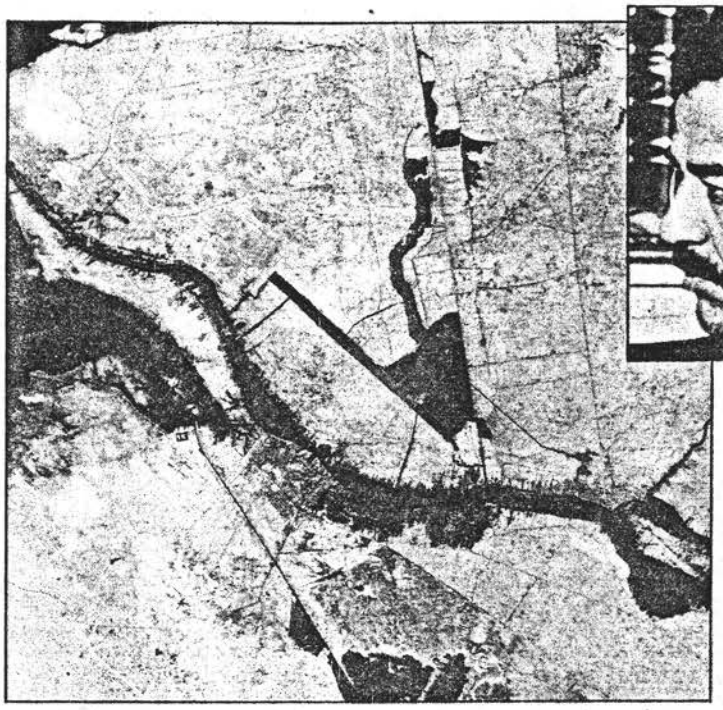
Iraq's secret weapon: water

Iraq has secretly built a giant artificial barrier of water in a desert battle zone of the Gulf war. The cost so far is more than $1 billion. Analysis of satellite pictures suggests that the lake may ultimately enable Iraq to rearrange the area's rivers and annex the crucial Shatt al Arab waterway and the oil-rich province of Khuzistan

Peter Fend and Ingo Gunther

IN 1981 the Iraqi government claimed that it had a "secret weapon" in its year-old war with Iran. Until now speculation about the nature of this weapon has centred on Exocet missiles and poisonous gases. But a series of images from satellite-data obtained between 1977 and 1984 suggest that the weapon is a massive piece of hydrological engineering in the salt flats, east of the port of Basra. Iraq has built a huge water barrier that is more than 50 kilometres long and up to 10 kilometres wide—and it is still growing.

The water barrier may eventually allow Iraq's President, Saddam Hussain, to fulfil his promise, made in December 1980 at the start of the Gulf war, that "all areas occupied by Iraqi troops in the Iranian province of Khuzistan ... will remain under Iraqi dominance and will be annexed to Iraq and integrated into the earliest maps of the country."



Camera Press

Water in the desert: The giant water barrier acts as both defence and an arm of attack for Iraq's President, Saddam Hussain (top right)

Among the ruins of the ancient civilisation of Susa in Mesopotamia lie about 10 000 square kilometres of salt-encrusted flats. These flats were once irrigated fields. They are now barren of life, except for migrating birds and insects during the occasional floods. They are good for little except tank battles. In the past five years, they have been the scene of the most heavily contested battles of the war between Iran and Iraq. Up to half a million people have died there. The key to the future of this wasteland, and to the war itself, may lie in a hydrological engineering project being undertaken by the Iraqis.

The evidence for this lies in analysis of a series of photographs and video tapes of the war zone, compiled from data collected by the US's remote-sensing satellite Landsat.

In the autumn of 1980, Iraq invaded Iran with the avowed purpose of gaining control of the entire Shatt al Arab, including the oil terminal at Abadan island, and "liberating" Khuzistan. By April 1981, the Iraqis had completed a giant water-filled trench east of Basra. It was 1·2 kilometres wide, 30 kilometres long and 3 metres deep—just deep enough to drown a man. It is not clear when the work started, but it may have been as early as 1977.

The Iraqis filled the trench with water from the nearby Shatt al Arab waterway. Giant pumps, detected by satellite imagery, sent the water in and out through four narrow canals.

The huge trench looks like an extremely expensive, but extremely effective defensive moat for Basra which straddles the only relatively dry land across southern Iraq. But there could be much more to it than that.

While the diversion of the waters of the Shatt was being built, the Iraqis pushed deep into Khuzistan. Most military analysts expected a swift Iraqi victory. Yet, despite their obvious superiority in the attack, the Iraqis baffled experts by not pressing on with the advance, and not committing aircraft or infantry. They appeared unwilling to consolidate a bridgehead across the one natural defence for the Iranians, the Karun River. Then, starting in the winter of 1982, the Iraqis retreated. Since 1982 Iran's "human waves" have attacked Basra in vain, foundering in the "killing grounds" east, north and south of that moat.

