Cross Border Lesson Study between Japan and Russia: about CO2 emission and energy supply

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Tottori University Attached Junior High School, Japan

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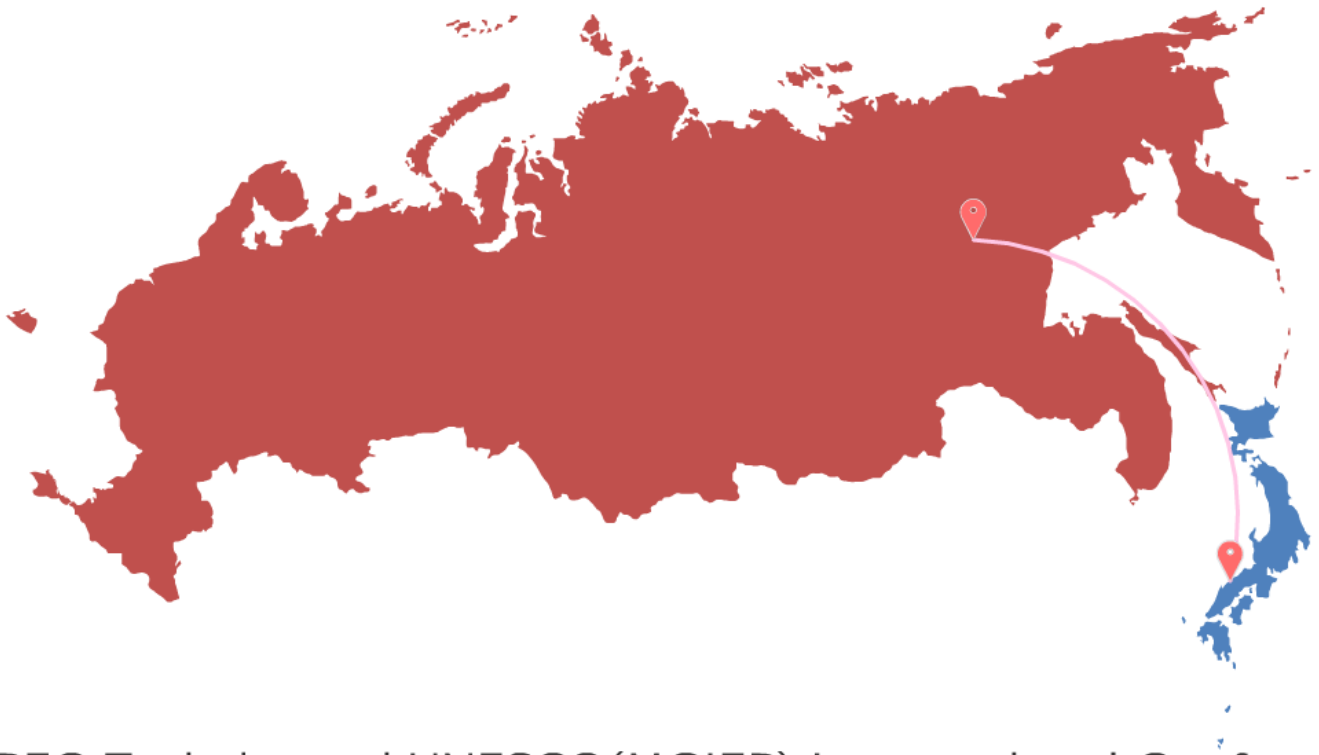
Tottori University, Japan

Ivan Visotsky
MCCME, Russia



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2018.2.8

Contents of report

- How did Cross Border Lesson study done by Japan and Russia?
- What features can be seen by Japanese teachers through this lesson study?

Outline of lesson study design

- Mathematical lesson is planned with the theme of environment and energy efficiency as a teaching material.
- The Japanese side made a draft of the lesson plan.
- We reviewed the lesson plan by e-mails.

A state of lesson study

- Date & Time : 14 Dec, 2017, 10:40 – 11:30 JST
  *No time difference in Japan and Russia.

- Student of
  Japan: Tottori University Attached Junior High School (7th grade)

  Russia: Yakutsk Phisics and Technics Liceum named after V.P.Larionov (8th grade)

A state of lesson study

- Equipment of
  - Skype：Dialogue between classrooms by video call,
  - Prezi：Presentation of graph by remote control,
  - Screen：Projecting on Skype & Prezi,
    - *The Japanese side has its own screen
    - *Russian side switches between Skype and Prezi
  - Loudspeaker：Output audio of video call,
  - Translator：Japanese to Russian.

