

Capítulo 12:

Impactos, Adaptación y Vulnerabilidad en América Central y del Sur

Ecosistemas terrestres, acuáticos y marinos

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INTERGOVERNMENTAL PANEL ON climate change

Climate Change 2022

Impacts, Adaptation and Vulnerability



WGII

Working Group II contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change



14 autores de 9 países
27 autores contribuyentes
2 editores revisores
Más de 3 años de trabajo
3 revisiones
Más de 1,700 referencias

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CHAPTER 12: CENTRAL AND SOUTH AMERICA

Executive Summary

Introduction

Summary of the Fifth Assessment Report and Recent IPCC SRs

Hazards, Exposure, Vulnerabilities and Impacts

Central America (CA)

Northwest South America (NWS)

Northern South America (NSA)

South America Monsoon (SAM)

Northeast South America (NES)

Southeast South America (SES)

Southwest South America (SWS)

Southern South America (SSA)

Key Impacts and Risks

Adaptation

Terrestrial and Freshwater Ecosystems and their Services

Ocean and Coastal Ecosystems and their Services

Water

Food, Fibre and other Ecosystem Products

Cities, Settlements and Infrastructure

Health and Wellbeing

Poverty, Livelihood and Sustainable Development

Cross-cutting Issues in the Human Dimension

Adaptation Options to Address Key Risks in CSA

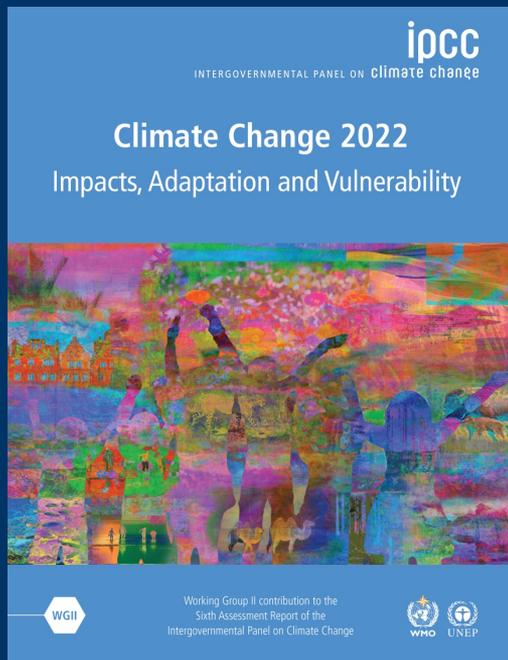
Feasibility Assessment of Adaptation Options

Case Studies

Knowledge Gaps

Conclusion

FAQs



Facts Sheets

Fact sheet - Central and South America

Climate Change Impacts and Risks

Vulnerability and climate change impacts

Central and South America are highly exposed, vulnerable and strongly impacted by climate change, a situation amplified by inequality, poverty, population growth and high population density, land use change particularly deforestation with the consequent biodiversity loss, soil degradation, and high dependence of natural and local economies on natural resources for production of commodities (high confidence). (ES-Ch12) Many extreme events are already impacting the region and projected to intensify including warming temperatures and driesness, sea level rise, coastal erosion, ocean and lake acidification resulting in coral bleaching, and increasing frequency and severity of droughts in some regions, with associated decrease in water supply, that impact agricultural production, traditional fishing, food security and human health (high confidence). (12.8)

Ecosystems

Ocean and coastal ecosystems in the region such as coral reefs, estuaries, salt marshes, mangroves and sandy beaches are highly sensitive and negatively impacted by climate change and disaster hazards (high confidence). Coral reefs are projected to lose their habitat, change their distribution range and suffer more bleaching events driven by ocean warming (high confidence).

The distribution of terrestrial species has changed in the Andes due to increasing temperatures (very high confidence). Up to 85% of natural systems (plant and animal species, habitats and communities) evaluated in the literature for biodiversity-rich spots in the region are projected to be negatively impacted by climate change (medium confidence).

The Amazon forest, one of the world's largest biodiversity and carbon repositories, is highly vulnerable to drought (high confidence). The Amazon forest was highly impacted by the unprecedented droughts and higher temperatures observed in 1998, 2005, 2010 and 2015/2016, attributed partly to climate change. This resulted in high tree mortality rates and basin-wide reductions in forest productivity (high confidence). The combined effect of anthropogenic land use change and climate change increases the vulnerabilities of terrestrial ecosystems to extreme climate events and fires (medium confidence). (ES-Ch12)

The Amazon forest, one of the world's largest biodiversity and carbon repositories, is highly vulnerable to drought (high confidence). The Amazon forest was highly impacted by the unprecedented droughts and higher temperatures observed in 1998, 2005, 2010 and 2015/2016, attributed partly to climate change. This resulted in high tree mortality rates and basin-wide reductions in forest productivity (high confidence). The combined effect of anthropogenic land use change and climate change increases the vulnerabilities of terrestrial ecosystems to extreme climate events and fires (medium confidence). (ES-Ch12)

Cities and Settlements

Urban areas in the region are vulnerable for many reasons, notably high rates of poverty and informality, poor and unevenly distributed infrastructures, housing deficits, and the recurrent occupation of risk areas (high confidence). (12.8, 12.5.5) This vulnerable condition is boosted by unstable political and governmental institutions, which suffer from corruption, weak governance and reduced capacity to finance adaptation (12.5.5.1). Impacts of climate events on urban water supply, drainage and sewer infrastructures are the most frequently reported in the region (12.3, 12.5.5, Figure 12.9).

Water
Glacier retreat, temperature increase and precipitation variability, together with land-use change, have affected ecosystems, water resources, and livelihoods through landslides and flood disasters (very high confidence). (ES-Ch12)
Increasing water scarcity and competition over water are projected. Droughts in water flows will significantly degrade ecosystems such as high-elevation wetlands and affect farming communities, public health and energy production (high confidence). (ES-Ch12)

Food/Agriculture
Since the mid-20th century, increasing mean precipitation has positively impacted agricultural production in Southeast South America, although extremely long dry spells have become more frequent affecting the economies of large cities in southeast Brazil. Inversely, reduced precipitation and altered rainfall seasons are impacting rainfed subsistence farming particularly in the Dry Corridor in Central America and in the tropical Andes comprising food security (high confidence). (ES-Ch12)

Impacts on rural livelihoods and food security, particularly for small and medium-sized farmers and Indigenous Peoples in the mountains, are projected to worsen, including the overall reduction of agricultural production, suitable farming area and water availability (high confidence). (ES-Ch12)

Migration
The Andes, northeast Brazil and the northern countries in Central America are among the more sensitive regions to climate-related migrations and displacements, a phenomenon that has increased since AR5 (high confidence). Climate drivers interact with social, political, geographical and economic drivers, the most common climate drivers for migration and displacements are droughts, biotic storms and hurricanes, heavy rains and floods (high confidence). (ES-Ch12)

Synthesis of observed and projected impacts to main sectors in Central and South America



Figure 1: Synthesis of observed and projected impacts, distinguished for different sectors and each subregion of Central and South America. Observed impacts refer to a time-period from mid-to end of the 21st century. Projected impacts represent a synthesis across several emission and warming scenarios, indicative of a time-period from mid-to end of the 21st century. (Figure 12.10)

