

A resilience and vulnerability perspective for analysing sustainable food system dynamics in the Mediterranean region: identifying indicators through system thinking

*Project “Metrics of Sustainable Diets and Food Systems”
Bioversity International and CIHEAM-IAMM
2012-2014*

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(Social and Nutritional Sciences)



Article

Sustainability and Food & Nutrition Security: A Vulnerability Assessment Framework for the Mediterranean Region

Paolo Prosperi^{1,2,3}, Thomas Allen⁴, Martine Padilla¹, Iuri Peri²,
and Bruce Cogill⁵

SAGE Open

April-June 2014: 1–15

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7 **Building consensus on food system assessment: Applying a Delphi method**

Paolo Prospero, Thomas Allen

Rivista di Economia Agraria, Anno LXXI, n. 1 (Supplemento), 2016

Sustainability and food and nutrition security: An indicator-based vulnerability and resilience approach for the Mediterranean Region

Paolo Prospero – University of Catania; Montpellier SupAgro; Mediterranean Agronomic Institute of Montpellier (CIHEAM-IAMM) - prospero@iamm.fr



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Sustainability and vulnerability assessment

Paolo Prosperi
 Institute of Montpellier

Environ Syst Decis (2016) 36:3–19
 DOI 10.1007/s10669-016-9584-7

REVIEW

Towards metrics of sustainable food systems: a review of the resilience and vulnerability literature

Paolo Prosperi¹  · Thomas Allen¹ · Bruce Cogill² · Martine Padilla³ · Iuri Peri⁴



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Agricultural biodiversity, social–ecological systems and sustainable diets

Thomas Allen^{1*}, Paolo Prosperi^{2,3,4}, Bruce Cogill⁵ and Guillermo Flichman²

Environmental Management (2016) **57**:956–975
 DOI 10.1007/s00267-016-0664-8

RESEARCH

Modeling Sustainable Food Systems

Thomas Allen¹ · Paolo Prosperi²

**Systems: a review
 structure**

dilla³ ·



Article

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RESEARCH

Modeling Sustainable Food Systems

Thomas Allen¹ · Paolo Prosperi²

Soc Indic Res (2019) **141**:1307–1339
<https://doi.org/10.1007/s11205-018-1865-8>

A Delphi Approach to Develop Sustainable Food System Metrics

Thomas Allen¹ · Paolo Prosperi^{1,2} · Bruce Cogill³ · Martine Padilla² · Iuri Peri⁴



- *Prosperi, P., Allen, T., Padilla, M., Peri, I., & Cogill, B. (2014). Sustainability and food & nutrition security: A vulnerability assessment framework for the Mediterranean region. Sage Open, 4(2).*
- *Allen, T., Prosperi, P., Cogill, B., & Flichman, G. (2014). Agricultural biodiversity, social–ecological systems and sustainable diets. Proceedings of the Nutrition Society, 73(4), 498-508.*
- *Prosperi, P., Allen, T., Cogill, B., Padilla, M., & Peri, I. (2016). Towards metrics of sustainable food systems: A review of the resilience and vulnerability literature. Environment Systems and Decisions, 36(1), 3-19.*
- *Allen, T., & Prosperi, P. (2016). Modeling sustainable food systems. Environmental management, 57(5), 956-975.*
- *Prosperi, P. (2016). Sustainability and food and nutrition security: An indicator-based vulnerability and resilience approach for the Mediterranean Region. Italian Review of Agricultural Economics, 71(1), 635-648.*
- *Allen, T., Prosperi, P., Cogill, B., Padilla, M., & Peri, I. (2019). A Delphi approach to develop sustainable food system metrics. Social Indicators Research, 141(3), 1307-1339.*
- *Prosperi, P., Allen, T., & Cogill, B. (2019). Building consensus on sustainable food system assessment. In: Sustainable Food System Assessment, 896-7.*

REPORT ON THE 1ST MEETING OF THE EXPERT WORKING GROUP

“METRICS OF SUSTAINABLE DIETS AND FOOD SYSTEMS”

BIOVERSITY INTERNATIONAL and CIHEAM-IAMM

NOVEMBER 4-5, 2014, in MONTPELLIER, FRANCE



Sustainability of food system: Changes and Challenges

- Climate change
- Economic instability
- Changes in food consumption patterns
- Policy actions
- Technological innovation
- Food insecurity
- Malnutrition
- Overconsumption
- Non-communicable diseases
- Socio-economic inequalities

Providing evidence-based knowledge on coexistence of changes and challenges

Shaping key dynamics of the economic, environmental and social unsustainability of the food system through identifying metrics for a multidimensional assessment



Sustainability of food system: Assessing complex dynamics

- **Multidimensional approaches** for assessing food insecurity and poverty (Anand et Sen, 1994; Alkire et Santos, 2010)
- Assessment of the **variability** of resource **flows** and **stocks** (Stiglitz et al., 2009; Ingram et al., 2010)
- **Systemic perspectives** that highlights causal links (Ionescu et al., 2009)
- Economic **assessment of trade-offs** between socio-economic and bio-physical processes (Flichman et al., 2011 ; Masset et al., 2014)
- Implementation of **public policies** through strategic governance



Aims

- Develop a new *conceptual framework* to explore the sustainability of food system in the face of a change
- *Identifying the main variables* to formalize and operationalize the socio-economic and environmental interactions within food systems

Modeling vulnerability and resilience for sustainable food systems



- *Sustainable Development (UN, 1987)*
- *Sustainable Food Security (UN, 1996)*
- *Sustainable Development Goals (2000-2015)*

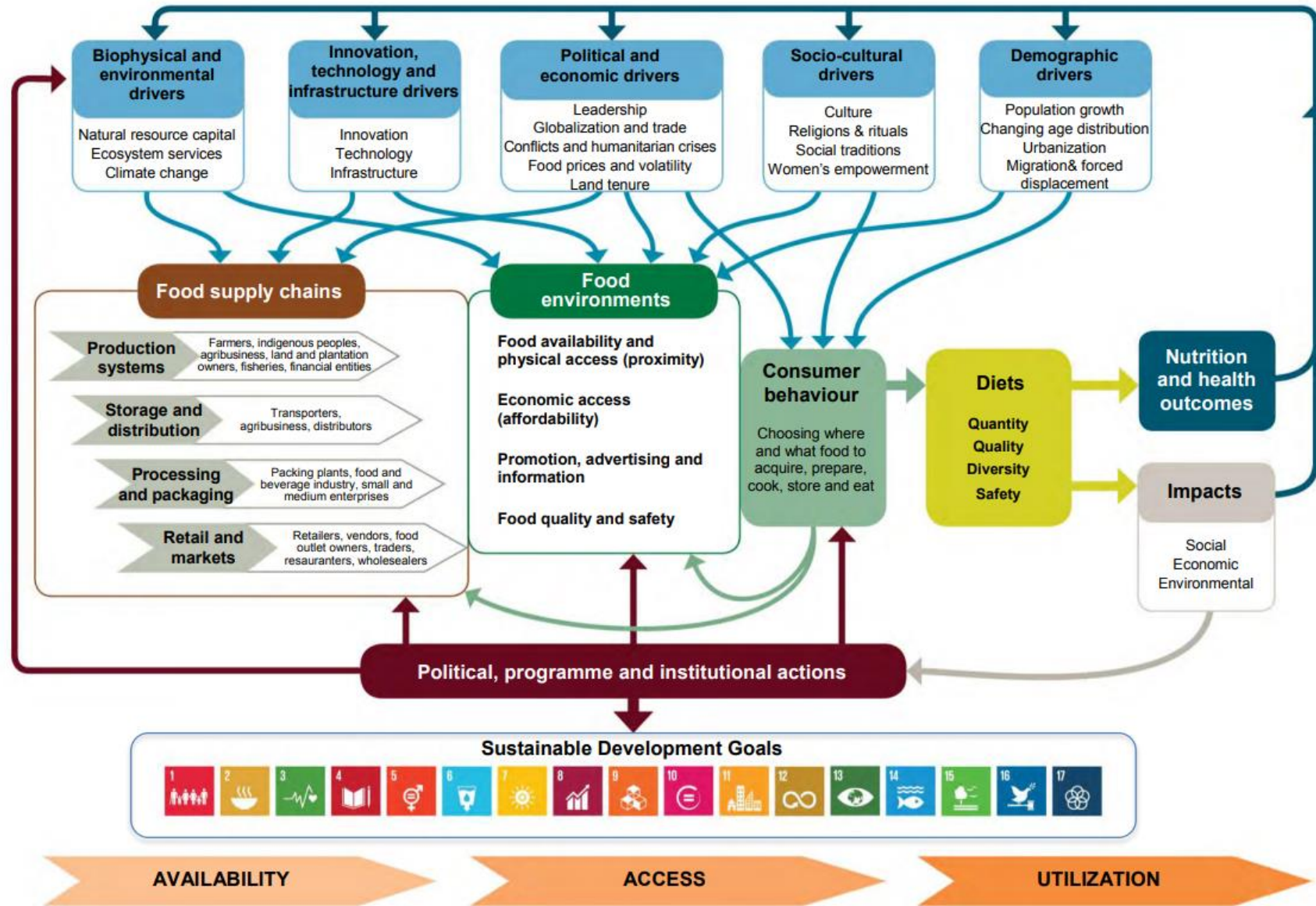
Sustainability is a property of a system