A state of lesson study

- Statistics data of Japan and Russia:

  CO2 emissions [1994-2014]

  Total primary energy supply [1994-2014]

  *Expert Group Energy Data Analysis

  Population [1994-2014]

  *World Bank

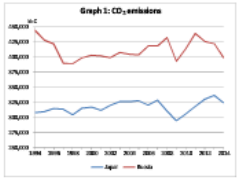
Then, these processed data.

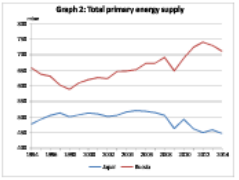
Lesson streaming *Plan for 50 minutes

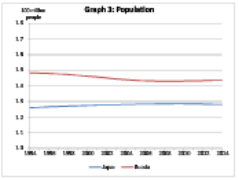
*Previous lesson (10 minutes)

New terminologies explanation: CO2, kt-C, primary energy, mtoe

Homework: Making questions of my country's data in graphs 1, 2 and 3.







*In that lesson:

Japanese student's

Q: In Graph 2, when is Japan's energy supply 450 mtoe?

Russian student's

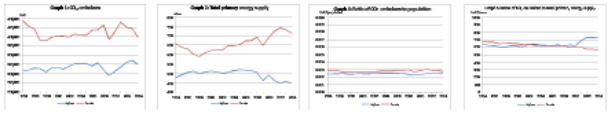
Q: In Graph 1, when is Russia's CO2 emissions the lowest?

00:00 Opening remarks

02:35 Activity 1: Question from my country data
Answer the data of the other country

12:14 Activity 2: Comparing graphs of CO2 & energy between Japan and Russia

Q: What can you say by comparing graphs of Japan and Russia?



A: The trend of increase and decrease in Japan and Russia is almost the same. But Russia has more quantity.

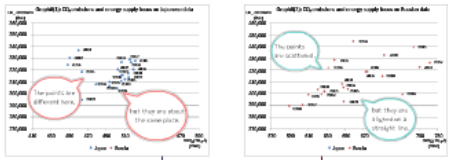
*Graph 4, 5:

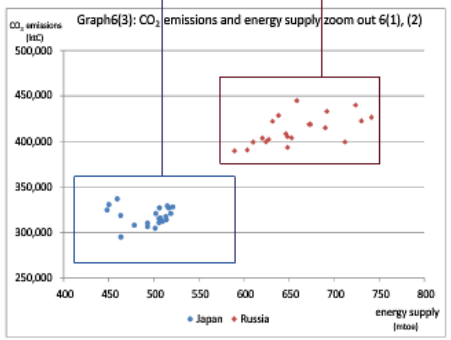
Making a graph of CO2 emissions per population / energy supply.

A: There is little difference (Almost the same).

34:09 Activity 3: Finding correlation between CO2 and energy

Q: What are you able to find from this graph?





Q: What are you able to find by zooming out 6(1), 6(2)?

A: A straight (regression) line between Japan and Russia is not the same.

Q: But, in Graph 4, 5, We thought that Japan and Russia are almost the same ...?

A: We found that as primary energy supply increases, it will increase with CO2 emissions.

50:00

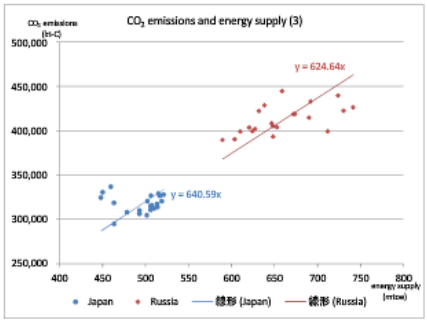
53:37 Closing remarks

Russian student said:
I'm good to communicate with the Japanese students. I got to know the scatter plot. I learned many things, but there were a lot of questions for me.

Japanese student said:
I thought that it was better for Russian students to state the reasons. I have an idea that I do not have, and I learned a lot.

60:58

considerations



Differences in opinion when discussing Lesson plan

Japanese side: There is value in itself to thinking about a re

Russian side: What kind of regression line is appropriate?

