

# MARS fact sheet #10

## Storylines: writing the future for effective water management – Fragmented World

*The future is uncertain. Depending on both human actions and the scale of climatic changes, we can expect any number of potential changes in freshwater ecosystems between now and 2060. In response to this uncertainty, MARS scientists and stakeholders have collaboratively developed a range of different scenarios, each based on climate and socioeconomic predictions.*

Using these scenarios, three ‘storylines’ were written to explore the potential future impacts of multiple stressors on the ecosystems and basin regions studied by MARS. Two time horizons are used for scenarios: 2030 (to inform the update of the Water Framework Directive in 2027) and 2060 (to show the impacts of climate change).

This scenario methodology has been used by many organisations to present unpredictable futures, including UNEP and the IPCC. Traditionally, these scenarios have been simple, linear predictions, with sequential and predictable relationships between socio-economic actions and climatic and environmental outcomes.

In recent years, however, scientists have pointed out that the interactions between humans and the environment are more complex than such a sequential approach gives credit for, and a more responsive methodology is used here, in which emissions and socio-economic scenarios are developed in parallel.



Manure desertification farming (photo: werktuigendagen, Flickr.com, CC licence)

Analytical priority is given to changes in emissions and greenhouse gas concentrations over time (termed ‘Representative Concentration Pathways’). Scenarios can then be created based on these emission pathways alongside parallel (and plausible) ‘Socio-Economic Pathways’ and policy scenarios.

### Scenarios and water management

As water management is usually site-specific, global data and predictions currently tells us little about water management in the future. Projections and data do tell us, however, about aggregate global demand and availability.

The storylines designed by MARS scientists use this data and create further predictions around potential changes such as technologies for irrigation, changes in river discharges, changes in pesticide use (and thus pollution), technologies like dikes and dams, water use in industry and energy production, and use of surface and groundwater.

### Fragmented World

In the Fragmented World, we envision a future with rising emissions and significant climatic change (Representative Concentration Pathway 8.5). Technological developments are slow, and fossil fuel dependence is high; international cooperation is poor and significant pockets of poverty persist (Shared Socio-Economic Pathway 3). The Fragmented World storyline features a future world with the following features:

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## Economy

In the Fragmented World, the economy grows in some European countries (particularly in Northern and Western Europe) and decreases in others (primarily the South). Security concerns have led many countries to limit trade and focus on their internal economies and national, rather than international, development. There are few international trade agreements.

Economic growth is slow, as is technological innovation, and industry is very resource intensive, with high dependence on fossil fuels. Inequality is rife, particularly in poorer countries, where resources are scarce.

## Energy

Energy use is high in the Fragmented World, and largely dependent on fossil fuels. Barriers to trade mean the international energy markets are complex, and energy security is a priority for most states.

Poor international cooperation and knowledge transfer means technological development and energy efficiency are low, and industry and power generation are resource intensive. There is investment in developing renewable energy, but this only happens when sufficient financial resources are available and there are no cheaper alternatives.

## Environment

Environmental protection is not a priority in the Fragmented World. Some national governments implement local scale solutions to environmental problems, but the lack of international cohesion means that large-scale and trans-boundary problems are rarely addressed. Many currently existing habitats are lost, and deforestation, soil erosion and desertification increase in vulnerable areas.

Poor technological progress means and the low priority of the environment means that pesticide use increases, and as a result, water pollution and nutrient load increases in freshwater ecosystems. Water resources are overexploited, and the ecosystem health of freshwater systems is ignored.

Poor technological and economic development, coupled with weak international institutions, mean that climate change mitigation is difficult. Unfortunately, poverty, uneven development and a lack of international cooperation mean that adaptation to climate change is also difficult.

## Policies

Current environmental commitments are not met in a Fragmented World future. European environmental policies expire or are broken before 2030, and are not renewed. Each state plans its own policies in isolation.

The majority of these policies favour economic development over environmental protection. Some local solutions are implemented in rich countries, but any diffuse environmental problems occurring over larger scales are neglected.

## Water Management Strategies

In the Fragmented World, water management is not strategic. All interventions in freshwater are reactive, and respond only to limited short-term aims: that people in the present and immediate future have enough water to drink and to service agriculture and industry, and that areas with high levels of economic activity are protected against floods.

## Links

Shared Socio-Economic Pathways:

<http://tinyurl.com/jcuhq4h>

Representative Concentration Pathways:

<http://tinyurl.com/hrnlx9s>