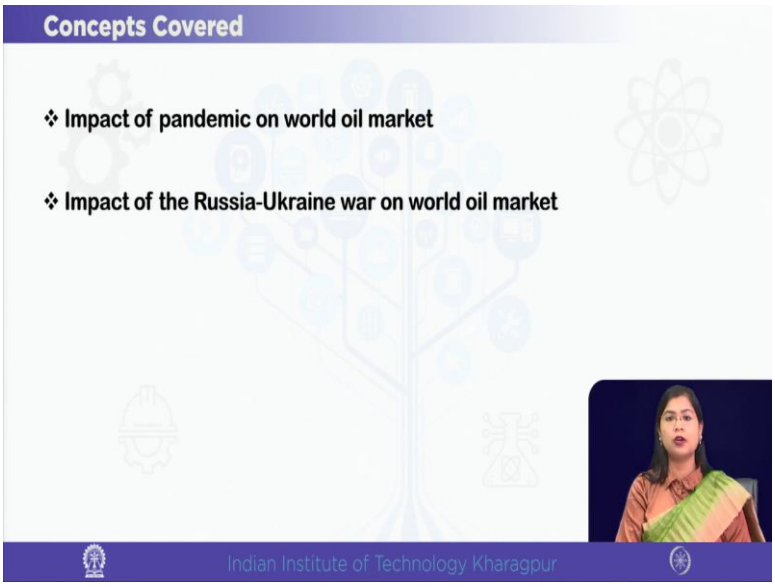
Petroleum Economics and Management
Prof. Anwesha Aditya
Department of Humanities and Social Sciences
Indian Institute of Technology, Kharagpur

Module - 04
Price of Oil
Lecture - 21
Oil Price in the Recent Times

Hi everyone, I am Dr. Anwesha Aditya, your instructor for the course of Petroleum Economics and Management. So, if you remember we are in module 4 of our course, where we are discussing the movement of oil prices. In today's lecture, we have come to the last lecture of module 4 that is the movement of Oil Price in the very recent time.

(Refer Slide Time: 00:46)



Now, I have discussed repeatedly that movement of oil price is one of the very important motivation of having a course on petroleum economics and management, because oil price movement has been just unparallel. There is no comparison with any other goods or services be it any other non-renewable resource or be it very necessary goods like agriculture, crops, food products.

So, oil price experience has been just uncomparable. So, we need to pay special attention to the movement of oil price. So, we have started from very historical time since the development of oil industry in US, Pennsylvania, then we have in depth discussed the oil

price movement post World War 2. But we saw that the trend has been phenomenals especially since 1970 since OPEC was formed.

So, we have discussed the major global events if you remember and we related with the movement of oil price. So, far we have discussed the oil price movement till 2018 and we have also discussed the sector-wise substitution possibility of oil, we have discussed this oil share in total energy production as well as we have compared it with the oils importance in electricity as well as with transport.

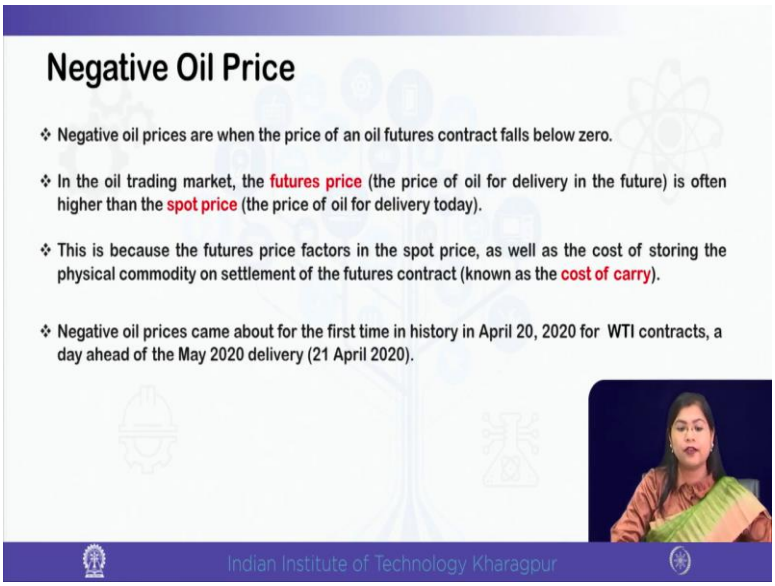
So, we saw that oils importance in electricity production has gradually diminished, but oil is very important for transportation. So, this was our discussion till now. So, now we need to look beyond 2018 because last few years the oil price movement has been again it has reached a new height. So, there are low phases also which were just unprecedented and unexpected.

So, in today's class we will be discussing very recent event of oil price movement post 2018. Because we all know that post 2018 our world was marked by the COVID-19 pandemic and the pandemic induce travel restrictions which were again not expected. So, those events have huge impact on world oil market.

So, we will start today's class with the impact of COVID-19 pandemic on world oil market. But then we also discuss while motivating our course that the train did not continue for long because again oil price train reverse due to the Russia-Ukraine war. So, we will be discussing very recent events and we will be using very latest data, as latest as October 2022.

So, that is why I said that this course will be useful for even those candidates who want to appear for any competitive exam like the civil services exam because we are discussing very recent event and very recent data.

(Refer Slide Time: 03:44)



So, let us first start with the impact of COVID-19 pandemic on the world oil market. So, if you remember we have already discussed that oil price reached a negative low. So, that was the WTI future contract became negative. So, we also explained what this negative price means. So, in today's class we are going to elaborate on this concept.

So, what does the negative oil price mean? It happens when the price of oil future contract falls below 0. So, if you remember that is the WTI future price contract which became negative not the Brent one. Because in the previous lectures we have in detail we have compared between WTI and the Brent crude oil prices.

So, what is the future price? That also we discuss briefly future price is the price of oil delivery in the future. So, that means, the parties are entering into agreement currently, but the delivery will take place in future. And what is the other price? That is the spot price which is the as the name suggest the spot price is the current market price. Now, in general what we see that the future prices are usually higher than the spot price.