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New terminologies explanation: CO2, kt-C, primary energy, mtoe

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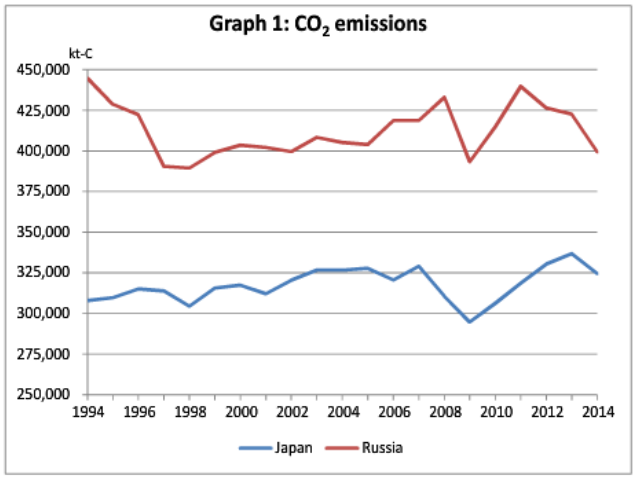

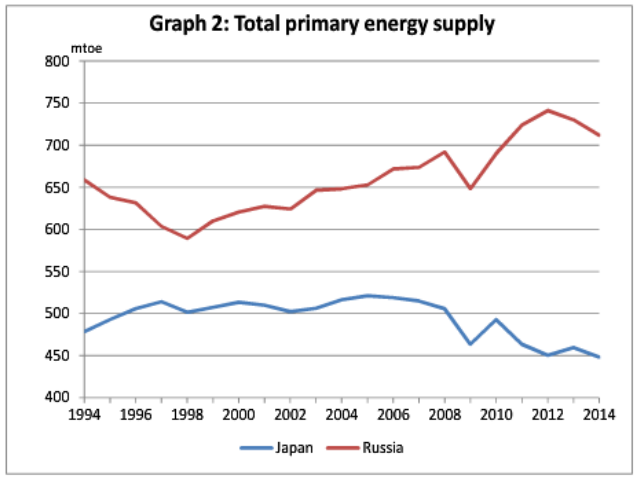

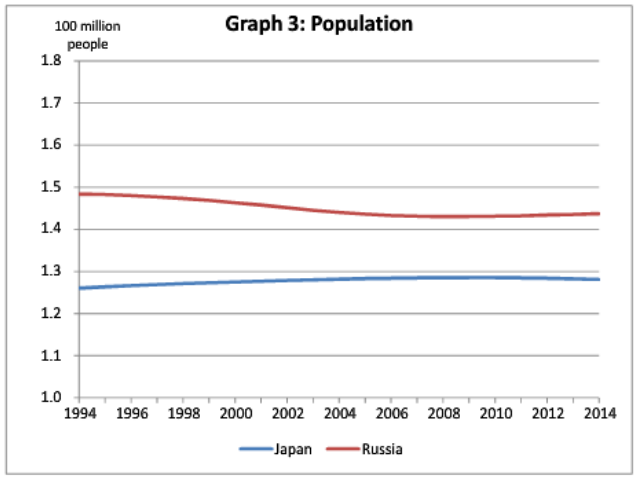

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Japanese student's

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Comparing graphs of CO2 & energy between Japan and Russia

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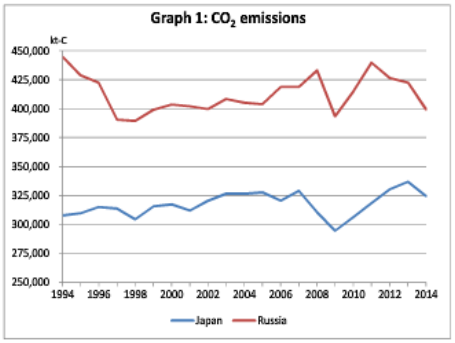

