Module 12: Assessing health vulnerability

In Module 12 we'll look at how as health professionals we can assess the health vulnerability of our country or region to climate change.

Key messages in Module 12

- The health impacts of climate change will be inequitably distributed within & between countries

"The rich will find their world to be more expensive, inconvenient, uncomfortable, disrupted & colorless — in general, more unpleasant & unpredictable, perhaps greatly so. The poor will die."

- Kirk R. Smith (2008)

University of California, Berkeley

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The key message shown here is the health impacts of climate change will be inequitably distributed within and between countries. Given this message, it is thus important to improve our understanding of communities' differential levels of vulnerability, in order to prioritise limited resources. Unless we have this understanding of different types and levels of vulnerability, then it is virtually impossible to design responses that meet the needs of communities.

Smith, K. (2008).Mitigating, adapting and suffering. How much of each? **Annual Review of Public Health (29)** (doi:10.1146/annurev.pu.29.031708.100011)

Key messages in Module 12

- Vulnerability is the propensity to be adversely affected
- Causes of vulnerability include biological characteristics, the physical environment, social circumstances & national & international politics
- Vulnerability can be assessed using HIA & HNAP
- Many facets of vulnerability means many opportunities for intervention

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Key messages around assessing health vulnerability to climate change that we'll cover are: (**CLICK** to animate four points)

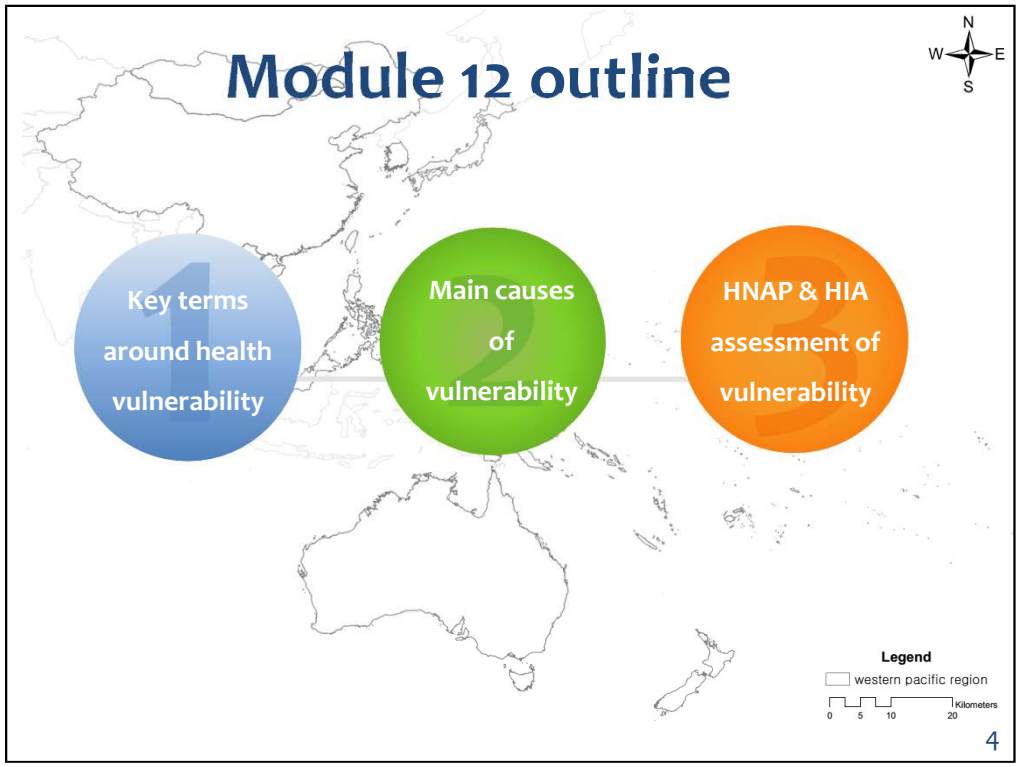
1. Vulnerability is the propensity to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

2. The causes of vulnerability fall across a spectrum, ranging from biological characteristics of organisms to the terms of international trade.

3. Framing vulnerability in this way is not to suggest the phenomenon is too big and wide to grasp. To the contrary, the many facets of vulnerability mean there is a correspondingly wide range of opportunities for intervention at the various levels.

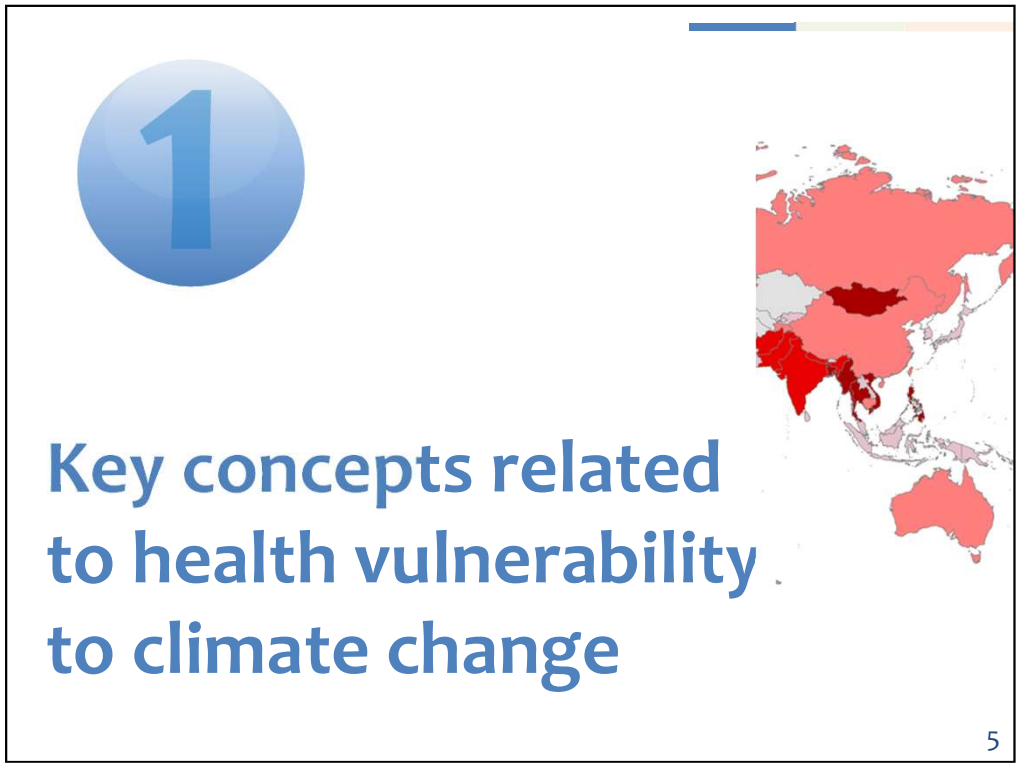
4. And finally, an important point: many of the causes of vulnerability to climate change make individuals and populations susceptible to other environmental threats as well. As a result, intervention to reduce vulnerability to climate change will bring other benefits, and these will very likely be evident before the full impact of climate change is apparent.