*Sustainability as the ability of a system
to maintain or enhance its essential outcomes over time*

(Hansen, 1996; Ingram, 2011; de Ruiter et al., 2014)



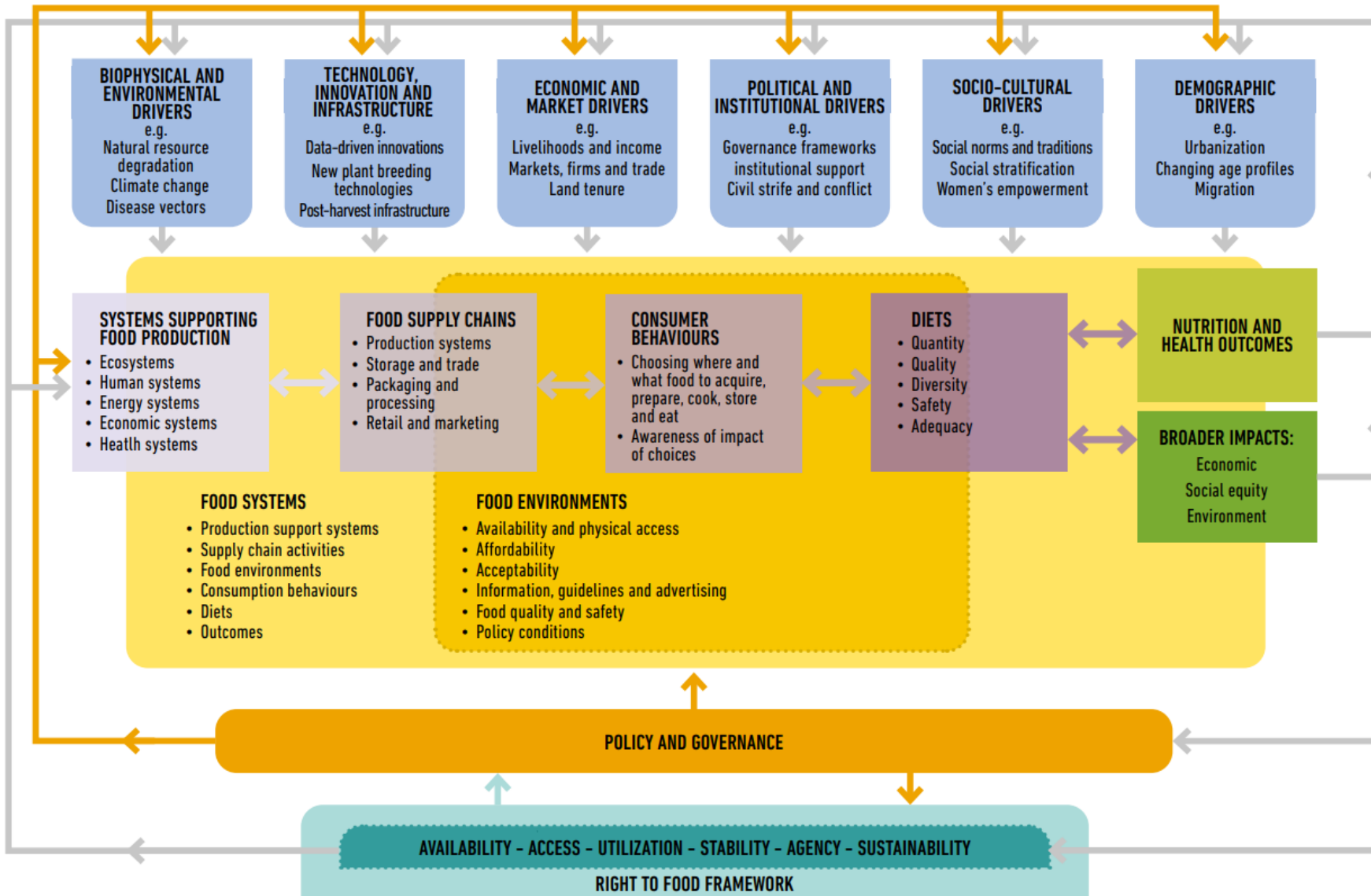
« Metrics of Sustainable Diets and Food Systems » (2012-2014)



(Food System framework: HLPE, 2017)

