

UCH-FC
D. Ambiental
A836
C.1



Universidad de Chile
Facultad de Ciencias

¿PUEDE CHILE INVERTIR EN LA CONSERVACIÓN DE SU BIODIVERSIDAD?

Marianne Verónica Asmüssen Soto

2006



“¿PUEDE CHILE INVERTIR EN LA CONSERVACIÓN DE SU BIODIVERSIDAD?”

Seminario de Título entregado a la Universidad de Chile
en cumplimiento parcial de los requisitos para optar al Título de
Biólogo con Mención en Medio Ambiente

MARIANNE VERÓNICA ASMÜSSEN SOTO

Dr. Javier Andrés Simonetti Zambelli
Director Seminario de Título

Handwritten signature of Javier Andrés Simonetti Zambelli in black ink.

Comisión Revisora

Prof. Italo Serey Estay
Presidente

Handwritten signature of Italo Serey Estay in blue ink.

Prof. Carmen Luz de la Maza Asquet
Corrector

Handwritten signature of Carmen Luz de la Maza Asquet in blue ink.

Santiago, Agosto de 2006.



“Para Sylvia”

“Debemos proteger y valorar adecuadamente nuestro patrimonio natural. La actual indiferencia hacia la pérdida de biodiversidad, sólo daña nuestras posibilidades de desarrollo tanto económico, cultural como social. Con este trabajo quiero ayudar a generar conciencia real que permita tomar acciones efectivas de inversión hacia la conservación y avanzar de esta manera, al desarrollo sustentable que la sociedad actual tanto anhela”.

AGRADECIMIENTOS

Este trabajo quiero dedicárselo a mi abuela y mejor amiga Sylvia. Sin sus cuidados, consejos, enseñanzas, dedicación, amor y recuerdo nada de esto hubiera sido posible.

Quiero agradecer en especial al maestro antes que doctor Javier A. Simonetti, por su paciencia, exigencia y apoyo tanto en el ámbito académico como personal. Ha sido una excelente experiencia poder compartir este tiempo con usted, gracias por permitírmelo.

A mi familia que me ha apoyado y más aún soportado. Perdonen los largos períodos de ausencia, pero finalmente valió la pena. Mis amigos, si los nombrara a todos estas páginas serían más largas que mi tesis, sin embargo, no puedo dejar de mencionar a Jennifer y Camila, mis grandes soportes; mis compañeros de Universidad que hicieron más fáciles y entretenidas las largas horas de estudio, gracias por las críticas y el cariño que me han dado. A Paola y Alejandra, no se que hubiera hecho sin ustedes, gracias por facilitar mucho mis últimos meses de trabajo.

También fueron muy importantes en este proceso Sergio, Álvaro, Sebastián, Yuri, Alejandra Muñoz, Araceli, Rony y Renzo. Y finalmente, quiero agradecer a Gonzalo por todo su amor y apoyo.

Bueno a todos, ¡muchas gracias!

ÍNDICE

AGRADECIMIENTOS.....	iii
RESUMEN.....	v
ABSTRACT.....	viii
INTRODUCTION.....	1
METHODS.....	4
RESULTS.....	7
DISCUSSION.....	10
REFERENCES.....	12

ÍNDICE DE FIGURAS

Figure 1 Estimatie of the SNASPE's operational deficit.....	7
Figura 2 Capacity of the State to overcome SNASPE's operational deficit, through government's expenditures in the D.L. 701.....	8
Figura 3 Capacity of the State to overcome SNASPE's operational deficit maintaining D.L. 701.....	9

ÍNDICE DE TABLAS

Table 1 Annual costs of biodiversity conservation.....	4
Table 2 Government expenditures in D.L. 701 and income by tributary route (CONAF 1998; INFOR 2005).....	5

¿Puede Chile invertir en la conservación de su biodiversidad?

Marianne Verónica Asmüssen Soto

Departamento de Ciencias Ecológicas, Facultad de Ciencias, Universidad de Chile.

RESUMEN

La severa amenaza de extinción que sufre la biodiversidad requiere tomar acciones para proteger este patrimonio natural de la humanidad. El establecimiento de áreas protegidas representa una aproximación clave. Sin embargo, estas presentan un déficit financiero crónico que pone en riesgo su eficiencia. Paradójicamente, muchos países solventan subsidios perversos, financiando actividades que generan impactos ambientales negativos que amenazan la conservación de la biodiversidad.