(Note that these four 'key messages' were taken from the conclusion slide at the end of the draft module. I'm not sure if they are the key messages drafted at the first meeting re the training. They can be shifted to the end and the slide title changed to 'Summary' if it was only intended to have the one key message re unequally distributed health impacts. – KT)



The structure of this module is:

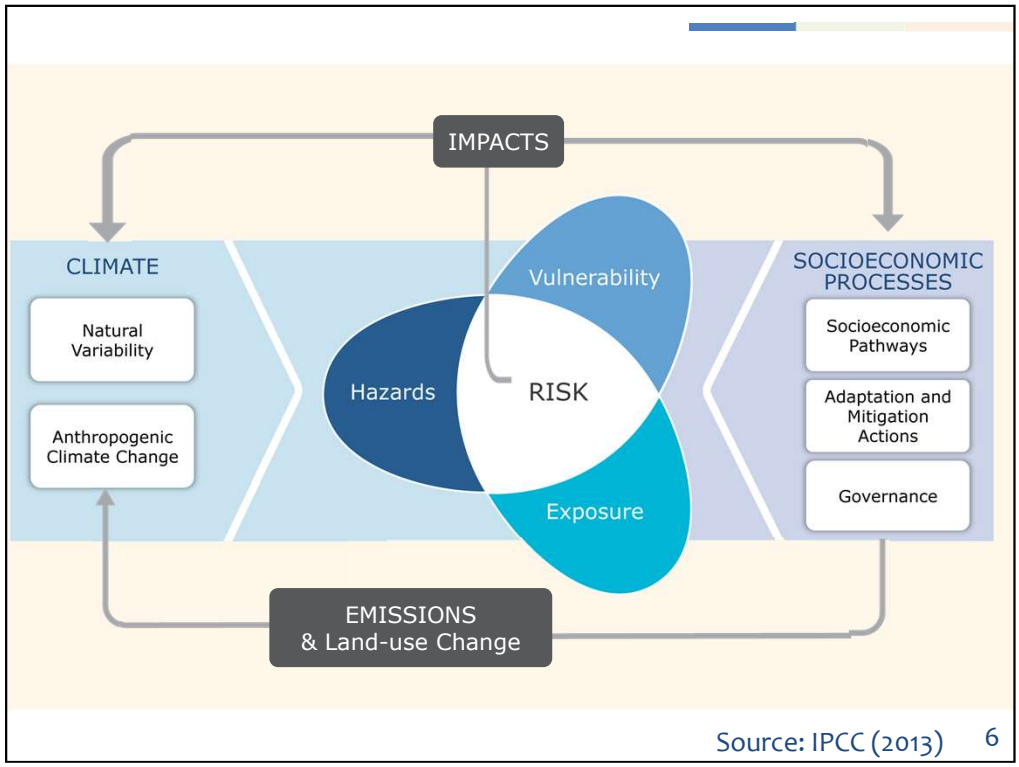
1. A definition of key terms around health vulnerability
2. The main causes of vulnerability to disease and injury resulting from climate change; and
3. Looking at the Health National Action Plan (or HNAP) and Health Impact Assessment (or HIA) approaches to assessing vulnerability



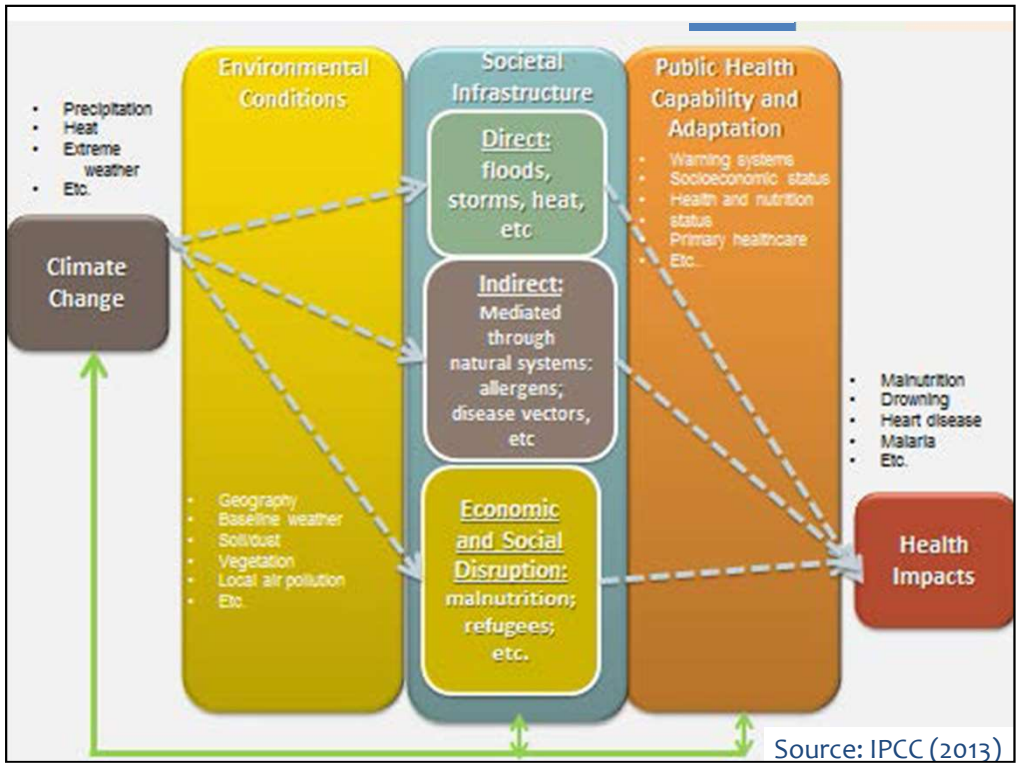
We'll start by looking at some of the key concepts related to health vulnerability to climate change

First off, what do we mean by the term 'vulnerability'?

Vulnerability is the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including sensitivity or susceptibility to harm, and a lack of capacity to cope and adapt.



This diagram is from the latest IPCC report (AR5). In it, we can see that risk is at the centre of the framework, and arises from the combination of vulnerability, exposure and hazards. The pressures indicated on the left and the right of the diagram influence these factors. Climate (natural variability and anthropogenic climate change) is of course one of the key determinants of hazards, and influences exposure and vulnerability. Socioeconomic processes on the right include socioeconomic pathways (e.g. development trajectories), action taken on adaptation and mitigation, and governance (e.g. types of decision-making that is occurring to respond to climate change, such as regulation of GHG emissions through a carbon tax); these strongly influence vulnerability and hazard. Future risks that individuals and communities face arise from the interactions of exposure, vulnerability and hazards, and are influenced by climate and development. This in turn determines the level of impacts from changes in the climate. This diagram highlights that we need to look at the system as a whole to understand risks and impacts. Although we can assess (e.g.) mitigation actions and exposure to weather events separately, it is the combination of all of these components shown in the diagram that gives us a holistic picture of the overall risks.



