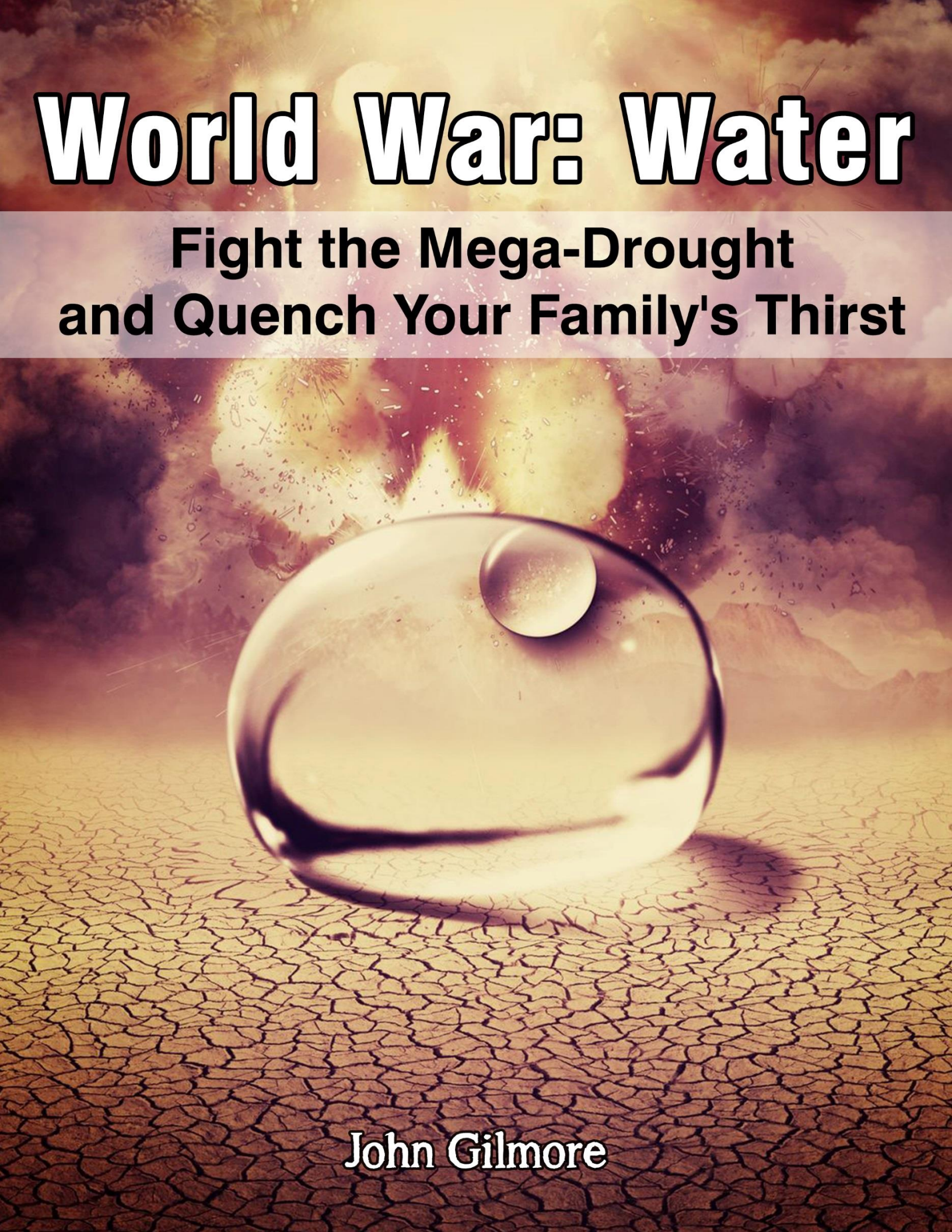
World War: Water

Fight the Mega-Drought and Quench Your Family's Thirst



John Gilmore

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TABLE OF CONTENTS

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AMERICA WITHOUT WATER

Water... it's justly considered to be one of the most basic elements of life. We use it for everything from drinking to watering our lawns. While many take it for granted, without it we can't survive.

In fact, the average person can't live more than three days without water. Our bodies are not only largely made up of water, but also use water to filter out and dispose of chemicals and minerals that can poison us.

This necessity of water has largely dictated how civilization has grown and where major cities have managed to thrive.

The Times Are Changing

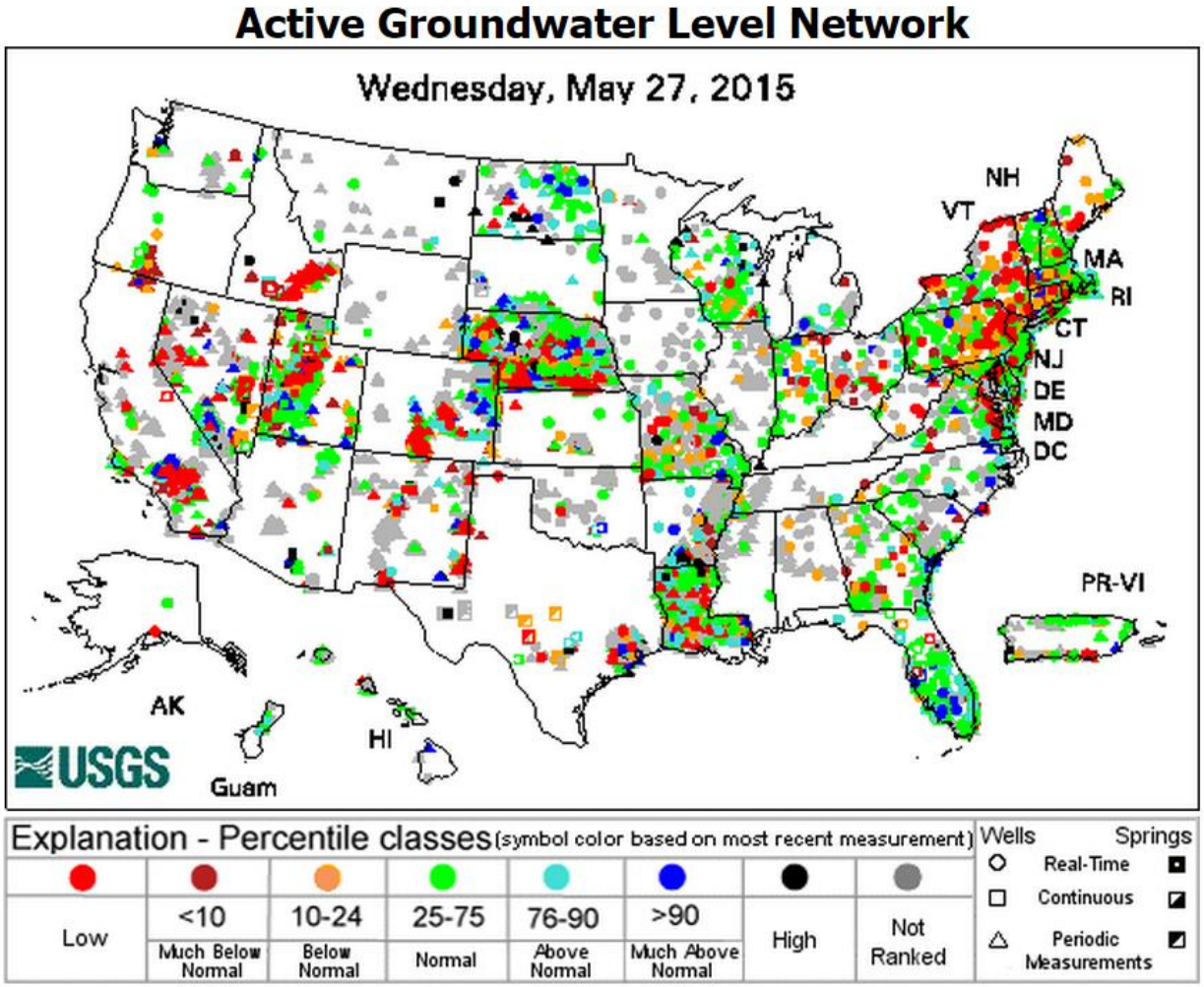
Over the last several years, water prices have been rising. The average American family is paying considerably more for their monthly water bill, than they were just a few short years ago. Municipal water prices have doubled in one out of every four cities over the last 12 years, with some cities actually seeing water prices triple in the same time period.

With water being one of the lower cost utilities, you might not think that this is all that big a deal. But to many families who are feeling the pinch of rising food and energy prices, while wages aren't on the rise, every small rise in utility costs hurts. Rising water prices decrease the disposable income that they have available each month, which is a large part of what drives the economy for consumer goods.

With so much water in the world, it would seem surprising that water prices would rise like that. But this is one place where looks can be very deceiving. While 71 percent of the earth's surface is covered in water, less than one percent of that water is drinkable

water. Actually, the number is much less than one percent, as only 0.37% of the Earth's water can be purified and used.

The percentage that is groundwater is even lower, at only 0.28%. With glaciers and icecaps being freshwater as well, the amount available for our use is miniscule at best.



Groundwater is important, because in most municipalities it is groundwater, rather than surface water that is purified for drinking. Groundwater has several advantages over surface water, mostly in that the process of percolating through the ground to reach the underground aquifers purifies the water. (See active groundwater level network in real time on USGS website.)

This miniscule amount of available water has to provide for all our needs. That's not just the needs we have in homes, but the needs we have in industry and agriculture as well. Denying water to farmers, so that we can have it for the cities, is cutting our own collective throat. Without adequate water for crops, those crops die. Ultimately, this leads to higher prices at the supermarket. Taken far enough, it can lead to shortages.

One major concern for long-term water usage is that many of the nation's most important aquifers are drying up.

The Ogallala Aquifer, the largest in the world, which stretches across much of America's breadbasket is gradually being pumped out. Each year, the water level drops another few inches. When these critical resources dry up, so will the farms that depend upon them.

Water needs are increasing constantly. The average American uses 100 gallons of water per day. Of that, only about 1/2 gallon is for drinking. The rest is used for everything from watering our lawns to flushing our toilets. While not all of those require purified water, the way we've built our infrastructure dictates that potable water is used for all of those uses. This increases the strain on our infrastructure, especially our water purification plants.

As the population grows, there is more demand on the available water. Regardless of availability, people need water to drink, water to bathe in and water to wash our clothes in. Water rationing, which is used in some municipalities, only deals with water that is used outside the home.

While this is 50% of our water usage, that doesn't equate to a 50% decrease in usage. Many people ignore the rationing, finding ways to get around it.

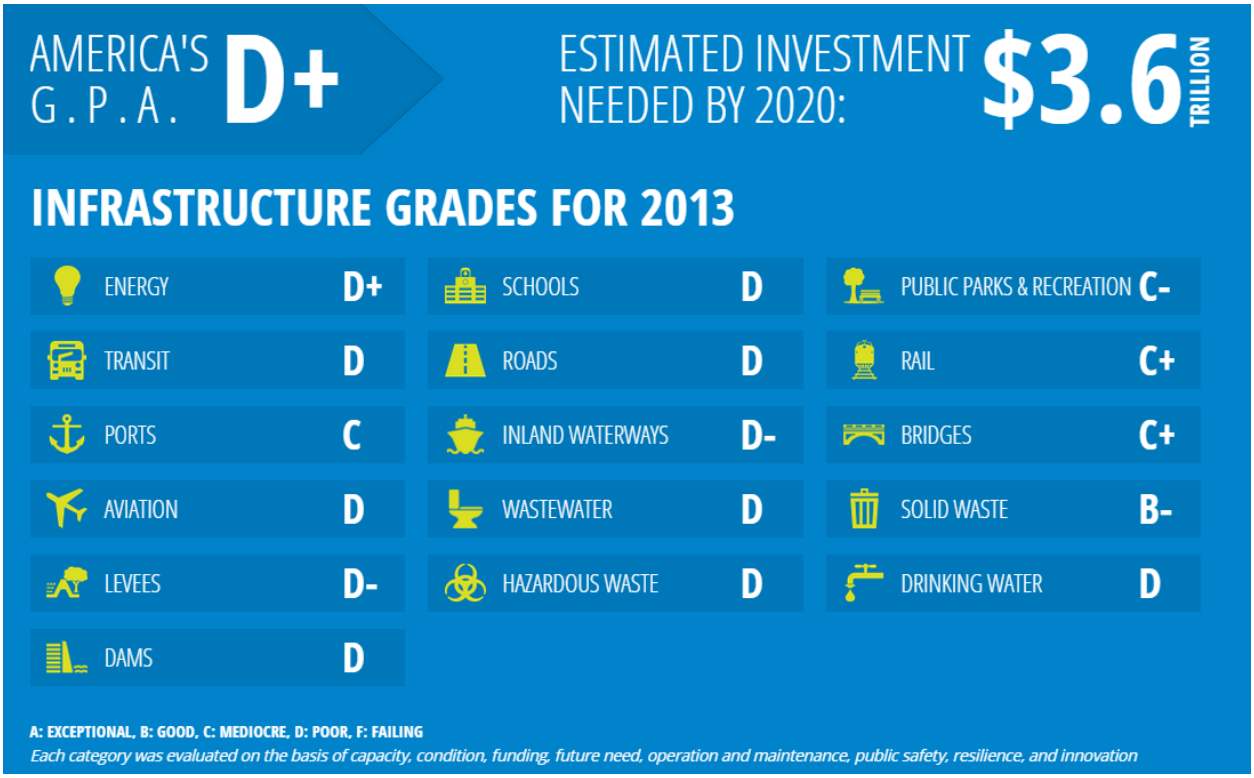
So, where is the water shortage coming from? It's actually a combination of factors. First of all, there is always the risk of drought. The southwest has been experiencing drought for several years now, creating a shortage of water for farmers and other uses.

