

Preparatory action workshop

Conservation of FGR in Europe in a changing climate

Amsterdam 16-06-2015

A decision cascade tool for gene conservation under climate change

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Introduction

- What is a «decision cascade tool»?
 - working title for a decision system
 - EUFORGEN working group FGR & CC (WG4)
- Why a decision system for conservation measures?
 - support for decisionmaking (complexity, uncertainty)
 - increase of effectiveness
- Aim of the talk?
 - overview about the idea and thoughts in WG4
 - focus on some important aspects
 - conclusion regarding need for action

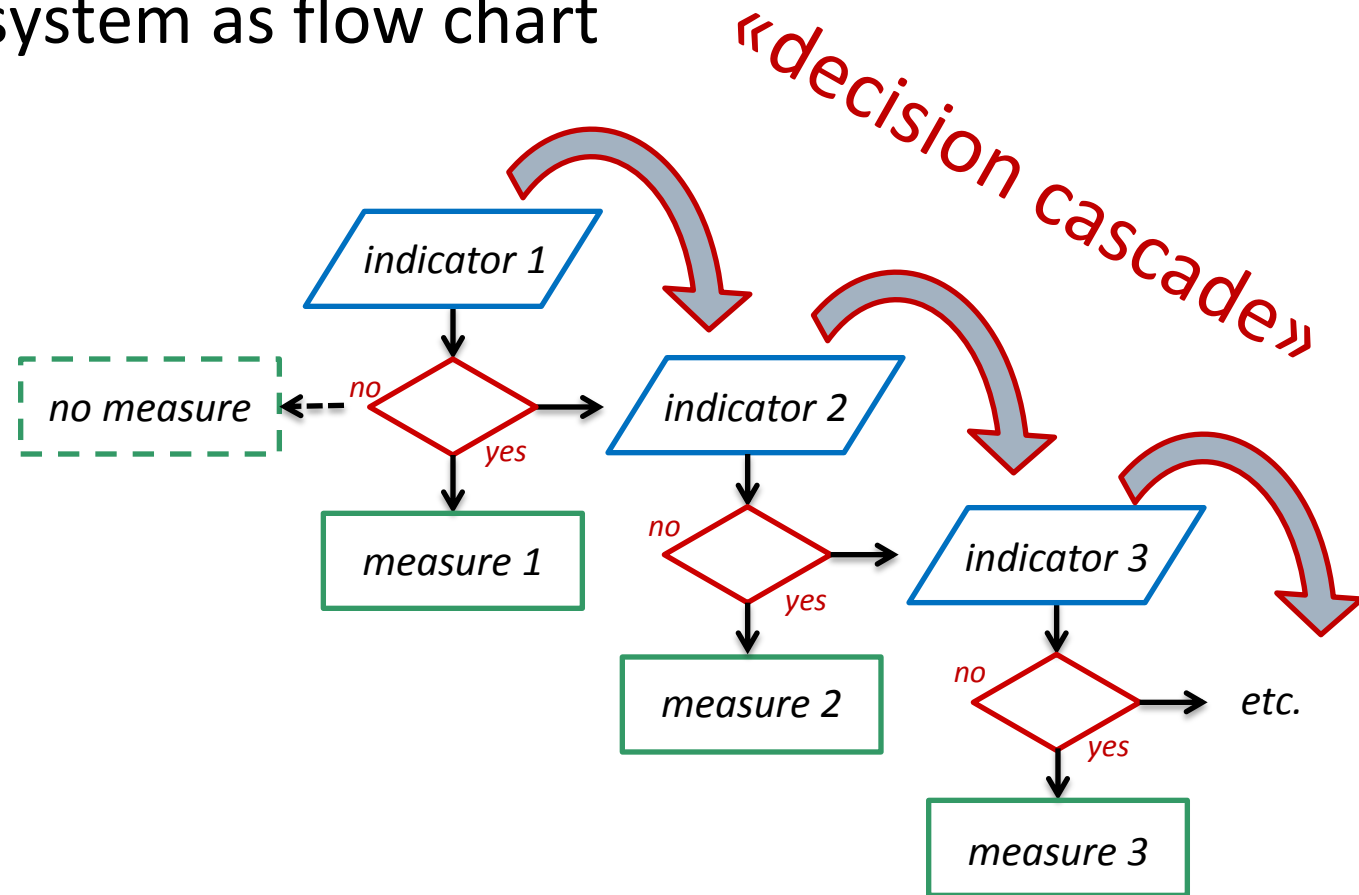
Decision system +

- Decision process as flow chart



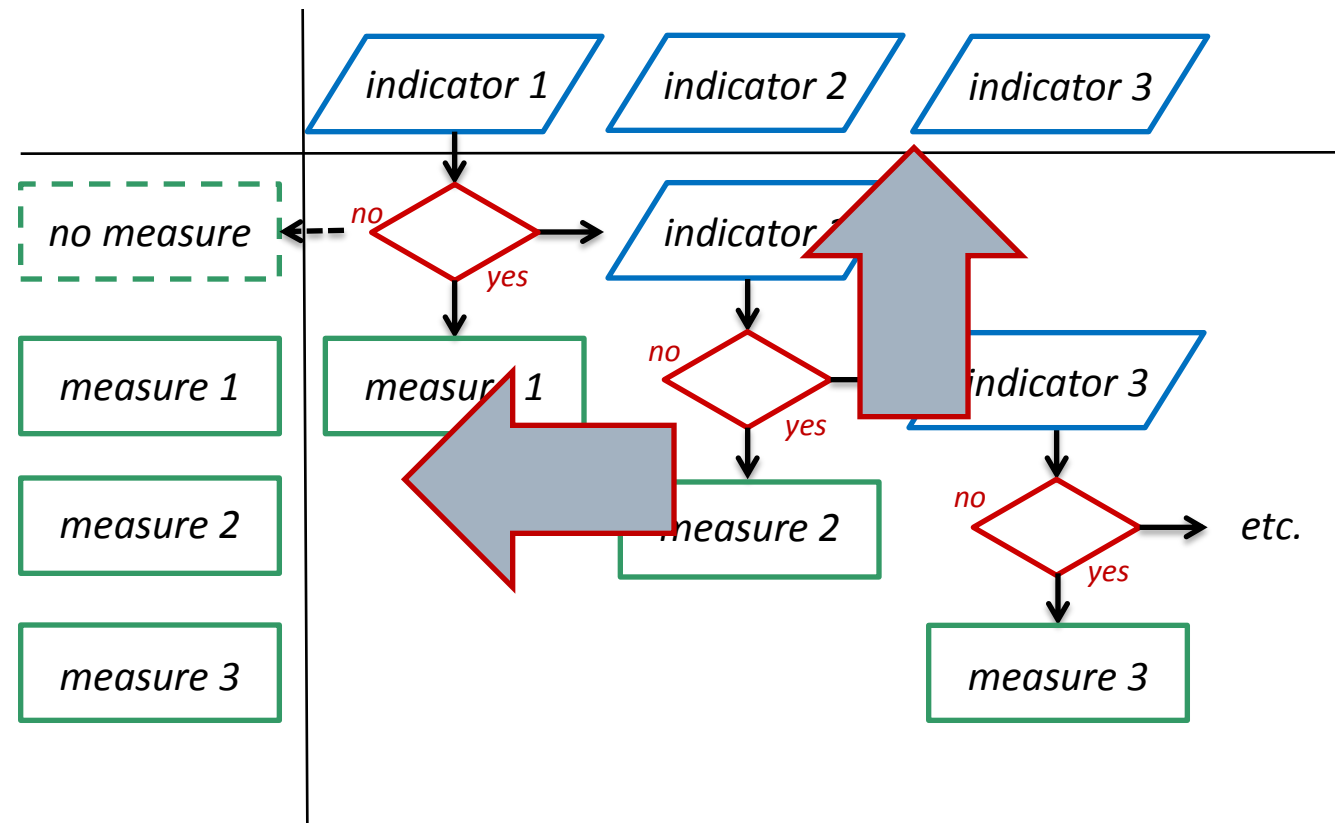
Decision system

□ Decision system as flow chart



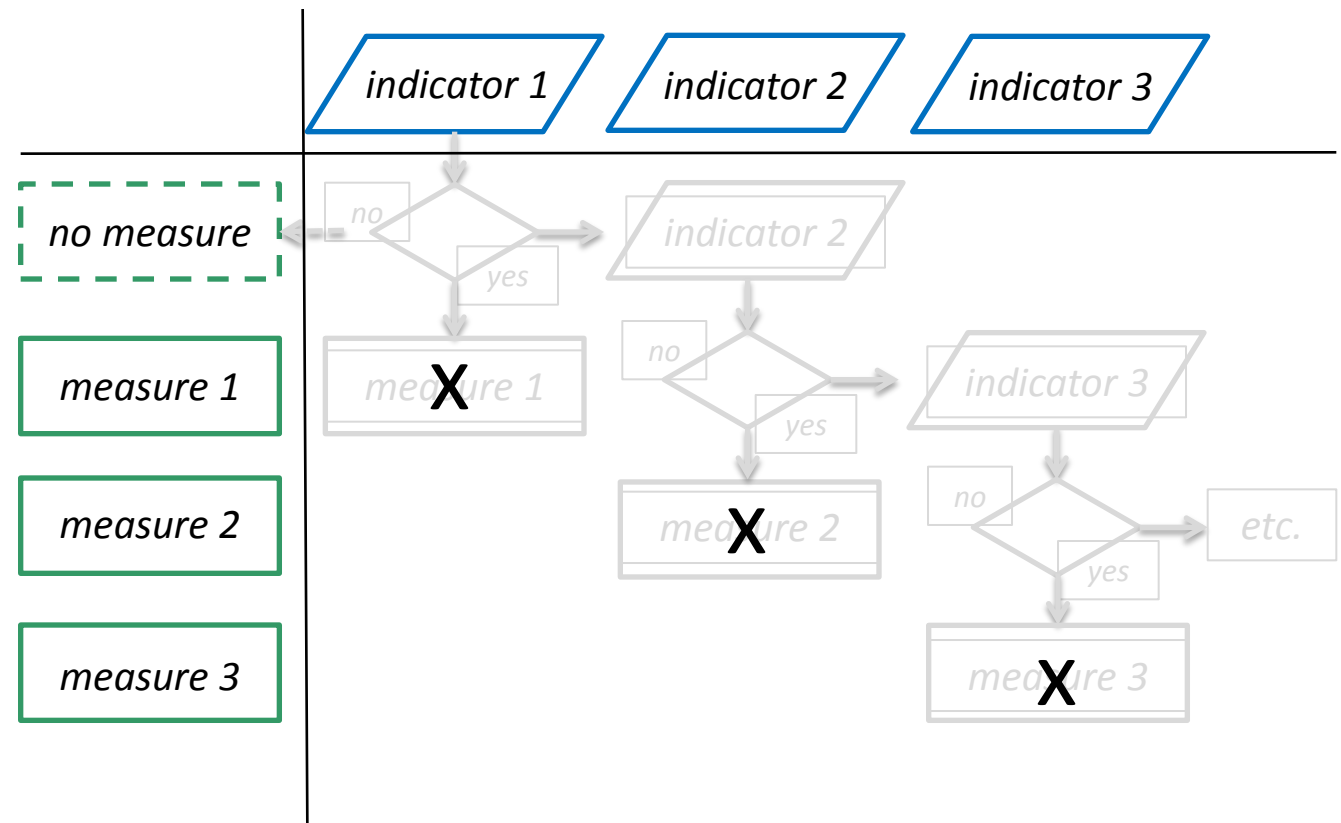
Decision system

□ Decision system as matrix



Decision system

□ Decision system as matrix



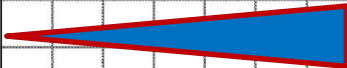
