

Introduction to the LTLS scenario framework

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Stakeholder workshop
CEH Lancaster: 15-16th March 2016





Development of the LTLS scenario approach

- Appraisal of existing frameworks (NEA, IPCC)
- Stakeholder Engagement* (LTLS workshop/questionnaire)
- Go with the flow (UK)NEA
- Areas of interest represented by stakeholders
 - Agriculture
 - Forestry
 - Freshwaters
 - Atmospheric inputs
 - Carbon
 - Dissolved Organic Carbon
 - Woodlands
 - Erosion
- Sensitivity testing approach adopted

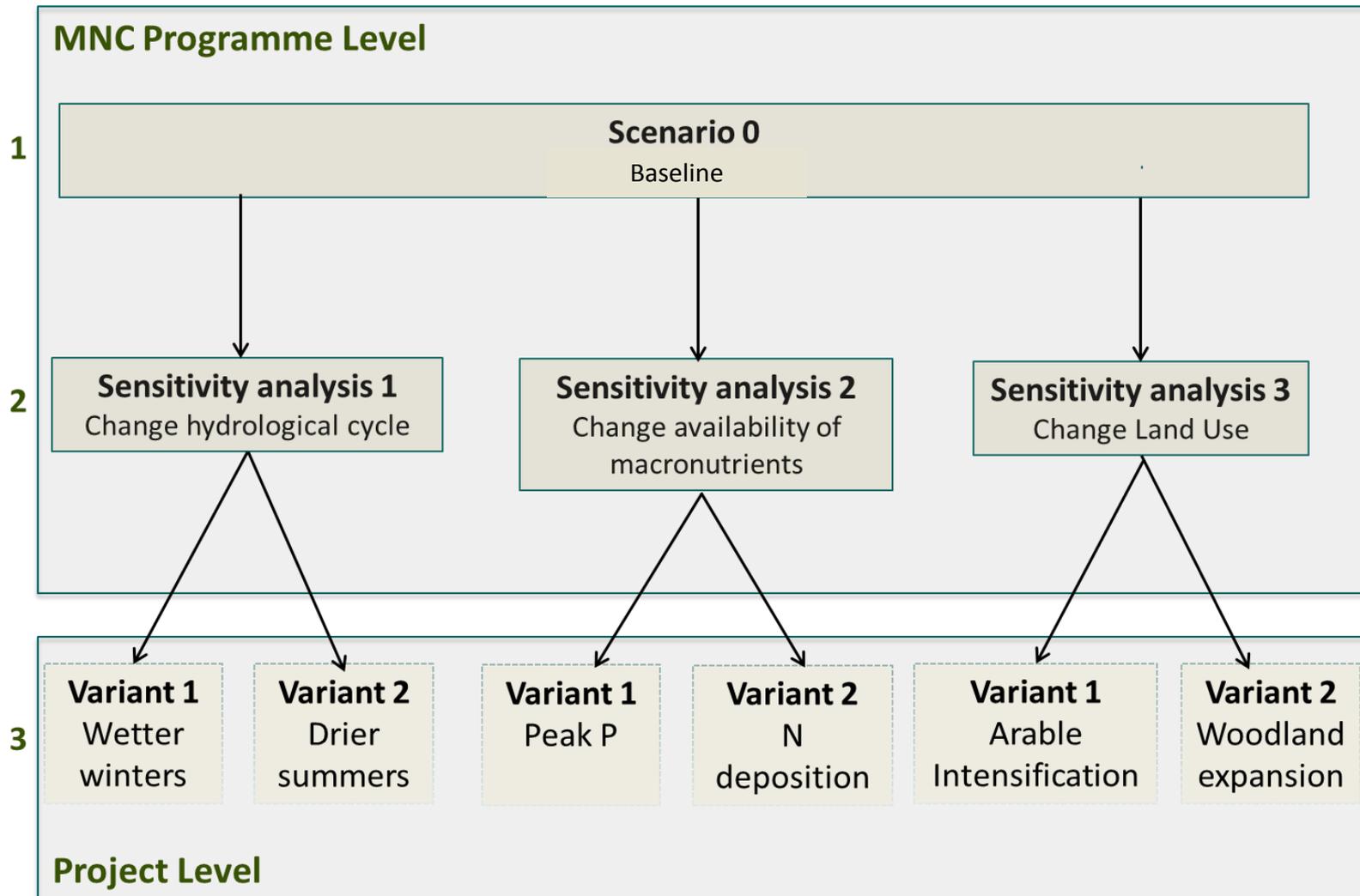
*Stakeholder views representing :