Part of this is because the snowfall in the Colorado Rockies, a major source of water for the southwest has been low. This year, Southern California is experiencing their worst drought in history, with many farmers unable to plant, due to the lack of water.

In addition to this lack of available water, there are a number of problems that municipal water services are having in getting that water to you. All of these ultimately raise costs to the consumer.

Whenever water shortages exist, water authorities have to seek out other sources. This can mean taking a wide variety of actions, from building dams and canals to drilling tunnels. All of these projects are enormously expensive. While they are mostly paid for with bonds, those bonds eventually have to be paid off, creating another cost to be passed on to the consumer.

The majority of our water infrastructure is close to 50 years old. Considering that it was designed with a life expectancy of only 50 years, this means that it's reaching the end of its useful life.



The American Society of Civil Engineers gave our drinking water a grade of "D" on their latest Infrastructure Report Card (2013). (You can read their report on ASCE website.)

Currently, the ASCE, as well as officials in these water authorities estimate that there is a need of investing over one trillion dollars in the water infrastructure to bring it up to an adequate level to provide water for the next decades.

There are an estimated 240,000 water leaks per year, requiring replacement of water mains. Each of these spills untold thousands of gallons of water before they are identified and repaired. This not only highlights the need for upgrading our water infrastructure, but it is also one of the things that drive costs up. Those repairs are expensive, just like upgrading the system is.

Other costs are going up for water suppliers as well, such as increased costs of the various materials and supplies they use. Water authorities use a considerable amount of electricity to power the large pumps needed to move water.

They also have to deal with rising personnel costs, along with meeting federal regulations. Since 9/11, these have included increased security safeguards, a very expensive provision to add to systems that never had to worry about security before.

At the same time that water production and distribution costs are rising, water utilities are battling with reduced incomes. Efforts over the last couple of decades to improve water conservation mean that customers are using less water. This reduction in water usage means that they have to raise prices, just to maintain their normal income level.

What Is the World Doing About It?

Dealing with the rising price of water, as well as the looming shortages, is one of the problems that faces modern society. Like most such problems, there are very different views on what would be the best possible solution.

Some advocate government investment in rebuilding the infrastructure, while others advocate a privatization of water, with private companies taking over this utility function.

As with any such discussion, there are good and bad examples which can be pointed to by both sides. Private industry takes a different approach to providing public services than the public sector does. Government employees at any level aren't required to think about making a profit, merely making people happy with the ruling political party.

However, any business must produce a profit in order to stay open. This drastically changes the decisions that are made by the heads of these businesses.

When private companies have taken over water utilities in the past, it has almost universally led to higher consumer rates. This is explained by the management of these companies as being driven by the need to repair and replace equipment which was ignored by the previous public sector management. Enemies of privatization accuse businesses of "gold plating" these systems, spending more than is necessary.

But from a businessman's viewpoint, they are putting in systems which will meet the needs for the future, spending now so that they can save later.

In most case, this is a very real need; but one that directly conflicts with the promise of cheaper rates that is made to the public, as a justification for privatization. Those lower rates only come about after updating equipment, if then. As anyone can see, once rates go up, there are always justifications available to keep them up.

Private companies also expect to be paid by their customers. When those customers don't pay, they cut off service. This has raised a firestorm of complaints by organizations that claim to look after the needs of the poor. These groups advocate that people have a right to water, whether they pay for it or not.

Those who are advocating public water utilities point to this problem, as well as other potential problems, as reason for not privatizing. Their reasons, whether real or imagined, include a potential for corruption, potential job losses, reducing local control and public rights, leaving the poor without water and a potential undermining of water quality.

On the flip side of the coin, there is a proven track record of private industry operating more efficiently than the government. Ultimately, the same work being done by the government costs more, even if those costs are hidden.

Where private water companies have to pay for the cost of new equipment and pass that cost on to the consumer, public water utilities are able to tap into tax money for upgrades and other costs, passing the cost on to the taxpayer. Since it doesn't show up in their monthly water bill, the taxpayers don't realize that they are still paying for it.

In both cases, the same people end up paying the costs, the average American citizen. The only difference is whether we pay through taxes or through utility bills. Which is better?

While privatization of water utilities captures the bulk of the attention, that's not the only thing that is happening to affect our water costs and supply. At the same time that water costs are skyrocketing for the average family, the government is working to take over ownership of every drop of water in the country. Specifically, it is the EPA who is trying to take over water supplies.

Let me give you the simplified version of what the EPA is doing. First of all, they already have control of all navigable waterways in the country. This definition has been expanded to include waterways that are only navigable sometimes. In other words, if there is an arroyo which fills with water during the rainy season, creating a navigable waterway, then the EPA can claim control over it.

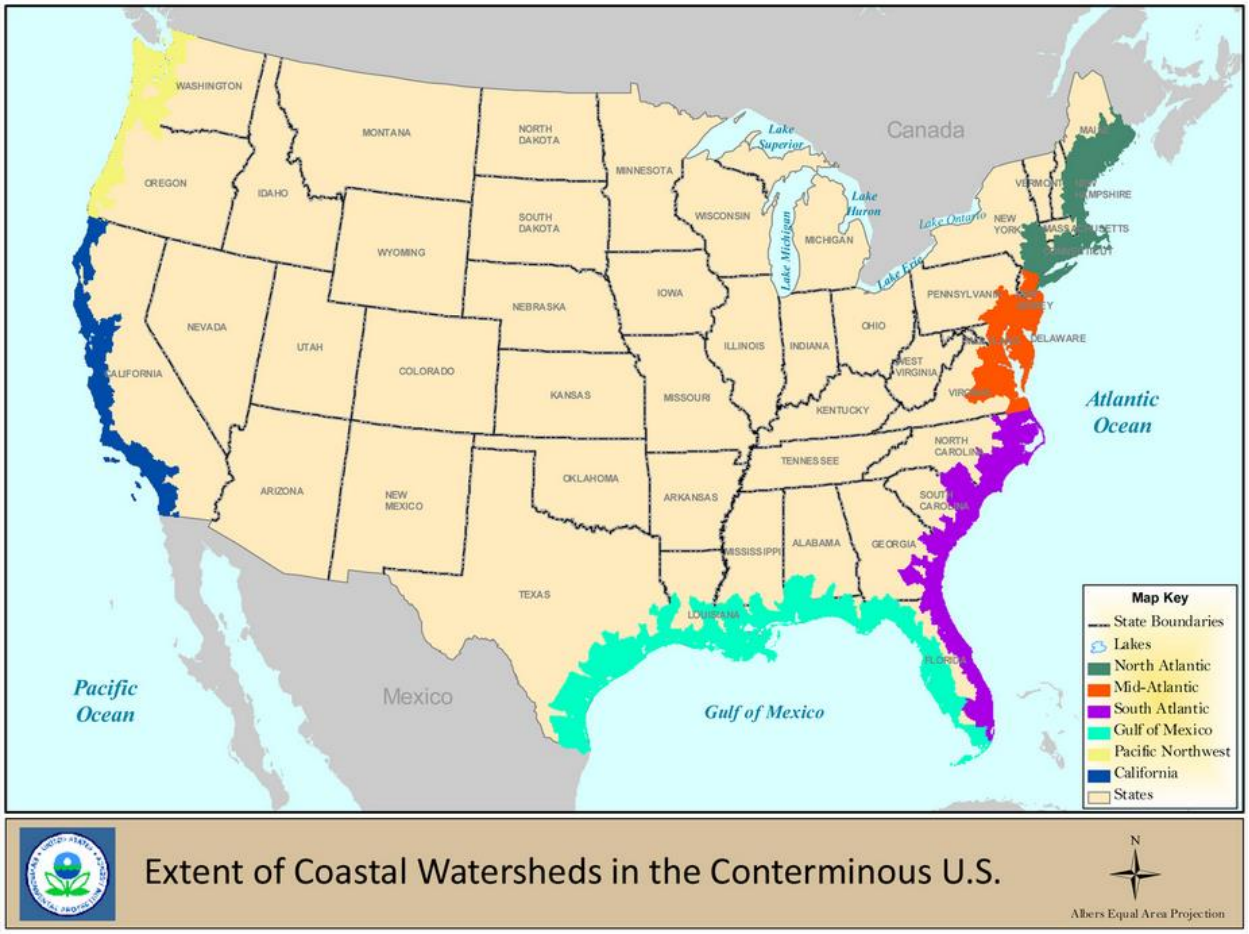
The key word in this is "navigable." A waterway is only considered navigable if some part of it can be used to transport interstate of foreign commerce. The definition clearly states that if some part of the waterway fulfills this definition, than it extends to the whole waterway.

That sounds logical, but in practice the EPA is taking that definition to include any and all tributaries. They are also trying to change the working of the regulation, eliminating the word "navigable." If they are able to do that, then they will have control over all

waterways, whether navigable or not. In other words, if you have a creek running across your property, they will be able to claim control over it.

We've already seen cases where the EPA has declared private property "temporary wetlands" because some plant or insect life set up housekeeping in a puddle on someone's property.

If they succeed in eliminating the word "navigable" they'll be able to take control of your property, if they can visually see a path that rainwater takes to drain off of your property. They will literally have control over all land in the country. If what they've done with the "temporary wetlands" is any example, they'll follow this up by throwing people off of their land. (More about wetlands on EPA website.)



The EPA isn't the only government organization that is trying to take away water rights, although they are leading the charge. State organizations may be working hand-in-hand with them in some cases. In many states, drilling a well requires permits, a licensed contractor and even an environmental impact study.

The foundations of these roadblocks is that most property sold today is sold without mineral rights. So, you don't have control over what is below your home, even though you supposedly own the property.

Another way in which government interference is blocking people's quest of independence is by outlawing rainwater collection. Even though the rain in question has fallen on the roof of a privately owned residence, officials are claiming that it is public water. In the states where these cases are happening, collecting rainwater becomes a punishable crime.

The Consequences of These Actions

As is always the case, today's actions determine tomorrow's world, just as yesterday's actions have defined today's world. Much depends upon what our political leadership decides to do in the next few years, specifically in:

- The management of our water supplies
- The restoration, replacement and expansion of our water infrastructure
- The freedom given to people to develop their own water supplies
- The development of new water sources and water purification methods

Regardless of whether water utilities are privatized or not, these same factors apply. About the only difference that privatization might make is in the overall costs of management and rebuilding our infrastructure. Since private business is more efficient in this, that option would be the most cost-effective, even after adding on profits, regardless of what big government proponents say.

It seems rather clear that we are looking at a future which contains considerable water shortages, unless some major actions are undertaken to ensure that there is sufficient water for all our needs. This could mean making some adjustments that adversely affect industry and the environment. At this point in time, everything should be on the table for examination.

In 2014, a Federal court upheld the decision of the Fish and Wildlife Service to severely restrict the pumping of water to Southern California, stating as their reason the risk to the Delta Smelt, a species of fish native to the Sacramento-San Joaquin Delta. This decision negated decades of water planning and infrastructure construction, aimed at preventing such shortages in Southern California. Now, farms are drying up from lack of water and the costs of produce are rising.

Decisions of this type have a major impact not only on fish but on the whole country. When decisions are made for purely environmental reasons, mankind always suffers. But on the other hand, when decisions are only made for business reasons, it's not common for the environment to suffer.

