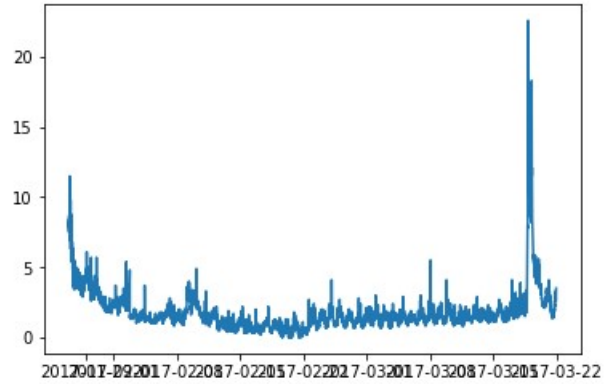
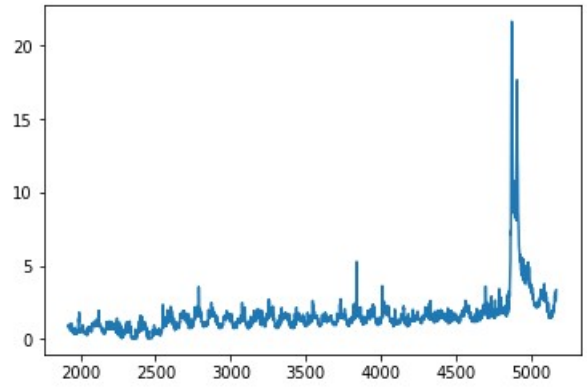
```
     ...: plt.show()
Traceback (most recent call last):

  File "<ipython-input-197-79e57995b25f>", line 2, in <module>
    plt.plot(turb.index.values,turb.Turb(FNU),label = "original")

  File "C:\Users\admin\Anaconda3\lib\site-packages\pandas\core\generic.py", line 4376, in
__getattr__
    return object.__getattribute__(self, name)

AttributeError: 'DataFrame' object has no attribute 'Turb'

<Figure size 1584x720 with 0 Axes>

In [198]:

In [198]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb.index.values,turb['Turb(FNU)'],label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Dissolved Oxygen")
     ...: plt.legend()
     ...: plt.show()
Traceback (most recent call last):

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\formatters.py", line 341,
in __call__
    return printer(obj)

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 244,
in <lambda>
    png_formatter.for_type(Figure, lambda fig: print_figure(fig, 'png', **kwargs))

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 128,
in print_figure
    fig.canvas.print_figure(bytes_io, **kw)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backend_bases.py", line
2049, in print_figure
    **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 510, in print_png
    FigureCanvasAgg.draw(self)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 402, in draw
    self.figure.draw(self.renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\figure.py", line 1649, in
```

```
draw
    renderer, self, artists, self.suppressComposite)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 2628,
in draw
    mimage._draw_list_compositing_images(renderer, self, artists)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1185, in draw
    ticks_to_draw = self._update_ticks(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1023, in
_update_ticks
    tick_tups = list(self.iter_ticks())  # iter_ticks calls the locator

