

“Capacity Building and Strengthening Institutional Arrangement / Data Yearbook”

Workshop: “Environmental Indicators and their use for  
indicator-based reporting activities”

**Working group**

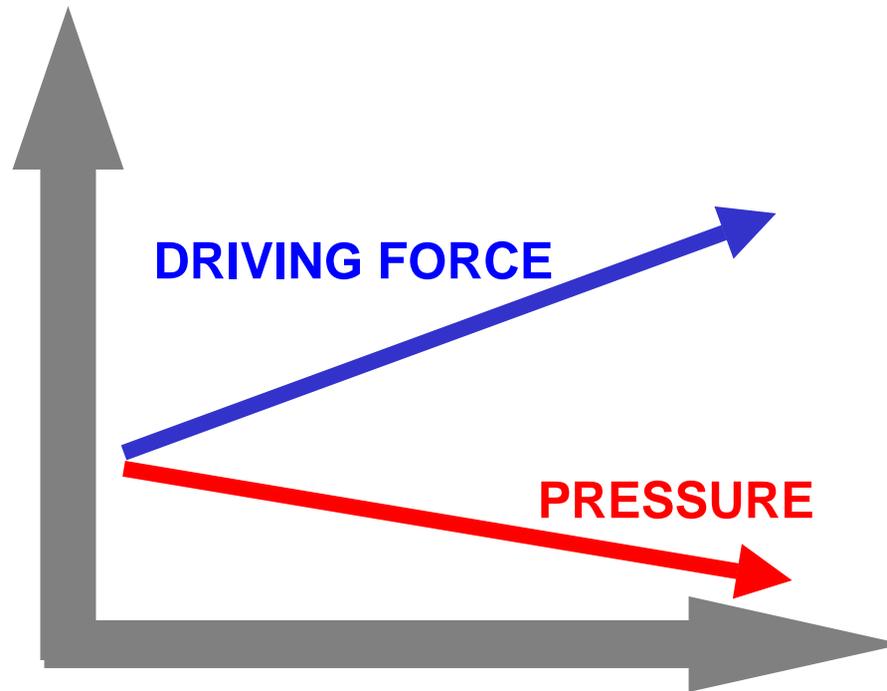
**Exercise n°2 Decoupling Model - Solutions**

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## Decoupling Model



## Solution Exercise A1

*For which of the following couples of variables it's correct to evaluate the decoupling.*

COUPLES OF VARIABLES		DECOUPLING
Emissions of CO <sub>2</sub> in the chemical industry		X
Emissions of CO <sub>2</sub> in the iron industry		
GDP		✓
Wastes generation		
National GDP		X
GDP Per capita		
Quantity of produced electric energy		✓
Emissions of pollutants linked to the electric energy production		
GDP		✓
Energetic use in the various productive sectors		

