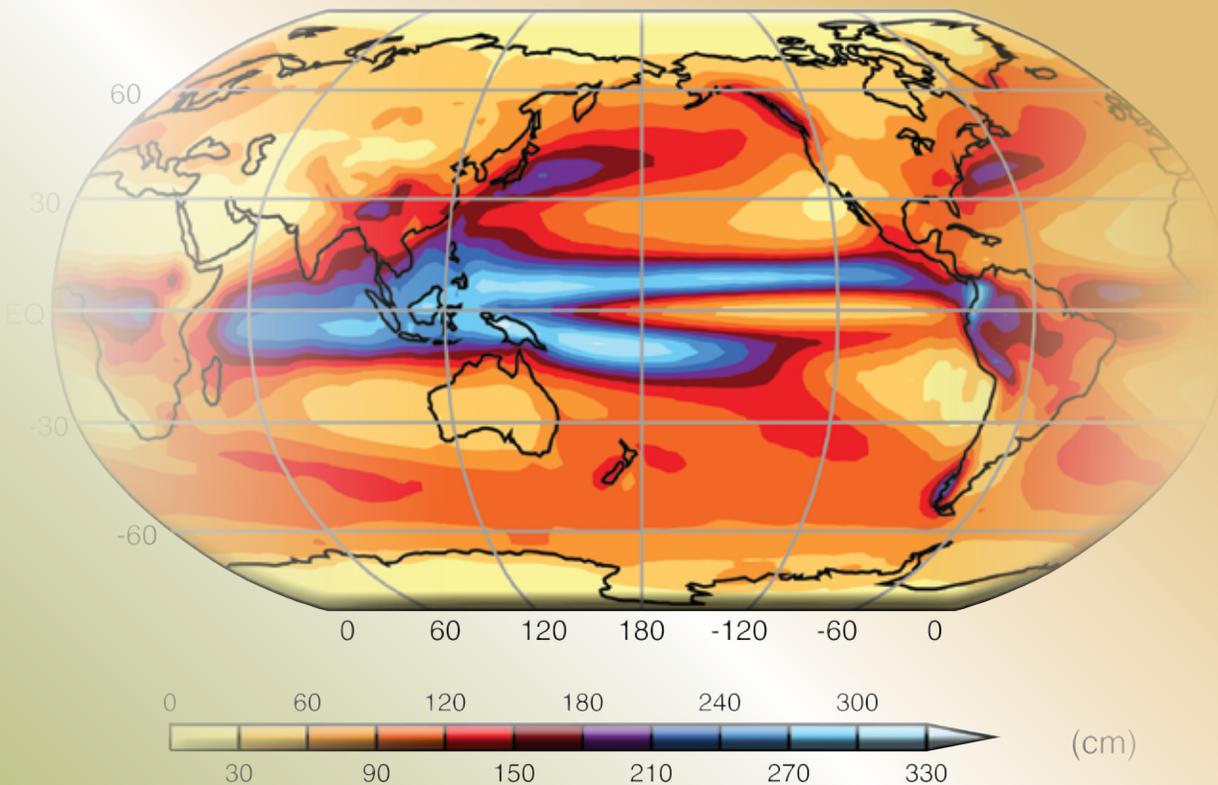




D E V E L O P M E N T   A N D   C L I M A T E   C H A N G E

# Climate Change Scenarios and Climate Data







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# Climate Change Scenarios and Climate Data

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*Cover graphic:* IPCC 4th Assessment Report, 2007.

All dollars are U.S. dollars unless otherwise indicated.

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## 1. BACKGROUND

The overall objective of the EACC study is to better understand what adaptation to climate change really is and how—without such adaptation—development progress will be threatened and may even be reversed. The study has two broad objectives. The first objective is to develop a “global” estimate of adaptation costs. This will aid the international community’s efforts to help those developing countries most vulnerable to climate change meet adaptation costs. The second objective is to help decision makers in developing countries better understand and assess the risks posed by climate change and create better design strategies to adapt to climate change.

These two objectives require any quantitative scientific or economic analysis to (a) be spatially comprehensive, with globally comprehensive and consistent data sets; and (b) include plausibly extreme climate projections that span the plausible futures.

Due to the very large uncertainties of the scientific projections of climate change, it is important that any analysis provide information on the “tails” or extremes of any probability distribution of future climates. This allows decision makers in developing countries to better understand and assess the risks posed by climate change.

This document reports on the rationale for selection of climate change scenarios and climate data for the EACC global analysis.

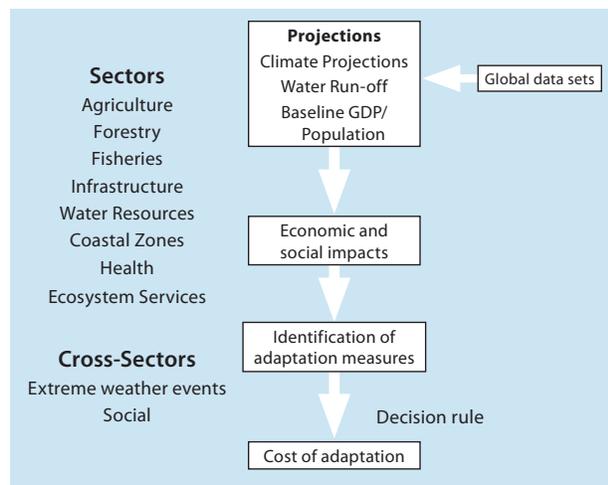
## 2. CLIMATE DATA NEEDS FOR THE EACC

Climate change impacts that will require adaptation include (a) increased incidence of extreme weather events, which will draw resources away from development initiatives; (b) increased incidence of infectious and diarrheal diseases, which will reverse development gains in health standards; (c) changes in temperature and precipitation, which will affect agricultural productivity, making investments in this sector less productive; and (d) sea-level rise, which will lead to loss of lives and assets. Under the global track, adaptation costs for all developing countries are estimated by major economic sectors using country-level data sets that have global coverage. The agriculture, forestry, fisheries, infrastructure, water resources, coastal zones, health, and ecosystem services sectors are covered. The analysis also considers the cost implications of changes in the frequency of extreme weather events, including the implications for social protection programs (Figure 1).

The climate data needed for these analyses are summarized in Table 1.

The majority of sectors use a consistent set of future climate and water runoff projections to establish the nature of climate change. A consistent set of GDP and population projections also are used to establish a baseline of development in the absence of climate change. The analysis subsequently estimates the economic and social impacts and the corresponding costs of adaptation.

FIGURE 1. EACC STUDY STRUCTURE GLOBAL TRACK



Source: 2009. EACC-The Cost of Developing Countries of Adapting to Climate Change.

TABLE 1. SECTOR ANALYSIS CLIMATE DATA NEEDS

Sector	Climate Variables	Time Step
Agriculture	Tmin, Tmax, Precipitation	Daily, monthly
Water Resources	Tavg, Precipitation	Monthly
Health	Tmax, Precipitation	Daily, Monthly
Infrastructure	Tmax, Precipitation Max	Monthly
Forestry	Tmin, Tmax, Precipitation	Monthly
Coastal	Sea level	Yearly

### 3. CLIMATE DATA FOR THE EACC GLOBAL TRACK

The analysis required a consistent global data set that covered data needs across all sectors and provided data for the entire global landmass with a time series of at least 30 years of monthly data. After examining a number of options, the team selected the CRU TS2.1 data set.

For historical climate data, we used a database provided by the Climate Research Unit (CRU) at the University of East Anglia in the United Kingdom. The CRU 2.1 data set provides a time series of monthly climate variables from 1901 to 2002 ([http://www.cru.uea.ac.uk/cru/data/hrg/cru\\_ts\\_2.10](http://www.cru.uea.ac.uk/cru/data/hrg/cru_ts_2.10)). We extracted a subset of monthly climate variables required to compute potential evapotranspiration (average daily T minimum, average daily T maximum, vapor pressure, cloudiness) and precipitation. This data, provided on a 0.5° longitude/latitude grid, is the most frequently used standard reference “baseline” for global, regional, and local climate change impact studies. Excluding Antarctica, there are 67,420 grids (0.5° x 0.5°) over the global land area. The 0.5° degree longitude/latitude grids are not constant in area due to the spherical shape of the earth. Table 2 provides information on the size of the grid cells from the equator to the poles.

