# Introduction to the IPCC Special Report on Climate Change and Land

**Dr Eamon Haughey** Trinity College Dublin and IPCC WGIII TSU

**Oxford Real Farming Conference** 

Oxford, UK, Wednesday 8<sup>th</sup> January 2020

### **Climate Change and Land**

An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

Summary for Policymakers







INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

- 1: Framing and Context
- 2: Land-Climate Interactions
- **3: Desertification**
- 4: Land Degradation
- **5: Food Security**
- 6: Interlinkages between desertification, land degradation, food security and GHG fluxes: Synergies, trade-offs and Integrated Response Options
- 7: Risk management and decision making in relation to sustainable development

# **Report Structure**



6 Land is a critical resource – we rely on it for food, water, health and wellbeing – but it is already under growing human pressure. Climate change is adding to these pressures



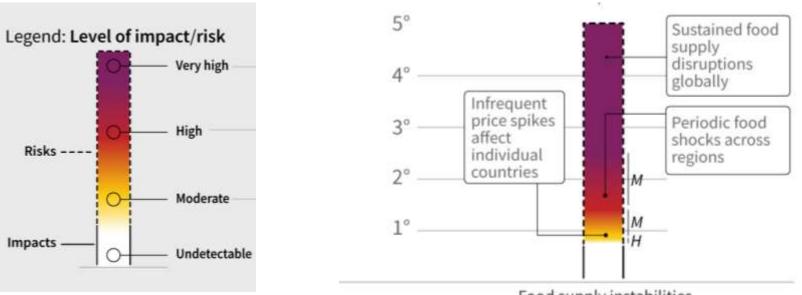


# Climate change - making a challenging situation worse

- The temperature over the land surface has already increased almost twice the global average
- Climate zones are shifting. Many extreme events have become more frequent and intense
- Future climate change will cause reduced crop yields and increased food prices
- Land degradation occurs over ¼ of the Earth's ice-free land area driven primarily by unsustainable land management
- Climate change exacerbates the rate and magnitude of land degradation processes
- In a warmer climate the capacity of land to store carbon can be reduced



## Assessment of risk – example: food supply instabilities

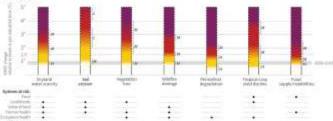


Food supply instabilities



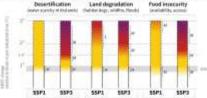
#### A. Risks to humans and ecosystems from changes in land-based processes as a result of climate change

Increments public treater surface treependers (2007), relation to pre-relativit levels, after processor involved to desertification (2007), relation to pre-relativit level, after processor involved to desertification (2007), relation to previous desertification (2007), relation to previous desertification (2007), relative to previous





#### B. Different socioeconomic pathways affect levels of climate related risks



Legend Level of impact, visk

inpats

Purple: Wey Fugh probability of sovers impacts/ risks and the presence of significant inversibility of the persistence of cleanse ediated heareds, combined with herited ability to adapt due to the nature of the heard or impacts/value.

Red. Significant and underground respectivities. Release: trajectoristic are detected as and attributable to clanate change with at least mechanic confidence. White: impacts/ticks are undetectable.

Confidence level for transition
Ar Aligh Ar Mostore & Aret

Satio-atonomic choices can reduce of

executivate climate related risks as well as orthorize the rate of temperature increase. The SSPL pathway illustrates a world with the population proofs, had second and

reduced inequalities, feerly rodecad in low GHG emission systems, effective land use resolution and bish adaptive capacity. The

SSP3 pathway has the opposite trends. Risks are lower to SSP3 compared with SSP3 given the same layed of GHS7

(rectangle

### Figure SPM.2

- Current levels of global warming are associated with moderate risks for soil erosion, vegetation loss, costal degradation and tropical crop yield decline
- At around 2.0°C of global warming risks from permafrost degradation, and food supply instabilities are projected to be very high
- Socioeconomic pathways also affect levels of risk associated with different temperature levels



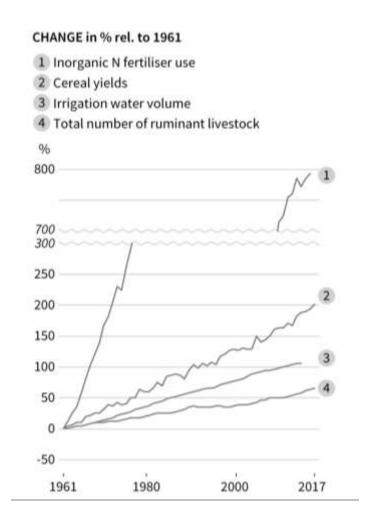


**Agriculture**, food production, and deforestation are major drivers of climate change.



# Intensification – consumption and production

- Population growth and changes in the consumption of food, feed, fiber, timber and energy have driven land use intensification
- Since 1961 cereal crop yields have increased by over 200%
- Over the same period there has been around an 800% increase in the rate of nitrogen fertilizer used
- There has also been a marked increase in ruminant livestock numbers and the amount of water used for irrigation
- At the same time **25-30%** of food produced globally is lost or wasted