So, spot price is the price which will be the price when the product is delivered at present or today. Now, why the spot price is usually lower or the future price is usually higher because the future price basically accounts for the spot price as well as there is some cost of storing the physical commodity which will be supplied once the agreement the contract time gets over. On the finish of the settlement of the contract period.

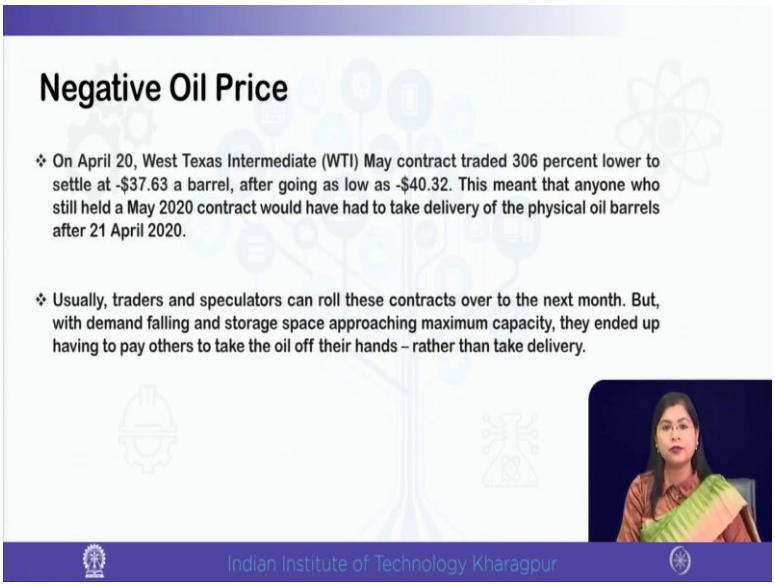
So, basically future price is spot price plus the storage cost, the cost of storage which is required to store the commodity until and unless the contract does not get over. Once the contract is over so, the refineries will supply the product to the retailers. So, this cost of storage this is known as the cost of carrying. So, future price is spot price plus cost of carrying.

So, you can easily understand that since the storage cost is positive so, usually the future prices are greater than the spot prices. But in April 20, 2020 we saw that the negative oil prices happened because the WTI contract became negative.

(Refer Slide Time: 06:21)

So, we discussed it with figure also and you can see from the data which is taken from the US EIA we have plotted the WTI spot price data the price in dollar in billion of barrel oil. So, you can see that oil price became negative during the COVID pandemic. So, which was just unprecedented. Because so far in the micro economics part what we discussed in the initial modules that price is positive.

(Refer Slide Time: 06:52)



But this violated the COVID experience on the oil market violated that. So, we need to pay special attention because this has got huge policy implications. Suppose one is a manager in some petroleum company. So, what should be the objective? Till now we have already discussed about the issues of sustainability environment or the issues of limited stock of petrol.

So, the objective is to increase the supply of petrol, but you see sometimes we have to manage the resource if there is some sudden unexpected demand side shock because the negative price happened because the storage cost was very high. The sellers were willing to pay to the buyers if the buyers were taking the goods, right.

So, this is just unprecedented in economics. So, if that will happen if the storage cost is very high. So, the seller will be better off by paying to the buyers if the buyers are ready to take the product if the storage cost exceeds the price that the seller is willing to pay to the buyers for taking the good, ok.

So, that means, it is not only important that you have sufficient supply of the resource, but it is also important to manage the resource once it is extracted. Because, if there is some abrupt demand side shock, we should be able to prudently say we store it for future use. So, that we should not experience a negative price, right. So, it is very important to create that capacity the storing capacity. So, that is the pandemic has taught us.

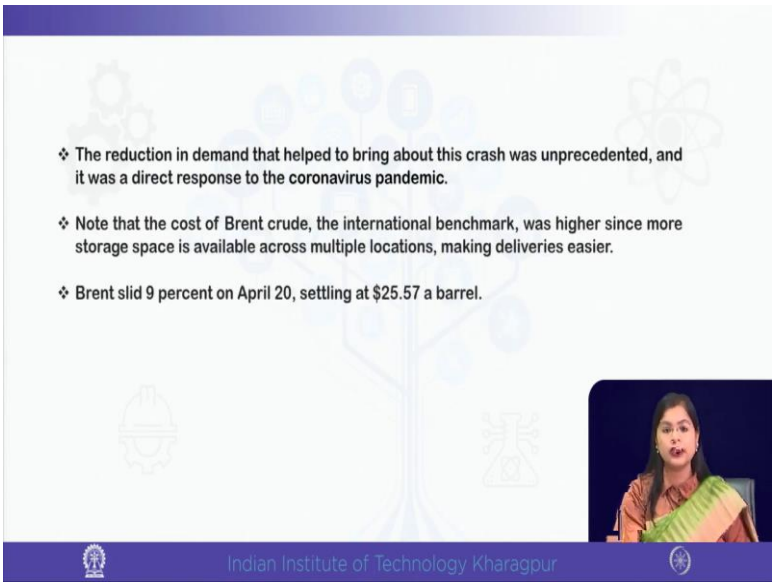
So, it is not only we need to focus on increasing the supply, but also to manage the resource, right. So, what happened, if we take a very deep look. So, if you look at the empirical evidence so, WTI the West Texas Intermediate may contract it traded 306 percent lower to settle at minus 37.63 dollar a barrel. And it went as low as minus 40.32 dollar per barrel, ok.

So, this means that anyone who had a May 2020 contract would have to take the delivery of the physical oil barrel after 21st April 2020. And the speculators and traders speculators means if you know so, speculation is what? Speculation is when we buy something cheaper in and we sell it off in future when the goods become costlier. So, buying something cheaper currently and selling it off when the goods become costlier in future.

So, arbitrage its basically arbitrage over time, ok. So, the traders and speculators can usually roll the contracts over to the next month. However, when demand is falling and the storage space becomes limited it reaches the maximum capacity. The companies were willing to pay others to take the oil from them because storing the oil would become very costly.

So, that is precisely what happen during the COVID pandemic when the lockdown restrictions were imposed since mid March or April onwards. A large part of world economy and transportation was under lot of restriction as we know only some essential services were allowed.

