
Commuters affected by heavy rains

A central issue that has been going on for more than just decades now is the change in climate. But first, what is climate change? According to the National Aeronautics and Space Administration or NASA, climate change is a change in the typical or average weather of a region or city. This could be a change in how much rain a place usually gets in a year, or a change in a place's usual temperature for a month. People often confuse climate with weather. NASA stated that weather is the short-term changes we see in temperature, clouds, precipitation, humidity, and wind in a region or city. This can change every day, and sometimes within the same day.

A large number of people are affected by the change in climate, with one of the primary victims being students and workers. This is mostly because a lot of them don't use any mode of transportation other than walking or riding a bicycle. According to the National Center for Safe Routes to School (2013), walking to and from school increased significantly between 2007 and 2012, from 12.4% to 15.7% in the morning; and from 15.8% to 19.7% in the afternoon. Lake (2015) observed that a fair number of workers walk to get to work, which is right around four million people. Whether students walk or commute going to school, they are still greatly affected by the change in climate.

Walking and riding a bicycle being the only modes of transportation for students and workers, they are usually caught in some number of minutes of rain, and sometimes even rainstorms. Since they are caught in the rain, everything they carry around with them ends up wet, and sometimes even if they are using an umbrella. Even those who commute are affected by the rain. In October of 2016, a news article reported that several accidents occurred in Pittsburgh during a Thursday morning commute due to the heavy rain. This shows that even though commuters are inside a vehicle, they can still be affected by rain and sometimes in worse ways than someone who is walking or riding a bike to get to their destination.

Students and workers who walk or ride bicycles to their destinations are not only at risk of a number of negative outcomes, they are also likely to be great affected by the weather such as rainstorms. According to climatemps.com, Manila, Luzon is provided with an average of 2061 mm (81.1 inches) of rain fall per year. On average, there are 144 days per year, or 12 days per month, with more than 0.1 mm of rainfall. Data show that it rains frequently in the Philippines, which adds more to the problem in which students and workers are at risk of being greatly affected by the rain while walking to their destination. To reach their destination without getting wet much from the rain, they are required to use certain items to protect themselves.

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Usually, students and workers who walk or ride bicycles make use of umbrellas, jackets, or raincoats when on the way to their destination while it is raining. However, using only these items don't always cover all their needs, especially when it is raining. The problem with using an umbrella is that there are times where the umbrella is not big enough to protect both you and your luggage from the weather. It's either, you are protected, your bag is protected, or only a part of you and your bag are protected. On the other hand, the problem with only using a jacket or a raincoat is that while you are almost fully protected from the weather, the items you carry are not, since a raincoat is only big enough to protect a single person.

There is a need to create some way to fully protect both the person and the bag that the person carries, without having to sacrifice something for the other. To do this, researchers thought of an accessory that could be attached to any bag and can protect a person and his/her items as if they were just wearing a raincoat. This accessory provides the person with a raincoat that can be folded and attached to the back of a bag, which can then be unfolded so that the person is able to wear the raincoat when needed. This also comes with a raincoat for the bag as well. In order for the researchers to do this, they must use the finest but cheapest possible materials in the creation of this accessory, and not just any mediocre material.

Numerous studies have been found regarding the number of children and students that walk to and from school. Some of these studies show that the number has increased within the past few years. According to the National Center for Safe Routes to School (2013), this number increased between 2007 and 2012, from 12.4% to 15.7% in the morning, and from 15.8% to 19.7% in the afternoon. The National Center for Safe Routes to School (2011) also stated that 48% of children ranging from 5 to 14 years usually walked or bicycled to school in 1969. In relation, Lake (2015) claimed that around four million workers walked to get to work. From his data, it can be observed that a fair number of people walk or ride a bike in order to get to their destinations.

Despite several studies showing an increase in the number of people who walk to and from their destinations, other studies claim the opposite. The Pedestrian and Bike Information Center (n.d.) claims that the decline in walking and bicycling to destinations is seen, in whatever perspective you view it. Although the National Center for Safe Routes to School (2011) stated that 48% of children usually walked or bicycled to school in 1969, this was shown to have decreased, as only 13% of children within the same age range are found to usually walk or ride a bicycle to school in 2009. In addition to this, Kalinowsky and Rushowy (2016) claimed that the number of 11-to-17-year-olds who walked or rode a bike to school decreased by 12.9% while the number of people who rode a car increased from 14% to 33% in between 1986 and 2011. Ham, Martin, and Kohl (2008) also stated that the number of students who walked or biked went from 42% to 16.2%. These studies contradict the previous students that were mentioned, as they show that there was a decline in the number of people who walked or bicycled.