TABLE 2. LATITUDE BY LONGITUDE AREAS (0.5° X 0.5°)

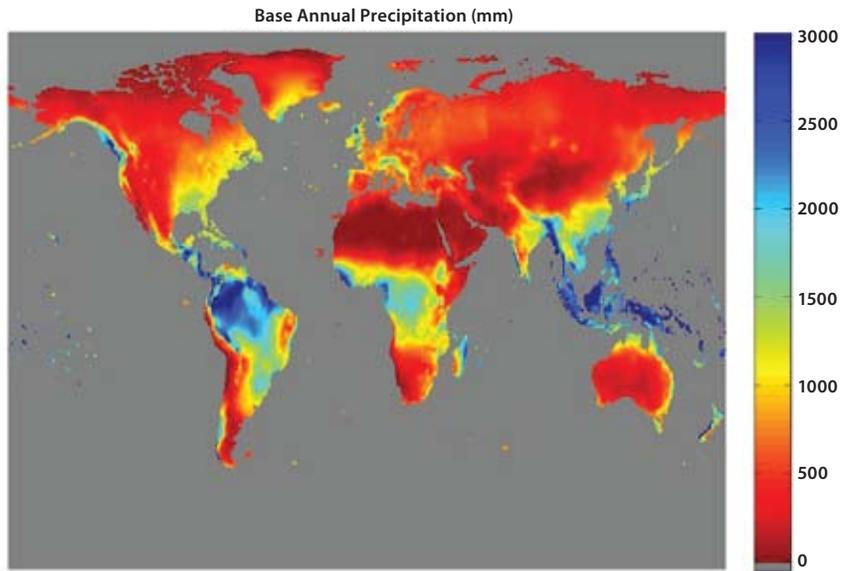
	0.5 Degree Longitude	0.5 Degree Latitude	0.25 Square Degrees
Latitude	km	km	km <sup>2</sup>
0	55.5	55.5	3080
+/-40	42.5	55.5	2359
+/-60	28	55.5	1554
+/-80	8.5	55.5	472

A visual presentation of the annual averages (1901 to 2002, 102 years) of precipitation and temperature is displayed in Figures 2 and 3.

This provided a database used by all sectors. For some sectors, additional sources of daily data were needed. These data sources and characteristics are described in the sectoral reports.

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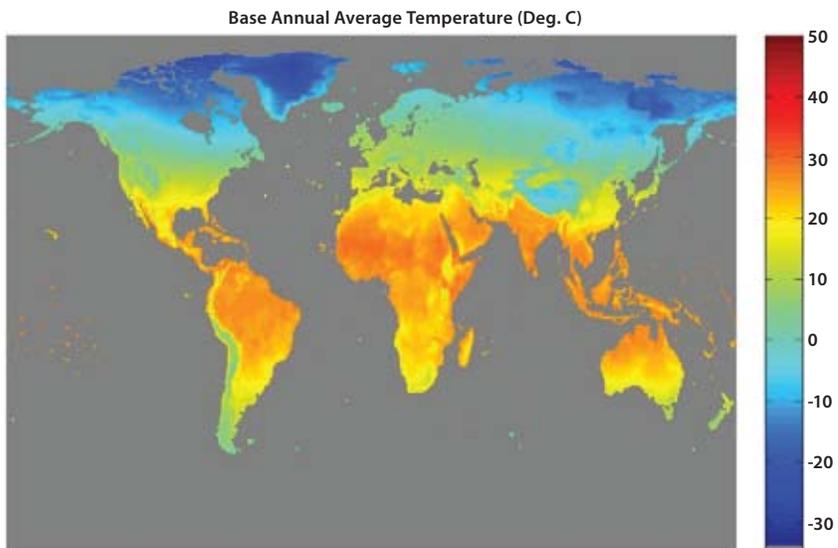
FIGURE 2. CRU AVERAGE ANNUAL PRECIPITATION



Source: Authors.

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FIGURE 3. CRU AVERAGE ANNUAL TEMPERATURE



Source: Authors.

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## 4. SELECTION OF CLIMATE CHANGE SCENARIOS

The IPCC 4<sup>th</sup> Assessment (AR4) has archived climate change scenarios for three SRES scenarios and twenty-two global circulation models, resulting in fifty-six climate change scenarios. This was far too many scenarios to perform a global multisectoral adaptation analysis. This section aims to answer the following question: Is there information from the climate science community that may assist in filtering 56 GCMS to a more manageable number?

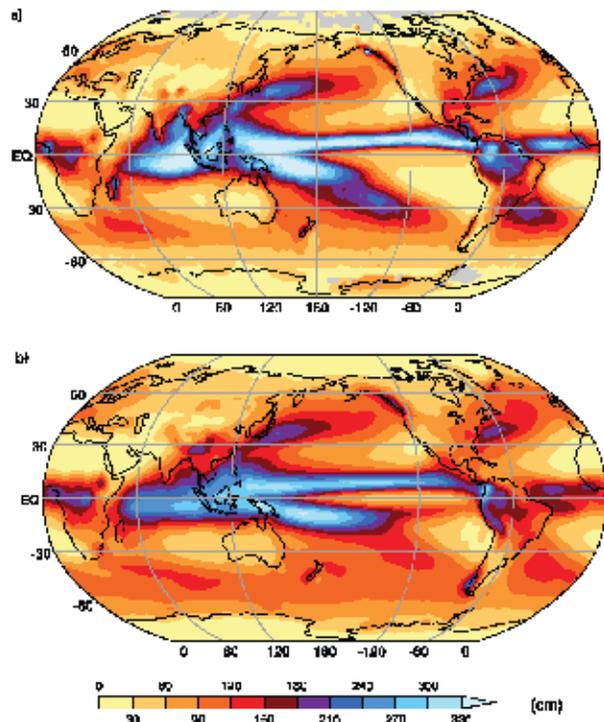
### REGIONAL PATTERNS AND EXTREMES IN CLIMATE MODELS: IMPLICATIONS FOR CLIMATE CHANGE PROJECTIONS

#### *Evaluation of Models of the Present Climate*

An extensive volume of published research has evaluated climate models that simulated past climate variations and trends and predicted climate anomalies at the seasonal to inter-annual scales. We clearly have no shortage of evidence to indicate that climate models have the capability to simulate continental-scale coherent patterns of temperature—and to a lesser degree precipitation—and anomalies associated with large-scale climate phenomenon such as the El Niño/Southern Oscillation. However, key uncertainties—that is, disagreements with observations among climate models—still exist regarding the precise location, timing, and/or magnitude of temporal climate variations. One only needs to look at global precipitation patterns to recognize these quantifiable deficiencies in climate models. Among the most prominent shortcomings of most climate models (Figure 4 shows the mean of the IPCC AR4 climate models) is the notable split in maximum precipitation in the eastern tropical Pacific, and to a lesser extent, in the western tropical Atlantic basin. In addition, the location and magnitude of the Indo-Asian Monsoon, as well as the South American rain-forest maximum precipitation as given by the model mean, disagree with observations. The model-mean results shown here also average out considerably larger differences in regional patterns (especially in the tropical regions) from individual models. These larger differences among the individual models (Figure 5) stem largely from assumption about atmospheric and

ocean physics made by the model building team. Embedded within all these processes is also the ability of any given climate model to faithfully represent the diurnal cycle of these mechanisms.

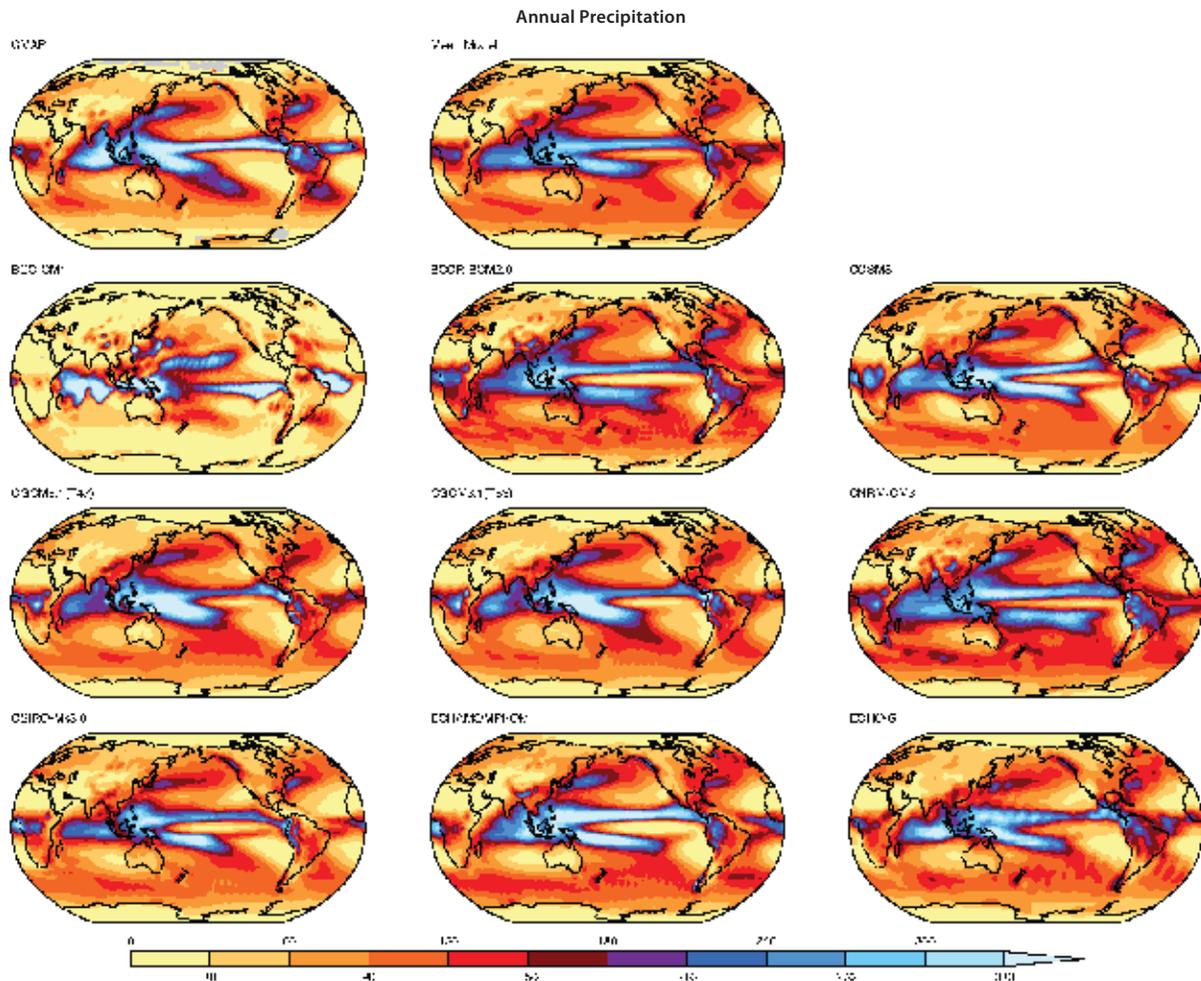
FIGURE 4. ANNUAL MEAN PRECIPITATION (CM), OBSERVED (A) AND SIMULATED (B), BASED ON THE MULTIMODEL MEAN