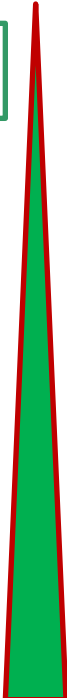
Level/Step	Measures	Indicators											
		Related unit type					Population						
		Relevant forest genetic resource (national data)	DCU minimum requirements (EUFGIS, Koskela et al 2013)	Criteria for DCU core network (WG1, deVries et al 20147)	Criteria for DCU genetic monitoring (WG2, ???)	Criteria for complementary DCU genetic monitoring (WG4, ???)	Relative number of reproducing trees declining (% per 10 years)	Absolute number of reproducing trees declining under < minimum requirement	Specific pest, invasive neophyte	Lack of regeneration over > 10 years	Migration barriers, exhausted vertical buffers	High probability for genetic drift	Danger of extinction
0 general													
	prevention from habitat destruction (or rehabilitation)	o											
	restriction against introduction of pest, invasive neophyte etc.	o											
1 in situ conservation in DCU													
	DCU establishment	o											
	EUFGIS record		o										
	DCU demographic monitoring		o										
	DCU core network			o									
	DCU genetic monitoring				x	x							
2 in situ silvicultural measures in DCU													
	regulation of competition or pathogens	o				>%	y	y					
	artificial regeneration	o							o				
3 in situ replacement/reorganisation of DCU													
	replacement by existing equivalent DCU within country x zone		o	o		>>%	y	y	o				
	duplication of DCU within surroundings/habitat		-o	o		>>%	y	y	o				
	recombining duplicates of similar/near DCUs within surroundings/habitat		o	o		>>>%	y	y	o		o		
4 ex situ assisted migration of DCU													
	duplication of DCU in direction of expected change (2x)			x	x	>>>%	y	y	o	z	z		
	recombining duplicates of DCUs in direction of expected change (2x)			x	x	>>>%	y	y	o		o		
5 ex situ preservation in field													
	genotype collections in conservation orchards, botanical garden networks			x	x		o	o			o		
6 ex situ preservation in stasis													
	seed bank, cryoconservation, in vitro conservation			x	x		o	o			o	o	

