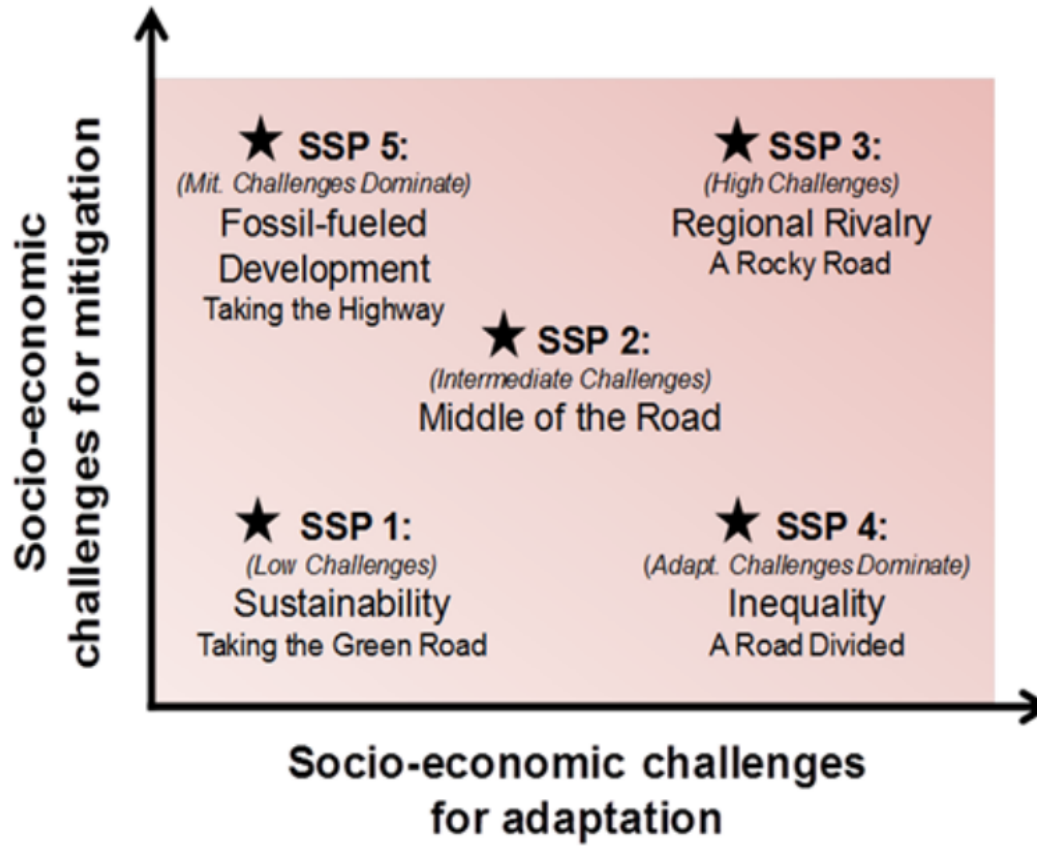# Scenarios – wrap-up

David Kanter & Wilfried Winiwarter

Agenda

- Decisions revisited
- Using NUE to project future N input
  - NUE as used by Zhang et al. (David)
  - Ymax (Luis)
- Way forward
  - Concept paper
  - Quantifying progress
  - AOB

SSPs selected

Socio-economic challenges for mitigation (vertical axis)

Socio-economic challenges for adaptation (horizontal axis)

★ **SSP 5:**
(Mit. Challenges Dominate)
Fossil-fueled Development
Taking the Highway

★ **SSP 3:**
(High Challenges)
Regional Rivalry
A Rocky Road

★ **SSP 2:**
(Intermediate Challenges)
Middle of the Road

★ **SSP 1:**
(Low Challenges)
Sustainability
Taking the Green Road

★ **SSP 4:**
(Adapt. Challenges Dominate)
Inequality
A Road Divided

- SSP 1 / RCP 4.5
- SSP 2 / RCP 4.5
  - Low N ambition
  - Moderate N ambition
  - High N ambition
- SSP 5 / RCP 8.5
- (Biofuel effect: SSP 1 / RCP 2.6)

SSP1, Sustainability

- Population in the region and globally peaks and starts to decline after 2050
- Rapid urbanization
- Gradual move towards less resource intensive lifestyles

- Increased plant based diet
- High N efficiency, high share of local & organic products
- Reduced agricultural land cover & livestock

- Tertiary treatment becomes the standard
- Separation of rainwater and sanitation
- Advanced on-the-site treatment common in rural areas