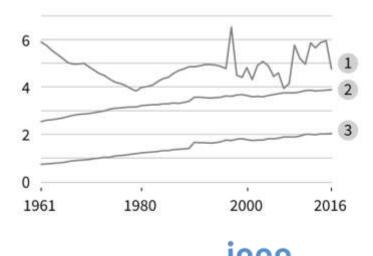
## Trends in global GHG emissions

- Agriculture, forestry and other types of land use account for 23% of human GHG emissions
- Since 1961 steady increase in CH<sub>4</sub> and N<sub>2</sub>O from agriculture
- This has been driven by changes in the scale and intensity of land use
- At the same time land is also a major carbon sink – absorbing an equivalent of almost a third of CO<sub>2</sub> emissions from fossil fuels and industry

#### CHANGE in EMISSIONS since 1961

- 1 Net CO<sub>2</sub> emissions from FOLU (GtCO<sub>2</sub> yr<sup>-1</sup>)
- CH<sub>4</sub> emissions from Agriculture (GtCO<sub>2</sub>eq yr<sup>-1</sup>)
- 3 N2O emissions from Agriculture (GtCO2eq yr<sup>1</sup>)

GtCO2eq yr<sup>-1</sup>



MENTAL PANEL ON

climate ch



There are actions available to us that can simultaneously improve land, enhance food security and improve nutrition.



Res	ponse options based on land management	Mitigation	Adaptation	Desertification	Land Degradation	Food Security	Cost		
	Increased food productivity	E ,	\.M.	6	M.	н.			
	Agro-forestry	М	M	м	м	4.			
	Improved cropland management	M	( <b>1</b> )	L	1	- U.	80		
Agriculture	Improved livestock management	M	(A)		<u>1</u>	16	000		
gricu	Agricultural diversification	Ĺ	L		M	L.	0		-
4	Improved grazing land management	M.	(A)	E	4	1		e e	Large
	Integrated water management	Ľ.	L.	L	L	4	88	Positive	Moderate
	Reduced grassland conversion to cropland	<b>L</b> /		L	L		0	Å.	Small
Forests	Forest management	М	4	£	. <u>L</u>	1	00	1	-
For	Reduced deforestation and forest degradation		(E)	1	12	L	00	1000	Negligible
	Increased soil organic carbon content	н	4 <sup>1</sup>	M	-M-	4	00	tive	Small
Soils	Reduced soil erosion	++ L	() <b>E</b> (	M.	- M-		00	Negative	Moderate
Ň	Reduced soil salinization		( <b>4</b> )	i t	4	14.	00	Z	
	Reduced soil compaction		L		1.	Ű,	0	↓ iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	Large
2	Fire management	M	M	M	М		0		
Other ecosystems	Reduced landslides and natural hazards	L	L	L	<u></u> 4	4			
cosy	Reduced pollution including acidification	→ M	// <b>M</b> .)		( //E :	1			
here	Restoration & reduced conversion of coastal wetlands	M	L	м	М	L			
ð	Restoration & reduced conversion of peatlands	M		na	M		0		



UNEI

#### Potential global contribution of response options to mitigation, adaptation, combating desertification and land degradation, and enhancing food security

Panel A shown reposter options that can be implemented without on with limited competition for land, including some that have the potential is maked the remain for land. Co-beneds and adverse side effects are shown quantitatively based on the high end of the image of potentials assessed. Marginal de of contributions are categorised using the valuability. For positive or negative impacts, Latara within the only inflations contributions in the magnitude of the impact relative to the thresholds have does import). Confidence in the detection of those pictore is given in the templitude of the impact relative to the thresholds used (see legoed). Confidence in the detection of those pictore is given in the state.