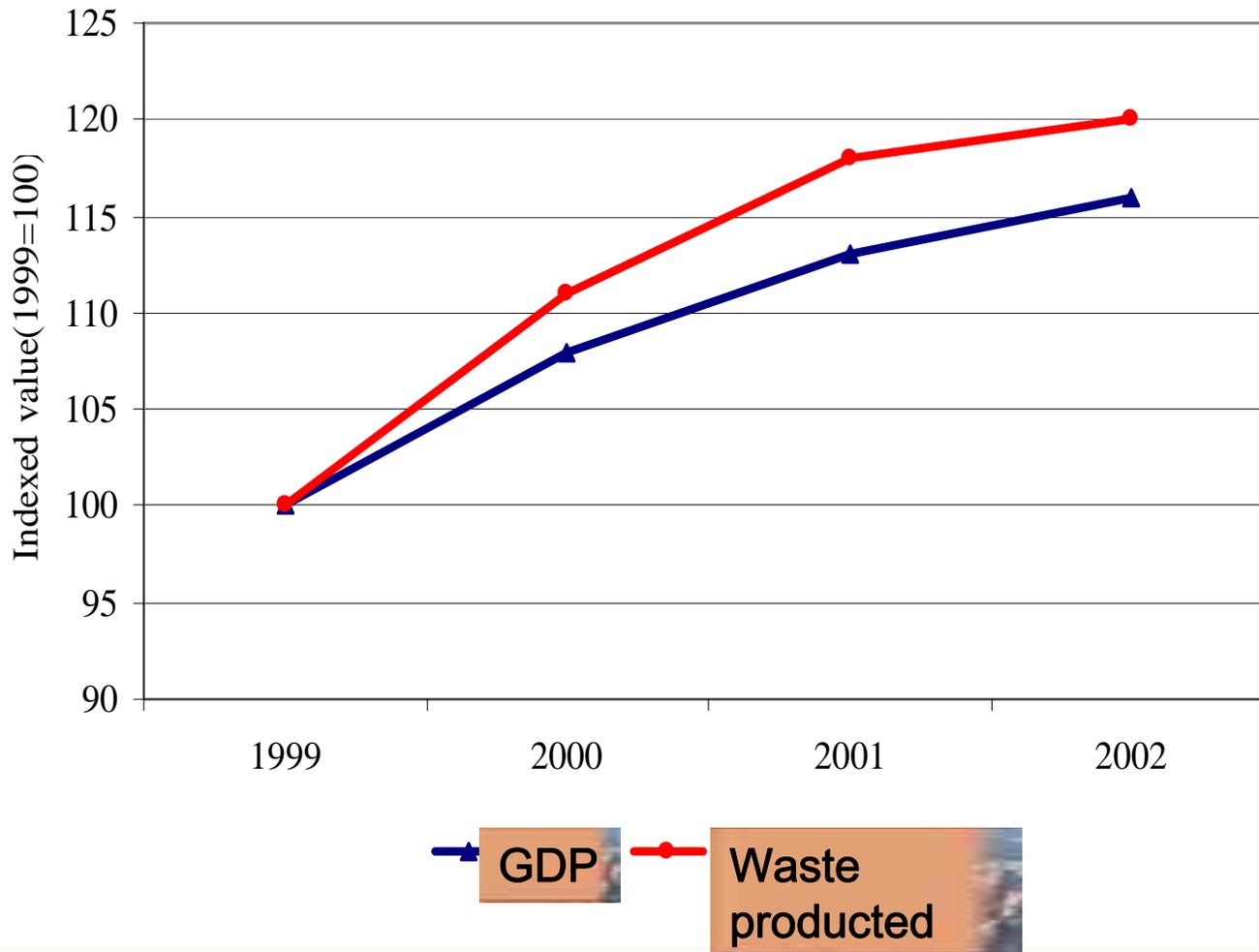
## COUPLES OF VARIABLES

## DECOUPLING

National agricultural production		✓
Use of synthetic herbal medicine		
Used Agricultural Surface (SAU)		✓
Use of chemical fertilizers for hectare		
Value in € of the general production of the chemical sector		✓
Emissions of NO <sub>x</sub> in the chemical industry		
Value in € of the steel production		X
Emissions of CO <sub>2</sub> in the paper industry		
Value in € of the steel production		✓
Emissions of CO <sub>2</sub> linked to the steel productive trials		

## Solution Exercise B1

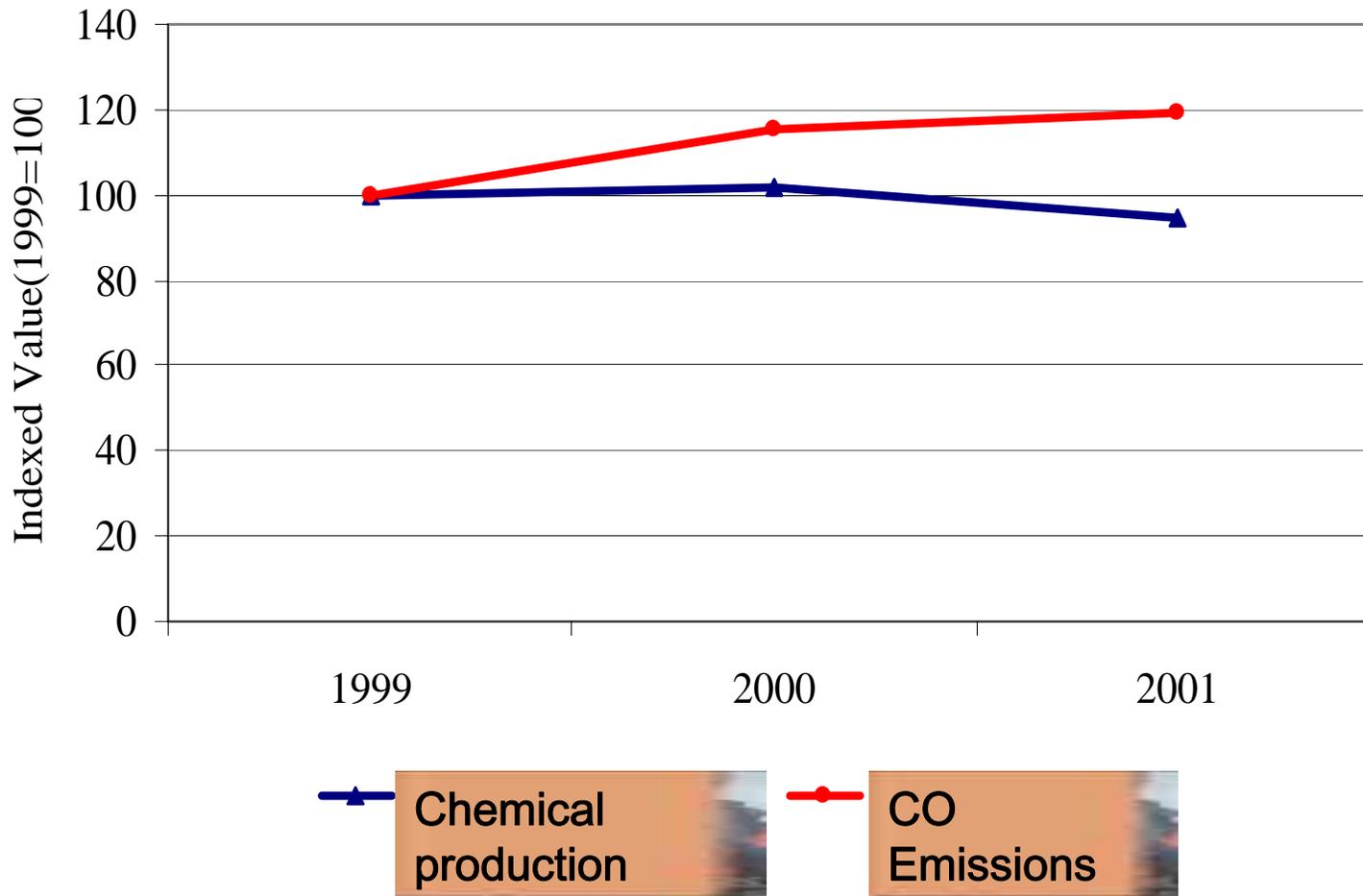
Based on the following graph, in which periods does not have sense to investigate the decoupling presence and why?