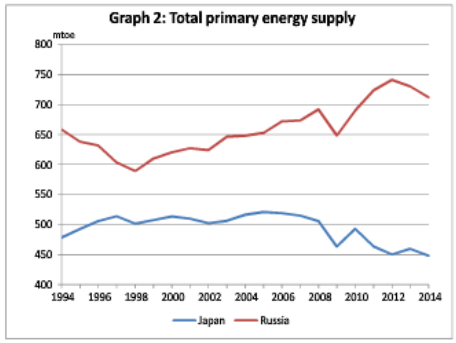

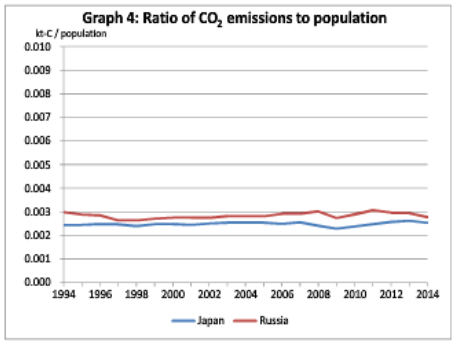

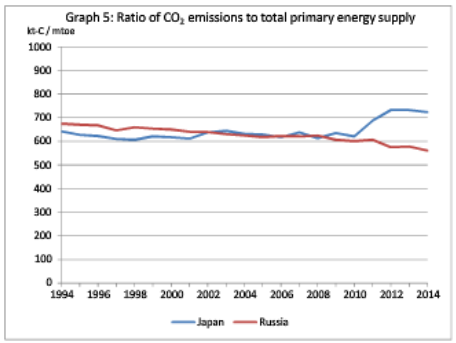

