

Climate Change Policy HIA Training for Health Professionals Toolkit

December 2011



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1 PARTICIPANT GUIDE & EVALUATION

Participant Guide

Learning Aim and Objectives

This training module's aim is to improve the knowledge of public health professionals on the use of Health Impact Assessments in evaluating the health effects of climate change policy.

The training is designed for professionals with experience conducting or contributing to Health Impact Assessments who are familiar with climate change's potential impact on population health. The training will provide a foundation of understanding different types of climate change policy and how each sector of policy can influence different health determinants.

On completion of the materials learners will

- Define critical climate change policy or policy elements that support prevention or mitigation of climate change among various sectors;
- Differentiate among health policy types including climate change health effects, mitigation policy effects, adaptation policy effects and emergency preparedness effects;
- Evaluate appropriateness of HIA on various climate change policy types such as adaptation, mitigation and emergency preparedness;
- Determine the apparent co-benefits for climate change policy, identify the co-costs, key areas of uncertainty, and the range of further questions necessary for addressing health outcomes;
- Delineate the critical pathways between climate change policy and population health effects, encompassing direct and indirect mechanisms;
- Identify relevant quantitative methods to measure these health effects; apply methods to various populations representing urban, rural and low-income;
- Understand how HIAs on climate change policy can address equity;
- Develop appropriate climate change policy communication techniques within the climate change political debate without being sidetracked;
- Appropriately scope a potential climate change policy based the policy details and available resources.

Training Outline

The training materials consist of a seven-chapter Powerpoint presentation with recorded audio, a Toolkit including exercises, resources and this Participant's Guide.

Presentation Outline

- Chapter 1 – Overview and Introduction
- Chapter 2 – Climate Change Policies
- Chapter 3 – Screening
- Chapter 4 – Scoping
- Chapter 5 – Assessment
- Chapter 6 – Recommendations, Reporting and Dissemination
- Chapter 7 – Monitoring and Evaluation

Evaluation

A training evaluation survey is included in the Toolkit, encouraging learners to provide feedback to the training administrators in order to improve the course content over time.

Course Authors and Reviewers

Upstream Public Health in collaboration with the Oregon Health Authority developed the materials for this training. Upstream is an Oregon-based non-profit organization that works to advance policies that create the social and economic conditions where all Oregonians can thrive. Upstream Public Health has been working to help policy makers consider the health and climate change impacts of land use, transportation and Farm to School policies. They were the lead author of three Health Impact Assessments, two of which were focused on climate change policies, available on their website -- www.upstreampublichealth.org/publications?type=reports. Upstream coordinated the first Health Impact Assessment (HIA) ever done on a climate change policy to study how each of the 11 initiatives under consideration to reduce VMT would impact health, both positively and negatively. This project gained national relevance, and the HIA was highlighted as one of three Trends in America in sustainable communities by the Council of State Governments.

This publication was supported by the Cooperative Agreement Number 5UE1EH000747 from The Centers for Disease Control and Prevention. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention.

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Training Day Structure (if applicable)

The structure of the day provided me opportunities to ask questions.

The group discussions helped my understanding.

The group exercises helped me understand how to apply the information.

There were enough breaks in the day.

Disagree Strongly	Disagree	Neither Agree nor Disagree	Agree	Agree Strongly
1	2	3	4	5

Presentation and Materials

The presentation helped give me a broad overview of Climate Change Policy HIAs.

The visual presentation was easy to follow.

The oral presentation added to my understanding of the content.

The exercises in the presentation helped me engage with the material.

The Toolkit items will help me deepen my understanding.

The Toolkit items have clear and adequate background information.

Disagree Strongly	Disagree	Neither Agree nor Disagree	Agree	Agree Strongly
1	2	3	4	5

2

CLIMATE CHANGE & HEALTH GLOSSARY OF TERMS

GLOSSARY

Climate Change Terms

The Glossary of Climate Change Terms was sourced and adapted from the United States Environmental Protection Agency's Glossary of Climate Change Terms. This glossary can be found online at: <http://www.epa.gov/climatechange/glossary.html>

A

Aerosol

A collection of airborne solid or liquid particles, with a typical size between 0.01 and 10 micrometers (μm) and residing in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin. Aerosols may influence climate in two ways: directly through scattering and absorbing radiation, and indirectly through acting as condensation nuclei for cloud formation or modifying the optical properties and lifetime of clouds. The term has also come to be associated, erroneously, with the propellant used in "aerosol sprays." See [climate](#), [particulate matter](#), [sulfate aerosols](#).³

Adaptation

Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.⁵

Afforestation

Planting of new forests on lands that historically have not contained forests.³

Albedo

The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Snow covered surfaces have a high albedo; the albedo of soils ranges from high to low; vegetation covered surfaces and oceans have a low albedo. The Earth's albedo varies mainly through varying cloudiness, snow, ice, leaf area and land cover changes.³

Alternative Energy

Energy derived from nontraditional sources (e.g., compressed natural gas, solar, hydroelectric, wind).⁵

Annex 1 Countries/Parties

Group of countries included in Annex I (as amended in 1998) to the United Nations Framework Convention on Climate Change, including all the developed countries in the Organization of Economic Co-operation and Development, and economies in transition. By default, the other countries are referred to as Non-Annex I countries. Under Articles 4.2 (a) and 4.2 (b) of the Convention, Annex I countries commit themselves specifically to the aim of returning individually or jointly to their 1990 levels of greenhouse gas emissions by the year 2000.⁵

Anthropogenic

Made by people or resulting from human activities. Usually used in the context of emissions that are produced as a result of human activities.⁶

Atmosphere

The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium, radiatively active greenhouse gases such as carbon dioxide (0.035% volume mixing ratio), and ozone. In addition the atmosphere contains water vapor, whose amount is highly variable but typically 1% volume mixing ratio. The atmosphere also contains clouds and aerosols.³

Atmospheric Lifetime

The lifetime of a greenhouse gas refers to the approximate amount of time it would take for the anthropogenic increment to an atmospheric pollutant concentration to return to its natural level (assuming emissions cease) as a result of either being converted to another chemical compound or being taken out of the atmosphere via a sink. This time depends on the pollutant's sources and sinks as well as its reactivity. The lifetime of a pollutant is often considered in conjunction with the mixing of pollutants in the atmosphere; a long lifetime will allow the pollutant to mix throughout the atmosphere. Average lifetimes can vary from about a week (sulfate aerosols) to more than a century (chlorofluorocarbons (CFCs), carbon dioxide). See [greenhouse gas](#) and [residence time](#).³

B

Biogeochemical Cycle

Movements through the Earth system of key chemical constituents essential to life, such as carbon, nitrogen, oxygen, and phosphorus.⁶

Biomass

Total dry weight of all living organisms that can be supported at each trophic level in a food chain. Also, materials that are biological in origin, including organic material (both living and dead) from above and below ground, for example, trees, crops, grasses, tree litter, roots, and animals and animal waste.⁷

Biosphere

The part of the Earth system comprising all ecosystems and living organisms, in the atmosphere, on land (terrestrial biosphere) or in the oceans (marine biosphere), including derived dead organic matter, such as litter, soil organic matter and oceanic detritus.³

Black Carbon

Operationally defined species based on measurement of light absorption and chemical reactivity and/or thermal stability; consists of soot, charcoal, and/or possible light-absorbing refractory organic matter. (Source: Charlson and Heintzenberg, 1995, p. 401.)³

Borehole

Any exploratory hole drilled into the Earth or ice to gather geophysical data. Climate researchers often take ice core samples, a type of borehole, to predict atmospheric composition in earlier years. See [ice core](#).

C

Cap

Mandated restraint as an upper limit on emissions. The Kyoto Protocol mandates emissions caps in a scheduled timeframe on the anthropogenic GHG emissions released by Annex B countries. By 2008-2012 the EU e.g. must reduce its CO₂-equivalent emissions of six greenhouse gases to a level 8% lower than the 1990-level.

Carbon Cycle

All parts (reservoirs) and fluxes of carbon. The cycle is usually thought of as four main reservoirs of carbon interconnected by pathways of exchange. The reservoirs are the atmosphere, terrestrial biosphere (usually includes freshwater systems), oceans, and sediments (includes fossil fuels). The annual movements of carbon, the carbon exchanges between reservoirs, occur because of various chemical, physical, geological, and biological processes. The ocean contains the largest pool of carbon near the surface of the Earth, but most of that pool is not involved with rapid exchange with the atmosphere.⁶

Carbon Dioxide

A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1. See [climate change](#) and [global warming](#).⁵

Carbon Dioxide Fertilization

The enhancement of the growth of plants as a result of increased atmospheric CO₂ concentration. Depending on their mechanism of photosynthesis, certain types of plants are more sensitive to changes in atmospheric CO₂ concentration.³

Carbon Dioxide Equivalent

A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). Carbon dioxide equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMTCO₂Eq)." The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP. The use of carbon equivalents (MMTCE) is declining. $MMTCO_2Eq = (\text{million metric tons of a gas}) * (\text{GWP of the gas})$

See [greenhouse gas](#), [global warming potential](#), [metric ton](#).

Carbon Intensity

The amount of carbon by weight emitted per unit of energy consumed. A common measure of carbon intensity is weight of carbon per British thermal unit (Btu) of energy. When there is only one fossil fuel under consideration, the carbon intensity and the emissions coefficient are identical. When there are several fuels, carbon intensity is based on their combined emissions coefficients weighted by their energy consumption levels.¹

Carbon Sequestration

The uptake and storage of carbon. Trees and plants, for example, absorb carbon dioxide, release the oxygen and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned. See [sinks](#).⁶

Chlorofluorocarbons

Greenhouse gases covered under the 1987 Montreal Protocol and used for refrigeration, air conditioning, packaging, insulation, solvents, or aerosol propellants. Since they are not destroyed in the lower atmosphere, CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone. These gases are being replaced by other compounds, including hydrochlorofluorocarbons and hydrofluorocarbons, which are greenhouse gases covered under the Kyoto Protocol. See [hydrochlorofluorocarbons](#), [hydrofluorocarbons](#), [perfluorocarbons](#), [ozone depleting substance](#).⁵

Climate

Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands of years. The classical period is 3 decades, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. See [weather](#).³

Climate Change

Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer). Climate change may result from:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- Natural processes within the climate system (e.g. changes in ocean circulation);
- Human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.)
- See [climate](#), [global warming](#), [greenhouse effect](#), [enhanced greenhouse effect](#), [radiative forcing](#).

Climate Feedback

An interaction mechanism between processes in the climate system is called a climate feedback, when the result of an initial process triggers changes in a second process that in turn influences the initial one. A positive feedback intensifies the original process, and a negative feedback reduces it. See [climate](#), [climate change](#), [radiative forcing](#).³

Climate Lag

The delay that occurs in climate change as a result of some factor that changes only very slowly. For example, the effects of releasing more carbon dioxide into the atmosphere may not be known for some time because a large fraction is dissolved in the ocean and only released to the atmosphere many years later. See [climate](#), [climate change](#).

Climate Model

A quantitative way of representing the interactions of the atmosphere, oceans, land surface, and ice. Models can range from relatively simple to quite comprehensive. See [General Circulation Model](#).⁶

Climate Sensitivity

In IPCC Reports, equilibrium climate sensitivity refers to the equilibrium change in global mean surface temperature following a doubling of the atmospheric (equivalent) CO₂ concentration. More generally, equilibrium climate sensitivity refers to the equilibrium change in surface air temperature following a unit change in radiative forcing (degrees Celsius, per watts per square meter, °C/Wm⁻²). In practice, the evaluation of the equilibrium climate sensitivity requires very long simulations with Coupled General Circulation Models (Climate model). The effective climate sensitivity is a related measure that circumvents this requirement. It is evaluated from model output for evolving non-equilibrium conditions. It is a measure of the strengths of the feedbacks at a particular time and may vary with forcing history and climate state. See [climate](#), [radiative forcing](#).³

Climate System (or Earth System)

The five physical components (atmosphere, hydrosphere, cryosphere, lithosphere, and biosphere) that are responsible for the climate and its variations.⁶

Coalbed Methane

Coalbed methane is methane contained in coal seams, and is often referred to as virgin coalbed methane, or coal seam gas. For more information, visit the [Coalbed Methane Outreach program site](#).

Coal Mine Methane

Coal mine methane is the subset of CBM that is released from the coal seams during the process of coal mining. For more information, visit the [Coalbed Methane Outreach program site](#).

Co-Benefit

The benefits of policies that are implemented for various reasons at the same time – including climate change mitigation – acknowledging that most policies designed to address greenhouse gas mitigation also have other, often at least equally important, rationales (e.g., related to objectives of development, sustainability, and equity). The term co-impact is also used in a more generic sense to cover both the positive and negative side of the benefits.⁵

Co-Cost

The negative impacts of policies that diminish health, coined by Upstream Public Health to differentiate between positive impacts to health (co-benefits) and negative impacts to health (co-costs) as part of co-impacts.

Concentration

Amount of a chemical in a particular volume or weight of air, water, soil, or other medium. See [parts per billion](#), [parts per million](#).⁷

Conference of the Parties

The supreme body of the United Nations Framework Convention on Climate Change (UNFCCC). It comprises more than 180 nations that have ratified the Convention. Its first session was held in Berlin, Germany, in 1995 and it is expected to continue meeting on a yearly basis. The COP's role is to promote and review the implementation of the Convention. It will periodically review existing commitments in light of the Convention's objective, new scientific findings, and the effectiveness of national climate change programs. See [United Nations Framework Convention on Climate Change](#).

Cost-Benefit Analysis

Monetary measurement of all negative and positive impacts associated with a given action. Costs and benefits are compared in terms of their difference and/or ratio as an indicator of how a given investment or other policy effort pays off seen from the society's point of view.

Cost-Effectiveness Analysis

A special case of cost-benefit analysis in which all the costs of a portfolio of projects are assessed in relation to a fixed policy goal. The policy goal in this case represents the benefits of the projects and all the other impacts are measured as costs or as negative costs (co-benefits). The policy goal can be, for example, a specified goal of emissions reductions of greenhouse gases.

Cryosphere

One of the interrelated components of the Earth's system, the cryosphere is frozen water in the form of snow, permanently frozen ground (permafrost), floating ice, and glaciers. Fluctuations in the volume of the cryosphere cause changes in ocean sea level, which directly impact the atmosphere and biosphere.⁶

D

Deforestation

Those practices or processes that result in the conversion of forested lands for non-forest uses. This is often cited as one of the major causes of the enhanced greenhouse effect for two reasons: 1) the burning or decomposition of the wood releases carbon dioxide; and 2) trees that once removed carbon dioxide from the atmosphere in the process of photosynthesis are no longer present.⁷

Desertification

Land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Further, the UNCCD (The United Nations Convention to Combat Desertification) defines land degradation as a reduction or loss, in arid, semi-arid, and dry sub-humid areas, of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest, and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil erosion caused by wind and/or water; (ii) deterioration of the physical, chemical and biological or economic properties of soil; and (iii) long-term loss of natural vegetation. Conversion of forest to non-forest.

Disaster Preparedness

Process of ensuring that an organization (1) has complied with the preventive measures, (2) is in a state of readiness to contain the effects of a forecasted disastrous event to minimize loss of life, injury, and damage to property, (3) can provide rescue, relief, rehabilitation, and other services in the aftermath of the disaster, and (4) has the capability and resources to continue to sustain its essential functions without being overwhelmed by the demand placed on them. Preparedness for the first and immediate response is called emergency preparedness.

Discounting

A mathematical operation making monetary (or other) amounts received or expended at different points in time (years) comparable across time. The operator uses a fixed or possibly time-varying discount rate (>0) from year to year that makes future value worth less today. In a descriptive discounting approach one accepts the discount rates people (savers and investors) actually apply in their day-to-day decisions (private discount rate). In a prescriptive (ethical or normative) discounting approach the discount rate is fixed from a social perspective, e.g. based on an ethical judgement about the interests of future generations (social discount rate).

E

Eccentricity

The extent to which the Earth's orbit around the Sun departs from a perfect circle.

Ecosystem

Any natural unit or entity including living and non-living parts that interact to produce a stable system through cyclic exchange of materials.⁶

El Niño - Southern Oscillation (ENSO)

El Niño, in its original sense, is a warm water current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. This oceanic event is associated with a fluctuation of the intertropical surface pressure pattern and circulation in the Indian and Pacific Oceans, called the Southern Oscillation. This coupled atmosphere-ocean phenomenon is collectively known as El Niño-Southern Oscillation. During an El Niño event, the prevailing trade winds weaken and the equatorial countercurrent strengthens, causing warm surface waters in the Indonesian area to flow eastward to overlies the cold waters of the Peru current. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world. The opposite of an El Niño event is called La Niña.⁴

Emergency Management

Emergency management is intended to reduce the risk posed by actual and potential hazards. Hazards can be natural, technological or complex.²

Emissions

The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere.

Emissions Factor

A unique value for scaling emissions to activity data in terms of a standard rate of emissions per unit of activity (e.g., grams of carbon dioxide emitted per barrel of fossil fuel consumed).⁷

Emissions Trading

A market-based approach to achieving environmental objectives. It allows those reducing GHG emissions below their emission cap to use or trade the excess reductions to offset emissions at another source inside or outside the country. In general, trading can occur at the intra-company, domestic, and international levels. The Second Assessment Report by the IPCC adopted the convention of using permits for domestic trading systems and quotas for international trading systems. Emissions trading under Article 17 of the Kyoto Protocol is a tradable quota system based on the assigned amounts calculated from the emission reduction and limitation commitments listed in Annex B of the Protocol.

Energy Intensity

The ratio of energy consumption to a measure of the demand for services (e.g., number of buildings, total floorspace, floorspace-hours, number of employees, or constant dollar value of Gross Domestic Product for services).²

Enhanced Greenhouse Effect

The concept that the natural greenhouse effect has been enhanced by anthropogenic emissions of greenhouse gases. Increased concentrations of carbon dioxide, methane, and nitrous oxide, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆), nitrogen trifluoride (NF₃), and other photochemically important gases caused by human activities such as fossil fuel consumption, trap more infra-red radiation, thereby exerting a warming influence on the climate. See [greenhouse gas](#), [anthropogenic](#), [greenhouse effect](#), [climate](#), [global warming](#).⁷

Evapotranspiration

The combined process of evaporation from the Earth's surface and transpiration from vegetation.³

F

Feedback Mechanisms

Factors which increase or amplify (positive feedback) or decrease (negative feedback) the rate of a process. An example of positive climatic feedback is the ice-albedo feedback. See [climate feedback](#).⁶

Flouorocarbons

Carbon-fluorine compounds that often contain other elements such as hydrogen, chlorine, or bromine. Common fluorocarbons include chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). See [chlorofluorocarbons](#), [hydrochlorofluorocarbons](#), [hydrofluorocarbons](#), [perfluorocarbons](#), [ozone depleting substance](#).⁶

Forcing Mechanism

A process that alters the energy balance of the climate system, i.e. changes the relative balance between incoming solar radiation and outgoing infrared radiation from Earth. Such mechanisms include changes in solar irradiance, volcanic eruptions, and enhancement of the natural greenhouse effect by emissions of greenhouse gases. See [radiation](#), [infrared radiation](#), [radiative forcing](#).

Fossil Fuels

Carbon-based fuels from fossil hydrocarbon deposits, including coal, peat, oil and natural gas.

G

General Circulation Model (GCM)

A global, three-dimensional computer model of the climate system which can be used to simulate human-induced climate change. GCMs are highly complex and they represent the effects of such factors as reflective and absorptive properties of atmospheric water vapor, greenhouse gas concentrations, clouds, annual and daily solar heating, ocean temperatures and ice boundaries. The most recent GCMs include global representations of the atmosphere, oceans, and land surface. See [climate modeling](#).⁶

Geosphere

The soils, sediments, and rock layers of the Earth's crust, both continental and beneath the ocean floors.