*a) The graph show in every period a condition of development, than has always sense investigate the presence or the absence of decoupling;*

## Solution Exercise B2

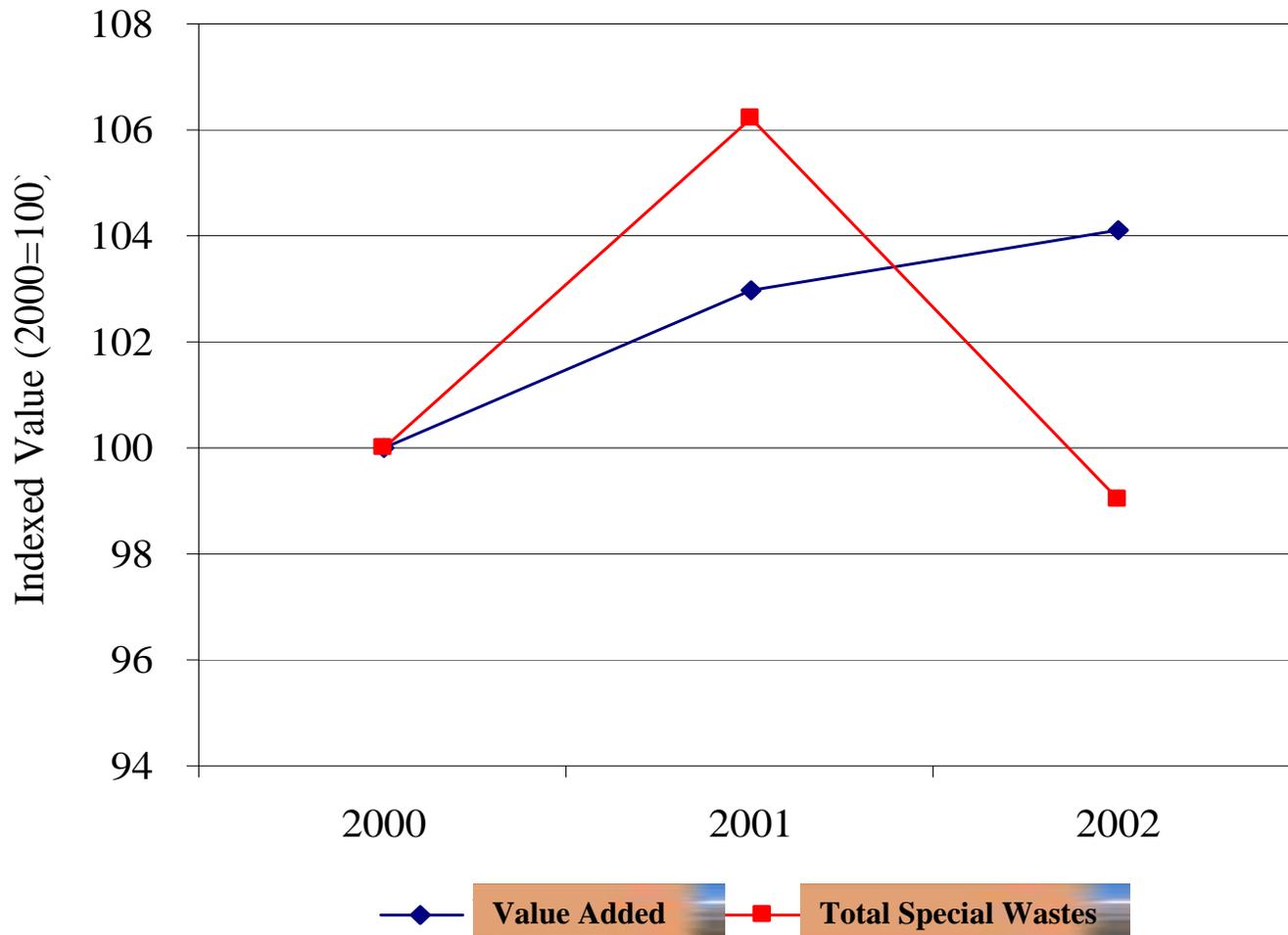
Based on the following graph, in which periods does not have sense to investigate the decoupling presence and why?