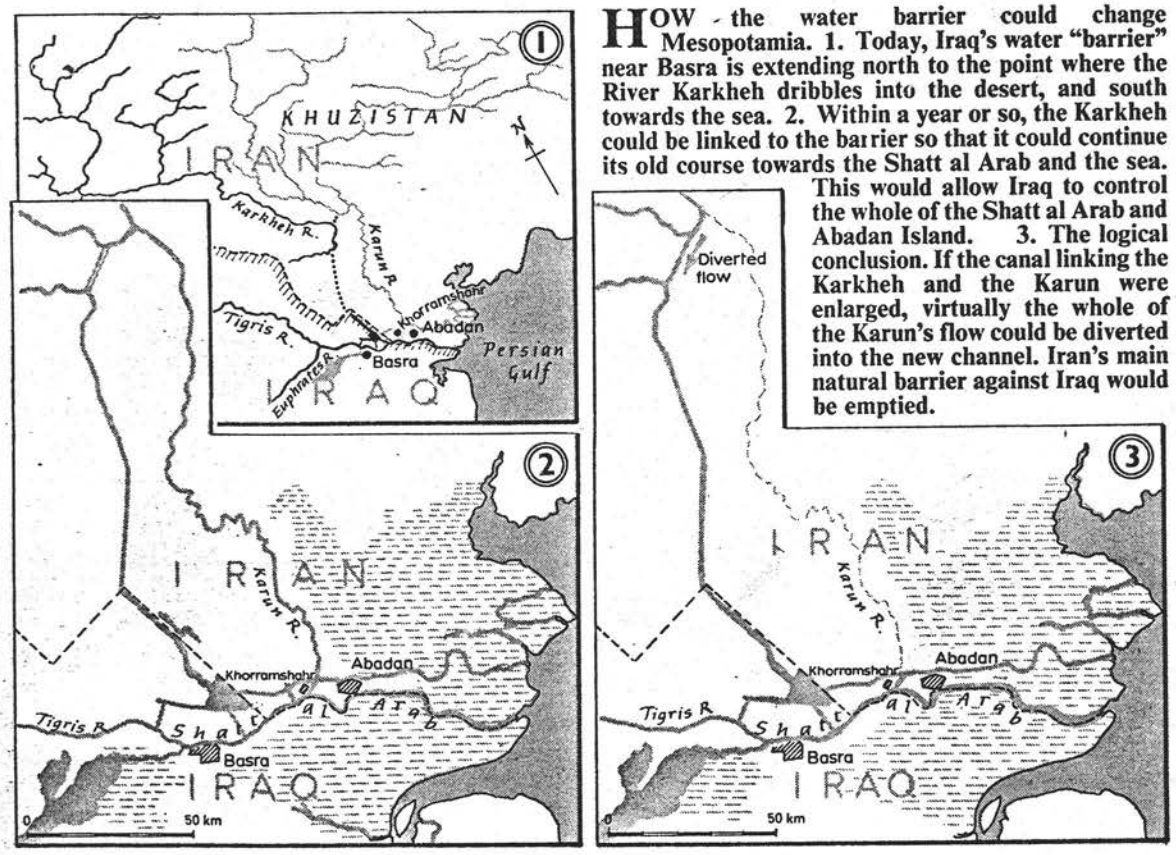
Since those futile Iranian attacks upon Basra began in 1982, the water diversion has more than tripled in size. By January 1983, it had been extended with a lake, 10 kilometres wide, at the southeast end. Two canals have been built from that lake. One narrow canal extends through Iranian territory towards Khorramshahr, and another shallow channel, which is two kilometres wide, heads due north. Construction continued through 1984. The original trench effectively blocked Iranian attacks on Basra, but the lake and canals have no obvious purpose in defending Iraqi territory. So why have they been built? One theory given to us is that the extensions are being made by the Iranians, not the Iraqis. Iran, it is said, wants to empty the barrier before launching an assault on Basra. But the evidence of the satellite data contradicts this. By July 1984, the water body extended 40 kilometres north and 10 kilometres southeast towards Abadan Island. The northern channel goes uphill—not very useful for draining the lake. And the channel heading southeast ends in marshland, from which drained water would inevitably back up.

Wherever the canals go, the Iraqis position their arsenal of heavy weapons behind them. As the body of water grows, the Iraqis advance. What was first a shield for defence had become a shield behind which to conduct an offensive.

In the southeast, the Iraqis have advanced behind the water shield, back into Iranian territory. The advances also allow Iraqi tanks access to the sole stretch of dry land leading to Abadan. In its previous offensives, Iraq had to attack Abadan from marshlands.

So far, the Iraqis have excavated some 400 million cubic metres of heavy salt-laden clay to build the lake and canals. Much of the work has been done under fire from Iranian troops. Civil engineers we have spoken to say that excavation alone must already have cost at least $1 billion. Moreover, the project was underway before or very soon after Iraq attacked Iran in 1980. It seems certain, therefore, that the project was conceived, planned and approved *before* the initial attack. We conclude that the structure is a central part of Iraq's military strategy in the Gulf war.