indicators

increasing threat

measures

increasing intensity



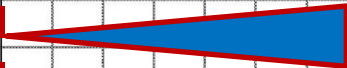
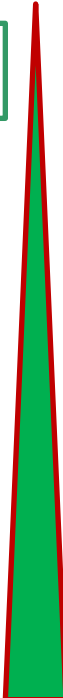
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indicators

increasing threat

measures

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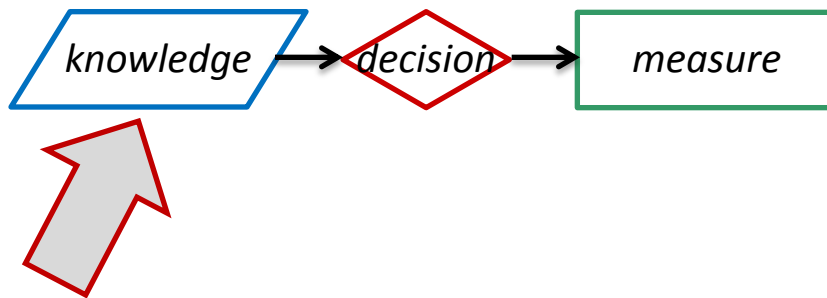


Adequate indicators?

- Problem of deficient knowledge
 - complexity of biological system
 - uncertainty about environmental system

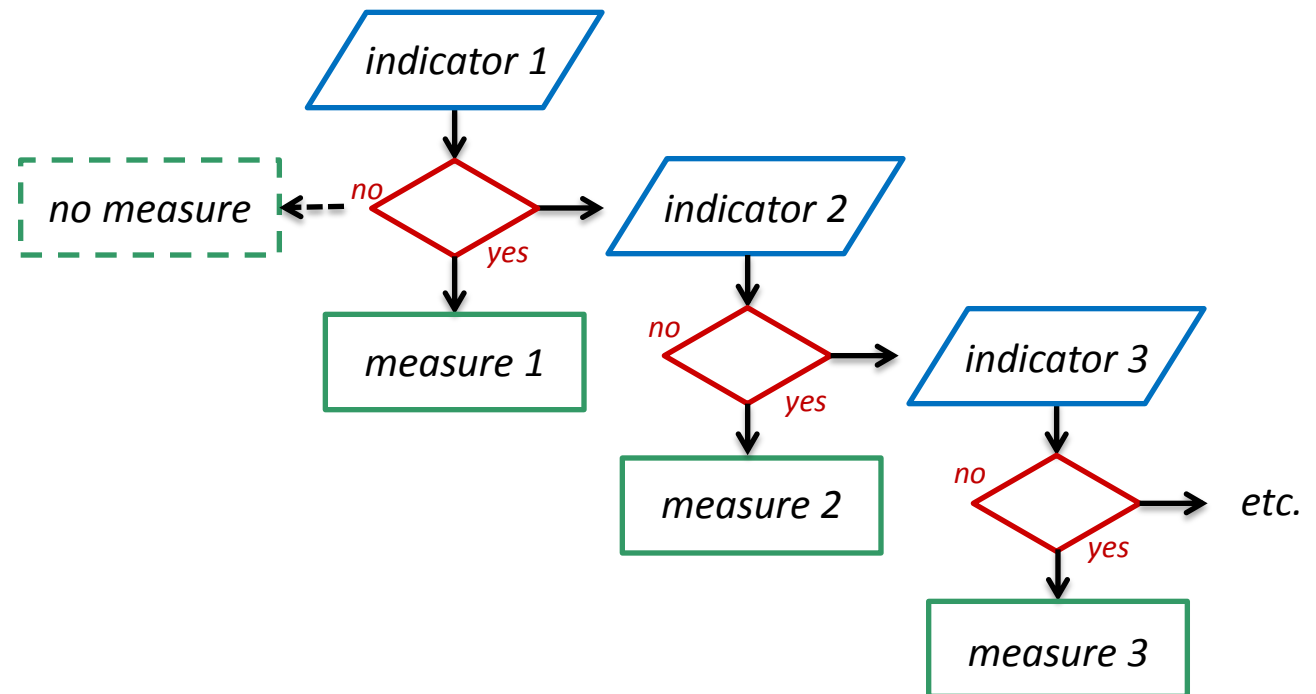
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- Decision process as flow chart