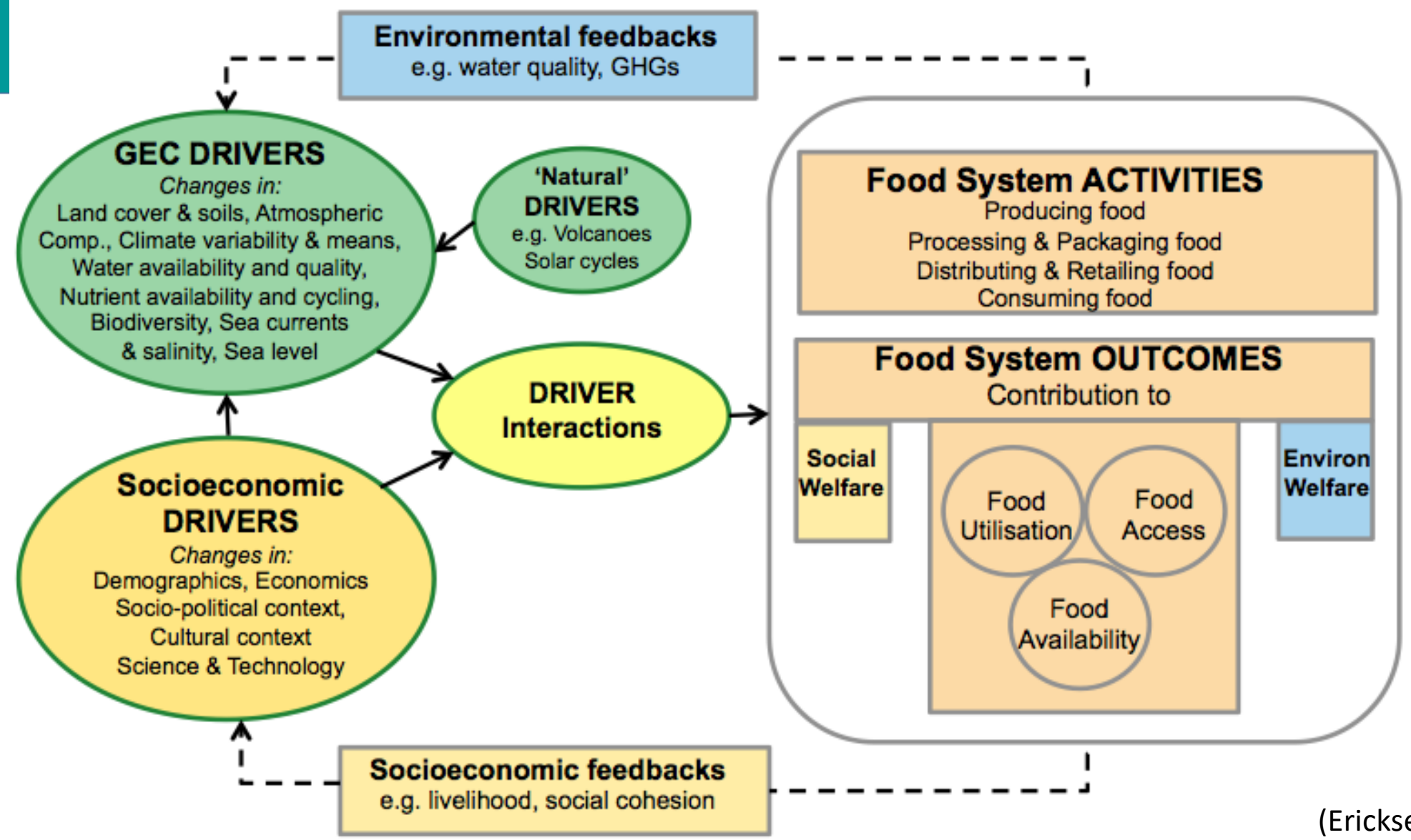


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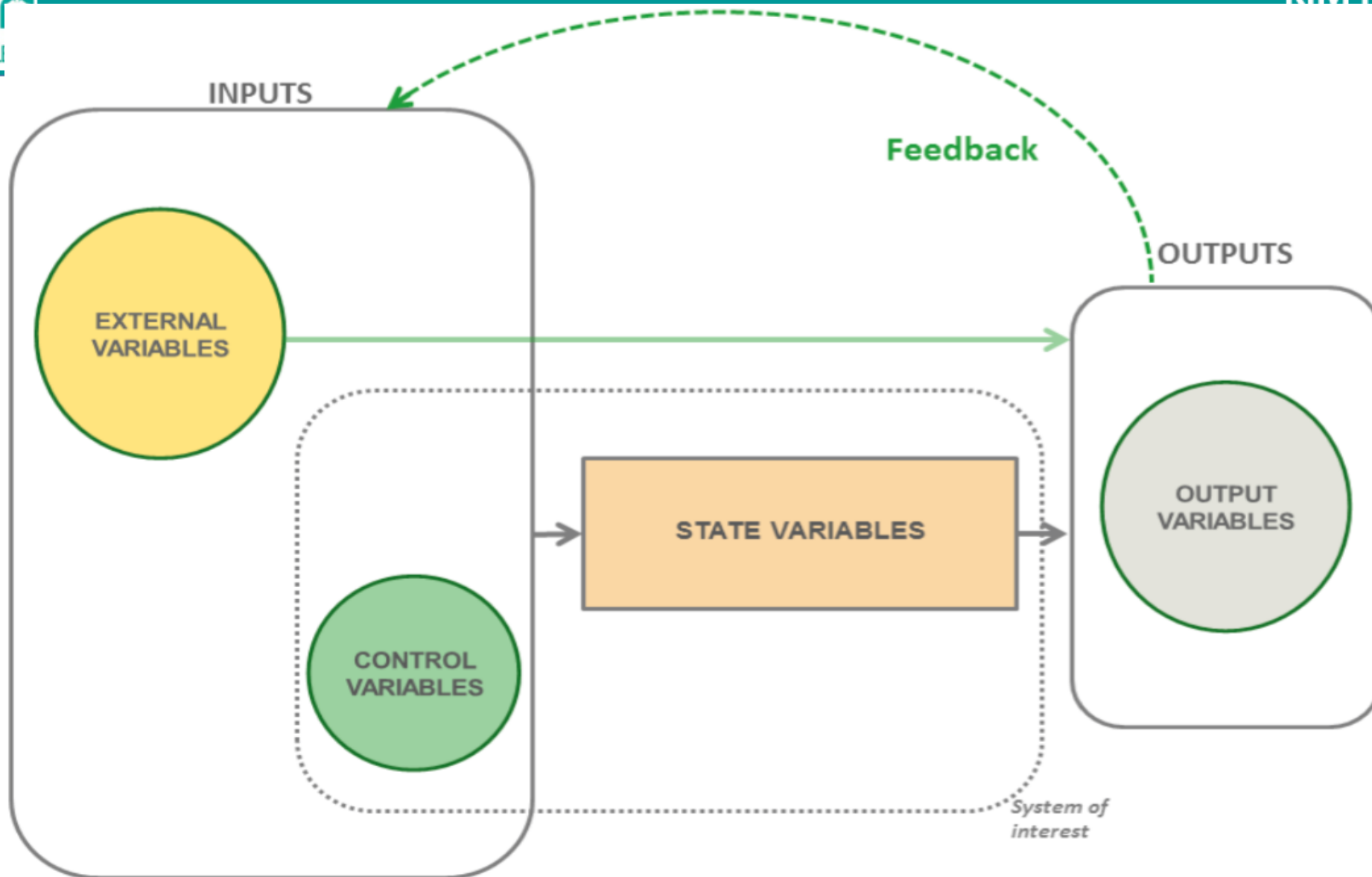




(Ericksen, 2008)

Identification of interactions between Drivers of change and Food system outcomes





Modeling the interactions between variables

(Allen and Prospero, 2016:
adapted from
Rastoin and Gherzi, 2010)



Theory of Vulnerability and Resilience



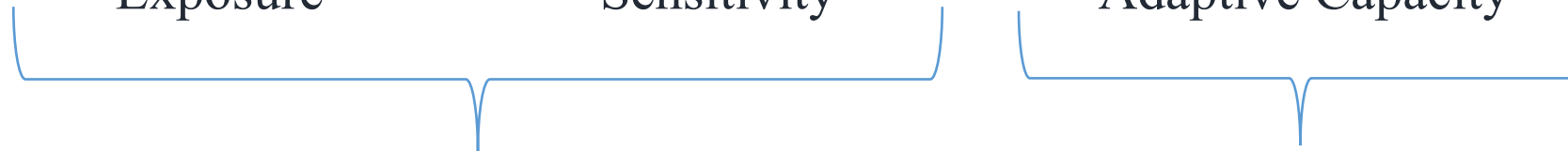
Exposure



Sensitivity



Adaptive Capacity



Potential impact



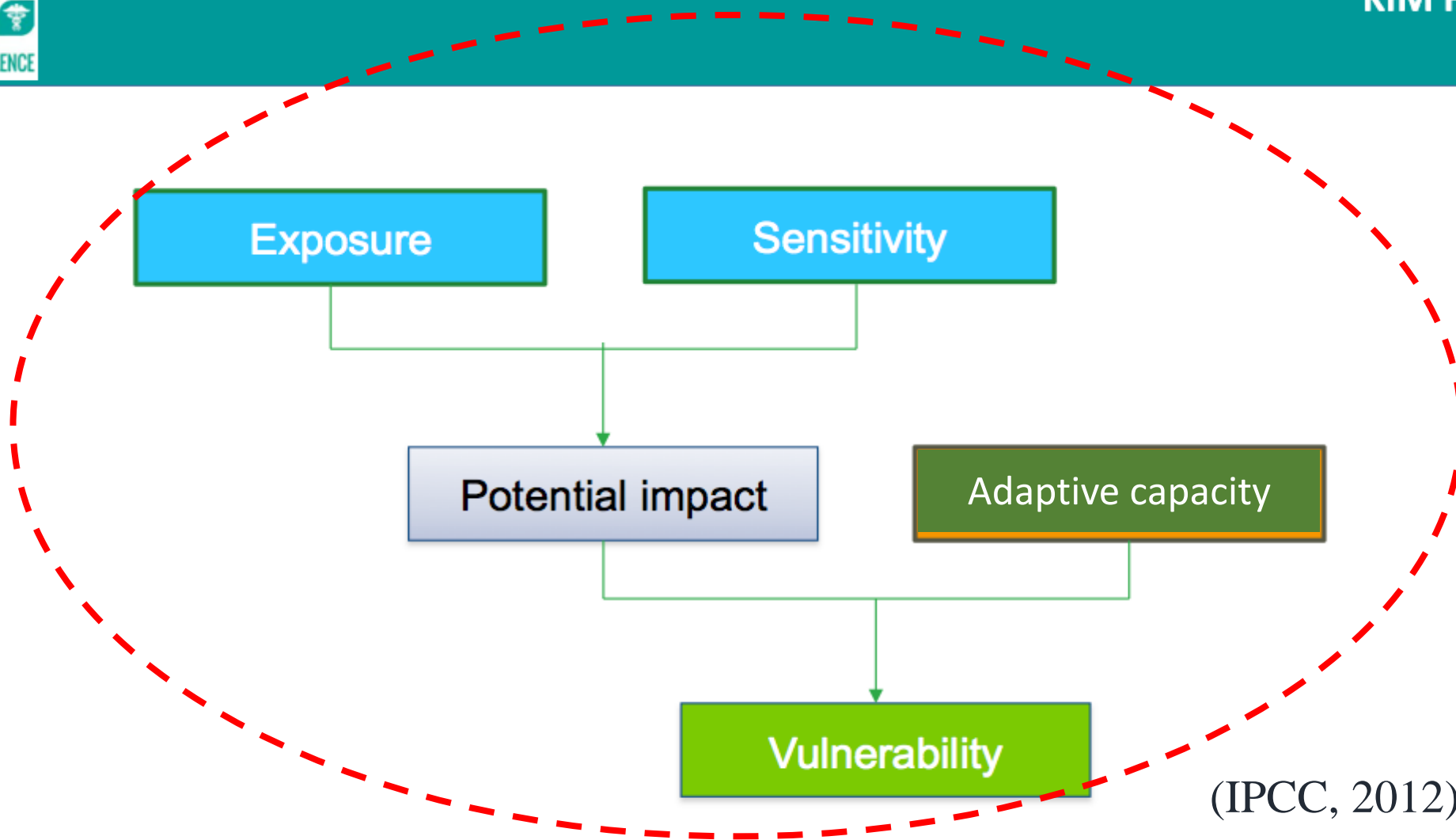
Recovery potential

(IPCC, 2012)

