Appendix A: Summary of applied techniques for SWI in different geographical locations

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| References | Case study  | Methods applied | Research remark |
| Abdalla et al.(2010b) | Oman, Batinah region  | TDEM survey, geophysical surveys, electricalresistivity | The saline/freshwater interface tracked by TDEM in 2007 is compared to the contact indicated by a corresponding TDEM studied in 2002.  |
| Price et al.( 2010) | carbonate coastal aquifer | Review work | The research suggests that subjecting the Key Largo limestone to SWI would result in the discharge of sorbed PO43- into brackish GW. |
| Abd-Elhamid and Javadi, (2011) | Florida, USA | Abstraction, Desalination and Recharge) (ADR), Genetic Algorithms (GA) | ADR is regarded as a useful method for planning and management of SWI in Biscayne aquifer USA. |
| Mondal et al. (2011) | Sadras, Tamilnadu, India | Principal Component Analysis (PCA) | The data collected serves as a foundation for long term hydrochemical studies that will assist in GW planning process, monitoring, and judgment in the Sadras watershed, Tamilnadu, India. |
| Sherif et al.(2012) | Wadi Ham Coastal Aquifer, UAE | MODFLOW, DEM, SRTM | GW salinity of the Kalbha well-field is forecast to reach 10,000 mg/l. The results also concluded that massive pumping restriction of GW would reduce SWI. |
| Cobaner et al.(2012) | Goksu Deltaic Plain, Turkey  | SEAWAT Software | The SEAWAT software possessed the ability to conceptualize the GW salination and pumping changes in the region. |
| Werner et al.(2013) | Overview work | Overview work | It was recommended that the most substantial research obstacle in SWI investigation is applying SWI knowledge into hydrogeochemical processes, investigative approaches, and management approaches onto action. To overcome significant gaps between SWI knowledge and management practice, strategies are required. |
| Masciopinto, (2013) | Lebanon  | MAR | Numerous factors, like soil qualities etc. can impact microorganism reduction. Moreover, the reduction in aquifer transmittance produced by obstruction can be used to informally quantify soil aquifer treatment during MAR. |
| Sefelnasr and Sherif, (2014) | Nile Delta Aquifer, Egypt | FEFLOW, GIS | The Nile Delta Aquifer contains approximately 883 km3 of fresh GW. |
| Tomaszkiewicz et al.(2014) | Coastal aquifers | GQISWI, GIS | The GQISWI, have benefits and drawbacks like other water quality indices.  |
| Morgan and Werner, (2015) | Australia. | Qualitative and analytic approach. | The integration of the two techniques namely confined aquifers in the Adelaide metropolitan area (SA) and Esperance (WA), as well as unconfined aquifers in Esperance (WA) and Derby (WA). |
| Javadi et al.(2015) | Coastal Aquifers | SUTRA, NSGA-II and GA and ADR-TW | The outcomes indicate that the suggested approach, ADR-TW, has the least salt concentration in the aquifer while also improving the delay of the freshwater/saline water interface. |
| Ketabchi et al.(2016) | Coastal aquifers | Review work | According to the study, all existing research have only examined a subset of known or predicted regulating variables in respective analysis. |
| Zhao et al.(2016) | Zhoushuizi districtof Dalian City in northern China | SEAWAT-2000 and 3D density-dependent numerical model. | Based on the 3D concentration simulation analysis that has been calibrated, the model was integrated with the present GW level. The results indicated that, according to some forecast scenarios, in the future, cumulative SWI will be substantially greater.strong, regardless of whether the tidal impact was considered in the modelling, whether or not to take into account |
| Najib et al.(2017) | Morocco  | Geoelectrical and hydrochemical methods | In the coastal fringe, SWI was prominent, and GW chemistry was mostly controlled by water-rock interaction and anthropogenic factors (fertilizer application, septic tank) as in upstream areas. |
| Kanagaraj et al.(2018) | Chennai, Tamilnadu India | Geophysical, geochemical, and stable isotope. | The impact of present SWI is responsible for the significant correlation between stable isotopes δD and δ18O, and EC and Cl-.  |
| Perera et al. (2018) | Bentota river, basin Sri Lanka | DR, PCA, Initial Eigenvalues, KMO, GIS, IDW, Weighted overlay technique and Fuzzy overlaying methods | In the context of climate change impacts and sea level rise, the quality of ground water of this region’s coastal sector, that has a relatively large population and building density, will be unsuitable or very poor in the future. |
| Senthilkumar et al. (2019) | Thiruvallurdistrict, Tamil Nadu, South India | Integrated geochemical and geophysical techniques | The output feature overlay map demonstrated clearly the SWI both on the transverse resistance (T) and longitudinal conductance (S) of the research area. |
| Manivannan and Elango, (2019) | Indian  | Review work | Due to geological formations and topographic elevation on the west coast, the amount of SWI is larger on the east coast than on the west coast. |
| Sae-Ju et al., (2020) | Prachuap-Khiri-Khan Province, Thailand | VES analysis, Chemical Analysis of GW, hydrochemical analysis, PCA | The assessment of SWI in coastal locations via VES data requires the aid of hydrochemical and hydrogeological data to better define SWI. |
| Vann et al. (2020) | KamalaBeach, Phuket, Thailand | Geo-electrical surveys, geochemistry analysis, 2D-ERI, time lapse ERI | The study results can support estimations of the aquifer’s ability and the threshold level of GW extraction, enabling a responsible use of water supply maintenance in this area. |
| Alshehri et al. (2021) | Red Sea coast, Saudi Arabia | GWQI, HPI, and MI | The MI and HPI values are highly correlated with GWQI values. |
| Martínez et al.( 2021) | La Paz aquifer in Baja California Sur, Mexico | Hydrochemical, multi-isotopic datasets and BIMM | This research emphasizes the importance of GW nitrate and sulphate contamination for efficient soil management under NO3-and SO42-input reduction methods. |
| Salaj et al.(2022) | Kozhikode coastal stretch, Kerala, South India | GIS and GALDIT-U model | The GW flows beneath the Kozhikode coastline stretch are being influenced by the influence of fast urban expansion (i.e. expanding the impervious surface). |
| Irfan et al.(2022) | Balochistan, Pakistan | Electrical resistivity survey (ERS) | This research evaluates the aquifer’s hydrological conditions, which might be useful for improved planning of agriculture fields, the site of a tube well, GW modelling, as well as its treatment in coastlines to prevent SWI in the region. |

Appendix B: Summary table of SWI studies curried out in Saudi Arabia

