

# The spatial variations of sediment properties and water quality in the Ishikari floodplain water body

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## Abstract

The water bodies in a floodplain (FWBs) are providing a broad range of services for the ecological system making the floodplain a hot-spot of biodiversity. However, the degradation of FWBs has accelerated because of anthropogenic activities. Human-modified landscape alter hydrological connectivity and release nutrients that can contaminate the FWBs system. This might generate a heterogeneity in the sediment properties of FWBs, that can influence water quality with sediments as an internal source of nutrients. Therefore, the status of FWBs and information about driving factors that can affect water quality are critically important for conservation of natural resources and biodiversity. This study aimed to test the hypothesis that landscape properties are associated with sediment properties and sediment properties is associated with water quality in FWBs of the Ishikari River in northern Japan. The secondary data of sediment properties (OM, COD, S, TN and TP) and water quality (TN, TP and Chl-a) from 2006 was provided by the Ministry of Land, Infrastructure, Transport and Tourism. Six FWBs were randomly selected to monitor temporal changes in water quality (pH, EC, DO, temperature, TN, TP and Chl-a) monthly from June to November in 2018. Landscape properties including agricultural, urban, water body, catchment area and drainage ratio of each FWB was estimated by ArcGIS. Results revealed a negative correlation between landscape and sediment properties. Drainage ratio has the strongest negative correlation with COD, TN, OM and S followed by agricultural and catchment area, respectively. Urban area has a weak correlation with TN and COD. Moreover, some sediment properties and water quality also showed correlation in both seasons. Chl-a has positive correlation with COD, TN and OM in summer. In autumn, correlation became weaker and there is no correlation between Chl-a and OM. Monitoring of 6 FWBs showed high variation of water quality in summer, while after September all parameters of all FWBs decrease and became similar in November. Our monitoring data also showed the correlation between sediment and water but in different parameters. Mean value of TN in water showed strong correlation with sediment TN, thus also support the association between sediment and water. Landscape properties especially drainage ratio play an important role on controlling sediment properties, possibly due to high hydrological activities that can cause shorter water retention time than less hydrologically active systems, and flushing of OM to the downstream or its export to the outlet can reduce OM accumulation in the sediment which can also reduce the potential of sediment as internal source of nutrients. For better management of FWBs, linkage among landscape, sediment and biogeochemistry that are driven by seasonal variation on water quality should be studied and integrated to reduce potential internal and external sources.

**Keywords:** Floodplain, Landscape properties, Sediment properties, Water quality, Drainage ratio