Source: IPCC 4<sup>th</sup> Assessment Report, Figure 8.5.

Notes: The Climate Prediction Center merged analysis of precipitation (Xie and Arkin 1997) observation-based climatology for 1980 to 1999 is shown. The model results are for the same period in the 20th-century simulations in the MMD at PCMDI. In (a), observations were not available for the grey regions.

FIGURE 5. ANNUAL GLOBAL PRECIPITATION OF AR4 GCM AND MODEL MEAN



This is of critical importance for convective precipitation processes. At present, all climate models show considerable deficiencies in representing the observed night-time maximum precipitation (most models release too much precipitation far too early, with a maximum occurring in the late afternoon). Nevertheless, we can be confident that the fundamental physics explicitly represented in climate models is sound, and the information they give us—as a whole or as a continuum of plausible outcomes—is useful. We must consider all their projections in the context of assessing potential impacts on and responses from our natural and managed systems.

#### *Evaluation Implications for Climate Change Projections*

When considering the ability of climate models to accurately reproduce observed climate trends and anomalies, and how these results may then be confidently applied to projected (and potential) changes in climate over the next century, we can draw some insight and guidance from the following passage in chapter 8 of the IPCC 4<sup>th</sup> Assessment Report:

“What does the accuracy of a climate model’s simulation of past or contemporary climate say about the

accuracy of its projections of climate change? This question is just beginning to be addressed... studies show promise that quantitative metrics for the likelihood of model projections may be developed, but... the development of robust metrics is still at an early stage..."

As these remarks suggest, we cannot make a direct inference that because climate models can reproduce large-scale observed climatologies and accurately predict (or reproduce) climate anomalies, we should then have complete confidence in any one climate model or even a collection of climate models. This even holds for models that have been run at an exceptionally high level of spatial detail (such as the MIROC-Hires). Experience in climate evaluation, particularly in the area of hydrologic variables, indicates that there is no "best model" and we must consider every model simulation individually. A simple example of this with respect to simulated climate change can be seen in the projected changes in precipitation, evaporation, runoff, and soil moisture shown in Figure 6. In the top set of panels, we see that the MIROC-Hires model would indicate a dramatic decrease in precipitation over much of the southern United States (extending north in the middle section of U.S.), which would pose a significant concern for water resource impacts. However, looking at the same result from the CCSM3 model, there is a complete reversal in the sign of the precipitation response over much of the southern U.S. (as well as the middle U.S.). The only area of consistency in sign to the MIROC-Hires result is in the southwestern U.S., but the CCSM precipitation decrease is considerably reduced. A similar situation can be seen for parts of Africa (MIROC showing large decreases, CCSM showing increases over much of Africa). Similarly, the changes in runoff (which can be regarded as the "available surface water") show similar marked discrepancies.

This simple example in the mean annual fields of the major hydrologic variables raises an important issue regarding impact and response assessments for water resources. If annual mean fields of changes show marked differences in sign and magnitude among climate models, the model average of these changes, not only at annual scales but also down to subdiurnal scales, is not an adequate input for impact, response, and adaptation assessments. To date, many studies have used the model mean as inputs, but it is important to move away

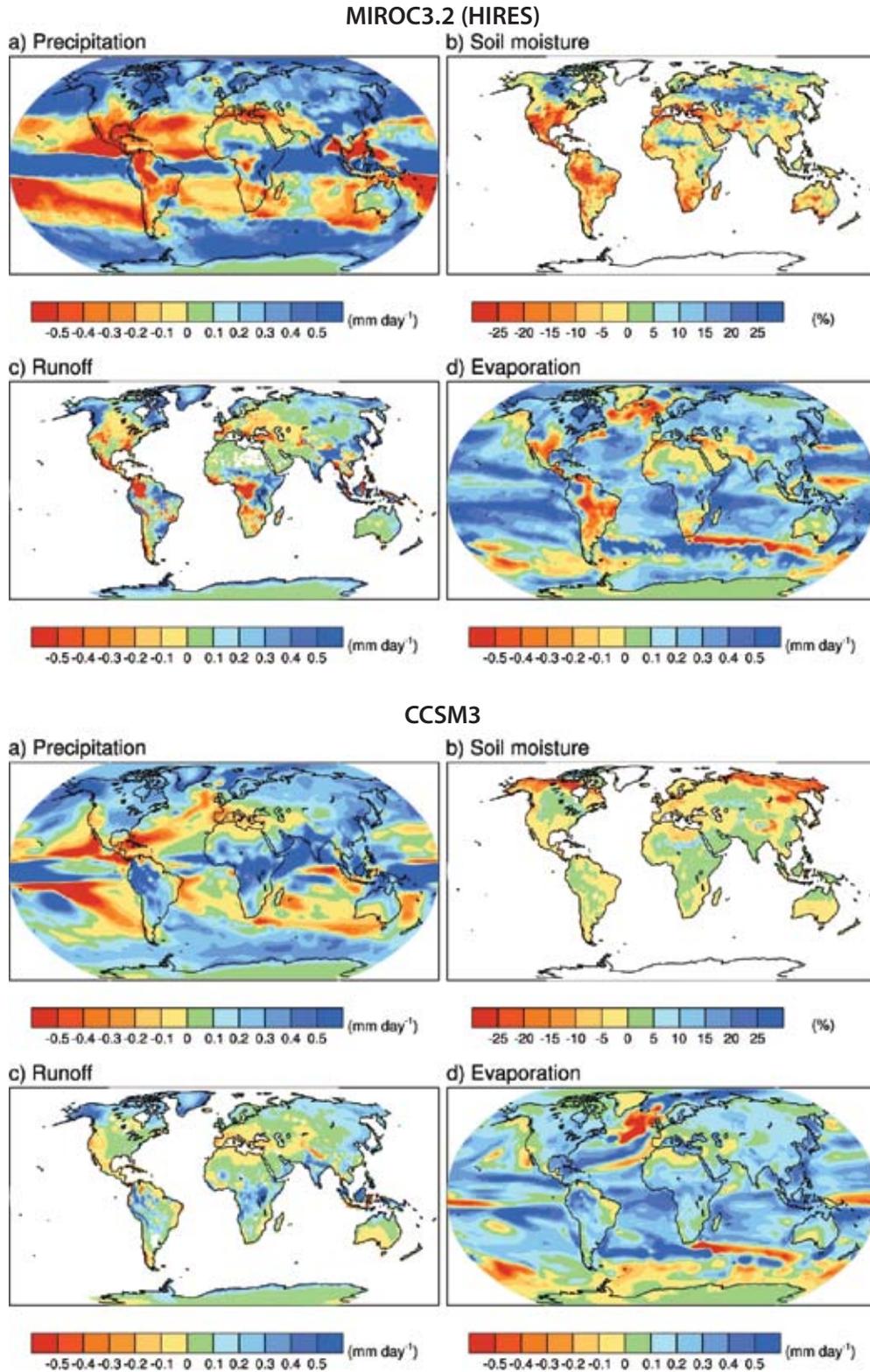
from this practice, simply because a model "average" of near zero is not necessarily the result of a combination of models predicting a near-zero change, but could also be a result of two opposing changes that differ in sign (as seen in Figure 6). This could result in a substantial risk and/or consequence, and the abatement of the risk—no matter how slight the chance of climate change might be—may be worthwhile to consider for policy and/or mitigation strategies.

