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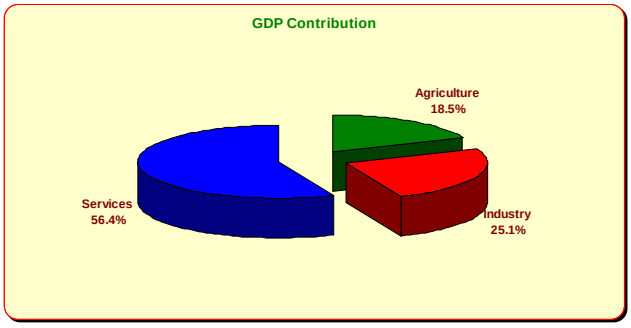
Zambia: Climate Risk Factsheet

GDP (US$ billion; 2006)[1]:	7.3
Population (million; 2006):	11.7
Land Area (1,000 sq. km):	743.4
Agricultural land (percentage of total land area, 2005)[2]:	47

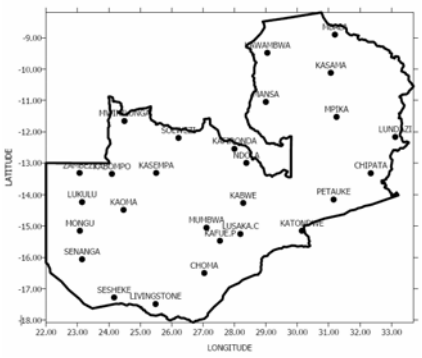


Observed Historical and Current Climate Trends

Temperature: The average temperature in the region was 21.57°C between 1960-1990 (Cline, 2007).

Rainfall: The annual average between 1960-1990 was 2.75mm/day (Cline 2007).

Geographical Locations of Meteorological Stations used to analyze rainfall data (NAPA)

