Approach Paper
"Toward a Clean World for All"

An Evaluation of World Bank Group Support for Pollution Management

July 19, 2016

Background and Context

Introduction to the Evaluation

1. Pollution takes an enormous toll, both in terms of impact on healthy lives and environmental degradation—to the extent that it jeopardizes progress made in poverty alleviation. While the 2001 World Bank environment strategy calls for mainstreaming environmental concerns into country development programs, the 2012 World Bank Group environmental strategy, *Toward a Green, Clean, and Resilient World for All,* explicitly defines a "clean world" as a strategic objective—a world with "low pollution and low emission." The World Bank Group approved a total of 3,870 projects, accounting for approximately US$297 billion in commitments that are pollution-relevant over the last 12 years, FY2004-15. To date, the effectiveness of these interventions has not yet been evaluated. This study will be the first stock-taking exercise focusing on those pollution phenomena that affect poor countries the most, that is, air and water pollution, and waste. It comes in a timely manner, after a period where climate change dominated the international agenda. This evaluation is also central to the Independent Evaluation Group's (IEG) Strategic Engagement Area of *Environmental Sustainability*. With its focus on the poverty-pollution nexus, this evaluation will deepen evidence about the implementation and results of Bank Group activities directly and indirectly aimed at encouraging environmental sustainability while promoting inclusive growth and poverty reduction.

Description of Context and Issues (the World beyond the World Bank Group)

2. **Despite progress made in poverty alleviation, there has been significantly less progress made in managing environmental sustainability**. Pollution, along with a range of other environmental threats, hampers countries' development efforts, as the 2012 World Bank Group environment strategy emphasizes. While pollution takes an enormous toll globally, the impacts are overwhelmingly felt in developing countries. Approximately nine million die from pollution[1], mostly young children (1.7 million) and older people (4.9 million) (Landrigan and Fuller 2016, Global Alliance for Health and Pollution 2016, and Gurjar et al. 2010). A full 94 percent, or 8.4 million, of the 9 million deaths caused each year by pollution occur in lower-middle-income countries (LMICs) (Landrigan and Fuller, 2016). Healthy life years lost due to pollution in developing countries amount to 15 times that of developed countries (WHO 2014 a and b). For illustrative purposes only, the magnitude of pollution-induced deaths (8.4 million) dwarfs other major health concerns, such as AIDS, which causes 1.5 million deaths per year.

3. **In the world's poorest countries, the predominant forms of pollution have been household air pollution, ambient air pollution, contaminated drinking water, and contamination by toxic waste, chemicals, and pesticides** (WHO 2012). Approximately three billion people cook and heat their homes using open fires and inefficient stoves burning biomass fuels. Indoor or household air pollution (HAP) caused 4.3 million premature deaths in 2012, many of whom were women—owing to their greater involvement in daily cooking (World Health Organization 2014), followed by children. Ambient air pollution is another major concern. More than 80 percent of people living in urban areas that monitor air pollution are exposed to air quality levels that exceed the limits set by the World Health Organization (WHO). Populations in low-income cities are the most impacted: 98 percent of cities in LMICs with

more than 100,000 inhabitants do not meet WHO air quality guidelines. However, in high-income countries, that percentage decreases to 56 percent (WHO 2016). Also, contamination by chemical and toxic waste is no longer a phenomenon of richer countries, but is increasing rapidly in LMICs. Globalization of, for example, the chemical manufacturing industry, the recycling industry, and other polluting industries are the drivers of this trend, for example the shipment into poor countries of 45 million tons per year of e-waste (Perkins et al. 2014). This trend is further aggravated by relocating polluting industries to poor countries where production costs are low and environmental regulations and public health infrastructure are often absent. (Laborde et al. 2015).

4. **The poor are hit particularly hard by pollution by way of several factors, including exposure to pollution and lack of access to pollution mitigation measures.** The pollution sources most relevant to the poor are indoor and outdoor air pollution, unsafe water, and industrial and municipal waste. A major reason that pollution disproportionately effects the poor is their location: Poor people live in areas with the worst environmental conditions—for example, in squatters dwellings with no access to clean water; no waste water treatment or waste disposal; and close to solid waste dumps or open waste burning sites, which contribute to the ambient air pollution (Cairncross and Kolsky 2003). On top of that, incentives structures in institutions are often not set up to place those issues that matter for the poor on the national agenda (Joint Agency Paper, 2008). Disproportionally strongly affected groups include—as already indicated —women and children, the elderly, and male workers with high exposure, for example agricultural workers being exposed to pesticides.

5. **Data on the impact of pollution abatement interventions focus on health effects.** A preliminary analysis of systematic reviews (SRs) revealed that SRs related to pollution are rare: 8 SRs were identified as relevant, primarily by the International Initiative for Impact Evaluation (3ie). All these studies inquire about the health effects of various pollution sources and indicate that household and ambient air pollution, household waste, and unsafe drinking water are prime concerns for health outcomes. SRs seem not to venture into other areas, such as industry pollution abatement through regulation or incentives, or the tradeoff of pollution vs. pro-poor growth. (See Attachment H)

6. **Beyond being a burden on the health system, pollution imposes substantial economic costs.** Diseases caused by pollution increase health costs and inflict an unnecessary load on health care delivery. This diverts scarce resources from essential prevention programs. It also undermines the development of poor countries by reducing the health, intelligence, and economic productivity of entire generations (Landrigan and Fuller 2014). For many countries, the economic costs of pollution range from 4 to 5 percent of their gross domestic product (GDP)—often higher than official development assistance (ODA) received which hovers around +/- 1 percent. Pollution threatens economic growth since growth is inextricably linked with a country's human capital that is often impaired by poor environmental conditions (Joint Agency Paper 2008). Pollution also threatens natural resources, like water with about 30 of the 47 of the world's largest rivers imperiled by pollution. Chemical waste from industry and agriculture affect humans and animals alike. Not surprisingly, pollution is a major concern for the World Bank Group's goal of reducing poverty and shared prosperity, as confirmed by the latest 2012 environmental strategy.

7. **Understanding and managing the tradeoff between pollution and economic growth has been a challenge for the last several decades.** Economic growth is often seen as a way forward, keeping unemployment low, helping reduce poverty, and promoting the kind of technological progress and increased efficiency needed to achieve environmental sustainability. Yet, growth is charged with causing environmental problems, such as pollution and resource degradation—and ultimately with exploiting the earth's finite resources (World Bank Group 1992; Kagerson 1998; Brock and Taylor 2005). Managing these tradeoffs requires a careful assessment of the benefits and costs of alternative policies as they affect the current population and future generations. For example, to set air quality standards, one

must quantify the improvement in well-being and compare the additional abatement costs that the measure would entail (Oates 2006). But strict standards and regulations may also *lead* to innovation and enhance a firm's position vis-à-vis competitors in other countries without such strict requirements (Porter and van der Linde 1995). These challenges are further exacerbated by the widespread use of GDP as a measure for income and growth. GDP not only hides the many costs of pollution and resource degradation, it accounts positively for countries' expenditures on pollution remediation measures (WDR 1992; Costanza et al 2009). This indicates the need for a more comprehensive *natural capital accounting*, similar to the Wealth Accounting and Valuation of Ecosystem Services (WAVES) initiative hosted by the World Bank.

8. **While pollution has been on the global development agenda for quite some time, lack of resources and a too fragmented approach in policy making and enforcement may have hampered progress to date.** The Millennium Development Goals (MDGs) already addressed pollution; MDG-7 on environmental sustainability, however, was found by the United Nations' own Environment Program (UNEP) as not dealing sufficiently with the growing problems of air and water pollution and the accumulation of chemical wastes throughout much of the developing world (UNEP 2013). In 2015, the global community's goalposts were revised and 17 new Sustainable Development Goals (SDGs) were adopted. Ten of these reference pollution.[2] Yet environmental pollution has received less than 0.5 percent of global development spending, according to recent research (Landrigan and Fuller 2016). The same research found that this is further aggravated by a disaggregated approach taken for pollution-related research, policy making, standard setting, and enforcement.[3]

WORLD BANK GROUP POLICIES AND INTERVENTIONS

9. **World Bank Group strategic documents have incorporated pollution concerns, but the emphasis of these strategies has shifted from mainstreaming to a more explicit approach over time.** The 2001 Environment Strategy—which remained the central strategy relevant for pollution until 2012—focused exclusively on the World Bank. While the strategy featured pollution concerns prominently, its emphasis on the need to *mainstream* the environment into country development programs, sector strategies, and investments was clear (World Bank 2001). More recently, in 2012, the World Bank Group presented a Bank Group-wide unified environment strategy for the period 2012-2022, *Toward a Green, Clean, and Resilient World for All*. This strategy establishes strong links between environmental concerns—degradation, pollution, and over-exploitation of natural resources—and economic progress. The "clean agenda"—one of three strategic objectives of the 2012 strategy—calls for low pollution, low emissions, and clean air and water resources.[4] The strategy also emphasizes the link between pollution and the poor, women, and children (World Bank 2012). These Bank Group strategies have been supported by a system of environmental, health, and safety (EHS) standards, safeguards policies, and performance standards (Attachment F).

10. **To implement its environmental strategy, the Bank Group deploys a wide range of instruments.** The Bank Group's engagement in pollution is multi-sectorial and cross-cutting: Pollution-relevant projects can be executed by the Environment Global Practice (GP), dedicated IFC Advisory Services or through a wide range of sector work (lending and investments), notably in the areas of waste water and solid waste management. As indicated above, IEG's preliminary portfolio review identified 3,870 projects (40 percent of total) during FY04-15 (excluding advisory services and analytics [ASA] which, as explained later, will be assessed by using an approach tailored to ASA) that relate to pollution (see Box 1 for a brief snapshot). For details on how the portfolio was identified including on sector, theme and industry codes used, see Attachment B.

11. This preliminary analysis suggests that these 3,870 projects be clustered into:

(i.) "**targeted**" projects referencing pollution concerns in their development objectives and

(ii.) projects aimed at reducing the pollution "**footprint**" indirectly by means of the application of safeguards (World Bank) and performance standards (IFC/MIGA).

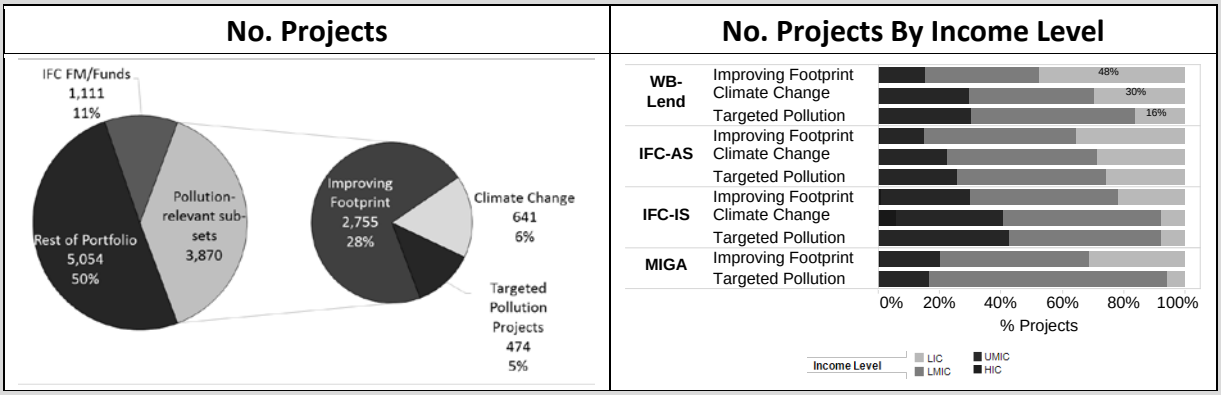
12. **Of the total 3,870 projects, 474 were identified as "targeted" projects.** These projects address pollution directly and in doing so apply a range of different approaches. They provide *government-facing policy advice* aimed to create awareness, develop strategies, create regulatory frameworks, build capacity or help establish monitoring systems and corresponding standards, data collection and sampling methods; at times they also seek to adjust macro frameworks, for example by abolishing disincentives for pollution abatement, like fuel subsidies. Typically, this policy advice is the domain of the World Bank, including both lending and non-lending; still a small number of IFC advisory services were found in this area as well. Similarly, IFC also implemented a range of interventions with the explicit objective to mitigate pollution. These include Cleaner Production or Sustainable Business Advisory interventions. These services are typically *private-sector client facing engagements* and are complemented by IFC investments to upgrade production processes. Furthermore, IFC's venture capital investments support companies with promising solutions that can be expected to mitigate pollution. These are classified as "targeted" interventions as well. Included in these "targeted" interventions are also investments and lending projects in support of the *pollution abating infrastructure*, that is waste water, solid waste management (including hazardous waste), and air pollution; these too have as an objective to mitigate pollution effects. The provision of funds for this type of infrastructure comes from the World Bank, IFC, and MIGA. [5] Bank Group projects addressing *legacy pollution issues*, for example the remediation of contaminated sites, have also been identified as part of these "targeted projects".

Box 1. A Snapshot of the World Bank Group Portfolio

Over the past 14 years, the Bank Group's targeted pollution portfolio experienced a slight decline relative to rest of the pollution-relevant portfolio; between 2004 and 2007, pollution projects accounted for 13 percent of the Bank Group portfolio while this portfolio accounted for 10 percent of projects between 2012 and 2015. Climate change projects, on the other hand, have become more prevalent over time.

Interesting to note, targeted pollution projects are less prevalent in low-income countries relative to the rest of the pollution-relevant portfolio subsets. Low-income countries received almost half of the World Bank's footprint projects, 30 percent of the Bank's climate change projects, and 16 percent of targeted pollution projects. This relationship holds for IFC advisory services and MIGA guarantees. For IFC investments, low-income countries see the same share of climate change and targeted pollution projects (eight percent each).

Figure. World Bank Group Portfolio Overall and Pollution-relevant Subsets (FY2004-2015)



Sources: IEG Portfolio Review – preliminary results. *Note:* Commitments include full-project amounts for all World Bank Group institutions; excludes World Bank ASA

13. **In addition to these pollution-targeted projects, the preliminary portfolio analysis found 2,755 projects that aim to reduce the environmental "footprint" of industries and operations through safeguards (World Bank) and performance standards (IFC/MIGA).** The Bank Group's EHS Guidelines provide technical references to prevent and minimize pollution and also provide industry-specific examples of good international industry practice. The implementation of these standards ensures the adherence of certain minimum pollutant guiding values, often more stringent than the host countries foresee.

14. **While the safeguards (World Bank) and performance standards (IFC) are applicable to all projects, this evaluation will focus on those projects where pollution concerns played a major role and a pollution-related standard came to application.** These are, for IFC, investments in pollution-intense industries, including cement; brick, tile, and ceramic; textiles; glass; pulp and paper; chemicals; primary metals; oil, gas, and mining; power[6]; food and beverage; animal production; and agriculture[7]. For World Bank, this evaluation will focus on category "A" projects as these have been assessed as having elevated environmental risks. These projects that aim at reducing the "footprint" through standards together with "targeted" projects are the focus of this evaluation.

