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Ground source heat pumps and environmental policy – The Finnish practitioner's point of view

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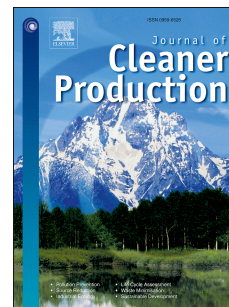
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1 **Ground source heat pumps and environmental policy – the Finnish** 2 **practitioner’s point of view**

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4 *Abstract*

5 Since the 1970s energy crises, and increasingly in recent years, ground source heat pumps have
6 attracted large interest as an instrument for energy conservation. Rapid growth of the industry has
7 raised questions about the environmental benefits and costs of heat pumps. Governments have
8 designed policies to both promote and regulate the industry. This study concentrates on the
9 development of the ground source heat pump industry in Finland, and on national policies and
10 regulations concerning the industry. The focus is on practitioners’ responses to heat pump
11 legislation, a topic so far overlooked by researchers, but also the users’ perspective is considered.
12 The study is based on interviews and questionnaire responses from heat pump professionals, heat
13 pump statistics, and literature. Six sectors of legislation and environmental policy are considered:
14 the regulation of ozone depleting substances and greenhouse gases in refrigerants, qualification
15 requirements imposed on the ground source heat pump industry, the permission procedure for
16 ground loop heat exchangers, legislation on groundwater protection, requirements and incentives
17 for heat pump efficiency and labelling, and public funding and subsidies for the industry. The
18 results show that policies have an important role in the development of the industry, and that
19 quality aspects deserve more attention in policies regarding e.g. GSHP training and planning
20 permissions.

21 *1. Introduction*

22 The idea of ground source heat pumps (GSHPs) was first presented more than a century ago by a
23 Swiss turbine engineer Heinrich Zoelly (Zogg 2008:13). GSHPs are used to extract heat from
24 ground loop heat exchangers, either vertical (borehole) or horizontal, and deliver it for heating the
25 house and sanitary water. In Finland, the first experimental GSHP systems were installed in the
26 1950s (Karjalainen 1959). Finland is located in northern Europe and due to the long and cold
27 winters the need for heating is substantial. Oil, electrical, wood and district heating with varying
28 proportions have been the dominant sources of heating in northern Europe over the past 50 years.

29 During the 1970s the world experienced the so-called oil crises that launched a great global
30 interest in alternative energy sources, including GSHPs. Two decades later, the growing climate
31 concern and increasing need for energy security prompted governments in different countries to
32 design policies with consequences also for the GSHP industry. For instance, in Sweden research
33 funding was strong, and a public procurement program (1993–1995) was organized by an
34 administrative authority to promote the development of more efficient, reliable and less expensive
35 GSHPs (Nilsson et al. 2005). Meanwhile, the Swiss Federal Office of Energy launched a heat
36 pump promotion programme, which began with the establishment of the Swiss Heat Pump
37 Association (1993), and continued through financial support for projects that promoted quality,
38 training and marketing within the heat pump industry (Rognon 2008). The Swiss canton of Zurich,
39 followed by most of the other cantons, adopted in 1997 legislation that restricted the share of non-
40 renewable energy for heating in new buildings, which contributed to the deployment of heat pumps
41 (Kiss et al. 2012). Similarly, the Republic of Korea adopted a law in 2004 that required new and

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