Health

Climate change affects the epidemiology of climate-sensitive infectious diseases in the region (high confidence). Examples are the effects of warming temperatures on increasing the suitability of transmission of vector-borne diseases, including endemic and emerging arboviral diseases such as dengue fever, chikungunya, and Zika. In the next decades, endemic and emerging climate-sensitive infectious diseases are projected to increase (medium confidence). (ES-Ch12)

Adaptation Options and Barriers

Adaptation options

Policies and actors at multiple scales and the participation of actors from all social groups, including the most exposed and vulnerable populations, are critical elements for effective adaptation (high confidence). (ES-Ch12)
Research approaches that integrate Indigenous knowledge and local knowledge systems with natural and social sciences have increased since AR5 (high confidence) and are helping to improve decision-making processes in the region, reduce maladaptation and foster transformational adaptation through the integration with ecosystem-based adaptation and community-based adaptation (high confidence). (ES-Ch12)

Barriers
The most reported obstacle for adaptation in terrestrial, freshwater, ocean and coastal ecosystems is financing (high confidence). There is also a significant gap in identifying limits to adaptation and weak institutional capacity for implementation (ES-Ch12)
Institutional instability, fragmented services and poor water management, inadequate governance structures, insufficient data and analysis of adaptation experience are barriers to address the water challenges in the region (high confidence). (ES-Ch12)

Climate Resilient Development

Social organization, participation and governance reconfiguration are essential for building climate resilience (very high confidence). Dialogue and agreement that include multiple actors are mechanisms to acknowledge trade-offs and promote dynamic, site-specific adaptation options (medium confidence). (12.5.7.2, ES-Ch12)

Initiatives to improve informal and precarious settlement, guaranteeing access to land and decent housing are aligned with comprehensive adaptation policies that include the development and reduction of poverty, inequality and disaster risk (medium confidence). (ES-Ch12)

Cross Chapter Papers

Cross-Chapter Papers



CROSS-CHAPTER PAPER 1
Biodiversity hotspots (land, coasts and oceans)
CCPI assesses the impacts and vulnerability to climate change of terrestrial, freshwater and marine ecosystems considered to be biodiversity hotspots.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 2
Cities and settlements by the sea
CCPI assesses climate change impacts and risks to coastal cities and settlements, their vulnerability as well as enabling conditions and options for adaptation.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 3
Deserts, semi-arid areas, and desertification
CCPI assesses climate change impacts and risks to deserts and semi-arid areas, including desertification, as well as options for adaptation and climate resilient development.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 4
Mediterranean region
CCPI assesses climate change impacts and risks, vulnerability as well as barriers and options for adaptation and climate resilient development in the Mediterranean region.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 5
Mountains
CCPI assesses climate change impacts and risks, vulnerability as well as barriers and options for adaptation and climate resilient development in mountain regions.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 6
Polar regions
CCPI assesses the climate change impacts and risks to ecosystems and human systems in Polar Regions, as well as options for adaptation and climate resilient development.

[DOWNLOAD](#)



CROSS-CHAPTER PAPER 7
Tropical forests
CCPI assesses climate change impacts and risks, as well as barriers and options for adaptation and increasing climate resilience in tropical forests.

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Amenazas observadas y proyectadas

Comunes para la Región:

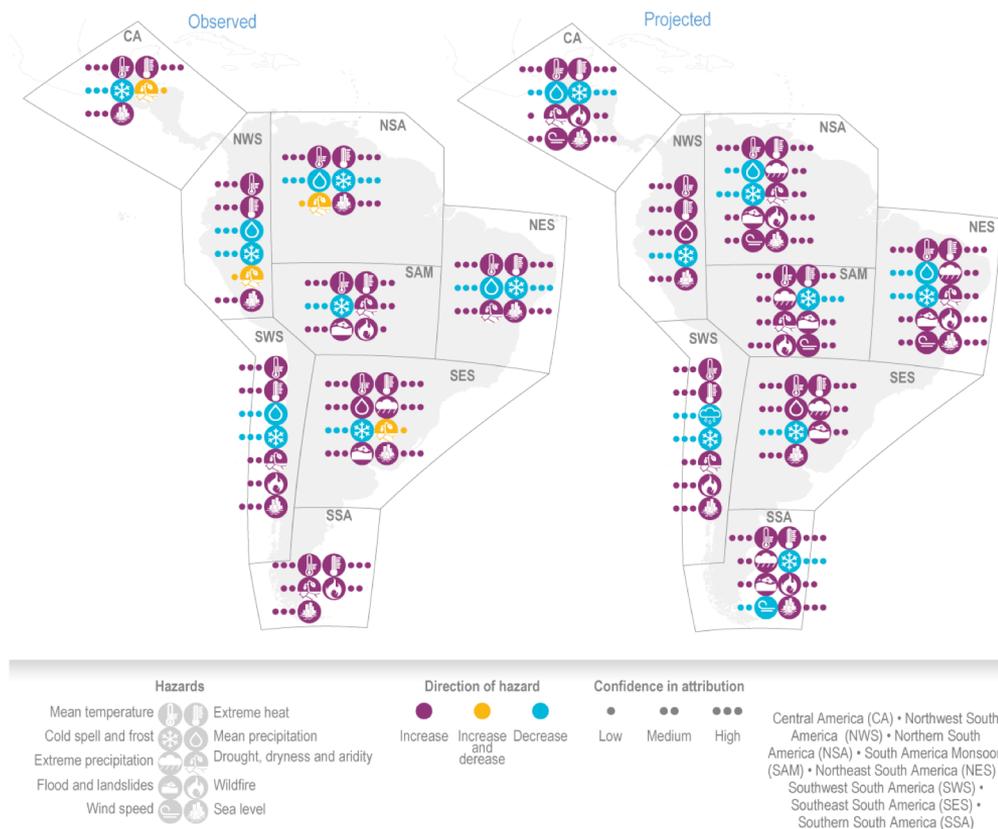
- Aumento de la temperatura
- Aumento de olas de calor
- Aumento de incendios (SWS)
- Aumento de heladas (excepción SSA)
- Aumento del nivel del mar

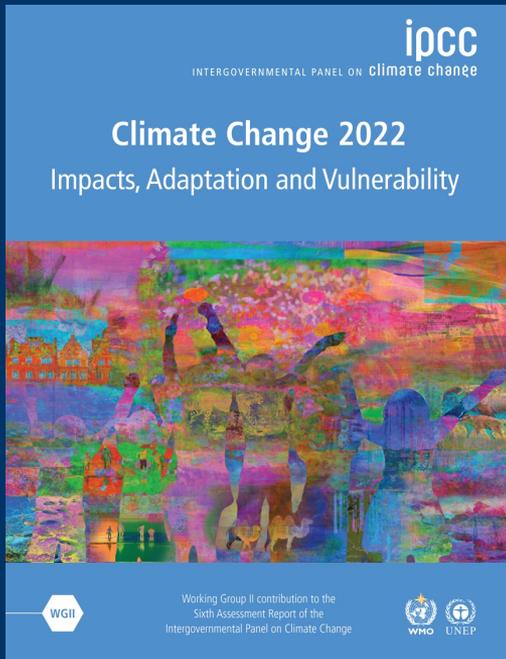
Diversidad en los patrones en la Región:

- Precipitaciones
- Sequías

Bajo un escenario RCP8.5 para 2100, toda la región experimentará los mismos cambios y aparecerán nuevas amenazas

Observed and projected hazards in Central and South America





“El cambio climático ha causado daños substanciales y ha incrementado las pérdidas irreversibles en ecosistemas terrestres, acuáticos y marinos”

“El tamaño y la magnitud de los impactos del cambio climático son mayores que los estimados por los reportes anteriores “

“Un generalizado deterioro de la estructura y función de los ecosistemas, resiliencia y capacidad adaptativa así como cambios en la sincronización estacional ha ocurrido debido al cambio climático con consecuencias económicas adversas”
(AR6 – SPM)

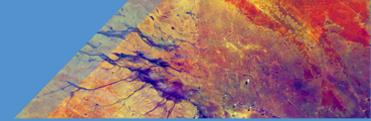


ECOSISTEMAS TERRESTRES (a escala global)

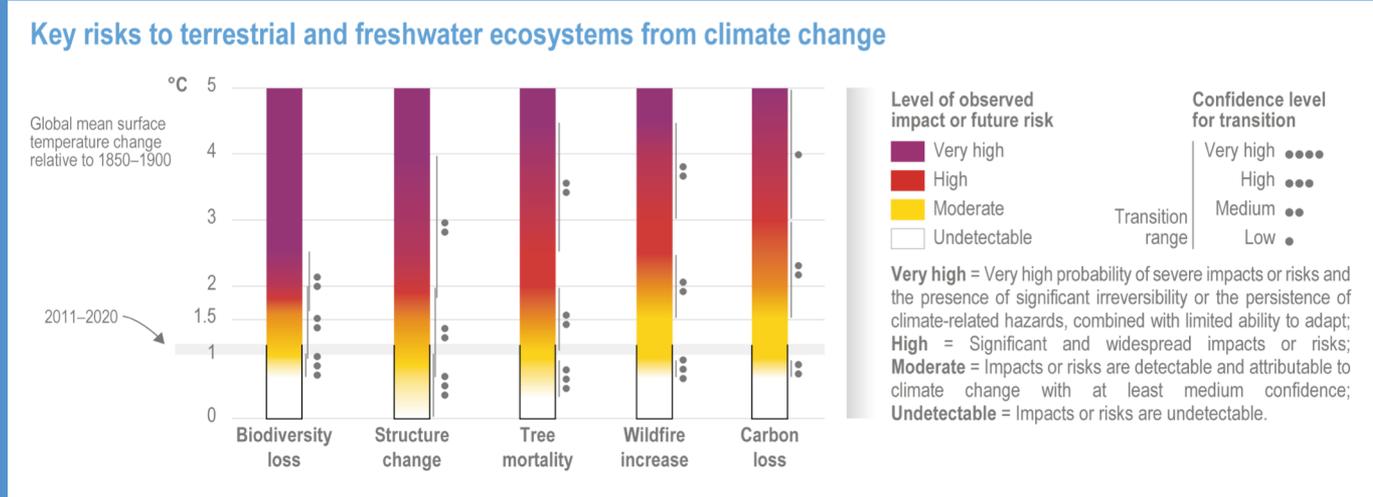
Existen múltiples líneas de evidencia que en combinación con tendencias fuertes y consistentes en todos los continentes y regiones del planeta que indican que muchos de los **cambios observados en rangos, fenología, fisiología y morfología de especies terrestres y acuáticas** son atribuidas a cambios climáticos regionales y globales, particularmente aquellos relacionados con el **aumento de la frecuencia de eventos extremos**

- Más de 12,000 especies muestran cambios consistentes con el cambio climático.
- Más de 2,000 especies han cambiado sus rangos de distribución hacia latitudes o elevaciones mayores
- Aumento de enfermedades en especies silvestres
- Extinciones locales (47% de las 976 especies examinadas) asociados a temperaturas máximas.

- También extinciones globales (en 3 especies) atribuidas a cambio climático
- Incrementos regionales en áreas quemadas por incendios (doble en comparación con causas naturales)
- Aumento de mortalidad de árboles (aumento del 20%)

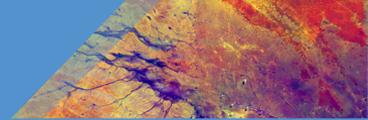


RIESGOS EN ECOSISTEMAS TERRESTRES (a escala global)

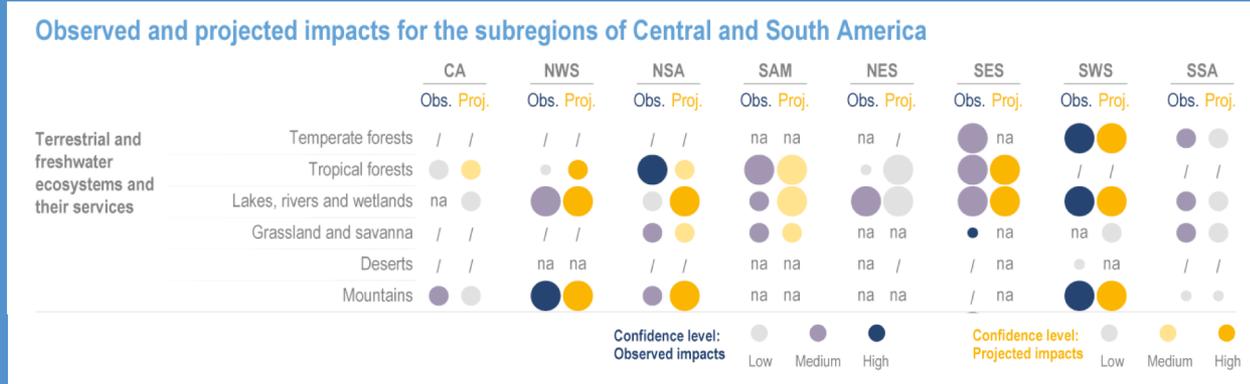


El cambio climático incrementa los riesgos en aspectos fundamentales de ecosistemas terrestre y acuáticos

- Una potencial pérdida de especies alrededor del 60% bajo un escenario de +5°C
- Cambios en los biomas (del 15 al 35% con 2°C ó 4°C de calentamiento, respectivamente)
- Incremento de áreas quemadas por incendios de un 35% al 40% entre 2°C o 4°C de calentamiento

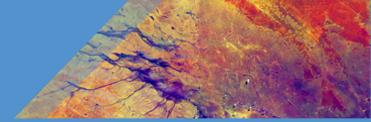


ECOSISTEMAS TERRESTRES – AMÉRICA CENTRAL Y DEL SUR



Cap. 12 – AR6 - WGII

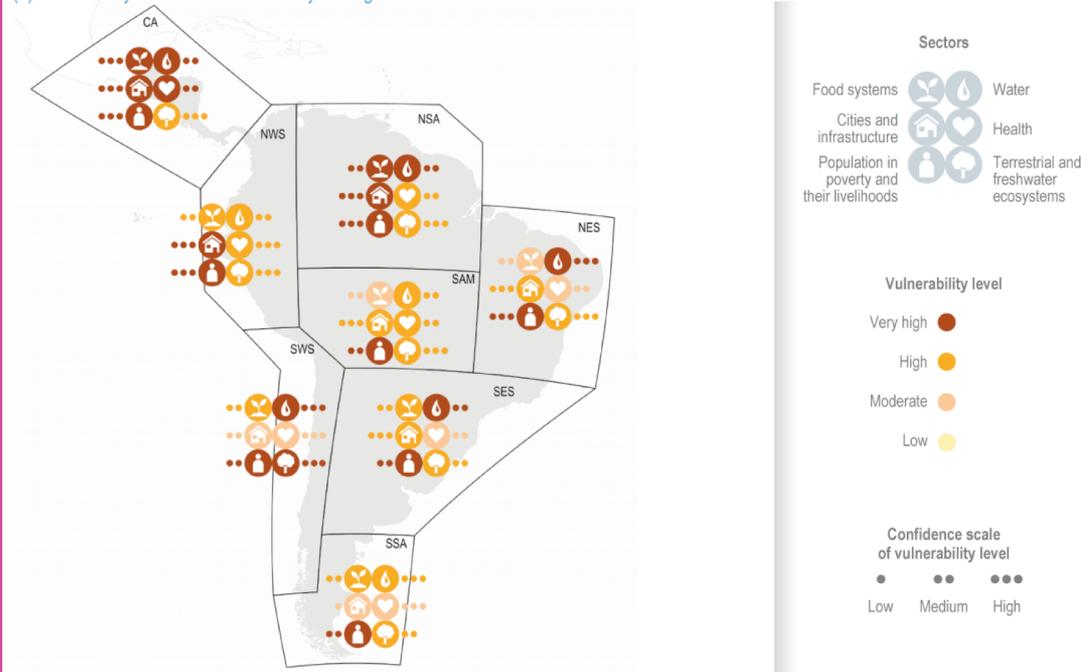
- Todos los ecosistemas terrestres y acuáticos de América Central y del Sur han sido impactados por las sequías (*confianza media*).
- Amazonas (hotspot de biodiversidad y depósito de carbono) es altamente vulnerable a sequías (alta mortalidad de árboles, reducción de la *productividad del bosque, de sumidero a emisor de CO₂*) (*alta confianza*)
- Distribución de especies terrestres ha cambiado (*alta confianza*) (hacia latitudes mayores, elevaciones mayores, contracción de rangos)
- Mayor evidencia (desde el AR5) de la sinergia entre incendios, uso de cambio de tierra (deforestación) y cambio climático con impactos en la salud, funcionamiento de ecosistemas, seguridad alimentaria, comunidades humanas) (*confianza media*)
- Temperatura, aridez y sequía ha incrementado la frecuencia e intensidad de incendios (región expuesta a incendios entre 1 a 26 días mas entre 2017-2020 que en el periodo comprendido entre 2001-2004) (*alta confianza*)



VULNERABILIDAD Y ACTUAL ADAPTACIÓN – ECOSISTEMAS TERRESTRES

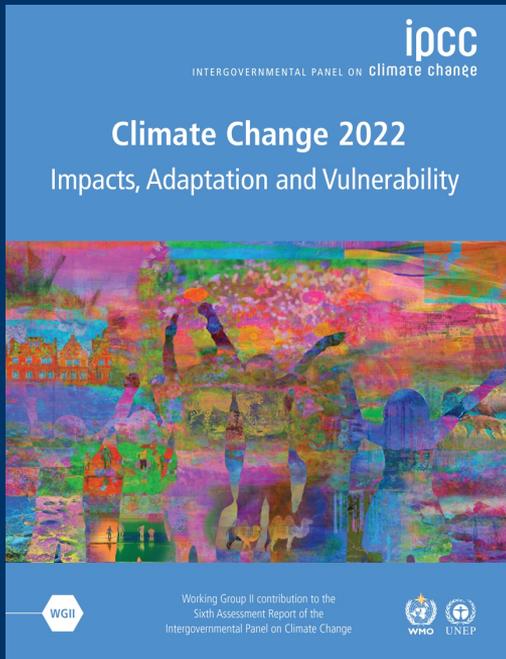
Sectoral distribution of vulnerability to climate change for Central and South America

(a) Vulnerability and confidence level by subregion and sector



La adaptación basada en ecosistemas es la estrategia más usada en ecosistemas terrestres y acuáticos (*alta confianza*).

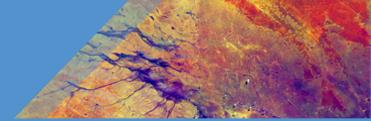
Insuficientes para salvaguardar los ecosistemas de los impactos negativos del cambio climático



“

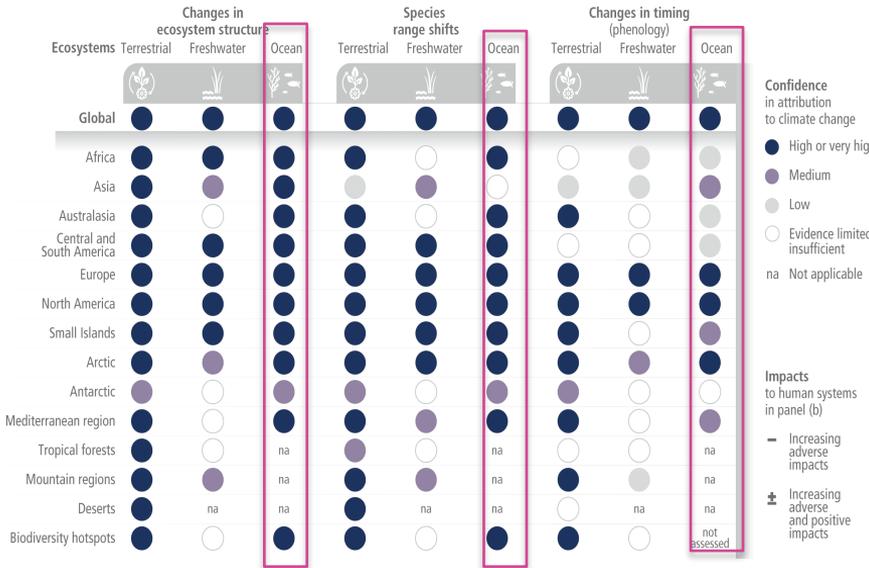
“El cambio climático ha expuesto a los océanos y costas a condiciones sin precedentes vistas hace milenios, lo que ha impactado la vida en todos los océanos y sus costas”.

“Cambios fundamentales en las características físicas y químicas del océano están cambiando la distribución y la abundancia de los organismos marinos en todas las regiones del mundo”
(Capítulo 3, AR6, WGII)

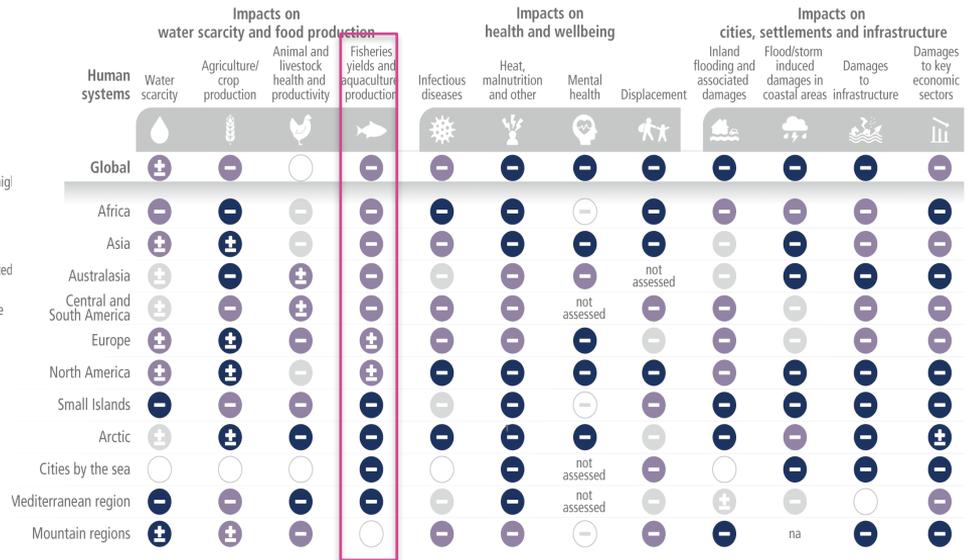


Impacts of climate change are observed in many ecosystems and human systems worldwide

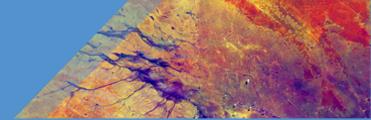
(a) Observed impacts of climate change on ecosystems



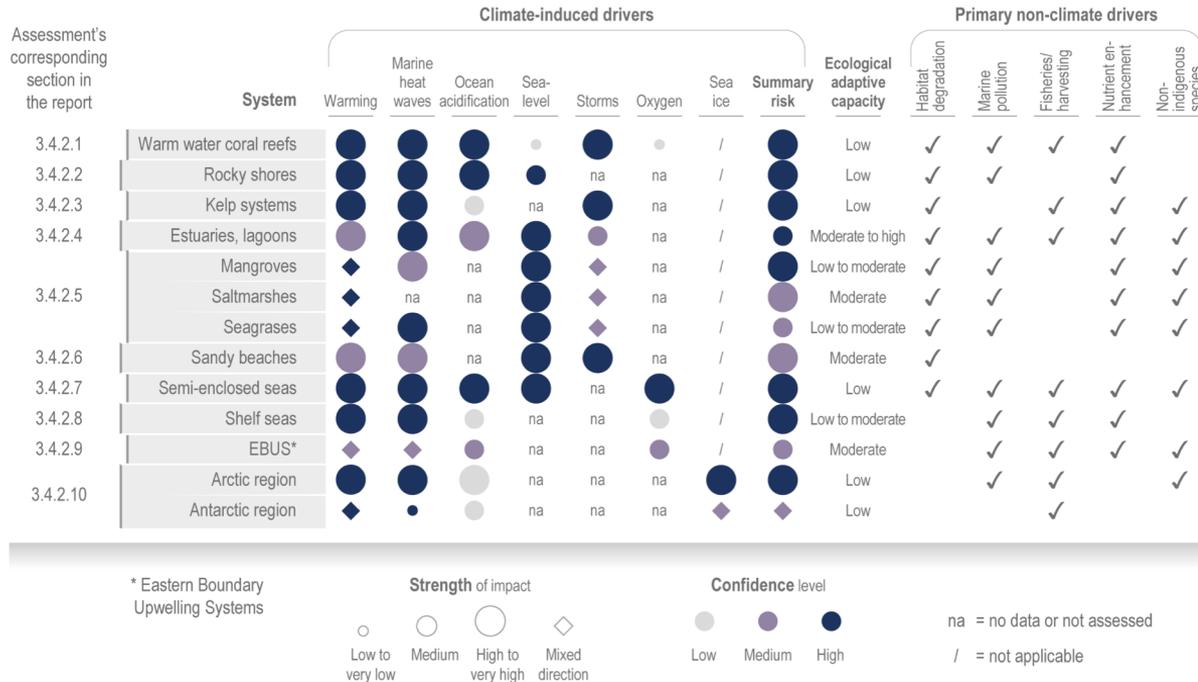
(b) Observed impacts of climate change on human systems



Cambios en estructura de los ecosistemas marinos, distribución y la sincronización fisiológica de especies han ocurrido en todos océanos del planeta **atribuidos al cambio climático**.
Sistemas humanos relacionados con las pesquerías y acuicultura han sufrido impactos negativos en la mayoría de las regiones del planeta.



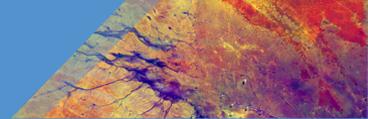
Summary assessment of observed hazards to coastal ecosystems and seas



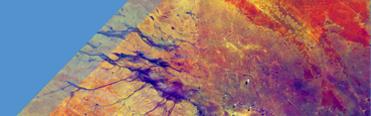
Calentamiento del océano, olas de calor marinas, acidificación del océano, aumento del nivel del mar, desoxigenación del océano afectan todos los ecosistemas marinos) a escala global.

La degradación del hábitat, contaminación, o la presencia de especies no nativas aumenta los impactos al cambio climático

La mayoría de estos ecosistemas marinos presentan una baja capacidad ecológica adaptativa a los cambios



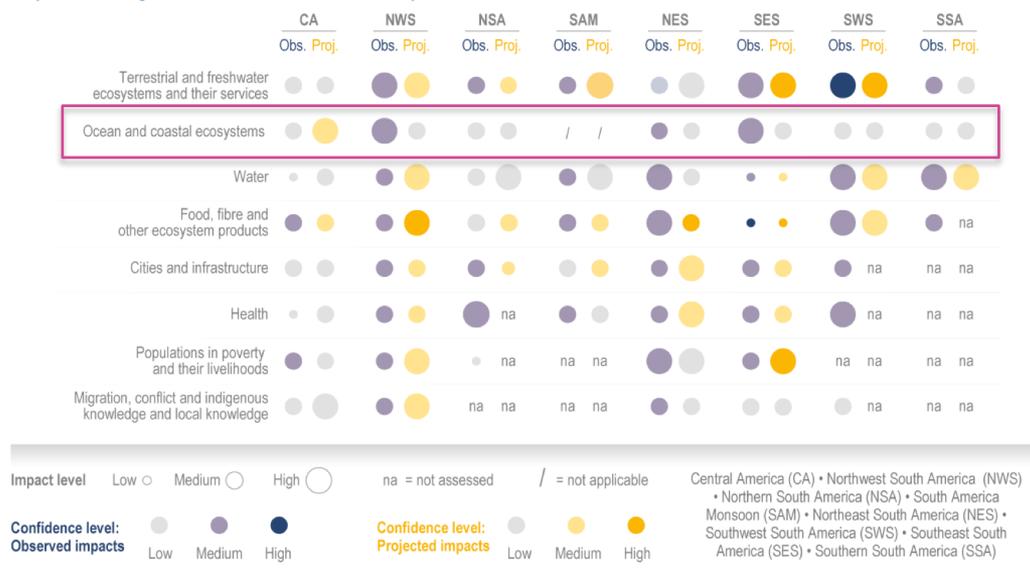
Los ecosistemas marinos y costeros de América Central y del Sur como arrecifes de corales, estuarios, marismas, manglares y playas han sido fuertemente impactados por el cambio climático