*b) In the period 2000-2001 doesn't occur a condition of economic development, then doesn't have sense to investigate the decoupling presence;*

## Solution Exercise B3

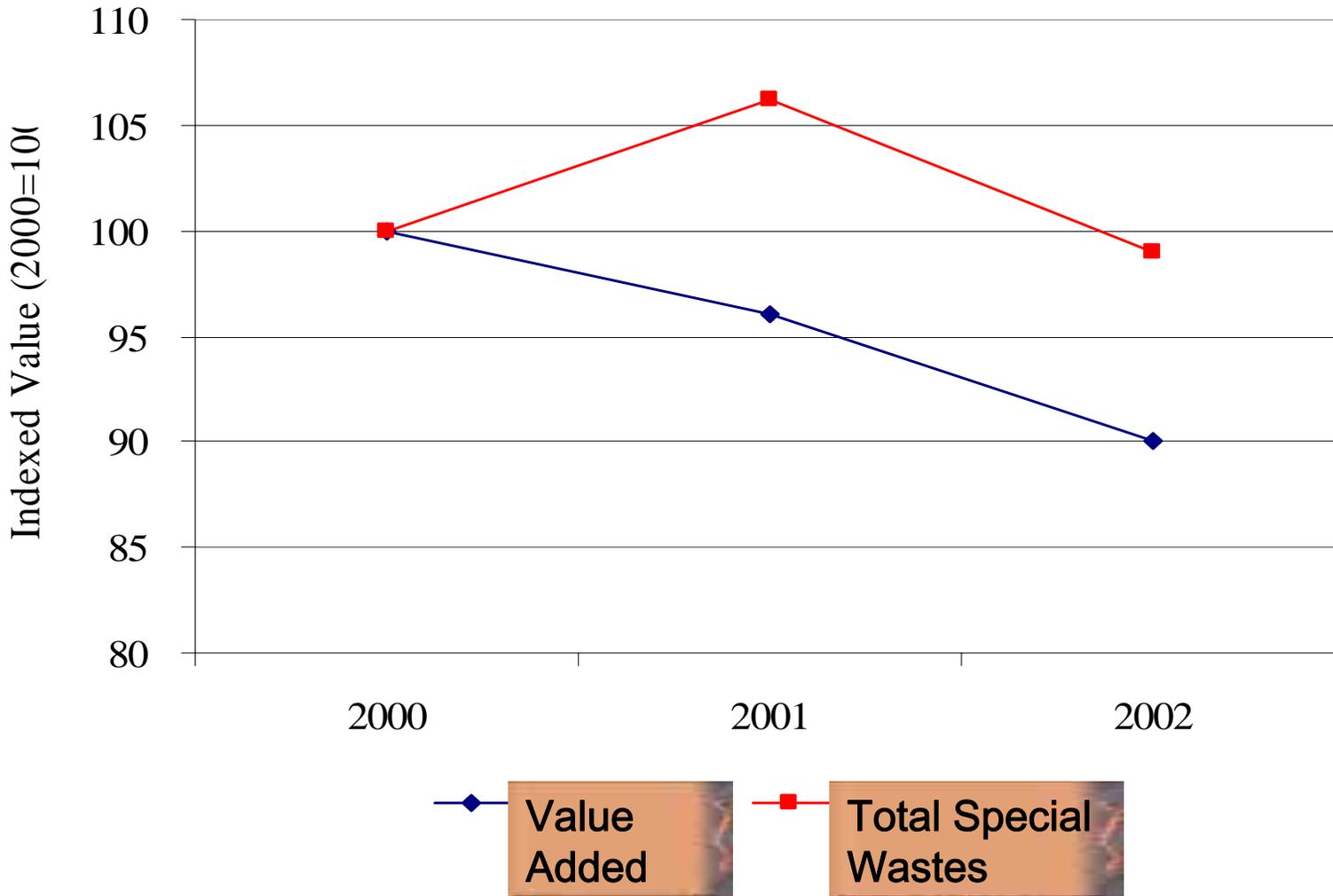
Based on the following graph, in which periods does not have sense to investigate the decoupling presence and why?



*c) Has always sense because, in every period, a condition of development is occurred*