In terms of understanding how exactly climate change affects health, and increases vulnerability, it is helpful to look at this diagram, which we saw in an earlier module (module 3 – Pop. Health and Climate).

This diagram from the IPCC AR5 report shows three primary exposure pathways by which climate change affects health:
- directly through weather variables such as heat and storms;
- indirectly through changes in natural systems that in turn affect disease vectors; and
- pathways heavily mediated through human systems such as undernutrition.

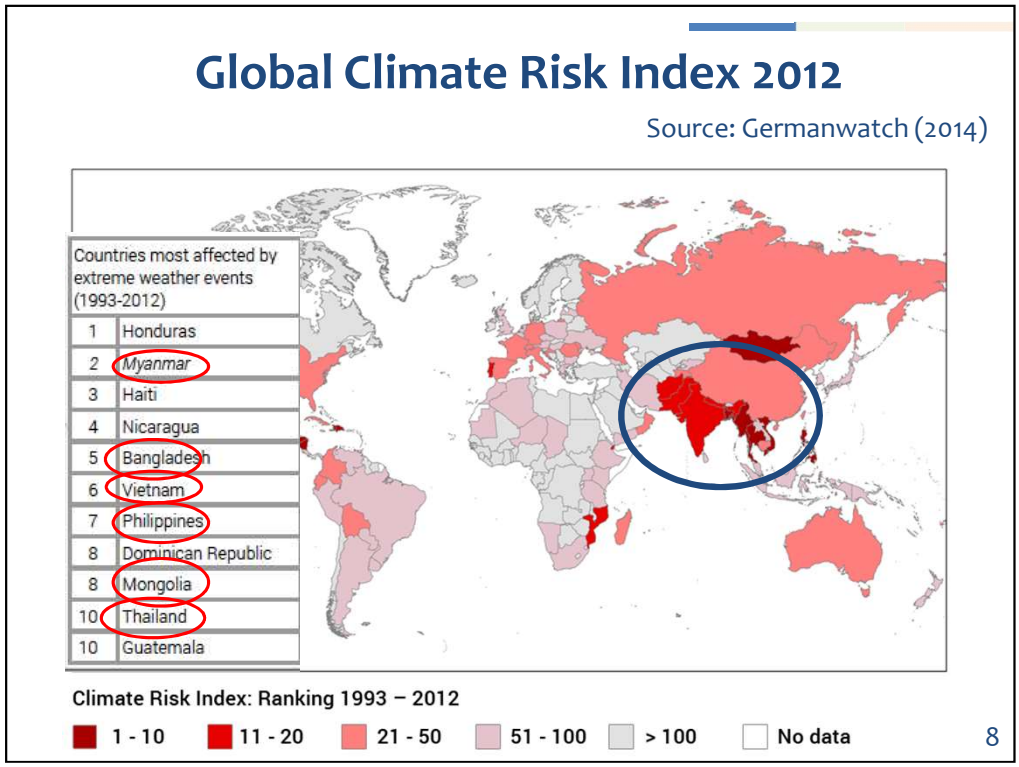
The yellow box indicates the moderating influences of local environmental conditions on how climate change exposure pathways occur in a particular population.

The orange box indicates that the extent to which the three categories of exposure translate to actual health burden is moderated by such factors as background public health systems and socioeconomic conditions, and adaptation measures.

The green arrows at the bottom indicate that there may be feedback mechanisms, positive or negative, between societal infrastructure, public health, and adaptation measures and climate change itself.

Source - AR5 Chapter 11

Note from Kris: “Should get the latest version from ipcc.ch”



This is an example of a vulnerability or risk map and was developed by Germanwatch (a German NGO). This index is a way to analyse the quantified impacts of extreme weather events — Meteorological events such as tropical storms, winter storms, severe weather, hail, tornado, local storms; hydrological events such as storm surges, river floods, flash floods, mass movement (landslide); climatological events such as freeze, wildland fires, droughts) both in terms of fatalities as well as economic losses that occurred—based on data from the Munich Re NatCatSERVICE, which is worldwide one of the most reliable and complete data bases on this matter.

We can see that 6 of the top ten countries most affected by extreme weather events are in the Asia Pacific region. These countries ranking the highest are the ones most impacted and should see the Climate Risk Index as a warning sign that they are at risk from extreme weather events.

The Climate Risk Index does not provide an all-encompassing analysis of the risks from anthropogenic climate change, but should be seen as one analysis informing countries' exposure and vulnerability to climate-related risks along with other analyses, based on the most reliable quantified data.

Source: Germanwatch (2014)

Other references for vulnerability maps include the document 'Climate Change Vulnerability Mapping for Southeast Asia' by Yusuf and Francisco from the Economy and Environment Program for Southeast Asia (EEPSEA), based in Singapore).

2

Climate change vulnerability & some of its causes

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Let's now look at some the main causes of vulnerability linked to climate.

Many of these vulnerable countries will be exposed to climate extremes such as storms, as well as sea level rise.

Some parts of the world are at increased risk of storms simply because of their location. An example shown in this slide is the Pacific islands that lie in the tropical storm belt, and hence will be exposed to any increase in the intensity of tropical storms, as may occur with climate change.

There are other physical attributes of these islands that make them vulnerable – at particular risk are the densely populated, low lying coral atolls.

The next slide includes a list of the Pacific islands, ranked in terms of their vulnerability to sea level rise. The major discriminator is island type – however, national GDP is included also as a measure of the islands' capacity to respond to the threat and to adapt.

Vulnerability of Pacific Islands to sea level rise

Nation	Major island type	GNP per capita 1994 (US $)	Population (1995)	Maximum altitude (m)	Susceptibility to sea level rise
Tokelau	Atoll	4000	1500	4	Extreme
Marshall Islands	Atoll	2500	54700	4	
Tuvalu	Atoll, raised coral	–	9500	4	
Line Islands	Raised coral	–		8	
Kiribati	coral, atoll	730	78400	81	
Micronesia	Various	1890	105700	791	Severe
Palau	Coral	3250	16500	207	
Pitcairn	Coral, atoll	–	50	304	
Nauru		12000	10500	71	
French Polynesia	Volcanic, atoll	7000	218000	2237	
Cook Islands	Volcanic, varied	2750	19100	652	
Niue	Coral	2250	2500	67	
Tonga	Various	1640	98200	1125	
American Samoa	Volcanic	8000	54800	931	Moderate
Fiji	Mixed	2220	774800	1323	
New Caledonia	Mixed	11000	182200	1628	
N Marianas	Volcanic	–	56700	965	
Solomon Islands	Mixed, volcanic	1200	367800	2446	
Vanuatu	Mixed	1300	164100	1979	Modest
Wallis and Fatuna	Volcanic	3000	14400	769	
Easter Island	Volcanic	–	2811	600	
Papua New Guinea	Mixed	1120	4302000	4694	
Guam	Mixed	11800	149300	393	
Western Samoa	Volcanic	900	163400	1857	

Source: Woodward et al. (1998)

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This table shows vulnerability of Pacific island to sea level rise in categories (extreme, severe, moderate etc.). Note these labels apply to all islands based on the previous filled in value in the table.

