

# Some General Principles for Successful Catchment Management

November 2021

# The importance of principles!!



*“As to methods there may be a million and then some, but principles are few. The person who grasps principles can successfully select their own methods. The person who tries methods, ignoring principles, is sure to have trouble.”*

A quote, slightly amended, from H. Emerson.

**Or, more simply, ‘principles before methods/techniques’.**

50 basic principles for ‘characterising & managing our water resources’ can be accessed in Section 2, Volume 1 of the Course Notes.

## Principle 1: “Focus on the objective – the achievement of environmental outcomes”



- ❑ Environmental outcomes are the key gauge of success, rather than an account of activities undertaken.

**“Activity without achievement”**

## Principle 2: “Check/know the objective”



### □ Is the objective:

➤ **Protection/maintenance**, where water quality (or terrestrial ecosystem) is satisfactory?

OR

➤ **Restoration/improvement** requiring mitigation, where the situation is unsatisfactory?

□ The answer influences the approach, focus and (usually) the resources (time & money) needed.

**Principle 20: Catchments are the land-based organising framework & landscape units for water resources management**



**Proposed definition**

**A multi-functional, topographically-based, dynamic, multiple-scale socio-biophysical system; defined by over ground and underground hydrology; connecting land, water, ecosystems and people; and used as the basis for environmental analysis, management and governance.**

**Connecting (and integrating) topography, water (all types), ecosystems, geosystems, flooding, GHGs, planning, and PEOPLE/COMMUNITIES in the catchment area**

## **Principle 3: Catchment science requires multidisciplinary inputs and approaches**

- **Environmental scientists**
- **Environmental engineers**
- **Hydrologists & hydrogeologists**
- **Biologists**
- **Agricultural scientists**
- **Planners**
- **Social scientists**
- **Environmental economists**



## Principle 6: “Pick important problems and fix them”



- ❑ In any catchment, there will be a multitude of environmental stressors/pollutants and pressures.
- ❑ The key is to pick those that will ‘**make a difference**’ and **fix them** as a means of achieving whatever the objective is.

## Principle 7: “Right measure in the right place”



- ❑ Measures/actions must be ‘tailor made’ and specifically targeted and prioritised on the:
  - i. the receptor requirement/**objective**
  - ii. **relevant stressors/pollutants** (e.g. phosphate, nitrate);
  - iii. **pressures** (e.g. UWWTPS, farming);
  - iv. on the **relevant areas**; and
  - v. **physical settings** where these areas occur,

as the means of achieving the desired environmental outcomes.

**Key driver** (Draft RBMP 2022-2027)

“The right measure, in the right place.”

## Principle 8: “Pressure ≠ Impact”.



- ❑ It is a fundamental error to think that ‘*the greater the pressure, the greater the impact*’ or that the nearby and visible pressure is the cause.
- ❑ These are generalisations and simplifications that may or may not be correct, depending on the circumstances.
- ❑ More detailed analysis is needed prior to drawing conclusions.

## Principle 10: Monitoring is a means not an end



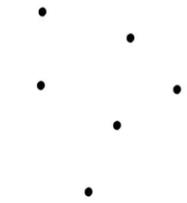
- ❑ Monitoring is necessary to contribute to understandings and measure outcome but, on its own, is not an activity to achieve outcomes.

## Principle 19: Catchments are “systems”



- ❑ Therefore, it is essential that we adopt ‘systems thinking’ and the ‘systems approach’.
- **Systems thinking** = an integrated, holistic approach to analysis that focuses on the way a system’s constituent parts interrelate and how systems work over time and within the context of larger systems.
- **Systems approach** = A multi-disciplinary, multi-objective and multi-stakeholder framework supporting a balanced evaluation of all relevant issues.