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 967, in
iter_ticks
    majorLocs = self.major.locator()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1230, in
__call__
    self.refresh()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1250, in
refresh
    dmin, dmax = self.viewlim_to_dt()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1001, in
viewlim_to_dt
    .format(vmin))

ValueError: view limit minimum -34804.49947916667 is less than 1 and is an invalid
Matplotlib date value. This often happens if you pass a non-datetime value to an axis that
has datetime units

<Figure size 1584x720 with 1 Axes>

In [199]:

In [199]: plt.plot(turb.index.values,turb['Turb(FNU)'],label = "original")
```

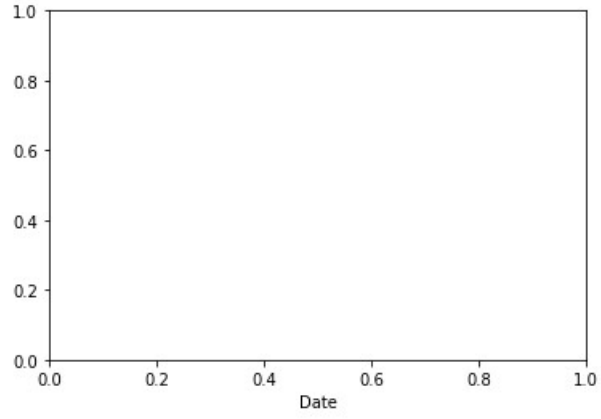
```
Out[199]: [<matplotlib.lines.Line2D at 0x2289515f6a0>]
```




```
In [200]: plt.plot(forecast,label = "predicted")
Out[200]: [<matplotlib.lines.Line2D at 0x2289683a978>]
```




```
In [201]: plt.xlabel("Date")
Out[201]: Text(0.5, 0, 'Date')
```




```
In [202]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb.index.values,turb['Turb(FNU)'],label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Dissolved Oxygen")
     ...: plt.legend()
     ...: plt.show()
Traceback (most recent call last):
```

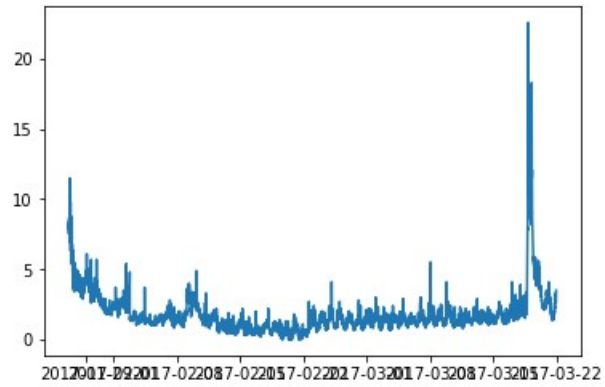
```
  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\formatters.py", line 341,
in __call__
    return printer(obj)

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 244,
in <lambda>
    png_formatter.for_type(Figure, lambda fig: print_figure(fig, 'png', **kwargs))

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 128,
in print_figure
    fig.canvas.print_figure(bytes_io, **kw)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backend_bases.py", line
2049, in print_figure
    **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 510, in print_png
    FigureCanvasAgg.draw(self)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 402, in draw