## Solution Exercise B4

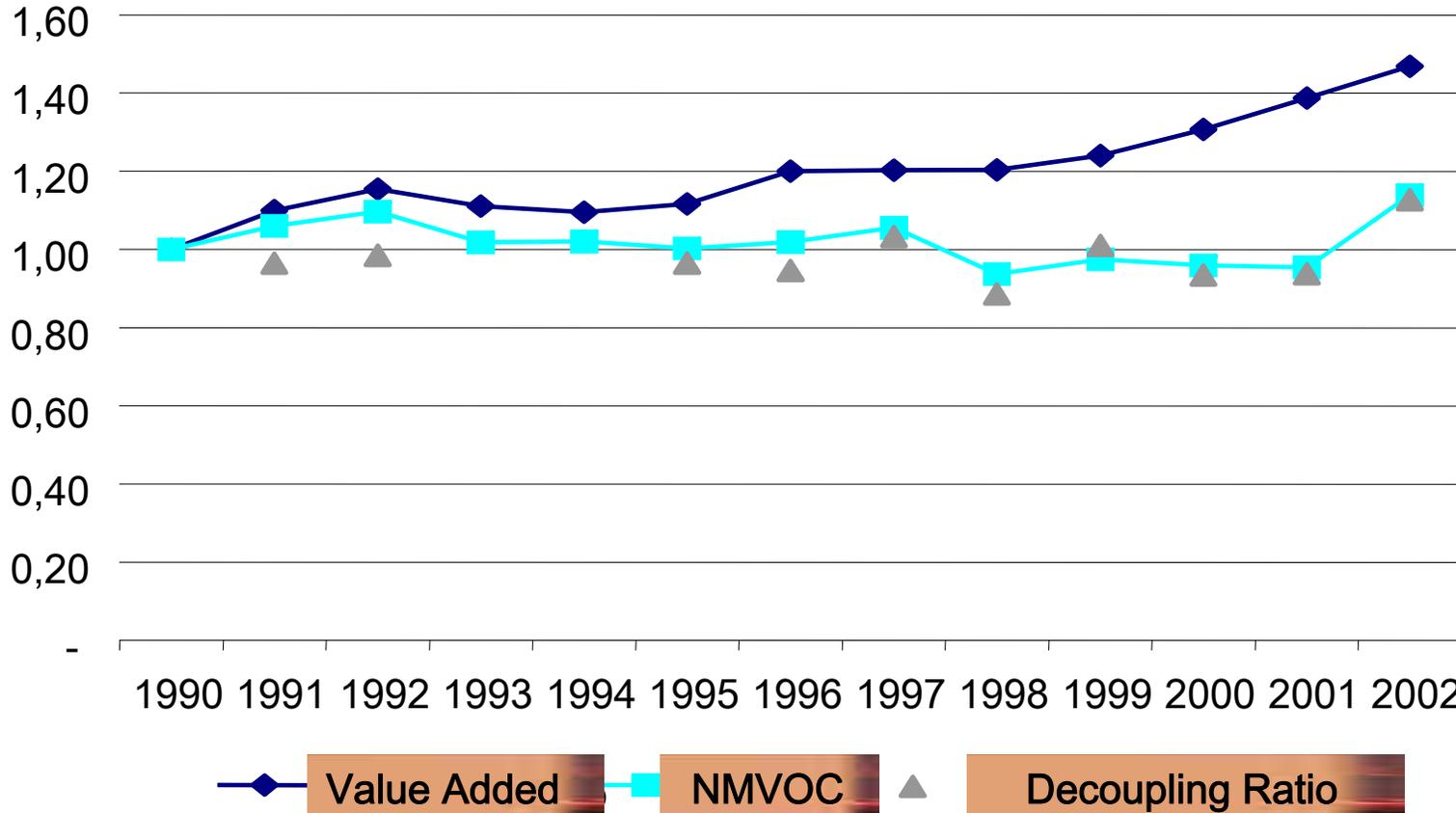
Based on the following graph, in which periods does not have sense to investigate the decoupling presence and why?



*d) Hasn't never sense because, in every period, a condition of development doesn't exist.*

## Solution Exercise C1

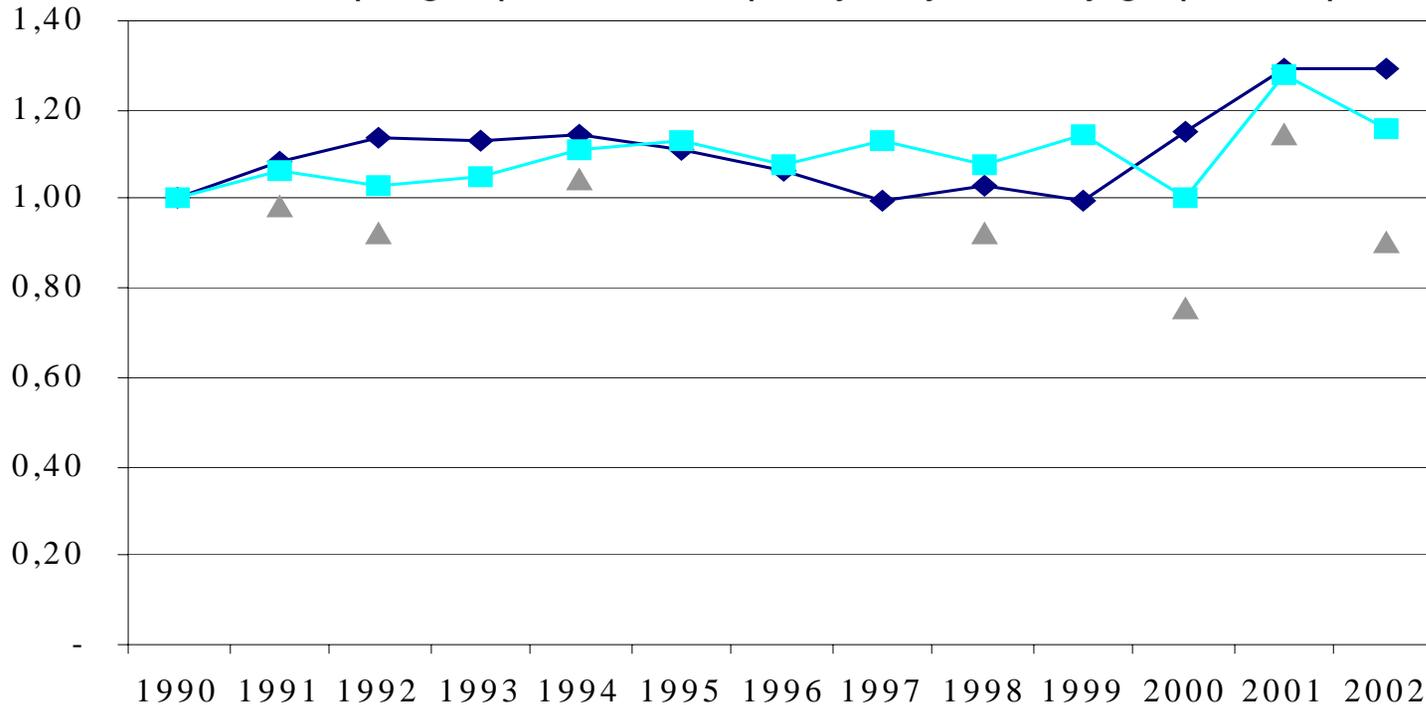
Establish where the decoupling is present and qualify it by the only graphic help.



