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Interplay between river dynamics and international borders: the Hirmand River between Iran and Afghanistan

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Fluvial dynamics in riverine borders can play an important role in political relationships between countries. Rivers move and evolve under the influence of natural processes and external drivers (e.g. land use change in river catchments). The Hirmand River is an important riverine border between Iran and Afghanistan. The present study shows the evolution and lateral shifting of the Hirmand River along the common international border (25.6 km) over a period of 6 decades (1955-2015). Seven data series of aerial photos, topographic maps and Landsat images were used to identify the land cover and morphological changes in the study reach. The land cover has changed dramatically on both sides of the border during the last 6 decades, especially in the Afghan part. Overall, 49% of all land surface changed its cover type, especially the area of agriculture and residential land contributed to that, with an increase in surface area of about 4931 ha and 561 ha, respectively. On the other hand, the natural cover and water bodies decreased to 38 % and 63 %, respectively. The impact of these land use changes on the morphological evolution of Hirmand River was investigated in 5 sub-reaches. We found an average decrease of the active channel width of 53% during 60 years and the average River Network Change Index for the whole study reach during 60 years was -1.25 m/yr. Deposition and narrowing turned out to be the main processes occurring within the study reach. Furthermore, due to natural riverine processes the Hirmand River has moved towards Afghanistan (37 m on average) and lateral shifting was found to be up to 1900 m in some sections.