coordinate efforts”

Coping strategies:

When asked about coping strategies in rural areas, participants mentioned the creation of farmer cooperatives to coordinate their efforts and collectively sell their

produce mainly in different markets in Pune. However, they mention price volatility as a major obstacle for long-term planning. To deal with water scarcity, farmers and citizens increase the depth of their wells and increasingly use water from tanker trucks. The installation of drip irrigation was mentioned as a strategy to – in the medium term – save water and effort. To deal with intermittent electricity supply, some farmers employ the practice of uncontrolled flood irrigation/load shedding. This means that water pumps are left on during the night. To improve soil quality, some farmers dig up soil from below, which also needs a considerable amount of energy.

“Sustainability is in Pune’s culture”

Solutions:

A great opportunity for Pune was seen on the one hand in the cooperative culture between citizens, between farmers, and between citizens and administration, and on the other hand in the awareness of a growing number of citizens about the need for change. Civil society organisations and citizen groups are very active in promoting solutions such as rainwater harvesting for groundwater recharge, protecting rivers by reducing chemicals used in agriculture, wastewater recycling, and urban agriculture. Proposals for public interventions included public groundwater recharge policies, and – related to this – mapping of aquifers, desiltation of dams, metering of piped- and waste water, installation of decentralized wastewater treatment, enhanced promotion and subsidization of solar energy, promotion of organic farming and farmers’ markets, payments to farmers for maintaining ecosystems just to name a few.

Participants stated that Pune has the potential to be a role model in many areas – from the re-use of waste and water to generating energy out of waste, sustainable urbanisation patterns without covering fertile and green land, and sustainable transport systems. Pune is a knowledge and IT hub and people are used to conserving, recycling and reusing resources.

Step 2: How to react to future challenges?

In the second part of the workshop, four future perspectives were presented (see p.6), relating to the potential increase in water scarcity, urbanisation, energy demand, and transformation of agriculture, respectively.

Participants discussed in groups how the different perspectives would affect their lives and how they would deal with arising challenges and opportunities.

- Discussions in the group focused on water scarcity addressed the promotion of climate resilient and water-saving crops, the implementation of water saving techniques, on questions related to equity and equality given that people living in slums will suffer more from water stress than other parts of society.



- In the urbanisation perspective, participants agreed that rising income of an urban middle class would lead to a change in preferences and lifestyle, and to a higher demand for water and energy as well as for convenience food products. There was a consensus that more awareness and more community participation in water use and conservation is required. In addition, the need for regional cooperation on FWE was addressed.

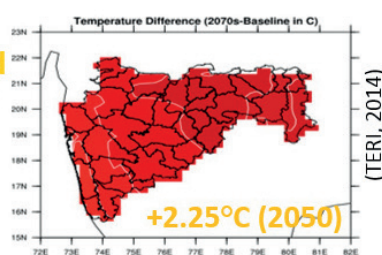


- The group that discussed the land transformation perspective concluded that growing cash crops in big farms would be more profitable, but sustain fewer livelihoods, which would lead to further migration of farmers to cities. Even more water would be pumped, but more feedstock could be used to produce bioenergy.
- In the field of energy, participants agreed that increased demand due to population growth and lifestyle changes will have to be met by advanced technology and renewable energy sources such as solar photovoltaics, wind energy, biomass, converting heat from industries into power, and energy storage solutions.



Perspectives of potential future developments presented by the FUSE team during the workshops

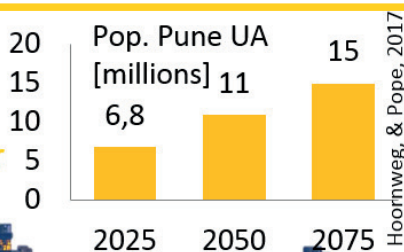
P I – Changing temperatures and water availability



Climate simulations predict an increase in average temperature of more than 2°C across the state by 2050. The total annual precipitation is expected to increase slightly, but with likely regional, interannual and seasonal variation. For crops such as rice or sorghum, this may imply decreasing yields.

New water allocation conflicts and a further widening of the socio-economic urban-rural and intra-rural disparities are expected.

P II – Urbanization: The Pune-Mumbai Corridor



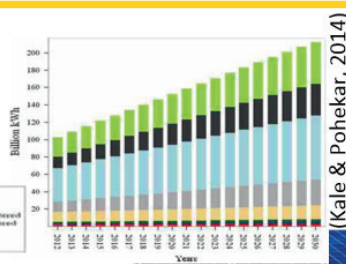
The Pune urban agglomeration (UA) has been growing rapidly over the last decades and no end to the population and spatial growth is in sight. The growth of the city entails an increased and more concentrated use of resources like water, and a loss of fertile land at the city's margins. Especially, the expressway to Mumbai will attract settlements, forming an urban corridor between the two metropolises.