Vulnerability is function of: exposure, sensitivity, adaptive capacity

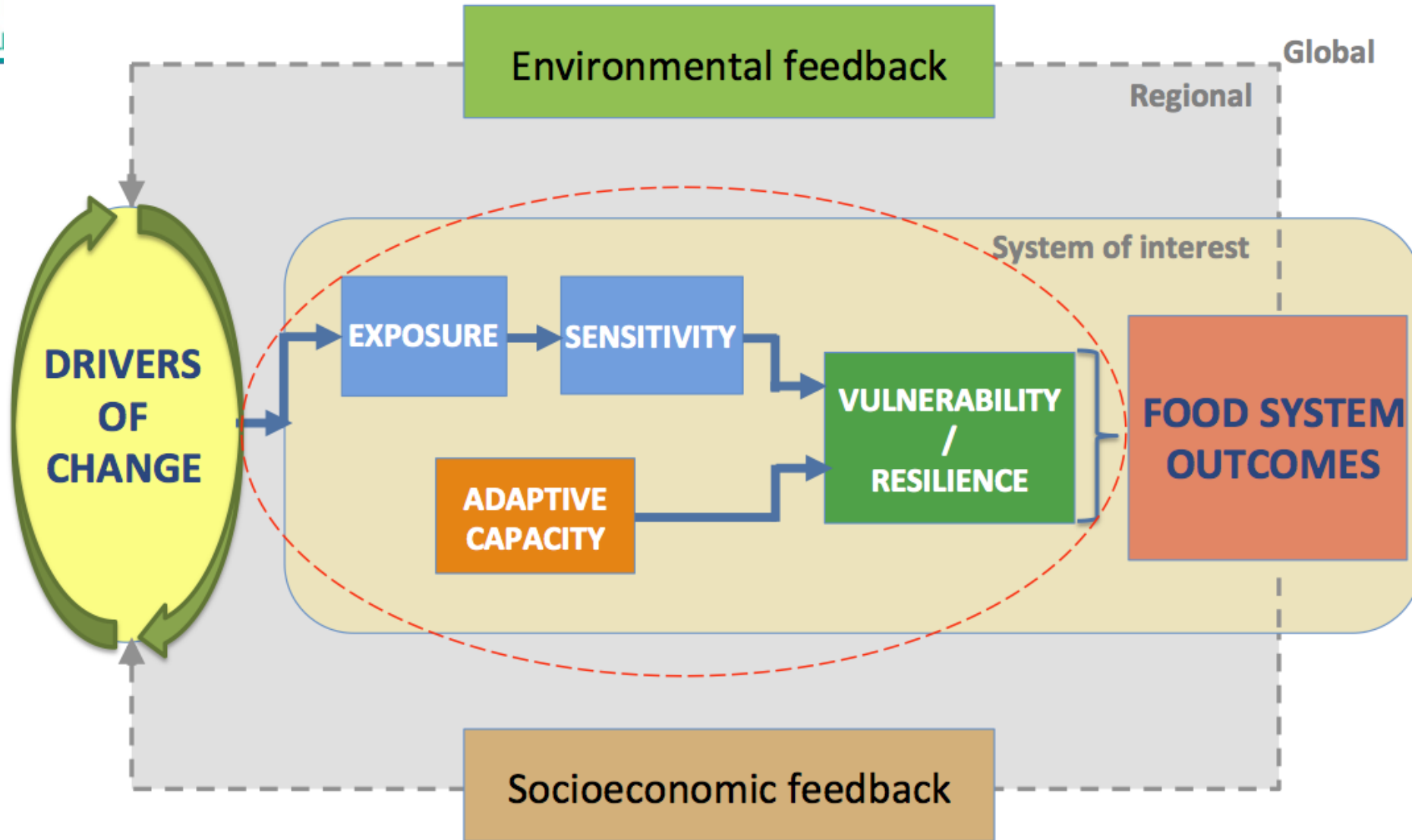
Adaptation is the response of a system to a change and it informs on strategies





Causal dynamics of variables





(Allen and Prospero, 2016)

Causal model of a food system



1) Definition of scale and study area

France, Italy, Spain

2) Identification of *Drivers* of change

- **Water** depletion
- Changes in **food consumption** patterns

- **Food price** volatility
- **Biodiversity** loss

3) Identification food system *Outcomes*

- **Affordability of food**
- Satisfaction of cultural **food preferences**

- Dietary **Energy Balance**
- **Nutritional quality** of food supply

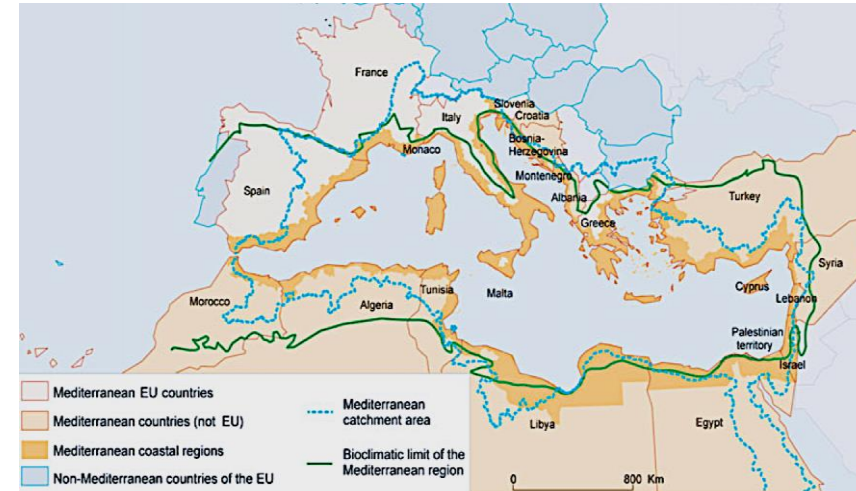
4) **Causal models** of **interactions** between Drivers and Outcomes



Focus on the **Mediterranean region**

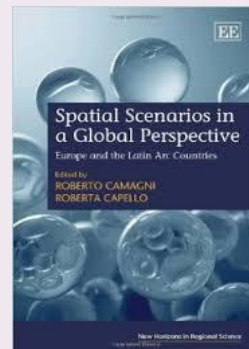
Context-specific **literature review** to identify:

- Common national and subnational **Food & nutrition security issues**
- Relevant global & regional **drivers of change**



Focus on France, Spain and Italy: the **Latin Arc**.

- Common national and subnational **Food & nutrition security issues**
- Common **biophysical and socioeconomic** common features



- WATER DEPLETION (*Molden, 1997*)
- BIODIVERSITY LOSS (*CBD, 2004*)
- FOOD PRICE VOLATILITY (*FAO, 2011*)
- CHANGING FOOD CONSUMPTION PATTERNS (*Kearney, 2010*)