Yorkshire Water, DEFRA, NFU, Natural England, Scottish Government, Newcastle Uni, Environment Agency, Forest Research

Macronutrient Cycling Programme



Framework for testing the sensitivity of models to future environmental perturbations





Future drivers of change



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Climate change

A2 emissions scenario (medium/high)
Model output from the EU FP6 WATCH project

Atmospheric deposition of N and S

Based on DECC Updated Energy Projections 43 (UEP43) energy forecasts

Sewage effluent

Enhanced P stripping at all waste water treatment works

Land use change

Arable intensification
Higher stocking densities
Woodland expansion



LTLs Integrated Model

Future C, N and P in soils,
freshwaters and estuaries

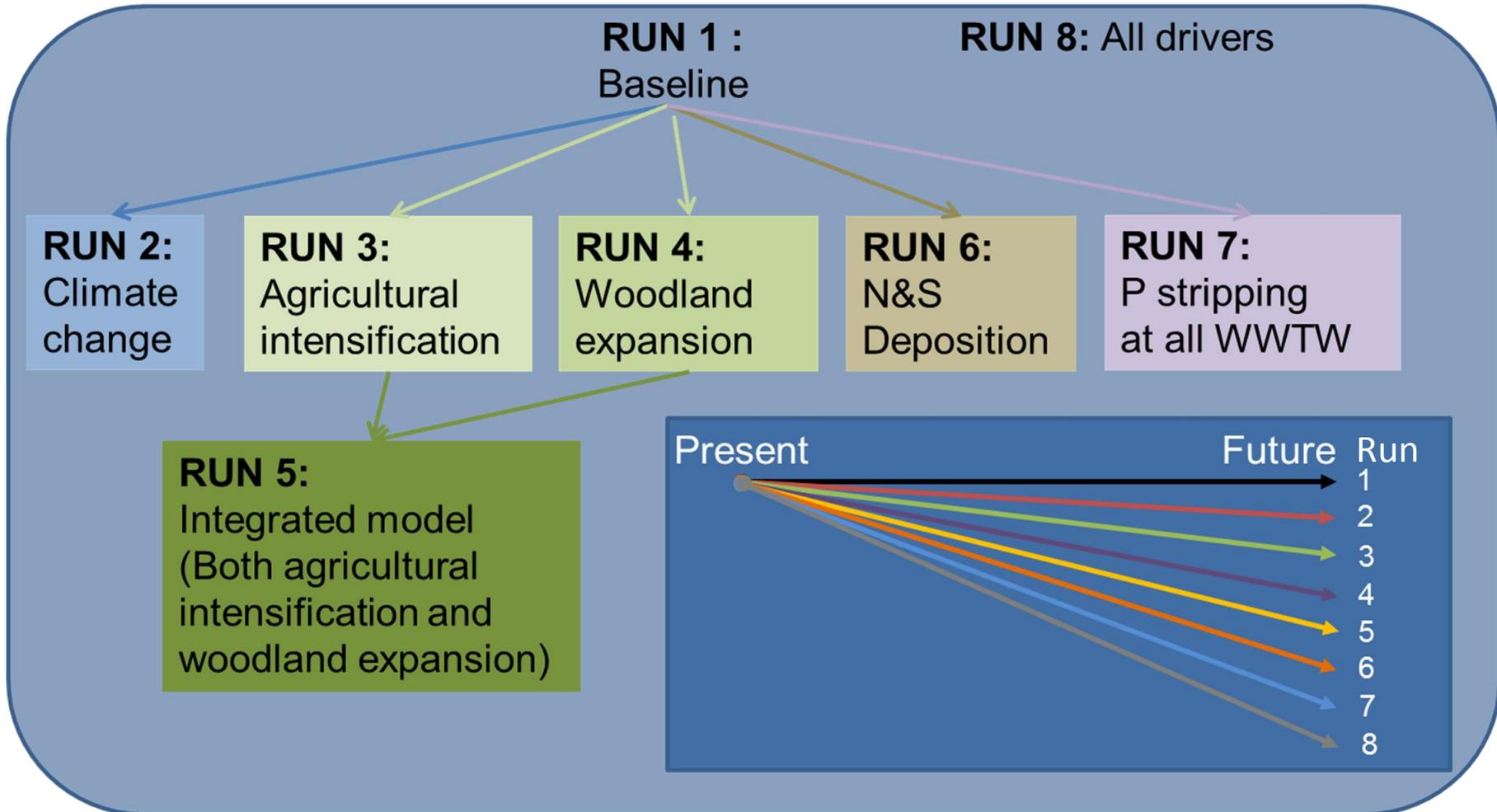


LTLS Scenarios Framework



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- *Note: Today presentations will focus on selected examples from this framework.*
- *Royal Society meeting: Full assessment of how systems will respond to drivers of change*





Timescales of interest to the LTLS stakeholders

- 2015 for achieving Environmental Objectives under the WFD
- 2020 Aichi targets
- 2021 Scottish Water climate change targets Business Plan
- 2030 Air quality targets
- 2030+ climate change targets integrated solutions in water security
- Water companies plan in 25 yr cycles (Infrastructures 50-60yrs)

Encompass all policy targets, LTLS models have been run until 2100

and Expansion Advisory Group (Scotland)



Baseline (Run 1)

- Baseline –
 - 1971-2010 WATCH model (ECHAM5) CONTROL period

Climate change (Run 2)

- Climate –
 - 2001-2010 WATCH model (ECHAM5) A2 (medium/high emission) scenario

In practice these are run as a sequence from 1971-2100



Land use: Arable intensification (Run 3)

Food security