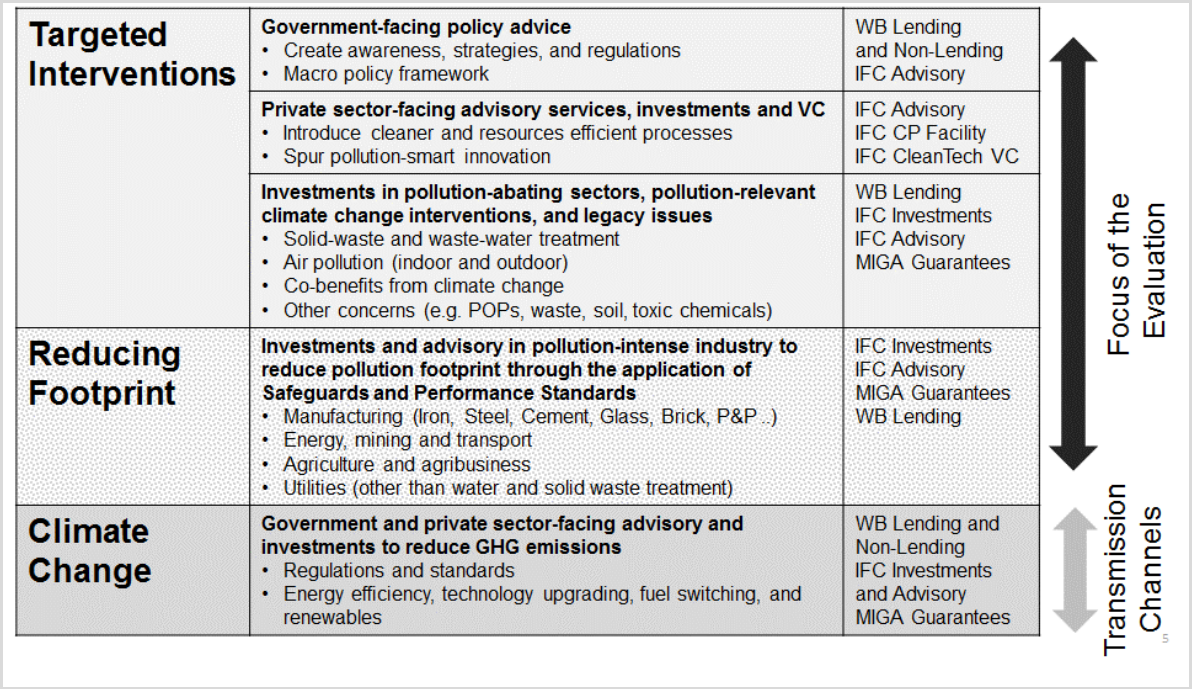
15. **The Bank Group also supports a large number of projects to curb the emission of greenhouse gases (GHG) in its pursuit of climate change mitigation**. These projects focus on reducing GHG emissions through upstream (regulation, standards, and enforcement) and downstream (direct investment) interventions in renewable energy and energy efficiency. Many interventions aimed at GHG reduction, can reasonably be expected to reduce the emission of conventional pollutants. The climate change agenda is, hence, intrinsically intertwined with the pollution agenda and is therefore included in the overall framework.

16. **In sum, the above mentioned "targeted" and "footprint" projects together with the climate change projects are jointly referred to as "pollution-relevant" portfolio in this document.** Those climate change projects that have an explicit reference to broader pollution issues – that is, those with explicit "co-benefits" – have been subsumed under "targeted" interventions, and together with the other "targeted' and "footprint" projects, are at the focus of this evaluation, as stated above. Climate change interventions with a *mere* focus on GHG reduction are categorized as a separate group and are outside the primary focus of the evaluation. For these climate change projects, the evaluation will concentrate on identifying transmission channels for co-benefits. Note that climate change projects were subject to a recent series of three IEG evaluations. Figure 1 visualizes the suggested clustering.

17. **The results chain in Figure 2 links the various Bank Group interventions with outputs and intended outcomes and impacts.** In summary, the Bank Group deploys its *government-facing policy advice* to put in place the policy environment for an improved pollution management agenda (see top box under outputs in Figure 2). These include also creation of awareness though citizen engagement and demand for solution of pollution problems. In parallel, IFC's *private sector-facing advisory services* and investments promote the adoption of cleaner production and efficient processes. IFC's venture capital investment is intended to spur pollution-smart innovation (see second box under outputs). Complementary to this, the Bank Group deploys IFC investments, advisory services, MIGA guarantees, and World Bank lending to improve pollution abating infrastructure, mainly waste water and waste management facilities (see third box under outputs). Together, these form the "targeted" interventions as defined previously. In addition, the application of World Bank safeguards and MIGA/IFC performance standards is intended to reduce the footprint of pollution-intense sectors (see lowest box under outputs). All of these outputs, if the assumptions of the results chain are held true, translate into the outcome, that is, reduced burden from pollution to humans and the environment at large. Ultimately, this is expected to result in increased protection of the environment while enabling sustainable pro-poor

development. This evaluation will focus on assessing outputs and outcomes. Note that contrary to the overall framework in Figure 1, the results chain in Figure 2 does not contain climate change interventions as they are not the focus of the evaluation.

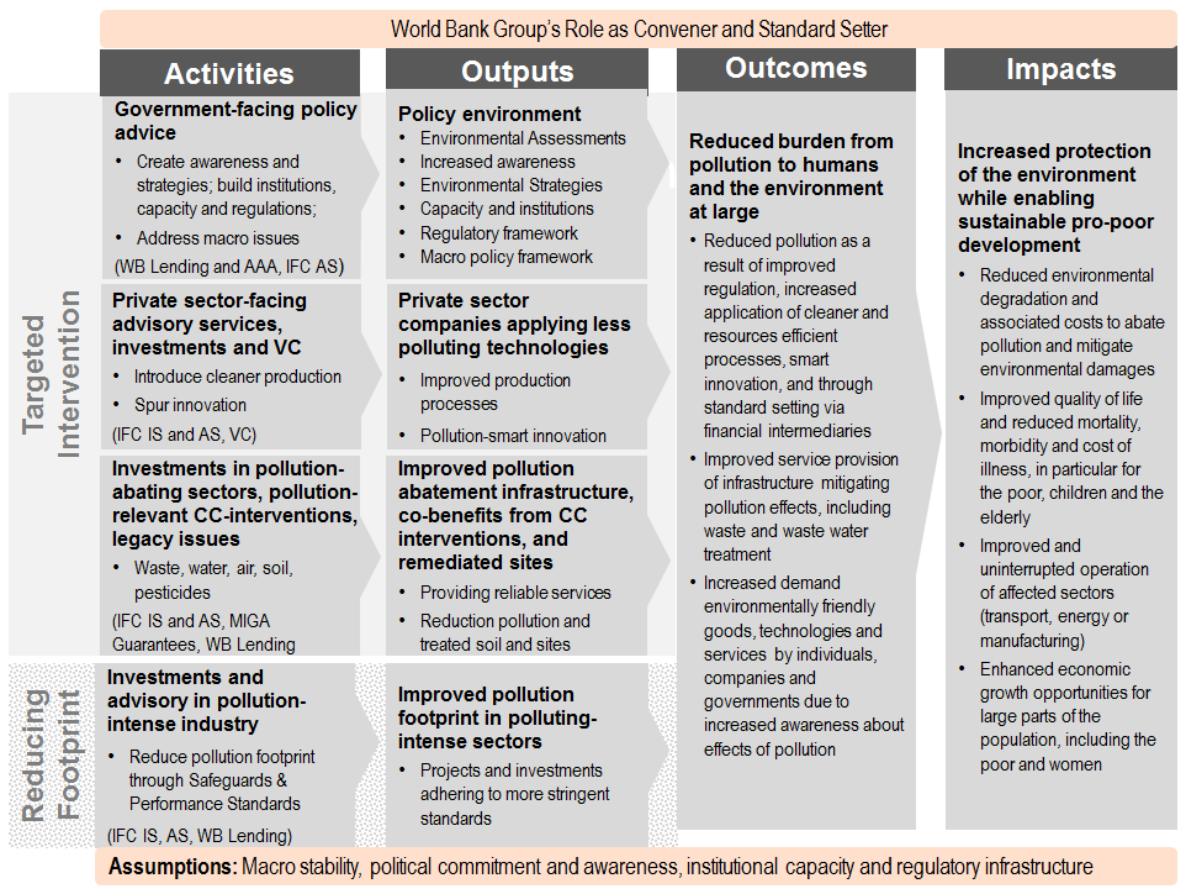
Figure 1. Framework for Structuring the World Bank Group Pollution-relevant Portfolio



Source: IEG Portfolio Review and interviews with Bank Group subject-matter experts and management

18. **All of this is supported by the Bank Group's role as a convener and standard setter and its role in partnerships**. The Bank Group acts as a convener on pollution related issues at national and international levels. By sharing knowledge and expertise on strategic as well as implementation issues, the Bank Group helps advance the agenda through these activities. With regard to standard setting, IFC's Performance Standards on Environmental and Social Sustainability have become globally recognized good practice in dealing with environmental and social risk management. Nearly 80 banks and financial institutions have voluntarily adopted the Equator Principles, which are based on IFC's performance standards. And 32 export credit agencies of the Organization for Economic Co-operation and Development (OECD) countries benchmark private sector projects against IFC's performance standards. Also Partial Risk Guarantee products of MIGA and WB have adopted the Performance Standards. Another key partnership that signifies the synergies between air pollution and climate mitigation interventions is the Climate and Clean Air Coalition (CCAC) that was formed in 2012 and has the World Bank as an active member. Given the importance of household air pollution, the World Bank partners with the Global Alliance for Clean Cook stoves (GACC). Another example of partnerships is the Bank Group's engagement in the Global Alliance on Health and Pollution (GAHP) which facilitates the provision of technical and financial resources to governments and communities to reduce the impact of pollution on health in low- and middle-income countries. [8] Partnering with the Global Environmental Facility (GEF) was instrumental in implementing the Stockholm Convention on Persistent Organic Pollutants (POPs). The 2015 launch of the Pollution Management and Environmental Health Program is most likely the most prominent example of leveraging Bank Group resources through a multi-donor trust fund to advance the agenda.

Figure 2. Theory of Change for World Bank Group Pollution Interventions



Source: IEG.
Note: ASA=Analytical, Assessment and Advisory, AS=Advisory Services, CP=Cleaner Production, CC=Climate change, IS=Investment Services, WB=World Bank, VC=Venture Capital

19. **This evaluation builds on previous IEG work on pollution**. These evaluations are as follows: *Environmental Sustainability – An Evaluation of World Bank Group Support*, 2008; *Investments in Renewable Energy Generation*—Category I Learning Product, 2015; *Climate Change and the World Bank Group Phase I: An Evaluation of World Bank Win-Win Energy Policy Reforms*, 2009; Phase II: *The Challenge of Low-Carbon Development Climate Change and the World Bank Group*, 2010; Phase III: *Adapting to Climate Change: Assessing the World Bank Group Experience, 2011*; and *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience*, 2010. Relevant lessons are summarized in Attachment C.

Purpose, Objectives, and Audience

20. **The objective of this evaluation is to enhance the Bank Group's effectiveness in supporting client countries to achieve progress toward the Bank Group's strategic objective of a "clean world for all"** by obtaining evidence-based findings, developing broadly-applicable lessons across all Bank Group institutions and Global Practices, and proposing appropriate recommendations. More specifically, this entails progress toward a world with smarter policies that manage the tradeoffs between

growth and pollution and with markets that take into account negative externalities, yet spurring innovation.

Stakeholders and Audience

21. **The primary audience for this evaluation study are the World Bank Group's Boards of Directors,** management, and staff involved in pollution-related operations. Further stakeholders that can benefit from this study include the Bank Group's client governments, multilateral and bilateral developmental banks and donors, the private sector, concerned civil society organizations, and the ultimate beneficiaries of polices and markets that better manage pollution issues.

22. **This evaluation is particularly timely as the Bank Group has launched a series of efforts in the pollution space.** With the explicit articulation of the "clean agenda" in the 2012 environmental strategy and the recent establishment of the Pollution Management and Environmental Health (PMEH) program, the Bank Group further intensified its effort, realizing the threat posed by pollution to human health and economies. Complementing its broader pollution management and environmental health business line, the PMEH program was officially launched in April 18, 2015. It is backed by a new multi-donor trust fund and will initially run from 2015 to 2020. The program focuses primarily on air quality management, but also tackles water and land pollution. This evaluation can provide evidence in support of all these efforts by distilling lesson on what works with regard to Bank Group interventions in the pollution space. With its specific pro-poor focus, this evaluation will assess interventions with a view to identifying policies that improve the situation of the poor, who are hardest hit by pollution. IEG will address both learning and accountability objectives. The accountability aspects of the study will look at how fully World Bank Group projects achieved their stated objective—a potentially valuable input to further strengthen Bank Group pollution work.

Evaluation Questions and Coverage/Scope

Evaluation Questions

23. **The overarching question that IEG seeks to answer in this evaluation is:** *To what extent has the World Bank Group been relevant, effective, and efficient in addressing pollution concerns in client countries through (i) targeted interventions and (ii) the use of safeguards and performance standards in pollution-heavy industries (as these concerns relate to the poor)? Going forward, how well is it equipped to support countries moving toward a "clean world for all"?* This overarching question will be addressed by answering the below subordinated questions in the area relevance, effectiveness, efficiency, and work quality. For methodology and additional sub-questions, see Attachment A.

- ***Relevance*—**To what extent has the Bank Group …
  1. Supported client countries in addressing the most important pollution concerns, that is, is the Bank Group targeting the relevant concerns in its client countries affecting the poor?
  2. Used the right instruments—is the Bank Group addressing the key "upstream" issues (including policy, regulations, institutions, subsidies, incentives, and so on) and "downstream" investments?
  3. Deployed the right diagnostic tools to assess pollution issues in client countries, including the special circumstances of project beneficiaries, including the poor, women, the elderly, or children?
- ***Effectiveness*—**Has the Bank Group been effective in...
  1. Building the required awareness, public disclosure mechanisms, knowledge, capacity, and institutions and setting up regulatory frameworks to deal with pollution-related issues through

its public sector-focused systemic/upstream interventions and are these outcomes sustainable?

2. In addressing pollution issues through its lending operations and public investments in pollution reduction[9], and though its safeguards (World Bank) and what were the effects, including for the poor?
3. In curbing pollution through its private sector-focused interventions, including those aimed at enhancing the private sector's capacity to address pollution issues through its advisory services and those addressing pollution issues through performance standards (IFC/ MIGA) in its investment and guarantees, and what were the effects including for the poor?

- ***Efficiency***
  1. Is the Bank Group positioned to address pollution issues in an efficient manner? What is the Bank Group's comparative advantage, given its range of interventions and services?
  2. What is the Bank Group's role vs. other development partners (multilateral development banks or international financing institutions) in providing knowledge or funding?
  3. What do we know about the efficiency of proposed abatement options? Are end-of-the-pipe solutions or the promotion of more comprehensive cleaner production/technology concepts prevalent?
- ***Work Quality and Working as One World Bank Group***
  1. Is the Bank Group effectively managing factors within its control and is the Bank Group meeting its established work quality standards in monitoring, reporting, and supervision?
  2. Are the different Bank Group institutions leveraging synergies through adequate coordination, knowledge sharing, and sequencing of interventions?

EVALUATION SCOPE AND SAMPLING

24. **This evaluation will cover the entire World Bank Group portfolio of pollution-relevant projects, as introduced above.** This includes lending, non-lending, ASA, investments, advisory services, and guarantees, approved FY04-15. Following extensive consultations across Bank Group stakeholders, the relevant portfolio was identified in a broad-based approach, using the Bank Group's industry coding and system-based flags together with text analytics strategies. For details on portfolio identification, see Attachment B.

25. **This study will focus on local and regional pollution phenomena,** as opposed the global concerns of climate change or ozone depleting substances.[10] This study will analyze the nexus of pollution and poverty while recognizing that many Bank Group interventions are broad-based, that is are not pro-poor targeted, but represent the underlying foundation for subsequent pro-poor interventions.[11] The study will focus on those pollution phenomena that matter most for poor countries and the poor who live in these countries that is, indoor and outdoor air pollution, water pollution, and waste. Waste occurs in various forms; this evaluation will address the types of waste that the Bank Group addresses in its interventions, typically municipal and industrial waste, toxic and hazardous waste, POPs and pesticide stock piles, soil and groundwater pollution (including legacy pollution) and agricultural run-off. The analysis covers air-born and water-born pollutants, as well as mobile sources. Pollution issues will be addressed regardless of the enterprise form, including industry as well as small- and medium-sized enterprises (SMEs).

26. This evaluation will assess the role of the Bank Group as a convener at international and national levels to advance the pollution agenda. In addition, it will cover partnerships that the Bank Group has entered into to advance the pollution agenda; these are partnerships introduced above, including the CCAC, the GACC and the GAHP; in addition, the PMEH program, and the Bank Group's collaboration

with the GEF in the context of implementing the Stockholm Convention, that is, in eliminating or substituting POPs. The assessment will focus on understanding the role of the Bank Group. It will not focus on the effectiveness of these partnerships.