Between 1990 and 1992 the decoupling is present in relative formality; among 1992 and 1994 it doesn't have sense investigate the decoupling because doesn't subsist a condition of development; among 1994 and 1995 the decoupling is absolute; among 1995 and 1996 it is relative; among 1996 and 1997 there is not decoupling; among 1997-1998 there is absolute decoupling; among 1998 and 1999 there is not decoupling; from 1999 to 2001 there is decoupling and it is absolute; among 2001 and 2002 there isn't decoupling.

## Solution Exercise C2

Establish where the decoupling is present and qualify it by the only graphic help.

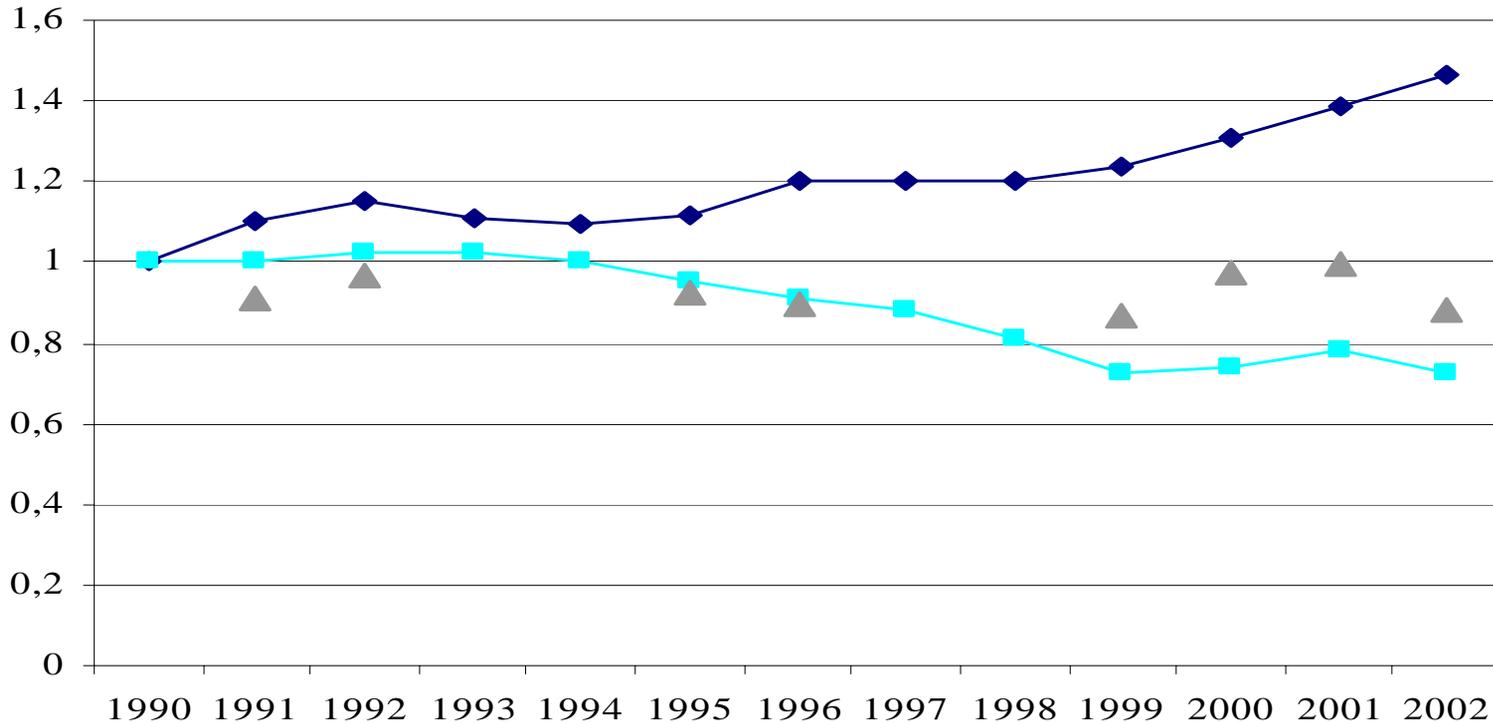


Value Added
  NO<sub>x</sub>
 Decoupling Ratio

Between 1990 and 1991 the decoupling is present in relative formality; among 1991 and 1992 there is an absolute decoupling. Among 1992 and 1993 a condition of development doesn't subsist therefore it doesn't have sense investigate; among 1993 and 1994 there is not decoupling; among 1994 and 1997 there is not development; among 1997 and 1998 there is an absolute decoupling; among 1998 and 1999 there is not development; among 1999 and 2000 there is an absolute decoupling; among 2000 and 2001 there is not decoupling; among 2001 and 2002 there is an absolute decoupling.