    self.figure.draw(self.renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\figure.py", line 1649, in
draw
    renderer, self, artists, self.suppressComposite)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 2628,
in draw
    mimage._draw_list_compositing_images(renderer, self, artists)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1185, in draw
    ticks_to_draw = self._update_ticks(renderer)
```

```
  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1023, in
_update_ticks
    tick_tups = list(self.iter_ticks())  # iter_ticks calls the locator

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 967, in
iter_ticks
    majorLocs = self.major.locator()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1230, in
__call__
    self.refresh()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1250, in
refresh
    dmin, dmax = self.viewlim_to_dt()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1001, in
viewlim_to_dt
    .format(vmin))

ValueError: view limit minimum -34804.49947916667 is less than 1 and is an invalid
Matplotlib date value. This often happens if you pass a non-datetime value to an axis that
has datetime units

<Figure size 1584x720 with 1 Axes>

In [203]:

In [203]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb.index.values,turb['Turb(FNU)'],label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
Out[203]: Text(0.5, 1.0, 'Time Series Forecast')Error in callback <function
install_repl_displayhook.<locals>.post_execute at 0x0000022881225158> (for post_execute):
Traceback (most recent call last):

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\pyplot.py", line 109, in
post_execute
    draw_all()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\_pylab_helpers.py", line
132, in draw_all
    f_mgr.canvas.draw_idle()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backend_bases.py", line
1899, in draw_idle
    self.draw(*args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 402, in draw
