



LAW
ENVIRONMENT AND
DEVELOPMENT
JOURNAL

LEAD

TACKLING COOKSTOVE EMISSIONS IN INDIA: TOWARDS AN ENABLING POLICY
ENVIRONMENT AND MORE EFFECTIVE LEGAL SOLUTIONS

Tuula Honkonen

ARTICLE



VOLUME
16/2

LEAD Journal (Law, Environment and Development Journal)
is a peer-reviewed academic publication based in New Delhi and London and jointly managed by the
Law, Environment and Development Centre of SOAS University of London
and the International Environmental Law Research Centre (IELRC).
LEAD is published at www.lead-journal.org
info@lead-journal.org
ISSN 1746-5893

ARTICLE

TACKLING COOKSTOVE EMISSIONS IN INDIA: TOWARDS AN ENABLING POLICY ENVIRONMENT AND MORE EFFECTIVE LEGAL SOLUTIONS*

Tuula Honkonen

This document can be cited as
Tuula Honkonen, 'Tackling Cookstove Emissions in India: Towards an
Enabling Policy Environment and More Effective Legal Solutions',
16/2, *Law, Environment and Development Journal* (2020), p. 195,
available at <http://www.lead-journal.org/content/a1611.pdf>
DOI: <https://doi.org/10.25501/SOAS.00033485>

Tuula Honkonen, Center for Climate Change, Energy and Environmental Law (CCEEL), University of Eastern
Finland, PO Box 111, 80101 Joensuu, Finland. E-mail: tuula.honkonen@uef.fi

Published under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Unported License

* **Acknowledgements:** Acknowledgements: This article has received funding from the ClimaSlow project, 'Slowing Down Climate Change: Combining Climate Law and Climate Science to Identify the Best Options to Reduce Emissions of Short-Lived Climate Forcers in Developing Countries' (ERC Grant Agreement No. 678889) under the EU Horizon 2020 research and innovation programme.

I would like to thank Prof Kati Kulovesi, my colleagues Tuuli Miinalainen, Pekka Niemelä and Yulia Yamineva as well as Mr Kamlesh Pathak for their valuable comments on an earlier draft of this paper, and the anonymous reviewers of the LEAD Journal for useful comments and suggestions.

TABLE OF CONTENTS

1.	Introduction	197
2.	The Problem of Cookstove Emissions in India	199
3.	The Multiplicity of Policies, Laws, and Institutional Frameworks on Cookstoves in India	201
	3.1 The International Regulatory Context	202
	3.2 National Regulation	203
	3.3 Multiple Objectives and Actors	206
4.	Towards an Enabling Policy Environment and Effective Regulatory Instruments	207
	4.1 Enhancing Cross-sectoral Cooperation and Coordination	207
	4.2 Applying a Household and Community-based Approach	208
	4.3 Investing in Effective Implementation and Ensuring Compliance	209
	4.4 Strengthening Linkages with the International Level Actions	210
	4.5 Strengthening Legislation and Soft Law Instruments	211
	4.6 Continuing to Use Complementary Instruments	212
5.	Conclusion	213

1 INTRODUCTION

Household air pollution resulting from cookstove emissions poses a serious threat to human health and well-being and is a significant contributory factor in local and global climate change.¹ Household cookstoves are used for cooking and heating on a large scale in many parts of the world. It has been estimated that around three billion people (some 40 per cent of the total global population) rely on traditional use of biomass or heavy fossil fuels for cooking, either using open fires or simple stoves.² The negative effects of household cookstove emissions are massive and well-known.³

India is home to the world's second largest population with 1.3 billion people. It has been estimated that 819 million people in India use traditional biomass cookstoves for their cooking needs.⁴ In other words, over 60 per cent of the country's population relies on traditional use of biomass for cooking and heating.⁵ This puts India at the bottom in terms of global ranking by the percentage of the population that has access to clean cooking.⁶

India has had national air quality and clean-cooking programs since the 1950s and these have increased in recent decades. The Air Act⁷ and supporting legislation⁸ have been in place for several decades, subsidies for cleaner energy for cooking⁹ have been introduced, and awareness-raising campaigns initiated.¹⁰ Despite these multiple multi-level regulatory efforts, the big picture on household cooking emissions has not seen a radical change for the better. The current regulatory and policy situation regarding reducing emissions from cookstoves in India is characterized by the interplay of a number of different objectives, policy instruments, actors, and levels of governance. This has led to uncoordinated actions and poorly monitored and ineffective programs. In addition, cookstove emissions have remained a somewhat marginalized problem despite accumulating evidence of its significant negative effects. The reasons for this are manifold, including the dispersed nature of the issue, deep links to poverty and gender gaps, social and cultural factors inherent in the utilization of cookstoves, etc.

1 F G Lacey and others, 'Transient Climate and Ambient Health Impacts due to National Solid Fuel Cookstove Emissions' (2017) 114(6) Proceedings of the National Academy of Sciences of the United States of America (PNAS) 1269; Y Huang and others, 'Global Radiative Effects of Solid Fuel Cookstove Aerosol Emissions' (2018) 18 Atmospheric Chemistry and Physics 5219; World Health Organization (WHO), Burden of Disease From Household Air Pollution for 2016 (WHO 2018) <www.who.int/airpollution/data/HAP_BoD_results_May2018_final.pdf?ua=1>.

2 International Energy Agency (IEA), Energy Access Outlook 2017: From Poverty to Prosperity (IEA 2017) 58.

3 *ibid* section 2.

4 International Energy Agency, World Energy Outlook 2016 (IEA 2016).

5 IEA (n 2) 61.

6 IEA (n 4) 57.

7 The Air (Prevention and Control of Pollution) Act, No. 14 of 1981.

8 In particular, the Environmental (Protection) Act, No. 29 of 1986. For the regulatory initiatives on air quality, see, Ministry of Environment, Forest and Climate Change, National Clean Air Programme (GOI 2019); Ministry of Environment, Forest and Climate Change, National Ambient Air Quality Standards (GOI 2017).

9 These have often been connected with clean cooking programs, either subsidizing the purchase of improved cookstoves or cleaner energy for cooking. See, e.g., S Arun and I H Rehman, 'Can Subsidies be a Tool for Strengthening the Improved Cookstoves Market?' (The Energy and Resources Institute (TERI) 2015) <www.teriin.org/policybrief/files/SUBSIDIES_spread/files/downloads/SUBSIDIES_spread.pdf>; N Mittal, A Mukherjee and A Gelb, Fuel Subsidy Reform in Developing Countries: Direct Benefit Transfer of LPG Cooking Gas Subsidy in India (Center for Global Development 2017) <www.cgdev.org/sites/default/files/fuel-subsidy-reform-developing-countries-india.pdf>.

10 The awareness-raising campaigns have been either government-led or organized by other actors such as the global Clean Cooking Alliance (see <www.cleancookingalliance.org>). See e.g. M Zahno and others, 'Health Awareness and the Transition towards Clean Cooking Fuels: Evidence from Rajasthan' (2020) 15(4) PLoS ONE e023193.

Household air pollution and black carbon emissions resulting from cookstoves, including within the Indian context, have been the subject of a fair amount of research and publications. Various studies and reports on the health risks of cookstove emissions have been published, which deal with the role of black carbon generally¹¹ and within the Indian context, specifically.¹² In the same vein, air pollution¹³ and climate change effects¹⁴ of cookstoves have been explored. The studies have concluded that there is an urgent need to adopt effective measures to tackle the

problems caused by emissions from household cookstoves. Many studies have focused on presenting different technical solutions and innovations to reduce emissions produced by cookstoves¹⁵ or have explored the issue as a question of changing energy sources.¹⁶ Some previous studies have reviewed past programs for cleaner household cookstoves in India and analysed why they have generally failed.¹⁷ In addition, the roles of, among others, the following economic and social solutions in promoting cleaner cooking have been explored: government subsidies,¹⁸ commercialization

11 N Scovronick, Reducing Global Health Risks Through Mitigation of Short-Lived Climate Pollutants: Scoping Report for Policy-makers (WHO 2015) <https://apps.who.int/iris/bitstream/10665/189524/1/978924-1565080_eng.pdf?ua=1>; WHO, Burning Opportunity: Clean Household Energy for Health, Sustainable Development, and Wellbeing of Women and Children (WHO 2016) <www.who.int/iris/bitstream/10665/204717/1/9789241565233_eng.pdf?ua=1>, 2018a; Lacey and others (n 1); World Health Organization, 'Household Air Pollution and Health' WHO (8 March 2018) <www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>.