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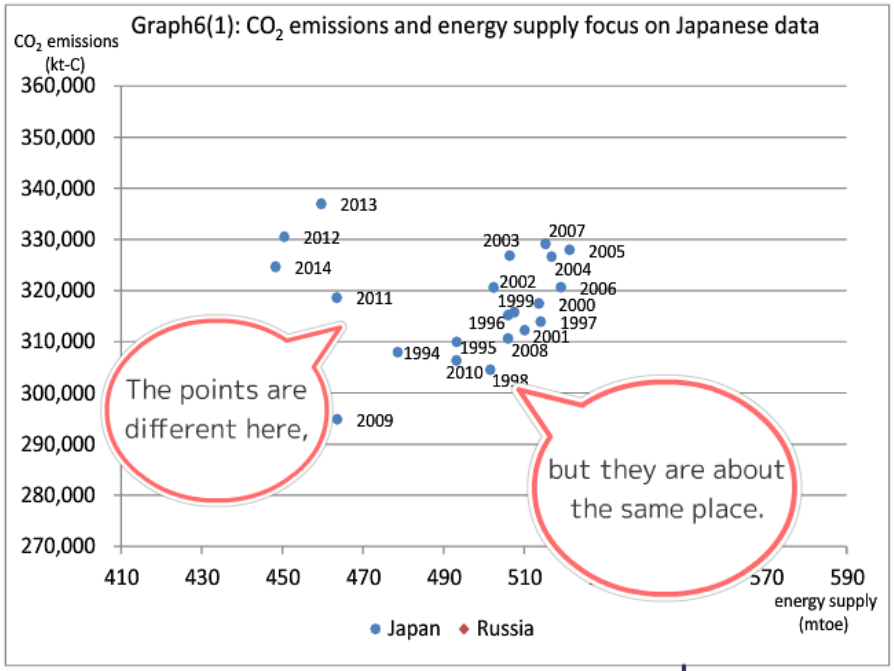
