# Note on Catchment Management Statistics

# 1 Purpose

The purpose of this note is to define what we mean by catchment statistics, as applied in SIMCAT modelling for WFD and N2K sites.

# 2 Basic Concepts

The basic concepts are:

* Impact concentration
  + *CSi* Spot impact, being the concentration at a point in the catchment, for a

sector, *i.*

* + *CCi* Catchment impact, being a representative concentration for the catchment

as a whole, for a sector, *i.*

* Share
  + *SSi*Spot share, being a sector share of the target concentration at a point in the

Catchment, for a sector, *i.*

* + *SCi* Catchment share, being the sector share of the target concentration.

This is a single value applied across the whole catchment, for a sector, *i.*

* Target
  + *TS* Spot target, being the target concentration (EQS) at a point in the catchment
  + *TC* Catchment target, being the average target (EQS) across the catchment
  + *TSi* Spot target being the target concentration at a point in the catchment,

for sector, *i.*

* + *TCi* Catchment target, being the average target across the catchment, for

sector, *i*.

* Reduction
  + *RSi* Spot reduction, being the ratio of the spot concentration to the spot target
  + (by sector).
  + *RCi* Catchment reduction, being the ratio of the catchment impact

concentration to the catchment target (by sector).

* + *RHi*  Hybrid reduction, being the ratio of the spot concentration to catchment

target (by sector).

# 3 Application

## 3.1 Fair share, WFD

Calculating Impact

For diffuse sector

For point sector

Notes

* This is predicated on the understanding that:
  + Diffuse concentrations are reasonably homogeneous over an operational catchment.
  + The target concentrations are also reasonably homongeneous.
  + Point sources are spatially impulsive. So averaging their impact would penalise them.
* The recommended percentile is the 85th. (This is consistent with earlier guidance on aiming for compliance in water bodies.)
* (Other percentiles could be examined, with a view to achieving higher, or lower catchment compliance.)

Calculating Sector Share

For diffuse sector:

(For Point Sector

but this is equivalent to PR19 analysis and so not considered/applied further.)

Note

* It is tempting to define the catchment share as being the average of the spot shares. This should be avoided because it is not consistent with the PR19 guidance and it is difficult to relate to our catchment impact concentrations.

Calculating Sector Target

For diffuse sector:

(and similarly for point target).

Calculating Reduction

For diffuse sector

(Similarly for point, but this has essentially been done in PR19).

(For diffuse sector – hybrid

As noted above, this approach is predicated on the assumption that the diffuse concentrations are homogeneous across the catchment. There may however be hotspots (or low spots), where greater (or lesser) reduction is required. This reduction is given by

Note that where greater reduction is required, the target is still the same for all.)

Comments

1. The above allows us to separate out the diffuse and point share obligations and hence manage them independently and so more easily and clearly.
2. In particular identifying catchment averaged targets for a sector greatly simplifies the problem, whilst ensuring equity within sectors (eg SAFFO agricultural measures are uniformly applied across a catchment).
3. This does not rule out the potential for collaboration between sectors.
4. The use of the percentile is powerful. From the specified percentile, we know that a corresponding percentage of the catchment will be compliant if the diffuse reduction measures are applied. Where the diffuse reduction measures are unattainable, we can look at the attainable measures and find the corresponding percentile, which will indicate how much of the catchment will be compliant.
5. The limitation of taking catchment statistics and using them to manage catchments is that ‘phase’ or location specific information is missing. So the effect of the presumed reductions should be calculated through SIMCAT and mapped out. This would be to check we are not over-egging the reductions which could occur if the STWs are preferentially located towards the head of the catchments. In short, if this were the case, then we could probably lessen the reductions needed in the lower catchment (or equivalently, find a local solution at the head of catchment).
6. As always, none of this should get in the way of common sense.

## 3.2 N2K sites

There is an interest in understanding the implications of fair share to N2K sites.

The peculiar features of N2K sites which will distinguish them for the above WFD approach are:

* N2K sites do not cover a whole catchment; in particular upstream areas may not be part of the site.
* Targets have greater variability in N2K

Upstream Areas

Under Habitats Directive, all sources impacting on a site are to be considered. Therefore, the simplest way to address upstream areas is to give them the same target as the adjacent downstream areas.

Target variability

It would be complex to develop a reliable algorithmic approach to a solution. Therefor a more exploratory approach is preferred, through the following steps, using the WFD methodology described above:

* Calculate the required reductions for minimum, average and maximum target.
* Compare them with the 10% (CSF), 30% (optimistic) 60% (maximum) categories. If they lie within the same category, recognising that there is probably a 20% uncertainty margin (there is available info on this), then the result would be that the same measures would be applied anyway.
* Map out, using SIMCAT the implications of applying these reductions. Choose minimum, average or maximum, or all three depending on circumstances. Apply the logic in comment 5 above to evaluate.