## Solution Exercise C3

Establish where the decoupling is present and qualify it by the only graphic help.

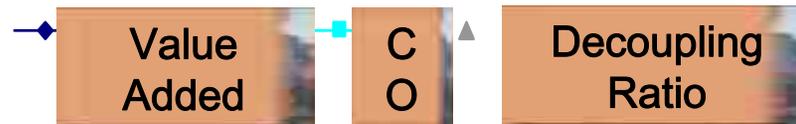
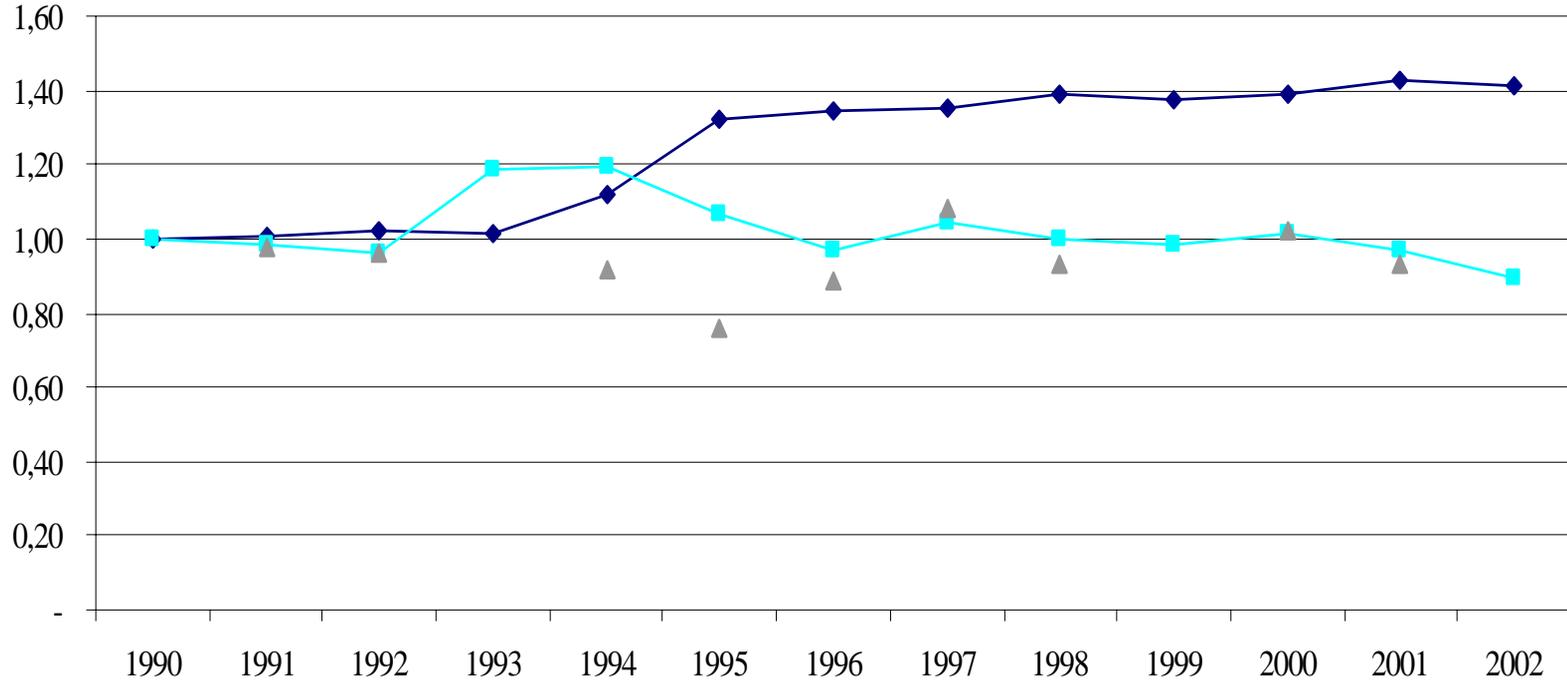


Value Added
  NO<sub>x</sub>
 Decoupling Ratio

Between 1990 and 1991 the decoupling is present in absolute formality; among 1991 and 1992 there is a relative decoupling. From 1992 to 1994 a condition of development doesn't subsist therefore it doesn't have sense investigate the presence of decoupling; from 1994 to 1996 there is an absolute decoupling; among 1996 and 1998 there is no development; among 1998 and 1999 there is an absolute decoupling; among 1999 and 2001 there is a relative decoupling; among 2001 and 2002 there is an absolute decoupling.

## Solution Exercise C4

Establish where the decoupling is present and qualify it by the only graphic help.