    self.figure.draw(self.renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
```

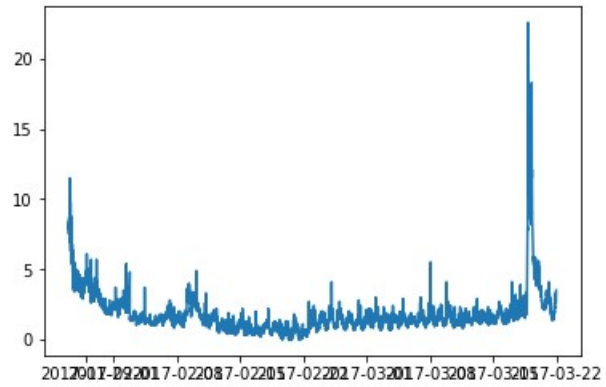
```
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\figure.py", line 1649, in
draw
    renderer, self, artists, self.suppressComposite)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 2628,
in draw
    mimage._draw_list_compositing_images(renderer, self, artists)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1185, in draw
    ticks_to_draw = self._update_ticks(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1023, in
_update_ticks
    tick_tups = list(self.iter_ticks())  # iter_ticks calls the locator

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 967, in
iter_ticks
    majorLocs = self.major.locator()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1230, in
__call__
    self.refresh()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1250, in
refresh
    dmin, dmax = self.viewlim_to_dt()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1001, in
viewlim_to_dt
    .format(vmin))

ValueError: view limit minimum -34804.49947916667 is less than 1 and is an invalid
Matplotlib date value. This often happens if you pass a non-datetime value to an axis that
has datetime units

Traceback (most recent call last):
```

```
  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\formatters.py", line 341,
in __call__
    return printer(obj)

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 244,
in <lambda>
    png_formatter.for_type(Figure, lambda fig: print_figure(fig, 'png', **kwargs))

  File "C:\Users\admin\Anaconda3\lib\site-packages\IPython\core\pylabtools.py", line 128,
in print_figure
    fig.canvas.print_figure(bytes_io, **kw)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backend_bases.py", line
2049, in print_figure
    **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 510, in print_png
