

# MAPPING SURFACE WATER QUALITY ZONE BY USING GIS CASE STUDY IN CAN THO CITY, VIETNAM

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## 1. BACKGROUND

- Water quality according to each pollution parameter from direct sampling method at some urban lake-canals system in 2013 are contaminating at an alarming rate

- Lack off the space and map tool to manage and visualize water quality in the city

-> The study focused on the water quality fluctuations by WQI and combines spatial interpolation method of IDW in the QGIS software to distribute surface water quality on the river system..

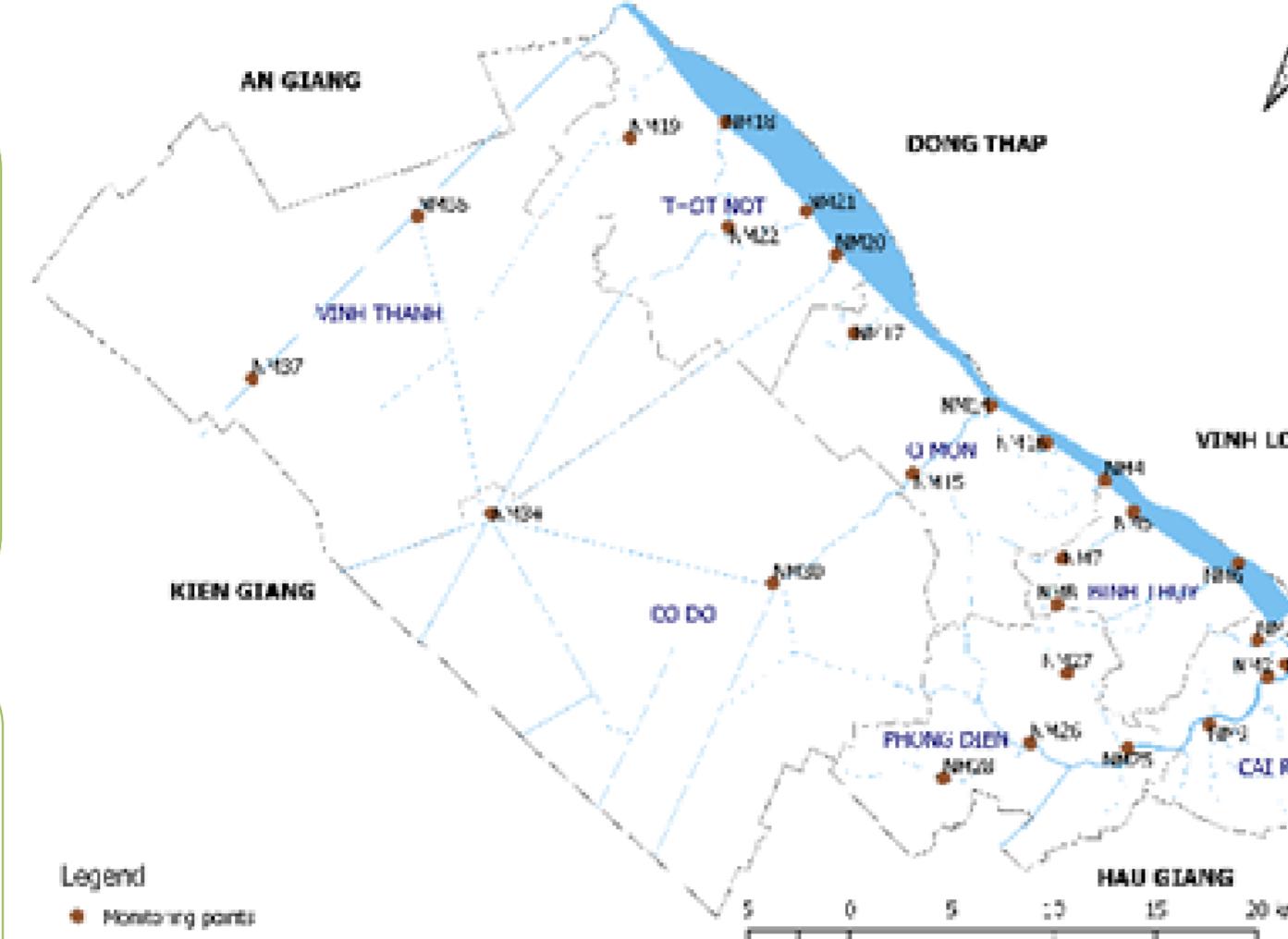


Fig. 1 Monitoring location map

## 2. METHODOLOGY

### Data collection and analysis

Five years data of water quality with sampling frequency in the monsoon wet and dry season was collected from the Center Environmental and Natural Resources Monitoring Can Tho City.

### Calculating the water quality index (WQI)

WQI adapted to Decision 1460/QĐ-TCMT of the General Department of Environmental is as follows:

$$WQI = \frac{WQI_I}{100} \times \frac{\left(\prod_{i=1}^n WQI_{II}\right)^{1/n}}{100} \times \frac{\left(\prod_{i=1}^m WQI_{III}\right)^{1/m}}{100} \times \left[ \left( \frac{1}{k} \sum_{i=1}^k (WQI_{IV})^2 \right) \times \frac{1}{l} \times \sum_{i=1}^l WQI_V \right]^{1/3}$$

In which:

$WQI_I$ : calculation results for pH parameter (group I)

$WQI_{II}$ : calculation results for the group of plant protection drug parameters (group II)

$WQI_{III}$ : calculation results for heavy metal parameters (group III);

$WQI_{IV}$ : calculation results for groups of organic and nutritional parameters (group IV)