En Chile, la conservación de la flora y fauna se realiza principalmente a través de parques y reservas nacionales. Un 19% del territorio está bajo el Sistema Nacional de Áreas Protegidas del Estado (SNASPE), el cual recibe sólo 0,03% del presupuesto nacional lo que genera un déficit financiero operacional que amenaza su éxito. En contraste, Chile gasta en el Decreto Ley 701 (D.L. 701) que subsidia al sector forestal promoviendo la conversión del bosque nativo con consecuencias negativas sobre la biodiversidad.

Aquí, evalúo la capacidad económica de Chile para cubrir el déficit. Para ello, comparé el déficit con: a) el gasto gubernamental asociado al D.L. 701 y b) la ganancia vía impuestos generados, una vez recuperado el gasto en el D.L. 701. Basado en estadísticas oficiales, Chile gasta 3,7 veces más en subsidios forestales y recibe 11,6 veces más desde la industria forestal de lo que invierte en el SNASPE. Estas comparaciones revelan que Chile dispone de fondos para cubrir el déficit operacional del SNASPE, incluso manteniendo en funciones el D.L. 701. Aún más, hay fondos suficientes que podrían invertirse en otros programas de conservación como el mejoramiento en la

representación ecosistémica dentro de áreas protegidas. Por lo tanto, el déficit se produce más por falta de voluntad política, que por un problema de escasez de recursos financieros. Chile tiene los recursos para financiar la conservación de su patrimonio biológico.

Palabras Clave: Biodiversidad, áreas protegidas, SNASPE, subsidios perversos, Decreto Ley 701.

ABSTRACT

The severe threat of extinction to biodiversity requires actions in order to protect Humanity's natural heritage. The establishment of protected areas is a keystone in this task. However, these areas exhibit a chronic financial deficit that undermines efficiency. Paradoxically, many countries offer perverse subsidies funding activities that have negative environmental impacts, further threatening biodiversity.

In Chile, biodiversity conservation is largely pursued by protecting it in national parks and reserves. Currently, 19% of the country is under the National System of State Protected Areas (SNASPE). However, only 0,03% of the Chilean national budget is allocated to its management, suffering an operational deficit which menaces its success. In contrast, Chilean Decree Law 701 (D.L. 701) subsidizes forestry activity promoting the replacement of native forest, with negative consequences on biodiversity.

Here, I assess whether Chile has the economic capacity to close this deficit. In order to do so, I compared SNASPE's deficit with a) the direct spending from D.L. 701 and b) the State's earnings through taxation, once the investment in subsidies is discounted from taxes collected. Based on official statistics, Chile invests 3,7 times more funds in forestry subsidies, and receives 11,6 times more funds from forestry industry than the investment in SNASPE. All cases reveal that Chile has funds enough to overcome SNASPE's operational deficit, even maintaining D.L. 701 operational. Furthermore, there could be funds enough to invest in other conservation programs such as improving ecosystem representation within protected areas. Therefore, the current deficit reveals lack of political will rather than a shortage of financial resources. Chile can support the conservation of its biological heritage.

Key Words: Biodiversity, protected areas, SNASPE, "perverse subsidies", Decree Law 701.

INTRODUCTION

Biodiversity faces severe extinction threats (Dirzo & Raven 2003). Due to anthropogenic actions, the current species extinction rate might be up four orders of magnitude higher than the one observed in the fossil record (May et al. 1995). Contemporary extinctions involve a decline of Humanity's natural heritage and the consequent reduction of goods and services that biological diversity provides to society, negatively impinging upon social, cultural and economic development (Costanza et al. 1997).

Protected areas are the keystone for biological conservation being one of the most important and oldest biodiversity conservation approaches (McNeely 1994; McKinney 2002). The 2003 United Nations List of Protected Areas shows that 12% of the Earth's terrestrial surface is under some level of governmental protection (approximately 18.8 million km²). The establishment and operation of protected areas requires permanent funding. World-wide spending is insufficient and varies widely across countries, reaching an estimated annual total of US\$ 6.0 billion, or US\$ 450 km²/yr, 88% of which is spent by developed nations (James et al. 1999). Budgets allocated to protected areas are often perceived as an "expense" rather than an investment, leading to a chronic financial deficit that undermines their efficiency, despite the important benefits protected areas grant to our society (Chapin et al. 2000; Mills 2002).

