

Development of an interactive web-based tool to support participatory analysis of SDG trade-offs associated with peri-urban land-use change

Fiona Marshall, SPRU, University of Sussex Business School, **Jonathan Dolley**, SPRU, University of Sussex Business School, **Bradley Butcher**, University of Sussex, School of Engineering and Informatics, **Novi Quadrianto**, University of Sussex, School of Engineering and Informatics, **Jeremy Reffin**, University of Sussex, School of Engineering and Informatics, **Baris Eray**, University of Sussex, School of Engineering and Informatics, **Prof Shijun Ding**, ZhongNan University of Economics and Law, Wuhan

BACKGROUND

Peri-urban areas are neglected frontiers of sustainability. Urban expansion generates an obvious trade-off between the benefits to GDP from new development, versus the cost of the loss of agricultural lands in the urban hinterland. But the transformation of peri-urban areas also results in some important hidden trade-offs which conventional methods miss. There is a lack of data -particularly in relation to informal, fragmented and rapidly changing land-use – along with planning processes that only include limited perspectives on the possibilities in these unchartered development zones. Thus, decision-making in urban planning is often blind to the potential impact of planning decisions on vulnerable groups, and indeed the potential to build synergies between SDG goals. Our project brought together an interdisciplinary team to develop an interactive web-based tool to analyse and highlight these hidden trade-offs and their implications for different social groups. We designed the tool to contribute to wider transdisciplinary processes; by helping to enable open and transparent stakeholder engagement in urban and peri-urban research and decision making.

METHODS

We created a web-app that allows non-experts to analyse land-use change using built-in deep learning techniques and freely available satellite imagery and create simple models to visualise the diverse impacts of that land-use change. This approach enabled us to detect changes in agricultural land-use that are not picked up through conventional land-use classification techniques and even, in the case of intensive vegetable cultivation, to identify the presence of migrant tenant farmers. We tested and demonstrated the web-app with a case study of peri-urban land-use change in Wuhan, China and have begun further testing through another case study of Ghaziabad, India.

FINDINGS

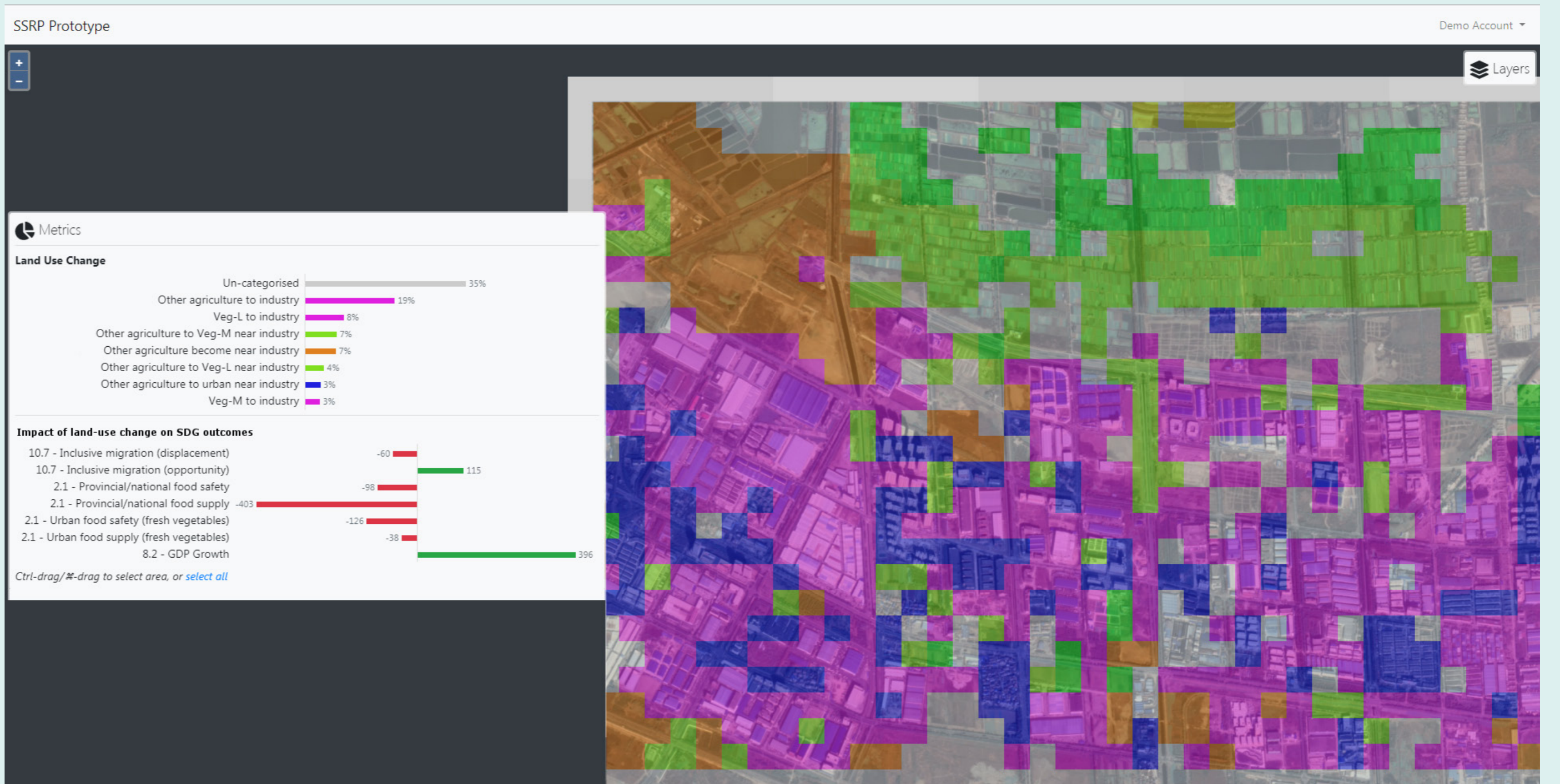
In the Wuhan case we used the web-app to analyse land-use change in a peri-urban district drawing on qualitative data from a previous project. Our analysis revealed a transformation in peri-urban agriculture in tandem with urban expansion. This agricultural transformation involved the conversion of grain and cotton fields into intensive vegetable cultivation, a large proportion of which was by migrant farmers. It showed that a hidden impact of urban expansion was the displacement of these migrant farmers who lost livelihoods and homes. This highlighted the extent of migrant involvement in the type of peri-urban agriculture most critical to urban food security. It also revealed the double edged sword of urbanisation creating new opportunities for migrants to establish agricultural livelihoods while constantly facing the negative impacts of periodic displacement. Finally, the analysis highlighted the increasing risk to food safety posed by recent urbanisation patterns which increasingly placed intensive vegetable cultivation in close proximity to potentially polluting industry. This reveals the hidden trade-offs with food safety (SDG 2) and inequality (SDG 10) which are closely connected to the changing role of informal migrant farmers in peri-urban agriculture and the impacts of urbanisation on their livelihoods.



(Top left)
Fig 1: Migrant peri-urban farmers in fields (Wuhan)



(Top right)
Fig 2: Village housing being demolished for redevelopment (Wuhan)



(Right)
Fig 3: Web-app demo graphic

CONCLUSIONS

We have created a prototype web-app that can be used by non-experts to visually show the hidden characteristics and impacts of peri-urban transformations and inform new approaches to city-region planning. It has the potential to support research into peri-urban dynamics and the inclusion of diverse stakeholder perspectives in agenda setting. It will be particularly helpful in enhancing our ongoing programme of action research concerned with sustainability transformations in peri-urban India, China and elsewhere.

