

An alternative way of supplying coastal cities with water

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Introduction

UNO estimate that close to 50% of today's world population lives in cities and that this proportion will increase to more than 60% by 2030 which is equivalent to a 2 billion increase in urban population. More than half of that population will reside in coastal areas.

The overall water need for this new coastal urban population will be greater than 2,000m³/s. Solving this gigantic problem will imply the use of all available technologies such as desalination. It could induce the erection of many hundreds of desalination plants around the world with their accompanying negative ecological impacts, in particular their very high energy consumption (over 3kWh/m³) and cost (close to 1\$/m³).

This paper proposes a way of dealing with this problem by using an untapped resource.

Using an untapped resource

In order to solve this huge problem while minimizing negative ecological impacts, alternative solutions need to be brought to the table. Available water at river mouths is obviously a resource of fresh water, so far untapped, which can be, at least partially, abstracted just upstream the salt wedge without significant ecological impact.

The remaining point to solve is to transport such water where it is needed at an economical cost knowing that the distances between the abstraction and the distribution points can be very large.

The innovative submariver® system proposes to transport it by special underwater pipes parallel to the coast (or across the sea for islands). At destination, it is distributed through the water network after the required treatment adapted to its final use: human consumption, industry needs or agricultural needs (2/3 of global water consumption).

Principle of submariver®

The patented submariver® system allows transportation of water in large quantities (from 1m³/s up to several dozens m³/s) over long distances (from a few dozens kilometers up to several hundreds). It is structured around a very flexible pipe that adapts to the seabed profile without preparation of the ground. It is laid on the seabed (typically at 200m depth) and ballasted by a "mattress". This flexible pipe is a woven pipe made of plastic fibers, similar to firemen hoses.

The larger the projects, the more parallel pipes are needed, beyond the two that are always considered for reasons of security of supply. For long distances (over 200km), intermediate pumping stations are necessary, which can be supplementary distribution points or catchment points.

Overall transportation prices for such a system are low (from 0.1 up to 0.3\$/m³ in most cases). The energy consumption is less than 0.2kWh/m³ in most cases, which is about 5% of the energy necessary for seawater desalination. The construction is rather easy and most projects can be conducted in 1 to 2 years. This

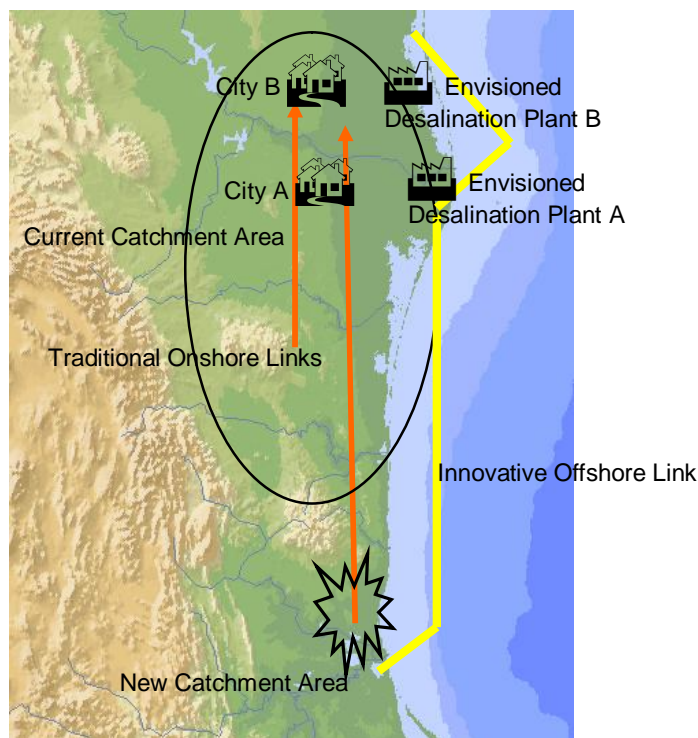
system allows, for a very small increase in cost, a huge flexibility (up to 50%) in the water demand over time.

This system is very competitive and is therefore a serious alternative to traditional land transmission lines and to desalination plants.

More than two dozens applications over all continents have been identified after a limited market study and are currently under discussion.

Examples of application

Applications of such a system are numerous. On the following map, the example of two coastal cities A and B, needing extra water, is given. In order to access new fresh water resources, they envision two different solutions, either the construction of two desalination plants one for each of them or a traditional onshore transmission line basically parallel to the coast extracting water from a new and farther apart catchment area. submariver® innovative offshore link could be considered as a serious alternative in such a scenario and replace in one single project all previously envisioned technical alternatives.



Conclusions

The advantages of the submariver® system are many:

- It allows the delivery of fresh water at an economical price even for agricultural needs.
- Its low energy consumption makes it more environment friendly and less sensitive to energy price.
- It is simple and sturdy which allows operation by classical workforce, without external technological dependence.

submariver® is not going to replace desalination as it is not applicable to all situations but it brings a complementary water resource so far unexploited.