Glacier

A multi-year surplus accumulation of snowfall in excess of snowmelt on land and resulting in a mass of ice at least 0.1 km² in area that shows some evidence of movement in response to gravity. A glacier may terminate on land or in water. Glacier ice is the largest reservoir of fresh water on Earth, and second only to the oceans as the largest reservoir of total water. Glaciers are found on every continent except Australia.⁶

Global Warming

Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities. See [climate change](#), [greenhouse effect](#), [enhanced greenhouse effect](#), [radiative forcing](#), [troposphere](#).

H

Hydrofluorocarbons (HFCs)

Compounds containing only hydrogen, fluorine, and carbon atoms. They were introduced as alternatives to ozone depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are also used in manufacturing. They do not significantly deplete the stratospheric ozone layer, but they are powerful greenhouse gases with global warming potentials ranging from 140 (HFC-152a) to 11,700 (HFC-23).

Hydrologic Cycle

The process of evaporation, vertical and horizontal transport of vapor, condensation, precipitation, and the flow of water from continents to oceans. It is a major factor in determining climate through its influence on surface vegetation, the clouds, snow and ice, and soil moisture. The hydrologic cycle is responsible for 25 to 30 percent of the mid-latitudes' heat transport from the equatorial to polar regions.⁶

Hydrosphere

The component of the climate system comprising liquid surface and subterranean water, such as: oceans, seas, rivers, fresh water lakes, underground water etc.³

Ice Core

A cylindrical section of ice removed from a glacier or an ice sheet in order to study climate patterns of the past. By performing chemical analyses on the air trapped in the ice, scientists can estimate the percentage of carbon dioxide and other trace gases in the atmosphere at a given time.

Infrared Radiation

Radiation emitted by the Earth's surface, the atmosphere and the clouds. It is also known as terrestrial or long-wave radiation. Infrared radiation has a distinctive range of wavelengths ("spectrum") longer than the wavelength of the red color in the visible part of the spectrum. The spectrum of infrared radiation is practically distinct from that of solar or short-wave radiation because of the difference in temperature between the Sun and the Earth-atmosphere system. See [radiation](#), [greenhouse effect](#), [enhanced greenhouse effect](#), [global warming](#).³

Intergovernmental Panel on Climate Change (IPCC)

The IPCC was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world's expert scientists as authors and thousands as expert reviewers.

Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world's governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national greenhouse gas emission inventories.

K

Kyoto Protocol

The Kyoto Protocol to the UNFCCC was adopted at the Third Session of the Conference of the Parties (COP) in 1997 in Kyoto. It contains legally binding commitments, in addition to those included in the FCCC. Annex B countries agreed to reduce their anthropogenic GHG emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) by at least 5% below 1990 levels in the commitment period 2008-2012. The Kyoto Protocol came into force on 16 February 2005.

L

Landfill

Land waste disposal site in which waste is generally spread in thin layers, compacted, and covered with a fresh layer of soil each day.⁷

Land-use

The total of arrangements, activities and inputs undertaken in a certain land-cover type (a set of human actions). The social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation). Land-use change occurs when, e.g., forest is converted to agricultural land or to urban areas.

Longwave Radiation

The radiation emitted in the spectral wavelength greater than 4 micrometers corresponding to the radiation emitted from the Earth and atmosphere. It is sometimes referred to as 'terrestrial radiation' or 'infrared radiation,' although somewhat imprecisely. See [infrared radiation](#).⁶

M

Methane (CH₄)

A hydrocarbon that is a greenhouse gas with a global warming potential most recently estimated at 23 times that of carbon dioxide (CO₂). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion. The GWP is from the IPCC's Third Assessment Report (TAR). For more information visit EPA's Methane site: <http://www.epa.gov/methane/scientific.html>.

Metric Ton

Common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 2205 lbs or 1.1 short tons. See [short ton](#).⁷

Mitigation

Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce GHG emissions and enhance sinks.⁸

Mount Pinatubo

A volcano in the Philippine Islands that erupted in 1991. The eruption of Mount Pinatubo ejected enough particulate and sulfate aerosol matter into the atmosphere to block some of the incoming solar radiation from reaching Earth's atmosphere. This effectively cooled the planet from 1992 to 1994, masking the warming that had been occurring for most of the 1980s and 1990s.⁶

Municipal Solid Waste (MSW)

Residential solid waste and some non-hazardous commercial, institutional, and industrial wastes. This material is generally sent to municipal landfills for disposal. See [landfill](#).

N

Natural Gas

Underground deposits of gases consisting of 50 to 90 percent methane (CH₄) and small amounts of heavier gaseous hydrocarbon compounds such as propane (C₃H₈) and butane (C₄H₁₀).

Nitrogen Oxides (NO_x)

Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere, nitrogen oxides can contribute to formation of photochemical ozone (smog), can impair visibility, and have health consequences; they are thus considered pollutants.⁶

Nitrous Oxide (N₂O)

A powerful greenhouse gas with a global warming potential of 296 times that of carbon dioxide (CO₂). Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning. The GWP is from the IPCC's Third Assessment Report (TAR).⁶

Non-Methane Volatile Organic Compounds (NMVOCs)

Organic compounds, other than methane, that participate in atmospheric photochemical reactions.



Oxidize

To chemically transform a substance by combining it with oxygen.⁷

Ozone (O₃)

Ozone, the triatomic form of oxygen (O₃), is a gaseous atmospheric constituent. In the troposphere, it is created both naturally and by photochemical reactions involving gases resulting from human activities (photochemical smog). In high concentrations, tropospheric ozone can be harmful to a wide range of living organisms. Tropospheric ozone acts as a greenhouse gas. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen (O₂). Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet (UV-) B radiation. See [atmosphere](#), [ultraviolet radiation](#).⁴

Ozone Depleting Substance (ODS)

A family of man-made compounds that include, but are not limited to, chlorofluorocarbons (CFCs), bromofluorocarbons (halons), methyl chloroform, carbon tetrachloride, methyl bromide, and hydrochlorofluorocarbons (HCFCs). These compounds have been shown to deplete stratospheric ozone, and therefore are typically referred to as ODSs. See [ozone](#).⁷

Ozone Layer

The layer of ozone that begins approximately 15 km above Earth and thins to an almost negligible amount at about 50 km, shields the Earth from harmful ultraviolet radiation from the sun. The highest natural concentration of ozone (approximately 10 parts per million by volume) occurs in the stratosphere at approximately 25 km above Earth. The stratospheric ozone concentration changes throughout the year as stratospheric circulation changes with the seasons. Natural events such as volcanoes and solar flares can produce changes in ozone concentration, but man-made changes are of the greatest concern. See [stratosphere](#), [ultraviolet radiation](#).⁶

Ozone Precursors

Chemical compounds, such as carbon monoxide, methane, non-methane hydrocarbons, and nitrogen oxides, which in the presence of solar radiation react with other chemical compounds to form ozone, mainly in the troposphere. See [troposphere](#).⁷

P

Particulate Matter (PM)

Very small pieces of solid or liquid matter such as particles of soot, dust, fumes, mists or aerosols. The physical characteristics of particles, and how they combine with other particles, are part of the feedback mechanisms of the atmosphere. See [aerosol](#), [sulfate aerosols](#).⁶

Parts Per Billion (ppb)

Number of parts of a chemical found in one billion parts of a particular gas, liquid, or solid mixture. See [concentration](#).

Parts Per Million (ppm)

Number of parts of a chemical found in one million parts of a particular gas, liquid, or solid. See [concentration](#).

Perfluorocarbons (PFCs)

A group of human-made chemicals composed of carbon and fluorine only. These chemicals (predominantly CF₄ and C₂F₆) were introduced as alternatives, along with hydrofluorocarbons, to the ozone depleting substances. In addition, PFCs are emitted as by-products of industrial processes and are also used in manufacturing. PFCs do not harm the stratospheric ozone layer, but they are powerful greenhouse gases: CF₄ has a global warming potential (GWP) of 5,700 and C₂F₆ has a GWP of 11,900. The GWP is from the IPCC's Third Assessment Report (TAR). See [ozone depleting substance](#).

Photosynthesis

The process by which plants take CO₂ from the air (or bicarbonate in water) to build carbohydrates, releasing O₂ in the process. There are several pathways of photosynthesis with different responses to atmospheric CO₂ concentrations. See [carbon sequestration](#), [carbon dioxide fertilization](#).³

Policies

In UNFCCC parlance, policies are taken and/or mandated by a government – often in conjunction with business and industry within its own country, or with other countries – to accelerate mitigation and adaptation measures. Examples of policies are carbon or other energy taxes, fuel efficiency standards for automobiles, etc. Common and coordinated or armonized policies refer to those adopted jointly by parties.

Precession

The comparatively slow torquing of the orbital planes of all satellites with respect to the Earth's axis, due to the bulge of the Earth at the equator which distorts the Earth's gravitational field. Precession is manifest by the slow rotation of the line of nodes of the orbit (westward for inclinations less than 90 degrees and eastward for inclinations greater than 90 degrees).⁶

Precautionary Principle

A provision under Article 3 of the UNFCCC, stipulating that the parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason to postpone such measures, taking into account that policies and measures to deal with climate change should be cost-effective in order to ensure global benefits at the lowest possible cost.

R

Radiation

Energy transfer in the form of electromagnetic waves or particles that release energy when absorbed by an object. See [ultraviolet radiation](#), [infrared radiation](#), [solar radiation](#), [longwave radiation](#).⁶

Radiative Forcing

Radiative forcing is the change in the net vertical irradiance (expressed in Watts per square meter: Wm^{-2}) at the tropopause due to an internal change or a change in the external forcing of the climate system, such as, for example, a change in the concentration of carbon dioxide or the output of the Sun. Usually radiative forcing is computed after allowing for stratospheric temperatures to readjust to radiative equilibrium, but with all tropospheric properties held fixed at their unperturbed values. Radiative forcing is called instantaneous if no change in stratospheric temperature is accounted for. Practical problems with this definition, in particular with respect to radiative forcing associated with changes, by aerosols, of the precipitation formation by clouds, are discussed in Chapter 6 of the IPCC Third Assessment Report Working Group I: The Scientific Basis.³

Recycling

Collecting and reprocessing a resource so it can be used again. An example is collecting aluminum cans, melting them down, and using the aluminum to make new cans or other aluminum products.⁷

Reforestation

Planting of forests on lands that have previously contained forests but that have been converted to some other use.³

Residence Time

The average time spent in a reservoir by an individual atom or molecule. With respect to greenhouse gases, residence time usually refers to how long a particular molecule remains in the atmosphere. See [atmospheric lifetime](#).⁷

Respiration

The process whereby living organisms convert organic matter to CO_2 , releasing energy and consuming O_2 .³

S

Scenario

A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are useful to provide a view of the implications of developments and actions.

Sequestration

Carbon storage in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO₂ from the atmosphere through land-use change, afforestation, reforestation, carbon storage in landfills and practices that enhance soil carbon in agriculture.

Short Ton

Common measurement for a ton in the United States. A short ton is equal to 2,000 lbs or 0.907 metric tons. See [metric ton](#).

Sink

Any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere.³

Soil Carbon

A major component of the terrestrial biosphere pool in the carbon cycle. The amount of carbon in the soil is a function of the historical vegetative cover and productivity, which in turn is dependent in part upon climatic variables.⁷

Solar Radiation

Radiation emitted by the Sun. It is also referred to as short-wave radiation. Solar radiation has a distinctive range of wavelengths (spectrum) determined by the temperature of the Sun. See [ultraviolet radiation](#), [infrared radiation](#), [radiation](#).³

Stratosphere

Region of the atmosphere between the troposphere and mesosphere, having a lower boundary of approximately 8 km at the poles to 15 km at the equator and an upper boundary of approximately 50 km. Depending upon latitude and season, the temperature in the lower stratosphere can increase, be isothermal, or even decrease with altitude, but the temperature in the upper stratosphere generally increases with height due to absorption of solar radiation by ozone.⁶

Stratospheric Ozone

See [ozone layer](#).

Streamflow

The volume of water that moves over a designated point over a fixed period of time. It is often expressed as cubic feet per second (ft³/sec).⁴

Sulfate Aerosols

Particulate matter that consists of compounds of sulfur formed by the interaction of sulfur dioxide and sulfur trioxide with other compounds in the atmosphere. Sulfate aerosols are injected into the atmosphere from the combustion of fossil fuels and the eruption of volcanoes like Mt. Pinatubo. Recent theory suggests that sulfate aerosols may lower the Earth's temperature by reflecting away solar radiation (negative radiative forcing). General Circulation Models which incorporate the effects of sulfate aerosols more accurately predict global temperature variations. See [particulate matter](#), [aerosol](#), [General Circulation Models](#).⁶

Sulfur Hexafluoride (SF₆)

A colorless gas soluble in alcohol and ether, slightly soluble in water. A very powerful greenhouse gas used primarily in electrical transmission and distribution systems and as a dielectric in electronics. The global warming potential of SF₆ is 22,200. This GWP is from the IPCC's Third Assessment Report (TAR). See [Global Warming Potential](#).⁷

T

Tax

A carbon tax is a levy on the carbon content of fossil fuels. Because virtually all of the carbon in fossil fuels is ultimately emitted as CO₂, a carbon tax is equivalent to an emission tax on each unit of CO₂-equivalent emissions. An energy tax - a levy on the energy content of fuels - reduces demand for energy and so reduces CO₂ emissions from fossil fuel use. An eco-tax is designed to influence human behavior (specifically economic behavior) to follow an ecologically benign path. An international carbon/emission/energy tax is a tax imposed on specified sources in participating countries by an international authority. The revenue is distributed or used as specified by this authority or by participating countries. A harmonized tax commits participating countries to impose a tax at a common rate on the same sources, because imposing different rates across countries would not be cost-effective. A tax credit is a reduction of tax in order to stimulate purchasing of or investment in a certain product, like GHG emission reducing technologies. A carbon charge is the same as a carbon tax.

Thermonaline Circulation

Large-scale density-driven circulation in the ocean, caused by differences in temperature and salinity. In the North Atlantic the thermohaline circulation consists of warm surface water flowing northward and cold deep water flowing southward, resulting in a net poleward transport of heat. The surface water sinks in highly restricted sinking regions located in high latitudes.³

Trace Gas

Any one of the less common gases found in the Earth's atmosphere. Nitrogen, oxygen, and argon make up more than 99 percent of the Earth's atmosphere. Other gases, such as carbon dioxide, water vapor, methane, oxides of nitrogen, ozone, and ammonia, are considered trace gases. Although relatively unimportant in terms of their absolute volume, they have significant effects on the Earth's weather and climate.⁶

Troposphere

The lowest part of the atmosphere from the surface to about 10 km in altitude in mid-latitudes (ranging from 9 km in high latitudes to 16 km in the tropics on average) where clouds and "weather" phenomena occur. In the troposphere temperatures generally decrease with height. See [ozone precursors](#), [stratosphere](#), [atmosphere](#).³

Tropospheric Ozone (O₃)

See [ozone](#).

Tropospheric Ozone Precursors

See [ozone precursors](#).

U

Ultraviolet Radiation (UV)

The energy range just beyond the violet end of the visible spectrum. Although ultraviolet radiation constitutes only about 5 percent of the total energy emitted from the sun, it is the major energy source for the stratosphere and mesosphere, playing a dominant role in both energy balance and chemical composition.

Most ultraviolet radiation is blocked by Earth's atmosphere, but some solar ultraviolet penetrates and aids in plant photosynthesis and helps produce vitamin D in humans. Too much ultraviolet radiation can burn the skin, cause skin cancer and cataracts, and damage vegetation.⁶

Uncertainty

An expression of the degree to which a value is unknown (e.g. the future state of the climate system). Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behavior. Uncertainty can therefore be represented by quantitative measures (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts).

United Nations Framework Convention on Climate Change (UNFCCC)

The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 189 countries having ratified. Under the Convention, governments:

- Gather and share information on greenhouse gas emissions, national policies and best practices
- Launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- Cooperate in preparing for adaptation to the impacts of climate⁷

W

Wastewater

Water that has been used and contains dissolved or suspended waste materials.⁷

Water Vapor

The most abundant greenhouse gas, it is the water present in the atmosphere in gaseous form. Water vapor is an important part of the natural greenhouse effect. While humans are not significantly increasing its concentration, it contributes to the enhanced greenhouse effect because the warming influence of greenhouse gases leads to a positive water vapor feedback. In addition to its role as a natural greenhouse gas, water vapor plays an important role in regulating the temperature of the planet because clouds form when excess water vapor in the atmosphere condenses to form ice and water droplets and precipitation. See [greenhouse gas](#).⁶

Weather

Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season. Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. A simple way of remembering the difference is that climate is what you expect (e.g. cold winters) and 'weather' is what you get (e.g. a blizzard). See [climate](#).

Climate Change Glossary References

The Glossary of Climate Change Terms was sourced and adapted from the United States Environmental Protection Agency's Glossary of Climate Change Terms. This glossary can be found online at: <http://www.epa.gov/climatechange/glossary.html>

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2. [Energy Information Administration's Energy Efficiency Glossary](#)
3. [IPCC Third Assessment Report Working Group I: The Scientific Basis](#)
4. [IPCC Third Assessment Report Working Group II: Impacts, Adaptation and Vulnerability](#)
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Health Impact Assessment Terms

The Glossary of Health Impact Assessment Terms was sourced and adapted from the UCLA Health Impact Assessment Clearinghouse Learning and Information Center's Glossary of Climate Change Terms. This glossary can be found online at:

<http://www.hiaguide.org/glossary>

B

Best Available Evidence

Conclusive evidence of the links between, for example, socio-environmental factors and health or the effectiveness of interventions is not always available. In such cases, the best available evidence – that which is judged to be the most reliable and compelling – can be used, but with caution.

C

Community Participation

Involving the community in an activity such as the planning of projects or carrying out a HIA. There are a number of models of community participation, some of which are outlined in the Gothenburg consensus paper on HIA (WHO, 1999). Levels of participation vary (Arnstein, 1969). Manipulation and co-optation can masquerade as participation.

Comprehensive Maxi (HIA)

A comprehensive or "maxi" HIA is a much more detailed rigorous exercise than either a rapid or intermediate HIA. It usually involves the participation of the full range of stakeholders, an extensive literature search, secondary analysis of existing data and the collection of new data. "Control" populations may also be used (Parry and Stevens, 2001).

Concurrent HIA

Concurrent HIA is carried out while a policy, program or project is being implemented.

Cost-Effectiveness Analysis (CEA)

Systematic comparison of the relative value of different interventions for producing desired effects (i.e. better health and/or longer life, where the denominator reflects the expected gain (e.g. deaths-prevented, quality-adjusted life-years (QALYs) or numbers of individuals meeting health recommendations) and the numerator expresses the expected cost of the intervention (Gold et al., 1996). CEA can offer a valuable adjunct to HIA when there is sufficient evidence to generate discrete, credible estimates of the health effects and costs of different policy options.

D

Decision-Making

The process of reviewing the findings and recommendations of a HIA and making choices about how they should be taken forward.

Determinants of Health

Determinants of health are factors that influence health status and determine health differentials or health inequalities. They include biological factors (e.g. age, gender and ethnicity), behavior and lifestyles (e.g. smoking, alcohol consumption, diet and physical activity), physical and social environment (e.g. housing quality, workplace stressors, and air pollution), and access to health care. (Lalonde, 1974; Labonte 1993). All of these are closely interlinked and differentials in the distribution lead to health inequalities. Analysts conducting an HIA will typically start by asking which of these determinants of health are affected by the proposed policy or project.