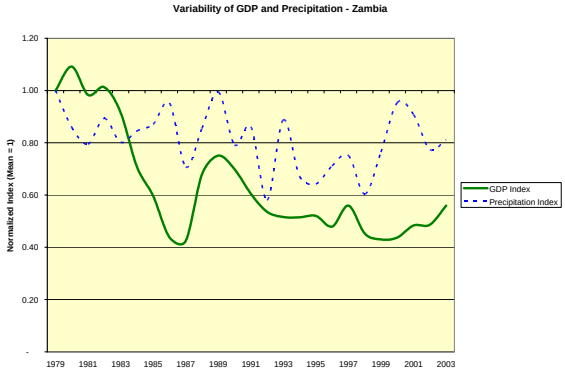


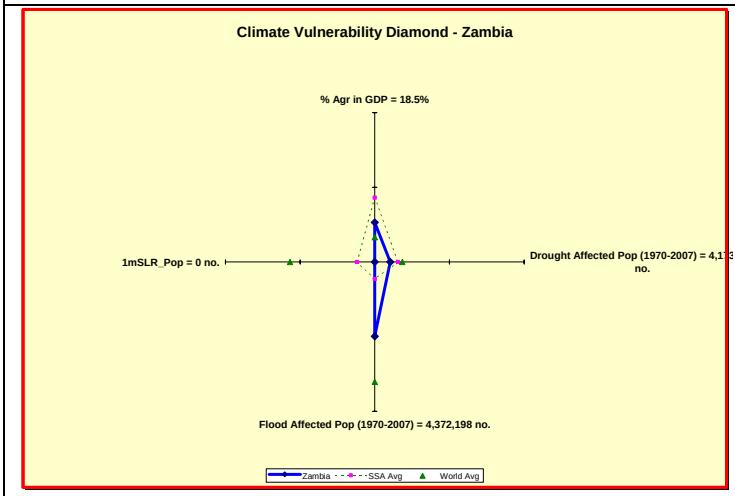
Projected Future Climate Trends

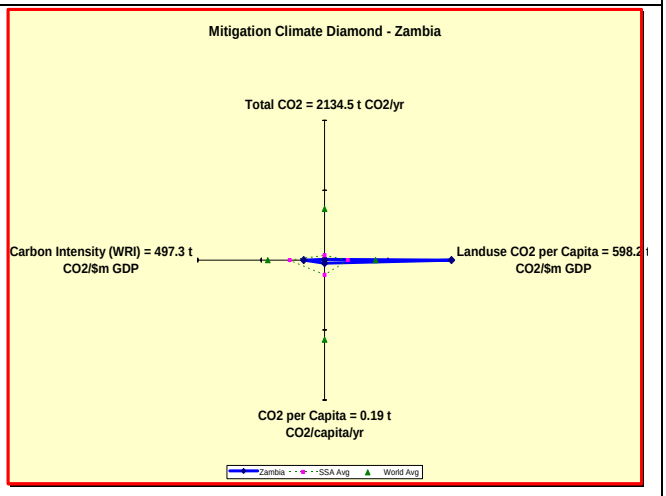
Temperature: It is projected that the temperature will be an average of 25.86°C between 2070–99 (Cline 2007)

Rainfall: The annual average rainfall between 2070–99 is projected to decrease to 2.61mm/day (Cline 2007).

Time-series Of Normalized GDP Growth And Precipitation

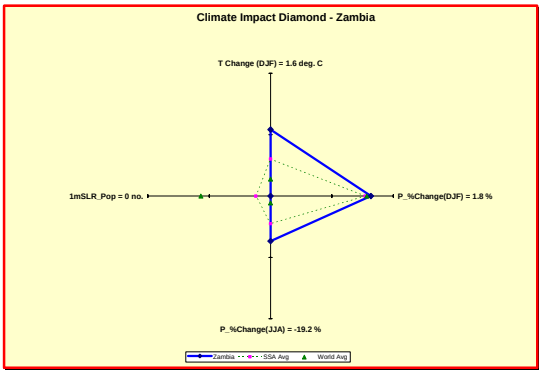






[1] World Bank, 2007, World Development Indicators. Available at: http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport

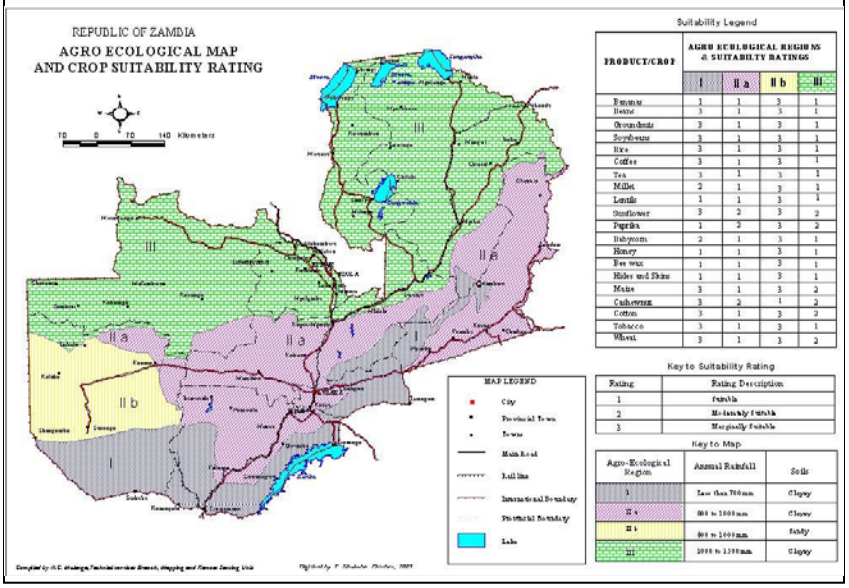
[2] World Bank, 2007, The Little Green Data Book



Key Sectors Affected

Agriculture: The NAPA has highlighted that areas suitable for staple crops, such as maize production in these regions are likely to be reduced by more than 80%. Within these regions, since the 1980s, there has also been a tendency for the later onset and earlier withdrawal of rains, as well as an increased occurrence of drought years. Such deficits could result in severe yield decrease for specific crops such as maize. Based on a CO2 doubling scenario in these regions, some estimates predict a yield reduction of approximately 66% under rain-fed conditions but only about 16% under irrigated conditions. Currently, less than 5% of arable land in Zambia is irrigated. With changes in rainfall patterns, the average length of the growing season length for maize is also likely to become shorter, with models predicting an approximate reduction in the length of the season of 20%. At the national level, yield changes and other impacts under climate change scenarios suggest frequent shortages of grain Region I is extremely vulnerable followed by Region II in terms of arable cropping. Hence planning for climate change in these two regions is definitely a necessity. Key crop varieties, particularly maize, would not mature due to shortening of the growing season in agro-ecological Regions1 I and II, respectively, undermining food security in the two regions.