We must therefore consider all possible outcomes that are being produced by climate models, and feed these changes individually through impact assessment models, which may also provide a critical coupled feedback to the climate models via land-use change or water fluxes. While the potential exists for the range of simulated climate-change projections to vary so much among one another that they could be construed as "noise," there is evidence to suggest that even when considering the collection of model outcomes, we see a consistency in some of the more salient changes. As an example, the trend in precipitation interval as simulated by the IPCC AR4 models show—statistically and/or probabilistically speaking—agreement in their projection of the change in precipitation interval across latitudes as the climate warms (Figures 7a, 7b).

What this implies is that although we cannot tie ourselves to one particular model outcome, we can have some confidence that we are not merely looking at "noise," and there are regions where a sign change is consistent among the climate models—but with a range that is important to explicitly consider for assessment of potential impacts and adaptation.

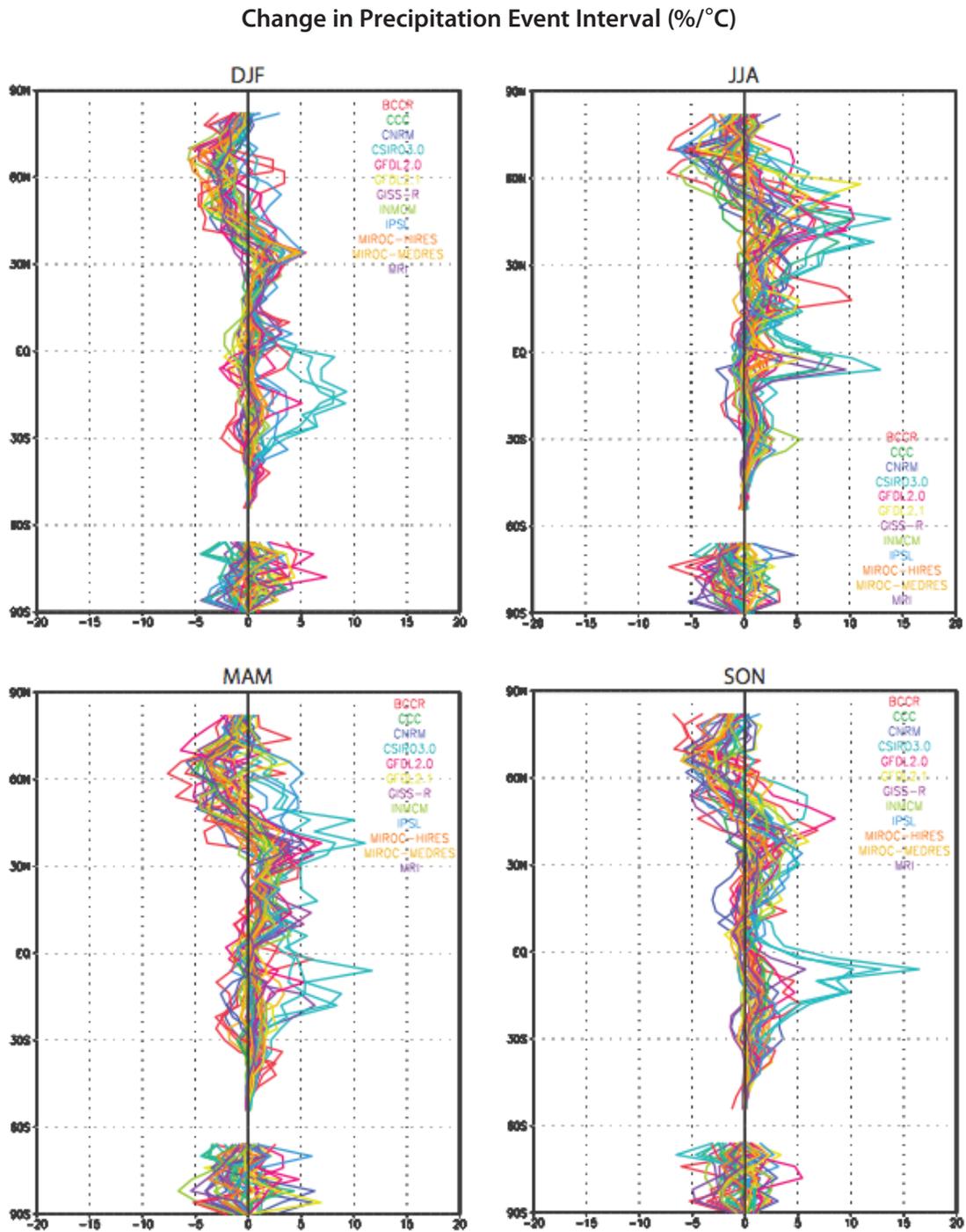
While an approach that explicitly considers the range of possible climate-change outcomes as projected by global climate models is desirable, it is important to carefully consider whether there are some projections that should be filtered out as nearly implausible or at the very least, extremely unlikely. This is a difficult task, as there is no clear metric with appropriate or sufficient data that can identify whether a given climate change projection can or should be excluded, particularly when considering a specific region of interest. Further, if there is any chance that any given climate change simulation can occur, it should be considered within the spectrum of potential impact and/or adaptation—particularly if the risk of

FIGURE 6. EXAMPLES FROM TWO CLIMATE MODELS OF PROJECTED CHANGES IN ANNUAL PRECIPITATION, EVAPORATION, RUNOFF, AND SOIL MOISTURE



Source: Figures obtained from Ch. 10, IPCC AR4 supplementary materials (accessible at: <[http://ipcc-wg1.ucar.edu/wg1/Reportv%20suppl/Ch10/Ch10\\_indiv-maps.html](http://ipcc-wg1.ucar.edu/wg1/Reportv%20suppl/Ch10/Ch10_indiv-maps.html)>).  
 Note: Changes are annual means for the SRES A1B scenario for the period 2080 to 2099 relative to 1980 to 1999.

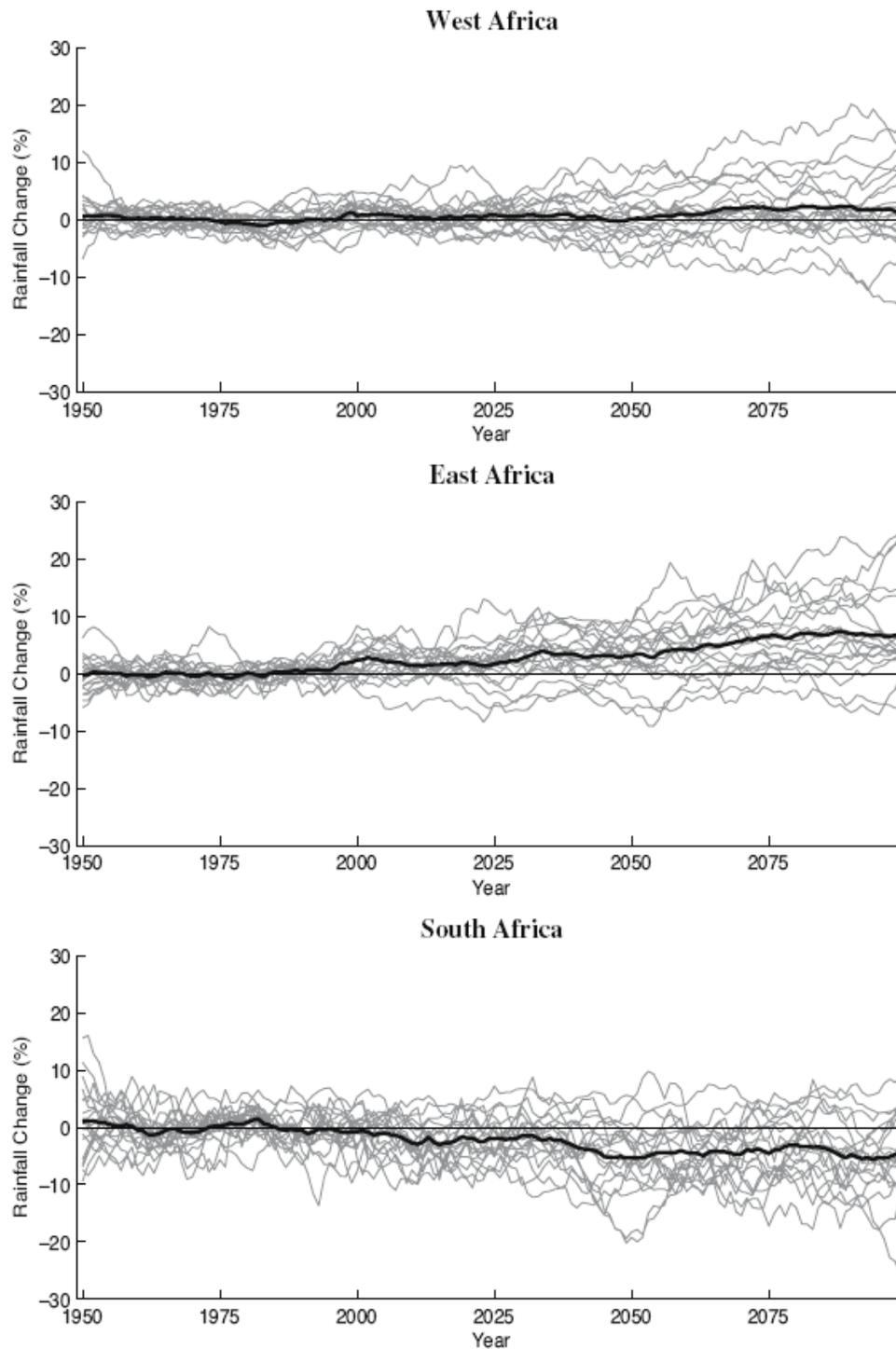
FIGURE 7A. PERCENTAGE CHANGE IN PRECIPITATION INTERVAL (I.E. INVERSE OF PRECIPITATION FREQUENCY), AS REPRESENTED BY THE PARTICIPATING CLIMATE MODELS IN THE IPCC 4TH ASSESSMENT REPORT



Source: Schlosser et al. 2008.

Note: Shown are the zonally averaged percent changes in the period between “wet” days per degree of global warming for each climate model. Results are based on differences between pre-industrial conditions and the time of CO<sub>2</sub> doubling.

FIGURE 7B. PERCENTAGE CHANGE IN PRECIPITATION, AS REPRESENTED BY THE PARTICIPATING CLIMATE MODELS IN THE IPCC 4<sup>TH</sup> ASSESSMENT REPORT



Source: IPCC 2007.

Note: Results based on differences between pre-industrial conditions and the time of CO<sub>2</sub> doubling.

catastrophic damages and/or consequences is high. Therefore, it may be a worthwhile effort at the outset of any risk/impact assessment to consider all climate model projections (at very little computational cost), and that the exclusion of certain climate change scenarios might be considered if the costs and/or damage of its associated impacts were very low. It may also highlight outcomes that are beneficial, and these also are important in providing a comprehensive assessment of climate impacts and risks. Overall, the method of using model-mean as inputs to impact and risk assessments should be replaced with the usage of the full spectrum of results, as the “tails” of the full spectrum of model projections may contain the riskiest aspects of climate change.

#### *Criteria for Selection of Climate Change Projections*

Given this context and the EACC study objective to help decision makers in developing countries to better understand and assess the risks posed by climate change, the team agreed to select two GCM scenarios that represented the extremes of climate change impacts on the globe. This section describes the criteria that should be used to evaluate climate change impacts.

The key economic sectors being evaluated in the EACC include agriculture, water resources, infrastructure, ecosystems, and health. All sectors are heavily influenced by soil moisture. Therefore the Climate Moisture Index (CMI), which is an indicator of the aridity of a region, was selected as an indicator to measure climate change impacts that would best represent impacts on the key sectors. The CMI depends on average annual precipitation and average annual potential evapotranspiration (PET).<sup>1</sup> If PET is greater than precipitation, the climate is considered to be dry, whereas if precipitation

is greater than PET, the climate is moist. Calculated as  $CMI = (P/PET) - 1$  {when  $PET > P$ } and  $CMI = 1 - (PET/P)$  {when  $P > PET$ }, a CMI of  $-1$  is very arid and a CMI of  $+1$  is very humid. As a ratio of two depth measurements, CMI is dimensionless. The CMI can be evaluated at each of the 67420 grid cells of the CRU database (Figure 8).

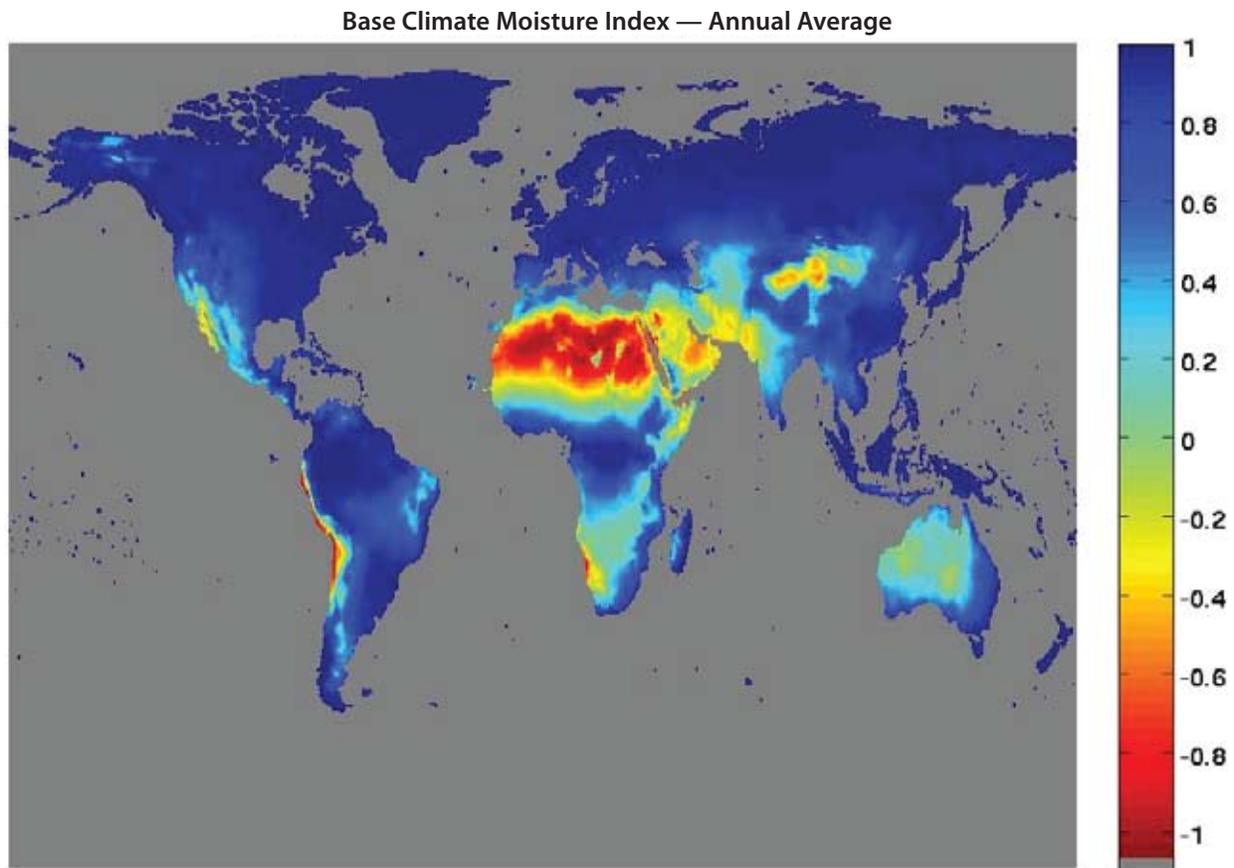
It is a straightforward calculation to determine the CMI for each of the 56 GCMs. For the EACC, it was decided to use the average changes in monthly precipitation and temperature for the years 2046 to 2055 for each GCM. These average monthly changes were applied to the CRU 1961–90 average monthly temperature and precipitation to determine a CMI for each CGM. The CMI can be averaged over any spatial region. It was decided to select the two GCMs that represented the wet and dry GCM in 2050 over the land mass of the globe. Wet is defined as the GCM that had the largest increase in average CMI over the 1961–90 CMI over the globe, while dry was defined as the CGM that had the largest decrease in average CMI over the 1961–90 CMI over the globe.

The reason the globe was selected rather than just over developing countries is that for the agricultural sector analysis, global food trade is a key element. Climate change impacts on agriculture in the developed world is a very important part of any analysis of climate change impacts on food, agriculture, and hunger in the developing world.

Figure 9 shows the range of CMI for all scenarios for the globe and World Bank Regions as a whole and the remaining land mass. Figure 10 show the CMI for all scenarios individually for each World Bank region. The red line represents the median CMI. The top of the box represents the 25<sup>th</sup> percentile, while the bottom of the box represents the 75<sup>th</sup> percentile. The whiskers show the extremes and the cross-hairs show the model outliers. The dashed lines represent the historical CMI (averaged from 1960–90). For example, in the LCR region, there is a 75 percent chance of drying with all three scenarios. The CMI for the SAR region has the largest spread because of the way the different GCMs model the monsoons. In the MNA region, there is not much variation because the area is so dry.