    FigureCanvasAgg.draw(self)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\backends\backend_agg.py",
line 402, in draw
    self.figure.draw(self.renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\figure.py", line 1649, in
draw
    renderer, self, artists, self.suppressComposite)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 2628,
in draw
    mimage._draw_list_compositing_images(renderer, self, artists)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\image.py", line 138, in
_draw_list_compositing_images
    a.draw(renderer)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\artist.py", line 50, in
draw_wrapper
    return draw(artist, renderer, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1185, in draw
    ticks_to_draw = self._update_ticks(renderer)
```

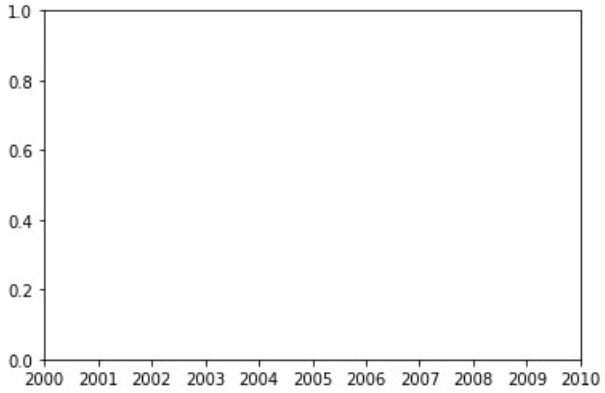
```
  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 1023, in
_update_ticks
    tick_tups = list(self.iter_ticks())  # iter_ticks calls the locator

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axis.py", line 967, in
iter_ticks
    majorLocs = self.major.locator()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1230, in
__call__
    self.refresh()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1250, in
refresh
    dmin, dmax = self.viewlim_to_dt()

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\dates.py", line 1001, in
viewlim_to_dt
    .format(vmin))

ValueError: view limit minimum -34804.49947916667 is less than 1 and is an invalid
Matplotlib date value. This often happens if you pass a non-datetime value to an axis that
has datetime units

<Figure size 1584x720 with 1 Axes>

In [204]:

In [204]:

In [204]: plt.plot(turb.index.values,turb['Turb(FNU)'],label = "original")
     ...:
Out[204]: [<matplotlib.lines.Line2D at 0x22892084668>]
```



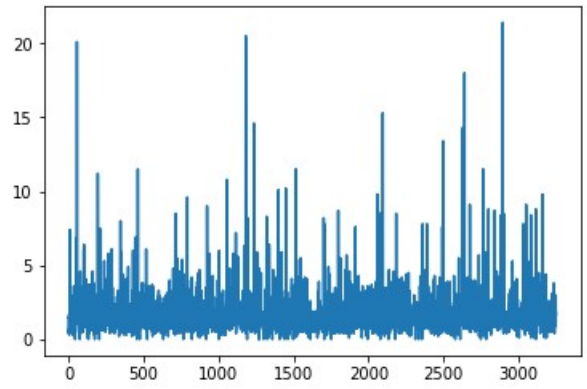

```
In [205]: plt.plot(turb,label = "original")
     ...:
Out[205]: [<matplotlib.lines.Line2D at 0x2289688e208>]
```



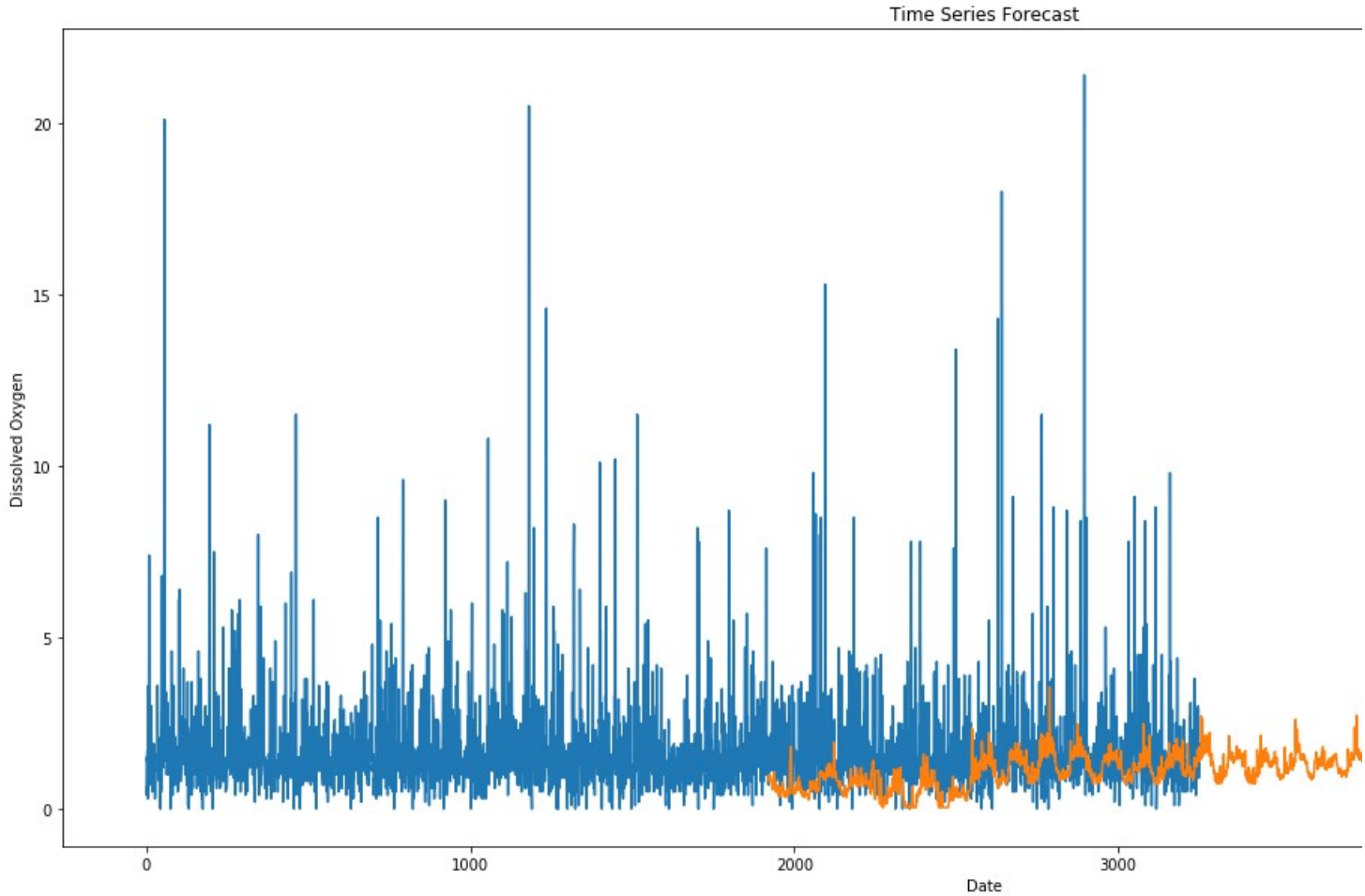