Disadvantaged/Vulnerable/Marginalized Populations

These terms are applied to groups of people who, due to factors usually considered outside their control, do not have the same opportunities as other, more fortunate groups in society. Examples might include unemployed people, refugees and others who are socially excluded.

E

Economic Impact Assessment

Economic impact assessment involves exploring and identifying the ways in which the economy in general, or local economic circumstances in particular, will be affected by a policy, program or project.

Environmental Impact Assessment

Environmental Impact Assessment (EIA) is a well-developed discipline, both in terms of theory and practice, having been in operation for nearly 30 years in the United States. Its origins lie in the U.S. National Environmental Policy Act of 1969 (NEPA). In the same way that HIA explores the health effects of policies, programs and projects on health, EIA does the same in terms of environmental effects. Some states have their own statutes, such as California's Environmental Quality Act (CEQA) governing environmental impact assessment. Because they are often subject to numerous mandates and legal challenge, EIAs are often long, complex documents that can take years and millions of dollars to complete. While ambient levels of health risks in the physical environment (e. g. air and water pollutants) are considered in EIAs, except for a consideration of certain environmental carcinogens and toxins in CEQA. An analysis of the social determinants of health may be touched on in some parts of EIA, (e.g. traffic congestion, employment levels, environmental justice), but it is not a major emphasis.

Equity in Health

Inequity has a moral and ethical dimension, resulting from avoidable and unjust differentials in health status. Equity in health implies that ideally everyone should have a fair opportunity to attain their full health potential and, more pragmatically, that no one should be disadvantaged from achieving this potential if it can be avoided (WHO EURO, 1985). More succinctly, equity is concerned with creating equal opportunities for health and with bringing health differentials down to the lowest possible level (Whitehead, 1990). HIA is usually underpinned by an explicit value system and a focus on social justice in which equity plays a major role so that not only both health inequalities and inequities in health are explored or addressed wherever possible (Barnes and Scott-Samuel, 1999).

Evidence-base

The evidence base refers to a body of information, drawn from routine statistical analyses, published studies and "grey" literature, which tells us something about what is already known about factors affecting health. For example, in the field of housing and health there are a number of studies that demonstrate the links between damp and cold housing and respiratory disease and, increasingly, the links between high quality housing and quality of life (Thomson et al., 2001).

H

Health Impact

A health impact can be positive or negative. A positive health impact is an effect that contributes to good health or to improving health. For example, having a sense of control over one's life and having choices is known to have a beneficial impact on mental health and wellbeing, making people feel "healthier" (Wilkinson, 1996). A negative health impact has the opposite effect, causing or contributing to ill health. For example, working in unhygienic or unsafe conditions or spending a lot of time in an area with poor air quality is likely to have an adverse effect on physical health status.

Health Impact Assessment (HIA)

Health impact assessment (HIA) is most often defined as "a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population" (World Health Organization, 1999). This broad definition from the World Health Organization European Center for Health Policy (ECHP) and presented in the Gothenburg Consensus paper on HIA reflects the many variants of HIA. A somewhat more precise definition is that HIA is "a multidisciplinary process within which a range of evidence about the health effects of a proposal is considered in a structured framework."

Healthy Public Policy

Healthy public policy is a key component of the Ottawa Charter for Health Promotion (1986). The concept includes policies designed specifically to promote health (for example banning cigarette advertising) and policies not dealing directly with health but acknowledged to have a health impact (for example transport, education, economics) (Lock, 2000).

Impact Assessment

Impact assessment is about judging the effect that a policy or activity will have on people or places. It has been defined as the "prediction or estimation of the consequences of a current or proposed action" (Vanclay and Bronstein, 1995)

Integrated Impact Assessment

Integrated impact assessment brings together components of environmental, health, social and other forms of impact assessment in an attempt to incorporate an exploration of all the different ways in which policies, programs or projects may affect the physical, social and economic environment. New Zealand and Australia have particularly noteworthy examples of integrating HIA into existing EIA processes.

Intermediate HIA Monitoring and Evaluation

An intermediate HIA may combine a workshop with key stakeholders followed by desk-based work to build up a more detailed picture of the potential health impacts than those that would be identified during a rapid or "mini" HIA. It may involve a limited literature search, usually non-systematic, and is mostly reliant on routine, readily available data (Parry and Stevens, 2001).

M

Monitoring and Evaluation

Monitoring is the process of keeping track of events. For example, the monitoring of a project may involve counting the number of people coming into contact with it over a period of time or recording the way in which the project is administered and developed. Evaluation involves making a judgement as to how successful (or otherwise) a project has been, with success commonly being measured as the extent to which the project has met its original objectives. Both the "process" (activities) and "outcomes" (what is produced, for example in terms of changes in the health of those targeted by the project) can be monitored and evaluated.

Multidisciplinary

HIA is not the preserve of any one disciplinary group. Instead, it draws on the experience and expertise of a wide range of "stakeholders", who are involved throughout the process. These may include professionals with knowledge relevant to the issues being addressed, key decision makers, relevant voluntary organizations and perhaps most importantly – representatives of the communities whose lives will be affected by the policy (Barnes and Scott-Samuel, 1999).

N

Neighborhood

The term neighborhood usually refers to a local area that is defined in some way physically (for example, an estate or an area bounded by major roads) or by people's perceptions of what constitutes their local area. Neighborhoods are usually fairly small. For example, neighborhoods designated for New Deal for Communities funding are usually made up of around 4,000 households or around 10,000 people.

O

Outcomes

The effect the process has had on the people targeted by it. These might include, for example, changes in their self-perceived health status or changes in the distribution of health determinants, or factors that are known to affect their health, well-being and quality of life.

Outputs

The products or results of the process. These might include, for example, how many people a project has affected, their ages and ethnic groups or the number of meetings held and the ways in which the findings of the project are disseminated.

P

Policy

A policy can be defined as an agreement or consensus on a range of issues, goals and objectives that need to be addressed (Ritsatakis et al., 2000). For example, "Saving Lives: Our Healthier Nation" can be seen as a national health policy aimed at improving the health of the population of England, reducing health inequalities and setting objectives and targets which can be used to monitor progress towards the policy's overall goal or aims.

Population (Affected Population)

Groups of individuals defined by locality, biological criteria (e.g. age, gender, health condition, or common exposure), or social criteria (e.g. socio-economic status or cultural affiliation). How a population is defined in an HIA will depend on the proposed project/policy being considered, health issues of most concern, the extent and classification of existing evidence on those health issues, and what information is of most value to the policy-making process.

Population Health

The health of groups, families and communities, defined by locality, biological criteria (e.g. age, gender or health condition), or social criteria (e.g. socio-economic status or cultural affiliation). The population health approach, which provides a foundation for HIA, emphasizes health as a resource or capacity, not simply a state.

Program

The term program usually refers to a group of activities that are designed to be implemented in order to reach policy objectives (Ritsataki et al., 2000). For example, many Single Regeneration Budget programs and New Deal for Communities initiatives have a range of themes within their program – often including health, community safety (crime), education, employment and housing – and within these themes are a number of specific projects which, together, make up the overall program.

Project

A project is usually a discrete piece of work addressing a single population group or health determinant, usually with a pre-set time limit. Usually (but not always), the term refers to "bricks and mortar" projects involving construction of a discrete structure or group of structures, such as a power plant, highway, or housing development.

Prospective HIA

Prospective HIA is carried out before any action has been taken, either in terms of drafting a policy, putting together an action plan or implementing it so that steps can be taken, at the planning stage, to maximize the positive health impacts of a policy, program or project and to minimize the negative effects (Scott-Samuel et al., 1998).

Q

Qualitative and Quantitative

HIA tries to balance qualitative and quantitative evidence. It involves an evaluation of the quantitative, "scientific" evidence where it exists but also recognizes the importance of more qualitative information. This may include the opinions, experience and expectations of those people most directly affected by public policies and tries to balance the various types of evidence (Barnes and Scott Samuel, 1999). Generally speaking, quantitative evidence is based on what can be counted or measured objectively whilst qualitative evidence cannot be measured in the usual ways and may more subjective, for example, encompassing people's perceptions, opinions and views.

R

Rapid (Mini) HIA

A rapid or "mini" HIA, as the name suggests, is done quickly. It may be a "desk top" exercise, reliant on information which is already available already available "off the shelf" (Parry and Stevens, 2001), or through a half day or one day workshop with key stakeholders (Barnes et al., 2001). In either case, there is usually a minimum quantification of the potential health impacts that are identified.

Relative Risk (Risk Ratio)

The ratio of the probability of an event occurring in an exposed group versus an unexposed group. A relative risk of 1 indicates that there is no difference in the two groups' risk of the event. A relative risk of 2 indicates that the exposed group has double the risk of the unexposed group.

Retrospective HIA

Retrospective HIA is carried out after a program or project has been completed. It is used to inform the ongoing development of existing work.

Risk Assessment (Risk Analysis)

The quantitative approach to HIA incorporates many of the elements of risk assessment laid out in environmental impact assessment and engineering. The risk assessment paradigm prescribes a sequence for four steps for assessing risks: (1) hazard identification, (2) exposure assessment, (3) dose-response assessment, and (4) risk characterization (i.e. evaluation of impact of changing exposure levels. Usually, but not necessarily this process is quantitative. Despite apparent objectivity, it is dependent on a series of assumptions and analytic choices (Nurminen, Nurminen and Corvalen, 1999).

Risk, Attributable

The proportion of new events or cases in a given time period attributable to exposure to a risk factor (Kleninbaum, Kupper, Morgenstern (1982).

S

Scoping

Scoping refers to the process of identifying the potential health impacts of a policy, program or project before they are quantified, as in a rapid HIA. It may include reviewing the relevant literature and evidence base and collecting the views of key stakeholders (those with expert knowledge of the project, those involved and those potentially affected) followed by the tabulation of the potential health impacts (Parry and Stevens, 2001).

Screening

In relation to HIA, screening usually refers to an initial step being taken in order to determine whether a policy, program or project should be subject to a HIA. The criteria used for this process may include, for example, the size and cost of the activity in question, the extent of any obvious or immediate health effects or the perceived extent of longer-term effects. A new road transport policy, for example, might meet these criteria in view of its potentially high financial cost, the possibility of immediate health effects in terms of road traffic accidents and likely longer-term effects in terms of air quality.

Social Impact Assessment

Social impact assessment is "the process of assessing or estimating, in advance, the social consequences that are likely to follow from specific policy actions or project development, particularly in the context of appropriate national, state or provisional policy legislation" (Vanclay and Bronstein, 1995). It is based on the assumption that the way in which the environment is structured can have a profound effect on people's ability to interact socially with other people and to develop networks of support. For example, a major road cutting across a residential area can have the effect of dividing a community with implications for social cohesion (Hendley et al., 1998).

Strategic Environmental Assessment (SEA)

SEA has been defined as "the environmental assessment of a strategic action: a policy, plan or program (Therivel and Partidario, 1996). SEA developed out of the recognition that the environmental impact assessment of specific projects, whilst an extremely valuable device, does not allow sufficient scope for the examination of the effect of a combination of projects. A commitment to sustainable development requires that a strategic approach to the environment be adopted. (Wood, 1995).

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T

Toolkit

The term toolkit is generally held to mean an information resource including, for example, routinely available data which may be required for quantifying potential health impacts, a compilation of literature on health determinants or a template for organizing a HIA or parts of the HIA process such as a workshop for key stakeholders.

U

Uncertainty

HIA is fundamentally about clarifying uncertainty – pointing out and attempting to minimize specific areas of uncertainty about the possible health impacts of a proposed policy. There are actually many types of uncertainty, including "model uncertainty" (uncertainty about the logical and mathematical representation to explain phenomena) and "parameter uncertainty" (certainty about the value, variation, accuracy, etc. of specific relations or conditions in a model). High levels of uncertainty (especially model uncertainty) may preclude HIA, but at the same time the value of information from an HIA tends to be highest when there are high levels of uncertainty.

HIA Glossary References

The Glossary of Health Impact Assessment Terms was sourced and adapted from the UCLA Health Impact Assessment Clearinghouse Learning and Information Center's Glossary of Climate Change Terms. This glossary can be found online at:

<http://www.hiaguide.org/glossary>

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3

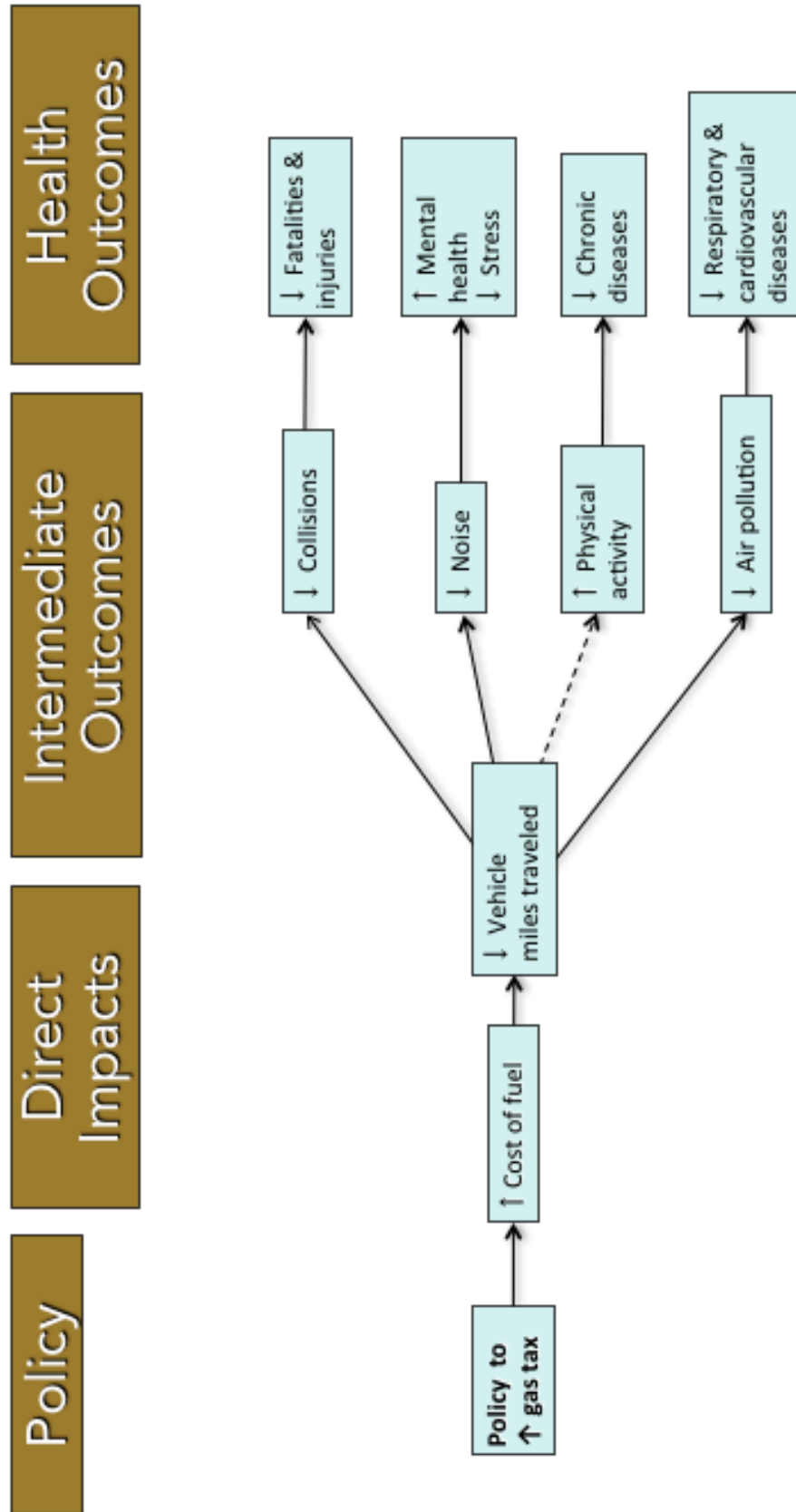
CLIMATE CHANGE POLICY PATHWAY TEMPLATES & EXAMPLES

Transportation Policy

Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
Transportation policies such as: <ul style="list-style-type: none"> • Vehicle miles traveled tax (M) • Congestion pricing (M) • Higher fuel economy standards (M) • Establishment of shoreline protection programs & evacuation route planning (A) • Requirement of agencies to plan for sea level rise & extreme weather events (A) Δ Signifies a Change	Δ GHG emissions Δ Vehicle miles traveled Δ Active transportation Δ Loss of transportation infrastructure Δ Technological innovation Δ Costs	Δ Physical activity Δ Air pollution Δ Collisions Δ Noise Δ Access to goods & services Δ Income Δ Stress	Δ Chronic diseases Δ Respiratory & cardiovascular diseases Δ Fatalities & injuries Δ Mental health A = Adaptation M = Mitigation

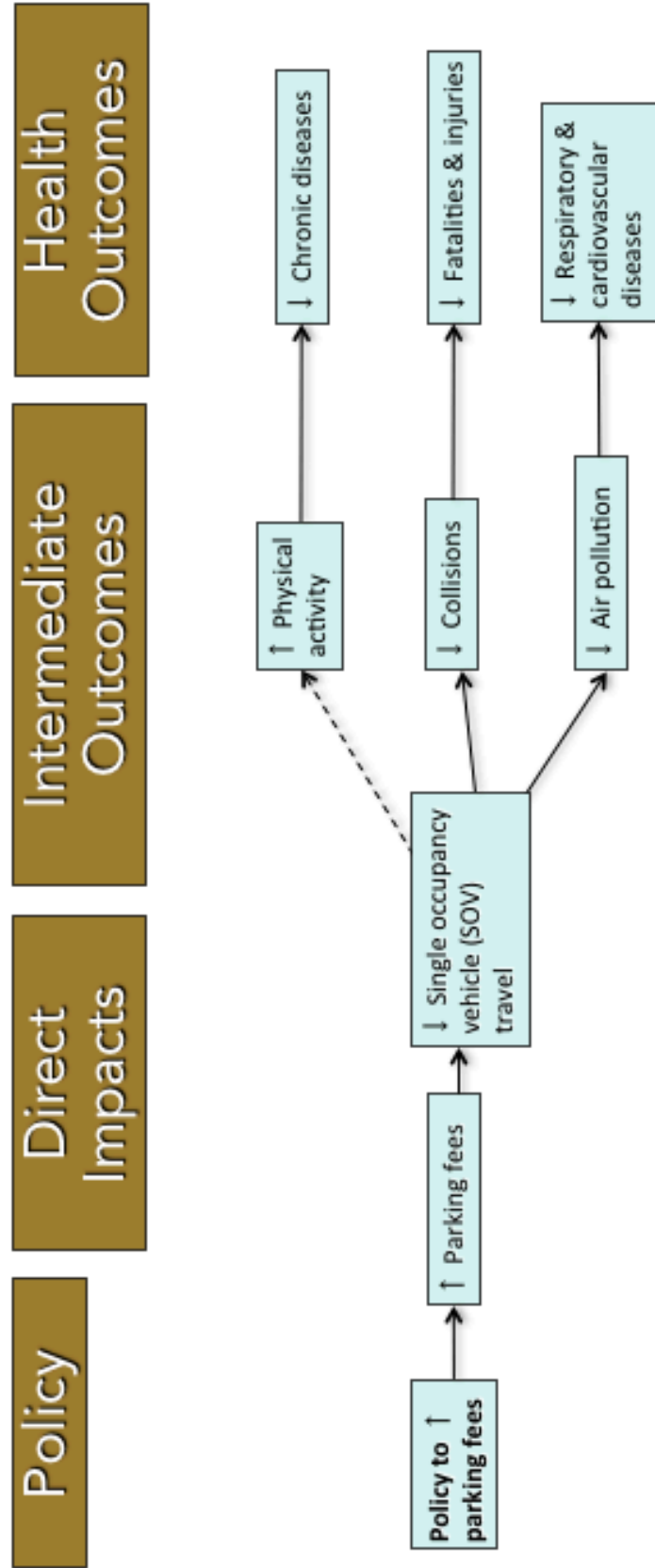
Transportation Policy Example (Higher Fuel Cost)