Inside present-day Iran, two river systems descend to the Mesopotamian Plain and the Shatt al Arab from among the mountains to the north. They join the more famous waters of Iraq's Tigris and Euphrates. One of these Iranian rivers, the Karkheh, passes through the ruins of the ancient Mesopotamian city of Susa, and then dissipates into countless abandoned canals and exhausts itself.



HOW - the water barrier could change Mesopotamia. 1. Today, Iraq's water "barrier" near Basra is extending north to the point where the River Karkheh dribbles into the desert, and south towards the sea. 2. Within a year or so, the Karkheh could be linked to the barrier so that it could continue its old course towards the Shatt al Arab and the sea. This would allow Iraq to control the whole of the Shatt al Arab and Abadan Island. 3. The logical conclusion. If the canal linking the Karkheh and the Karun were enlarged, virtually the whole of the Karun's flow could be diverted into the new channel. Iran's main natural barrier against Iraq would be emptied.

The water lands up in salt pans, occasional playas (temporary salt lakes), and vast areas of white salt flats.

The second river, the Karun, is twice as large. It loses up to 70 per cent of its water to evaporation, but still gets through the desert to the Shatt. In so doing, it forms a natural line of defence for Iran against Iraq. The Iranians have deliberately flooded land around the Karun several times to halt Iraqi advances.

There is sizeable evidence that Iraq's ultimate objective in its desert waterworks is to destroy this line of defence and advance into Khuzistan, which is populated largely by Arabs rather than by Iranians.

The Iraqis have worked patiently, under direct exposure to enemy fire, to restore a small flow of fresh water from the Karkheh to the lowest reaches of the Shatt al Arab. If this were extended to create a proper river flowing south into the Shatt or the Bahmanshir, the Iraqis would have extraordinary potential for radically altering the drainage patterns of the region.

The economic and political consequences would be vast. For instance, a short canal already links the Karun and Karkheh, before the latter runs dry in the desert. Iraq could enlarge this canal and divert water from the Karun into the Karkheh (see diagrams above). This would prevent flooding along the Karun, reduce its flow and make it much easier for Iraqi forces to cross in an invasion.

We cannot, of course, be sure what the Iraqis will do or intend to do. But we can determine what is reasonable in terms of hydrological engineering, and assess the potential military use of such work. But the benefits for the region go beyond military ones.

If a steady flow of fresh water were re-established through the Karkheh valley to the sea, the salt flats could be flushed out, drained of salts, and life could return.

During the flood season, some water from the Karkheh trickles south and collects in hollows north of the Shatt al Arab and forms temporary salt lakes. Since digging their excavations, the Iraqis have replaced these temporary lakes with a single body of fresh water flowing to the Shatt and the sea. They have also gathered waters trickling down from the north first into some holding ponds and then into a wide channel leading into a rather broad lake, from which drainage continues further, by several canals, to the Shatt al Arab and the sea.

The great enemy of water engineering in the desert is, of course, evaporation. Up to 90 per cent of the flow of the River Tigris, for example, is lost to evaporation between Kut, halfway towards Baghdad, and the sea.

Moreover, irrigation projects increase rates of evaporation. They spread waters out over shallow pans with modest flows and no clear outlet. Either the water is absorbed in the ground and by plants, or it evaporates. One consequence is an accumulation of salts in irrigated soils. Salts make the land useless to life. This is the legacy of Susa. The irrigation system of that ancient civilisation eventually poisoned the soil and killed the River Karkheh.

The solution is to drain the soils to allow water to flow more quickly through the system. This reduces the amount of salt the soil absorbs, and increases the water's capacity to carry away salt. By building a large lake and single channel in a salt-encrusted terrain, and in integrating this with freshwater from the Shatt al Arab, the Iraqis will create an effective salt-drainage system. Whether by accident or design, they have begun to execute exactly what is necessary to make the desert return to life.

A hydrologist would recommend that the Iraqis continue the excavation of the channel northwards for a further 50 or 60 kilometres to meet the River Karkheh. The steady rise in altitude along the channel from 3 metres above sea level to 40 metres would ensure a gravity flow.

The volume of the Karkheh is modest. The flow of water averages 155 cubic metres per second. To fill what has been excavated so far, the Shatt would need to give up about 500 m^3/sec, a considerable part of its flow. This means that the saline flood plain of the Karkheh now receives a volume of freshwater more than three times greater than normal.

Once the Karkheh was connected, the intake from the Shatt could probably be disconnected, and the entire lake and river system would maintain enough head, force and volume to retain its size.

But, to ensure sufficient water, hydrologists could recommend adding water from the Karun, using the existing canal linking the Karun to the Karkheh. The Karun has an average flow of 330 cubic metres per second. Such a link could virtually empty the Karun.

In this war, the consequence of feeding waters from the Karun into the parallel river of a revived Karkheh would be to destroy the main defence of the Iranians against Iraq—both as a river and as a means for flooding surrounding land to prevent enemy advances.

The heavy artillery and armour of the Iraqis could move across once flooded lands and capture Khuzistan.

Even if the fortunes of the war prevent the completion of these hydrological works in the way that we have described, Iraq has already accomplished a major feet of engineering with important consequences for the area, whoever controls it. □

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