```
In [206]: plt.plot(turb.index.values, forecast,label = "predicted")
Traceback (most recent call last):

  File "<ipython-input-206-39d82528e9ce>", line 1, in <module>
    plt.plot(turb.index.values, forecast,label = "predicted")

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\pyplot.py", line 2813, in
plot
    is not None else {}), **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\__init__.py", line 1810, in
inner
    return func(ax, *args, **kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_axes.py", line 1611,
in plot
    for line in self._get_lines(*args, **kwargs):

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 393, in
_grab_next_args
    yield from self._plot_args(this, kwargs)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 370, in
_plot_args
    x, y = self._xy_from_xy(x, y)

  File "C:\Users\admin\Anaconda3\lib\site-packages\matplotlib\axes\_base.py", line 231, in
_xy_from_xy
    "have shapes {} and {}".format(x.shape, y.shape))

ValueError: x and y must have same first dimension, but have shapes (5171,) and (3252,)
```




```
In [207]:

In [207]: plt.plot(turb_test.index.values, forecast,label = "predicted")
Traceback (most recent call last):

  File "<ipython-input-207-5c6488f30121>", line 1, in <module>
    plt.plot(turb_test.index.values, forecast,label = "predicted")

NameError: name 'turb_test' is not defined


In [208]:

In [208]: turb_train,turb_test = tts(turb_v,test_size =test_size, random_state=0
  File "<ipython-input-208-ff54a9b3a0c8>", line 1
    turb_train,turb_test = tts(turb_v,test_size =test_size, random_state=0
                                                                          ^
SyntaxError: unexpected EOF while parsing


In [209]:

In [209]: turb_train,turb_test = tts(turb_v,test_size =test_size, random_state=0)
     ...:

In [210]: plt.plot(turb_test.index.values, forecast,label = "predicted")
Traceback (most recent call last):

  File "<ipython-input-210-5c6488f30121>", line 1, in <module>