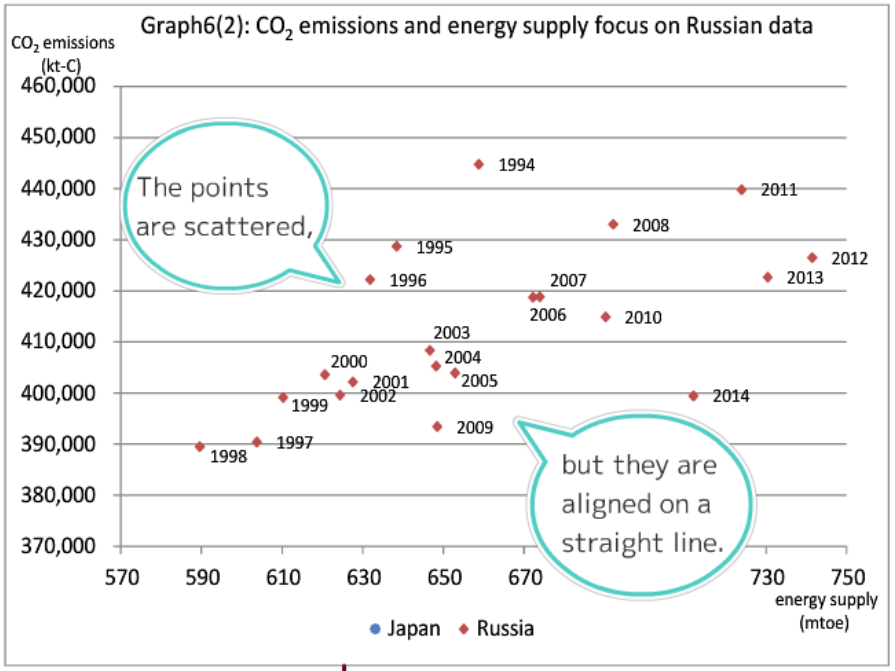
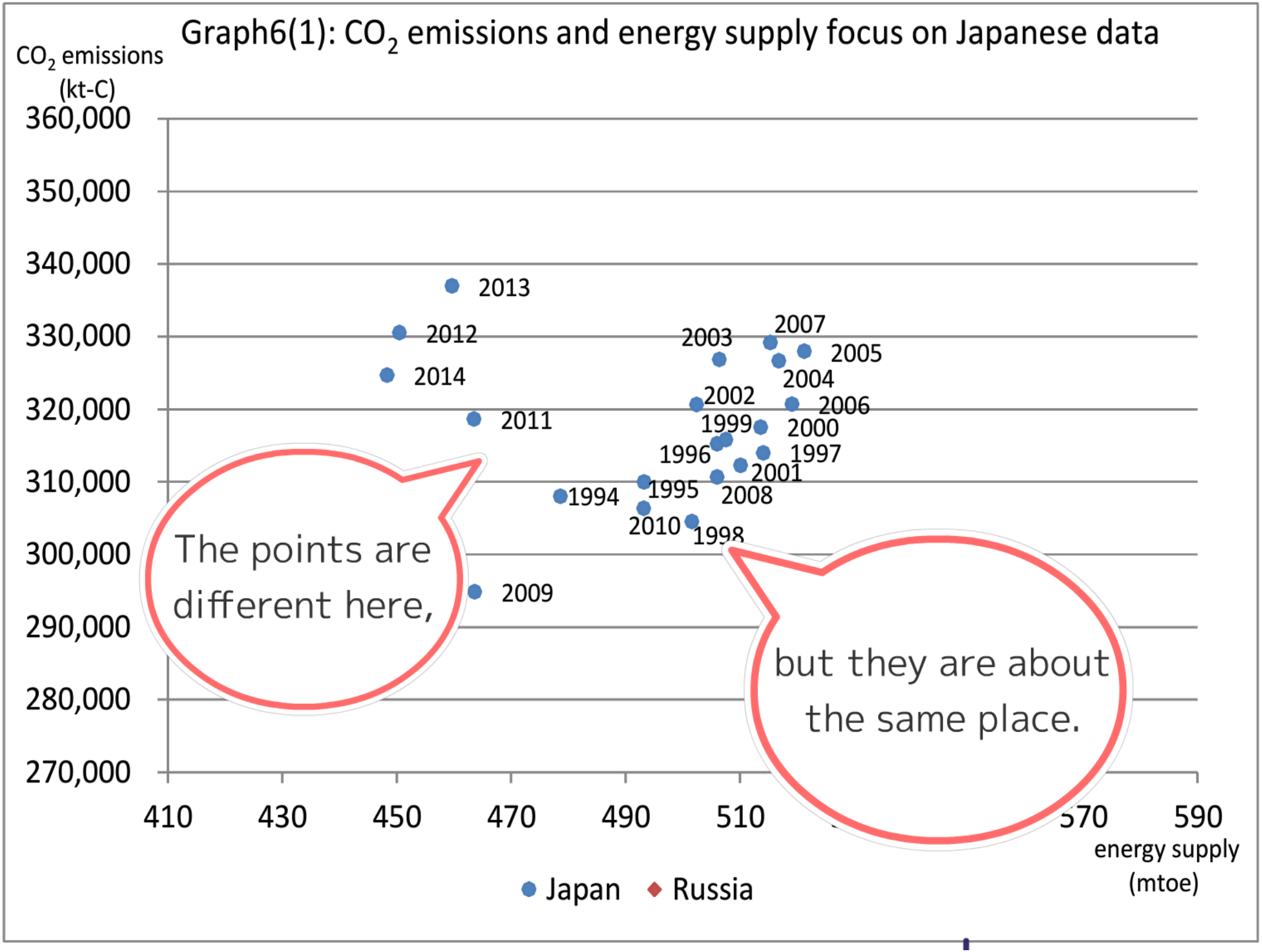
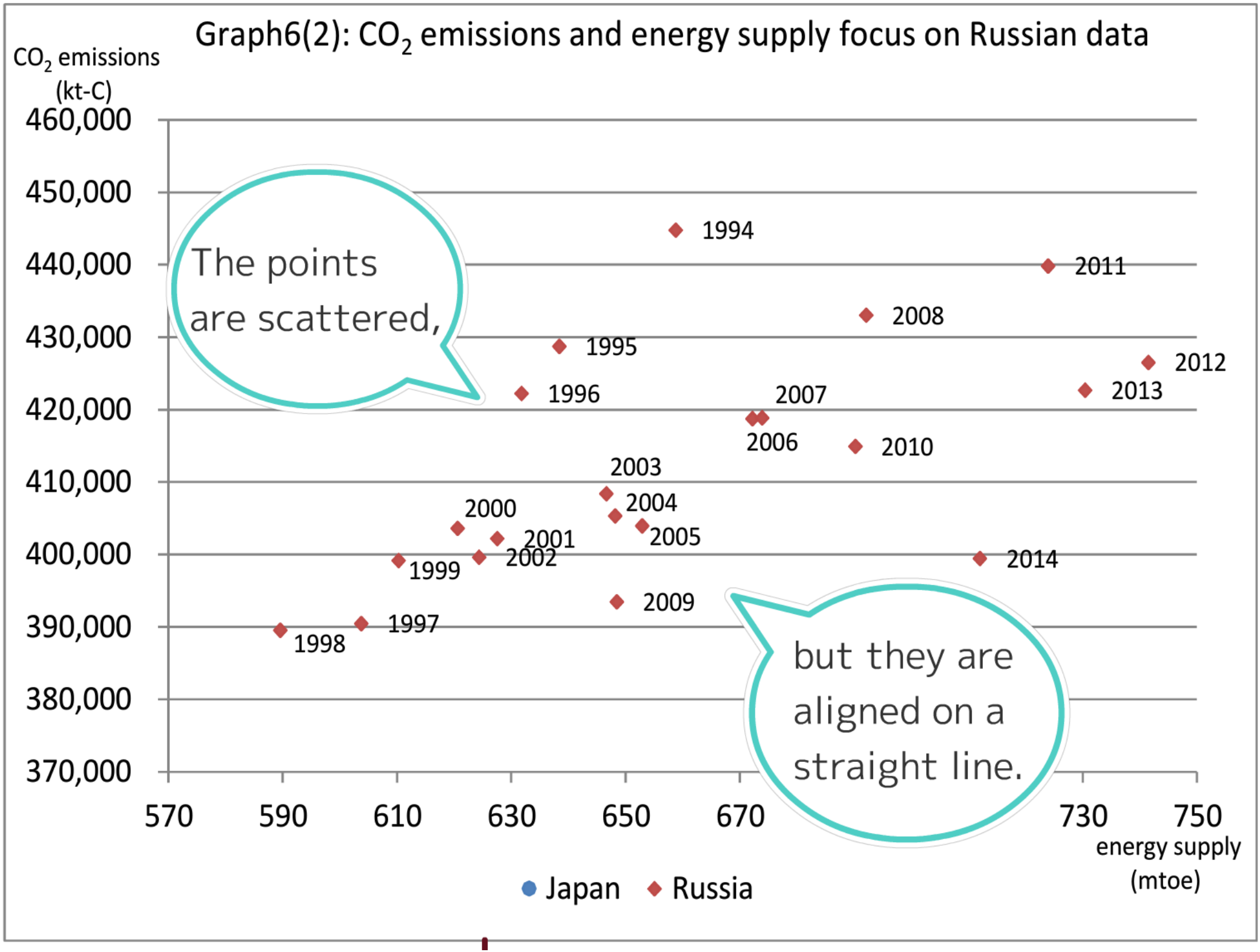