# TOOLS OF A SYSTEM THINKER



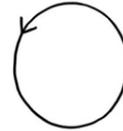
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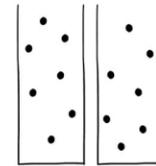
INTERCONNECTEDNESS



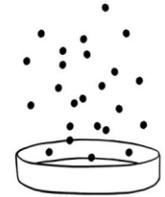
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CIRCULAR



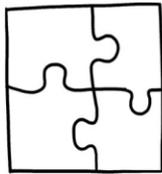
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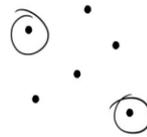
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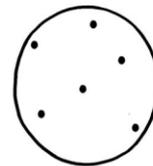
PARTS



WHOLES



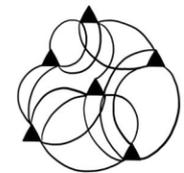
ANALYSIS



SYNTHESIS



ISOLATION



RELATIONSHIPS

## **Principle 27: Public participation is a core principle of the WFD**



- ❑ Without the involvement, cooperation and co-ownership of water (and environmental) management by local communities (and particularly farmers and householders) and the opportunity to learn from them, Ireland's water quality objectives will not be achieved in the foreseeable future.**

**Principle 31: “Understanding” – the key to successful environmental management**



**“You can’t manage what you don’t understand.”**

John Cherry (renowned hydrogeologist)

**“Everyone hears only what he/she understands.”**

Johann Wolfgang von Goethe

**“The noblest pleasure is the joy of understanding.”**

Leonardo da Vinci

**So, we will be trying to enhance our understanding of water in catchments.**

## “Mental models” – vital in developing our understanding



- ❑ A **mental model** is an explanation of the thought process about how something works in the real world. It is a representation and visualisation of the surrounding world, and the relationships between its various parts and our intuitive perception about how this world functions.
- ❑ The ‘world’ for us on this Course is the landscape, water, ecosystems, geosystems, atmospheric systems, and people in catchments.
- ❑ The better we **understand** this ‘world’, the more appropriate, effective and satisfying our actions.

# The influence of mental models



According to Professor Peter Lunn, Behavioural Research Unit of ESRI, when writing about the Covid-19 situation:

*“Mental models are subtle things. They alter what comes to mind when we face decisions and affect the words we use to describe decisions.*

*In the end, they determine how we decide.”*

**Our aim is to influence your ‘mental model’ of water in catchments, such as your local catchments.**

## Principle 36: Identify critical source areas (CSAs)



- ❑ **CSAs** are areas that deliver a disproportionately high amount of pollutants from diffuse sources compared to other areas in catchment.
- ❑ They need to be located enables the **mitigation** or **protection measures** (whichever is appropriate) to be targeted.
- ❑ **“Right measure in the right place”**.

**Principle 46: Consider mitigation actions according to the point in the source-pathway-receptor continuum**



# The transfer continuum – a landscape-based framework for diffuse pollution

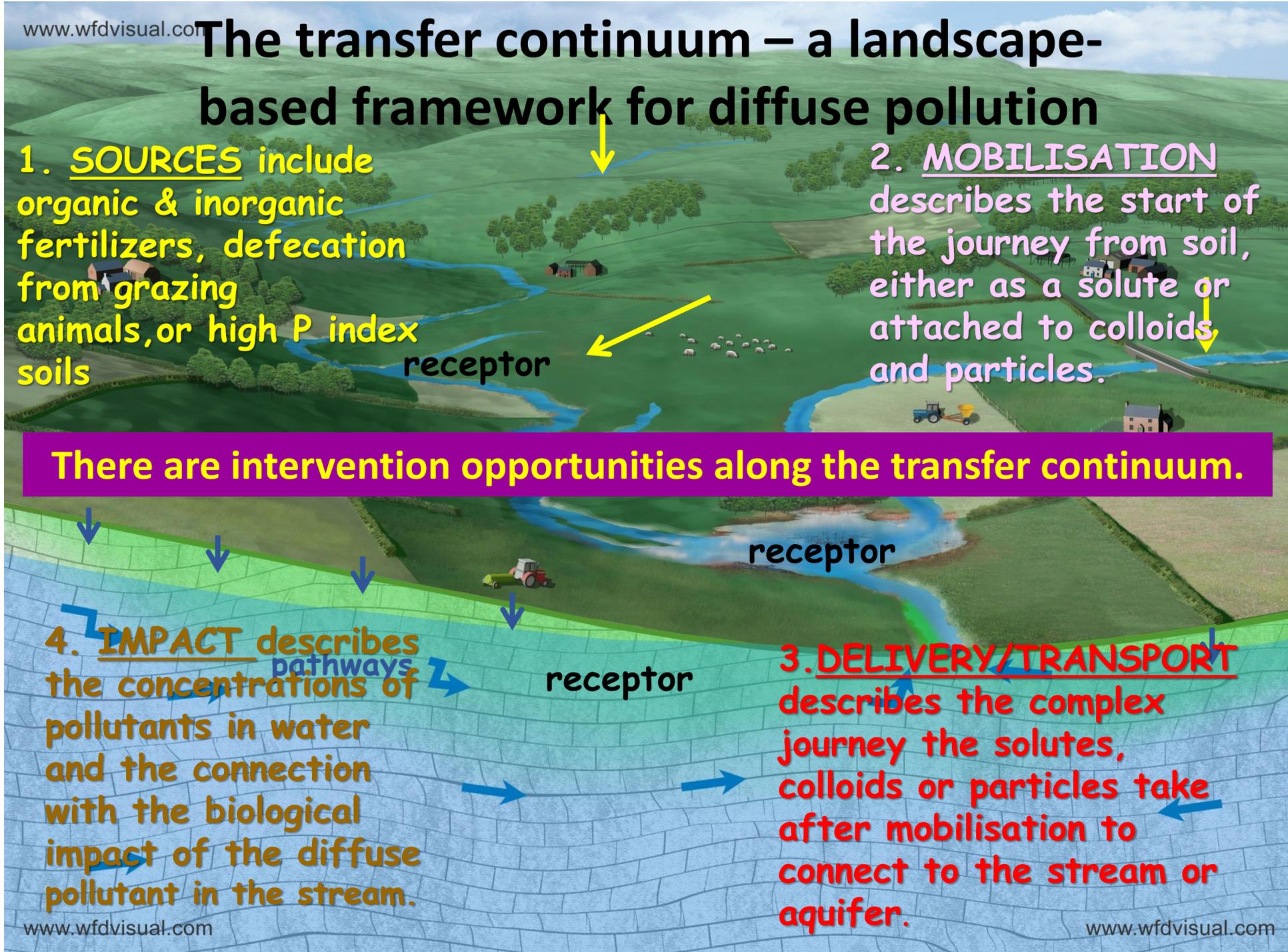
1. SOURCES include organic & inorganic fertilizers, defecation from grazing animals, or high P index soils

2. MOBILISATION describes the start of the journey from soil, either as a solute or attached to colloids and particles.

There are intervention opportunities along the transfer continuum.

4. IMPACT describes the concentrations of pollutants in water and the connection with the biological impact of the diffuse pollutant in the stream.

3. DELIVERY/TRANSPORT describes the complex journey the solutes, colloids or particles take after mobilisation to connect to the stream or aquifer.



## **Principle 46: Consider mitigation and protection actions according to the point in the source-pathway-receptor continuum**



- i. Source reduction or elimination.**
- ii. Mobilisation control.**
- iii. Pathway interception.**
- iv. Receptor/instream works.**
- v. Treatment, in the case of drinking water sources.**

# Principle 50: Take account of co-benefits of measures/actions

Table 1: Illustration of the range of environmental benefits provided by different farming and forestry practices within the Framework for Integrated Land and Landscape Management

Management option to address pressures	Water quality	Biodiversity	Flood mitigation	Soil conservation	Landscape	Climate Change Mitigation	Climate Change Adaptation
Creation of buffer strips, e.g. riparian zones, grass margins.	●	●	○	●	○	●	○
Planting of clover and multi-species grasses	●	●	-	●	-	●	-
Planting hedges alongside watercourses & across slopes	●	●	○	●	○	●	○
Liming of mineral soil to ensure optimum pH	●	-	-	●	-	●	○
Agroforestry	●	●	○	●	○	●	○
Reforestation with native species	●	●	●	-	○	●	○
Interception ponds and constructed wetlands	●	●	○	○	●	●	●
Rewetting peatlands	●	●	○	-	○	●	●



= Management option contributes directly to an environmental benefit



= Management option contributes indirectly to an environment benefit

## The other 36 principles



- ❑ 50 basic principles for ‘characterising & managing our water resources’ are given in Section 2, Volume 1 of the Course Notes.
- ❑ They provide a summary of characterising and managing our water resources.