    plt.plot(turb_test.index.values, forecast,label = "predicted")

AttributeError: 'numpy.ndarray' object has no attribute 'index'


In [211]:

In [211]: plt.plot(turb_test,label = "original")
     ...:
Out[211]: [<matplotlib.lines.Line2D at 0x2288f5726a0>]
```

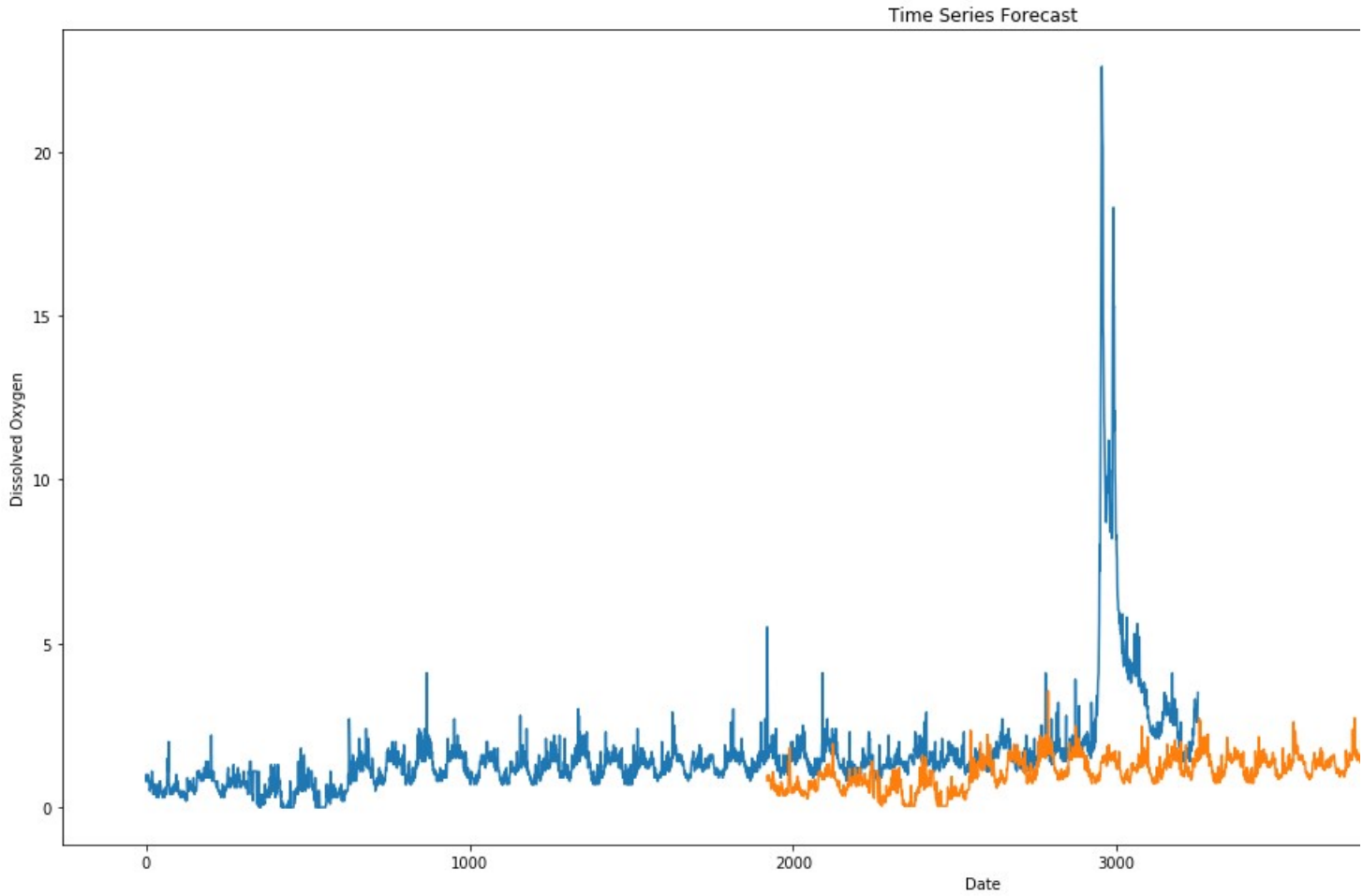



```
In [212]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb_test,label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Dissolved Oxygen")
     ...: plt.legend()
     ...: plt.show()
```



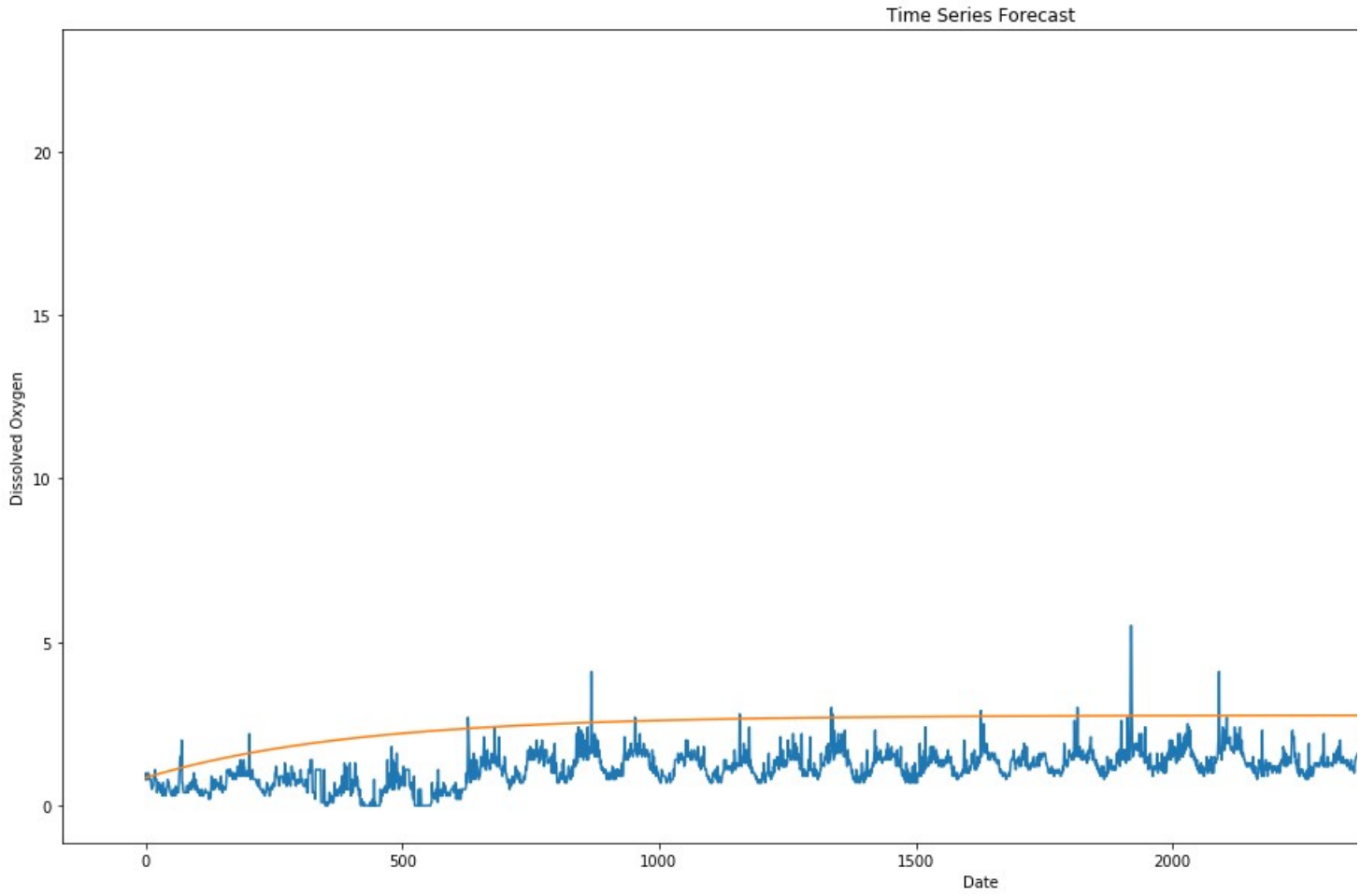

```
In [213]: turb_train,turb_test = tts(turb_v,test_size =test_size, random_state=0,
```

```
shuffle=False)

In [214]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb_test,label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Dissolved Oxygen")
     ...: plt.legend()
     ...: plt.show()
```

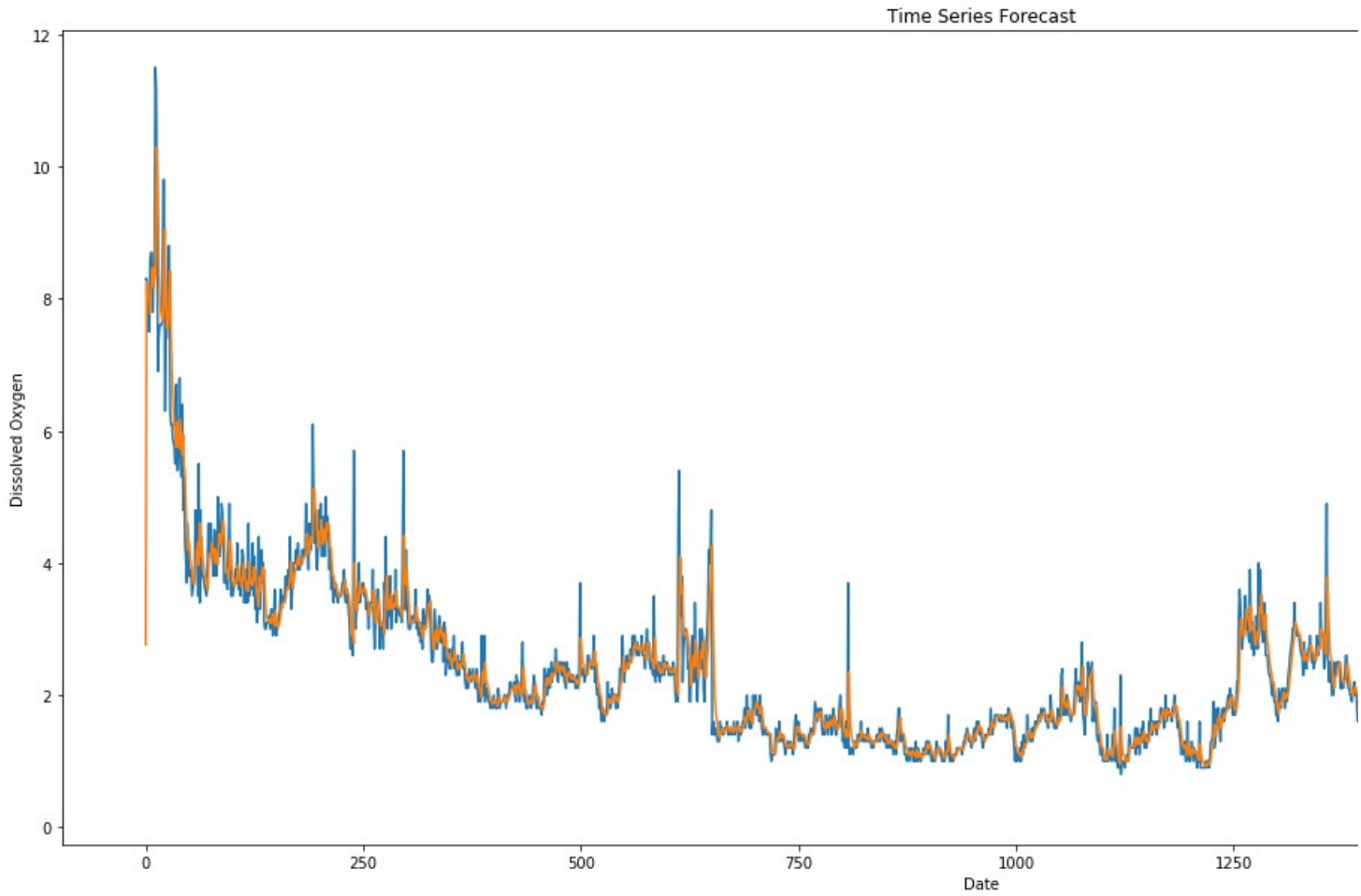



```
In [215]: forecast = model_fit.predict(start=0, end=1919)
     ...:

In [216]: ts = turb_train
     ...: model = ARIMA(ts, order=(1,0,1)) # (ARMA) = (p,d,q)
     ...: model_fit = model.fit(disp=0)

In [217]: forecast = model_fit.predict(start=1919, end=5171)
     ...:
     ...: # visualization
     ...: plt.figure(figsize=(22,10))
     ...: plt.plot(turb_test,label = "original")
     ...: plt.plot(forecast,label = "predicted")
```

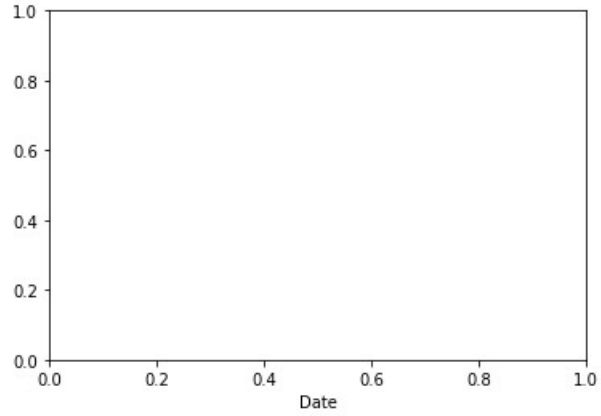
```
...: plt.title("Time Series Forecast")
...: plt.xlabel("Date")
...: plt.ylabel("Dissolved Oxygen")
...: plt.legend()
...: plt.show()
```




```
In [218]: forecast = model_fit.predict(start=0, end=1920)

In [219]: plt.figure(figsize=(22,10))
     ...: plt.plot(turb_train,label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Dissolved Oxygen")
     ...: plt.legend()
     ...: plt.show()
```

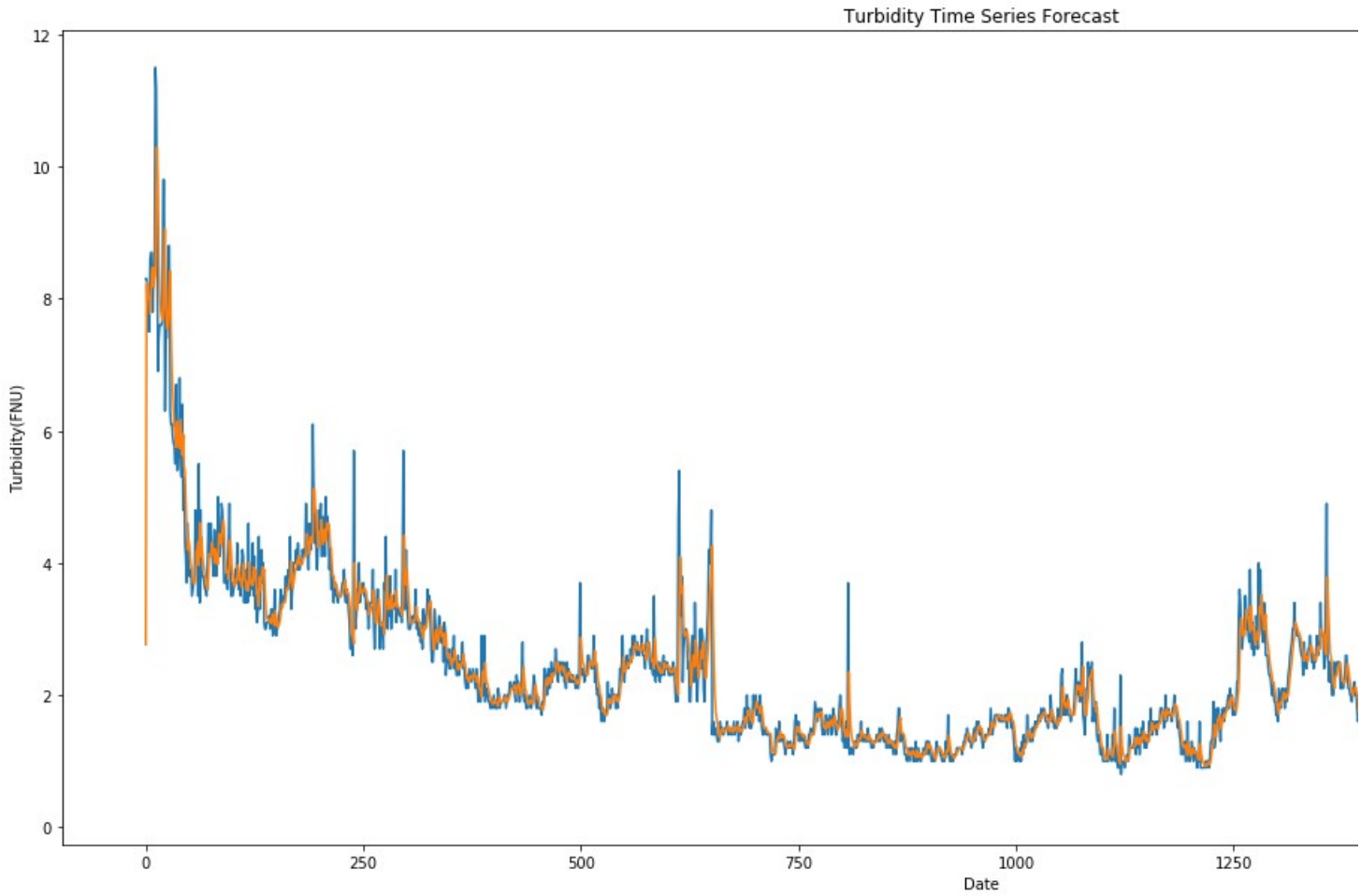



```
In [220]: plt.xlabel("Date")
Out[220]: Text(0.5, 0, 'Date')
```




```
In [221]: def arima_model(ts, order):
