How can peasants adapt to hydrosocial uncertainty? A case study from periurban Pune

Sarah Luft, Carsten Butsch

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Introduction

Peasants in periurban India operate in the midst of social and ecological transformation processes, which manifest inter alia through a changing quantity and quality of water and alterations in the access to water, and new regimes of distribution of and control over water (Hussain & Hanisch 2014, Narain 2014, Butsch & Heinkel 2020). Agriculture is exposed to growing uncertainties in periurban hydrosocial environments (Swyngedouw 1999) and challenged with the need to plan and adapt accordingly. Yet, peasants' agency to influence developments is restricted and the demand for more integrative approaches towards sustainable transformations of periurban agriculture with greater public participation is increasing (Bruns & Frick 2014, Mitra & Banerji 2018, Punjabi & Johnson 2018). Our study is guided by the question how periurbanisation transforms local environments and alters the preconditions of water-based livelihoods. It aims to contribute to a broader perspective of alternative periurban futures in India. The approach developed here aims at enabling and empowering peasants' adaptive decision-making towards their future livelihoods (Luft and Butsch 2022). Through this we explore how peasants can actively shape environments in the future.

The production of hydrosocial uncertainty

The concept of the hydrosocial cycle (Budds et al. 2014, Linton 2014) investigates water as created through socio-natural processes (Swyngedouw 1999). In our case study, the conceptualization of a reciprocal relation between water and society, influenced by power structures, provides a valuable framework for the analysis (Butsch et al. 2021). In this, we take water-related infrastructural developments, practices, and institutions into account. The constant changing, adapting and (re)shaping of the periurban by multiple actors creates uncertainty, especially for those most dependent on water. The production of hydrosocial uncertainty (Fig. 1) is considered from two perspectives: (i) Through uneven access to water (e.g., through climatic variability), rising urban demand and resource competition (Butsch & Heinkel 2020, Follmann et al. 2021) resulting in unsustainable practices, and changing environments (Hussain & Hanisch 2014, Thomas et al. 2017). (ii) Through institutional ambiguity due to parallel existing governance entities (e.g., gram panchayat, Irrigation Departments) (Butsch et al. 2017, Hui & Wescoat 2019) and the replacement of existing actors by new ones. This results in uneven and changing access to water infrastructures for different groups (Versteeg et al. 2021). Livelihoods that depend on the quality and quantity of available water resources, such as farming, are highly exposed to hydrosocial uncertainty during periurban transformations.

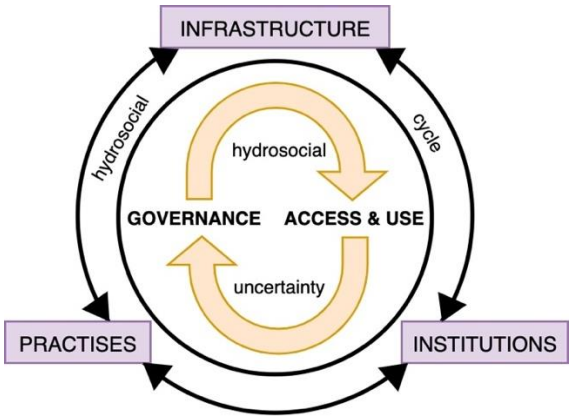

Fig. 1: The production of hydrosocial uncertainty (own draft)

Hydrosocial patterns of Paud, India

Paud, with its 4,000 inhabitants, was selected as one of six study sites in the project "H2O–T2S", as an example of an early stage of periurban transformation (Butsch et al. 2021). It is located 30 km West of Pune on the banks of the Mula River almost in the Western Ghats (Fig. 2). Agriculture, especially paddy cultivation, is one of the main traditional water-based livelihoods. However, over the last 50 years, hydrosocial changes have affected farming patterns. Originally, agriculture was mainly rainfed, but climatic variability and the higher water requirements of new crop varieties deemed this risky. Thus, many peasants invested in hydraulic systems for effective irrigation. Access to water underlies specific water user hierarchies and power gradients based on individual and collective hydrosocial preconditions. Official support systems for peasants are not in place. As a result, informal institutions emerged, e.g., neighboring peasants sharing access to water or equipment. Nevertheless, water becomes an increasingly scarce resource, as other water-based livelihoods compete with farming, and agricultural land is slowly transforming into settlements with higher water demand. Due to these hydrosocial

alterations, peasants have the options to intensify or withdraw from their livelihood.