12 R Ray and T Lahiri, Health Effects of Chronic Exposure to Smoke from Biomass Fuel Burning in Rural Households: A Study in Northern and Eastern India (Central Pollution Control Board (CPCB) 2012) <<https://cpcb.nic.in/uploads/healthreports/Health-effects-of-chronic-exposure-smoke-2012.pdf>>; Ministry of Health and Family Welfare, Report of the Steering Committee on Air Pollution and Health Related Issues (GOI 2015) <https://main.mohfw.gov.in/sites/default/files/5412023661450432724_0.pdf>; Public Health Foundation of India (PHFI) and Centre for Environmental Health, Air Pollution and Health in India: A Review of the Current Evidence and Opportunities for the Future (2017) <www.ceh.org.in/wp-content/uploads/2017/10/Air-Pollution-and-Health-in-India.pdf>.

13 A Stohl and others, 'Evaluating the Climate and Air Quality Impacts of Short-lived Pollutants' (2015) 15 Atmospheric Chemistry and Physics 10529. Within the Indian context, see, e.g. B R Gurjar, R Khaiwal and A S Nagpure, 'Air Pollution Trends over Indian Megacities and Their Local-to-global Implications' (2016) 142 Atmospheric Environment 475; A P Grieshop and others, 'Emission Factors of Health- and Climate-relevant Pollutants Measured in Home during a Carbon-uncertainty-approved Cookstove Intervention in Rural India' (2017) 1 GeoHealth 222.

14 Lacey and others (n 1) 1269.

15 Within the Indian context, see, e.g., Venkataraman and others, 'The Indian National Initiative for Advanced Biomass Cookstoves: The Benefits of Clean Combustion' (2010) 14 Energy for Sustainable Development 63; R Hanna, E Duflo and M Greenstone, 'Up in Smoke: The Influence of Household Behavior on the Long-Run Impact of Improved Cooking Stoves' (2016) 8(1) American Economic Journal: Economic Policy 80.

16 WHO, Burning Opportunity (n 11). Within the Indian context, see, e.g., M Bansal, R P Saini and D K Khatod, 'Development of Cooking Sector in Rural Areas in India – A Review' (2013) 17 Renewable and Sustainable Energy Reviews 44; S Patnaik and S Tripathi, Access to Clean Cooking Energy in India: State of the Sector (Council on Energy, Environment and Water 2017) <www.ceew.in/sites/default/files/CEEW-Clean-Cooking-Energy-Access-in-India-21Oct17.pdf>; WHO, Opportunities for Transition to Clean Household Energy: Application of the Household Energy Assessment Rapid Tool (HEART) in India (WHO 2018) <<https://apps.who.int/iris/bitstream/handle/10665/274280/9789241513999-eng.pdf?sequence=1&isAllowed=y>>.

17 B Sinha, 'The Indian Stove Programme: An Insider's View – the Role of Society, Politics, Economics and Education' 48 Boiling Point (2002) 23; The National Programme for Improved Cookstoves, Ingredients for Sustainable Cookstove Interventions: Lessons Learned from the Indian National Programme for Improved Cookstoves (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH 2013); M Khandelwal and others, 'Why Have Improved Cook-Stove Initiatives in India Failed?' (2017) 92 World Development 13.

18 Within the Indian context, see, e.g., Arun and Rehman (n 9); Mittal and others (n 9).

of improved cookstoves,¹⁹ carbon financing,²⁰ and social drivers and networking.²¹

This paper provides a legal and policy analysis of the current Indian regulatory setting with regard to reducing emissions from household cookstoves. The study identifies the so far largely incomplete or failed international and national efforts to tackle cookstove emissions. The analysis results in the identification of conditions, elements, and tools (also an ‘enabling policy environment’) for more effective and integrated future policy-making and regulation for reducing cookstove emissions. In this paper, the term ‘enabling policy environment’ denotes the general conditions and characteristics of the policy-making processes in terms of the applicable policy and regulatory approaches and their implementation. In other words, it is the large-scale framework within which certain policy goals are pursued. A good policy environment creates conditions within which the establishment and implementation

of measures, from broad overarching policies to concrete regulatory instruments, is made easier and can be achieved more effectively.

The research results of this paper are presented within the Indian context but have applicability also beyond the Indian context: people in many developing countries rely on cookstoves for cooking and heating and the resulting emissions form a remarkable environmental, social, and human health problem.

This paper is structured as follows. After an introduction, section two frames the problem of cookstove pollution in India, briefly describing the sources and impacts of the pollution. Section three reviews the relevant international and national regulatory setting and the legal and policy measures applied to address cookstove emissions within the Indian context. The section also discusses the multiple objectives and regulatory actors seeking to tackle the problem of cookstove emissions in the country. Section four maps out elements of an enabling policy environment for controlling household air pollution by cookstove emissions in India, and provides recommendations on the roles of different regulatory tools in this context. The concluding section draws together the paper’s main arguments and findings.

2

THE PROBLEM OF COOKSTOVE EMISSIONS IN INDIA

Household cookstoves that burn biomass or fossil fuels produce many types of air pollutants. The most significant of these are carbon dioxide (CO₂), carbon monoxide (CO), and small particles. The particles primarily emitted during incomplete combustion are generally called black carbon since they are composed mainly of carbon. Black carbon is referred to as a short-lived climate pollutant (SLCP), which means that the lifetime of the particles in the atmosphere is short, usually from days to weeks.

Household air pollution, resulting from emissions of stoves used for cooking and heating, is a serious

19 R Bailis and others, ‘Arresting the Killer in the Kitchen: The Promises and Pitfalls of Commercializing Improved Cookstoves’ (2009) 37(10) *World Development* 1694; K Rai and J McDonald (eds), *Cookstoves and Markets: Experiences, Successes and Opportunities* (GVEP International 2009); G Shrimali and others, ‘Improved Stoves in India: A Study of Sustainable Business Models’ (2011) 39 *Energy Policy* 7543; O E Freeman and H Zerriffi, ‘Complexities and Challenges in the Emerging Cookstove Carbon Market in India’ (2015) 24 *Energy for Sustainable Development* 33; J J Lewis and others, ‘Piloting Improved Cookstoves in India’ (2015) 20 *Journal of Health Communication* 28.

20 O E Freeman and H Zerriffi, ‘Carbon Credits for Cookstoves: Trade-offs in Climate and Health Benefits’ (2012) 88(5) *The Forestry Chronicle* 600; G L Simon, A G Bumpus and P Mann, ‘Win-win Scenarios at the Climate–development Interface: Challenges and Opportunities for Stove Replacement Programs through Carbon Finance’ (2012) 22 *Global Environmental Change* 275.

21 Within the Indian context, see, e.g., V H Honkalaskar, U V Bhandarkar and M Sohoni, ‘Development of a Fuel Efficient Cookstove through a Participatory Bottom-up Approach’ (2013) 3(16) *Energy, Sustainability and Society* 4; P Kumar and others, ‘Adoption and Sustained Use of Cleaner Cooking Fuels in Rural India: a Case Control Study Protocol to Understand Household, Network, and Organizational Drivers’ (2017) 75 *Archives of Public Health* 70; P Kumar and L Igdalsky, ‘Sustained Uptake of Clean Cooking Practices in Poor Communities: Role of Social Networks’ (2019) 48 *Energy Research & Social Science* 189.

and widespread problem in India. The country has a huge and growing population, the majority of which uses cookstoves daily. It has been estimated that in 2015, more than 70 per cent of the energy used in households in India was for cooking.²² Cooking will continue to be a significant source of energy consumption well into the future in India and thus, it is of crucial importance that cleaner solutions are found in this field. The following section briefly discusses the impacts of household cookstoves in order to demonstrate why reduction of their emissions is so important from environmental, human health, and social perspectives.