1. Average annual PET is a parameter that reflects the amount of water lost via evaporation or transpiration (water consumed by vegetation) during a typical year for a given area if sufficient water were available at all times. Average annual evapotranspiration (ET) is a measure of the amount of water lost to the atmosphere from the surface of soils and plants through the combined processes of evaporation and transpiration during the year (measured in mm/yr). ET, which is both connected to and limited by the physical environment, is a measure that quantifies the available water in a region. Potential evapotranspiration is a calculated parameter that represents the maximum rate of ET possible for an area completely covered by vegetation with adequate moisture available at all times. PET is dependent on several variables, including temperature, humidity, solar radiation, and wind velocity. If ample water is available, ET should be equal to PET.

FIGURE 8. AVERAGE CMI 1961–90



Source: Authors 2010.

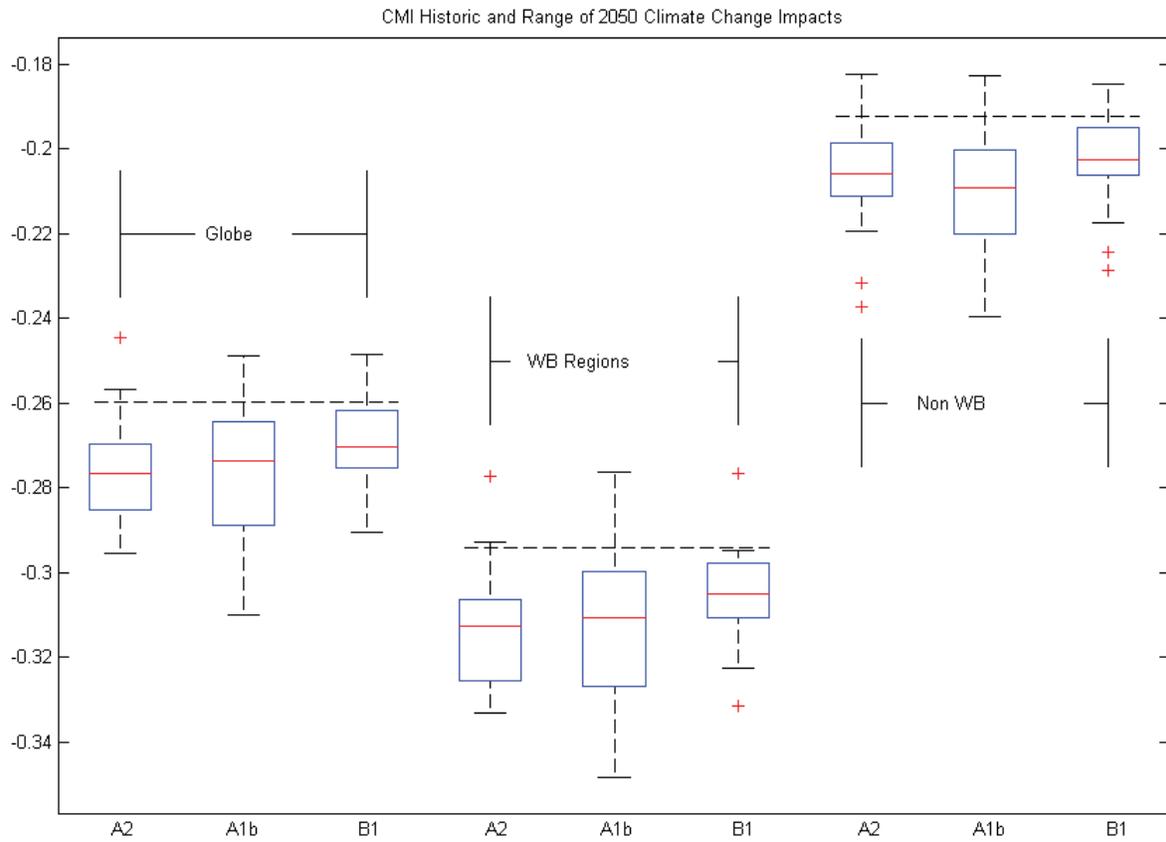
It is important to note that the CMI is only calculated over land masses and not over the ocean. Many climate change analyses discuss GCMs with regard to their properties/results over land and sea, but for hydrology and water resources impacts all that matters is what is occurring over the land. One may notice that all the CMI in the box and whiskers plots are negative. These results show that warming leading to increases in potential evapotranspiration dominates over increased precipitation over the globe's land mass, leading to an increase in aridity or a drying for more than 75 percent of all GCMs.

#### *Selection of Climate Change Projections*

Figures 9 and 10 show that the 56 GCMs provide for a large range of CMI for the globe, developing countries, and each individual World Bank region. However, for reasons related to socioeconomic baseline consistency, the EACC team decided to limit GCM scenarios to those run for the A2 SRES scenario. This reduced the possible number of GCMs to 17.

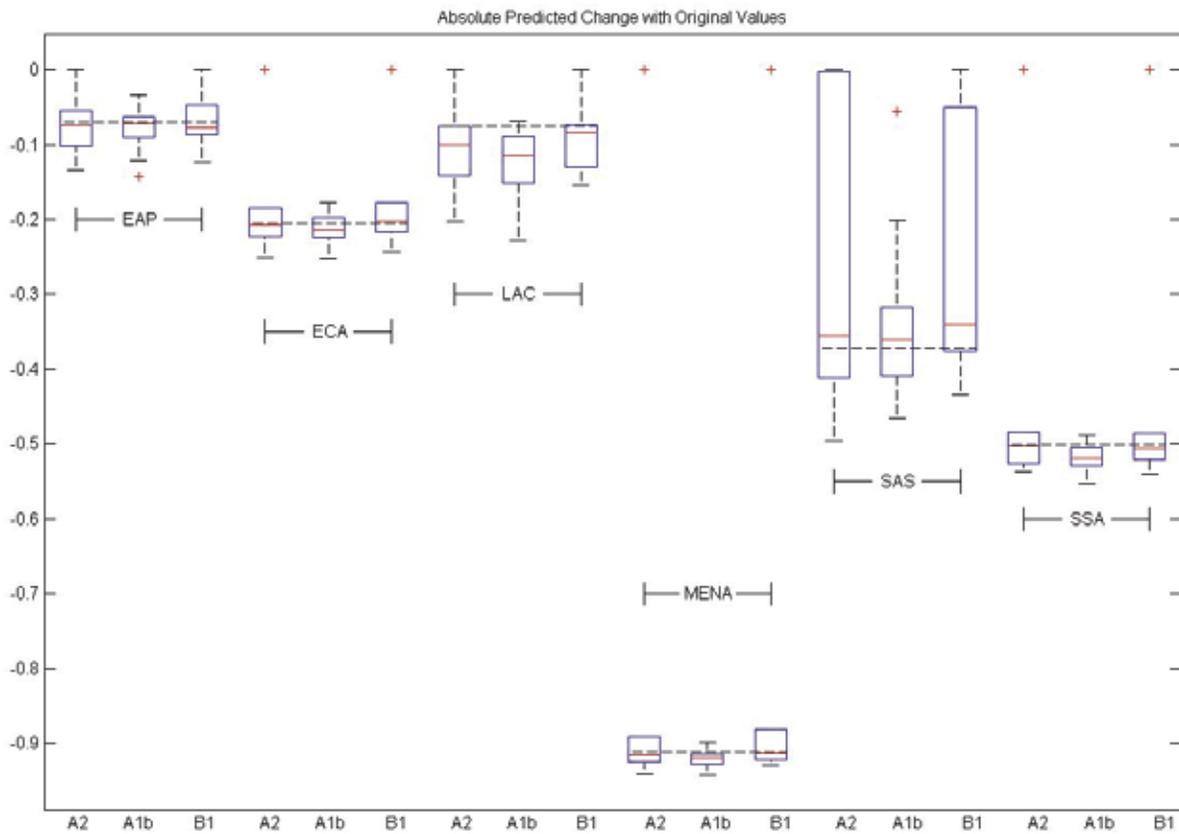
A further constraint was placed on the suite of candidate GCMs. The agricultural sector required that the GCM selected must provide monthly Tmin and Tmax to the AR4 archive. This limited the number of SRES A2 to six that met all constraints.

FIGURE 9. CLIMATE MOISTURE INDEX SPREAD FOR EACH SCENARIO AND GLOBAL LAND MASS AND EACH REGION



Source: C. J. Willmotta and J. J. Feddema. 1992. "A More Rational Climatic Moisture Index." *The Professional Geographer* 44.1: 84–88.