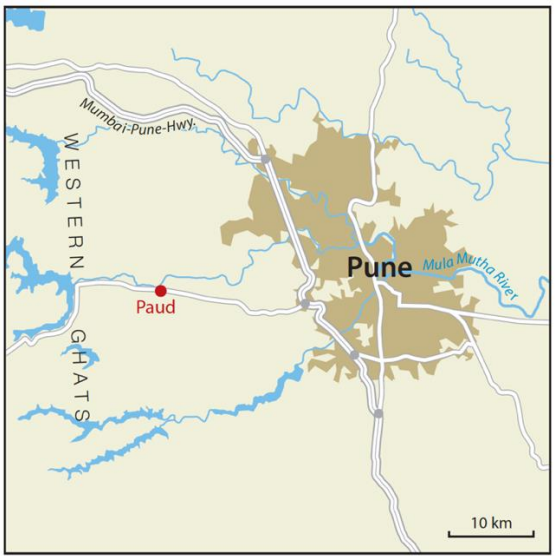

Fig. 2: Location of Paud (cartography: Martin Gref)

A modified Delphi method as tool for scenario-based planning

Scenario-based planning is an interactive method applied in planning and used by scientists to understand complex, long-term uncertainties and their development over time. It supports adaptive decision-making under uncertainty and helps to identify context-depended pathways and future coping mechanisms (Giaoutzi et al. 2012, Wulf et al. 2013). The Delphi method is one method applied in scenario-based planning. It follows the criteria of anonymity, iteration, controlled feedback, and group opinion. It creates non-biased expression of opinion, represents (dis)agreement, and reflects individual viewpoints through progressively addressing specific aspects over time (Tapio et al. 2011, Perveen et al. 2017). We modified the Delphi method by simultaneously tapping into local and expert knowledge systems. We selected 16 local actors of different livelihoods, institutional affiliations, gender and age categories, and 18 Indian and international experts, representing diverse regional expertise, different affiliations (academia, research, NGOs, planning), and research interests. We conducted three rounds of interviews with both panels between December 2020 and October 2021. As field access was still restricted due to COVID-19, we worked digitally and remotely. The first round focused on building normative future scenarios; in the second round, these scenarios were prioritized by evaluating specific scenario elements; the third round was used to reflect and sequence the scenario elements. We chose specific communication modes for the local actors (structured telephone interviews, WhatsApp) and the experts (digital semi-structured interviews, online surveys). In each round, the panelists received information on the village and on the previous round's results in form of videos (Luft & Butsch 2022).

Periurban futures in Paud

Three different future livelihood scenarios for Paud could be identified (Fig. 2): (i) The realistic pathway ("business-as-usual" (BAU)/ "preferred livelihood scenario" (PLS)) focuses on the fact that in future multiple, diverse livelihoods are possible. (ii) The first alternative ("extended traditional livelihoods" (ETL)/ "water-sensitive farming" (WSF)) addresses upgrading traditional water-based livelihoods without leaving the primary sector completely. (iii) The second alternative ("extension of economic activities" (EEA)/ "commercial farming and fishing" (CFF)) concentrates on economic upgrading within the primary sector and points to broader economic opportunities. The achievement of each scenario is connected to the occurrence of specific drivers, with different levels of importance and timings.

1) The actors consider "village development" the most likely driver to affect livelihoods in the future. Positively, it could lead to the creation of employment, better education, and active local political participation. It is likely to transform the village into a town, and although this causes uncertainty, residents believe the outcome would produce a positive long-term impact. Negatively, "village development" could enhance intransparency, in governance action which increases peasants' exposure to uncertainty and the need to initiate change. Other drivers potentially affecting the future development of livelihoods mentioned by the actors were "land-use changes", "urbanization", and "changing water management".

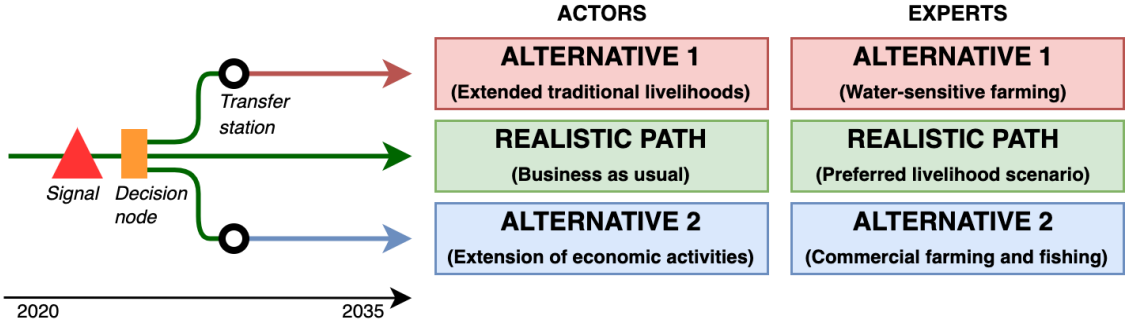

Fig. 1: Future livelihood scenarios for Paud (own draft)

2) For the experts, the driver "urbanization" has the greatest impact on livelihoods in the future. It may affect each of the three scenarios and strongly intersects with other drivers. Positively, "urbanization" may create new occupation for peasants leaving the primary sector. Negatively, it could contribute to land-use changes by triggering migration influx, which in return could affect the socio-cultural village fabrics. It could further contribute to a greater exposure to pollution, resulting in degrading water quality and quantity jeopardizing peasants' livelihoods. Other drivers mentioned by the experts are "weak institutional framing", "lack of access to education and finances", "overexploitation and pressure on resources", and "inequality among livelihood groups".