Reduction of indoor air pollution has been the primary motivator of past efforts to curb cookstove emissions at the national level.²³ Household air pollution, including black carbon emissions, give rise to serious and wide-ranging human health risks and costs. The WHO estimates that 3.8 million premature deaths attributable to household air pollution occurred in 2016. In terms of years of healthy life lost, household air pollution is the single most important environmental health risk factor worldwide – more important even than lack of access to clean water and sanitation.²⁴ India bears the heaviest burden in this respect with more than one million premature deaths from household air pollution each year.²⁵

Cookstove combustion is a source of both long-lived greenhouse gases and a range of short-lived pollutants that have a strong climate forcing (heating effect). SLCPs such as black carbon impact the global climate system through several mechanisms. The main impact mechanism changes the Earth's radiative balance. Black carbon particles absorb solar radiation and reduce

reflectivity, thus increasing heat absorption. On snow and ice, black carbon facilitates increased melting and diminishes their reflective capacity.²⁶ Compared to CO₂, for instance, the impacts of SLCPs are also typically more local in character given their short-lived quality.²⁷ Overall, however, scientific uncertainties remain regarding the exact impacts that black carbon and other SLCPs have on the climate system.²⁸

As described above, air quality and climate change are closely related. Thus, improving air quality can make a significant contribution in tackling the climate change problem.²⁹ In the specific case of reducing emissions from cookstoves, positive climate effects, interestingly, result not only from a lesser amount of greenhouse gases and SLCPs being emitted but often also from reduced deforestation, since the amount of (often unlawfully) collected and burnt wood is reduced and possibly replaced by other, less emitting fuels.³⁰

The use of household cookstoves and the resulting emissions have, in addition to the human health and climate effects, negative social impacts.³¹ Women and children are disproportionately affected by smoke and emissions,³² leading arguably to a 'gender paradigm

22 International Energy Agency, *India Energy Outlook (IEA 2015)* 66.

23 Lacey and others (n 1) 1269.

24 WHO, *Burning Opportunity* (n 11) 16. Research has shown that household air pollution causes noncommunicable diseases including stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer. In addition, close to half of deaths due to pneumonia among children under 5 years of age are caused by particulate matter inhaled as a result of household air pollution.

25 WHO, *Burning Opportunity* (n 11) 17.

26 Scovronick (n 11) 29.

27 Lacey and others (n 1) 1269.

28 For instance, the absorbent or reflective effects (the warming or cooling effect) and interactions between aerosols and clouds are issues that need further study and modelling. See, e.g., *ibid* 1269; and for a recent study on quantifying the net global radiative effects of black and organic carbon aerosols from global and Indian solid fuel cookstove emissions, see Huang and others (n 1) 5219.

29 United Nations Environment Programme, *Air Pollution in Asia and the Pacific: Science-based Solutions (UNEP 2019)* <https://wedocs.unep.org/bitstream/handle/20.500.11822/26861/Air_pollutionAP_ES.pdf?sequence=1&isAllowed=y>.

30 Indian governments have for quite a long time favored and subsidized liquefied petroleum gas (LPG) for cleaner household cooking energy. Other alternatives to fuel wood include biogas and piped natural gas. See, e.g., Patnaik and Tripathi (n 16) 1.

31 See, generally, e.g., Putti and others, *The State of the Global Clean and Improved Cooking Sector (World Bank Technical Report 007/15 2015)* 34-38 <<https://openknowledge.worldbank.org/bitstream/handle/10986/21878/96499.pdf?sequence=1&isAllowed=y>>.

32 WHO, *Burning Opportunity* (n 11) 3.

for indoor air pollution health impacts'.³³ In addition to the gender perspective, the health risks of cookstoves are strongly correlated with poverty. For cooking, low-income households tend to depend on solid fuels, which cause the most severe pollution but may be freely gathered.³⁴ Generally, it is important to recognize that not only rural areas but also urban slums must be targeted when household air pollution is being placed within the regulatory loop.³⁵

In total, it was estimated in 2015 that the mid-range economic value of the negative externalities posed by household cookstove emissions globally stood at over USD 120 billion annually against a scenario of shifting all solid fuel users to high performing improved cookstoves.³⁶ Although a conservative estimate, the figure gives an idea of the global scale of the problem in economic terms.

The overview of the effects of household air pollution and the role of cookstoves therein on global and Indian scales set out above clearly shows that the problem is huge, acute, and serious. It is curious, then, that the problem – or 'crisis' as the WHO has put it³⁷ – of household air pollution is still largely overlooked. This may be explained by reference to several unfortunate factors: the effects of the problem often materialize slowly, the greatest impacts are felt by the most marginalized people in society (the rural poor, women and children), and simply the fact that people have accepted smoke as an unavoidable nuisance associated with using cookstoves.³⁸ It is also important to note that emissions from cookstoves mean that air pollution is not only a problem in cities in developing countries but an acute issue in rural areas as well.

A 2011 UNEP report on short-lived climate forcers concluded that focusing on cookstoves is the most cost-effective strategy to achieve black carbon

abatement.³⁹ Within the Indian context, household emissions are deemed to be the largest contributor to ambient small particle (PM_{2.5}) exposure.⁴⁰ It has been modelled that if the use of biomass for cooking was completely mitigated, it would result in a 17.5 per cent reduction in the nation-wide, population-weighted average annual ambient PM_{2.5} exposure. This would, then, lead to a 6.6 per cent reduction in Indian premature mortality.⁴¹

Great potential exists for the dissemination of improved cooking technologies and alternative fuels and raising public awareness within the Indian context. It appears, however, that the required changes will not happen spontaneously or through market developments alone. Accordingly, the establishment and maintenance of an enabling policy environment and effective regulatory tools to successfully tackle the problem is needed.

3

THE MULTIPLICITY OF POLICIES, LAWS AND INSTITUTIONAL FRAMEWORKS ON COOKSTOVES IN INDIA

The multidimensionality of the issue of reducing and controlling household air pollution in India is reflected in the array of policy and regulatory tools currently in use to address the problem. As discussed below, the current regulatory framework includes legislation, air

33 UNEP Air Pollution (n 29) 20.

34 WHO, Burning Opportunity (n 11) 17.

35 See also Report of the Steering Committee (n 12) 100-1.

36 Putti and others (n 31) 18.

37 WHO, Burning Opportunity (n 11) 3.

38 *ibid* 19.

39 United Nations Environment Programme, Near-term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers (UNEP 2011) <wedocs.unep.org/bitstream/handle/20.500.11822/8048/-Nearterm%20Climate%20Protection%20and%20Clean%20Air%20Benefits_%20%20Actions%20for%20Controlling%20Short-Lived%20Climate%20Forcers%20-%20A%20UNEP%20Synthesis%20Report-20111080.pdf?sequence=3&isAllowed=y>.

40 S Chowdhury and others, 'Indian annual ambient air quality standard is achievable by completely mitigating emissions from household sources' (2019) 116(22) PNAS 10711-6.

41 *ibid* 10711-6.

quality standards and programs, clean cookstove initiatives and programs, health policy instruments, subsidy policies, and clean cooking campaigns. The variety of regulatory and policy tools in play is strikingly broad, and this variety extends to the legal status, level of detail, and subjects of the various forms of regulation in use. In addition to traditional command and control forms of regulation, financial instruments and information-based regulatory tools are also in use.

In addition to using different types of regulation, policy-making with respect to cookstove emissions takes place at different levels. The international regulatory framework sets the stage and motivates many pieces of national regulation. Currently in India, most of the regulation relevant for controlling cookstove emissions has been issued at the federal or central government level. However, state and city-level action and regulation are also increasing in volume and significance.

3.1 The International Regulatory Context

The overall framework and impetus for action on cookstove emissions are provided by key international legal and policy developments. The Paris Agreement (2015)⁴² does not directly mention SLCPs or black carbon emissions, but some countries have included them in their nationally determined contributions (NDCs),⁴³ in which Parties specify their periodical

emissions reduction commitments.⁴⁴ The Paris Agreement represents an opportunity to include cookstove emissions in India's internationally recognized emissions reduction commitments.

Under the international climate policy, the clean development mechanism (CDM) provides a financing mechanism for cookstove projects in developing countries. India has hosted numerous such projects where carbon credits have provided funding to cleaner cookstove projects. Generally, these are often regarded as 'win-win' projects with many benefits for the parties and the climate. However, a closer look reveals that the sustainability of the projects easily leaves room for improvement.⁴⁵ Within the Indian context, the experiences on the benefits of cookstove CDM projects are mixed.⁴⁶

India joined the Climate & Clean Air Coalition (CCAC)⁴⁷ in 2019. The CCAC is a voluntary

42 Paris Agreement to the United Nations Framework Convention on Climate Change (12 December 2015); American Society of International Law, *International Legal Materials* (Vol. 55, Cambridge University Press 2016) 740.