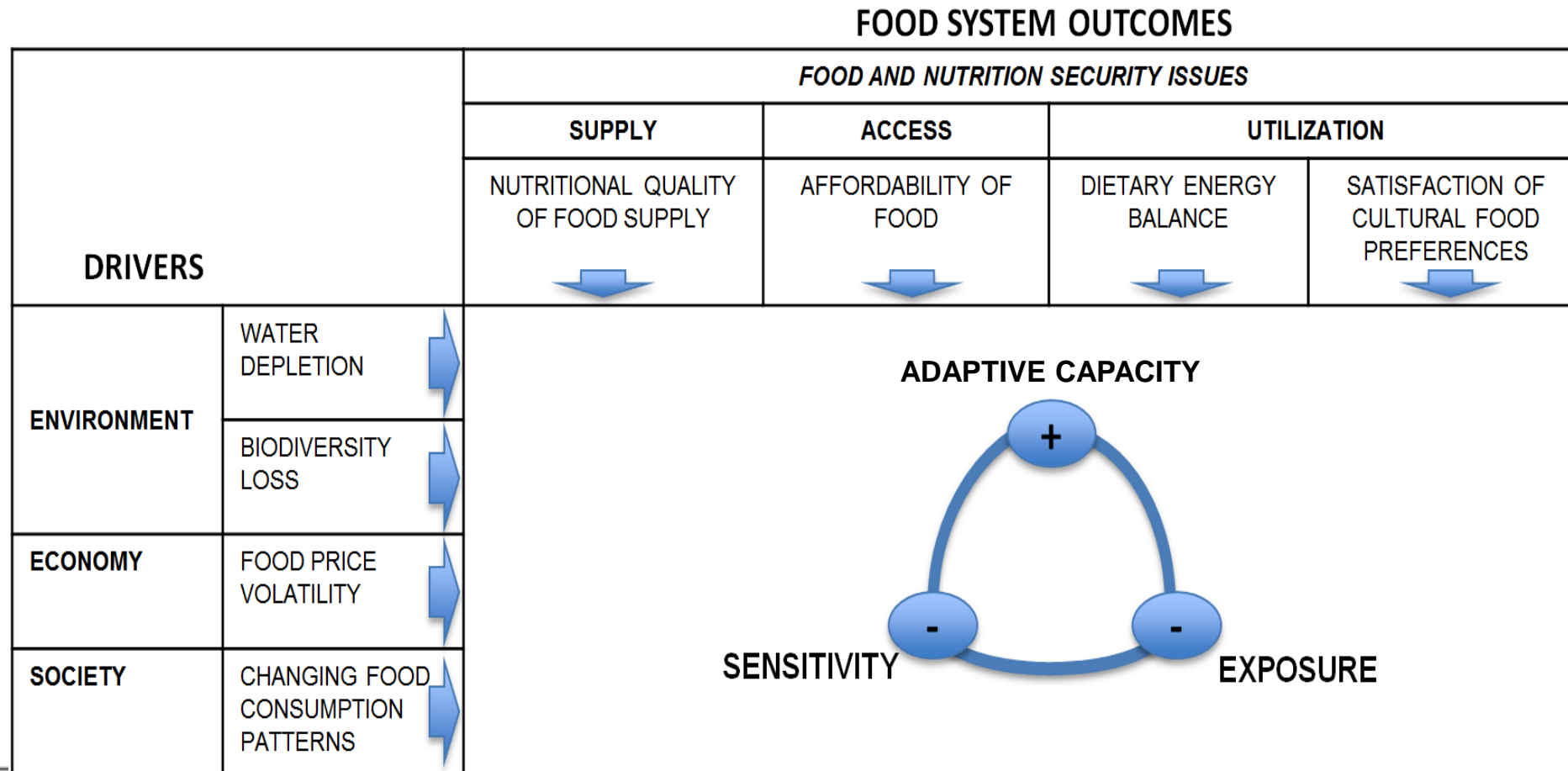


- NUTRITIONAL QUALITY OF FOOD SUPPLY (*Oquali – WHO*)
- AFFORDABILITY OF FOOD (*Ingram, 2011*)
- DIETARY ENERGY BALANCE (*Patel et al., 2004*)
- SATISFACTION OF CULTURAL FOOD PREFERENCES (*Sobal et al., 1998*)



4) **Causal models** representing the **interactions** between drivers of change and outcomes

- 4 *global and regional* drivers of change (**Drivers**)
- 4 *context-specific* food & nutrition security issues (**Outcomes**)



Water depletion



Economic affordability

POTENTIAL IMPACT

- Increase water price
 - Altering production, prices, markets, supply
- (Ingram and Kapadia, 2010; Wood et al. 2010)*

RECOVERY POTENTIAL

- Food import
 - Resistant crops
 - Irrigation efficiency
 - Water reuse
- (Hellegers et al, 2008; Waugray, 2011; Yang and Zehnder, 2008)*

Water depletion



Nutritional quality

POTENTIAL IMPACT

- Decreasing food supply
 - Food quality decrease
 - Agri-food contamination
- (Bates, 2008)*

RECOVERY POTENTIAL

- Water productivity
 - Agro-biodiversity
 - Water reuse
 - Importing food
- (Chapagain et al, 2006; ...)*



Biodiversity loss



Nutritional quality

POTENTIAL IMPACT

- Homogenising production systems
- Lowering response to climate change
(Remans et al., 2011; ...)

RECOVERY POTENTIAL

- Fostering agrobiodiversity
- Increasing organic farming
(Thrupp, 2000; ...)

Biodiversity loss



Food preferences

POTENTIAL IMPACT

- Reducing health information and benefits
- Losing traditional foods
(Kuhnlein et al., 2009; ...)

RECOVERY POTENTIAL

- Investing on varied diets
- Promoting traditional food
(Termote et al., 2010; ...)



Price volatility

POTENTIAL IMPACT

- Altering supply for low incomes
- Decrease quality foods
- Hindering prod. from fossil energies (*DEFRA, 2008, WHO, 2014*)



Nutritional quality

RECOVERY POTENTIAL

- Dietary diversity
- Local supply
(*Pinstrup-Andersen, 2013*)



Price volatility

POTENTIAL IMPACT

- Altering incomes and purchasing power
- Exacerbating economic shocks
(*Regmi and Meade, 2013..*)



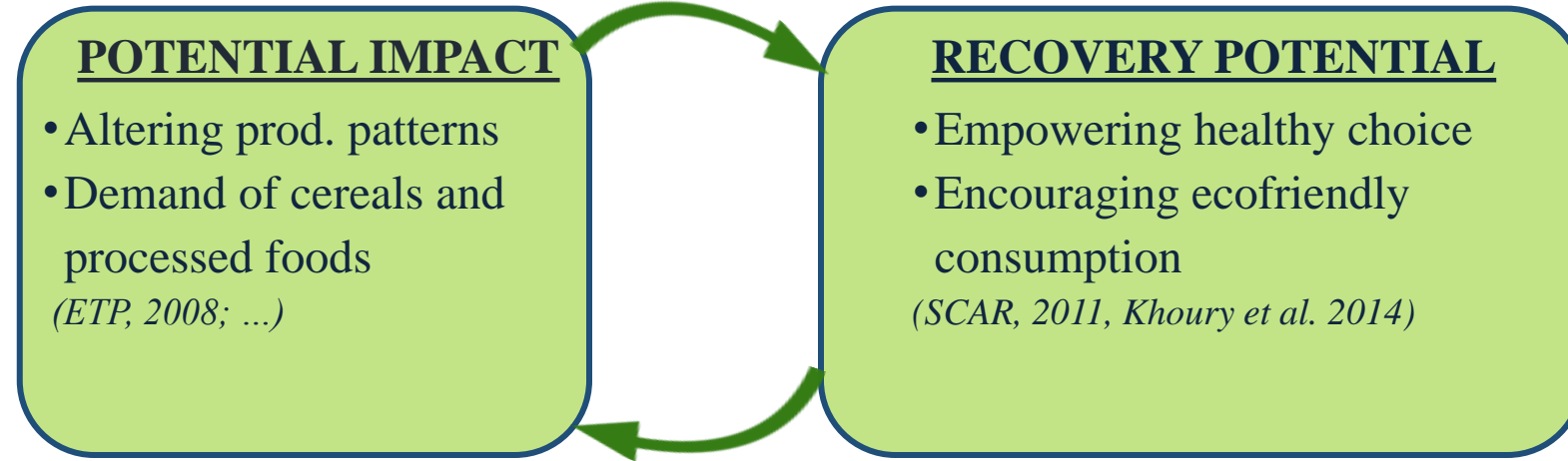
Economic affordability

RECOVERY POTENTIAL

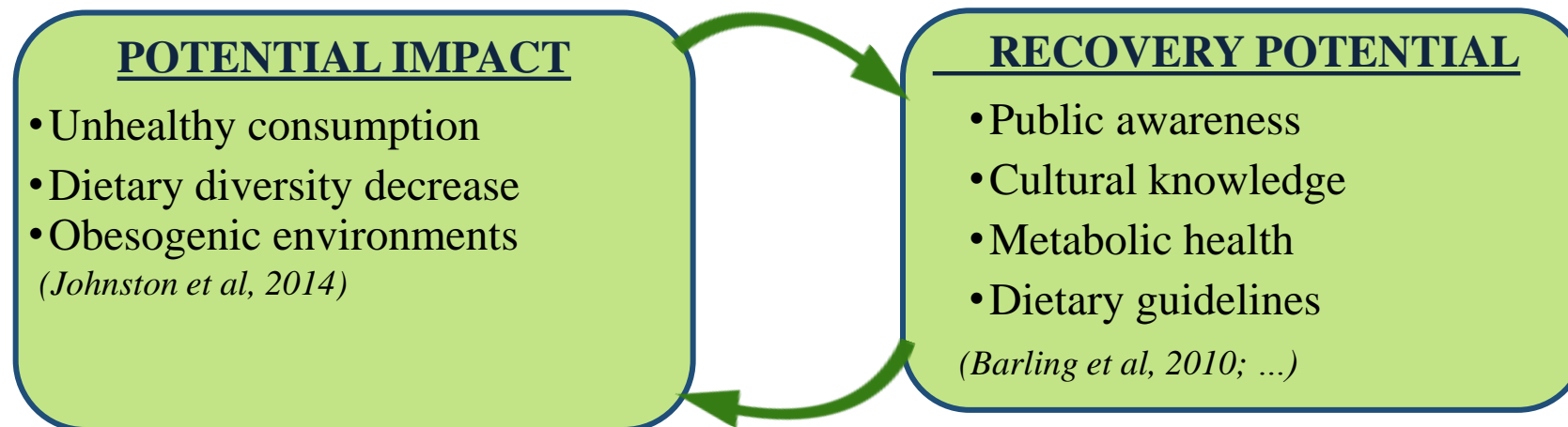
- Food policies for supply variety
- Dietary diversity
(*Brunori and Guarino, 2014; ..*)