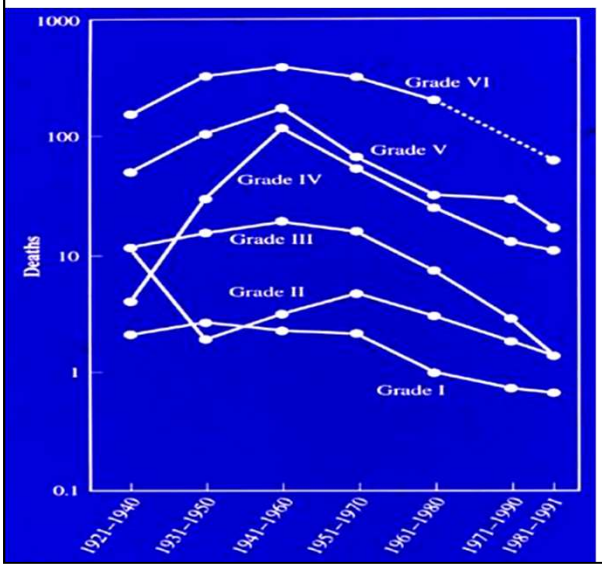
The low lying coral atolls, especially Tokelau, the Marshalls, and Tuvalu, have the greatest susceptibility to sea level rise. None of these islands are wealthy, as measured by GDP per capita. There are important cultural sources of resilience – traditional methods of weather forecasting, for example, and food storage, have helped many generations to cope with tropical storms. But without significant economic resources, these countries will find it difficult to make the structural adaptations that are required in the face of long-term climate change.

This is an important point – the most severe effects of climate change are likely to be experienced by those populations with the least resources. Poverty is a powerful driver of vulnerability.

However, poverty is not the only cause of vulnerability, and sometimes populations that are poor are very good at coping with climate extremes.

Source: Woodward et al. (1998)

Typhoon impacts by classification: a preparedness evaluation



Loss of life due to typhoons is decreasing owing to better preparedness (Fukuma, 1993)

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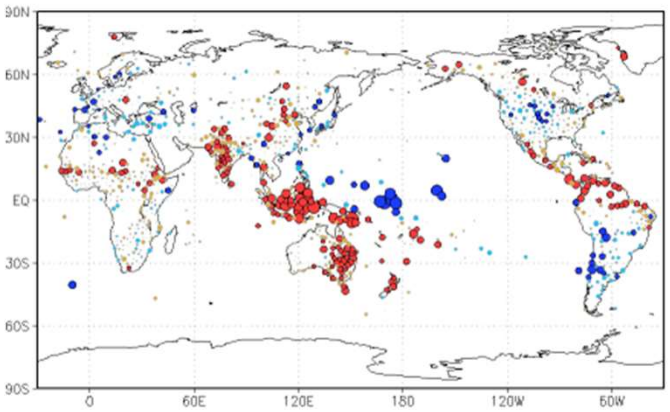
Moving to another example of a weather event – typhoons.

Typhoons frequently pass across Japan, and mortality per typhoon has varied markedly over the last 70 years.

The impact of these storms was greatest in the period 1941 to 1960, and since then has declined steeply. The recent improvement has been most marked for typhoons of intermediate severity (not surprising since this is where adaptive strategies are likely to make the greatest difference). Possible explanations include better land management, coastal protection, communications, and early warning systems and housing.

Effect of El Niño on rainfall



Data:
June – August over 40 years, to 2000

Red dots: drier than usual during El Niño

Blue dots: more rainfall

Size of circle: size of effect

Source: KNMI (2009)

El Niño events associated with weakening easterlies, warming of the western Pacific, & shift in rainfall patterns

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In terms of the weather events we've touched on, it is useful to understand a little bit about climate patterns, such as El Nino.

First, a brief explanation of what is meant by an 'El Niño event'.

These events are part of a cyclical climate pattern known as the El Niño Southern Oscillation, in which there are periodic shifts in ocean currents and prevailing winds, centered in the western Pacific. The El Niño part of this cycle involves weakening easterlies, warming of the Pacific on the western side, and a tendency for rainfall patterns to shift eastwards.

This map shows how El Niño events typically bring warmer and drier conditions to much of South East Asia, including the Indian sub-continent.

Pacific: Does modern agriculture reduce vulnerability to climate variability?

Traditional agriculture

- Crop diversity
- Drought-resistant staples (e.g. taro, yam)
- Robust methods of food preservation
- Strong social networks
- Inter-island trade systems

Modern agriculture

- Cash cropping
- Reliance on imported staples (e.g. rice)
- Unreliable methods of food preservation (e.g. refrigerators)
- Attenuated social networks
- Trade systems global, not local

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Source? - TBC

Modernity does not necessarily bring greater protection against climate extremes and other natural hazards, and traditional social systems. Although cash-poor, the Pacific's agricultural methods often included very important adaptive components.

Here are some examples from the Pacific, continuing the theme of food security and vulnerability to hunger.

3

HNAP & HIA approaches to assessing vulnerability

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In this third and last section of Module 12 we'll move on to a closer look at the process of conducting a vulnerability and adaptation assessment using a Health National Action Plan (or HNAP) and Health Impact Assessment (or HIA) approaches.