Dotted Lines Indicate A Weaker Evidence-base

Adapted from: Fossil Fuel tax in California: A Health Impact Assessment

Transportation Policy Example (Higher Parking Fees)



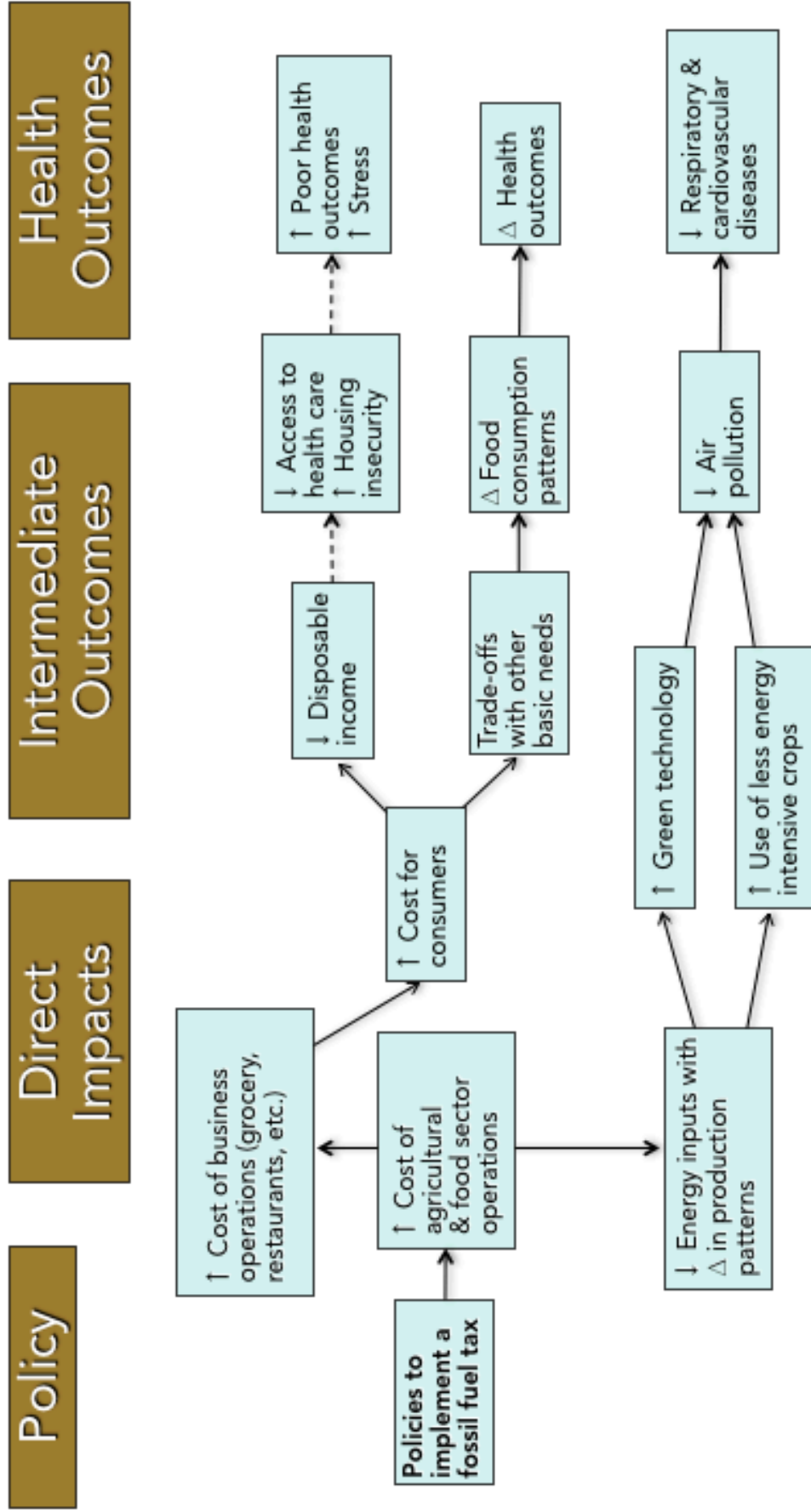
Source: Upstream Public Health VMT HIA

Food & Agricultural Policy

Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<p>Food and agricultural policies such as:</p> <ul style="list-style-type: none"> Limiting the number of livestock allowed per hectare (M) Reduce subsidies or introduce taxes on inputs such as fertilizers or fossil fuels (M) Promote crop rotation, timing of planting & species better suited to a changing climate (A) <p>Δ Signifies a Change</p>	<ul style="list-style-type: none"> Δ GHG emissions Δ Fertilizer use Δ Pesticide use Δ Food costs Δ Labor costs Δ Solid waste Δ Loss of crops Δ Technological innovation 	<ul style="list-style-type: none"> Δ Environmental build-up & human exposure Δ Food accessibility due to costs Δ Income Δ Use of less energy-intensive crops Δ Food purchasing & eating habits Δ Stress 	<ul style="list-style-type: none"> Δ Food-borne & water-borne illnesses Δ Respiratory & cardiovascular diseases Δ Chronic diseases Δ Nutrition Δ Mental health <p>A = Adaptation M = Mitigation</p>

Food and Agricultural Policy Example (Fossil Fuel Tax)



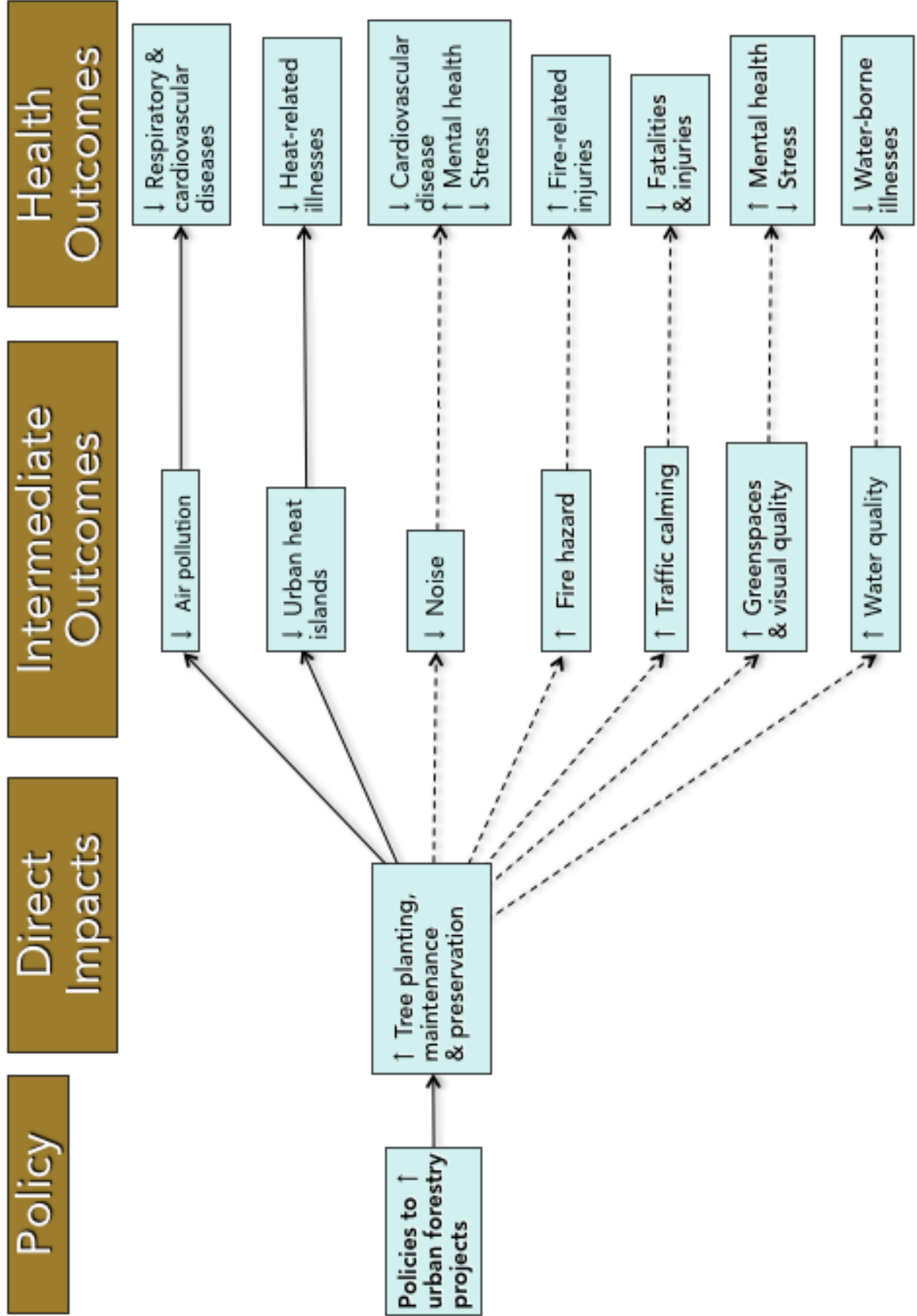
Dotted Lines Indicate A Weaker Evidence-base

Adapted from: Fossil Fuel Tax in California: A Health Impact Assessment

Forestry Policy Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<p>Forestry Policies such as:</p> <ul style="list-style-type: none"> Limiting the amount of forest land that can be converted to other uses (ex. Conservation easements) (M) Requiring the quantification & mitigation of CO₂ emissions that result from forestland conversion to non-forest uses (M) Promoting fire suppression & forestry practices to reduce weather-related fire risk (A) Promoting species mix at different scales, fire and pest management, soil conservation & adjusted rotation periods (M/A) Use of sustainable forestry & development practices (M/A) <p>Δ Signifies a Change</p>	<ul style="list-style-type: none"> Δ GHG emissions Δ Shade Δ Tree planting, maintenance & preservation Δ Water retention 	<ul style="list-style-type: none"> Δ Erosion & landslide hazard Δ Air pollution Δ Water quality Δ Invasive species Δ Fire risk Δ Traffic calming Δ Greenspaces & visual quality Δ Noise Δ Carbon sequestration Δ Pollen 	<ul style="list-style-type: none"> Δ Fatalities & injuries Δ Respiratory & cardiovascular diseases Δ Water-borne illnesses Δ Mental health Δ Stress Δ Heat-related illness Δ Fire-related fatalities Δ Allergies <p>A = Adaptation M = Mitigation</p>

Forestry Policy Example (Increased Urban Forestry Projects)



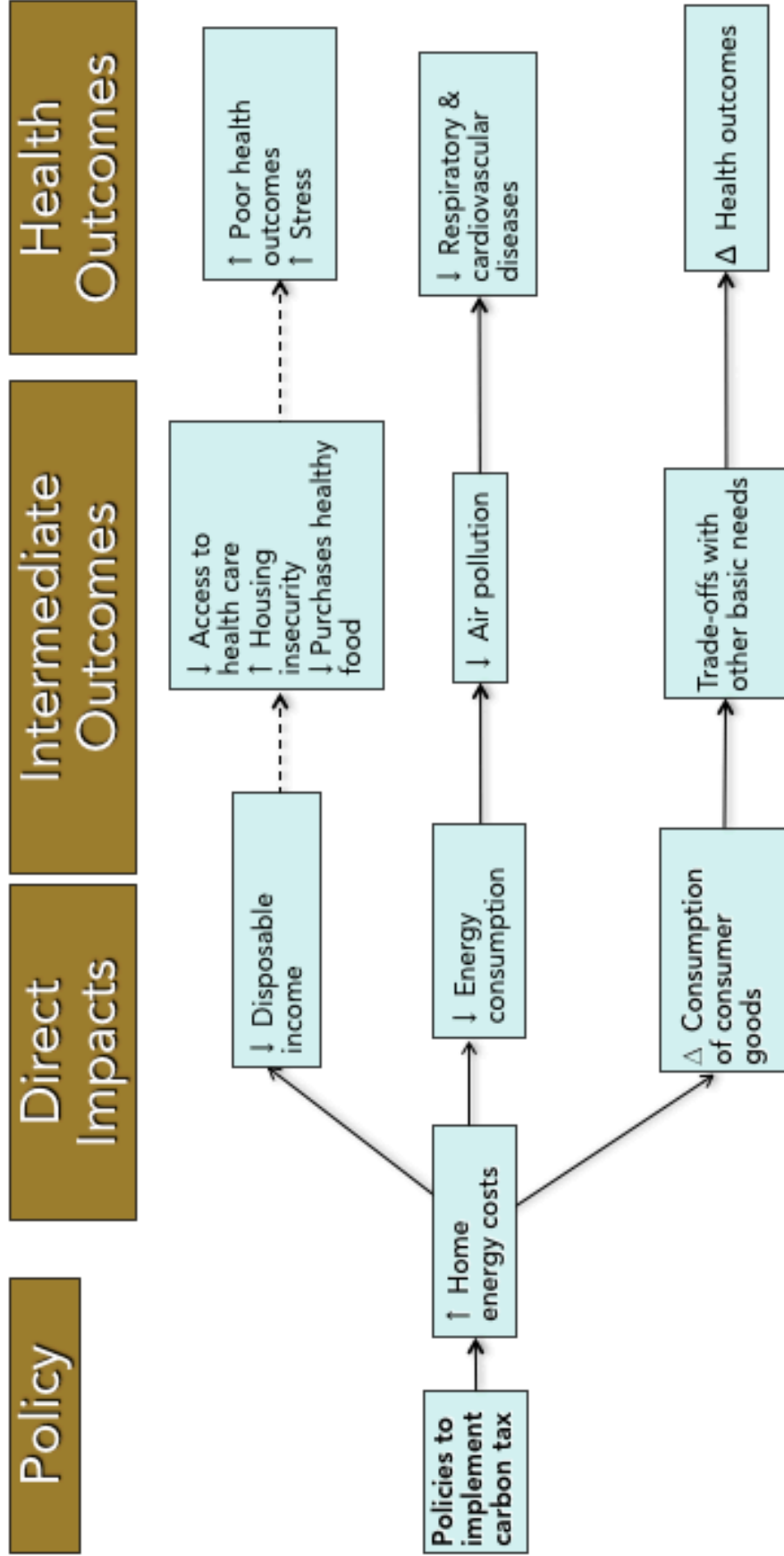
Dotted Lines Indicate A Weaker Evidence-base

Adapted from: Health Impact Assessment of a Cap-and-Trade Framework

Energy Policy Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<p>Energy policies such as:</p> <ul style="list-style-type: none"> • Cap-and-trade (M) • Carbon tax (M) • Requirements to use renewable energy sources (M) • Incentives/subsidies for the development of more efficient end-use technologies for residential and commercial building heating and cooling (M/A) • Planning to protect energy facilities from extreme weather events (A) • Diversifying power supply to avoid power failures caused by extreme weather events (M/A) <p>Δ Signifies a Change</p>	<ul style="list-style-type: none"> Δ GHG emissions Δ Demand Δ Cost of consumer goods Δ Investment in energy-efficient technologies Δ Technological innovation 	<ul style="list-style-type: none"> Δ Air pollution Δ Electricity costs Δ Business expenses & job loss Δ “Green” jobs Δ Food security Δ Income Δ Stress 	<ul style="list-style-type: none"> Δ Respiratory & cardiovascular diseases Δ Mental health Δ Chronic diseases <p>A = Adaptation M = Mitigation</p>

Energy Policy Example (Carbon Tax and Home Energy Costs)



Dotted Lines Indicate A Weaker Evidence-base

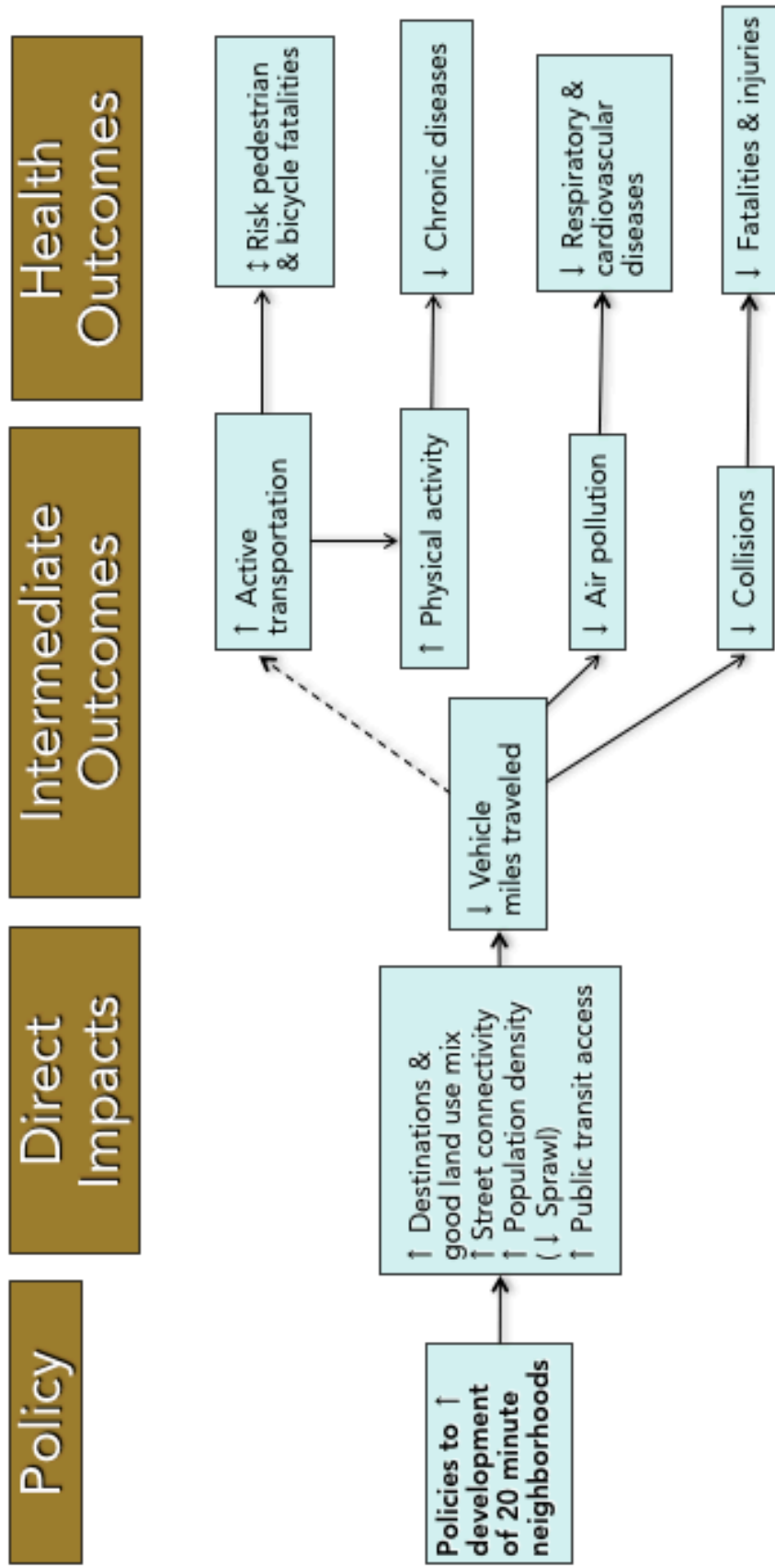
Adapted from: Fossil Fuel Tax in California: A Health Impact Assessment