Changing consumption ↔ Nutritional quality



Changing consumption ↔ Dietary energy balance



Shortlisting indicators

- Setting up a long list of indicators derived from the literature
- Shortlisting 136 indicators discussed during a focus group
- Gaining *consensus* through an exchange of opinions

➔ *Using a Delphi expert consultation protocol*

- Testing an *online* Delphi questionnaire (3 rounds)

1,500 indicators

136 indicators

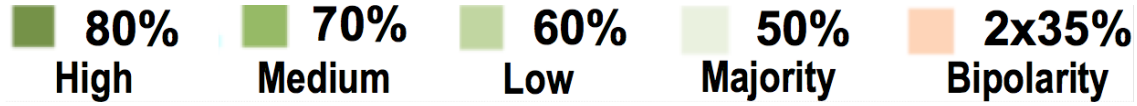
24 indicators

FOOD SYSTEM OUTCOMES

FOOD AND NUTRITION SECURITY ISSUES

		SUPPLY	ACCESS	UTILIZATION
		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD	DIETARY ENERGY BALANCE
				SATISFACTION OF CULTURAL FOOD PREFERENCES
ENVIRONMENT	WATER DEPLETION			
	BIODIVERSITY LOSS			
ECONOMY	FOOD PRICE VOLATILITY			
SOCIETY	CHANGING FOOD CONSUMPTION PATTERNS			

Indicators: Delphi Round 1



		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
FOOD PRICE VOLATILITY	EXPOSURE	- % of nutrient intakes from 10 most volatile foods	- % of food household expenditure - Food Purchasing Power Index
	SENSITIVITY	- Price elasticity of 10 most nutrient-dense foods	- Sensitivity to price volatility
	RESILIENCE	- Household Dietary Diversity Score	- Presence of food safety net programs - % of diets produced locally

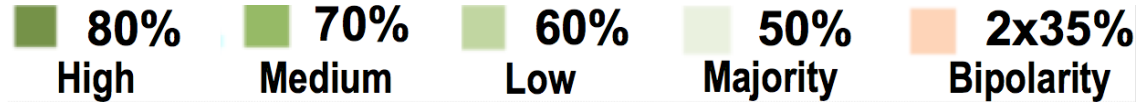
		NUTRITIONAL QUALITY OF FOOD SUPPLY	DIETARY ENERGY BALANCE
CHANGES IN FOOD CONSUMPTION PATTERNS	EXPOSURE	- Food Purchasing Power Index	- At-risk-of-poverty rate - Caloric share of ready-to-consume products
	SENSITIVITY	- Household Dietary Diversity Score	- Prevalence of overweight & obesity
	RESILIENCE		

		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
WATER DEPLETION	EXPOSURE	- Water Footprint of nutrient-dense foods	- Water Footprint for an average diet
	SENSITIVITY	- Intensity of use of actual water resources	
	RESILIENCE	- Irrigation Water Efficiency Index	

		NUTRITIONAL QUALITY OF FOOD SUPPLY	SATISFACTION OF CULTURAL FOOD PREFERENCES
BIODIVERSITY LOSS	EXPOSURE	- % of total acreage of top 5 varieties	
	SENSITIVITY	- Nutritional Functional Diversity	- % of diets locally produced
	RESILIENCE	- Crop Agrobiodiversity Factor	



Indicators: Delphi Round 2



		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
FOOD PRICE VOLATILITY	EXPOSURE	- % of nutrient intakes from 10 most volatile foods	- % of food household expenditure
	SENSITIVITY	- Price elasticity of 10 most nutrient-dense foods - Price elasticities of nutritional adequacy of diet	- Sensitivity to price volatility
	RESILIENCE	- Household Dietary Diversity Score	- Presence of food safety net programs - % of diets produced locally

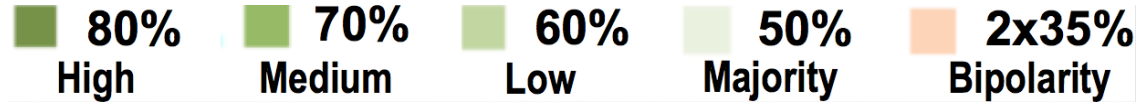
		NUTRITIONAL QUALITY OF FOOD SUPPLY	DIETARY ENERGY BALANCE
CHANGES IN FOOD CONSUMPTION PATTERNS	EXPOSURE	- <i>Food Purchasing Power Index</i>	- At-risk-of-poverty rate - Caloric share of ready-to-consume products
	SENSITIVITY	- Household Dietary Diversity Score	- <i>Prevalence of overweight & obesity</i>
	RESILIENCE		- <i>Existence of policy plan for overweight/obesity</i>

		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
WATER DEPLETION	EXPOSURE	- Water Footprint of nutrient-dense foods	- Water Footprint for an average diet
	SENSITIVITY	- <i>Intensity of use of actual water resources</i>	- Price elasticity of D - 10 most water-demanding foods
	RESILIENCE	- Irrigation Water Efficiency Index	- Cross-price elast. of D - high/low of water-demanding foods - % of farmers growing drought-resistant crops

		NUTRITIONAL QUALITY OF FOOD SUPPLY	SATISFACTION OF CULTURAL FOOD PREFERENCES
BIODIVERSITY LOSS	EXPOSURE	- % of total acreage of top 5 varieties	- <i>Import Dependency Ratio</i>
	SENSITIVITY	- Nutritional Functional Diversity	- % of diets locally produced
	RESILIENCE	- Crop Agrobiodiversity Factor	- <i>Integration of biodiversity considerations in business</i>



Indicators: Delphi Round 3



		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
FOOD PRICE VOLATILITY	EXPOSURE	- % of nutrient intakes from 10 most volatile foods	- % of food household expenditure
	SENSITIVITY	- Price elasticity of 10 most nutrient-dense foods - Price elasticities of nutritional adequacy of diet	- Sensitivity to price volatility
	RESILIENCE	- Household Dietary Diversity Score	- Presence of food safety net programs

		NUTRITIONAL QUALITY OF FOOD SUPPLY	DIETARY ENERGY BALANCE
CHANGES IN FOOD CONSUMPTION PATTERNS	EXPOSURE	- Food Purchasing Power Index	- At-risk-of-poverty rate - Caloric share of ready-to-consume products
	SENSITIVITY	- Household Dietary Diversity Score	- Prevalence of overweight & obesity
	RESILIENCE		- Funding allocated to nutrition education - Existence of policy plan for overweight/obesity

		NUTRITIONAL QUALITY OF FOOD SUPPLY	AFFORDABILITY OF FOOD
WATER DEPLETION	EXPOSURE	- Water Footprint of nutrient-dense foods	- Water Footprint for an average diet
	SENSITIVITY	- Intensity of use of actual water resources	- Price elasticity of D - 10 most water-demanding foods
	RESILIENCE	- Irrigation Water Efficiency Index	- Cross-price elast. of D - high/low of water-demanding foods - % of farmers growing drought-resistant crops

		NUTRITIONAL QUALITY OF FOOD SUPPLY	SATISFACTION OF CULTURAL FOOD PREFERENCES
BIODIVERSITY LOSS	EXPOSURE	- % of total acreage of top 5 varieties	- <i>Import Dependency Ratio</i>
	SENSITIVITY	- Nutritional Functional Diversity	- % of diets locally produced
	RESILIENCE	- Crop Agrobiodiversity Factor	- Integration of biodiversity considerations in business



SATISFACTION OF CULTURAL FOOD PREFERENCES / BIODIVERSITY LOSS						
EXPOSURE	Time available for food preparation	24	Import Dependency Ratio	33	Import Dependency Ratio	47
SENSITIVITY	% of diets locally produced	49	% of diets locally produced	62	% of diets locally produced	72
RESILIENCE	Integration of biodiversity considerations in business	29	Integration of biodiversity considerations in business	49	Integration of biodiversity considerations in business	53
NUTRITIONAL QUALITY OF FOOD SUPPLY / CHANGE IN FOOD CONSUMPTION PATTERNS						
EXPOSURE	Food Purchasing Power Index	35	Food Purchasing Power Index	46	Food Purchasing Power Index	64
SENSITIVITY	Household Dietary Diversity Score	35	Household Dietary Diversity Score	64	Household Dietary Diversity Score	83
RESILIENCE	Existence of national dietary guidelines	22	% of public expenditure on food subsidies	23	% of public expenditure on food subsidies AND Existence of national dietary guidelines	28