Paradoxically, governments often direct public funds to defray the costs of activities that have an adverse impact upon biodiversity (de Moor and Calaimai 1997). Subsidies supporting agricultural production, commercial fisheries and forestry, keep prices for producers and consumers below market levels, thereby encouraging resource

overexploitation (Porter 1998). Furthermore, these “perverse” subsidies indirectly harm protected areas, capturing funds otherwise assignable to their operational costs (Robin et al. 2003). In fact, just 2% of the US\$ 950 billion spent yearly on “perverse” subsidies would cover the current operational deficit of protected areas, ensuring the conservation of biodiversity (James et al. 2001).

In this context, Latin America is not an exception. In Chile, the establishment of protected areas dates to 1907. Currently, the National System of State Protected Areas (SNASPE for its initials in Spanish) comprises 94 units, including 31 National Parks, 48 National Reserves and 15 Natural Monuments, covering 19% (141.252,73 km²) of continental Chile. These areas are aimed at protecting representative samples of Chilean biodiversity (Pauchard & Villarroel 2002).

Chile has unique ecosystems, ranging from the driest desert in the world, the Atacama, to the southernmost temperate rainforests, with a biota holding high levels of endemisms (Simonetti et al. 1995). This biota is regarded as an international priority for conservation (Biodiversity Support Program et al. 1995). However, the SNASPE receives only 0,03% of the Nation’s budget (CONAF 2005). Limited funding precludes proper control and conservation activities inside protected areas, menacing their success (Pauchard & Villarroel 2002; OCDE 2005). In sharp contrast, Chile subsidizes the forestry industry. Issued in 1974, Decree Law 701 (D.L. 701) and its later modifications, provide subsidies for afforestation costs as well as tax reductions to the forestry industry (Lara & Veblen 1993), a factor that sprung the expansion of plantations with exotic species (largely *Pinus radiata*) and, as a consequence, a replacement of native forests and reduction of biodiversity (Núñez 1992; Lara & Veblen 1993; Figueroa et al. 1996; Clapp 2001). Therefore, if public funds are being privatized and allocated to

subsidize environmentally harmful activities, couldn't Chile invest in biodiversity conservation?

Here, I analyze if Chile has or has had the economic capacity to overcome the operational deficit of SNASPE comparing this deficit with two different figures: a) direct governmental expenditures in D.L. 701 and b) the State earnings, that is the amount of economic resources earned by State after governmental expenditure in subsidies are discounted from tax revenue. If any of these figures is larger than SNASPE's operational deficit, Chile could support its biodiversity conservation but under different scenarios. While in the first comparison, it might imply reducing forestry subsidies setting the ground for a potential "conservation vs growth" debate, in the second comparison, if profits are available, covering operational deficit of SNASPE is economically feasible without impinging upon subsidies, hence "growth".

METHODS

In order to assess the SNASPE's annual operational deficit, I gathered information about the annual budget allocated to it from 1996 to 2004 (CONAF 2005). Afterward, I calculated the operational cost of the SNASPE based on two different estimates, a national and an international one, advanced by Action Forest Plan for Chile (PAF-CHILE 1994) and James et al. (2001), respectively. They offer estimates of the cost/km² for proper conservation activities. The product between each one of them and the current SNASPE's area provides two levels of funding requirements (Table 1). If current annual budget is subtracted from these figures, the SNASPE's annual operational deficit is estimated (Figure 1). All figures are expressed in US\$ dollars. Chilean currency was converted into US\$ dollars at a fixed 2005 exchange rate.

Table 1. Annual costs of biodiversity conservation. Based in two different estimates, a national and an international one, advanced by Action Forest Plan for Chile (PAF-CHILE 1994) and James et al. (2001), respectively.

#	Estimation	Conservation cost (US\$/ km ²)	Protected Area (km ²)	Requirement (US\$)
1	James et al. (2001)	305	141.252,73	43.050.273
2	PAF-CHILE (1994)	88	141.252,73	12.429.929

To assess Chilean capability to cover SNASPE's annual operational deficit, I used two figures:

- a) Direct expenditures: I compared the expenditures associated with D.L. 701 with SNASPE's operational deficit. The difference between these figures is a gross indicator of capacity of the State to overcome SNASPE's deficit. Funds allocated

to D.L. 701 were calculated for the period 1996- 2004. These funds are allocated to bonus plantations, management, prunes, and recovery of degraded lands on private lands. Additionally, it also cover costs incurred by the Forestry National Corporation (CONAF for initials in Spanish) to implement and administer activities associated with D.L. 701 (Table 2).