43 NDCs are documents that Parties are obliged to prepare, communicate and maintain under the Paris Agreement. They detail the efforts of each country to reduce national greenhouse gas emissions and to adapt to the impacts of climate change.

44 For instance, Mexico specifically mentions black carbon together with greenhouse gases in its NDC pledge; the country is committed to reducing black carbon by 51 per cent by 2030. The reduction target may rise to 70 per cent contingent on international support. Chile announced its updated NDC in spring 2020, accordingly, the country is committed to reducing black carbon emissions by 25 per cent in 2030. For all NDCs, see, UNFCCC, NDC Registry <www4.unfccc.int/sites/NDCStaging/Pages/Home.aspx>.

45 Simon, Bumpus and Mann (n 20) 275; Freeman and Zerriffi, 'Complexities and Challenges' (n 19) 28; L Sanford and J Burney, 'Cookstoves Illustrate the Need for a Comprehensive Carbon Market' (2015) 10 *Environmental Research Letters* 084026. Sustainability has been undermined by imbalances between the climate and health benefits of the projects, by lacking cost-effectiveness etc. Freeman and Zerriffi, 'Complexities and Challenges' (n 19) 42.

46 Freeman and Zerriffi, 'Carbon Credits for cookstoves' (n 20) 600; T W Aung and others, 'Health and Climate-Relevant Pollutant Concentrations from a Carbon-Finance Approved Cookstove Intervention in Rural India' (2016) 50(13) *Environmental Science & Technology* 7228; Warnecke and others, *Vulnerability of CDM Projects for Discontinuation of Mitigation Activities: Assessment of Project Vulnerability and Options to Support Continued Mitigation* (German Emissions Trading Authority 2017) <<https://newclimate.org/wp-content/uploads/2017/05/vulnerability-of-cdm.pdf>>.

47 See, Climate and Clean Air Coalition <cacaoalition.org/>.

organizations, businesses, scientific institutions, and civil society organizations and focuses on climate protection and air quality improvement through actions that reduce SLCPs.⁴⁸ Joining the CCAC can be expected to significantly strengthen India's capacity to create and implement effective policies to reduce cookstove emissions. Upon joining, the Indian government stated that India will work under the CCAC to 'adopt cleaner energy sustainable production and consumption patterns' and will also work on best practices and experiences for the effective implementation of India's National Clean Air Programme (NCAP) (UN Environment, 2019). CCAC does not directly impose any regulatory measures for reducing emissions, but its value in the present context is in providing an important platform for sharing of experiences, learning, and adoption of best practices in reducing greenhouse gases and air pollution.

Overall, the international regulatory context provides an important framework and forms part of the overarching set of rules by which governance on cookstove emissions is to be achieved. Significantly, it brings private and voluntary sector actors and activities into the regulatory setting. The CCAC provides an important platform for cooperation, sharing of experiences, learning, and adopting best practices from other countries.

3.2 National Regulation

The National Clean Air Programme (NCAP)⁴⁹ is a recent governmental initiative, launched in January 2019 by the Ministry of Environment, Forest and Climate Change (MoEFCC). The Programme focuses on the most polluted Indian cities which are to prepare action plans with time-bound targets to prevent, control, and reduce emissions. The NCAP marks the first time that the government has established a time-bound target for particulate matter reduction. The NCAP is not legally binding, but it relies on actions that can be realized under the Air Act. The focus of the

NCAP is on ambient air pollution, leaving the problem of cookstove emissions largely to one side.

The Indian National Ambient Air Quality Standards, which also concern fine particulate matter (black carbon), were adopted in 2009. The standards are part of the Environmental (Protection) Rules⁵⁰ and thus, legally binding in nature. However, there is no legal enforcement mechanism in place to tackle non-compliance with these Standards. The accompanying National Air Monitoring Programme (NAMP) concentrates on outdoor air pollution, mainly from industrial point sources, leaving out diffuse sources and indoor air pollution.

The National Air Quality Index was launched in 2015. Its main purpose is to be a tool for effective communication of air quality status to those living in India. The Index covers information on eight pollutants, including two different particulate matters, but gives no information as to the sources of the particular types of emissions covered.

Over the years, India has implemented several national programs targeting cookstove emissions.

- The National Programme on Improved Cookstoves (NPIC) was operational from the 1980s to the early 2000s. It had the dual objective of fuelwood conservation and smoke reduction in kitchens, especially in rural areas. Millions of improved cookstoves were installed under the NPIC, but the real long-term benefits of the Programme remain questionable.⁵¹
- The National Biomass Cookstoves Initiative (NBCI), which commenced in 2009 and is administered by the Ministry of New &

⁴⁸ See *ibid.*

⁴⁹ Ministry of Environment, Forest & Climate Change, National Clean Air Programme (GOI 2019) <moef.gov.in/wp-content/uploads/2019/05/NCAP_Report.pdf>.

⁵⁰ Ministry of Environment and Forests, Government of India, The Environment (Protection) Rules (1986) <https://upload.indiacode.nic.in/showfile?actid=AC_MP_74_308_00003_00003_1543231806694&type=rule&filename=ep_rules_1986.pdf>.

⁵¹ Sinha (n 17) 23; Khandelwal and others (n 17) 13 The long-term impacts remained modest due to, *inter alia*, poor maintenance of the new stoves and people's reluctance to give up their traditional stoves and cooking habits. *ibid.*

Renewable Energy (MNRE), is a more recent program. Its primary aim is to enhance the availability of clean and efficient energy for the energy deficient and poorer sections of the country.⁵²

- The Unnat Chulha Abhiyan (UCA) Programme, also run by the MNRE, promoted biomass cookstoves in the country during the period from 2012 to 2017. The objectives of this programme were to mitigate both social inequities and climate change by reducing the levels of black carbon and other emissions resulting from burning biomass for cooking.⁵³
- India's Ministry of Petroleum and Natural Gas (MOP&NG) also runs a program targeting cookstove emissions. The Pradhan Mantri Ujjwala Yojana initiative, launched in 2016, provides cooking gas, i.e. liquid petroleum gas (LPG), connections to women from poorer households.
- The National Biogas and Manure Management Programme (NBMMP), run by the MNRE, is a scheme for setting up biogas plants for use in households to meet cooking energy needs. The main objectives of the Programme are to reduce firewood consumption as well as indoor air pollution and greenhouse gas emissions.⁵⁴

The national programs have not had lasting impacts. Some of them managed to distribute a large number of improved cookstoves to households at affordable prices, but too many challenges persisted in the implementation of the programs.⁵⁵ For a long time,

the public demand for improved cookstoves was very low.⁵⁶ Then again, the government had many motives for encouraging the adoption of improved cookstoves. These, sometimes disparate, motives have included improving health, addressing a fuelwood crisis and deforestation, releasing women from domestic labour, educating girls, and preventing climate change.⁵⁷ Cleaner cookstove policy indeed has multiple objectives, which places high requirements for their communication to the public, and for finding the most appropriate design and ways for implementation of the policy and regulation. There have been problems in the administration and budgeting of the Indian cookstove programs,⁵⁸ in the operation of the specific government subsidies,⁵⁹ and in monitoring and evaluation.⁶⁰

Many reasons for the failure of the past Indian clean cookstove program are not related to the regulatory design, as such, in a narrow sense (design of the instruments) but to the supporting and operating environment and social factors (esp. tackling poverty and gender issues), on one hand, and to the design and functionality of the new stoves and their supporting services, on the other hand. Common to all these factors is the need for coordination and mutual supportiveness of different relevant policy fields and goals, and the importance of knowing and meeting the needs of the users of the stoves.⁶¹

To date, little attention has been paid to emissions from cookstoves within the context of the Indian national climate change policy. For example, neither the National Action Plan on Climate Change, issued in 2008, nor the Indian NDC under the Paris Climate Agreement mention cookstoves or black carbon.

52 Ministry of New and Renewable Energy (MNRE), National Biomass Cookstoves Initiative (2009) <<https://mnre.gov.in/national-biomass-cookstoves-programme>>.

53 *ibid*.

54 MNRE, Biogas <<https://mnre.gov.in/biogas>>.

55 Numerous studies on the Indian clean cookstoves programs of the past have been conducted. For key literature, see WHO Report (n 11).

56 Khandelwal and others (n 17) 13.

57 *ibid* 15.

58 Sinha (n 17) 23.

59 *ibid*; Douglas F Barnes and others, *Cleaner Hearths, Better Homes: New Stoves for India and the Developing World* (Oxford University Press 2012). For references, see (n 12).

60 GIZ (n 17) 5.

61 *ibid*; See generally, Honkalaskar and others (n 21); Khandelwal and others (n 17) 23.

The Indian government has been preparing a new National Energy Policy. The draft document (as of 27 June 2017) sets out the key objective of providing clean cooking fuel to everyone living in India within a reasonable timeframe. To support that goal, the document provides for the establishment of a National Mission on Clean Cooking.

The Indian national health policy increasingly takes household air pollution explicitly into consideration. The Vision Statement on Environment and Human Health (2003) recognized the negative effects of incomplete solid fuel combustion and called for the improvement of air quality monitoring systems, specifically covering respirable particulate matter (item 4.1.5). The 2017 National Health Policy⁶² included, for the first time, the reduction of indoor and outdoor air pollution as a priority area for action (section 3.2). Significantly, the policy document calls for coordinated action in this field across sectors.

The main piece of legislation dealing with air pollution in India is the Air (Prevention and Control of Pollution) Act, enacted in 1981. The Act generally provides for the prevention, control, and abatement of air pollution. It does not address household air pollution as such but establishes the overall regulatory framework and institutions for addressing air pollution in the country.

Certain other legal acts have more indirect impacts on the regulation of cookstove emissions. For instance, the 1986 Environmental (Protection) Act established the general legal and institutional framework for taking nation-wide environmental protection measures. The Act empowers the central government to establish authorities for environmental protection and to take measures, for example, in terms of 'laying down standards for emission or discharge of environmental pollutants from various sources whatsoever' (section 3(2)(iv)). The Environmental (Protection) Rules prescribe standards for emissions, but these do not relate to household cookstoves.

62 Ministry of Health and Family Life, Government of India, National Health Policy (2017) <www.nhp.gov.in/nhpfiles/national_health_policy_2017.pdf>.

India's Constitution declares that the state is committed to the protection and improvement of the environment (Article 48A). The relevant article is a 'directive principle of state policy' (reflecting the title of Part IV of the Constitution), representing the socio-economic goals that the nation is expected to achieve.⁶³ Thus, Article 48A is not directly legally enforceable. However, it has been applied together with other constitutional provisions, to give effect to the right to a healthy environment. Most importantly, the right to clean air has, through judicial interpretation, been identified as an element of the right to life under Article 21 of the Constitution.⁶⁴ In addition, the Supreme Court of India has observed that Articles 39(e), 47 (on people's health) and 48A of the Constitution, by themselves and collectively, impose a duty on the state to secure the health of the people or to improve public health and to protect and improve the environment.⁶⁵ Thus, people living in India do have recognized legal rights to environmental protection and clean air. Naturally, the precise implications of these constitutional rights are subject to interpretation.

India has a long tradition of subsidizing the transition towards cleaner energy. In respect of cookstove combustion, a number of residential LPG subsidy programs⁶⁶ have been initiated to tackle the widespread affordability challenges faced by households in shifting to cleaner fuels. LPG has been the Indian government's clean cooking fuel of choice since the 1970s.⁶⁷ The LPG subsidy programs have addressed the cleaner fuel aspect of the challenge of reducing cookstove emissions in India, while the improved cookstove initiatives discussed above have approached the issue from a technical entry point, sometimes coupled with a financial subsidy in relation to the cost

63 A De and V Madhok, 'Constitutional Provisions and Environment Protection in India: A Legal Insight' (2015) 1(2) *Plebs Journal of Law* <www.researchgate.net/publication/311922823_CONSTITUTIONAL_PROVISIONS_AND_ENVIRONMENT_PROTECTION_IN_INDIA_A_LEGAL_INSIGHT>.

64 P P Bhawe and N Kulkarni, 'Air Pollution and Control Legislation in India' (2015) 96(3) *Journal of Institution of Engineers India Ser. A* 259.

65 De and Madhok (n 63).

66 For a summary, see, e.g., WHO, *Opportunities for Transition* (n 16) 19-20.

67 Patnaik and Tripathi (n 16) 1.

of an improved stove. India has also been pioneering provincial level LPG programs.⁶⁸

In addition to government-led programs and initiatives for cleaner cooking, there have been several campaigns either based on a public-private partnership or fully realized through non-governmental actions.⁶⁹ The international Clean Cooking Alliance is one example of this and seeks to foster clean cooking solutions and create demand and supply for improved stoves and cooking practices worldwide. The Alliance is active in India with several projects implemented and on-going.⁷⁰

3.3 Multiple Objectives and Actors

Efforts to reduce and control air pollution in India are characterized by multiple regulatory levels and instruments as described above. Regulation has been largely free-standing, uncoordinated, and polycentric in nature. The wide variety of objectives and the multitude of actors involved in initiating, developing, and implementing such regulation adds to the challenges involved. As regards household air pollution from cookstoves, direct legal regulation is scarce.

As noted above, multiple objectives lie behind the policies on cookstove emissions in India. Protection of human health is an important objective, and often the overriding one. This is understandable: the effects of cookstove emissions on health are significant, both in terms of human suffering and economic costs. The climate change impacts of cookstove emissions, resulting from greenhouse gas emissions and particulate matter pollution, are also severe. The negative social effects of biomass combustion in cookstoves entail different types of social inequality. The use of cookstoves is also an important energy

issue and offers an opportunity to promote domestic energy sources (supporting national energy security) and cleaner energy solutions. Finally, estimates of the economic costs of the effects of cookstove emissions and of the different alternatives are always in the background in relation to policy-making in this area.

Due to the multi-objective nature of the issue, a number of ministries have endorsed policy measures that are relevant to tackling indoor air pollution caused by cookstoves in India. The MoEFCC is responsible for traditional pollution control and monitoring. Among other things, it carries out the NCAP and oversees and coordinates the national climate change mitigation policy. The MNRE is responsible for the national improved cookstove initiatives, which focus on promoting and facilitating access to new technology cookstoves, coupled with cleaner energy solutions and policies. The main contribution of the MOP&NG to reducing black carbon emissions from household cookstoves has been through the facilitation of access to LPG as cooking energy. The Ministry of Health and Family Welfare (MoHFW) addresses cookstove emissions through the national health policy. The Ministry has made considerable efforts in recent years to promote the incorporation of health considerations into policy-making concerning air pollution and cookstoves.⁷¹ Finally, the Central Pollution Control Board (CPCB) serves as a regulatory, advisory, and monitoring body in relation to air pollution in India.

At the state-level, State Departments of Environment and State Pollution Control Boards or Committees are responsible for improving environmental quality and implementing various pollution control acts and rules.

Indian cities – especially the populous mega-cities, which suffer from severe pollution problems – represent a further level on which action is taken to mitigate air pollution. Many Indian cities have awakened to the problems posed by poor air quality and are becoming increasingly active in finding solutions to this challenge. For instance, Delhi has prepared a long-term comprehensive action plan for

68 WHO, *Opportunities for Transition* (n 16) 13-21.

69 For the action of Clean Cooking Alliance, see, Khandelwal and others (n 17) 13; Lewis and others (n 19) 28.

70 Clean Cooking Alliance, 2019 Annual Report (2020) <www.cleancookingalliance.org/reports2/2019AnnualReport/CCA-annual-report-2019.pdf>. India is among the focus countries of the organization's work.

71 See especially, the National Health Policy (n 62); Report of the Steering Committee (n 12).

air pollution control.⁷² The role of cities in this area can be expected to grow in the future. Current city-level efforts tend to focus on tackling air pollution caused by industrial and transport-related emissions⁷³ and consequently, cookstoves have not been at the centre of the efforts made. However, household air pollution is also a problem in urban areas and should not, therefore, be left unaddressed in city-level action plans on air pollution.

Members of the general public are, ultimately, the most important actors in the efforts to control household air pollution. They are the people who use cookstoves and make decisions on their qualities and the fuels used. Individuals and households may participate in policy-making through civil society groups and non-governmental organizations, which have been active in relation to the issue of clean cooking in India in recent years.

Business and industry players (most importantly, cookstove designers and manufacturers) naturally play a key role in planning and implementing policies designed to limit cookstove emissions. Businesses work with the government or invest in new technologies on their own initiative, often in response to an enabling environmental policy. In addition, international development agencies and other financing organizations provide resources for projects to reduce household air pollution. Different forms of private

carbon financing are also important sources of support that allow cookstove emission reduction projects to be realized.

As a conclusion, it can be said that control of cookstove emissions in India entails multiple levels of governance, ranging from federal to local, together with connections at the international regulatory level. The responses that have been adopted involve both public and private actors. To date, the governance of cookstove emissions in India has been rather centrally led, in that the federal government has been in charge of most regulatory and policy actions. This has the benefit of potentially ensuring some overall coherence in policy-making and preventing stagnation in times of crisis.⁷⁴ However, the set-up involves a risk that progress will be slow in curbing emissions if the federal regulation is slow in coming, unambitious, or without follow-up and enforcement. It is interesting, then, that the 2019 NCAP specifically targets Indian cities, requiring them to take more action in mitigating air pollution. This could be interpreted as recognition of the failure of past federal regulatory efforts in promoting clean cooking and of the growing regulatory role of (large) Indian cities in tackling the vast air pollution problem in the country.

4

TOWARDS AN ENABLING POLICY ENVIRONMENT AND EFFECTIVE REGULATORY INSTRUMENTS

4.1 Enhancing Cross-sectoral Cooperation and Coordination

Household air pollution is an issue the regulation of which cannot be the responsibility of only one governance unit or authority. Air pollution caused by cookstove emissions has direct links with climate

⁷² Comprehensive Action Plan for air pollution control with the objective to meet ambient air quality standards in the National Capital Territory of Delhi and National Capital Region, including states of Haryana, Rajasthan and Uttar Pradesh (2017).

⁷³ S K Guttikunda, R Goel and P Pant, 'Nature of Air Pollution, Emission Sources, and Management in the Indian Cities' (2014) 95 *Atmospheric Environment* 501-510. For instance, the draft Air Action Plan on Abatement of Air Pollution in the Delhi National Capital Region (2017) presents a total of 12 action points, 5 of which concern transport, 2 industry and construction and 2 households (actions on crop stubble burning and solid waste management). The Comprehensive Action Plan for air pollution controlling the National Capital Territory of Delhi and National Capital Region, including states of Haryana, Rajasthan and Uttar Pradesh (2017) is likewise focused on controlling transport and industry emissions but addresses shortly also cookstoves (action point 2.10: Domestic chulha burning and open eateries).

⁷⁴ R Gillard and others, 'Can National Policy Blockages Accelerate the Development of Polycentric Governance? Evidence from Climate Change Policy in the United Kingdom' (2017) 45 *Global Environmental Change* 174, 180.

change, health, social, and development policies. Household cookstove emissions, as is the case in respect of SLCP mitigation generally, is a cross-cutting issue: it is impossible for any single governance framework to focus specifically on this issue in a dedicated and cohesive manner.⁷⁵ Therefore, the policy response to it should be based on an integrated approach in which policies and regulatory measures in relation to the environment, energy, human health, and social issues (esp. poverty and gender aspects) inform each other and function in a coordinated manner. This will help to avoid overlap of institutional barriers and achieve benefits through synergies, as well as potentially increasing awareness of the issue. Taking an integrated approach may also help in securing adequate financing for policy measures.

In India, the situation regarding the governance of air pollution and cross-sectoral cooperation is mixed. The main responsibility for the NCAP, for instance, lies with the MoEFCC, but the Programme will be implemented with the help of other ministries. Clean cooking fuel policies have been implemented by the two Energy Ministries, but even between them, a lack of coordination has largely prevailed.⁷⁶

In recent years, there has been increasingly active discussion on the need to better integrate air pollution and public health policies in India.⁷⁷ The public health administration has criticized the current policy-making related to emissions standards for pollution control from different sources for not requiring a review of health information, a health impact assessment, or a health cost-benefit analysis to guide policy action.⁷⁸ In the same vein, it has been pointed out that the

MoEFCC and the MOP&NG have no mechanism for cooperating with the MoHFW to share information or incorporate health messages in their information and communication strategies.⁷⁹ These are well-grounded arguments, given the ministries' shared objectives of reducing air pollution in the country.

Lack of institutional cooperation and coordination is also reflected in the policy instruments that (could) indirectly address household air pollution. The full potential of these instruments is not being utilized. For instance, India's clean fuel programs do not have clear policy drivers targeted at household pollution management.⁸⁰ Furthermore, policy documents such as the Smart Cities Mission Statement and Guidelines (2015) and the draft National Energy Policy either ignore air pollution altogether or contain merely a cursory mention of the issue.⁸¹ Effective cross-sectoral cooperation would allow the environmental, social, and human health impacts of these policy instruments to be fully accounted for and their potential to achieve air pollution mitigation to be better utilized.

4.2 Applying a Household and Community-based Approach

Any policy seeking to address cookstove emissions needs to target action at the household-level. In order to achieve success, this approach requires special knowledge and tools. The policy-making and regulatory approach cannot be overly top-down in nature; it must account for user preferences, different local conditions, etc. This may require considerable changes being made in the relevant policy-making processes. It is often the case that energy development

75 See UNEP, *Near-term Climate* (n 39) 52.

76 The draft National Energy Policy document (2017,19) refers to clean cooking fuel as 'the biggest casualty of lack of coordination between different energy Ministries'.

77 Report of the Steering Committee (n 12). In late 2019, the Union Minister of Minister of Environment, Forest and Climate Change was openly criticized by the WHO for having denied the correlation between air pollution and impacts on people's health. See, Kerean Watts, 'Javadekar Criticised by the WHO Over Pollution Claims' *Heath Issues India* (11 December 2019) <www.healthissuesindia.com/2019/12/11/javadekar-criticised-by-the-who-over-pollution-claims/>.

78 Report of the Steering Committee (n 12) 107.

79 WHO, *Opportunities for Transition* (n 16) 35.

80 Report of the Steering Committee (n 12) 108.

81 PHFI and Centre for Environmental Health (n 12) 28.

The draft National Energy Policy has been in the making for several years. Interestingly, the new policy would most likely propose an integration of all energy ministries into one, thereby responding very concretely to the call for greater inter-ministerial coordination in the energy sector and regulation. See, e.g., Anshu Sharma, 'New National Energy Policy to propose merger of ministries and regulators' *CNBCTV18* (3 December 2019) <www.cnbctv18.com/energy/new-national-energy-policy-to-propose-merger-of-ministries-and-regulators-4805141.htm>.

and health authorities, which work with cookstove emissions governance, are not particularly accustomed to addressing issues at the household level.⁸² The same may apply to environmental authorities.

The majority of the air pollution regulation and policy-making currently in existence in India is targeted at industry-level, leaving households in a secondary position. Therefore, it is important to devote efforts to developing best practices in addressing this issue at the household level. Social acceptability is a major precondition for effective cookstove regulation. It is important to recognize this dimension of the issue, which may require unconventional thinking and broader consultation on the part of the governing actors.

4.3 Investing in Effective Implementation and Ensuring Compliance

Strengthening of the science-policy interface is necessary in order to achieve improvements in air pollution regulation, generally, and the mitigation of cookstove emissions, in particular. The relevant information in this regard includes scientific and observed information on the formation and impacts of the emissions, on different stove technologies, on the household cooking practices, etc. A good understanding of the relevant science can also help in aligning priorities across other sectors that are primary contributors to emissions.⁸³ The 2014 WHO Guidelines for indoor air quality: household fuel combustion⁸⁴ states that a national needs assessment is a key tool in the relevant policy-making (section 5.3). In respect of air pollution caused by cookstoves, this assessment information already exists to a large degree. What is needed is better communication of the information among governance units and stakeholders and genuinely

utilizing this information as the basis of ambitious policy-making.

Monitoring air pollution and air quality is another key task for public authorities in planning and implementing policies to control emissions. Routine monitoring and assessments provide important support to make informed decisions. These can be facilitated by clear targets and indicators. Within the Indian context, it has been contended that routine air pollution monitoring, to the extent that it has happened, has almost exclusively been confined to large cities. This has made it difficult to grasp the full extent of the problem.⁸⁵ The organization of comprehensive monitoring of air pollution by cookstoves is challenging to organize,⁸⁶ but scientific modelling, for instance, could be part of the solution.⁸⁷

85 Report of the Steering Committee (n 12) 44; Balakrishnan and others, 'Addressing the Burden of Disease Attributable to Air Pollution in India: The Need to Integrate across Household and Ambient Air Pollution Exposures' (2014) 122(1) *Environmental Health Perspectives* A6-A7.

86 Due to, inter alia, a very large number of the sources of pollution, the nature of indoor air pollution, and different fuels being used and cooking habits followed.

87 In many cases, modelling can be a good and cost-efficient alternative or complement to physical measurement as a means of obtaining an adequate knowledge base for addressing indoor air quality. See, e.g., S Silva and others, 'Modelling Indoor Air Quality: Validation and Sensitivity' (2017) 10 *Air Quality, Atmosphere & Health* 643-652. Such modelling has been conducted also in cases of indoor air pollution from cookstove emissions. See, M Johnson and others, 'Modeling Indoor Air Pollution From Cookstove Emissions in Developing Countries Using a Monte Carlo Single-box model' (2011) 45(19) *Atmospheric Environment* 3237-3243; M Tagle and others, 'Monitoring and modeling of household Air Quality Related To Use Of Different Cookfuels in Paraguay' (2018) *Indoor Air* 1-11. In the study by M Johnson and others, the used model combines stove emission rates with expected distributions of kitchen volumes and air exchange rates in the developing country context to produce a distribution of indoor air pollution concentration estimates. The authors recognize that their model ended up underestimating some indoor air pollution concentrations and overestimating others. Nevertheless, such models are a good start; they can be finetuned with new elements or more accurate assumptions of relevant elements. Overall, scientific modelling can be used in the development of national policies aiming to reduce exposure to household air pollution.

82 J Rosenthal and others, 'Clean Cooking and the SDGs: Integrated Analytical Approaches to Guide Energy Interventions for Health and Environment Goals' (2018) 42 *Energy for Sustainable Development* 152, 153.

83 PHFI and Centre for Environmental Health (n 12) 28.

84 World Health Organisation, WHO Guidelines for Indoor Air Quality: Household Fuel Combustion (WHO 2014) <www.who.int/airpollution/guidelines/household-fuel-combustion/en/>.

Proper implementation of and compliance with given policies and regulations are crucial in order for their objectives to be achieved. Much of the regulation of indoor air pollution in India is founded on non-legally binding soft law instruments and thus, their implementation is not legally backed up. Nevertheless, proper implementation measures are needed in order to bolster the credibility of these programs and standards.

Within the Indian context, ensuring compliance in a strict sense would require the explicit integration of binding emissions standards or cookstove requirements into the statutory framework represented by the Air Act and supporting legislation. Currently, national air quality standards are routinely violated⁸⁸ because they lack legal enforcement mechanisms. The NCAP has also been criticized for its lack of legal mandate and accountability mechanisms.⁸⁹ Moreover, monitoring plays a crucial role in ensuring proper implementation of clean cookstove policies.⁹⁰

Furthermore, it would be beneficial to have mechanisms in place to hold the governing units accountable for progress. The diffusion of responsibilities in the polycentric Indian governance system relating to cookstove emissions makes it challenging to hold policy-makers accountable for their performance. To many, the whole governance system may appear obscure, and it may be difficult to discern the responsibilities of various governing actors.

4.4 Strengthening Linkages with the International Level Actions

Effective governance of black carbon emissions produced by household cookstoves is usually regarded as, first and foremost, a national issue. It is the national context that matters most to households targeted by pollution mitigation policies. However, there are clear benefits in establishing explicit links between national, regional, and international clean air goals. For instance, the WHO guidelines for indoor air quality, which focuses on household fuel combustion and includes emission rate targets for particulate matter and carbon oxides (Recommendation 1), is intended as the basis for developing national standards.

It should be recognized that black carbon and its impacts can indeed effectively spread beyond national boundaries.⁹¹ Therefore, it is advisable to take concerted action to limit emissions. The international climate change regime, with its latest addition, the Paris Agreement, is an appropriate context in which such endeavours may be made. Explicitly including black carbon emissions in the NDCs under the Agreement help to raise the national and global status of the issue.⁹²

The Sustainable Development Goals (SDGs), agreed in 2015, form another global framework for action

88 National Clean Air Programme (n 49) 16-17 <https://cpcb.nic.in/uploads/Non-Attainment_Cities.pdf>.

89 S Ghosh and others, Comments on the National Clean Air Programme (Centre for Policy Research 2019) <<https://cprindia.org/sites/default/files/Comments%20on%20the%20NCAP%20-%20CPR%20-%2017052018-.pdf>>; A Roychowdhury, 'National Clean Air Programme: Good Idea but Weak Mandate' Down to Earth Blog (11 January 2019) <www.downtoearth.org.in/blog/air/national-clean-air-programme-good-idea-but-weak-mandate-62785>. It is to be noted that Ghosh and others did not comment the final version of the NCAP whereas Roychowdhury did..

90 Projects carried out under the CDM could offer a model for ensuring effective implementation of national clean cookstove policies. In general, CDM projects must comply with a pre-defined monitoring and evaluation program. CDM cookstove projects monitor their results and include, for example, the maintenance of new stoves as part of their implementation.

91 See, e.g., Kühn and others, 'Effects of black carbon mitigation on Arctic climate' (2020) 20(9) Atmospheric Chemistry and Physics 5527–5546.

92 Compared with CO₂, emissions of SLCPs/black carbon are not equally well-known at country-level, which makes their inclusion in NDCs challenging. India is currently the second-largest emitter of black carbon in the world, with emissions projected to rise steadily in the coming decades. A Rana and others, 'Black Carbon Aerosol in India: A Comprehensive Review of Current Status and Future Prospects' (2019) 218 Atmospheric Research 207–230. There is recent research on the magnitude of black carbon emissions in the country as well as on their sources, climate impacts and key areas for improvement in terms of further research and policy-making. Consequently, India should consider including black carbon in its future NDCs. See also, C Venkataraman, S Ghosh and M Kandlikar, 'Breaking out of the Box: India and Climate Action on Short-Lived Climate Pollutants' (2016) 50 Environmental Science & Technology 12527–12529.

towards limiting air pollution. Reduction of cookstove emissions is inherently linked to several SDGs: Goal 7 ('Access to clean & affordable energy to everyone by 2030'); Goal 3 ('Ensure health and well-being for all'); and Goal 5 ('Achieve gender equality and empower all women and girls'). These are important broader objectives for Indian clean cookstove policies, and also offer the potential to create inter-linkages between policy fields and attract additional investments to tackle indoor air pollution.

4.5 Strengthening Legislation and Soft Law Instruments

In addition to enhancing the relevant policy environment, it is important to identify the concrete means and regulatory tasks and strategies through which emissions from household cookstoves can be effectively reduced. Put simply, the key issues are cleaner energy solutions and cleaner stove technologies. There are also informational and social tasks that need to be addressed in the context of the relevant policies and regulatory tools. These include the facilitation of changes in cooking traditions and community-level thinking,⁹³ facilitating the affordability of clean fuels and cookstoves, and making the detrimental effects of indoor air pollution known to the target groups. In this light, the mitigation of cookstove emissions is not only of a multi-objective nature but it also involves multiple regulatory tasks or strategies that are being applied simultaneously. It is important that these tasks are identified ahead of introducing new regulation and that the anticipated effects of each instrument on different tasks get assessed.

India has had a specific law on air pollution for quite some time. The Air Act does not, however, provide much leverage for addressing indoor air pollution and cookstove emissions. Then again, it is not even feasible to try to establish very detailed legislation that would, in practice, force millions of households to follow a specific path in order to reduce the emissions that they produce by cooking. The circumstances on the ground

are so diverse and the issue of household air pollution so multi-dimensional that a single national legal act would be incapable of effectively addressing the whole range of issues involved. However, what the legislation could do is to establish a more comprehensive legal framework and stipulate certain legally binding elements for a national policy on mitigating cookstove emissions. For instance, there could be an obligation for the state to apply standards for indoor air pollution (in practice: for cookstoves), to update them regularly, and to create a monitoring and enforcement system to this effect.⁹⁴ Generally, a policy that targets upstream (manufacturers) may have a better chance of success than downstream, where the consumers are dispersed.

There is also a potential for strengthening other relevant existing legal acts besides the Air Act. For instance, the WHO has suggested that the Indian deforestation regulations should be enforced to curb tree-cutting for firewood. This would contribute to enabling a shift to use alternative, cleaner fuels for cooking.⁹⁵ However, this kind of approach could face legitimacy problems since vulnerable groups collecting firewood for daily sustenance would be targeted, at the same time when corporations are regularly engaged in deforestation activities on a much larger scale.⁹⁶ It

⁹⁴ Globally, standards for cookstoves are currently being developed. This is not a simple task since such standards should be developed in a transparent and inclusive manner and have an agreed-upon and harmonized methodology and reporting criteria; strong and accessible organizations who can conduct rigorous and independent testing; data sharing using common metrics; and the appropriate combination of regulations and policies for standards and labeling from governments and organizations. White Paper No. 4, 'Solutions – Standards, Testing, Technology, Policy, Financing', (Stoves Summit: Addressing Black Carbon and Other Emissions from Stoves Globally: Used for Both Heating and Cooking and Using Coal for Heating, Warsaw, Poland, 29-30 May, 2017) <warsawstovesummit.org/wp-content/uploads/2017/03/WP4-Solutions-final-0617.pdf> For the current global situation, see, ISO Technical Committee 285, Clean Cookstoves and Clean Cooking Solutions (2013)<www.iso.org/committee/4857971.-html>.

⁹⁵ WHO, Opportunities for Transition (n 16) 21.

⁹⁶ It is a common argument that traditional cookstove use causes deforestation in India, but up-to-date data on the extent of this problem is lacking. Khandelwal and others (n 17) 16.

⁹³ WHO, Opportunities for Transition (n 16) 16-17.

would seem that when addressing household cookstove emissions, public education and promotion of alternative fuels would be better tools to address the fuelwood collection problem than strict enforcement of deforestation regulation.

In addition to legislation, non-legally binding regulation continues to play an important role in guiding behaviour towards reduced household air pollution. A relatively wide range of soft law instruments, that deal with air pollution, is currently in existence in India.⁹⁷ However, they mostly target ambient air pollution and thus, have limited relevance to household air pollution by cookstoves. The NCAP is a good platform on which further action to address cookstove emissions can be built. The NCAP focuses on large Indian cities that are to develop action plans to prevent, control, and reduce emissions. These action plans could be made to include actions to curb cookstove emissions. Moreover, household air pollution is also a serious problem outside major cities, in rural and semi-rural areas in India, and the use of an instrument to address air pollution in these areas would be of benefit. The nation-wide elements of the NCAP could be strengthened to complement the current regional and city-level action plans. They could consolidate and prioritize a large number of national actions and establish national and sub-regional targets for the reduction of air pollution. In addition, the NCAP could have explicit connections with other country-wide plans for sustainable development and other national priorities.⁹⁸ This would better enable addressing SLCPs and household air pollution. The strengthened NCAP could act as an improved umbrella under which air pollution issues could be addressed in a comprehensive way, and coordination can be enhanced in the national governance of air pollution.

4.6 Continuing to Use Complementary Instruments

Economic incentives have played a major role in the past efforts to mitigate emissions from household cookstoves in India. The government has subsidized

cleaner fuels and new cookstoves that use improved technology. While these subsidies have not achieved their full potential in terms of results, they have had positive impacts. Since the majority of Indian cookstove users have low incomes, these subsidies have supported the market and made improved cookstoves available to a larger part of the population than would otherwise have been the case.⁹⁹ However, subsidies may also have negative effects which should be recognized: they may distort the market by devaluing the product, discourage the uptake of the stove once subsidies dry up, and lead to possible leakage or misdirection of the program funds.¹⁰⁰ Therefore, care should be taken to ensure that subsidization works as intended and that the markets will function properly after the subsidy program has ended. Regarding the latter aspect, a tapering subsidy program might work best, allowing simultaneously for commercialization and more balanced market development.

It has been said that '[o]nly a well-informed consumer will purchase the clean cookstove or fuel, and only a well-trained consumer will use the cookstove in the correct way so that the benefits can be realized'.¹⁰¹ This summarizes very well the significance of information and education for the effective realization of clean cooking policies. It is end-users, individual people – usually women¹⁰² – who make the decisions about shifting to use a new cookstove and/or an alternative cooking fuel.

In support of clean cooking policies, information must be provided and public awareness strengthened on the formation of mechanisms of emissions, their effects, cleaner fuels, and improved user practices. The introduction of clean cooking options has a win-win character: less-polluting cookstoves benefit human

⁹⁷ These include air quality programs and action plans at different administrative levels.

⁹⁸ UNEP, Near-term Climate (n 39) 35.

⁹⁹ Arun and Rehman (n 9) 1.

¹⁰⁰ *ibid* 1.

¹⁰¹ Global Alliance for Clean Cookstoves, *Igniting Change: A Strategy for Universal Adoption of Clean Cookstoves and Fuels* (2011) 24 <www.cleancookingalliance.org/binary-data/RESOURCE/file/000/000/272-1.pdf>.

¹⁰² Women are often in a key role in relation to the adoption of cleaner cooking solutions. Provision of information and education can encourage them to choose less polluting stoves and fuel, or position stoves in such a way as to maximize smoke/pollutant dispersion. UNEP, *Air Pollution* (n 29) 20.

health, climate, and air quality and directly benefit people. For example, clean cooking options lead to less time having to be spent collecting firewood. This in turn reduces the rate of deforestation, which then produces additional and broader benefits including improved climate change adaptability of the environment.

Participation is closely linked to the provision of information and education. It is important that people are not only passively receiving information but that they can also express their preferences. In the case of household cookstove emissions, the source of pollution strongly involves social and cultural traditions, lifestyle issues, etc. Within this kind of a setting, people want to be a part of the solution and meaningfully participate in policy-making.

5 CONCLUSION

More than 800 million people in India cook on traditional biomass cookstoves. The negative effects of household cookstove emissions are massive and well known. The country has had cookstove programs since the 1950s, but they have not led to a clean cooking break-through. The current regulatory and policy situation is characterized by polycentric governance involving the interplay of a number of different objectives, policy instruments, actors, and levels of governance. This tackles the multi-dimensionality of the problem but also tends to lead to uncoordinated actions and poorly monitored and ineffective regulation.

This paper has identified the elements of an enabling policy environment and of effective regulatory instruments by which India could better address the problem of household cookstove emissions. From this perspective, continuity and coordination are two key aspects that need to be present in any scheme to reduce cookstove emissions. Furthermore, it is important to recognize the multi-objective nature of the problem and its solution concepts as well as the linkages between different governance and thematic levels. Co-benefits is the buzzword: the different

governing actors and stakeholders should be increasingly aware of the air quality, climate, and developmental co-benefits that can be gained through better design and implementation of clean cooking policies and regulation.¹⁰³

Both top-down and bottom-up approaches have their place in the Indian setting of governing cookstove emissions. The Indian government has, to a degree, exercised deliberate delegation of responsibility in this issue by handing over major responsibility for the implementation of the NCAP to the most polluted cities. However, there are also signs of a more spontaneous bottom-up type of governance emerging in the cookstove sector, such as local projects and voluntary campaigns for clean cooking.

In addition to strengthening the legislation, which has been a rather under-used instrument in addressing household air pollution in India, it is advisable to use the recently adopted NCAP as a platform for further regulatory action. However, the instrument should be complemented by enforceable targets and clear obligations to address the current discrepancies of clean cooking policies in the country.

103 World Health Organisation, WHO Guidelines for Indoor Air Quality: Household Fuel Combustion (WHO 2014) 55-58.

*LEAD Journal (Law, Environment and Development Journal) is jointly managed by the
Law, Environment and Development Centre, SOAS University of London
soas.ac.uk/ledc
and the International Environmental Law Research Centre (IELRC)
ielrc.org*