Agro-Ecological Map and Crop Suitability Rating for Zambia



Water Resources: Zambia has abundant surface water resources, however communities living in arid parts of the country's agro-ecological Region I experience severe water shortages during summer. Moreover, population increases in urban centres have also put pressure on groundwater through mismanagement. The water balances between demands and resources for the drought year with a ten-year return period showed that Southern province is extremely vulnerable and does in fact experience critical shortages during drought conditions.

Health: Human health is particularly sensitive to climate and synoptic weather patterns because many maladies in the tropics are associated with temperature and precipitation regimes. Malaria was chosen for further study because it is the leading killer disease in the country, responsible for 4.0 millions cases and 50,000 deaths annually. The vulnerability assessment showed that Zambia is vulnerable many other climate-sensitive diseases such as dysentery, cholera, respiratory infections and malnutrition. These diseases are more pronounced in the provinces that are most vulnerable to climate change/variability in agro-ecological regions I and II. The target provinces are, therefore, Central, Southern, Eastern, Lusaka and Western. The US Country Study Programme showed that there are low disease transmission rates during the cold season implying that temperature is a major limiting abiotic factor. Years of high rainfall also showed high malaria incidence thereby implying that rainfall is another regulating abiotic factor.

Energy: The hydro-electric power generation has been negatively affected by the droughts and floods. Drought has had devastating effect on the hydropower generation in Zambia with significant economic reduction in the power potential. A study of the baseline period (1970-2000) established the influence of rainfall fluctuations on run-off, reservoir storage capacity and hydropower potential on the Zambezi River basin. The analysis shows that climate change/variability, indeed has effects on hydropower generation. Significant wet and dry episodes were identified in the sub basins for the baseline period of 30 years. And the response of run-off, reservoir storage capacity and hydroelectric power potential to extreme wet and dry years was ascertained. In the 1991/92 rainy season, a devastating drought crippled many sectors of the economies in the riparian states of the Zambezi basin. Amongst the sectors worst affected were agriculture and hydroelectricity power generation.

***Source**: NAPA, 2006*

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Recommendations for Improved Management of Climate Risks

Overall Objective: Improve climate-smart development through appropriate institutional and investment activities.

SECTOR	Enabling Environment/ Capacity Building	Investments
Capacity Building & Cross-cutting	- Develop and strengthen the Knowledge Base o Data and information – acquisition, analysis, dissemination, utilization o Enhanced hydro-meteorological monitoring systems, and improved and expanded human resources in the hydrological and meteorological services o Analytical tools and products tailored to sector needs o Information on adaptation options based on pilots, field tests and research o Early warning systems o Information exchange networks to enable access to and exchange of data and information between all levels of user and decision makers - Regional and National Networks – Networks of agencies and policy makers, experts, knowledge bases, data and information, research and field experience (pilots, tests) is crucial to stimulating and facilitating investment in adaptation	- Introduce modern technology for data collection, transmission and assessment; Introduce the use of compatible standards and systems to enhance data and knowledge sharing across sectors; - Strengthen and expand systematic observations of meteorological and hydrological parameters; strengthen the technical capacity of hydro-met services including the development and dissemination of knowledge products to enhance the adaptation of project design and implementation to climate variability and change; - Strengthening and develop early warning systems for drought and flood hazards and natural disasters to improve preparedness, response and recovery in all the sectors (agriculture, health, natural resource, and energy)
Agriculture (including irrigation, watershed management & community development)	- Develop flood, drought and drainage risk maps to enhance sector development planning - Combine risk mapping with river basin and sub-basin water resource assessments including rainfall variability.	- Scale up investment in research and extension services to enhance production and farm incomes with a new emphasis on adaptation to climate variability and change - Invest in piloting new, crops, cropping patterns (at farm scale), and new technology packages (both for adaptation and carbon sequestration) to enhance adaptation in areas with high climate variability and vulnerability to change - Scale up investment in the introduction of irrigation and water management systems and appropriate technologies, especially water conservation in drought prone areas - Scale up investment in livelihood focused participatory rural develop including sustainable land management, watershed management and community driven development (CDD) approaches - Pilot risk insurance schemes including indexed crop insurance
Water Resources Mgt	- Improve technical capacity of water resource management agencies including hydro-met and groundwater management services - Institutionalize multi-sector, integrated water resources planning and management - Strengthen the analytical and modeling capability of water resource agencies to utilize enhanced hydrologic and metrological data acquisition and monitoring networks and support river basin and sector development and management planning	- Scale up investment in: o River basin and sub-basin water resource assessments and the associated institutional capacity to sustain such program on a continuous basis o Development of decision support systems (DSS) including hydrologic models and other analytical tools to enhance sector planning and risk assessment o Implement new mechanisms to disseminate these assessments, DSS and tools to support enhance strategic planning in sectors that are dependent on the basins natural resources
Energy	- Strengthen electricity utilities to improve their efficiency and financial viability - Strengthen sector strategic planning to include a greater emphasis on climate vulnerability and climate change risk by introducing: o Assessment of vulnerability of supply systems, including hydropower and the development of other renewable sources less sensitive to climate o Assessment of climate change impacts on demand o Expand off-grid expansion opportunities (potential for	- Support the expansion and development of regional electricity grid interconnections - Scale up investment in electricity access and energy efficiency - Review the effects of climate variability and climate change on the reliability and capacity of existing and potential hydropower facilities and developments; - Accelerate expanded pre-investment studies of hydropower and other renewable sources for grid and off-grid electricity supply

SECTOR	Enabling Environment/ Capacity Building	Investments
	renewable energy) o Grid extension - Carbon finance opportunities	- Coordinate grid and off-grid electricity access planning with rural development and forestry sectors and SLM programs to support efforts to reduce fuel-wood harvesting and use
Transport	- Enhance the capacity of road and transport sector agencies in the area of strategic planning to identify and incorporate climate vulnerability into sector plans and project designs	- Review and revision of planning and design standards for river and stream crossing, and cross drainage, in regions with existing and potentially increased future flood hazard including increases in high intensity rainfall - Increase the use of flood, drought (greater access to network) and drainage risk mapping in sector planning in rural and urban areas - Introduce risk assessment into the selection of design standards including pavement type
Urban Development, Water Supply and Flood Management	- Enhance strategic supply planning capability of urban water supply utilities including climate vulnerability and risk assessment of water supply sources - Strengthen urban development planning based on improved flood and drainage hazard mapping	- Invest in infrastructure upgrading and improvement to mitigate and adjust to changing flood and drainage hazard patterns - Invest in urban services to reduce flood and drainage risks including housing relocation, reduced encroachment into flood hazard areas, secure solid water management
Health	- Develop/strengthen climate-related surveillance systems (as part of overall monitoring system) - Increase awareness of health related climate vulnerability and increase capacity to incorporate adaptation in to the health care system	- Invest in disease vector control systems - Invest in increased surveillance of existing and emerging threat areas affected by climate variability and climate change
Forestry, Biodiversity and Coastal Zone Management	- Strengthen capacity to monitor forest and biodiversity resources, evaluate their status and threats and formulate actions - Develop and test new governance arrangements for forest resources	- Invest in forest resource management to enhance climate resilience, enhance livelihoods of people living near and in forest areas, and promote resource conservation - Invest in reforestation and afforestation, and in their sustainable management - Invest in forest fire prevention, risk surveillance, and response

As can be seen, many of these investments to reduce climate risks involve faster sustainable development, careful assessment of vulnerability, strengthening institutional capacity, and re-orienting investments.