Each driver is connected to distinct signals, which trigger a change in the pathway, eventually leading to different future livelihood scenarios. Awareness about the drivers and signals can help peasants to particularly plan and adapt towards the future.

Comparing alternative pathways

In the Extended Traditional Livelihoods (ETL) scenario, actors engage in traditional farming and fishing and also expand to other agricultural occupations. In this scenario, "village development" leads to better educational and employment opportunities, "land-use changes" lead to a strong sense of environmental protection, and "changing water management" leads to stronger water conservation initiatives. Among the necessary actions in this scenario (Fig. 3), three actions are considered most important: (i) Receiving financial support (e.g., for tools) to upgrade product scales and patterns, (ii) equally allocating local resources (e.g., to secure access to lakes, or land) to increase yields, and (iii) increasing market access, e.g., in Pune. For the actors, the scope for action is actually more restricted in practice than in theory, as hydrosocial uncertainty limits their scope of action. Especially long-term planning requires institutional support, e.g., through financial assistance, hydro-political implications, or social welfare programs. In the Water Sensitive Farming (WSF) scenario, experts consider Paud's location in the river catchment area advantageous, as rainwater could be used for irrigation. Signals to move to the WSF scenario are falling water tables, water scarcity, progressing land development, and insufficient governance coordination, which could impede access to institutions for vulnerable groups. Compared to the actors, the experts suggested more varieties of actions and institutions (Fig. 4). Two actions are most important: (i) Receiving education and training, and (ii) analyzing and monitoring water quality and quantity trends. The experts precisely visualized how, why, and when hydrosocial alterations may be setting in and suggested counteractions for specific uncertainties for periurban peasants. With the suggested actions, local agency could be strengthened and especially vulnerable peasants could be empowered.

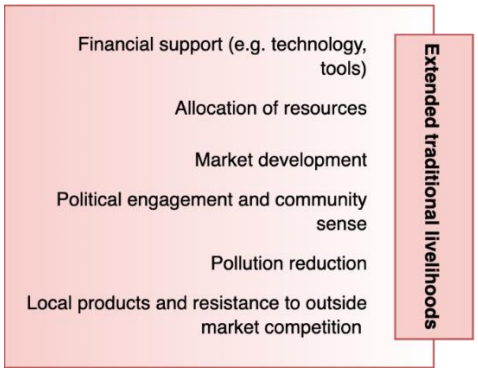

Fig. 3: Actions in the ETL scenario (own draft)

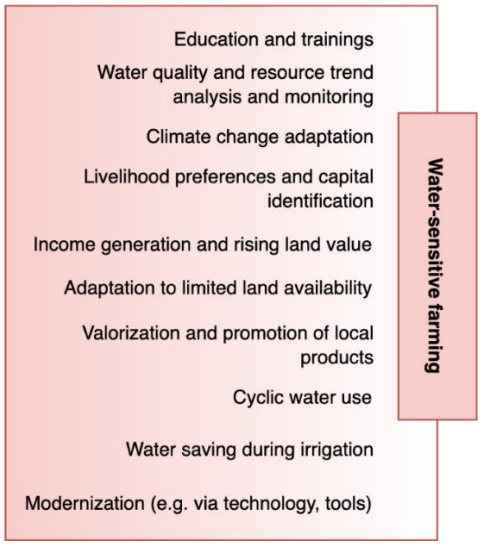

Fig. 4: Actions in the WSF scenario (own draft)

Concluding remarks

Our study illustrates the heterogeneity of future livelihoods in the transforming periurban hydrosocial environment. Against this background, scenario-based planning through progressively integrating local and expert knowledge is a useful approach to enhance long-term perspectives on livelihood development related decision-making and to build adaptive capacity accordingly. By complementing different knowledge systems, it supports especially peasants to create a better understanding of hydrosocial changes, and to restructure their access to water according to changing environments and water-related power relations in the short and long-term. Given the restrictions of the COVID-19 pandemic, the transformative potential of this participatory research could not unfold. Yet, adaptive planning allows for a structured interaction on the local level and the empowerment of marginalized communities. Through more inclusive longer-term research, and with transfers from theory into practice, our results could in further refinement contribute to facilitating a more sustainable transformation of periurban agriculture.

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Contact

Sarah Luft (MA)
s.luft@uni-koeln.de
Carsten Butsch (Dr. PD)
butschc@uni-koeln.de
Beide: Geographisches Institut, Universität zu Köln
Albertus-Magnus-Platz, 50923 Köln