Table 2. Government expenditures in D.L. 701 and income by tributary route (CONAF 1998; INFOR 2005)

Year	Government expenditures in D.L. 701			Total Taxes (US\$)
	Cost for bonus (US\$)	Administration cost of CONAF (US\$)	Total expenditure (US\$)	
1996	19.448.410	7.330.546	26.778.957	45.669.681
1997	9.459.679	7.301.642	16.761.321	55.398.222
1998	9.504.917	7.274.182	16.779.099	71.656.399
1999	12.006.653	7.248.094	19.254.747	76.393.883
2000	13.405.813	7.223.311	20.629.124	74.371.674
2001	8.370.018	7.199.766	15.569.784	90.121.797
2002	13.062.854	7.177.400	20.240.254	81.732.612
2003	25.408.772	7.156.152	32.564.924	77.271.475
2004	32.914.804	7.135.963	40.050.768	78.727.084
Mean	15.953.547	7.227.451	23.180.997	72.371.425

b) State's earnings: Finally, I used estimates by CONAF (1998) on the State's earnings increase as a result of D.L. 701 implementation. The income corresponds to revenues in terms of Chilean taxes, including the Complementary Global Tax, the First Category Rent Tax and Added Value Tax (Table 2). To obtain the net productive increase of the State, I estimated the difference between the State's income by taxation and governmental cost for implementation of the D.L. 701. Earnings are assessed as the difference between revenues by taxation and governmental expenditures in D.L.701. I

compared this result with SNASPE's operational deficit. The difference between these figures is an indicator of the capacity of the State to overcome SNASPE's deficit without affecting the application of the D.L. 701, as the same amount for further investing in it would be still available.

RESULTS

On average, Chile invests US\$ 6.208.292 per year supporting the SNASPE. This amount is lower than the operative costs of SNASPE according to both the national and international estimations. Operational deficit ranges from US\$ 6.221.638 to US\$ 36.841.981 per year, that is a 108 to 619% of current budget (Figure 1).

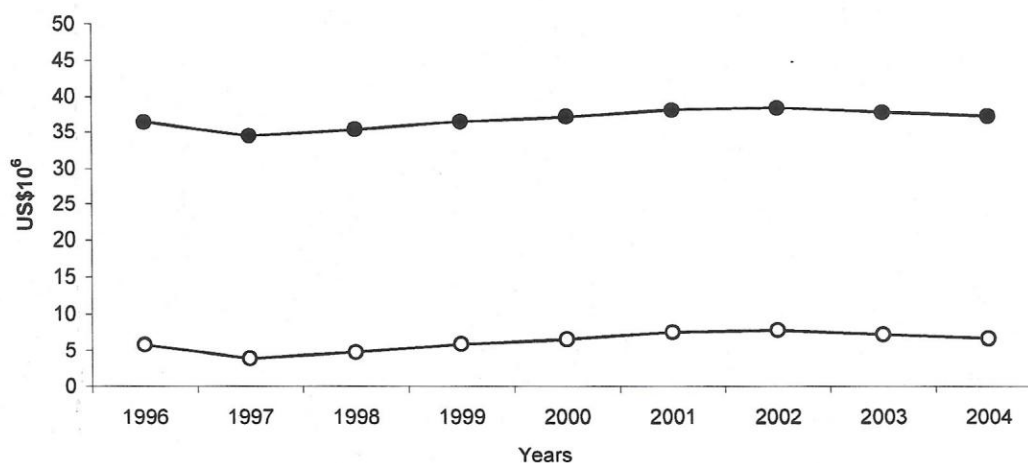


Figure 1. Estimation of the SNASPE's operational deficit. Figures are based on an international estimate (James et al. 2001, full dots) and a national one (PAF-CHILE 1994; open dots), expressed as US\$km²

Regarding Chilean capability to cover SNASPE's annual operational deficit, our two estimates suggest funding availability:

- a) Direct investment in D.L. 701 is 1,9 times higher than the SNASPE's operational deficit assessed by PAF-CHILE (1994), but covers just 63% of the operational deficit is assessed by James et al. (2001). Nevertheless, in 2004, the figures

would have overcome SNASPE's deficit regardless if assessed at a national or international standard (Figure 2).