27. **The evaluation will also reflect the concerns of specific beneficiary groups (children, the elderly, women, and workers of concerned sectors of both gender).** As pointed out in the introduction, among the poor it is mainly the children, the elderly, women, and male workers in specific trades who are affected the most by pollution. This study will examine to what extent the Bank Group's interventions have taken into account the special conditions leading to their increased risk exposure and implementation factors that have been introduced to mitigate pollution effects for them. To the extent data are available, the outcomes of such interventions will be assessed in a disaggregated manner. Beneficiary assessments are planned for at least one country case study or Project Performance Assessment Report (PPAR).

28. **The portfolio subject to this evaluation and the available evaluative evidence are summarized in Table 1, following the structure introduced in Figure 1.** Accordingly, the portfolio consists of 474 projects identified as "targeting" pollution concerns directly, 2,755 that aim at reducing the "footprint" of pollution-intense industries, and 641 that tackle climate change concerns. In addition, the portfolio contains 362 targeted, 3,554 footprint, and 748 climate change ASA, depicted separately in Table 1 as they will receive a tailored approach described further ahead. Targeted pollution interventions and those reducing the pollution-footprint are the *primary focus* of this evaluation.

Table 1. Pollution-relevant Projects Approved FY04-FY15

Institutions	Targeted Pollution		Improving Footprint		Climate Change	
	No. Projs	with Eval	No. Projs	with Eval	No. Projs	with Eval
World Bank Lending (IBRD/IDA)	275	104	1,486	628	271	79
IFC Investments	80	7 (**)	900	181	150	16
IFC Advisory Services	101	29	215	70	220	30
MIGA Guarantees	18	3 (**)	154	26		
Sub-total	474	143	2,755	905	641	125
World Bank ASA (ESW/TA)	362	-- (*)	3,554	--(*)	748	--(*)
Total	836	143	6,309	905	1,389	125

Sources: World Bank and IEG

Notes: (*) ASA is not evaluated at the project level, so no evaluative evidence is available. (**) Few evaluated projects are available as more than 80 percent of these projects were approved on or after 2010 and are thus not yet operationally mature. IBRD=International Bank for Reconstruction and Development; IDA=International Development Association; ESW=economic and sector work; TA=technical assistance.

29. **The safeguards system and performance standards are not subject to evaluation.** Although the analysis aims to assess the effects of these standards on pollution-intense industries, the systems will not be evaluated.[12] Macroeconomic interventions with direct effects on pollution (such as fiscal interventions to abolish fuel subsidies) will be considered, but broad-based macroeconomic interventions that could indirectly affect the "clean world" agenda do not fall within the evaluation's scope. This evaluation will not include from analysis of the general tension between investments in the real economy and pollution, but a literature review on this issue will be commissioned. [13]

Assessing Performance

30. **The high number of projects subject to this evaluation (table 1) calls for a careful deployment of methods to assess performance.** "Targeted" interventions will be assessed on a project-by-project basis through a comprehensive portfolio review. Those interventions aiming to improve the pollution-footprint will be assessed through a more *selective* assessment of pollution-relevant indicators. This part

of the analysis will zoom in on the effects of the Bank Group safeguards and performance standards on preventing or abating pollution.

31. **For "targeted" projects, IEG will conduct a comprehensive portfolio analysis.** This portfolio analysis will help identify and categorize the characteristics, objectives, and components of these activities and analyze their performance as well as the drivers of success and failure. Relying primarily on the available microevaluation data of 143 evaluated projects, IEG will analyze results achievement at project closure for World Bank lending projects and at the point of operational maturity for IFC and MIGA projects, based on the respective project-level evaluation reports.[14] Complementary data of the Bank Group's own monitoring and evaluation systems will be used as well, with the understanding that these have not been subject to an IEG validation.[15]

32. **For projects aiming to reduce the pollution-footprint, IEG will base its analysis on relevant data captured by the Bank Group's safeguards and performance standards systems.** Data will be used to assess not only the extent of *compliance*, but to analyze the effect of enforcing these standards on lifting standards above the nationally prevailing norms. Such data are available for all of IFC's 181 evaluated investments and for 26 MIGA guarantees, captured for IFC at least in a comprehensive E&S database.[16] For the 70 IFC advisory services, pollution-relevant data in Project Completion Reports (PCRs) will be used. For the 628 evaluated World Bank projects in the pollution intense industry, the analysis will focus on those projects where it can be reasonably expected to find available data, that is, those categorized "A" (48 out of 628 World Bank projects). These 48 category A projects have elevated environmental risks and are subject to an environmental assessment; the associated assessment reports, together with E&S data in Implementation Completion Report Reviews (ICRRs) will form the basis for the assessment. Of the 275 World Bank projects categorized as "B," a sample across the relevant sectors will be selected based on risk flags; this sample will then be assessed to the extent specific indicators on pollution aspects is available.

33. **Climate change interventions have already been addressed through a series of three IEG evaluations.** Hence, the scope of this evaluation will be limited to analyzing the channels through which climate change interventions have a pollution abatement effect. A literature review will be commissioned to address these linkages.

34. **Recognizing the important role of ASA, this evaluation will put a strong emphasis on such Bank Group interventions.** ASA work is an essential Bank Group intervention, often instrumental in underscoring the importance of environmental degradation, contributing to national strategy formulation and addressing pollution issues. Recognizing ASA's role in the context of the Bank Group's pursuit of being a "knowledge bank," this evaluation will assess ASA work in four ways: i) IEG will take stock of the coverage of ASA work globally. For the 362 ASA projects that target pollution directly (see table 1), IEG will establish the linkages between them and Bank Group lending operations to shed light on complementarity and potential gaps. ii) IEG will also analyze the role of ASA in desk- and mission-based country cases. For in total 37 countries Country Environmental Assessment, one type of ASA, are available. IEG will examine in a systematic review the consistency and quality of the assessment and their role in prioritizing Bank Group country portfolios. iii) In those five cases where IEG will conduct a mission-based country case study, the role, quality and influence that ASA work had will be assessed, including that of country environmental assessments and strategic environmental assessments. At the same time ASA work will be instrumental in analyzing to what extent Bank Group interventions reflect the specific circumstances and needs of beneficiary groups, including children, women and the elderly who are particularly hard hit by pollution. iv) Finally, IEG will examine the patterns of World Bank self-evaluation data on ASA work to see the extent to which they can help illuminate more and less successful activities of the work.

35. **This evaluation complements two ongoing IEG evaluations on water and sanitation and on urban transport.** A substantial section of the "targeted" World Bank lending portfolio (about one-third) addresses pollution issues related to waste water. The focus of evaluating these projects will be on investigating the downstream water quality aspects, that is pollution issues related to waste water and water treatment. This evaluation will not address sanitation and water supply and treatment issues and will therefore be complementary to IEG's evaluation on water supply and sanitation, where the focus will be more on service delivery to the poor (and associated quality issues on the supply side) and sanitation. To the extent feasible, data collection and portfolio analysis of the shared portfolio in water supply and sanitation will be conducted by the water and sanitation evaluation team. As pollution has no spatial boundaries, this evaluation addresses rural as well as urban aspects of pollution. Relevant projects in the transport sector will therefore be assessed from a pollution angle. This will provide valuable insights for the ongoing evaluation on urban transport.

Evaluation Design and Evaluability Assessment

Evaluation Design, Data Requirements, Their Strengths, and Limitations

36. **The evaluation questions will be answered through a combination of the following methods:** (i) a literature review, (ii) a review of Bank Group policy and strategy documents at country and corporate levels, (iii) strategic mapping of global and regional environmental concerns and the Bank Group response; (iv) a portfolio review of World Bank Group projects and activities; (v) 37 desk-based country reviews; and (vi) five purposively selected country case studies including a field mission. In addition, four PPARs will be conducted. The approach will combine qualitative and quantitative methods and draw on external and internal data.

37. **The literature review will address important knowledge gaps.** As noted earlier, actions for protecting the environment are, at times, seen as in competition with economic development and growth. Developing countries tend to be more concerned about creating jobs than abating pollution. Analyzing the existing literature on the tradeoffs between managing pollution vs. sustainable economic development in the context of an IEG-commissioned literature review will help close an important knowledge gap.[17] Furthermore, evidence about the linkages between the climate change and the pollution agenda will be gathered through the literature review. Interventions aimed at GHG reduction can reasonably be expected to reduce the emission of conventional pollutants (like SO_2 or particulate matter). Understanding these "co-benefits" will complement this evaluation and allow the team to judge better the Bank Group's effectiveness overall.

38. **The proposed strategic mapping will rely mainly on external data.** The purpose of this exercise will be to assess to what extent the Bank Group allocates its resources at the global and regional levels in line with environmental priorities. To the extent ambient pollution data is available, these will be used. Proxies for ambient pollution data will be used alternatively, including data on economic losses and health.[18] See Attachment E for data sources identified by the team.

39. **This strategic mapping will be complemented by a country-level analysis of the coherence of solutions developed by the Bank Group.** IEG will carry out desk-based studies of 20 countries to analyze to what extent the Bank Group's interventions are aligned with countries' priorities. These 20 countries will be split into two groups, 10 countries with an existing Country Environmental Assessment (CEA) plus another 10 without a CEA. These assessments will try to answer the questions to what extent the Bank Group is deploying the right instruments to identify pollution priorities, will shed light on the availability of environmental data that could be useful to set a country's priority, to what extent pollution priorities are reflected in Country Assistance / Partnership Strategies and will assess the coherence of Bank Group interventions with identified priorities, taking into account the maturity of the institutional frameworks.

40. **The portfolio analysis will capture results and their drivers, as outlined previously.** It is important to note that the analysis mainly captures early project outcomes. The underlying project-level evaluations capture outcomes only at a very early stage; outcomes materializing later on are not reported in the project-level evaluation system. IEG assesses long(er)-term outcomes regularly through PPARs and country case studies.

41. **In addition, five mission-based country cases will be carried out.** The purpose of these is to identify drivers of success and failure; assess the long-term outcomes of interventions that are typically not captured in project-level evaluations; assess nonlending and advisory work, including ASA and technical assistance that might have provided diagnostics of the country's environmental status; address issues of balancing upstream vs. downstream work; and assess the sequencing and synergies across Bank Group institutions. Contribution analysis will be used to assess the Bank Group role in advancing the pollution agenda, given the multiple stakeholder in the process and the general economic developments in a country.

42. **The selection of country cases was carried out criteria-driven first, with a subsequent purposive selection of five cases.** Given this rationale, country case studies can only be a fruitful source of knowledge if they address countries with a certain minimum number of relevant Bank Group interventions.[19] Therefore, in the first criteria-based selection, countries with presence of at least two of the total five types of pollution-relevant interventions (lending, investments, advisory, guarantees, ASA, technical assistance, and economic and sector work) with available project-level evaluation reports (for example, ICRRs, Expanded Project Supervision Reports [XPSRs], PCRs). Applying these criteria to all 148 client countries, yields a list of 25 eligible countries of which five (see Table 2) were chosen according to the a set of principles. See Attachment G for details on the selected countries and their projects.

(i.) Coverage of the most prominent issues related to air, water, and waste pollution;
(ii.) The complementary nature of interventions, that is, work that aims at improving the enabling environment (for example, setting up pollution regulations) and those investing in pollution-intense industries subsequently, or funding relevant infrastructure in waste water or waste;
(iii.) Coverage of the various sectors across pollution-intense industries;
(iv.) Coverage and depth of ASA work and the mix of World Bank lending instruments
(v.) Geographic, regional, and income-level considerations; and
(vi.) Institutional capacity to drive the country's environmental agenda.

43. **Parallel IEG missions to India and China will feed into this evaluation.** By coordinating with planned IEG missions to China and India conducted by the urban transport and water and sanitation evaluation teams, this evaluation will not only increase the diversity and coverage of field-work in these two important countries, it may also shed light into missed opportunities – that is, cases where pollution management could have been included in project design.

44. **In addition to these country missions, the evaluation proposes to conduct four PPARs with field work in Morocco, Tanzania, Ethiopia, China, Croatia, and the Arab Republic of Egypt to deepen the evaluative evidence base.** Projects were selected to represent a diversity of lending instruments (SILs, FILs, and DPLs) and operational approaches that cover a wide spectrum of pollution concerns. The Africa Stockpile Program (P075776-FY06) was selected given its focus on eliminating obsolete pesticide stockpiles and associated waste and implementing measures to reduce and prevent future related risks; visits to three countries are planned in the context of this PPAR (Morocco, Tanzania and Ethiopia). The proposed PPAR of the Thermal Power Efficiency Project in China (P098654) will not only assess the outcomes of this targeted intervention, but also represent an opportunity to look at Bank Group's broader involvement in air pollution abatement in China and into co-benefits of climate change projects. In Croatia, the GEF Agriculture Pollution Runoff Project (P100639-FY08) was selected given its investment to support the use of environmentally friendly agricultural practices by farmers in the

country's Danube River Basin to reduce nutrient discharge from agricultural sources to surface and ground water. Unlike previous attempts in other countries, the World Bank's Second Pollution Abatement Project in Egypt (P090073) successfully used a line-of-credit approach directed at abating industrial pollution and is hence suggested as a fourth PPAR. The project leveraged an innovative, multi-donor approach, supported the capacity of the Egyptian Environmental Affairs Agency, and contained a stand-alone carbon finance sub-program.

Table 2. Case Study Countries and associated projects

Country	Region	Income Level	Subsets	WB Lend	WB AAA	IFC IS	IFC AS	MIGA	Total
Colombia	LCR	UMIC	Targeted	9 (4)*	6	1	4		20 (4)
			Footprint	13 (7)	29	19 (6)	7 (3)		68 (16)
Croatia	ECA	HIC	Targeted	3 (3)	3		3		9 (3)
			Footprint	11 (6)	8	6 (2)			25 (8)
Egypt, Arab Rep.	MNA	LMIC	Targeted	6 (1)	7	1	2	1 (1)	17 (2)
			Footprint	15 (3)	36	28 (1)	1	4	84 (4)
Ghana	AFR	LMIC	Targeted	6 (3)	2		1		9 (3)
			Footprint	23 (13)	26	11 (2)	3 (2)	3 (1)	66 (18)
Indonesia	EAP	LMIC	Targeted	6 (5)	14	3			23 (5)
			Footprint	32 (15)	99	30 (6)	7 (1)	3 (1)	171 (23)
Total				124 (60)	230	99 (17)	28 (6)	11 (3)	492 (86)

* () = Number of evaluated projects

45. **The proposed fieldwork covers the Bank Group's work across the most important pollution concerns relating to air, water, and waste while providing an opportunity to delve deep into specific sector issues, intervention types, and the use of unique instruments or approaches.** Taking PPARs and parallel missions into account, in total ten countries will be visited. Air pollution, one of the major killers, will be covered in five out of these ten countries. Two of these countries include indoor air pollution concerns while outdoor air pollution concerns will be covered through the industry lens in targeted projects such as Egypt's pollution abatement series as well as through footprint projects in pollution-intense industry. Waste management concerns will be covered in four out of the five country case studies, for example, through the Colombia DPL series and related investments in solid waste management. Waste water management will be covered in all country case studies.

46. **This evaluation will handle data limitations in a pragmatic manner.** While it may be desirable to assess the results of Bank Group operations in terms of improved environmental conditions, such an assessment would require data on actual emissions or similar. This evaluation will try to make an effort to analyze such data to the extent they are available in project evaluation reports. For the five mission-based country case studies, the team will also try to gather such data from the respective national agencies and use them to analyze the effectiveness of Bank Group interventions. Data will be gathered in a systematic manner, using performance indicators for each type of pollutant. However, this evaluation will not gather data in this regard beyond what is already available.

Quality Assurance Process

47. **This approach paper has been peer reviewed to ensure relevance of evaluation questions and issues covered,** adequacy of scope of the evaluation, and appropriateness of methodology. Peer reviewers for this evaluation come from outside IEG: Professor Elizabeth Edwards, University of Toronto; Cristián Franz Thorud, Head of the Environmental Protection Agency Chile (Superintendente del Medio Ambiente and former Senior Environmental Specialist with the Inter-American Development

Bank), and Susmita Dasgupta, Lead Environmental Economist, Development Economics Vice Presidency (World Bank).