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The people who walk or bike to their destinations are often affected by the weather, such as rainstorms. In order to protect themselves, they must use an umbrella, or a raincoat for full-body protection. Each raincoat is usually made with different materials. Some of these raincoats have good build quality while others don't. In order for a raincoat to have a good build quality, it must be made out of certain materials. Unfortunately, these materials are either hard to find, very expensive, or both. But nevertheless, they are usually worth it considering the durability of the output.

Several researchers have studied on different materials and have determined which materials would create a highly durable raincoat. According to Herald (2017), there are three basic types of children's raincoats in the market. These raincoats are made of either water-repellant material, coated in vinyl, or made entirely from vinyl. Herald (2017) also claimed that if one wants a raincoat that is effective in protection against the rain, raincoats coated in vinyl and made of fabric would be best. This type of raincoat is usually made of tightly woven fabric, which is usually nylon, polyester, or rayon). Toronto (2009) stated that there are certain materials that make new coats have an impermeable quality. These materials include cotton, polyester, and even silk fabrics backed with polyurethane and sometimes threads wound with rubber.

While there are raincoats that are made out of the best materials available, there are also raincoats that aren't. One cannot just buy any kind of raincoat. One must make sure that the raincoat is made up of the best possible materials with consideration of the price of the product. For some reason however, there are some people who are not aware of what certain materials' effects are, whether it be to the user or to the raincoat itself.

There are a few materials out there that must not be used to make a raincoat. Webster (2015) emphasized that there must be greater examination as well as national and international controls when it comes to what materials are used in order to create certain products such as raincoats. This pushes people to avoid products containing PFAS's which are used to create various products such as raincoats and furniture. Targeted News Service (2013) then stated that materials can have

certain chemicals that can permanently disrupt the brain. According to them, 70% of the raingear that they tested contained high levels of cadmian. Cadmian, according to Merriam Webster dictionary, is a toxic bluish-white malleable ductile divalent metallic element used in batteries, pigments, and protective platings.

Despite several studies claiming that raincoats coated in or made of vinyl are usually the best in terms of quality, other studies have shown that vinyl has a number of harmful effects. According to Vancouver (1992), vinyl garments are notoriously feeble, which makes them prone to creasing. They usually rip easily and deteriorate when dry-cleaned. Escandon (2013)

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emphasized that vinyl is uniquely toxic due to the highly toxic ingredients in it which affects the environment during its production, use, and disposal. She also stated that vinyl is 57% chlorine, which is a toxic substance that generates a huge amount of pollution.

From the sources above, one can observe that they mostly focused on the number of people who walk to and from their destination in general. They also focused on which materials can and cannot be used to create raincoats. The focus of this study and product is on the number of people who walk to and from their destination, who also carry bags with them. As one may know, the Philippines usually has unexpected rainfall from time to time. With the product created from this study, people will be able to safely walk under the rain without their items getting wet, and without having to sacrifice their bags' space just to carry protection against the rain.

While there are studies that point out which materials must and must not be used in order to create an attachable raincoat with good quality, there is still a certain question that can be brought up. This question would be; would the raincoat be feasible and practical enough to warrant its use? Because of this, additional studies and research must be made and done in order to assure the researchers that the product will succeed.

The purpose of this paper is to study about different raw materials that can be used in the production of a raincoat. The researchers aim to find the best and most ideal materials that could possibly be used to create a raincoat that can be attached to any kind of backpack. The raincoat will be attachable with the help of Velcro straps, which can then be used by people who usually walk to get to their destinations during rainy seasons.

This research studies about the best possible materials that can be used to create raincoats. These raincoats can be attached to any kind of backpack, which means the user can wear his or her backpack over the raincoat, while also protecting the backpack itself. This raincoat will be attachable with the use of Velcro straps for easy access and comfortability. This attachable raincoat can be used by any person, especially those who usually walk to get to their destinations, and most especially those who walk during rainy seasons.

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