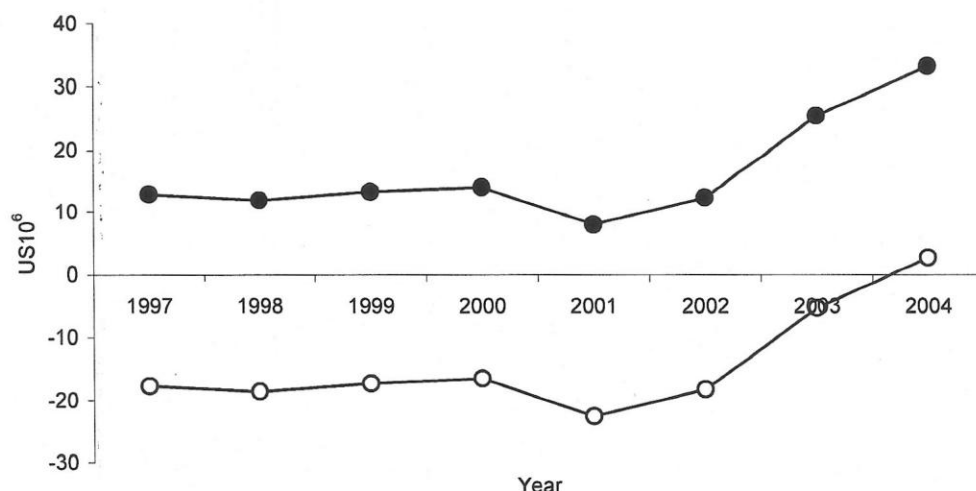


Figure 2. Capacity of the State to overcome SNASPE's operational deficit, through government's expenditures in the D.L. 701. Open dots are from international estimation (James et al. 2001) and full dots are from national estimation (PAF-CHILE 1994).

- b) Earnings: The comparison between taxes generated as a result of D. L. 701 implementation and SNASPE's deficit reveals that taxes reach an average of US\$ 72.371.425 per year (Table 2). After discounting governmental expenditures in D.L.701, there is a positive figure. Therefore, Chile is profiting from the subsidy to forestry activity. On average, Chile generates US\$ 49.190.000 yr⁻¹ as a profit, ranging from as low as US\$ 18 million in 1996 up to US\$ 74 million in 2001. If the operational deficit (US\$ 6 or 36 million, depending on national or international assessment) is discounted from the revenues, the resulting figure is still positive excepting 1996. From 1997 onward, Chile has had funding enough to cover 100% of SNASPE's deficit and still have funds to cover other activities. The amount of funds after discounting expenditures and

deficit from tax revenues range from US\$1 up to 67 million pending on deficit estimate used (Figure 3).