Expected Outputs, Outreach, and Tracking

48. **Planned Reporting Vehicle.** The primary output of the evaluation will be the report to the Board's Committee on Development Effectiveness (CODE), which will contain the main findings and recommendations. The finished evaluation will be published and disseminated both internally and externally. IEG will develop working papers, presentations, blogs, videos, and other products as appropriate for other audiences for the evaluation, including key stakeholders.

49. Regular stakeholder interaction will be sought to enhance the evaluation process. This will include consultation while the evaluation is under way and dissemination and outreach once the study is complete. During evaluation preparation, the team will solicit feedback from stakeholders, in particular World Bank Group management, environmental practitioners, and government agencies, to improve the evaluation's accuracy and relevance. Such stakeholder interaction will contribute important information and qualitative data to supplement interviews, case studies, and other research. Social media will be used to reach out to the broader development community and concerned stakeholders, potentially including beneficiaries of pollution-abating initiatives. Consultations will also be held during field missions with stakeholders, including government counterparts, Bank staff, nongovernmental organizations , donors, private sector actors, and beneficiaries.

50. **Outreach strategy.** In addition to outreach during the evaluation process, IEG will implement an outreach plan once the evaluation is completed. IEG will launch the report in Washington, DC, and at a major international conference. The efforts will target key stakeholders, including staff at headquarters and country offices, other multilateral development banks and donors, government authorities, civil society organizations, and counterpart officials. Through these means and relevant international fora, the team will seek to maximize awareness and the value and use of findings and recommendations to strengthen development outcomes.

Resources

51. **Timeline and budget.** The evaluation will be submitted to CODE by the end of Q1 FY18. The budget for the study is estimated at $1,070,000 an amount consistent with other major IEG sector studies. The budget for PPARs will be separately covered.

52. **Team and Skills Mix.** The skills mix required to complete this evaluation includes expertise in environmental management, evaluation experience, and knowledge of IEG methods, including econometric and portfolio analysis; familiarity with the policies, procedures, and operations of IFC, MIGA, and the World Bank; and knowledge of the Bank Group and external sources.

53. The evaluation will be prepared by a team led by Stefan Apfalter (task team leader), Gürkan Kuntasal (senior environmental specialist), Stephen Hutton (environmental economist), Antonio Giuffrida (lead health specialist), Bekele Shiferaw (lead evaluation officer), Jacqueline Andrieu (evaluation analyst), Jack Fritz, Bernard Baratz, and Bekir Onursal (senior environmental consultants), W. Ismail and V. Malca (analysts), and Anjali Kumar and Zeljko Bogetic (advisors). This team has substantial knowledge and experience in key subject matters and about the respective institutions of the Bank Group, and methodology. The report will be prepared under the direction of Midori Makino, Manager, IEGSD; and Marvin Taylor-Dormond, Director, IEGSP.

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Endnotes

[1] Note that depending on the data source, the exact number of deaths may vary. This Approach Paper presents a range of data currently available and deemed reliable. Through the evaluation, the team will ensure consistency of data used.

[2] SDGs address pollution issues directly or indirectly in 10 SDGs: In the context of health (SDG3), clean water and sanitation (SDG6), clean energy (SDG 7), sustainable economic growth and industrialization (SDG 8 and 9), sustainable cities (SDG 11), responsible production (SDG 12), climate action (SDG 13), oceans and marine resources (SDG 14), and sustainable terrestrial ecosystems (SDG 15.

[3] Environmental protection and public health agencies in countries around the world typically have separate bureaus dealing with air, water, and solid waste and suffer from problems with inter-agency coordination with other substantive ministries, such as agriculture or health, that are often more powerful.

[4] Pollution undoubtedly also links to the other two agendas in the strategy, but mainly in an indirect fashion. The "green" agenda on the sustainable management and conservation of natural resources, is relevant for pollution in the context of contamination of these resources, for example. The "resilient" agenda deals with preparation for shocks and adaptation to climate change and his hence also relevant for pollution with climate change being intertwined with air pollution (and other forms of pollution).

[5] These interventions at times address legacy issues, that is, cleaning up contaminated sites, but often build structures to handle concerns of the future

[6] Including utilities and thermal power generation

[7] It is acknowledged that the application of performance standards can have an absolute reducing effects in the case of brownfield operations where a more stringent standard can indeed reduce emissions. It is further acknowledged that the application of performance standards to greenfield developments is likely to only have a relative positive effect; even if fully meeting all requirements, greenfield investments will increase the environmental load on the receiving airshed and water almost always. Still, IFC's involvement can results in a relative positive effect, in particular when IFC's performance standard is more stringent than the otherwise applicable local standard.

[8] The GAHP is a collaborative body supported by the Asian Development Bank (ADB), the Inter-American Development Bank (IDB), the European Commission, several UN agencies, and a range of bilateral agencies.

[9] Including in waste/hazardous waste/clean-up/pollution reduction.

[10] Note that climate change issues have already been addressed by IEG by a series of three evaluations.

[11] The evaluation recognizes that many interventions may not require special attention to certain groups, like improving air quality through general fuel standards. In cases where a special focus on target groups appears warranted, the evaluation will assess to what extent the circumstances of the poor and other groups (children, women, the elderly or male agricultural workers) have been taking into account when designing interventions and to what extent they achieved their stated objectives.

[12] Please see attachment C for lessons from the 2010 IEG evaluation of the safeguards system

[13] Arguably, any Bank Group-supported investment in infrastructure, such as transport or energy, is likely to entail increased emissions; any assistance to improve rural road system will likely increase

traffic. This study will not evaluate the tradeoffs between pollution and such development interventions as evaluative evidence is lacking.

[14] For World Bank projects, Implementation Completion and Results Reports (ICRRs) and their IEG reviews will be the primary source of results information, complemented by Project Performance Assessment Reports (PPARs) where available. For IFC Investment Services and MIGA, this evaluation will largely rely on Extended Project Supervision Reports (XPSRs), Project Evaluation Summaries (PES'), and Project Evaluation Reports (PERs) conducted at operational maturity, usually about two years after financial closure. It is important to note the limitations of using ICRRs, XPSRs, PES' and PERs.

[15] Including PCRs = Project Completion Report; PIMs = Post Implementation Monitoring reports (both IFC Advisory Services); IFC investment supervision and monitoring reports. World Bank ASA work for this period was not subject to IEG validation, so self-evaluation is the only source of information.

[16] To assess performance and effects of private sector-facing interventions by IFC, this evaluation will use a specific E&S database. For both, the assessment of IFC targeted interventions as well as projects aiming to improve the pollution footprint through the application of Performance Standards, this evaluation will resort to the IEG E&S database which has data on about 700 projects that have been evaluated by IEG since 2007 as part of the XPSR program, using IEG's established E&S evaluation methodology on the principle of IFC's Policy on E&S Sustainability and Performance Standards.[16] In addition, this analysis will capitalize on IEG Annual E&S Sector Highlights that summarize findings of overall portfolio performance and provide trends for E&S Effects and IFC's E&S Work Quality and IFC's E&S Role and Contribution.

[17] The team acknowledges that environmental policies need not be seen as requiring a tradeoff with development as they may actually contribute to growth and protect the vulnerable.

[18] The analysis will try to control for country and sector specific capacities that would affect Bank Group resource allocation

[19] This does not imply that interventions in countries with overall lower activity levels are less important. Indeed they may yield equal insight and provide opportunities to learn what deters governments and the private sector from seeking support in pollution management, from innovative approaches; however, as all projects will be analyzed at the portfolio level, the evaluation will give them due consideration.

Approach Paper
"Toward a Clean World for All"
An Evaluation of World Bank Group Support for Pollution Management
July 19, 2016

Attachment A

Detailed Evaluation Design Matrix

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
How relevant, effective, and efficient has the World Bank Group been in addressing pollution concerns in client countries through (i) targeted interventions and (ii) the use of safeguards and performance standards in pollution-heavy industries (as these concerns relate to the poor)? Going forward, how well is it equipped to support countries moving toward a "clean world for all"?					
➢ RELEVANCE					
1. To what extent has the WBG supported client countries in addressing the most important pollution concerns, that is, is the Bank Group targeting the relevant concerns in its client countries affecting the poor? a. What are Bank Group's diagnostic tools to identify and address pollution concerns? b. How strategically did the World Bank Group allocate its resources on pollution interventions to those	Information on the nature and scope of Bank Group diagnostic work Information on resources allocations of pollution interventions Information on the nature and scope of Bank Group support, project components and design features	Portfolio data, including ASA/AAA Portfolio data, including ASA/AAA	Data retrieval Document retrieval	Content Analysis using text analytics and manual coding to allow for adequate classification and coding Strategic resources mapping to assess resources deployment and indicators of relative need and constraints while	ASA / AAA work often difficult to locate due to limitations in the ASA identification system

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
countries how need them most?	Information about client countries' actual pollution priorities and corresponding Bank Group interventions	Selected data bases by WHO, EPI (Yale), UNEP, World Bank, UNSTAT, WRI Climate Data Explorer	Data retrieval	controlling for institutional capacity of client countries	Data limitations on referred data sets see Attachment F
c. Given the body of evidence and data on global pollution issues, is the Bank Group addressing the right priorities in the right country through its country level portfolio of interventions?	Information on resources allocations of Bank Group pollution interventions and nature and scope of such support Information on relevance of interventions given the countries' level need and relative development priorities / pollution concerns	Project documents, portfolio databases; 41 Country Environmental Assessment for 37 countries identifying country level priorities	Portfolio analysis, data collections/ retrieval (indicators) Portfolio analysis, data collections/ retrieval (indicators)	20 Desk-based studies to assess relevance of interventions based on CEAs Content Analysis using text analytics and manual coding to assess in how far projects addressed priority issues according CEAs 5 Country case studies (missions) to get context information and expand coverage to non-lending activities / systemic intervention / enabling environment	Potential inconsistency in CEAs methodologies in quantifying pollution concerns and their weight; if consistency found, these will be reported in a transparent way Part of the Bank Group's country level response is likely to be provided in form of "footprint" projects, i.e. through the application of Bank Group E&S standards. These are not targeted at a specific pollution concerns and my pose challenges in assessing their relevance
d. To what extent has the Bank Group addressed the multi-sectorial nature of pollution? Has the Bank Group helped its client countries to develop strategies and action plans	Information on the nature of Bank Group interventions and their composition and cross-sectorial nature	Project documents, portfolio database	Portfolio analysis, data collections/ retrieval (indicators	Portfolio Analysis to assess cross-sectorial nature of pollution interventions 5 Country case studies to provide insight on the cross-	

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
across the various agencies involved?				sectorial nature of the issues and the extent to which it was addressed; to assess how well the Bank Group has supported client countries in resolving inter-agency issues	
2. To what extent has the Bank Group deployed the right diagnostic tools to assess pollution issues in client countries, including the special circumstances of project beneficiaries, including the poor, women, the elderly or the children 3. To what extent has the Bank Group used the right instruments – is the Bank Group addressing the key "upstream" issues (incl. policy, regulations, institutions, subsidies, incentives etc.) and "downstream" investments? a. What are IFC's, MIGA's and World Bank's support instruments for pollution and how do they relate to each institution's corporate and environmental	Information on the scope and depth of assessment of the special circumstances of project beneficiaries Information on corporate strategies and environmental strategies and policies	41 Country Environmental Assessment for 37 countries identifying beneficiary constraints Strategies, operational notes and frameworks, project design documents (PADs, Board Documents, Underwriting Documents	Document retrieval Document retrieval	Content Analysis within the 37 desk-based studies to assess in how far projects addressed priority issues according CEAs 5 Country case studies making used of additional ASA, including relevant Strategic Environmental Assessment Reports and similar Content analysis to identify how types of interventions relate to corporate and environmental strategies	In absence of a benchmark for what is a "good enough" assessment of beneficiary constraints, it may be difficult to pass a judgement. Therefore, IEG will report transparently on findings before passing a judgment

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
strategy? How do they differ from each other, and are they consistent and complementary? b. Are these instruments putting in place the right incentives and remove existing disincentives (e.g. fuel subsidies)? c. What drives client countries to request the Bank Group's support to address pollution concerns? d. What drives private sector companies to request IFC investments and advice?	Information on the nature, scope and depth of Bank group engagement Information on the nature, scope and depth of Bank group engagement, in particular related to DPLs and Prior Actions Information on motivational factors of client government and political economy factors Information on motivational factors of private companies, their planning horizon and risk appetite	Qualitative information on addressing macro issues and disincentives to pollution mitigation in IEG validated micro evaluation systems, in particular in ICRs of DPLs	Document retrieval Key informant interviews (semi-structured interviews) with country level counterparts in the public sector (EPAs and other substantive ministries) as well as private sector representatives	Country case studies (desk-based and missions) to identify detailed information on addressing macro issues. Technical Note on the role and influence of WB lending instruments, including DPLs Country case studies (mission-based)	ASA work may not focus sufficiently on macro factors including disincentives. In the context of mission-based country cases this can be triangulated with additional environmental assessment by other institutions. Political economy factors may be difficult to assess due to the variety of arguments of the different stakeholders.
➢ EFFECTIVENESS					
1. Has the Bank Group been effective in building the required awareness, public disclosure mechanisms, knowledge, capacity, and institutions and setting up regulatory frameworks to deal	Information on development outcomes		Data extraction of ratings and	Portfolio analysis of portfolio data and outcome ratings in exiting ICRRs,	Potentially a significant share of Bank Group systemic interventions has been carried out through non-lending / ASA which is not embedded in a results

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
with pollution-related issues through its public sector-focused systemic/upstream intervention and are these outcomes sustainable? a. Are the outcomes of these projects sustainable? b. Are the created institutions effective in monitoring and enforcing the required pollution standards?	and performance of projects (lending and non-lending), in particular on policy advice relevant aspects including institution building	Ratings and qualitative information on development outcomes and results achievement from IEG validated micro evaluation systems of relevant WB lending and non-lending operations, including ICRs, and PPARs	specific section within the micro evaluation documents referring to achievement of set objective (rating and other qualitative information indicating success or failure) and portfolio analysis of the thus obtained data pertaining to upstream policy advice	XPSRs, PCRs etc. to assess development outcomes / results achievements including patterns Content analysis to identify patterns of success and failure (using frequency counts as primary indicators) in micro evaluation documents Country case studies (mission-based) to gain insights on sustainability of regulatory frameworks and institutions created, to what extent they are responsive and why they succeed (or failed)	framework nor its outcomes evaluated independently upon completion; outcomes of non-lending will hence only be assessed based on existing self-ratings and, in an independent manner, in the context of country case studies (missions-based) In addition, many observed changes may be attributable to a variety of positive and negative factors, including the work of Governments and other donors. This complicates the task of identifying the Bank Group's contribution.
c. What can we learn from cases where the implementation of systemic interventions was particularly successful or failed?	Information on drivers of success and failure	Mission case study interviews with relevant experts and stakeholders			
2. Has the Bank Group been effective in addressing pollution issues through its lending operations and public investments in pollution reduction, and though its safeguards (World Bank) and what were the effects, including for the poor?	Information (qualitative and quantitative) on how pollution issues were addressed and with what results	Relevant sections of microevaluation focusing on E&S aspects and safeguards, in particular in ICRs and ICRRs and PPARs	Data extraction of E&S section within the micro evaluation documents referring to pollution	Portfolio analysis of performance / results reported in E&S section in micro evaluation documents	For the WB side, a central repository for E&S data may be lacking. In such a case, the analysis will focus on a sample projects, representing all major sectors For the 628 evaluated World Bank projects, the analysis will focus