$WQI_V$ : calculation results for the group of microbiological parameters (group V)

Table 1. Water quality rating scale

WQI value	Water quality	Suitable for the intended purposes	Colors
91 - 100	Excellent	Good use for domestic water supply purposes	Blue
76 - 90	Good	Used for domestic water supply purposes, but needed appropriate treatment measures	Green
51 - 75	Medium	Used for irrigation and other equivalent purposes	Yellow
26 - 50	Poor	Used for navigation and other equivalent purposes	Orange
10 - 25	Very poor	Water is severely polluted, needs future treatment measures	Red
<10	Heavy pollution	Poisoned water, need to take measures to overcome and treat	Brown

(Source: General Department of Environment, 2019).

### The IDW Spatial Interpolation Method by QGIS

The IDW method was constructed in QGIS determines the value of unknown points by averaging the distance-weighted values of the points with known values in the vicinity of each pixel. The IDW method has been evaluated optimally when there is no big difference between the interpolated value and the results of sample analysis at the laboratory (Asadzadeh et al., 2013; Gong & O'Bryant, 2014).

## 3. RESULTS & DISCUSSION

### Water quality index

- WQI indicated that the low water quality in some monitored points in the monsoon and dry season periods during five years in Can Tho.
- The dry season and the beginning of the rainy season are the times when the water quality in the region is worse. During the monsoon, the water quality recovers.
- Water quality increased by the improved lake-canal system in the city (2016 – 2018) (Fig.2; Fig.3)