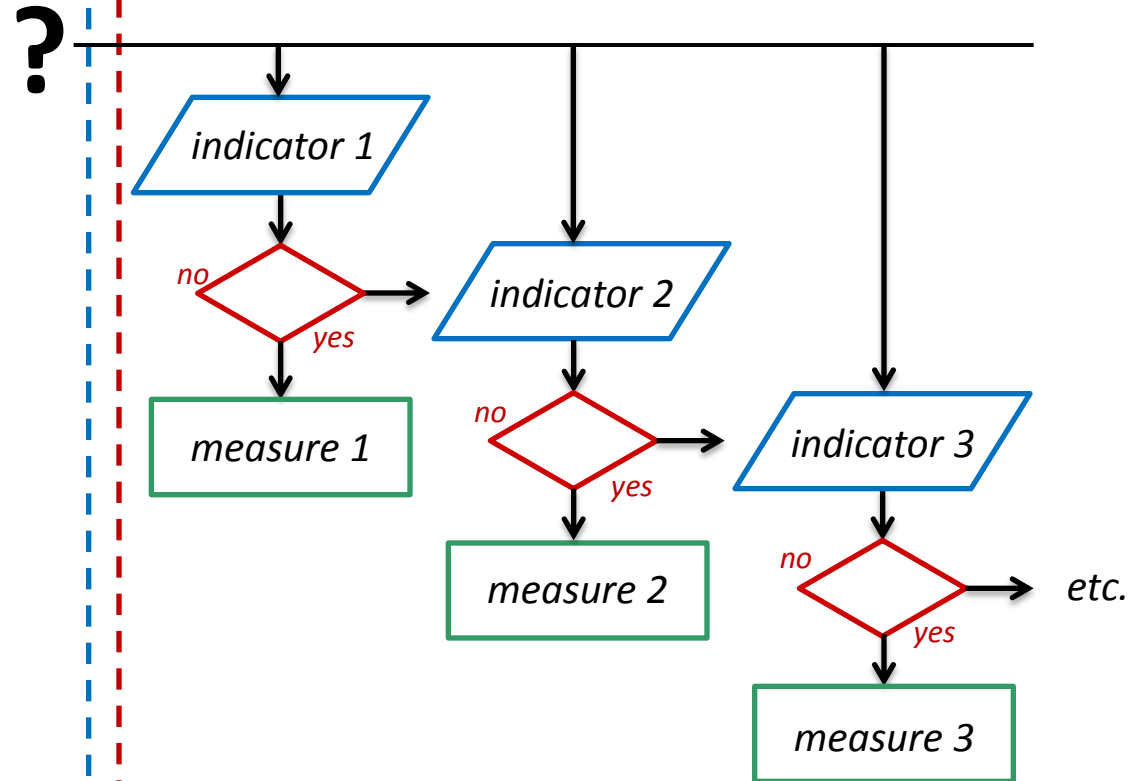


Decision system +

□ Decision system as flow chart



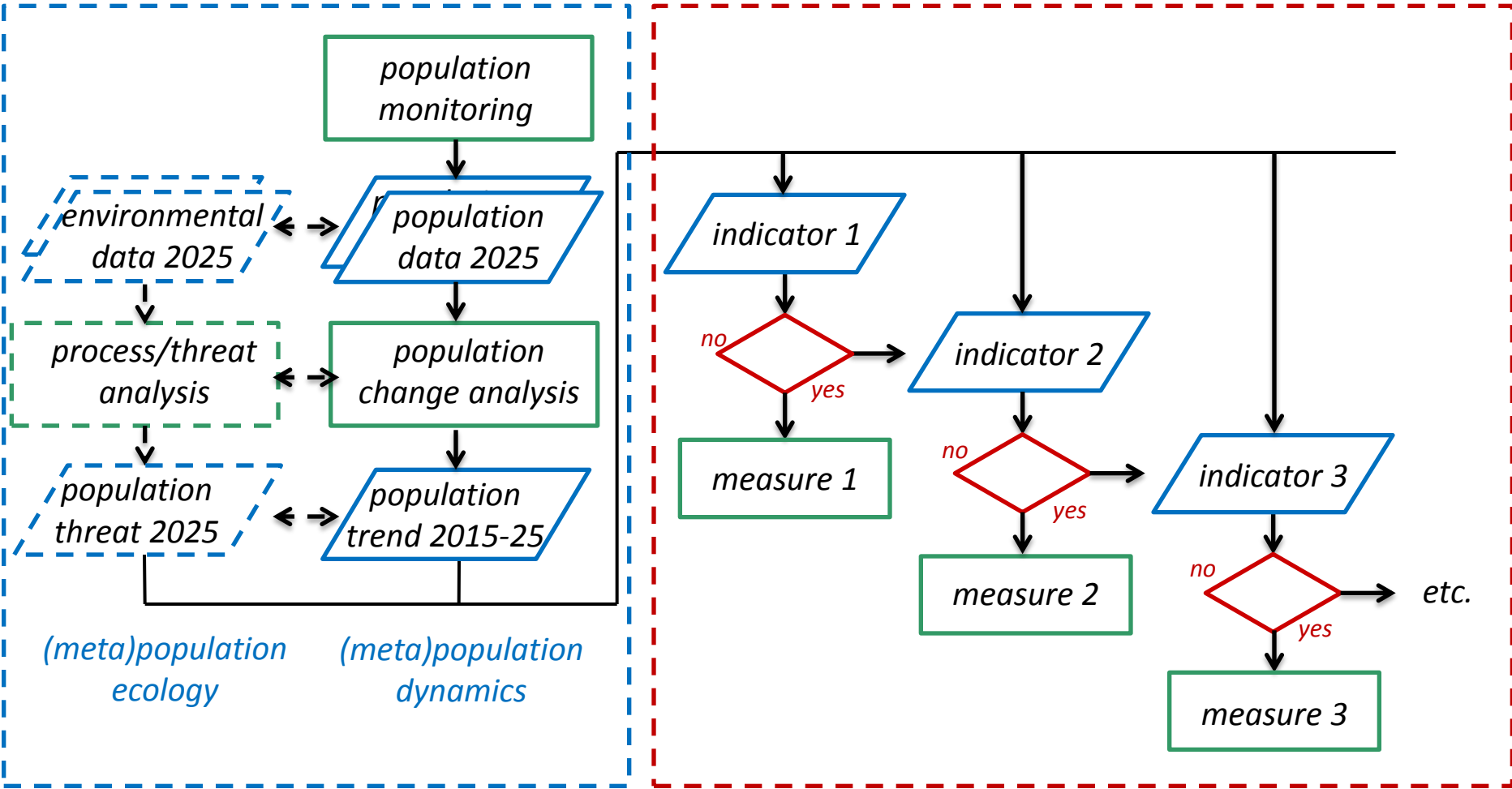
Decision system +



related to knowledge

related to decision

Decision system +



related to knowledge

related to decision

Indicators – Approach

□ Estimation of threat

- IUCN red list categories and criteria
- EUFORGEN working group FGR & CC (2015)

□ Indicators for general threat

- Low genetic variation
- Low or declining abundance
- Lack of regenerative capacity and dispersal ability
- High degree of fragmentation

□ Indicators for threat triggered by climate change

- High susceptibility for drought stress
- Migration impediments
- Limitation to azonal rare habitat
- Synecological indicators

Indicators – Operationalization

- Operational indicators – first ideas/examples
 - relative number of reproducing trees declining (% per 10 years)