Between 1990 and 1992 the decoupling is present in absolute formality. From 1992 to 1993 a condition of development doesn't subsist therefore it doesn't have sense investigate the presence of decoupling; from 1993 to 1996 there is an absolute decoupling; between 1996 and 1997 and between 1999 and 2000 there isn't decoupling, because environmental pressure growth more than value added; among 1997 and 1998 there is an absolute decoupling; among 1998 and 1999 and 2001-2002 there isn't a development; among 2000 and 2001 there is an absolute decoupling.

## Solution Exercise D1

Verify the decoupling existence for the period 1999-2002 by decoupling factor calculation.

	1999	2000	2001	2002
	t			
<b>Steel production</b>	24.780.357	26.622.561	26.526.195	26.301.427
<b>SO<sub>x</sub> Emissions</b>	382	398	375	450

1) To Index values:

	1999	2000	2001	2002
<b>Steel production</b>	100	107	107	106
<b>SO<sub>x</sub> Emissions</b>	100	104	98	117

2) To calculate rate

$$\text{Decoupling Ratio [1999-2002]} = (117/106)/(100/100) = 1,10$$

3) Decoupling factor [1999-2002] =  $1 - 1,10 = -0,10 \rightarrow$  NO DECOUPLING

## Solution Exercise D2

Verify the decoupling existence for the period 1999-2002 by decoupling factor calculation.

	1999	2000	2001	2002
	t			
<b>Steel production</b>	22.580.357	23.322.561	24.526.195	25.301.427
<b>SO<sub>x</sub> Emissions</b>	382	360	320	280

1) To Index values:

	1999	2000	2001	2002
<b>Steel production</b>	100	103	109	112
<b>SO<sub>x</sub> Emissions</b>	100	94	84	73

2) To calculate rate

$$\text{Decoupling Ratio [1999-2002]} = (84/109)/(100/100) = 0,77$$

3) Decoupling factor [1999-2002] =  $1 - 0,77 = 0,23 \rightarrow$  DECOUPLING!!!

## Solution Exercise D3

Verify the decoupling existence for the period 1999-2002 by decoupling factor calculation.

	1999	2000	2001	2002
	t			
<b>Steel production</b>	24.780.357	26.622.561	26.526.195	26.301.427
<b>SO<sub>x</sub> Emissions</b>	382	398	375	349

1) To Index values:

	1999	2000	2001	2002
<b>Steel production</b>	100	107	107	106
<b>SO<sub>x</sub> Emissions</b>	100	104	98	91

2) To calculate rate

$$\text{Decoupling Ratio [1999-2002]} = (91/106)/(100/100) = 0,86$$

3) Decoupling factor [1999-2002] =  $1 - 0,86 = 0,14 \rightarrow$  DECOUPLING!!!

## Solution Exercise D4

Verify the decoupling existence for the period 1999-2002 by decoupling factor calculation.

	1999	2000	2001	2002
	t			
<b>Paper production</b>	78.397	79.987	78.562	71.714
<b>SO<sub>x</sub> Emissions</b>	510	480	460	450

1) To Index values:

	1999	2000	2001	2002
<b>Paper production</b>	100	102	100	91
<b>SO<sub>x</sub> Emissions</b>	100	94	90	88

2) To calculate rate

$$\text{Decoupling Ratio [1999-2002]} = (88/91)/(100/100) = 0,96$$

3) Decoupling factor [1999-2002] =  $1 - 0,96 = 0,04 \rightarrow \text{DECOUPLING!!!}$

## Solution Exercise E1

Verify the decoupling existence in the period 2000-2002 between the “determinant” and the “pressure” indicators synthetically expressed in the following.

1) "Specific NOx emissions in the chemical industry"

Driving force = production of the sector (t)

Pressure = general emissions (g)

<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>g/t</b>		
89,07	90,24	76,44

2) Decoupling Ratio [2000-2002] =  $(76,44/89,07) = 0,86 \rightarrow$  DECOUPLING!!!

## Solution Exercise E2

Verify the decoupling existence in the period 2000-2002 between the “determinant” and the “pressure” indicators synthetically expressed in the following.

1) "Specific NOx emissions in the iron industry"

Driving force = production of the sector (t)

Pressure = general emissions (g)

<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>g/t</b>		
2742	2645	2600

2) Decoupling Ratio [2000-2002] =  $(2600/2742) = 0,95 \rightarrow$  DECOUPLING!!!

## Solution Exercise E3

Verify the decoupling existence in the period 2000-2002 between the “determinant” and the “pressure” indicators synthetically expressed in the following.

1) “Energetic intensity of the textile sector”

Driving force = sector GDP (millions of €)

Pressure = energetic consume (equivalent petroleum tons)

<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>ept/millions of €</b>		
104	107	115

2) Decoupling Ratio [2000-2002] =  $(115/104) = 1,1 \rightarrow$  NO DECOUPLING!!!

## Solution Exercise E4

Verify the decoupling existence in the period 2000-2002 between the “determinant” and the “pressure” indicators synthetically expressed in the following.

1) “Energetic intensity of the textile sector”

Driving force = sector GDP (millions of €)

Pressure = energetic consume (equivalent petroleum tons)

<b>2000</b>	<b>2001</b>	<b>2002</b>
<b>ept/millions of €</b>		
190	193,7	197,2

2) Decoupling Ratio [2000-2002] =  $(197,2/190) = 1,03 \rightarrow$  NO DECOUPLING!!!