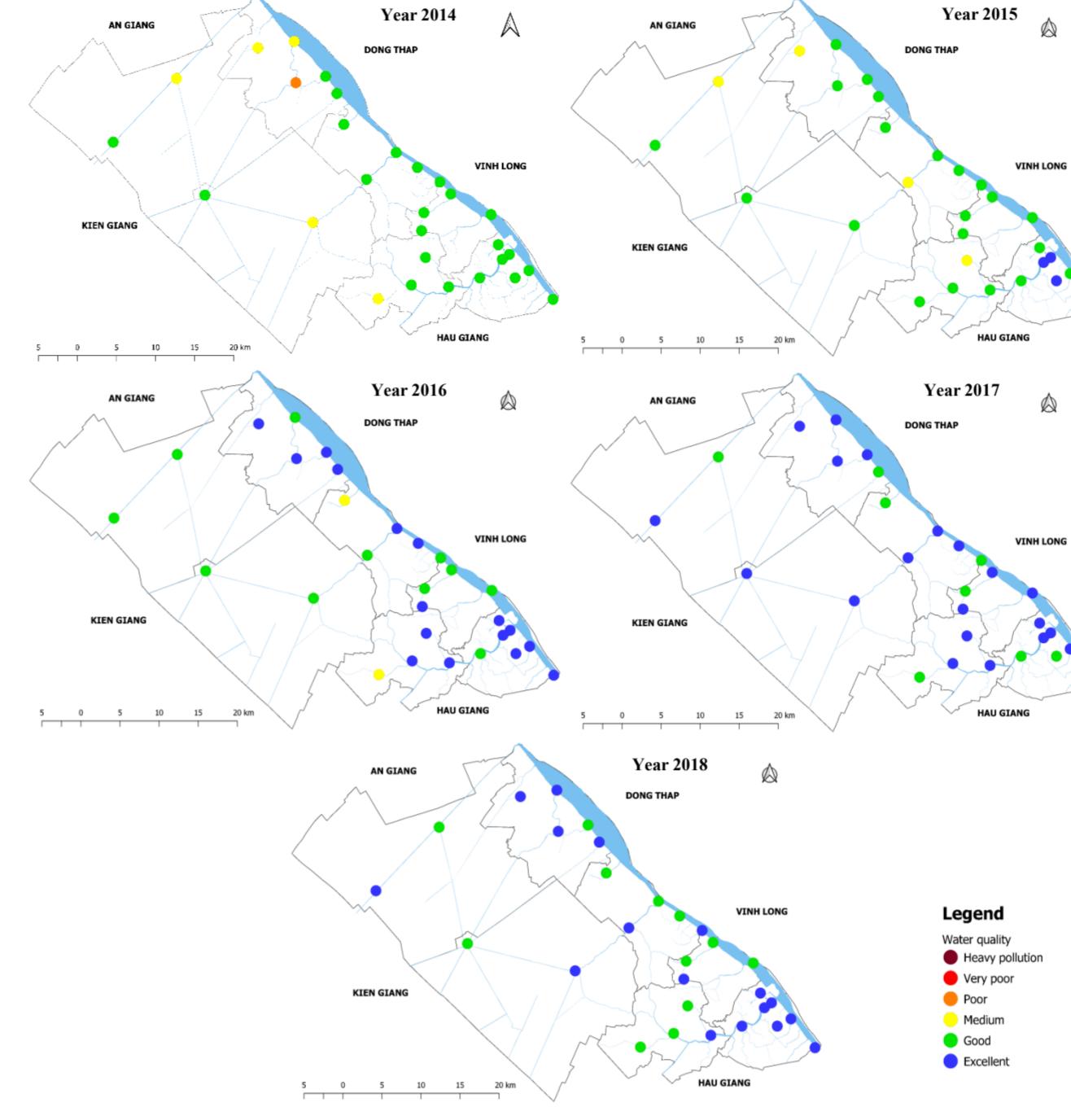


Fig. 2 Water quality in the 5 years of dry seasons

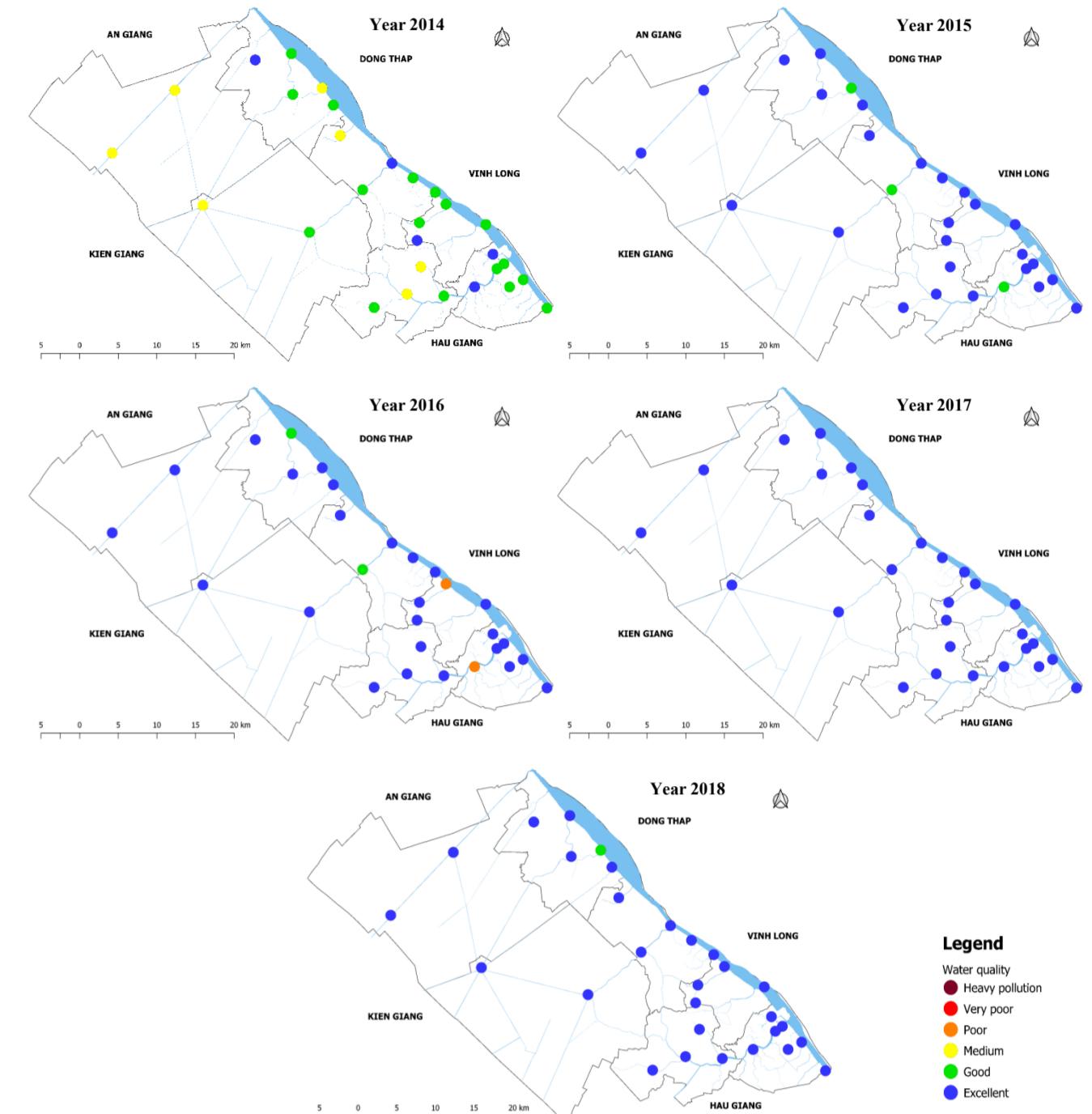


Fig. 3 Water quality in the 5 years of monsoons

### Mapping water quality zone

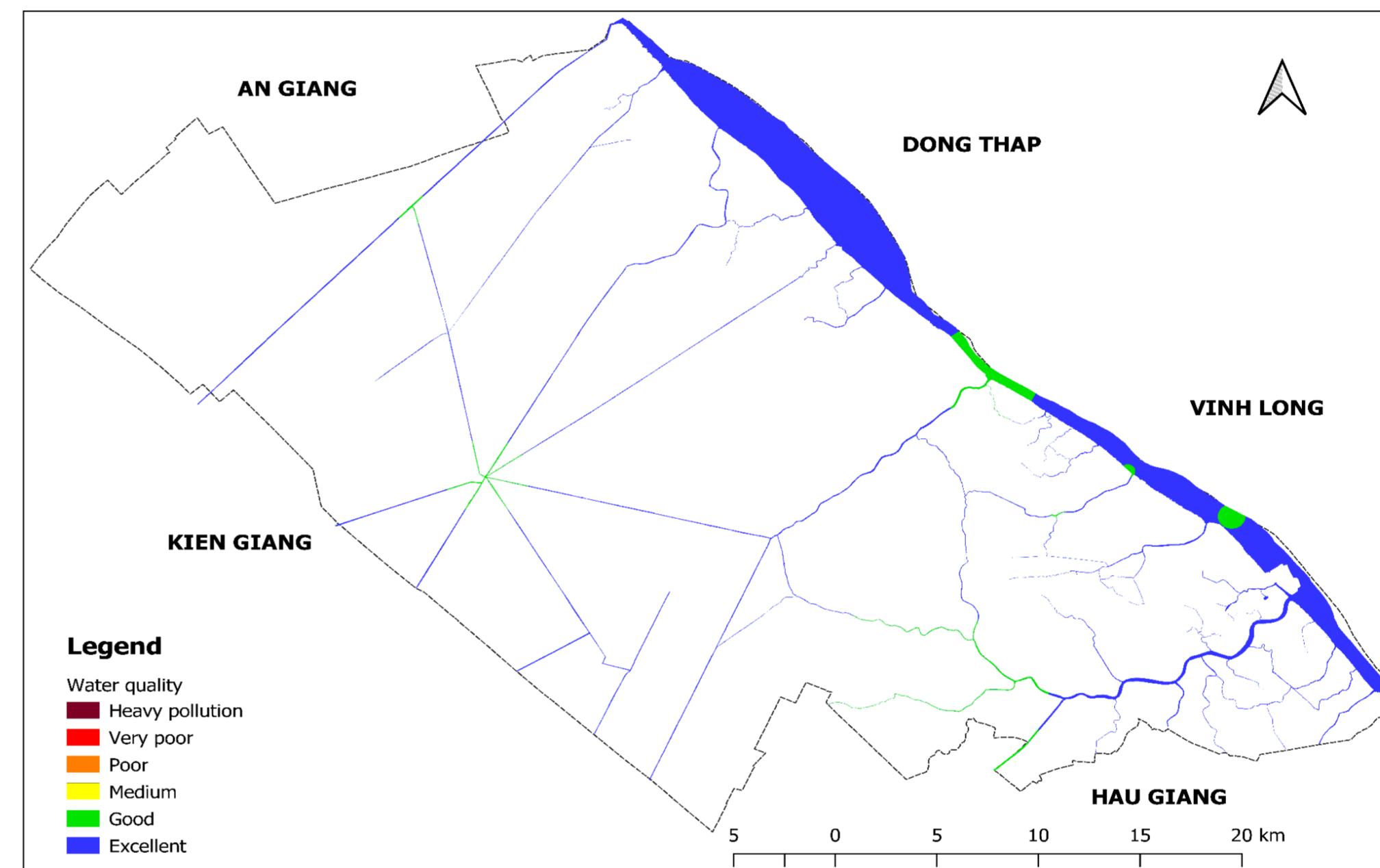