HNAP – a systematic process to:

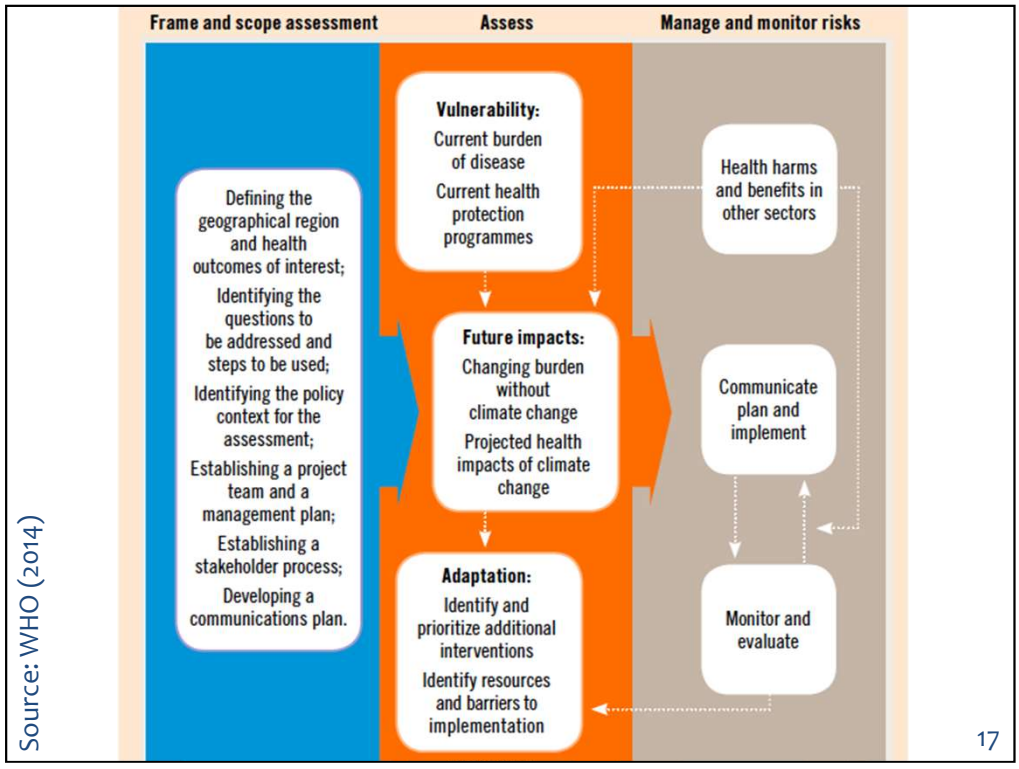
- Engage in the overall NAP process at the national level
- Identify national strategic goals for building health resilience to climate change (if countries have not done so through, for e.g., a National Health Adaptation Strategy)
- Develop a national plan with prioritized activities to achieve these goals, within a specific time period & given available resources

http://who.int/globalchange/publications/guidance-health-adaptation-planning/en/

This particular example showcases the current WHO guidance on developing a Health National Adaptation Plan (or HNAP). This 'WHO guidance to protect health from climate change through health adaptation planning' was published in 2014 and can be found online at the web address listed: http://www.who.int/globalchange/publications/guidance-health-adaptation-planning/en/

Under the United Nations Framework Convention on Climate Change, all countries are conducting National Adaptation Plans (NAPs).

Guidance on conducting NAPs was developed by the Least Developed Country Expert Group (LEG) << http://unfccc.int/adaptation/groups_committees/ldc_expert_group/items/4727.php>>. WHO developed guidance for Ministries of Health to develop the health components of the NAPs. The guidance is designed to fit within the national health process.



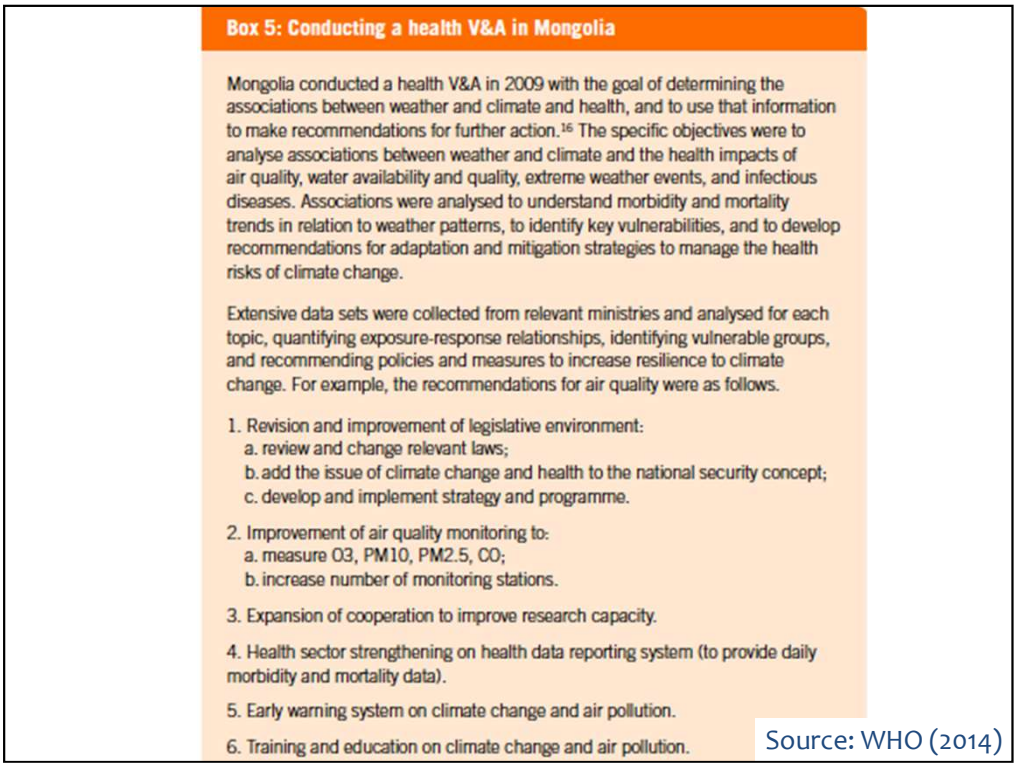
A core component of a HNAP is conducting a vulnerability and adaptation assessment. The process for doing so is outlined in the figure. **CLICK** to animate the figure to fill the screen.

WHO has a guidance document on conducting such an assessment << http://www.who.int/globalchange/publications/Final_Climate_Change.pdf>>.

Source: WHO operational framework for building climate-resilient health systems

The three categories of activities are:
1.Framing and scoping the assessment
2.Conducting the assessment; and
3.Managing and monitoring risks.

This guidance document is being used to conduct vulnerability and adaptation assessments in Asia and the Pacific.



