

# The terrestrial N and P cycles summarized

**TABLE 5.15** Terrestrial Nitrogen Cycle

Process	Total Flux (Tg N/yr)	Percent of Total Input or Output	Anthropogenic Flux (Tg N/yr)	Reference
<i>Land input</i>				
Biological fixation	139	49	44	Burns and Hardy 1975
Fertilizers & industry	85	30	85	FAO 1989
Precipitation and dry deposition	61	21	37	Table 3.15
<b>Total input</b>	<b>285</b>	<b>100</b>	<b>166</b>	
<i>Land output</i>				
River N	49–62	19	13–27	Table 5.16
Denitrification to N <sub>2</sub> , N <sub>2</sub> O	179	63	?	To balance (see text)
NH <sub>3</sub> gas loss	37	13	27	(See Chapter 3)
NO <sub>x</sub> : soil gas loss and biomass burning	14	5	5	(See Chapter 3)
<b>Total output</b>	<b>279–292</b>	<b>100</b>	<b>&gt;45</b>	

Note: Tg = 10<sup>6</sup> metric tons = 10<sup>12</sup> g.

Berner and Berner, "Global Environment"

**TABLE 5.17** Phosphorus Fluxes in Rivers and Rain (in Tg P/yr)

Source	Total Flux		Polluted Part	Reference
<i>P in river runoff</i>				
Dissolved ortho-P	0.8	<b>Inorg Org</b>	0.4	Meybeck 1982; 1993
Dissolved organic P <sup>a</sup>	1.2		0.6	
<b>Total dissolved P</b>	<b>2.0</b>		<b>1.0</b>	Meybeck 1982; 1993
Particulate organic-P	8.0	<b>Inorg Org</b>	?	Meybeck 1982; 1993
Particulate inorganic-P <sup>a</sup>	12.		?	
<b>Total particulate P</b>	<b>20.0</b>		<b>?</b>	Meybeck 1982; 1993
<b>Total output</b>	<b>22</b>		<b>&gt;1</b>	
<b>Reactive P output<sup>b</sup></b>	<b>5</b>			See text
<i>P in rain + dry deposition to land</i>				
Soil particle origin	3.0		0.2	Graham and Duce 1979
Industry, combustion	0.21		0.21	Graham and Duce 1979
Sea salt	0.03		—	Graham and Duce 1979
<b>Total rain and dry deposition</b>	<b>3.2</b>		<b>0.41</b>	
<b>Rain only to land</b>	<b>1.0</b>		<b>—</b>	Meybeck 1982

<sup>a</sup> Calculated by difference from total; no data.

Berner and Berner, "Global Environment"

<sup>b</sup> Total dissolved P plus 15% of particulate P (after Berner and Rao 1994).

**TABLE 5.16** River Nitrogen Transport (in Tg N/yr)

	Natural	Pollution	Total
<i>Dissolved N</i>			
DIN			
NO <sub>3</sub> <sup>-</sup> N	4.0	<b>Inorganic</b>	
NH <sub>4</sub> <sup>+</sup> N	0.5		
DON	10.0	<b>Organic</b>	
<b>Total dissolved</b>	<b>14.5</b>	<b>7<sup>a</sup>–21<sup>b</sup></b>	<b>22<sup>a</sup>–36<sup>b</sup></b>
Particulate N (PN)	21	6 <sup>b</sup>	27–33 <sup>c</sup>
<b>Total N (TN)</b>		<b>Inorg + Org</b>	<b>49–63</b>
Reactive N <sup>d</sup>			28–42

Note: <sup>a</sup> Meybeck 1993.

<sup>b</sup> Wolast 1993.

<sup>c</sup> Meybeck (1993), 21 Tg; Ittekkot and Zhang (1989), 33 Tg; Wolast (1993), 27 Tg.

<sup>d</sup> Total dissolved N plus 22% of PN; see text.

Source: Meybeck 1982; 1993, except where noted.

Berner and Berner, "Global Environment"

✿ N and P cycle in inorganic and organic forms (bound in organic compounds).

✿ N and P cycle in dissolved and particulate forms.

✿ Anthropogenic (pollutive) fluxes of both elements are ~50% of today's total N and P cycles.