Fig. 4 Actual mapping water quality zone in the dry season

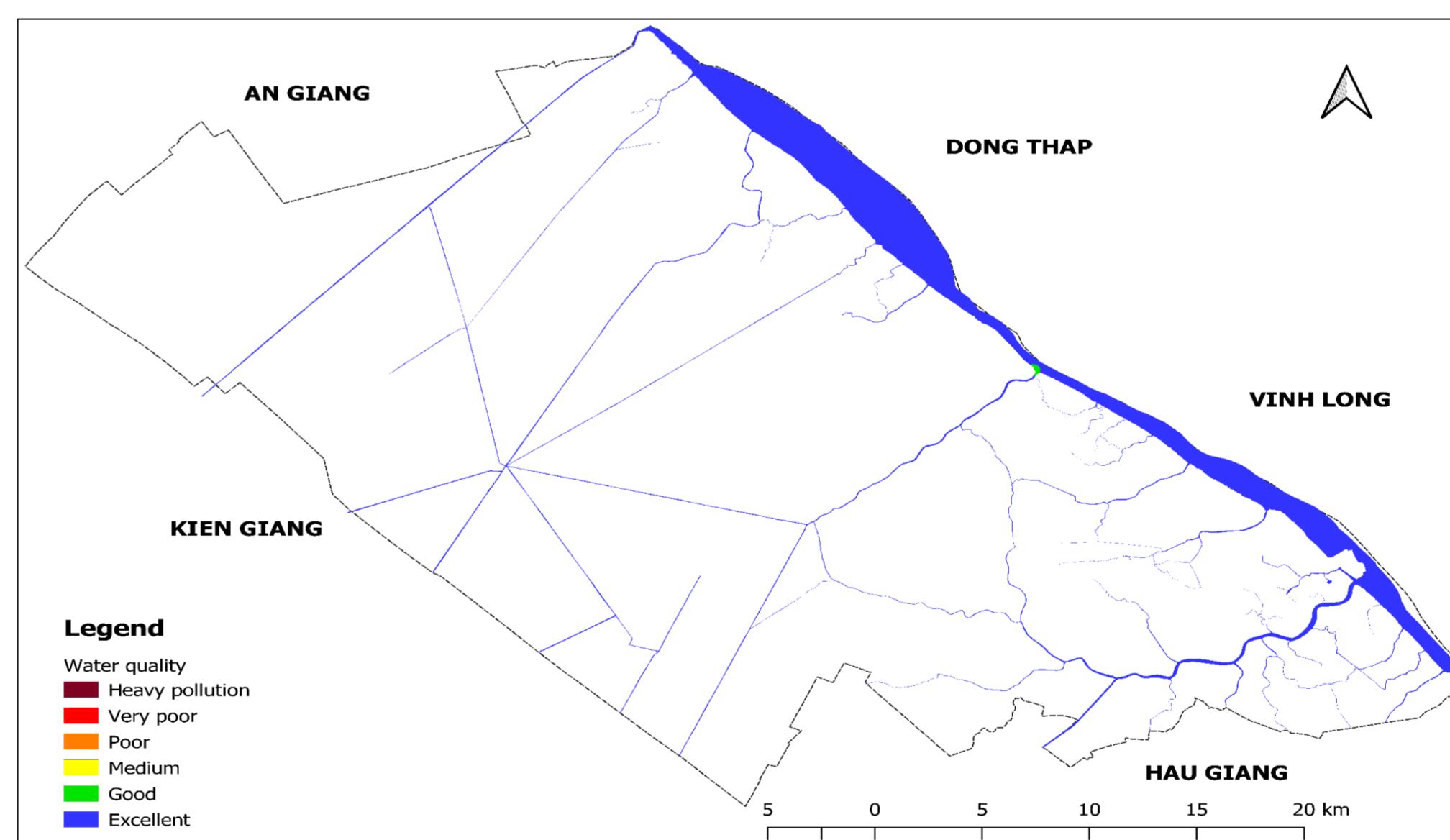


Fig. 5 Actual mapping water quality zone in the monsoon

## 4. CONCLUSIONS

- The water have uneven quality according to space and time
- The more inland the water quality decreases.
- In the dry season and the beginning of the rainy season, the water quality is poor and gradually recovers in the middle and the end of the rainy season.
- Canals with low quality are often situated in the markets and next to large industrial zones.
- The fundamental cause of water pollution is mainly domestic and industrial wastewater.
- At points with limited density of monitoring such as Vinh Thanh and Co Do the interpolation results from the IDW method could be used for reference purposes.

## 5. ACKNOWLEDGMENTS

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