- Sustainable fisheries with high quality products
- Circular economy in aquaculture
- Small-scale, low impact fishes promoted
- Avoidance of habitat damaging gear and bycatch

SSP5, Fossil-fueled development

- Global population peaks in 2050, population in the Baltic Sea region increases steadily
- Rapid urbanization
- Resource and energy intensive lifestyles prevail

- Increased meat and dairy products in diet
- Globalised, export oriented sector, intensification
- Increased livestocks => expansion of agricultural land cover

- New investments made to serve growing urban areas
- focus on human health rather than environmental quality
- Some upgrading due to technology spill-overs

- Large-scale fishing focusing on maximising profits
- Habitat destructive gear and bycatch allowed
- Industrial scale development of freshwater and marine aquaculture with no nutrient focus

Extension of two extreme global futures to the Baltic Sea region. The global futures translate to developments in the regional drivers of agricultural nutrient loading, wastewater treatment and the fisheries

Changes in:	SSP1 Sustainable development	SSP2 Middle of the road	SSP5 Fossil fuelled development
Agricultural land use	- 10%	0%	+ 10%
Livestock density	- 50%	0%	+ 50%
Manure nitrogen efficiency	+ 10%	+ 5%	- 10%
Applied effective nitrogen	- 5%	0 %	+ 5%
Atmospheric deposition of N	-40%	-30%	-15%
Urban wastewater	-35% / -40%*	-20% / -25%*	-16% / -23%*
Rural wastewater	-30% / -30%*	-17% / -17%*	1% / -23%*

*The first number refers to changes in N and the second to changes in P where applicable

Scenario scope

- Spatial:
  - 0.5° x 0.5°
  - AgMIP regions refined to also match INMS demo areas
- Temporal:
  - 1970, 1990, 2010, 2030, 2050, 2070, (2100)
  - Use 1988 or preferably 1989 instead of 1990 in case of data problems
  - Drop 2100 if model developers consider results unhelpful. But also consider policy stakeholders

Scenario guidance

- Use default model parametrization on N inputs and other N –relevant factors

- Scenarios to provide common guidance on NUE improvements

- Then modellers individually translate NUE improvements as their model requires

- Quantify maximum N reduction potential; effects of specific N policy ambition levels; effects of biofuel expansion

- Use of individual N measures (as developed under A2.3) to achieve N scenarios to be performed ex-post

Table 1 | N budget and NUE in crop production by region and crop in 2010 and projected for 2050

	Current (2010)				Projected (2050)			
	Harvest N (Tg N yr^{-1})	Input N (Tg N yr^{-1})	NUE	Surplus N (Tg N yr^{-1})	Projected harvest N* (Tg N yr^{-1})	Target NUE	Required input N (Tg N yr^{-1})	Resulting surplus N (Tg N yr^{-1})
By region†								
China	13	51	0.25	38	16	0.60	27	11
India	8	25	0.30	18	11	0.60	19	8
USA and Canada	14	21	0.68	7	19	0.75	25	6
Europe	7	14	0.52	7	10	0.75	13	3
Former Soviet Union	4	6	0.56	3	6	0.70	8	2
Brazil	6	11	0.53	5	10	0.70	15	4
Latin America (except Brazil)	7	12	0.52	6	10	0.70	15	4
Middle East and North Africa	3	5	0.48	3	4	0.70	5	2
Sub-Saharan Africa	4	5	0.72	2	9	0.70	13	4
Other OECD countries	1	2	0.52	1	2	0.70	2	1
Other Asian countries	8	19	0.41	11	10	0.60	17	7
Total	74	174	0.42	100	107	0.67	160	52
By crop type‡								
Wheat	13	30	0.42	17	18	0.70	25	8
Rice	11	29	0.39	18	14	0.60	23	9
Maize	13	28	0.46	15	19	0.70	28	8
Other cereal crops	5	9	0.53	4	7	0.70	11	3
Soybean	16	20	0.80	4	24	0.85	28	4
Oil palm	1	1	0.46	1	1	0.70	2	1
Other oil seed	4	10	0.43	6	8	0.70	11	3
Cotton	2	5	0.37	3	3	0.70	5	1
Sugar crops	1	5	0.19	4	2	0.40	4	2
Fruits and vegetables	3	25	0.14	21	5	0.40	11	7
Other crops	5	11	0.41	7	7	0.70	10	3
Total	74	174	0.42	100	107	0.68	157	50

Zhang et al. 2015