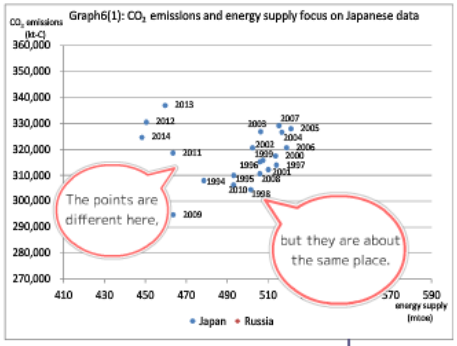


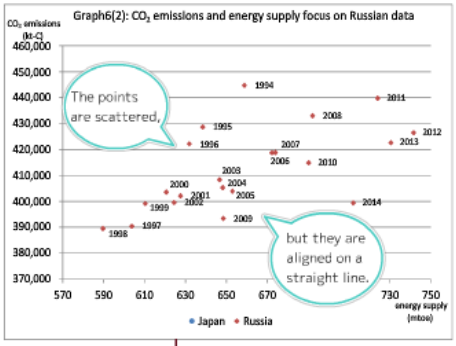

Graph6(1): CO_2 emissions and energy supply focus on Japanese data
CO_2 emissions (kt-C)
360,000
350,000
340,000
330,000
320,000
310,000
300,000
290,000
280,000
270,000
410
430
450
470
490
510
570
590
energy supply (mtoe)
2013
2012
2014
2011
2009
2007
2003
2005
2004
2002
2006
1999
2000
1996
1997
2001
1994
1995
2008
2010
1998
The points are different here,
but they are about the same place.
Japan
Russia

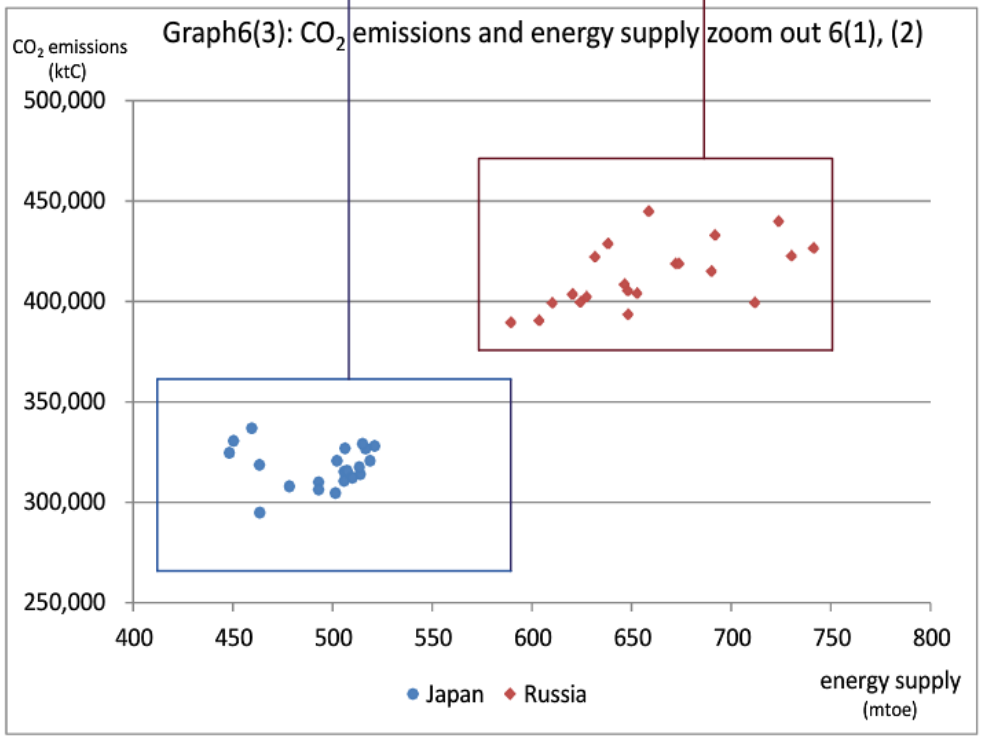

Graph6(2): CO_2 emissions and energy supply focus on Russian data
CO_2 emissions (kt-C)
460,000
450,000
440,000
430,000
420,000
410,000
400,000
390,000
380,000
370,000
570
590
610
630
650
670
730
750
energy supply (mtoe)
1994
2011
2008
1995
2012
1996
2007
2013
2006
2010
2003
2004
2000
2005
2001
2002
1999
2014
2009
1998
1997
The points are scattered,
but they are aligned on a straight line.
Japan
Russia

Finding correlation between CO2 and energy

Q: What are you able to find from this graph?







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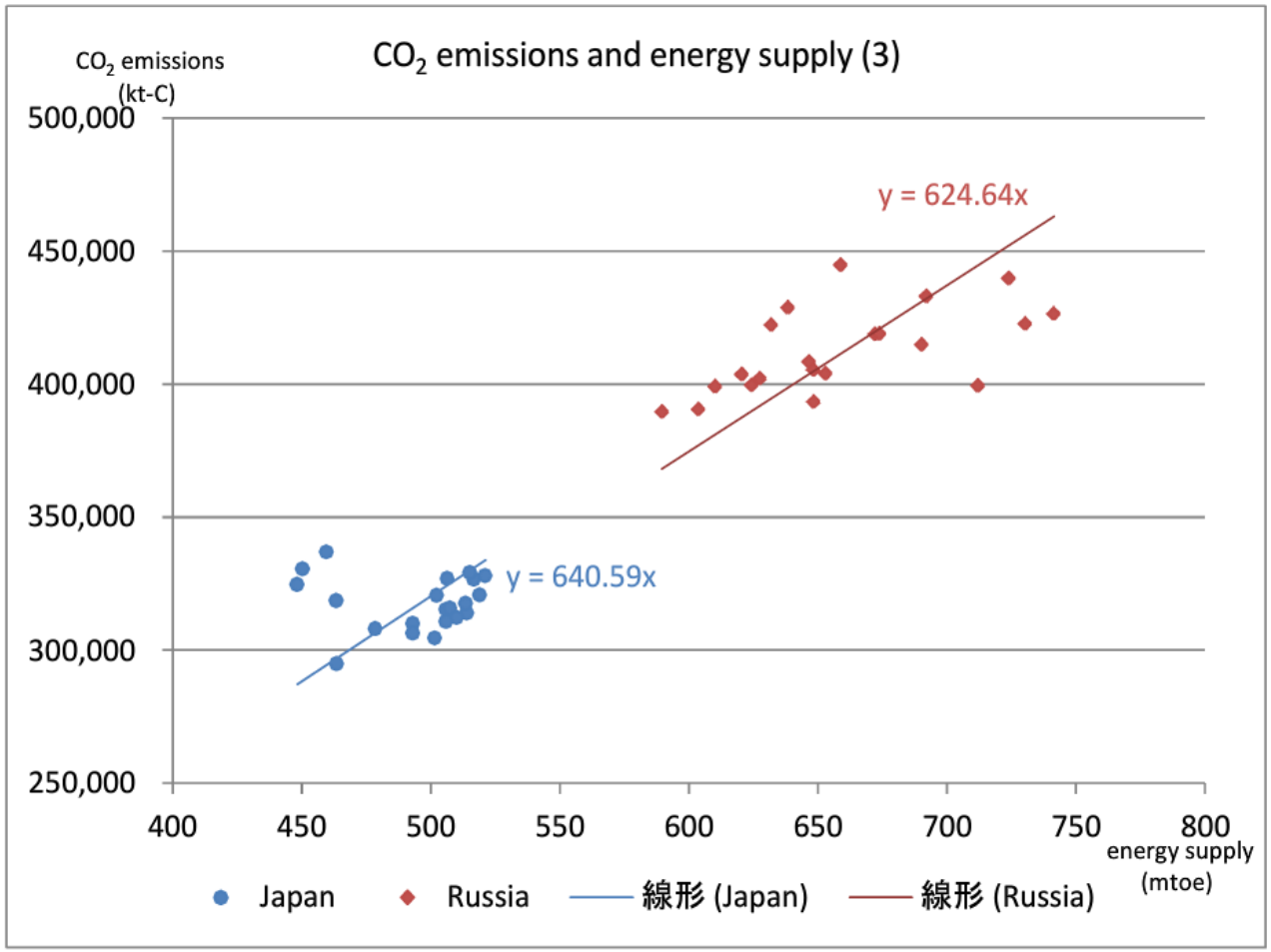

Differences in opinion when discussing Lesson plan

Japanese side: There is value in itself to thinking about a regression line.

Russian side: What kind of regression line is appropriate?

Differences in the induction of the lesson

Japanese teacher aimed at:

analyzing graphs and cultivating mathematical way of thinking in relation with energy and environmental data.

Russian teacher aimed at:

thinking about issues of energy and environment using mathematics and the other.

Differences that teachers expect in this lesson

Japanese side:

The object of learning is analysis of graphs and its mathematical viewing and thinking. learning materials are energy and environmental data.

Russian side:

The object of learning is to think about energy and environmental problems using mathematics and others.

Differences in expected functions of equipment

Japanese side:

By projecting the graph on the blackboard, that function as media which shares ideas and focuses. Normally, what was written on the blackboard remains throughout the lesson.

Russian side:

Switch between Skype and Prezi with one monitor. It is not important at least in this lesson to always keep what is shared.

Conclusions

- For Japanese and Russian Cross Border Lessons study, Japanese side drafted a lesson plan and discuss it with e-mail etc. The lesson study was roughly successful.

- Japanese teachers place emphasis on learning mathematical viewing and thinking as a object of the lesson. Japanese teachers use blackboards as media to share discussion and focus.