	ROUND 1	ROUND 2	ROUND 3			
NUTRITIONAL QUALITY OF FOOD SUPPLY / WATER DEPLETION						
EXPOSURE	Water Footprint of nutrient-dense foods	35	Water Footprint of nutrient-dense foods (m ³ /kg)	56	Water Footprint of nutrient-dense foods (m ³ /kg)	75
SENSITIVITY	Intensity of use of actual water resources	35	Intensity of use of actual water resources	49	Intensity of use of actual water resources	61
RESILIENCE	Irrigation Water Efficiency Index	51	Irrigation Water Efficiency Index	64	Irrigation Water Efficiency Index	83
AFFORDABILITY OF FOOD / WATER DEPLETION						
EXPOSURE	Water Footprint for an average diet	39	Water Footprint for an average diet	67	Water Footprint for an average diet	86
SENSITIVITY	Price index for 10 most water-demanding foods AND Price elasticity of demand for 10 most water-demanding foods	27	Price index for 10 most water-demanding foods	51	Price index for 10 most water-demanding foods	53
RESILIENCE	% of farmers who grow drought-resistant crops	25	Cross-price elasticity of demand of high/low water demanding foods	36	Cross-price elasticity of demand of high/low water demanding foods	47
NUTRITIONAL QUALITY OF FOOD SUPPLY / BIODIVERSITY LOSS						
EXPOSURE	% of total acreage of top 5 varieties	41	% of total acreage of top 5 varieties	44	% of total acreage of top 5 varieties	64
SENSITIVITY	Nutritional Functional Diversity	41	Nutritional Functional Diversity	69	Nutritional Functional Diversity	83
RESILIENCE	Crop Agrobiodiversity Factor	53	Crop Agrobiodiversity Factor	74	Crop Agrobiodiversity Factor	89
SATISFACTION OF CULTURAL FOOD PREFERENCES / BIODIVERSITY LOSS						
EXPOSURE	Time available for food preparation	24	Import Dependency Ratio	33	Import Dependency Ratio	47
SENSITIVITY	% of diets locally produced	49	% of diets locally produced	62	% of diets locally produced	72
RESILIENCE	Integration of biodiversity considerations in business	29	Integration of biodiversity considerations in business	49	Integration of biodiversity considerations in business	53
AFFORDABILITY OF FOOD / PRICE VOLATILITY						
EXPOSURE	% of food household expenditure	39	% of food household expenditure	62	% of food household expenditure	81
SENSITIVITY	Sensitivity to price volatility	55	Sensitivity to price volatility	74	Sensitivity to price volatility	86
RESILIENCE	Presence of food safety net programs	45	Presence of safety net programs	46	Presence of safety net programs	53
NUTRITIONAL QUALITY OF FOOD SUPPLY / PRICE VOLATILITY						
EXPOSURE	% of nutrient intakes from 10 most volatile foods	35	% of nutrient intakes from 10 most volatile foods	64	% of nutrient intakes from 10 most volatile foods	72
SENSITIVITY	Price elasticity of 10 most nutrient-dense foods	31	Price elasticity of 10 most nutrient-dense foods	44	Price elasticity of 10 most nutrient-dense foods	47
RESILIENCE	Household Dietary Diversity Score	59	Household Dietary Diversity Score	74	Household Dietary Diversity Score	92
NUTRITIONAL QUALITY OF FOOD SUPPLY / CHANGE IN FOOD CONSUMPTION PATTERNS						
EXPOSURE	Food Purchasing Power Index	35	Food Purchasing Power Index	46	Food Purchasing Power Index	64
SENSITIVITY	Household Dietary Diversity Score	35	Household Dietary Diversity Score	64	Household Dietary Diversity Score	83
RESILIENCE	Existence of national dietary guidelines	22	% of public expenditure on food subsidies	23	% of public expenditure on food subsidies AND Existence of national dietary guidelines	28
DIETARY ENERGY BALANCE / CHANGE IN FOOD CONSUMPTION PATTERNS						
EXPOSURE	At-risk-of-poverty rate	41	At-risk-of-poverty rate	46	Caloric share of ready-to-consume products	47
SENSITIVITY	Prevalence of overweight & obesity	33	Prevalence of overweight & obesity	41	Prevalence of overweight & obesity	58
RESILIENCE	Literacy rate of adults	25	Existence of policy plan for overweight/obesity	36	Existence of policy plan for overweight/obesity AND Funding allocated to nutrition education	28

136 Potential indicators
↓
18 Definitive indicators

« *Toolbox* » for assessing, modeling and building indicators



Research impact?





Papers/ Citations	Prosperi et al. 2014 <i>SAGE O.</i>	Allen et al. 2014 <i>PNS</i>	Allen & Prosperi 2016 <i>EM</i>	Prosperi et al. 2016 <i>ESD</i>	Allen et al. 2019 <i>SIR</i>
Google Scholar	62	107	175	52	57
SCOPUS	34	49	90	28	35
Web Of Science	8	44	78	-	29





Papers/ Citations	Prosperi et al. 2014 <i>SAGE O.</i>	Allen et al. 2014 <i>PNS</i>	Allen & Prosperi 2016 <i>EM</i>	Prosperi et al. 2016 <i>ESD</i>	Allen et al. 2019 <i>SIR</i>
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SCOPUS	34	49	90	28	35
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Some examples:

Béné et al. (2019) *Global Food Security* - **Béné** et al. (2019) *World Development* - **Béné** et al. (2022) *Plos ONE* - **Boylan** et al. (2019) *Public Health Nutrition* - **Clapp** et al. (2020) *Food Policy* - **Dardonville** et al. (2021) *Journal of Cleaner Production* - **David-Benz** et al. (2022) *FAO, CIRAD, EU* - **Fanzo & Davis** (2021) *Food Systems, Food Environments, and Consumer Behavior* - **Glaros** et al. (2022) *Trends in Food Science & Technology* - **Mayton** et al. (2020) *Food Policy* - **Melesse** et al. (2020) *Global Food Security* - **Paas** et al. (2021) *Ecology & Society* - **Rutten** et al. (2018) *Agricultural Systems* - **Seconda** et al. (2019) *British Journal of Nutrition* - **Sonnino** et al. (2019) *Cities* - **Toillier** et al. (2020) *The Journal of Agricultural Education and Extension* - **Valerino-Perea** et al. (2020) *Public Health Nutrition* - **Zou** et al. (2020) *Global Food Security*, etc...



- Improvement of the **conceptualisation of food systems as social-ecological systems**
- Definition of **drivers and outcomes of food systems** (and additional adaptation)
- **Operationalisation** of a dynamic **food system model**
- Part of the «*emerging literature that suggests **causal vulnerability and resilience of food systems*** »
- « *analyze **concrete food system interactions and develop metrics** that can capture them* »
- « ***assessment tools**, which accommodate this multidimensional systems perspective, and that **can track progress on SFS*** »
- Methodological reference of the **DELPHI method** for agri-food related literature



- Value chain dynamics and **actors are not considered in this analysis** (from comments and literature)
- Some **drivers** do not take into account the time factor that distinguishes **shocks and stresses** (from literature)
- **No targeting audience** (from literature)
- SES approaches do not interest **practitioners** (Foran et al., 2014)
- **Practitioners** use sustainability variables and metrics (Dicks et al., 2013)
- **Reproducible models** for different food systems
- **Modeling tool** to identify and build sustainable food system indicators



*“Food systems metrics are important to describe the current state of food systems, facilitate **quantifying relationships needed for exploring causal mechanisms**, set baselines against which to measure progress on key goals, **evaluate impacts of system transitions and proposed changes**, gauge efficacy of interventions, and ultimately facilitate the **scaling up of successful interventions** (Allen and Prosperi, 2014; Global Panel, 2015; McDermott et al., 2015; IFPRI, 2016).”*

Melesse, M. B., van den Berg, M., Béné, C., de Brauw, A., & Brouwer, I. D. (2020). Metrics to analyze and improve diets through food Systems in low and Middle Income Countries. *Food Security*, 12(5), 1085-1105.