Reis	ponse options based on land management	Witgeter	AData ini	(keeproFication)	Land Registration	Food Socarity	Cell
	Valuent family advantanty		26 - X	1	1 - CP	÷	
	Ageo Rossey		S 8			4 H.	
	Intervent insplaint management				100	2 HI	
÷	improved livesteck managiment		ti ti			1 II.	
\$	Agricultured diversification	P. 1	6 6	1.67		S	*
n	begoived graving land management		5	1.46			
	t degested under mensagen met		3 E	1.4		E (1)	
	Related glassiand concerning to coupland						
ŝ	Forut Managireant		- I			A.	
£,	Fishuad decontation and farent improduced		(i )		1	0 (A)	**
	transport with representation spream		(T) 👯		1 10		
¢	Teducet and seaters	+-+- 1	S - 8			2	
۴	The entrol service		4	- 45	. A.	0 <b>+</b>	
	Tedarel and sergisting		1 k			5 B	
	the not generat		1 N				
Ł	Realization from the fide of an all your set of the second s		1 I.	1.6	1	÷ 1	
£	Reduced participant studies and the state		1 ×			9 - 11	
ž	Responsible & value of conversion of costal and ands			.+			
в,	Testostian kosta et constant d'partents					-	
les	ponse options based on value chain manager	sent					
	Perturni part Rendel Jacon			1.4	1		
2	Detaycharge			1			
2	Veduced food early (concerner of netwine)			0	1 14	c	-
	Sunstitutes receiving		2 A		1 de		
8	trightweat fixed processing and resulting				_	C (6	
4	Interviewed acturings and the facial syndromy		11 4		_	÷ +1	
les	ponse options based on tisk management					_	
*	Management of attack spatial		-	1.14		_	
8	Plat sharing indicated					-	

Golden arows one share for which does one evaluate to some place potential for these or years laced challenges. The wegetieves, we receased industriateds for each sprine continue rest califica.

		62103-4121	Atlantation	Print Building	Lord Digadeters Million Anti-	Freed Sampriky
14	÷1	Mysmed	Positive ler Herve tran 25	Postive ter Para turci	Footbyrter wars that 3	Peaktine For more than 200
Mo	denate	43m3	1930	10113	03863	Excisi.
24	÷	And Bas 2.2	testimut	insthered	Institutti	less than 1
100	eners.	Restort	In the lot	terebet .	Southers	Austine
64	all i	Louisve 43	MILINE	Loss than 8.2	Granhevit	see that i
Mo	dista .	4244	1000	101117	03403	0.001.00
Le.	44	Hostilat-1	riegidor far riegidor far	Testine for	Heppine for work that 2	Angelog for more chart (80)
	and the	the parties or regarded		index I m	echaomicable	

Figher	sate confidence in the
100.00	ate of moghttude category.
11.1	sph confidence
MA	Audian-confidence
2.4	accordinates
cia	canon.
Cest Sven renat	nonge christi satiweter soli sta 180 travel availata "
Cest	Nonge chilos ( castor for cost con UNICOUNTY of the for " High cost
See a renge	Hartge child al caption for coli con UNX 120.97" ar d10 for " High cost
Cest here	nonge christi satiweter soli sta 180 travel availata "

### Figure SPM.3

- Global assessment land-based options are not additive
- Many of these response options can be of benefit across multiple challenges, are at an advanced technology level and many are relatively low cost
- However, report found that the scale of deployment of some response options is a cause of concern
- Specifically, the deployment of bioenergy, reforestation, afforestation and biochar needs to be implemented carefully to avoid negative effects on food security and biodiversity





The way we produce our food matters; dietary choices can help reduce emissions and pressure on land.



Diversification in the food system (e.g., implementation of integrated production systems, broad-based genetic resources, and diets) can reduce risks from climate change (medium confidence). Balanced diets, featuring plant-based foods, such as those based on coarse grains, legumes, fruits and vegetables, nuts and seeds, and animal-sourced food produced in resilient, sustainable and low-GHG emission systems, present major opportunities for adaptation and mitigation while generating significant co-benefits in terms of human health (high confidence). By 2050, dietary changes could free several million km<sup>2</sup> (medium) confidence) of land and provide a technical mitigation potential of 0.7 to 8.0 GtCO<sub>2</sub> eq  $yr^{-1}$ , relative to business as usual projections (high confidence). Transitions towards low-GHG emission diets may be influenced by local production practices, technical and financial barriers and associated livelihoods and cultural habits (high confidence). {5.3, 5.5.2, 5.5, 5.6}





## **Response options – summary**

- Protect current **carbon stocks** and restore degraded ecosystems (peatlands, forests)
- Increased bioenergy and forestry cover sustainable implementation required
- Food system production: improved livestock and pasture management, agricultural diversification, agroforestry, and increasing soil carbon
- Food system demand: moving towards more plant-based diets and animal sourced food produced in sustainable and low-GHG emission systems

RGOVERNMENTAL PANEL ON CLIMATE

Reducing food loss and waste (25-30% currently lost or wasted)



Getter land management can play its part in tackling climate change, but it can't do it all.

 Reducing greenhouse gas emissions from all sectors is essential if we want to keep below 2°C



# **i**OCC INTERGOVERNMENTAL PANEL ON CLIMPTE CHORE **Climate Change and Land** An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems Summary for Policymakers

### FOR MORE INFORMATION:

Website: http://ipcc.ch IPCC Secretariat: ipcc-sec@wmo.int IPCC Press Office: ipcc-media@wmo.int

#### FIND US ON:



www.youtube.com/c/ipccgeneva



WGI