     ...:     # fit model
     ...:     ts = turb_train
     ...:     model = ARIMA(ts, order=(1,0,1)) # (ARMA) = (p,d,q)
     ...:     model_fit = model.fit(disp=0)
     ...:
     ...:     # predict
     ...:     forecast = model_fit.predict(start=0, end=1920)
```

```
     ...:
     ...:     # visualization
     ...:     plt.figure(figsize=(22,10))
     ...:     plt.plot(turb_train,label = "original")
     ...:     plt.plot(forecast,label = "predicted")
     ...:     plt.title("Turbidity Time Series Forecast")
     ...:     plt.xlabel("Date")
     ...:     plt.ylabel("Turbidity(FNU)")
     ...:     plt.legend()
     ...:     plt.show()

In [222]: def arima_model(ts, order):
     ...:     # fit model
     ...:     ts = turb_train
     ...:     model = ARIMA(ts, order=(1,0,1)) # (ARMA) = (p,d,q)
     ...:     model_fit = model.fit(disp=0)
     ...:
     ...:     # predict
     ...:     forecast = model_fit.predict(start=0, end=1920)
     ...:
     ...:     # visualization
     ...:     plt.figure(figsize=(22,10))
     ...:     plt.plot(turb_train,label = "original")
     ...:     plt.plot(forecast,label = "predicted")
     ...:     plt.title("Turbidity Time Series Forecast")
     ...:     plt.xlabel("Date")
     ...:     plt.ylabel("Turbidity(FNU)")
     ...:     plt.legend()
     ...:     plt.show()

In [223]: ts = turb_train
     ...: model = ARIMA(ts, order=(1,0,1)) # (ARMA) = (p,d,q)
     ...: model_fit = model.fit(disp=0)
     ...:
     ...: # predict
     ...: forecast = model_fit.predict(start=0, end=1920)
     ...:
     ...: # visualization
     ...: plt.figure(figsize=(22,10))
     ...: plt.plot(turb_train,label = "original")
     ...: plt.plot(forecast,label = "predicted")
     ...: plt.title("Turbidity Time Series Forecast")
     ...: plt.xlabel("Date")
     ...: plt.ylabel("Turbidity(FNU)")
     ...: plt.legend()
     ...: plt.show()
```


Turbidity Time Series Forecast
Turbidity(FNU)
Date
0
2
4
6
8
10
12
0
250
500
750
1000
1250

In [**224**]: