

MODULE 10: HOW IS INDONESIA'S PRECIPITATION CHANGING PAST, PRESENT AND PREDICTIONS FOR THE FUTURE?

ANSWER SHEET: INDONESIA

Projections of mean annual rainfall from different models in the ensemble vary considerably but tend to indicate overall increases in rainfall for Indonesia. The range of changes in annual rainfall simulated by different models varies between - 28 and +53mm per month (- 12% to +20%) by the 2090s. .

- The proportion of total annual rainfall that falls in heavy events is projected to increase by all the models used in the Global Circulation Modelling by up to an additional 15% by the 2090s.
- All models used project increases in the magnitude of 1 and 5 day rainfalls of up to 86mm and 123mm, respectively, by the 2090s.
- The increases in heavy rainfall are greatest where total rainfall is projected to increase also, but in some regions the proportional rainfall occurring in heavy events increases even where total rainfall is projected to decrease.

Indonesia's coastal lowlands are vulnerable to sea - level rise. Sea - level in this region is

projected by climate models to rise by the following levels⁴ by the 2090s, relative to 1980 - 1999 sea - level:

- o 0.18 to 0.43m under SRES B1
- o 0.21 to 0.52m under SRES A1B
- o 0.23 to 0.56m under SRES A2

For further information on Climate Change projections for Asia, see Christensen *et al.* (2007) IPCC Working Group I Report: '*The Physical Science Basis*', Chapter 11 (*Regional Climate projections*): Section 11.4 (*Asia*).

An interactive activity can be found at <http://www.geographyteachingtoday.org.uk/images/activities/sealevelriserisk.html> which shows the areas of the world which are most at risk from rising sea levels.

ACTIVITY ONE

1. Mean rainfall over Indonesia has decreased significantly in every season. Annual rainfall has decreased at an average rate of 7.8mm per month (3.6%) per decade since 1960.
2. Trends are similar in all seasons, varying between - 7.5mm (3.3%) per decade in OND to - 8.9mm per month (3.6%) per decade, but greatest proportional decreases have been seen in the drier season, JAS, at - 4.8% per decade. These trends, however, are strongly influenced by several years with particularly low rainfalls in the last decade and do not represent a consistent trend throughout the 46 year observed period.

3. The number of 'heavy' precipitation events has decreased, particularly in the wet season. A 'heavy' event is defined as a daily rainfall total which exceeds the threshold that is exceeded on 5% of rainy days in current the climate of that region and season.
4. The variations in the black line can be accounted for by the Indian Ocean Dipole (IOD) and the El Nino Southern Oscillation (ENSO)

ACTIVITY TWO

1. There are, however, large spatial and seasonal variations in projected rainfall changes. The easternmost islands (Region D) generally incur the greatest total increases in rainfall (- 6 to +38% by the 2090s), and increases are projected throughout most of the year.
2. Projections for the remainder of the region vary considerably with season. Rainfall decreases in projection over the south and western islands (southern Sumatra, Java and the smaller southern islands) in the dry season, JAS, and to a lesser extent in OND. Decreases in rainfall in northern Sumatra are projected in JFM.
3. The overall increases in rainfall projected for the future contradict the recent evidence of decreases in observed rainfall throughout the year. It should, however, be noted that the observed decreases in recent years may not reflect a long term climate change signal