Land Use

Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<p>Land use policies such as:</p> <ul style="list-style-type: none"> Focusing new economic & residential growth within existing urban growth boundaries (M) Ensuring high-density mixed-use development (M) Providing guidelines to agencies for evaluating the impact to developments in areas susceptible to hazardous conditions created by climate change (A) Implementing standards & regulations for relocation, reinforcement & protection from extreme weather events (A) <p>Δ Signifies a Change</p>	<ul style="list-style-type: none"> Δ GHG emissions Δ Street connectivity Δ Land use mix Δ Destinations Δ Population density Δ Employment density Δ Work distance Δ Greenspaces Δ Active transportation 	<ul style="list-style-type: none"> Δ Air pollution Δ Urban heat islands Δ Physical activity Δ Water quality 	<ul style="list-style-type: none"> Δ Respiratory & cardiovascular diseases Δ Mental health Δ Heat-related illnesses Δ Water-borne illnesses Δ Chronic diseases <p>A = Adaptation M = Mitigation</p>

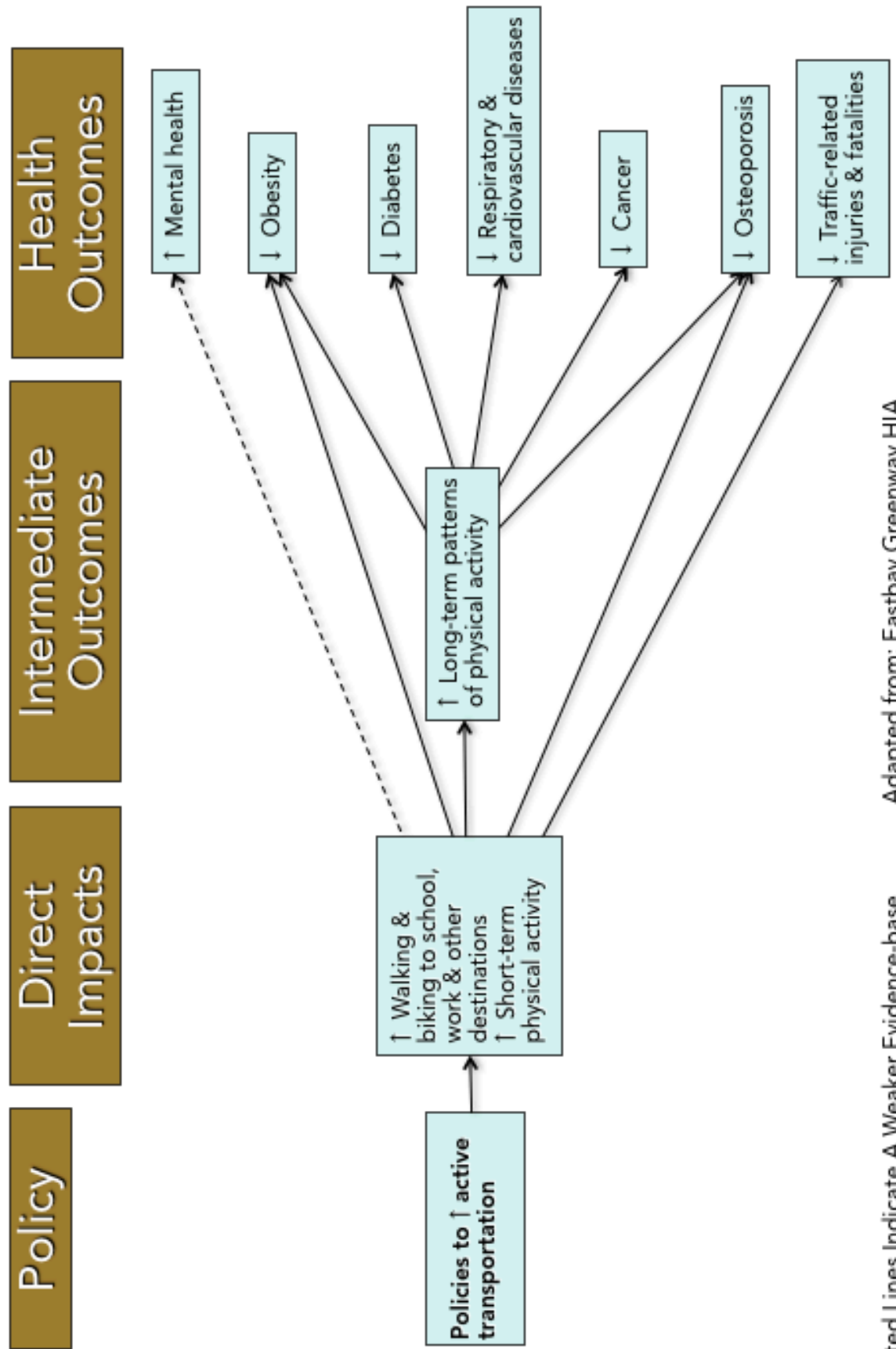
Land Use & Transportation Policy Example (“20 Minute Neighborhoods”)



Adapted from: Health Impact Assessment on Transportation Policies in the Eugene Climate and Energy Action Plan

Dotted Lines Indicate A Weaker Evidence-base

Land Use & Transportation Policy Example (Active Transportation)



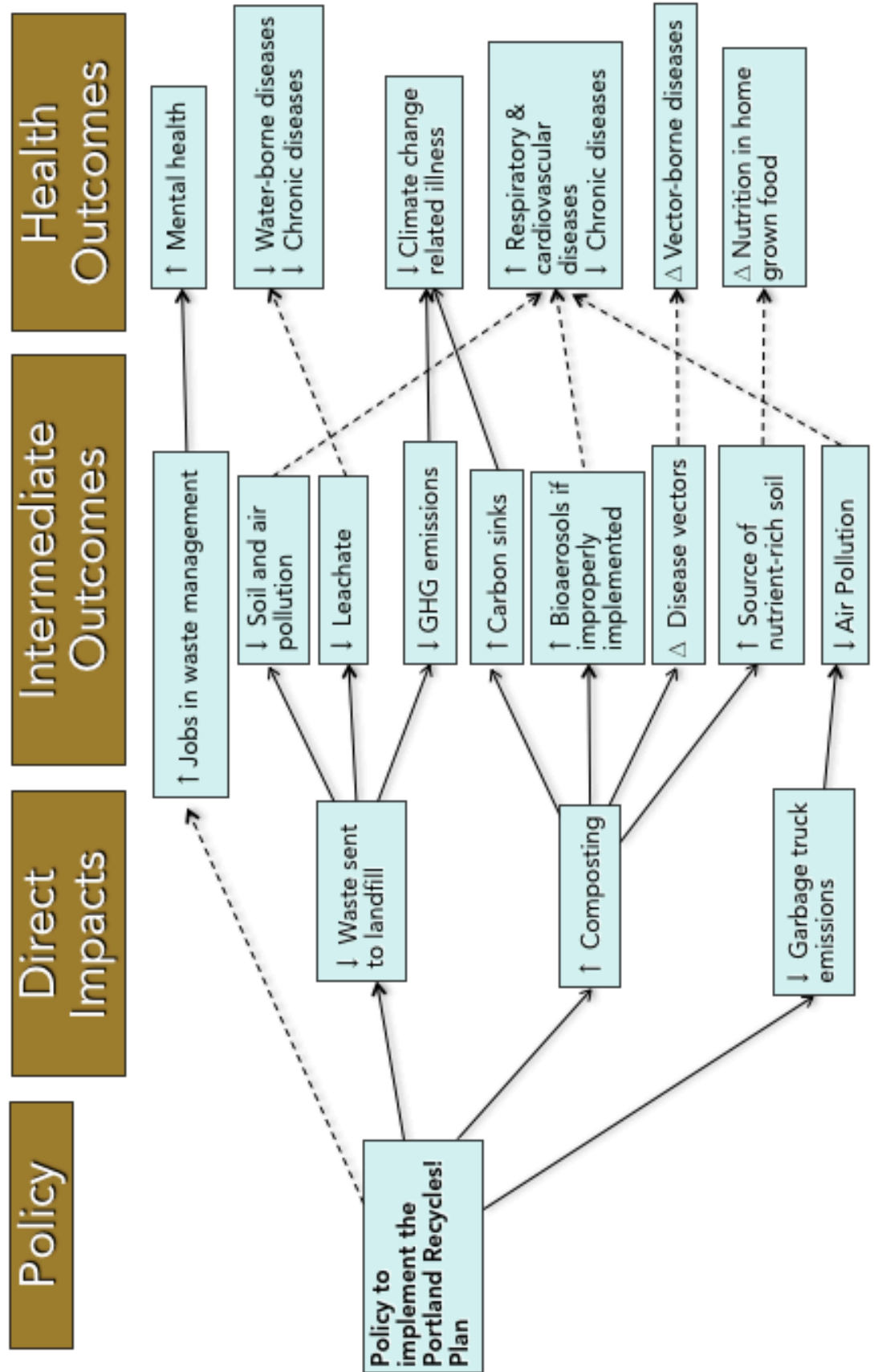
Adapted from: Eastbay Greenway HIA

Dotted Lines Indicate A Weaker Evidence-base

Waste Management Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<p>Waste management policies such as:</p> <ul style="list-style-type: none"> • Landfill performance standards that reduce emissions by capture & combustion of gases (M) • Requirements for programs to reduce the amount of biodegradable waste that is sent to landfills (M) • Creation of programs to increase recycling and re-use (A) • Bans on specific goods, such as plastic bags (M) <p>Δ Signifies a Change</p>	<ul style="list-style-type: none"> Δ GHG emissions Δ Costs Δ Jobs Δ Technological innovation Δ Infrastructure requirements Δ Dumping of waste Δ Home and community composting Δ Recycling Δ Conservation of natural resources 	<ul style="list-style-type: none"> Δ Air pollution Δ Pathogenic microorganisms Δ Disease vectors Δ Water quality Δ Environmental build-up & human exposure Δ Water & soil contamination 	<ul style="list-style-type: none"> Δ Respiratory & cardiovascular diseases Δ Vector-borne illnesses Δ Food-borne & water-borne illnesses Δ Chronic diseases <p>A = Adaptation M = Mitigation</p>

Waste Management Policy Example

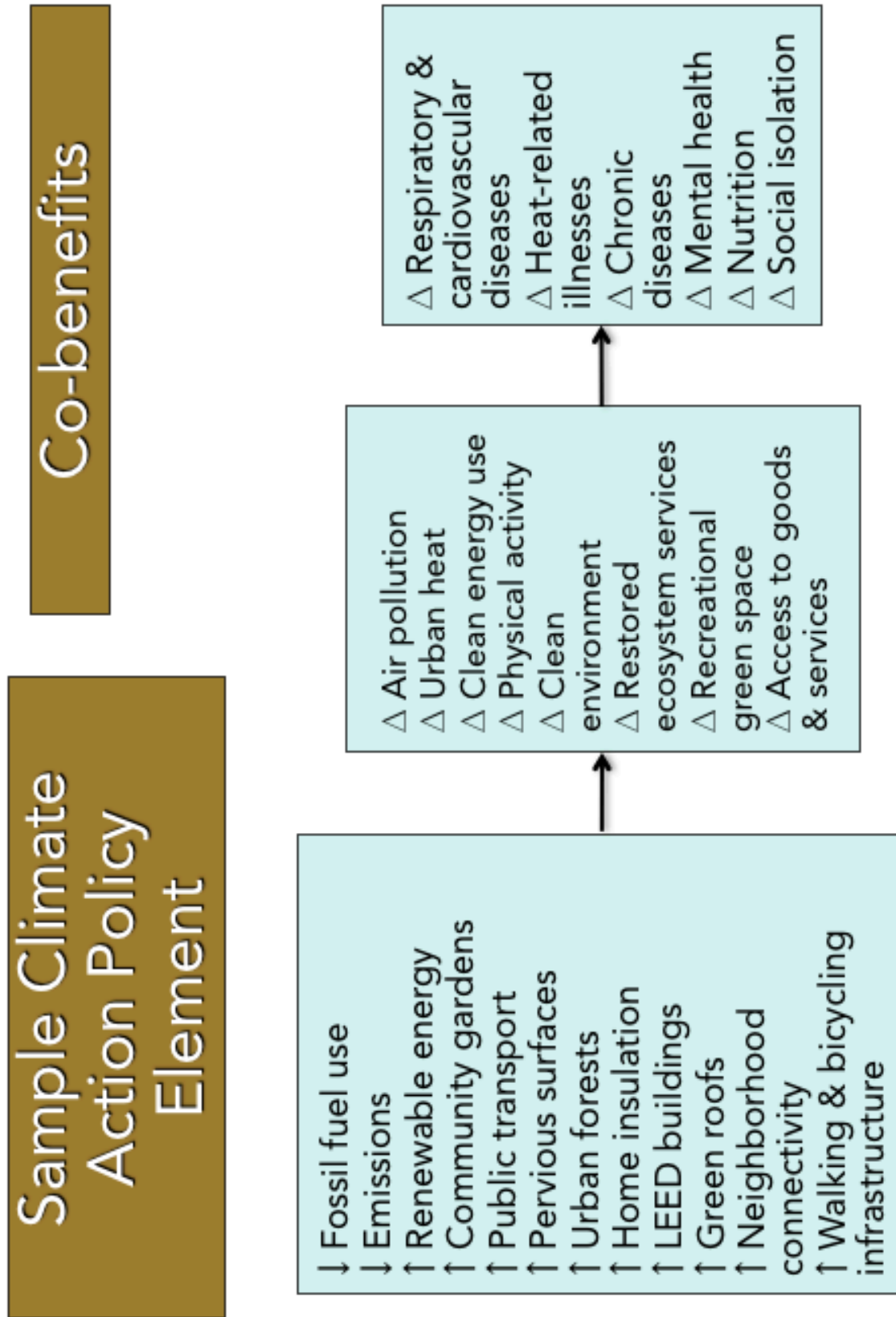


Dotted Lines Indicate A Weaker Evidence-base

Adaptation & Emergency Management

Sample Health Outcomes

Policy	Direct Impacts	Intermediate Outcomes	Health Outcomes
<ul style="list-style-type: none"> Heat/health watch warning system (EM/A) Air quality monitoring & alert system (A) Early warning systems and flood hazard mapping for extreme weather events (EM/A) 	<ul style="list-style-type: none"> Δ GHG emissions Δ Early warning of residents about upcoming periods of elevated temperatures Δ Alerts to residents before or during periods of poor air quality Δ Early warning of storms & flooding 	<ul style="list-style-type: none"> Δ Air pollution Δ Urban heat islands Δ Extreme weather Δ Readiness for extreme weather events 	<ul style="list-style-type: none"> Δ Respiratory & cardiovascular diseases Δ Heat-related illnesses Δ Weather-related fatalities & injuries <p>A = Adaptation M = Mitigation EM = Emergency Management</p>
<p>Δ Signifies a Change</p>			



△ Signifies a Change

Sample Climate Action Policy Element

Co-costs

- ↓ Fossil fuel use
- ↓ Emissions
- ↑ Renewable energy
- ↑ Community gardens
- ↑ Public transport
- ↑ Pervious surfaces
- ↑ Urban forests
- ↑ Home insulation
- ↑ LEED buildings
- ↑ Green roofs
- ↑ Neighborhood connectivity
- ↑ Walking & bicycling infrastructure

- △ Air pollution
- △ Urban heat islands
- △ Clean energy use
- △ Physical activity
- △ Clean environment
- △ Restored ecosystem services
- △ Recreational green space
- △ Access to goods & services

- △ Maintenance
- △ Uneven development
- △ Inequities if not addressed in policy implementation
- △ Pollen
- △ Water demand

△ Signifies a Change

4 UCLA HEALTH DETERMINANT SCREENING/SCOPING CHECKLIST

Health Determinant Screening/Scoping Checklist

HIA Screening Checklist of Health Determinants (UCLA Health Impact Assessment Project, April 2002)	Potentially <i>significant</i> impact					
	Likelihood of impact?			Likely <i>magnitude</i> of impact?		
	(1) no/unlikely	(2) possible	(3) likely	(1) low	(2) medium	(3) high
Biophysical environment						
Housing conditions						
Fire, building safety	1	2	3	1	2	3
Security	1	2	3	1	2	3
Sanitation	1	2	3	1	2	3
Indoor air quality (including radon)	1	2	3	1	2	3
Asbestos	1	2	3	1	2	3
Lead	1	2	3	1	2	3
Crowding	1	2	3	1	2	3
Affordability and access	1	2	3	1	2	3
Working conditions (includes psychosocial factors ¹)						
Structural safety (including fire, earthquake, etc)	1	2	3	1	2	3
Air quality	1	2	3	1	2	3
Toxins, biohazards	1	2	3	1	2	3
Work task safety	1	2	3	1	2	3
Ergonomics	1	2	3	1	2	3
Psychosocial (including stress)	1	2	3	1	2	3
School conditions (see Services – Education ²)	N/A			N/A		
Water quality						
Drinking water quality	1	2	3	1	2	3
Water quality – waterways and recreational	1	2	3	1	2	3
Water availability/Access	1	2	3	1	2	3
Outdoor air quality (including odors)						
Toxins, carcinogens	1	2	3	1	2	3
Allergens, irritants (e.g. particulates, asthma triggers)	1	2	3	1	2	3
Nuisance odors	1	2	3	1	2	3
Noise	1	2	3	1	2	3
Disasters, probability/consequences of (see also Services)						
Earthquakes	1	2	3	1	2	3
Floods	1	2	3	1	2	3
Fire	1	2	3	1	2	3
Storms – hurricane, tornado, wind, lightning	1	2	3	1	2	3
Solid waste (production, disposal and recycling)	1	2	3	1	2	3
Food Supply						
Food security and access	1	2	3	1	2	3
Food purity and contamination	1	2	3	1	2	3
Nutritional quality, wholesomeness	1	2	3	1	2	3
Infectious diseases and other biological hazards						
Infectious disease (see also food purity)	1	2	3	1	2	3
Anti-microbial resistance	1	2	3	1	2	3
Vector and animal control	1	2	3	1	2	3
Ionizing radiation (ambient, medical) (for radon see: Biophysical env)	1	2	3	1	2	3
Notes: (1)All elements of work conditions, not just biophysical elements, are listed here since all these elements should be considered together. For instance, ergonomics involves both biophysical and psychosocial issues. (2) While school health and safety conditions are part of the biophysical environment, they are listed together under “Services” since education is generally thought of as a service, and since it is more useful to address the programmatic and facilities aspects of education together.						