 - absolute number of reproducing trees declining under minimum requirement
 - specific pest, invasive neophyte
 - lack of regeneration over > 10 years
 - migration barriers, exhausted vertical buffers
 - high probability for genetic drift
 - danger of extinction

Adequate indicators?

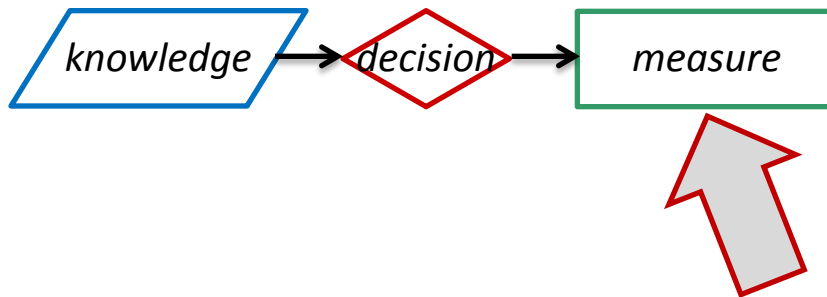
- Problem of deficient knowledge
 - complexity of biological system
 - uncertainty about environmental system
- >> Estimation of threat
- >> DCU monitoring database
 - demographic and genetic monitoring data, consistent with decision system indicator data
- >> General FGR species and subpopulation database?
 - covering all relevant species (metapopulation) and special subpopulations (ecotypes, rear edge margins)
 - effective stratification of distribution (eg. main, side, relict)

Adequate measures?