(Refer Slide Time: 10:17)



Otherwise, almost all the goods and services transport were restricted especially services or movement of people from one place to another was completely restricted. Unless some necessary services otherwise international transportation was also came to a halt. And we have studied in detail that how oil is very essential for transportation.

So, if there are restrictions on transport obviously, that will have huge impact on demand for oil. And from our basic understanding of the economics concept if you remember we have already drawn the demand and supply curves. So, what happened if the demand curve demand falls. So, what will happen the demand curve will shift in, ok. So, price will fall. So, that is what basically happened it was a demand side shock.

And we will also discuss we discussed in earlier classes also that the suppliers also not ready to cut back their output hence that led into a fall in oil price. We also discussed earlier if you remember that the Brent price also fell, but it did not become negative for reasons we have already spelled out because the Brent storage cost is relatively low. Because Brent crude oil is easily available around the coastal lines.

Whereas, WTI contract refers to the US benchmark of oil price where the oil is extracted mainly in the land lock areas. Land lock means they are far from the coastal lines. So, the cost of transportation and storage increases and that is why where Brent price also fell, but it did not reach a negative level.

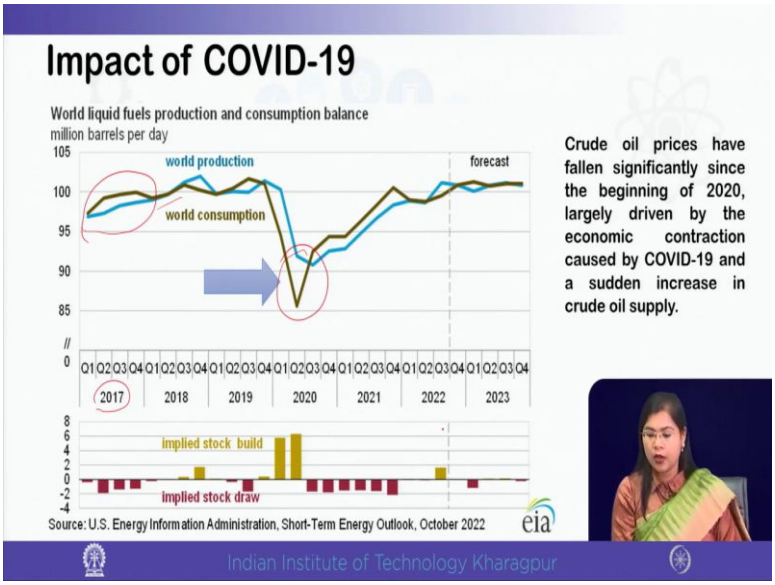
So, what we are discussing is that the reduction in demand for oil led to this crash in oil price which was just unprecedented and it was a direct response to the COVID-19 pandemic. And we also discussed that Brent crude did not become negative because the delivery is easy since it is available near the coastal line. Brent price also declined to 9 percent, but it did not become negative.

(Refer Slide Time: 12:26)

Now, what are the conditions in the futures markets? So, basically there are two types of scenario in the future market. One is the Contango scenario where the that is the normal future market condition and the future price is traded above the spot price. So, just the rationale we get because future price is spot price plus the cost of carry.

So, Contango is the normal scenario. And the other less common scenario is backwardation where the future price is traded below the spot price. So, that is what we experience during the COVID pandemic.

(Refer Slide Time: 13:02)



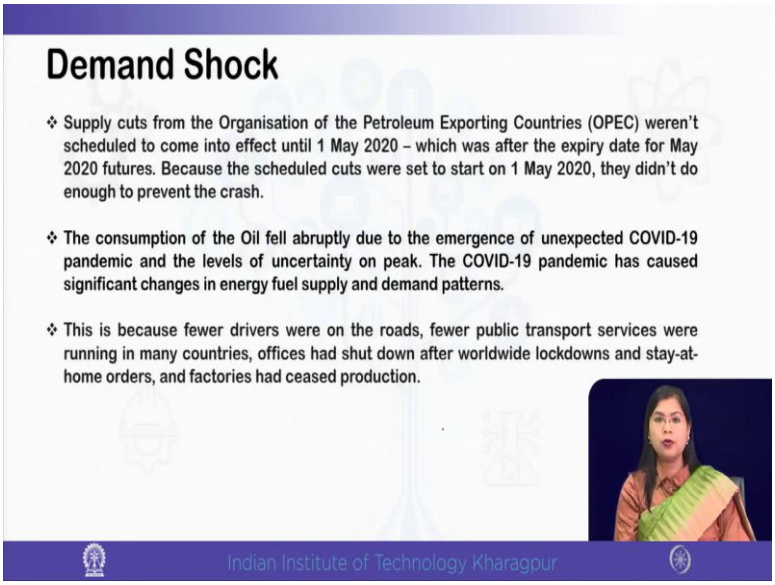
So, if we look at the data more closely, we can see we have plotted the world production and consumption data from 2017 onwards to till date and you can see that we have also plotted some forecasted value. So, this is from the US Energy Information Administration short term energy outlook report October 2020 report, 22 report.

So, we have seen that production and consumption more or less they moved in similar fashion, but due to the pandemic and the restriction production and consumption fail. And we saw that consumption was below the production level. Because initially if you see from the beginning of the plot in 2017 you see consumption was greater, ok.

But you now find out what happened over time. So, we can easily see that during the first 2017 you see consumption is greater than production, right. Because the demand is greater than supply. Then they moved together after the production increased a bit and consumption was less, but you look at the COVID period mainly where both production and consumption fail, but consumption was even lower than the falling production.

So, we can find it out very easily. And you can see the forecast value. So, we will be discussing the post 2022 onwards what happened to the oil market due to the Russia-Ukraine War.

(Refer Slide Time: 14:41)

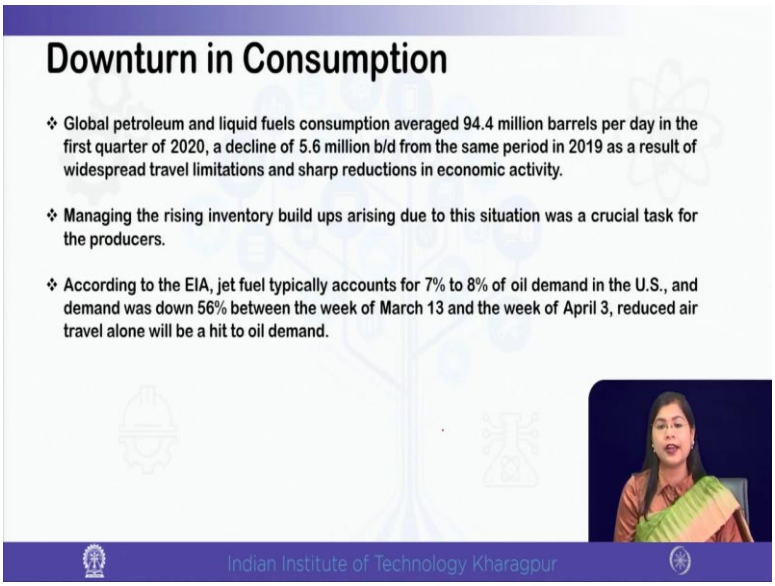


So, now we have just now discussed that there was a demand shock and the supply shock in the supply side what happened because the OPEC countries were not ready to reduce their supply till the 1st May 2020 because we will be discussing in next module, we will be discussing in depth about the role of OPEC in controlling the world oil markets.

So, we will see that OPEC enters into an agreement OPEC countries they decide how much they will supply over the next few months. So, that is why when the COVID pandemic hit the world. So, the OPEC countries were not ready to reduce their supply, ok. So, they continue to supply what they agreed upon till 1st May 2020. Because that was the expiry date for the May 2020 future contract.

So, the scheduled cuts were supposed to take place from 1st May onward. So, till that time they were not ready to reduce their supply. So, with increased supply or continued supply if there is a shock in the demand side; obviously, that will result into a falling oil price.

(Refer Slide Time: 15:59)



So, we have already discussed in detail that the COVID pandemic induced lockdown led to restriction and travel and it was mainly due to the travel restriction that the oil prices became negative because till now we are not able to find out good substitute of oil in the transportation sector.

So, transportation heavily depends on oil, but we have already seen with data that how from mid 1980 onward in electricity production oil is being gradually replaced with other cheaper sources of energy like coal and natural gas and we are also more relying on other renewable sources of energy like tidal power plants, hydroelectric power plants, even nuclear power and more recently bio fuels and solar energy.

So, in electricity the dependence on oil is gradually being reduced especially in the developed countries. Even the developing countries are also starting to find out alternate sources of oil, but in transportation we are heavily dependent on oil whether it is the developed countries or the developing countries. So, when there is a shock in the transportation sector when there is a sudden halt in transportation; obviously, that will impact the oil price.

So, what we can see from data is that the global petroleum and liquid fuel consumption it was around 94.4 million barrel per day in the first quarter of 2020. And in 2019 during the same period, it was 5.6 million barrel dollar greater. So, this was mainly due to the travel limitations and the reduction in economic activity. Because we know that the

COVID pandemic induced lockdown also led to lot of restrictions because when movement is restricted.

So, people are travelling less and even the manufacturing productions also to some extent they were also adversely affected. The service sector was adversely affected. So, economic activity as a whole there was a shrinkage in that. So, overall the demand for oil reduced and there was inventory build up because of that it was very difficult for the suppliers, for the managers to manage the very important resource.

So, that is why I am saying repeatedly that it is our goal should not be only to increase the supply, but we have to also manage the resource very prudently. Because if we are again because see many scientist have already warned that we may face similar pandemic in future.

So, we should be ready to handle similar such situation we should learn from the COVID-19 pandemic and we should create enough storage capacity that if there is any kind of abrupt shock or it may also happen that due to technological breakthrough let us say, there may be replacement in oil we do not know we cannot say definitely because we have already studied the shale oil revolution we saw that how the rising oil price trend got reversed due to the shale oil.

So, we should be ready to face similar such situation. So, therefore, creating the capacity to store the inventory is very important if there is unsold quantity, we should not make the price negative, but we should be able to store it. So, when the price increases the market is restored, we should be make profit out of our stock.

So, according to the EIA data if we look at the demand for oil in US jet fuel alone accounts for almost 7 to 8 percent of total oil demand in US. So, reduced air travel you can see from the data will definitely hit the oil demand. Because we can see that the oil demand fail around 56 percent between the first week of March to till 3rd of April.

(Refer Slide Time: 20:06)

But at the same time you see there is a good side also because if you remember we have discussed that India is one of the major importer of energy and among the energy imports oil is the most dominant one, ok. Because the large part of India's energy is met by oil or fossil fuel. So, if there is a falling world price of oil then countries like India should be benefited, right.

So, according to the ET energy world report the lower oil price due to the COVID pandemic could cut India's import bill by 8 percent to 103 billion dollar. So, that will be relief for India to some extent because we have already discussed that huge import of oil puts a lot of stress on India's foreign exchange reserve.

Because when we are buying something from global market obviously, we need to pay in terms of dollar. And since oil price is increasing from 1970 it more or less the trend is rising with some temporary dips. But we have seen that even after the temporary dips the oil market again revived its trend, right.

Even, the COVID pandemic also soon we will be discussing the impact of Russia-Ukraine war and we will be seeing that how the declining oil price due to the COVID pandemic that also change its pattern, right. So, if price of oil is falling and oil being inelastic in nature India's import bill on oil is high.

So, we if oil price is falling then it should be good for importers net importers of oil like India. So, we can save upon our foreign exchange reserve which is in scarcity because we have to also import lot of necessary goods and it can also provide a cushion to the domestic government.

So, they can impose some additional taxes. So, we can take the example of additional excise duty that was imposed on petrol and diesel this was addition to what we already had. So, it was around rupees 3 per liter in 2020. Because the government had to spend in terms of lot of oil fair projects during the COVID pandemic because we know that the pandemic and the lockdown adversely hit the labor market especially the informal sector.

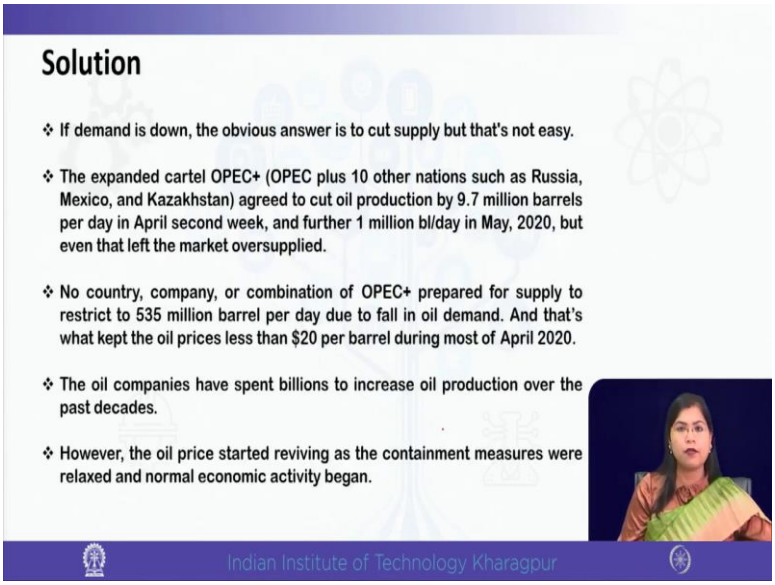
So, the government had to spend a lot on that even for the vaccination also. So, additional tax was imposed on petrol and diesel because and the government could do that because the oil price was falling. If you remember we have discussed in detail why petroleum taxes are so important, right.

So, it is a very reliable source of tax revenue given that its nature is in elastic. So, if price increases quantity demanded fall will be less than proportionate. So, even not only for the developing countries we have seen with data that for the developed countries also a large part of the retail price accounts for the taxes.

And if you remember we have seen that even the taxes also some in many countries it exceed the crude oil price, right. So, see the share of taxes and the crude oil price in the retail price and the profit margin also if you remember we saw that for many of the OECD countries taxes were even higher than the crude oil price and the percentage term we saw how in the total wholesale price or the retail price how the taxes were dominating in share than the profit margin and the crude price.

So, it is very important if the oil price is falling. So, the government should be able to impose some additional taxes so as to earn more revenue. So, that the government is able to spend on welfare projects like the vaccination scheme or subsidizing some informal sector or providing some temporary relief to the informal sector who were adversely affected due to the pandemic and the lockdown restrictions.

(Refer Slide Time: 24:25)



And not only that if you remember we have also discussed about the positive impact of the oil taxes on energy because we saw that in the post tax situation quantity of consumption is discouraged. So, that is also good from the point of view of use of resource and also from environment because we know that fossil fuel use leads to lot of greenhouse gas emissions.

So, if we impose positive amount of tax and that leads to a lower consumption. So, that will have positive impact on environment as well as from the point of view of exhaustion of the resource will be then stretching the use of the resource over a longer period of time. So, now what should be the solution for the oil producing and exporting countries?

Because if price of oil is negative with or if it is falling then, you already know that how many of the countries like the OPEC countries how they are dependent on oil. We have already discussed the data on the share of oil rent in GDP and we saw that many OPEC countries they are heavily dependent on the oil rents or the profits coming from the oil sector.

So, what should be the solution? The solution it is; obviously, you can understand from your basic knowledge of demand and supply. So, if demand is less. So, price will be low quantity transacted will be low. So, this optimal response should be to also reduce the supply, right.

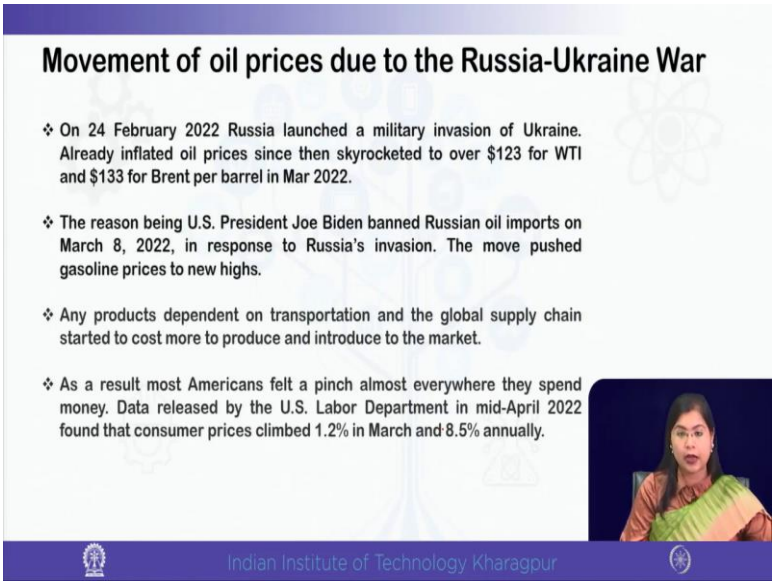
But that is much easy to say, but it is difficult to carry out because we will be also showing in our next module the impact of the role of OPEC and OPEC plus. So, what we can see from empirical evidence is that the expanded cartel of OPEC that is known as the OPEC plus where it includes 10 more countries apart from the OPEC members like Russia, Mexico, Kazakhstan which are not part of OPEC, but they are part of OPEC plus.

So, this expanded cartel the OPEC plus they agreed to reduce their oil supply and in both April 2nd week and in also May 2020, but that also left the market over supplied because already they were continuing the OPEC countries as we discussed we just mentioned a few slides back that the OPEC countries continued their supply till 1st May 2020, ok. So, the countries or the companies even the OPEC plus were not prepared to restrict the supply.

So, that is what kept the oil price low in most part of April 2020. Because you see their logic was that they have spent they have invested a lot in ensuring continuous supply increase supply of oil. So, they will be losing out. So, that is why the supply was sufficient, but there was a demand side shock and that led to the falling oil price. So, that is why I am repeatedly saying that we need to manage the resource very prudently.

So, but as we know that with vaccination and other measures the pandemic came under control to a large extent and normal economic activity also started resuming from especially from mid 2021 onwards. So, oil price trend also gradually change its pattern.

(Refer Slide Time: 27:51)



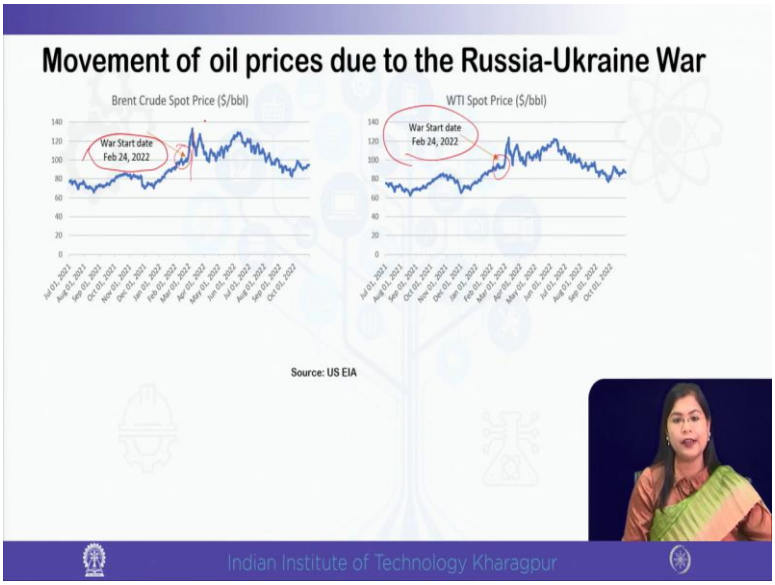
So, oil prices were revived when the normal economic activity started. But not only that from beginning of 2022 we even saw a change in the oil price movement. What happened? We all know that on 24th February 2022 Russia launched a military invasion in Ukraine and the oil prices just skyrocketed.

So, if we look at the data what happened in March 2022 the oil prices skyrocketed to over 123 dollar per barrel for the WTI index and 133 dollar per barrel for the Brent Price index. So, the what was the reason the reason was that the US President Joe Biden banned Russian oil import on 8th March 2022.

Because this was in response to Russia's invasion at Ukraine. So, this ban of oil import from Russia by US led to increased price of oil. Because earlier US was importing oil, but when US restricted the import of oil from Russia that led to a higher world price of oil, ok. So, Americans actually felt some inflationary pressure.

So, if we look at the data released by the US Labor Department in mid April 2022 we find that the consumer price index increased by 1.2 percent in March and 8.5 percent annually.

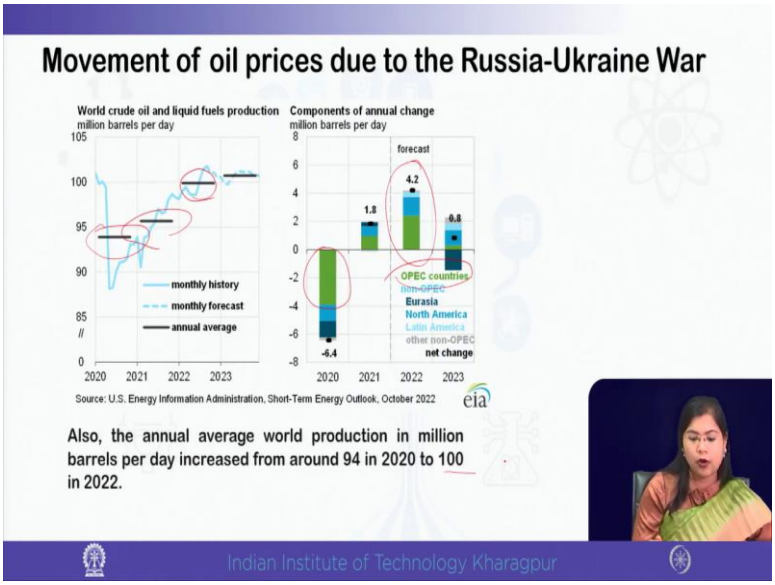
(Refer Slide Time: 29:31)



So, there was inflationary pressure in the US economy. So, if we look at the movement of oil price in 2021 and 2022 period monthly data and if we compare the Brent Price and the WTI Price. So, we can easily see that how the war date we can relate the oil price change with the war date. So, you see the war start date is 24th April and how suddenly oil price has jumped in both the cases you see.

So, the data source is US EIA so, those who are interested they should browse through the original data sources because you can get lot of more data which is very relevant due to time constraint, we are not able to discuss all types of data. So, we can see that directly the attack of Russian Ukraine that suddenly led to a spike in oil price. You see earlier the oil price was just fluctuating there was a sudden jump in oil price. So, you will see that the oil market is subject to lot of volatility and uncertainty.

(Refer Slide Time: 30:29)



There are things which are beyond the control of the suppliers or the oil companies, but that hugely affect the oil price instantly. It is not that the affect will be felt after few periods the impact is felt instantly. Now, again see in the next figure what we have done we have compared the movement of oil price and we have compared the oil price movement with the annual average and the monthly forecast, ok.

So, you can see the blue line is basically the monthly history and the black one is the annual average and of course, you can see that we have also plotted the forecast. So, again this data is from the US Energy Information Administration short term energy outlook report October 2022. So, you can see that in 2020 during the COVID period it was less the monthly value was less than the annual average.

Then the monthly value actually cross the annual average from mid 2021 onward. So, just now I discussed that as the normal economic activity started resuming then demand for oil also increased. Travel restrictions were gradually more relaxed. So, demand for oil increased and oil price also revived.

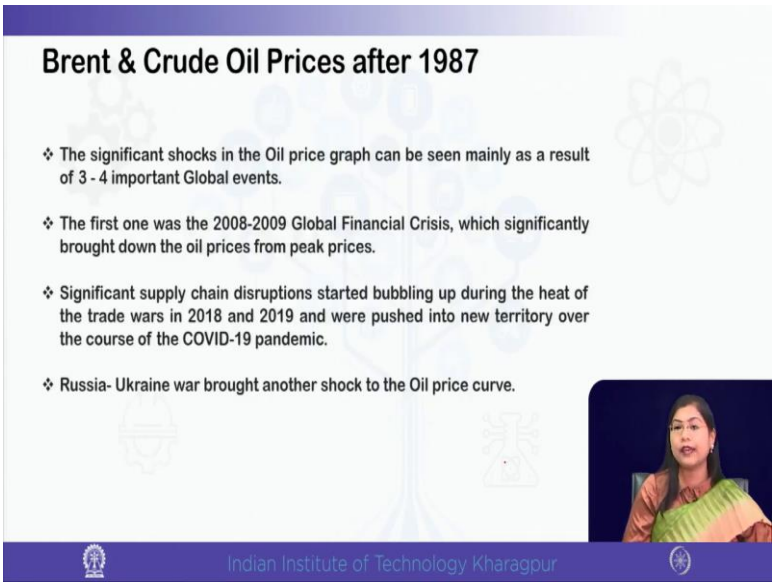
So, the monthly values increase the annual average and, but you see the Russia-Ukraine war period where the monthly value was very high even the annual average was also quite high and you can see the predicted the forecast value. Now, if you look at the components of annual change region wise. So, we have plotted the data in the second

panel for the oil exporting countries like the OPEC countries, even non OPEC and Eurasia, North America, Latin America and we have plotted the net change.

So, we can see that the change was heavily felt by the OPEC countries. So, in the COVID period it was negative and a large part this green, color correspond to the OPEC countries. So, the OPEC countries actually felt the heat because they are major exporter of oil. So, for the other non-OPEC countries it was less. Now, again see the Russia-Ukraine War period again the oil price increased and if you see the net change is high for the OPEC countries, right.

So, we can conclude that the annual average world production in million barrel per day it increased from 94 million barrel per day to 100 million barrel per day. So, you see that how the things which are beyond control of the suppliers or the producers how they can affect their profits and the price of oil.

(Refer Slide Time: 33:07)



So, if we now summarize our discussion what we can show is that we can conclude is that from this graph also the oil price figures that we are referring to. So, if we look at the movement of oil price from 2000 onward. So, what we can summarize is that the movement of oil price since the 21st century can be attributed to major global events. So, what was the events?

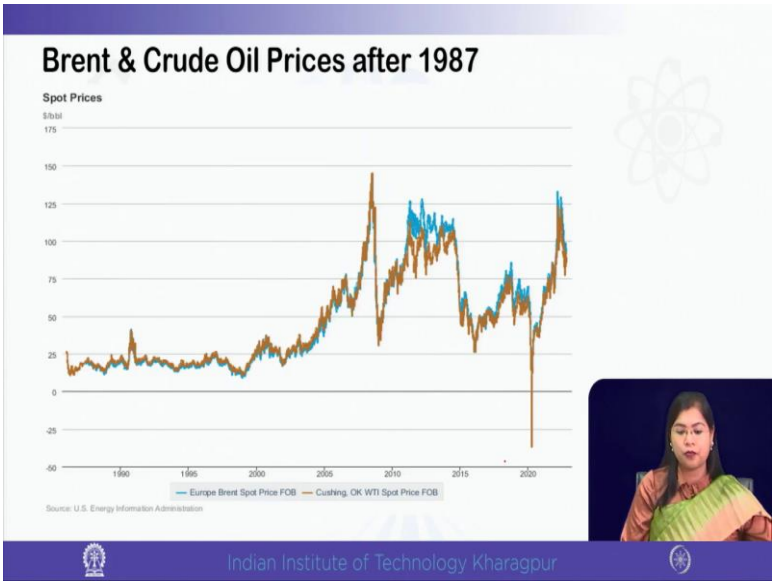
Mainly if we start with the oil price movement in the early 2000 what happened in 2004, 5, 6 we had a commodity boom period. So, oil price increased. Because at that time as we already discussed the world economy was doing very good. So, oil price increased because there was overall increased economic activity, there was increased demand for transportation, increased consumption demand.

So, energy demand also increased along with that oil demand also increased, but that change that trend also changed due to the global financial crisis that happened in 2008-9 and oil prices were brought down from its peak. So, that was. So, we already discussed two events one was the commodity boom period, then there was the global financial crisis and then again we know that the world economy and the US economy also started reviving from the global financial crisis from 2012 onwards.

So, oil price again started increasing, but then what happened? That we had the shale oil revolution in 2014. So, again oil price dipped suddenly. But then we had the US and China trade war with that there was supply chain disruptions. And then the finally, the COVID pandemic and this events led to declining oil price, but that trend did not continue for a long time. Because again with Russia-Ukraine war the oil price skyrocketed.

So, you see in the last two decades oil price is fluctuating so much, sometimes it is reaching a new high sometimes it is reaching some unforeseen negative value. So, you see we have lot of uncertainty and volatility in the oil market.

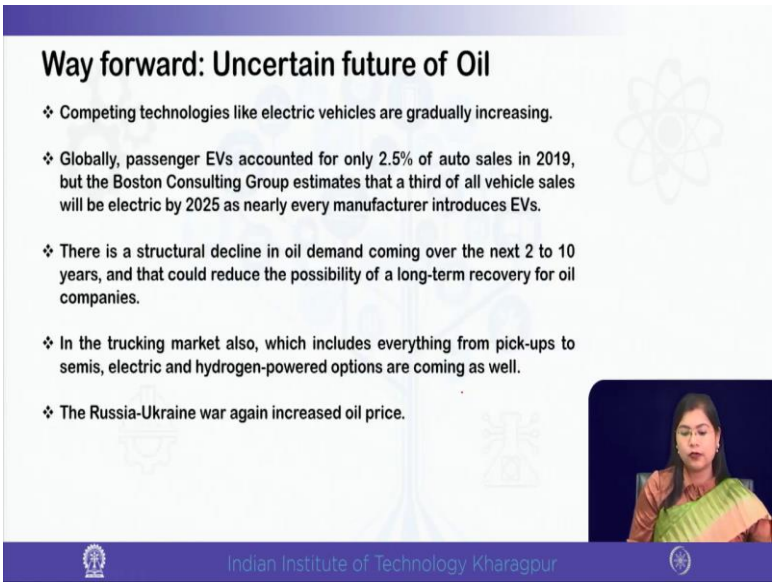
(Refer Slide Time: 35:35)



Therefore, we need to be very prepared for any kind of movement of oil price with respect to geopolitical events, natural calamities, pandemics. So, again we are plotting the data, the Brent and crude prices and you see this is the Brent price and the WTI price. I think we have already discussed enough data. So, I am not spending much time and we can see that from 2000 onward the fluctuations are so high.

Before that the fluctuation was not very much, you can we have plotted the data from 1985 onwards so, you see it moved in a particular band. So, as you remember we already marked 1985 to 1999 as the low price period, but from 2000 onward the oil price you see it has moved so much, it has fluctuated. So, much the high and lows are very frequent.

(Refer Slide Time: 36:33)



So, that is why we need to understand the impact of the historical events, the recent events also on the oil market. And what is the future now? Now, there is lot of uncertainty with respect to oil as you can see like the pandemic has already hit the oil market and also, we have technological improvement in say electric vehicles, ok.

So, these are the competing technologies because electric vehicle can prove to be a closer substitute of oil as far as transportation sector is concerned. Because transportation till now heavily depends on oil. So, if we can come up with some substitute of oil in transportation so that will also be one demand side shock in the oil market so, you should be ready for that.

So, if we look at the data, we can show that the passenger electric vehicles account for only 2.5 percent of auto sale in 2019. But the Boston Consulting Group they have estimated that a third of all electric vehicle one third of the total vehicle sale will be electric by 2025, right.

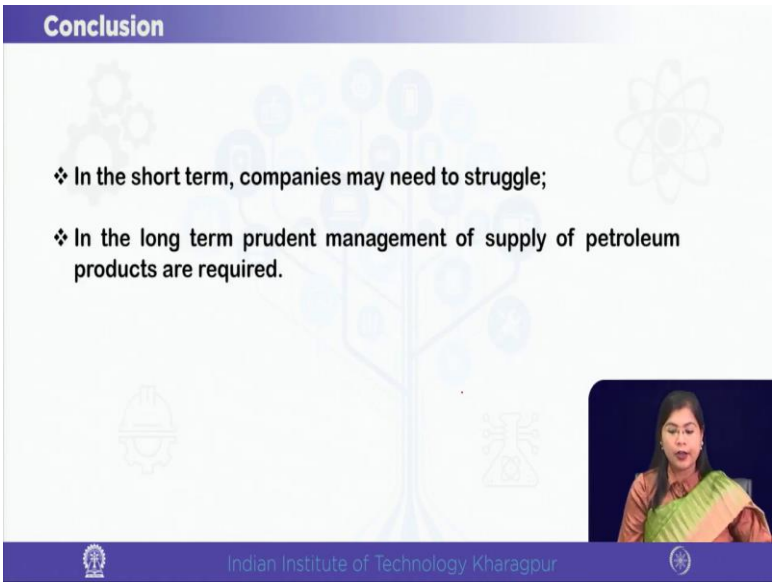
So, we should be very careful about the substitution possibility of oil in the transportation sector and we should be the oil producers, the oil suppliers, the countries which are dependent on oil export they should be ready for this technological improvement in electric vehicle.

Therefore, what we can say is that over the next few decades or next few years even there can be a structural declining in the demand for oil and that can also limit the possibility of long time recovery of oil companies. In the trucking market also which includes everything from pick-up to semis electric and hydrogen powered options they are also coming up.

So, we should be careful about the technological improvement in the supply side of oil that can also influence the oil demand, ok. So, the countries are investing into R & D to come up with cheaper and close substitutes of oil in the transportation sector in the energy use.

Therefore, the countries which are dependent on oil should be careful and the geopolitical events also change can change this pattern as we have already experienced with the Russia-Ukraine War.

(Refer Slide Time: 38:59)

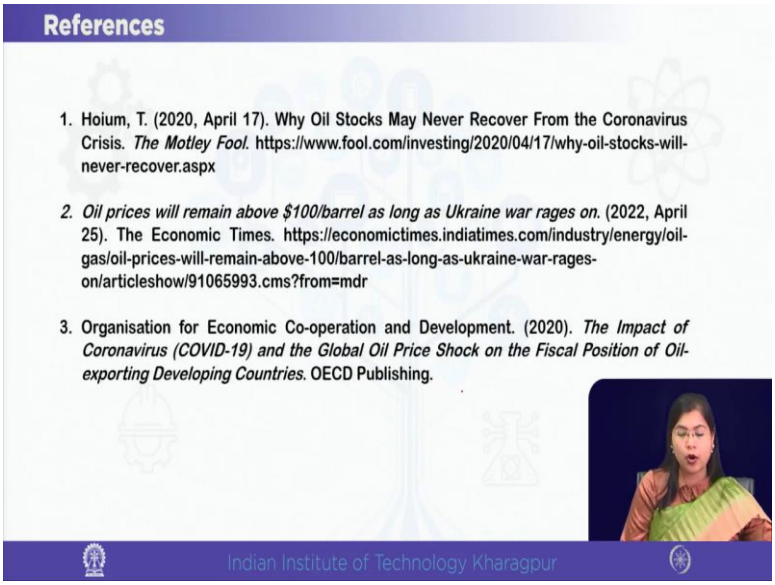


So, what we can conclude is that due to this geopolitical events or natural calamities the oil companies or the countries dependent on oil they may need to struggle in the very short run. However, in the medium to long run we have to manage our resource prudently.

So, it is not only that we should be ensuring sufficient supply, but we should also ensure and we should create proper inventory storage capacity. So, that we should not be

experiencing a negative price again if there is a demand side shock or even there is a technological improvement.

(Refer Slide Time: 39:39)



So, this is very important as far as the oil market as far as managing the resource is concerned. So, for this part as you can see the earlier petroleum economics book mainly covered the oil price movement till 2014. So, we have to rely on some latest resources. So, we have already mentioned all the references and we will be providing the references to you as the materials.

So, these are the references we have followed for today's lecture. So, thank you very much. So, we with this we finish our module 4 where we have discussed in depth the movement of oil price from historical time to a very recent time of the COVID pandemic and the Russia-Ukraine War.

Thank you very much.