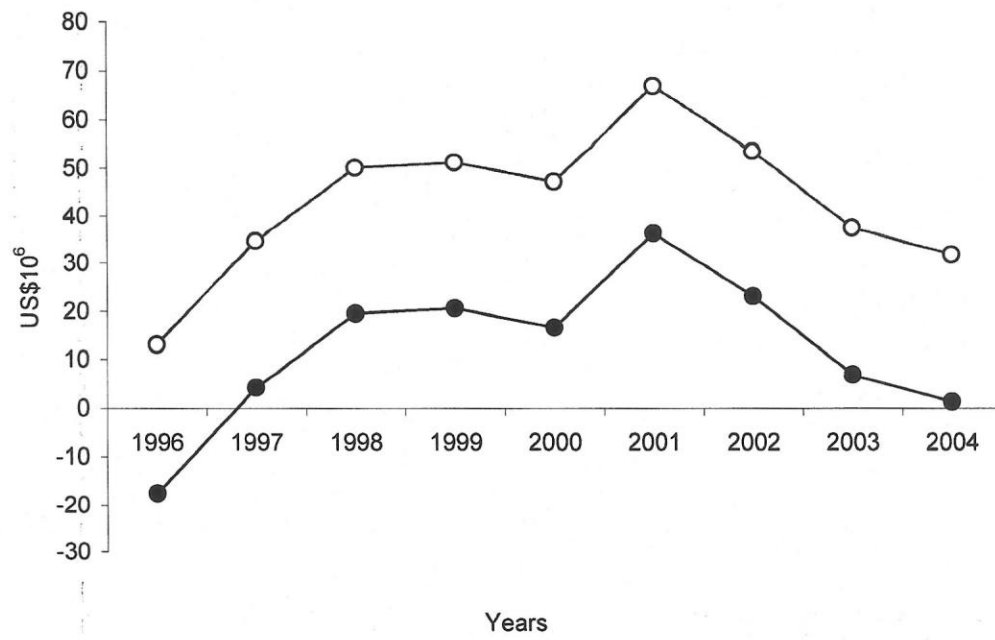


Figure 3 Capacity of the State to overcome SNASPE's operational deficit maintaining D.L. 701. Open dots are from national estimation (PAF-CHILE 1994) and full dots are from international estimation (James et al. 2001)

DISCUSSION

The SNASPE in Chile, as is often the case in developing countries, has an operational deficit that menaces biodiversity conservation. A simple analysis of subsidies allocated to the forestry sector demonstrates that Chile has had resources enough to overcome the SNASPE's operational deficit, even under standards at an international level. Therefore, SNASPE's deficit is mainly a political decision rather fund shortage.

In the case of the D.L. 701, a political decision has allowed an increase in the forestry sector (Lara & Veblen 1993) turning it into the second most important economic activity contributing 3.4% of the GNP (INFOR 2005). Nevertheless, currently a state subsidy to a totally developed industry with high international competitiveness is not justified (Fierro and Morales 1994; Chacón 1998; CONAF 1998). It should be noticed that D.L. 701 involves a tax reduction to forestry activities (Valdebenito 2005). Even though, revenues by taxation are large enough to cover SNASPE's deficit and embrace other conservation activities. Regardless of how environmentally negative the application of D.L. 701 could be, if profits are allocated to conservation measures, such action could not only partially mitigate the environmental impact of forestry but also secure the proper funding of Chilean protected areas, even under high economic requirement, such as James et al. (2001).

Therefore, Chile is in good stead for the allocation of funds to overcome the SNASPE's deficit and even to finance additional activities like improving ecosystem representation in the SNASPE (OCDE 2005). However, governamental policies do not recognize the value of biodiversity as a vital asset and, therefore, resources needed to ensure biodiversity conservation are not allocated (Souter 2000; OCDE 2005).

Chile is only one case. Many types of perverse subsidies exist in countries such as Colombia, Ecuador, Peru, Bolivia and Mexico, among others. In fact, developing countries spend US\$ 205 billion just in subsidies to agriculture (Myers & Kent 2001). Therefore, funds might be available for conservation of biodiversity not only in Chile but other developing countries. What seems to be missing is the political will to allocated such funds, despite the need to maintain our natural heritage and the services they provide.

REFERENCES

- Biodiversity Support Program, Conservation International, The Nature Conservancy, Wildlife Conservation Society, World Resources Institute & World Wildlife Fund. 1995. A regional analysis of geographic priorities for biodiversity conservation in Latin America and the Caribbean. Biodiversity Support Program. Washington D.C, 140 pp.
- Chacón, I. 1998. Evaluación económica del D. L. 701 en la VII región. Serie Estudios 1. Facultad de Ciencias Forestales. Universidad de Talca. Talca.
- Chapin, F.S., E.S. Zavaleta, V.T. Eviner, R.L. Naylor, P.M. Vitousek, H. L. Reynolds, D.U. Hooper, S. Lavorel, O.E. Sala, S.E. Hobbie, M.C. Mack and S. Díaz 2000. Consequences of changing biodiversity. *Nature* 405: 234-242.
- Clapp, R. 2001. Tree farming and forest conservation in Chile: do replacement forests leave any originals behind?. *Society and Natural Resources* 14: 341-356.
- CONAF. 1998. Evaluación de resultados de la aplicación del Decreto Ley N° 701 de 1974. Oficina de Estudios y Planificación. Corporación Nacional Forestal, Ministerio de Agricultura. Santiago, 140 pp.
- CONAF. 2005. Balance Presupuestario Anual. Documento interno. CONAF, Santiago.
- Constanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. O'Neill, J. Paruelo, R. Raskin, P. Sutton and M. Van den Belt. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253-260.
- De Moor, A., and P. Calamai. 1997. Subsidizing unsustainable development: undermining the Earth with public funds. The Earth Council. San José,. 66 pp.
- Dirzo, R., and P. H. Raven. 2003. Global state of biodiversity and loss. *Annual Review of Environment and Resources* 28: 137-167.
- Fierro, G., and R. Morales. 1994. Evaluación del subsidio de la forestación y propuesta para su continuación después de 1994. Publicación 95/06/C. Departamento de Ingeniería Industrial. Universidad de Chile, Santiago.
- Figueroa, E., G. Donoso, G. Lagos, R. Alvarez, and J. Muñoz. 1996. Sustentabilidad ambiental del sector exportador chileno. In: Sunkel. (ed.) Sustentabilidad ambiental del crecimiento económico chileno. Programa de desarrollo sustentable. Centro de Análisis de Políticas Públicas, Universidad de Chile, Santiago, 376 pp.
- INFOR. 2005. Boletín Estadístico 101. Estadísticas Forestales 2004. Instituto Forestal, Santiago, 159 pp.