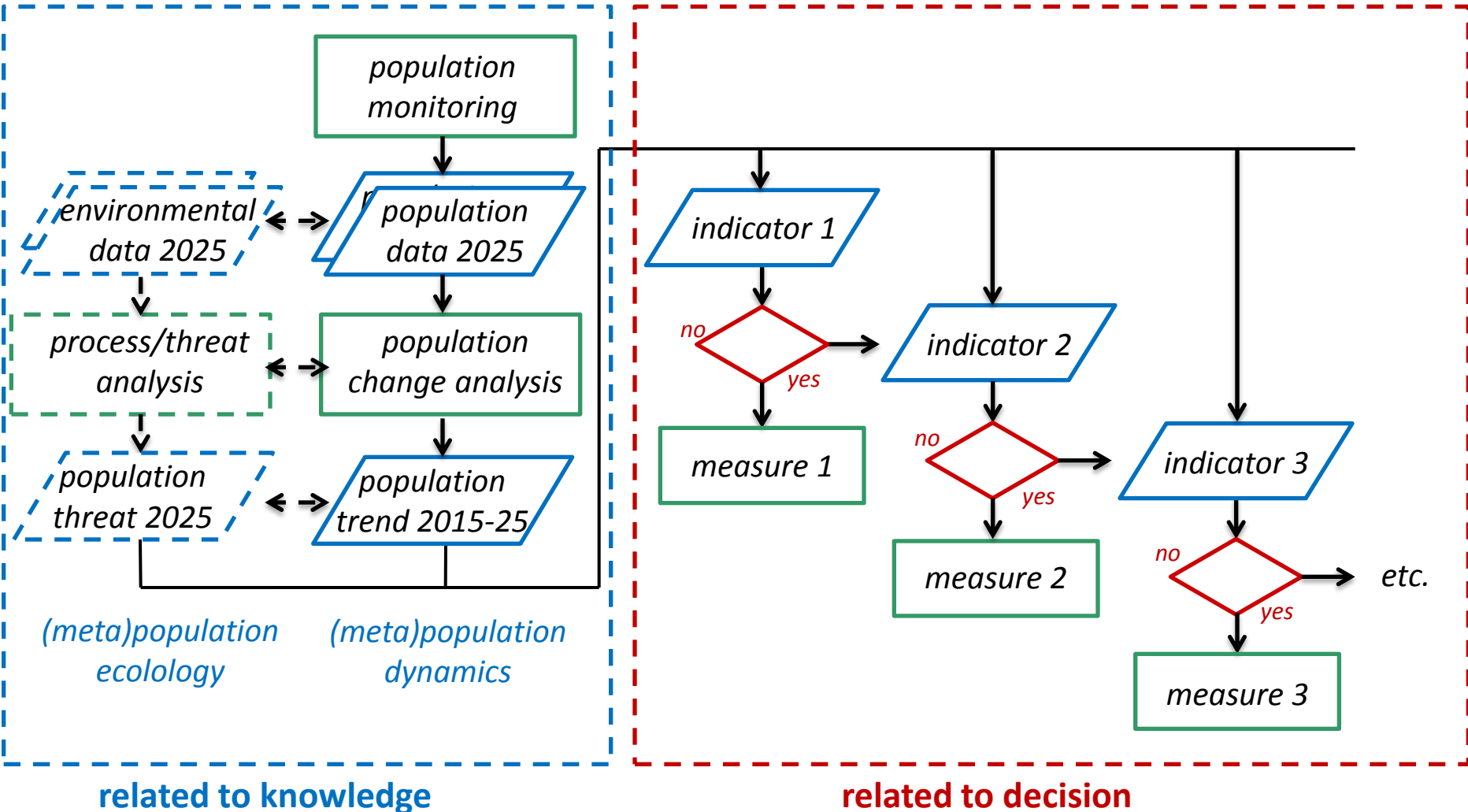
- Problem of effectiveness of measures
 - maximazation of output
 - effectiveness = optimality x efficiency