Box 5: Conducting a health V&A in Mongolia

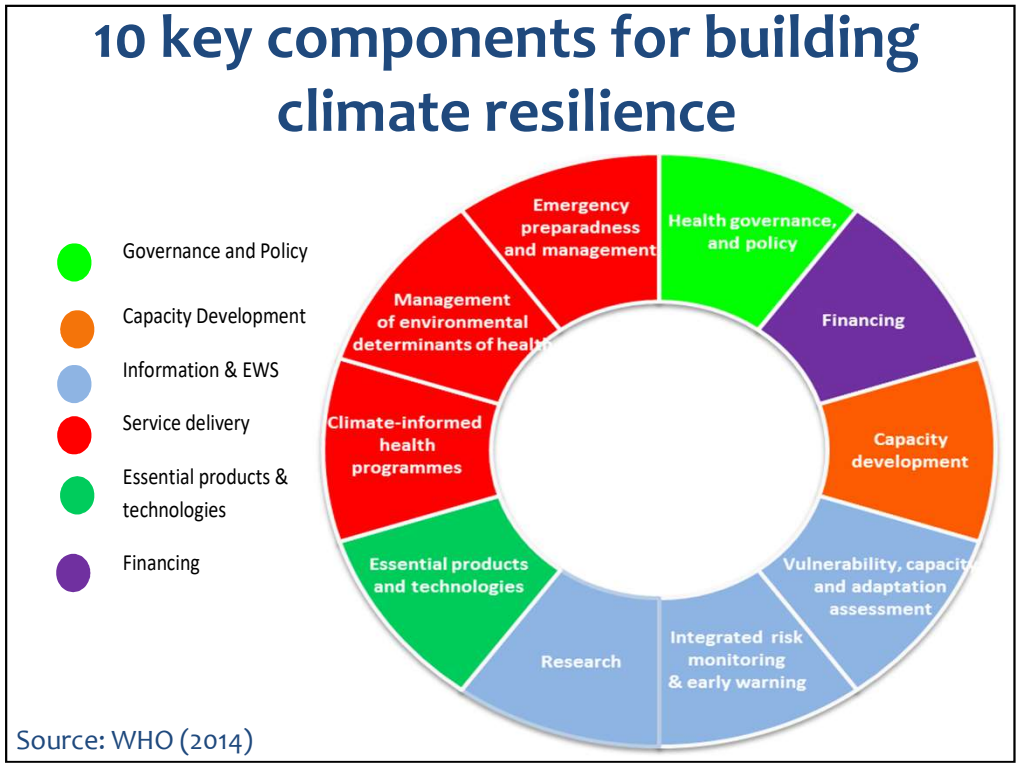
Mongolia conducted a health V&A in 2009 with the goal of determining the associations between weather and climate and health, and to use that information to make recommendations for further action.[16] The specific objectives were to analyse associations between weather and climate and the health impacts of air quality, water availability and quality, extreme weather events, and infectious diseases. Associations were analysed to understand morbidity and mortality trends in relation to weather patterns, to identify key vulnerabilities, and to develop recommendations for adaptation and mitigation strategies to manage the health risks of climate change.

Extensive data sets were collected from relevant ministries and analysed for each topic, quantifying exposure-response relationships, identifying vulnerable groups, and recommending policies and measures to increase resilience to climate change. For example, the recommendations for air quality were as follows.

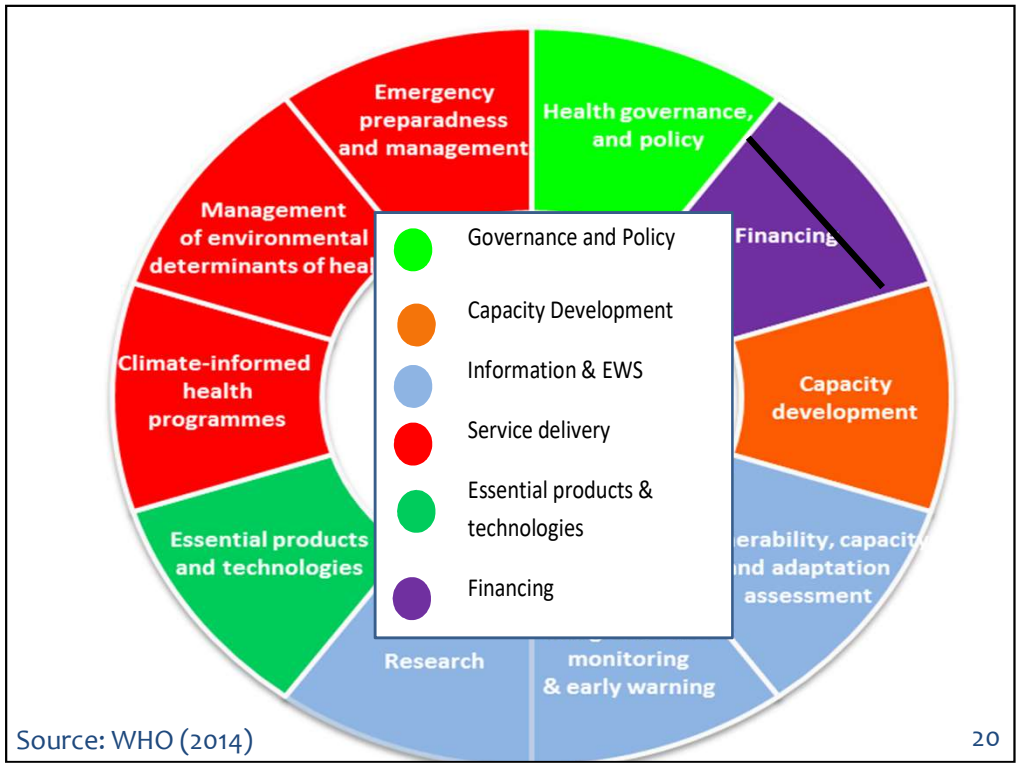
1. Revision and improvement of legislative environment:
   a. review and change relevant laws;
   b. add the issue of climate change and health to the national security concept;
   c. develop and implement strategy and programme.
2. Improvement of air quality monitoring to:
   a. measure O3, PM10, PM2.5, CO;
   b. increase number of monitoring stations.
3. Expansion of cooperation to improve research capacity.
4. Health sector strengthening on health data reporting system (to provide daily morbidity and mortality data).
5. Early warning system on climate change and air pollution.
6. Training and education on climate change and air pollution.

Source: WHO (2014)

The box provides an example of conducting a comprehensive health vulnerability and adaptation assessment in Mongolia. The box summarizes the goal and objectives of the assessment are stated, the approaches for conducting the assessment, and example recommendations for air quality. This is one of many examples in the guidance document, to help countries as they conduct their vulnerability and adaptation assessments.



The figure shows the ten key components for building climate resilience from the WHO operational framework for building climate-resilience health systems. The components are categorized into those whose primary focus is risk management, information, or foundational activities. The HNAP should identify priority adaptation policies and programmes to promote resilience within those components where the country needs are the largest to effectively manage the health risks of climate change.



Reflection exercise:

I'd like to give you a chance to reflect on your own country's vulnerability now. Next we're going to look at the HNAP and HIA as a comprehensive way to assess your country's vulnerability to health impacts from climate change – these will be key tools for you to take away in your ongoing work to reduce vulnerability.

But within the space of this session, I'm going to give you some time – about **4 minutes** – to do a very initial and informal assessment of roughly how your country is performing in each of these 10 areas that contribute to climate resilience.

In your slide notes, please take your pen and draw a line across each section of this pie at the level – out of 10 – that you think your country is performing at. For example, if your country generally has good financing available for programs targeting climate change and the health impacts of climate change, you might draw a line like this, towards the outer edge of the pie section – **CLICK** to show curved line. The closer to the outside of the pie your lines are, the more resilient you think your country is in this particular area. If sections have lines closer to the inside of the circle, this would be an area you think your country is much less climate resilient in.

So over the next 4 minutes consider each pie section and draw a line somewhere across each section, with 0 – not resilient - on the inner ring and 10 – very resilient - on the outer ring.

Are there any questions? No? Ok, please do your rough spider diagram."

Give time countdown: **3 mins** "You have another minute to finish off.

4 mins: "Ok, now that you have a rough spider diagram of the resilience of your country in these 10 areas, I'd like you to pair up with a person near you and share the key areas where you think your country is most resilient, and those where you think you are least resilient to climate change.

You'll have 45 seconds each to share, so these will be only the 2 – 3 most resilient and least resilient areas you'll be sharing.

Give swap over instruction at **1 minute**.

At 2 minutes: "Ok, thank you for sharing."

To finish off, I'm curious about which categories of these 10 components you think your country is *least* resilient in. Have a look again at the category titles for the section colours – **CLICK twice** to show – Government & policy, capacity development, information & early warning systems, essential products & technologies, and financing, and where your lowest lines where, closest to the inner ring.

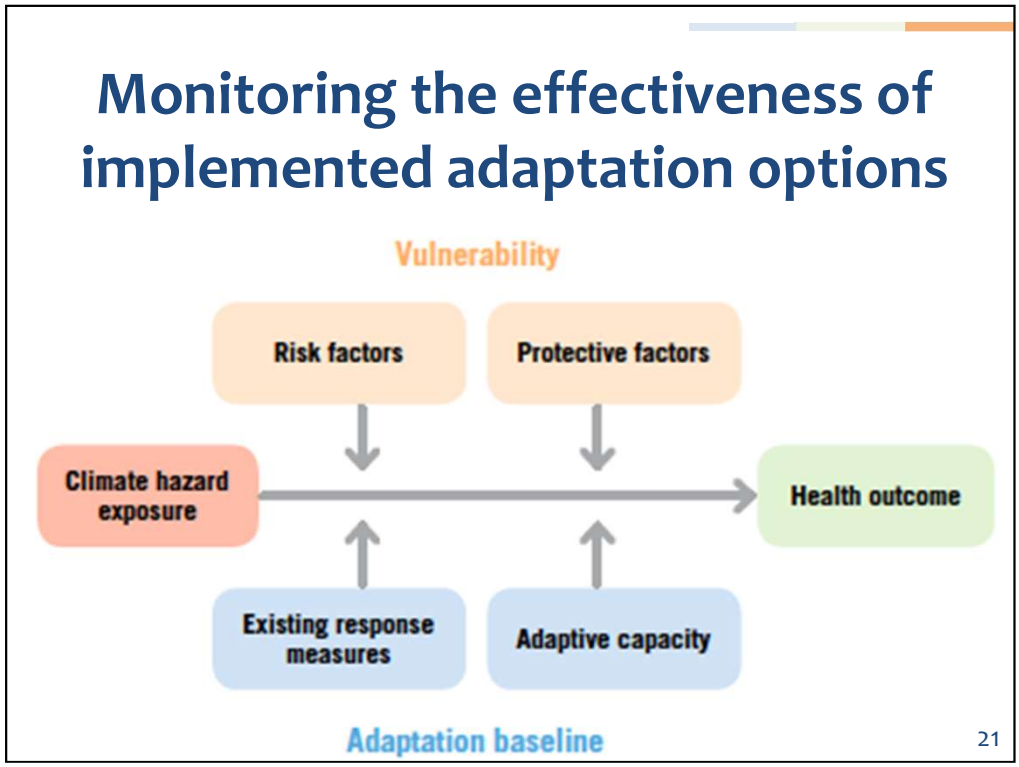
Can I get you to raise your hand as I name each category if that was an area where your lowest lines occurred?"

Read each, *slowly*, raising your own hand as you say the category title to model the behaviour you're seeking. Allow enough time between each category that people can look around the room to get a sense of areas that other countries may also be less resilient in.

- Government & policy
- Capacity development
- Information & early warning systems
- Essential products & technologies; and
- Financing

"Thank you, that's an interesting indicative exercise that might give us a sense of some of the key areas that will feature in the HNAP's developed by a range of countries."

Trainer note: NB This exercise was developed after the review process to introduce an exercise for this module. But if the trainer presenting it is not comfortable with the stringency of this informal assessment compared to a HNAP or HIA, please delete this slide.



When a HNAP is developed, an important component is indicators for monitoring the effectiveness of adaptation options that have been implemented.

From the perspective of vulnerability, indicators should be identified for monitoring changes in risk and protective factors. From the perspective of the level of adaptation before the HNAP was conducted, indicators should be identified for monitoring changes in the effectiveness of existing response measures and in the community / national capacity to prepare for, respond to, cope with, and recover from the health risks of climate change. These four factors are mediators of the extent to which exposure to the hazards of climate change are translated into health impacts.

Let's look next at a Health Impact Assessment and what that would be made up of.

SOURCE?

Health Impact Assessment (HIA)

A combination of procedures, methods & tools by which a policy, project or hazard may be judged as to its potential effects on the health of a population, & the distribution of those effects within the population

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A Health Impact Assessment is a combination of procedures, methods & tools by which a policy, project or hazard may be judged as to its potential effects on the health of a population, & the distribution of those effects within the population

An adaptation assessment can be considered as part of a health impact assessment.

Elements in a HIA

- Quantification of the expected health burden due to an environmental exposure in a specific population
- Integrated assessment of impacts, i.e. not concentrating on single risk factors & disease outcomes (a holistic view of health)
- Relates to policies & projects outside the health sector
- Provides information for decision-makers, designed with needs of decision-makers in mind
- Multidisciplinary process

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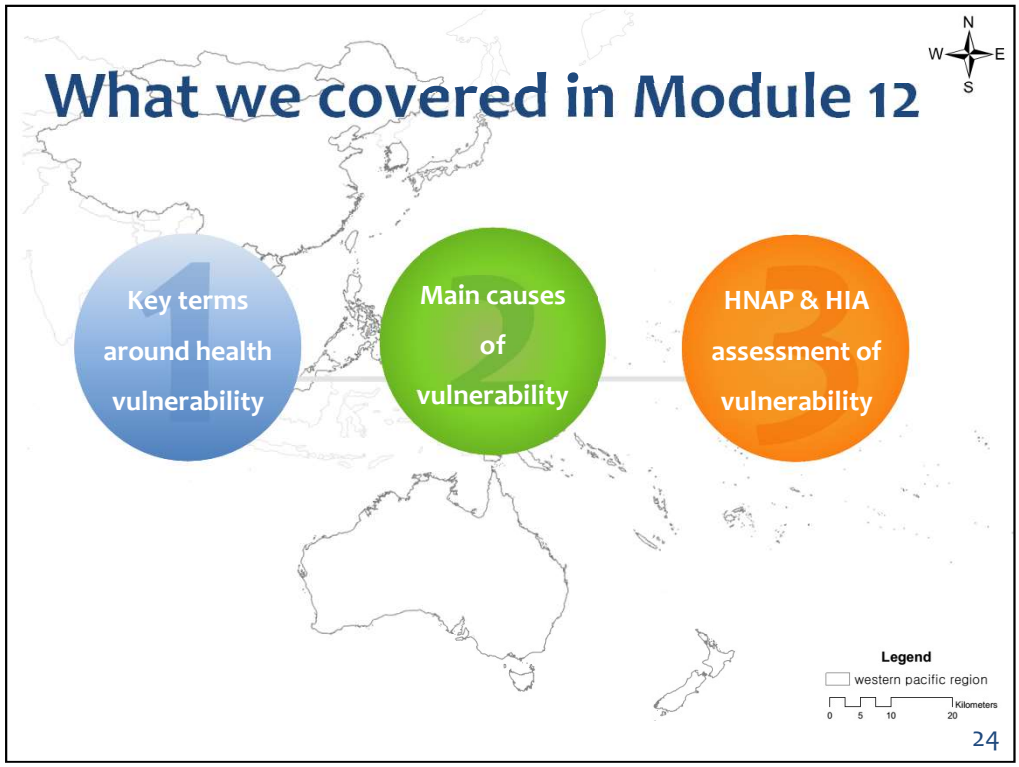
This lists the standard elements of a health impact assessment - **CLICK** to animate each one (5 in total)



In module 12 we covered:

1. A definition of key terms around health vulnerability
2. The main causes of vulnerability to disease and injury resulting from climate change; and
3. Describing the HNAP and the Health Impact Assessment approaches to assessing vulnerability

Learning from Module 12

The health impacts of climate change will be inequitably distributed within & between countries

"The rich will find their world to be more expensive, inconvenient, uncomfortable, disrupted & colorless — in general, more unpleasant & unpredictable, perhaps greatly so. The poor will die."

- Kirk R. Smith (2008)

University of California, Berkeley

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Combine with conclusions

The key message shown here is the health impacts of climate change will be inequitably distributed within and between countries. Given this message, it is thus important to improve our understanding of communities' differential levels of vulnerability, in order to prioritise limited resources. Unless we have this understanding of different types and levels of vulnerability, then it is virtually impossible to design responses that meet the needs of communities.

Smith, K. (2008).Mitigating, adapting and suffering. How much of each? **Annual Review of Public Health (29)** (doi:10.1146/annurev.pu.29.031708.100011)

Learning from Module 12

- Vulnerability is the propensity to be adversely affected
- Causes of vulnerability include biological characteristics, the physical environment, social circumstances & national & international politics
- Vulnerability can be assessed using HIA & HNAP
- Many facets of vulnerability means many opportunities for intervention

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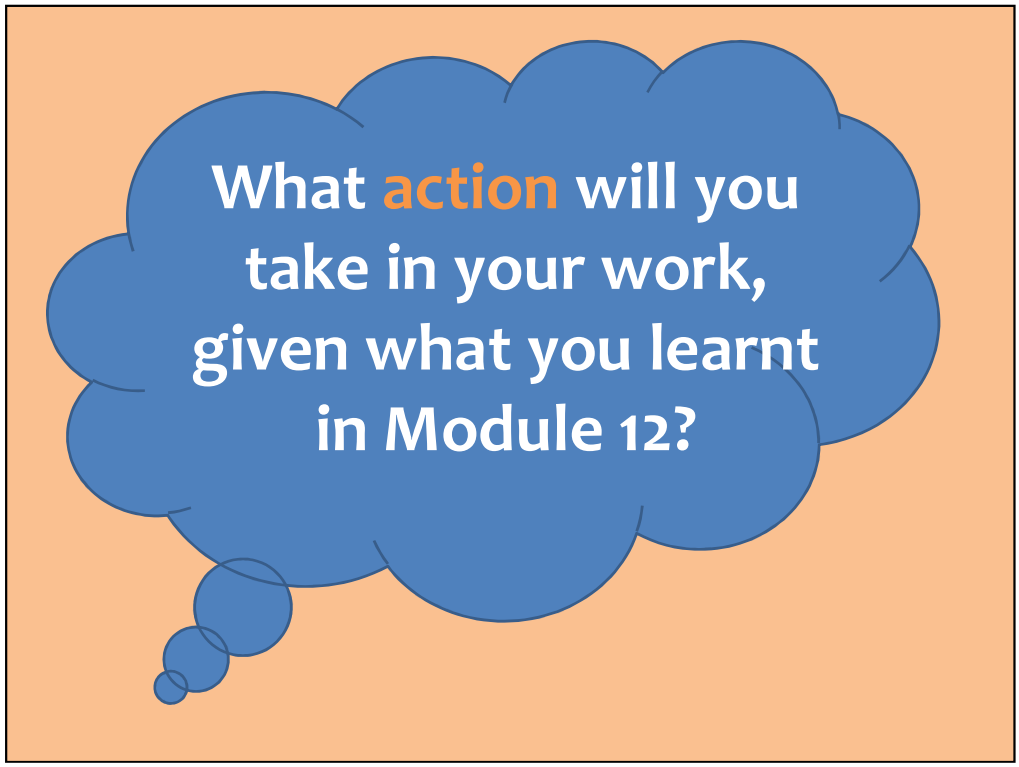
Key learnings around assessing health vulnerability to climate change are: (**CLICK** to animate four points)

1. Vulnerability is the propensity to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

2. The causes of vulnerability fall across a spectrum, ranging from biological characteristics of organisms to the terms of international trade.

3. Framing vulnerability in this way is not to suggest the phenomenon is too big and wide to grasp. To the contrary, the many facets of vulnerability mean there is a correspondingly wide range of opportunities for intervention at the various levels.

4. And finally, an important point: many of the causes of vulnerability to climate change make individuals and populations susceptible to other environmental threats as well. As a result, intervention to reduce vulnerability to climate change will bring other benefits, and these will very likely be evident before the full impact of climate change is apparent.



To finish off Module 12, I'll ask you to spend the next few minutes looking over your notes and reflecting on the key learnings from this module for you.

Please take some notes on any action steps you'd like to take once you're back at work, based on what you've learnt around assessing health vulnerability.

Encourage quiet reflection (verbally if needed). At the end of **2 minutes**: "Thanks. I look forward to hearing some of the actions that were captured over the coming days."

Coming up tomorrow…

Day 3:

- Understanding the impacts of thermal extremes & extreme weather events
- Managing disaster risk
- Learning from good practice in the region

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Next tomorrow…

Module 6:

Impacts of thermal extremes