HIA Screening Checklist of Health Determinants (UCLA Health Impact Assessment Project, April 2002)	Potentially significant impact					
	Likelihood of impact?			Likely magnitude of impact?		
	(1) no/unlikely			(1) low		
	(2) possible			(2) medium		
	(3) likely			(3) high		
Social and economic environment						
Employment and household economic resources						
Job stability	1	2	3	1	2	3
Employment opportunities	1	2	3	1	2	3
Income	1	2	3	1	2	3
Cost-of-living	1	2	3	1	2	3
Access to financial services	1	2	3	1	2	3
Wage and other economic disparities	1	2	3	1	2	3
Social/Cultural norms and practices	1	2	3	1	2	3
Social networks						
Social support	1	2	3	1	2	3
Social cohesiveness	1	2	3	1	2	3
Social inclusion/exclusion	1	2	3	1	2	3
Discrimination						
Racism	1	2	3	1	2	3
Employment discrimination	1	2	3	1	2	3
Housing segregation	1	2	3	1	2	3
Community participation						
Political	1	2	3	1	2	3
Non-political, civic	1	2	3	1	2	3
Spiritual participation	1	2	3	1	2	3
Violence (see also Services – Education, and Biophysical environment – Work conditions)						
Street violence	1	2	3	1	2	3
Family and relationship violence	1	2	3	1	2	3
Health-Related Behaviors and Lifestyles						
Diet	1	2	3	1	2	3
Physical activity	1	2	3	1	2	3
Recreation	1	2	3	1	2	3
Means of transport	1	2	3	1	2	3
Substance abuse						
Tobacco use	1	2	3	1	2	3
Alcohol use	1	2	3	1	2	3
Prescription drug abuse	1	2	3	1	2	3
Illicit drug use	1	2	3	1	2	3
Sexual behavior	1	2	3	1	2	3
Motor vehicle use and practices	1	2	3	1	2	3
Firearm ownership	1	2	3	1	2	3
Oral health practices	1	2	3	1	2	3
Mental health practices	1	2	3	1	2	3
Health care seeking attitudes and practices	1	2	3	1	2	3
Social networking practices (see also Social and Economic environment - Social networks)	1	2	3	1	2	3
Violent and abusive behavior (see also Social and Economic environment – Violence)	1	2	3	1	2	3

5

SAMPLE PROJECT PLANNING & TRACKING TOOL (VMT Project)

Sample Project Planning + Tracking Tool

Upstream Public Health

Project:

Health Impact Assessment on Vehicle Miles Traveled

Date:

December 10, 2008

Purpose(s):

1. To provide rigorous, community-based participatory research on the health impacts of proposed VMT legislation,
2. build capacity for healthy community design, and
3. advocate for legislation to reduce vehicle miles traveled in Oregon

Inputs	Outcomes	Outputs/ Products	Indicators of success	Timeline	Who?
Money, staff time available	The benefits, changes or improvements that will result from your implemented program or project	Projected level of success or result you hope to achieve	The way change is observed and the data you will collect to measure the progression towards an outcome	Date(s) when output is expected to be achieved.	Who is primarily responsible for the output
0.5 FTE of Upstream staff \$10,120 for printing, graphic design, postage and other supplies \$25,000 – Epidemiologist \$11,820 – HIA Consultant (99 hours of time plus 1/2 of Training costs) \$2,000 – Community partners	Produce research that is rigorous and effective for advocacy on healthy community design / reduction of VMT.	Four effective meetings of advisory committee	Participants attend meetings, and provide valuable input to study	January - April	Upstream
		Health Impact Assessment	Scientifically rigorous and well written study	May	Epidemiologist
		Brochure on Health and VMT	Accessible and persuasive fact sheet	May	Upstream
	Disseminate Health Impact Assessment Research	Write and distribute press release	Stories appear in newspapers, radio and TV	May	Upstream
		Write and submit persuasive op-ed	Op-ed is published	May	Upstream

SAMPLE PROJECT PLANNING & TRACKING TOOL

Inputs	Outcomes	Outputs/ Products	Indicators of success	Timeline	Who?
		Distribute to public health leaders	Distributed to key public health spokespeople	May	Upstream
		Send update to UPHAN	Email sent and UPH receives significant response	May	Upstream
		Submit peer-reviewed journal article	Journal article is accepted	December	Epidemiologist
	Advocate for healthier transportation and land use policy	Facilitate a workgroup to develop messages and strategy, and train spokespeople	Active workgroup that meets at least four times	February - May	Upstream
		Testify at legislative hearings	Four instances of testimony by public health leaders	March - June	Upstream / Coalition partners
		Meet with key legislators	Meet with four key legislators	April - June	Upstream / 1000 Friends
	Build the capacity of health partners	Facilitate a HIA training planning group	Meet several times to plan logistics of training	January - March	Upstream
		Host a health impact assessment training	Good attendance and feedback at training	March or April	Consultant, Upstream

6

UCLA HEALTH IMPACT DECISION SUPPORT TOOL DESCRIPTION

UCLA Health Impact Decision Support Tool (DST)

Released May 2010

http://www.ph.ucla.edu/hs/health-impact/docs/Description_DST.pdf

Description of the Health Impact DST

The UCLA Health Impact Decision Support Tool (DST) is a graphical, spreadsheet-based tool designed to help decision-makers systematically synthesize, weigh and compare evidence specific to public health-relevant interventions and policies in a relatively short time frame. The explicit rating criteria and graphical interface of the DST supports a relatively quick, but systematic, assessment of available evidence to assess the potential value of public health interventions. It is not meant as a substitute for evidence-based reviews, but is rather intended as a support for decision-makers when time is critical and the relative merits of alternatives are mixed or ambiguous.

The DST allows comparison of up to five alternatives rated on 18 preset rating criteria encompassing four domains: feasibility, evidence of effectiveness, population impact and disparities reduction. Up to four additional user-specified criteria may be added. Users may also modify the preset rating criteria as needed. Given inherent uncertainties about the potential effects of alternatives, differing opinions and inconsistent evidence about the relative merits of alternatives in different domains, the DST does not aim to select an overall best alternative or to replace judgment about trade-offs and uncertainty, but rather it aims to support reasoned and transparent decision-making and to prompt questions that should be addressed before choosing an alternative.

Rater procedures

While the DST may be used by an individual, it is ideally suited for use by a small group that collectively evaluates and rates each specific alternative. DST users do not need to be experts, but they should have some general knowledge of concepts used in program evaluation, including efficacy, effectiveness and quality of evidence. Prior to or during the rating exercise, short summaries should be created of available evidence on the alternatives being discussed. Raters can then quickly refer to these summaries while rating alternatives. Preferably as a part of small group discussions, raters specify the importance and set the weight of each rating criteria for each alternative. Step-by-step instructions guide users on optimal use of the DST. These included on the first page of the spreadsheet.

Viewing Results

The DST displays the weighted scores for the alternatives in three different formats—table of numbers, table of icons (similar to *Consumer Reports*[®]), bar graphs and a scatterplot. By seeing the visual comparison of alternatives, users can quickly identify the relative strengths and weakness of each alternative, identify a preferred alternative and discuss options for improving on the selected alternative.

7 TRAINING EXERCISES

Exercise 1

Identify climate change policy type

Directions.

Review each policy or project name or brief description in the column on the left to determine if each entry is climate change related. In the center column next to each entry, indicate a “yes” or “no” if you would consider it a “climate change” policy or project. If your answer is a “yes,” write the type of climate change policy or project (e.g. adaptation, mitigation or emergency preparedness). Discuss how policies may blend multiple components from adaptation or mitigation.

Policy or Project	Climate Change Related? (Yes or No)	If Yes, Adaptation, Mitigation or Emergency Preparedness?
San Francisco Housing Authority Policy – Regulates public housing development flooring options		
Rural Humboldt County Update to General Plan – Agricultural county in CA with three growth options		
Zoning for Healthy Baltimore – Comprehensive Plan Revisions		
Fossil Fuel Tax in California		
Reducing Speed Limits in California		
Rhode Island Flood Awareness and Climate Change Taskforce Plan		

Exercise 2

Screening Exercise – Determine HIA Feasibility

Directions

Assume you have received a directive to complete a Health Impact Assessment on a policy or project that has climate change significance. Your public agency wants to contribute to the public dialogue about how climate change related policies could have positive benefits to public health. You have funding for one full time person and a half time research assistant for a six-month project. You could complete a rapid, desk-based, intermediate or comprehensive HIA depending on the policy project. There are several potential policies your supervisor has asked you to consider in order to narrow the field to two possible projects. This cursory exercise will help you select the policy that best fits your needs and capacity in order to delve further into two policy options in a follow-up meeting (e.g. the next exercise in this Toolkit). The thinking you do on the other policies will also guide non-profit partners in the region who are applying for grants to complete additional HIAs.

Review the list of policy descriptions below.

1. Go through each and determine what type of climate change impact each could have (e.g. adaptation, mitigation or emergency management).
2. Next, consider the unique political perspective of your state, county or jurisdiction. What value would a Health Impact Assessment bring to the discussion on each of these policies?
3. Is the policy politically relevant at this time?
4. Is there sufficient evidence in the literature or in secondary data sources to examine the impact on health outcomes?
5. Do you have sufficient resources to complete an HIA on this policy?
6. What type of HIA would you do (rapid, desk-based, comprehensive or intermediate)?

Policy Option 1: State Fossil Fuel Tax - The proposed carbon tax will be a tax on the carbon content of all fossil fuels (gas, diesel, jet fuel) used in surface and air transportation and measured in terms of carbon dioxide equivalent (CO₂e). Air and surface transportation sectors represent between 40% and 50% of emissions in your state. The proposed tax rate is \$20 per ton of carbon dioxide equivalent, which equates to an estimate \$0.19 per gallon. Estimated revenues from the tax are between \$5 and \$10 billion each year and will go into the State budget with an undetermined amount set aside to increase the earned income credit for low-income households. Taxpayers would notice a change in line item on utility bills and at the pump.

Timeline – Originally, the legislative sponsors of the bill planned to bring it forward in the next spring session. However, given the current economic climate the bill will not be introduced for 18 months from now

Policy Option 2: City Building Material Upgrade Resolution - Local environmental groups proposed a resolution for all new developments 5000 ft and over in the central city area of the state capitol to use materials with increased reflectivity and/or decreased emissivity. The purpose is to increase the albedo (the reflective power of a surface) on all new developments so that the central city is cooler through absorbing less heat (e.g. reducing the urban heat island effect). Advocates cite research that found the use of concrete to increase albedo in Los Angeles would result in millions from energy savings, avoid smog-related medical costs, and prevent lost-work expenses.

Timeline – The policy was filed with the City Council last month. The Council will decide whether to move forward with developing a plan in the next two months.

Policy Option 3: Use of Pervious Surfaces in Transportation Strategic Plan - The Rural County Department of Transportation (RCDOT) teamed up with the Sustainability Department to update its strategic road services plan. One element of the revision is the replacement of asphalt with pervious surfaces to increase cooling capacity on all new road repairs/projects. While there is some evidence that different cement-based pervious surfaces can support cooling, RCDOT engineers are concerned the road types will not hold up to heavy traffic, lead to engineering issues, and cost more in repairs.

Timeline – The County will have public meetings to gather input on aspects of the old road services plan before putting out a new draft in four months. The public comment period on the new draft will take place between four and six months from now.

Policy Option 4: Central City Closure to Single Occupancy Vehicles - The state capitol's Transportation Department has proposed closing the Central City to all single occupancy vehicles during peak hours beginning 14 months from now. From 6am-9am and from 4pm-7pm only freight, transit, carpool, and emergency vehicles will be allowed to enter the limits of the Central City, as currently defined by the Planning Department. Businesses operating within the Central City limits can apply for fleet exemptions and pay a special use fee. This policy is designed primarily to decrease single occupancy commute trips into and out of the Central City during peak hours and has potential for cost savings in road maintenance.

Timeline – The Transportation Department will begin outreach to businesses and to the public three months from now. These discussions will inform the policy that will be drafted in nine months and will ultimately be put before City Council for a vote in one year.

Policy Option 1: State Fossil Fuel Tax

Policy Type - Is the policy Adaptation, Mitigation, Emergency Preparedness or a mix?

Policy Relevance - What value will this add to the policy dialogue?

Evidence Base - Is there sufficient information in the literature or in secondary data sources on health outcomes?

Resources - What level of HIA would be feasible?

HIA Appropriate - Yes or No?

Policy Option 2: City building material upgrade resolution.

Policy Type - Is the policy Adaptation, Mitigation, Emergency Preparedness or a mix?

Policy Relevance - What value will this add to the policy dialogue?

Evidence Base - Is there sufficient information in the literature or in secondary data sources on health outcomes?

Resources - What level of HIA would be feasible?

HIA Appropriate – Yes or No?

Policy Option 3: The Rural County Department of Transportation teamed up with the Sustainability Department to update its strategic road services plan.

Policy Type - Is the policy Adaptation, Mitigation, Emergency Preparedness or a mix?

Policy Relevance - What value will this add to the policy dialogue?

Evidence Base - Is there sufficient information in the literature or in secondary data sources on health outcomes?

Resources - What level of HIA would be feasible?

HIA Appropriate – Yes or No?

Policy Option 4: Closing Central City to all single occupancy vehicles.

Policy Type - Is the policy Adaptation, Mitigation, Emergency Preparedness or a mix?

Policy Relevance - What value will this add to the policy dialogue?

Evidence Base - Is there sufficient information in the literature or in secondary data sources on health outcomes?

Resources - What level of HIA would be feasible?

HIA Appropriate – Yes or No?

Exercise 3

Preliminary Scoping Exercise

Read the two case study descriptions below. Working in a group or on your own, select one case to use for developing a preliminary scope. You will continue working on this case in two additional exercises. The directions for this exercise follow the two case study descriptions.

HIA Training Case Study A

Ann Arbor and Washtenaw County Public Health *Urban Forest Canopy as a Climate/Health Adaptation*

Background:

The city of Ann Arbor is developing an Urban and Community Forest Management Plan, utilizing a street tree inventory that identifies 42,000 street trees and 8,000 stumps or planting sites. Canopy cover can reduce urban temperatures by 4C (7F); more urban canopy cover will be critical as temperatures climb as a result of global warming¹.

Canopy analysis using “leaf-on” remote sensing identified that Ann Arbor currently has 33% tree canopy cover in the city. Other beneficial data useful in the development of the plan comes from the city’s stormwater utility that uses near-IR “leaf-off” remote sensing to identify pervious and impervious surfaces. Washtenaw County is working on a State grant from the CDC on high heat events useful to the city in terms of identifying high-risk areas and populations.

Ann Arbor has data that can assess the canopy cover and tree canopy opportunities in areas of the city most vulnerable to high heat events. Coupling these data with the County Public Health information on potential health effects of high heat events and a Health Impact Assessment for tree planting can support the way that Urban Forestry decisions are made.

Decision-Makers and Decision-Making Process:

City Council will ultimately decide on the budget for Urban Forestry based on the Urban and Community Forest management plan (expected to go through at least April 2012). Staff will make and receive recommendations from the Environmental and Housing commissions, based on the plan, to help inform City Council.

Timeline:

Plan development began in January 2011 and is scheduled to be complete in April, 2012. Plan adoption and budget discussions follow. Tree planting decisions are ongoing.

¹ <http://news.bbc.co.uk/2/hi/science/nature/7271725.stm>

History of Concerns:

There has been a historical lack of funding for tree planting because these funds come from the general fund and compete with police and fire support. The urban forestry program has been moved to the stormwater fund so there is a more stable funding source. If certain tree planting provides both a stormwater and human health benefit, or a different tree would be used to provide a better human health benefit, this information is useful for future tree planting decisions.

Main Research Question:

1. Are there populations in the city that are more vulnerable to high heat events?
2. Are these populations located in areas of the city with less tree canopy?
3. What are the potential health benefits from providing tree canopy in areas where vulnerable populations reside?

Environmental & Social Determinants of Health to Consider:

- Heat Stress
- Stormwater/ Groundwater
- Aesthetics
- Walkability

Stakeholders:

Communities vulnerable to heat stress
 Urban Forestry and Natural Resource Planner
 City Systems Planning Staff
 Water Resources Manager
 Environmental Commission
 Housing Commission
 Planning Commission
 County Public Health
 City Council
 Dean Fund

Resources:

<http://www.nrs.fs.fed.us/urban/utc/local-resources/downloads/PrioritizationExplanation.pdf>

http://www.itreetools.org/news/articles/GTR_NRS62_Sustaining_Americas_Urban_Trees_and_Forests.pdf

<http://www.cfr.washington.edu/research/factSheets/29-UrbEconBen.pdf>

HEATING AND COOLING COSTS - A 25 foot tree reduces annual heating and cooling costs of a typical residence by 8 to 12%, producing an average \$10 savings per American household. Also, buildings and paving in city centers create a heat island effect. A mature tree canopy reduces air temperatures by about 5 to 10° F, influencing the internal temperatures of nearby buildings.

HIA Training Case Study B

Upstream Public Health-Vehicle Miles Traveled Policies in Oregon *VMT Policy as a Mitigation Strategy*

Background:

The Oregon State Legislature previously approved a multi-year plan to reduce greenhouse gas emissions (GHGs). In order to meet Oregon's aggressive goals in reducing GHGs, it will require policies that both improve fuel efficiency and reduce overall driving. The Oregon Governor in 2009 put forward a legislative proposal to use integrated land use and transportation planning to reduce total vehicle miles traveled (VMT) in each of the six metropolitan areas of Oregon.

Key policies that were discussed as strategies to reduce VMT include using zoning to ensure that residential areas are located near workplaces and other key destinations, to invest in public transit, and to use taxes and tolls to increase the cost of driving. In order to meet VMT targets, the municipalities would first choose a mix of land use and transportation policies, then do transportation modeling to estimate impacts on VMT, then implement the transportation and land use policies that they choose.

Decision-Makers and Decision-Making Process:

The state legislature is the key decision-making body that will approve the process to set VMT targets and provide financial resources to meet those targets. The state Governor is also an important stakeholder who has proposed the policy to the state legislature and has advocated for the policy.

Timeline:

The HIA research team has eight months from when the project starts to when the legislature would vote on legislation to reduce VMT.

History of Concerns:

There are concerns from individual citizens as well as some industry groups. Some individuals believe that integrated land use and transportation planning infringes on individual freedoms to build houses and plan cities as they wish. They are also concerned about the financial impacts on people who are dependent on driving to get to work. Others question the existence of global warming or the seriousness of the impacts, and therefore think it is not worth the resources to invest in VMT reduction strategies.

Industry groups such as the Homebuilders Association, or truckers are concerned about the impact on jobs and the financial strength of their industries. They are seeking strategies that ensure continued homebuilding, and that do not disrupt trucking routes for freight.

Main Research Questions:

1. What are the key policies to reduce VMT that local cities will consider?
2. What are the key impacts of a variety of policies to reduce VMT on human health?
3. What are the impacts on vulnerable populations (i.e. transportation-limited populations)?

Environmental & Social Determinants of Health to Consider:

VMT reduction policies may impact a broad range of economic and social factors.

- Household income
- Time spent in transit
- Location of employers
- Neighborhood design

Potential health determinants to consider include changes in the following.

- Exposure to air pollutants
- Physical activity
- Collision rates
- Access to goods and services
- Household transportation costs
- Noise levels

Stakeholders:

Legislators
 Advisors to Governor
 Staff at metropolitan planning agencies
 Bicycle transportation advocates
 Land use advocates
 Homebuilders Association
 Trucking industry

Resources:

A summary of the Governor's Jobs and Transportation Act, of which VMT targets were one component:

http://archivedwebsites.sos.state.or.us/Governor_Kulongoski_2011/governor.oregon.gov/Gov/docs/jobs_transp_act_2009_v2.pdf

Information on VMT in Oregon:

<http://www.oregon.gov/ODOT/TD/TDATA/tsm/vmtpage.shtml>

Literature Review on Health Impacts of Transportation and Land Use Policies:

<http://www.cdc.gov/nccdphp/dnpa/pdf/aces-workingpaper1.pdf>

Case Study Preliminary Scoping Worksheet 1

Directions

For your case study, consider that the policy is taking place in your city, county or state. You can apply the background information in the case study and any information you know about your area to the exercise. Consider the following questions and fill in the table below (spend about 15 minutes on this section).

1. What are the current conditions this policy will affect?
2. What are the direct, short-term and intermediate impacts of the policy?
3. What are the health determinants this policy will affect (list at least two)?
4. What populations will be impacted?
5. What are the potential long-term health outcomes of the policy?
6. Considering the direct impacts, the health determinant(s) and the health outcomes, what are some potential co-benefits that are either created by the policy, or could be added?
7. Considering the direct impacts, the health determinant(s) and the health outcomes, what are some potential co-costs, or trade-offs, that could occur as a result of the policy?
8. Write additional research questions in the table.

Following this, create a draft health determinant pathway diagram from the policy, the direct impacts, the intermediate outcomes, and the long-term health outcomes.

Use the example pathway diagrams, the UCLA health determinant list, and health determinant tables in your Toolkit as a reference.