FIGURE 10. CLIMATE MOISTURE INDEX SPREAD FOR EACH SCENARIO AND EACH WORLD BANK REGION



Source: C. J. Willmotta and J. J. Feddema. 1992. "A More Rational Climatic Moisture Index." *The Professional Geographer* 44.1: 84-88.

Based on the global CMI analysis, the CSIRO MK\_3\_0 was selected as the EACC dry climate scenario and NCAR\_CCSM was selected as the wet

climate scenario. Figures 11 and 12 are a plot of the annual precipitation changes in 2050 for the dry and wet scenarios, respectively.

FIGURE 11. PRECIPITATION CHANGE FOR 2050 FOR A2 SRES CSIRO GCM

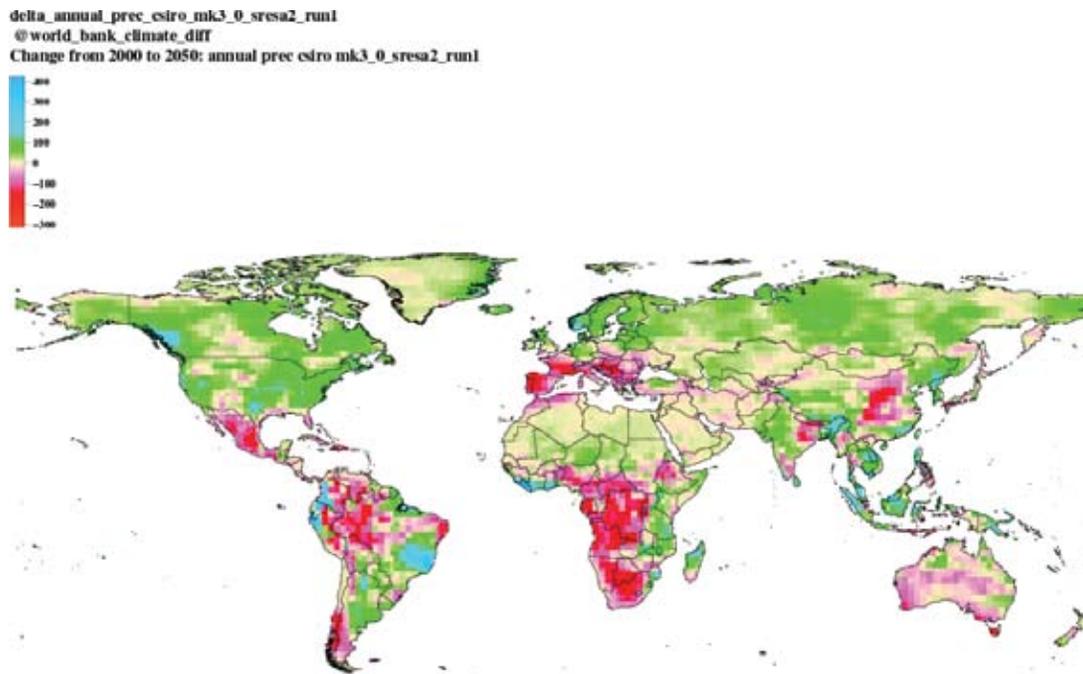
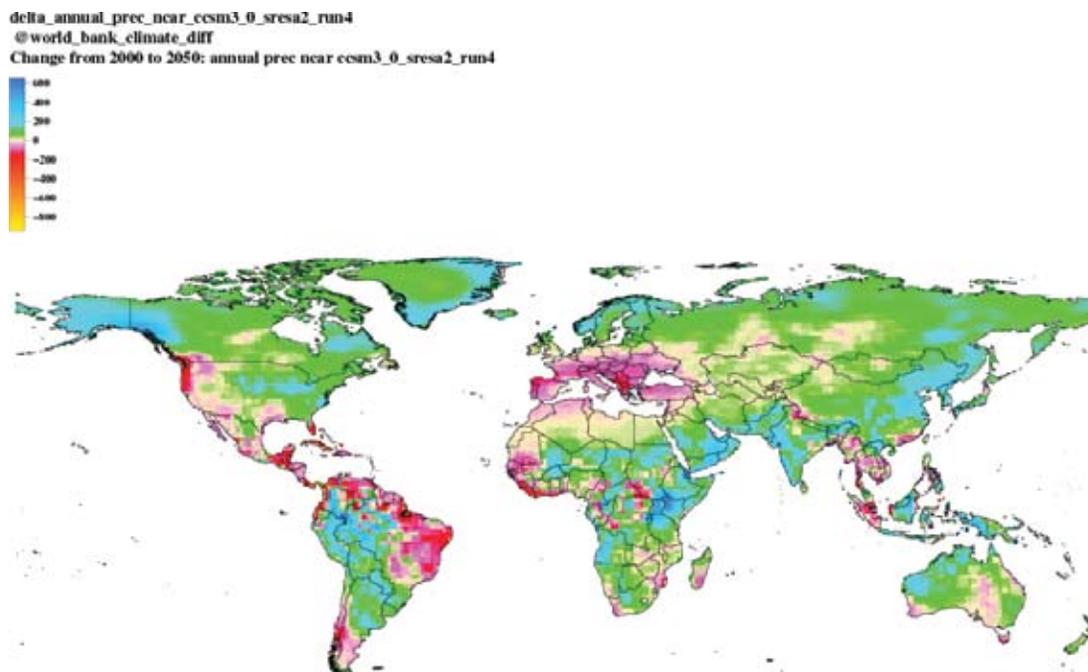


FIGURE 12. PRECIPITATION CHANGE FOR 2050 FOR A2 SRES NCAR GCM



Source: Figure 11, 12, 13, and 14 maps are based on data developed at the Massachusetts Institute of Technology Joint Program for the Science and Policy of Global Change using the WCRP's CMIP3 multimodel dataset. Maps were produced by the International Food Policy Research Institute.

Figures 13 and 14 are plots of the annual maximum temperature changes in 2050 for the dry and wet scenarios, respectively.

A series of appendices are provided with this document that provide detail plots for global precipitation,

temperature, calculated modified Penman-Monteith potential evapotranspiration (PET), and calculated CMI for 2030 and 2050. Annual results are in Appendix A, seasonal results are in Appendix B, and monthly results are in Appendix C.