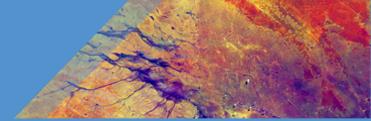
Impactos observados y proyectados en ecosistemas

Synthesis of observed and projected impacts to main sector in Central and South America

Projections averaged across scenarios and 21st century



- Cambios en la abundancia, densidad y cobertura de especies
- Cambios en las comunidades (bentónicas como pelágicas)
- Cambios en las redes tróficas
- Pérdida de humedales
- Blanqueamiento de corales



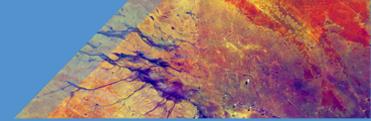
Impactos observados y proyectados en ecosistemas

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Projections averaged across scenarios and 21st century



- Cambios en la abundancia,

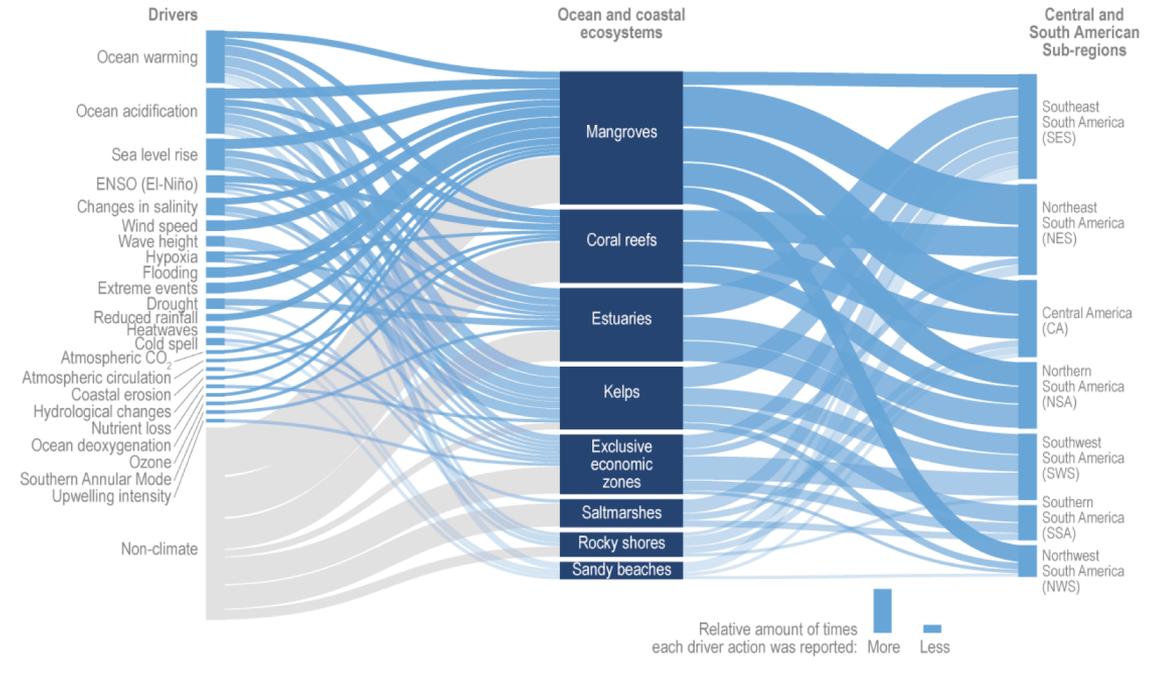


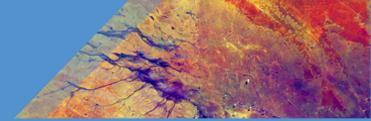
SENSIBILIDAD (ECOSISTEMAS MARINOS)

Los manglares, los arrecifes de coral, estuarios, bosques de algas y las zonas económicas exclusivas son altamente sensibles al calentamiento, acidificación, y al aumento del nivel del mar

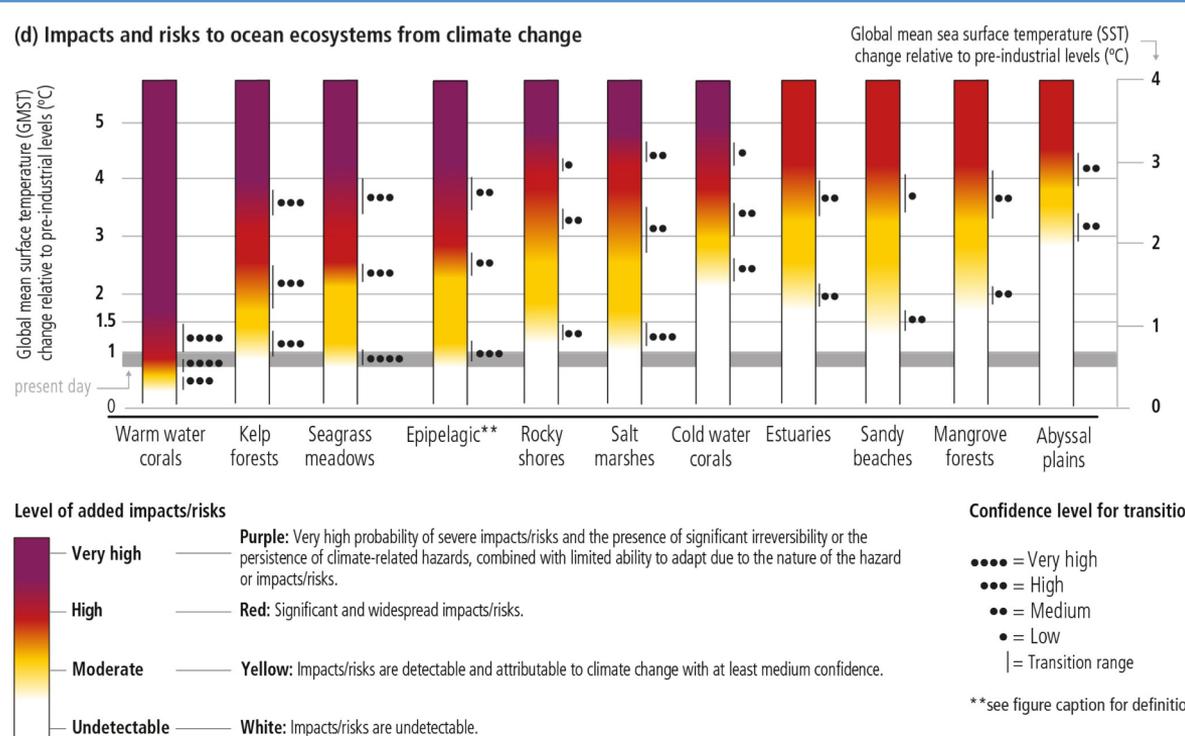
Sensitivity of ocean, coastal ecosystems, and Exclusive Economic Zones (EEZs) to climate and non-climate drivers in Central and South America