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
					on Cat "A" projects (48 out of 628). The associated assessment reports together with E&S data in ICRRs will form the basis for the assessment. Of the 275 World Bank projects categorized as "B", a sample across the relevant sectors will be selected based on risk flags; this sample will then be assessed to the extent specific indicators on pollution abatement / prevention is available E&S data are available for all of IFC's 181 evaluated investments and for 26 MIGA guarantees, captured for IFC at least in a comprehensive E&S database. For the 70 IFC advisory services pollution-relevant data in the PCRs will be used. The IFC E&S database contains data since 2007, compiled as part of the XPSR program, using IEG's established E&S evaluation
1. Has the Bank Group been effective in in curbing pollution through its private sector-focused interventions, including those aimed at enhancing the private sector's capacity to address pollution issues through its Advisory Services and those addressing pollution issues through Performance Standards (IFC/ MIGA) in its investment and guarantees, and what were the effects for the poor	Information on development outcomes and performance of projects (IFC investments and advisory), in particular related to cleaner production and resources efficiency Information (qualitative and quantitative) on how pollution issues were addressed and with what results	Relevant sections of microevaluation focusing on E&S aspects / IFC /MIGA Performance Standard, in particular in XPSRs, PERs and PES' IEG E&S database containing all relevant information on action triggered through Performance Standards and implementation	Data extraction of ratings, quantitative and qualitative information and specific section within the micro evaluation documents and the E&S database	Portfolio analysis of performance / results reported in E&S database Country case studies (mission-based) to identify detailed country level data on outcomes and effects of Performance Standards; and gain in-depth	

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
				understanding factors of success and failure	methodology. This coverage is likely still leading to a comprehensive assessment as investments operationally mature in 2007 were approved 2004 or 2005.
➢ EFFICIENCY 1. Is the Bank Group positioned to address pollution issues in an efficient manner? What is the Bank Group's comparative advantage, given its range of interventions and services? 2. What is the Bank Group's role vs. other development partners (MDBs or IFIs) in providing knowledge and/or funding? 3. What do we know about the efficiency of proposed abatement options? Are end-of-the-pipe solutions or the promotion of more comprehensive cleaner production/technology concepts prevalent?	Information on Bank Group service offerings, their inter-connectedness, client reach and delivery pace Information on role of other MDBs in countries, their service offerings and strategies Information about RoI of implemented cleaner production options	Country level stakeholder Country level stakeholder, representatives of other MDGs, CSOs Project level evaluation reports of IFC AS Cleaner Production and Sustainable Business Advisory (SBA); firm level data	Key information interviews of country level stakeholder including ministries and CSOs Key information interviews of country level stakeholder including MDBs, ministries, CSOs Data extraction and portfolio analysis of supported projects from IFC AS database	Country case studies (mission-based) to identify country level usage of Bank Group services and products and client perception of efficient delivery Quantitative analysis of data pertaining to CP options implemented and their RoI Country case studies (mission-based) to obtain contextual information on the success and failure of CP options implementation	IFC AS M&E systems may not collect data on the implementation of individual CP options. In such a case, this analysis can only be done in the context of missions-based country cases

Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
4. To what extent has the Bank Group helped client countries identify adequate technologies, including those that allow it to "leap-frog" over traditional technological solutions?	Information on the nature of technology used in interventions	Project-level evaluation report across the Bank Group	Data extraction and portfolio analysis of supported projects	Portfolio analysis and Country case studies to assess the extent to which leap-frogging technologies were applied	Project documents may not specific the nature of the technological solution actually used
➢ WORK QUALITY					
1. Is the World Bank Group effectively managing factors within its control? 2. Is the Bank Group effectively managing factors within its control and is the Bank Group meeting its established work quality standards in monitoring, reporting and supervision? 3. Are the different Bank Group institutions levering synergies through adequate coordination, knowledge sharing and sequencing of interventions? a. What can we learn from successful or failed	Information working quality standards and meeting thereof Information on quality standards in monitoring, reporting and supervision and meeting thereof Information on sequencing and coordination of Bank Group interventions Information on the extent to which World Bank Group units worked in the same country, set of	Project level evaluation reports (ICRs, PPARs, PCRs, XPSRs etc.); qualitative information from these sources; country case studies; CAS, CASCR-Rs; Country management staff, key information interviews with staff in country counterparts	Data extraction of ratings and specific section within the micro evaluation documents referring to work quality and achievement of set objective (rating and other qualitative information indicating success or failure) Interviews with key informants and project stakeholders, including at the country level	Portfolio analysis of portfolio data to assess work quality of project portfolio and how they vary by country, region and if and how the results correlate with presence / absence of related reform efforts Country case studies (mission-based) to assess sequencing and coordination across Bank Group interventions Portfolio analysis of to assess M&E	Coordination efforts tend to be poorly documented in project documents and micro evaluation documents, according to IEG experience; hence the document-based review will have to be

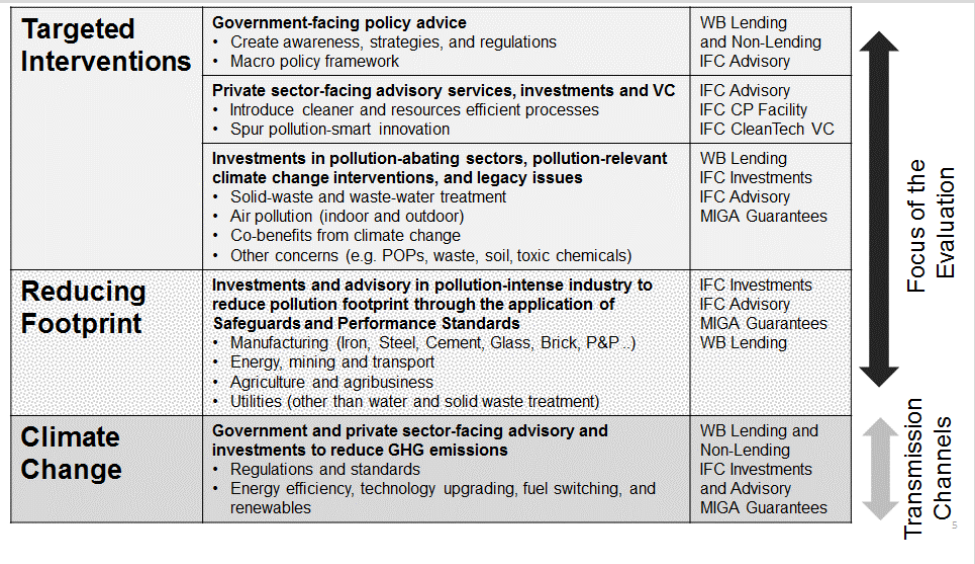
Evaluation questions	Information required	Information sources	Data collection methods	Data analysis methods	Limitations
coordination across the various institutions?	interventions, regions etc. Information on complementary role, coordination and collaboration of World Bank Group activities at project and country level Information on drivers of success and failure.			activities and if they are fit for purpose Country case studies (mission-based) to assess adequateness of M&E standards and practice	complemented by country visits to complete the picture

Attachment B: Preliminary Portfolio Review

Identification of Pollution-relevant Projects across the Bank Group – Framework

1. **Pollution-relevant projects can be categorized in three major areas: projects that aim to directly address pollution concerns through targeted interventions, projects that focus on improving the footprint of pollution-intense industry, and projects that focus exclusively on climate change concerns.** The first of such areas includes projects which aim to directly address pollution concerns through targeted interventions and have pollution abatement or mitigation as part of their objectives. The second area, which is also the broadest, deals with improving the footprint of Bank Group projects in pollution-heavy industries such as cement, pulp and paper, agriculture, or power. These projects address pollution concerns through the implementation of World Bank Safeguards and IFC Performance Standards as opposed to through direct objectives. The third and final area includes projects that also aim to address pollution but through the lens of climate change, focusing exclusively on curbing carbon emission (see Figure B 1).

Figure B 1. Framework for Pollution-relevant Subsets



Source: IEG Portfolio Review and interviews with World Bank Group subject-matter experts and management

Identification of Pollution-relevant Projects across the Bank Group – Methodology

2. **Underpinning the portfolio identification methodology employed by IEG are extensive consultations with stakeholders and experts across the Bank Group as well as the review of available internal and external literature and strategy documents.** These interactions and review of the literature informed the evaluation approach by highlighting important concepts and frameworks as well as revealing industry coding, system flags, and keywords that would facilitate the identification of the portfolio and its classification into relevant portfolio subsets. During the evaluation phase, IEG will review the identified list of projects together with relevant Bank Group departments in order to ensure completeness and accuracy of the project universe.

3. **IEG's identification methodology leveraged the Bank Group's industry coding and system-based flags together with text analytics strategies to systematically capture and categorize the relevant portfolio subsets.** In addition to consultations with relevant stakeholders, IEG employed the following steps in order to identify the evaluation's portfolio of projects: (i) identify relevant system flags (e.g. sector codes), (ii) for projects that do not contain at least one of the relevant system flags, perform a targeted keyword search, and (iii) manually review the projects identified in steps (i) and (ii) in order to remove false positives and systematically categorize them in order to achieve a unified portfolio view.

4. **For the World Bank, IEG identified six sector and theme codes as key to the evaluation: pollution management and environmental health, environmental institutions, other environment, climate change, energy efficiency, and renewable energy.** Projects were selected for review if they contained at least one of these codes (Fig B 2). IEG also performed a targeted keyword search of all project abstracts, keyword tags, and prior actions. This resulted in a list of approximately 1,500 projects (or about 34 percent of the portfolio) which were manually reviewed (step iii) in order to identify the targeted pollution and climate change portfolio subsets (275 and 271 projects respectively). World Bank "improving footprint" projects were identified based on sector coding where projects contained at least one sector code in agriculture, energy, transport, and urban development. Given the lack of documentation available for World Bank ASA, these projects were identified using only the targeted sector code pollution management and environmental health. This resulted in a list of 362 targeted pollution ASA (or about 3 percent of the portfolio).

Figure B 2 World Bank and ASA System Codes Used to Identify Pollution-relevant Subsets by Intervention Type

Source:	OPCS Sector and Theme Codes: http://www.worldbank.org/projects/sector?lang=en&page= http://www.worldbank.org/projects/theme?lang=en&page= File from World Bank Business Intelligence (BI) Portal and Analysis for Office (AO) Application
Targeted Interventions	Sector Codes: • WB – Solid Waste Management • WT – Wastewater Collection and Transportation • WV – Wastewater Treatment and Disposal Theme Codes: • 82 – Environmental Policies and Institutions • 84 – Pollution Management and Environmental Health • 86 – Other Environment and Natural Resources Management
Footprint Interventions	Sector and Theme Codes for: Agriculture, Energy, Transport, and Urban Development
Climate Change	Sector Codes: • LA – Energy Efficiency in Heat and Power • LE – Renewable Energy • LR – Other Renewable Energy Theme Codes: 81 – Climate Change

Source: IEG Review and interviews with World Bank Group subject-matter experts and management

5. **For IFC Advisory, IEG identified key product lines relating to environmental sustainability, environmental standards, resource efficiency, clean energy, and sustainable energy finance.** Projects were selected for review if they contained at least one of these product lines (Fig B 3). In addition, IEG performed a targeted keyword search of all projects using ASOP's memo listings for objective and project description. This resulted in a list of approximately 450 projects (or about 15 percent of the portfolio) which were manually reviewed (step iii) in order to identify the targeted pollution and climate change portfolio subsets (101 and 220 projects respectively). IFC Advisory "improving footprint" projects were identified based on sector coding where projects contained at least one sector code in chemicals; oil, gas, and mining; plastics and rubber; primary metals; pulp and paper; etc.

Figure B 3. IFC Investment and Advisory System Codes to Identify Pollution-relevant Subsets by Intervention Type

Source:	IFC Sector Names, Product Names, and Industry Group Codes File from iDesk (MIS Extract) and ASOP (Project Product Detailed Listing)
Targeted Interventions	Sector Names: • Utilities: o C-BA – Water and Wastewater Utilities o C-DA – Waste Collection Treatment and Management o C-DB – Waste to Energy – Waste Industry Group Codes: • Water and Wastewater Utilities Product Names (IFC-Advisory Only): • Environmental, Social and Trade Standards • Environmental and Social Sustainability Advisory
Footprint Interventions	Sector Names: • Agriculture: A-AA to A-BD • Oil, Gas, and Mining: B-AA to B-FA • Utilities: C-BA to C-DB • Transportation and Warehousing: E-BA • Food and Beverages: F-AA to F-BC • Chemicals: G-AA to G-HA • Non-metallic Mineral Product Manufacturing: H-AA to H-CA • Primary Metals: I-AA to I-BB • Pulp and Paper: J-AA to J-AH • Textiles, Apparel & Leather: K-AC • Plastics and Rubber: L-AA to L-AC • Industrial and Consumer Products: M-AA to M-AF; M-DA to M-DC; M-FA to M-FD • Electric Power: V-AA to V-AE; V-CA; V-EA; V-IA Industry Group Codes: • Agribusiness & Forestry: Beverages, Food processing, Livestock, Primary production, Pulp & Paper • Infrastructure: Electric power; Urban transport • Manufacturing: Chemicals & Fertilizers, Construction materials, Machinery, Transport Equipment, Other Manufacturing, Textiles, apparel & leather • Oil, Gas & Mining

Climate Change	Sector Names: • Electric Power: V-BA to V-BJ Product Names (IFC-Advisory Only): • Climate Advisory • Energy & Resource Efficiency • Sustainable Energy Finance

Source: IEG Review and interviews with World Bank Group subject-matter experts and management

6. **Given the nature of IFC Investments and MIGA Guarantees, a modified strategy was implemented in order to identify their relevant portfolio subsets.** For IFC Investment, 80 projects in the cleaner production and waste and waste water projects were identified and included in the targeted pollution portfolio subset. An additional 900 projects were identified and included in the "improving footprint" portfolio subset based on sector coding; i.e. projects contained at least one sector code in chemicals; oil, gas, and mining; plastics and rubber; primary metals; pulp and paper; etc. (Fig B 3). For MIGA Guarantees, 18 projects in the waste and waste water sectors were identified and included in the targeted pollution portfolio subset while an additional 154 heavy industry were identified and included in the "improving footprint" portfolio subset based on sector coding; e.g. agriculture, chemicals, infrastructure, manufacturing, mining, oil, power, transport, etc. (Fig B 4).

Figure B 4. MIGA System Codes Used to Identify Pollution-relevant Subsets by Intervention Type

Source:	MIGA Sector Codes https://www.miga.org/Pages/Projects/AdvSearch.aspx File from MIGA Portal
Targeted Interventions	Sector Codes: Solid Waste Management, Waste and Wastewater
Footprint Interventions	Sector Codes: Agribusiness, Chemicals, Infrastructure, Manufacturing, Mining, Oil and Gas, Power, Transportation
Climate Change	• N/A

Source: IEG Review and interviews with World Bank Group subject-matter experts and management

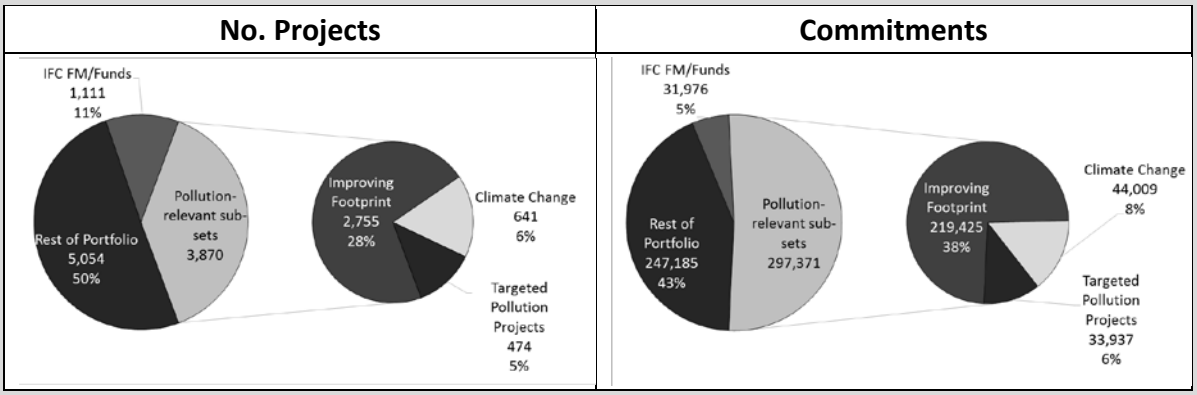
Description of the Identified Portfolio of Pollution-relevant subsets

7. **The Bank Group has deployed a wide range of pollution-relevant instruments and services over the period fiscal years 2004-2015.** The portfolio is expansive both in terms of numbers of projects as well as commitments; it spans the three Bank Group institutions and multiple sectors. Three major subsets make up the pollution portfolio: targeted pollution projects, projects that aim to improve the footprint of pollution-intense industry, and climate change projects. IEG's preliminary portfolio review identified a total of 3,870[1] projects and activities (~40 percent) within

[1] Excludes World Bank ASA from numbers and commitments

this broad portfolio which account for approximately US$297[2] billion in commitments (~50 percent). Of this portfolio, the targeted pollution subset account for 474 projects[3] and activities accounting for approximately US$ 34 billion in commitments (full project amounts) (Figure B 5).

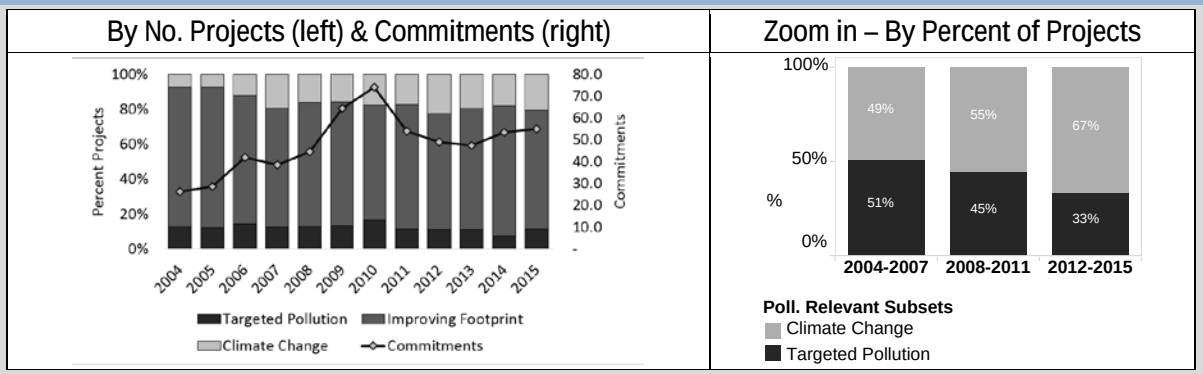
Figure B 5. World Bank Group Portfolio Overall and Pollution-relevant Subsets (FY2004-2015)



Source: IEG Portfolio Review – preliminary results
Note: Commitments include full-project amounts for all Bank Group institutions; excludes World Bank ASA

8. **Over the past 14 years, the Bank Group's targeted support to pollution has experienced a slight decline relative to rest of the pollution-subsets.** In the early period between fiscal years 2004 and 2007, pollution projects accounted for thirteen percent of the Bank Group portfolio and commitments; these figures declined to ten percent of projects and commitments during the fiscal year period 2012 and 2015. Climate change projects, on the other hand, have become more prevalent over time. In the early period, fiscal years 2004 to 2007, climate change projects accounted for thirteen percent of projects and seven percent of commitments while in the later period between 2012 and 2015, these figures rose to twenty percent of projects and fourteen percent of commitments (Figure B 6a). Zooming in to the targeted pollution and climate change portfolios more clearly depicts this trend (Figure B 6b).

Figure B 6. World Bank Group Portfolio of Pollution-relevant Sub-sets Over Time (FY2004-2015)

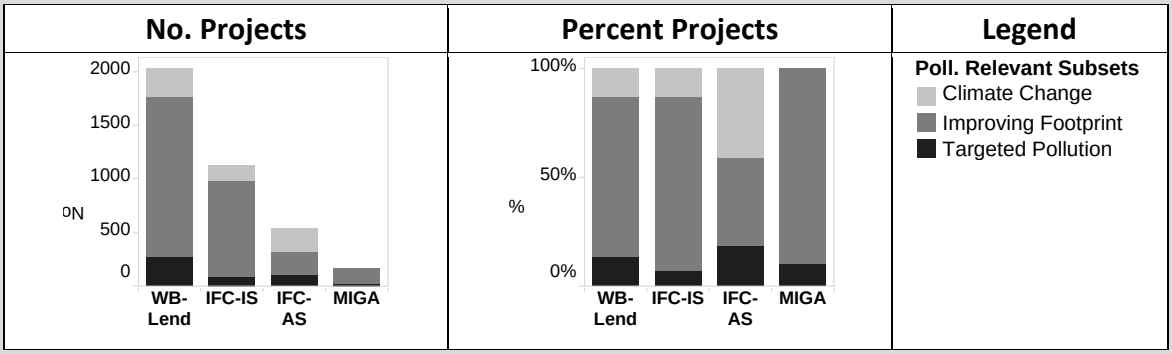


Source: IEG Portfolio Review – preliminary results
Note: Commitments include full-project amounts for all Bank Group institutions; excludes World Bank ASA

[2] Full project amounts
[3] An additional 362 World Bank ASA were identified using this methodology.

9. **The World Bank Group has been active in the pollution relevant space through targeted and non-targeted projects.** The World Bank accounts for the largest share of the World Bank Group pollution relevant portfolio (2,032 projects or 53 percent). Much of this comes from the Bank's "improving footprint" subset which accounts for 73 percent of the 2,032 projects. The IFC Investment and MIGA Guarantee portfolios are similarly weighted with "improving footprint" projects accounting for 80 and 90 percent of their pollution relevant portfolios respectively (out of 1,130 and 172 projects respectively). IFC Advisory is the only institution with a more limited "reducing footprint" portfolio subset; targeted pollution and climate change subsets account for 80 percent of the institution's total projects (40 percent each). (Fig B 7)

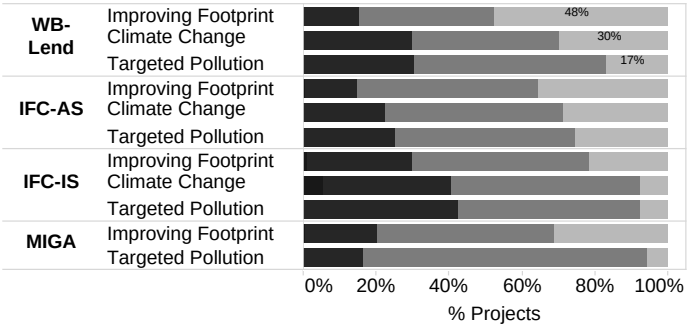
Figure B 7. World Bank Group Pollution-relevant Subsets by Institution (FY2004-2015)



Source: IEG Portfolio Review – preliminary results
Note: Excludes World Bank ASA

10. **Low-income countries receive the smallest relative share of targeted pollution projects across all Bank Group institutions when compared against the "improving footprint" and climate change portfolio subsets.** For example, almost half of the World Bank's "improving footprint" projects over the fiscal years 2004 to 2015 period were in low-income countries (LIC). Low-income countries received thirty percent of the Bank's climate change projects and only 16 percent of the targeted pollution projects. This relationship holds for IFC advisory and MIGA guarantees. For IFC investment, low-income countries see the same small share of climate change and targeted pollution projects. (Fig B 8)

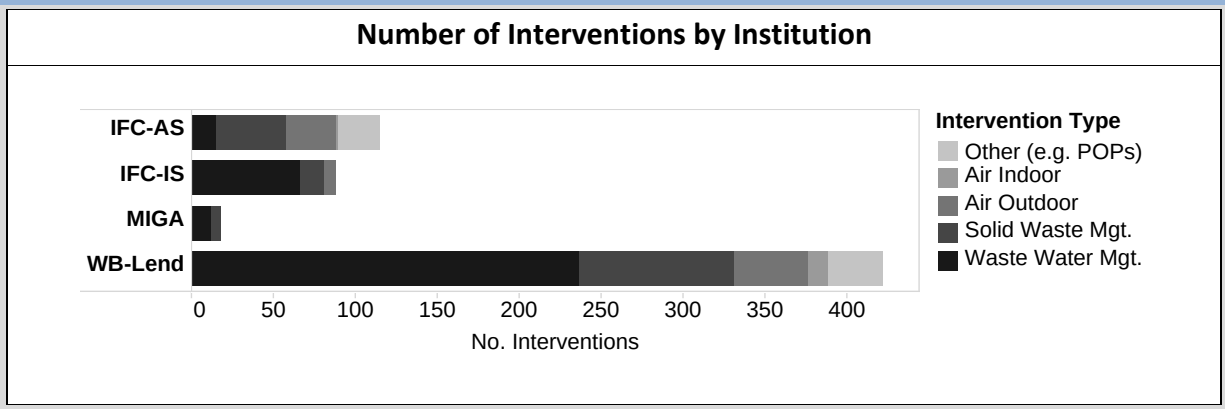
Figure B 8. World Bank Group Pollution-relevant Subsets by Institution and Income level (FY2004-2015)



Source: IEG Portfolio Review – preliminary results
Note: Excludes World Bank ASA

11. **The most prevalent interventions across the World Bank targeted pollution portfolio are waste water and solid waste management while air pollution (both outdoor but in particular indoor) are far less prevalent (Fig. B 9).**

Figure B 9. World Bank Group Targeted Pollution Portfolio Across Institutions (FY2004-2015)



Source: IEG Portfolio Review – preliminary results
Note: Excludes World Bank ASA; Other includes POPs, ODS; Projects may contain more than one intervention, thus the numbers above may be greater than the number of direct pollution projects

12. **The World Bank's targeted pollution portfolio is concentrated in a few Global Practices and focuses mainly on waste water and solid waste management.** During the evaluation period, the World Bank approved 275 projects accounting for US$ 30 billion. Most projects (80 percent) lie within the following Global Practices: Water, Environment and Natural Resources, and Social, Urban, Rural, and Resilience. Investment lending is the most often utilized lending instrument of projects (87 percent) while the remaining 13 percent are development policy loans.

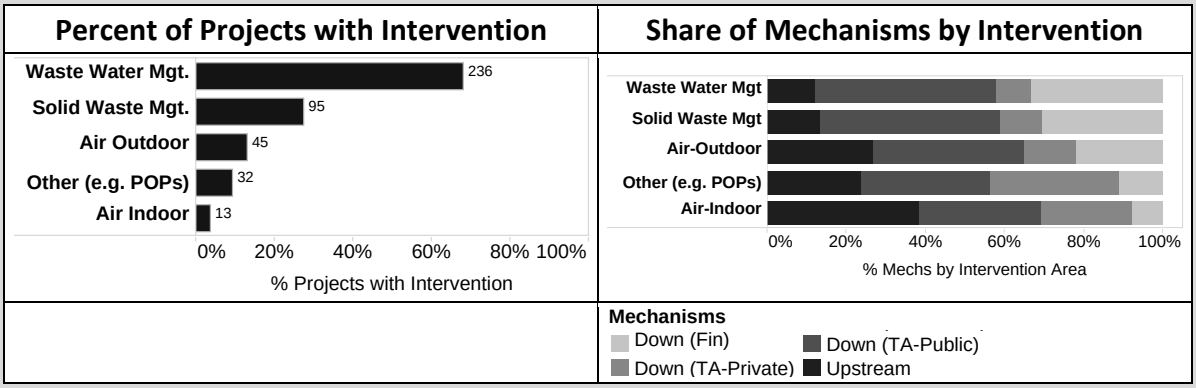
13. **In recent years, World Bank approvals for targeted pollution projects has declined while climate change projects have increased.** While almost 100 projects were approved between fiscal years 2004 and 2007 and between 2008 and 2011, 67 projects were approved in the later period (between 2012 and 2015) representing a 35 percent decrease from the early to later period. The climate change portfolio subset, however, saw the opposite trend: while 73 projects were approved between 2004 and 2007, almost 100 projects were approved in each of the following two periods, representing a 34 percent increase from the early to the later period.

14. Of the 362 World Bank ASA delivered during the evaluation period, 65 percent lie in the Environment global practice while an additional 11 percent are in Energy and Extractives, and 10 percent in water. Projects are almost evenly distributed across ESW (191 activities) and TA (171 activities).

15. **The World Bank's portfolio is diverse and includes upstream policy support and capacity building of public institutions as well as downstream support to the private sector and through direct investment.** While the World Bank's portfolio shows diversity, it is also concentrated: almost three quarters of its portfolio contain activities in waste water and solid waste management. This support was mainly carried out through downstream TA (both public and private) and direct investment. For example, in Croatia, the Coastal Cities Pollution Control APL aimed to "improve the quality of Croatia's Adriatic coastal waters to meet European Union ambient quality standards in the participating municipalities, in a financially and operationally sustaina-

ble manner" by investing in the construction and expansion of sewerage networks, main collectors, pumping stations, wastewater treatment plants, and submarine outfalls. In addition, the project's components included support for: devising and implementing a framework for water pollution control, complete engineering designs and environmental and social assessments for investments, strengthen utilities management, facilitate private sector participation, etc (Fig B10).

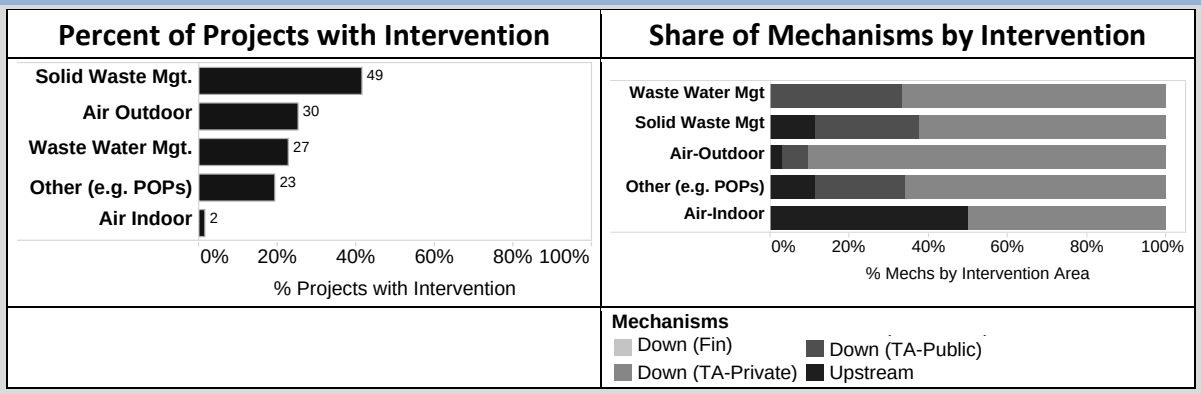
Figure B 10. World Bank Targeted Pollution Portfolio by Intervention and Mechanism (FY04-15)



Source: IEG Portfolio Review – preliminary results
Note1: Other includes POPs, ODS
Note2: Projects may contain more than one intervention, thus the numbers above may be greater than the number of direct pollution projects

16. **For IFC Advisory, 101 targeted pollution projects were approved during the evaluation period accounting for US$106 million of total funds managed by IFC.** The majority of these projects (80 percent) are within the CAS business line, mainly CAS-Energy and CAS-PPP. Similar to the World Bank, the number of projects dropped from a high of 41 in 2008-2011 to 26 in 2012-2015 while climate change projects remained stable at around 70 projects per period (Fig B 11).

Figure B 11. IFC Advisory Targeted Pollution Portfolio by Intervention and Mechanism (FY04-15)

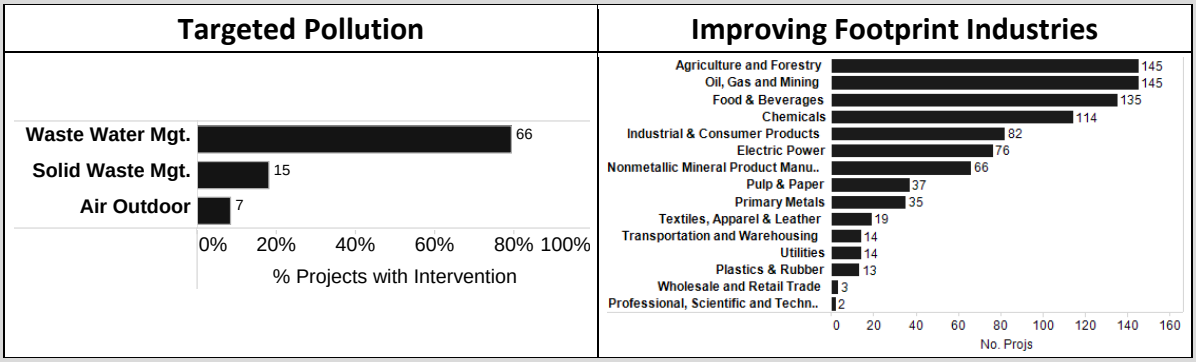


Source: IEG Portfolio Review – preliminary results
Note1: Other includes POPs, ODS
Note2: Projects may contain more than one intervention, thus the numbers above may be greater than the number of direct pollution projects

17. **The set of IFC Advisory interventions in its targeted pollution portfolio are more balanced across air, water, and solid waste than other Bank Group institutions.** While solid waste management accounts for nearly forty percent of projects in the IFC Advisory portfolio, air pollution (indoor and outdoor) and waste water management account for nearly 25 and 20 percent of projects, respectively. The mechanism most often across this portfolio was technical assistance to private and public sector entities while upstream policy support was present but less prevalent. In Maldives, in order to increase private sector participation and investment in solid waste management, IFC Advisory would assist the government in developing a strategy for establishing solid waste management services and identifying a private partner for the strategy's implementation.