## Additional Principle: Local Authorities have a critical role in water resources management



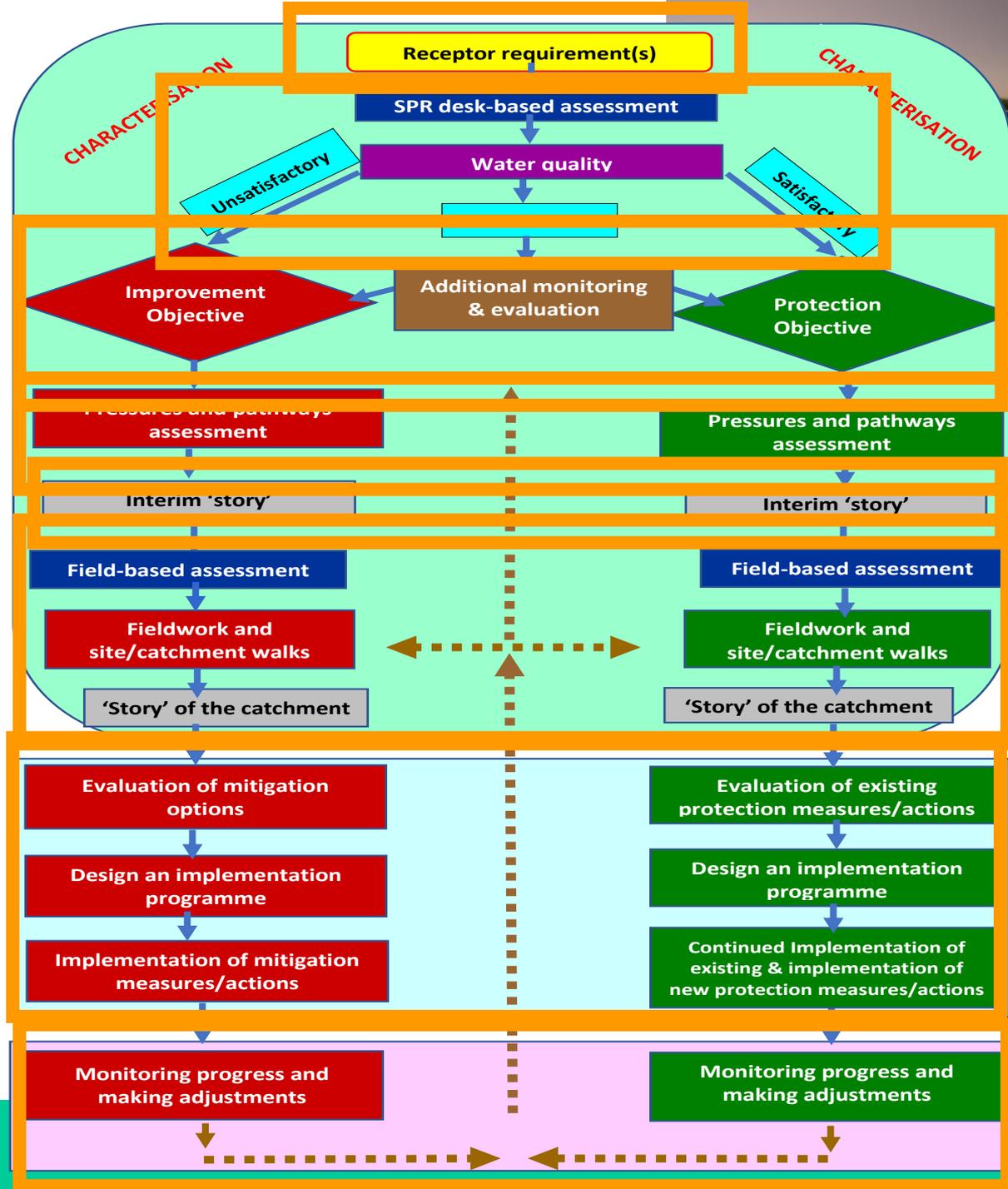
- ❑ Most WFD implementation requirements will be on our land and landscapes: the land and landscapes that **local** authorities have certain/many responsibilities for.
- ❑ Therefore, LAs are a key, if not the key, public bodies managing our land and landscapes.
- ❑ Therefore, LAs have a vital role in achieving the WFD objectives and in implementing the River Basin Management Plan effectively and efficiently.

# Recommended process

3 broad stages:

1. Characterisation.
2. Protection & mitigation actions
3. Monitoring progress and making adjustments

This is the Process or approach used by the EPA Catchments Unit, LAWPRO and the NFGWS.



**A final thought:  
'Whole of  
environment'  
philosophy**

**Illustration of the  
interconnectedness  
and  
interdependencies  
of the  
environmental  
components**