Synthesis of field and laboratory experiments reporting drivers generating sensitivity on ocean, coastal ecosystems and EEZs

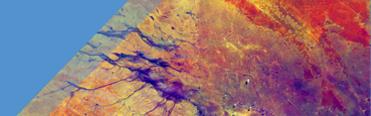




RIESGOS GLOBALES (ECOSISTEMAS MARINOS)

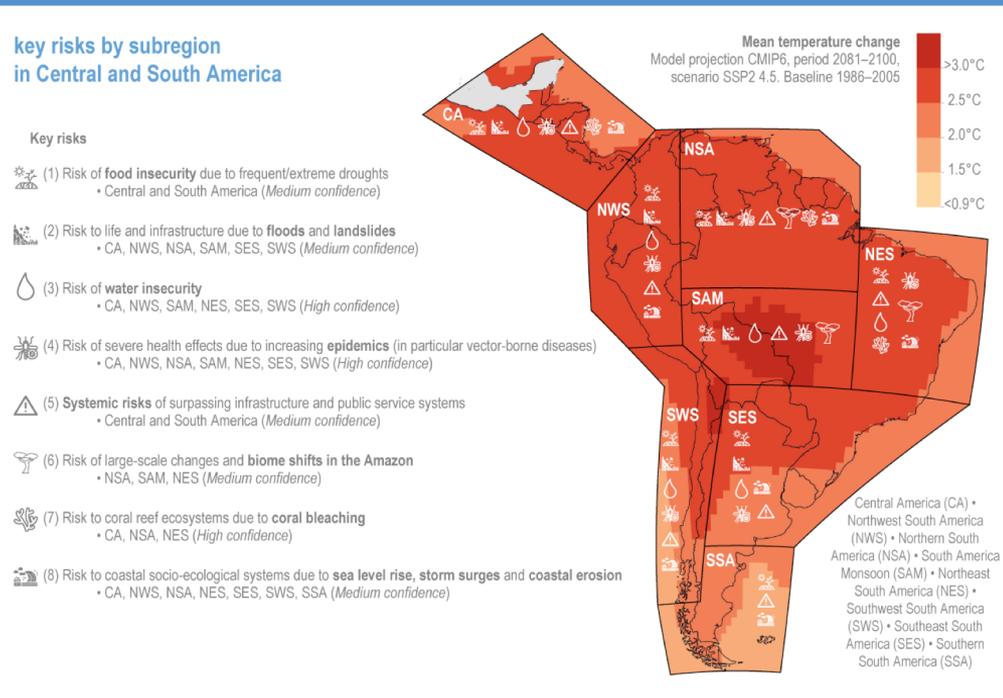


En océanos y ecosistemas costeros, el riesgo de pérdida de biodiversidad es entre moderado y muy alto para un escenario de 1.5°C y 2°C, e incrementa de alto a muy alto bajo un escenario de 3°C (SPM B.4.1)

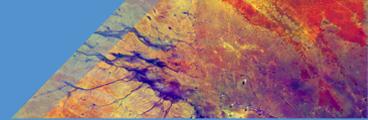


RIESGOS (América Central y del Sur)

1. Seguridad alimentaria por sequía
2. Vida e infraestructura por inundaciones y deslizamientos de tierra
3. Seguridad hídrica
4. Epidemias
5. Infraestructura y los servicios públicos
6. Cambios en los biomas del Amazonas
7. Blanqueamiento de corales
8. Comunidades y ecosistemas costeros a aumento del nivel del mar, tormentas y erosión costera



Los arrecifes de coral perderán su hábitat y cambiarán su rango de distribución y sufrirán mas eventos de blanqueamiento. Para el 2050 bajo escenarios RCP8.5 y 4.5 se proyecta un evento severo por año de blanqueamiento



(CR)² Center for Climate and Resilience Research

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Inicio ▸ slider ▸ Análisis CR2 | Ahondando en el nuevo Reporte del IPCC: Impactos, vulnerabilidad...

Análisis CR2 | Ahondando en el nuevo Reporte del IPCC: Impactos, vulnerabilidad y posibilidades de adaptación en Chile (1ra parte)

16 marzo, 2022 👁 493

Laura Ramajo, Investigadora del Centro de Ciencia del Clima y la Resiliencia (CR)2 e Investigadora del Centro de Estudios Avanzados en Zonas Áridas (CEAZA)

El reciente [informe de evaluación de cambio climático del IPCC sobre Impactos, Adaptación y Vulnerabilidad](#) entrega una importante y nueva cantidad de evidencia sobre las consecuencias del cambio climático en diferentes sectores y regiones del mundo. Los resultados son inequívocos: el cambio climático está afectando la naturaleza, las vidas de las personas y la infraestructura a nivel global, poniendo en peligro necesidades básicas como el agua y los alimentos de miles de millones de personas, y amenazando el

Agenda

- 31 de marzo | Charla «Clima y sociedad en tiempos de cambio»
24 marzo, 2022
- 24 de marzo | Seminario web «Migración y salud en un contexto de cambio...»
17 marzo, 2022
- 18 de marzo | Implicaciones clave para América Central y América del Sur del...
17 marzo, 2022

Iniciativas

<https://www.cr2.cl/analisis-cr2-ahondando-en-el-nuevo-reporte-del-ipcc-impactos-vulnerabilidad-y-posibilidades-de-adaptacion-en-chile-1ra-parte/>



ADAPTACIÓN (ECOSISTEMAS MARINOS)

Assessment of feasibility and effectiveness of adaptation solutions for ocean and coastal ecosystems

Assessment's corresponding section in the report	Solutions	Feasibility dimensions					Primary solutions for sectors at risk					
		Technical & economic	Institutional & geopolitical	Socio-ecological	Feasibility (overall)	Effectiveness	Coastal settlements	Fisheries & mariculture	Tourism	Maritime transport	Health	
3.6.2.1	Socio-institutional adaptation	Knowledge diversity	●	●	●	●	●	✓	✓	✓	✓	✓
		Socially inclusive policies	●	●	●	●	●	✓	✓	✓	✓	✓
		Participation	●	●	●	●	●	✓	✓	✓	✓	✓
		Livelihood diversification	●	●	●	●	●		✓			✓
		Mobility	●	●	●	●	●	✓	✓		✓	
		Migration	●	●	●	●	●		✓			✓
		Finance and market mechanisms	●	●	●	●	●	✓	✓	✓		✓
		Disaster response programs	●	●	●	●	●	✓		✓	✓	✓
		Multi-level ocean governance	●	●	●	●	●			✓	✓	✓
		Institutional transboundary agreements	●	●	●	●	●		✓		✓	✓
3.6.2.2	Built infrastructure and technology	Accommodation and relocation	●	●	●	●	●	✓			✓	✓
		Protection and nourishment	●	●	●	●	●	✓		✓	✓	✓
		Early-warning systems	●	●	●	●	●		✓			✓
		Seasonal and dynamic forecasts	●	●	●	●	●			✓		✓
		Monitoring systems	●	●	●	●	●		✓			✓
		Habitat development	●	●	●	●	●				✓	
		Active restoration	●	●	●	●	●		✓			✓
		Assisted evolution	●	●	●	●	●		✓	✓		
3.6.2.3	Marine and coastal Nature-based Solutions (NbS)	Habitat restoration	●	●	●	●	●	✓	✓		✓	
		Marine Protected Areas and OECMs*	●	●	●	●	●	✓	✓	✓	✓	
		Conservation of climate refugia	●	●	●	●	●		✓			
		Transboundary marine spatial planning and ICZM**	●	●	●	●	●		✓	✓	✓	
		Sustainable harvesting	●	●	●	●	●		✓			✓
		Climate adaptive management	●	●	●	●	●		✓			✓
Ecosystem-based management	●	●	●	●	●		✓	✓		✓		