FIGURE 13. MAXIMUM TEMPERATURE CHANGE FOR 2050 FOR A2 SRES CSIRO GCM

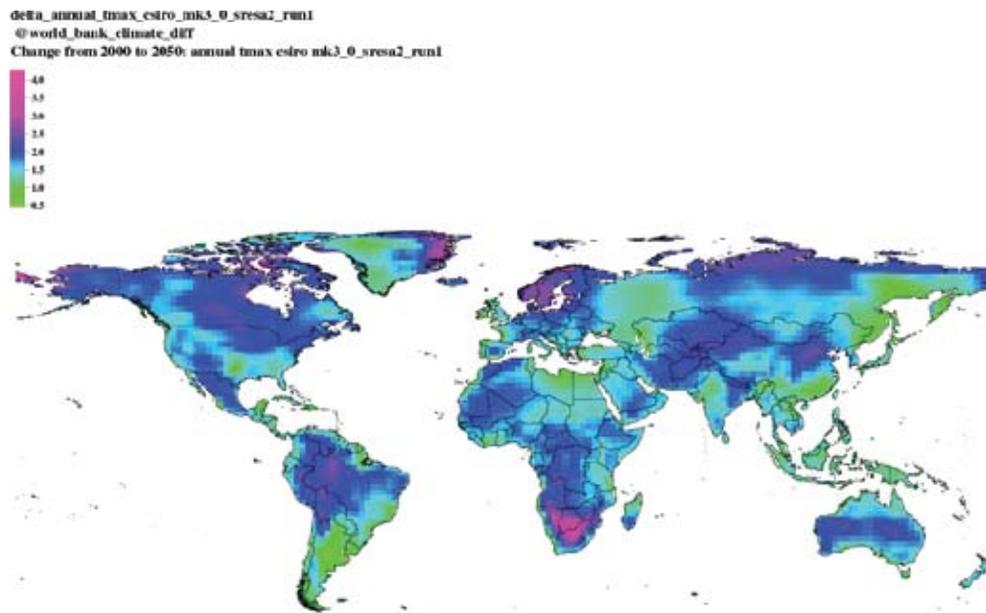


FIGURE 14. MAXIMUM TEMPERATURE CHANGE FOR 2050 FOR A2 SRES NCAR GCM

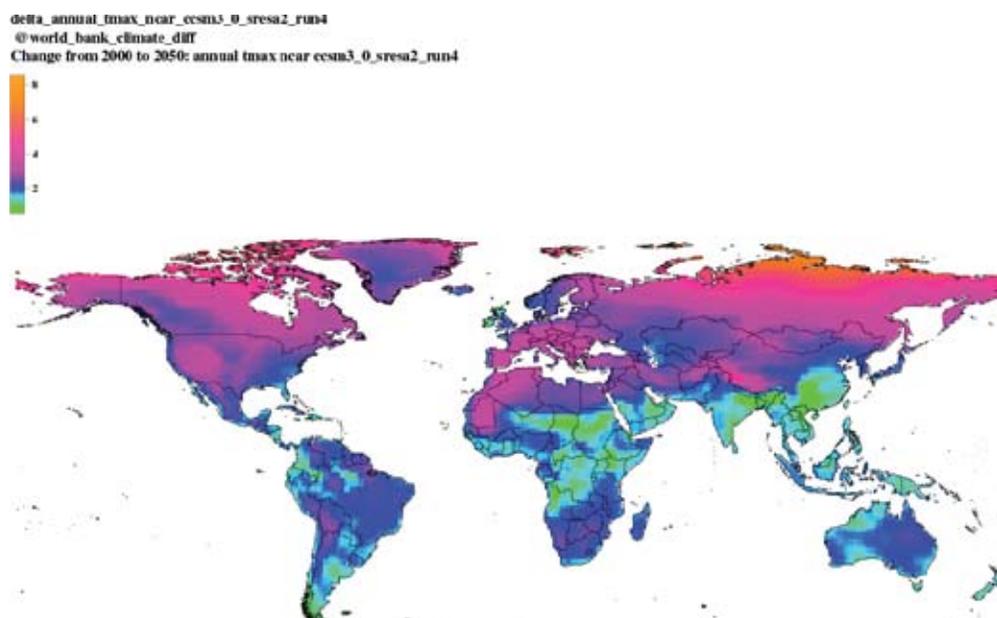


Figure 13 & 14: Source: Maps are based on data developed at the Massachusetts Institute of Technology Joint Program for the Science and Policy of Global Change using the WCRP's CMIP3 multimodel dataset. Maps were produced by the International Food Policy Research Institute.

## 5. USE OF CLIMATE CHANGE SCENARIOS

The spatial and temporal scale of impact and adaptation analyses needed for the EACC sectoral analyses span a wide range from very small (1–10 km<sup>2</sup> and daily to weekly) for local village water supply to very large catchments (100,000 km<sup>2</sup> and monthly to yearly) for major reservoirs. Climate change will occur at local scales, but models currently used for projecting climate change due to future GHG emissions have an average resolution of 2.6° x 3.0°. One potential difficulty with using climate information in impact assessments is the mis-match between the low spatial (and temporal) resolution of GCMs, on the one hand, and the scale at which assessments need typically to be conducted, on the other. GCMs provide climate change projections at a low spatial resolution (~2.5° x 2.5° grid), while the EACC is using a much finer resolution (~0.5° x 0.5° grid)

There are several methods available for addressing scale issues, including statistical downscaling (using empirical relationships), dynamical downscaling (using regional climate models), and spatial techniques<sup>2</sup> (linear interpolation, krigging, spline fitting, and intelligent interpolation). Downscaling involves methods used to map the large-scale signals from GCMs to a finer resolution (tens of kilometers versus hundreds of kilometers).

Care needs to be taken in selecting a method. Beyond reproducing the underlying uncertainties of GCMs, many introduce additional uncertainty and biases. For example, downscaling techniques increase the detail of information, but also the uncertainties associated with that information since the GCM output is manipulated below the scale at which the physics of the GCM itself are mathematically described. Under some downscaling schemes, mass balances of water and energy over the GCM scale are violated by the downscaling algorithm. Use of dynamic and statistical downscaling techniques requires extensive quantification of the sensitivities of the underlying assumptions of both the GCMs and the

downscaling algorithms, resulting in the need for exhaustive numerical experimentation. Time and cost constraints often do not allow use of more than a couple of GCMs in downscaling exercises. Running multiple GCMs at a coarse resolution may provide more insight into the range of possible futures than more detailed information obtained from fewer GCMs

There is no one “best” method; the most appropriate method for a particular application will strike a careful balance between precision (resolution) and accuracy (confidence in projections). Figure 15 provides a visual representation of the trade-off between precision and accuracy. As resolution increases, so too does the uncertainty associated with the more detailed information. In other words, more “precise” information comes at a cost, and the additional uncertainty must be recognized and taken into account in assessing impacts. Given the trade-off, it is critical to establish at the outset of any impact assessment whether the goal is to have finer resolution or “better”—that is, more reliable—information.

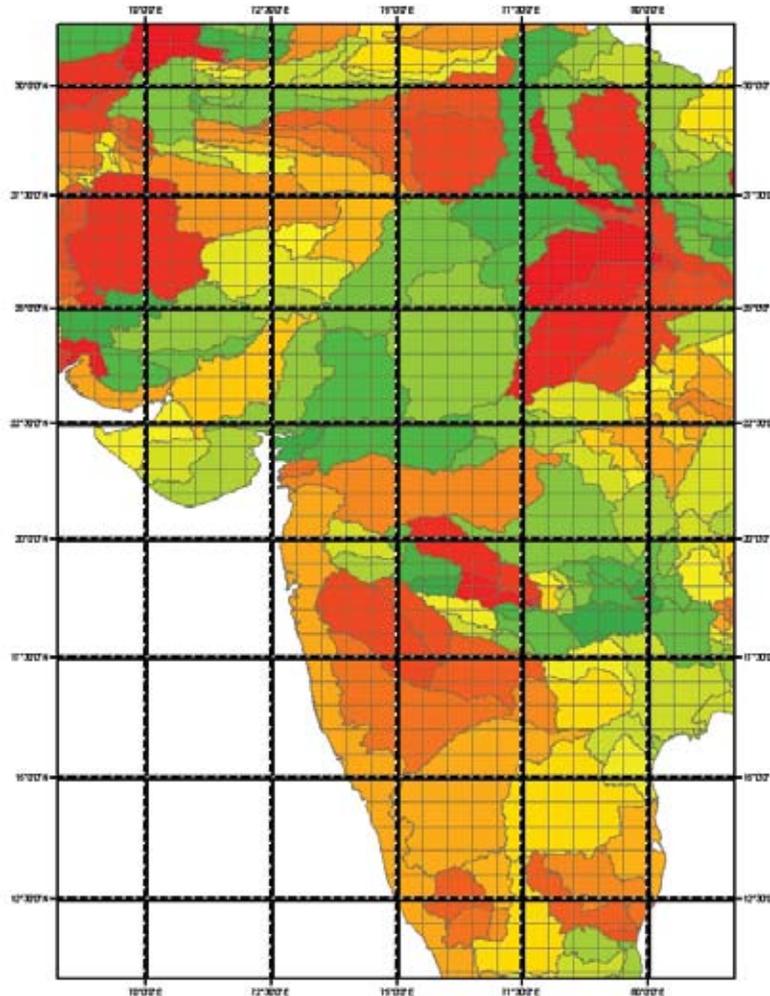
### *Sub-GCM Grid Scale Climate Change Projections*

For this work the spatial resolution for the use of GCM was at the native grid scale of each GCM. The GCM provided relative changes in temperature and precipitation for the years 2030 (average over 2026 to 2035) and 2050 (average over 2046 to 2055) on a monthly level as compared to the model baseline (1961–90) of the 20th century. These relative changes were then applied directly to the historic climate variables from the CRU data set. As seen in Figure 15, there are numerous half degree by half degree CRU grids within each GCM grid box. For this analysis, we apply the relative changes from the GCM grid box uniformly to all CRU grid cells within the GCM grid box. While this leads to some discontinuities at the border of grid boxes, it is the most appropriate technique for this work given the scope and mathematics of the GCM models.

With the uncertainty inherent in the GCM and the CRU data, it would be unwise to perform this analysis at the lowest level of resolution; half degree by half degree. Aggregating to a higher spatial level would reduce the uncertainty in the model indicators and more correctly reflect the larger scale climate change projections from the GCM models. For the agricultural

2. “Spatial technique” is often referred to as “spatial downscaling.” Technically, it does not involve downscaling, but rather statistical and spatial relationships. The majority of “downscaling” being done is with this method.

FIGURE 15. SECTION OF THE SAR REGION SHOWING 0.5° BY 0.5° (HISTORIC HYDROLOGY) GRID SCALE AND 2.5° BY 2.5° (GCM) GRID SCALE RELATIVE TO CATCHMENT BOUNDARIES



sector analysis, a large-scale food producing unit (FPU) is the unit of analysis; for the water resources analysis, a catchment scale (refer to Figure 15) is used; and for infrastructure and health, a national-scale analysis is used.

scenarios support the objective of the EACC study—“to better understand what adaptation to climate change really is and how without such adaptation, development progress will be threatened and may even be reversed.” These scenarios are described in detail in the sectoral analysis reports.

## 6. SUMMARY

This report has documented the process used by the EACC team to select climate change scenarios for use in the sectoral analyses that were “spatially comprehensive” and “plausible extreme climate projections.” The

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