- James, A.N., M.J.B. Green, J.R. Pain. 1999. Global review of protected areas budgets and staff. : WCMC – World Conservation Press, Cambridge, 23 pp.
- James, A., K.J. Gaston and A. Balmford. 2001. Can we afford to conserve biodiversity?. *BioScience* 51: 43-52.
- Lara, A., and T.T. Veblen 1993. Forest plantations in Chile: a successful model?. In: Mather A. (ed.) *Afforestation policies, planning and progress*. Belhaven Press., London: 118-139
- May, R.M., J.H. Lawton, and N.E. Stork. 1995. Assessing extinction rates. In: Lawton J.H. & May R.M. (eds.) *Extinction rates*. Oxford University Press, New York: 1-25.
- McKinney, M.L. 2002. Effects of national conservation spending and amount of protected area on species threat rates. *Conservation Biology* 16: 539–543.
- McNeely, J. 1994. Protected areas for the 21st century: working to provide benefits to society. *Biodiversity and Conservation* 3: 390-405.
- Mills, J. 2002. More than biodiversity: the socio-economic impact of implementing biodiversity action plants in the UK. *Journal of Environmental Planning and Management* 45: 533-547.
- Myers, N., and R. Kent. 2001. *Perverse subsidies: how tax dollars can undercut the environment and the economy*. Island Press, Washington, 267pp.
- Núñez, J. 1992. Desarrollo sustentable. Un análisis empírico en el sector forestal chileno. *Estudios de Economía* 19: 257-276.
- OCDE. 2005. *Environmental performance reviews - Chile*. Published by: OCDE. París, 230pp.
- PAF-CHILE. 1994. Proyecto de fortalecimiento nacional de áreas silvestres protegidas. In: *Plan de acción forestal para Chile*. Ministerio de Agricultura, Santiago: 36-41.
- Pauchard, A. and P. Villarroel. 2002. Protected areas in Chile: history, current status, and challenges. *Natural Areas Journal* 22: 318-324.
- Porter, G. 1998. *Natural resource subsidies, trade and environment: the cases of forests and fisheries*. Center for International Environmental Law, Washington, DC. Available from <http://www.ciel.org/Publications/NaturalResourceSubsidies.pdf> (accessed May 2006).
- Robin, S., R. Wolcott, and C.E. Quintela. 2003. *Perverse subsidies and the implications for biodiversity: a review of recent findings and status of policy reforms*. Vth World Parks Congress: Sustainable Finance Stream, Durban, South Africa. Available from http://www.conservationfinance.org/WPC/WPC_documents/Overview_PanB_Wolcott_v2.pdf (accessed May 2006).

- Simonetti, J., M.T.K. Arroyo, A. E. Espotorno, and E. Lozada. 1995. Diversidad biológica de Chile. Comisión Nacional de Investigación Científica y Tecnológica. Santiago, 361pp.
- Souter, R., L. Pancel, and E. de la Maza. 2000. Bosque nativo chileno: un recurso para el desarrollo. Proyecto CONAF/GRZ. Santiago, 92pp
- Valdebenito, G. 2005. Evaluación de efectividad del fomento forestal en Chile, período 1996-2003. Tesis Magíster. Facultad de Ciencias Físicas y Matemáticas. Universidad de Chile, Santiago, 97pp.