The chances of a river flooding after a period of rain are determined by natural factors

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Flooding is a natural process which occurs every day all around the world. The power of a flood can range from causing colossal amounts of damage, for example the Pakistani floods which claimed the lives and homes of around 2.5 million, to just something with little power which goes unnoticed. Although floods have the potential to cause much damage to human life, and sometimes animal life, they can in fact be of benefit to eco-systems as a whole. For example, in the Amazon rainforest floods are one of the ways in which nutrients are distributed around the biome to provide life for other trees and plants. When considering the causes of a flood, many factors, both natural and human related, can influence the power and size of the flood. For instance, two rivers of identical size which have received the same amount of rainfall can have different outcomes; one could flood heavily, and the other not at all.

One of the fundamental influences on the chances of a river flooding is the lag time. Lag time is the time between when the rainfall occurs to when all of that water reaches the river. If the lag time is very small then the chances of a river flooding are higher, because there is a higher volume of water which the river has to cope with. Alternatively, if the lag time is high, the river stands less chance of flooding as the river distributes the peak discharge over a longer period of time, allowing the volume of the river to remain consistently moderate. Both human and natural factors can change the lag time.

The physical characteristics of the ground and what is on that ground severely influences the lag time of a river. With more trees, plants and other natural vegetation more of the rainfall is going to be intercepted where the precipitation can either; evaporate and return to hydrological cycle, flow down the stem of the plants and trees (stem flow) and then flow along the ground (surface run-off), or throughfall can occur. Throughfall is when the precipitation passes through the plant canopy and reaches the ground; from here surface run-off can occur. In addition, both stem flow and throughfall can result in the precipitation infiltrating the ground. When this happens, the precipitation can either flow towards the river through the ground (through-flow), or it can percolate further into the ground where it then flows deeper in the ground to the river. Furthermore, all of these processes can be influenced by other physical features. For example, the structure of the soil, the rock permeability, and the saturation of the ground can all influence the point at which, in the process aforementioned, the water flows to a river. If the rocks are impermeable then infiltration is less likely to happen, so there will be an increase in surface run-off, which could result in a shorter lag time and therefore a greater chance of a flood occurring; and vice-versa. Likewise if there has already been high amounts of rainfall, the ground water store could be completely saturated, which again would result in less infiltration and more surface run-off, triggering a potential flood.

One of the other main influences is to do with the physical characteristics of the drainage basin itself. Firstly, the size and shape of the drainage basin effects the lag time. For instance, if we had two identical rivers where one had a large and wide drainage basin and one with a small and narrow one, the river with the larger drainage basin would have a higher lag time, meaning that a flood could be less likely to occur. Whereas the river with the smaller drainage basin would have a much smaller lag time, so the precipitation would take less time to reach the river and thus more likely to flood. In addition, the length of stream channels in the basin area (drainage basin density) equally tells us something about the chances of a river flooding. Generally speaking a drainage basin with a high

drainage basin density has more impermeable ground or exposed bedrock; which results in high levels of surface run-off, thus creating smaller 1st order streams. With there being more 1st order streams, the precipitation is more likely to reach the river faster as there is a greater surface area for the initial precipitation to land in a stream or the river itself. Also there less distance for the precipitation traveling via through-flow or ground water flow to reach a channel or the river, consequently increasing the chances of a flood occurring. Finally, the topography of the drainage basin could influence the chances of a flood occurring, as the angle of the drainage basin can affect the speed that the precipitation flows at; with a great angle it would be faster, and with a more obtuse angle it would be slower due to the effects of gravity.

The natural factors which have been mentioned so far can all be altered by human interference which can cause an increase, or even a decrease, in the chances of a flood occurring. One of the biggest problems that human interference causes is increasing surface run-off by urbanisation. By building villages, towns, cities, roads etc. we vastly increase the surface run off which occurs as most of the materials we use are impermeable. By doing this we are decreasing the lag time and stopping any infiltration that could occur, which consequently stops through-flow and ground-water flow; the stages where large amounts of water is lost and where lag time can increase. Much vegetation is also lost to urbanisation and clearing land for agriculture, which causes further problems as less water is evaporated and more water reaches the ground quicker. This particular problem is a major issue in some places in Holland and Germany along the river Rhine as many vegetated areas are being cleared for agricultural fields causing the ground to become saturated a lot faster. This results in more water reaching the river faster by surface run-off causing the peak discharge to happen much quicker than it should and increasing the chances of a flood; because of this the River Rhine is flooding in some areas. However, with some urbanisation comes an improvement in drainage systems. So more water is being drained out of built up areas and put to rivers where flooding isn't too likely. These systems are designed to minimalize the chances of a flood in built up areas.

So, as we can see both human interference and natural factors can influence the chances that a river has of flooding. Therefore, the statement 'the chances of a river flooding after a period of rain are determined by natural factors' is true to an extent, bu t only tells us half the story. We as humans have a responsibility to prevent needless dama ge to the environment, with just small changes and management schemes we can prevent such occurrences causing unnecessary damage to the environment and ultimately, mankind.