- Arable area remains the same (LCM07) but the land is tightly managed (new technologies, fertilizers input, high yielding crops).
- We run the scenarios of improved varieties adapted to climate change with and without additional nutrient inputs





Land use: Woodland expansion (Run 4)



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Low Carbon Economy

Baseline (LCM07 & NFI (FC))

Woodland expansion was based on:

- Physical constraints (tonnes)
- Designations
- Climate change

Integrated land use (Run 5)
 Arable intensification/woodland expansion
 use policy targets

Woodland planting targets in the UK

Country	Target (% of country)	Target Area	% Broadleaf	% Conifer
Scotland	25% by 2050 ¹		40	60
England	12% by 2060 ²		50	50
Wales	20% by 2030 ³		50	50
N Ireland		1000ha/yr to be planted until 2050 ⁴	50	50



N & S Deposition (Run 6)

Best representation of future changes in emissions:

- FRAME model
- UEP43 for UK emissions (NH_3 , NO_x , SO_2)
- IIASA for European emissions
- VITO for international shipping emissions
- Resolution 5 km x 5 km
- Reductions to 2030 then constant to 2100

There were significant reductions for NO_x (~50%) and SO_2 emissions (~40%) but a small increase in NH_3 emissions (4%) forecast between 2010 and 2030

- Deposition fields (~semi-natural, forest, arable, improved grassland, urban)
- Deposition of SO_x and Total N (NO_y and NH_x)



Waste water treatment (Runs 7)



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Baseline:

- The baseline in 2010 was the current proportion of dry weather flow in E,W,S & NI.

Phosphorus stripping:

- P stripping was applied to all WWTW simultaneously in the year 2010.
 - It assumes that the effluent P is 0.16 of the influent P instead of 0.42 for secondary treatment and 0.35 for tertiary treatment.

Finally ...Integrate all drivers for Run 8