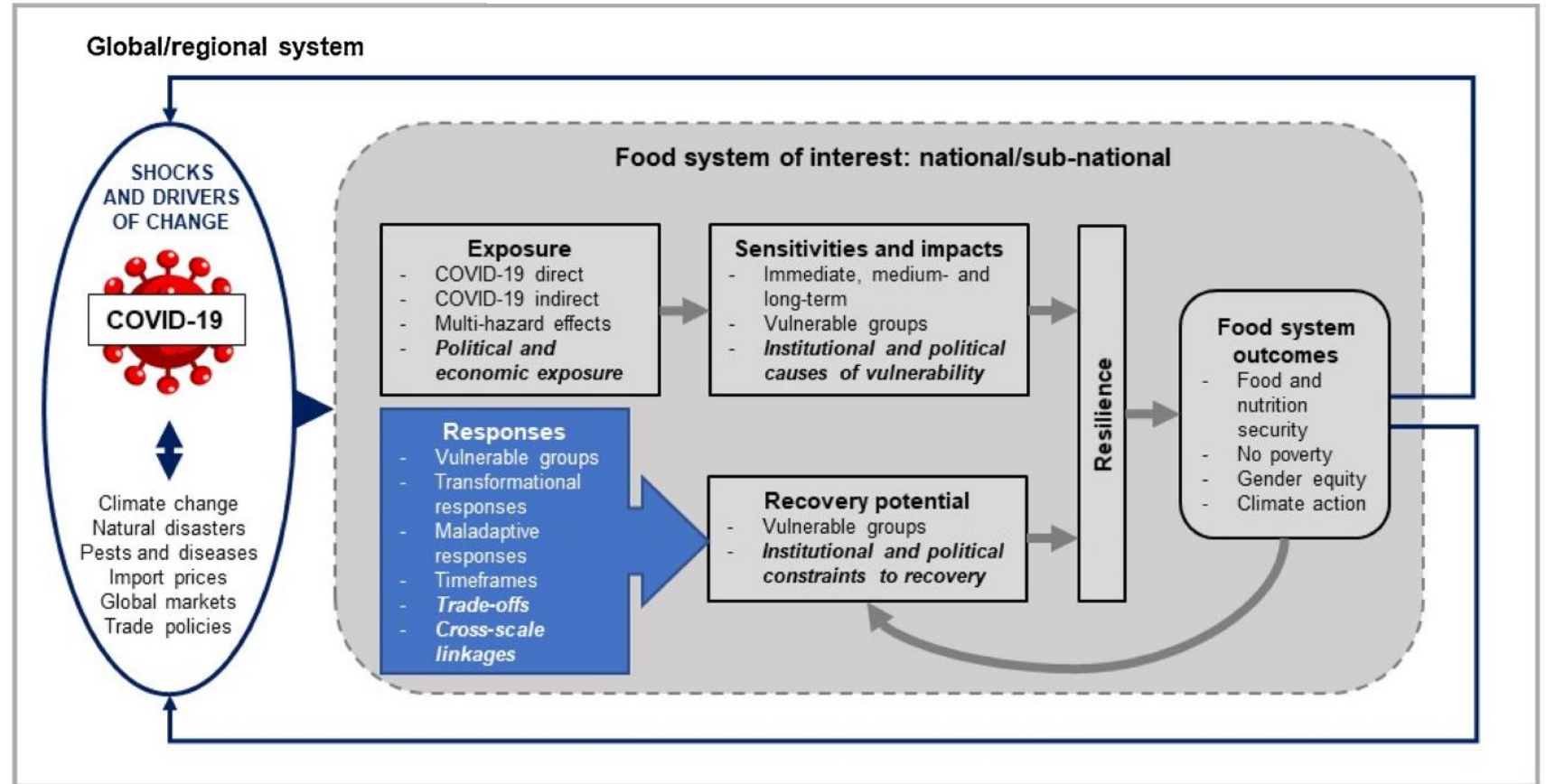
A rapid assessment framework for food system shocks: Lessons learned from COVID-19 in the Indo-Pacific region

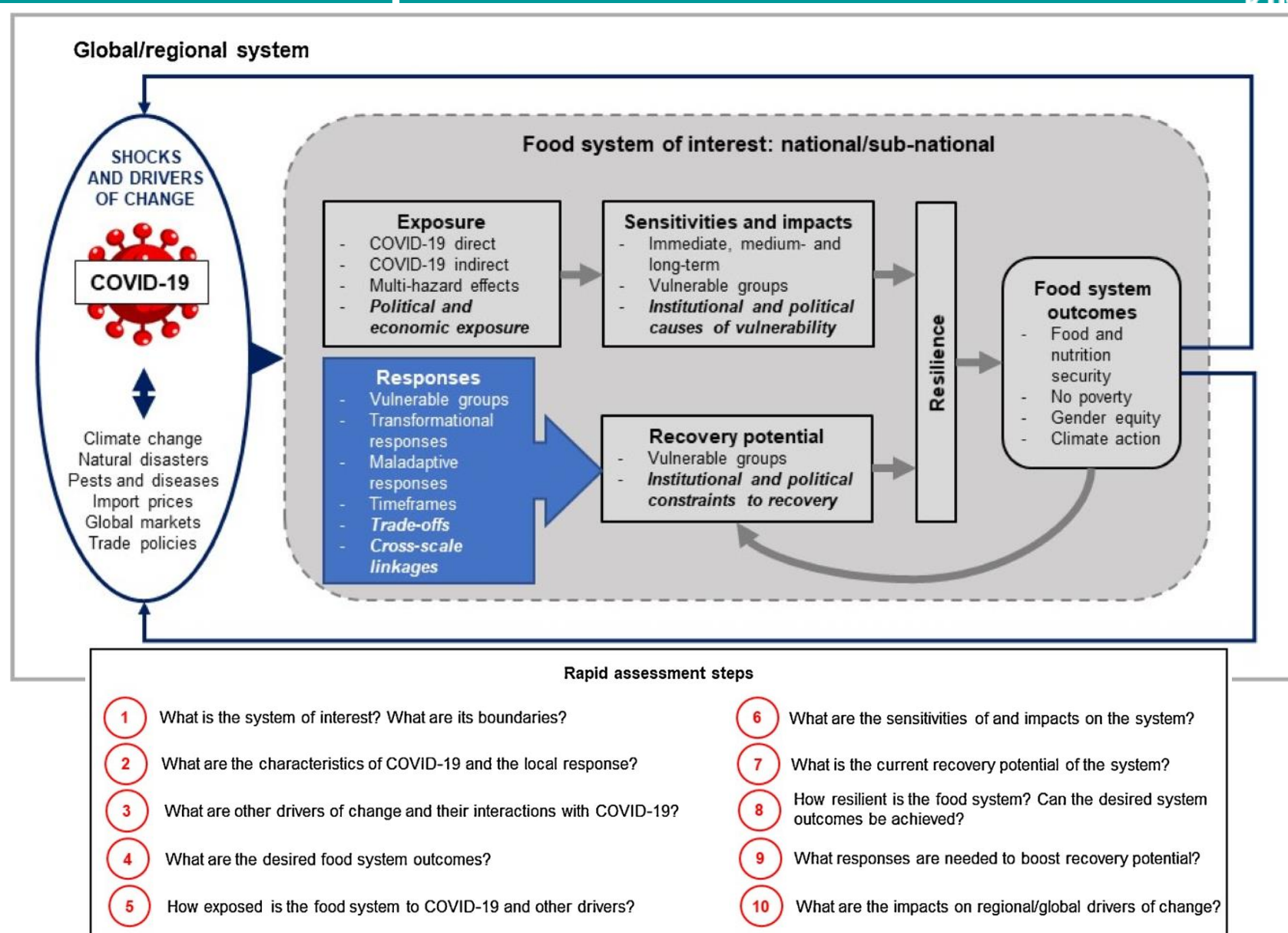
James R.A. Butler ^{a,*}, Federico Davila ^b, Robyn Alders ^c, R. Michael Bourke ^d, Steve Crimp ^e, John McCarthy ^f, Andrew McWilliam ^g, Anton S.M. Palo ^h, Lisa Robins ^e, Michael J. Webb ⁱ, Monica van Wensveen ^j, Todd Sanderson ^k, Daniel Walker ^k

J.R.A. Butler et al.

« For the **rapid assessment** we adopted an analytical framework proposed by Allen and Prosperi (2016). »

“ The lack of examples that **linked food systems responses with external shocks and a step-wise analytical process** led us to adopt Allen and Prosperi’s (2016) approach which **models a food system’s sustainability and resilience to global environmental and socio-economic drivers and shocks**”





Merci pour votre attention

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UMR MoISA – Montpellier Interdisciplinary Center on Sustainable Agri-Food Systems (Social and Nutritional Sciences)



REPORT ON THE 1ST MEETING OF THE EXPERT WORKING GROUP

“METRICS OF SUSTAINABLE DIETS AND FOOD SYSTEMS”

BIOVERSITY INTERNATIONAL and CIHEAM-IAMM

NOVEMBER 4-5, 2014, in MONTPELLIER, FRANCE





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*Thanks for
supporting and working
together*



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CGIAR: Advancing through sustainable diets

Bioversity/CIHEAM-IAMM: Metrics of Sustainable Diets and Food Systems



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