

supplementary file:

Figure 1: Bio-physical and socio-ecological analysis

The secondary soil salinization is a complex and dynamic environmental sustainability problem, mainly occurs due to pressure from anthropogenic activities with the interactions between topography, geology, climate, hydrology, and policy [8,13–15,31,32]. In order to conduct rational desalinization design, it is necessary to understand the mechanism and related variables behind of salinity hazards [8,9]. This study selected 39 variables from reliable sources which related to soil salinization of the Keriya Oasis [7,8,10,18,19], and used the DPSIR sustainable framework [33], built the socio-ecological and bio-physical conceptual models of salinization in the Oasis, studied the mechanisms of the salinization process as below. The definition of each DPSIR component illustrates the concept of each category [33]. From the model (Fig. 1), it is apparent that the desalinization design should focus on the response category but pay close attention to the pressure category, particularly to the anthropogenic pressure component.

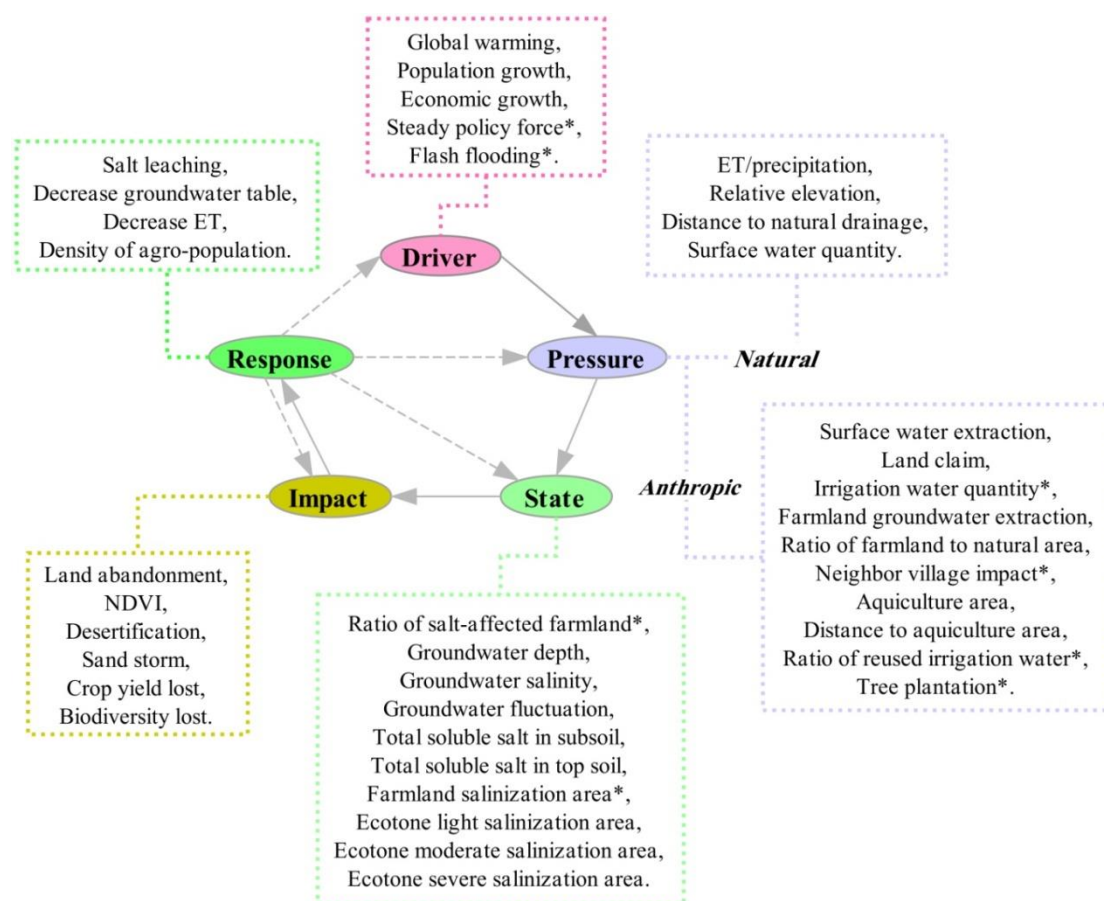


Fig.1. Conceptual model of bio-physical and socio-ecological variables related to the desalinization of secondary soil salinization in the Keriya Oasis.