Policy:

Current Conditions	Research Question Impacts	Health Determinant(s)	Health Outcomes
Impacted Populations	Potential Co-benefits	Potential Co-costs	Additional Research Questions

Exercise 3. Case Study Preliminary Scoping Worksheet 2

Draft Health Determinant Pathway Diagram (15 minutes for this section).

Use the example pathway diagrams and health determinant tables in your Toolkit as a reference (turn sideways and enter policy on the left side similar to other pathways).

HEALTH
OUTCOMES

INTERMEDIATE
OUTCOMES

DIRECT
IMPACTS

POLICY

Exercise 4

Bite Size Scope

Directions

Now that you have created a draft health determinant pathway and completed a portion of a preliminary scope, your agency has been asked to provide an option of an intermediate scope and rapid HIA scope version of your policy. Return to your draft pathway diagram from the last exercise and discuss options for limiting the scope. **Use the example pathway diagrams and health determinant tables in your Toolkit as a reference.**

In order to conduct a rapid HIA, you will need to limit the scope to only **two** health determinant sub-pathways. Consider the political climate in your jurisdiction or state and choose which two health determinant sub-pathways you would select. Consider which sub-pathways, 1) would add the most value to the discussion of direct benefits or co-benefits, 2) have a sufficient evidence base, and 3) have a greater potential impact on vulnerable populations. Describe your reasons for that decision below.

In order to conduct an intermediate HIA, limit the scope to only **four** health determinant sub-pathways. Consider the political climate in your jurisdiction or state and choose which four health determinant sub-pathways you would select. Consider which sub-pathways, 1) would add the most value to the discussion or a potential co-benefit, 2) have a sufficient evidence base, and 3) have a greater potential impact on vulnerable populations. Describe your reasons for that decision below.

**A "sub-pathway" is one key health determinant, so for example, in the VMT project you might focus on 2 of the following: air pollution, collisions, physical activity, mass transit ridership, noise or access to goods and services*

Exercise 5

Identify Research Questions, Data and Methods

To prepare for the Assessment stage, your agency needs to develop research questions, develop a set of methods to answer these questions, and identify potential data sources. Continue with your case study from the previous activity. Answer the following questions in the table below.

- What are three potential research questions about the impact of the policy? You can develop research questions about the impact on existing conditions and/or questions about the intermediate and long-term impacts on health outcomes.
- What research methods would you use to answer these questions? Do you need a quantitative measure, a qualitative measure or both?
- What type of data would you use to answer these research questions?
- Where would you go to find relevant data?

Research question 1	Method to answer question (Quantitative, qualitative or mix?)	Type of data	Source of data
Research question 2	Method to answer question (Quantitative, qualitative or mix?)	Type of data	Source of data
Research question 1	Method to answer question (Quantitative, qualitative or mix?)	Type of data	Source of data

What content experts do you need to involve for this HIA?

What content information or expertise would they provide?

Exercise 6

Communication Frame Development

Directions

On the next page is an exercise to help you think through constructing a message frame. Using your existing case study, assume you have completed your Assessment stage and have preliminary findings. At least one finding indicates implementing the policy would provide significant co-benefits and positive health impacts for your population(s). Develop one potential policy recommendation using this assumed positive finding. Develop a communication message frame around this policy recommendation. Message frames can be used on any aspect of an HIA. They are especially helpful in articulating findings and recommendations.

1. Select an audience (e.g. decision makers, advocates, general public, reporters) and write this at the top of the page.
2. Think of a health determinant and health outcome research finding that you want to highlight (e.g. air pollution and respiratory illness) and write this below your audience.
3. Think of a relevant policy recommendation connected to this potential health outcome benefit (e.g. "implement the policy targeting "x" area in order to increase the benefit for the "y" population). Write down your recommendation next to your potential finding.
4. In the top left hand box ("Value Message") think of a value that appeals to your audience related to that health determinant, health outcome and recommendation (e.g. clean air for all, healthy environments for children) and write this in the top left hand box.
5. In the top right hand box, ("Barrier Message") consider a common barrier that might cause a member of your audience to not listen, or not act on the information you tell them (e.g. "that does not affect me").
6. In the bottom left hand box ("Vision Message") think of how, if HIA recommendations are followed, or positive findings are present in the HIA, the audience's life would be positively affected (e.g. lower health costs, community's health improved, better visibility for tourism).
7. In the bottom right hand box ("The Ask") think of an action you would like this member of your targeted audience to do (e.g. listen to the HIA findings, implement your recommendations).

Optional: At the end, you can also combine one or more of these elements (e.g. value + vision) to create a whole frame recommendation message such as: "Our dependence on cars doesn't just hurt the environment – it harms our health every day. Implementing a combination of policies is the best way to promote the positive health benefits of alternative forms of transportation."

(Adapted From: The Metropolitan Group)

Value Message: How does the issue you seek to change align with the audience's already existing, closely held values?

Barrier Message: What is your audience members' best reason to say no? How do you counter it?

Vision Message: What will happen if you accomplish your objective? How are things better for the audience?

The Ask: What, specifically, do you want the audience to do?

8 TRANSPORTATION HEALTH EQUITY PRINCIPLES



TRANSPORTATION HEALTH EQUITY PRINCIPLES

WHO IS IMPACTED BY TRANSPORTATION INEQUITY?

People of color, people experiencing poverty, people with disabilities, and people who experience language barriers are disproportionately impacted by burdens of the transportation system but do not receive an equal share of the benefits. In this document, we will refer to these groups of individuals as ‘impacted communities’ or ‘impacted persons’.

1 Ensure equal access to essential goods & services, jobs & economic opportunities, and healthy foods & places.

We all rely on the transportation system everyday to get from home to school, work, and other destinations. Impacted persons, who are more likely to depend on public transit, often live in areas with poor transit service, fewer destinations, and poor connectivity due to historical underinvestment and disinvestment. These unfair burdens increase transportation costs, increase stress, and create unequal access to economic and educational opportunities, housing, healthy foods, and opportunities for physical activity—all of which have direct impacts on health.

Examples that support this principle include:

- Complete streets policies that meet the needs of all users, including pedestrians, bicyclists, public transit riders, children, older adults, and people with disabilities.
- Inclusionary zoning policies and transit-oriented development incentives to connect jobs to attainable housing and reduce commute times, congestion, and air pollution.



PHOTO: Flickr User inmotionman

2 Engage & empower impacted communities early & often, with opportunities to have real influence during all stages of decision-making.

Meaningful public participation processes are open, inclusive, and provide participants with opportunities to shape transportation outcomes. Impacted communities are often underrepresented, tokenized, or are not offered meaningful opportunities to participate in public processes. As a result, impacted communities have been disempowered and disproportionately burdened by transportation projects that do not benefit their communities and that cause negative health and environmental outcomes.



PHOTO: Flickr User heacphotos

Examples that support this principle include:

- Engaging transit-dependent groups in public processes, particularly for decisions about fares, service, and accessibility; budget for participant compensation.
- Outreach strategies, materials, and events that are tailored to the language, culture, media, location, and physical abilities of impacted communities.

3 Implement transportation funding & investment policies that address historical disinvestment for impacted persons & for underserved neighborhoods.

Funding for transportation investments must be equitably collected and distributed to impacted communities with the greatest disparities in access to affordable transportation. Transportation and housing costs make up the majority of a household’s budget, so transportation and housing policies and investments must be integrated to provide smart solutions for lower-income families.

Examples that support this principle include:

- Road-pricing policies, such as tolls or fees, which do not disproportionately burden low-income communities or limit access to goods, services, and opportunities.
- Increasing access to car sharing, carpooling, and other programs that limit the cost of car ownership for people who have few transportation options.



TRANSPORTATION HEALTH EQUITY PRINCIPLES

4 Promote access to jobs, including in the transportation sector.

Transportation has a significant impact on each person’s ability to find and maintain a job, and transportation investments can be used to increase access to jobs in all industries for impacted communities. Training and employment opportunities within the transportation industry should be created to build leadership within impacted communities and to create stable, family-wage jobs. A stable, family-wage income directly improves health through reduced stress and through access to healthy food, health care, education, and other goods and services.

Examples that support this principle include:

- Prioritizing transportation investments that create jobs and economic opportunities for communities experiencing high unemployment and poverty rates.
- Prioritizing investment in education, training, and employment opportunities for groups traditionally underrepresented in the transportation sector.



PHOTO: Flickr User greenforall

5 Prioritize transportation investments that ensure healthy & safe communities.



PHOTO: Flickr User Ed Yourdon

The communities that we have identified as most impacted are often disproportionately burdened with unsafe transportation environments, including few safe crossings, too much high-speed traffic, and poor sidewalk and bicycle infrastructure. Investments that focus on making active modes of transportation safer for youth and families will make these choices more convenient and accessible—increasing physical activity levels, reducing air pollution, and making communities healthier.

Examples that support this principle include:

- Shifting the unjust balance of expensive, highway-dominated transportation investments to safe, reliable, and efficient alternatives that support impacted communities.
- Using Health Impact Assessments to evaluate how transportation planning and projects will impact health equity.

6 Adopt transportation policies that promote environmental justice & sustainability.

Impacted communities disproportionately suffer from transportation-related air, water, and noise pollution, all of which can have significant negative impacts on health. Efforts to address disproportionate environmental burdens and historic disinvestment must include strategies to ensure that impacted communities benefit from new investments and are not disproportionately burdened by displacement or disinvestment.

Examples that support this principle include:

- Strengthening and enforcing measures to improve air quality and reduce exposure to vehicle emissions, especially in impacted communities.
- Considering cumulative environmental impacts of past land use and transportation decisions in new plans and projects.

For more information, contact Heidi Guenin, Transportation Policy Coordinator • www.upstreampublichealth.org

9

SAMPLE HIA ONE-PAGER: Creating a Transportation Policy for a Healthier Oregon



CREATING A TRANSPORTATION POLICY FOR A HEALTHIER OREGON

A Health Impact Assessment on How Investments in Public Transportation and Community Design Will Help Us Be More Active, Breathe Easier—and Improve Our Overall Health

Health Impact Assessments (HIAs) examine how a policy or project helps and harms the well-being of people affected by it. HIAs are commonly used in Europe and Canada, and the Centers for Disease Control recommends their use in the United States.

Upstream Public Health commissioned this HIA after Governor Ted Kulongoski proposed to set specific targets for reducing the total number of miles driven in Oregon in order to meet Oregon’s legislature-approved greenhouse gas emission targets. It looks at the health impacts of three policy areas that reduce driving: land-use planning, public transit, and driving-related fees. This is the first-ever statewide HIA in Oregon. It offers critical analysis that decision-makers can use to implement healthier urban land-use and transportation policies at the local level. This was a collaboration between Upstream Public Health, Oregon Health & Science University, Human Impact Partners, and an expert advisory committee.

The Transportation-Health Connection

Our dependence on cars doesn’t just hurt the environment—it harms our health every day. Autos emit toxic pollutants, like benzene and arsenic, into the air we breathe, causing asthma and lung cancer. They also promote a less active way of life, which contributes to an epidemic of overweight Oregonians. Experts are predicting that for the first time ever, children today may live shorter lives than their parents due to obesity-related epidemics like diabetes and heart disease.

Here’s how it looks by the numbers...

- Minutes of moderate physical activity each day recommended by experts: **30**
- Average minutes of commute-related walking among those who take public transit: **16**
- Average minutes of commute-related walking among those who don’t take public transit: **1½**
- Number of Oregonians who are overweight or obese: **1.8 million**
- Annual obesity-related healthcare costs in Oregon: **\$781 million**
- Minimum number of extra pounds per person experts attribute to urban sprawl: **6**
- Healthcare savings Oregon could realize annually if every person in the state lost those 6 pounds: **\$206 million**
- Estimated number of deaths annually due to outdoor air pollution in the U.S.: **42,100**
- Number of Oregonians with Asthma: **355,000**
- Rank of Oregon in Asthma rate among all states (1 is highest): **2**

For HIA findings turn over...



Read the full report at:
www.upstreampublichealth.org/transportation.html

For more information contact:
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Health Impact Assessment of Policies to Promote Alternative Options to Driving in Oregon Metropolitan Areas

The study examined 11 specific policies to reduce driving in six metro areas in the state and how each would affect Oregonians' health.

Study Findings:

- Implementing a combination of policies is the best way to promote the positive health benefits of alternative forms of transportation.
- Creating affordable neighborhoods that are high-density, mixed-use, and highly connected will make people more active, decrease air pollution, and reduce car crash fatalities.
- Employer parking fees would promote health more than a gas or a vehicle-miles-traveled tax because it would actually shift people away from driving to public transit.
- Driving-related taxes may disproportionately impact low-income, elderly or disabled individuals. If taxes are put into place significant revenues from them should be re-invested in low-income communities through strategies such as improving access to public transit and building affordable housing.

Read the full report at www.upstreampublichealth.org/transportation.html

For more information, contact: Mel Rader, Project Director
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Sources for "By the Numbers:"

- Walking times for transit and non-transit users was obtained from a study by Lachapelle and Frank, "Transit and Health: Mode of Transport, Employer-Sponsored Public Transit Pass Programs, and Physical Activity." *Journal of Public Health Policy* 2009, 30, 573-794.

- Oregon obesity-related costs and rates were obtained from the report "SB 931: Task Force for a Comprehensive Obesity Prevention Initiative," prepared by the Oregon Department of Human Services, 2009.

- Sprawl-related weight gain was drawn from a report by Smart Growth America, "Measuring the Health Effects of Sprawl." 2003. <http://www.smartgrowthamerica.org/healthreport.html>

- Healthcare costs per pound came from an analysis done by Humana health insurance company:
http://www.businesswire.com/portal/site/humana/?ndmViewId=news_view&newsId=20081231005280&newsLang=en

- Air Pollution mortality estimate obtained from the World Health Organization WHOIS Database, http://www.who.int/entity/quantifying_ehimpacts/countryprofilesebd.xls

- Asthma rate for Oregon is from "The Burden of Asthma in Oregon, 2008" by the Oregon Department of Human Services.

- Asthma Rankings came from Trust for America's Health: <http://healthyamericans.org/states/?stateid=OR>

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**SAMPLE ARTICLE ON
HIA RESULTS:
"Transportation, Health
+ Climate Change:
Promoting Healthier
Transportation Policy in
Oregon"**



Transportation, Health & Climate Change: Promoting Healthier Transportation Policy in Oregon

By Mel Rader, Yvonne Michael, and Leslie Perdue

America's love affair with the automobile has given us freedom of travel at the expense of the environment and health. Our daily transportation choices are a critical driver of global warming, contributing 29 percent of America's greenhouse gas emissions; and also affect our health through the air we breathe, the risk of an accident, and the amount of physical activity. For example, a 2003 study in the *American Journal of Health Promotion*, showed sprawl in urban areas adds at least six pounds of weight to the average person's waistline through changes in physical activity. Walking and biking to work are well-known healthy options, but public transit users also get a daily average of 16 minutes of physical activity during their commute, while someone who drives to work typically only walks for 1½ minutes.

Physical activity is just one piece of the transportation-health puzzle. Cars also emit toxic pollutants, such as benzene and arsenic, into our air, causing asthma, lung cancer, and dozens of

HIA's are more powerful tools when the results are used to advocate for specific policy objectives.

other diseases. An estimated 42,000 people die in the United States every year because of outdoor air pollution. This burden of disease falls heavily on low-income and minority populations that are more likely to live near highways. In addition, fatal vehicle collisions killed 313 people in Oregon's metropolitan counties in 2007.

Motivated by dire scientific predictions of global warming, the West Coast governors have formed a partnership to address global warming, including a new vision for our transportation and land use systems that shifts investments toward healthier transportation options such as public transit, bicycling, and walking. Oregon Governor Ted Kulongoski proposed targets for reducing the total miles driven in the state's six metropolitan areas (so-called, Vehicle Miles Traveled or VMT) to reduce greenhouse gas emissions as part of the 2009 Jobs and Transportation Act.

Upstream Public Health – a non-profit dedicated to promoting health in Oregon through policy

change – decided to examine the health co-benefits of this policy proposal by commissioning the first-ever Health Impact Assessment (HIA) on a climate change-related policy. HIAs are one powerful tool to examine the relationship between projects or policies and their ultimate impacts on death and disease. The research analysis was conducted by Oregon Health and Science University researchers, guided by a 12-person advisory committee of technical experts and community groups. Partners included the state public health division, metropolitan planning organizations, land use and planning organizations, public health nonprofits, academic healthcare organizations, and bicycle and pedestrian advocates.

Looking at how three policy topic areas that reduce driving – land-use planning, public transit, and driving-related fees – would affect physical activity, air pollution, and car collision rates, enabled us to offer critical analysis that decision makers could use to develop healthier urban land-use and transportation policies at the local level. In total,

11 specific policy proposals were chosen by the advisory committee, including street connectivity, mixed-use neighborhoods, access

to public transit, and driving-related fees such as employee parking fees, a gas or vehicle miles traveled tax, and congestion pricing.

The Health Impact Assessment included an extensive literature review on the connection between the 11 specific policies and their impacts on health in the areas of air pollution, vehicle collisions, and changes in physical activity. The relationships between the policies and health were described through cause and effect diagrams and the strength of the evidence was assessed for each link of the diagrams.

The study found that a combination of policies that increase transportation choices, and increase density is the most effective way to promote positive health benefits. Creating affordable neighborhoods that are high-density, mixed-use, and highly connected with bicycle- and pedestrian-friendly infrastructure would not only make people more active, but would decrease both air pollution and collision rates.



However, increasing the cost of driving, by itself, was not consistently found to have those same effects. Employer parking fees were found to promote health more than a gas tax, a VMT tax, or congestion pricing because it would shift people away from driving and toward public transit. The report cautioned that the tax would disproportionately affect low-income and marginalized populations; instead it suggested ways to reinvest tax revenues in ways that rebuild low-income neighborhoods.

Since a goal in preparing the HIA was to influence policy makers, we distributed a final report with the recommendations and a two-page fact sheet to state and local decision makers, the media, and key transportation, land use, and health stakeholders throughout Oregon. Representative Jules Bailey wrote a letter to his colleagues in the Oregon Legislature. Upstream Public Health used the HIA report in testimony at the state and local levels, as well as presentations to the Portland-area Metro Government.

While the HIA did not change the outcome in the 2009 legislative session (the final legislation only included a VMT target for Portland), it did change the dialogue about health and transportation in Oregon. Several legislators, Metro government councilors, and reporters publicly expressed interest in the findings, or asked follow-up questions about health impacts. In addition, Portland City and Metro Governments have taken measurable steps toward healthy community design, including staff training, discussion at the local government level, and incorporation of health goals into future plans and projects.

All metropolitan areas in California and



Steve Morgan

Washington, along with the Portland metro area in Oregon, have made commitments to specific targets for reduced driving, through broad changes in how we design our cities and our transportation options. Other metropolitan areas in Oregon are debating specific targets. By taking the leap into a new type of transportation design and by designing for health from the start, we can all live in cities where we breathe more easily and live more active, healthier lives.

Health Impact Assessments can be a powerful tool to shed light on the complicated and important relationships between climate change policy, transportation and health – but sometimes assessment alone will not create measurable improvements in health. That is why HIAs are more powerful tools when the objectives and results serve the interests of communities, and when research results are used to advocate for specific policy objectives to improve the health of communities. ■

Two buses at the Forest Grove, Oregon terminal of TriMet, the public transit agency serving the Portland, Oregon metropolitan area.

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11

CLIMATE CHANGE, HIA & HEALTH LINKS

LINKS

Climate Change, HIA + Health

CLIMATE CHANGE TRAINING COURSES

WHO Training Courses for Public Health Professionals on Protecting Our Health from Climate Change

http://www.searo.who.int/en/Section260/Section2468_14932.htm and http://www.who.int/globalchange/training/health_professionals/en/index.html

Introductory Course on the Greenhouse Effect, Climate Change and the Road to Sustainability

<http://grimstad.hia.no/puls/climatechange/>

Heat Waves, Floods and the Health Impacts of Climate Change: A Prototype Training Workshop for City Officials

<http://web.wkc.who.int/projects/uhe/heatw/>

Climate Information for Public Health: Curriculum for Best Practices

<http://portal.iri.columbia.edu/portal/server.pt?open=512&objID=1094&PageID=0&cached=true&mode=2&userID=2>

NOAA “Planning for Climate Change” Workshop

<http://nerrs.noaa.gov/CTPIndex.aspx?ID=455>

COMMUNICATIONS + MESSAGING

Pew Center on Global Climate Change – Communicating Climate Change

<http://www.pewclimate.org/communicating>

George Mason University Center for Climate Change Communication

<http://www.climatechangecommunication.org/>

Yale Project on Climate Change Communication

<http://environment.yale.edu/climate/>

A New Way to Talk About the Social Determinants of Health

<http://www.rwjf.org/vulnerablepopulations/product.jsp?id=66428>

Frameworks Institute

<http://www.frameworksinstitute.org/>

HIA RESOURCES

Centers for Disease Control and Prevention - Healthy Places

The CDC provides an overview of HIA methodology and includes links to many resources.

<http://www.cdc.gov/healthyplaces/hia.htm>

The Health Impact Project

The Health Impact Project is a collaborative of Pew Charitable Trusts and Robert Wood Johnson Foundation. The website includes news, resources, and funding opportunities.

<http://www.healthimpactproject.org/>

Robert Wood Johnson Foundation HIA Clearinghouse

<http://www.rwjf.org/publichealth/product.jsp?id=72216>

UCLA Health Impact Assessment Clearinghouse

UCLA maintains a learning resource center, and a catalog of completed HIAs conducted around the U.S.

<http://www.hiaguide.org/>

<http://www.health-forecasting.org/>

World Health Organization - HIA resources

This website provides guides, resources and links to other HIA websites around the world.

<http://www.who.int/hia/en/>

Health Impact Assessment Blog

This blog provides updates on developments in the HIA field.

<http://healthimpactassessment.blogspot.com/>

London Health Observatory

<http://www.lho.org.uk/Training/HIA/AboutHIA.aspx>

HIA Connect

<http://www.hiaconnect.edu.au/>

Health Equity Impact Assessment

<http://www.wellesleyinstitute.com/policy-fields/healthcare-reform/roadmap-for-health-equity/health-equity-impact-assessment/>

HIA METHODS

Healthy Development Measurement Tool (HDMT)

http://www.thehdmtool.org/hia_resources.php

Guide to Quantitative Methods

<http://www.scribd.com/doc/26734204/Guide-to-Quantitative-Methods-in-HIA-SNIPH-Sweden-2008>

DYNAMO-HIA Tool

<http://www.dynamo-hia.eu/root/o14.html>

Methodology Models – UCLA

<http://www.ph.ucla.edu/hs/health-impact/models.htm>

<http://www.hiaguide.org/methods-resources/methods>

National Association of County and City Officials

<http://www.naccho.org/topics/environmental/landuseplanning/toolbox.cfm>

CLIMATE CHANGE INFO

U.S. Global Change Research Program

<http://www.globalchange.gov/>

Pew Center on Global Climate Change

<http://www.pewclimate.org/>

NASA Global Warming and Climate Change Policy Websites

http://gcmd.nasa.gov/Resources/pointers/glob_warm.html

RealClimate: Climate Science from Climate Scientist

<http://www.realclimate.org/index.php/archives/2007/05/start-here/>

Environmental Health and Toxicology Enviro-Health Links – Climate Change and Health

<http://sis.nlm.nih.gov/enviro/climatechange.html>

WHO Climate Change: Directory of References/Resources

<http://www.who.int/heli/risks/climate/climatedirectory/en/index9.html>

LINKS

EPA Climate Change – Health and Environmental Effects

<http://www.epa.gov/climatechange/effects/health.html>

Health Canada – Climate Change and Health

<http://www.hc-sc.gc.ca/ewh-semt/climat/index-eng.php>

Georgetown Climate Center

<http://www.georgetownclimate.org/index.php>

Climate Change Myths and Facts – Oregon State University Global Environmental Change Organization

http://oregonstate.edu/groups/geco/pages/GECO_climate_change_myths_facts.html

Union of Concerned Scientists – Global Warming

http://www.ucsusa.org/global_warming/

National Association of County and City Officials

<http://www.naccho.org/topics/environmental/landuseplanning/toolbox.cfm>

Remote Sensing Data - National Ocean Atmospheric Association Satellite and Information Service

<http://noaasis.noaa.gov/NOAASIS/ml/education.html>

12

REVIEW SUMMARY of HIAs on CLIMATE CHANGE

RESOURCE GUIDE

Energy Sector

1. E. Avis, C. Chen, L. Foster, J. Lynch, M. Rimland, M. Ross, et al. A health impact assessment of California's cap-and-trade greenhouse gas mitigation policy. Berkeley, CA: University of California at Berkeley; 2009.
2. California Department of Public Health. Health impact assessment of a cap-and-trade framework. Oakland, CA: California Department of Public Health; 2010.

Transportation Sector

1. R. Babka, M. Negev. A health impact assessment of reducing highway speed limits in California: Would a maximum speed limit of 55 mph on California's highways reduce greenhouse gases and improve health? Berkeley, CA: University of California at Berkeley; 2009.
2. M. Rader, Y. Michael, L. Perdue. Health impact assessment on policies reducing vehicle miles traveled in Oregon metropolitan areas. Portland, OR: Upstream Public Health; 2009.
3. H. Guenin, L. Perdue, M. Rader. Health impact assessment on transportation policies in the Eugene Climate and Energy Action Plan. Portland, OR: Upstream Public Health; 2010.
4. D. Fleming, D. McLerran, P. Carr, J. West, B. Wright. SR 520 health impact assessment: A bridge to a healthier community. Seattle, WA: Public Health Department of Seattle and King County; 2008.

Food and Agriculture Sector

1. T. Henderson, M. Rader. HB 2800: Oregon farm to school and school garden policy health impact assessment. Portland, OR: Upstream Public Health; 2011.

Transportation, Food and Agriculture and Home Energy Sectors

1. R. Beltre, K. Sheehan, T. Yuen, M. Glaser, B. Hendrickson, N. Schneider, et al. Fossil fuel tax in California: A health impact assessment. Berkeley, CA: University of California at Berkeley; 2009.

Project-focused HIAs

1. M. Simmons. Taylor Energy Center Health Impact Assessment. Florida: Healthy Development Incorporated; 2007.

Adaptation-focused HIAs

1. L. Baiardi, E. Kara, S. Raichand, C. Eshareturi. Health effects of climate change in the West Midlands: Technical report. West Midlands: UK: West Midlands Public Health Observatory; 2010.
2. J. Spickett, H. Brown, D. Katscherian. Health impacts of climate change: Adaptation strategies for Western Australia. Perth, Australia: Western Australia Department of Health; 2008.

LITERATURE REVIEW METHODS

We conducted a literature review in HIA compendiums and databases to identify relevant policy-specific HIAs that discuss climate change in relation to health outcomes (see Table 2 below). This review was restricted to English language. We searched Google Scholar, MEDLINE, SCIENCE DIRECT, SAGE, EBSCOHOST and HIGHWIRE databases. Search terms included “HIA” or “health impact assessment” and “climate change” and “health” and “co-benefits” and “mitigation” and “adaptation”. We reviewed author reference lists for additional relevant HIAs. HIAs of policies to mitigate or adapt to climate change were included. A total of eleven HIAs were found. We did not include HIAs that are from climate change sectors if they did not discuss the issue.

Table 2. Climate change HIA literature review

Search Terms	HIA Compendiums	Databases
HIA	The UCLA Health Impact Assessment Website http://www.ph.ucla.edu/hs/health-impact/reports.htm	Google Scholar,
Health Impact		MEDLINE,
Assessment	The UC Berkeley Health Impact Assessment Website http://sites.google.com/site/ucbhia/projects-and-research	SCIENCE DIRECT,
Climate change		SAGE,
Health	The Assn. of Public Health Observatories HIA Gateway http://www.apho.org.uk/default.aspx?RID=44538	EBSCOHOST
Co-benefits		T and
Mitigation	Upstream Public Health http://www.upstreampublichealth.org/	HIGHWIRE
Adaptation		

A majority of the HIAs are on policies that require mitigation strategies such as cap-and-trade or a carbon tax. Two other reports were included that deal primarily with adaptation to climate change irrespective of a focus on a particular climate change policy. The *Health Impacts of Climate Change: Adaptation Strategies for Western Australia* and *Health Effects of Climate Change in West Midlands*, were included because of the scale of the adaptation strategies listed and the depth of the assessment of the health impacts of climate change on particular regions. A primary aim of both HIAs is to provide baseline information on the health effects of climate change so that adaptation and mitigation strategies can be decided in the future.

One HIA included, *Taylor Energy Center Health Impact Assessment*, was not completed on a policy, but on a project. This HIA was included because it was done in a rural area that is economically disadvantaged and has poorer health compared to the state average. This HIA identifies the health and equity issues involved with siting a coal-fired power plant in a rural area and identifies equity concerns that made it appropriate for inclusion.

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RESOURCES SUMMARY

Resources Review Summary

This section presents an overview of English-language literature that was gathered to support the climate change curriculum. The climate change resource list is grouped by topics integral to understanding the health impacts of climate change. A bibliography and reference topic dictionary and guide is provided below. The literature review methods section can be found on the following page of this document. The bibliography and reference section starts on the page that follows the literature review methods section.

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Literature Review Methods

We conducted a systematic literature review in multiple databases to identify resources for the climate change curriculum. The review was restricted to English language documents. A search was completed in Google Scholar, MEDLINE, SCIENCE DIRECT, SAGE, EBSCOHOST and HIGHWIRE databases. Search terms included:

- “Climate Change and Health”
- “Climate Change Health Co-Benefits”
- “Climate Change Mitigation and Health”
- “Climate Change Adaptation and Health”
- “Climate Change and Health Impact Assessment”
- “Climate Change Health Communication”

Additional search terms included: “HIA”, “Equity” and “Emergency Preparedness”. The reference lists of the included articles were examined to obtain additional pertinent articles. A Google search of organizational websites was used to scan for relevant documents and reports. Reports from groups such as the World Health Organization, Pew Center on Global Climate Change, American Public Health Association, United States Climate Science Program, Environmental Protection Agency, among others, were obtained using this method.

Reports and Reviews

1. The Interagency Working Group on Climate Change and Health. A human health perspective on climate change. Research Triangle Park, NC: Environmental Health Perspectives and the National Institute of Environmental Health Services; 2010.
2. K. L. Ebi, A. E. Grambsch, F. G. Sussman, T. J. Wilbanks. Analyses of the effects of global change on human health and welfare and human systems. A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research. Washington, DC: Environmental Protection Agency; 2008.
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16. World Health Organization. Protecting health from climate change: Connecting science, policy and people. Geneva, Switzerland: World Health Organization; 2009.

Health Co-Benefits

17. L. S. Kalkstein, J. S. Greene. An analysis of potential heat-related mortality increases in U.S. cities under a business-as-usual climate change scenario. Milwaukee, WI: International Society of Biometeorology; 2007.
18. S. L. Harlan, D. M. Ruddell. Climate change and health in cities: Impacts of heat and air pollution and potential co-benefits for health. Current Opinion in Environmental Sustainability. 2011;3:126-134.
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25. K. R. Smith, K. Balakrishnan. Mitigating climate, meeting MDGs, and moderating chronic disease: The health co-benefits landscape. London, England: Commonwealth Secretariat; 2009.

HIA Resources

26. R. Bhatia. A guide for health impact assessment. San Francisco, CA: California Department of Public Health; 2010.
27. H. Brodin, S. Hodge. A guide to quantitative methods in HIA. Stockholm, Sweden: Swedish National Institute of Public Health; 2008.
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Communication, Messaging and Framing

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Climate Change Science

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Government Planning

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Adaptation

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Presentation references are in the list; image references are in the table in the next section.

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Chapter 4

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Chapter Seven

See image sources in table.

Climate Change Policy and HIA Presentation Image Sources

Chapter	Slide	Image	Source
1	10	Earth	Our Changing Planet 2008, US Global Change Research Program
1	11	Flood	FEMA image library
1	11	Drought	Wpclipart.com
1	12	Food	Fruits Worldtraveler Hubpages
1	12	Water and houses	MorgueFILE users hotblack and chelle
1	13	Anopheles mosquito	CDC
1	13	People with masks	http://www.fotopedia.com/items/flickr-3509380883 , ALFREDO ESTRELLA/ AFP/ Getty Images photo credit
1	13	Sun	CDC
1	14	precip	US Global Change Research Program
1	16	Vibrio table	McLaughlin et al., 2005; World Health Organization Climate Change Training Module 2008
1	17	Extreme events	US Global Change Research Program
1	18	Hurricane chart	Mills, 2009; World Health Organization Climate Change Training Module 2008
1	19	Hot days map	US Global Change Research Program
1	20	Ozone changes in NY	World Health Organization Climate Change Training Module 2008; Kinney et al. 2006
1	21	Regional map	Climate Change: Our Health in the Balance. (2008). American Public Health Association. Human Impact Partners adapted from Dahlgren G & Whitehead M (1991) <i>Policies and strategies to promote social equity in health</i> . Institute for Future Studies, Stockholm (Mimeo)
1	29	Health det's	Human Impact Partners
1	30	Tree exercise	Image Source: The MIT Joint Program on the Science and Policy of Global Change
1	33	Chart	http://globalchange/mit.edu
1	35	hurricane	Our Changing Planet 2009 Image 70; US Global Change Research Program
1	36	Cartoon	2007-098 John Ditchburn
2	42	Flow chart	Haines, A., Patz, J. Health effects of climate change. JAMA. 2004; 291(1): 99-103.
2	43	ibid	ibid
2	44	CAP map	PEW Center on Global Climate Change http://www.pewclimate.org/
2	48	Flow chart	Haines, A., Patz, J. Health effects of climate change. JAMA. 2004; 291(1): 99-103.
2	49	Adaptation plan map	PEW Center on Global Climate Change http://www.pewclimate.org/
2	54	Flow chart	Haines, A., Patz, J. Health effects of climate change. JAMA. 2004; 291(1): 99-103.
2	59	Flow chart	ibid

Chapter	Slide	Image	Source
2	63	Pollution	Our Changing Planet 2009 Image 68; US Global Change Research Program
2	64	cows	Mensatic Cows DSC
2	64	Energy lines	Demondimum 07June2008 MorgueFile
2	64	trash	Landfill compactor Wikipedia
2	64	Smoke stack	Conesville Power Plant MorgueFile
2	64	Cars photo	MorgueFILE user dantada
2	69	2002 Farm Bill	UCLA Health Impact Assessment Group 2002 HIA on Policies Reducing Vehicle Miles Traveled in Oregon Metropolitan Areas, 2009
2	70	Oregon map	Healthy Development, Inc., Taylor Energy Center
2	71	Fish Advisory Map	Health Impact Assessment Phase 1 of 3, Summer 2006.
2	71	Coal plant	Coal plant image in Kansas: EPA Issues New Standards for Coal-Burning Plants http://www.npr.org/2011/07/07/137681222/epa-issues-new-standards-for-coal-burning-plants
3	7	Dogs photo	Flickr: thelastminute
3	10	Flood damage photo	Flickr user simminch; real name Chuck Simmins
3	11	Pollution photo	MorgueFILE user puravida
3	12	Child inhaler photo	Asthma spacer Wiki commons
3	13	Young photo	Taliesinmomchild
3	13	Elderly photo	MorgueFILE users Alvimann, People_Assorted_3051(10)
3	14	Household utility expenditures	U.S. Census Bureau 2011 Census Abstract, Consumer Expenditure Survey, Table 687 – Average Annual Expenditures Of All Consumer Units by Income Level: 2008
3	15	Income by race	U.S. Census Bureau, Income, Poverty, and Health Insurance Coverage in the United States: 2008; Current Population Reports, P60-236(RV), and Detailed Tables -- Table HINC-06, September 2009. Table 692.
3	23	Clean Energy Works pathway	Logo is from Clean Energy Works Oregon. Diagram was vetted with Kelly Haines, www.cleanenergyworksoregon.org
4	34	Forestry/Ag photo	MorgueFile user gracey, JGS_CornfieldandTreeRow.jpg
4	34	Transport, buildings, waste photo	MorgueFile user jppi SW Railroad in Seattlencp102
4	36	Higher Fuel Cost	R. Beltre, K. Sheehan, T. Yuen, M. Glaser, B. Hendrickson, N. Schneider, et al. Fossil fuel tax in California: A health impact assessment. Berkeley, CA: University of California at Berkeley; 2009
4	38	20 min neighborhoods	Health Impact Assessment on Transportation Policies in the Eugene Climate and Energy Action Plan, Upstream Public Health, Portland, Oregon; 2010
5	12	Africa vegetation	Famine Early Warning System Network (www.fews.net), including organizational partners USAID and NOAA

Chapter	Slide	Image	Source
5	13	Africa rainfall	Ibid
5	14	Africa food insecurity	Ibid
5	15	Africa drought	Ibid
5	22	CO ₂ emission scenarios	Hansen J et al. PNAS 2000;97:9875-9880
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5	25	Health impact timeline	Dai, X.; Maskell, K.; and Johnson, C.A., ed. http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/428.htm
5	29	Soil water index	National Oceanic and Atmospheric Administration Avis et al, 2009. A Health Impact Assessment of California's Cap-and-Trade Greenhouse Gas Mitigation Policy, Center for Chronic Disease Prevention and Health Promotion, California Department of Public Health
5	32	AB 32 inequity image	Flickr: satinonline2
6	16	Government	Flickr: stevendepolo
6	17	Advocates	Flickr: Tim Phillips photos
6	18	Business	Flickr: janie_hernandez55
6	18	Business	Flickr: United Nations Photo
6	20	Debate	Flickr: Andrew Phelps
6	21	Farmer	Flickr: allmothers
6	22	Inhaler	National Resources Defense Council. Found at http://www.nrdc.org/health/climate/
6	23	Dengue map	Flickr: call4org
6	24	Emissions	Flickr: bobjr1
6	25	Framing	Flickr: Beth Coe Maeda
6	26	Shaping Frames	Flickr: sakeeb
6	27	Heat Illness	Flickr: marmalademook
6	27	Handshake	Flickr: thekid01
6	28	NYSE	Flickr: am_express
6	29	No sale	Metro Regional Government. Metro area residents' attitudes about climate change and related land use and transportation issues [Internet]. 2011 Apr 12; Available from: library.oregonmetro.gov/files//adamdavisclimatesummit.pdf
6	33	Metro survey	Metro Regional Government. Metro area residents' attitudes about climate change and related land use and transportation issues [Internet]. 2011 Apr 12; Available from: library.oregonmetro.gov/files//adamdavisclimatesummit.pdf
6	34	Metro survey	Metro Regional Government. Metro area residents' attitudes about climate change and related land use and transportation issues [Internet]. 2011 Apr 12; Available from: library.oregonmetro.gov/files//adamdavisclimatesummit.pdf

Chapter	Slide	Image	Source
6	37	Park blocks	Flickr: Portland State University Flickr Site
6	38	Trees	Flickr: juleezworld
6	38	Sitting in shade	Flickr: foilman
6	39	Traffic	Flickr: Wondering Wanderer
6	40	Smokestack	Flickr: Courtney Hansen Photos
6	40	Smiling	Flickr: nansesfoto
6	41	Earth	Flickr: FlyingSinger
6	42	Porch	Flickr: Wkiskeygonebad