A perfect example of this is fracking. While the jury is still out as to whether fracking has any long-term negative effects on the environment, there is ample evidence to show that it could. One of these evidences is the increase in earthquakes in states where fracking is being used.

The bigger concern about fracking is the enormous amount of water that it requires. Freshwater is used, basically taking all the water supplies for an area where fracking is occurring.

At times, this leaves communities and farmers without water. Worse, if the water they are using for fracking is coming out of the same aquifers that are gradually drying up, it will accelerate the process of turning the American breadbasket and turning it into the American dustbowl.

The United States holds some of the world's largest surface water reserves in the Great Lakes, sharing them with Canada. In total, the Great Lakes account for 21 percent of

the world's freshwater surface water. Yet, these bodies of water can only provide for a small part of the country's needs, due to the difficulty of transporting the enormous amounts of water needed to sustain a city.

Many of the country's largest population centers are located on coastlands, but saltwater is unusable for most purposes. To date, there are 324 desalination plants in the United States, a small percentage of the more than 17,000 desalination plants worldwide.

While desalination has historically been seen as being a very expensive alternative, new technologies have been bringing the cost down. As costs increase across the nation and water supplies diminish, desalination may be our best hope for the future.

Of course, building these plants is going to require a major investment in new plants and infrastructure. Proper planning would say that the construction of these plants and the renovation of the existing infrastructure should be integrated, so as to reduce the overall cost.

What Can You Do About It?

The outlook is grim. Looking at the current situation, the poor water management we have today, our crumbling infrastructure and the political battles surrounding any improvement to our water infrastructure, it is doubtful that a solution will be agreed upon until the situation becomes grave.

Even then, the solution settled upon will most likely be for political expediency, rather than what would actually be best for the country.

Seeing this, you and I are faced with the reality of needing to do something for our families. We must find some way of providing them with clean, usable water, regardless of what is happening around us.

Considering the condition of the world today, that doesn't just mean providing a source of water which can be used when everything is going fine, but also one that can be used

when things go wrong and we can't count on the city water authority to pipe water to our homes.

There are a few different options that we can look at to provide us with water in our homes. As with anything in life, each has its pros and cons. The best bet would probably be to not depend on just one means of getting water, but to be prepared to get water from several different means, that way, we can be assured of a consistent water supply.

This may seem a bit excessive, but when you consider that the average person can't live more than three days without water, you see that water is a pretty major need in our lives. It's enough of a need to be worth taking a few risks over, especially if the risks don't eliminate other options for seeking water.

Start by Putting in a Tank

With the lack of security there is in our existing water sources, it might be a good idea to make sure that you have some water on hand. This is actually a common practice in many third-world and emerging counties, where water supplies are inconsistent and unreliable. The people put in a water tank at their home, often on the roof. That way, they can fill it when the water is running and use that water when it isn't.

Most modern American homes can't support a water tank on the roof. A 200 gallon water tank is five feet in diameter and will hold 1,600 pounds of water. That works out to about 80 pounds per square foot.

Considering that the building code requires that roofs be able to hold a live load of 30 pounds per square foot, it's probably more or less impossible to modify the average home so that you can put a water tank on the roof.

That doesn't negate the need for a water tank though; it just limits the places it can be put. Instead of being on the roof, it will probably have to be in the basement or backyard. So, it will be impossible to use gravity feed to get the water from the tank to the sink.

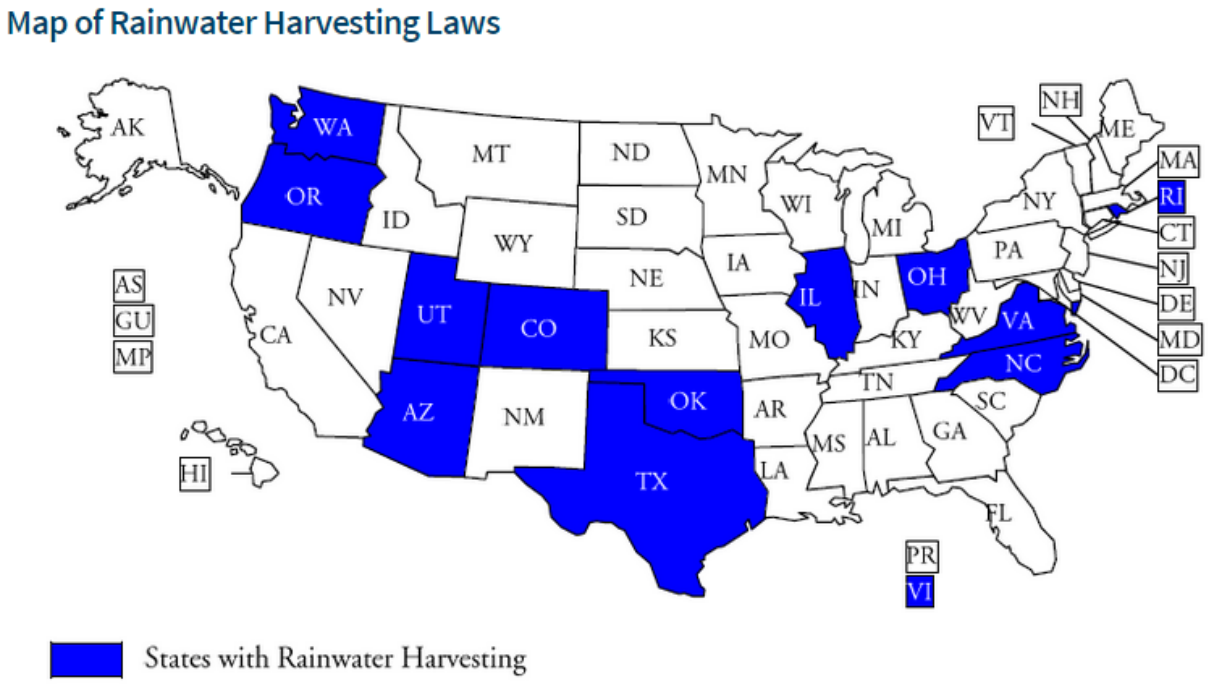
The other issue is keeping that tank hidden, so that people don't know what you are doing.

The easiest way to do that is to put in a swimming pool. A 15 foot diameter above-ground pool can be bought for anywhere from $200 to about $800, depending upon the quality of the pool you decide to buy. That pool will hold just shy of 4,000 gallons of water, a respectable supply to take care of your family in an emergency. For the rest of the time, your kids can use it to swim in.

Rainwater Collection

Although becoming illegal in various parts of the country, rainwater collection is still a good way of gathering water.

The trick is to just make sure that you're not caught at it, if you are collecting rainwater in one of the states where they are trying to make it illegal. Check your local rules and regulations on harvesting rainwater or go to the National Conference of State Legislatures website to see the environmental legislation on this topic.



A simple rainwater collection system consists of nothing more than the gutters on your home and a water tank (or tanks). If your home doesn't already have gutters and downspouts, there's no law stating that you can't add them. Then, all you have to do is to have the downspouts run into a tank, saving the water that falls on your home.

While tanks for these systems are normally placed on stands, above the ground, there's no rule that says they have to be. If you have to hide the system and you don't want to erect a screen around it, you can always put in an underground tank. Just dig a big enough hole, and put a plastic tank in it. The water can be pumped out of the tank with either an electric or manual pump when you need it.

Sink a Well

The most secure source of water for most people is to put in a well. The problem with a well is that it is usually pretty expensive to put in. At least, it's expensive if you have a licensed contractor put it in for you. However, there are other options you may want to consider.

First of all, we need to understand that the ground beneath our feet contains water. Most of it is trapped in layers of sand, but it can also be trapped in layers of clay, dirt and some types of rock as well. When a well is put in, the idea is to put it in deep enough so that you get down to one of the sandy layers, because those will usually produce the most water.

Generally speaking, the deeper the layer you're pulling the water out of, the more pure the water is going to be in it. As the water seeps downwards, it passes through layers of dirt, sand and coal which filter it. Therefore, a well contractor will want to put in a deep well, so that they can give you the best quality water. Since they charge by the foot, which also gives them the opportunity to charge more.

If you put it in yourself, all you need to do is get to a layer of sand that gives you good water. That can happen in as little as 20 feet, not the 200 feet or more that the

contractor tells you. So, it is possible that you could put in a shallow well that will provide your family with usable water, without a lot of expense.

There are two basic ways of putting in a well, besides the old-fashioned one of digging it with a shovel. The most common is drilling the well; but you can also put in what is known as a driven well in some places.

A driven well is a well that is made by pounding pipe into the ground. You start with a well point. This is a piece of galvanized steel pipe, which has a well screen inset into it. The end of the pipe has a hardened steel point on it, making the well point into an oversized nail. You thread a cap onto the back end of the pipe and drive it into the ground with a sledge hammer or a fence post driver.

Once the pipe is almost all the way in, the cap is removed from the end of the pipe and another section of pipe (without the well screen) is screwed on. This process continues, forcibly driving the well point into the ground until you reach water. Then a pump hose is run down the pipe to draw out the water.

There are some limitations to a driven well. First of all, you can only drive a well a maximum of about 25 feet into the ground. Any more than that, and friction stops you from advancing. That's okay, because surface mounted well pumps, of the type used with this sort of well, can only pump water up from a well that is 25 feet deep. The other problem is that you can't drive a well into ground that contains a lot of clay or rock, it won't drive through them.

Drilling a well requires a well drilling rig. This is essentially a motor mounted on a stand, which allows you to run a drill bit down into the hole. Galvanized steel pipe is usually used as the drill rod, carrying the rotational force of the motor down into the hole and turning the drill. This is the type of setup that a professional well drilling contractor will use.

In some places, you can rent these drilling rigs, so that you can drill your own well. In addition to the rig, you'll need the pipe, as well as plastic pipe and sand for the well

casing. A submersible pump will be put in the bottom of the well casing, once the well is drilled.

Anyway, check out your local rules and regulations or visit EPA website before starting to dig a well, considering that you need approval for this endeavor.

Make Sure You Can Purify It

No matter where you get your water from, you'll need to have a way of purifying it. City water is purified and treated to remove dangerous pathogens from it. It is also monitored for chemicals and dangerous minerals. If you are supplying your own water, you will need to watch for these dangers yourself.

The FDA has no authority over the quality of drinking water that you produce from your own well or rainwater collection system. However, if you don't ensure that it is clean, you could make your family very sick, so this isn't something to take likely.

The biggest risk is that the water that you get from your rainwater collection system or out of your well will contain bacteria and other microscopic pathogens. When city water is purified, the biggest concern is removing these pathogens, not removing chemicals and minerals. That's why municipal water is treated with chlorine, to kill these pathogens.

You must also remove suspended particulate matter from the water. This is just dirt, sand and organic (plant or animal) particles that come up from the ground with the water. Simple filtration will remove these.

A high quality home filtration unit is not cheap, but you don't want to cut corners here. If the filter doesn't get down to 0.1 micron or less, you can't be sure that it will remove all the bacteria. The best home water filters around are made by Berkely and Sawyer.

Water can also be purified by treating it with chlorine, although this will not remove suspended matter. Common household bleach is chlorine. To purify water, add eight drops of bleach per gallon of water, agitate it and allow it to sit for 20 minutes. After that,

it's safe to drink. Just make sure that you use standard unscented bleach, not the color safe kind.

Another way to purify water is to heat it. Most people do this by bringing it to a boil. While a boil will kill all pathogens, the water doesn't actually need to get that hot. Water boils at 212^{o}F and those pathogens will die at 160^{o}F. So, if you have a means of measuring the temperature, you can pasteurize it at 160^{o}F, rather than boiling it.

Only water that is going to be drunk, is used for washing produce or is used for washing dishes needs to be purified to this degree.

All the rest of the water you use, for bathing, washing clothes, mopping the floor and watering your garden, can be water straight out of the well or out of a nearby stream. As long as it isn't muddy, it will work.

A Better Water Solution - Make Water Out of the Air

There is another option for clean water that most people don't think of, that's pulling water right out of the air. This is done with a device called "H_20 Dynamo." If you look for one of these online, you'll see that they are quite expensive; perhaps because they aren't all that common.

The idea of this water generator is to condense the moisture that is in the air, in the form of humidity. This is essentially the same as what a dehumidifier does, but the water is being saved and purified for use, rather than disposed of. People living in high humidity areas can harvest a lot of water with one of these devices; perhaps even enough to provide all their water needs in an emergency.

Although these systems are rather expensive, you can build your own much cheaper. In fact, a window air conditioner unit just about does what you want.

If you have a window air conditioner, you should know that it has a drain on the outside of the house. As the air conditioner cools the air, the humidity in it condenses in water

droplets on the outside of the evaporator. That water drips down into a tray, where it is captured and sent to the outside drain.

A home dehumidifier works almost exactly the same as that room air conditioner. The difference is that it is not focused on producing cold air, but rather getting the moisture to condense out of the air. In doing so, it accomplishes our goal of having a low-cost way of providing water to meet our family's needs. We can't get enough water this way to replace all of our water usage, but we can get enough to supply the most critical needs of drinking and cooking.

Dehumidifiers need a minimum of 35% humidity to function. So, this form of making water out of thin air will only work in places where you have that much humidity. It might be possible that you live in an area where the humidity is only that high at night and then drops during the daytime.

If that is the case, then you might want to put your dehumidifier on a timer, so that it is only drawing water out of the air in the nighttime.

Building a Home Water Generator

Rather than buy a commercially made atmospheric water generator, it's much cheaper to make your own. Just follow the next chapters of this course, and you might get a perfect solution for your homestead.

You really don't need that many components to do so.

- Water tap, aquarium water pump and different sized hoses
- electric cable and power switch
- heat shrink varnish,
- silicone corner protector,
- dehumidifier,
- water dispenser filter,
- one wooden board and one plywood board

- 50 gal plastic barrel and two barrel caps.

Purifying the Water

One would expect water that is coming right out of the air to be pure, just like water that is distilled. Sadly, this is not the case. So, even if the water being produced by the dehumidifier looks perfectly clean, it probably isn't: it can be loaded with biological contaminants and metallic residues that are not safe to drink.

That's why we take the output of the dehumidifier and run it into some sort of a water filter in order to be safe, because only boiling will not remove the components that make it unsafe to drink.

Also, keep in mind that the condensate would not be quite different from distilled water, which is safe to drink, but not necessarily goodespeciallyon long term. The reason is that distilled water lacks all the minerals and useful elements that are usually found in tap water.

Drinking distilled water could increase body acidity, and may contribute to mineral loss in your body. Also, drinking distilled water will not really hydrate the body, because this type of water is stripped of minerals and oxygen through distillation, and it loses its natural structure.

What should you do with your demineralized water if you are going to use it for drinking? One solution is to add concentrated mineral drops containing calcium, magnesium, or sodium in order to enrich it.

Power for the Dehumidifier

The dehumidifier will need electrical power to operate, although the water filter system should not. While it operates under the same principle as a room air conditioner, the dehumidifier doesn't use anywhere near as much electricity as the air conditioner does. To give you an example, a 70 pint per day dehumidifier (which is a pretty large one)

draws 7.8 amps or 745 watts of electrical power. A 30 pint per day dehumidifier drops that down to 3.4 amps or 320 watts.

This means that for your H_20 Dynamo to work in the midst of a disaster, you're going to need to have some sort of electrical generation capability, just in case your electrical power goes out. Since it is common for the electrical power to go out in the case of a disaster, you should expect to need to provide your own electricity.

You'll either need a generator, solar panels or a wind turbine. I would recommend a combination of solar panels and a wind turbine, so that you can be sure of having electrical power at all times. By attaching this to a battery backup system, you will have power for when there is a lull in power production.

Of course, if you are preparing to survive a disaster, having some sort of electrical power generation should be part of your plan anyway.

PARTS &TIPS

1. Air Dehumidifier

There are two types of household use dehumidifiers... with or without a compressor. You will need a compressor based device. It has a longer lifespan, and consumes less power.

Make sure that the dehumidifier you acquire has the water tray on the front. Also, these devices have different water collecting capacities per day. The one I used is the most affordable and it can collect 2.5 gal a day.

The dehumidifier we used (Kalorik ADH7) is 30pints (260W) but you can use a different size dehumidifier (depending on your needs) like the 50pints or 70 pints.

Just remember to make sure that is a compressor based device and has the water tray on the front.

There are bigger ones, at a higher price that can collect 4 gals, 5 gals or even 8 gals. But I recommend getting one between 2.5 and 5. Keep in mind that a bigger dehumidifier could mean that you would need a bigger barrel.

You'll find it anywhere from $80 to $200.

2. Water Dispenser Filter

The water dispenser filter looks like a water jug, but has 2 containers one on top of the other, with the actual filter cartridge between. That way, the water that is to be filtered is on top, and the clean drinkable gets in the bottom container.

There are different sized containers. Mine has a capacity of 1.5 gal on top and 1.5 on the bottom. You have to search for a filtration system for cylindrical water dispensers with a single filter cartridge.

The one we used is 3 gallons (1,5 gallons on top and 1,5 gallons on bottom). Check out the links in the final section of this manual, and you'll find the type of filter that is needed for the project.

What you really should look for when buying the filter, is the quality and performance of the cartridge. The more layers it has, the better it will filter the water. You'll find it anywhere from $15 to $50.

3. Auto Cabin Filter

Every car with AC or Climate Control has a cabin filter. The sizes and variations are endless. And that's a good thing for you!

After you buy the dehumidifier, remove the water tray and the cover that's over the air intake.

Behind it you'll find the dehumidifier's air filter, which is just a simple piece of mesh...

Measure it so you'll know what size the cabin filter should be. Mine fit almost perfectly from a 2005 Toyota Prado.

You'll find it from $5 to $50.

4. Water Tap

You can choose any kind of tap...

I got a soap dispenser tap because it fit perfectly as size, but also because if not pressed, it's sealed shut.

So I eliminated the risk of dust and insects getting inside the water circuit.

You'll find it from $5 to $25.

5. Aquarium Water Pump

You'll need a simple aquarium water pump, but it has to be submersible. Nothing expensive or too powerful... A pump big enough to push the water to the tap above.

The power of the pump is measured by the height it can pump water to.

Mine could lift up to 4.5 ft. A 160-250 GP/h should be good.

You'll find it from $15 to $40.

6. Power Switch

A simple on/off for AC current is good.

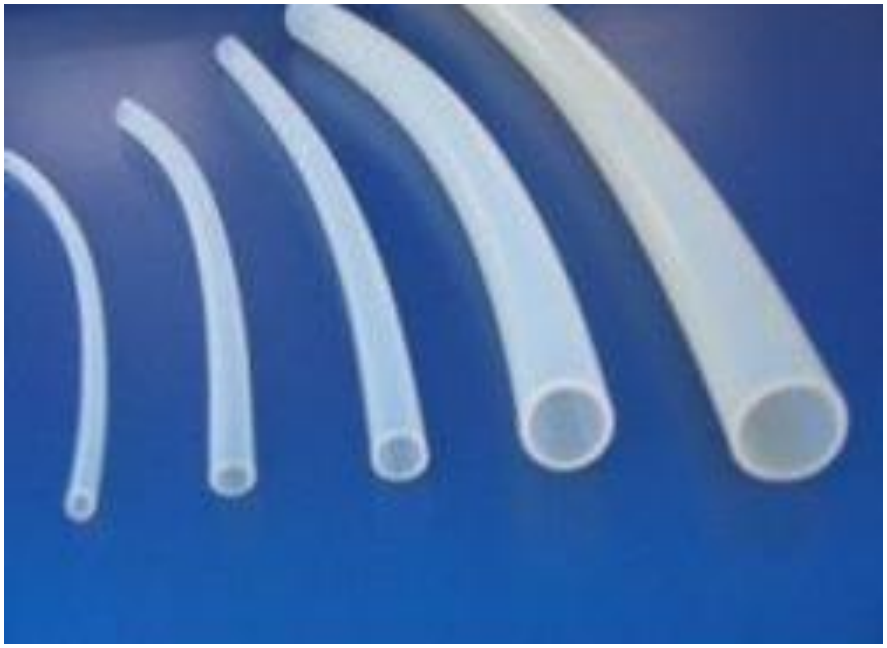
You'll find it from $3 to $8.

7. Silicone Hoses

You will need different diameter sized hoses.

I used 3 sizes. One will have to fit on the nozzle of the water pump, one will have to fit the nozzle on the tap, and you'll need a slim sized hose for the water cooling system.

My water cooler hose was a quart of an inch interior diameter. At one point you'll have to connect these hoses to one another. And you'll also need a tight fit, so they won't leak.

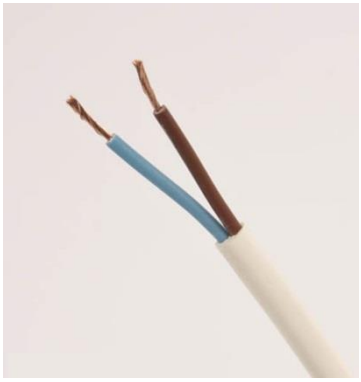


You might be lucky and it all fits together the first time. If it doesn't, use intermediary sized hoses to make reductions.

The length of the hoses should be around 9 ft per each size.

You'll get them for $10 to $20 for the whole lot.

8. Electric Cable



You'll need about 12 ft of electric cable to make an extension on the water pump's power cable.

You'll get it for $2 to $5.

9. Heat Shrink Varnish

The heat shrink varnish looks like a plastic tube.

You'll pull it over the insulated connections on the electric cables. It shrinks when heat is applied from a stove or lighter flame.

It won't lit up unless you keep it over the flame for too long.

It also comes in different diameters.

You'll find it from $2 to $5.

10. Silicone Corner Protection

You can use any type of silicone or rubber pieces, as long as they are malleable enough to take the barrel's shape, and thick enough for the middle barrel cap to sit on.

You'll find it for prices from $2 to $10.

11. One Wooden Board

The board is needed to make the dehumidifier stand inside the barrel.

It should be 2-3 inches wide, by half an inch thick. The length varies according to the barrel's diameter.

You will need to cut 2 pieces equal to the barrel's diameter in length.

12. One Plywood Board

The plywood board will be screwed in place over the wooden boards. The dehumidifier will stand on it.

So its size should be the same or a bid larger than the dehumidifiers' base footprint.

Mine was 1 ft 3 inches long by 6 inches wide and half an inch thick.

13. Two Plastic Barrel Caps

One of the barrel caps has to be that of the barrel itself.

They can be both the same, but the second one can be bigger.

The second one will be cut at a specific size and placed inside the barrel to limit the clean water container.

14. 50 gal Plastic/ Fiberglass Barrel

The right sized barrel should be cone shaped, not too tall and slim, but also not too short and thick.

You'll find it for prices from $25 to $80.

TOOLS & TIPS

1. Screwdrivers

Depending on the dehumidifier type, you'll need the appropriate screwdrivers for prying it open.

In my case I needed a flat and a cross.

2. Duct Tape

3. Scissors

4. Permanent Marker

5. Box Cutter Knife

6. Measuring Tape

7. Metal Hacksaw

8. Power Drill

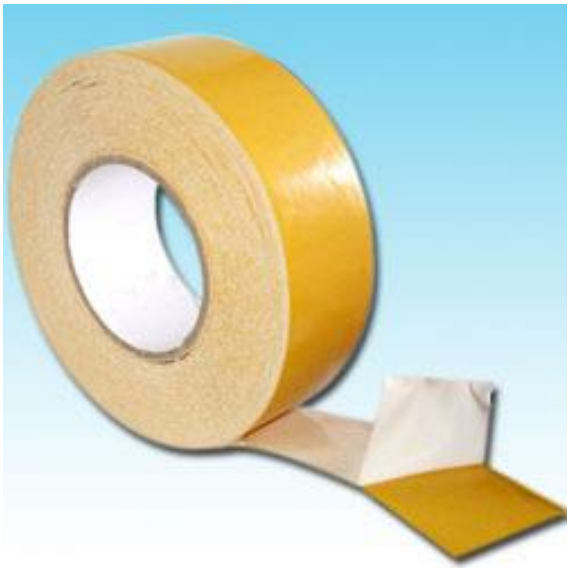
9. Different Drill Bits

You will need to drill holes through which you'll pass the different sized hoses, water tap assembly and electric cables.

10. Screws for Wood or Drywall

11. Piece of String

12. Double Sided Tape



This is used for sticking the silicone protectors or rubber pieces inside on the barrel. You can also use epoxy glue or super glue instead.

13. Pliers

14. Insulating Tape

15. Lighter

16. Sanitary Silicone& Sanitary Silicone Gun

ADDITIONAL TIPS

After buying all the parts that will come into contact with the water, clean and disinfect them properly with dish wash detergents. This includes:

- the dehumidifier's water tray
- condenser radiator,
- water pump,
- the hoses,
- water filter
- barrel interior.

Search online for discounted dehumidifiers, older models or resealed on stock. You'll get them cheaper and brand new. Search for a cheap parts manufacturer when buying the cabin filter. I spent $4.5 on mine. You only pay the brand if you get an expensive one.

Don't go spending a lot of money on powerful dehumidifiers. 2.5 gals per day is more than enough. The truth is you'll use this water for drinking. So 4-6 gallons will suffice for a week. It will take a 2.5 gal dehumidifier 2-3 days to collect all that water, for only $2 worth of electricity. The bigger the dehumidifier, the more it will consume.

It is possible that your unit is different than mine. Maybe you got a good deal from another manufacturer... Or you just had one laying around your house. Don't worry. Take your time and inspect it first. See which screws you'll have to take out to get the job done. Do not use brute force... Just common sense and patience.

When building the device, remember! It doesn't have to be pretty. It has to get the job done.

Never drink water directly from the tap. Use a glass or a mug. The water pump runs on electricity. It's not dangerous under normal circumstances. But it should be a precaution.

BUILDING THE H_20 DYNAMO

Let's start by assembling the water dispenser filter. It's really easy.

You can do it either by following its user's manual, or simply by trying it out yourself.

On some filters there might be a hole on the bottom for the water dispenser connection. Use a piece of duct tape to cover it up so it won't leak. Once the filter is ready, we'll go to the next step.

Disassembling the Dehumidifier Unit

My dehumidifier has the water tray on the bottom front (this is the most common layout, and the one that I recommend). Remove it.

The condenser cover should be right above it and probably houses the air filter. I had to get through 6 screws to take it off.

It is possible that your unit is different than mine. Maybe you got a good deal from another manufacturer... Or you just had one laying around your house. Don't worry. You'll have the covers off in no time. Take your time and inspect it first. See which screws you'll have to take out to get the job done. Do not use brute force... Just common sense and patience.

You will have to gain access to the air filter and the condenser behind it. The condenser is the cold circuit of the device. Because it's cold, it will condensate water from the surrounding air. And to be sure you found it, it looks like a car radiator, probably in two layers with a half inch gap between the two.

On the inside of the cover you'll see the air filter. Because we want to use the condensed water for drinking, we'll apply an auto cabin filter on the original. It will drastically improve the water quality and the lifespan of the water filter.

The best surface match I found for my air filter was from a 2005 Toyota Prado.

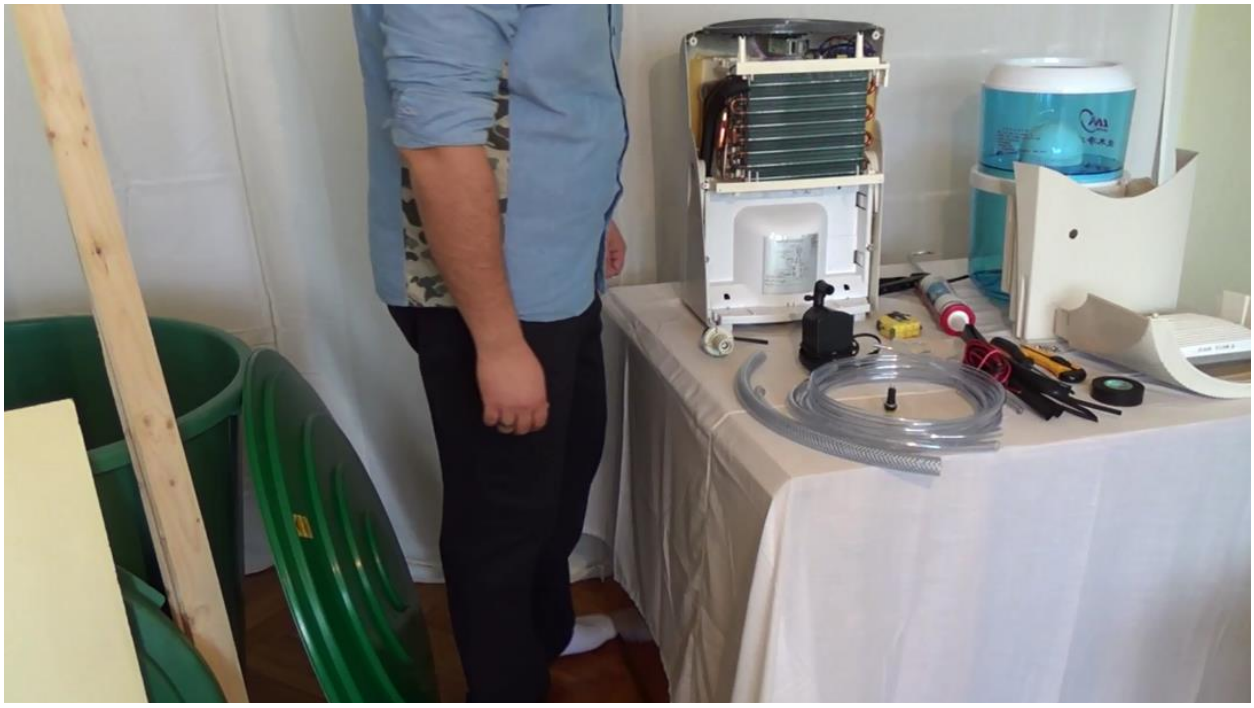
Measure the cabin filter and cut it down to size for a perfect fit. Use duct tape to bind the filters together just like you see in the video.

After you've finished taping the filter, put it back in its original position. In my case, it's the condenser cover.

Assembling the H_20 Dynamo

Here you have all the parts you need to make your own H_20 Dynamo.

- Water tap, aquarium water pump and different sized hoses
- electric cable and power switch
- heat shrink varnish,
- silicone corner protector,
- dehumidifier,
- water dispenser filter,
- one wooden board and one plywood board
- 50 gal plastic barrel and two barrel caps.



Put the cover back on the dehumidifier.

It should fit perfectly. If there isn't enough space between the air filter and the condenser radiator, stretch the cabin filter and tape it as a single sheet on the original.

Measure the height from the base of the device to the condenser cover. You can go higher if you want. The important thing is that the dehumidifier's air intake and air exhaust (that's at the back) are above the measured level. I got 10 inches on mine.

Measure the total height of the water barrel.

If your measurements are different, don't worry. That's because you probably found different barrel and dehumidifier models. Stick to your measured values, and replace them in the following instructions. I marked 10 inches down from the top. Give it a few

more levels around the barrel, marking 10 inches (or your own values) below the top level.

Now do the same inside the barrel. Give it 8-10 measurements.

It's time to cut the plywood board which will be used for the dehumidifier stand. It shouldn't be more than 2 inches longer than the barrel top radius.

In my case it was 1ft 3 inches long by 6 inches wide.

Next we'll cut the wooden board. You'll need 2 pieces with a length equal to the barrel top diameter. For me, that was 2 ft 3 inches long, 3 inches wide. The width of the wooden board should be anywhere between 2 and 3 inches, but not very thick.

Place the 2 wooden boards on the barrel just like you see in the video. Keep them parallel at 6 - 10 inches, and mark their position on the barrel using the permanent marker.

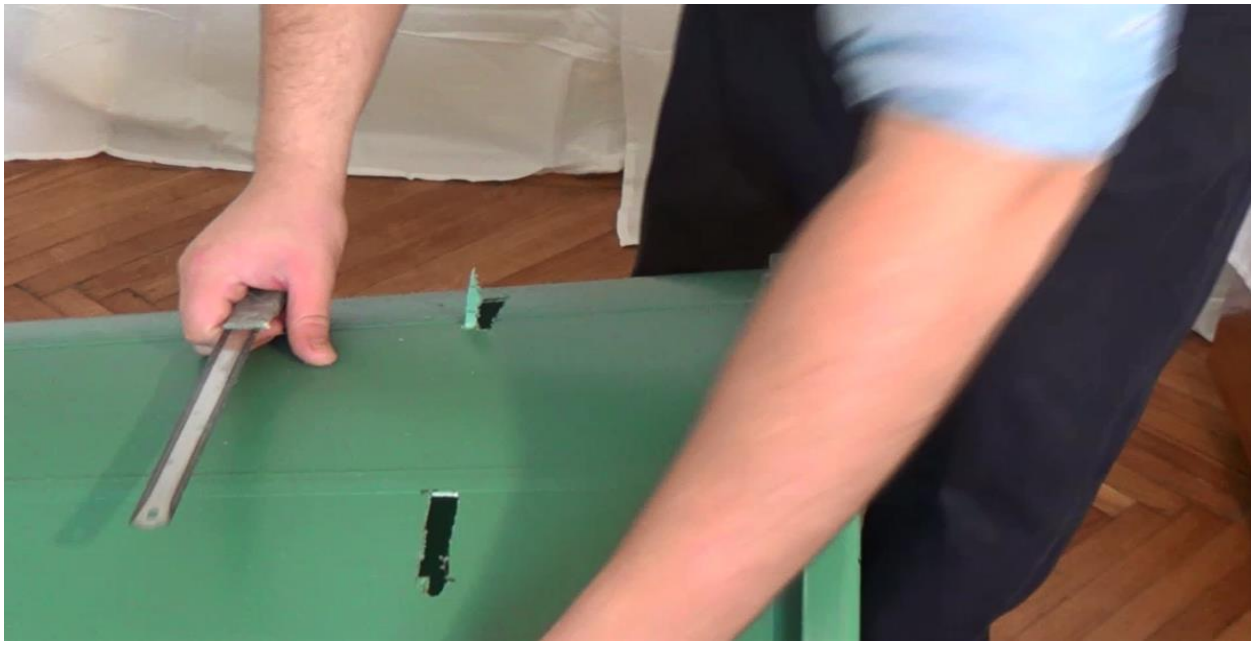
Now you'll have to drill holes in the barrel, so the wooden boards will go through it. That will create a stand for the dehumidifier.

The holes must be drilled on the same vertical line as the marked wood board limits on the top, at the previously measured dehumidifier level.

Remember, my height measurement on the dehumidifier was 10 inches. If you got a different value, use that one instead.

You'll have to expand the holes so the wood boards will slide as smooth as possible through them. Don't drill them too big and make sure all 4 holes are on the same level all around the barrel.

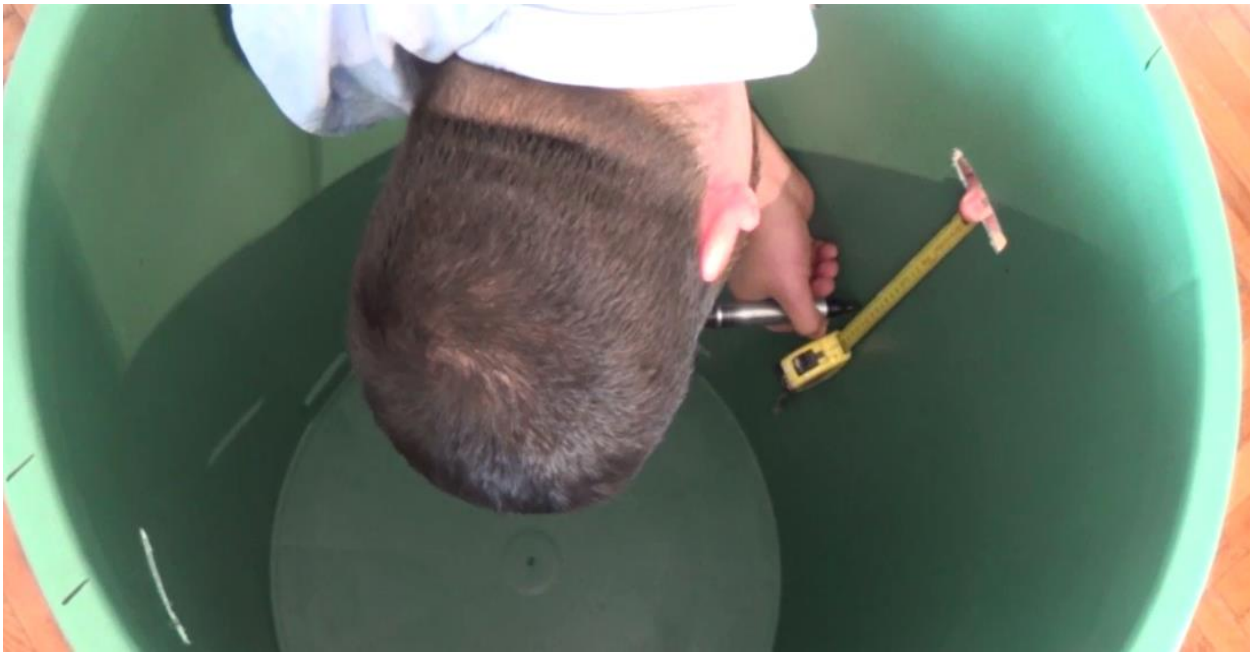
It's best that you draw an outline of the boards and use a metal hacksaw to cut the holes in a straight line.

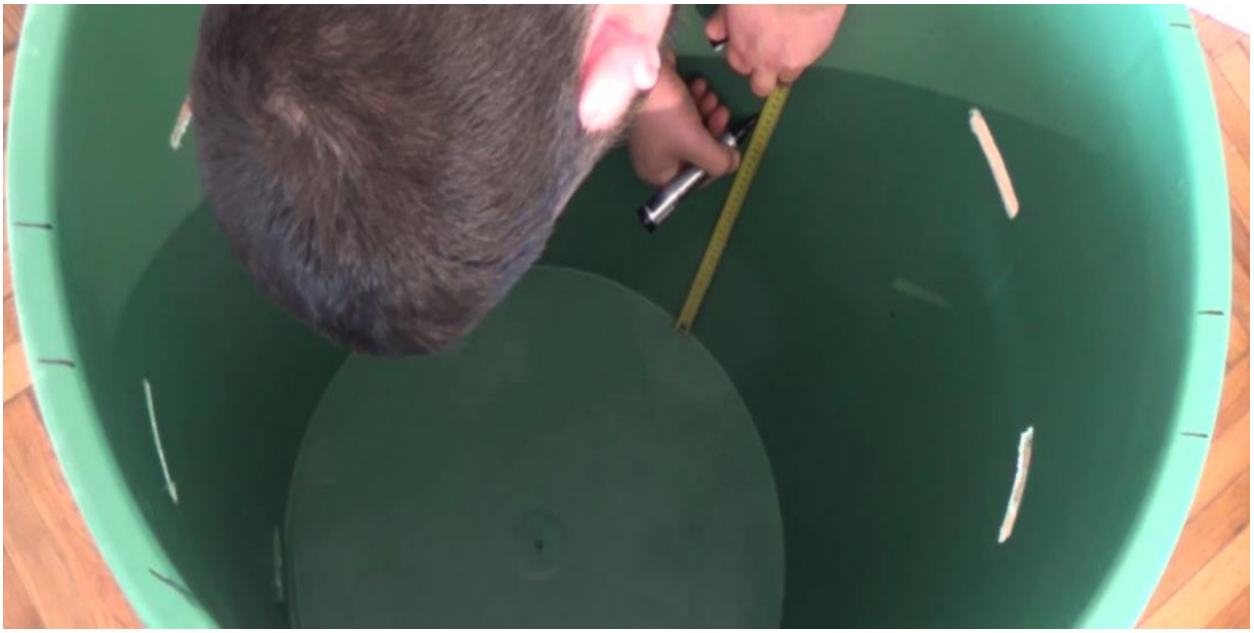


Now we'll disassemble the water filter and measure the height of the top container. Mine was 6 inches. If your water filter is different and you get a different value, continue using your own.

From the bottom of the holes you drilled earlier, mark 6 + 2 inches (or your own value + 2 inches) down towards the bottom. Do that 8 times inside around the barrel. Those 2 extra inches ensure that the wooden boards that will support the dehumidifier won't touch the top of the water filter container.

The 8 measurements should be 2 by 2 diametrically opposed and at equal distances from one another. Right under those markings we'll glue the silicone corner protections.





Measure the inside diameter at that level. We'll cut one of the barrel caps at that diameter to create the filtered water container. I got 1.9 ft.

Now it's time to cut the barrel cap to the previously measured diameter.

What I did is split the diameter in half to get the radius, and mark about 30 radiuses around the cap.

That helped me drawing a perfect circle.

To draw a perfect circle you will need a divider. It's easy to make your own using a screw, a permanent marker or pencil and a piece of string.

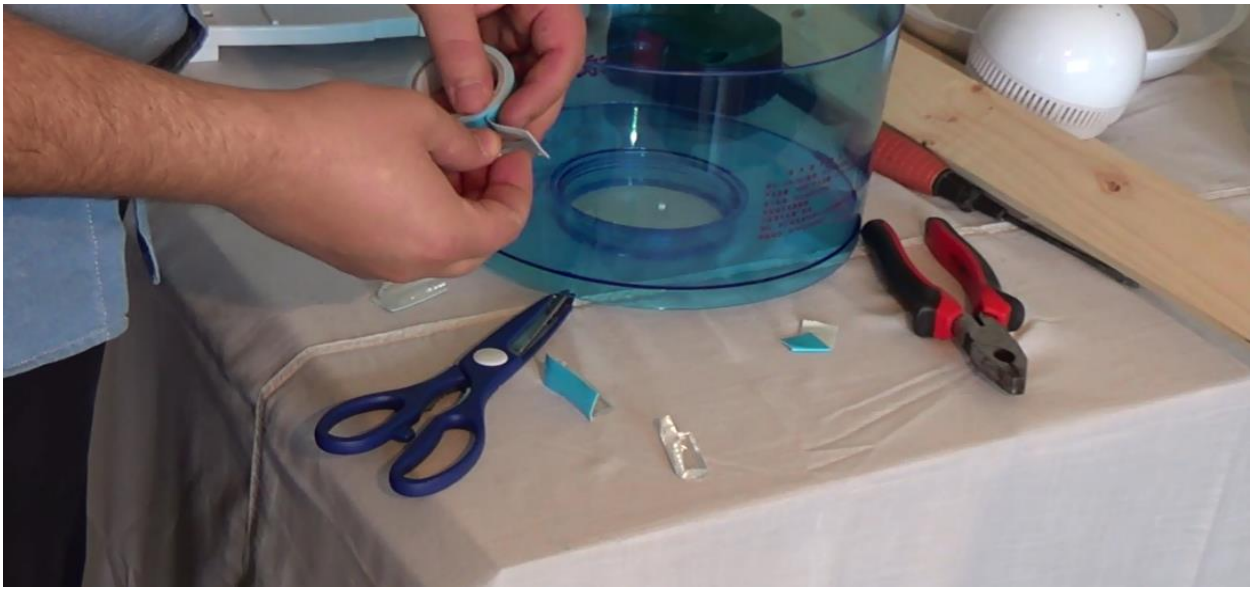
Put the screw in the middle of the barrel cap, tie a piece of string to it, and the other end of the string tie it to the marker.

Now draw the circle guiding yourself by the 30 or more radiuses you measured and marked around the cap.

It's time to cut the barrel cap at the specified size. I used a box cutter knife because the cap was soft plastic. If the one provided with your barrel is harder, use a metal hacksaw to get the job done.

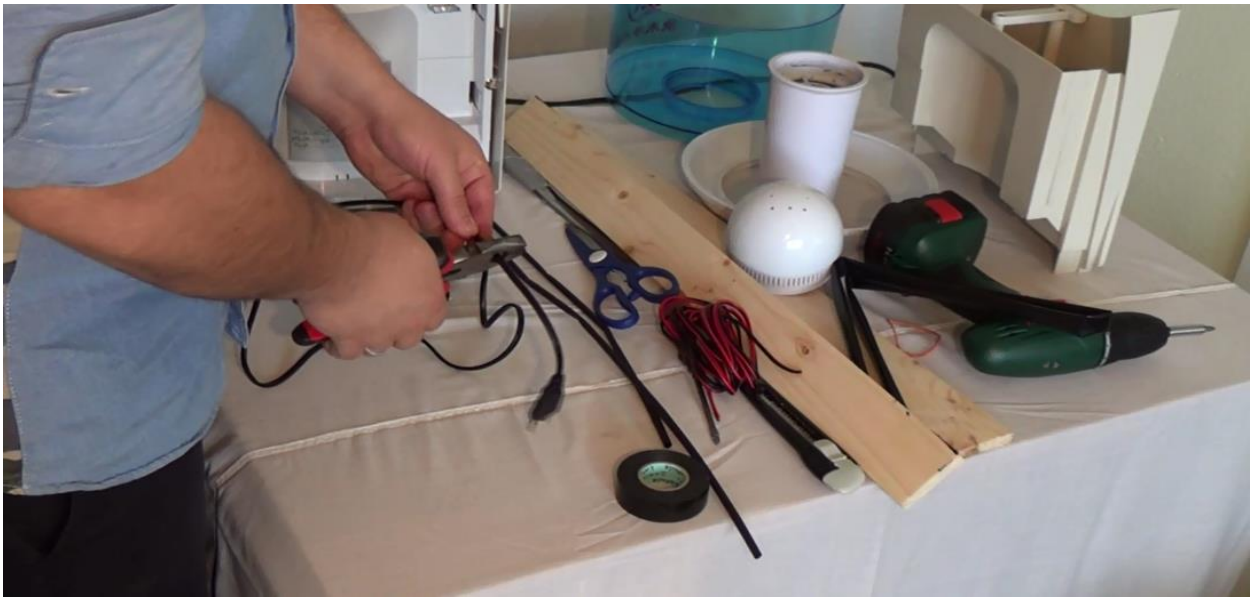
It's time to glue the silicone protectors inside the barrel. You'll have to cut them in half first. You can use any kind of silicone or rubber parts for this. As long as it's thick

enough to support the barrel cap. I used a strong double-sided tape. You could also do it with instant glue or epoxy.

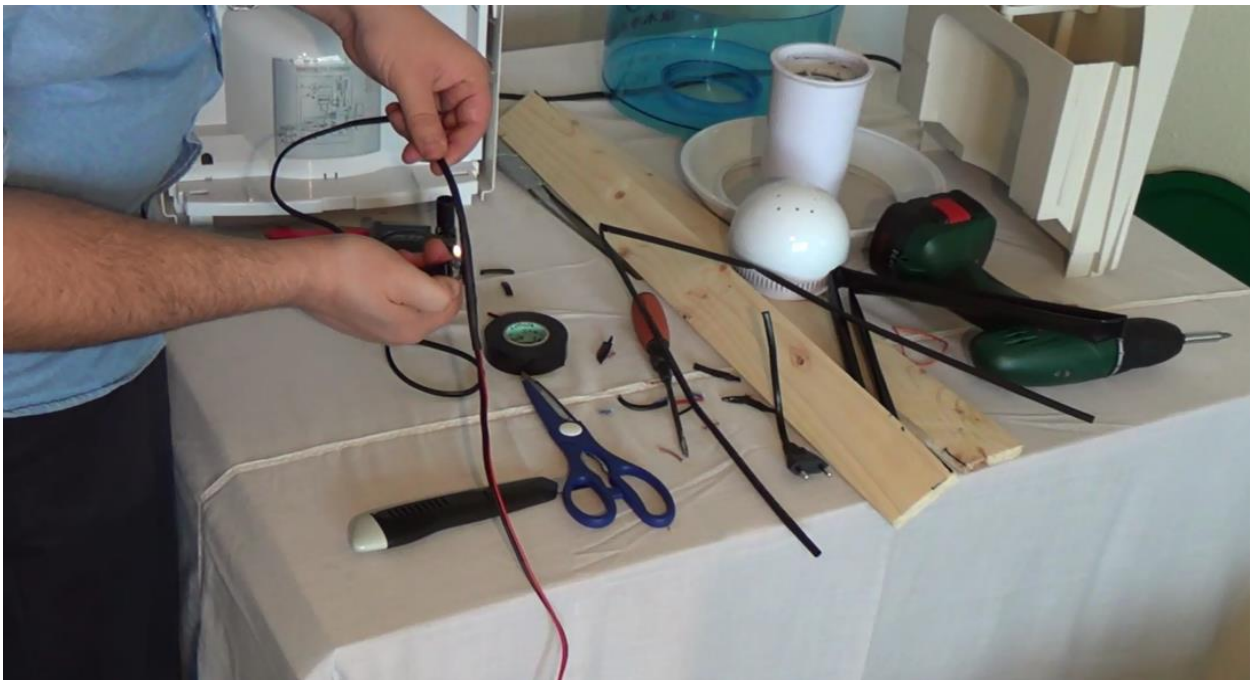


Make sure you place the protectors at the same level inside the barrel, so the previously cut cap will rest on all of them.

Now let's extend the water pump's electric cable. Just cut it near the plug, and tie the extension wires, one by one like you see in the video. Use the heat shrink varnish for better insulation.



Don't tie the plug to the extension. You'll tie it later on.



Check the position of the pump inside the barrel.

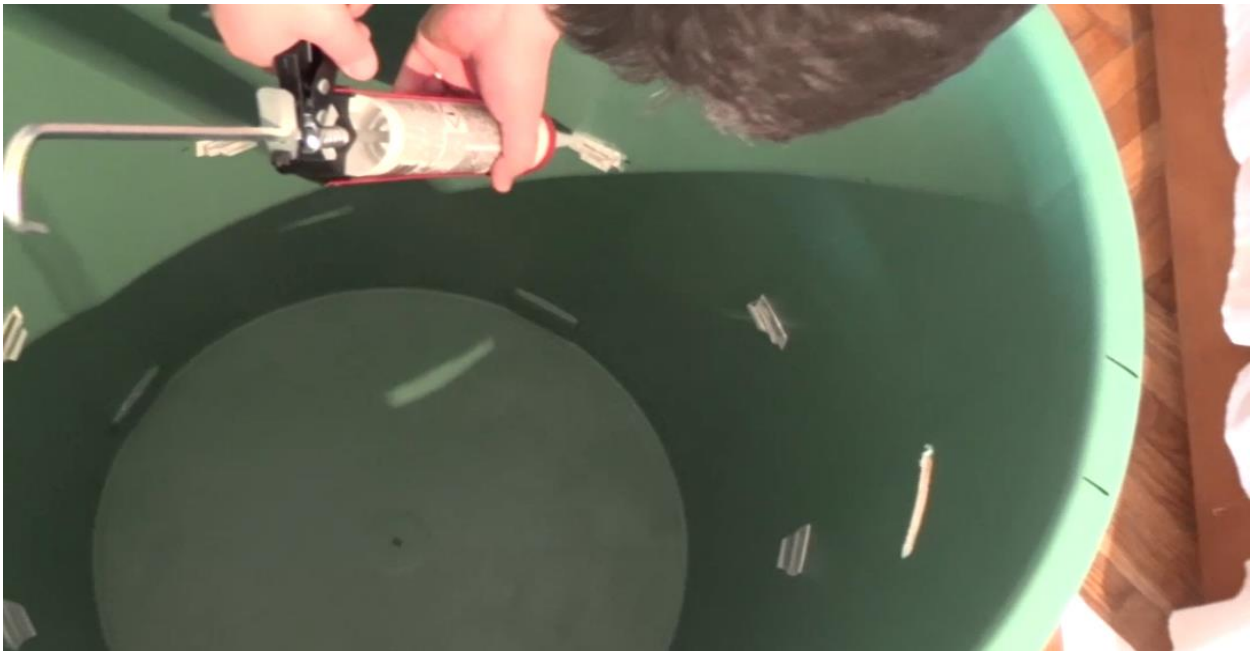
Measure the outside diameter of the water filter funnel just like you see in the video. We'll use that measurement to cut a hole in the center of the barrel cap we trimmed to size earlier.

Give it a couple of radiuses, and use the divider like you did before and cut the round disc out.

Make sure your water filter container fits perfectly inside the hole.

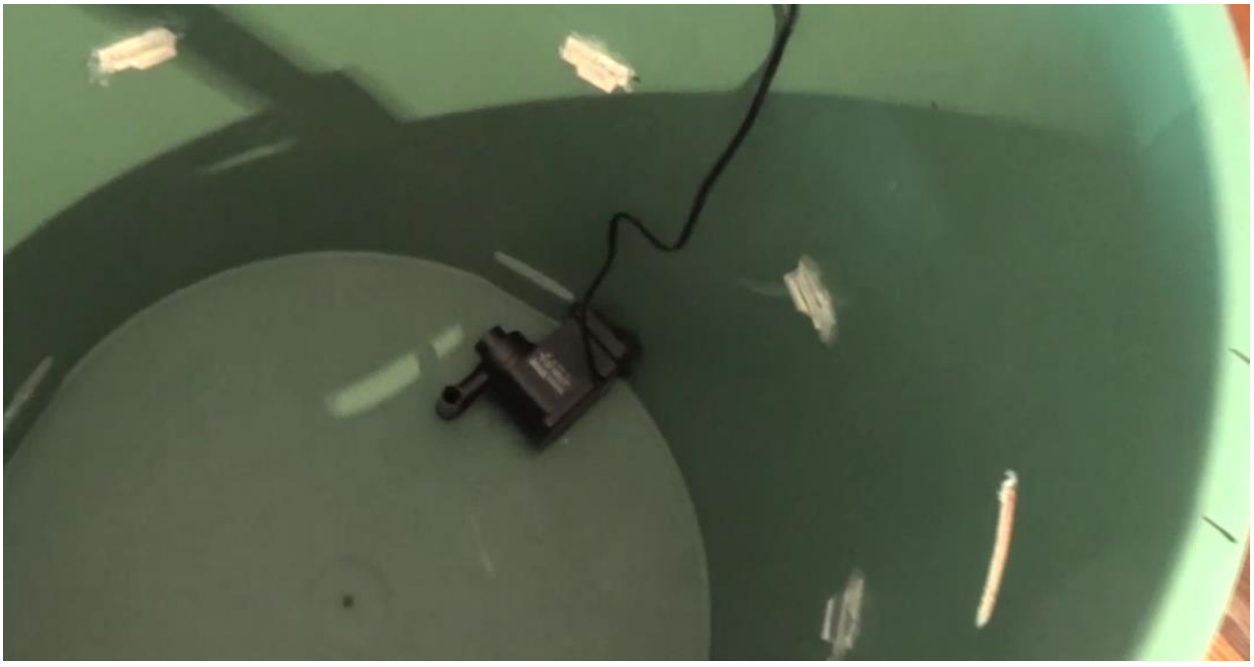
Now drill two holes in the cap. One for the water pump power cord, and one for the pump's hose.

Use sanitary silicone to glue the corner protectors like you see in the video. This will ensure that the silicone protectors will not give away and fall if pressure is applied.



Now put some sanitary silicone on the bottom of the barrel, where the water pump will be placed.

Put the water pump over it and press 'till it sticks to the bottom. This way, when you'll have to move the system, the pump will stay firmly set in its position.



Connect the hose to the pump. Depending on what pump you find, make sure that the hose for it is a tight fit.

Pass the power cord and the hose through the holes in the cap you drilled earlier.

Place the cap on the silicone protectors. It should be nice and fit. If it's not, trim the cap a little with a pair of scissors.

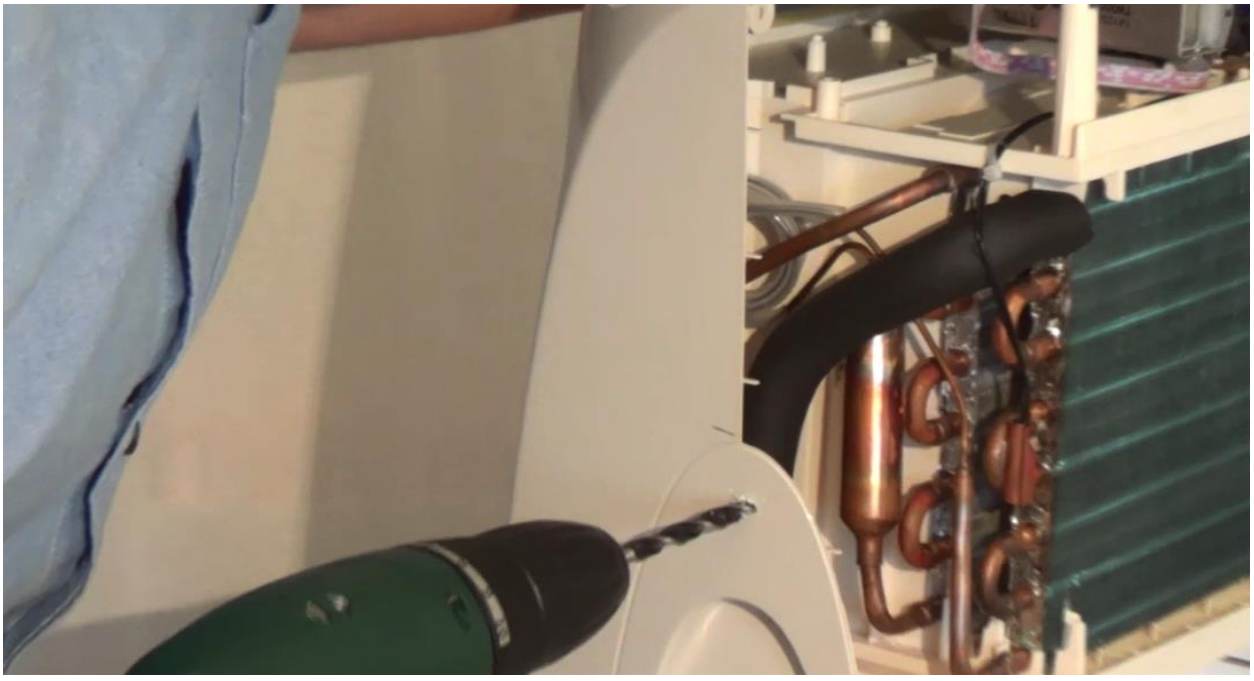
Use sanitary silicone to insulate and glue the cap to the inside of the barrel. Make sure you don't leave any gaps as dust might contaminate the water beneath it.

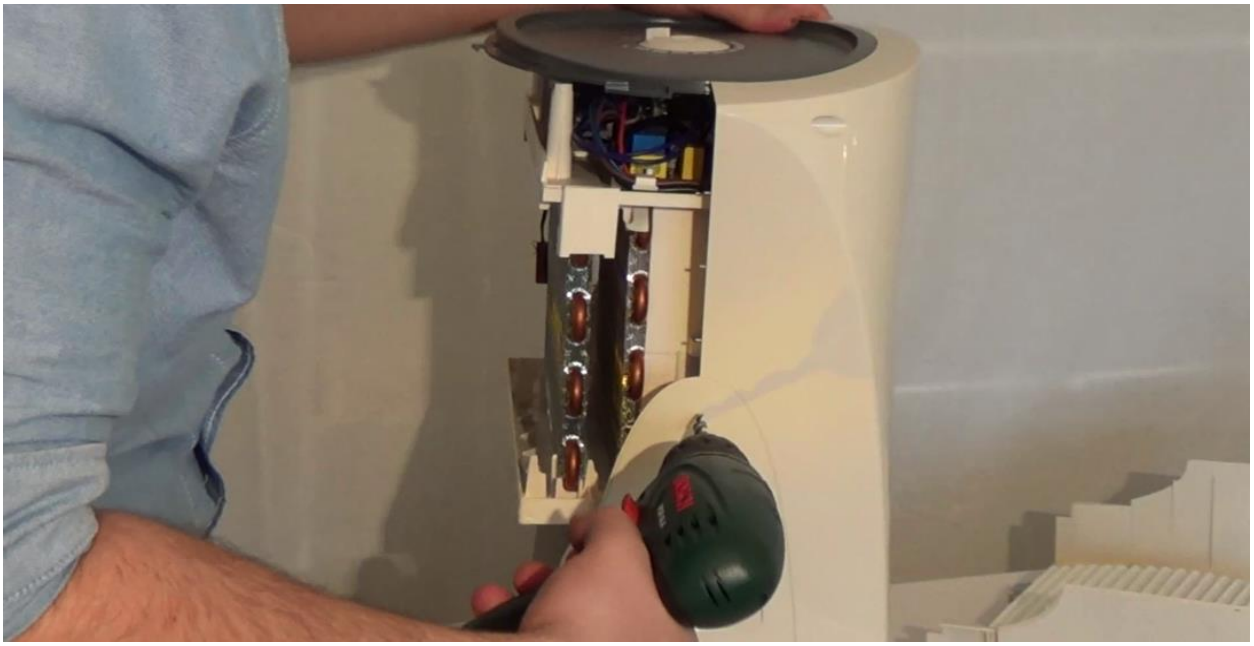
Put the water filter inside its container and place them in their final position.

Now put the wooden boards through the barrel.

The next step is adding a water cooling system to the dehumidifier. Use the thin hose. The thinner the hose, the colder the water will be. You will have to drill two holes in the

device. Depending on the model, the exact spot may vary. I chose to drill a hole on each side. Use caution when drilling not to puncture any pipes or electric cables.





The hose must do at least 3 loops around the condenser radiator. More loops means colder water. You should have at least two feet of hose left on each side.

Be sure to test if the hose doesn't get in the way when trying to put the cover back on. And don't pull too hard on the hose when looping it, or it may get strangled and the water won't flow through it.

Now put the condenser cover back on. Be careful not to squeeze the water cooling hose.

The next step is bypassing the water tray. Above the tray there should be a draining orifice. We'll connect a hose to the orifice, and run it through the water tray.