*indicates qualitative data, while other components are quantitative data.

Reference:

7. Abliz, A.; Tiyp, T.; Ghulam, A.; Mamat, J. D.; Fei, S.; Ilyas, Z.; Abdugheni, N. Effects of shallow groundwater table and salinity on soil salt dynamics in the Keriya Oasis , Northwestern China. 2016, doi:10.1007/s12665-015-4794-8.
8. Seydehmet, J.; Lv, G. H.; Nurmemet, I.; Aishan, T.; Abliz, A.; Sawut, M.; Abliz, A.; Eziz, M. Model Prediction of Secondary Soil Salinization in the Keriya Oasis , Northwest China. 1–22, doi:10.3390/su10030656.
9. Seydehmet, J.; Lv, G. H.; Abliz, A.; Shi, Q.D.; Turup, A. Irrigation Salinity Risk Assessment and Mapping in Arid Oasis, Northwest China. *Water*, 2018, 10.1–24, doi:10.3390/w10070966.
10. Mitsch, W.J., Lu, J., Yuan, X., He, W., Zhang, L. Optimizing ecosystem services in China. *Science*, 2008, 322, 528, doi: 10.1126/science.322.5901.528b.
13. Chen, C.; Meurk, C.; Chen, J.; Lv, M.; Wen, Z. Restoration design for Three Gorges Reservoir shorelands , combining Chinese traditional agro-ecological knowledge with landscape ecological analysis. *Ecological Engineering* 2014, 71, 584–597, doi:10.1016/j.ecoleng.2014.07.008.
14. Forman, R.T.T., 1995. *Land Mosaics: The Ecology of Landscapes and Regions*. Cambridge University Press, Cambridge, pp. 452.
15. Moshia, M.E., Mashatola, M.B., Shaker, P., Fouche, P.S., Boshomane, M.A.W. Land suitability assessment and precision farming prospects for irrigated maize–soybean intercropping in Syferkuil experimental farm using geospatial information technology. *J. Agric. Soc. Res.* 2008, 8, 138–147, doi:10.4314/jasr.v8i2.43351.
18. Willison, J.H.M., Li, R., Yuan, X.Z.. Conservation and eco-friendly utilization of wetlands associated with the Three Gorges Reservoir. *Environ. Sci. Pollut. Res.*, 2013, 20, doi:6907–6916. 10.1007/s11356-012-1438-3.
19. Yuan, X.Z., Zhang, Y.W., Liu, H., Xiong, S., Li, B., Deng, W. The littoral zone in the Three Gorges Reservoir, China: challenges and opportunities. *Environ. Sci. Pollut. Res.*, 2013, 20, 7092–7102, doi:10.1007/s11356-012-1404-0.
31. Akramkhanov, A.; Martius, C.; Park, S. J.; Hendrickx, J. M. H. Environmental factors of spatial distribution of soil salinity on flat irrigated terrain. *Geoderma* 2011, 163, 55–62, doi:10.1016/j.geoderma.2011.04.001.
32. Huang, J.; Prochazka, M. J.; Triantafilis, J. Irrigation salinity hazard assessment and risk mapping in the lower Macintyre Valley, Australia. *Science of the Total Environment* 2016, 551–552, 460–473, doi:10.1016/j.scitotenv.2016.01.200.
33. Spangenberg, J. H.; Douguet, J. M.; Settele, J.; Heong, K. L. Escaping the lock-in of continuous insecticide spraying in rice: Developing an integrated ecological and socio-political DPSIR analysis. *Ecological Modelling* 2015, 295, 188–195, doi:10.1016/j.ecolmodel.2014.05.010.