Decision system +

- Decision process as flow chart

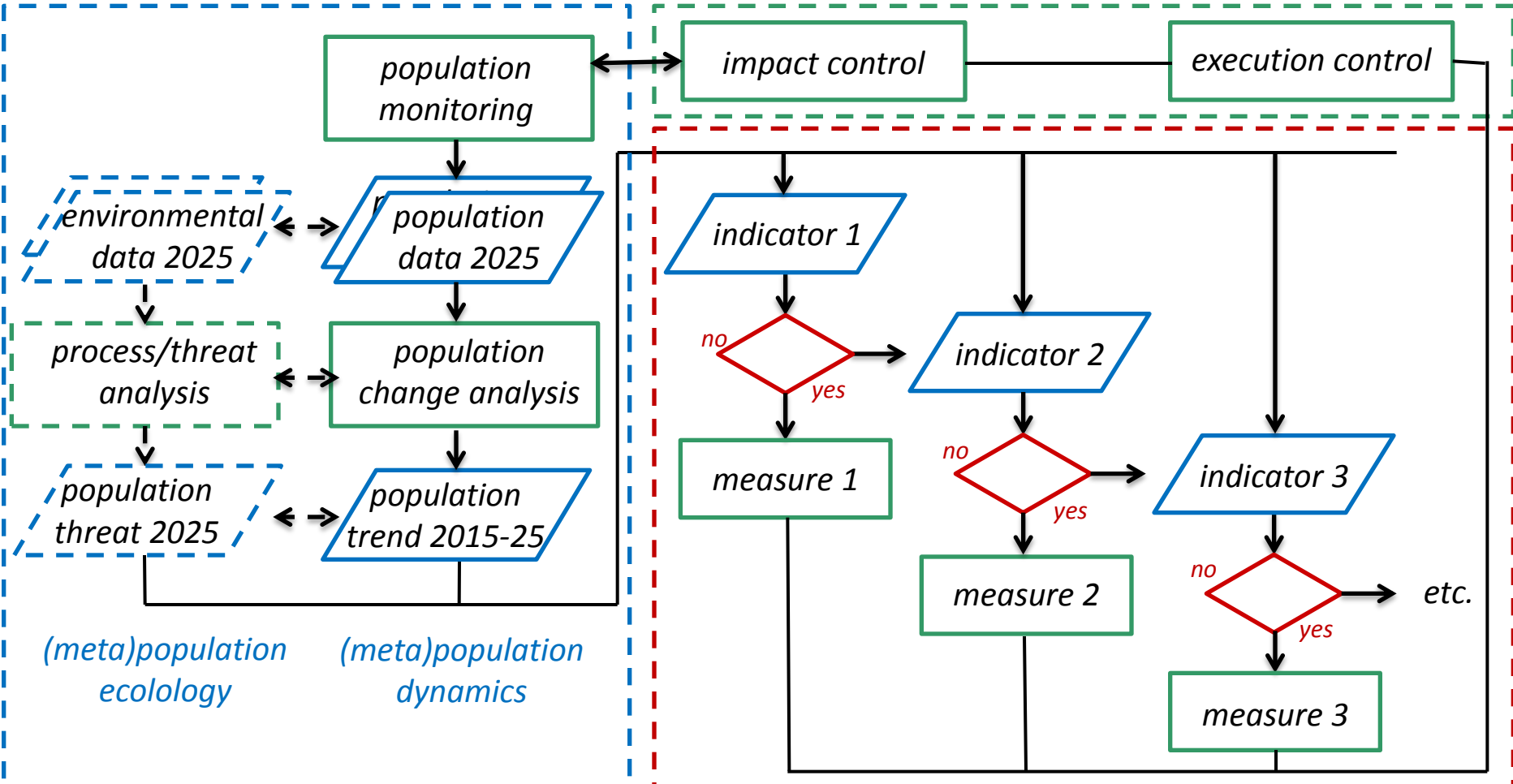


Decision system +



Decision system +

related to measure



related to knowledge

related to decision

Measures - Approach

□ Levels of measures (cf. decision cascade tool)

0 general

1 *in situ* conservation in DCU

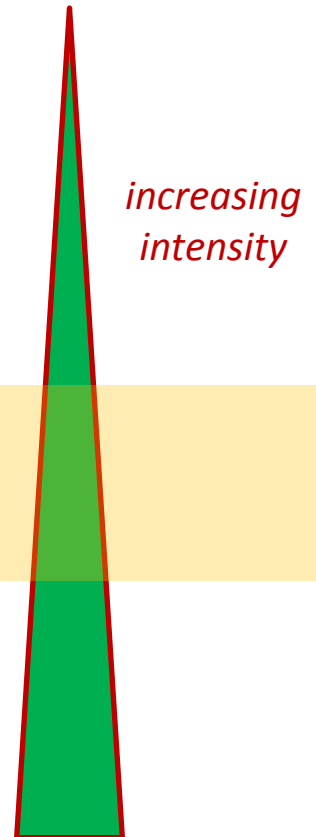
2 *in situ* silvicultural measures in DCU

3 *in situ* replacement/reorganisation of DCU

4 *ex situ* assisted migration of DCU

5 *ex situ* preservation in field

6 *ex situ* preservation in stasis



Adequate measures?

□ Problem of effectiveness of measures

- maximization of output
- effectiveness = efficiency x optimality

>> Controlling of measures

- execution control (methods, cost efficiency)
- impact control (in line with targets, optimality)

>> DCU monitoring database

- effectiveness of measure controlling data consistent with decision system indicator data

Conclusions – Need for action

1. Decision system for effective conservation measures

(«decision cascade tool»)

- Adequate indicators by estimation of threat
- Adequate measures by controlling

2. DCU monitoring database

- demographic and genetic monitoring data
- effectiveness of measure controlling data

3. General FGR species and subpopulation database

- species (metapopulation, density strata)
- special subpopulations (ecotypes, rear edge margins)
- effective stratification of distribution (eg. main, side, relict)

Conclusions – Need for action

What we have

- EUFORGEN
 - Expert network (16+22)

- Conservation tools
 - Distribution maps (34)
 - EUFGIS database
 - DCU concept (WG1)
+ DCU core network (14)
 - Gen. monitoring concept (WG2)
 - FGR+CC evaluation (WG4)

What we need

- **General FGR species and subpopulation database**
 - **DCU monitoring data (EUGIS extension)**
 - **Decision system for effective measures**
- 