I couldn't find a hose for a perfect fit. So I had to widen it a little. I used the flame from a lighter to heat the tip of the hose. It will become malleable and you'll be able to force it on the water drain. Now drill a hole in the water tray, large enough for the hose to pass through it. When reattaching the water tray to the dehumidifier, proceed with caution so you won't pull the hose off the drain.

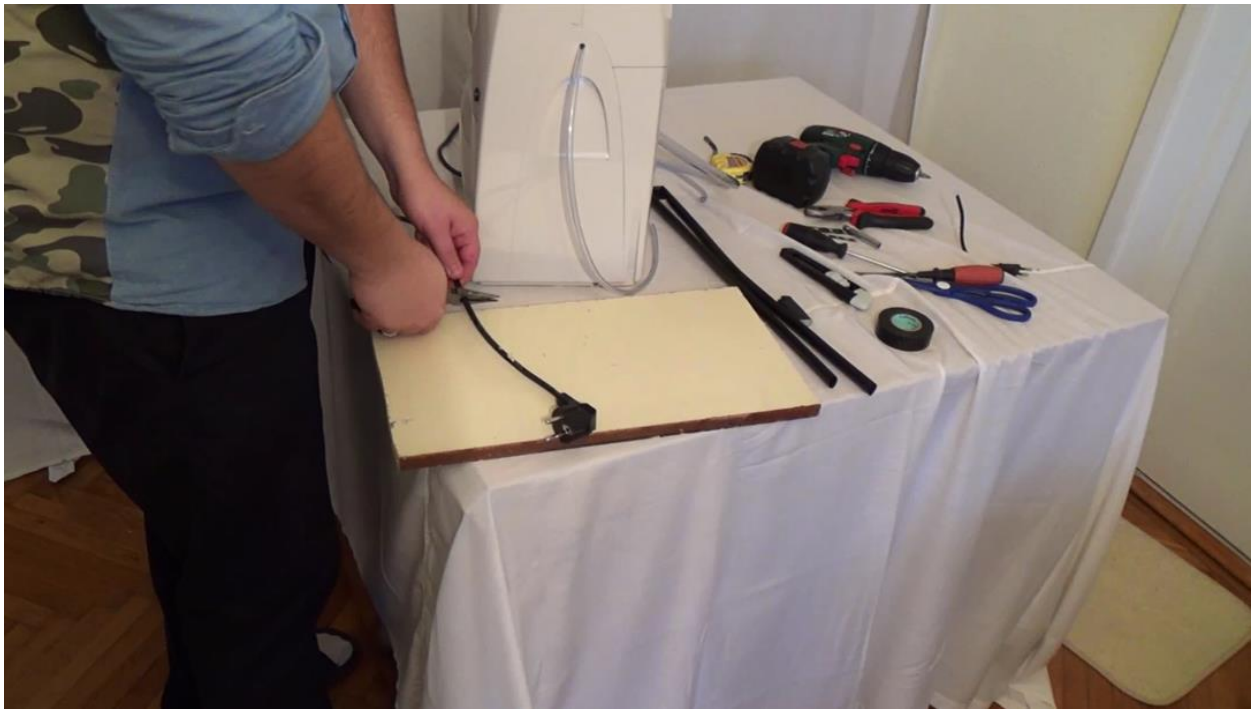
It's time to screw the plywood board in place. Drill 4 holes through it, so the screws won't crack it, and tighten the screws.

Use sanitary silicone to insulate and glue the 2 wood boards to the barrel.

Next we'll be cutting the hole in the top barrel cap so the dehumidifier will fit inside. Measure the length and the width of the device. Now outline it on the barrel cap. Keep in mind that the hole you are cutting should be above the plywood board.

Use a box cutter knife or a metal hacksaw, depending on how hard the barrel cap is.

You'll have to cut the cable on the dehumidifier. We'll drill a hole in the barrel and the plug is too big to go through.



Drill the hole in the barrel behind the dehumidifier's position.

Place the device on the plywood board, and run its electric cable and the water pump's through the hole in the barrel.

Place the water drain hose inside the water filter container. Cut it down to size if necessary so it won't bend.

Cut the water pump hose so it won't be too long. The longer the circuit, the harder it will be to pump the water out. Connect it to one side of the water cooling hose. Mine didn't fit perfectly the first time. So I found a hose with intermediary size and used it as a reduction. It's important that it won't leak.

On the other side of the water cooling system, connect a hose that will lead to the tap. Use the same method as before. Cut the tap hose down to size.

It's time to drill the holes for the tap and water pump switch. Don't drill them too far apart. If you opt for a soap dispenser tap like I did, you'll have to press the tap and the switch with one hand.

Mount the water tap on the barrel cap.

Pull the pump's extension cord through the hole drilled in the cap. You'll have to make the wire connections outside the cap. This of course depends on the type of power switch you choose. But for most of them you'll have to follow this method.

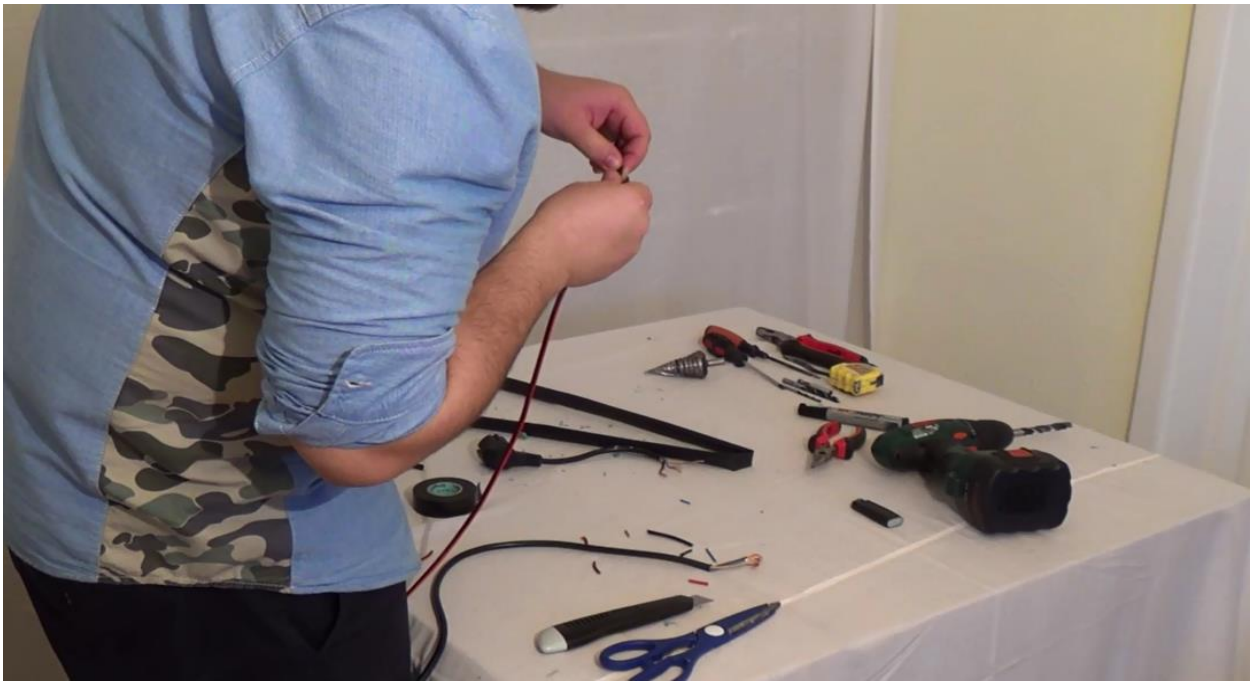
Pull the 2 wires from the extension apart, and cut one of them. Now connect one end of the previously cut wire to one of the switch's poles, and the other end to the second pole on the switch. Insulate them properly with insulating varnish, and push the switch in its hole.

Connect the tap hose to the tap.

Put the barrel cap on the barrel. Be careful not to crack it, rip or strangle the hoses.

We're almost done!

The final step is to tie back the plugs of the dehumidifier and the water pump. Do it patiently following the color codes of the wires. Make sure you don't mix them up. Insulate them properly with insulating tape and varnish.



Plug in the dehumidifier and give it some time to start condensing.

Now you have your own DIY H_20 Dynamo!

Enjoy cool, crystal clear water!

WHERE TO BUY

Here is a list with all the parts you will need to build your H_20 Dynamo. For the essential parts we offered two alternatives: an economic one that will keep it budget friendly and a higher quality one in case your budget allows it.

For a budget friendly version of the H_20 Dynamo you will spend around $370 while for a higher quality one you will have to pay around $640or more.

Both of the version will serve you will it's just up to you and your budget how much you will choose to invest in your source of water.

1. Dehumidifier

Low Price: http://www.tesco.com/direct/electriq-cdw12l-12l-slim-digital-humidistat-dehumidifier-up-to-3-bed-house-wall-mountable/256-9711.prd?pageLevel=&skuId=256-9711

Good Quality: http://www.walmart.com/ip/Frigidaire-ENERGY-STAR-50-Pint-Dehumidifier-FAD504DWD/22863049

http://www.walmart.com/search/?query=dehumidifier

2. Water Dispenser Filter

http://www.homedepot.com/p/Greenway-Water-Dispenser-Filtration-System-GWF8/203369076

3. Cabin Air Filter

Low Price: http://www.amazon.com/POTAUTO-MAP-1026C-Replacement-HYUNDAI/dp/B00UZYIGMU/ref=sr_1_10?s=automotive&ie=UTF8&qid=1432813937&sr=1-10&keywords=cabin+air+filter

Good Quality: http://www.amazon.com/Mann-Filter-CUK-2722-2-Filter-Mercedes-Benz/dp/B001DRNNLC/ref=sr_1_37?s=automotive&ie=UTF8&qid=1432815046&sr=1-37&keywords=cabin+air+filter

4. Water Tap

Low Price: http://www.amazon.com/Water-Dispenser-Replacement-Faucet-White/dp/B000BARBGK/ref=sr_1_1?ie=UTF8&qid=1432815524&sr=8-1&keywords=water+tap

Good Quality: http://www.amazon.com/Stainless-Works-Beverage-Dispenser-Replacement/dp/B00IX87W1Q/ref=sr_1_2?ie=UTF8&qid=1432815524&sr=8-2&keywords=water+tap

5. Aquarium Water Pump

Low Price: http://www.amazon.com/VicTsing%C2%AE-Submersible-Aquarium-Powerhead-Hydroponic/dp/B00EWENKXO/ref=sr_1_1?ie=UTF8&qid=1432816074&sr=8-1&keywords=aquarium+water+pump

Good Quality: http://www.amazon.com/Eheim-AEH1001310-Compact-Water-Aquarium/dp/B001EUI5JI/ref=sr_1_8?ie=UTF8&qid=1432816074&sr=8-8&keywords=aquarium+water+pump

6. Power Switch

http://www.amazon.com/Light-DPST-Rocker-Switch-28x22mm/dp/B0055F5NR0/ref=sr_1_13?ie=UTF8&qid=1432817343&sr=8-13&keywords=AC+power+switch

http://www.ebay.com/bhp/mini-rocker-switch

7. Silicone Hose

http://www.amazon.com/dp/B00DYAFISW/ref=biss_dp_sa1

8. Electric Cable

http://www.ebay.com/itm/Flaxible-Stranded-Equipment-1Pin-16-30AWG-Cable-Wire-Cord-Hook-UP-DIY-Electrical-/141209921099?pt=LH_DefaultDomain_3&var=&hash=item20e0c4664b

9. Heat Shrink Varnish

http://www.ebay.com/itm/NEW-328Pcs-5-Colors-8-Sizes-Assorted-2-1-Heat-Shrink-Tubing-Wrap-Sleeve-Kit-/361252809337?pt=LH_DefaultDomain_0&hash=item541c586a79

10. Silicone Corner Protection

http://www.amazon.com/Finex-Premium-Customizable-Childproofing-Corner/dp/B00NOQVE1G/ref=sr_1_cc_6?s=aps&ie=UTF8&qid=1432820675&sr=1-6-catcorr&keywords=silicone+corner+protection

11. Wooden Board ½ in. x 2 in.

http://www.homedepot.com/p/Sure-Wood-Forest-Products-1-2-in-x-2-in-x-3-ft-Oak-Hobby-Board-190272/202519141

12. Plywood Board

http://www.homedepot.com/s/plywood?NCNI-5

13. Plastic Barrel Lid

http://www.kalyx.com/shopexd.asp?id=1210732

14. 50 Gal.Plastic/ Fiber Glass Barrel

http://www.homedepot.com/p/No-Brand-55-Gal-Blue-Industrial-Plastic-Drum-PTH0933/205845768