Table 2: Volcanic Effects -origin, characteristics and potential for harm

	Origin	Characteristics	Harmful Effects
Pyroclasts	All explosive eruptions	Hot broken fragments of rock ejected with great velocity	Rocks may be very large and cause damage on impact
Tephra	All explosive eruptions	Collective term for all airborne or ground-flowing pyroclasts including solidified magma. Tephra is classified according to size: Bombs: > 64mm diameter Lapilli 2-6mm diameter Ash <2mm diameter	Tephra may be spread over distances of 1500km or more causing major and minor damage
Eruption Column	Explosive eruptions of silica-rich and gaseous magmas - gases decompress rapidly to produce upthrusting gases and tephra	May include a white cloud column from emission of steam, dark masses of pyroclastic material and clouds of fine ash. "Mushroom cloud" often produced due to the perturbation of atmospheric temperature and pressure; moist air near the column is drawn up and condenses to form the "mushroom"	Fallout may be destructive and widespread
Pyroclastic Flow	Explosive eruptions May also be caused by collapse of eruption column	Hot, and often gas-charged, high velocity flow of tephra. Often composed of a mixture of bombs, lapilli, ash and extremely hot gases. The resultant deposit, high in pumice, is termed an ignimbrite	May extend many kilometres from source and travel at high velocity (average 300kmh^{-1}) May therefore represent a lethal mix of bombs, lapilli, ash and hot gases
Atmospheric effects	Eruption columns which may extend hundreds of kilometres into the atmosphere allowing ash, for example, to be transported by high level winds	Ash and dust particles including acidic aerosols. Light-scattering leads to unusual optical effects	Clouding reduces sunlight reaching earth's surface, cooling the troposphere, but release of greenhouse gases contributes to tropospheric warming
Landslides	Dislocation of land and rocks by magmatic pressure	May form huge flows of rocks, mud and tephra	Destruction of property and land
Lahars	Rain or meltwater may loosen tephra	Volcanic mud-flows which may move downhill very rapidly, as determined by topography	Extensive destruction to property and often loss of life eg **Nevado del Ruiz, Columbia 1985, Mount Pinatubo 1991**
Lateral Blasts	Rapid decompression of dissolved gases due to exposure of a mass of magma by a landslide	Sideways and sudden release of pulverised rock and hot gases	May travel at speed of sound. Lethal within blast zone which, in the case of **Mount St Helens** extended to 600km^2
Lava Flows	Any eruption	Flow rate dependent on temperature - as lava cools, its viscosity increases and speed reduces until it is less than walking speed. As it cools, a solidified surface is produced. Volume and range of flow variable - may extend up to 100km from source	Can cause ignition of fires and burial of land and objects, but in general the relatively slow flow rate means it poses little risk to life
Poisonous Gases	Any eruption	Ash-laden gases including carbon monoxide, carbon dioxide, hydrochloric acid, hydrofluoric acid, sulphur dioxide	Many are directly toxic and contribute to acid rain. 1700 people were asphyxiated by CO_2 in the 1986 eruption at **Lake Monoun, Cameroon**. May also cause long term starvation and disease
Flooding	Submarine eruptions displacing large volumes of rock and hence water. Blockage of rivers by lahars or lava flows	Inundation of fresh or salt water. May be gradual or rapid	Dramatic changes in erosion and deposition pattern of rivers. Destruction of property and agricultural land

The Beneficial Effects of Volcanism

Although volcanic activity is usually perceived as solely harmful, there are a number of beneficial effects:

- The scenic landscapes produced increase the potential for **tourism**
- **Soils** derived from basic lava are particularly fertile; volcanic ash falls are often rich in potassium and phosphorus and act as natural fertilisers. This explains the prevalence of settlements near many volcanos
- **Industrial materials** and **chemicals** are derived from volcanic rock - sulphur, pumice, boric acid and ammonia are examples.
- **Geothermal water** which reaches the surface may be harnessed for energy. In **Reykjavik, Iceland**, homes are heated by this method and in **Italy, New Zealand**, the **US, Mexico** and the former **Soviet Union**, naturally occurring steam is used to produce electricity.