

QRC final report

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The title for my study is “Assessing Resilience in the Spatial Patterns and Socio-ecological Functions of the Chengdu Plain: Towards a New Basis of Cultural Landscape Preservation”, which is also the title for my doctoral dissertation, but I will focus this report on the most QRC-related aspects of the work.

My study site, Chengdu, is the capital city of Sichuan Province in Southwest China. Nourished by the ancient Dujiangyan gravity irrigation and flood control system, which was begun over 2,200 years ago and now makes up China’s largest irrigation district, the Chengdu Plain has become one of the world’s most densely populated and richly productive agricultural regions. Downstream of the irrigation headworks is a cultural landscape called *linpan*, which refers to a unusual form of settlement made up of scattered small clusters of dwelling sites, bamboo and tree groves. The age and origin of this *linpan* landscape is the subject of on-going research. Current urban planning policy tend to concentrate farming households in larger modern settlements, and to consolidate agricultural fields. I am interested in knowing what the impact of this policy is on resilience? How do we measure resilience, what are the parameters, and how to preserve this landscape?



Figure 1 Linpan landscape in Chengdu Plain, an unusual form of settlement made up of scattered small clusters of dwelling sites, bamboo and tree groves but recently faced with threats. (Source: Wuhan University Library, <http://www.lib.whu.edu.cn/~calis/yrrd/txk/img/480.jpg>)

International Collaborative Archeological research has been carried out in Chengdu Plain from 2005 -2011. The archeologists stated that they think there may be evidence to show that this scattered living patterns existed even before the Dujiangyan irrigation headwork because instead of large walled settlements, most

people should live in those small settlements. We assume that this flood control system allowed the population to live in a scattered pattern without the need for large concentrated walled refuge areas.

Based on our connections with the local government, we surveyed Pi County in 2017 and 2018 in conjunction with Sichuan University Summer Immersion Program. We did some field survey and a lot of interviews with local farmers. It was a lucky coincidence that our study site falls within the circle of the former archeological group. After exploring the google earth images, my advisor Prof. Dan Abramson and I have come up with a hypothesis we want to test for this study. Our hypothesis is that first draw a line connecting Chengdu City and the Dujiangyan irrigation system, then draw a transect perpendicular to this line. We think that the closer the linpan settlements are to the axis (historic core), the smaller and denser they will be; and the farther away from the axis, the larger and sparser they will be. This small and dense, large and sparse pattern corresponds well to the age of the irrigation system -- the historic core and the newly constructed irrigated area; also the carrying capacity of the land and the water abundance.

I chose five sample areas along the axis, each roughly 4 by 4 km, and trace all the linpan features by hand. I have also tested machine learning technique to auto detect the features, but it does not work very well, because of the time constraints, I just go with the traditional method. Finally, the calculated result in GIS corresponds well to our hypothesis.

The google earth images only dated back to 2000, when urban expansion of Chengdu central city began to transform the rural landscape, but what was it like before 2000? I then got some declassified corona images both from USGS and some Chinese resources. The image are black and white, a little hard to detect linpan, but it is still possible. It will help fill the gap of the history before 2000 and enable us to trace the historical landscape change. This part has not been fully done, but it will remain as a continuing project and a potential paper for the future.

Finally, I would like to thank again the QRC for funding my research. I received the grant before the pandemic, and there were many challenges to adapt, including the difficulties of international travel and conducting field work. I truly appreciate the flexibility of the QRC in allowing me to spend travel funds instead on stipends for helpers in Sichuan to conduct interviews and surveys for me, and communicate remotely. With this help, I was able to publish three articles, including:

1. **Wu, S.** (2021), "Rethinking the socio-ecological resilience of linpan rural landscape under the threat of COVID-19", Proceedings of the 2020 APRU Sustainable Cities and Landscapes Hub PhD Symposium. [doi: 10.17608/k6.auckland.13578254.v1](https://doi.org/10.17608/k6.auckland.13578254.v1)
2. **Wu, S.**, Wu, N., and Zhong, B. (2020), "What Ecosystem Services Flowing from Linpan System—A Cultural Landscape in Chengdu Plain, Southwest China", *Sustainability*, 12, 4122. [doi:10.3390/su12104122](https://doi.org/10.3390/su12104122).
3. **Wu, S.** (2020), "Linpan resilience and its responses to major public events", *Development of small cities and towns*, 6. [doi: 10.3969/j.issn.1009-1483.2020.06.008](https://doi.org/10.3969/j.issn.1009-1483.2020.06.008).