18. **IFC targeted pollution investments more than doubled from a low of 14 during the period 2004-2007 to 34 in 2008-2011 and 32 in 2012-2015, totaling 80 investments worth US$ 1.8 billion.** Most of its activities (80 percent) have been focused on the utilities sector with the remaining 20 percent focusing on cleaner production across a variety of sectors such as chemicals, pulp and paper, and industrial and consumer products. IFC projects often aligned themselves with climate change objectives. For example, in Turkey, a cleaner production project aimed to improve the energy efficiency of a company as well as install new generation equipment which would reduce the need for detergents and other pollutants. The IFC targeted pollution portfolio also includes a series of projects addressing municipal and city waste and waste water treatment concerns. (Fig B 12)

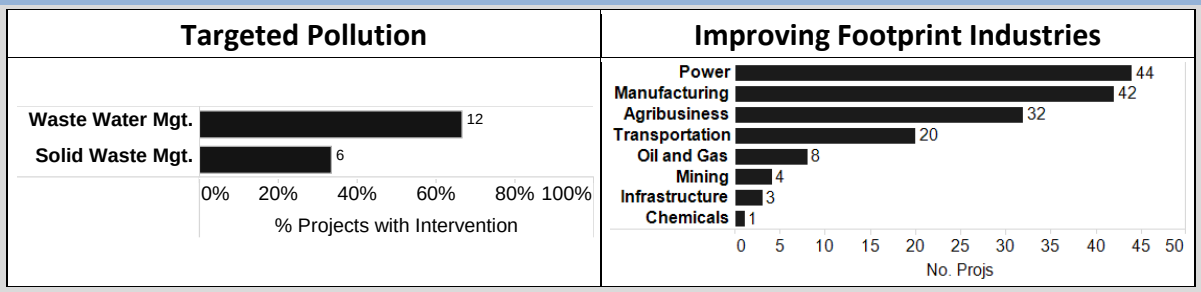
Figure B 12. IFC Targeted Pollution Portfolio by Intervention and Mechanism and Improving Footprint Industries (FY04-15)



Source: IEG Portfolio Review – preliminary results
Note1: Other includes POPs, ODS
Note2: Projects may contain more than one intervention, thus the numbers above may be greater than the number of direct pollution projects

19. **Three quarters of MIGA's targeted pollution projects were approved during the early period between 2004 and 2007.** Two additional contracts of guarantee underwritten for each of the later periods, 2008-2011 and 2012-2015, totaling 441 of gross exposure. All of MIGA's projects are in the waste water and solid waste management sectors (Fig B 13). In Senegal, for example, MIGA issued a series of guarantees to support the establishment and operation of a waste management system in Dakar as a build-own-operate-transfer contract which involved street cleaning, collection and transportation of urban solid waste, recycling, landfill disposal of non-recyclable waste, and the production and commercialization of compost fertilizer.

Figure B 13. MIGA Targeted Pollution Portfolio by Intervention and Mechanism and Improving Footprint Industries (FY04-15)



Source: IEG Portfolio Review – preliminary results
Note1: Other includes POPs, ODS
Note2: Projects may contain more than one intervention, thus the numbers above may be greater than the number of direct pollution projects

Attachment C: Lessons from Previous IEG Evaluations

Environmental Sustainability Evaluation 2008: The study emphasized that World Bank Group's advisory activities have been crucial in influencing national policies, especially when it came to areas like industrial pollution abatement. The study stressed the constant need for supervision of projects to track progress when it comes to pollution management, by encouraging setting up pollution control systems upfront for IFC & MIGA projects. The study points out the "counter-vailing" factors against environmental quality interventions, especially in rapidly industrializing countries—leading to the dilemma of economic development versus environmental sustainability.

Investments in Renewable Energy Generation 2015: This category I learning product evaluated the role of IFC investments in this area. The evaluation also highlighted the need for ongoing monitoring and evaluation (M&E) of renewable energy projects to see what differences in emissions such interventions have led to.

Climate Change Study Series I-III (2009, 2010, and 2011): IEG's work in the area of climate change is indispensable when approaching the subject of pollution, especially under the climate change lens. The three studies in the series on climate change (especially the first one) emphasized a regulatory approach to encourage collaborative action to address a global concern like climate change. Like the other two IEG evaluations mentioned, the climate change series also raised the question of economic development versus environmental management (particularly in terms of climate change), and the growing need to keep track of and supervise projects for emission levels. Monitoring emission levels is paramount when it comes to tracking ambient air pollution. The final study in the series focused on climate change adaptation, which was found to have a focus of relatively less relevance to a macro evaluation of air and water pollution.

Safeguards: The evaluation concluded that the World Bank's safeguard policies are imbalanced, with environmental assessment (Operations Policy4.01) covering a very broad spectrum of environmental issues, as opposed to IFC's binding requirement for its clients to use EHS guidelines for specific guidance and requirements to prevent pollution. Where the Bank Group's cutting-edge approach and identification of risks upfront is crucial for effectiveness, however, there is a need for effective implementation and supervision and for the checks and balances provided by M&E, disclosure of findings, and verification of results.

Sources: IEG 2008, IEG 2015; IEG 2009 and 2010; IEG 2011

Attachment D

Outline of Evaluation Report

1. Evaluation Summary
2. Introduction – Pollution and the Poor
    a. Definition, evaluation and application in development
    b. The Challenge of finding the right tradeoffs: pollution vs. economic growth – results of a literature review
    c. The World Bank Group's role in supporting pollution management – strategy and operations
3. Relevance of the Bank Group's interventions in pollution management
    a. Relevance at global level – results from the strategic mapping
    b. Alignment with country priorities -- results from 37 desk-based country cases
4. World Bank Group effectiveness of pollution-"targeted" interventions
    a. Bank Group systemic interventions for policy frameworks to address pollution in client country
    b. Bank Group targeted interventions in cleaner production and VC
    c. Bank Group targeted interventions in the relevant infrastructure areas
5. Effectiveness of the Bank Group's application of safeguards and performance standard in pollution management
    a. The effects of IFC Performance Standards and WB Safeguards
    b. The linkages of climate change and pollution management – results of the literature review
6. Work Quality, coordination and leveraging synergies across the World Bank Group
7. Conclusions and Recommendations

Attachment E

Data Sources on Pollution

Source	Description	Shortcoming and Suggested Solution
Institute for Health Metrics and Evaluation (IHME)	Provides health-related data based on global, regional, and country profiles. Data results can be found in the form of "visual" maps, policy reports, and infographics including on topics of pollution	In terms of exposure data, only air pollution is covered. Solution: data can be disaggregated based on the various risk factors (exposure to toxic material, fuel exhausts, etc.) in order to produce results relevant to sources of pollution other than air.
WHO	Data on ambient air pollution emissions, unsafe water, HAP	Emissions measured by PM, and missing for many countries (especially in Africa). Solution: bridge the data gap by taking data from EPI, and layering it with UNEP data that differentiates between different particulate matters.
EPI (Yale)	Data on drinking water, environmental risk exposure, air pollution in terms of exposure to PM and NOx	Economic losses due to pollution are not reported here.
UNEP	Broad spectrum of harmful substances (including Nox and SO2) and hazardous waste	Data varies in terms of timeline, with some data being dated and out of scope for this evaluation. Solution: bridge the data gap by taking data from EPI, and get more information from country cases
World Bank	Data on economic losses due to particulate emissions, emission levels (CO2 included)	Instead of "air pollution", only particulate emissions are recorded.
UNSTATS	Solid database hosting different data sources, easily searchable to redirect to several databases	Can be challenging to obtain uniform data from a single source on multiple indicators useful for this evaluation.
WRI Climate Data Explorer	Hosts tools on emissions data, international treaties on climate change and emissions, computes socio-economic indicators related to emissions	More of a "big picture" data for a broader understanding of the topic, however, not too useful for the methodology.

Source: IEG.

Attachment F

World Bank Group Internal Policy Framework to Address Pollution – The EHS Guideline, Safeguards and Performance Standards

The World Bank Group's involvement in pollution management started almost three decades ago. The World Bank published Environmental Guidelines in 1988 to provide technical advices and guidance to both staff and consultants involved in projects with pollution potential.

Ten years later, the World Bank updated and replaced the 1988 guidelines with the Pollution Prevention and Abatement Handbook (PPAH). The 1998 PPAH described pollution prevention and abatement measures and emission levels that were acceptable to the Bank and was developed to be used in the context of the Bank Group's Operational Policy (OP) 4.01 "Environmental Assessment". The OP 4.01 was developed in 1999 (revised later in 2013) and required environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable.

Similarly, IFC and MIGA also adopted similar safeguards and applied PPAH to the private sector projects. However, in 2003 IFC launched work to update PPAH. While this update was in progress, IFC developed eight Performance Standards (PS) as part of its Policy on Social and Environmental Sustainability (PSES) in 2006 (revised later in 2012). Performance Standard 3 was mostly dedicated to the Pollution Prevention and Abatement aspects and recognized that increased levels of air and water pollution due to increase industrial activity and urbanization may threaten people and the environment. In 2007, IFC published over 60 Environmental, Health and Safety (EHS) Guidelines for wide range of sectors and these World Bank Group EHS Guidelines were referred in IFC/MIGA Performance Standards and the Bank's OP 4.01. Thus, the World Bank Group EHS Guidelines replaced the 1998 PPAH and included acceptable pollution prevention and abatement measures and emissions levels (both for air and water) in Bank Group-financed projects.

Currently, both the Bank and IFC/MIGA address air and water pollution using the World Bank Group EHS Guidelines as referenced in the OP 4.01 and the PSES, respectively. The World Bank Group EHS Guidelines are widely used in the world by other development institutions

Attachment G

Criteria underlying the selection of field work (country case studies and PPARs)

The proposed field-work covers the World Bank Group's work around the most important pollution concerns relating to air, water, and waste while providing an opportunity to delve deep into specific sector issues, intervention types, and the use of unique instruments or approaches. The evaluation proposes five field-base case studies of which two will also include a PPAR. In addition, the evaluation will collaborate with two recently launched IEG evaluations which will be conducting field-work in China and India in the related fields of urban transport and water and sanitation in order to leverage IEG's overall country reach. In total eleven countries will be visited, taking PPARs and the two parallel missions to India and China into account.

Air pollution, one of the major killers, will be covered in five out of these ten countries. Two of these countries include indoor air pollution concerns while outdoor air pollution concerns will also be covered through the industry lens in targeted projects such as Egypt's Pollution Abatement series as well as through footprint projects in heavy industry. Waste management concerns will be covered in four out of the five country case studies, for example, through the Colombia DPL series and related investments in solid waste management. Waste water management will be covered in all country case studies through targeted and footprint projects. In Croatia, for example, the World Bank's Coastal City Pollution Control supported investments in sewage networks, pumping stations, and wastewater treatment plants while IFC Investment and Advisory work supported the animal processing sector to better manage wastewater.

By coordinating with planned IEG missions to China and India, conducted by the urban transport and water and sanitation teams, this evaluation will not only increase the diversity and coverage of field-work, it may also shed light into missed opportunities – that is, cases where pollution management could have been included in project design. Such missions are referred to as "co-mission" in the Table G 1 below.

Table G 1: Coverage of interventions by country field work and PPARs

Method Type	Countries	Coverage	Air Indoor	Air Outdoor	Solid Waste Mgt.	Waste Water Mgt.	Other (e.g. POPs)
Country Case Study	Colombia	CCS	1 (1)	10 (1)	5 (1)	6 (1)	
	Croatia	CCS + PPAR				6 (1)	
	Egypt,	CCS + PPAR		1 (1)	2 (1)	6	2
	Ghana	CCS	1	2 (1)	2 (1)	2 (1)	3 (1)
	Indonesia	CCS		3 (1)	4 (1)	4 (1)	
PPAR	Morocco/ Tanzania/ Ethiopia	PPAR					3 (3)
Co-mission	China	Co-mission + PPAR		X		X	
	India	Co-mission		X		X	
Total			2 (1)	16 (4)	13 (4)	24 (4)	8 (4)
Note: Projects may contain one or more of the interventions described above, thus, totals may be greater than the actual number of projects							

Details on the five mission-based country cases

Country	Rationale
Colombia	The Colombia Case Study is unique in that it offers an opportunity to study the use of a series of World Bank environmental DPLs and complementary Investment lending as well as IFC's use of the cleaner production lending program and significant engagement in the paper and packaging industries. Colombia has a series of Sustainable Development DPLs which aim to strengthen environmental institutions and support laws relating to "air quality, water quality, solid waste management, and environmental licensing will also be supported." The DPL series ICRR states that a PPAR "of this series together with similar series … would be highly instructive on ways in which programmatic DPLs can be used effectively to strengthen environmental protection institutions and policies." In addition to a country environmental assessment, the country contains a strong package of AAA focusing on strengthening environmental institutions and sector issues such as waste water and sanitation sector issues. The country's substantial IFC portfolio offers a unique opportunity to study the paper and packaging industry from the perspective of investment lending (including cleaner production) and advisory services. The portfolio also contains a number of evaluated projects in industries such as agribusiness (dairy), oil and extractives, and power generation. In addition, the World Bank's portfolio contains a series of targeted pollution investments which focus on waste water and sanitation and directly addressing air pollution concerns through transport and mass-transit projects.
Croatia	The Croatia Case Study will add a unique perspective to the evaluation given its portfolio in pollution management of agriculture and agro-processing activities and pollution control of coastal cities to meet ambient quality standards. The World Bank and IFC have been active in the area of pollution management of agriculture and agro-processing activities. Belonging to the targeted pollution portfolio, the GEF "Agriculture Pollution" project supported the use of environmentally friendly agricultural practices by farmers in Croatia's Danube River Basin in order to reduce nutrient discharge from agricultural sources to surface and ground water bodies. This project was identified as a PPAR candidate and will thus provide additional depth of analysis to the country case study. Linked IFC Investment and Advisory projects were also identified in the country's "improving the industrial footprint" portfolio focusing on wastewater and bio-waste treatment emanating from animal rearing, slaughtering, and meat processing. Coastal city pollution concerns were addressed through the country's "Coastal Cities Pollution Control" APLs I & II and a GEF grant. These projects aimed to manage pollution concerns of coastal cities through investments in (among others) construction and expansion of sewerage networks, pumping stations, wastewater treatment plants as well as institutional strengthening and support to develop an institutional framework for water pollution control. This support has been provided through both World Bank and GEF projects as well as through AAA on private sector participation in solid waste management, providing an opportunity to study the synergies and complementarity of AAA, World Bank lending, and GEF interventions.
Egypt	The Egypt Case Study provides an opportunity to learn from a portfolio covering a diverse number of issue areas (e.g. air pollution, industrial runoffs, and coastal pollution management) that is rich in institutional presence (i.e. World Bank, IFC IS/AS, and MIGA) and utilizes rare mechanisms such as financial intermediary lending for industrial pollution abatement from which the evaluation can derive lessons and best practices for future operations.