P III – Land transformation in rural areas

Smallholder farms (down arrow) → Large-scale cash-crop farms (up arrow)

Maharashtra is experiencing an industrialization of agriculture: Large-scale, high-intensity, water-demanding agriculture (cash crops, e.g., sugarcane) replace smallholder, subsistence farming. Solar farming might become an alternative to cash crops. Transformation also occurs as natural land is converted to agriculture. The transformation will entail further rural-urban migration.

P IV: Electricity: demand increase and insecurity



Maharashtra's electricity demand is expected to grow until 2030 by 110% and until 2050 by ca. 150%. Reasons are primarily population growth, higher living standards and changing agricultural practices involving energy-intensive water pumping. Renewables have high potential but large investments would be required to keep pace with the growing demand. Poor people may increasingly face energy poverty due to rising prices.

2. Expert Workshop (February 20, 2019)

- **What:** Create a common vision of a sustainable Pune and the Upper Bhima Basin in 2050, and develop ideas and proposals for measures and policies for a sustainable FWE system.
- **Who:** 45 participants from academia, public institutions, former government officials, and from various parts of the private sector
- **How:** After an introduction to the project, and after a presentation of the results of the first workshop, the participants elaborated on their vision of a sustainable Pune region in 2050. Subsequently, they developed measures to reach this vision, based on the challenges collected in the first workshop, and on the four future perspectives.

Step 1: Vision exercise

Participants in different groups produced pictures or mindmaps, representing a future vision of a sustainable Pune region. What would the region ideally look like in 2050 with a focus on the FWE nexus and on social dimensions. Each group came up with a common understanding of this ideal future. Though the pictures looked different, there were many similarities in their respective visions. Differences arose concerning strategies on how to reach the vision, which was part of the next session.



“The common vision”

“Pune could be a role model for sustainable lifestyles and economy with its knowledge- and IT-hub that generates a high level of well-being. Civil society, government, business, and academia work together based on knowledge, values and awareness as an integrated response to achieve sustainability. People have equal access to all natural resources (water, energy, food) and infrastructure (health care, education, etc.) in cities and rural areas.”

Selected elements of the common vision

- **Water:** Equitable access to clean water is guaranteed by efficient water management, including wastewater treatment, rainwater harvesting, and groundwater recharge. Eventually natural water bodies exist and tap water is drinkable.
- **Energy:** Energy is produced from renewable sources (mainly solar, also wind and hydro) and waste.
- **Governance:** Productive cooperation between the different sectors exists, laws are implemented.
- **Transparency and availability of data** (about groundwater, surface water, future plans, forecasts, wells, etc.) are key ingredients in most visions produced.
- **Agriculture:** Sufficient nutritious and healthy food is produced to feed the local population. Life in rural areas is attractive. Agricultural products are processed to create value.
- **Nature:** Extensive nature reserves exist for recreation, and ecosystems are maintained and improved.
- **Transportation:** Individual transport is reduced and replaced by public and shared mobility (using electric vehicles).
- **Cities and rural areas:** Urbanisation patterns are sustainable, maintaining fertile and green land, public transport, and local food supply.

Step 2: How can this vision be reached?

The next 30 years will be affected by big and fast changes, such as climate change, increased urbanisation, further population growth, technological advances, changes in lifestyles, partly aimed at greater sustainability, and partly towards higher resource consumption. The demand for land, food, water, and energy will further increase. As a second step, the participants elaborated in small groups how their vision can be reached within the four different perspectives that the FUSE team presented. The following graphic summarizes the proposals that participants came up with.

Measures proposed by participants – Highlights



Outlook / Next Steps

The FUSE team collected, documented and processed the information gathered during the workshops and will include it in different parts of the model and other elements of the research.

Household surveys about water, energy and food consumption (conducted during summer 2019) will deepen the findings and further inform the model and other parts of the research.

At the end of 2020, results of the research will be presented to and discussed with the stakeholders and experts.