*Other effective area-based conservation measures

**Integrated coastal zone management

Feasibility/Effectiveness



Overall feasibility confidence level

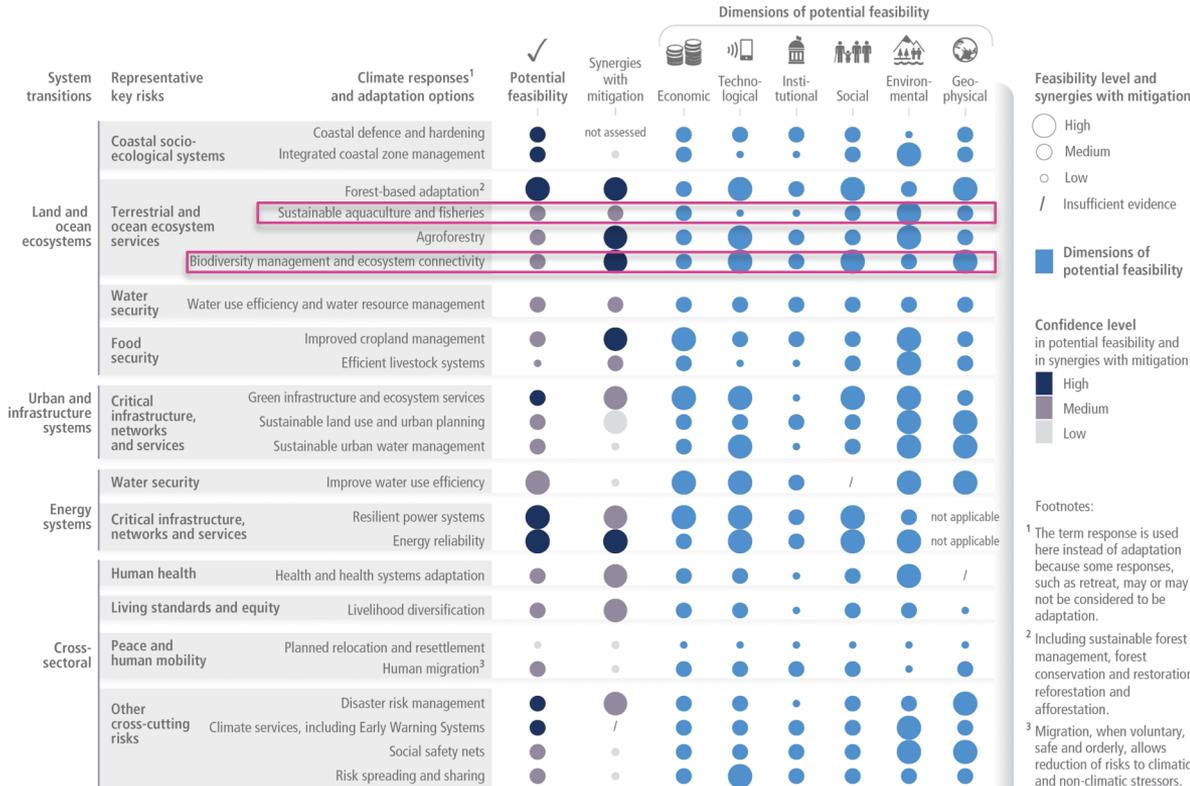


Acciones que incluyen:

- incremento del conocimiento
 - políticas inclusivas sociales
 - Participación
 - mecanismos de financiamiento
 - programas de respuesta a desastres
 - gobernanza a múltiples niveles
 - sistemas de alerta
 - Restauración
 - Protección
 - planificación espacial marina
- son soluciones factibles para abordar los impactos del cambio climático, y reducir la vulnerabilidad.



Diverse feasible climate responses and adaptation options exist to respond to Representative Key Risks of climate change, with varying synergies with mitigation
Multidimensional feasibility and synergies with mitigation of climate responses and adaptation options relevant in the near-term, at global scale and up to 1.5°C of global warming



Manejo basado en ecosistemas (biodiversidad, pesquerías y acuicultura), así como otras aproximaciones que trabajan con procesos naturales aportan a:

- seguridad alimentaria
- nutrición, salud y bienestar
- biodiversidad
- Sustentabilidad
- servicios ecosistémicos

SIXTH ASSESSMENT REPORT

Grupo de Trabajo II– Impactos, Adaptación y Vulnerabilidad

ipcc
INTERGOVERNMENTAL PANEL ON climate change



Importantes acciones de adaptación se han implementado a la fecha en la región en diferentes sectores que han estado focalizadas en la reducción de la pobreza y en el logro del desarrollo sustentable.



ADAPTACIÓN EN LOS PLANES NACIONALES DE ADAPTACIÓN

Adaptation Goals identified for ocean and coastal systems

in National Adaptation Plans of Central and South American countries

	Research and monitoring	Legislation and policies	Biodiversity and conservation	Risk management	Productive management	Infrastructure and tech	Capacity building and awareness	Financial management	Water and residues management	Social inclusion	Traditional practices
Chile	30	10	7	1	4	2	4	1	1		
Guatemala	9	8	16	3	4	3	3	1	4	1	2
Brazil	24	8	2	6	1		1	1	1		
Peru	4	3	3	8	7	2	5			2	1
Suriname	6	9	3		2	4	1	2	4		
Guyana	3	4	2	7	4	1	1	4	2	2	
Honduras	2	5	8	2	5	2					
Argentina	3	3	4	2	1	2					
Uruguay	3	1		5			1	4		1	1
Colombia		1	4	1		1		1	1		
Nicaragua		1			6						
Ecuador			2								
Costa Rica											
El Salvador											
Total	84	53	51	35	34	17	16	14	13	6	4

En océanos y costas de América Central y del Sur, las acciones de adaptación han estado focalizadas en la conservación, restauración y protección, zonificación, la generación de conocimiento y el mejoramiento de los programas educativos, así como la creación de políticas específicas

Políticas y acciones a múltiples escalas y con la participación de actores de todos los grupos sociales, incluyendo lo más vulnerables, es crítico para abordar los objetivos de adaptación de la Región (SPM, AR6- WGII)

Gracias!





SOBRE GÉNERO Y CAMBIO CLIMÁTICO

<https://www.cr2.cl/las-mujeres-tambien-son-las-mas-afectadas-por-el-cambio-climatico-por-laura-ramajo/>

Check also CCB Chapter 18: Gender