	Egypt presents a unique opportunity to study industrial pollution abatement through the lens of a rare mechanism, financial intermediation, with significant potential for learning and identification of best practices. Unlike previous attempts in other countries, the World Bank's Second Pollution Abatement project in Egypt successfully utilized a Line of Credit approach directed at abating industrial pollution. The project also leveraged an innovative multi-donor approach which included concessionary loans from the European Investment Bank, French Development Agency, and Japan Investment Cooperation. The project aimed to demonstrate that market-based financial and technical approaches are an effective way to help reduce industrial pollution in selected hot-spot areas around Alexandria and the Greater Cairo areas. In addition, the project aimed to support the capacity of the Egyptian Environmental Affairs Agency and contains a stand-alone Carbon Finance sub-program that also addressed pollution concerns. For these reasons, the project was selected as an ideal PPAR candidate by IEG; the PPAR will carefully look at why the Bank followed this approach in Egypt and will focus on identifying its drivers of success such that they may become a best practice approach that can be replicated in other countries. Egypt's substantial analytical works provide insight into country-wide, sector, and resource concerns. Such AAA include an extensive Country Environmental Assessment (CEA) and one of the few follow-up CEA as well as focused pieces on urban air quality and water management issues. The 2013 Assessment of Air Quality in Cairo contains an extensive review of existing data and analysis on air quality and emissions inventory and the development of an air dispersion modeling study of major pollutants. The role of women in environment were also considered through a non-lending TA using skills building and awareness building mass communication campaigns. Environmental degradation concerns were addressed through GEF work on coastal management while recent investments aim to deal with POPs concerns. The GEF Alexandria CZM and Lake Mariout project aimed to improve institutional mechanisms to reduce land-based pollution to the Mediterranean sea focusing on pollution reduction through treatment and other reduction measures. Other exotic topics include the 2014 Sustainable POPs Management project which aims to improve the management and disposal of targeted stockpiles in an environmentally sound manner. Egypt provides an opportunity to study the three Bank Group institutions in the targeted pollution space. All three Bank Group institutions are present in the Egypt's waste and waste water sectors, providing an opportunity to dive deeply into this sector while learning about the complementarity and sequencing of World Bank Group activities in this area. This work focused on building institutional capacity and sector frameworks, improving the quality of monitoring systems, and building or improving physical infrastructure. Analytical work underpinning this area includes urban development and sector policy work, suggesting a holistic approach to the delivery of waste and waste water services.
Ghana	Ghana's Country Case Study offers an excellent opportunity to learn from the World Bank Group's substantial engagement in the oil production and development sector through World Bank analytics, investments, and policy operations that aimed to strengthen the country's Environmental Protection Agency (EPA) and through IFC Investments and MIGA Guarantees directed at this sector. In addition, the case study provides an opportunity to study the WB/IFC's work in indoor air pollution and waste management. In June 2007, Ghana discovered commercial quantities of light crude oil with significant amount of associated natural gas in its offshore area. Since then, the World Bank has supported the country through AAA focused on use and management of oil revenue (2009) and legal and regulatory concerns (2010). A three part DPL series on natural resource management and environmental governance addressed emerging oil sector concerns and to adopt a more holistic, integrated approach to the management of its extractive industries and supported the country's EPA in strengthening its Environmental Impact Assessment (EIA) through legislation and updated sector guidelines for the oil, mining, forestry, energy, and transport sectors. The World Bank's Gas and Oil Capacity Building project (2009 and 2011 AF) would help strengthen the capacity of the country's EPA to quickly react to oil spillages and improve its moni-

	toring capacity to ensure coastal waters are not polluted by offshore oil activity. In conjunction, IFC supported four investments in this sector for which one has been evaluated while a 2010 MIGA guarantee supported a floating production storage and offloading facility. Air pollution concerns have been addressed through World Bank urban development projects which aimed to reduce dust and the IFC/WB Lighting Africa program which promoted the use of cleaner and affordable lighting alternatives to fuel-based lighting. The program is jointly managed by IFC-World Bank; Ghana was one of the program's two pilot cases. Other pollution concerns were also addressed by the World Bank's engagement in urban development, focusing on solid waste management (improved landfills and dumps), and water management plans (rehabilitated sewers). The Ghana Greater Accra Metropolitan Area Sanitation and Water project focused on solid and liquid waste management and envisioned working closely with IFC to engage the private sector to strengthen sustainability of treatment facilities and expand services in target areas through business development support.
Indonesia	In Indonesia, the World Bank Group's pollution-relevant portfolio is overall substantial but with specific areas of inquiry not readily available in other countries, namely the link between transport, fuel subsidies and standards, and air quality concerns. The World Bank's portfolio includes a series DPLs in the infrastructure sector which provide an opportunity for the evaluation to study how such a series can support the pollution abatement agenda through the lens of oil subsidies. In conjunction, the portfolio contains a substantial number of targeted pollution AAA, including a Country Environmental Assessment and two on Persistent Organic Pollutants awareness and capacity building. The portfolio also includes an economic and sector work titled "Fuel Quality Issues and Air Pollution" which aimed inform the Bank the current situation with regards to vehicle emissions and fuel quality standards and key actions that need to be taken. While much of the discussion focuses on GHG reduction, the report also includes a substantial discussion on conventional pollutants stating that "his report describes the factors affecting transport sector emissions in a simple overview framework. To begin reducing emissions within the Indonesian context (both greenhouse gases and conventional pollutants), simple policies in the transportation sector that promote economic efficiency and incentives could help. In particular, GHG reduction policies that increase fuel savings from cars and trucks would give multiple benefits. Based on international experience, the simplest way to reduce fuel use (and associated GHG emissions and air pollution) is through vehicle emission and fuel quality standards." IFC Investments in the motor vehicle parts industry provides a private sector perspective to this issue area. In addition, IFC's portfolio that aims to reduce industrial footprint includes six evaluated projects, three of which are in chemicals and textiles industry. In particular, one of these three investments includes a semi-targeted component, meaning that part of the loan would be utilized to increase the company's capacity to use renewable raw material and reduce its environmental impact. Finally, the portfolio includes a series of projects in waste and waste water through IFC Investments and embedded in the World Bank Infrastructure DPLs.

Attachment H

Preliminary Analysis of Systematic Reviews (SRs) from 3ie

Owing primarily to the data from International Initiative for Impact Evaluation (3ie), a preliminary analysis of systematic reviews (SRs) found that HAP from indoor smoke is an important risk factor for pneumonia and chronic respiratory diseases, and concluded that reduction of HAP through switching to "cleaner" fuels would make an important contribution to prevention of pneumonia morbidity and mortality. Other SRs concluded that sewerage systems in urban settings and clean drinking water access for households significantly reduce incidences of diarrhea and related health outcomes. SRs from other sources also concluded that reduction in indoor air pollution and ambient air pollution reduce the mortality from strokes and cardiac failures, ultimately reducing the health economic consequences.

Looking at a first group of SRs, approved by 3ie, yield the following picture: A significant SR of evidence (Puzollo et al, 2013)[4] finds that Household air pollution from solid fuels (HAP) is an important risk factor for pneumonia, chronic respiratory diseases and several other health outcomes, resulting in more than 3.5 million annual deaths and improvements to household energy technology and fuels can bring many benefits (in addition to disease prevention): including reductions in pollution emissions and exposure, greater fuel efficiency with associated cost and time savings. Another SR on HAP (Lewis & Pattanayak, 2102)[5] found evidence of a systematic and theoretically consistent relationship between adoption of clean energy products and socioeconomic status (including income, education, and social marginalization) and urban location. An SR commissioned by WHO (Dherani et al, 2008)6 concluded that reduction of HAP from solid fuel use, for example, through switching to other fuels would make an important contribution to prevention of pneumonia morbidity and mortality. Similarly an SR and meta-analysis on effects of sewerage in developing countries (Norman et al, 2010)[7] finds that where water-borne sewerage may not be the appropriate choice in all settings, however, replacing on-site sanitation in urban settings with such sewerage systems seems to substantially reduce the incidence of diarrhea and related outcomes. Another SR based on 33 studies from 21 different developing countries across

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[4] Puzzolo, Elisa, Debbi Stanistreet, Daniel Pope, Nigel Bruce, and Eva Rehfuess. "Factors Influencing the Large-scale Uptake by Households of Cleaner and More Efficient Household Energy Technologies." EPPI-Centre, 2013

[5] Lewis, Jessica J., and Subhrendu K. Pattanayak. "Who Adopts Improved Fuels and Cook stoves? A Systematic Review." Environmental Health Perspectives, May 2013, 637-45.

[6] Dherani, Mukesh, Maya Mascarenhas, Daniel Pope, Kirk R. Smith, Martin Weber, and Nigel Bruce. "Indoor Air Pollution from Unprocessed Solid Fuel Use and Pneumonia Risk in Children Aged under Five Years: A Systematic Review and Meta-analysis." Bulletin of the World Health Organization, 2008.

[7] Norman, Guy, Steve Pedley, and Bahi Takkouche. "Effects of sewerage on diarrhoea and enteric infections: a systematic review and meta-analysis." Lancet, 9 July 2010, Volume 10 , Issue 8 , 536 - 544

the world on drinking water quality (Clasen et al, 2007)[8] concluded that Interventions to improve water quality are generally effective for preventing diarrhea in all ages and in under-fives, with estimates suggesting interventions result in 30 to 50 per cent reductions in diarrhea disease among children, on average. Similarly, an SR on health outcomes related to household water quality in developing countries (Gundry et al, 2004)[9] found that there is a clear association between storage water contamination and cholera cases and that these can be avoided by introducing water treatment and storage at the household level.

Other Sources: Other SRs worth mentioning (not hosted on 3ie) concluded that air pollution has a close temporal association with heart failure hospitalization and heart failure mortality. Although more studies from developing nations are required, air pollution is a pervasive public health issue with major cardiovascular and health economic consequences, and it should remain a key target for global health policy (Shah et al, 2013)[10]. A later study by the same authors only reinforced the same results by finding that gaseous and particulate air pollutants have a marked and close temporal association with admissions to hospital for stroke or mortality from stroke. Public and environmental health policies to reduce air pollution could reduce the burden of stroke (Shah et al, 2015)[11].

Other Technical Studies: SRs from various sources (primarily 3ie) also covered technical aspects of water and air pollution, which do not have a direct relevance to the scope of this evaluation but they might be worth looking at in order to draw relation with the impact of pollution on the poor. Following are the studies and corresponding findings:

Title: Are interventions to reduce the impact of arsenic contamination of groundwater on human health in developing countries effective? A systematic review

Main findings: "Most studies were poorly conducted and reported. Consequently, although some technologies met national guidelines, the evidence-base for decision-making regarding arsenic mitigation technologies at household- and community-level is weak. To improve this situation, primary research needs to be commissioned with adequate sample sizes, testing the impact of

[8] Clasen, Thomas, Wolf-Peter Schmidt, Tamer Rabie, Ian Roberts, and Sandy Cairncross. "Interventions to Improve Water Quality for Preventing Diarrhoea: Systematic Review and Meta-analysis." The British Medical Journal, January 4, 2007.

[9] Gundry, Stephen, Jim Wright, and Ronan Conroy. "A Systematic Review of the Health Outcomes Related to Household Water Quality in Developing Countries." Journal of Water & Health, 2004.

[10] Shah, Anoop SV, Jeremy P. Langrish, Harish Nair, David A. McAllister, Amanda L. Hunter, Ken Donaldson, David E. Newby, and Nicholas L. Mills. "Global Association of Air Pollution and Heart Failure: A Systematic Review and Meta-analysis." Lancet, September 21, 2013, 1039-048.

[11] Shah, Anoop SV, Jeremy P. Langrish, Harish Nair, David A. McAllister, Amanda L. Hunter, Ken Donaldson, David E. Newby, Kuan Ken Lee, and Nicholas L. Mills. "Short term exposure to air pollution and stroke: systematic review and meta-analysis" The British Medical Journal, 2015.

key contextual factors, using valid tools for analysis, and meeting standards for completeness of reporting." (Jones-Hughes et al, 2013)[12].

Title: Household drinking water in developing countries: a systematic review of microbiological contamination between source and point-of-use

Main findings: "The bacteriological quality of drinking water significantly declines after collection in many settings. The extent of contamination after water collection varies considerably between settings, but is proportionately greater where fecal and total coliform counts in source water are low.

Conclusions: Policies that aim to improve water quality through source improvements may be compromised by post-collection contamination. Safer household water storage and treatment is recommended to prevent this, together with point-of-use water quality monitoring." (Wright et al, 2004)[13].

An evidence gap map was also obtained from 3ie, which consolidates the "knowledge map" on *Water, Sanitation, and Hygiene*: this is visualized in the Figure below. However, the only relevant parts to this evaluation are "water quality" interventions, and sewer/drainage systems under "sanitation". The data on health impacts of water quality is based on 41 impact evaluations and 4 SRs, which equates water quality to diarrhea morbidity largely (as also summarized in the findings above), and absenteeism in terms of education (school attendance), which further translates into data on intermediate outcomes, based on 4 impact evaluations and 1 SR. Similarly, there is data on diarrhea morbidity from lack of sanitation (sewer/drainage systems) based on 3 impact evaluations and 1 SR. As seen from the gap map, there is a lack of evidence-base on these two aspects of pollution management, which leaves big gaps in health impacts (other than diarrhea), non-health impacts, and intermediate outcomes of water quality and sanitation.

[12] Jones-Hughes, Tracey, Jaime Peters, Rebecca Whear, Chris Cooper, Hywel Evans, Michael Depledge, and Mark Pearson. "Are interventions to reduce the impact of arsenic contamination of groundwater on human health in developing countries effective? A systematic review" The Official Journal of the Collaboration for Environmental Evidence, 2013.

[13] Wright, John, Gundry Stephen, and Conroy Ronan "Household drinking water in developing countries: a systematic review of microbiological contamination between source and point-of-use" Tropical Medicine and International Health, January, 2004.

Table H 1. Summary of Findings of Systematic Review related to Pollution

Title Authors (Year)	Types of Studies	Source	Impacts	Mitigation Benefits
"Factors Influencing the Large-scale Uptake by Households of Cleaner and More Efficient Household Energy Technologies." Puzzolo et al. (2013)	SR (3ie approved)	HAP	Pneumonia, chronic respiratory diseases and several other health outcomes	Reduction in emissions & exposure, economic benefits (fuel efficiency and cost & time savings)
"Indoor Air Pollution from Unprocessed Solid Fuel Use and Pneumonia Risk in Children Aged under Five Years: A Systematic Review and Meta-analysis." Mukesh et al. (2008)	SR (3ie approved)	HAP	Pneumonia	Reduction in pneumonia morbidity and mortality
"Effects of sewerage on diarrhoea and enteric infections: a systematic review and meta-analysis." Norman et al. (2010)	SR (3ie approved)	Household waste	Diarrhea	Reduction in diarrhea incidences in urban settings
"Interventions to Improve Water Quality for Preventing Diarrhoea: Systematic Review and Meta-analysis." Clasen et al. (2007)	SR (3ie approved)	Unsafe drinking water	Diarrhea	Effective for preventing diarrhea in all ages and in under-fives
"A Systematic Review of the Health Outcomes Related to Household Water Quality in Developing Countries." Gundry et al. (2004)	SR (3ie approved)	Unsafe drinking water	Cholera	Can prevent cholera cases in future
"Global Association of Air Pollution and Heart Failure: A Systematic Review and Meta-analysis." Shah et al. (2013)	SR (British Medical Journal)	Ambient Air pollution	Cardiovascular and health economic consequences	Reduced burden from cardiovascular diseases
"Short term exposure to air pollution and stroke: systematic review and meta-analysis" Shah et al. (2015)	SR (Lancet)	Ambient Air pollution	Mortality and hospitalization from strokes	Reduced burden from stroke
"Are interventions to reduce the impact of arsenic contamination of groundwater on human health in developing countries effective? A systematic review" Jones-Hughes et al. (2013)	SR (3ie approved)	Toxic Waste	Inconclusive results due to weak evidence-base	

Sources: Puzollo et al, 2013, Lewis & Pattanayak, 2102, Dherani et al, 2008, Norman et al, 2010, Clasen et al, 2007, Gundry et al, 2004, Shah et al, 2013, Shah et al, 2015, Jones-Hughes et al, 2013.

Figure H 1. Water, Sanitation and Hygiene Evidence Gap Map

Source: International Initiative for Impact Evaluation (3ie)