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Resurgence belt discharge as indirect indicator of withdrawal magnitude and sustainability.

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The groundwater resources in the Friuli Venezia Giulia Region (northeast Italy) are an important natural resource in terms of quantity, quality and ease of supply. This optimal condition, however, has long believed that it allowed an irrational and uncontrolled exploitation of it. This inevitably produced tangible consequences on the quantity and quality of water resources available in our area. Although the situation on a global scale can be regarded as not yet alarming, even if are increasingly frequent reports on water pollution and more obvious indicators of the progressive depletion of underground water reserves. Since ten years ago, there is a lowering in groundwater levels in the Upper Plain and a loss of pressure in Low Plain confined aquifers. These phenomena are accompanied by the gradual amplitude range reduction of Resurgence belt, resulting in decrease in the amount of available water to the naturalness of the lowlands, its impact on ecosystems and related loss of traditional habitats such as wet meadows. In light of this, it is easy to predict that, unless appropriate measures will be implemented at a regional level, the intense human pressure will cause the persistence, if not the increase, of the just described phenomena. It is indisputable in fact that the flow rates derived for hydroelectric and irrigation uses and well withdrawals for domestic, drinking, industrial, irrigation, fishing industry and geothermal purposes, have created a change in the normal cycle of water, in the natural drainage ways and in the residence time for groundwater. On one side, the derived discharge rates in mountain basins are returned to the valley only after the intersection with the Resurgence belt producing a decline in the active recharge of the High Plain. On the other side, well withdrawals dissolve a significant amount of water resource and constitute now the most important forced element for the groundwater flow. Well withdrawals, moreover, are currently the only reliable and predictable outflow from the aquifer systems: are missing, in fact, evidences of substantial losses to the sea, both along the coast and at some distance from the coast, while at the state of knowledge, are difficult to evaluate the shares with the groundwater adjacent regional hydrogeological basins.

By using a purposefully oversimplified conceptual model, the presence of the Resurgence belt appears to be produced by a kind of groundwater "overflow" for the regional plain. The studied territory can be considered as a "semi-closed box" in which the pouring into the sea and underground interchange with the adjacent domains are not relevant and recharging groundwater is mainly due to the dispersion of runoff water, infiltration, rainfall and irrigation practices incident on the High Plain.

According to these assumptions, the Resurgence belt drains an average quantity of water equal to the active recharge from the High Plain subtracting the magnitude of well withdrawals from the confined aquifer systems in the lowlands. Withdrawal entity, Resurgence belt discharge, freatimetric levels in the Upper Plain and confined aquifers pressure in the Low Plain are closely interdependent and in dynamic balance. According to this schematization, the Resurgence belt discharge is an indirect indicator of the withdrawal magnitude and its sustainability. Although even if it still represents a surplus of the active recharge to the aquifer systems in the Low Plain, the assessment of water use sustainability, or the maximum allowable amount of groundwater withdrawals can not be reduced to a mere quantification of the instream flow to assigne to the discharge of the Resurgence belt.