Participants in Stakeholder Workshop



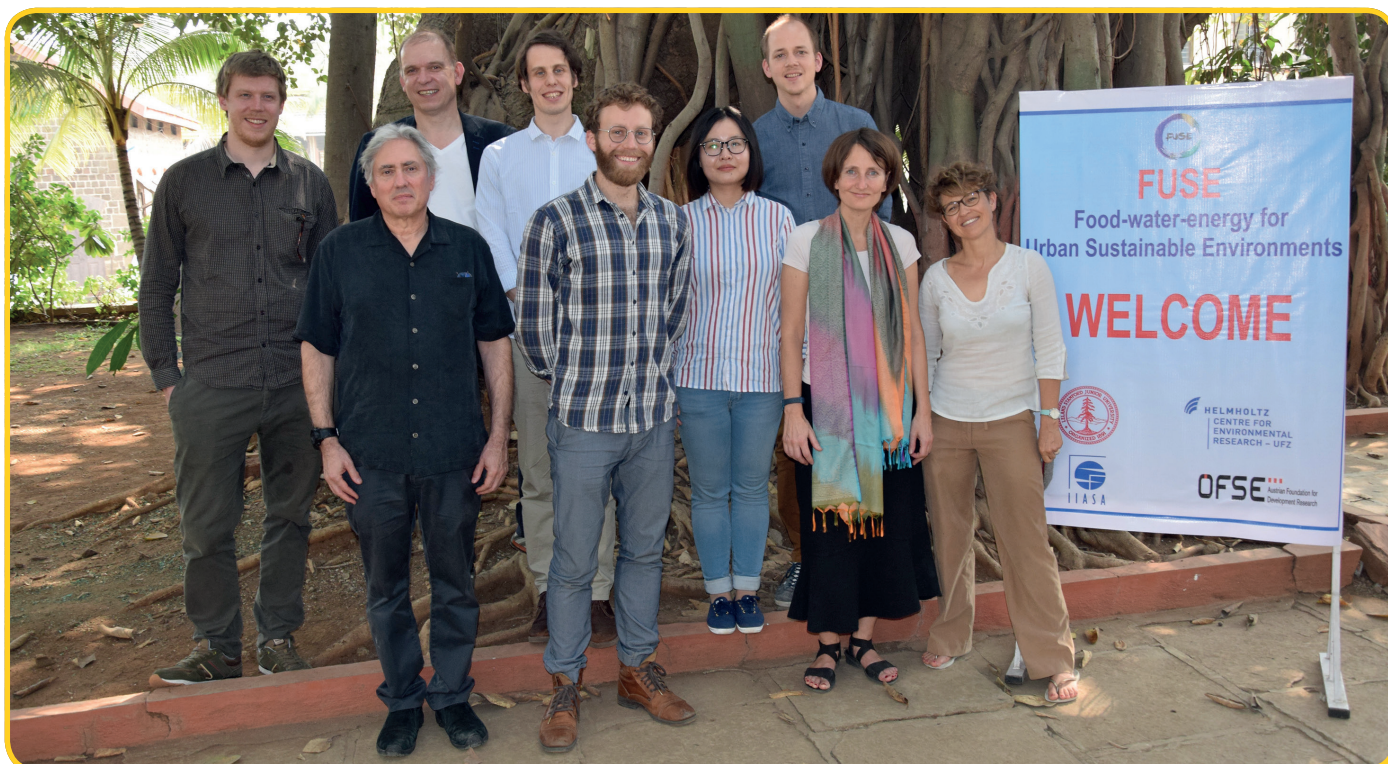
Participants in Expert Workshop

The FUSE team would like to thank all participants for their valuable contributions and the Gokhale Institute for hosting the workshops!

Participating Institutions

100 Resilient Cities, Rockefeller Foundation
 2030 Water Resource Group
 Action for Agricultural Renewal in Maharashtra (AFARM)
 Adarsh Foundation
 Advanced Center for Water Resources Development and Management (ACWADAM)
 AECOM
 Center for Environment Education (CEE)
 Appropriate Rural Technology Institute (ARTI)
 Aundh Gaon Urban Village
 Centre for Development Studies and Activities (CDSA)
 Confederation of Indian Horticulture
 Ecology Society of India
 Gokhale Institute of Politics and Economics (GIPE)
 Gomukh Environmental Trust for Sustainable Development
 Groundwater Surveys and Development Agency (GSDA)
 Habitat Forum
 Group of Farmers
 Jeevitnadi Living River Foundation
 Loni Kalbhor Village
 Maharashtra Electricity Regulatory Commission (MERC)
 Maharashtra Industrial Development Corporation (MIDC)

Maharashtra Social Housing and Action League (MASHAL)
 Maharashtra State Electricity Distribution Company (MSEDCL)
 Maharashtra Water Resource Regulatory Authority (MWRRA)
 Mahratta Chamber of Commerce, Industries and Agriculture (MCCIA)
 Mission Groundwater
 Nexus Energy TECH
 Pani Panchayat Movement
 Pimparkhed Village
 Prayas Energy Group
 Pune Municipal Commission (PMC)
 Rachana Foundation Trust
 Samuchit Environmental Foundation
 Selco
 Shashwat Eco Solution Foundation
 University of Pune
 Vasantdada Sugar Institute (VSI)
 Vasundhara Pune
 Vasundhara Swachata Abhiyan
 Water and Land Management Institute (WALMI)
 Water Resource Department (WRD) Maharashtra
 Watershed Organisation Trust (WOTR)
 Water Resources Department (WRD), Government of Maharashtra



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